IMPACT ASSESSMENT REPORT

FOR

HOMES NSW

171 Weston & 2 to 6 Hinemoa Streets, Panania, NSW (BGYAP)

Report No: 24/1466

Project No: 31349/6286D-G

July 2024

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DOCUMENT CONTROL

REPORT TITLE: IMPACT ASSESSMENT REPORT

REPORT NO: 24/1466

Revision	Details	Date	Prepared By
0	Original	June 2024	MT

1. INTRODUCTION

At the request of Homes NSW (The Client), STS Geotechnics Pty Ltd (STS) has prepared this report to assess the potential impact of the proposed development at 171 Weston & 2 to 6 Hinemoa Streets, Panania, NSW (the Site) on the existing Sydney Trains railway corridor near the site.

1.1. Background

This report follows on from the previous Geotechnical Investigation (GI) report (Report No 22/1561 dated May 2022) prepared by STS **(Appendix A)**. The findings and recommendations in GI report were adopted to carry out modelling of subsurface conditions.

The following additional documents were used to assist us with the preparation of this report:

- Detail & Level Survey drawings prepared by Norton Survey Partners; Job No: 52042; Dated 07.06.2024 **(Appendix B.1)**.
- Architectural plan by Morson Group Pty Ltd, 'Panania – LAHC 2021/505 171 Weston & 2 to 6 Hinemoa Streets, Panania', dated 13.02.2024 **(Appendix B.2)**.

Based on the provided documents, STS understands that the proposed development involves the construction of a five-storey residential building with one basement level that will require excavating to a depth of 3 m below the existing ground surface. Ground levels varying from RL 18.8 m AHD at the western site corner to RL 21.0 m AHD at the eastern site corner. According to the architectural drawings **(Appendix B.2)** final level of excavation is about RL 16.8 m AHD.

Based on the information provided, the development is to be constructed within the vicinity of Sydney Trains corridor comprises of two tracks as part of T8 Leppington to City Circle via Airport line. The closest set back to the rail boundary from the site boundary is about 20.1 m. The tracks are running in an east-west direction.

2. FINITE ELEMENT ANALYSIS

Finite Element Analysis (FEA) of the proposed construction has been undertaken using PLAXIS 2D Advanced (Version 22.01.00.452). PLAXIS 2D is a commercially available finite element package intended for the two-dimensional analysis of deformation and stability in geotechnical engineering. It is equipped with features to deal with various aspects of geotechnical structures and construction processes using robust and theoretically sound computational procedures.

The Sheet 4 of the detailed survey plan attached in **Appendix B.1** presents two sections: Section A and Section B, each accurately detailing the distances from the site boundary to the railway corridor. Both sections indicate that the railway corridor is set back 20.1 m from the Weston Street site boundary. Additionally, drawings in the architectural plans **(Appendix B.2)** suggest that the excavation extends approximately 6 m from the site boundary. Therefore, the proposed excavation is approximately 26.1 m away from the railway corridor.

2.1. Subsurface Conditions

The subsurface conditions presented in STS GI report (BH102) were adopted to model the geological subsurface conditions. Survey plans also indicate that, in Section A, ground level near the site boundary is RL 19.0 m AHD and the ballast layer in railway corridor is about RL 19.25 m AHD. Therefore, for the purpose of undertaking a PLAXIS 2D analysis, horizontal ground profile is assumed at RL 19.0 m AHD. The final level of excavation is about RL 16.8 m AHD. Groundwater table is not considered in the FEA as per the observations and recommendations given in the GI report.

Adopted soil profile is presented in Table 1.

Table 1: Subsurface profiles encountered in boreholes.

Material		Depth to Top of Unit (m BEGL)	RL of Top of Unit (m AHD)	Thickness (m)
Topsoil		0	19.0	0.3
Silty Clay		0.3	18.7	2.2
Shale V		2.5	16.2	1.8

The railway corridor is modeled by considering a 150 mm subballast layer overlaid by a 300 mm ballast layer. The side slope of the ballast layer is 1:2, with a ballast shoulder of 600 mm. The rail sleeper was modeled as a plate element with a thickness of 150 mm.

2.2. Adopted Soil & Rock Parameters

The PLAXIS modelling of the soil and bedrock has been carried out using Mohr-Coulomb (MC) material model. Adopted material parameters are shown in Table 2.

Table 2: Summary of adopted material parameters

Material		Material Model	Drainage Type	γ_{unsat} (kN/m³)	γ_{sat} (kN/m³)	E' (MPa)	ν	c' (kPa)	φ (deg)
Topsoil		MC	Drained	17	17	5	0.30	2	25
Silty Clay		MC	Drained	19	19	30	0.30	5	26
Shale V		MC	Drained	22	22	80	0.25	30	28
Ballast		MC	Drained	16	19	25	0.25	-	42
Sub-ballast		MC	Drained	17	17	80	0.30	-	35

Where soil or bedrock is in contact with structural elements, a reduction factor (R_{inter}) of 0.67 has been adopted. This applies to the soil or bedrock strength parameters to model the reduction in shear strength between two non-homogenous materials.

2.3. Structural Model Inputs

STS has assumed a soldier pile wall with shotcrete panels to be founded in Class V Shale. The following structural model properties were adopted. Further analysis will be required if the retaining structure is notably differ from the assumed structural shoring system.

Table 3: Summary of adopted structural model parameters

Structural Element	Element Type	Spacing (m)	Diameter /Thickness (m)	E (kPa)	EA (kN/m)	EI (kN m²/m)
Soldier pile wall	Elastic	2.4	0.6	$3x10^7$	$3.53x10^6$	$4.77x10^4$
Basement Slab	Elastic	-	0.3	$3x10^7$	$9.00x10^6$	$1.60x10^{-2}$

2.4. Applied Loading

The following surcharges have been adopted in this analysis:

- The surcharge imposed by railway has been modelled by assuming uniformly distributed railway traffic loading of 60 kPa over 1.5 m width of each track location.
- The surcharge imposed by the Weston Street has been modelled as uniformly distributed load of 20 kPa.
- The surcharge imposed due to the basement excavation has been modelled as uniformly distributed load of 10 kPa.
- The loading imposed by the building structure has been modelled by considering a 100 kPa uniformly distributed load at the basement.

2.5. Model Phases

The construction sequences adopted in PLAXIS models are based on the provided information. The excavation was modelled using the following phases, in the order shown below.

- Initial Phase – Existing ground conditions on the site
- Phase 1 – Excavate, construct and load railway tracks
- Phase 2 – Reset displacements
- Phase 3 – Shoring wall is installed
- Phase 4 – Excavate BEL
- Phase 5 – Construct basement and apply building load

3. RESULTS OF FEA

An overview of the final model is provided below.

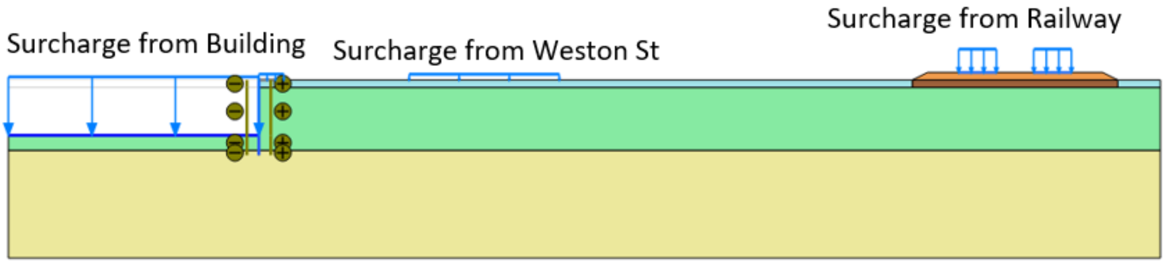

Figure 1: Overview of Phase 5

Outputs and results from the FEA are shown in **Appendix C**. The maximum deflections at selected location predicted by the FEA and their corresponding phases are presented in Table 4**.**

Table 4: Summary of FEA results

Asset	Railway sleeper	Critical Construction Phase
Horizontal deflection towards excavation	0.01 mm	4
Maximum Vertical settlement	0.03 mm	4

Refer to FEA results in Appendix C

4. CONCLUSION

The outcome of FEA suggest that the predicted vertical and horizontal settlements beneath the closest railway track is in the order of within 1 mm because of proposed excavation. Based on the findings and within the limitations outlined below, **STS considers that the proposed excavation will have negligible impact on the Sydney Trains assets, provided appropriate engineered retaining system and construction methodology are employed.**

We recommend that appropriate construction methodology and monitoring program be prepared by the structural engineer and implemented during the construction phases to minimise the impact on Sydney Trains Assets.

It should be noted that 2D analysis does not take into consideration 3D effects such as the propping effect from the corners and load shedding through the capping beam. The use of a 2D model is inherently conservative for the situation under consideration, for the properties adopted in the geological model and thus the predicted displacements are likely to be conservative also, although the extent to which this is the case is difficult to quantify.

Should you have any queries regarding this report, please do not hesitate to contact STS.

Yours faithfully

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5. STATEMENT OF LIMITATIONS

This report has been prepared for the exclusive use of HOMES NSW who is the only intended beneficiary of STS's work. The scope of the investigation carried out for the purpose of this report is limited to those agreed with HOMES NSW.

No other party should rely on the document without the prior written consent of STS, and STS undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without STS's approval.

STS has used a degree of care and skill ordinarily exercised in similar investigations by reputable members of the geotechnical industry in Australia as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section of this report must be read in conjunction with the whole of this report, including its appendices and attachments.

The conclusions presented in this report are based on a limited investigation of conditions, with specific sampling and test locations chosen to be as representative as possible under the given circumstances.

STS's professional opinions are reasonable and based on its professional judgment, experience, training and results from analytical data. STS may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified by STS.

STS's professional opinions contained in this document are subject to modification if additional information is obtained through further investigation, observations, or validation testing and analysis during construction. In some cases, further testing and analysis may be required, which may result in a further report with different conclusions.

We draw your attention to the document "Important Information", which is included in Appendix D of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by STS, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

APPENDIX A – GEOTECHNICAL INVESTIGATION
Report by STS Geotechnics Pty Ltd

ADDITIONAL GEOTECHNICAL INVESTIGATION

FOR

NSW LAND AND HOUSING CORPORATION

171 Weston & 2 to 6 Hinemoa Streets, Panania, NSW (BGYAP)

Report No: 22/1561

Project No: 31349/6286D-G

May 2022

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DOCUMENT CONTROL

REPORT TITLE: Geotechnical Investigation

REPORT NO: 22/1561

Revision	Details	Date	Amended By
0	Original	May 26, 2022	

Following advice from the Building Commissioner, the advice, recommendations and design parameters provided in this report are only valid and to be relied upon if geotechnical inspections of footings and support/shoring systems are conducted by STS Geotechnics during construction.

GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

1. INTRODUCTION

This report presents the results of an additional geotechnical Investigation carried out by STS Geotechnics Pty Limited (STS) for the proposed new residential development to be constructed at 171 Weston and 2-6 Hinemoa Streets, Panania NSW. The site is located across the road from the rail corridor.

The inspection report should be read in conjunction with the documents outlined below:

- Geotechnical Investigation Report prepared by STS – Report No. 21/2603 dated 16th September 2021 and
- Architectural plan by Ministry of Planning Industry & Environment, NSW Government, 'RFB – 171 Weston St + 2-6 Hinemoa, Panania', East Hills Corridor, Development Feasibility.

The previous report referenced above was prepared assuming there is no basement excavation. The revised plans referenced above indicate that the site development will comprise a four-storey residential building, including single basement that will require excavating to a depth of 3 metres below the existing ground surface.

The purpose of the investigation was to provide information on:

- Subsurface conditions,
- Site classification,
- Excavation conditions and excavation monitoring,
- Maximum permissible temporary and permanent batter slopes and retaining wall design parameters,
- Appropriate foundation system for the site including design parameters,
- Exposure classification in accordance with AS2870 & AS2159,
- WALLAP design parameters for all materials encountered, and
- Impact on the rail infrastructure.

The investigation was undertaken in accordance with STS proposal P22-175 dated March 28, 2022.

Our scope of work did not include a contamination assessment.

2. NATURE OF THE INVESTIGATION

2.1. Fieldwork

The fieldwork consisted of drilling four (4) boreholes numbered BH101 – BH104, inclusive, at the locations shown on Drawing No. 22/1561. The boreholes were drilled using a track mounted Geo 205 drilling rig equipped with Tungsten-Carbide (T-C) bit and NMLC diamond coring equipment. The drilling rig is owned and operated by GeoSense Drilling. Soil strengths were determined by undertaking Standard Penetration Tests (SPT) and visual observation of the recovered rock cuttings at each borehole location. The recovered cores were boxed on site transported to the STS laboratory where the cores were logged, photographed, and point load tested. To measure the groundwater level, monitoring wells were installed in BH102 and BH104.

The subsurface conditions observed are recorded on the borehole logs given in Appendix A together with photographs of the recovered rock core and results of the point load testing. An explanation of the terms used on the logs is also given in Appendix A. Notes relating to geotechnical reports are also given in Appendix A.

2.2. Laboratory Testing

To assess the underlying founding rocks for their strengths, representative rock core samples were tested to determine the Point Load Index.

Detailed test report has been attached in Appendix B.

3. GEOLOGY AND SITE CONDITIONS

The Penrith geological map at a scale of 1:100,000 shows the site is underlain by Triassic Age Ashfield Shale belonging to the Wianamatta Group. Materials within this formation typically comprise dark grey to black claystone-siltstone and fine sandstone-siltstone laminite

The site is irregular in shape and encompasses 171 Weston Street as well as 2, 4 and 6 Hinemoa Street. At the time of the fieldwork, the site was occupied by existing residential dwellings with surrounding concrete driveways, grass, trees, and shrubs. The ground surface falls of approximately 2 to 3 metres.

On the opposite side of Weston Street is the East Hills railway line.

The site is bound by Weston Street to the north, Hinemoa Street to the east, and other residential dwellings to the south and west.

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4. SUBSURFACE CONDITIONS

4.1. Stratigraphy

When assessing the subsurface conditions across a site from a limited number of boreholes, there is the possibility that variations may occur between test locations. The data derived from the site investigation programme are extrapolated across the site to form a geological model and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour regarding the proposed development. The actual condition at the site may differ from those inferred, since no subsurface exploration programme, no matter how comprehensive, can reveal all subsurface details and anomalies, particularly on a site that has been previously developed.

Based on our observations, the stratigraphy has been grouped into four major geotechnical units. A summary of the subsurface conditions is presented in Table 4.1. More detailed descriptions of subsurface conditions at each borehole location are available on the borehole logs presented in **Appendix A**. The details of the methods of rock classifications, explanatory notes and abbreviations adopted on the borehole logs are also presented in **Appendix A**.

Table 4.1 – Stratigraphy Summary

Unit	Material	Depth to Top of Unit (m)[1]	Observed Thickness (m)	Comments
1	Topsoil	Surface	0.3 to 0.4	Dark to orange - brown, grey, fine to medium, silty clayey sand fill. The fill does not appear to be engineered material.
2	Stiff to Very Stiff Silty Clay	0.3 to 0.4	1.3 to 2.2	Orange to red brown, mottled grey, brown, medium plasticity, trace of fine to medium then coarse gravels with rootlets.
3	Shale (Class IV/ V)[2]	1.6 to 2.5	2.3 to 2.6	Pale grey, very thinly to thinly bedded, very low to low strength, extremely to distinctly weathered shale with some extremely weathered zones.
4	Shale (Class III)[3]	4.3 to 4.8	1.2 to 1.7	Grey, very thinly to thinly bedded, medium strength, distinctly weathered shale.

Notes:

1 Approximate depth below existing ground level at the time of our assessment, depths and levels may vary across the site,

2 The unit was not cored in BH104 as the auger was used to drill to the depth of refusal.

3 The unit was not observed in BH101 and 103 as these boreholes are non - cored.

4.2. Groundwater Observation

No groundwater wells were installed in the initial investigation.

During this recent investigation, following completion of drilling, BH102 and BH104, were bailed dry. Water circulation used in the boreholes prevented observations of groundwater levels during or immediately following drilling operations. Therefore, a secondary site visit was done to measure the monitoring wells. The groundwater levels were measured as noted in Table 4.2.

Table 4.2 – Groundwater Levels (m BEGL/RL)

Date	BH ID	Ground Water Depth Below Existing Ground Level (m)
09/05/2022	BH102	3.2
	BH104	2.9

5. DISCUSSION

5.1. Site Classification

The classification has been prepared in accordance with the guidelines set out in the "Residential Slabs and Footings" Code, AS2870 – 2011. Site classifications are not relevant to these types of development; however, the classification is provided in the event some high-level footings are required.

Because there are trees and existing dwellings present, abnormal moisture conditions (AMC) prevail at the site. (Refer to Section 1.3.3 of AS2870).

Because of the AMC and greater than 400 mm of fill present in BH5, the site is classified a *Problem Site (P).* Provided the recommendations given below are adopted the site may be reclassified *Highly Reactive (H1)* based on the findings of the previous laboratory investigation.

5.2. Excavation Conditions

Based on the subsurface conditions observed in boreholes, the proposed basement excavation is expected to encounter topsoil, silty clay, and weathered Shale. Excavators without assistance should be able to remove the soils and some of the Class IV/V weathered shale.

Medium strength shales are likely to be encountered prior to reaching bulk excavation level. Care will be required to ensure that the structures on the subject site and buildings or other developments on adjacent properties are not damaged when excavating the rock. Excavation methods should be adopted which limit ground vibrations at the adjoining structures to not more than 5 mm/sec. Vibration monitoring may be required to verify that this is achieved.

Table 5.1 – Recommendations for Rock Breaking Equipment

Distance from adjoining structure (m)	Maximum Peak Particle Velocity 5 mm/sec	
	Equipment	Operating Limit (% of Maximum Capacity)
1.5 to 2.5	Hand operated jackhammer only	100
2.5 to 5.0	300 kg rock hammer	50
5.0 to 10.0	300 kg rock hammer or 600 kg rock hammer	100 50

The limits of 5 mm/sec are expected to be achievable if rock breaker equipment or other excavation methods are restricted as indicated in Table 5.1.

Use of other techniques (e.g., grinding, rock sawing), although less productive, would reduce or possibly eliminate risks of damage to property through vibration effects transmitted via the ground. Such techniques may be considered if an alternative to rock breaking is required.

If rock sawing is carried out around excavation boundaries in not less than 1-metre-deep lifts, a 900 kg rock hammer could be used at up to 100% maximum operating capacity with an assessed peak particle velocity not exceeding 5 mm/sec, subject to observation and confirmation by a geotechnical engineer at the commencement of excavation.

It should be noted that vibrations that are below threshold levels for building damage may be experienced at adjoining developments.

It would be appropriate before commencing excavation to undertake a dilapidation survey of any adjacent structures that may potentially be damaged. This will provide a reasonable basis for assessing any future claims of damage.

5.3. Groundwater Conditions

Reference to Table 4.2 above, indicates that the ground water table is at the threshold of the basement excavation and below the soil/rock interface. These readings were taken eighteen days after the boreholes were drilled. Our assessment is that the water levels measured are due to seepage along the soil/rock interface into borehole and not a general groundwater table.

Due to the low permeability of the soils and bedrock profile, any groundwater inflows into the excavation are unlikely to have an adverse impact on the proposed development or on the neighbouring sites. We expect some minor temporary groundwater inflows into the excavation along the soil/rock interface and through any defects within the shale bedrock (such as jointing, and bedding planes, etc.) particularly following a period of heavy rainfall.

We anticipate that any seepage that does occur can be controlled by a conventional sump and pump system. We recommend that a sump-and-pump system be provided both during construction and for permanent groundwater control below the basement floor slab.

In the long term, drainage should be provided behind all basement retaining walls, around the perimeter of the basement and below the basement slab. The completed excavation and water inflows should be inspected by the hydraulic engineer to confirm that adequate drainage has been allowed for. Drainage should be connected to the sump-and-pump system and discharged into the stormwater system. The permanent groundwater control system should consider any possible soluble substances in the groundwater which may dictate whether groundwater can be pumped into the stormwater system.

The design of drainage and pump systems should take the above issues into account along with careful ongoing inspections and maintenance programs.

In our opinion there will be no need to undertake dewatering during or after construction.

5.4. Temporary and Permanent Batter Slopes

In the short term, dry cut soil slopes should remain stable at an angle of 1(H) to 1(V). In the long-term dry cut slopes formed at an angle of 2(H) to 1(V) should remain stable. Slopes cut at this angle would be subject to erosion unless protected by topsoil and diversion drains at the crest of the slopes. Dry cut slopes in the weathered shale should remain stable at an angle of 1(H) to 1(V). The above temporary batters should remain stable provided that all surcharge loads, including construction loads, are kept at a distance of at least 2h (where 'h' is the height of the batter in metres) from the crest of the batter. If steeper batters are to be used, then these must be supported by shotcrete and soil nail system designed by a suitable experienced structural or geotechnical engineer.

Where space for temporary batters is not available, a suitable retention system will be required for the support of the entire depth of excavation within soils or weathered shale materials.

Excavations on the subject site should not extend below the zone of influence of any adjacent structure footings, without first installing temporary support or discussing the works with a geotechnical engineer.

5.5. Foundation and Retaining Wall Design Parameters

Due to the potential for differential settlements, we do not recommend founding and structural loads within the topsoil materials. Upon completion of bulk excavation, the exposed material will likely comprise Class IV shale.

High level pad and/or strip footings founded in the stiff and very stiff natural silty clays or may be proportioned using an allowable bearing pressure of 100 kPa. The minimum depth of founding must comply with the requirements of AS2870.

Piers, pad footings, and strip footings founded at bulk excavation level or beyond, in weathered shale or better, may be proportioned using an allowable end bearing pressure of 700 kPa. An allowable adhesion value of 70 kPa may be adopted for the portion of the shaft in weathered shale.

The parameters used to proportion retaining wall support depend on whether the walls can be permitted to deflect. For walls, which cannot be permitted to deflect, an at rest earth pressure coefficient (Ko) of 0.6 should be adopted for the topsoils and silty clays. For walls that can be allowed to deflect, an active earth pressure coefficient (Ka) of 0.4 should be adopted for the topsoils and silty clays.

Retaining walls, piles and spread footings may be designed for the allowable bearing pressures shown in the Table 5.2.

Table 5.2 – Design Allowable Bearing Pressures

Material[1]		Unit 1 Topsoil	Unit 2 Stiff to Very Stiff Silty Clay	Unit 3 Shale (Class IV/V)	Unit 4 Shale (Class III)[6]
Depth to Top of Unit (m)[2]		Surface	0.3 – 0.4	1.6 – 2.5	4.3 – 4.8
Bulk Unit Weight (kN/m^3)		17	19	23	24
Friction Angle ϕ' (Degrees)		25	25	28	31
Earth Pressure Coefficients	At rest K_o[3]	0.6	0.6	0.5	0.5
	Active K_a[3]	0.4	0.4	0.4	0.3
	Passive K_p[3]	-	2.5	2.8	3.1
Allowable Bearing Pressure (kPa)[5]		-	100	700	3,500
Allowable Shaft Adhesion (kPa)[4,5]	In Compression	-	-	70	350
	In Uplift	-	-	40	175
Allowable Toe Resistance (kPa)		-	-	50	200
Allowable Bond Stress (kPa)		-	-	50	200

Notes:

1 More detailed descriptions of subsurface conditions are available on the borehole logs presented in **Appendix A.**

2 Approximate levels of top of unit at the time of our investigation. Levels may vary across the site.

3 Earth pressures are provided on the assumption that the ground behind the retaining walls is horizontal.

4 Side adhesion values given assume there is intimate contact between the pile and foundation material and should achieve a clean socket roughness category R2 or better. Design engineer to check both 'piston pull-out' and 'cone lift out' mechanics in accordance with AS4678-2002 Earth Retaining Structures.

5 To adopt these parameters, we have assumed that:
Footings have a nominal socket of at least 0.3m, into the relevant founding material;

- For piles, there is intimate contact between the pile and foundation material (a clean socket roughness category of R2 or better);
- Potential soil and groundwater aggressivity will be considered in the design of piles and footings;
- Piles should be drilled in the presence of a Geotechnical Engineer prior to pile construction to verify that ground conditions meet design assumptions. Where groundwater ingress is encountered during pile excavation, concrete is to be placed as soon as possible upon completion of pile excavation. Pile excavations should be pumped dry of water prior to pouring concrete, or alternatively a tremmie system could be used;
- The bases of all pile, pad and strip footing excavations are cleaned of loose and softened material and water is pumped out prior to placement of concrete;
- The concrete is poured on the same day as drilling, inspection, and cleaning.
- The allowable bearing pressures given above are based on serviceability criteria of settlements at the footing base/pile toe of less than or equal to 1% of the minimum footing dimension (or pile diameter).

6 To adopt this allowable bearing pressure it is assumed that an additional two cored boreholes shall be drilled and spoon testing shall be conducted for 1/3rd of footings.

Geotechnical inspections of foundations are recommended to determine that the required bearing capacity has been achieved and to determine any variations that may occur between the boreholes and inspected locations.

To ensure the bearing values given can be achieved, care should be taken to ensure the base of the excavations is free of all loose material prior to concreting. To this end, it is recommended that all excavations be concreted as soon as possible, preferably immediately after excavating, cleaning, inspecting and approval. Pier excavations should not be left open overnight. The possibility of groundwater inflow needs to be considered when drilling the piers and pouring concrete.

During foundation construction, should the subsurface conditions vary to those inferred in this report, a suitably experienced geotechnical engineer should review the design and recommendations given above to determine if any alterations are required.

5.6. Impact on Rail Line

As noted above, the East Hills railway line is present on the opposite side of Weston Street. The distance between the site and rail corridor boundaries is about 20 metres. The proposed development includes a basement excavation of about 3 metres. The zone of influence of the excavation is determined by drawing a line upwards at a slope of 1 to 1 from the base of the excavation. Therefore, the rail corridor is well outside the zone of influence. Our assessment is that the proposed development will have negligible if any impact on the rail infrastructure.

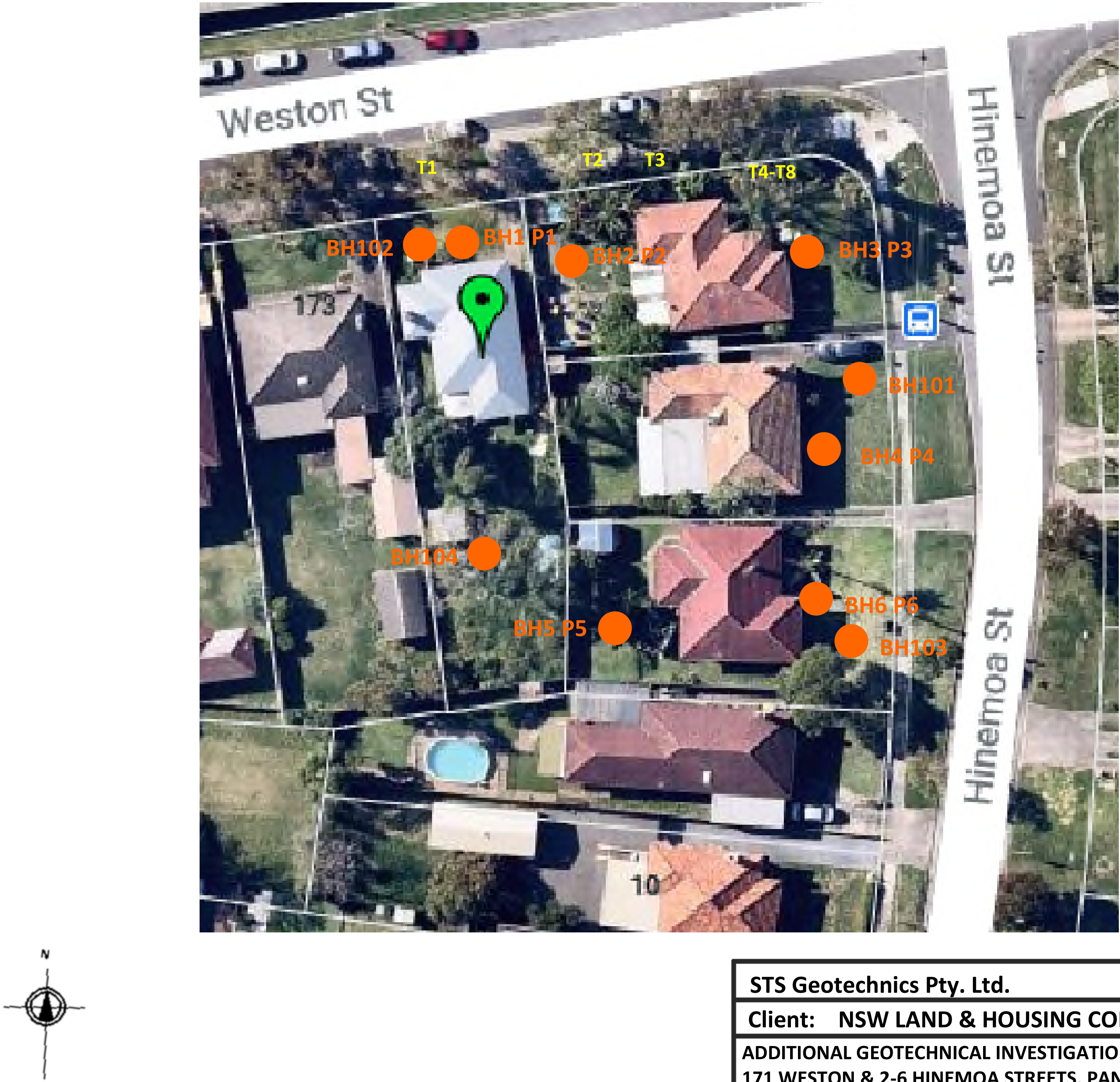
In the event a finite element assessment (WALLAP) is required, the relevant soil and rock parameters are provided in Table 5.2.

6. FINAL COMMENTS

During construction, should the subsurface conditions vary from those inferred above, we would be contacted to determine if any changes should be made to our recommendations.

Yours faithfully,

Krishna Shakya	*Ian Watts*	*Laurie Ihnativ*
Geotechnical Engineer	*Geotechnical Engineer*	*Principal Geotechnical Engineer*
STS Geotechnics Pty Limited	*STS Geotechnics Pty Limited*	*STS Geotechnics Pty Limited*



STS Geotechnics Pty. Ltd.	Scale: Unknown	Date: April 2022
Client: NSW LAND & HOUSING CORPORATION		
ADDITIONAL GEOTECHNICAL INVESTIGATION 171 WESTON & 2-6 HINEMOA STREETS, PANANIA BOREHOLE AND PENETROMETER LOCATIONS		Project No. 31349/6286D-G Drawing No: 22/1561

NOTES RELATING TO GEOTECHNICAL REPORTS

Introduction

These notes have been provided to outline the methodology and limitations inherent in geotechnical reporting. The issues discussed are not relevant to all reports and further advice should be sought if there are any queries regarding any advice or report.

When copies of reports are made, they should be reproduced in full.

Geotechnical Reports

Geotechnical reports are prepared by qualified personnel on the information supplied or obtained and are based on current engineering standards of interpretation and analysis.

Information may be gained from limited subsurface testing, surface observations, previous work and is supplemented by knowledge of the local geology and experience of the range of properties that may be exhibited by the materials present. For this reason, geotechnical reports should be regarded as interpretative rather than factual documents, limited to some extent by the scope of information on which they rely.

Where the report has been prepared for a specific purpose (eg. design of a three-storey building), the information and interpretation may not be appropriate if the design is changed (eg. a twenty storey building). In such cases, the report and the sufficiency of the existing work should be reviewed by STS Geotechnics Pty Limited in the light of the new proposal.

Every care is taken with the report content, however, it is not always possible to anticipate or assume responsibility for the following conditions:

- Unexpected variations in ground conditions. The potential for this depends on the amount of investigative work undertaken.
- Changes in policy or interpretation by statutory authorities.
- The actions of contractors responding to commercial pressures.

If these occur, STS Geotechnics Pty Limited would be pleased to resolve the matter through further investigation, analysis or advice.

Unforeseen Conditions

Should conditions encountered on site differ markedly from those anticipated from the information contained in the report, STS Geotechnics Pty Limited should be notified immediately. Early identification of site anomalies generally results in any problems being more readily resolved and allows re-interpretation and assessment of the implications for future work.

Subsurface Information

Logs of a borehole, recovered core, test pit, excavated face or cone penetration test are an engineering and/or geological interpretation of the subsurface conditions. The reliability of the logged information depends on the drilling/testing method, sampling and/or observation spacings and the ground conditions. It is not always possible or economic to obtain continuous high quality data. It should also be recognised that the volume or material observed or tested is only a fraction of the total subsurface profile.

Interpretation of subsurface information and application to design and construction must take into consideration the spacing of the test locations, the frequency of observations and testing, and the possibility that geological boundaries may vary between observation points.

Groundwater observations and measurements outside of specially designed and constructed piezometers should be treated with care for the following reasons:

- In low permeability soils groundwater may not seep into an excavation or bore in the short time it is left open.
- A localised perched water table may not represent the true water table.
- Groundwater levels vary according to rainfall events or season.
- Some drilling and testing procedures mask or prevent groundwater inflow.

The installation of piezometers and long term monitoring of groundwater levels may be required to adequately identify groundwater conditions.

Supply of Geotechnical Information or Tendering Purposes

It is recommended tenderers are provided with as much geological and geotechnical information that is available and that where there are uncertainties regarding the ground conditions, prospective tenders should be provided with comments discussing the range of likely conditions in addition to the investigation data.

APPENDIX A – BOREHOLE LOGS, CORE PHOTOGRAPHS, POINT LOAD TESTING RESULTS AND EXPLANATION SHEETS

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: NSW Land & Housing Corporation	Project / STS No. 31349/6286D-G		BOREHOLE NO.: BH 101
Project: 171 Weston & 2-6 Hinemoa Streets, Panania	Date: April 22, 2022		
Location: Refer to Drawing No. 22/1561	Logged: KS	Checked By: IW	Sheet 1 of 2

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
			TOPSOIL: SILTY CLAY: dark grey to brown, low to medium plasticity, trace of fine to medium gravels	CL	-	M
	SPT 0.5-0.95m 3, 4, 5 N = 9		SILTY CLAY: dark grey, medium plasticity, trace of medium to coarse gravels with rootlets	CL	STIFF	M
		1.0	From 1.0m grading towards orange brown, mottled grey			
	SPT 1.5-1.95 m 6, 6, 6 N = 12					
		2.0	From 1.8m grading towards grey mottled brown			
			EXTREMELY LOW STRENGTH SHALE OR SHALY CLAY: grey		EXTREMELY LOW STRENGTH	D
		3.0				
			CONTINUED AS CORED LOG FROM 3.6 M			
		4.0	For core details, refer to core log sheets			
		5.0				

D - disturbed sample	U - undisturbed tube sample	B - bulk sample	Contractor: Geosense
WT - level of water table or free water		N - Standard Penetration Test (SPT)	Equipment: Commachio Geo 205
S - jar sample			Hole Diameter (mm): 100
NOTES:	See explanation sheets for meaning of all descriptive terms and symbols		Angle from Vertical (^{o}): 0
			Drill Bit: Spiral

STS Geotechnics Pty Ltd | **GEOTECHNICAL LOG - CORED BOREHOLE**

Client: NSW Land & Housing Corporation | Project / STS No.: 31349/6286D-G | **BOREHOLE NO.: BH 101**

Project: 171 Weston & 2-6 Hinemoa Streets, Panania | Date : April 22, 2022

Location: Refer to Drawing No. 22/1561 | Logged: KS | Checked By: IW | Sheet 2 of 2

DRILLING | MATERIAL STRENGTH | DISCONTINUITIES

Estimated Rock Strength: Extremely Low, Very Low, Low, Medium, High, Very High, Extremely High

Average Defect Spacing (mm): 20, 40, 100, 300, 1000

Method	Water	RQD (SCR)	Recovery / TCR	Depth (m)	Rock Type (Colour, Grain Size, Structure & Minor Components)	Weathering	Estimated Rock Strength	Average Defect Spacing (mm)	Visual	Additional Data (Joints, partings, seams, zones etc. Description, orientation, infilling, or coating, shape, roughness, thickness, other)
				1.0						
				2.0						
				3.0	For non core details, refer to non core log sheets					
					START CORING AT 3.6 M					
NMLC CORING	10%	42%	100%	4.0	SHALE: pale grey thinly bedded, low strength, extremely weathered	XW	Low	40–100		3.71 to 3.78 m BP, 5 deg. Pr, Ro, CS, 3mm 3.94 m BP, 3 deg. Pr, Ro, XWS, Clay 5 mm 3.97 m BP, 2 deg. Pr. Ro. CS, 23 mm
					CORE LOSS 165 mm					
	90%	40%	100%	5.0	From 4.8 m grading towards medium strength From 5.21 to 5.87 m visible ironstone bands BOREHOLE DISCONTINUED AT 6.0 M	XW	Low to Medium	40–100		4.17, 4,28 m BP, 5 deg. Pr, Ro, CS 33 mm and 20 mm respectively 4.37 m BP, 10 deg. Pr, ro. 4.44 m BP, 10 deg. Jt. 75 deg. BP, Pr, Ro. 4.52 to 4.51 m BP, 10 deg. Pr, Ro, CS, 10 mm and 25 mm respectively 4.58 m BP, 10 deg. Pr, Ro, XWZ, by 100 mm 4.68 m BP, 5 deg. Pr, Ro. CS, 75 mm 4.77 m Jt, 90 deg. Pr, Ro, VNR 4.85 to 5.15 m BP, 5 deg. Pr, Ro, VNR 5.15 m JT, 75 deg. Pr, Ro, VNR 5.22 to 5.36 m BP, 5 deg. Pr, Ro. 5.36 to 5.75 m BP, 15 deg. Pr, Ro, XWZ 5.78 m BP, 15 deg, UN, Ro, VNR 5.82 m BP, 15 deg. Pr, Ro, CS, 90 mm

Notes:

Contractor: Geosense

Equipment: Commachio Geo 205

Hole Diameter (mm): 100

Angle from Vertical (°): 0

See explanation sheets for meaning of all descriptive terms and symbols

STS Geotechnics Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: NSW Land & Housing Corporation	Project / STS No. 31349/6286D-G		**BOREHOLE NO.: BH 102**
Project: 171 Weston & 2-6 Hinemoa Streets, Panania	Date: April 22, 2022		
Location: Refer to Drawing No. 22/1561	Logged: KS	Checked By: IW	Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
			TOPSOIL: SILTY CLAY: dark brown, low to medium plasticity, trace of fine to medium gravels	CL	-	M
	SPT 2, 3, 4 N = 7		SILTY CLAY: red brown mottled grey, medium plasticity, trace of fine to medium gravels	CL	FIRM	M
			From 0.7m grading towards orange brown		STIFF	
		1.0				
	SPT 3, 8, 8 N = 16		From 1.4m grading towards grey to red brown		VERY STIFF	
			From 1.8m grading towards grey and red brown			D-M
		2.0				
			WEATHERED ROCK: grey, extremely weathered, shale or shaly clay		EXTREMELY LOW STRENGTH	D
		3.0	From 2.9m grading towards very low strength shale (increased resistance)			
			From 3.2m grading towards low strength shale			
		4.0				
		5.0				
			AUGER REFUSAL AT 5.1 M ON WEATHERED ROCK			

D - disturbed sample	U - undisturbed tube sample	B - bulk sample	Contractor: Geosense
WT - level of water table or free water		N - Standard Penetration Test (SPT)	Equipment: Commachio Geo 205
S - jar sample			Hole Diameter (mm): 100
NOTES:	See explanation sheets for meaning of all descriptive terms and symbols		Angle from Vertical (^{o}): 0
			Drill Bit: Spiral

STS Geotechnics Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: NSW Land & Housing Corporation	Project / STS No. 31349/6286D-G		**BOREHOLE NO.: BH 103**
Project: 171 Weston & 2-6 Hinemoa Streets, Panania	Date: April 22, 2022		
Location: Refer to Drawing No. 22/1561	Logged: KS	Checked By: IW	Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
			TOPSOIL: SILTY CLAY: grey brown, low to medium plasticity, trace of fine to medium gravels	CL		M
	SPT 0.5-0.95 m 3, 4, 6 N = 10		SILTY CLAY: dark grey, red brown, medium plasticity, trace of gravel	CL	STIFF	M
		1.0	From 0.8m grading towards orange brown, mottled grey, trace of medium to coarse ironstone gravels			
	SPT 1.5-1.8 m 10, 16 HB					
			WEATHERED ROCK: extremely weathered shale or shaly clay, grey		EXTREMELY LOW STRENGTH	D
		2.0				
			From 2.6m grading towards very low strength shale			
		3.0	From 2.9m, increased resistance			
			From 3.8m, very high resistance, low strength shale			
		4.0	AUGER REFUSAL AT 3.9 M ON WEATHERED ROCK			
		5.0				

D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)
S - jar sample

Contractor: Geosense
Equipment: Commachio Geo 205
Hole Diameter (mm): 100
Angle from Vertical (^{o}): 0
Drill Bit: Spiral

NOTES: See explanation sheets for meaning of all descriptive terms and symbols

STS Geotechnics Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: NSW Land & Housing Corporation	Project / STS No. 31349/6286D-G	BOREHOLE NO.: BH 104
Project: 171 Weston & 2-6 Hinemoa Streets, Panania	Date: April 22, 2022	
Location: Refer to Drawing No. 22/1561	Logged: KS Checked By: IW	Sheet 1 of 2

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
			TOPSOIL: SILTY CLAY: dark brown, low to medium plasticity, trace of fine to medium gravels	CL	-	M
	SPT 2, 3, 5 N = 8					
			SILTY CLAY: orange brown, mottled grey, medium plasticity, trace of fine to medium gravels	CL	STIFF	M
			From 0.8m grading towards grey/brown			
		1.0				
	SPT 9, 9, 10 N = 19				VERY STIFF	
			From 1.8m medium to coarse ironstone gravels			
		2.0				
			WEATHERED ROCK: extremely weathered shale or shaly clay, grey		EXTREMELY LOW STRENGTH	D
			From 2.6m grading towards very low strength shale			
		3.0				
		4.0				
			CONTINUED AS CORED LOG FROM 4.3 M			
			For core details, refer to core log sheets			
		5.0				

D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)
S - jar sample

NOTES: See explanation sheets for meaning of all descriptive terms and symbols

Contractor: Geosense
Equipment: Commachio Geo 205
Hole Diameter (mm): 100
Angle from Vertical (^{o}): 0
Drill Bit: Spiral

STS Geotechnics Pty Ltd — **GEOTECHNICAL LOG - CORED BOREHOLE**

Client: NSW Land & Housing Corporation — Project / STS No.: 31349/6286D-G — **BOREHOLE NO.: BH 104**

Project: 171 Weston & 2-6 Hinemoa Streets, Panania — Date : April 22, 2022

Location: Refer to Drawing No. 22/1561 — Logged: KS — Checked By: IW — Sheet 2 of 2

Method	Water	RQD (SCR)	Recovery / TCR	Depth (m)	Rock Type (Colour, Grain Size, Structure & Minor Components)	Weathering	Estimated Rock Strength (Extremely Low / Very Low / Low / Medium / High / Very High / Extremely High)	Average Defect Spacing (mm) (20 / 40 / 100 / 300 / 1000)	Visual	Additional Data (Joints, partings, seams, zones etc. Description, orientation, infilling, or coating, shape, roughness, thickness, other)
				1.0						
				2.0						
				3.0						
				4.0	For non core details, refer to non core log sheets					
					START CORING AT 4.3 M					
NMLC CORING	N/A	40%	100%		SHALE: grey, thinly bedded, low strength, distinctly weathered	DW	Medium	40-100		4.33-4.76 m BP, Pr, Ro, 2 deg, VNR, Clay
										4.81 m BP, 2 deg. Pr, Ro, CS, 30 mm
										4.88 m BP, 10 deg. Pr, Ro, VNR, Clay
				5.0						4.92 m BP, 2 deg, Pr, Ro, VNR, Clay
										4.96 m BP, 10 deg. Jt, 25 deg. Pr, Ro, VNR, Clay
										5.10-5.41 m BP, 2 deg. Pr, Ro, VNR, Clay
										5.41 m BP, 2 deg. Pr, Ro, CS, 40 mm
										5.49 m BP, 2 deg. Pr, Ro, VNR, Clay
										5.55 m BP, 2 deg. Pr, Ro, CS, 60 mm
										5.61-5.73 m BP, 2 deg. Pr, Ro, VNR, Clay, CS
					BOREHOLE DISCONTINUED AT 6.0 M					

Notes:

Contractor: Geosense

Equipment: Commachio Geo 205

Hole Diameter (mm): 100

Angle from Vertical (°): 0

See explanation sheets for meaning of all descriptive terms and symbols

PROJECT: 171 WESTON AND 2-6 HINEMOA STREET, PANANIA
PROJECT NO. 31349/6286D-G
CLIENT: NSW LAND & HOUSING CORPORATION

STS Geotechnics Pty Ltd
14/1 Cowpasture Place, Wetherill Park NSW 2164
Phone: (02)9756 2166 | Email: enquiries@stsgeo.com.au

Accredited for Compliance with ISO/IEC 17025 - Testing No. 2750

Point Load Strength Index Report

Project: 171 WESTON & 2-6 HINEMOA STREETS, PANANIA — Project No.: 31349/6286D-G
Client: NSW LAND & HOUSING CORPORATION — Report No.: **22/1560**
Address: 12 Darcy Street, Parramatta — Report Date: 03/05/2022
Test Method: as 4133.4.1 — Page: 1 OF 1
Sampling Procedure: AS 1289.1.2.1 Clause 6.5.3 - Power Auger Drilling (Not covered under NATA Scope of Accreditation)

Borehole / Sample No.	Depth (m)	Date Sampled	Date Tested	Test Type	Is (MPa)	**$Is_{(50)}$ (MPa)**	Rock Type	Failure Type	Moisture
BH101	3.79	22/04/2022	26/04/2022	A	**0.18**	**0.12**	SH	3	M
BH101	4.47	22/04/2022	26/04/2022	A	**0.12**	**0.12**	SH	3	W
BH101	5.38	22/04/2022	26/04/2022	A	**0.42**	**0.41**	SH	3	M
BH104	4.65	22/04/2022	26/04/2022	A	**0.51**	**0.53**	TS	3	D
BH104	5.3	22/04/2022	26/04/2022	A	**0.62**	**0.61**	TS	3	D

Failure Type
1 = Fracture through bedding or weak plane
2 = Fracture along bedding
3 = Fracture through rock mass
4 = Fracture influenced by natural defect or drilling
5 = Partial fracture or chip (invalid result)

Test Type
A = Axial
D = Diametrial
I = Irregular
C = Cube

Moisure Condition
W = Wet
M = Moist
D = Dry

Rock Type
SS = Sandstone
ST = Siltstone
SH = Shale
YS = Claystoane
IG = Igneous

Remarks:

Approved Signatory.................

Technician: FV

Orlando Mendoza - Laboratory Manager

E1. CLASSIFICATION OF SOILS

E1.1 Soil Classification and the Unified System

An assessment of the site conditions usually includes an appraisal of the data available by combining values of engineering properties obtained by the site investigation with descriptions, from visual observation of the materials present on site.

The system used by STS Geotechnics Pty Ltd (STS) in the identification of soil is the Unified Soil Classification system (USC) which was developed by the US Army Corps of Engineers during World War II and has since gained international acceptance and has been adopted in its metricated form by the Standards Association of Australia.

The Australian Site Investigation Code (AS1726-2017, Appendix D) recommends that the description of a soil includes the USC group symbols which are an integral component of the system.

The soil description should contain the following information in order:

Soil composition

- SOIL NAME and USC classification symbol (IN BLOCK LETTERS)
- plasticity or particle characteristics
- colour
- secondary and minor constituents (name estimated proportion, plasticity or particle characteristics, colour

Soil condition

- moisture condition
- consistency or density index

Soil structure

- structure (zoning, defects, cementing)

Soil origin

interpretation based on observation eg FILL, TOPSOIL, RESIDUAL, ALLUVIUM.

E1.2 Soil Composition

(a) Soil Name and Classification Symbol

The USC system is summarised in Figure E1.2.1. The primary division separates soil types on the basis of particle size into:

- Coarse grained soils - more than 50% of the material less than 60 mm is larger than 0.06 mm (60 µm).
- Fine grained soils - more than 50% of the material less than 60 mm is smaller than 0.06 mm (60 µm).

Initial classification is by particle size as shown in Table E1.2.1. Further classification of fine grained soils is based on plasticity.

TABLE E1.2.1 - CLASSIFICATION BY PARTICLE SIZE

NAME	SUB-DIVISION	SIZE
Clay (1)		< 2 µm
Silt (2)		2 µm to 60 µm
Sand	Fine Medium Coarse	60 µm to 200 µm 200 µm to 600 µm 600 µm to 2 mm
Gravel (3)	Fine Medium Coarse	2 mm to 6 mm 6 mm to 20 mm 20 mm to 60 mm
Cobbles (3)		60 mm to 200 mm
Boulders (3)		> 200 mm

Where a soil contains an appropriate amount of secondary material, the name includes each of the secondary components (greater than 12%) in increasing order of significance, eg sandy silty clay.

Minor components of a soil are included in the description by means of the terms “some” and “trace” as defined in Table E1.2.2.

TABLE E1.2.2 - MINOR SOIL COMPONENTS

TERM	DESCRIPTION	APPROXIMATE PROPORTION (%)
Trace	presence just detectable, little or no influence on soil properties	0-5
Some	presence easily detectable, little influence on soil properties	5-12

The USC group symbols should be included with each soil description as shown in Table E1.2.3

TABLE E1.2.3 - SOIL GROUP SYMBOLS

SOIL TYPE	PREFIX
Gravel	G
Sand	S
Silt	M
Clay	C
Organic	O
Peat	Pt

The group symbols are combined with qualifiers which indicate grading, plasticity or secondary components as shown on Table E1.2.4

TABLE E1.2.4 - SOIL GROUP QUALIFIERS

SUBGROUP	SUFFIX
Well graded	W
Poorly Graded	P
Silty	M
Clayey	C
Liquid Limit <50% - low to medium plasticity	L
Liquid Limit >50% - medium to high plasticity	H

(b) Grading

"Well graded"	Good representation of all particle sizes from the largest to the smallest.
"Poorly graded"	One or more intermediate sizes poorly represented
"Gap graded"	One or more intermediate sizes absent
"Uniformly graded"	Essentially single size material.

(c) Particle shape and texture

The shape and surface texture of the coarse grained particles should be described.

Angularity may be expressed as "rounded", "sub-rounded", "sub-angular" or "angular".

Particle **form** can be "equidimensional", "flat" or elongate".

Surface texture can be "glassy", "smooth", "rough", pitted" or striated".

(d) Colour

The colour of the soil should be described in the moist condition using simple terms such as:

Black	White	Grey	Red
Brown	Orange	Yellow	Green
Blue			

These may be modified as necessary by "light" or "dark". Borderline colours may be described as a combination of two colours, eg red-brown.

For soils that contain more than one colour terms such as:

- Speckled Very small (<10 mm dia) patches
- Mottled Irregular
- Blotched Large irregular (>75 mm dia)
- Streaked Randomly oriented streaks

(e) Minor Components

Secondary and minor components should be individually described in a similar manner to the dominant component.

*E1.3 **S**oil Condition*

(a) Moisture

Soil moisture condition is described as "dry", "moist" or "wet".

The moisture categories are defined as:
Dry (D) - Little or no moisture evident. Soils are running.
Moist (M) - Darkened in colour with cool feel. Granular soil particles tend to adhere. No free water evident upon remoulding of cohesive soils.

In addition the moisture content of cohesive soils can be estimated in relation to their liquid or plastic limit.

(b) Consistency

Estimates of the consistency of a clay or silt soil may be made from manual examination, hand penetrometer test, SPT results or from laboratory tests to determine undrained shear or unconfined compressive strengths. The classification of consistency is defined in Table E1.3.1.

TABLE E1.3.1 - CONSISTENCY OF FINE-GRAINED SOILS

TERM	UNCONFINED STRENGTH (kPa)	FIELD IDENTIFICATION
Very Soft	<25	Easily penetrated by fist. Sample exudes between fingers when squeezed in the fist.
Soft	25 - 50	Easily moulded in fingers. Easily penetrated 50 mm by thumb.
Firm	50 - 100	Can be moulded by strong pressure in the fingers. Penetrated only with great effort.
Stiff	100 - 200	Cannot be moulded in fingers. Indented by thumb but penetrated only with great effort.
Very Stiff	200 - 400	Very tough. Difficult to cut with knife. Readily indented with thumb nail.
Hard	>400	Brittle, can just be scratched with thumb nail. Tends to break into fragments.

Unconfined compressive strength as derived by a hand penetrometer can be taken as approximately double the undrained shear strength ($q_u = 2\ c_u$).

(c) Density Index

The insitu density index of granular soils can be assessed from the results of SPT or cone penetrometer tests. Density index should not be estimated visually.

TABLE E1.3.2 - DENSITY OF GRANULAR SOILS

TERM	SPT N VALUE	STATIC CONE VALUE q_c (MPa)	DENSITY INDEX (%)
Very Loose	0 - 3	0 - 2	0 - 15
Loose	3 - 8	2 - 5	15 - 35
Medium Dense	8 - 25	5 - 15	35 - 65
Dense	25 - 42	15 - 20	65 - 85
Very Dense	>42	>20	>85

E1.4 Soil Structure

(a) Zoning

A sample may consist of several zones differing in colour, grain size or other properties. Terms to classify these zones are:

Layer - continuous across exposure or sample
Lens - discontinuous with lenticular shape
Pocket - irregular inclusion
Each zone should be described, their distinguishing features, and the nature of the interzone boundaries.

(b) Defects

Defects which are present in the sample can include:

- fissures
- roots (containing organic matter)
- tubes (hollow)
- casts (infilled)

Defects should be described giving details of dimensions and frequency. Fissure orientation, planarity, surface condition and infilling should be noted. If there is a tendency to break into blocks, block dimensions should be recorded

E1.5 Soil Origin

Information which may be interpretative but which may contribute to the usefulness of the material description should be included. The most common interpreted feature is the origin of the soil. The assessment of the probable origin is based on the soil material description, soil structure and its relationship to other soil and rock materials.

Common terms used are:

"Residual Soil" - Material which appears to have been derived by weathering from the underlying rock. There is no evidence of transport.

"Colluvium" - Material which appears to have been transported from its original location. The method of movement is usually the combination of gravity and erosion.

"Landslide Debris" - An extreme form of colluvium where the soil has been transported by mass movement. The material is obviously distributed and contains distinct defects related to the slope failure.

"Alluvium" - Material which has been transported essentially by water. usually associated with former stream activity.

"Fill" - Material which has been transported and placed by man. This can range from natural soils which have been placed in a controlled manner in engineering construction to dumped waste material. A description of the constituents should include an assessment of the method of placement.

E1.6 Fine Grained Soils

The physical properties of fine grained soils are dominated by silts and clays.

The definition of clay and silt soils is governed by their Atterberg Limits. Clay soils are characterised by the properties of cohesion and plasticity with cohesion defines as the ability to deform without rupture. Silts exhibit cohesion but have low plasticity or are non-plastic.

The field characteristics of clay soils include:

- dry lumps have appreciable dry strength and cannot be powdered
- volume changes occur with moisture content variation
- feels smooth when moist with a greasy appearance when cut.

The field characteristics of silt soils include:

- dry lumps have negligible dry strength and can be powdered easily
- dilatancy - an increase in volume due to shearing - is indicted by the presence of a shiny film of water after a hand sample is shaken. The water disappears upon remoulding. Very fine grained sands may also exhibit dilatancy.
- low plasticity index
- feels gritty to the teeth

E1.7 Organic Soils

Organic soils are distinguished from other soils by their appreciable content of vegetable matter, usually derived from plant remains.

The soil usually has a distinctive smell and low bulk density.

The USC system uses the symbol Pt for partly decomposed organic material. The O symbol is combined with suffixes "O" or "H" depending on plasticity.

Where roots or root fibres are present their frequency and the depth to which they are encountered should be recorded. The presence of roots or root fibres does not necessarily mean the material is an "organic material" by classification.

Coal and lignite should be described as such and not simply as organic matter.

E2 CLASSIFICATION OF ROCKS

E2.1 Uniform Rock Description

The aim of a rock description for engineering purposes is to give an indication of the expected engineering properties of the material.

In a similar manner to soil materials, the assessment of site conditions where rock is encountered has to be based on the use of a descriptive method which is uniform and repeatable. Description has to:

- provide a clear identification of the rock substance and its engineering properties, and
- include details of the features which affect the engineering properties of the rock mass.

There is no internationally accepted system for rock description but STS Geotechnics Pty Ltd has adopted a method which incorporates terminology defined by common usage in the engineering geological profession. Most feature definitions are as recommended by the International Society of Rock Mechanics and by the Standards Association of Australia.

For uniform presentation the different features are described in order:

Rock Substance

- NAME (in block letters)
- Mineralogy
- Grain Size
- Colour
- Fabric
- Strength
- Weathering/Alteration

Rock Mass

- Defect type
- Defect orientation
- Defect features
- Defect spacing

E2.2 Rock Substance

(a) Rock name

Each rock type has a specific name which is based on:

- mineralogy
- grain size
- fabric
- origin

The only method of determining the precise rock name is by thin section petrography.

Field identification of rocks for engineering purposes should be based on the use of common, easily understood, simple, geological names. In many cases knowledge of the precise name is of little consequence in the assessment of site conditions. If required the "field name" can be qualified by reference to a petrographic report. Reference to local geological reports often provides information on the rock types which may be expected.

(b) Mineralogy

The rock description should include the identification of the prominent minerals. This identification is usually restricted to the more common minerals in medium and coarse grained rocks.

(c) Grain Size

Rock material descriptions should include general grouping of the size of the predominant mineral grains as defined in Table E2.2.1. The maximum size, or size range, of the larger mineral grains or rock fragments should be recorded.

TABLE E2.2.1. - GRAIN SIZE GROUPS

TERM	GRAIN SIZE (mm)
Very Coarse	>60
Coarse	2 – 60
Medium	0.06 – 2
Fine	0.002 - 0.06
Very Fine	<0.002
Glassy	

(d) Colour

The colour of the rock should be described in the moist condition using simple terms such as:

Black	White	Grey	Red
Brown	Orange	Yellow	Green
Blue			

These may be modified as necessary by "light" or "dark". Borderline colours may be described by a combination of two colours, eg: grey-blue.

(e) Fabric

The fabric of a rock includes all the features of texture and structure, though the term refers specifically to the arrangement of the constituent grains or crystals in a rock. The fabric can provide an indication of the mode of formation of the rock:

- in sedimentary rocks bedding indicates depositional conditions,
- in igneous rocks the texture indicates the rate of cooling, and
- in metamorphic rocks the foliation indicates the stress conditions

Descriptions of fabric should include structure orientation, either with reference to North and horizontal, or to a plane normal to the core axis.

Tables E2.2.2, E2.2.3 and E2.2.4 list common textural features of sedimentary, igneous and metamorphic rocks with the subdivision of stratification spacing in Table E2.2.5.

TABLE E2.2.2 - COMMON STRUCTURES IN IGNEOUS ROCKS

STRATIFICATION (Planar)	STRATIFICATION (Irregular)
Bedding	Washout
Cross Bedding	Slump Structure
Graded Bedding	Shale Breccia
Lamination	

TABLE E2.2.3 - COMMON STRUCTURES IN IGNEOUS ROCKS

	FINE GRAINED ROCKS	COARSE GRAINED ROCKS
Uniform Grain Size	Massive	Massive
	Flow Banded	Granitic
	Vesicular	Pegmatitic
Different Grain Size	Porphyritic	Porphyritic

TABLE E.2.2.4 - COMMON STRUCTURES IN METAMORPHIC ROCKS

FINE GRAINED ROCKS	COARSE GRAINED ROCKS
Slatey Cleavage	Granoblastic
Spotted	Porphyroblastic
Hornsfelsic	Lincated
Foliated	Gneissic
Mylonitic	Mylonitic

TABLE E2.2.5 - STRATIFICATION SPACING

TERM	SEPARATION (mm)
Very Thickly Bedded	>2000
Thickly Bedded	600 - 2000
Medium Bedded	200 - 600
Thinly Bedded	60 - 200
Very Thinly Bedded	20 - 60
Laminated	6 - 20
Thinly Laminated	<6

(f) Strength

Substance strength is one of the most important engineering features of a rock and every description should include at least an estimate of the rock strength class of the material. This estimate can be calibrated by test results, either by Point Loan Strength Index or by Unconfined Compressive Strength.

The rock strength class in As 1726-2017 is defined by Point Loan Strength Index I_s,(50). The relationship between Point Loan and Unconfined Strength is commonly assumed to be about 20, but can range from 4 (in some carbonate rocks) to 40 (in some igneous rocks). It is necessary to confirm the relationship for each rock type and project. classification should be based on material at field moisture content, as some rocks give a significantly higher strength when tested dry.

Table E2.2.6 defines the rock strength classes, with indicative field tests listed in Table E2.2.7 which assist in classification when testing equipment is not available.

TABLE E2.2.6 - CLASSIFICATION OF ROCK STRENGTH

SYMBOL	TERM	POINT LOAD STRENGTH (MPa)	APPROX Qu (MPa)
EL	Extremely low	<0.03	<1
VL	very low	0.03 - 0.1	1 - 3
L	Low	0.1 - 0.3	3 - 10
M	Medium	0.3 - 1	10 - 30
H	High	1 - 3	30 - 70
VH	very high	3 - 10	70 - 200
EH	Extremely high	>10	>200

TABLE E2.2.7 - FIELD TESTS FOR ROCK STRENGTH CLASSIFICATION

STRENGTH CLASS	FIELD TEST
Extremely Low	Indented by thumb nail with difficulty
Very Low	Scratched by thumb nail
Low	Easily broken by hand or pared with a knife
Medium	Broken by hand or scraped with a knife
High	Broken in hand by firm hammer blows
Very High	Broken against solid object with several hammer blow
Extremely High	Difficult to break against solid object with several hammer blows

(g) Weathering/Alteration

In addition to the description of rock substance as examined, an assessment is required of the extent to which the original rock material has been affected by subsequent events. The usual processes are:

- Weathering - Decomposition due to the effect of surface or near surface activities
- Alteration - Chemical modification by the action of materials originating from within the mantle below.

The classification of weathering/alteration presented in Table E2.2.8 is based on the extent/degree to which the original rock substance has been affected. This classification has little engineering significance, as the properties of the rock as examined may bear no relationship to the properties of the fresh rock.

TABLE E2.2.8 - CLASSIFICATION OR ROCK WEATHERING/ALTERATION

TERMS	DEFINITION
Fresh (Fr)	Rock substance unaffected.
Fresh Stained (FR St)	Rock substance unaffected. Staining of defect surfaces.
Slightly (SW)	Partial staining or discolouration of rock substance.
Moderately (MW)	Staining or discolouration extends throughout the whole rock substance.
Highly (HW)	Rock substance partly decomposed.
Completely (CW)	Rock substance entirely decomposed.

E2.3 Rock Mass

The engineering properties of rock mass reflect the effect which the presence of defects has on the properties of the rock substance. Description of the rock mass properties consists of supplementing the description covered by Section E2.2 with data on the defects which are present.

(a) Defect type

The different defect types are described in Table E2.3.1.

(b) Defect orientation

Descriptions of defects should include orientation, either of individual fractures or of groups of fractures. Orientation should be with reference to North and horizontal, or to a plane normal to the core axis.

TABLE E2.3.1 - ROCK DEFECT TYPES

TYPE	SYMBOL	DESCRIPTION
Parting	Pt	A defect parallel or subparallel to a layered arrangement of mineral grains or micro-fractures which has caused planar anistrophy in the rock substance.
Joint	Jt	A defect across which the rock substance has little tensile strength and is not related to textural or structural features with the rock substance.
Sheared Zone	SZ	A zone with roughly parallel planar boundaries or rock substance containing closely spaced, often slickensided, joints.
Crushed Zone	CZ	A zone with roughly parallel planar boundaries of rock substance composed of disoriented, usually angular, fragments of rock.
Seam	Sm	A zone with roughly parallel boundaries infilled by soil or decomposed rock.
Drilling Break	DB	Break in core due to drilling
Handling Break	HB	Break in core during handling

(c) Defect features

The character of a defect is described by its continuity, planarity, surface roughness, width, and infilling.

Continuity In outcrop the extent of a joint, bedding plane or similar defect both along and across the strike can be measured. In core, continuity measurement is restricted to defects nearly parallel to the core axis.

Planarity Described as “Planar”, “Irregular”, “Curved” or “Undulose”.

Roughness Described as “Rough”, “Smooth”, “Polished” or “Slickensided”.

Width Measured in millimetres normal to the plane of the defect

Infilling Described as “Clean”, “Stained”, “Veneer” (<1 mm) or “Infill” (>1 mm). The coating or infilling material should be identified.

(d) Defect spacing

The spacing of defects, particularly where they occur in parallel groups or sets, provides an indication of the rock block sizes which:

- have to be supported in the face or roof of an excavation
- will be produced by the excavation operation.

It is preferable to provide measured data but discontinuity spacing is grouped as shown in Table E2.3.2.

TABLE E2.3.2 - DISCONTINUITY SPACING

DESCRIPTION	SPACING (mm)
Extremely Widely Spaced	>6000
Very Widely Spaced	2000 - 6000
Widely Spaced	600 - 2000
Medium Spaced	200 - 600
Closely Spaced	60 - 200
Very Closely Spaced	20 - 60
Extremely Closely Spaced	<20

E3. DESCRIPTION OF WELL CONSTRUCTION, PID AND GROUNDWATER SYMBOLS

TABLE E3.1 – BORE CONSTRUCTION DETAILS

SHADING / SYMBOL	DESCRIPTION
	Cement-Based Grout
	Bentonite Seal
	Sand Filter
	Borehole Cuttings
	Class 18 PVC casing
	Class 18 PVC Slotted Screen
	End Caps
	Vapour Probe Tip
	Teflon Tubing

TABLE E3.2 – PID SYMBOLS

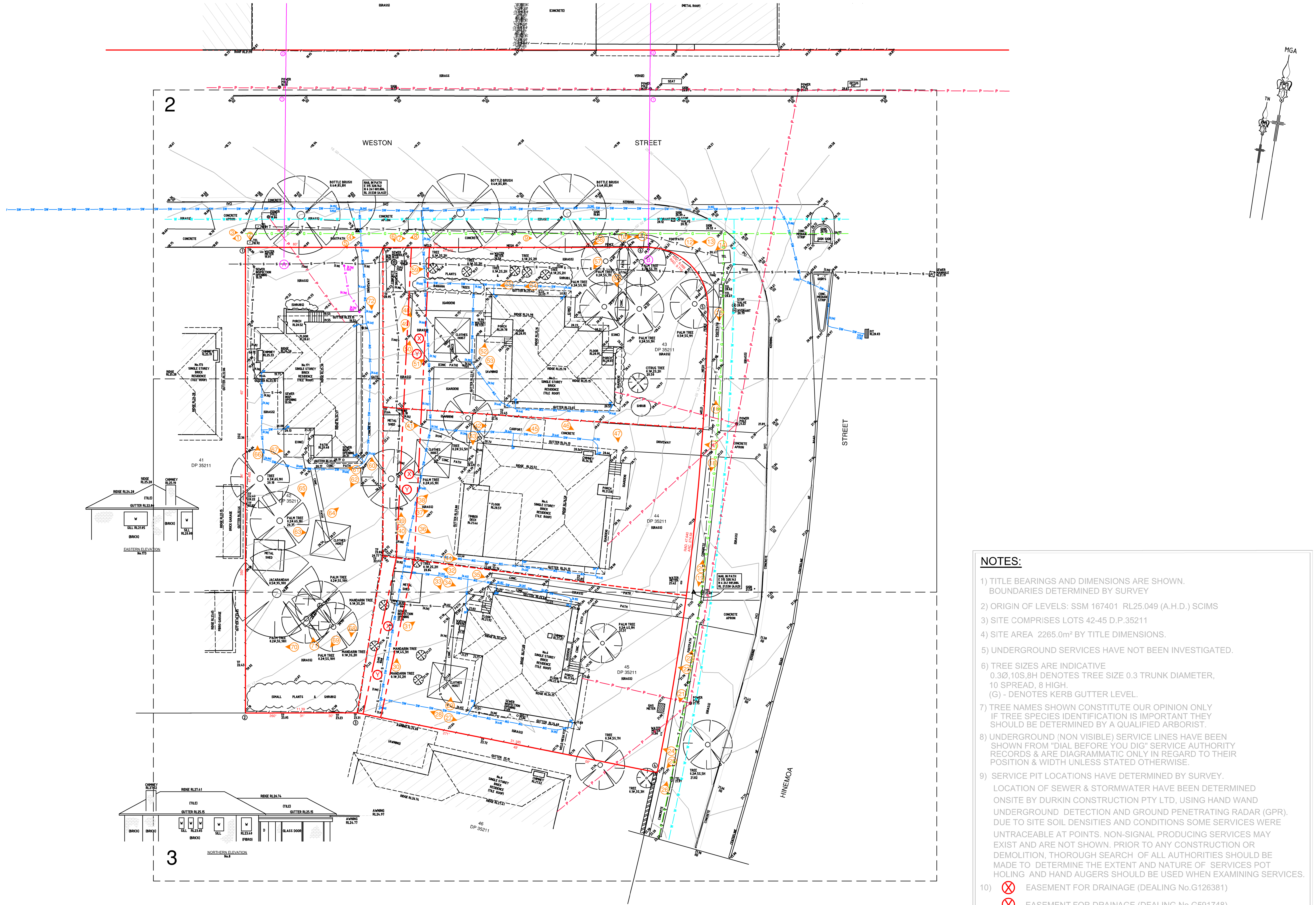
SYMBOL	MEANING
I	Insitu
A	Above Soil
H	Headspace

TABLE E3.3 – WATERTABLE SYMBOLS

SYMBOL	DESCRIPTION
	Standing Water Level
	Inflow
	Outflow

APPENDIX B.1 – Detailed Survey Drawings

L.G.A. CANTERBURY-BANKSTOWN



BOUNDARY CO-ORDINATES

	EASTING	NORTHING
1	315 277.325	6 241 109.078
2	315 285.095	6 241 062.259
3	315 296.330	6 241 064.134
4	315 327.496	6 241 063.144
5	315 324.879	6 241 110.651
6	315 317.846	6 241 115.803

LEGEND :

- TF - DENOTES TOP OF FENCE LEVEL
- (PC) - DENOTES PRAM CROSSING
- (VC) - DENOTES VEHICLE CROSSING
- SIO - DENOTES SEWER INSPCTION OPENING
- 1 - DENOTES PHOTO LOCATION
- — ? — - DENOTES UNKNOWN SERVICE LOCATED BY "DURKIN CONSTRUCTION"
- EOT - DENOTES END OF TRACE
- [0.50] - DENOTES UNDERGROUND SERVICE DEPTH.

NOTES:

1) TITLE BEARINGS AND DIMENSIONS ARE SHOWN. BOUNDARIES DETERMINED BY SURVEY
2) ORIGIN OF LEVELS: SSM 167401 RL25.049 (A.H.D.) SCIMS
3) SITE COMPRISES LOTS 42-45 D.P.35211
4) SITE AREA 2265.0m² BY TITLE DIMENSIONS.
5) UNDERGROUND SERVICES HAVE NOT BEEN INVESTIGATED.
6) TREE SIZES ARE INDICATIVE 0.3Ø,10S,8H DENOTES TREE SIZE 0.3 TRUNK DIAMETER, 10 SPREAD, 8 HIGH. (G) - DENOTES KERB GUTTER LEVEL.
7) TREE NAMES SHOWN CONSTITUTE OUR OPINION ONLY IF TREE SPECIES IDENTIFICATION IS IMPORTANT THEY SHOULD BE DETERMINED BY A QUALIFIED ARBORIST.
8) UNDERGROUND (NON VISIBLE) SERVICE LINES HAVE BEEN SHOWN FROM "DIAL BEFORE YOU DIG" SERVICE AUTHORITY RECORDS & ARE DIAGRAMMATIC ONLY IN REGARD TO THEIR POSITION & WIDTH UNLESS STATED OTHERWISE.
9) SERVICE PIT LOCATIONS HAVE DETERMINED BY SURVEY. LOCATION OF SEWER & STORMWATER HAVE BEEN DETERMINED ONSITE BY DURKIN CONSTRUCTION PTY LTD, USING HAND WAND UNDERGROUND DETECTION AND GROUND PENETRATING RADAR (GPR). DUE TO SITE SOIL DENSITIES AND CONDITIONS SOME SERVICES WERE UNTRACEABLE AT POINTS. NON-SIGNAL PRODUCING SERVICES MAY EXIST AND ARE NOT SHOWN. PRIOR TO ANY CONSTRUCTION OR DEMOLITION, THOROUGH SEARCH OF ALL AUTHORITIES SHOULD BE MADE TO DETERMINE THE EXTENT AND NATURE OF SERVICES POT HOLING AND HAND AUGERS SHOULD BE USED WHEN EXAMINING SERVICES.
10) Ⓧ EASEMENT FOR DRAINAGE (DEALING No.G126381)
Ⓨ EASEMENT FOR DRAINAGE (DEALING No.G591748)

No.	DATE	NOTATION/AMENDMENT
A	7.06.24	DISTANCES TO RAILWAY ASSETS ADDED

No.	DATE	NOTATION/AMENDMENT

FILE	FILE SIZE (MB)	CHECKED BY

CONTOUR INTERVAL: 0.2m
DATUM: A.H.D.
ORIGIN OF DATUM: SSM 167401 25.049 SCIMS
100 YEAR FLOOD RL: N/A
RECOMMENDED MINIMUM FLOOR RL: N/A
SOURCE OF FLOOD INFO: N/A

LEGEND OF COMMONLY USED SYMBOLS
WATER (DBYD)
SEWER
ELECTRICITY O/H
ELECTRICITY U/G
TELECOM (DBYD)
GAS (DBYD)
STORMWATER
BENCH MARK
SURVEY CONTROL MARK
PM SSM

REDUCTION RATIO 1 : 200 (A1)
0 10 5 10
LAND TITLE INFORMATION
LOTS: 42, 43, 44, 45
PLAN NOs : D.P 35211
OTHER:
AREA: TOTAL 2265.0m²

DATE OF SURVEY: 27/02/2024
SURVEY CONSULTANT: MA

Norton Survey Partners
SURVEYORS & LAND TITLE CONSULTANTS
PH +61 2 9555 2744
office@nspartners.com.au
SUITE 1 /505 BALMAIN ROAD
LILYFIELD N.S.W. 2040
REF: 52042.DWG

DRAWING TITLE
DETAIL & LEVEL SURVEY

LOCATION
PANANIA

STREET ADDRESS
171 WESTON STREET
2-6 HINEMOA STREET

TYPE
S

JOB NUMBER
52042

SHT. 1 OF 4

L.G.A. CANTERBURY-BANKSTOWN

No.	DATE	NOTATION/AMENDMENT	No.	DATE	NOTATION/AMENDMENT
A	7.06.24	DISTANCES TO RAILWAY ASSETS ADDED			

FILE | FILE SIZE (MB) | CHECKED BY

CONTOUR INTERVAL: 0.2m
DATUM: A.H.D.
ORIGIN OF DATUM: SSM 167401 25.049 SCIMS
100 YEAR FLOOD RL: N/A
RECOMMENDED MINIMUM FLOOR RL: N/A
SOURCE OF FLOOD INFO: N/A

LEGEND OF COMMONLY USED SYMBOLS
WATER — W —
SEWER — S —
ELECTRICITY O/H — P —
ELECTRICITY U/G — E —
TELECOM — T —
GAS — G —
STORMWATER — SW —
BENCH MARK
SURVEY CONTROL MARK
PM SSM

REDUCTION RATIO 1 : 100 (A1)

LAND TITLE INFORMATION
LOTS: 42, 43, 44, 45
PLAN NOs : D.P 35211
OTHER:
AREA: TOTAL 2265.0m²

DATE OF SURVEY: 27/02/2024
SURVEY CONSULTANT: MA

Norton Survey Partners
SURVEYORS & LAND
TITLE CONSULTANTS
PH +61 2 9555 2744
office@nspartners.com.au
SUITE 1 /505 BALMAIN ROAD
LILYFIELD N.S.W. 2040

REF: 52042.DWG

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DRAWING TITLE
DETAIL & LEVEL SURVEY

LOCATION
PANANIA

STREET ADDRESS
171 WESTON STREET
2-6 HINEMOA STREET

TYPE
S

JOB NUMBER
52042

SHT. 2 OF 4

No.	DATE	NOTATION/AMENDMENT
A	7.06.24	DISTANCES TO RAILWAY ASSETS ADDED

No.	DATE	NOTATION/AMENDMENT

FILE	FILE SIZE (MB)	CHECKED BY

CONTOUR INTERVAL: 0.2m
DATUM: A.H.D.
ORIGIN OF DATUM: SSM 167401 25.049 SCIMS
100 YEAR FLOOD RL: N/A
RECOMMENDED MINIMUM FLOOR RL: N/A
SOURCE OF FLOOD INFO: N/A

LEGEND OF COMMONLY USED SYMBOLS
WATER — W — W — W — W
SEWER — S — S — S — S
ELECTRICITY O/H — P — P — P — P
ELECTRICITY U/G — E — E — E — E
TELECOM — T — T — T — T
GAS — G — G — G — G
STORMWATER — SW — SW — SW — SW
BENCH MARK
SURVEY CONTROL MARK
PM SSM

REDUCTION RATIO 1 : 100 (A1)
LAND TITLE INFORMATION
LOTS: 42, 43, 44, 45
PLAN NOs : D.P 35211
OTHER:
AREA: TOTAL 2265.0m²

DATE OF SURVEY: 27/02/2024
SURVEY CONSULTANT: MA

Norton Survey Partners
SURVEYORS & LAND
TITLE CONSULTANTS
PH +61 2 9555 2744
office@nspartners.com.au
SUITE 1 /505 BALMAIN ROAD
LILYFIELD N.S.W. 2040

DRAWING TITLE
DETAIL & LEVEL SURVEY

LOCATION
PANANIA

STREET ADDRESS
171 WESTON STREET
2-6 HINEMOA STREET

TYPE
S

JOB NUMBER
52042

SHT. 3
OF 4

L.G.A. CANTERBURY-BANKSTOWN

DISTANCES FROM SITE BOUNDARY SECTION A		DISTANCES FROM SITE BOUNDARY SECTION B	
1	KERB 15.44	1	KERB 15.40
2	RAIL BDY 20.12	2	RAIL BDY 20.12
3	FENCE 29.50	3	N/A
4	NEAR RAIL 37.57	4	NEAR RAIL 37.56
5	O/H POWER 38.21	5	O/H POWER 38.31

A. Whitfield
ANDREW WHITFIELD
REGISTERED SURVEYOR
BOSSI ID No.8382

No.	DATE	NOTATION/AMENDMENT
A	7.06.24	DISTANCES TO RAILWAY ASSETS ADDED

No.	DATE	NOTATION/AMENDMENT

FILE	FILE SIZE (MB)	CHECKED BY

CONTOUR INTERVAL: 0.2m
DATUM: A.H.D.
ORIGIN OF DATUM: SSM 167401 25.049 SCIMS
100 YEAR FLOOD RL: N/A
RECOMMENDED MINIMUM FLOOR RL: N/A
SOURCE OF FLOOD INFO: N/A

LEGEND OF COMMONLY USED SYMBOLS
WATER — W — W — W — W
SEWER — S — S — S — S
ELECTRICITY O/H — P — P — P — P
ELECTRICITY U/G — E — E — E — E
TELECOM O/H U/G — T — T — T — T
GAS — G — G — G — G
STORMWATER — SW — SW — SW — SW
BENCH MARK
SURVEY CONTROL MARK PM SSM

REDUCTION RATIO 1 : 100 (A1)
0 10 5 10

LAND TITLE INFORMATION
LOTS: 42, 43, 44, 45
PLAN NOs : D.P 35211
OTHER:
AREA: TOTAL 2265.0m²

DATE OF SURVEY: 27/02/2024
SURVEY CONSULTANT: MA

Norton Survey Partners
SURVEYORS & LAND TITLE CONSULTANTS
PH +61 2 9555 2744
office@nspartners.com.au
SUITE 1 /505 BALMAI ROAD
LILYFIELD N.S.W. 2040

REF: 52042.DWG

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DRAWING TITLE
DETAIL & LEVEL SURVEY

LOCATION
PANANIA

STREET ADDRESS
171 WESTON STREET
2-6 HINEMOA STREET

TYPE
S

JOB NUMBER
52042

SHT. 4
OF 4

APPENDIX B.2 – Architectural Drawings

ABN 41 159 480 056 NOMINATED ARCHITECT: P Morson(8100)

ISSUE	DATE	AMENDMENT
P1	2023-08-03	FOR CLIENT REVISION
P2	2023-08-09	PRE-DA MEETING
P3	2024-01-23	FOR CLIENT REVISION
P4	2024-01-29	FOR CLIENT REVISION

TRUE NORTH

0 5 10 15 20m
SCALE 1:200@A1 (1:400@A3)

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

CLIENT
NSW LAHC
LOCKED BAG 5022
PARRAMATTA NSW 2124
PHONE 1800 738 718

PROJECT No. 21042

CLIENT
LAHC

NOMINATED ARCHITECT - P F
MORSON REGISTRATION NUMBER 8100
ACN 159 480 056, ABN 41 159 480 056
www.morsongroup.com.au
(02) 9380 4946
PO Box 170, Potts Point, NSW 1335

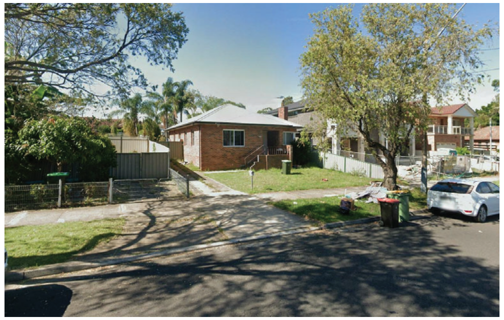
SHEET SIZE: A1
SHEET NAME: **SITE PLAN**
SCALE: 1 : 200

DRAWING No. **DA08**
ISSUE No. **P4**

13/02/2024 16:11:26
C:\Users\hfrub\MG Dropbox\Ruben Hernandez Fernandez\21042 - LAHC General Housing\Architecture\CAD\21042_171 Weston St, Panania General Housing_20240213_RH.rvt

2 Hinemoa St

4-6 Hinemoa St



171 Weston

Weston Hinemoa Corner

1. THE CONTRACTOR SHALL IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES TO THE COUNCIL'S SPECIFICATION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND DURING CONSTRUCTION.

2. ALL EROSION & SEDIMENT CONTROL DEVICES SHALL BE MAINTAINED IN A SATISFACTORY WORKING ORDER DURING THE CONSTRUCTION PERIOD. INSPECTIONS OF THESE DEVICES SHALL BE CARRIED OUT AFTER EACH STORM. REPAIRS AND/OR DE-CLOGGING SHALL BE CARRIED OUT TO ENSURE PROPER OPERATION OF THE DEVICE.

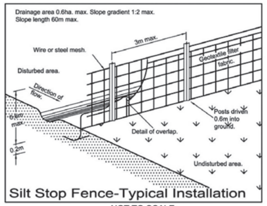
3. STORAGE OF MATERIALS AND EQUIPMENT SHALL BE WITHIN SEDIMENT CONTROLLED AREAS.

4. REMOVE SILT STOP FENCING AND DRAINAGE STRUCTURE SEDIMENT CONTROL TRAPS AFTER VEGETATION IS ESTABLISHED.

NOTE:

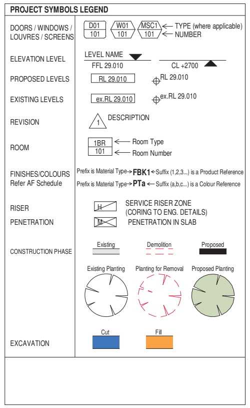
1. ALL DEMOLITION WORK TO BE CARRIED OUT IN ACCORDANCE WITH AS 2601-2001(THE DEMOLITION OF STRUCTURES)

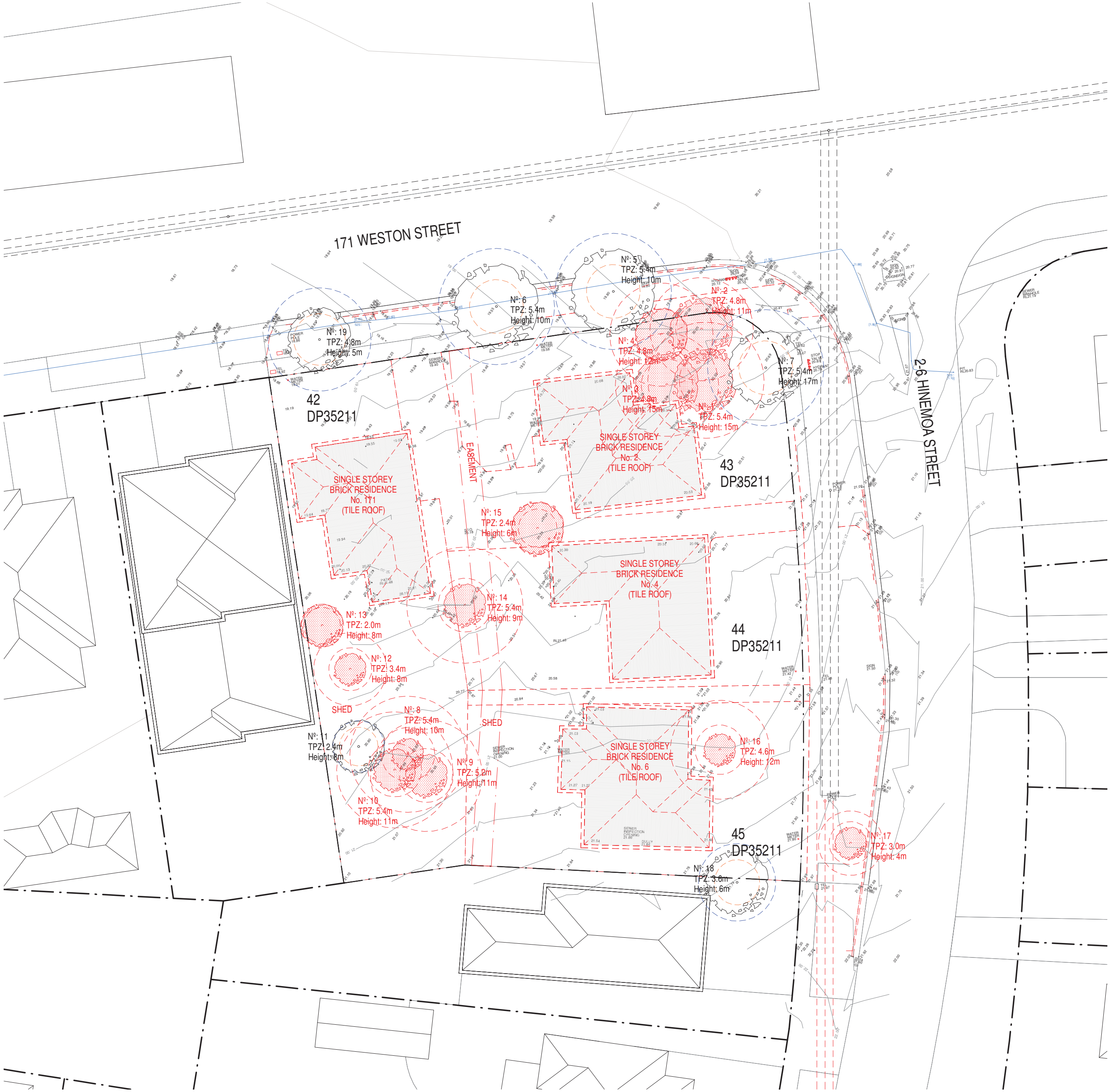
2. THIS DEMOLITION DRAWING GIVES AN INDICATION OF THE SCOPE REQUIRED TO CARRY OUT THE ALTERATIONS & ADDITIONS AS PROPOSED. THE BUILDER IS ASSUMED TO HAVE INSPECTED THE SITE DURING TENDERING & ALLOWED FOR ALL DEMOLITION INCLUDING SUNDRY WORKS NOT INDICATED ON THIS DRAWING THAT ARE REQUIRED IN ORDER TO CONSTRUCT THE WORKS.



Silt Stop Fence-Typical Installation

NOT TO SCALE





ISSUE	DATE	AMENDMENT
P1	2023-08-03	FOR CLIENT REVISION
P2	2023-08-09	PRE-DA MEETING

DEMOLITION NOTE:
This demolition drawing gives an indication of the scope required to carry out the alterations & additions as proposed. The builder is assumed to have inspected the site during tendering & allowed for all demolition including sundry works not indicated on this drawing that are required in order to construct the works.

TRUE NORTH

0 5 10 15 20m
SCALE 1:200@A1 (1:400@A3)

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

CLIENT
NSW LAHC
LOCKED BAG 5022
PARRAMATTA NSW 2124
PHONE 1800 738 718

PROJECT No. 21042

CLIENT
LAHC

NOMINATED ARCHITECT - P F
MORSON REGISTRATION NUMBER 8100
ACN 159 480 056, ABN 41 159 480 056
www.morsongroup.com.au
(02) 9380 4946
PO Box 170, Potts Point, NSW 1335

SHEET SIZE: A1
SCALE: 1 : 200
SHEET NAME: **DEMOLITION PLAN**

DRAWING No. **DA09**
ISSUE No. **P2**

ISSUE	DATE	AMENDMENT
P2	2023-08-10	FOR CLIENT REVISION
P3	2023-11-22	FOR CLIENT REVISION
P4	2024-01-23	FOR CLIENT REVISION
P5	2024-01-29	FOR CLIENT REVISION

TRUE NORTH

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

CLIENT
NSW LAHC
LOCKED BAG 5022
PARRAMATTA NSW 2124
PHONE 1800 738 718

PROJECT No. **21042**

CLIENT
LAHC

MORSON GROUP
NOMINATED ARCHITECT - P F
MORSON REGISTRATION NUMBER 8100
ACN 159 480 056, ABN 41 159 480 056
www.morsongroup.com.au
(02) 9380 4946
PO Box 170, Potts Point, NSW 1335

SHEET SIZE: A1
SHEET NAME: **BASEMENT**
SCALE: 1 : 100

DRAWING No. **DA10**
ISSUE No. **P5**

13/02/2024 16:11:32 C:\Users\hfrub\MG Dropbox\Ruben Hernandez Fernandez\21042 - LAHC General Housing\Architecture\CAD\21042_171 Weston St, Panania General Housing_20240213_RH.rvt

ISSUE	DATE	AMENDMENT
P3	2023-11-22	FOR CLIENT REVISION
P4	2024-01-23	FOR CLIENT REVISION
P5	2024-01-29	FOR CLIENT REVISION
P6	2024-02-13	FOR CLIENT REVISION

TRUE NORTH

0 1 2 3 4 5 7 10m
SCALE 1:100@A1 (1:200@A3)

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

CLIENT
NSW LAHC
LOCKED BAG 5022
PARRAMATTA NSW 2124
PHONE 1800 738 718

PROJECT No. 21042
CLIENT LAHC

MORSON GROUP
NOMINATED ARCHITECT - P F MORSON REGISTRATION NUMBER 8100
ACN 159 480 056, ABN 41 159 480 056
www.morsongroup.com.au
(02) 9380 4946
PO Box 170, Potts Point, NSW 1335

SHEET SIZE: A1
SHEET NAME: **GROUND LEVEL**
SCALE: 1 : 100

DRAWING No. **DA11**
ISSUE No. **P6**

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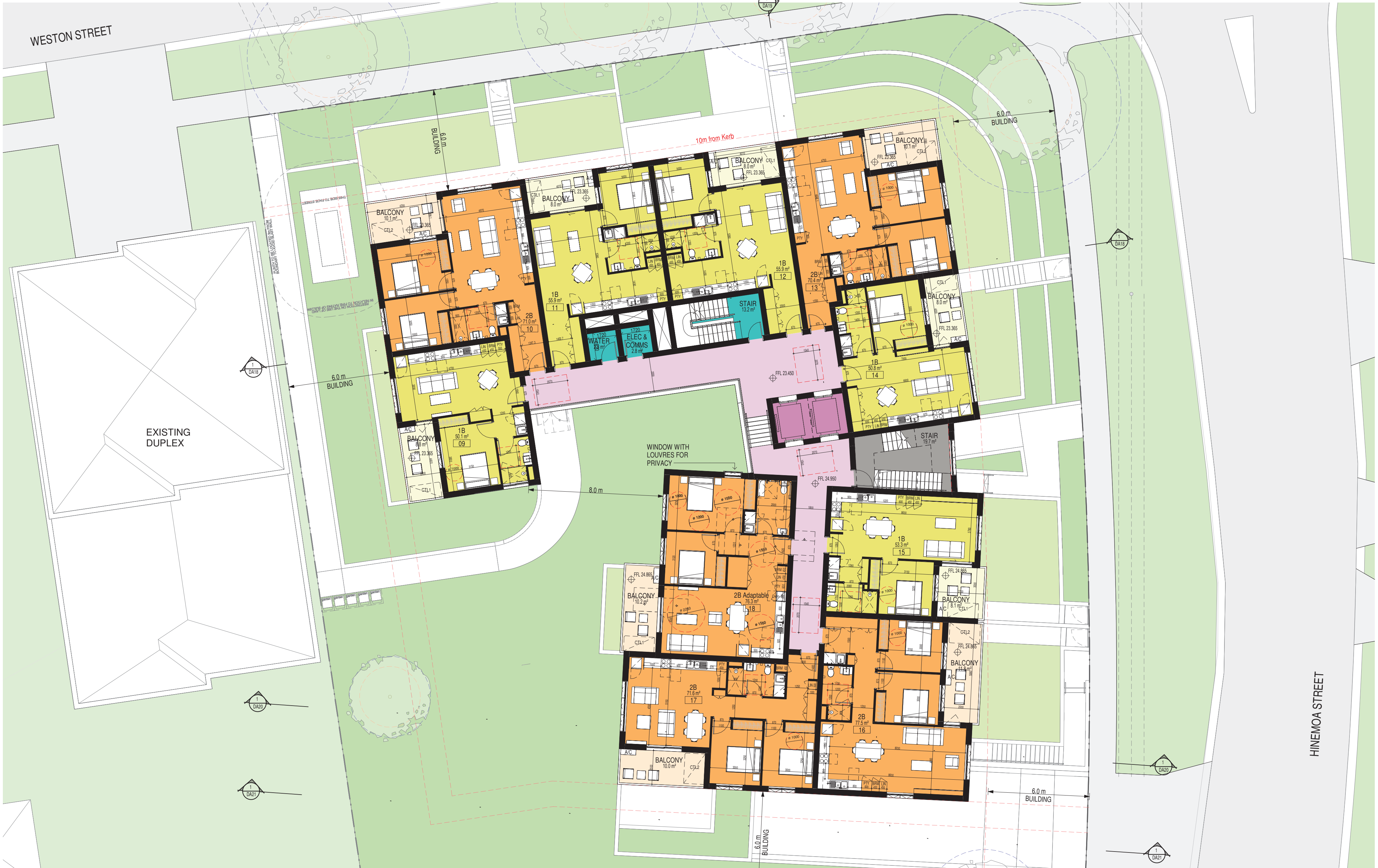

ISSUE	DATE	AMENDMENT
P2	2023-08-10	FOR CLIENT REVISION
P3	2023-11-22	FOR CLIENT REVISION
P4	2024-01-23	FOR CLIENT REVISION
P5	2024-01-29	FOR CLIENT REVISION

TRUE NORTH

0 1 2 3 4 5 7 10m
SCALE 1:100@A1 (1:200@A3)

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

CLIENT
NSW LAHC
LOCKED BAG 5022
PARRAMATTA NSW 2124
PHONE 1800 738 718

NSW GOVERNMENT

PROJECT No. 21042

CLIENT
LAHC

MORSON GROUP
NOMINATED ARCHITECT - P F
MORSON REGISTRATION NUMBER 8100
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PO Box 170, Potts Point, NSW 1335

SHEET SIZE: A1
SHEET NAME: **LEVEL 1**
SCALE: 1 : 100

DRAWING No. **DA12**
ISSUE No. **P5**

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ISSUE	DATE	AMENDMENT
P2	2023-08-10	FOR CLIENT REVISION
P3	2023-11-22	FOR CLIENT REVISION
P4	2024-01-23	FOR CLIENT REVISION
P5	2024-01-29	FOR CLIENT REVISION

TRUE NORTH

0 1 2 3 4 5 7 10m
SCALE 1:100@A1 (1:200@A3)

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

CLIENT
NSW LAHC
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PARRAMATTA NSW 2124
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PROJECT No. 21042

CLIENT
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SHEET SIZE: A1
SHEET NAME: **LEVEL 2 and 3**
SCALE: 1 : 100

DRAWING No. **DA13**
ISSUE No. **P5**

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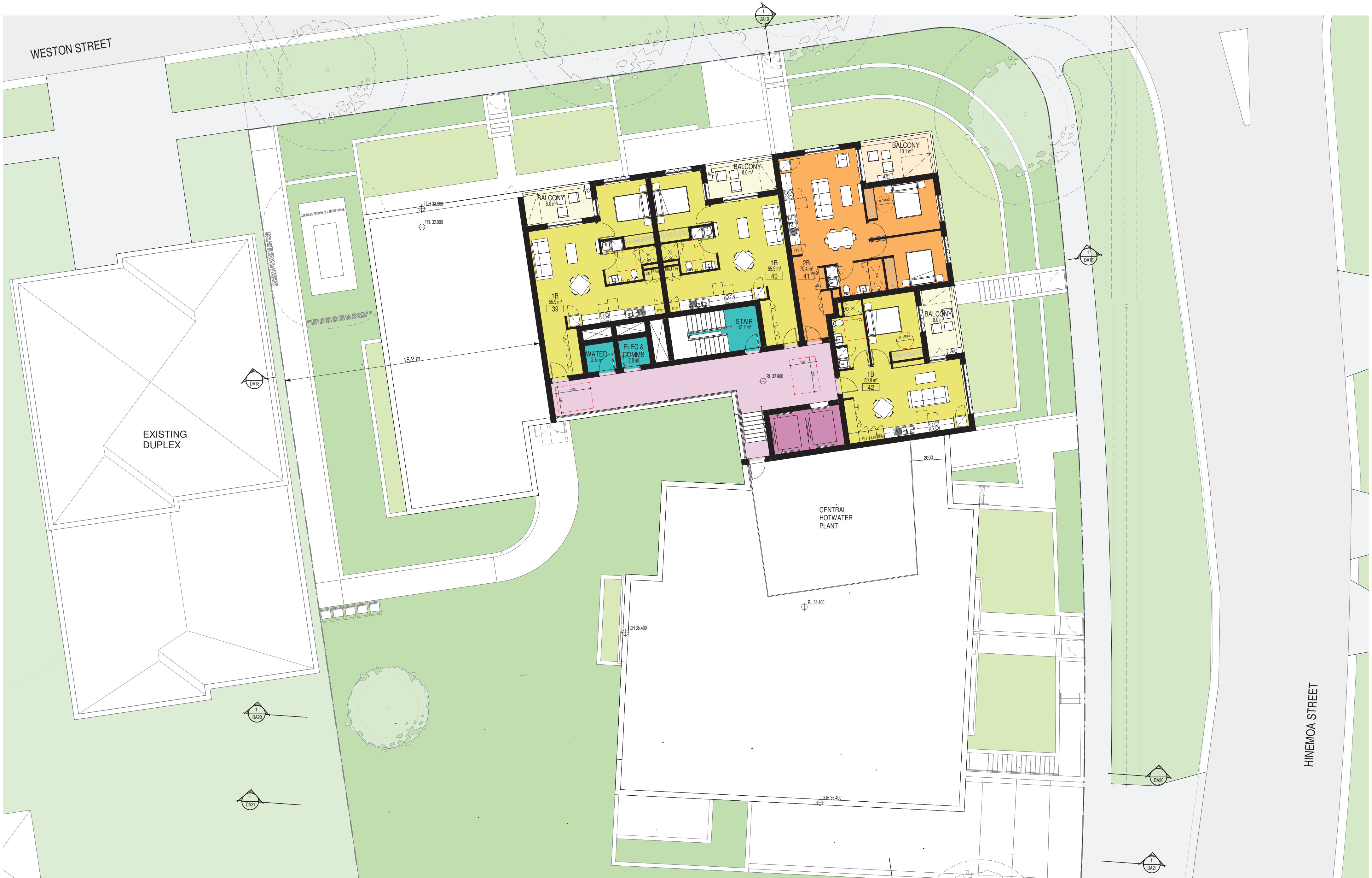

ISSUE	DATE	AMENDMENT
P3	2023-11-22	FOR CLIENT REVISION
P4	2024-01-23	FOR CLIENT REVISION
P5	2024-01-29	FOR CLIENT REVISION
P6	2024-02-13	FOR CLIENT REVISION

TRUE NORTH

0 1 2 3 4 5 7 10m
SCALE 1:100@A1 (1:200@A3)

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

CLIENT
NSW LAHC
LOCKED BAG 5022
PARRAMATTA NSW 2124
PHONE 1800 738 718

NSW GOVERNMENT

PROJECT No. 21042

CLIENT
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SHEET SIZE: A1
SHEET NAME: **LEVEL 4**
SCALE: 1 : 100

DRAWING No. **DA14**
ISSUE No. **P6**

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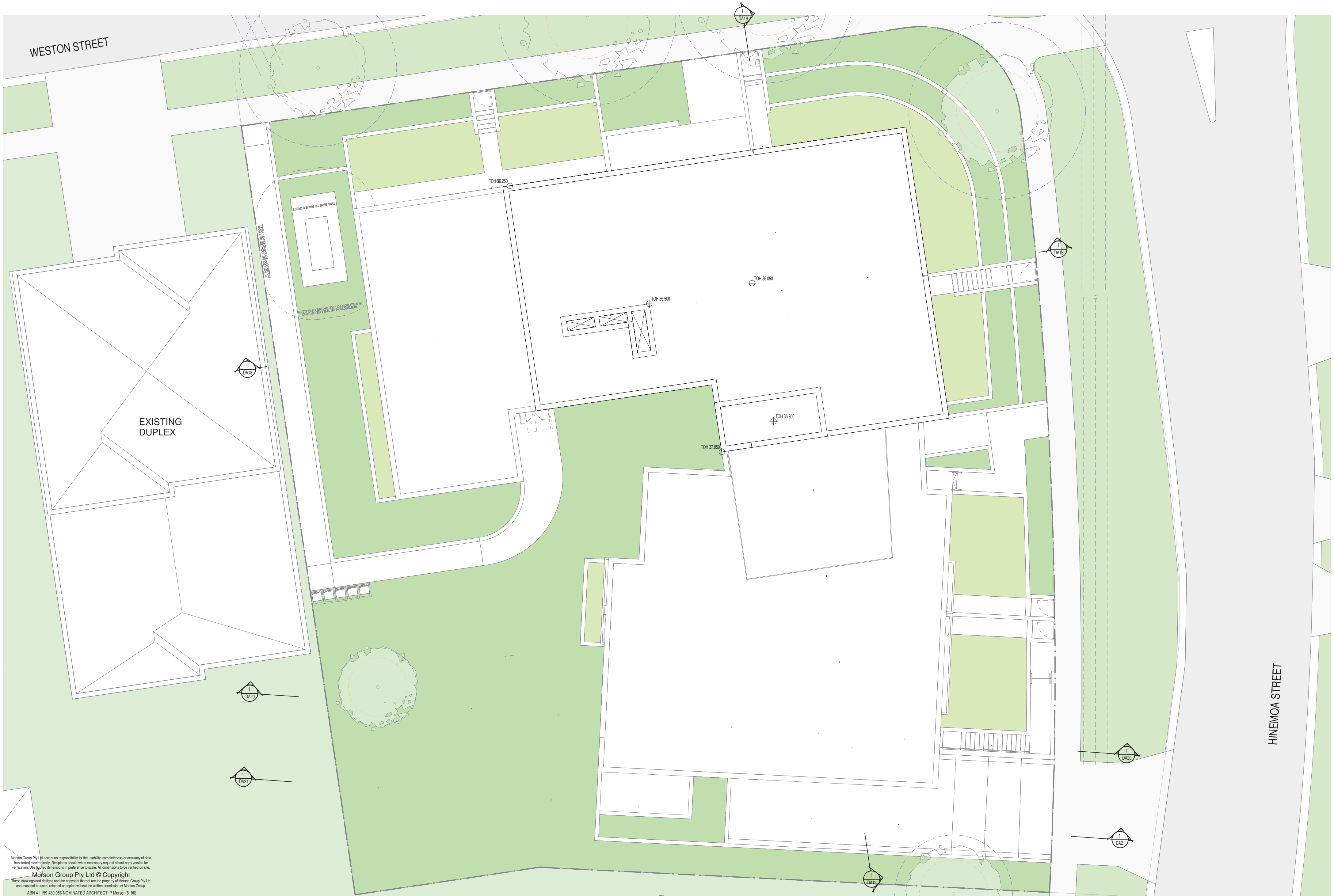

ISSUE	DATE	AMENDMENT
P1	2023-11-22	FOR CLIENT REVISION
P2	2024-01-23	FOR CLIENT REVISION
P3	2024-01-29	FOR CLIENT REVISION
P4	2024-02-13	FOR CLIENT REVISION

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

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NSW LAHC
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PARRAMATTA NSW 2124
PHONE 1800 738 718

PROJECT No. **21042**

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SHEET SIZE: A1
SCALE: 1 : 100
SHEET NAME: **ROOF LEVEL**
DRAWING No. **DA15**
ISSUE No. **P4**

ABN 41 159 480 056 NOMINATED ARCHITECT: P Morson(8100)

ISSUE	DATE	AMENDMENT
P1	2023-08-03	FOR CLIENT REVISION
P2	2023-08-09	PRE-DA MEETING
P3	2024-02-13	FOR CLIENT REVISION

0 1 2 3 4 5 7 10m
SCALE 1:100@A1 (1:200@A3)

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
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NSW LAHC
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PROJECT No. **21042**

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SHEET SIZE: A1
SHEET NAME: **SECTION 1**
SCALE: 1 : 100

DRAWING No. **DA18**
ISSUE No. **P3**

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ABN 41 159 480 056 NOMINATED ARCHITECT: P Morson(8100)

ISSUE	DATE	AMENDMENT
P1	2023-08-03	FOR CLIENT REVISION
P2	2023-08-09	PRE-DA MEETING
P3	2023-11-22	FOR CLIENT REVISION
P4	2024-02-13	FOR CLIENT REVISION

0 1 2 3 4 5 7 10m
SCALE 1:100@A1 (1:200@A3)

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

CLIENT
NSW LAHC
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SHEET SIZE: A1
SHEET NAME: **SECTION 2**
SCALE: 1 : 100

DRAWING No. **DA19**
ISSUE No. **P4**

13/02/2024 16:12:20
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ABN 41 159 480 056 NOMINATED ARCHITECT: P Morson(8100)

ISSUE	DATE	AMENDMENT
P1	2023-08-03	FOR CLIENT REVISION
P2	2023-08-09	PRE-DA MEETING
P3	2023-11-22	FOR CLIENT REVISION
P4	2024-02-13	FOR CLIENT REVISION

0 1 2 3 4 5 7 10m

SCALE 1:100@A1 (1:200@A3)

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

CLIENT
NSW LAHC
LOCKED BAG 5022
PARRAMATTA NSW 2124
PHONE 1800 738 718

PROJECT No. **21042**

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LAHC

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ACN 159 480 056, ABN 41 159 480 056
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PO Box 170, Potts Point, NSW 1335

SHEET SIZE: A1

SHEET NAME: **SECTION 3**

SCALE: 1 : 100

DRAWING No. **DA20**

ISSUE No. **P4**

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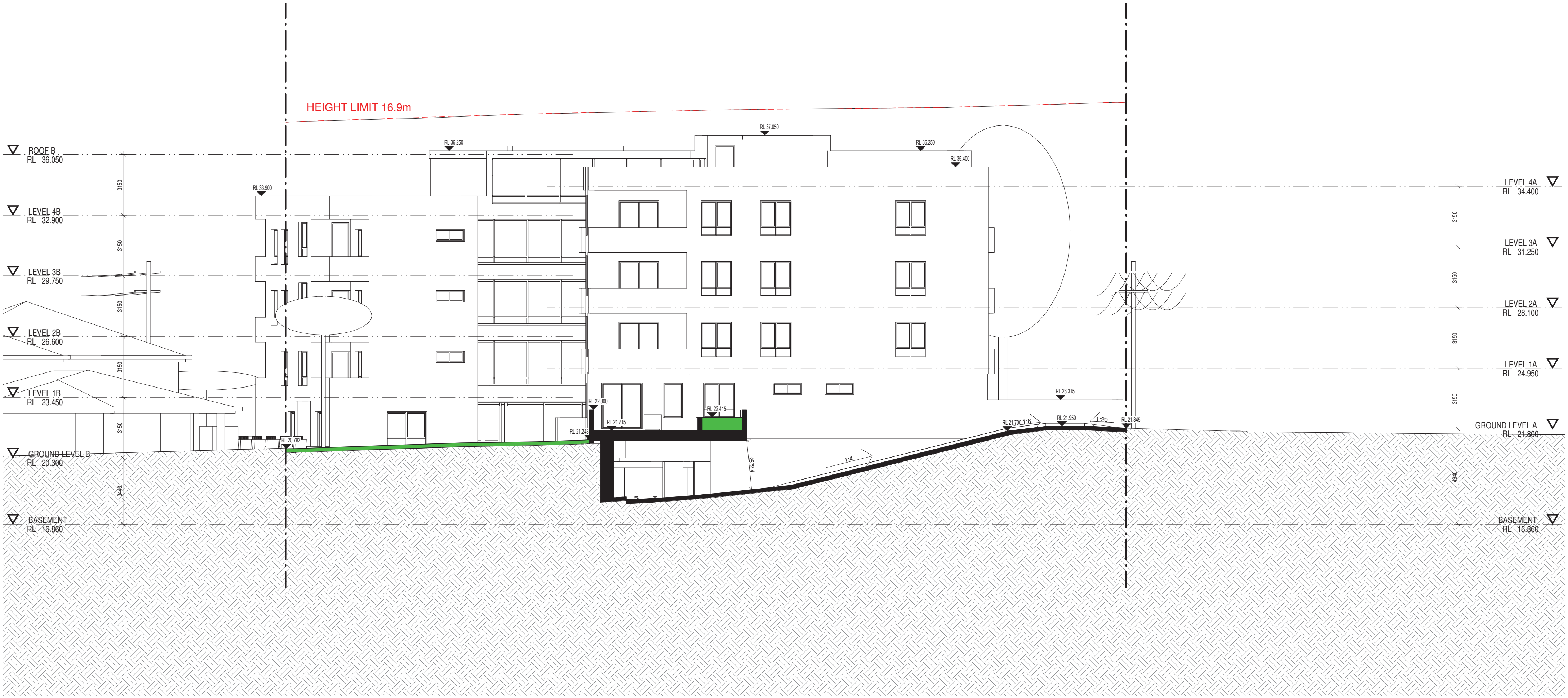

ISSUE	DATE	AMENDMENT
P1	2024-01-29	FOR CLIENT REVISION
P2	2024-02-13	FOR CLIENT REVISION

0 1 2 3 4 5 7 10m
SCALE 1:100@A1 (1:200@A3)

PROJECT
PANANIA - LAHC 2021/505
ADDRESS
171 Weston St & 2-6 Hinemoa St, Panania, NSW, 2213
LOT 42, 43, 44, 45 / DP35211

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NSW LAHC
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CLIENT
LAHC

NOMINATED ARCHITECT - P F
MORSON REGISTRATION NUMBER 8100
ACN 159 480 056, ABN 41 159 480 056
www.morsongroup.com.au
(02) 9380 4946
PO Box 170, Potts Point, NSW 1335

SHEET SIZE: A1
SCALE: 1 : 100
SHEET NAME: **SECTION 4**

DRAWING No. **DA21**
ISSUE No. **P2**

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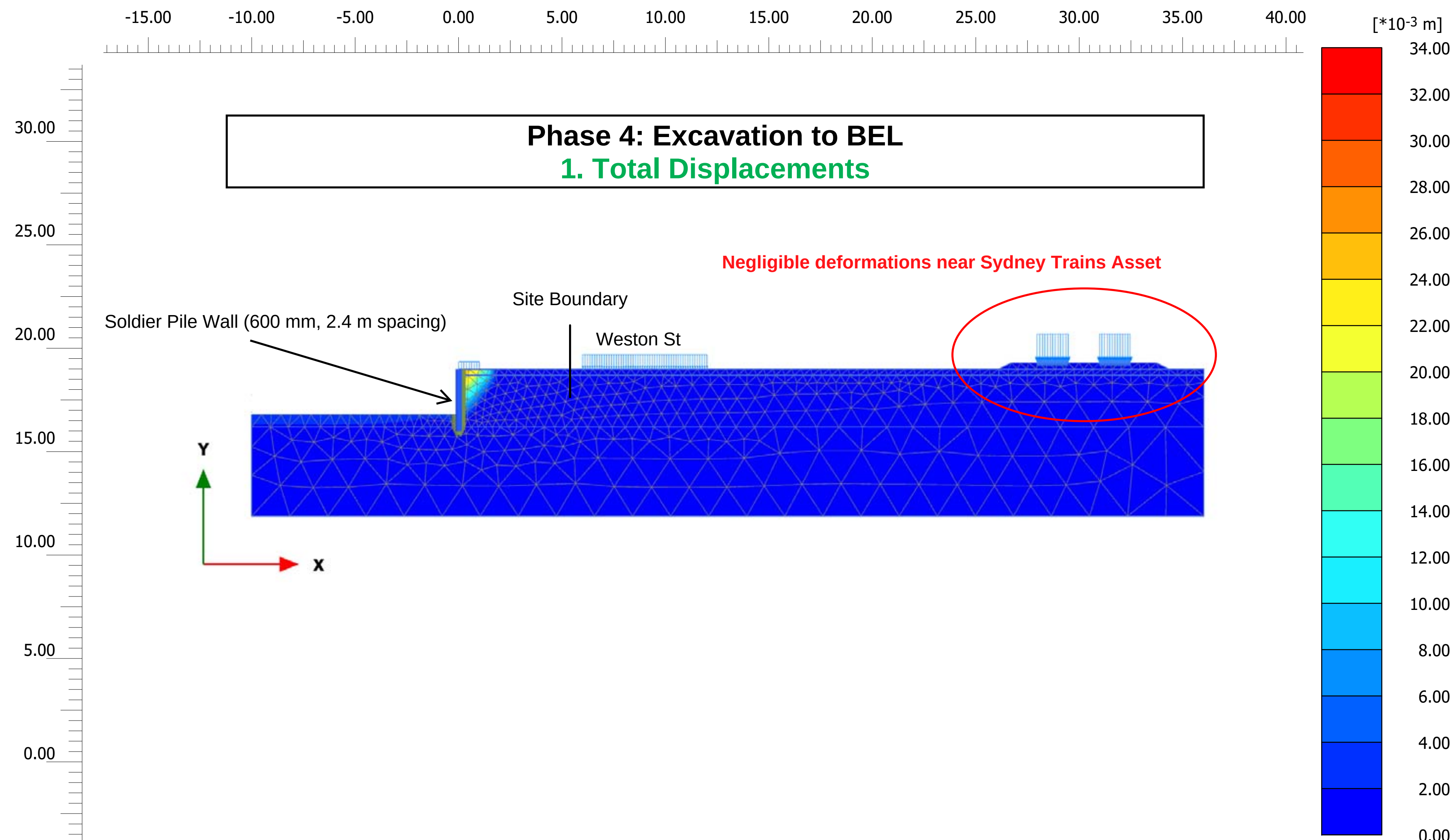
APPENDIX C – FEA Results

Output Version 2024.1.0.1060



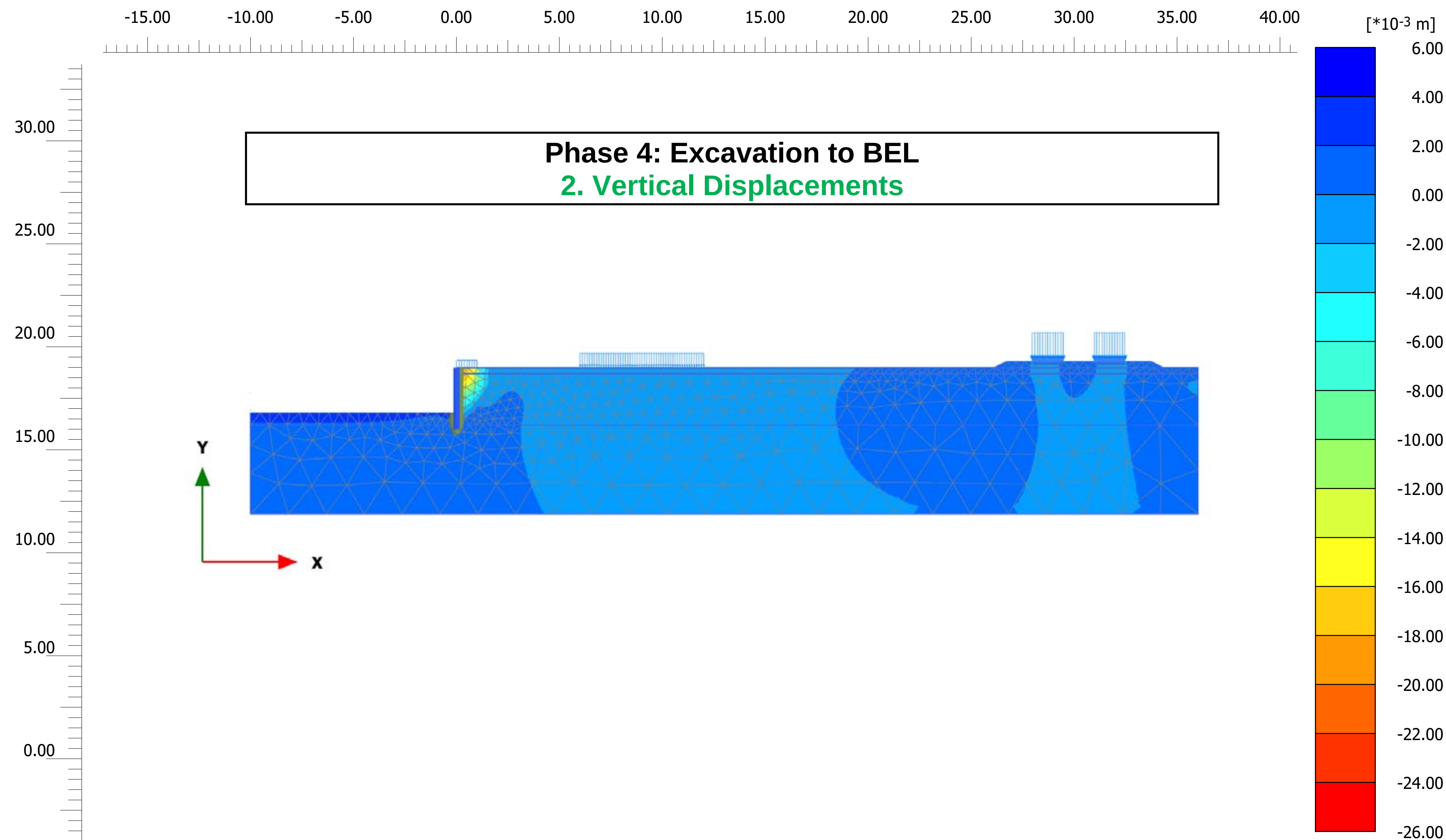
Total displacements |u| (scaled up 50.0 times)

Maximum value = 0.03396 m (Element 80 at Node 1183)

STS GEOTECHNICS PTY LTD CONSULTING GEOTECHNICAL ENGINEERS	*Project description* 31349 17 Weston St Panania			*Date* 4/07/2024
	Project filename Panania with Soilder at rock ...	*Step* 60	*Company* STS Geotechnics	

C:\Users\logger1\Desktop\STS Projects\Panania - Sydney Trains\Panania with Soilder at rock_converted.p2dxdat\

Output Version 2024.1.0.1060



Total displacements u_y (scaled up 50.0 times)

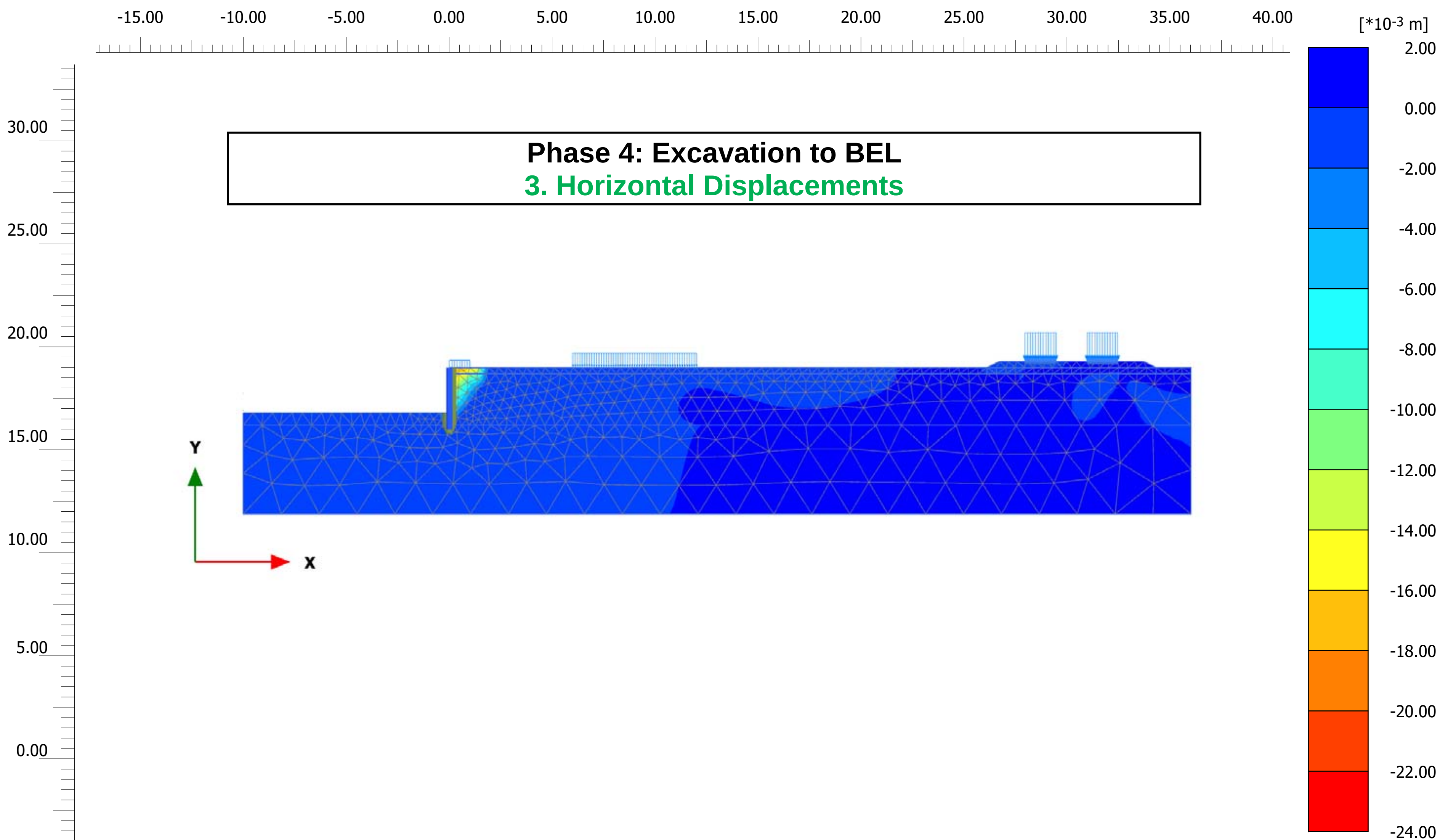
Maximum value = 4.197*10^{-3} m (Element 866 at Node 2387)

Minimum value = -0.02480 m (Element 80 at Node 1183)

STS GEOTECHNICS PTY LTD CONSULTING GEOTECHNICAL ENGINEERS	*Project description* 31349 17 Weston St Panania		*Date* 4/07/2024
	Project filename Panania with Soilder at rock ...	*Step* 60	*Company* STS Geotechnics

C:\Users\logger1\Desktop\STS Projects\Panania - Sydney Trains\Panania with Soilder at rock_converted.p2dxdat\

Output Version 2024.1.0.1060



Total displacements u_x (scaled up 50.0 times)

Maximum value = $0.04455*10^{-3}$ m (Element 491 at Node 6023)

Minimum value = -0.02331 m (Element 191 at Node 1169)

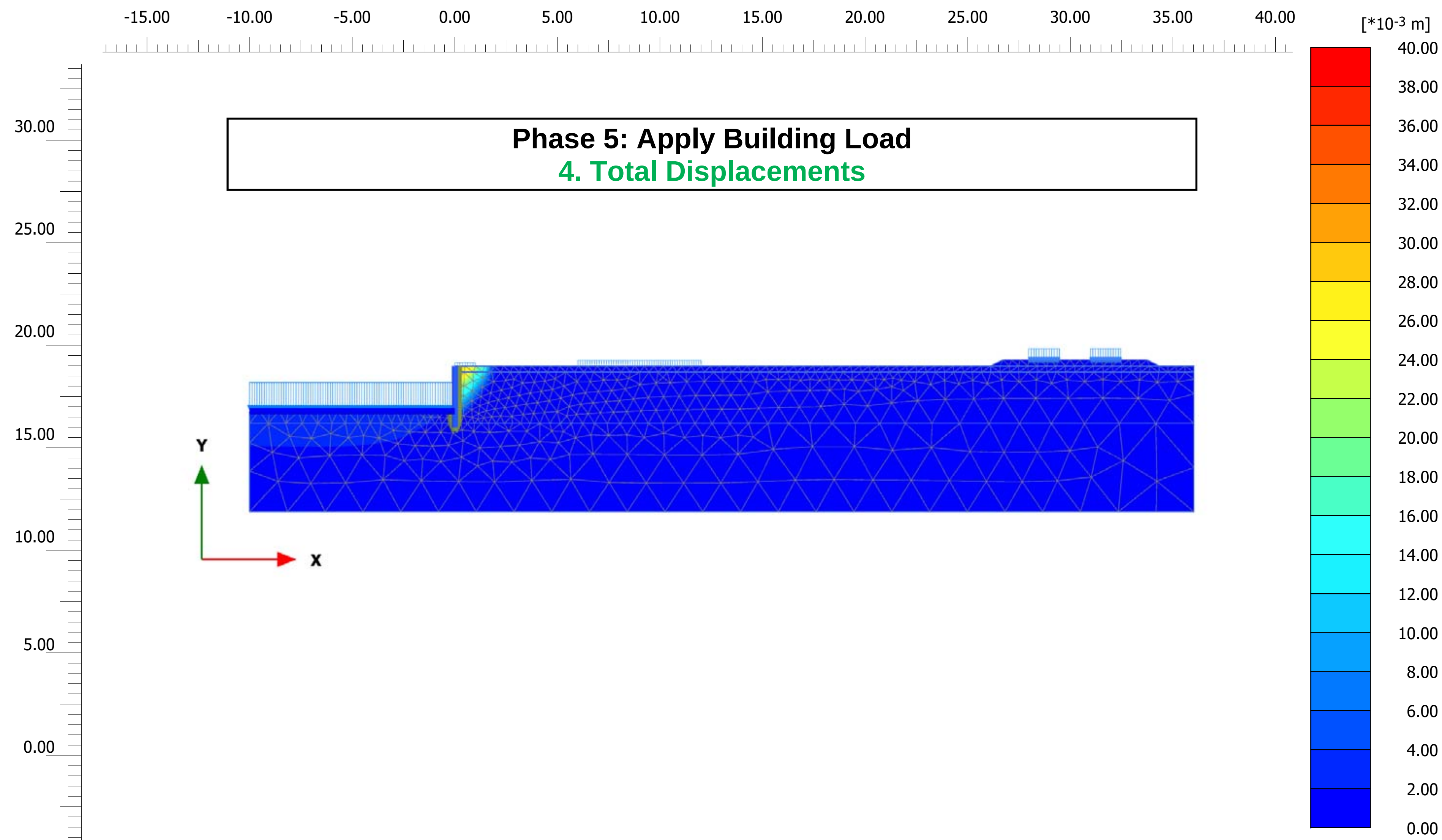
STS GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

Project description	Date
31349 17 Weston St Panania	4/07/2024

Project filename	Step	Company
Panania with Soilder at rock ...	60	STS Geotechnics

C:\Users\logger1\Desktop\STS Projects\Panania - Sydney Trains\Panania with Soilder at rock_converted.p2dxdat\

Output Version 2024.1.0.1060



Total displacements |u| (scaled up 50.0 times)

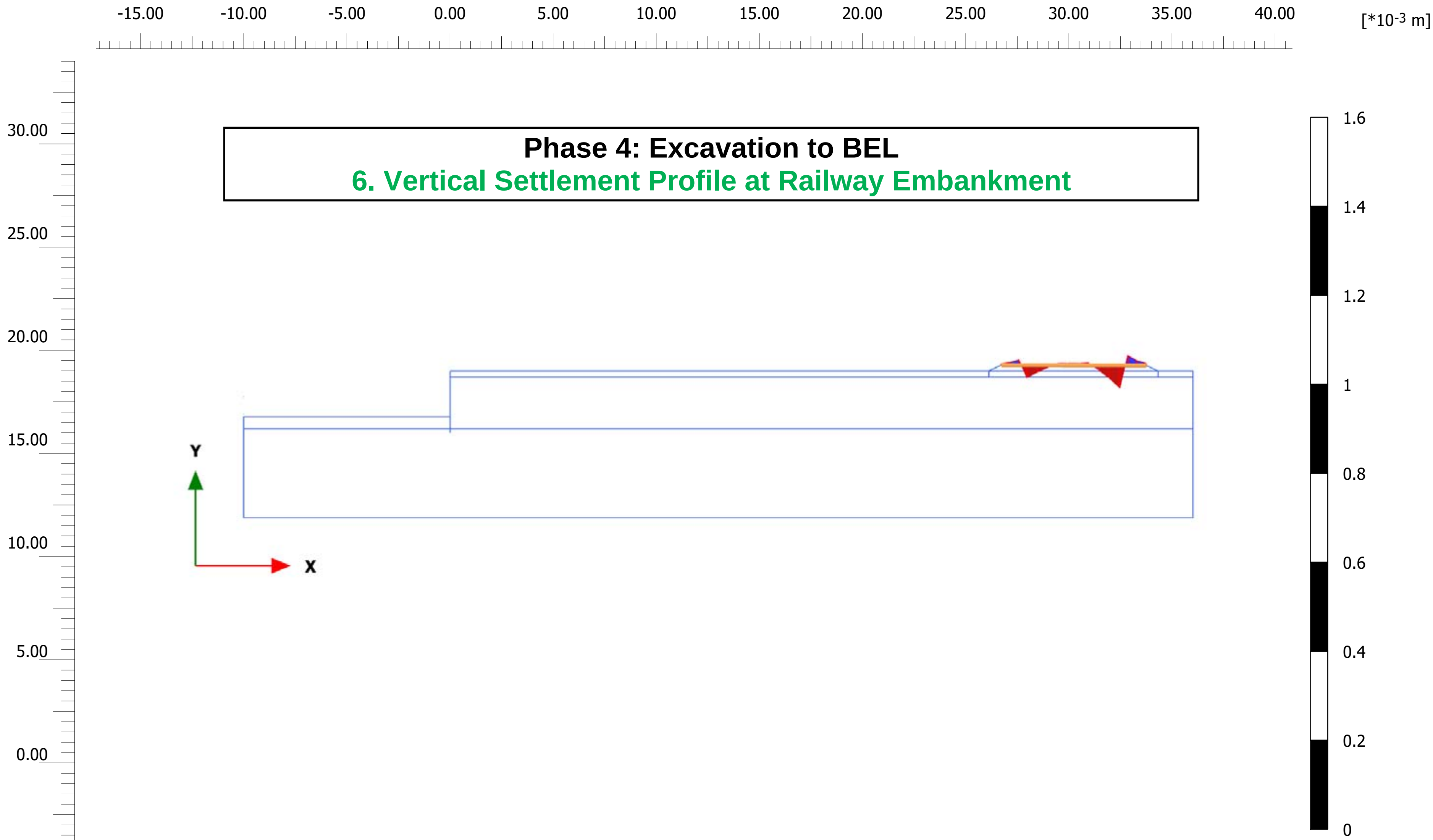
Maximum value = 0.03812 m (Element 80 at Node 1183)

GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

Project description	Date
31349 17 Weston St Panania	4/07/2024

Project filename	Step	Company
Panania with Soilder at rock ...	67	STS Geotechnics

C:\Users\logger1\Desktop\STS Projects\Panania - Sydney Trains\Panania with Soilder at rock_converted.p2dxdat\



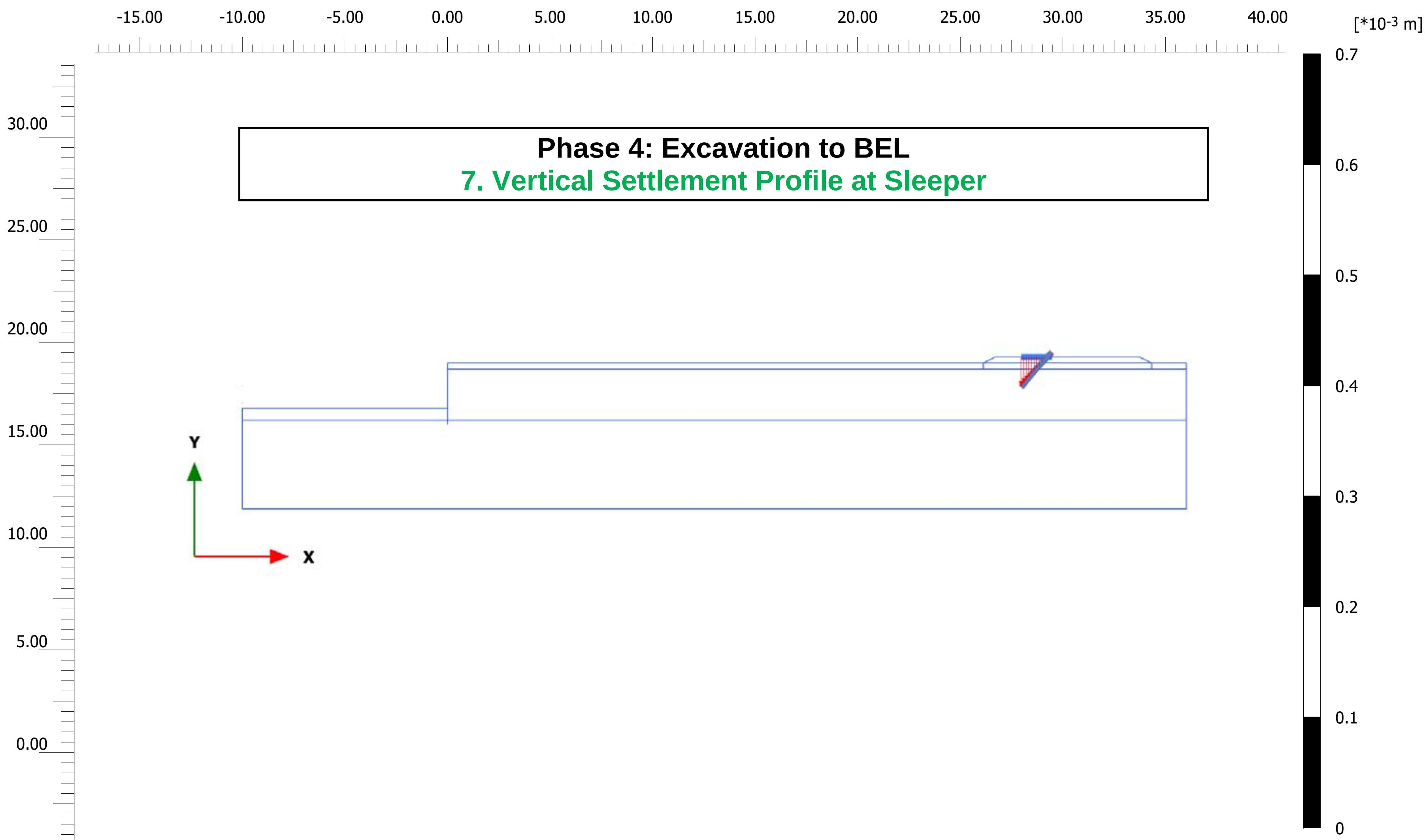
Total displacements u_y (scaled up $20.0*10^3$ times)

Maximum value = $0.02522*10^{-3}$ m

Minimum value = $-0.05534*10^{-3}$ m

STS GEOTECHNICS PTY LTD CONSULTING GEOTECHNICAL ENGINEERS	*Project description* 31349 17 Weston St Panania		*Date* 4/07/2024
	Project filename Panania with Soilder at rock ...	*Step* 60	*Company* STS Geotechnics

C:\Users\logger1\Desktop\STS Projects\Panania - Sydney Trains\Panania with Soilder at rock_converted.p2dxdat\



Total displacements u_y (scaled up $50.0*10^3$ times)

Maximum value = $4.478*10^{-6}$ m (Element 3 at Node 8382)

Minimum value = $-0.02971*10^{-3}$ m (Element 1 at Node 8134)

STS GEOTECHNICS PTY LTD
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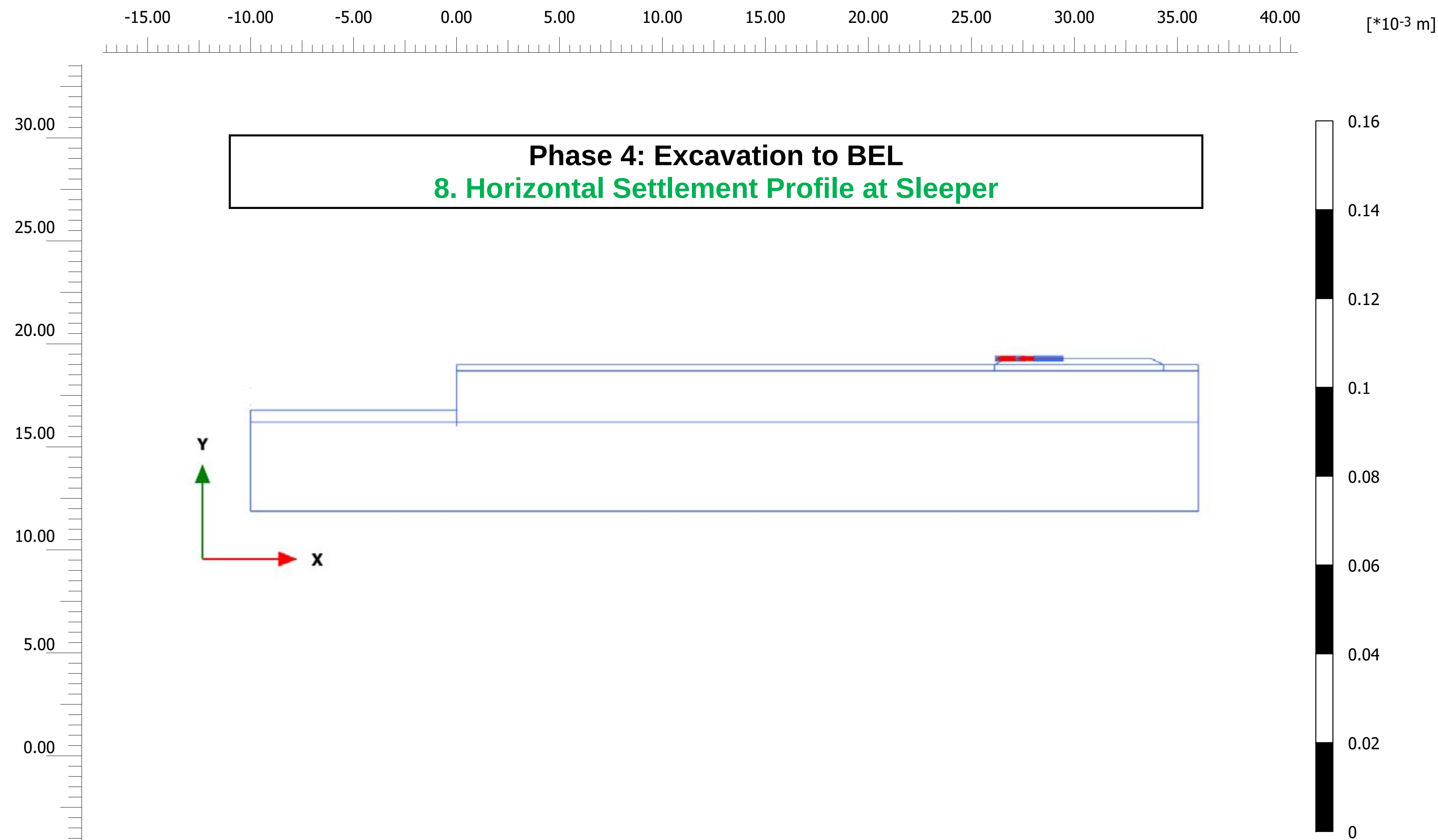
Project description			Date
31349 17 Weston St Panania			4/07/2024
Project filename	Step	Company	
Panania with Soilder at rock ...	60	STS Geotechnics	

Output Version 2024.1.0.1060



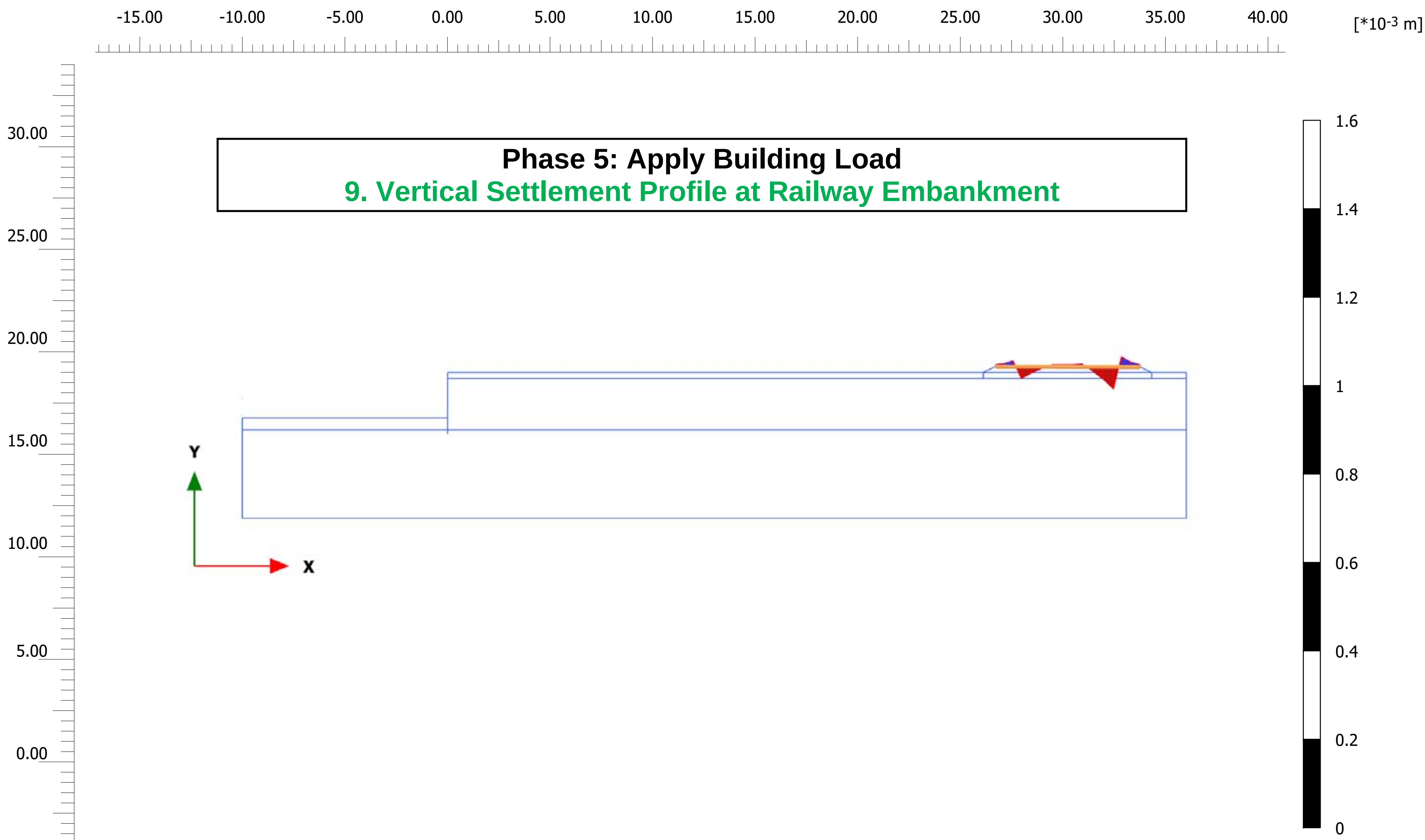
Total displacements u_x (scaled up $200*10^3$ times)

Maximum value = $-9.066*10^{-6}$ m (Element 3 at Node 8382)

Minimum value = $-9.113*10^{-6}$ m (Element 1 at Node 8134)

STS GEOTECHNICS PTY LTD CONSULTING GEOTECHNICAL ENGINEERS	*Project description* 31349 17 Weston St Panania		*Date* 4/07/2024
	Project filename Panania with Soilder at rock ...	*Step* 60	*Company* STS Geotechnics

C:\Users\logger1\Desktop\STS Projects\Panania - Sydney Trains\Panania with Soilder at rock_converted.p2dxdat\

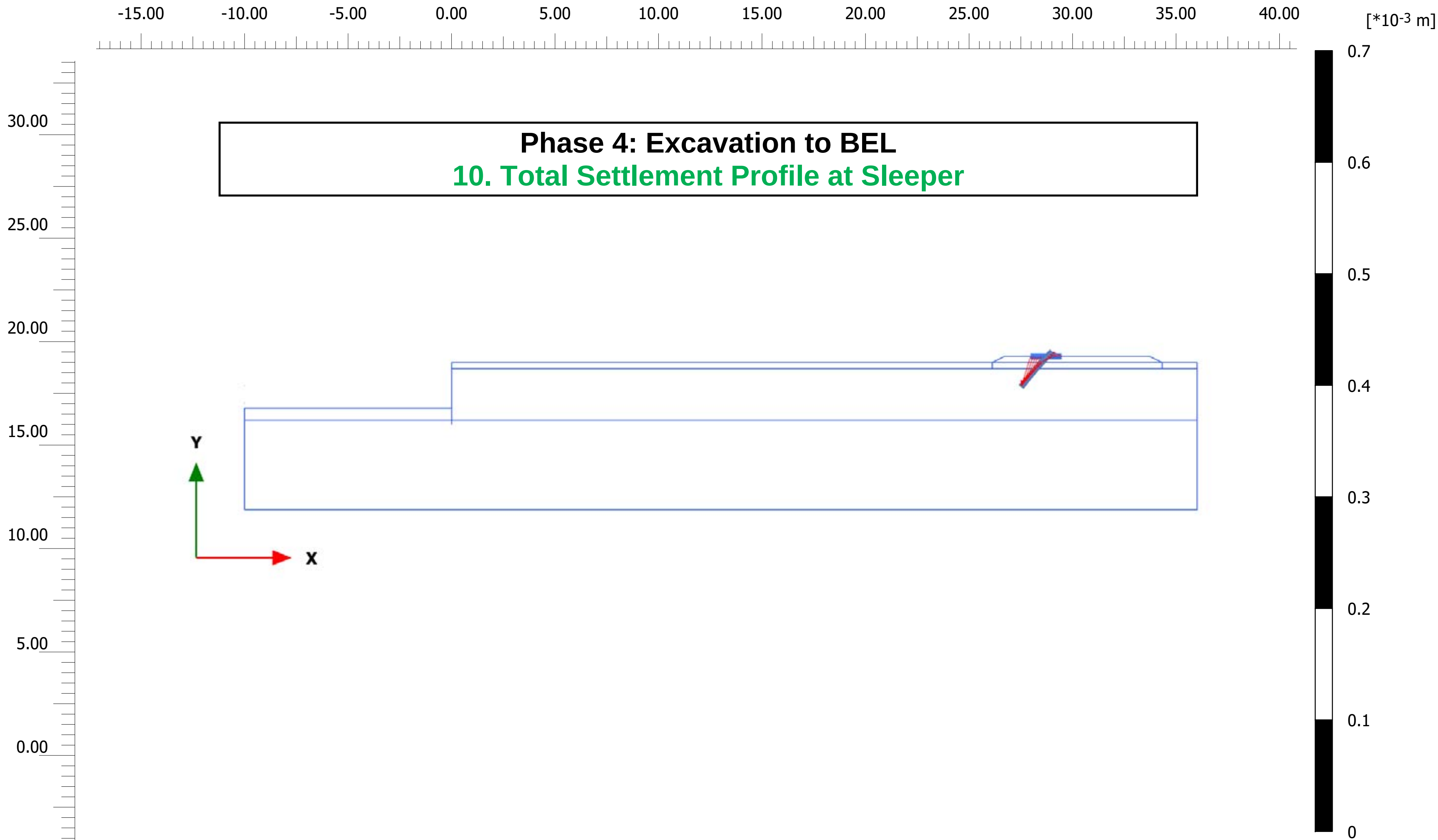


Total displacements u_y (scaled up $20.0*10^3$ times)

Maximum value = $0.02585*10^{-3}$ m

Minimum value = $-0.05464*10^{-3}$ m

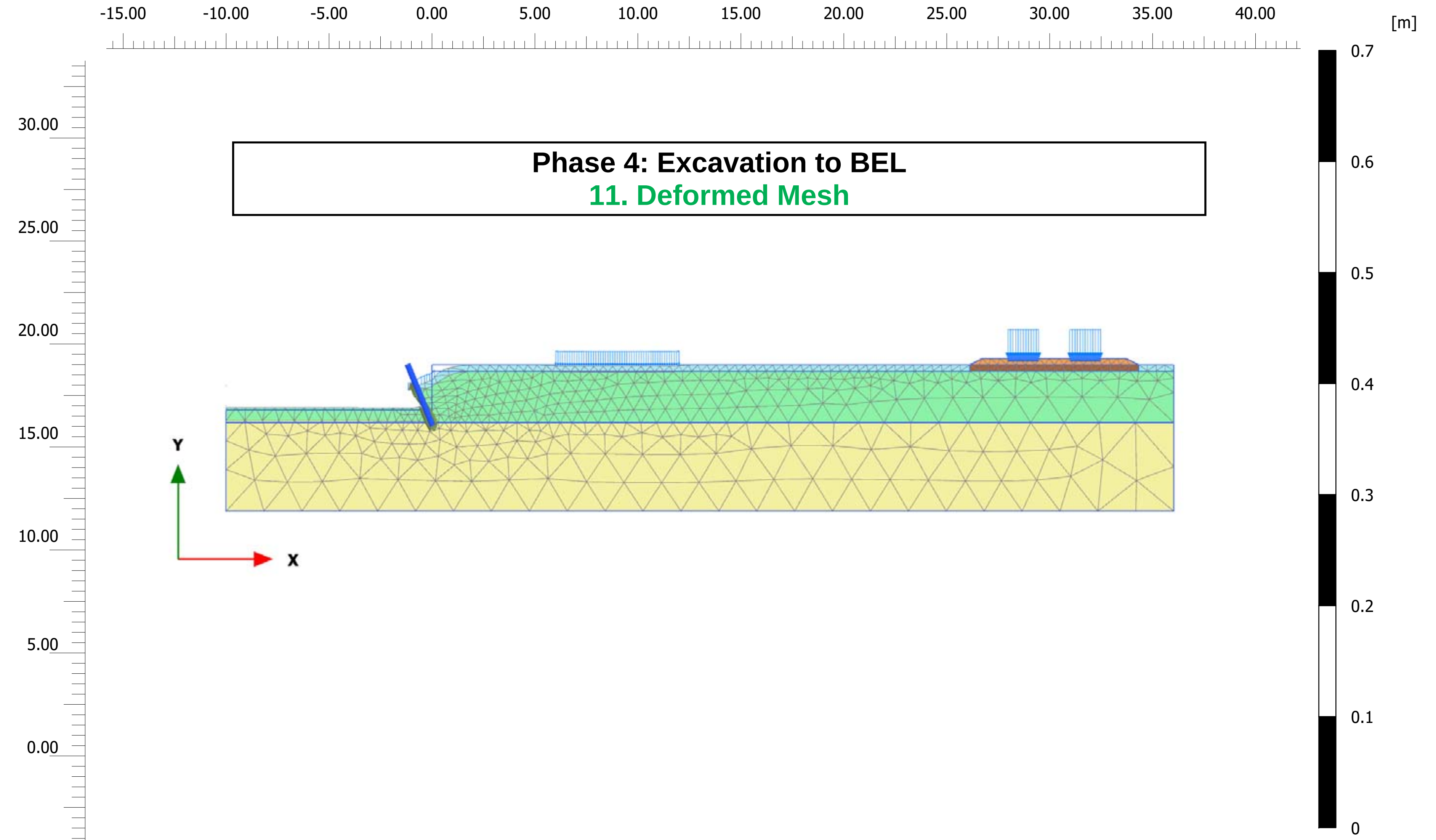
STS GEOTECHNICS PTY LTD CONSULTING GEOTECHNICAL ENGINEERS	*Project description* 31349 17 Weston St Panania		*Date* 4/07/2024
	Project filename Panania with Soilder at rock ...	*Step* 67	*Company* STS Geotechnics



Total displacements |u| (scaled up 50.0*10^3 times)

Maximum value = 0.03107*10^{-3} m (Element 1 at Node 8134)

GEOTECHNICS PTY LTD CONSULTING GEOTECHNICAL ENGINEERS	*Project description* 31349 17 Weston St Panania		*Date* 4/07/2024
	Project filename Panania with Soilder at rock ...	*Step* 60	*Company* STS Geotechnics



Deformed mesh |u| (scaled up 50.0 times)

Maximum value = 0.03396 m (Element 80 at Node 1183)

Project description	Date
31349 17 Weston St Panania	4/07/2024

Project filename	Step	Company
Panania with Soilder at rock ...	60	STS Geotechnics

GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

APPENDIX D – Important Information

Important Information

STS GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

INTRODUCTION

These notes have been provided to outline the methodology and limitations inherent in geotechnical reporting. The issues discussed are not relevant to all reports and further advice should be sought if there are any queries regarding any advice or report. When copies of reports are made, they should be reproduced in full.

GEOTECHNICAL REPORTS

Geotechnical reports are prepared by qualified personnel on the information supplied or obtained and are based on current engineering standards of interpretation and analysis.

Information may be gained from limited subsurface testing, surface observations, previous work and is supplemented by knowledge of the local geology and experience of the range of properties that may be exhibited by the materials present. For this reason, geotechnical reports should be regarded as interpretative rather than factual documents, limited to some extent by the scope of information on which they rely.

Where the report has been prepared for a specific purpose (eg. design of a three-storey building), the information and interpretation may not be appropriate if the design is changed (eg. a twenty storey building). In such cases, the report and the sufficiency of the existing work should be reviewed by STS Geotechnics Pty Limited in the light of the new proposal.

Every care is taken with the report content, however, it is not always possible to anticipate or assume responsibility for the following conditions:

- Unexpected variations in ground conditions. The potential for this depends on the amount of investigative work undertaken.
- Changes in policy or interpretation by statutory authorities.
- The actions of contractors responding to commercial pressures.

If these occur, STS Geotechnics Pty Limited would be pleased to resolve the matter through further investigation, analysis or advice.

UNFORSEEN CONDITIONS

Should conditions encountered on site differ markedly from those anticipated from the information contained in the report, STS Geotechnics Pty Limited should be notified immediately. Early identification of site anomalies generally results in any problems being more readily resolved and allows re-interpretation and assessment of the implications for future work.

SUBSURFACE CONDITIONS

Logs of a borehole, recovered core, test pit, excavated face or cone penetration test are an engineering and/or geological interpretation of the subsurface conditions. The reliability of the logged information depends on the drilling/testing method, sampling and/or observation spacings and the ground conditions. It is not always possible or economic to obtain continuous high quality data. It should also be recognised that the volume or material observed or tested is only a fraction of the total subsurface profile.

Interpretation of subsurface information and application to design and construction must take into consideration the spacing of the test locations, the frequency of observations and testing, and the possibility that geological boundaries may vary between observation points.

Groundwater observations and measurements outside of specially designed and constructed piezometers should be treated with care for the following reasons:

- In low permeability soils groundwater may not seep into an excavation or bore in the short time it is left open.
- A localised perched water table may not represent the true water table.
- Groundwater levels vary according to rainfall events or season.
- Some drilling and testing procedures mask or prevent groundwater inflow.

The installation of piezometers and long term monitoring of groundwater levels may be required to adequately identify groundwater conditions.

SUPPLY OF GETEOECHNICAL INFORMATION OR TENDERING PURPOSES

It is recommended tenderers are provided with as much geological and geotechnical information that is available and that where there are uncertainties regarding the ground conditions, prospective tenders should be provided with comments discussing the range of likely conditions in addition to the investigation data.