

Water Balance Assessment

483 Battery Road, Cowra NSW 2794

Final Report

P2511190JR01V01

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Prepared for Outline Planning Consultants Pty Ltd

environmental science & engineering

Project Details

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1 Introduction

1.1 Overview

Martens & Associates Pty Ltd (**MA**) have been engaged by Outline Planning Consultants Pty Ltd (the **client**) to prepare a water balance assessment report to support an application pursuant to section 4.55(2) of the Environmental Planning and Assessment Act 1979 (**EP&A Act**) to modify existing Development Consents (refer to Table 1, hereafter jointly referred to as '**the DAs**' for ease of reference) for the approved quarry operations at 483 Battery Road, Cowra NSW 2794 (the **site**).

The existing quarry operates under the DAs, as summarised in Table 1, which authorise the extraction of basalt, quartz pebble/sand, gold and clays from the approved extraction areas.

Table 1: Development consent details.

Consent Authority	Development Application No.	Date Issued
Cowra Council	73/2007	27 August 2007
Hilltops Council (formerly Boorowa Council)	117/2006	25 September 2007

The purpose of this report is to assess the potential water balance implications associated with the proposed modifications to the approved quarry operations, including water demand, site runoff, sediment and erosion controls, and water reuse, and to demonstrate that the proposed modifications will not result in any adverse environmental impacts beyond those previously approved. The proposed modifications are consistent with the approved quarry development and do not alter the fundamental nature of the development or the approved quarry footprint as authorised under the existing consents.

1.2 Relevant Guidelines

This report has been prepared in accordance with the following standards / guidelines:

- BMT WBM (2015) NSW MUSIC Modelling Guidelines.
- NSW Health (2012) Septic Tank and Collection Well Accreditation Guideline.

2 Site Description

2.1 Site Description and Location

The DAs provide for the operation of Glenella Quarry and associated site facilities. The Glenella Quarry and the site facilities area are located within the larger 'Glenella' freehold property, refer to Figure 1, with a total site area approximately 700 ha. The Glenella Quarry is approximately 54 ha, of which 29 ha are located within the Hilltops Council and the remaining 35 ha within the Cowra Council. The subject area forms a relatively small portion of the total freehold property.

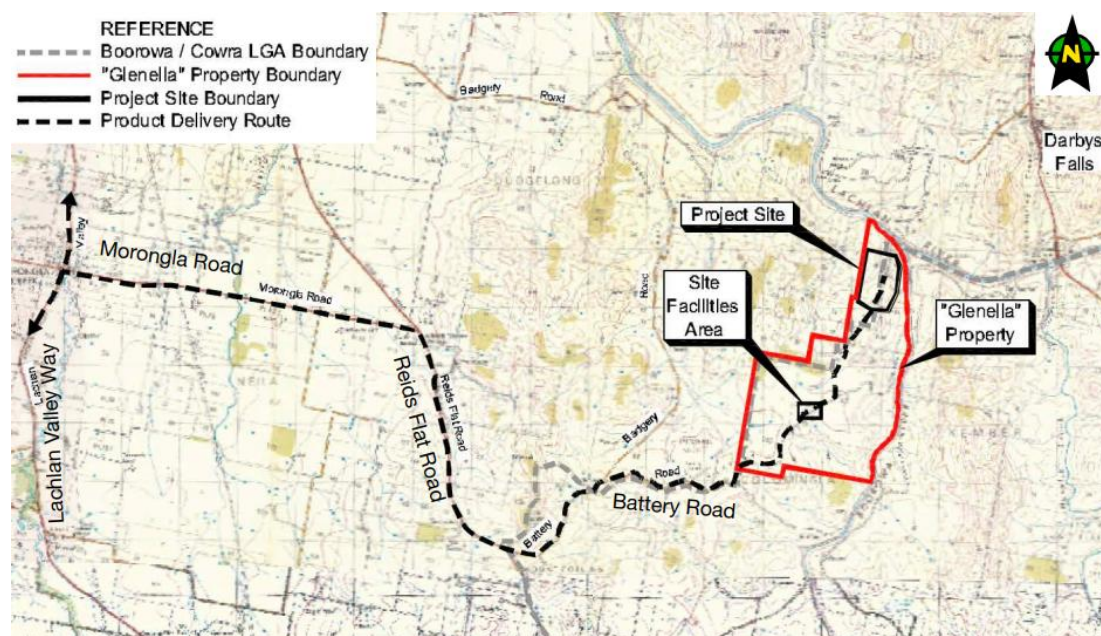


Figure 1: Extents of the proposed quarry (picture provided by Outline Planning Consultants).

A site description has been provided in Table 2.

Table 2: Site description summary.

Item	Description / Comment
Address	483 Battery Road, Cowra NSW 2794
Lot/DP	Lots 35 & 44 DP 752935, Lots 1-3 DP795553, Lot 106 DP 752935 Lots 27, 28, 63 & 123 DP 754584
Land Zoning	RU1: Primary Production
Local Government Area	Cowra Council Hilltops Council (formerly Boorowa Council)
Quarry Area	54.0 ha (approximately)

Item	Description / Comment
Existing Site Development	The site consists of quarry operational and extraction areas, haul roads, and an associated network of water management structures.
Neighbouring Environment	The property is bounded to the east by the Boorowa River, which joins the Lachlan River to the north. Surrounding land is primarily agricultural grazing, with valleys and ridgelines enclosing the quarry. The nearest residences are located more than 1.5 km from the quarry footprint, and 14 residences front the product delivery route.
Site Topography	The site is hilly and undulating, with ridge lines grading into plateau areas. Elevations range from approximately 290 mAHD near the rivers to 420 mAHD within the quarry footprint, with isolated hills exceeding 470 mAHD. Slopes are moderate to steep in the surrounding valleys.
Site Drainage	Runoff from the exposed quarry surfaces is directed to a series of sediment dams located downstream of the extraction and storage areas. These basins act as stormwater treatment measures, allowing sediment to settle before water is discharged. They also function as water harvesting facilities, supplying water for processing activities and dust suppression. In the event of overflow, excess water is directed to nearby watercourses.

2.2 Proposed Development

The following modifications, as advised by the client, are sought as part of this application:

- Clarifying the nature of the quarry operation and increasing the maximum allowable extraction rate from 200,000 tonnes per annum to 499,000 tonnes per annum, with no change to the approved quarry footprint.
- Increasing the number of loaded trucks from 35 to 50 per day.
- Updating daytime noise limits and monitoring requirements, following a noise assessment, to align the operation with the NSW Noise Policy for Industry (2017).

The quarry development proposed under this modification is substantially the same as the approved quarry development in terms of the nature of the works and potential environmental impacts. No changes are proposed to the approved extraction area or operating hours, and the overall quarry operation remains consistent with the existing consents.

3 MUSIC Water Balance Assessment

3.1 Methodology

3.1.1 Overview

The Model for Urban Stormwater Improvement Conceptualisation (*MUSIC*, Version 6.3) developed by the CRC for Catchment Hydrology was used to undertake the site water balance assessment to detail potable and non potable water supply and demands for the development.

Modelling has been undertaken in accordance with NSW MUSIC Modelling Guidelines (2015) with the developed site based on design briefs.

3.1.2 Approach

The water balance is assessed considering the following components:

1. **Site Water Demand:** Consideration of quarry operational water demands.
2. **Site Water Supply:** Assessment of site water supply (surface water runoff).
3. **Site Water Balance:** The balance of supply and demand is assessed based on a range of climatic conditions to determine the need for additional supply.

The details of the MUSIC model inputs are presented in Appendix A.

3.1.3 Climate Data

The water balance assessment was completed using the following:

1. Daily rainfall data obtained from the Bureau of Meteorology (**BoM**) for the Wyangala Dam climatological station (Station No. 63267).
2. Potential evapotranspiration (**PET**) data obtained from the Scientific Information for Land Owners (**SILO**) database, using records from the nearest available source, the SILO grid point located at latitude -33.95, longitude 148.80.

The water balance was prepared to assess the following range of rainfall scenarios:

1. **Dry year:** Annual rainfall equal to 10th percentile rainfall of all years to assess 'severe' water deficit (482.0 mm).
2. **Average year:** Annual rainfall equal to average rainfall of all years (702.3 mm).
3. **Wet year:** Annual rainfall equal to 90th percentile rainfall of all years to assess 'severe' water surplus (940.3 mm).

The assessment modelled three rainfall scenarios from the historical rainfall data for Wyangala Dam as proxy for an average rainfall case, and worse case rainfall scenarios (wet and dry years), refer below:

3. **Dry year (1972):** recorded rainfall 488.2 mm
4. **Average year (2000):** recorded rainfall 699.7 mm
5. **Wet year (1992):** recorded rainfall 936.1 mm

3.1.4 Input Parameters

Refer Appendix A for listed input parameters.

3.1.5 Model parameters

Base and storm flow concentration inputs were adopted based on NSW MUSIC Modelling Guidelines (2015) and MUSIC defaults for the proposed modification.

3.1.6 Catchment Area

Catchment areas have been provided by the client, refer to Appendix B and Table 3.

Table 3: Summary of catchment areas.

Catchment	Approximate Area (ha)
N1	0.29
N2	0.75
N3	0.76
N4	0.44
7	0.17
8	0.89
9	0.71
10a	12.55
10b	2.38
11	9.86
EB1	7.54
EB2	4.51
Void	5.50

For modelling purposes, catchment areas and existing water structures were grouped based on their water reuse and treatment:

- All quarry operational areas were combined into a single catchment node, discharging to a combined sediment basin representing all existing water structures and supplying water for non-potable site uses.
- Roof areas were modelled as a separate catchment node with runoff directed to a combined rainwater tank representing two existing 30 kL rainwater tanks for potable water use.

Modelled catchment areas are provided in Table 4.

Table 4: Summary of modelled catchment areas.

Catchment	Approximate Area (ha)
Combined Quarry Area	46.35
Roof Area	0.04

3.1.7 Site Water Demand

Non potable water demands for the site are based on the water required for quarry operations and dust suppression, the estimates below have been provided by the client.

The potable water demand for the site is estimated as 27 L/person/day (based on NSW Health (2012) guidelines for industrial use). Based on information provided by the client, up to 6 employees will be on site for 6 days a week (excluding public holidays) providing an annual demand of 0.05 ML/yr.

Water demands for the quarry are summarised in Table 5.

Table 5: Summary of site water demand / losses for all stages.

Activity	Water Demand ML/year
Dust suppression	13.65
Production	2.90
Staff amenities (toilet flushing)	0.05
Total non potable water demand	16.55
Total potable water demand	0.05

3.1.8 Site Water Supply

Non potable water supply is to reuse stormwater runoff which is captured in the water structures. Water supply is based on the MUSIC modelling using the climate data detailed in Section 3.1.3.

The site is not serviced by town water supply. Staff amenities water therefore is provided via collected roof water. Drinking water is supplied separately via bottled water purchased in bulk for staff consumption.

3.1.9 Site Water Balance Results

The site water balance for the proposed quarry is summarised in Table 6 (dry year); Table 7 (average year) and Table 8 (wet year).

Table 6: Summary of site water balance – dry year.

Supply	ML/year	Demand	ML/year
Non-Potable			
Runoff to sediment basin	+173.52	Road dust suppression	-13.65
Storage (evaporative & seepage) losses	-19.11	Production	-2.90
Non-Potable Balance			+137.86
Potable			
Runoff to rainwater tank	+0.19	Staff amenities	-0.05
Potable Balance			+0.14

Note:

Positive number denotes a surplus / negative number denotes a deficit.

Table 7: Summary of site water balance – average year.

Supply	ML/year	Demand	ML/year
Non-Potable			
Runoff to sediment basin	+250.27	Road dust suppression	-13.65
Storage (evaporative & seepage) losses	-19.11	Production	-2.90
Non-Potable Balance			+214.61
Potable			
Runoff to rainwater tank	+0.27	Staff amenities	-0.05
Potable Balance			+0.22

Note:

Positive number denotes a surplus / negative number denotes a deficit.

Table 8: Summary of site water balance – wet year.

Supply	ML/year	Demand	ML/year
Non-Potable			
Runoff to sediment basin	+346.62	Road dust suppression	-13.65
Storage (evaporative & seepage) losses	-19.11	Production	-2.90
Non-Potable Balance			+310.96
Potable			
Runoff to rainwater tank	+0.36	Staff amenities	-0.05
Potable Balance			+0.31

Note:

Positive number denotes a surplus / negative number denotes a deficit.

4 Conclusion

The water balance analysis results show that the site will be provided with sufficient non-potable and potable water supply from the existing water structures and rainwater tanks (supplied by roof water) under all modelled scenarios including average, dry, and wet years. On this basis, we conclude that surface water collection and re-use within the site will be sufficient to meet site demands without reliance on other sources of water supply.

5 References

BMT WBM (2015), *NSW MUSIC Modelling Guidelines*.

NSW Health (2012), *Septic Tank and Collection Well Accreditation Guideline*

Appendix A – MUSIC Modelling Inputs

Parameter	Description	Input	Reference
Setup	Climate File	Rainfall data from BOM, Wyangala Dam Station No. 63267 and PET data from SILO (grid point located at latitude -33.95, longitude 148.80) were used to create the MLB files for each scenario in Section 3.1.3.	BOM and SILO
Source Nodes	Rainfall Threshold	Based on surface type specified in Table 5-4 of NSW MUSIC Modelling Guidelines	BMT WBM MUSIC Modelling Guidelines (2015)
	Base & Storm flow Parameter	As per Table 5-6 & 5-7 of NSW MUSIC Modelling Guidelines	BMT WBM MUSIC Modelling Guidelines (2015)
	Estimation Method	Stochastically generated	BMT WBM MUSIC Modelling Guidelines (2015)
Sediment Basins	Low Flow By-Pass	0 m ³ /s	Assumed no bypass
	High Flow By-Pass	100 m ³ /s	Assumed no bypass
	Extended Detention Depth	0.01 m	Nominally zero (no detention depth modelled)
	Surface Area	13957 m ²	Provided by the client
	Permanent Volume	45158 m ³	Provided by the client
	Initial Volume	45158 m ³	By design
	Exfiltration Rate	0.0 mm/hr	By design
	Evaporative Loss	75 %	MUSIC default
	Equivalent Pipe Diameter	300 mm	MUSIC default
	Overflow Weir width	2 m	MUSIC default

Appendix B – Water Storages and Sub-catchments

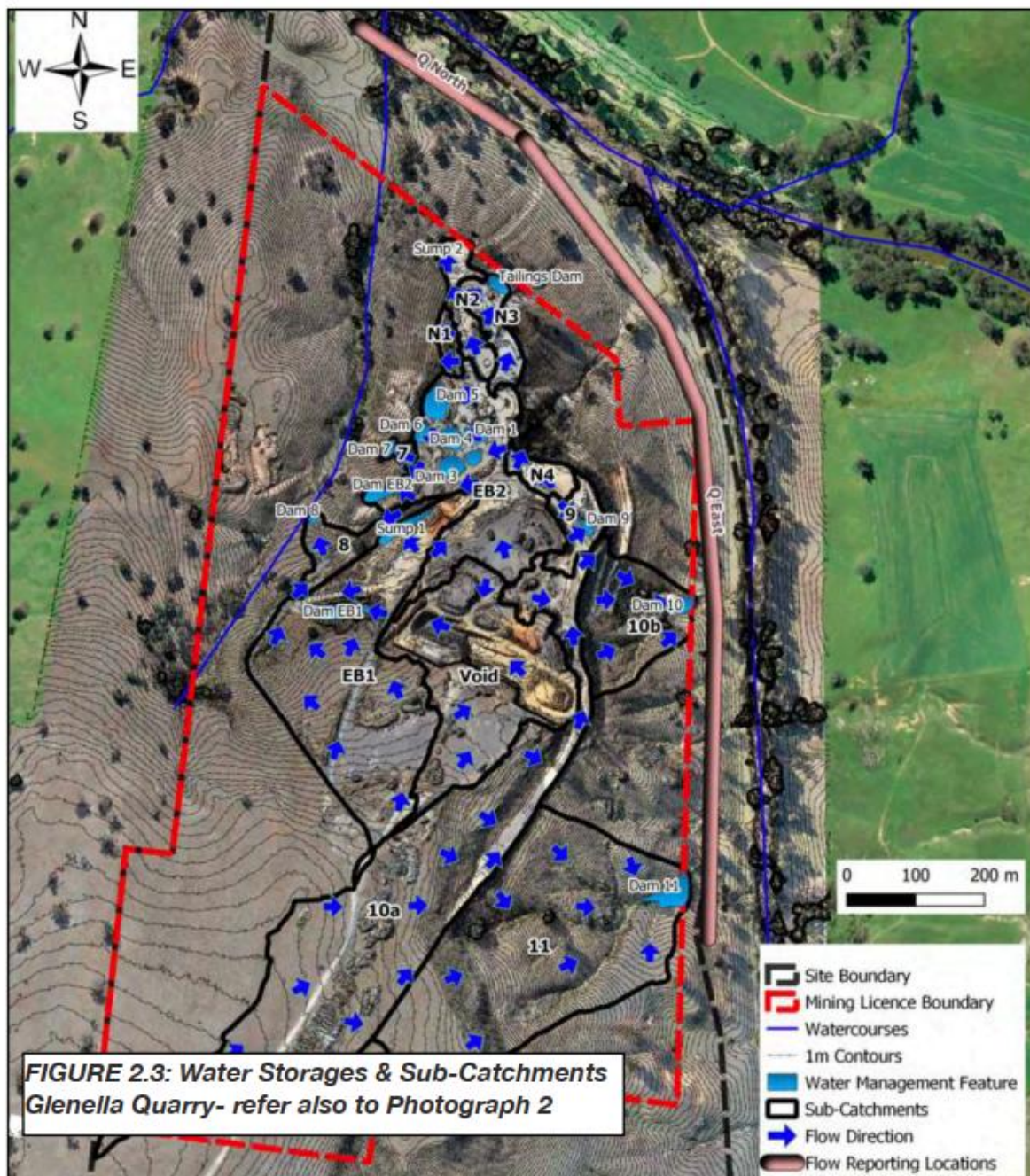


Figure 2: Water storage and sub-catchments (picture provided by Outline Planning Consultants).