



GS8579-1A

24th August 2022

Momentum Project Group
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Dear Andrew,

**RE: Groundwater Monitoring and Inflow Investigation Report:
28 Lockwood Avenue, Belrose, NSW, 2085.**

1. Introduction

As requested, Aargus Pty Ltd (Aargus) carried out groundwater monitoring and inflow testing at 28 Lockwood Avenue, Belrose, NSW to assess the current standing groundwater level, and ground permeability at the site. To this end, slug tests were initially conducted in the wells at the project site (see Figure 2 for test locations), followed by groundwater level monitoring for a period of three days.

The field measurements were performed using submersible dataloggers, Diver # AP608 and Barometer # BM704 (TD-Diver by vanEssen Instruments) enabling Aargus to measure the real time groundwater levels during the slug test and subsequent water level monitoring.

The water level monitoring was conducted as part of Water NSW requirements for the proposed development at 28 Lockwood Avenue, Belrose, NSW. The present report summarises the results of in-situ infiltration testing and groundwater monitoring for the period of 2nd August 2022 to 4th August 2022.

2. Available Information

Prior to the preparation of the report, the following document/s were referred to.

- Geotechnical Investigation Report for the above site, (prepared by: Atlas Geotechnical Services, Report No. G10132-1, dated: 16th/09/2021).
- Excavation plan and survey plan, (prepared by: Auspacific Engineering Pty. Ltd., Project No. 220004, Drawing No. S0150 and S0151 Revision B, dated: 11 July 2022),
- Architectural drawings for excavation plan (prepared by: Nicholas Lycenko, Drawing No.: CC-006, Issue: 1, dated: July 2022),

3. Geotechnical Subsurface Conditions

Reference to Atlas' (2021) geotechnical report shows that the subsurface conditions of the site comprise:

1. Fill, consisting of well compacted gravelly clay of 0.2m thickness
2. Topsoil, consists of Silty Sand, loose to very dense, below the undelaying fill material to depths of 0.5 to 0.8m,
3. Residual soils, consist of Silty Sand and Sandy Clay, loose to very dense, below the topsoil to the depths of 0.8m to 2.5m,
4. Bedrock, consisting of very low to high strength Sandstone, Class V to III rock, below the residual soils to the depth of the investigation of 6.5-11.10m.

Groundwater levels measured during and soon after the geotechnical investigation (refer to Atlas Geotechnical Report # G10132-1) are summarized in Table 1 below.

The standing groundwater level in wells BH02 was measured on 2nd August 2022, tabulated in Table 1. The total depth of the well is 14.6m bgl (RL 143.0m AHD).

Table 1. Standing groundwater levels

Date	Borehole/Well	Water Depth (m bgl)	Water Level RL (m AHD)
17 th March 2022	BH02	5.3	152.3
2 nd August 2022	BH02	4.25	153.35

4. Fieldwork

The fieldwork for this investigation comprised in-situ inflow testing in the groundwater well previously installed by Atlas in BH02 followed by continuous water level monitoring for a period of 3 days. The inflow slug testing in BH2 was initiated on 2nd August 2022 (1 day), enough for infiltration testing. Subsequently, water level variation in BH02 was monitored until 4th August 2022.

5. Groundwater levels

The variation of groundwater levels in the monitoring well BH02 is plotted in Figure 1. The maximum, minimum, and average recorded groundwater levels in the monitoring well BH02 are summarised in Table 2.

Ground surface relative levels (RL) are derived from the survey plan provided by Auspacific Engineering.

According to the data in Table 2, the average standing groundwater depth (or reduced level, RL) was 4.12m (RL 153.48m) during the investigated period. Comparing the data with observations during 2nd August 2022, the water level within the project site has risen approximately between 0.13m during the period from 2nd August 2022 to 4th August 2022.

Table 2. Groundwater levels (2nd August to 4th August 2022)

		BH02 ⁽²⁾
Standing water depth, below ground level, in metres and water level, in m AHD	Initial	4.25 (153.35) (2/8/2022)
	Maximum	4.10 (153.50) (8/3/2022 7:38:33 AM)
	Minimum	4.14 (153.46) (8/2/2022 11:59:33 PM)
	Average	4.12 (153.48)

⁽¹⁾ BH02 RL at the ground level is: 157.6m AHD

⁽²⁾ Values in parenthesis are water level RL in m AHD

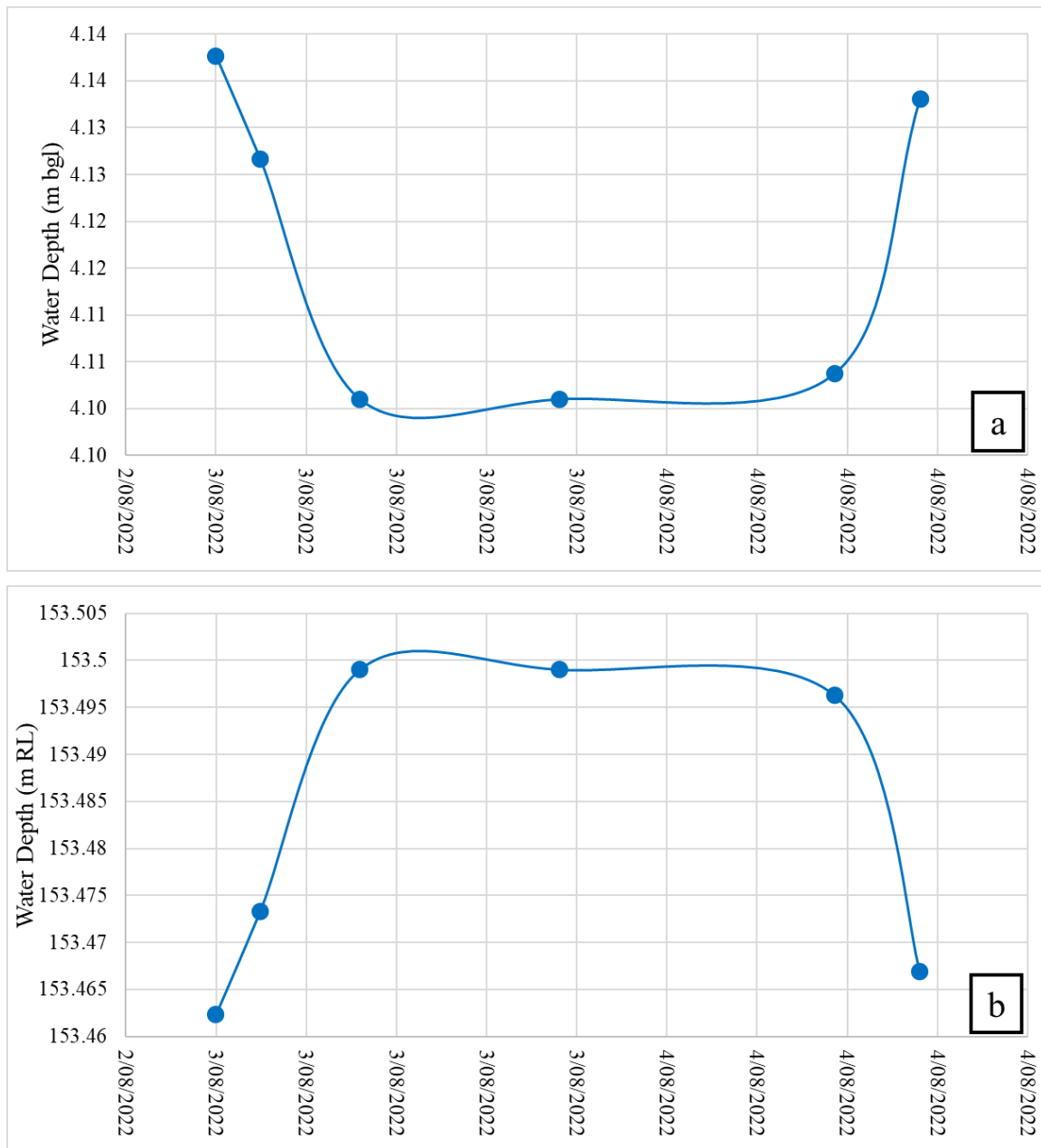


Figure 1. Variation of a) water depth and b) water level in monitoring well BH02, between 2nd August and 4th August 2022

6. Groundwater Inflow Rates

From the drawings provided by Momentum Projects (see Section 2) the maximum bulk excavation level at the project site is approximately RL 143.3m AHD with a finished Basement 4 level at RL 143.6m AHD.

Infiltration rate testing was conducted in the monitoring well BH02 with the details discussed in Section 4.

Based on the results, the average horizontal hydraulic conductivity (i.e., k_h) of the ground layers is calculated and summarised in Table 3. To this end, the water level change data and well construction data were used to estimate the horizontal hydraulic conductivity of the bedrock at the screened interval. The method used for calculating k_h values (Table 3) is the Bouwer and Rice (1976) method. The calculated value for k_h in Table 3, refers to the average hydraulic conductivity of the subsurface layers from groundwater level (4.25m bgl) to the depth of about 14.30m.

The values of vertical hydraulic conductivity (k_v) are typically around a factor of 0.1 of k_h values and are shown in Table 3.

Table 3. In-situ horizontal hydraulic conductivity values

Borehole/Well	k_h (m/day)	k_v (m/day)	Total Depth (m) (bgl)
BH02	0.0079	0.00079	14.30

Table 4. Water inflow rates during excavation works

Average Daily Inflow (m ³ /day)	Average Monthly Inflow (m ³ /month)	Average Annual Inflow (m ³ /year)	Total Annual Inflow (ML/year)
24.43	733	8,796	8.796

Initial inflow rates above are calculated based on the analytical methods of Powrie and Preene (1992). After the first three days these rates reduce to approximately one third.

The groundwater levels in the well of BH02 for the monitoring period from 2nd August 2022 to 4th August 2022 show that the standing water level at the project site is expected to be at RL 153.35m. As such, the proposed bulk excavation is expected to be about 10.0m below the groundwater level.

The daily, monthly, and annual inflow rates during the excavation works could also be calculated with transient or steady-state groundwater flows using numerical modelling based on the details of the excavation stages and according to the hydraulic conductivity values outlined in Table 3.

7. Limitations

The testing undertaken for this report was done in a well installed on the site by Atlas Geotechnical. Should the well installation details be different than those presented in Atlas' Geotechnical Report, then the groundwater permeability and inflow rates may be different from those presented in this report.

Aargus, its staff and directors cannot be held liable for information presented by others as factual which later is found to be inaccurate or incorrect.

It is recommended that should ground conditions, including subsurface and groundwater conditions, encountered during construction and excavation vary substantially from those presented within this report, Aargus Pty Ltd be contacted immediately for further advice and any necessary review of recommendations. Aargus does not accept any liability for site conditions not observed or accessible during the time of the inspection.


This report and associated documentation and the information herein have been prepared solely for the use of **Momentum Project Group** and any reliance assumed by third parties on this report shall be at such parties' own risk. Any ensuing liability resulting from use of the report by third parties cannot be transferred to Aargus Pty Ltd, directors or employees.

The conclusions and recommendations of this report should be read in conjunction with the entire report.

Please do not hesitate to contact this office, should there be any further queries.

For and on behalf of:

Aargus Pty Ltd



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Reviewed by



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Figure 2. Groundwater Monitoring Well Location - BH02.