Sheridans Hard Rock Quarry Pty Ltd

Water Balance Assessment: Faheys Pit - 9720 Armidale Road, Tyringham NSW

martens consulting engineers

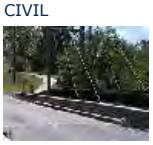
ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL



PROJECT MANAGEMENT

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All enquiries regarding this project are to be directed to the Project Manager.

Contents

1 Introduction

1.1 Overview

This report has been prepared to support a development application (DA) for the expansion of an existing quarry at 9720 Armidale Road, Tyringham, New South Wales.

This report provides evidence of compliance with Secretary's Environmental Assessment Requirements (SEAR's) 1722 as they relate to the requirement for a water balance assessment and the documentation of the results of the assessment.

1.2 Relevant Planning Controls and Design Principles

The following planning and engineering controls and design principles have been used:

- Clarence Valley Council (CVC) (2011) Rural Zones Development Control Plan (DCP).
- Clarence Valley Council (CVC) (2022) Sustainable Water Requirements.

2 Site Description

2.1 Site Description and Location

Site description is provided in Table 1.

Table 1: Site description summary.

Element	Site Details
Site Address	9720 Armidale Road, Tyringham NSW
Legal Identifier	Lot 31 DP 1203488
Local Government Area	Clarence Valley Council
Site Area	Approximately 11.4 ha
Existing Site Development	Mostly undeveloped, vegetated land. A quarry operates in the south east of the site.
Neighbouring Environment	To the west of the quarry is a rural property with the Hyland State Forest located to the north. To the east is an existing sawmill and dwelling, and a Council quarry known as 'Ellis' Pit'. Armidale Road run is located to the south of the site.
Site Topography	The site is flat at the higher elevations and undulating elsewhere with slopes up to around 30%. Site elevation ranges between approximately 1095 mAHD (in the south east corner) to 1025 mAHD (in the west).
Site Drainage	Via overland flow through site drainage depressions towards Merchin Creek.
Vegetation	Forest

2.2 Proposed Development

The development will include:

- Expansion of the existing quarry.
- Staged construction of sedimentation basins:
    - Stage 1: Existing 6.05 ML basin to be retained and 5.86 ML basin to be constructed.
    - Final: Existing 6.05 ML basin from Stage 1 to be rebuilt to a 5.5 ML capacity basin and all surface flows to be directed to it.

Figure 1 and Figure 2 shows the development at stage 1 and final stage.

Figure 1 quarry and location of sedimentation basins at stage 1 (provided by Sheridans Hard Rock Quarry).

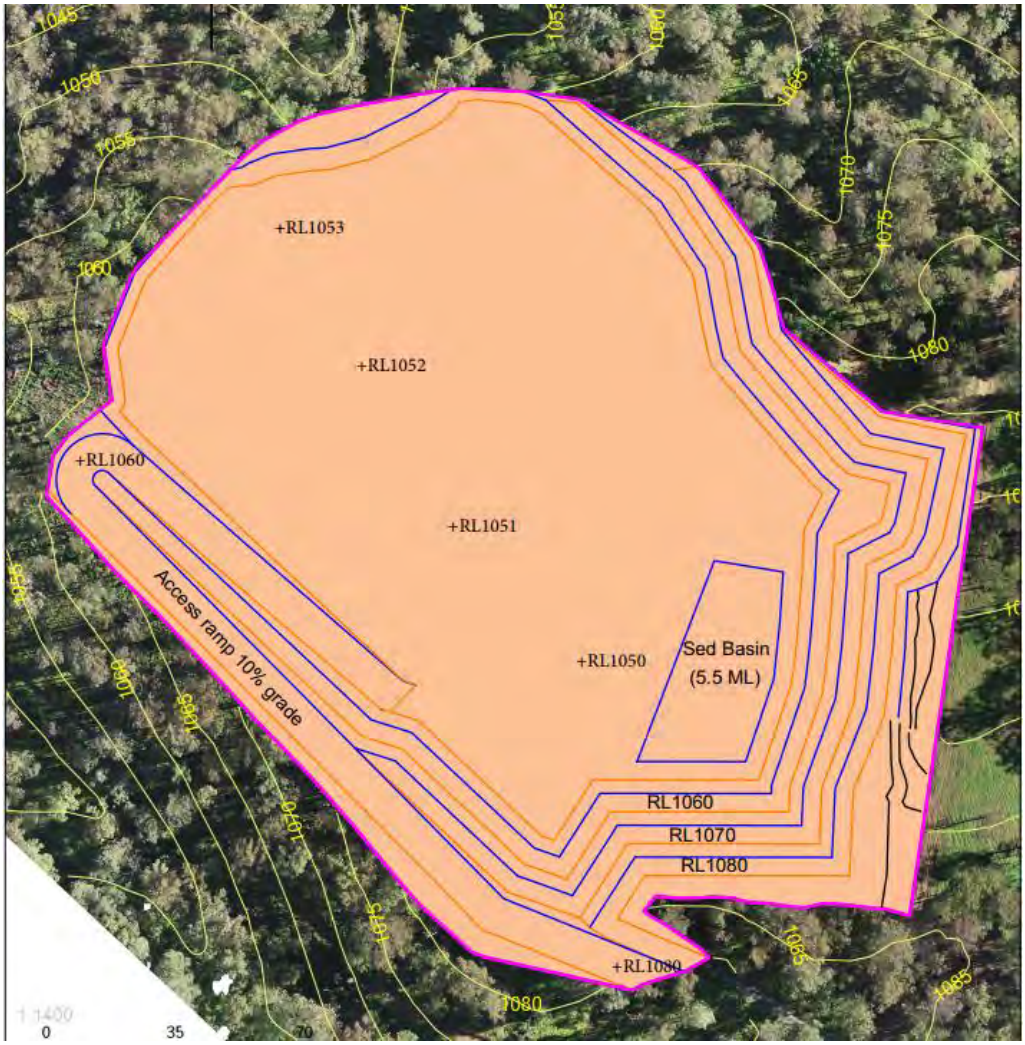

Figure 2 final stage quarry (provided by Sheridans Hard Rock Quarry).

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 or to detail the excess water released to the environment.

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

3.1.3 Climate Data

The water balance is assessed for a range of rainfall scenarios for the following purposes:

1. Average year – with annual rainfall equal to average rainfall of all years (1141.5 mm).

2. Dry year – with annual rainfall equal to 10th percentile rainfall of all years to assess 'severe' water deficit (757.3 mm).

3. Wet year – with annual rainfall equal to 90th percentile rainfall of all years to assess 'severe' water surplus (1571.9 mm).

Rainfall climate data was sourced from the Bureau of Meteorology (BOM) weather station located at the Tyringham (Station No. 059118). The data for the following years was used as a proxy for the three different scenarios listed above:

- Average year (1992): recorded rainfall 1130.6 mm
- Dry year (1986): recorded rainfall 760.4 mm
- Wet year (1988): recorded rainfall 1591.4 mm

3.1.4 Input Parameters

Refer to Attachment 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 quarry.

3.1.6 Catchment Area

The catchment size that drains to the sedimentations basins is 4.1 ha.

3.2 Site Water Demand

Water demands for the quarry are summarised in Table 2.

Table 2: Summary of site water demand / losses for stage 1.

Activity	Water Demand ML/year
Dust suppression	1.00
Production	4.00
Staff amenities	0.03
Total non-potable water demand	**5.0**
Total potable demand	**0.03**

The non-potable water demands for the site are based on the water required for quarry operations and dust suppression, the estimates above have been provided by Outline Planning Consultants Pty Ltd.

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 Outline Planning Consultants Pty Ltd, up to 4

employees will be on site for 6 days a week (excluding public holidays) providing an annual demand of 0.03 ML/yr.

3.3 Site Water Supply

Non-potable water supply is to reuse stormwater runoff which is captured in the sedimentation basins. 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 therefore, potable water can be provided via collected roof water and/or water tanker delivery.

3.4 Site Water Balance Results

3.4.1 Stage 1

Two scenarios are considered for stage 1:

- Scenario 1: Both sedimentation basins are contributing to the water reuse of stormwater during stage 1.
- Scenario 2: only the existing basin with capacity of 6.05 ML will supply the water reuse during stage 1.

The site water balance for the proposed quarry at Stage 1 in scenario 1 is summarised in Table 3 (average year); Table 4 (dry year) and Table 5 (wet year).

Table 3: Summary of site water balance in scenario 1– average year.

Supply	ML/year	Demand	ML/year
NON-POTABLE			
Runoff to sedimentation basins	36.63	Road dust suppression	1.00
Storage (evaporative & seepage) losses	-6.13	Production	4.00
Non-Potable Balance			25.50[1]
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03[1]

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

Table 4: Summary of site water balance in scenario 1 – dry year.

Supply	ML/year	Demand	ML/year
NON-POTABLE			
Runoff to sedimentation basins	24.02	Road dust suppression	1.00
Storage (evaporative & seepage) losses	-6.11	Production	4.00
Non-Potable Balance			12.91[1]
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

Table 5: Summary of site water balance in scenario 1– wet year.

Supply	ML/year	Demand	ML/year
NON-POTABLE			
Runoff to sedimentation basins	55.92	Road dust suppression	1.00
Storage (evaporative & seepage) losses	-6.13	Production	4.00
Non-Potable Balance			44.79[1]
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

The site water balance for the proposed quarry at Stage 1 in scenario 2 is summarised in Table 6 (average year); Table 7 (dry year) and Table 8 (wet year).

Table 6 : Summary of site water balance in scenario 1– average year.

Supply	ML/year	Demand	ML/year
NON-POTABLE			
Runoff to sedimentation basins	21.98	Road dust suppression	1.00
Storage (evaporative & seepage) losses	-3.07	Production	4.00
Non-Potable Balance			13.91[1]
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03[1]

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

Table 7: Summary of site water balance in scenario 1 – dry year.

Supply	ML/year	Demand	ML/year
NON-POTABLE			
Runoff to sedimentation basins	14.41	Road dust suppression	1.00
Storage (evaporative & seepage) losses	-3.06	Production	4.00
Non-Potable Balance			6.35[1]
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

Table 8: Summary of site water balance in scenario 1– wet year.

Supply	ML/year	Demand	ML/year
NON-POTABLE			
Runoff to sedimentation basins	33.55	Road dust suppression	1.00
Storage (evaporative & seepage) losses	-3.07	Production	4.00
Non-Potable Balance			25.48[1]
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

3.4.2 Final Stage

The site water balance for the proposed final quarry is summarised in Table 9 (average year); Table 10(dry year) and Table 11 (wet year).

Table 9: Summary of site water balance – average year.

Supply	ML/year	Demand	ML/year
NON-POTABLE			
Runoff to sedimentation basin	36.63	Road dust suppression[1]	1.00
Storage (evaporative & seepage) losses	-3.19	Production[1]	4.00
Non-Potable Balance			28.44[1]
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03

Notes:
[1] Positive number demotes a surplus / negative number denotes a deficit.

Table 10: Summary of site water balance – dry year.

Supply	ML/year	Demand	ML/year
NON POTABLE			
Runoff to sedimentation basin	24.02	Road dust suppression[1]	1.00
Storage (evaporative & seepage) losses	-3.18	Production[1]	4.00
Non-Potable Balance			15.84[1]
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

Table 11: Summary of site water balance – wet year.

Supply	ML/year	Demand	ML/year
NON POTABLE			
Runoff to sedimentation basin	55.92	Road dust suppression[1]	1.00
Storage (evaporative & seepage) losses	-3.19	Production[1]	4.00
Non Potable Balance			47.73[1]
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

3.5 Conclusion

A water balance analysis has been undertaken to assess the adequacy of water at the site for necessary site operations. The water balance assessment demonstrates that for all years (average, dry and wet) the site shall generate and capture sufficient runoff within the proposed site sedimentation basins to provide for all non-potable water demands (5 ML/year).

A potable water deficit is estimated based on the requirements for site staff in the order of 30 kL/year which can be provided via collected roof water and/or water tanker delivery.

4 References

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

Clarence Valley Council (CVC) (2011) *Rural Zones Development Control Plan* (DCP).

Clarence Valley Council (CVC) (2022) *Sustainable Water Requirements.*

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

Attachment A – MUSIC Model Inputs

Table 12: Treatment node inputs.

Element	Factor	Input	Source
Setup	Climate File	Tyringham mlb file	BOM
Source Nodes	Rainfall Threshold	Based on surface type specified in Table 5-4	BMT WBM (2015)
	Base & Stormflow Properties	As per Table 5-6 & 5-7	BMT WBM (2015)
	Estimation Method	Stochastically generated	BMT WBM (2015)
Existing Sedimentation basin (6.05 ML) Stage 1	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 extended detention depth modelled)
	Surface Area	720 m^2	Provided by Outline Planning Consultants Pty Ltd
	Permanent Volume	6050 m^3	Provided by Outline Planning Consultants Pty Ltd
	Initial Volume	6050 m^3	By design
	Exfiltration Rate	0.36 mm/hr	Based on site soil profile
	Evaporative Loss	75%	MUSIC default
	Outlet Pipe	300 mm	MUSIC default (no extended detention depth modelled)
	Overflow Weir	2.0 m	MUSIC default
Sedimentation basin (5.86 ML) Stage 1	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 extended detention depth modelled)
	Surface Area	720 m^2	Provided by Outline Planning Consultants Pty Ltd
	Permanent Volume	5860 m^3	Provided by Outline Planning Consultants Pty Ltd
	Initial Volume	5860 m^3	By design
	Exfiltration Rate	0.36 mm/hr	Based on site soil profile
	Evaporative Loss	75%	MUSIC default
	Reuse rate	6.85 kL/day	MUSIC default (no extended detention depth modelled)
	Overflow Weir	2.0 m	MUSIC default
Sedimentation basin (5.5 ML) Final stage	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 extended detention depth modelled)
	Surface Area	1000 m^2	Provided by Outline Planning Consultants Pty Ltd
	Permanent Volume	5500 m^3	Provided by Outline Planning Consultants Pty Ltd
	Initial Volume	5500 m^3	By design

Element	Factor	Input	Source
	Exfiltration Rate	0.36 mm/hr	Based on site soil profile
	Evaporative Loss	75%	MUSIC default
	Outlet Pipe	300 mm	MUSIC default (no extended detention depth modelled)
	Overflow Weir	2.0 m	MUSIC default