18 June 2021

Boral Resources (NSW) Pty Ltd

Rachael Snape
via email: Rachael.Snape@boral.com.au

Dear Rachael,

Marulan South Limestone Mine – Response to Submissions

1 Introduction

Boral Resources (NSW) Pty Ltd (Boral) are currently responding to comments from the Department of Planning, Industry and Environment (DPIE) on the Marulan South Limestone Mine Project. The DPIE have requested Boral provide clarification and further information on predicted groundwater impacts relating to water licensing. Boral requested Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) review the requests and provide a written response to the queries.

2 Water licencing

Groundwater in the Project area is managed under the Water Sharing Plan (WSP) for the Greater Metropolitan Region Groundwater Sources. The WSP includes 13 water sources based on geology and aquifer properties, with the Project area located within the Goulburn Fractured Rock Groundwater Source as shown in Figure 1.

Surface water in the Project area is managed under the Water Sharing Plan for Greater Metropolitan Region Unregulated River Water Sources. The plan area is divided into water sources, which are further subdivided into extraction management areas. The Project area is within the Shoalhaven Water Source and within the Bungonia Creek and Barbers Creek management zones as shown in Figure 2.

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The groundwater assessment prepared for the Project[1] used a numerical groundwater flow model to provide estimates of:

- incidental [2]groundwater take occurring through groundwater seepages into the open pit (Section 8.7.3);
- consumptive[3] groundwater take via pumping from proposed water supply pumping bores; (Section 8.7.5); and
- passive[4] water take occurring within the surrounding alluvium and connected surface waters (Section 8.7.4 and Appendix A-2).

Table 1 compares the predicted groundwater takes to the Water Access Licences held by Boral to determine if the latter are adequate to account for the impact of the Project as well as the legacy operations combined. Table 2 presents the same for surface water.

Table 1 shows that the Water Access Licences held by Boral are more than adequate to account for the incidental water take occurring due to the proposed and legacy open pit, and also for the consumptive use via pumping proposed from the water supply bores.

The passive surface water take presented in Table 2 is based on the assumption that the reduction in groundwater flow to the Bungonia Creek alluvium and the Barbers Creek alluvium predicted by AGE (2019) translates to a 1:1 loss in baseflow. Table 2 shows that Water Access Licences held by Boral are more than adequate to account for the passive take of baseflow from the Barbers Creek Management Zone.

Boral do not hold any Water Access Licences for the Bungonia Creek Management Zone and therefore currently cannot account for the small, predicted passive take from this zone. Despite this, there a 11,069 ML of water in this Shoalhaven River Water Source distributed across 246 licences, and therefore there is sufficient depth in the water market to allow Boral to purchase an entitlement to account for the predicted impact.

Table 1 Water Access Licences – Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources – Goulburn Fractured Rock Groundwater Source

Management zone	Predicted Water Take (ML)[1,2]			Share component held by Boral	WAL No.	Units (ML)
	Incidental (to pit)	Passive	Consumptive (bores)			
None in water source	23	0	81	850	41976	838
					24697	12

Notes: 1: all estimated water take volumes are rounded to the nearest 1 ML.
2: water take less than 1 ML is considered zero for licensing purposes.

[1] Australasian Groundwater and Environmental Consultants Pty Ltd (2019). Marulan South Limestone Mine Continued Operations - Groundwater Technical Study, Project No. G1714C, March 2019.

[2] Incidental water is defined in the Aquifer Interference Policy 2012 as *"Water that is taken by an aquifer interference activity that is incidental to the activity; including water that is encountered within and extracted from mine workings, tunnels, basements or other aquifer interference structures that must be dewatered to maintain access, serviceability and/or safe operating conditions. This water is not actually required to be used as part of the process of carrying out that activity".*

[3] Consumptive water is defined as water directly taken from an aquifer by pumping and consumed by the activity.

[4] Passive water take is defined as water losses from a groundwater system that occur indirectly due to an adjacent activity.

Table 2 Water Access Licences – Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources – Shoalhaven River Water Source

Water source/management zone	Predicted Water Take (ML)[1,2]			Share component held by Boral	WAL No.	Units (ML)
	Incidental (to pit)	Passive	Consumptive			
Bungonia Creek Management Zone	0	2[3]	0	0	-	-
Barbers Creek Management Zone	0	2[3]	0	86	25373	10
					25207	76

Notes: 1: all estimated water take volumes are rounded to the nearest 1 ML.

2: water take less than 1 ML is considered zero for licensing purposes.

3: value calculated by rounding down predicted peak water take (4.2 ML/year in AGE 2019 Table A2) from Bungonia and Barbers Creek alluvium and dividing evenly across the Bungonia Creek and Barbers Creek management zones.

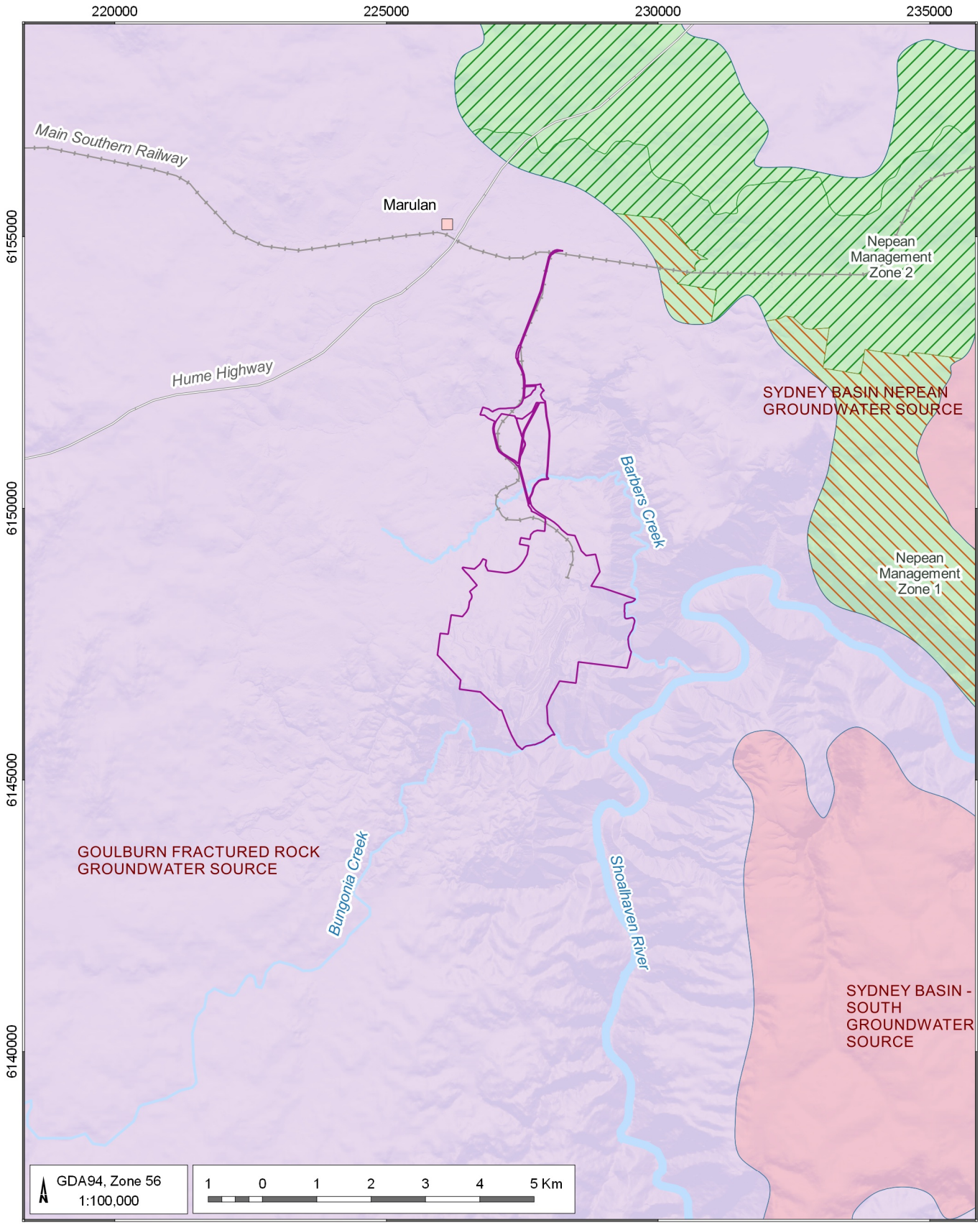
3 Impact on springs

DPIE also requested "clarification and a statement justifying the conclusion that the Project is unlikely to impact GDEs and spring dependent ecosystems'.

Section 9.3.4 of the EIS states that "springs are unlikely to be impacted as mining is likely to result in an increase of 11m^3 of outflow from the pit into the underlying geology". This sentence within the main EIS appears to be a transcription error and a miss interpretation of the statements within the groundwater assessment (Section 9.4 AGE, 2019).

The groundwater assessment concludes that springs and associated GDEs are unlikely to be impacted as groundwater that seeps into pit through the walls, can in many areas then seep back through the pit floor into the water table. This unique situation occurs because of the very steep topography where the Project is located and means that the western area of the pit can be below the water table, but the eastern areas are above the water table. The effect of this is that groundwater seepages flowing into the pit through the walls can seep back to the water table through the pit floor sumps. This process has been observed onsite.

The gross loss of groundwater and surface water outlined in Table 1 and Table 2 are conservative estimates based on numerical modelling that does not directly represent the return of groundwater seepage to the water table through the pit floor. The conservative baseflow loss predicted for Barbers Creek and Bungonia Creeks combined is about 0.1L/sec at it's peak. This predicted volume is very low, despite the conservatism in the model, and is not likely to be discernible at the springs that can have relatively high flows (refer AGE, 2019 Figure 5-8).



LEGEND

- Populated place
- Rail
- Watercourse, drainage
- Project boundary

Groundwater Sources and Groundwater Management areas

- Goulburn Fractured Rock Groundwater Source
- Sydney Basin - South Groundwater Source
- Sydney Basin Nepean Groundwater Source
  - Nepean Management Zone 1
  - Nepean Management Zone 2

Maurlan Limestone Mine RTS (G1714E)

Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011

AGE

DATE 21/05/2021

FIGURE No: 1

Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
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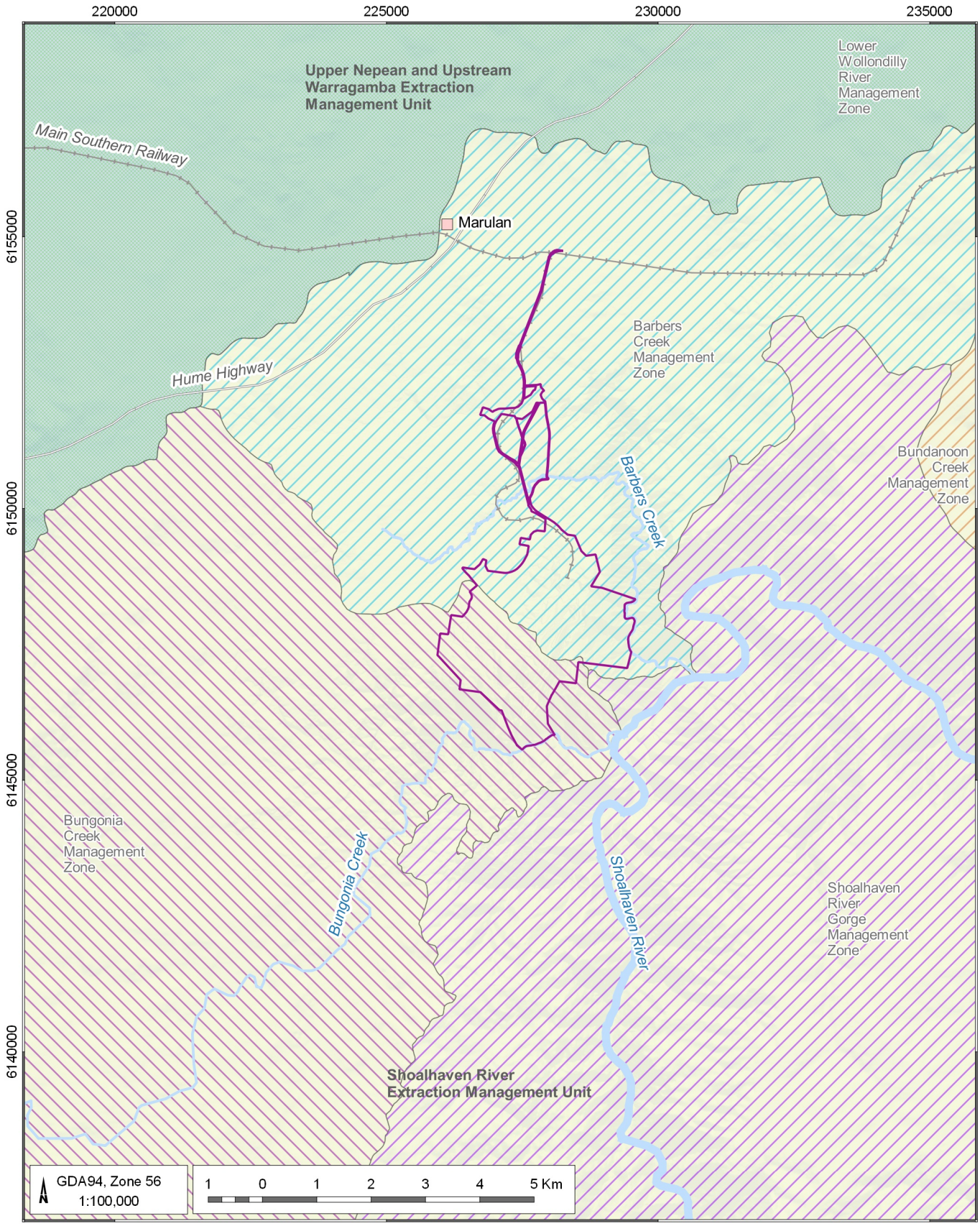

LEGEND

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Extraction Unit

- Upper Nepean and Upstream Warragamba Extraction Management Unit
  - Lower Wollondilly River Management Zone
- Shoalhaven River Extraction Management Unit
  - Barbers Creek Management Zone
  - Bundanoon Creek Management Zone
  - Bungonia Creek Management Zone
  - Shoalhaven River Gorge Management Zone

Maurlan Limestone Mine RTS (G1714E)

Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011

AGE

DATE 21/05/2021

FIGURE No: **2**

Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
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Yours faithfully,

James Tomlin
Principal Hydrogeologist / Technical Director
Australasian Groundwater and Environmental Consultants Pty Ltd