Douglas Partners
Geotechnics | Environment | Groundwater

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Project 86266.08
14 May 2021
R.001.Rev1
ZH

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Geotechnical Monitoring Plan
Proposed Student Accommodation
13-23 Gibbons Street, Redfern

1. Introduction

This Geotechnical Monitoring Plan (GMP) sets out the proposed geotechnical monitoring requirements during basement excavation and piling construction works for the Proposed Student Accommodation at 13-23 Gibbons Street, Redfern. The Eastern Suburbs Railway Line / Illawarra Relief Rail Tunnels (managed by Sydney Trains) are located within about 9 m to the west of the site, at the closest point, and run approximately parallel to Gibbons Street and the western boundary of the site. The Illawarra Relief Tunnels are twin tunnels merging and forming a station box close to the north western end of the site. Gibbons Street that is an RMS asset is also located to the west of the site.

The proposed bulk excavation level is about RL 21.5 m AHD which is approximately 600 mm below the existing basement slab level and approximately 6 m to 9 m away from the 1st Reserve of the Illawarra Relief Tunnels/station box. .

The existing basement retaining wall along the site boundary to the south, west, and north will be retained and used for the new development and will be temporarily supported by internal struts during construction. The long-term lateral support for the basement retaining wall will be provided by the new basement floor slab and the ground floor slab. It is understood that the existing retaining wall on the eastern boundary of the site will be temporarily retained by an earth berm using backfill material and will be made redundant for the long term. It is also understood that the new (permanent) eastern retaining wall will have an offset of about 7 m to 10 m from the site boundary.

It is understood that 750-900 mm diameter piled foundations with preliminary lengths of 20-24 m will be constructed from either ground level or basement level under proposed columns/walls/raft core to support the superstructure loads. It is understood that these foundation piles will be subject to further detailed design.

Two geotechnical investigations were undertaken for the project by Douglas Partners in February 2018 (Ref. 86266.00.R.001.Rev0) and December 2018 (Ref. 86266.03.R.001.Rev0). This GMP has been based on the conditions encountered in these previous investigations.

Numerical modelling was also undertaken by Douglas Partners (Ref. 86806.02.R.001) to assess likely displacements of the rail tracks and ground movements within the project site and the 1st Reserve zone of the railway tunnels/station box.

2. Pile Design Review

A pile geotechnical design review should be carried out by an experienced geotechnical engineer, with comments on the assumed ground profile in the pile design, geotechnical parameters and geotechnical strength of the piles.

The pile design review should be done prior to the piling construction works.

3. Design Review for Temporary Basement Wall Support

Geotechnical design review of the temporary lateral support to the basement walls needs to be carried out by an experienced geotechnical engineer, with comments on the assumed ground profile in the temporary support design, geotechnical parameters, ground pressure behind the walls and also the geotechnical strength of the temporary support footings.

The design review should also include assessment of the founding conditions of the existing basement wall footings and review of the underpinning methodology if required.

The temporary support design review should be done prior to the commencing excavation works.

4. Geotechnical Monitoring

Geotechnical monitoring is to include the following:

- Monitoring of survey targets at 10 m centres along the top of the existing retaining walls to the south, west and north that will support the development site (refer attached Drawing GMP1).

Baseline readings will be established on two occasions prior to the commencement of the piling construction and bulk excavation works. In addition, geotechnical inspections during installation of the temporary lateral supports (i.e. props), excavation, piling works, and the base of the bulk excavation will need to be carried out as works progress.

5. Geotechnical Monitoring Frequency and Hold Points

The frequency of geotechnical monitoring and Hold Points for the works are outlined in Table 1.

Table 1: Geotechnical Monitoring Frequency and Hold Points

Hold Point	Responsibility	Description
1	Registered Surveyor	Installation of survey monitoring targets as shown on the attached Drawing GMP1. Baseline survey of monitoring targets on two occasions before commencement of any construction works.
2	Geotechnical Engineer	• Inspection of the prop footings construction to confirm adequacy of foundation materials to support the internal struts and that the strut footing installation works have been constructed as per the design drawings. • Inspection of strut installation by Geotechnical Engineer to confirm struts have been installed as per the design drawings to the northern, southern and western retaining walls. Inspection to confirm the earth berm has been constructed along the eastern retaining walls and provides adequate lateral support. • (if required) inspection of the underpinning works to confirm the vertical bearing capacity of the existing retaining wall for basement deepening.
3	Geotechnical Engineer	• Geotechnical engineer to attend the site and carry out a working platform assessment in order to assess the requirement of a working platform for a piling rig to install the foundation piles. • Working platform to be installed as per the recommendations made by the geotechnical engineer prior to rig tacking onto site. • Inspection of the foundation piles/pad footings to confirm adequacy of foundation materials to support footings and that the foundation installation works have been constructed as per the design drawings.
4	Registered Surveyor	Survey of the relevant monitoring points during and after piling construction and basement excavation: • during ground level piling; • once tower Crane mobilised on site; • following installation of the temporary props; • once the existing ground floor slab is demolished; • during basement level piling; • ; • weekly following the completion of bulk excavation; • once basement slabs and ground floor slabs have been constructed and props are removed; • one month following completion of basement structure or after three consecutive measurements not less than a week apart showing no further movement, whichever is the later; and

Hold Point	Responsibility	Description
		• one month following completion of the building structure or after three consecutive measurements not less than a week apart showing no further movement, whichever is the later.
5	Geotechnical Engineer	Inspection of strut removal by Geotechnical Engineer to confirm that the props have been disconnected from the structure.

Hold Points are released after verification by the design engineer.

A separate Tunnel Geotechnical Monitoring Plan (TGMP), has been prepared by DP for the site (Ref: 86266.06.R.003.Rev2 dated 5 March 2021) that provides a sequence for the execution of tunnel geotechnical monitoring activities required during construction.

6. Movement Trigger Levels

The movement trigger levels for the shoring wall are based on an estimated wall deflection of 10 mm along the basement retaining wall. The threshold levels adopted are provided in Table 2. The acceptable wall deflection should be nominated by the shoring wall designer and structural engineer and the threshold values adjusted accordingly.

Table 2: Movement Trigger Levels for the Basement Retaining Wall

Threshold Level	% of Agreed Limit	Magnitude of Deflection	Required Action
Alert Level	Up to 80%	Up to 8 mm	No action. Excavation can continue
Action Level	81% to 100%	8 mm to 10 mm	Review monitoring data and increase monitoring frequency to an agreed level. Excavation can continue
Alarm Level	Over 100%	>10 mm	Excavation to stop and agreed contingency measures to be implemented

7. Contingency Measures

Contingency measures will depend on the nature of the trigger level exceedance. Measures are likely to include backfilling against the retaining wall, installation of additional temporary props etc.

Note that all monitoring devices should be kept in operating condition at all times. Construction works should be suspended where more than 30% of the devices are not operational.

8. Certification

Certification by a Chartered Professional Engineer (CPEng) will be required to confirm that the geotechnical conditions are in accordance with those described in the geotechnical report and that the works have been constructed in accordance with the design drawings.

We understand that the monitoring and management of vibration during construction is to be addressed by others and therefore this aspect is not included in this GMP.

9. Limitations

Douglas Partners (DP) has prepared this Geotechnical Monitoring Plan for this project at 13-23 Gibbons Street, Redfern in accordance with DP's proposal SYD201244.P.001.Rev3 dated 20 April 2021 and acceptance received from Cale Holmes of Richard Crookes Constructions Pty Ltd dated 20 April 2021. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Richard Crookes Constructions Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

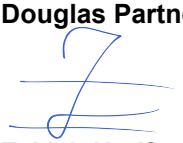
DP's advice is based upon the conditions encountered during previous investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

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

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

Yours faithfully
Douglas Partners Pty Ltd

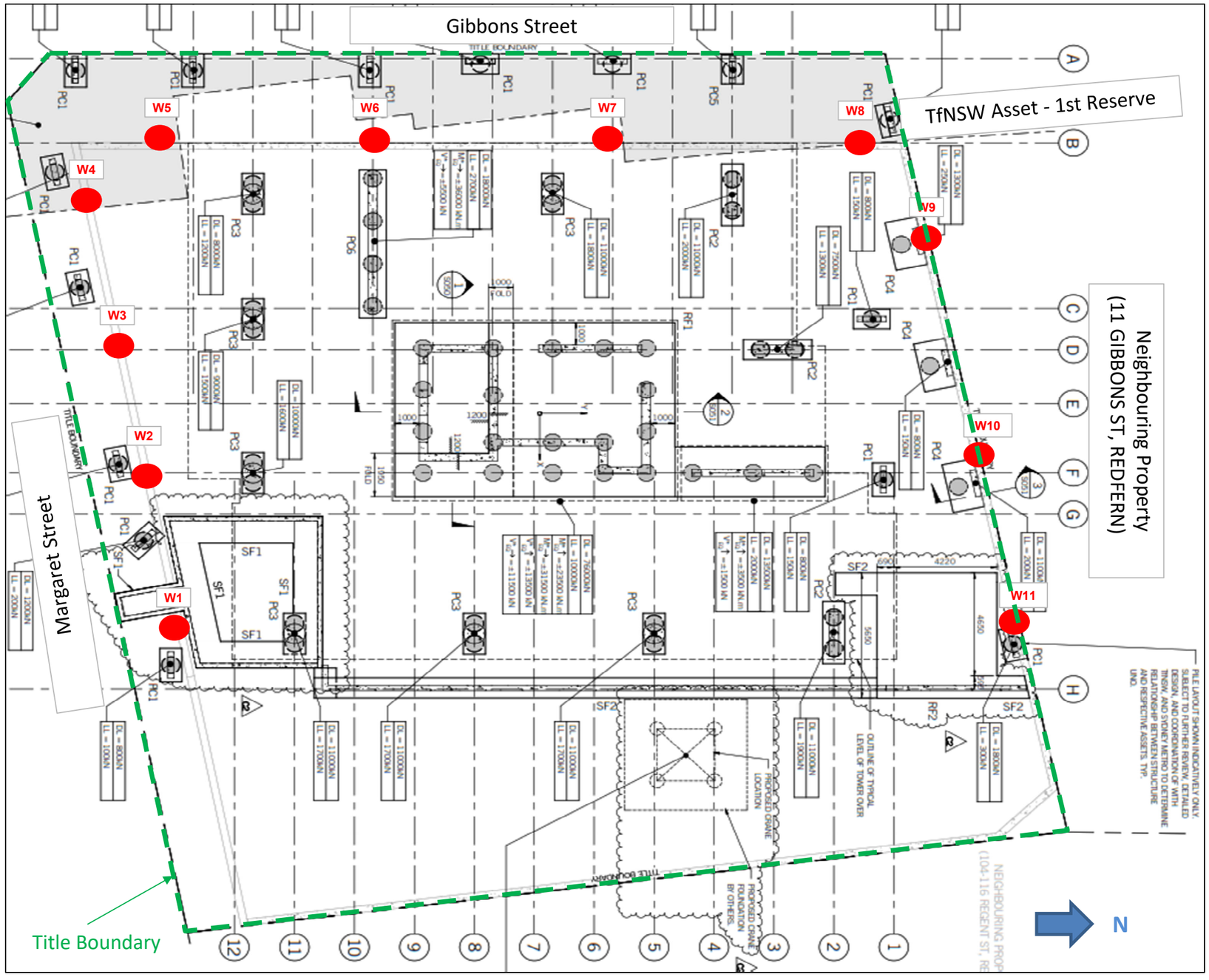


Zakieh Harif
Geotechnical Engineer

Reviewed by

Scott Easton
Principal

Attachments: Drawing GMP1



Survey monitoring point on Basement Retaining WALL

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Richard Crookes Constructions Pty Ltd		TITLE: **Locations of Monitoring Points**	PROJECT No:	86266.08
	OFFICE: Sydney	DRAWN BY: ZH	**Proposed Student Accommodation**	DRAWING No:	GMP1
	SCALE: NTS	DATE: 14 May 2021	**13-23 Gibbons Street, Redfern**	REVISION:	1