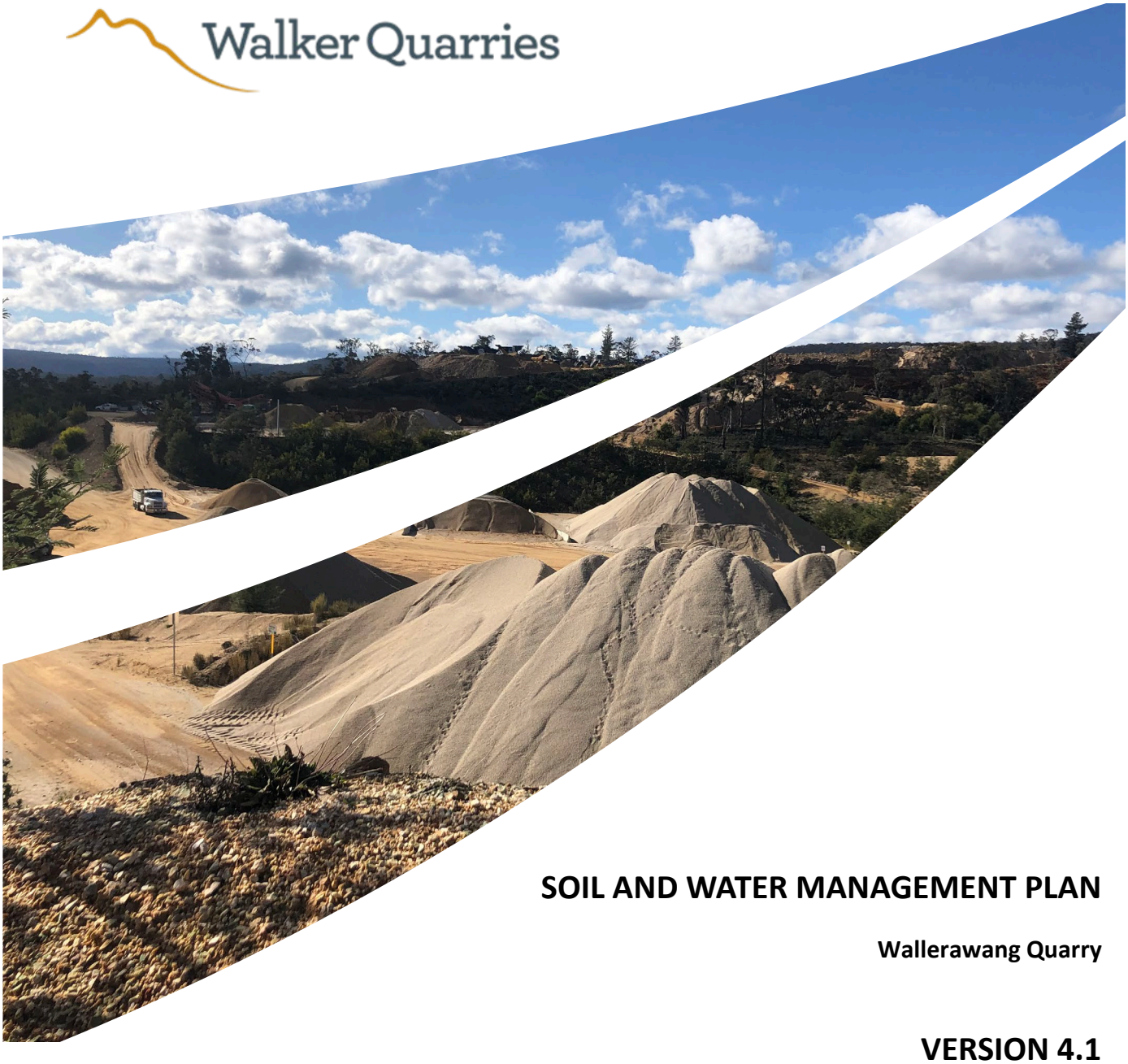
Walker Quarries



SOIL AND WATER MANAGEMENT PLAN

Wallerawang Quarry

VERSION 4.1

October 2022

umwelt
Environmental & Social Consultants

SOIL AND WATER MANAGEMENT PLAN

Wallerawang Quarry

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Walker Quarries Pty Limited

Project Director:	Alex Irwin
Project Manager:	Alex Irwin
Report No.	4433/R06
Date:	October 2022

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
0*	Alex Irwin	8 February 2019	Alex Irwin	26 February 2019
1	Alex Irwin	1 April 2019	Alex Irwin	1 April 2019
2	Alex Irwin	30 April 2020	Johann van der Merwe (Walker Quarries)	12 May 2020
2.1	Alex Irwin	12 June 2020	Johann van der Merwe (Walker Quarries)	12 June 2020
2.2	Alex Irwin	13 August 2020	Johann van der Merwe (Walker Quarries)	14 August 2020
3.0	Alex Irwin	10 December 2020	Johann van der Merwe (Walker Quarries)	11 December 2020
4.0	Alex Irwin	9 November 2021	Kerry Burke (Walker Quarries)	23 November 2021
4.1	Alex Irwin	4 May 2022	Kerry Burke (Walker Quarries)	28 October 2022

Note * V0 represents the first version of this plan prepared by Umwelt Pty Ltd. This follows from Rev 4 produced by RW Corkery & Co. Pty Limited

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1.0 Scope

1.1 Introduction

The Wallerawang Quarry (the Quarry) is located approximately 8 kilometres (km) northwest of Lithgow (**Figure 1.1**) and is approved to produce 500 000 tonnes per annum (tpa) of hard rock aggregate material and sand. DA 344-11-2001 approves disturbance up to a maximum of 28.6 ha for the purpose of quartzite and other hard rock extraction, processing, stockpiling, management and on-site disposal of non-saleable (overburden) materials, and ancillary infrastructure.

This Soil and Water Management Plan (SWMP) for the Quarry has been reviewed and updated by Mr Alex Irwin, Principal Environmental Consultant of Umwelt (Australia) Pty Limited (Umwelt), on behalf of Walker Quarries Pty Limited (Walker Quarries) in accordance with *Condition 3(18)* of the Development Consent DA 344-11-2001. Mr Irwin has been confirmed as a suitably qualified and experienced person to prepare the SWMP by the Department of Planning, Industry & Environment (DPIE) (see **Appendix 1**).

The SWMP synthesises the recommendations made during the preparation of the various environmental assessments completed for the Quarry, the conditions of DA 344-11-2001 and Environment Protection Licence (EPL) 13172 and the document *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th eds.* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008), hereafter referred to as the "Blue Book".

1.2 Document History

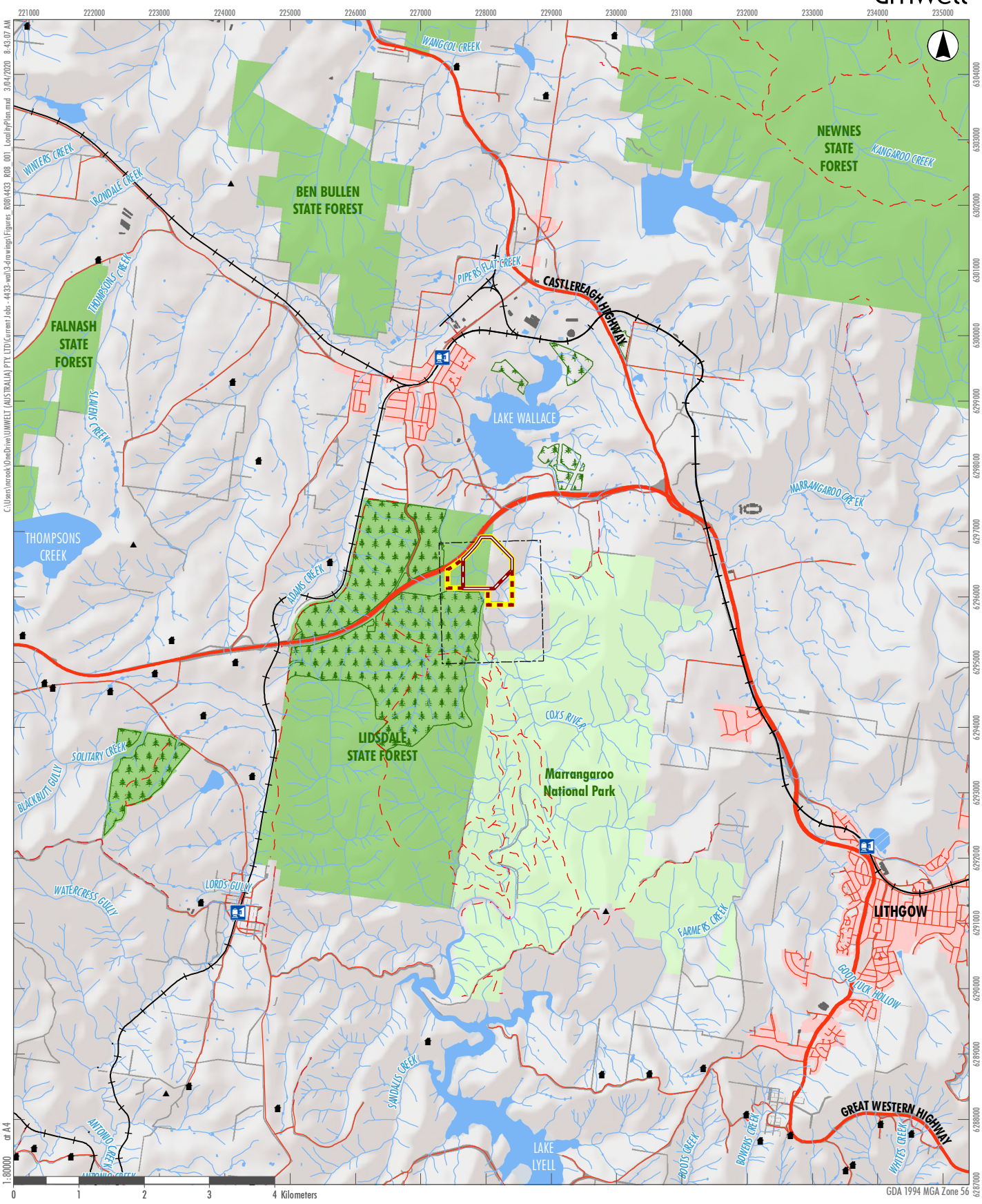
1.2.1 Overview

This version of the SWMP (V4.1) has been prepared following the completion of an Independent Environmental Audit (IEA) (JBA, 2021) and IEA Response Plan (Umwelt, 2021a) submitted on 20 July 2021, and Annual Review (Umwelt, 2021b) submitted on 30 September 2022. In accordance with *Condition 5* of *Schedule 5* of DA 344-11-2001, the DPIE was notified on 12 October 2021 following the completion of the Annual Review of the completed review of the SWMP and intention of Walkers Quarries to revise and resubmit the SWMP. The preceding version of the SWMP was submitted to the DPIE on 11 December 2020 and approved by the DPIE on 16 December 2021.

This version of the SWMP was updated and resubmitted in October 2022 (as V4.1) following correspondence from the Department of Environment and Planning (DPE) on 16 August requesting:

- Further consultation with the NSW Environment Protection Authority (EPA), DPE-Water and WaterNSW. A record of this additional consultation is provided in **Section 1.2.1** and **Appendix 2**.
- Justification for the changes made in **Sections 4**, **7**, **9** and **10**. **Appendix 7** has been created and added which identifies the key changes and justification for these.

Table 1.1 provides the full history of SWMP revisions.



Legend

- Quarry Site Boundary
- Quarry Site ML Extension
- Quarry Site (ML1633)
- EL 4473
- State Forest
- NPWS Estate

FIGURE 1.1

Locality Plan

Image Source: Copyright:(c) 2014 Esri Data source: DFSI (2019)

Table 1.1 Document Status History

Rev No.	Prepared by		Purpose
	Name	Date	
0	Alex Irwin	February 2019	Updated following Modification 2 (issued December 2018)
1	Alex Irwin	April 2019	Updated following DPIE Review (March 2019)
2.1	Alex Irwin	May 2020	Updated following Modification 3 (issued 26 Feb 2020)
2.2	Alex Irwin	August 2020	Updated following DPIE review of V2
3.0	Alex Irwin	December 2020	Updated following additional consultation with WaterNSW, DPIE-Water & NRAR
4.0	Alex Irwin	November 2021	Updated to reflect the recommendations of the IEA, 2021 Annual Review and updated status of operations
4.1	Alex Irwin	October 2022	Updated in response to a request by DPE for consultation with EPA, DPE-Water and WaterNSW and justification of key changes.

1.2.2 Consultation

The original version of this SWMP was prepared in consultation with the Environment Protection Authority (EPA), Department of Industry – Office of Water (DPI-Water) and WaterNSW. A record of this consultation and where requests for coverage have been addressed is provided in **Appendix 2**.

Following the issue of DA 344-11-2001 MOD3 leading to the revision of this SWMP, the EPA, WaterNSW and DPIE – Water (DPIE-Water) were consulted with respect to requirements for inclusion in the SWMP. The responses of these agencies are summarised as follows.

- The EPA responded confirming no requirements for the SWMP would be provided.
- WaterNSW referred the request to the Natural Resource Access Regulator (NRAR) with no further response received.
- DPIE-Water acknowledged receipt of the request, however, did not provide any further response.

A summary of consultation and responses received in 2017 and 2020 is provided in **Appendix 2**. SWMP Rev 2 was issued following the completion of this round of consultation.

On 23 July 2020, the DPIE requested Walker Quarries consult again with NRAR with any comments to be incorporated into an updated version of the SWMP. The following provides a summary of additional consultation undertaken (with evidence provided in **Appendix 2**).

- On 12 August 2020, a copy of the SWMP was provided to the NRAR requesting feedback or comments on the SWMP by 9 September 2020. No response or feedback was received from NRAR following this request.
- On 20 October 2020, an enquiry was made to NRAR by email again seeking feedback on the SWMP.
- On 28 October 2020, a phone enquiry was made to NRAR seeking confirmation of receipt of the previous email and an indication of timing to respond. An email was received from a water regulation officer on 4 November 2020 confirming the enquiry had been received and made a matter of priority.

- On 28 October 2020, an enquiry was made to WaterNSW again seeking feedback on the SWMP. On 13 November 2020, a catchment assessment officer responded confirming the SWMP adequately addresses matters previously raised by WaterNSW in the assessment of MOD3. The officer also noted the request for feedback had again been forwarded to NRAR.

- On 20 November 2020, an enquiry as to status of any review of the SWMP was made to the water regulation officer. A response was received on the same day confirming the review had been assigned. No further response from NRAR has been received.

- On 27 November 2020, the DPIE acknowledged sufficient effort to consult with NRAR and DPIE-Water and instructed the SWMP could be resubmitted for DPIE review.

Following resubmission of the SWMP via the major Projects Portal on 11 December 2020, further feedback was received as follows.

- On 22 December 2020, DPIE issued a request for further information on the approach to application of sediment settling (flocculant) agents and management of discharge. A response to these requests was provided to DPIE on 23 April 2021 (refer to **Appendix 2**), with **Sections 6.4.4** and **7.3.3** updated.

- On 8 February 2021, DPIE-Water issued a request for the following to be included in the SWMP Refer to **Appendix 6**).

    - The determination of the maximum groundwater level should be done in consultation with DPIE Water.

      Section 9.4.2.1 *has been updated to confirm this.*

    - The SWMP shall include groundwater quality monitoring as detailed in the SEE Section 9.3.

      Section 9.3.2.2 *has been added to the SWMP to provide for annual monitoring of groundwater quality*

    - Documentation on the determination and implementation of "Make good provisions" for surrounding bores should be included in the SWMP and include monitoring of bores GW801271, GW111587, GW805211 as a minimum, enacting of provisions when an impact of 2m has been determined.

      This was considered, however, for the reasons included in a letter provided to DPIE-Water on 26 April 2021 considered outside the reasonable scope of the SWMP (refer to ***Appendix 2****).*

On 16 August 2022, DPE issued correspondence requiring further consultation with EPA, DPE-Water and Water NSW. A copy of V4 of the SWMP was supplied to these agencies with a request for comment on 21 September 2022. The following correspondence has been received.

- On 14 October 2022, Water NSW provided correspondence noting the SWMP adequately reflects the comments previously provided with respect to the SWMP following assessment of MOD 3. Water NSW goes on to recommend the following.

    - A review of the soil and erosion controls especially the volumes of dirty and clean water dams be undertaken to ensure there is minimum risk of unplanned discharges from the quarry site.

      Section 6.4 *of the SWMP reflects a review of erosion and sediment control requirements in light of some minor modifications to the operational layout of the Quarry.*

- Another water quality monitoring site immediately downstream of the Wallerawang Quarry site in the Coxs River be considered in addition to site SW4 (WaterNSW gauging station, approximately 6.6 km downstream of Tributary A discharge point to the Coxs River). SW4 is located further downstream after the confluence of Marangaroo Creek and Coxs River and includes surface water runoff influence of cleared rural and residential land, the Lithgow Correctional Facility and Marrangaroo Quarry.

  The recommendation of WaterNSW is noted and Walker Quarries is committed to reviewing the location of SW4 during the current reporting period. It is noted that the location downstream of Marangaroo Creek has been identified as not ideal, however, safe access to the Coxs River upstream of this point has not yet been identified.

- On 19 October 2022, the EPA responded noting it has no statutory obligations in the assessment of management plans. The EPA noted the SWMP should "*assist the licensee in meeting their commitment to statutory compliance and wider environmental management and, where appropriate, should be integrated with other operational or management strategies*." The EPA confirmed review of the SWMP and "has no specific comments to make about the content of the Plan" other than that Environment Protection Licence 13172 be varied to reference the updated Plan (on approval of the SWMP by DPE).

1.2.3 Term of Coverage

The term of coverage of this SWMP is restricted to a period coinciding with the period of the approved Mining Operations Plan (which incorporates a Rehabilitation Management Plan) (to 19 July 2025). The Erosion and Sediment Control Plan (ESCP) which accompanies the SWMP (**Appendix 3**) is further restricted to and excludes works associated with the Southern Stockpile Extension (refer to **Figure 2.1**) and will be updated prior to commencement of these works and associated water diversions.

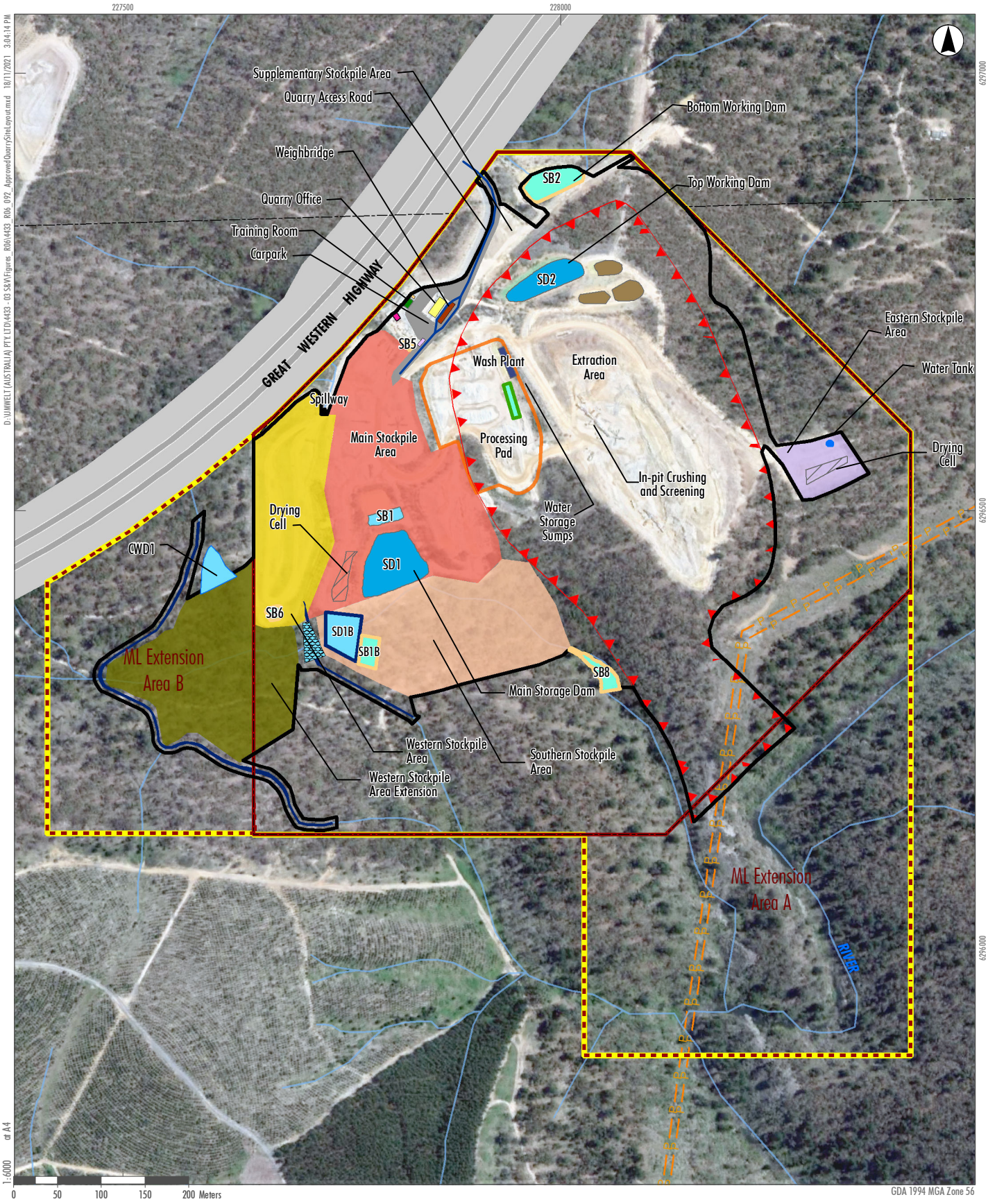
2.0 Site Description and Operations

Figure 2.1 displays the layout of the Quarry. Detailed information regarding approved activities is available in the following documents:

- Environmental Assessment for the Modification to the Operations at the Wallerawang Quarry (DA 344-11-2001), dated May 2017 (RWC, 2017).
- Statement of Environmental Effects (SEE) for Proposed Modification No 2 (MOD 2) to DA 344-11-2001 (Wallerawang Quarry), dated October 2018 and approved December 2018 (RWC, 2018).
- Statement of Environmental Effects (SEE) for Proposed Modification No 3 (MOD 3) to DA 344-11-2001 (Wallerawang Quarry), dated June 2019 and approved January 2020 (Umwelt, 2019).
- Wallerawang Quarry Mining Operations Plan (incorporating Rehabilitation Management Plan), 4TH MOP, July 2020. Prepared by Umwelt (Australia) Pty Limited on behalf of Walker Quarries Pty Ltd for the period 20 July 2020 to 19 July 2025 (Umwelt, 2020).

In general, the following activities are undertaken, subject to market demand:

- Where it can be accessed, topsoil will be stripped and stockpiled for use in rehabilitation activities. Vegetation that is cleared will be selectively placed within areas being revegetated to take advantage of the existing seed bank, where available.
- Raw material is extracted using conventional drill and blast, load and haul methods.
- Overburden material is temporarily stockpiled within the footprint of the open cut from where it is either used within the site for approved construction activities or sold for use as road base materials.
- Processing of raw material involving crushing, screening and washing using fixed or mobile plant to meet customer requirements.
- Product transportation involves loading of road registered trucks. Trucks then enter the Great Western Highway directly from the Quarry Site entrance.
- Progressive rehabilitation of eastern slopes of the extraction area and rehabilitation of the remaining landform at Quarry closure in accordance with the approved Mining Operations Plan (MOP).



Legend

- Quarry Site Boundary
- Quarry Site (ML1633)
- Quarry Site ML Extension
- EL 4473
- Disturbed Areas for Modified Operations
- Approved Extraction Area
- Main Stockpile Area (935m AHD)
- Processing Pad
- Southern Stockpile Area (935m AHD)
- Western Stockpile Area
- Western Stockpile Extension (940m AHD)
- Eastern Stockpile Area
- Clean Water Diversion
- Sediment Basins
- Settlement Ponds
- Storage Dam
- Water Tank
- Rock-lined Drain
- Clean Water Dam
- Silt Cells
- P Electricity Transmission Lines

FIGURE 2.1

Approved Quarry Site Layout

Image Source: Nearmap (2020) Data source: Walker Quarries (2019); Umwelt (2019); NSW LPI DTDB (2019); CEH Survey (November 2016)

3.0 Regulatory Requirements

3.1 Development Consent DA 344-11-2001 (as modified)

Conditions 3(16) and *3(17)* of DA 344-11-2001 (as modified on 26 February 2020) provide instructions as to the requirements of Walker Quarries in relation to soil and water management. *Condition 3(18)* requires the preparation of a *Soil and Water Management Plan*. *Conditions 5(3)* to *5(5)* provide instruction on the preparation, review and amendment to consent required management plans.

Table 3.1 identifies each of these conditional requirements and identifies the section of this SWMP where each is addressed.

Table 3.1 Conditional Requirements for Soil and Water Management Plan of DA 344-11-2001

No	Condition	Section
Extraction Depth		
2(6)	The Applicant must not conduct quarrying operations within one metre of the maximum groundwater level, except for (with the approval of the Secretary) construction and use of drainage sumps, groundwater monitoring bores, exploration boreholes and the like.	**9.3**
2(6A)	Prior to the commencement of quarrying operations below 901 mAHD (unless approved under condition 6 of this Schedule), the Applicant must: (a) determine the maximum groundwater level within and adjacent to the proposed extraction area, in consultation with DIE – Water, using all available groundwater and rainfall monitoring data collected from the site or in the vicinity of the site and appropriate modelling software and parameters; (b) establish the proposed maximum extraction depth to comply with condition 6; (c) prepare a contour map or similar, showing the proposed maximum extraction depth; for approval of the Secretary.	**9.4**
Water Supply		
3(16)	The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of operations under the consent to match its available water supply, to the satisfaction of the Secretary.	**7.3**
Water Discharges		
3(17)	The Applicant must comply with the discharge limits in any EPL, or with section 120 of the POEO Act.	**0, 4.0**
Soil and Water Management Plan		
3(18)	The Applicant must prepare a Soil and Water Management Plan for the development to the satisfaction of the Secretary. This plan must: (a) be prepared by suitably qualified and experienced person/s approved by the Secretary; (b) be prepared in consultation with the EPA, DPIE – Water and WaterNSW; (c) be submitted to the Secretary for approval within three months of the determination of Modification 1 and Modification 3, unless otherwise agreed by the Secretary; and	**Appendix 1** **Appendix 2** Noted

No	Condition	Section
3(18) cont'd	(d) include a:	
	• Site Water Balance that includes:	
	– details of:	
	▪ sources and security of water supply;	**7.1, 7.3.1, 7.3.3**
	▪ water use and management on site;	**7.2, 7.3.2**
	▪ any off-site water transfers; and	N/A
	▪ reporting procedures; and	**9.7**
	– measures to be implemented to minimise clean water use on site;	**7.1**
	• Surface Water Management Plan, that includes:	
	– a program for obtaining detailed baseline data on surface water flows and quality in water bodies that could potentially be affected by the development;	**9.2.1, 9.3.1**
	– a detailed description of the surface water management system on site including the:	**6.0 & Appendix 3**
	▪ clean water diversion system;	**6.2**
	▪ erosion and sediment controls;	**6.4**
	▪ dirty water management system; and	**6.4**
	▪ water storages; and	**6.3**
	– a program to monitor and report on:	
	▪ any surface water discharges;	
	▪ the effectiveness of the water management system,	
	▪ the quality of water discharged from the site to the environment;	**9.1, 9.2.1, 9.3.1, 9.4.1**
	▪ surface water flows and quality in local watercourses;	
	• Groundwater Management Plan that includes:	
	– a provision that requires the Applicant to obtain appropriate water licence(s) to cover the volume of any unforeseen groundwater inflows into the quarry from the quarry face or floor; and	**3.3**
	– a monitoring program to manage potential impacts, if any, on any alluvium and associated surface water source near the proposed extraction area that includes:	
	▪ identification of a methodology for determining threshold water level criteria;	
	▪ contingency measures in the event of a breach of thresholds; and	**9.1, 9.2.2, 9.3.2, 9.4.2**
	▪ a program to regularly report on monitoring.	
Management Plan Requirements		
5(3)	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	
	(a) a summary of relevant background or baseline data;	**5.1.1**
	(b) details of:	
	• the relevant statutory requirements (including any relevant approval, licence or lease conditions);	**3.0**
	• any relevant limits or performance measures/criteria; and	**9.4**
	• the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	**9.0**
5(3) cont'd	(c) any relevant commitments or recommendations identified in the document/s	**6.0**

No	Condition	Section
	listed in condition 2(c) of Schedule 2;	
	(d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	**6.0, 9.0 & 10.0**
	(e) a program to monitor and report on the: • impacts and environmental performance of the development; and • effectiveness of the management measures set out pursuant to condition 2(c) of Schedule 2;	**9.0**
	(f) contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	**9.6**
	(g) a program to investigate and implement ways to improve the environmental performance of the development over time;	**9.6, 10.0, 11.1**
	(h) a protocol for managing and reporting any: • incident, non-compliance or exceedance of the impact assessment criteria or performance criteria; • complaint; or • failure to comply with statutory requirements; and	**10.0**
	(i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and	**11.0**
	(j) a protocol for periodic review of the plan.	**12.3**
5(3A)	The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site.	**4.0**
5(4)	The Applicant must continue to apply existing approved management plans, strategies or monitoring programs that have most recently been approved under this consent, until the approval of a similar plan, strategy or program under this consent.	**12.3**
5(5)	Within 3 months of the submission of an: (a) incident report under condition 9 below; (b) Annual Review under condition 11 below; (c) audit report under condition 14 below; and (d) any modifications to this consent, the Applicant must review the strategies, plans and programs required under this consent, to the satisfaction of the Secretary. The applicant must notify the Department in writing of any such review being undertaken. Where this review leads to revisions in any such document, then within 6 weeks of the review the revised document must be submitted for the approval of the Secretary.	**12.3**

3.2 Environment Protection Licence EPL - 13172

Environment Protection Licence 13172 (EPL 13172) contains a number of conditional requirements related to the prevention of pollution of or to water. **Table 3.2** identifies each of these conditional requirements and identifies the section of this SWMP where each is addressed.

Table 3.2 Conditional Requirements for Prevention of Pollution (Water) of EPL 13172

<table>
<tr><th>No</th><th>Condition</th><th>Section</th></tr>
<tr><td colspan="3">P1 Location of Monitoring/Discharge Points and Areas</td></tr>
<tr><td>P1.3</td><td>The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.
<table>
<tr><th>EPA ID. No</th><th>Type of Monitoring Point</th><th>Type of Discharge Point</th><th>Location Description</th></tr>
<tr><td>1</td><td>Discharge to waters; Discharge quality monitoring.</td><td>Discharge to waters; Discharge quality monitoring.</td><td>Overflow from settlement dam to unnamed tributary of Coxs River as shown by point “SD1” in Figure 4 ”Surface Water Monitoring Locations” Wallerawang Quarry Soil and Water Management Plan Report Np 949/02f – January 2018”.</td></tr>
<tr><td>2</td><td>Discharge to waters; Discharge quality monitoring.</td><td>Discharge to waters; Discharge quality monitoring.</td><td>Overflow from settlement dam to unnamed tributary of Coxs River as shown by point “SB2” in Figure 4 ”Surface Water Monitoring Locations” Wallerawang Quarry Soil and Water Management Plan Report Np 949/02f – January 2018”.</td></tr>
</table></td><td>9.2</td></tr>
<tr><td colspan="3">L1 Pollution of Waters</td></tr>
<tr><td>L1.1</td><td>Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.</td><td>9.4</td></tr>
<tr><td colspan="3">L2 Concentration Limits</td></tr>
<tr><td>L2.1</td><td>For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area must not exceed the concentration limits specified for that pollutant in the table.</td><td>9.4</td></tr>
<tr><td>L2.2</td><td>Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.</td><td>9.4</td></tr>
<tr><td>L2.3</td><td>To avoid any doubt, this condition does not authorize the pollution of waters by any pollutant other than those specified in the table\s.</td><td>9.4</td></tr>
<tr><td>L2.4</td><td>Water and Land Concentration Limits.
<table>
<tr><th>Pollutant</th><th>Units of Measure</th><th>50th percentile concentration limit</th><th>90th percentile concentration limit</th><th>3DGM concentration limit</th><th>100th percentile concentration limit</th></tr>
<tr><td>Oil and grease</td><td>Milligrams per litre</td><td></td><td></td><td></td><td>10</td></tr>
<tr><td>pH</td><td>pH</td><td></td><td></td><td></td><td>6.5 – 8.5</td></tr>
<tr><td>Sulfate</td><td>Milligrams per litre</td><td></td><td></td><td></td><td>250</td></tr>
<tr><td>Total suspended solids</td><td>Milligrams per litre</td><td></td><td></td><td></td><td>30</td></tr>
</table></td><td>9.4</td></tr>
<tr><td>L2.5</td><td>The concentration limits stipulated by condition L2.4 for EPA identification points 1 and 2 are deemed not to apply when the discharge from the stormwater control structures (sediment dams) occurs solely as a result of rainfall measured at the premises which exceeds:
a) A total of 56 mm of rainfall over any consecutive 5 day period.</td><td>9.4</td></tr>
</table>

No	Condition	Section
L2.6	The concentration limit for total suspended solids stipulated by condition L2.4 for EPA identification points 1 and 2 are deemed not to apply where: a) The water discharged is covered by condition L2.5: OR b) When not covered by condition L2.5, the water discharged (in accordance with conditions O5.1 and O5.2) is within pH range 6.5 – 8.5 and has a turbidity (as measured in nephelometric turbidity units (NTU) using a hand held turbidity meter) of 25 NTU or less at the time of the discharge; and c) The EPA is advised within 3 working days of the completion of the sample testing and analysis as required by condition M2.2 of any results above the licence discharge limits specific under condition L2.4.	**9.4**
O4 Effluent Application to Land		
O4.1	The quantity of effluent applied to the utilization areas(s) must not exceed the capacity of the utilization areas(s) to effectively utilise the effluent.	N/A (**8.0**)
O4.2	Effluent application to the utilization area(s) must not occur in a manner that causes surface run-off from the utilization areas(s).	
O4.3	Spray from the effluent application to the utilizations area(s) must not drift beyond the boundary of the utilization area(s).	
O5 Other Operating Conditions		
O5.1	The stormwater control structures (sediment dams) identified at Condition L2.4 EPA identification point 1 and 2 must be drained or pumped out as necessary to maintain each basins design storage capacity within 5 days following rainfall.	**6.4 & Appendix 3**
O5.2	Water discharged to comply with condition O5.1 may only be discharged to waters from those stormwater control structures (sediment dams) identified at EPA identification point 1 and 2 where the discharged water complies with the discharge limits stipulated at condition L2.4 (and taking into consideration condition L2.6).	
O5.3	The licensee must undertake maintenance as necessary to desilt any storage basin identified at EPA identification points 1 and 2 in order to retain each storage basins design storage capacity (the capacity to store 56mm of rainfall over any consecutive 5 day period).	
M1 Monitoring Records		
M1.1	The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.	**9.7**
M1.2	All records required to be kept by this licence must be: a) in a legible form, or in a form that can readily be reduced to a legible form; b) kept for at least 4 years after the monitoring or event to which they relate took place; and c) produced in a legible form to any authorised officer of the EPA who asks to see them.	**9.6**
M1.3	The following records must be kept in respect of any samples required to be collected for the purposes of this licence: a) the date(s) on which the sample was taken; b) the time(s) at which the sample was collected; c) the point at which the sample was taken; and d) the name of the person who collected the sample.	**9.5**
M2 Requirement to monitor concentration of pollutants discharged		
M2.1	For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns.	**9.6**

<table>
<tr><th>No</th><th>Condition</th><th>Section</th></tr>
<tr><td>M2.2</td><td>Water and/or Land Monitoring Requirements.
<table>
<tr><th>Pollutant</th><th>Units of Measure</th><th>Frequency</th><th>Sampling Method</th></tr>
<tr><td>Conductivity</td><td>Microsiemens per centimetre</td><td>Monthly during discharge</td><td>Grab sample</td></tr>
<tr><td>Oil and Grease</td><td>Milligrams per litre</td><td>Monthly during discharge</td><td>Grab sample</td></tr>
<tr><td>pH</td><td>pH</td><td>Monthly during discharge</td><td>Grab sample</td></tr>
<tr><td>Sulfate</td><td>Milligrams per litre</td><td>Monthly during discharge</td><td>Grab sample</td></tr>
<tr><td>Total Suspended Solids</td><td>Milligrams per litre</td><td>Monthly during discharge</td><td>Grab sample</td></tr>
</table></td><td>9.3</td></tr>
<tr><td colspan="3">M3 Testing methods – concentration limits</td></tr>
<tr><td>M3.1</td><td>Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.</td><td>9.5</td></tr>
<tr><td colspan="3">M5 Recording of pollution complaints</td></tr>
<tr><td>M5.1</td><td>The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.</td><td>10.2.3</td></tr>
<tr><td>M5.2</td><td>The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.</td><td>10.2.3</td></tr>
<tr><td>M5.3</td><td>The record of a complaint must be kept for at least 4 years after the complaint was made.</td><td>10.2.3</td></tr>
<tr><td colspan="3">R1 Annual return documents</td></tr>
<tr><td>R1.1</td><td>The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance – Licence Conditions,
4. a Statement of Compliance – Load based fee,
5. a Statement of Compliance – Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance – Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance – Environmental Management Systems and Practices.</td><td>9.7</td></tr>
<tr><td>R1.2</td><td>An Annual Return must be prepared in respect of each reporting period, except as provide below. …</td><td>9.7</td></tr>
<tr><td colspan="3">R2 Notification of environmental harm</td></tr>
<tr><td>R2.1</td><td>Notifications must be made by telephoning the Environment Line service on 131 555.</td><td>10.3</td></tr>
<tr><td>R2.2</td><td>The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.</td><td>10.2</td></tr>
</table>

3.3 Water Licensing and Approvals

3.3.1 Groundwater Licences and Approvals

The Quarry is located within the Coxs River Fractured Rock Groundwater Source of the Water Sharing Plan (WSP) for the Greater Metropolitan Region Groundwater Sources. Walker Quarries holds water access licence (WAL) 42081 and WAL 42390 for this water source. WAL 42390 was issued under the *Water Management Act 2000* (WM Act) for a 100 unit (ML) share for extraction of water.

The associated water supply works and use approvals are:

- Water Supply Works Approval 10WA124360: for a groundwater bore on Lot 7 DP872230, and
- Water Supply Works and Use Approval 10CA123169: for the open cut void on Lot 6 DP872230.

3.3.2 Surface Water Licences and Approvals

The Quarry is located within the Wywandy Management Zone of the Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources ("the Water Sharing Plan"). Walker Quarries holds zero share WAL 42082, issued under the Water Management Act 2000 (WM Act) for a 100 unit (ML) share for extraction of water.

4.0 Objectives and Outcomes

Table 4.1 presents the objectives and key performance outcomes relating to water management for this SWMP and the Quarry.

Table 4.1 Water Management Objectives and Key Performance Outcomes

Objectives	Key Performance Outcomes
To ensure compliance with the conditions of DA 344-11-2001 and EPL 13172 and reasonable community expectations.	Implementation of this SWMP. No legitimate community complaints or reportable incidents.
To implement appropriate water management and mitigation measures during all stages of the Quarry so as to ensure that harm to the environment is minimised as far as possible.	Implementation of this Plan. No discharge of water in breach of EPL 13172 criteria. No reportable incidents related to water management or pollution.
To implement an appropriate monitoring program which reviews compliance with relevant criteria during all stages of the Quarry.	All identified monitoring is undertaken in accordance with the relevant procedures and at the relevant intervals. Monitoring results are published and reported annually within the Annual Review and/or Annual Return.
To implement continual improvement for investigating, implementing and reporting on reasonable and feasible measures to improve water quality and reduce soil loss.	Following each Annual Review, independent audit, modification or reportable incident, a review of this Plan is completed. The Plan is updated as required in response to this review and resubmitted to the DPIE for approval.
To implement an appropriate incident reporting program, if required.	Incidents (if any) are reported in an appropriate manner (in accordance with this Plan).

5.0 Site Characteristics

5.1 Surface Water

5.1.1 Baseline Water Quality

Sampling of the water in the Coxs River was undertaken between April and October 2016 at locations upstream of the Quarry (SD-3) and downstream of the Quarry (SD-4) (refer to **Figure 9.1,** p. 48). Monitoring was repeated in June 2019 in accordance with the then annual monitoring schedule of the SWMP (V1) with monthly monitoring recommencing in February 2020 in accordance with this SWMP (refer to **Section 9.3**). The results of this monitoring are presented in **Table 5.1**.

Table 5.1 Coxs River Water Sampling Results

Year	No. Samples	pH		Total Suspended Solids (mg/L)		Oil and Grease (mg/L)		Sulphate (mg/L)		Electrical conductivity (mS/cm)	
		SD-3	SD-4	SD-3	SD-4	SD-3	SD-4	SD-3	SD-4	SD-3	SD-4
2016	**7**	8.4	8.7	<5	<5	NT	NT	139	135	979	955
2019	**1**	8.8	8.8	<5	<5	NT	NT	120	120	1000	1000
2020	**11**	8.2	8.3	<5	<5	<5	<5	180	127	806	596
2021	**12**	7.9	7.8	<10	<10	<5	<5	157	130	545	497
2022	**8**	7.6	7.7	<10	<10	<5	<5	86	86	383	390
Average		**8.0**	**8.1**	**<10**	**<10**	**<5**	**<5**	**147**	**122**	**686**	**605**

NT = Not Tested Source: Walker Quarries Pty Ltd

The results of the monitoring within the Coxs River illustrate a slightly alkaline pH without any notable signs of pollution. Oil & Grease was not tested in 2019 and 2020 as there were no discharges from the Quarry which required review of up (control) and down (impact) stream samples.

Monitoring of water quality in the Coxs River will continue on a monthly basis from in accordance with **Section 9.0**.

5.1.2 Catchments

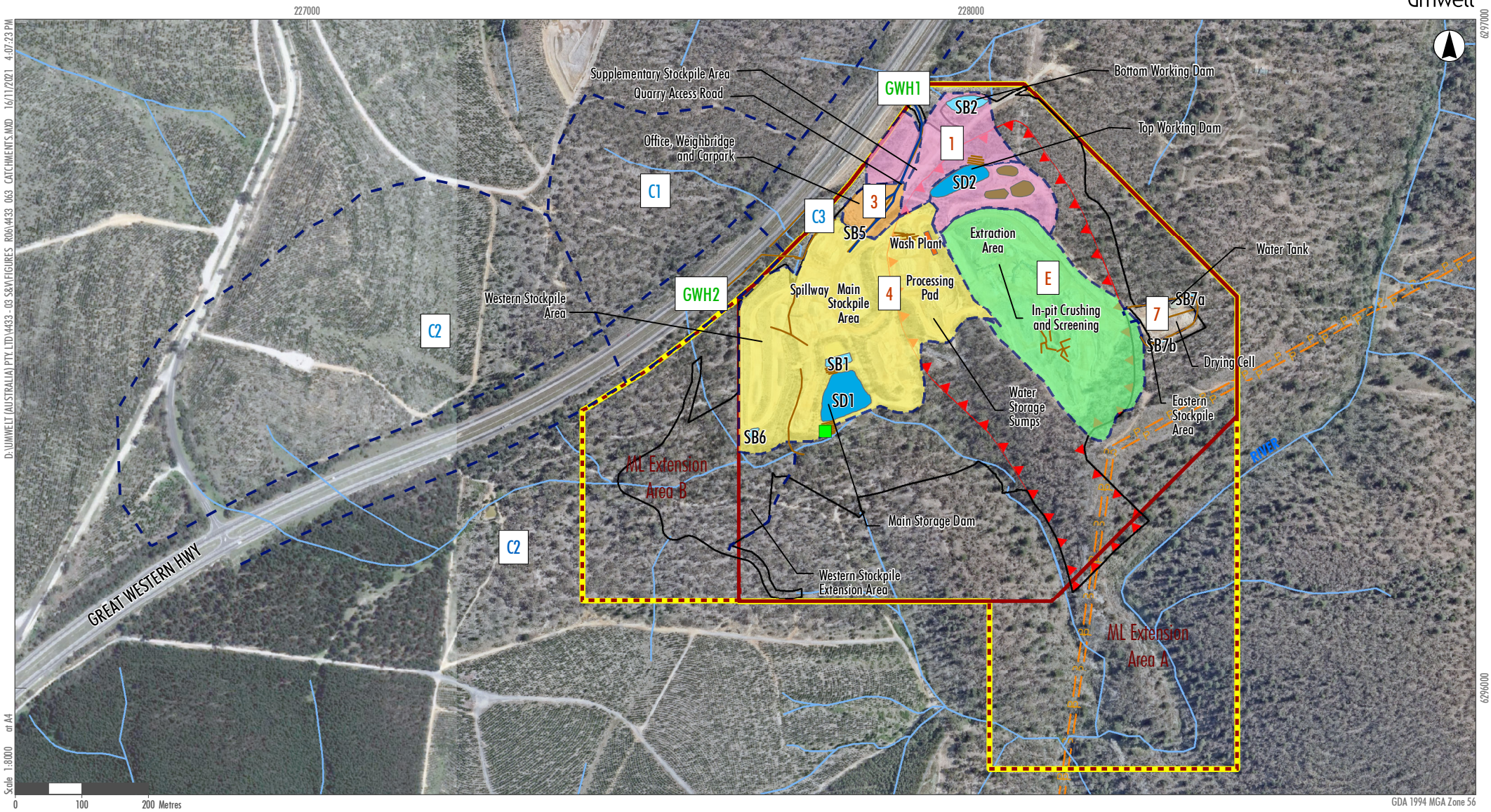
5.1.2.1 Existing Quarry Catchments

Runoff of the Quarry Site is currently segregated into eight separate catchments by site topography, drains or bunds (refer to **Figure 5.1**). **Table 5.2** identifies and describes each catchment, nominates whether the runoff within each is clean, dirty or a combination and nominates the destination of runoff.

As the extraction area of the Quarry Site is extended in accordance with DA 344-11-2001 and the Quarry Mining Operations Plan (MOP) (Umwelt, 2020), the size of Catchment E will increase and the relative size of Catchment 1 and 4 will reduce.

With reference to the type of runoff identified in **Table 5.2**

- dirty water refers to runoff from disturbed areas of the Quarry Site,
- clean water refers to runoff from catchments unaffected by Quarry Site activities (regardless of water quality), and
- combined refers to catchments receiving both clean and dirty water runoff.



Legend

- Quarry Site Boundary
- Quarry Site ML Extension
- Quarry Site (ML1633)
- Disturbed Areas for Modified Operations
- Approved Extraction Area
- RWC Layout CURRENT 2018_line
- Watercourses
- P Electricity Transmission Lines
- Sediment Basin
- Silt Cell
- Storage Dam
- Water Storage Sumps
- Licensed Discharge Point

FIGURE 5.1

Current Quarry Site Catchments

Image Source: Data source:

Table 5.2 Existing Quarry Site Catchment Areas

Name	Area (ha)	Runoff Type	Description	Storage	Volume (ML)
E	5.2[1]	Dirty	Active extraction area	In-pit sumps	N/R
GWH1	1.0	Clean	Runoff collected in roadside drains and culverts of the Great Western Highway adjacent to the Quarry Entrance	Bottom Working Dam (SB2)	2.8
1	3.2	Combined	Cobble extraction area (including the silt cells and top working dam (SD2) and roads), Quarry access road (to weighbridge) and associated slopes draining to the Quarry Access Road		
3	0.25	Dirty	Site office, weighbridge area and carpark	Office Sediment Basin (SB5)	0.32
4	6.8	Dirty	Processing and stockpiling areas, internal access roads Western Stockpile Area (reports to SB6 initially)	Main Sediment Basin (SB1)	4.2
				Main Storage Dam (SD1)	8.1
				Western Sediment Basin (SB6)	0.1
7	0.35	Dirty	Eastern Stockpile Area	Bunded stockpile area (Nil Discharge)	-
GWH2	2.9	Clean	Runoff collected in roadside drains of the Great Western Highway west of the culvert diverting flows from Catchment C1	Discharge to Central Clean Water Drain	-
C1	8.5	Clean	Upslope catchment on the northern side of the Great Western highway diverting flows via an under highway culvert on to the Quarry Site and into the central clean water drain		-
C3	0.8	Clean	Undisturbed ground north of the Office and Main Stockpile Area		-
C2	46.4	Clean	Upslope catchment (on both sides of the Great Western Highway) draining to the main tributary of the Coxs River to the south of the Main Stockpile Area	Natural discharge	-

Note 1: Catchment to increase in size as the extraction area is extended in accordance with DA 344-11-2001 and the Quarry MOP

As shown in **Table 5.2**, seven catchments contain dirty water runoff, which with the exception of runoff from Catchment E (the below ground level area of the open cut), is diverted to one of four sediment basins (SB1, SB2, SB5 and SB6). Additional capacity for water storage is provided by two storage dams (SD1 and SD2). **Table 5.2** identifies the storage capacity of each structure, which all provide in excess of the 5 day 95th percentile design water storage and sediment settlement capacity (refer to **Table 6.6** and the Erosion and Sediment Control Plan – refer to **Appendix 3**).

One catchment is identified as carrying clean water (Catchments GWH). By virtue of the construction of the Quarry Site intersection with the Great Western Highway, runoff from the small section of the highway drainage (Catchment GWH) is diverted via roadside drains to a culvert below the Quarry Site Access Road which also accepts dirty water runoff from Catchment 1. This runoff is diverted to SB2. The remaining clean water runoff from the Great Western Highway is segregated from Quarry Site disturbance, captured within central clean water drain, which includes a section of below ground pipe transfer, and discharges to natural drainage to the south of the SD1.

Further information on the design, capacities and management of these clean and dirty water structures is provided in **Section 6.4** and the Quarry *Erosion and Sediment Control Plan* (ESCP) (refer to **Appendix 3**).

5.1.2.2 MOD3 Quarry Catchments

DA 344-11-2001 MOD 3 approves additional disturbance in the form of a Southern Stockpile Area, extension of the Western Stockpile Area, further extension of the extraction area and construction and operations of associated water management infrastructure (refer to **Figure 2.1**).

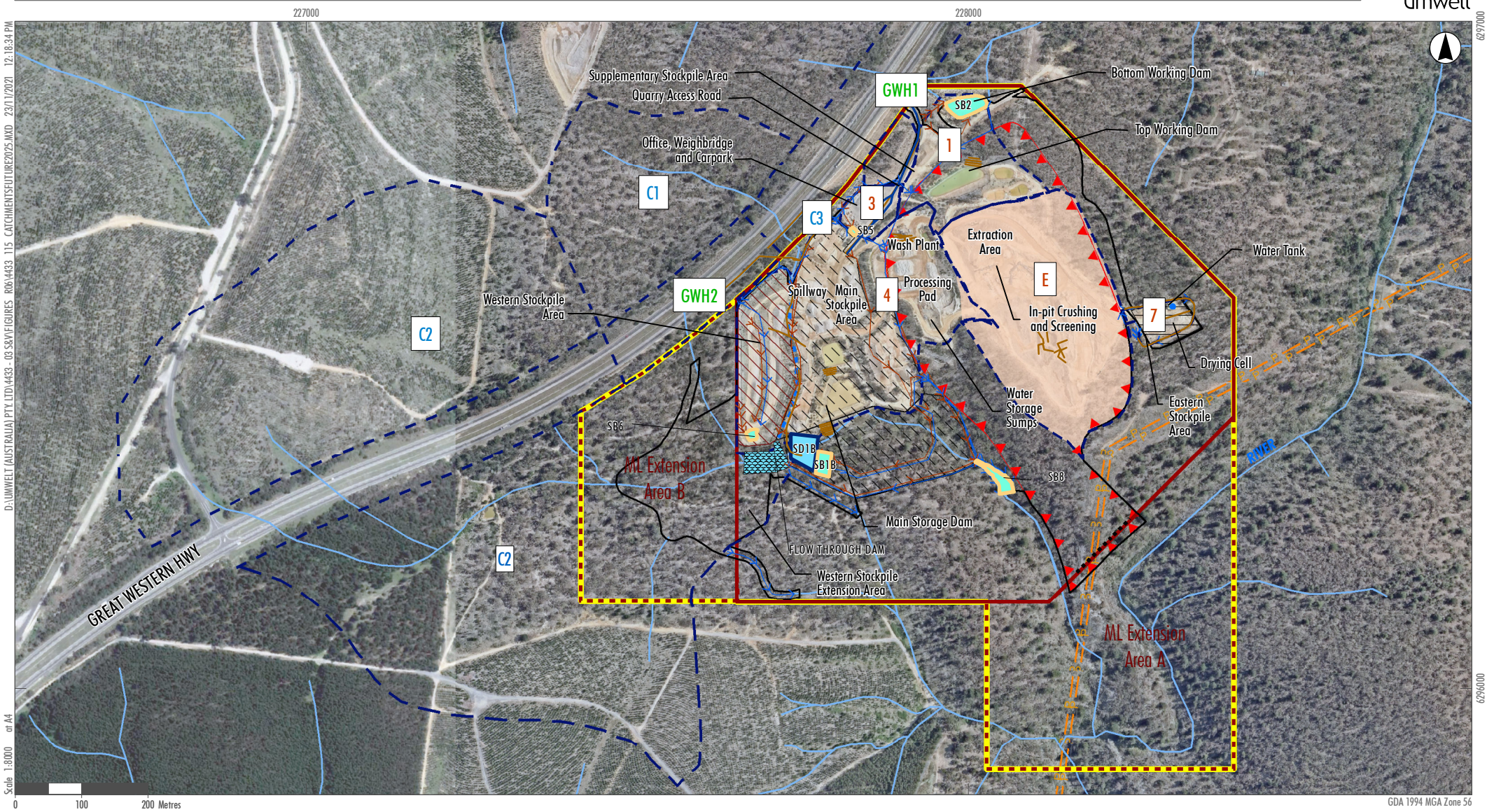
Figure 5.1 and **Figure 5.2** illustrate the future catchments of the Quarry Site over the term of this SWMP and the life of the Quarry. While the final size and management of these catchments will be subject to the actual disturbance footprint of the Quarry (which may be updated in modified or future version of this SWMP), the following provides an overview of the additional or modified catchments and associated water management features.

Over the term of this SWMP

- Catchment 4 will be extended to incorporate the construction and operation of the Southern Stockpile Area (to an elevation of 935 mAHD).
    - SB1 and SD1 will eventually be decommissioned and backfilled with new structures identified as SB1B and SD1B constructed near the southwestern corner of the Southern Stockpile Area. All runoff from Catchment 4 will diverted to SB1B which will overflow into SD1B.
    - As the elevation of the Main Stockpile Area is increased, the central clean water drain will be covered and pipeline extended to a rubble lined drain where the open drain currently discharges.
    - The water accumulated in the rubble lined drain will overflow to a new diversion drain which will discharge this clean water to natural drainage to the south.
- Catchment 8, a dirty water catchment, will be created as the batters of the Southern Stockpile Area are constructed. Runoff will be discharged to a new sediment basin (SB8) which will be constructed with a capacity much larger than required to store and settle runoff from the catchment (so as to provide supplementary storage of water captured in other Quarry Site sediment basins).
- Catchment C2 will be modified slightly as the central clean water drain carrying water from Catchments C3 and GWH2 is backfilled as part of the construction of the Southern Stockpile Area.
- Catchment C4, a clean water catchment, will be created upslope of the Southern Stockpile Area and SB8 as a result of these structure intercepting natural drainage which cannot be diverted to the west. This runoff will be diverted around SB8 and discharged to natural drainage.

Beyond the term of this SWMP

- Catchment C5, a clean water catchment, will be created upslope of the extended Western Stockpile Area with runoff to be captured within a new water storage dam (CWD1).
    - The remaining clean water catchment from the north and west of the extended Western Stockpile Area will be diverted around the stockpile area and discharged to natural drainage to the south.
- Catchment 11, a dirty water catchment, will be created by the construction of the extended Western Stockpile Area.
    - This water will be contained by drains and bunds which divert the runoff to SB6.
    - SB6 will be enlarged to account for the additional catchment.
- Catchment 6 will be reinstated as the Western Stockpile Extension Area is developed and runoff from the upper tier of the Western Stockpile Area diverted to SB6.



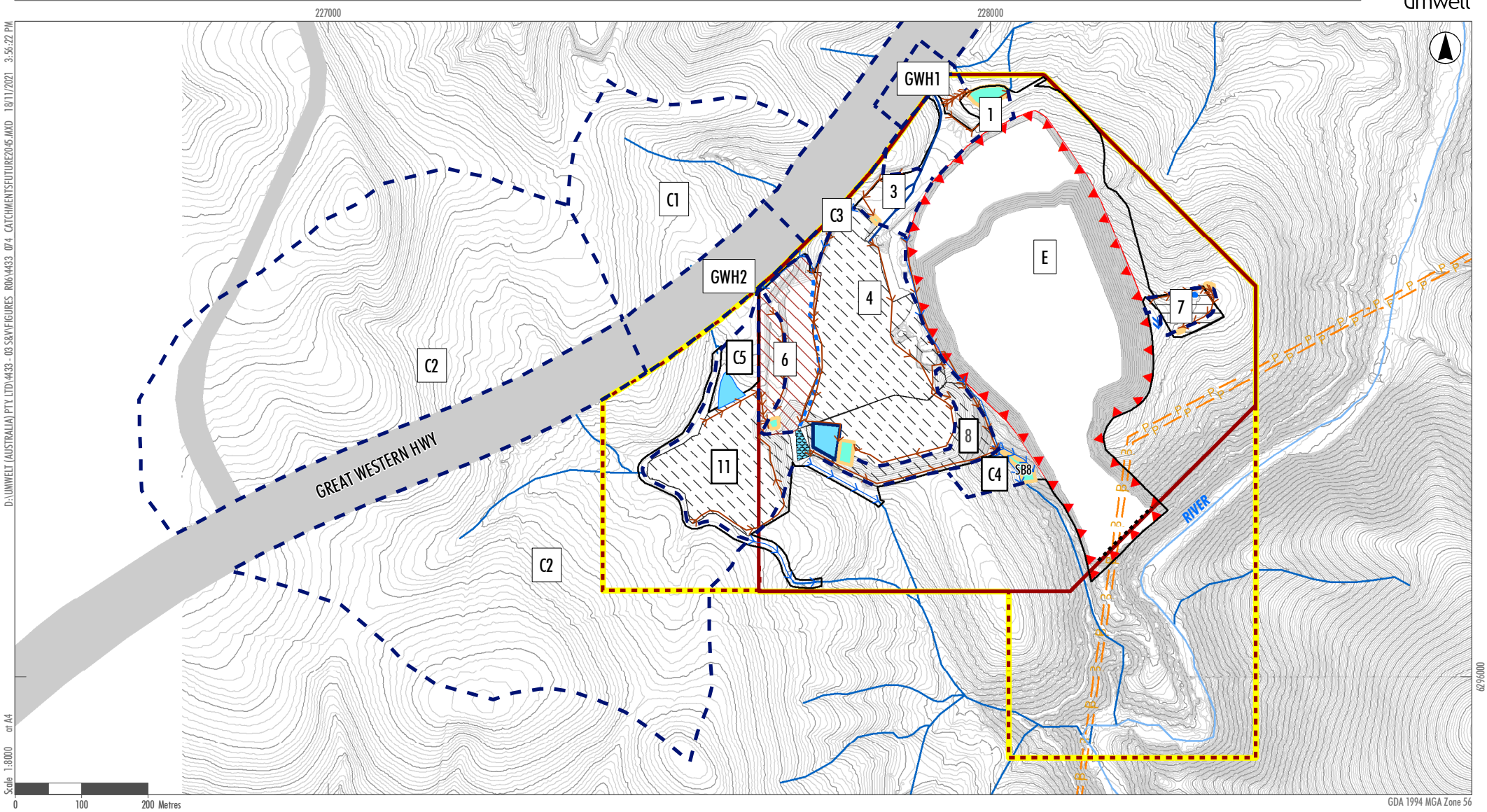
Legend

- Quarry Site Boundary
- Quarry Site ML Extension
- Quarry Site (ML1633)
- Disturbed Areas for Modified Operations
- Approved Extraction Area
- Catchment
- Main Stockpile Area (935m AHD)
- Southern Stockpile Area (935m AHD)
- Western Stockpile Area
- Eastern Stockpile Area
- Watercourses
- Buried Pipe Culvert
- Clean Water Diversions
- Dirty Water Diversions
- In Pit Sed Basin Wall
- P Electricity Transmission Lines
- Sediment Basins
- Storage Dam
- Water Tank
- Rock-lined Drain

FIGURE 5.2

Future Quarry Site Catchments (2025)

Image Source: Data source:



Legend

- Quarry Site Boundary
- Quarry Site ML Extension
- Quarry Site (ML1633)
- Disturbed Areas for Modified Operations
- Approved Extraction Area
- Office, Weighbridge and Carpark
- Sediment Basin
- Sediment Dam
- Clean Water Dam
- Watercourses
- Natural Drainage
- P Electricity Transmission Lines
- Buried Pipe Culvert
- Clean Water Diversions
- Dirty Water Diversions
- Dirty Water Drain
- In Pit Sed Basin Wall
- Catchment Boundaries
- Main Stockpile Area (935m AHD)
- Southern Stockpile Area (935m AHD)
- Western Stockpile Area
- Western Stockpile Extension (940m AHD)
- Eastern Stockpile Area
- Rock-lined Drain

FIGURE 5.3

Future Quarry Site Catchments

Data source: </bol> Walker Quarries (2019); Umwelt (2019); NSW LPI DTDB (2019); CEH Survey (November 2016)

Table 5.3 identifies and describes each catchment of the fully disturbed Quarry Site, nominates whether the runoff within each is clean, dirty or a combination and nominates the destination of runoff.

Table 5.3 Future Quarry Site Catchment Areas

Name	Area (ha)	Runoff Type	Description	Storage	Volume (ML)
E	13.3	Dirty	Active extraction area	In-pit sumps	N/R
GWH1	1.0	Clean	Runoff collected in roadside drains and culverts of the Great Western Highway adjacent to the Quarry Entrance	SB2	2.8
1	1.2	Combined	Quarry access road (to weighbridge) and associated slopes draining to the Quarry Access Road		
3	0.5	Dirty	Site office, weighbridge area and carpark	SB5	0.32
4	5.8	Dirty	Processing and stockpiling areas, internal access roads	SB1B	4.0
6	0.5	Dirty	Upper Tier of the Western Stockpile Area	SB6	3.0
7	0.35	Dirty	Eastern Stockpile Area	Bunded stockpile area	
8	1.0	Dirty	Batters of the Southern Stockpile Area	SB8	3.0
9	0.6	Clean	Clean water intercepted by the Southern Stockpile Area and SB8	Discharged	-
11	2.8	Dirty	Western Stockpile Area extension	SB6	3.0
GWH2	2.0	Clean	Highway catchment delivering runoff via a culvert to the central clean water drain	Discharge to Central Clean Water Drain	-
C1	8.5	Clean	Upslope catchment from northern side of the Great Western Highway discharging via a culvert to the central clean water drain		-
C2	41.7	Clean	Upslope catchment from both sides of the Great Western Highway to be diverted around the Southern (2025) and Western Stockpile Area Extensions (2040)	Discharge via Western Clean Water Drain	-
C4	0.6	Clean	Upslope catchment between the Southern Stockpile Area and SB8.	Discharge to natural catchment	-
C5	1.1	Clean	Clean water intercepted by Western Stockpile Area extension	CWD1	2.0

Table 5.3 identifies the modified storage capacity of each structure based on the current designs. Notably, each would provide for the capture and storage of in excess of the 5 day 95th percentile design storage capacity (refer to the Erosion and Sediment Control Plan [ESCP] – **Appendix 3**).

5.2 Local Groundwater

The extraction area of the Quarry Site occurs within the undifferentiated Palaeozoic metamorphic rocks described as quartzite, shale, sandstone, limestone and tuff. Carboniferous aged granite occurs to the north and east of the extraction area with sedimentary siltstone, lithic sandstone and conglomerate of the Shoalhaven Group occupying a small area of the northern portion of the Quarry Site. Based on the data collected through the desktop and field investigations, a hydrogeological investigation and assessment of

the extended Quarry operations (Jacobs, 2019) has established a conceptual hydrogeological model for the Quarry Site.

- Groundwater flow conditions are unconfined to semi-confined with flow direction similar to the broad topography trend, i.e. discharge to the Coxs River.
- Hydraulic gradients in the area of the Quarry are about 2 to 5% towards the Coxs River.
- The metamorphic unit has a low representative bulk hydraulic conductivity value, with isolated areas of moderate hydraulic conductivity in areas with a relatively higher concentration of fracturing. The granite unit to the north and east has very low hydraulic conductivity due to limited fracturing. The sedimentary unit is relatively shallow and not expected to be saturated in the area of the proposed extraction area. Local groundwater which could be encountered by the extraction area would be primarily from the metamorphic unit.
- Specific yield is low and likely less than 0.01. Specific storage is within the reported range for 'fissured and jointed rock' and 'sound rock' of less than 3.28×10^{-6} m-1 to 6.89×10^{-5} m-1.
- Low recharge rate by rainfall of the order of about 39 mm/year (4% of mean annual rainfall, as outlined in the WSP – refer to **Section 3.3**).
- The geology has limited use as water supply source, as bore density in the region of the Quarry is low.

The depth to the water table within the Quarry Site has been inferred from data obtained from the three groundwater monitoring bores installed on the Quarry Site (refer to **Section 9.2.2**). Based on the results obtained from these bores, and the original investigations of Jacobs (2019), the groundwater table below the extraction area occurs at an elevation of no higher than 890m AHD.

DA 344-11-2001 currently limits the depth of extraction to 901 mAHD (initially) and no deeper than 1 m above the maximum groundwater elevation established through analysis of monitoring data collected as described in **Sections 9.3.2** and **9.5.3**.

6.0 Site Water Management System

6.1 Principles

As detailed in previous sections, water is managed in a manner that maximises opportunities for reuse and recycling and minimises the possibility of uncontrolled discharge. The site water management system has been developed in a manner that enables the:

- efficient recovery and use of natural resources,
- effective management of available storage volumes that prevents uncontrolled discharge to receiving environments, and
- effective water quality management strategies that prevent discharge of impacted water to receiving environments.

This is achieved by utilising strategies and infrastructure to transfer water around the site for use in Quarry activities. Each water storage is utilised in a specific role in the site water management system so that the system can operate in an integrated manner to achieve SWMP objectives (refer to **Section 4.0**).

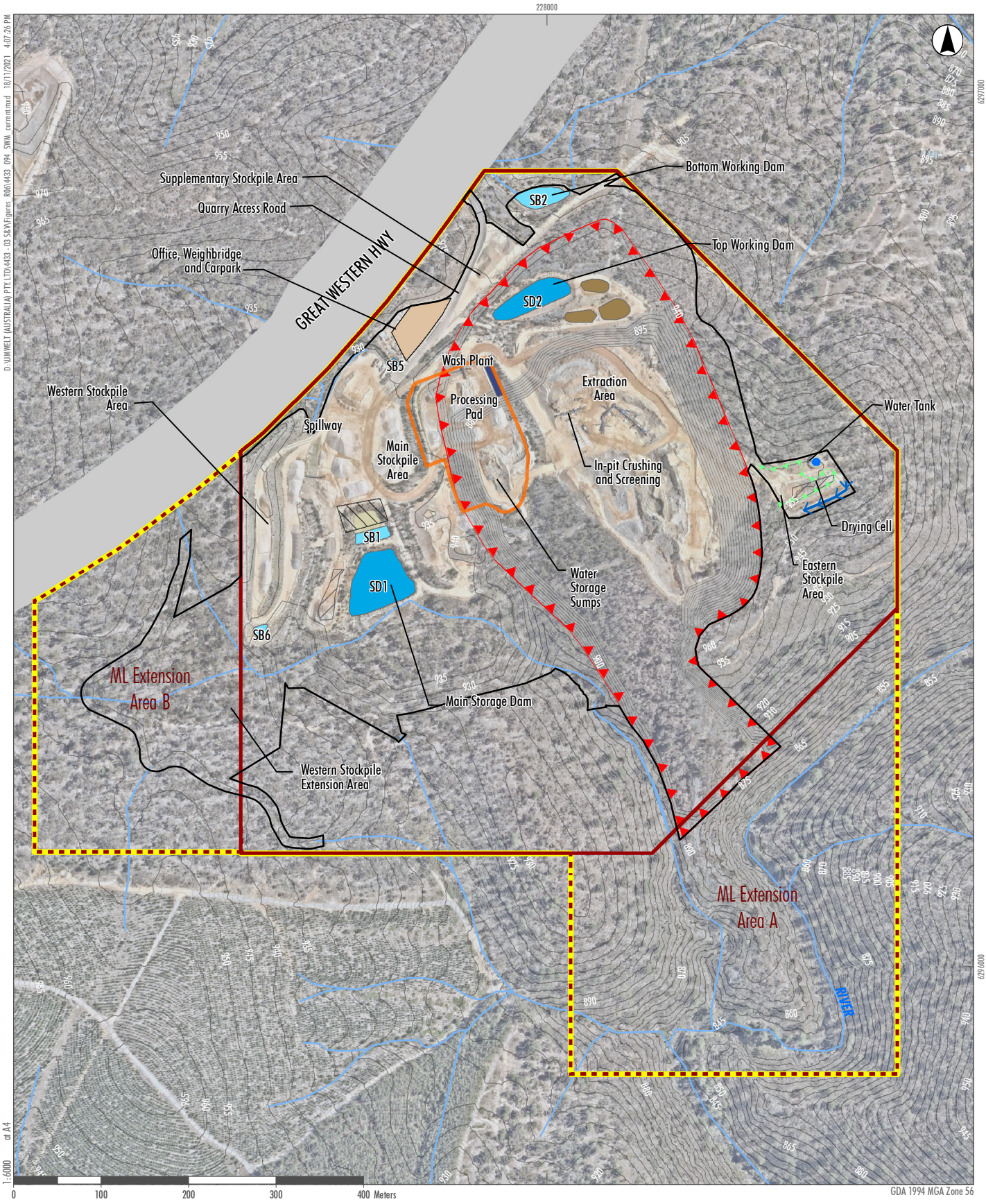
Figure 6.1 presents the status of the Water Management System at the commencement of this SWMP and **Figure 6.2** a schematic as to how water is diverted, collected, transferred and discharged. **Figure 6.3** provides the planned water management system for the term of this SWMP (2020 – 2025) and **Figure 6.4** a schematic diagram of water management at the Quarry. **Figure 6.5** provides the conceptual water management system as the Quarry reaches its maximum impact footprint (2040 – 2045) and **Figure 6.6** the accompanying schematic diagram.

Prior to the commencement of any surface disturbing works, appropriate controls will be installed to ensure appropriate diversion of clean water around areas of disturbance or capture and management of runoff from areas of disturbance. Priority would be given to minimising erosion from disturbed areas through appropriate use of ground cover followed by management of sediment laden waters through the installation of appropriate sediment controls. The installation or construction of any erosion and sediment control structures will be undertaken in accordance with Managing Urban Stormwater Volumes 1 and 2 (Landcom, 2004 and DECCW, 2008).

The following sections discuss the key elements of the Water Management System, clean water diversion and water storage and sediment control. Where Standard Drawings (SDs) of Landcom (2004) are referenced, these can be reviewed as Sheets 12 to 15 of the ESCP **(Appendix 3**).

6.2 Clean Water Diversions

Diversion of water by the clean water drains prevents mixing of disturbed and clean runoff, therefore reducing the volumes of water requiring management on site and lowering the risk of an uncontrolled discharge from site. The diversion of this water around the site also assists in maintaining the local hydrologic regime of the downstream receiving environment.



Legend

- Quarry Site Boundary
- Quarry Site ML Extension
- Quarry Site (ML1633)
- Main Stockpile Extension
- Disturbed Areas for Modified Operations
- Office, Weighbridge and Carpark
- Drying Cell
- Sediment Basin
- Silt Cell
- Storage Dam
- Water Storage Sumps
- Water Tank
- Clean Water Drain (SD 5-5)
- Watercourses
- Earth Bund

FIGURE 6.1

Water Management System (Current)

Image Source: Nearmap (2020) Data source: Walker Quarries (2019); Umwelt (2019); NSW LPI DTDB (2019); CEH Survey (November 2016)

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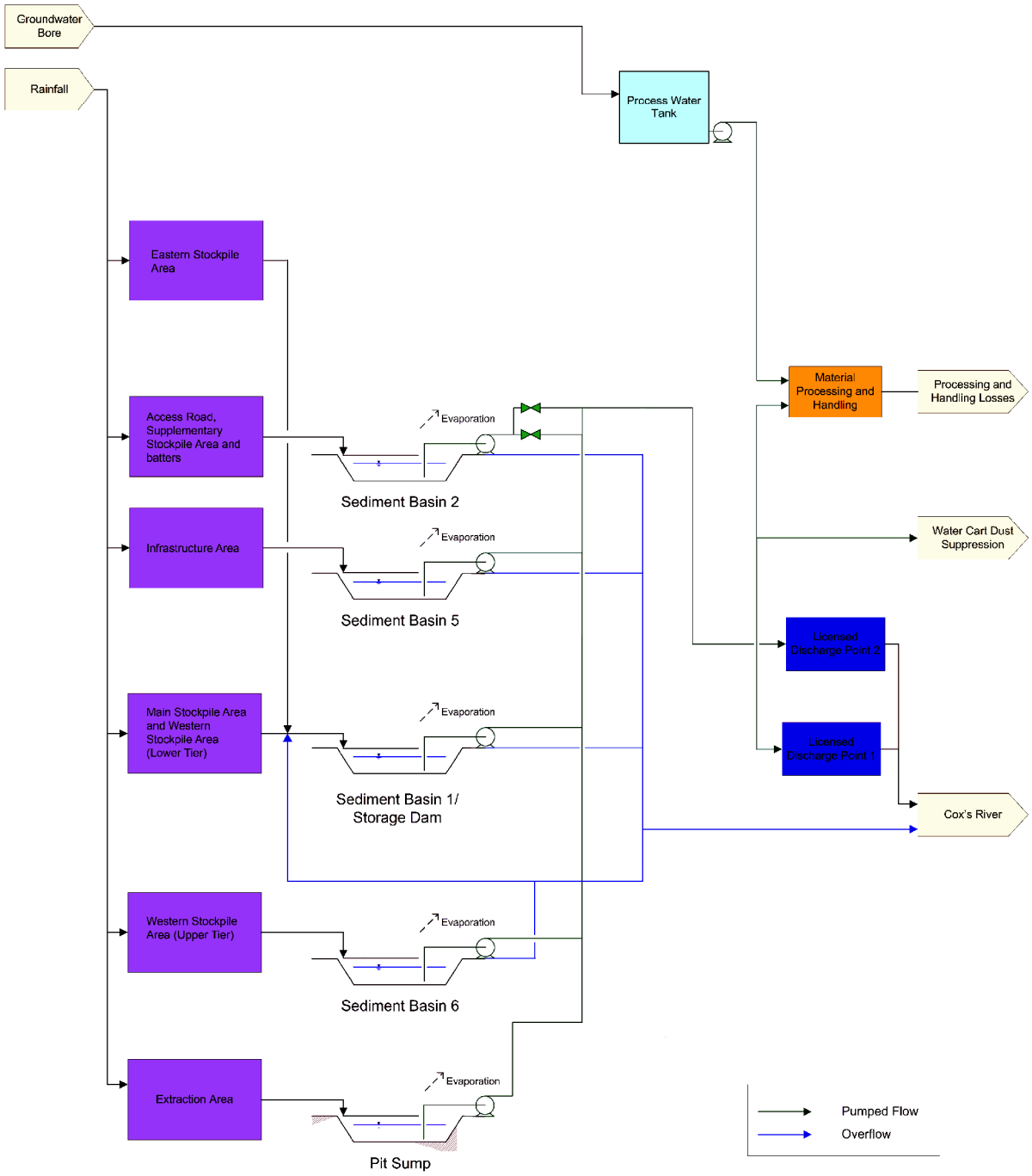
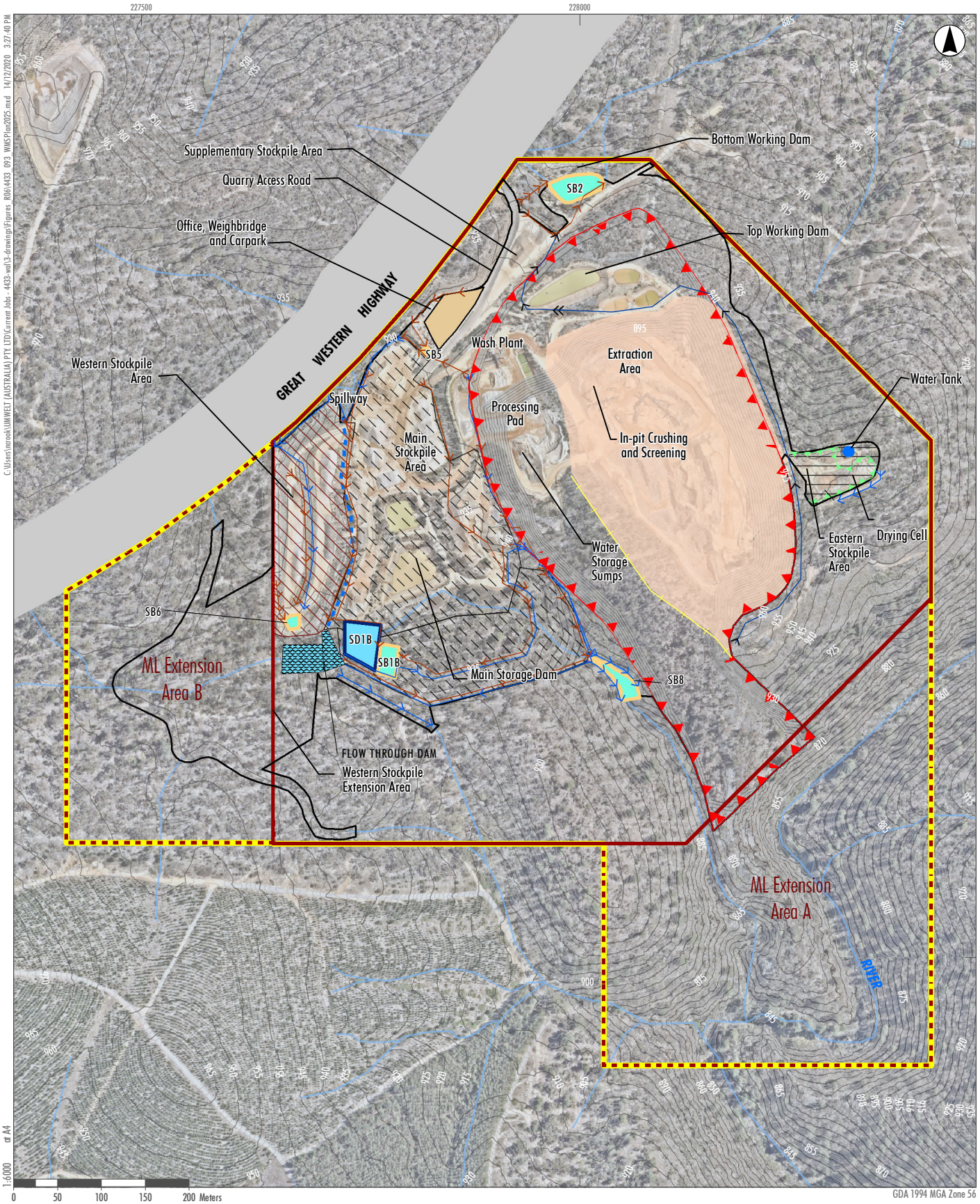


FIGURE 6.2

Water Management System Schematic (Current)



Legend

- Quarry Site Boundary
- Quarry Site (ML1633)
- Quarry Site ML Extension
- Disturbed Areas for Modified Operations
- Approved Extraction Area
- Current Extent of Extraction Area (2025)
- Sediment Basins
- Storage Dam
- Water Tank
- Rock-lined Drain
- Office, Weighbridge and Carpark
- Main Stockpile Area (935m AHD)
- Southern Stockpile Area (935m AHD)
- Western Stockpile Area
- Eastern Stockpile Area
- Watercourses
- Earth Bund
- Buried Pipe Culvert
- Clean Water Diversions
- Dirty Water Diversions
- Dirty Water Drain
- Sediment Fencing

FIGURE 6.3

Future Water Management System (2025)

Image Source: Google Earth (2016) Data source: Walker Quarries (2019); Umwelt (2019); NSW LPI DTDB (2019); CEH Survey (November 2016)

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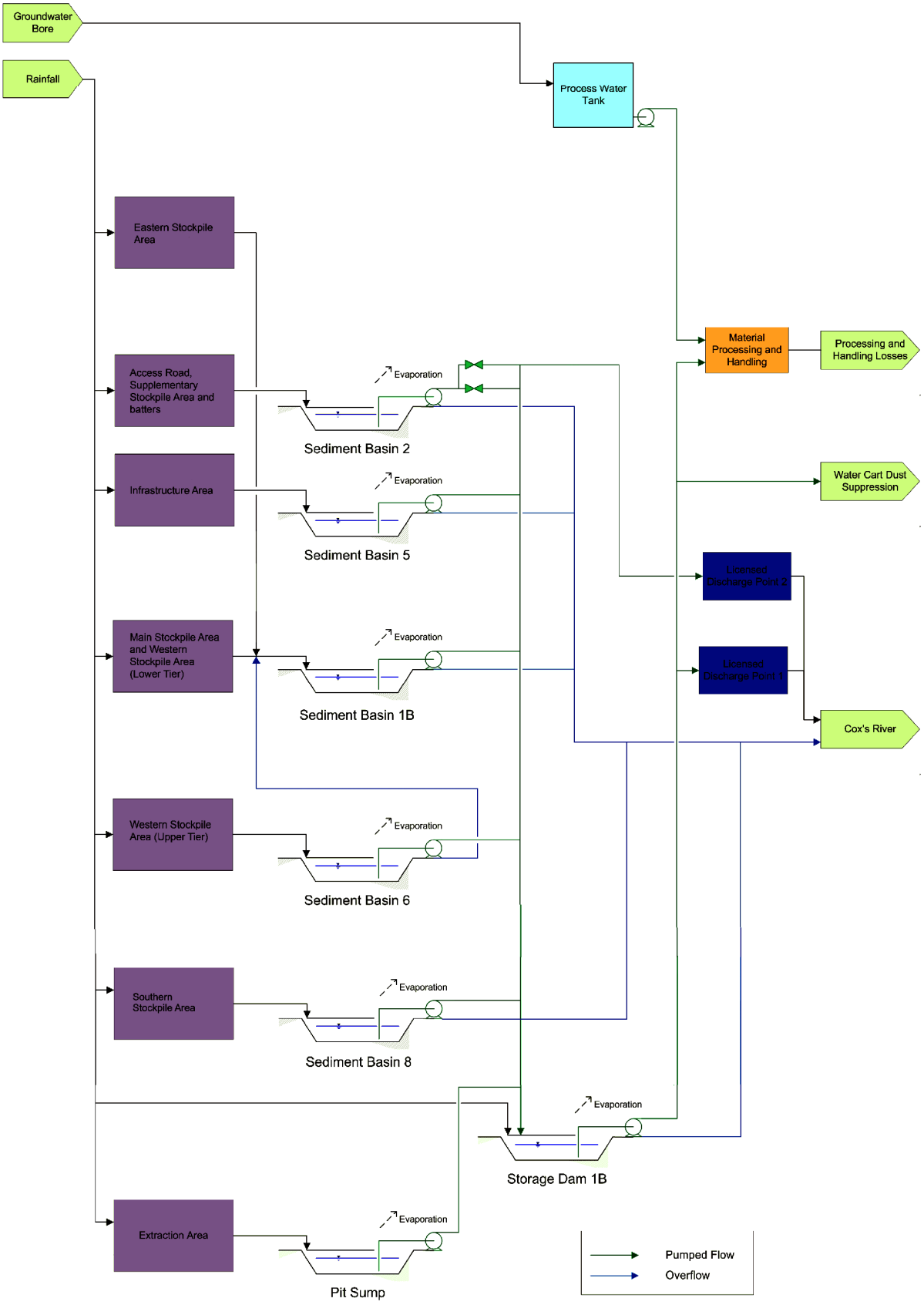
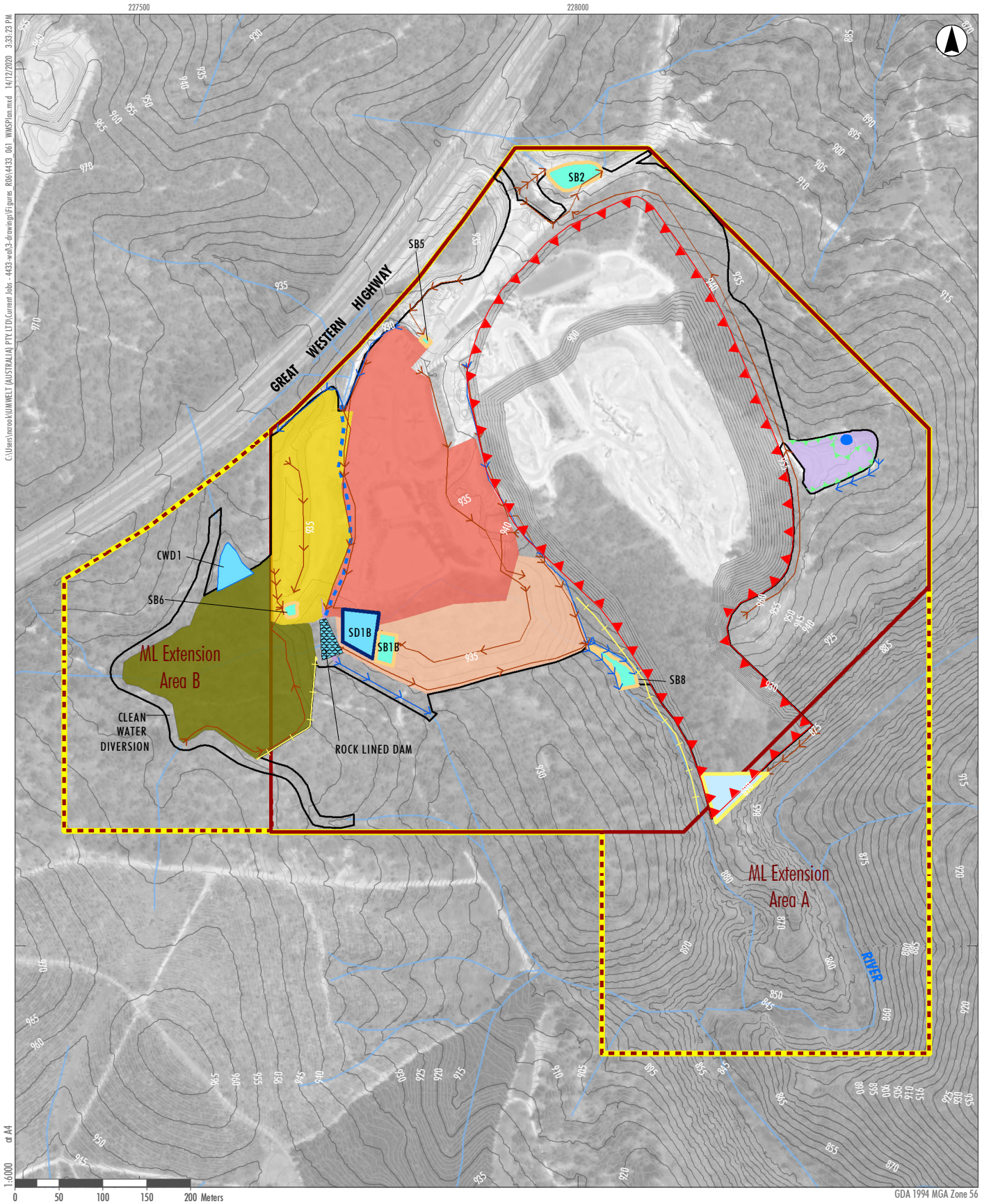


FIGURE 6.4

Water Management System Schematic (2025)



Legend

- Quarry Site Boundary
- Quarry Site (ML1633)
- Quarry Site ML Extension
- Approved Extraction Area
- Current Extent of Extraction Area
- Disturbed Areas for Modified Operations
- Clean Water Dam
- Sediment Basins
- Settlement Ponds
- Storage Dam
- Main Stockpile Area (935m AHD)
- Southern Stockpile Area (935m AHD)
- Western Stockpile Area
- Western Stockpile Extension (940m AHD)
- Eastern Stockpile Area
- Earth Bund
- Buried Pipe Culvert
- Clean Water Diversions
- Dirty Water Diversions
- Dirty Water Drain
- Future Sediment Basin
- Sediment Fencing

FIGURE 6.5

Future Water Management System (2045)

Image Source: Google Earth (2016) Data source: Walker Quarries (2019); Umwelt (2019); NSW LPI DTDB (2019); CEH Survey (November 2016)

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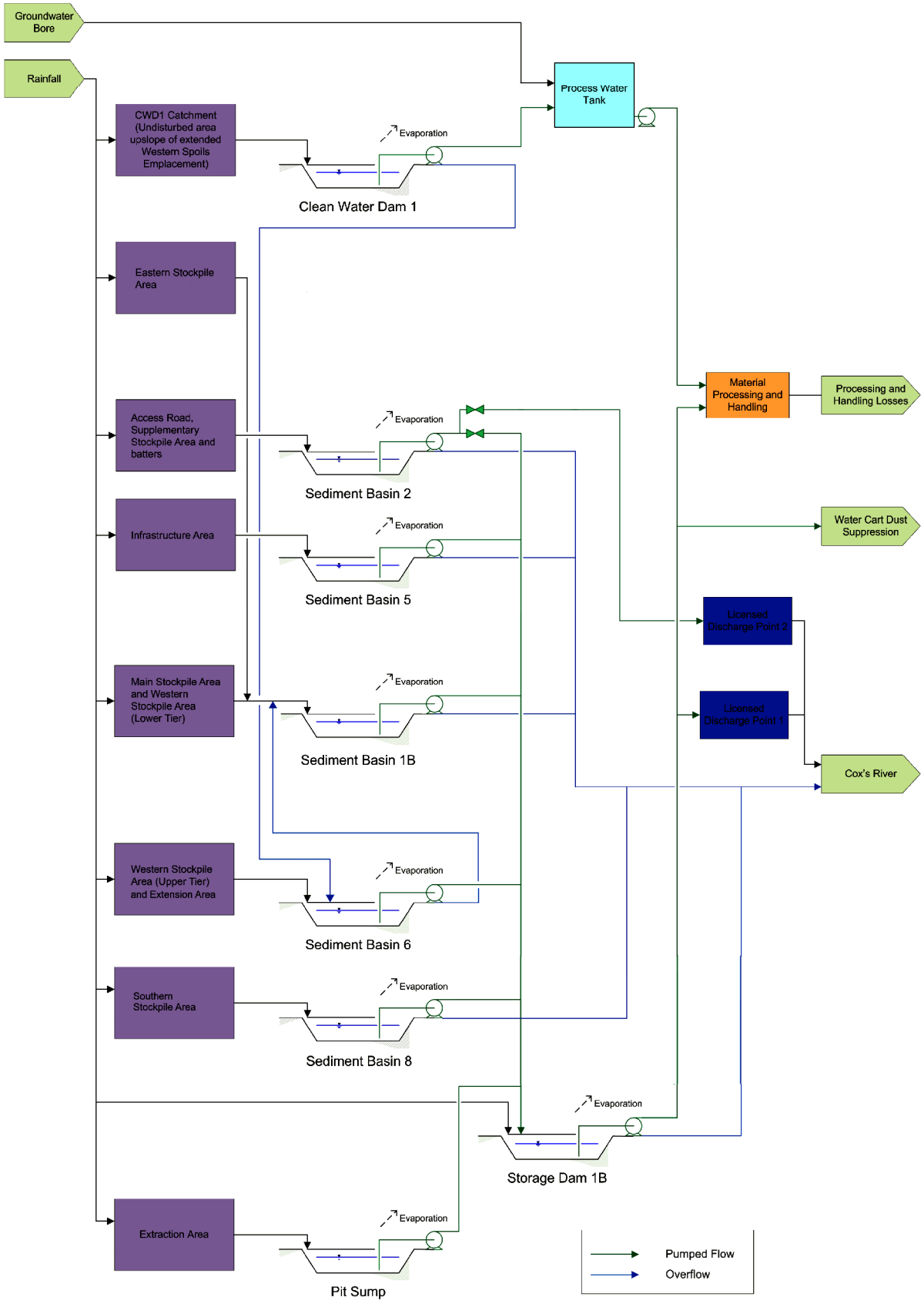


FIGURE 6.6

Future Water Management System Schematic (2045)

6.2.1 Existing Clean Water Diversion

Clean water diversion drains are maintained on the Quarry Site as follows (refer to **Figure 5.1**).

- Water from roadside drains of the Great Western Highway (Catchment GWH1) flows onto the Quarry Site through rock-lined drains and diverts to SB2.
- Runoff from Catchments C1, C3 and roadside drainage of the Great Western Highway (Catchment GWH2) enters the Quarry Site north of the Main Stockpile Area and is diverted by pipeline an open rock-lined drainage to a natural tributary of the Coxs River.

Diversion and collection of clean water from Catchment GWH1 is necessary due to the existing drainage created by the construction of the Quarry Site intersection with the Great Western Highway. The capture of this water assists in ensuring sufficient water is accumulated on the Quarry Site for dust suppression and processing activities.

Clean water flows the catchments to the north of the Main Stockpile Area of the Quarry Site (Catchments C1, C3 and GWH2) are diverted through the Quarry via the Central Clean Water Drain. This is constructed as both an open, rock lined drain which is collected and transferred below the stockpile areas via a 400 mm HDPIE pipe, before discharging to an open, rock lined drain again. The clean water is then diverted to the south of the Quarry where it discharges into a natural tributary of the Coxs River. An energy dissipater and outlet protection (equivalent to SD 5-8 of the Blue Book) is to be maintained at the discharge point from the pipeline and open drain sections of CWD-5.

6.2.2 Future Clean Water Diversion (this SWMP)

The following diversion of clean water will be required over the term of the SWMP (see **Figure 6.3**).

- The HDPE pipeline section of the Central Clean Water Drain (diameter 300 mm) will be extended to the current discharge point.
- The discharge point of the extended pipeline will be rock lined to provide for energy dissipation and outlet protection. The design of the rock-lined drain discharge point will be in accordance with Standard Drawing (SD) 5-8 of Landcom (2004) as follows (to be confirmed by final design prior to construction).
    - Clean fill will be imported to raise the height of existing channel to the elevation of the discharge pipe (930 mAHD). This will involve backfill of the existing watercourse to the west.
    - The imported clean fill (sub-grade) will be compacted to the density of the soil and subsoil of the existing channel and banks and rolled to create a smooth, even foundation.
    - A needle punched geotextile will be laid over the foundation and inspected for damage prior to application of rock. Should any minor damage be identified, this will be repaired by patching with geotextile such that an overlap of at least 300 mm is provided.
    - Clean (washed) aggregate of greater than 300 mm diameter will be laid with a depth of at least 1 m.
    - The aggregate will be laid with a width of 1 m at the discharge point from the pipe (>3 x pipe diameter) and flare to a width of 11 m over a length of at least 25 m (l:w ratio of 5:1).
    - Aggregate of greater than 300 mm diameter will be laid over the geotextile covered foundation of the existing watercourse (to the west of the discharge point), a length of approximately 50 m.

- The rock-lined discharge point will form the commencement point of a diversion drain to carry water from the central clean water diversion discharge and flow from the existing watercourse from Lidsdale State Forest

- From the constructed discharge point, an open high flow drain will be constructed (in accordance with SD 5-6 of Landcom, 2004) to the south and into an alternative tributary of the Coxs River.

- **Table 6.1** provides the design parameters for the open drain to divert flows from the central clean water drain discharge and Lidsdale State Forest to the west.

Table 6.1 Central Clean Water Diversion Design Information

Catchment area (ha)	Design Storm				Channel Lining	Hydraulic Results				Design					
	Average Recurrence Interval (ARI) (years)	Time of Concentration (mins)	C10 [1]	Frequency Factor		Flow (m^3/s)	Velocity (m/s)	Maximum Permissible Velocity (m/s)	Depth of Flow	Slope (%)	Base Width (m)	Site Batters (v:h)	Freeboard	Minimum Channel Depth (m)	Channel Top Width (m)
57.8	20	39	0.25	1.21	Jute Mesh (close weave, bitumen sprayed) & seeded	2.63	1.5	1.7	0.27	1%	8	1:3	0.15	0.5	11.0

Note 1: Undisturbed upslope catchment, determined using Figure 5.1 Volume 2 – Australian Rainfall and Runoff (ARR) 1987

- Low flow diversion drains will be constructed along the either side of SB 8 in accordance with SD 5-5 of Landcom (2008).
  - The channel and bank will be grassed where practical to achieve a C-Factor of 0.05 (equivalent to 70% ground cover) within 120 days.
  - If grassing of channel and bank cannot be achieved within 120 days, and where the channel slope exceeds 10% (~6°), rock check dams (constructed in accordance with SD 5-4 of Landcom, 2004) will be constructed at intervals no greater than 5 m elevation change.
  - The discharge point of each drain will be constructed and maintained as a Level Spreader with dimensions meeting the design standards of SD 5-6, namely:
    - drain slope of <1% for >6m on approach to discharge,
    - sill width of >4m,
    - sill grade of 0%, and
    - sill to be maintained with grass cover.

Should key parameters for the discharge point, high flow open drain or low flow diversion drains be modified as a result of final design, the SWMP will be revised and provided to the DPIE for approval prior to commencement.

6.2.3 Future Clean Water Diversion (2040-2045)

As identified on **Figure 6.5**, an existing second order ephemeral drainage line will be intercepted by the Western Stockpile Area Extension. Should the Western Stockpile Area Extension be required, noting that markets for non-quartzite material are being sourced by Walker Quarries, a clean water diversion drain will be constructed upstream to divert clean water from the second order drainage line originating within the Lidsdale State Forest to the south into a tributary of Coxs River.

Once the diversion is in place and adequately stabilised with appropriate ground cover the Western Stockpile Area Extension would be constructed. The parameters for this clean water diversion are presented in **Table 6.2**.

Table 6.2 Western Clean Water Diversion Conceptual Design Information

Catchment area (ha)	Design Storm				Channel Lining	Hydraulic Results				Design					
	Average Recurrence Interval (ARI) (years)	Time of Concentration (mins)	C10 [1]	Frequency Factor		Flow (m^3/s)	Velocity (m/s)	Maximum Permissible Velocity (m/s)	Depth of Flow	Slope (%)	Base Width (m)	Site Batters (v:h)	Freeboard	Minimum Channel Depth (m)	Channel Top Width (m)
56.8	20	37	0.25	1.21	Jute Mesh (close weave, bitumen sprayed) & seeded	2.47	1.3	1.7	0.22	1%	8	1:3	0.15	0.37	9.1

Note 1: Undisturbed upslope catchment, determined using Figure 5.1 Volume 2 – Australian Rainfall and Runoff (ARR) 1987

6.3 Water Capture and Storage

As detailed in **Section 5.1.2**, surface water runoff generated within "dirty" catchments is captured and directed into sediment basins by site topography, diversion drains or bunds. The sediment basins have been designed to provide sufficient water settlement and sediment storage capacity up to the design rainfall conditions (56.4 mm in 5 days) (refer to **Section 6.4**). In accordance with the ESCP (refer to **Appendix 3**), these structures will be maintained as 'dry' structures, i.e. emptied to reinstate the required storage capacity within 5 days of water accumulation.

Two storage dams are maintained at the Quarry into which water accumulated in the sediment basins after rainfall is transferred (either by overflow from SB1 to SD1, or pumping to SD2). Water for dust suppression and processing operations is drawn from these dams. As discussed in **Section 5.1.2.2**, as the Southern Stockpile Area is constructed and the Main Stockpile Area lifted, SD1 will be decommissioned and replaced by SD1B.

The three silt cells (of combined 7.2ML capacity) provide for the settling of silt from water used to wash sand and other quartzite products. The water pumped to these silt cells flows back to SD2 for reuse on the Quarry Site (washing or dust suppression).

Prior to the construction of the Western Stockpile Area Extension, an additional clean water dam (CWD1) will be constructed to collect runoff from the north of the stockpile which cannot be effectively diverted around the structure.

Table 6.3 provides an overview of the storage capacities, purpose and water use of these water storages with additional detail provided below.

Table 6.3 Quarry Site Water Storage Information

Storage	Volume (ML)	Purpose	Water Use
SD1: Main Storage Dam	8.1	Supplementary water settlement and sediment storage capacity for Catchment 4. Storage of runoff to ensure sediment basins can retain nominated capacity.	Supplementary supply for processing or dust suppression. Discharge to receiving environment under rainfall conditions exceeding design event or if of suitable quality.
SD1B: Future Main Storage Dam	10.0	Storage of runoff to ensure sediment basins can retain nominated capacity.	
SD2: Top Working Dam[1]	4.0	Process water supply. Storage of water accumulated within sediment basins.	Primary supply for sand washing and dust suppression.
CWD1: Clean Water Dam	2.0	Capture of runoff from Catchment 10.	Transfer to SD2 or SD1B to provide a source of water for dust suppression and sand washing.
Silt Cells 1 to 3[1]	3 x 2.4 (7.2)	Progressive settlement of silt from water used in sand washing. Discharge to SD2 for re-use in sand washing.	

Note 1: To be relocated to the Southern Stockpile Area prior to extraction within the Cobble Extraction Area

SD1: Main Storage Dam

SD1 will accept overflow, via a stabilised (rock-lined) spillway from SB1, or by pumping. SD1 provides 8.1ML of storage which allows significant settlement time for any accumulated water prior to discharge as well as providing a significant repository of water on-site to account for extended low rainfall periods.

Water held in SD1 may be transferred to the Top Working Dam (SD2) to supplement supply of water for dust suppression and sand washing.

Whenever effective storage capacity within SB1 cannot be maintained at or above the minimum water storage capacity requirement for a 5-day 95th percentile rainfall event (~3 ML – refer to **Table 6.4**), this will be provided by SD1. Maintained as a clean water storage, controlled discharge will be undertaken from time to time to create this storage capacity (subject to water quality analysis and confirmation of compliance with quality criteria – refer to **Section 9.3.1.1**).

A surveyed marker provides the level at which effective capacity of 2 ML is retained within SD1.

SD1B: Main Storage Dam (Future Operations)

Following construction of the Southern Stockpile Area a new storage dam will be constructed to accept overflow from SB1B or other sediment basins of the Quarry Site (as per current management of SD1). Identified as SD1B on **Figure 6.3**, this dam will be constructed with a storage volume of at least 8.1 ML to retain the significant settlement time for any accumulated water prior to discharge as well as providing a significant repository of water on-site to account for extended low rainfall periods.

SD2: Top Working Dam

This storage is operated as the principal point of draw for dust suppression and sand washing. It is constructed above ground, with no run-on catchment, and accepts overflow from the silt cells as well as water pumped to it from other basins and SD1.

SD2 is the primary source of water for dust suppression and sand washing, and is kept at or close to full capacity as a result. Under rainfall conditions exceeding 5-day 95th percentile conditions (55.6 mm), SD2 may discharge water via a rock-lined spillway. Discharge from the spillway of SD2 flows to SB2.

As the extraction area is extended in the future, SD2 and the silt cells will be relocated to the Southern Stockpile Area along with the washing plant infrastructure.

Silt Cells

Three silt cells are operated at the Quarry, these structures accept water from sand washing operations containing elevated silt and fines content. The silty water flows through these cells, allowing for the settlement and collection of silt, before discharge into SD 2 (Top Working Dam) from which the water is redrawn for washing and operations.

Prior to the extraction area extending over the current location of SD2 and the silt cells, additional silt settlement and water storage infrastructure will be constructed, most likely on the Southern Stockpile Area. This change to water management will be undertaken beyond the period of this SWMP and will be detailed in future versions.

6.4 Erosion and Sediment Control

6.4.1 Overview

As detailed in **Sections 6.1**, stormwater runoff generated in those areas disturbed by Quarry activities is directed via gravity or drainage infrastructure to sediment basins.

Water from undisturbed (clean) catchments, on site or upstream, is directed away from disturbed areas via diversion drains which discharge directly to the receiving environment downstream of the Quarry (refer to **Section 6.2**).

The following-sub-sections describe, in general terms, the management of stormwater at the Quarry. Further detail on the design, management, maintenance and monitoring of the various structures described is provided in an ESCP for the Quarry (refer to **Appendix 3**).

6.4.2 Sediment Basins and Discharge Protection

Runoff generated on disturbed catchments is to be directed to one of seven sediment basins. Each of these storages effectively acts as Type D (equivalent to SD 6-4 of the Blue Book) sediment basin for their respective catchments. Type D sediment basins are designed to capture runoff from disturbed catchments and store the runoff for a sufficient period of time to allow the sediment to settle out of suspension prior to discharging water of suitable quality to receiving environments.

The required design volumes for each of the current and future sediment basins, calculated using the following equation, are presented in **Table 6.4** and **Table 6.5**.

Settling zone = 10 x C_v x A x $R_{(y\%ile,\ 5\ day)}$

Where:

10 = unit conversion factor

C_v = coefficient of runoff (volumetric) (**0.74**)

A = catchment area (ha)

$R_{(y\%ile,\ 5\ day)}$ = 5 day 95th percentile design rainfall depth (mm) (**55.6mm**)

Table 6.4 Sediment Basin Minimum Storage Requirements – Existing Operations

Catchment	Area (ha)	Reporting to:	Water Settlement (m^3)	Sediment Storage (m^3)	Minimum Basin Volume Requirement (m^3)
1	2.4	SB2	1,420	710[1]	2,130
GWH	1.0				
3	0.25	SB5	105	55[1]	160
4	7.3	SB1	3,050	10[2]	3,060

Note 1: Sediment storage zone capacity based on 50 % settling zone capacity

Note 2: Sediment storage zone capacity based on 2 months soil loss calculated by RUSLE

Source: Detailed Calculation Sheets (using RUSLE) (refer to **Appendix 3**)

Table 6.5 Sediment Basin Minimum Storage Requirements – Future Operations

Catchment	Area (ha)	Reporting to:	Water Settlement (m^3)	Sediment Storage (m^3)	Minimum Basin Volume Requirement (m^3)
1	1.2	SB2	920	460	1,380
GWH	1.0				
3	0.35	SB5	210	105	315
4	5.8	SB1B	2421	1,210	3,631
6	0.5	SB6	1,377	689	2,066
11	2.8				
8	1.0	SB8	417	209	626

Source: Detailed Calculation Sheets (using RUSLE) (refer to **Appendix 3**)

Table 6.6 provides an overview of the storage capacities, purpose and water use of the sediment basins of the Quarry with additional detail on management provided below.

Table 6.6 Quarry Site Sediment Basins

Storage	Volume (ML)	Purpose	Water Use
SB1: Main Sediment Basin	4.2	Collection and storage of runoff Catchment 4 (Main and Western Stockpile Areas).	Source of water for dust suppression and sand washing. Discharges via spillway to SD1.

Storage	Volume (ML)	Purpose	Water Use
SB1B: Future Main Sediment Basin	4.5	Collection and storage of runoff from Catchment 4 (after decommissioning of SB1)	To remain a source of water for dust suppression and sand washing. To discharge via spillway to SD1B.
SB2: Bottom Working Dam	2.5	Collection and storage of runoff from Catchments 1 and GWH. Secondary control in the event of overflow from the silt cells	Transferred to SD2 to maintain design storage for sediment control or discharged to the receiving environment if of suitable quality.
SB5: Office Sediment Basin	0.32	Collection and storage of runoff from the Site office and selected haul roads.	Transferred to SD2 to maintain design storage for sediment control or discharged.
SB6: Western Sediment Basin	0.5	Collection and storage of runoff from the upper tier of the Western Stockpile Area.	Overflow to Catchment 6b and discharge to SB1.
SB6: Western Sediment Basin (future)	3.0	Collection of runoff from the upper tier and extended area of the Western Stockpile Area.	Transfer to SD1B to maintain design storage for sediment control.
SB8: Southern Sediment Basin	≥3.0	Collection of runoff from the Southern Stockpile Area batters. Supplementary storage of runoff from other SBs.	Transfer to SD1/SD1B or discharge to receiving environment under rainfall conditions exceeding design event or if of suitable quality.

Comparing the storage volume requirements for water settlement of **Table 6.4** and **Table 6.5** to the design capacities of all sediment basins (refer to and **Table 5.3**), sufficient capacity will be provided for their respective catchments.

SB1: Main Sediment Basin

SB1 currently captures runoff from the Main Stockpile Area and Western Stockpile Area of the Quarry (Catchment 4) (with SB6 collecting runoff from the upper tier of the Western Stockpile Area before discharging to the lower tier – refer to **Figure 6.1**). Runoff on the Main Stockpile Area is diverted to SB1 via perimeter diversion drains and bunds, including a concrete lined drain around the eastern perimeter of the Main Stockpile Area. Runoff from the lower tier of the Western Stockpile Area is diverted via a drain at the base of the batter between the upper and lower tier and then via a pipe to the Main Stockpile Area (refer to **Figure 6.1**). A series of flow-through coarse sediment detention basins have been constructed in sequence immediately upslope of SB1 and allow for collection and settlement of coarser sediments before flowing into SB1.

SB1 has a capacity of 4.2 ML which exceeds the minimum basin capacity requirements for the settlement of runoff and storage of sediment generated under 5-day 95th percentile conditions (refer to **Section 6.4.2**). SB1 will be regularly emptied of water through transfer to other storages such that the required minimum storage capacity (2 ML) can be maintained. The accumulated sediment removed will be allowed to dry on the stockpiling area and either sold as fill or blended with other products prior to sale.

SB1 overflows to SD1 which will managed such that an effective storage capacity of 3 ML is provided whenever SB1 cannot be emptied, e.g. there is no available capacity within other water storages on the Quarry Site.

A surveyed marker provides the level at which effective capacity of 3 ML is retained within SB1.

SB1B: Main Sediment Basin (Future Operations)

Following construction of the Southern Stockpile Area a new sediment basin will be constructed to accept runoff from the combined area of the Main and Southern Stockpile Area. Identified as SB1B on **Figure 6.3**, this sediment basin will be constructed with a storage volume of at least 4.0 ML and therefore have a capacity for the settlement of runoff and storage of sediment generated under 5-day 95th percentile conditions.

Similar to the current arrangement where overflows from SB1 is to SD1, SB1A will overflow to a new Storage Dam (SD1B) (see below).

SB2: Bottom Working Dam

SB2 captures runoff from:

- Catchment 1, via rock-lined roadside drains,
- Catchment GWH, via concrete drains and culverts of the Great Western Highway, and
- Catchment 2 via various low flow and road-side drains (refer to **Figure 5.1**).

The design volume of SB2 (2.8ML) provides sufficient settlement and storage volume for runoff generated under 5-day 95th percentile conditions (refer to **Section 9.0**). As water accumulates within SB2, it will be pumped to SD2, SD1 or the silt cells, or discharged subject to achieving the water quality criteria nominated in **Section 9.4.1**, within 5 days of accumulation. The transfer of captured runoff from this storage assists in managing the design storage requirements for sediment control and lowers the possibility of discharge.

Existing Sediment Basins (SB5 and SB6)

These sediment basins are maintained within the three additional dirty water catchments of the Quarry Site (Catchments 3 and 6a). Each sediment basin has been designed and will be maintained (by pumping of accumulated water to SD2 or SD1) to accept runoff and sediment following a 5-day 95th percentile rainfall event (refer also to **Section 8.0**).

Future Sediment Basins (SB6 and SB8)

Prior to commencement of construction of the Southern Stockpile Area, a sediment basin will be constructed immediately downslope of the toe of the stockpile area batter. While the actual disturbed catchment of the Southern Stockpile Area batter will be less than 1.0 ha, and therefore the minimum water settlement and sediment storage requirement less than 0.7 ML, the storage capacity of this sediment basin will exceed 3.0 ML (refer to **Table 6.3**) to allow for additional storage and settlement of water across the Quarry Site.

Prior to the construction of the Western Stockpile Area extension, the capacity of SB6 will be enlarged to at least 3.0 ML to allow for the collection, storage and settlement of runoff from the extended stockpile area.

Further detail on the maintenance of these sediment basins is provided in the ESCP (refer to **Appendix 3**). In summary, a marker will be maintained within each sediment basin near the discharge point identifying minimum freeboard requirement. Sediment basins will be inspected monthly to monitor accumulated sediment levels. Prior to the accumulated sediment exceeding this marker, the basin will be cleaned, with the accumulated sediment placed on the stockpiling area for blending and sale.

Under EPL 13172, discharge of water is permitted from the spillways of SD1 and SB2.

6.4.3 Other Erosion and Sediment Control Measures

Other erosion and sediment control measures will be installed as required to reduce the velocity of flows and capture sediments. Additional sediment protection will include the use of one or more of the following:

- **Sediment Fencing**
  - Sediment (silt) fencing consisting of geotextile filter fabric supported by wire and posts will be utilised in areas where the:
    - the area draining to the fence is 0.6 ha or less;
    - the maximum slope gradient behind the fence is 1:2 (V:H); and
    - the maximum slope length behind the fence is 60 m.
  - Sediment fences will generally be installed prior to disturbance activities (e.g. down slope of soil stockpiles) or downslope of areas being rehabilitated and maintained until stabilisation of the area.
- **Straw Bale Filters and Check Dams**
  - In the event that additional erosion control is required at the outlet of a drain or across a swale or channel of a diversion bund, a temporary barrier of straw bales laid end to end across the direction of flow may be utilised to reduce the water velocity and capture sediments. Check dams may also be utilised consisting of rock material. Check dams would primarily be utilised to reduce the velocity of water to prevent erosion rather than as a sediment retention structure.
- **Rock Armouring and Jute Mesh**
  - In the event additional erosion controls are required, other options that will be considered include the use of rock armouring, whereby a channel or outlet is effectively lined with appropriately sized aggregate material to provide a physical barrier to erosion. Similar to rock armouring, jute mesh, a biodegradable erosion control blanket, may be installed, particularly where vegetation growth is preferable.
- **Energy Dissipaters and Outlet Protection**
  - In the event that additional erosion controls are required to reduce water velocity and mitigate erosion at the outlet of pipe drains, the outlet and a section of the receiving drain or watercourse is lined with appropriately sized, angular and durable material to provide a physical barrier to erosion and lower water velocity by obstructing the flow path and absorbing energy (rip rap apron). The rip rap apron will be underlain with geotextile and the rip rap apron level matched to the invert level of the receiving watercourse. The dimensions of the rip rap apron and material will be determined by the flow conditions (water level and peak discharge) and pipe diameter.

These additional measures are applicable to water management structures, active disturbance areas and rehabilitated areas which have not yet stabilised.

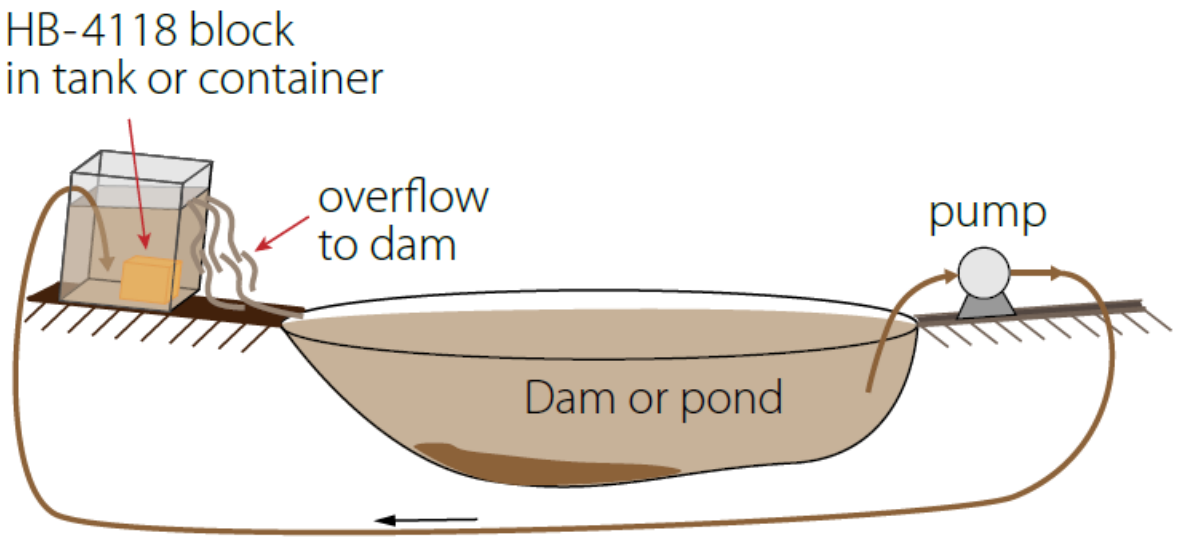
6.4.4 Sediment Settling (Flocculant) Agents

Walker Quarries has used of an anionic acrylamide copolymer flocculent (Hydrobond HB-4118) prior to controlled discharges from sediment basins. This is an approved flocculant product used across a variety of industries including, construction, extractive, manufacturing and power generation industries.

In accordance with product usage instructions (refer to **Appendix 5**), a cage containing the solid block is located at the discharge of the licensed discharge point allowing for turbulent water to scour the polymers from the block where it mixes with the rest of the water. Under controlled discharge scenarios, the caged polymer is placed within a tank and water from the dam pumped into the tank allowing for scour/mix of the polymer prior to discharge.

A review of products and application methods has been conducted and the following results obtained.

- Application of gypsum was trialled, however, active dispersion of material proved difficult due to the size of the dams. Several methods including bulk addition, pre-mixed sprays and manual spreading were trialled without a notable improvement in water quality.
- The Hydrobond HB-4118 product was further investigated and based on the Safety Data Sheet and product information available, Walker Quarries is satisfied it meets EPA requirements (refer to **Appendix 5**). This flocculent has a median lethal concentration (LC_{50}) greater than 100 milligrams per litre for fish and half maximal effective concentration (EC_{50}) greater than 100 milligrams per litre for water invertebrates.
- An internal pumping system whereby water is pumped between the Quarry dams and a tank containing the flocculant to treat the water prior to discharge (refer to **Figure 6.7**) has been considered. Based on the volume of water contained within the dams and historically low volume of water discharged from the Quarry Site, this was determined to be unnecessary under normal operating conditions.



Source: Hydroflux Utilities – Hydrobond HB-4418 Product Bulletin

Figure 6.7 Flocculant Treatment System

7.0 Site Water Balance

7.1 Water Sources

The principal source of water on the Quarry Site is rainfall that generates surface runoff with this supplemented by groundwater (up to 100 ML per year) extracted under licence (WAL 42390).

Runoff, both clean and dirty water, is diverted to and stored in the various storage dams and sediment basins of the Quarry Site and periodically transferred to SD2 and SD1 from where it is drawn for dust suppression and sand washing purposes.

Once all approvals required under the *Water Management Act 2000* are in place, groundwater will be pumped from a bore located on Lot 7 DP872230 through a flexible poly pipeline to a water tank located on the Eastern Stockpile Area. Water is periodically pumped transferred from the water tank to SD2 for use.

No water is required to be purchased and transferred to the Quarry.

7.2 Water Requirements and Losses

Water is required at the Quarry for four principal purposes:

1. Dust suppression of active and exposed areas, e.g. internal roads, hardstand surface and stockpile areas.
2. Dust suppression of crushing operations.
3. Sand and cobble washing.
4. Evaporative losses.

The following provides information on the anticipated water use for each of these activities.

7.2.1 Dust Suppression – General

Exposed and trafficked areas of the Quarry Site are watered as required using a 14 kL water truck to reduce the potential for wind or wheel generated dust. The volume of water used for this purpose varies significantly from day to day and month to month based on seasonal and meteorological conditions.

The following provides an indication of water use under various meteorological conditions:

- rainfall conditions: no applications
- temperature ≤15°: 1 to 2 applications
- temperature >15° ≤25°: 2 to 3 applications
- temperature >25° ≤30°: 3 to 4 applications
- temperature >30°: 5 to 6 applications.

Between 14 ML and 16 ML is estimated to be used for general dust suppression, with approximately 70% of this volume required during the period of October to March (inclusive). This could increase by 50% to 21 to 24 ML as the area of disturbance increases over the life of the Quarry.

7.2.2 Dust Suppression - Crushing

Based on historic dust suppression rates to the road base and aggregate crushing trains, the Applicant applies water at the following rates:

- 20 L/t of crushed aggregate
- 7 L/t of crushed road base.

At a production rate of 350,000 tpa, which reflects the likely maximum sand production rate of 150,000 tpa, the following water usage is anticipated:

- 40 kL per day (when crushing) and up to 5ML per year to produce 250,000 t of aggregates
- 10 kL per day (when crushing) and up to 1ML per year to produce 100,000 t of road base.

7.2.3 Sand Washing

An estimated 1ML of water is used per day (8 hours) to wash 650 t of sand. This equates to approximately 1,500 L/t of sand washed.

A large proportion of the water used to wash the sand is recycled with losses estimated as follows:

- approximately 5% (75 L/t) is lost as moisture content of the final sand product
- approximately 10% (150 L/t) is lost as evaporation or seepage on the processing and stockpile area.

At a maximum sand production rate, it is estimated that 34 ML per year would be lost.

7.2.4 Evaporative Losses

Evaporative losses are based on average monthly evaporation at the BoM Bathurst Agricultural Station (Station 63005), a pan factor of 0.8 and water storage surface areas calculated using area-volume relationships.

7.3 Water Balance

7.3.1 Operating Rules and Assumptions

Based on water requirements for the maximum Quarry impact footprint and maximum production levels, a daily time step Model using GoldSim software was prepared and completed to predict the potential for groundwater requirements and potential discharges from the Quarry Site (Umwelt, 2019b).

The key operating rules of the water balance, to be applied at the Quarry, are as follows.

- Dirty water captured in sediment basins is used in priority to clean water and groundwater.
- Clean water is used in priority to groundwater.
- Groundwater will be stored within a tank of 50 kL capacity.
- All sediment basins are dewatered to one of the storage dams in accordance with the rules of the Quarry ESCP (**Appendix 3**) to reinstate the minimum storage requirements within five days following a rainfall event.
- Discharge to SD1 (and subsequently SD1B) from sediment basins (excluding SB2) would proceed regardless of the available freeboard in the storage dam. Controlled discharges from SD1 / SD1B were estimated based on subsequent overflows predicted by the model.

- Controlled discharges from SB2 would occur when SD1. SD1B was at capacity and SB2 did not have sufficient freeboard to accommodate a five day 95th percentile rainfall event.
- The Pit Sump is only dewatered when there is sufficient freeboard available in the Quarry storage dams.

7.3.2 Groundwater Use

Groundwater extracted under WAL 42390 is likely to be required to supplement surface water harvested from water storages on the Quarry Site.

Table 7.1 presents the predicted bore water import volume statistics indicating that even under the driest conditions, the bore water import demand is significantly less than the groundwater entitlement of 100 ML/year.

Table 7.1 Bore Water Imports

Statistic	Result (ML/year)
Minimum	0.0
10th percentile	0.0
50th percentile	5.9
90th percentile	19.6
Maximum	35.6

Source: SWIA (Umwelt, 2019) - Table 4.6

7.3.3 Water Discharges

7.3.3.1 Discharge Types

With reference to the water balance prepared for the Quarry (Umwelt, 2019), and without additional internal management of water on the Quarry Site, discharge may occur under the following circumstances.

1. Under high rainfall conditions, a controlled discharge may be required to ensure the minimum water storage capacity is available within the site sediment basins (refer **Table 6.4** and ESCP of **Appendix 3**).
2. Under rainfall conditions exceeding 55.6 mm over 5 consecutive days, when only the minimum water storage capacity is available within the site sediment basins (refer to **Table 6.4** and the ESCP of **Appendix 3**), water may discharge from the sediment basins.

The following sub-sections review the potential discharge requirements and management.

7.3.3.2 Controlled Discharge / Transfer

Table 7.2 and **Table 7.3** present the predicted volume and frequency statistics of the Quarry water balance with respect to the discharge or transfer of water from the two licensed discharge points of the Quarry.

The discharge or transfer of water (predominantly from SD1) is likely to be required in average (50th percentile) to wet (90th percentile, Maximum) years to manage high site water inventories as a result of high or prolonged rainfall events. Predicted discharges from SB2 are less frequent than from SD1/ SD1B as SB2 is oversized for the catchment that it services and has capacity in excess of the five day 95th percentile rainfall event, i.e. surplus water can be held in SB2 without the requirement to dewater.

Table 7.2 Controlled Discharge Volumes

Statistic	SD1 / SD1B Discharge (ML/year)	SB2 Discharge (ML/year)
Minimum	0.0	0.0
10th percentile	0.0	0.0
50th percentile	7.0	0.0
90th percentile	21.2	0.0
Maximum	41.4	1.6

Source: SWIA (Umwelt, 2019) - Table 4.7

Table 7.3 Controlled Discharge Frequency

Statistic	SD1 / SD1B Discharge (days/year)	SB2 Discharge (days/year)
Minimum	0.0	0.0
10th percentile	0.0	0.0
50th percentile	17.0	0.0
90th percentile	38.4	0.0
Maximum	67.0	17.0

Source: SWIA (Umwelt, 2019) - Table 4.8

Walker Quarries adopts a priority management protocol for the transfer/discharge of water from these water storages.

1. Water which accumulates above the minimum water storage volume/level in SD1 and/or SB2 will be pumped to other water storages on the Quarry Site with retained capacity. This may include transfer of water between SD1 and SB2 if available capacity available.

2. Water will be pumped to the extraction area and stored in a sump or non-operational area of the pit. A void space of >20 ML has been constructed at the northern end of the extraction area and would be available to store surplus water. As water is drawn down again from SD1, water contained in the pit would be pumped back.

3. Where capacity is not available within existing water storages of the Quarry Site to accept transferred water, a controlled discharge, following addition of a sediment settling agent as nominated in **Section 6.4.4**, will be undertaken.

4. In order to mitigate for potentially non-compliant water quality, controlled discharge will be undertaken as follows.

    a. Discharge will commence and a water sample taken immediately and sent for analysis. The sample will be nominated as high priority with a result within 24 hours of supply requested and expected.

    b. Following the collection and despatch of the initial sample, discharge will be ceased until compliance with water quality is confirmed.

    c. If a compliant water quality result is returned, discharge will be recommenced.

    d. If a non-compliant result is returned, additional flocculent will be added and steps a. to c. repeated until a compliant result is confirmed.

It is noted that Walker Quarries has yet to commission a controlled discharge of water from the Quarry Site.

7.3.3.3 Uncontrolled (Wet Weather) Discharge

Table 7.4 presents the frequency of spill events from sediment basins which is expected to be less than once per year. This is less than the recommended frequency of sediment spills (one to two spills/year) of the Blue Book for development discharging to a sensitive receiving environment.

Table 7.4 Sediment Basin Spill Frequency

Sediment Basin	Minimum (events/year)	Average (events/year)	Maximum (events/year)
SB2	0	<1	1
SB5	0	<1	6
SB6	0	<1	5
SB8	0	<1	5
SB1B	0	<1	4

Source: SWIA (Umwelt, 2019) - Table 4.9

The frequency and volume of discharge could be less depending on the final capacity of SB1B, SB6 and SB8.

7.3.4 Contingency Management

7.3.4.1 Water Sources

In the event that water cannot be sourced from surface water harvest or groundwater sources under licence (WAL 42390), Walker Quarries will adjust the scale of operations to match the water availability.

7.3.4.2 Discharge Water Quality

Should the water quality of discharged water be identified as non-compliant, the incident response procedures nominated in **Section 10.0** will be commenced.

7.4 Reporting

The volume of water discharged will be reported annually in the Quarry Annual Review (to the DPIE) and Annual Return (to the EPA), along with the results of water quality analysis.

If off-site water purchases are made, these will also be reported in the Annual Review.

Groundwater extracted from a bore located on Lot 7 DP872230 under WAL 42390 will also be recorded and reported in the Annual Review as well as to WaterNSW as a condition of the WAL.

8.0 Waste Water Management (for beneficial use)

Waste water generated at the Quarry is categorised as follows:

- Effluent/ablutions water
- Process water discharge.

Runoff from disturbed areas of the Quarry Site is considered stormwater and managed in accordance with ESCP (refer to **Section 8.0**).

The following reviews the management, beneficial use and monitoring of these waste water streams.

Effluent and Ablutions Water

Several methods of disposal were investigated, including application to a utilisation area, however, following a review of site and soil limitations, the only viable option for management was a monitoring pump out system. The limiting features for on-site land application disposal were the soil permeability, shallow bedrock, soil structure, and textures, run-on and seepage. Each of these features imposes major limitation to the use of an on-site disposal.

As a consequence of the limitations to onsite disposal, all wastewater generated via the effluent and ablutions system is collected and disposed of offsite by a licenced contractor. Therefore, as this stream of waste water is not applied to land on the Quarry, no monitoring will be undertaken.

Process Water Discharge

The water management system (refer to **Section 6.0**) describes how silt containing water from the wash plant is delivered to three silt cells (constructed in series)[1]. The water flows through these structures, depositing silt in each before discharging into the Top Working Dam (SD 2). The water is then re-used through the wash plant or used for dust suppression.

Monitoring of water quality, including this waste water stream, is described in **Section 9.0**.

[1] Prior to the extraction extending to its maximum extent, the affected silt cell(s) will be relocated.

9.0 Water Monitoring Program

9.1 Monitoring Program Objectives

Table 9.1 presents the objectives and key performance outcomes relating to the surface water and groundwater monitoring program for the Quarry that were introduced in **Section 4.0**.

Table 9.1 Water Management Objectives and Key Performance Outcomes

Objectives	Key Performance Outcomes
To implement appropriate water management and mitigation measures during all stages of the Quarry.	• Implementation of this Plan. • No discharge of water in breach of licence criteria. • No reportable incidents related to water management or pollution.
To implement an appropriate monitoring program which reviews compliance with relevant criteria during all stages of the Quarry.	• All identified monitoring is undertaken in accordance with the relevant procedures and at the relevant intervals. • Monitoring results are published and reported annually within the Annual Review and/or Annual Return. • No unanticipated groundwater inflow to extraction area.

9.2 Monitoring Locations

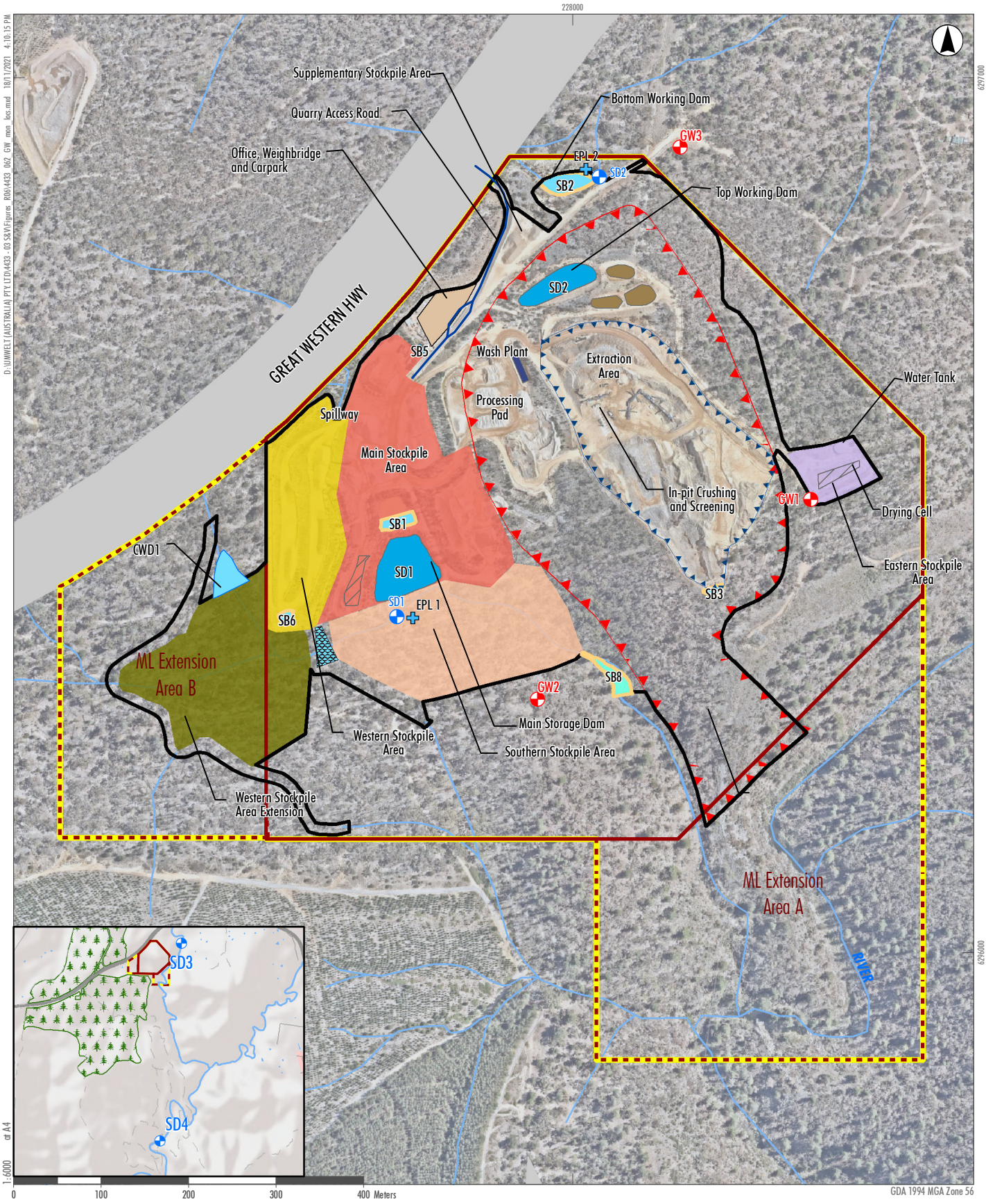
9.2.1 Surface Water

Surface water monitoring at the Quarry is undertaken at the locations shown on **Figure 9.1** and described in **Table 9.2**. Monitoring is undertaken to assess the quality of water discharged from the Quarry, and in the receiving system (Coxs River) both upstream and downstream of the Quarry.

Table 9.2 Surface Water Monitoring Points

Type	Ref	Location	Description
Discharge	**SW1 (EPL 1)**	SD1	Discharge over the spillway of SD1 to ephemeral drainage line identified as Trib A. OR From SD1.
	SW2 (EPL 2)	SB2	Discharge over the spillway SB1 to ephemeral drainage line identified as Trib B of the Coxs River.
Off-site Baseline	**SW3**	Coxs River	Upstream of the Quarry and entry of Trib B to the Coxs River.
	SW4	Coxs River	WaterNSW gauging station, approximately 6.6 km downstream of Trib A discharge point to the Coxs River.

It is noted that SW4 is located downstream of the confluence of Marrangaroo Creek (from the northeast) with the Coxs River. Marrangaroo Creek emanates from the Blue Mountains National Park and includes cleared rural and residential land, the Lithgow Correctional Facility and Marrangaroo Quarry within the catchment. These features are considered representative of local catchments and unlikely to unduly influence the quality of the water flowing into the Coxs River.



Legend

- Quarry Site Boundary
- Quarry Site (ML1633)
- Quarry Site ML Extension
- Disturbed Areas for Modified Operations
- Approved Extraction Area
- Current Extent of Extraction Area
- Groundwater Bore Location
- Surface Water Monitoring Locations
- EPL Licensed Discharge Point
- Office, Weighbridge and Carpark
- Drying Cell
- Watercourses
- Clean Water Dam
- Clean Water Diversion
- Sediment Basins
- Settlement Ponds
- Storage Dam
- Water Tank
- Rock-lined Drain
- Silt Cells
- Main Stockpile Area (935m AHD)
- Southern Stockpile Area (935m AHD) (Future)
- Western Stockpile Area
- Western Stockpile Extension (940m AHD) (Future)
- Eastern Stockpile Area

FIGURE 9.1

Monitoring Locations

Image Source: ESRI World Imagery (2019); Nearmap (2020) Data source: Walker Quarries (2019); Umwelt (2019); NSW LPI DTDB (2019); CEH Survey (November 2016)

9.2.2 Groundwater

Three bores (GW1 to GW3) have been constructed to north, east and southwest of the extraction area. Data loggers have been installed with the data collected for the purpose of better defining the groundwater characteristics and establishing of a median groundwater level prior to future extraction. **Figure 9.1** provides the location of these groundwater monitoring bores.

Consideration as to the requirement to monitor groundwater levels in bores on properties surrounding the Quarry was considered following the submission of DPIE-Water of 8 February 2021 (refer to **Appendix 2**). On review of various factors, it has been determined that monitoring of these bores is beyond the remit of this SWMP. These factors are discussed in **Appendix 6**.

9.3 Monitoring Parameters and Frequency

9.3.1 Surface Water

9.3.1.1 Water Quality

The water quality parameters to be analysed and frequency of monitoring will vary between the Quarry sites (SW1 and SW2) and background Coxs River sites (SW3 and SW4).

The water quality monitoring and analysis of the Quarry sites is based on assessment of impact in the event of a discharge. On the basis that all quarrying is to remain at least 1 m above the groundwater table, the potential for mixing of groundwater (which may contain concentrations of metals exceeding those of the background Coxs River catchment) is to be prevented. The water quality parameters to be monitored reflect the potential pollutants of the Quarry (TSS, pH, oil & grease, electrical conductivity) or historic pollutants of the upper Coxs River (sulphate).

The water quality monitoring and analysis of the background Coxs River sites is to satisfy two requirements.

- To allow for comparison of water quality upstream and downstream of the Quarry.
- To allow for the establishment of a significantly large data set (at least 24 data points) to establish background concentrations of metals which could be contained in the groundwater in higher concentrations (and therefore allow for the establishment of performance criteria should extraction below the groundwater table occur in the future).

The proposed water monitoring parameters and frequencies are presented in **Table 9.3**.

Table 9.3 Surface Water Monitoring Parameters and Frequency

Monitoring Site	Parameter	Unit	Frequency
Quarry Sites (SW1/SW2)	pH	pH units	Quarterly or Monthly During Discharge
	Total Suspended Solids (TSS),	mg/L	
	Electrical Conductivity	µS/cm	
	Grease and Oil	mg/L	
	Turbidity	NTU	
	Sulfate	mg/L	

Monitoring Site	Parameter	Unit	Frequency
Background (Coxs River) Sites (SW3/SW4)	pH	pH units	Monthly
	Total Suspended Solids (TSS),	mg/L	
	Electrical Conductivity	µS/cm	
	Turbidity	NTU	
	Sulfate	mg/L	
	Grease and Oil	mg/L	Quarterly
	Arsenic (dissolved)	mg/L	
	Cadmium (dissolved)	mg/L	
	Chromium (dissolved)	mg/L	
	Copper (dissolved)	mg/L	
	Nickel (dissolved)	mg/L	
	Lead (dissolved)	mg/L	
	Zinc (dissolved)	mg/L	
	Mercury (dissolved)	mg/L	

9.3.1.2 Discharge and Flow

Discharge Volume

When water is discharged from the licensed discharge points of the Quarry (as identified in **Table 9.2**), the volume of total discharge will be estimated by multiplying the period of discharge by the approximate flow rate.

Flow Rate

A semi-quantitative assessment of flow at Sites SW3 and SW4 will be made when sampling (refer to **Section 9.5.2**).

9.3.2 Groundwater

9.3.2.1 Groundwater Levels

The standing water level within the three groundwater monitoring bores will be monitored at a minimum daily interval by the data logger for the period of quarrying.

The data will be collected approximately quarterly and supported with manual groundwater level measurements at time of collection and summarised in an annual report.

9.3.2.2 Water Quality

The three groundwater bores will be sampled at least every six months and analysed for the following parameters.

General

- Electrical Conductivity
- pH

Metals

- Arsenic
- Cadmium
- Chromium
- Copper
- Nickel
- Lead
- Zinc
- Mercury

Anions/Cations

- Sulphate
- Chloride
- Calcium
- Magnesium
- Sodium
- Potassium

Alkalinity

- Hydroxide
- Carbonate
- Bicarbonate

9.4 Monitoring Criteria

9.4.1 Surface Water

Quality criteria only apply to water discharged from the Quarry. **Table 9.4** lists the water quality criteria for the Quarry, as provided by EPL 13172. The limits presented below do not authorise the pollution of waters by any other pollutants and the Quarry must comply with Section 120 of the *Protection of the Environment Operations Act 1997*.

In accordance with Conditions L2.5 and L2.6 of EPL 13172, the criteria are deemed not applicable where the following can be demonstrated.

- A total of 56.4 mm of rainfall is received at the Quarry Site over any consecutive 5 day period.
- The measured pH of the water is within 6.5 – 8.5 and turbidity <25 NTU at the time of the discharge.

Water flow within the Coxs River is a qualitative measure and as such no criteria are attached to this parameter.

Table 9.4 Surface Water Monitoring Criteria

Pollutant	Unit of Measure	Criteria
TSS	mg/L	30
Sulfate	mg/L	250
Grease and Oil	mg/L	10
Electrical Conductivity	µS/cm	1 500
pH	pH	6.5-8.5
Turbidity	NTU	25[1]
Metals	mg/L	none

Note 1: No criteria for turbidity has been set as the purpose of monitoring is to establish baseline conditions. A limit of 25 NTU applies for analysis as below this value, the water quality criteria of EPL 13172 do not apply (see discussion below).

Note 2: No criteria for turbidity has been set as the purpose of monitoring is to establish baseline conditions.

9.4.2 Groundwater

9.4.2.1 Groundwater Level

There are no prescribed groundwater monitoring criteria in DA 344-11-2001 or EPL 13172. The Quarry is however, prohibited from extraction to within one metre of the 'maximum groundwater level' (MGL) (Condition 2(6) of DA 344-11-2001 MOD 3).

Until the maximum groundwater level is established, Condition 2(6A) of DA 344-11-2001 MOD 3 limits extraction to 901 mAHD, which is considered unlikely above an elevation of 901m AHD (refer to **Section 5.2**).

The method for establishing the maximum groundwater level will be confirmed in consultation with DPIE-Water. Extraction below 901 mAHD will not be undertaken until DPIE-Water confirm satisfaction with the established maximum groundwater level.

9.4.2.2 Groundwater Quality

No criteria apply to the groundwater quality monitoring which is for the establishment of baseline concentrations only.

9.5 Water Monitoring Procedures

9.5.1 Surface Water

The procedures water sampling and analysis generally follow those presented in the *Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales* (DEC, 2004).

Monitoring Equipment

The following equipment is used for the collection of surface water samples:

- Chain of custody form (laboratory supplied).
- Labelled sample containers. As supplied by laboratory.
- Marker pen and ink pen.
- Esky (with ice or chilled briquettes).
- Camera.
- Spares kit, including:
    - spare sampling bottles; and
    - marker pen/ink pen.

Due to the types of analyses required, it is anticipated that two separate sampling containers would be required for the purposes of collecting samples:

1. Electrical conductivity, TSS, pH and Sulfate.
2. Oil and Grease.

A minimum of 10 sets of sampling bottles (i.e. sufficient for two rounds of sampling) will be retained on site. Additional bottles are available through the laboratory services provider.

Sampling Procedure

The following procedures apply to surface water sampling.

1. Clearly label each sample bottle **before sampling**, as follows.

Site:	Walker Quarry
Sampling Location:	e.g. SD1
Date:	15/10/2019
Time:	7:00 am
Sampled by:	John Smith

2. Remove lid of TSS, EC, pH and Sulfate sampling container and rinse with at least 500mL of water from the sample area. Ensure rinsed water is tipped away from the sampling area.
3. Fill the sampling container and use it to carefully fill the other sampling container ensuring not to spill the preservative contained within the other sampling container or mix the lids between bottles. Tighten the sampling container lid and place the sample in the chilled esky immediately.

4. Refill the other sampling container to capacity. Tighten the sample bottle lid and place the sample in the chilled esky immediately.

5. Prior to leaving each monitoring site, photograph the site and record observations on stream flow, water colour or any other relevant matter.

Collected water samples will be delivered to laboratory for analysis as soon as possible and submitted with a chain of custody form.

9.5.2 Surface Water Flow Monitoring

The methods for determining flow when sampling for water quality are modified from the Velocity-Area method of Part 3 of Australian Standard (AS) 3778-2009: Measurement of water flow in open channels (SA, 2009).

The flow will be recorded as either:

- High: rapid movement of water flowing at, or over the defined channel,
- Medium: moderate movement of water covering >50% of the defined channel,
- Low: slow movement of water covering <50% of the defined channel, or
- None: no movement of water.

A photo will be taken on each occasion for comparison to previous flows.

On an annual basis data from the Water NSW gauging station on the Coxs River, which is coincident with SD4, will be reviewed.

9.5.3 Groundwater Monitoring

The following provides the equipment and methods to be implemented as part of the groundwater monitoring program.

Monitoring Equipment

The following equipment will be used for the collection of groundwater data from the deployed logger:

- A portable data reader to download logger information (ensure suitability and methods in accordance with data logger manufacturer's instructions prior to use).
- Spares kit, including;
    - pliers
    - replacement batteries, and
    - spare cable.

Field Measurement and Observations

The data logger will be calibrated prior to redeployment after downloading, and a record of the calibration will be kept.

Once the groundwater level data has been downloaded, the download will be recorded on a field sheet, along with the following information.

1. Monitoring bore identifier.
2. Date and time of download.
3. Extraction floor elevation at the time of download.
4. General site observations including presence of algae or vegetation on data logger.
5. Odour.
6. Anything else that may be significantly contributing to the groundwater conditions at the location.

Further detail on monitoring is included in the document "Wallerawang Quarry – Groundwater Monitoring Procedures" (refer to **Appendix 4**).

9.6 Review and Recording of Monitoring Data

9.6.1 Surface Water

Following receipt of water quality monitoring results, Walker Quarries (or delegated environmental consultant) will review the data against the criteria listed in **Table 9.4**. The results will also be entered into an existing water monitoring database where trends in water quality can be considered. Daily rainfall data from the on-site meteorological station for the previous 5 days will be reviewed and recorded in the water monitoring database beside the water quality monitoring results. As noted in **Section 9.4.1**, where rainfall received at the Quarry Site over the previous 5 days exceeds 56.4 mm, the surface water monitoring criteria presented in **Table 9.4** do not apply. Where the pH of the water is within 6.5 – 8.5 and turbidity <25 NTU, and the EPA is advised within 3 working days of the completion of the sample testing and analysis, the TSS criteria of **Table 9.4** do not apply.

Original copies monitoring results supplied by the NATA accredited laboratory will be retained by Walker Quarries for at least 4 years.

9.6.2 Groundwater

9.6.2.1 Review and Reporting

Groundwater data obtained from the data loggers will be entered into an existing water monitoring database and reviewed against the action triggers identified in **Section 9.4.2**. The standing water levels would be compared to the current extraction floor elevation.

Review of the groundwater data will be completed to establish the trends in standing water levels in the groundwater monitoring bore(s). If review of the trend data identifies that an action trigger level is met (refer to **Section 9.6.2.2**), a review of recent rainfall records (rising trend) and any pit inflow volumes (lowering trend) will be completed to assist in identifying a possible reason for the trend.

If review of the trend data identifies that groundwater inflow to the extraction area is likely to occur, a review of groundwater monitoring data and recent rainfall records will be undertaken to determine if anomalous rainfall events are the cause (rising trend) or if extraction operations will intersect the natural long-term trend in standing water level, as established by the monitoring program.

9.6.2.2 Contingency Response Management

Contingency management would be required in the event of the following events.

Unanticipated Groundwater Inflow

Unanticipated groundwater inflows shall be deemed to be occurring when groundwater inflow to the active section of the extraction area is observed (direct inflow), or if the active extraction area is observed to contain standing water in the absence of a rainfall and runoff event (inferred inflow). If this is observed, the following action/response procedures will be implemented.

- Extraction will be ceased in the immediate vicinity of the identified seepage zone and relocated to an alternate location.
- The Quarry Manager will cordon off the area, to prevent inadvertent access, and take photos of the seepage zone.
- The unanticipated groundwater inflow will be reported immediately to the DPIE and DPIE-Water.
- Within 7 days of the commencement of inflow, a report to DPIE-Water will be prepared that includes the following information:
    - time at which inflow event commenced,
    - time at which inflow event ceased,
    - duration of the inflow event,
    - volume of groundwater inflow, and
    - extraction area floor elevation at which the inflow event occurred.
- The recommendations of DPIE-Water will be followed with extraction from the affected areas of the Quarry only recommencing on approval by DPIE-Water.

Breach of Threshold Trigger (Standing Water Level)

If the Standing Water Level (SWL) is observed within 2 m of the extraction area floor (Monthly Measured Trigger), extraction will not progress any deeper until the following action/response procedures are implemented:

- The DPIE-Water will be notified.
- A methodology to calculate any future inflow of water will be established.
- A Water Access Licence and adequate allocation will be obtained.

If the extraction area is developed below the groundwater table, and the SWL is observed to deviate by greater than 2 m from the long-term median, the following action/response procedures will be implemented:

- The DPIE-Water will be notified.
- A qualified hydrogeologist will be commissioned to complete a review of operations and assess:
    - the relationship, if any, between the SWL reduction and Quarry operations; and
    - the potential impact of the SWL reduction on other groundwater users.
- The results of the assessment, along with recommendations for additional contingency or mitigation measures if required, will be provided to DPIE-Water for review.
- Unless instructed otherwise by DPIE-Water, the recommended contingency or mitigation measures will be implemented.

9.7 Inspections and Maintenance

Regular visual inspections are undertaken of all water management (erosion and sediment control) structures. Inspections are undertaken on a monthly basis and following a rainfall event of >25mm/24hr. The inspections of water management structures record the general condition of the water management structures and/or the soil surface of the rehabilitation area.

In any areas where active erosion is observed, consideration will be given to installation of additional erosion and sediment controls as described in **Section 6.4**.

9.8 Reporting and Publication of Monitoring Data

9.8.1 Monitoring Data

In the event that water is discharged from the Quarry (from the licensed discharge points) during the annual reporting period of EPL 13172, the results of water quality monitoring will be included within an Annual Return, submitted to the EPA within 60 days of the Anniversary date of EPL 13172 (21 October) each year, in accordance with *Condition R1.1* of EPL 13172, and Annual Review, submitted by the end of September each and required by *Condition 5(12)* of DA 344-11-2001. The results included in the Annual Return will be assessed by an independent reviewer prior to submission to confirm accuracy.

In the event that the results of water quality monitoring identify an exceedance of the criteria nominated in **Section 9.4**, the Quarry Manager will immediately notify the DPIE[2], the EPA and WaterNSW.

In the event the groundwater monitoring threshold triggers are breached, Walker Quarries will immediately notify the DPIE and DPIE-Water. A report will be prepared and submitted to the DPIE-Water (and DPIE if requested) within 7 days of the breach being identified.

Additionally, results of water quality monitoring required by DA 344-11-2001 and other regulatory approvals will be made publicly available on the Walker Quarries website in accordance with the current version of EPA's guideline "*Requirements for publishing pollution monitoring data"*, within 14 days of analysis being received by Walker Quarries. The Quarry Manager is responsible for publication of this monitoring information.

In the event in-field pH and turbidity is measured and the results confirm the water quality criteria as not applicable (refer to **Section 9.4.1**), these results will be provided in writing to the EPA within three working days of water sampling.

9.8.2 Overall Performance

The results of monitoring, along with assessment of any incidents and observations made as part of regular inspections will be reviewed annually and summarised in the Annual Review prepared each year with respect to the effectiveness of the water management system. Where improvements to water management are identified, these will be included as action items for the following 12 month period and will eb reported upon as part of the next Annual Review.

Where results, incidents or observations indicate a review of the SWMP is requires, the DPIE will be advised as nominated in **Section 12.3**.

[2] Using the contact name, email address and phone number provided by the DPIE.

10.0 Incident Management

10.1 Incident Identification

Condition R2 of EPL 13172 requires that Walker Quarries must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident.

In accordance with the definition provided by Section 147 of the POEO Act, harm to the environment is deemed to be material if:

- it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial; or
- it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (or such other amount as is prescribed by the regulations).

An incident which causes or threatens to cause material harm to the environment (and may or may not result in an exceedance of water quality criteria) is referred to as a **Pollution Incident**.

An incident which is only as a result of an exceedance of water quality criterion, is referred to as a **Non-compliance**.

10.2 Incident Management and Notification

10.2.1 Pollution Incident

Immediately after Walker Quarries becomes aware of a pollution incident, i.e. without delay the following notifications will be made.

Department of Planning, Industry & Environment

Written notification of the incident will be emailed to the DPIE at the following address: compliance@planning.nsw.gov.au.

Written notification of a pollution incident will:

(a) identify the development and application number,

(b) provide details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident, i.e. non-compliance or pollution),

(c) identify how the incident was detected,

(d) identify when the Applicant became aware of the incident,

(e) identify any actual or potential non-compliance with the conditions of this consent,

(f) describe what immediate steps were taken in relation to the incident,

(g) identify further action(s) that will be taken in relation to the incident, and

(h) identify a project contact for further communication regarding the incident.

Where any of the above cannot be provided immediately following identification of the incident, e.g. identification of actual or potential non-compliance with the conditions of this consent, this will not be relied upon to delay written notification. If required, the notification will make commitment to provide follow-up information to satisfy any of the above requirements.

Environment Protection Authority

The EPA's Environment Line service (131 555) will be called to provide initial notification and seek guidance on management.

Within seven days of becoming aware of the incident, Walker Quarries will provide written notification of the incident. Walker Quarries will follow instructions provided by the EPA with respect to further actions and reporting.

Other Authorities and Stakeholders

Walker Quarries will also notify other regulatory authorities and local community (as relevant) in accordance with the procedures nominated in the Quarry Pollution Incident Management Response Management Plan (PIRMP).

10.2.2 Non-compliance

Within seven days of becoming aware of a non-compliance, Walker Quarries will provide written notification to the DPIE by email to compliance@planning.nsw.gov.au.

Written notification of a non-compliance will:

(a) identify the development and application number,

(b) out the condition of this consent that the development is non-compliant with,

(c) why it does not comply and the reasons for the noncompliance (if known), and

(d) what actions have been, or will be, undertaken to address the non-compliance.

It is noted that notification for the purpose of a pollution incident (refer to **Section 10.2.1**), where this describes the non-compliance, satisfies the notification requirements above.

Following notification, an investigation into the source of the non-compliance or complaint commenced in accordance with the response and corrective actions described in *Sections 6.2* and *6.3* of the Quarry *Environmental Management Strategy*.

10.2.3 Complaint

A Complaints Management Procedure is provided in *Section 6.2* of the *Environmental Management Strategy*. Following receipt of a complaint, appropriate action will be taken within two working days to determine the cause and identify appropriate actions to remediate the complaint source. The following details will be recorded following receipt of any dust-related complaint:

- The date and time of the complaint.
- The method by which the complaint was made.
- Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect.
- The nature of the complaint.

Within 48 hours of receipt of a complaint, action to identify the cause of the complaint and identify appropriate actions to remediate this will be commenced. On completion of actions to address the complaint, the following information will be added to the complaint register:

- The action taken in relation to the complaint, including any follow-up contact with the complainant.
- If no action was taken, the reasons why no action was taken.

Complaints of a general nature, e.g. “turbid water from the Quarry” will be investigated and an appropriate response provided to the complainant.

The complaints register maintained on the Walker Quarries website and is updated monthly (http://walkerquarries.com.au/complaint-register/).

10.2.4 Groundwater Inflow

It is not anticipated that extraction activities at the Quarry will encounter groundwater. However, any unanticipated groundwater inflows to the extraction area will be immediately reported to the DPIE and DPIE-Water. In accordance with the contingency management measures nominated in **Section 9.6.2.2**, a report will be issued to DPIE-Water within 7 days of the commencement of inflow and include the following information:

- Time at which direct inflow event observed or inferred.
- Time at which inflow event ceased.
- Duration of the inflow event.
- Estimated volume of groundwater inflow.
- Pit floor elevation at the time which the groundwater inflow event occurred.

The recommendations of DPIE-Water will be followed with extraction from the affected areas of the Quarry only recommencing on approval by DPIE-Water.

10.2.5 Local Bore Impacts

As noted in the response to DPIE-Water provided in **Appendix 6**, the potential for adverse impact on local groundwater bores outside of the Quarry Site is considered to be negligible.

This notwithstanding, in the event Walker Quarries is contacted by a surrounding landowner with a claim of adverse impact on their groundwater supply, the following protocol will be followed.

1. Details of the bore, screened depth, geology and prior water supply will be requested.
2. If not available, Walker Quarries will seek to obtain this information from other sources.
3. Walker Quarries will review groundwater conditions surrounding the extraction area and discuss this in context of the noted impact at the bore with the landowner.
4. Where it cannot be resolved to the satisfaction of Walker Quarries and/or the landowner that the Quarry is not responsible for the impact, the matter will be referred to the DPIE-Water for consideration.
5. If following independent review it is deemed the Quarry has impacted on groundwater supply, Walker Quarries will provide compensatory water supply for as long as the impact is ongoing.

10.3 Incident Reporting

Following implementation and review of the corrective measures, a short description of the incident, actions taken and results of the corrective actions will be documented by the Quarry Manager.

A summary of all incidents, including dates of occurrence, corrective measures taken and success of these measures will be compiled and reported in the Annual Return to the EPA and the Annual Review to the DPIE.

11.0 Data Management and Reporting

11.1 Review and Recording of Monitoring Data

Walker Quarries will retain records of water quality monitoring for a minimum period of four years. Monitoring records will be made available to relevant government authorities following a written request.

11.2 Reporting and publication of monitoring data

Walker Quarries will include all water quality monitoring reports as appendices to the Annual Review. That document, once approved by the relevant government agencies, would be published on Walker Quarries website.

In accordance with the requirements of Section 66(6) of the *Protection of the Environment Operations Act 1997*, each month Walker Quarries will publish all pollution monitoring data on their website. The information will be published within 14 days of the last sample for that period being collected. These requirements are presented in detail in *Requirements for Publishing Pollution Monitoring Data" (EPA, 2013).* A summary of all monitored data will be included in the Annual Return submitted to the EPA.

12.0 Plan Implementation

12.1 Roles and Responsibilities

Table 12.1 outlines the roles and responsibilities of personnel with reference to water management.

Table 12.1 Roles and Responsibilities of Personnel with Respect to Management of Water

Role	Responsibilities
Managing Director	Ensure adequate resources are available to implement the SWMP. Ensure suitably trained personnel are available to implement the responsibilities of the Quarry Manager during any time of the Quarry Manager's absence from site.
Quarry Manager, or his/her nominee	Ensure the implementation of the SWMP. Ensure compliance with the SWMP. Ensure monitoring results are regularly reviewed/evaluated. Review of meteorological forecasts are undertaken on a daily basis prior to the commencement of operations. Implementation of the Water Quality Management System (**Section 6.0**). Relocate or postpone relevant activities in the event of adverse weather conditions. Provide primary contact for complaints and supply follow-up information to any complainant. Initiate investigations of complaints as received from the public or government agency. Prepare a report to government agencies following a notifiable pollution incident (**Section 10.0**). Inform the Managing Director of identified causes of elevated water in storage and any alterations to site operations that may or has influenced stored water volumes. Ensure employees are aware through training and awareness programs.
All On-site Personnel	Operate in manner that minimises risks of incidents to themselves, fellow workers or the surrounding environment. Fully implement the relevant control measures within the SWMP. Report any extraordinary events to the Quarry Manager. Follow any instructions provided by the Quarry Manager.

12.2 Competence Training and Awareness

All personnel and contractors working at the Quarry undergo an induction. This induction includes information on the management of water while working on site.

Regular toolbox meetings are held to discuss whole-of-site production, management, safety and environmental issues. Matters relating to water and water quality are raised during these meetings, when necessary.

12.3 Plan Review

In accordance with *Schedule 5 Condition 5* of DA 344-11-2001, this Plan will be reviewed within three months of the submission of an:

- incident as defined by **Section 10.1**,

- Annual Review[3],
- an Independent Environmental Audit completed in accordance with *Condition 5(14)* of DA 344-11-2001, and
- any modifications to this consent.

It is noted this SWMP has been prepared for the period 2020 – 2025 to coincide with the approved MOP/RMP period. The SWMP will be reviewed (and revised as relevant) in the event the MOP/RMP is varied over the period 2020 – 2025.

Walker Quarries will notify the DPIE in writing of any review being undertaken and if this review results in any revisions to the SWMP, submit a copy to the Secretary of the DPIE for approval (within 6 weeks of the review).

Each review will also evaluate the effectiveness of the overall water quality monitoring program and whether there is scope for modification. This will ensure the adequacy of the SWMP and allow for opportunities for adaptive management and continual improvement.

[3] The Annual Review is due by 30 September each year.

13.0 References

Department of Environment and Conservation (DEC) (2004). Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales, March 2004.

Department of Environment and Climate Change (DECC) (2008). Managing Urban Stormwater – Volume 2E Mines and Quarries.

Environmental Protection Authority (EPA) (2013). Requirements for Publishing Pollution Monitoring Data.

Jacobs Pty Ltd (2019). Wallerawang Quarry - Groundwater Impact Assessment, Wallerawang Quarry Extension. Prepared for Umwelt (Australia) Pty Limited on behalf of Walker Quarries Pty Ltd.

James Bailey & Associates (JBA) (2021). Wallerawang Quarry Independent Environmental Audit for Walker Quarries Pty Ltd, 19 July 2021

Landcom (2004). Managing Urban Stormwater: Soils and Construction, Volume 1, 4th eds.

Pacrim Environmental Pty Ltd (Pacrim) (2001). Environmental Impact Statement for the Proposed Wallerawang Quarry, Report 01/206.1.

Pacrim Environmental Pty Ltd (Pacrim) (2002). Supplementary Report to the EIS for the Proposed Wallerawang, Quarry, Report 02/206.1.

Rangott Mineral Exploration Pty Ltd (RME) (2016a). Wallerawang Quarry Mining Operations Plan, for the period 14 August 2016 to 14 August 2018.

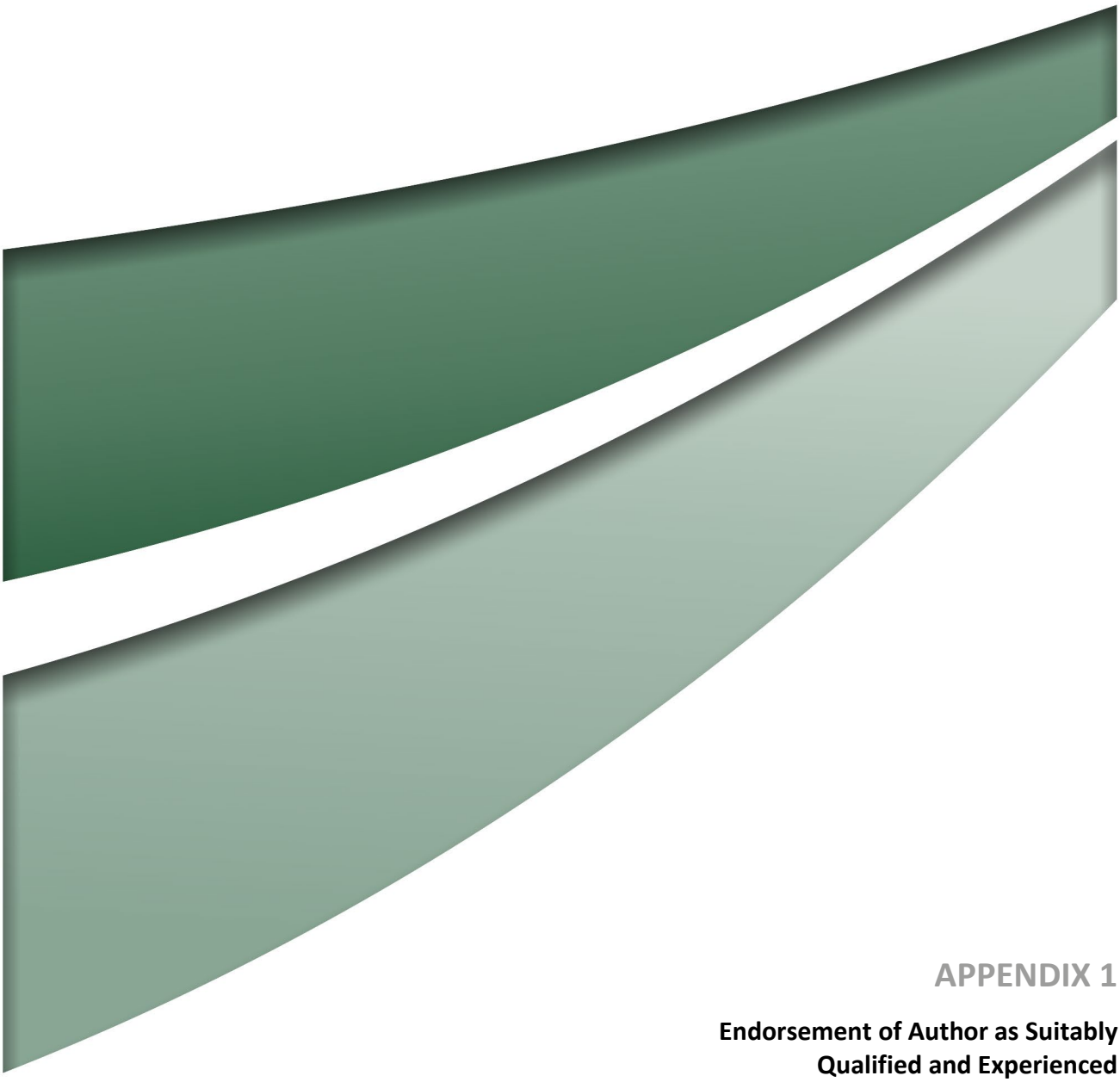
Rangott Mineral Exploration Pty Ltd (RME) (2016b). Annual Environmental Management Report and Annual Review for the Wallerawang Quarry, for the period 1 July 2015 to 30 June 2016.

Rangott Mineral Exploration Pty Ltd (RME) (2017). Annual Environmental Management Report and Annual Review for the Wallerawang Quarry, for the period 1 July 2016 to 30 June 2017.

RW Corkery & Co Pty Limited (RWC) (2017) Environmental Assessment for the Modification to the Operations at the Wallerawang Quarry (DA 344-11-2001).

Sitegoal Pty Ltd (2014). Water Management Plan for Wallerawang Quarry.

Umwelt (Australia) Pty Limited (Umwelt) (2019) Statement of Environmental Effects Wallerawang Quarry Modification 3 (DA 344-11-2001)



APPENDIX 1

Endorsement of Author as Suitably Qualified and Experienced

Mr Alex Irwin
Principal Environmental Consultant

Wallerawang Quarry
963 Great Western Highway
MARRANGAROO NSW 2790

28/05/2020

Dear Mr Irwin

Wallerawang Quarry (DA344-11-2001)
Approval of Expert for Management Plan Preparation

I refer to your request for the Planning Secretary's approval of suitably qualified persons to prepare three management plans required under the Wallerawang Quarry (DA344-11-2001) development consent.

The Department has reviewed the nomination of Mr Alex Irwin, and the supporting information you have provided, and is satisfied that Mr Irwin is suitably qualified and experienced. The Department also notes that Mr Irwin has been previously approved by the Department to prepare the management plans listed below.

Consequently, I can advise that the Planning Secretary approves the appointment of Mr Irwin to prepare and/or revise the following management plans:

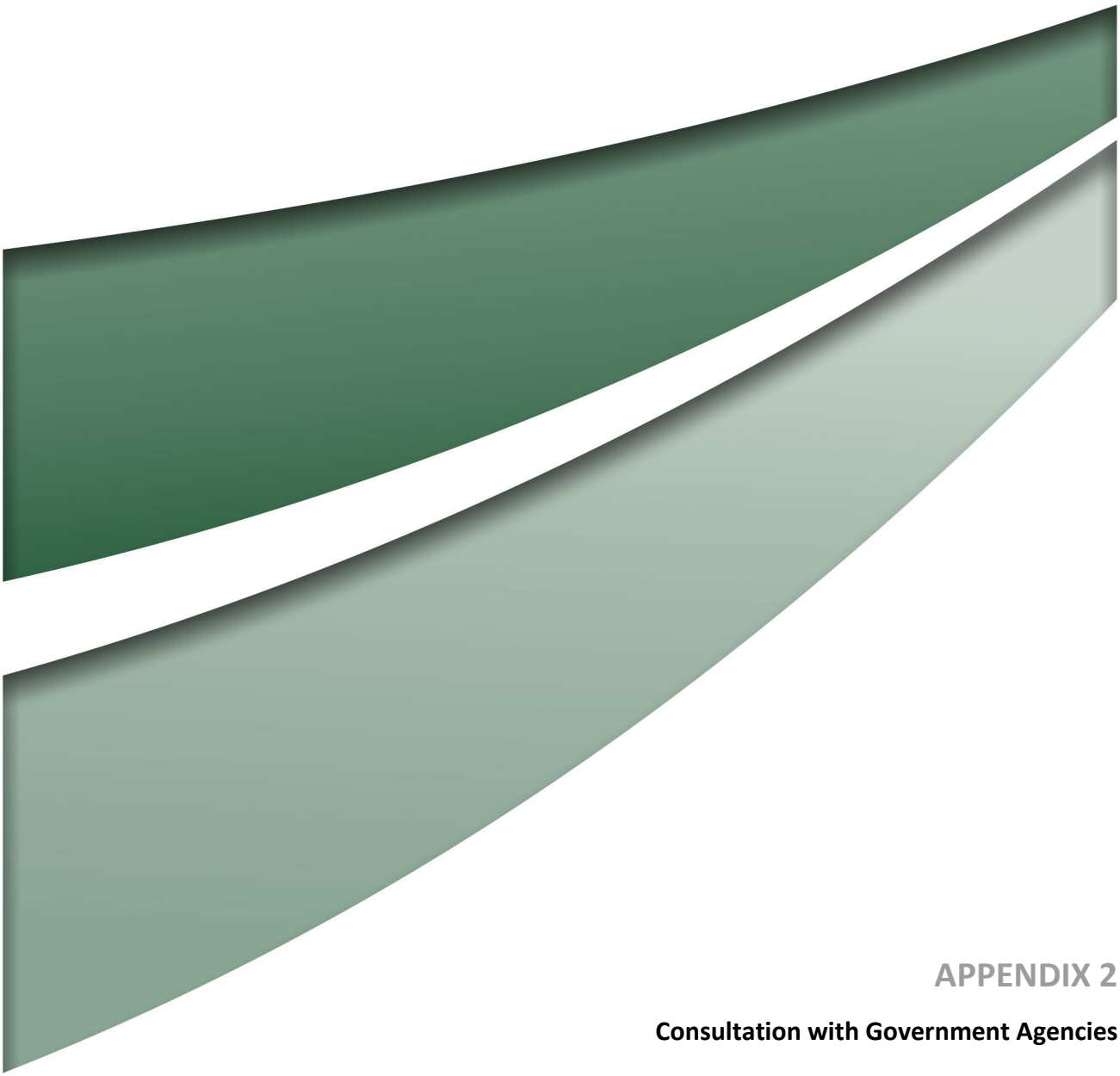
- Soils and Water Management Plan (as required by condition 18(a) of Schedule 3);
- Biodiversity Management Plan (as required by condition 26(a) of Schedule 3); and
- Rehabilitation Management Plan (as required by condition 31(a) of Schedule 3).

If you wish to discuss the matter further, please contact Melissa Anderson on 8275 1392.

Yours sincerely

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

As nominee of the Planning Secretary



APPENDIX 2

Consultation with Government Agencies

Consultation Record

Agency	Consulted on	Replied on	Requests/Requirements	Addressed
EPA	20/07/2016	4/08/2016	None	
	20/10/2017	No reply		
	18/3/2020	9/4/2020	Confirm EPA would not be providing requirements for the Management Plans	
DPI-Water	20/10/2017	Referred within agency on 20/10/2017	No further response received	
DPIE-Water	18/3/2020	No reply	No response received	
WaterNSW	5/08/2016	24/08/2016	None	
	20/10/2017	31/10/2017	The existing Water Management Plan needs to be updated with regards to the modified Quarry operations.	Complete (refer to Figure 3)
			Review of modified catchment and design of erosion and sediment control;	Complete (refer to Appendix 3)
			Review of the site water balance and assessment of potential for impacts associated with the surplus or deficit of water at the quarry site; and	Complete (refer to Section 7)
			Review of the potential for impacts on the receiving environment as a result of the modified features.	Complete (refer to Sections 5, 6, 9 and 10)
	18/3/2020	18/3/2017	Referred to Natural Resource Access Regulator (NRAR)	
	28/10/2020	13/11/2020	Noted SWMP adequately addressed previously comments made during assessment of MOD3	
			Recommendation made to retain, maintain and monitor erosion and sediment control measures on steep slopes	Section 6.4.3
NRAR	18/3/2020 (referred by WaterNSW)	No reply		
	12/8/2020	No response	No response to request for feedback made through Major Projects Portal	
	20/10/2020	No response	No response to email	
	28/10/2020	4/11/2020	Notification of receipt of enquiry	
	20/11/2020	20/11/2020	Confirmation of referral internally. No subsequent response received.	

Consultation Documents (2017)

From: Alex Irwin
Sent: 20 October 2017 2:04 PM
To: John Galea
Subject: 949 - Wallerawang Quarry
Attachments: Notice of Modification_25 August 2017.pdf; 94902f_WMP 2016 - September 2016.pdf

Good afternoon John,

Walker Quarries Pty Ltd received approval for a modification to the project approval for the Wallerawang Quarry (DA 344-11-2001) on 25 August 2017 (attached).

Conditions 3(5) and 3(18) of DA 344-11-2001 require Walker Quarries to consult with DPI-Water in the preparation of a Soil and Water Management Plan and Rehabilitation Management Plan respectively.

With respect to the nominated conditions, and noting that Walker Quarries is currently operating under a Water Management Plan (also attached), can you provide any specific requirements of DPI-Water for the preparation and/or update of these.

I note DA 344-11-2001 requires these plans to be submitted to the Secretary for approval by 25 November 2017 and so we would appreciate any advice as soon as possible.

Regards,

Alex Irwin
Senior Environmental Consultant
(Mobile 0429 635 975)

RW Corkery & Co Pty Limited

Geological and Environmental Consultants

Local Government PROCUREMENT APPROVED CONTRACTOR

Brooklyn
Level 1, 12 Dangar Road
PO Box 239
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Phone: (02) 9985 8511
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Brisbane
Suite 5, Building 3,
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From: Alex Irwin
Sent: 20 October 2017 2:13 PM
To: 'Miles Ellis'
Subject: 949 - Wallerawang Quarry - Requirement to Consult with WaterNSW
Attachments: Notice of Modification_25 August 2017.pdf; 94902f_WMP 2016 - September 2016.pdf

Good afternoon Miles,

Walker Quarries Pty Ltd received approval for a modification to the project approval for the Wallerawang Quarry (DA 344-11-2001) on 25 August 2017 (attached).

Condition 3(18) of DA 344-11-2001 requires Walker Quarries to consult with DPI-Water in the preparation of a Soil and Water Management Plan.

With respect to the nominated condition, and noting that Walker Quarries is currently operating under a Water Management Plan (also attached), can you provide any specific requirements of WaterNSW for the preparation and/or update of this plan.

I note DA 344-11-2001 requires these plans to be submitted to the Secretary for approval by 25 November 2017 and so we would appreciate any advice as soon as possible.

Regards,

Alex Irwin
Senior Environmental Consultant
(Mobile 0429 635 975)

RW Corkery & Co Pty Limited

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From: Ravi Sundaram <ravi.sundaram@waternsw.com.au>
Sent: 31 October 2017 11:55 AM
To: Alex Irwin
Cc: Peter Dupen
Subject: RE: 949 - Wallerawang Quarry - Requirement to Consult with WaterNSW regarding Soil and Water Management

Hello Alex
Thank you for consulting with WaterNSW with regards to preparation of a Soil and Water Management Plan for Wallerawang Quarry as required by the modification project approval for the Wallerawang Quarry (DA 344-11-2001) granted on 25 August 2017. This is proposed to be addressed by updating the existing Water Management Plan (WMP) dated September 2016.
The modification project involves:

- Construction and operation of the Western and Eastern Stockpile Extension Areas (WSEA and ESEA).
  WSEA:
  - Stockpiling of less in-demand product on two benches
  - In-fill of the existing clean water diversion drain passing through the WSEA and piping this clean water diversion beneath the WSEA.
  - Dirty water drains to new Sediment Basin SB6

  ESEA:
  - Stockpiling of less in-demand product
  - Drying of excavated fines from silt dams
  - Dirty water drains to two new Sediment Basins SB7a and SB7b.
- Operation of a screening and washing circuit and associated silt cells (including drying cell) to enable the production of washed aggregate (<7mm) and sand (<5mm) products.
- Rehabilitation of the Quarry inclusive of stockpile areas.

The existing Water Management Plan needs to be updated with regards to the above changes. The Modification application project Environmental Assessment main report notes that:

- The existing WMP already accounts for the disturbance associated with the WSEA and water use and management associated with the operation of the fine aggregate and sand processing operations (and silt cells).
- The WMP however does not include the ESEA or the additional silt drying cell proposed as an additional measure for managing the silt removed from the dine aggregates and sand by washing.

The EA therefore proposes to conduct further assessments in relation to updating the current WMP including:

- Review of modified catchment and design of erosion and sediment control features;
- Review of the site water balance and assessment of potential for impacts associated with the surplus or deficit of water at the quarry site; and
- Review of the potential for impacts on the receiving environment as a result of the modified features.

WaterNSW agrees and supports the above approach.

WaterNSW also notes that silt dams, sediment dam (SB3) and some dirty water diversion drains in Figure 2, Page 3 of the EA main report appear to be within approved extraction area shown in Figure 8, page 31 of the EA main report. This matter should be addressed as part of the proposed update of the existing WMP.

WaterNSW would appreciate receiving a draft copy of the updated Soil and Water Management Plan for review.

Please contact me if you wish to discuss any matter discussed above.

Regards.

Ravi
Dr Ravi Sundaram
Mining Catchment Specialist
WaterNSW
Level 14 169 Macquarie Street
PO Box 398
Parramatta, NSW 2124
www.waternsw.com.au

p.: +61 2 9865 2507
m.: +61 428 226 152/ +61 451 510 194
email: Ravi.Sundaram@waternsw.com.au

From: Alex Irwin [mailto:alex@rwcorkery.com]
Sent: Friday, 20 October 2017 2:13 PM
To: Miles Ellis
Subject: 949 - Wallerawang Quarry - Requirement to Consult with WaterNSW

Good afternoon Miles,

Walker Quarries Pty Ltd received approval for a modification to the project approval for the Wallerawang Quarry (DA 344-11-2001) on 25 August 2017 (attached).

Condition 3(18) of DA 344-11-2001 requires Walker Quarries to consult with DPI-Water in the preparation of a Soil and Water Management Plan.

Consultation Documents (2020)

Alex Irwin

From: Alex Irwin
Sent: Wednesday, 18 March 2020 11:16 AM
To: customer.helpdesk@waternsw.com.au
Subject: 4433_Wallerawang Quarry_Review of Management Plans_Request for WaterNSW Requirements or Recommendations
Attachments: Final Consolidated Consent Mod 3_.pdf

To the relevant officer,

As you may be aware, Walker Quarries received approval for a proposed modification to operations at the Wallerawang Quarry which is operated under State Significant Development 344-11-2001 and EPL 13172.

Wallerawang Quarry currently operates in accordance with a number of environmental management plans required by DA 344-11-2001. Condition 5(5) of DA 344-11-2001 requires that these management plans are reviewed and updated as necessary within 3 months of receiving approval for a modification.

Several of the management plans are prepared in accordance with conditions of DA 344-11-2001 which require consultation with the EPA, namely:

- Condition 18(b) of Schedule 3 requires the Soil and Water Management Plan to be prepared in consultation with WaterNSW.
- Condition 31(b) of Schedule 3 requires the Rehabilitation Management plan to be prepared in consultation with WaterNSW.

I have attached DA 344-11-2001 for the EPA's benefit. The current version of the SWMP can be viewed and downloaded from Walker Quarries website here:

https://walkerquarries.com.au/statutory-information/#section3

It is noted that the Rehabilitation Management Plan has been incorporated into the Mining Operations Plan of the Quarry. This can be viewed and downloaded from Walker Quarries website here:

http://walkerquarries.com.au/statutory-information/#section2

It is requested that WaterNSW provide any requirements for the update of the nominated management plans. It is noted that Umwelt is currently updating these management plans to reflect the modified operations and conditions relating to water. This includes updating the Erosion and Sediment Control Plan for the Quarry.

Alternatively, should the WaterNSW decline the invitation to provide requirements or recommendations for the management plans, a response from WaterNSW to confirm this is requested.

As Walker Quarries has until the 26 May 2020 to resubmit the management plans, a response from WaterNSW by 17 April is requested. Should WaterNSW's preference be to review updated versions of the management plans and comment on these, an earlier response would be appreciated.

Should you require any further information, please do not hesitate to contact me.

Regards,

Alex Irwin
Principal Environmental Consultant

Alex Irwin

From: WaterNSW Advisory Services <water.enquiries@waternsw.com.au>
Sent: Wednesday, 18 March 2020 3:35 PM
To: Alex Irwin
Subject: Re: [Request ID :##375021##] : 4433_Wallerawang Quarry_Review of Management Plans_Request for WaterNSW Requirements or Recommendations

Dear Alex,

Thank you for your recent contact with WaterNSW.

This matter has been forwarded to the Natural Resource Access Regulator (NRAR) as it falls under their jurisdiction.

Should you seek to contact NRAR please do so by either phone: 1800 633 362, or email: nrar.enquiries@nrar.nsw.gov.au

You should receive a response shortly.

Regards,

Ramona Blacklock

Water Regulation (Advisory Services)

WaterNSW
PO Box 398, Parramatta NSW 2124
T: 1300 662 077
E: water.enquiries@waternsw.com.au
www.waternsw.com.au

375021

Wed, Mar 18 11:19:20 EST 2020

Alex Irwin

airwin@umwelt.com.au

4433_Wallerawang Quarry_Review of Management Plans_Request for WaterNSW Requirements or Recommendations

To the relevant officer,

As you may be aware, Walker Quarries received approval for a proposed modification to operations at the Wallerawang Quarry which is operated under State Significant Development 344-11-2001 and EPL 13172.

Alex Irwin

From: Alex Irwin
Sent: Wednesday, 18 March 2020 11:01 AM
To: water.enquiries@dpi.nsw.gov.au
Subject: 4433_Wallerawang Quarry_Review of Management Plans_Request for DPIE-Water Requirements
Attachments: Final Consolidated Consent Mod 3_.pdf

To the relevant officer,

As you may be aware, Walker Quarries received approval for a proposed modification to operations at the Wallerawang Quarry which is operated under State Significant Development 344-11-2001 and EPL 13172.

Wallerawang Quarry currently operates in accordance with a number of environmental management plans required by DA 344-11-2001. Condition 5(5) of DA 344-11-2001 requires that these management plans are reviewed and updated as necessary within 3 months of receiving approval for a modification.

Several of the management plans are prepared in accordance with conditions of DA 344-11-2001 which require consultation with the EPA, namely:

- Condition 18(b) of Schedule 3 requires the Soil and Water Management Plan to be prepared in consultation with DPIE-Water.
- Condition 31(b) of Schedule 3 requires the Rehabilitation Management plan to be prepared in consultation with DPIE-Water.

I have attached DA 344-11-2001 for the EPA's benefit. The current version of the SWMP can be viewed and downloaded from Walker Quarries website here:

https://walkerquarries.com.au/statutory-information/#section3

It is noted that the Rehabilitation Management Plan has been incorporated into the Mining Operations Plan of the Quarry. This can be viewed and downloaded from Walker Quarries website here:

http://walkerquarries.com.au/statutory-information/#section2

It is requested that DPIE-Water provide any requirements for the update of the nominated management plans. It is noted that Umwelt is currently updating these management plans to reflect the modified operations and conditions relating to water. This includes updating the Erosion and Sediment Control Plan for the Quarry.

Alternatively, should the DPIE-Water decline the invitation to provide requirements or recommendations for the management plans, a response from DPIE-Water to confirm this is requested.

As Walker Quarries has until the 26 May 2020 to resubmit the management plans, a response from the EPA by 17 April is requested. Should the EPA's preference be to review updated versions of the management plans and comment on these, an earlier response would be appreciated.

Should you require any further information, please do not hesitate to contact me.

Regards,

Alex Irwin
Principal Environmental Consultant

Alex Irwin

From: Industry - FeedbackAssist <industry.feedback@industry.nsw.gov.au>
Sent: Wednesday, 18 March 2020 4:56 PM
To: Alex Irwin
Subject: Enquiry Acknowledgement - 00052546

New South Wales Government

nsw.gov.au

RECEIVED IN PROGRESS COMPLETE

Dear Alex,

Thank you for taking the time to contact DPIE Water. Your SSD enquiry for Wallerawang Quarry has been assigned to a staff member, who will look into this matter and will follow up with you within 5 business days.

If you need more information or would like an update in the meantime, please contact us by replying to this email.

Yours sincerely,
Fiona Nuttall

ref:_00D6F1OCz9._5006F2ZwTSY:ref

ref:_00D6F1OCz9._5006F2ZwTSY:ref

Alex Irwin

From: Alex Irwin
Sent: Wednesday, 18 March 2020 9:59 AM
To: EPA RSD Central West Mailbox
Subject: 4433_Wallerawang Quarry_Review of Management Plans_Request for EPA Requirements
Attachments: Final Consolidated Consent Mod 3_.pdf

To the relevant officer,

As you may be aware, Walker Quarries received approval for a proposed modification to operations at the Wallerawang Quarry which is operated under State Significant Development 344-11-2001 and EPL 13172.

Wallerawang Quarry currently operates in accordance with a number of environmental management plans required by DA 344-11-2001. Condition 5(5) of DA 344-11-2001 requires that these management plans are reviewed and updated as necessary within 3 months of receiving approval for a modification.

Several of the management plans are prepared in accordance with conditions of DA 344-11-2001 which require consultation with the EPA, namely:

- Condition 5 of Schedule 3 requires the Noise Management Plan to be prepared in consultation with the EPA.
- Condition 18 of Schedule 3 requires the Soil and Water Management Plan to be prepared in consultation with the EPA.

I have attached DA 344-11-2001 for the EPA's benefit. The current version of the management plans can be viewed and downloaded from Walker Quarries website:

https://walkerquarries.com.au/statutory-information/#section3

It is requested that the EPA provide any requirements for the update of the nominated management plans. It is noted that Umwelt is currently updating these management plans to reflect the modified operations and conditions relating to noise and water.

Alternatively, should the EPA decline the invitation to provide requirements or recommendations for the management plans (as has previously been the case), a response from the EPA to confirm this is requested.

As Walker Quarries has until the 26 May 2020 to resubmit the management plans, a response from the EPA by 17 April is requested. Should the EPA's preference be to review updated versions of the management plans and comment on these, an earlier response would be appreciated.

Should you require any further information, please do not hesitate to contact me.

Regards,

Alex Irwin
Principal Environmental Consultant

Umwelt (Australia) Pty Limited
Office 1, 3 Hampden Avenue
Orange, NSW 2800

Phone: (02) 4950 5322
Mobile: 0436 606 529

Our reference DOC20/251208-2
Contact David Joseph; (02) 6333 3822

Alex Irwin
Umwelt (Australia) Pty Ltd
Office 1, 3 Hampden Avenue
Orange NSW 2800

09 April 2020

Dear Mr Irwin

Request to Review Environmental Management Plans for Wallerawang Quarry

I refer to the request to the NSW Environment Protection Authority (EPA) to provide input to assist Umwelt to update the Environmental Management Plans for the Wallerawang Quarry (the premises).

The EPA encourages the development of Environmental Management Plans to ensure that proponents have determined how they will meet their statutory obligations and environmental objectives as specified by any Project Approval and/or the conditions of an environment protection licence.

Please note, the EPA's role is to set conditions/criteria for environmental protection and management, not to be directly involved in the development of strategies to comply with such conditions/criteria. On this occasion the EPA will not be providing requirements to update these plans.

Where the EPA does conduct reviews and provide comments on management plans its preference is to do this for updated versions of the plans. The EPA therefore requests that these updated versions be forwarded to the EPA when available.

As a management tool, such plans should assist Wallerawang Quarry in meeting its commitment to statutory compliance and wider environmental management and where appropriate should be integrated with other operational or management plans. The EPA recommends that such plans be audited to an industry standard or certified to the ISO 14001 standard (if applicable) as part of any overall environmental management system.

Should you have any further enquiries in relation to this matter please contact Mr David Joseph at the Central West (Bathurst) Office of the EPA by telephoning (02) 6333 3822 or via email to central.west@epa.nsw.gov.au

Yours sincerely

SHERIDAN LEDGER
Unit Head Central West Region
Environment Protection Authority

Phone 131 555
Phone +61 2 6333 3800
(from outside NSW)
Fax +61 2 9995 5999
TTY 133 677
ABN 43 692 285 758
PO Box 1388
Bathurst
NSW 2795 Australia
L102,346 Panorama Avenue
Bathurst NSW
2795 Australia
info@epa.nsw.gov.au
www.epa.nsw.gov.au

Provide Advice to Proponent

Actions

Assignments

Below is the list of Assignments

No work assigned

Engagement Details

Proponent Request

Public Authority Name	Reason for Consultation / Expected Results	Due Date
Natural Resources Access Regulator	Post Approval	09/09/2020

Engagement Notes

Attached is a revised version of the Soil and Water Management Plan for the Wallerawang Quarry, prepared following approval of DA 344-11-2001-MOD3 and previously submitted to the Department of Planning, Industry and Environment on 21 May 2020 and 14 August 2020 after first review by the DPIE.
Comment from NRAR is sought to confim the content of the SWMP is to the satisfaction of NRAR, or identify where additional information is requested or required.

Attachments

SWMP_August 2020_V2.2
PAE-9011915 | Request Advice on Post Approval - Proponent | Alex Irwin

Alex Irwin

From: Alex Irwin
Sent: Tuesday, 20 October 2020 2:58 PM
To: nrar.enquiries@nrar.nsw.gov.au
Subject: 4433_Wallerawang Quarry_Soil and Water Management Plan

Good afternoon,

A Soil and Water Management Plan has been prepared for the Wallerawang Quarry as a condition of State Significant Development DA 344-11-2001_MOD3.

While consultation with NRAR was not prescribed by the relevant condition of development consent (Condition 3(18), our request for content requirements was originally forwarded to NRAR (by WaterNSW) on 18 March. No feedback was received and we prepared and submitted the SWMP to DPIE.

DPIE subsequently requested we consult with NRAR and a request to review the SWMP was lodged using DPIE's Major Projects Portal in late August.

https://majorprojects.planningportal.nsw.gov.au/prweb/IAC/nFOlhaSdMtGYtjTH1uzqzw%5B%5B*/!STANDARD?pzPostData=1169856024

No feedback has been received and I am seeking to confirm whether NRAR intends on providing any comment on the SWMP.

Regards,

Alex Irwin
Principal Environmental Consultant

Umwelt (Australia) Pty Limited
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Orange, NSW 2800

Phone: (02) 4950 5322
Mobile: 0436 606 529

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Alex Irwin

From: Juri Jung <Juri.Jung@waternsw.com.au>
Sent: Friday, 13 November 2020 4:26 PM
To: Alex Irwin
Cc: kerryburke2@bigpond.com; Wayne Jones; Ravi Sundaram
Subject: RE: 4433_Wallerawang Quarry Soil and Water Management Plan

Hi Alex,

Thanks for consulting with WaterNSW regarding this SWMP.

I have reviewed and consider that this report was updated adequately, reflecting Water NSW's previous comments on:

- Future clean water diversion
- Erosion & sediment control plan
- Surface water monitoring.

During the review, I noted only sediment fences were proposed on steep slope area near the Coxs River (Figure S3, South of future quarry). WaterNSW recommend that during the works, the erosion and sediment measures shall be retained, maintained and monitored to ensure the measures are working effectively on the slope.

Furthermore, I have contacted NRAR to pass this report for review (note this is not WaterNSW's referral, the applicant needs approval under Water Management Act S91) and NRAR can get back to you. NRAR also advised me that any documents for referral or approval should be sent to nrar.servicedesk@dpie.nsw.gov.au.

If you have any other questions, please feel free to contact me via email or mobile.

Kind regards,
Juri Jung
Catchment Assessment Officer
For noting: *I am currently working remotely. Please reach me via email or 0418 986 712.*

Level 14, 169 Macquarie Street
PO Box 398
Parramatta NSW 2124
M: 0418 986 712
juri.jung@waternsw.com.au
www.waternsw.com.au

From: Alex Irwin <airwin@umwelt.com.au>
Sent: Wednesday, 28 October 2020 2:45 PM
To: Environmental Assessments <Environmental.Assessments@waternsw.com.au>
Cc: kerryburke2@bigpond.com; Wayne Jones <wayne.jones@planning.nsw.gov.au>
Subject: 4433_Wallerawang Quarry Soil and Water Management Plan

To the relevant officer,

After speaking with Ms Juri Jung this afternoon, I provide a copy of a Soil and Water Management Plan prepared following approval of DA 344-11-2001_MOD3 for review and comment.

I note that initial correspondence sent to WaterNSW seeking requirements for inclusion in the SWMP was referred to NRAR. At the time no response was received from NRAR. On request from the Department of Planning, industry and Environment (DPIE), we have forwarded the SWMP to NRAR via the Major Projects Portal and nrar.enquiries@nrar.nsw.gov.au email address.

No response has been provide by NRAR to this point and on advice from DPIE we have again contact WaterNSW.

Any comments on the SWMP will be considered and the document updated before being resubmitted to the DPIE for final assessment and approval.

If possible, could comments be provided by 13 November 2020.

Kind regards,

Alex Irwin
Principal Environmental Consultant

Umwelt (Australia) Pty Limited
Office 1, 3 Hampden Avenue
Orange, NSW 2800

Phone: (02) 4950 5322
Mobile: 0436 606 529

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Alex Irwin

From: Jane Curran <jane.curran@nrar.nsw.gov.au>
Sent: Friday, 20 November 2020 3:31 PM
To: Alex Irwin
Cc: Wayne Jones
Subject: RE: FIN0179164 : NRAR- 4433_Wallerawang Quarry_Soil and Water Management Plan

Hi Alex, an officer from DPIE Water has been assigned and its expected to be coming through soon, likely next week.

Kind regards,

Jane Curran | Water Regulation Officer
Natural Resources Access Regulator | Water Regulation (East)
Level 0 | 84 Crown Street | Wollongong NSW 2500
PO Box 53 Wollongong NSW 2520
T: +61 2 *4275 9327* | F: +61 2 *4224 9740*
E: jane.curran@nrar.nsw.gov.au
W: www.industry.nsw.gov.au

NSW GOVERNMENT | Natural Resources Access Regulator

From: Alex Irwin <airwin@umwelt.com.au>
Sent: Friday, 20 November 2020 2:50 PM
To: Jane Curran <jane.curran@nrar.nsw.gov.au>
Cc: Wayne Jones <wayne.jones@planning.nsw.gov.au>
Subject: RE: FIN0179164 : NRAR- 4433_Wallerawang Quarry_Soil and Water Management Plan

Jane,

Yes, the current date for resubmission is 27 November.

If you could advise when we can expect DPIE Water's review that will assist as I will have to seek another extension to submission date.

Regards,

Alex Irwin
Principal Environmental Consultant

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Orange, NSW 2800

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Please consider the environment before printing this email

From: Jane Curran <jane.curran@nrar.nsw.gov.au>
Sent: Friday, 20 November 2020 2:45 PM
To: Alex Irwin <airwin@umwelt.com.au>
Subject: RE: FIN0179164 : NRAR- 4433_Wallerawang Quarry_Soil and Water Management Plan

Hi Alex,

Are you meaning next Friday 27th Nov? The review by DPIE Water Groundwater team will not be ready by today. I'll chase up the review for next Friday delivery.

Kind regards,

Jane Curran | Water Regulation Officer
Natural Resources Access Regulator | Water Regulation (East)
Level 0 | 84 Crown Street | Wollongong NSW 2500
PO Box 53 Wollongong NSW 2520
T: +61 2 *4275 9327* | F: +61 2 *4224 9740*
E: jane.curran@nrar.nsw.gov.au
W: www.industry.nsw.gov.au

From: Alex Irwin <airwin@umwelt.com.au>
Sent: Friday, 20 November 2020 1:50 PM
To: Jane Curran <jane.curran@nrar.nsw.gov.au>
Subject: RE: FIN0179164 : NRAR- 4433_Wallerawang Quarry_Soil and Water Management Plan

Good afternoon Jane,

Are you able to provide any further advice on review timelines for this?

I note WaterNSW have provided me with a response and noted no additional detail being required.

The Department of Planning, Industry & Environment have requested I resubmit the Soil and Water Management Plan for Secretary's review and approval by next Friday (20/11). Is it likely we will have feedback from NRAR before then.

Regards,

Alex Irwin
Principal Environmental Consultant

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Orange, NSW 2800

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Mobile: 0436 606 529

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From: Jane Curran <jane.curran@nrar.nsw.gov.au>
Sent: Wednesday, 4 November 2020 4:57 PM
To: Alex Irwin <airwin@umwelt.com.au>
Subject: FW: FIN0179164 : NRAR- 4433_Wallerawang Quarry_Soil and Water Management Plan

Hi Alex,

I have received the below enquiry into the review of the Soil and Water Management Plan for Wallerawang Quarry. I have made the matter a priority with the DPIE Water team for their review. I'm yet to hear from them on a due date for this one.

Kind regards,

Jane Curran | Water Regulation Officer
Natural Resources Access Regulator | Water Regulation (East)
Level 0 | 84 Crown Street | Wollongong NSW 2500
PO Box 53 Wollongong NSW 2520
T: +61 2 *4275 9327* | F: +61 2 *4224 9740*
E: jane.curran@nrar.nsw.gov.au
W: www.industry.nsw.gov.au

From: CS Connect Service Centre <cspconnect@service-now.com>
Sent: Wednesday, 28 October 2020 3:50 PM
To: NRAR Service Desk Mailbox <nrar.servicedesk@dpie.nsw.gov.au>
Subject: FIN0179164 : NRAR- 4433_Wallerawang Quarry_Soil and Water Management Plan

Cloned Ticket/s- NO
Customer Name - Alex Irwin
Phone Number - Phone: (02) 4950 5322 Mobile: 0436 606 529
Email Address - airwin@umwelt.com.au
Location - Wallerawang NSW
Reference No - DA 344-11-2001_MOD3.
Details -28/10
Alex has called again today to follow up on his enquiry
He explained that this was originally logged with DPIE water he is desperately requesting correspondence on a

update for his enquiry.
Can NRAR please assist

Could NRAR please respond to Alex as she has submitted this enquiry in MARCH 2020.

received from: airwin@umwelt.com.au

Good afternoon,

A Soil and Water Management Plan has been prepared for the Wallerawang Quarry as a condition of State Significant Development DA 344-11-2001_MOD3.

While consultation with NRAR was not prescribed by the relevant condition of development consent (Condition 3(18), our request for content requirements was originally forwarded to NRAR (by WaterNSW) on 18 March. No feedback was received and we prepared and submitted the SWMP to DPIE.

DPIE subsequently requested we consult with NRAR and a request to review the SWMP was lodged using DPIE's Major Projects Portal in late August.

https://majorprojects.planningportal.nsw.gov.au/prweb/IAC/nFOlhaSdMtGYtjTH1uzqzw%5B%5B*/!STANDARD?pzPostData=1169856024

No feedback has been received and I am seeking to confirm whether NRAR intends on providing any comment on the SWMP.

Regards,

Alex Irwin
Principal Environmental Consultant

Umwelt (Australia) Pty Limited
Office 1, 3 Hampden Avenue
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Ref:MSG1623769_yrp9h5A6PH5G5gYW3UsN

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Alex Irwin

From: Alex Irwin
Sent: Friday, 23 April 2021 11:03 AM
To: Wayne Jones
Subject: RE: Wallerawang Quarry SWMP Review

Wayne,

A belated reply to your queries is provided below. I have been discussing the matter of the DPIE-Water comment re: compensatory water supply and additional monitoring with Walker Quarries and will soon be in a position to resubmit the SWMP.

SWMP does not document what occurs on site in the interval between start and completion of 'review' and how discharge water quality is managed to below discharge criteria prior to discharge.
A review has been completed and on the basis of this review, the nominated flocculent is considered the most appropriate. Gypsum was trialled, using various application method, however, potentially due to the volume of water or nature of the sediments this proved ineffective.
Other commercially available products were reviewed, however, none presented better environmental factors (LC_{50}, EC_{50}).
Further information on the use of the product, along with product information and SDS, is now included in the SWMP.

What occurs on site if water quality limits cannot be met and site needs to discharge as there is no capacity left? 41ML/year discharge is much larger than SD 4/8mL capacity?
It is noted that the water balance results were considered for each individual catchment and without considering the ability of the operator to transfer water between storages. In reality, Walker Quarries has the ability to, and traditionally has transferred water between water storages such that controlled discharges have not been required. A new void space has been constructed in the pit for the purpose of accepting and storing surplus water. Discharges have historically only occurred following rainfall events exceeding the 5-day 95th percentile (under which discharge water quality criteria are not applicable). This includes the last six months where rainfall has been above average.
Further discussion on this is now included in the SWMP.
In the event the water quality of a controlled discharge exceeds criteria, following addition of floculant, this would be identified and reported as an incident (in accordance with nominated management procedures within the SWMP)

Regards,

Alex Irwin
Principal Environmental Consultant

Umwelt (Australia) Pty Limited
Office 4, 3 Hampden Avenue
Orange, NSW 2800

Phone: (02) 4950 5322
Direct: (02) 4907 0123
Mobile: 0436 606 529

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From: Wayne Jones <wayne.jones@planning.nsw.gov.au>
Sent: Tuesday, 22 December 2020 4:00 PM
To: Alex Irwin <airwin@umwelt.com.au>
Subject: Wallerawang Quarry SWMP Review

Hi Alex,

I have reviewed the SWMP for Wallerawang Quarry again and I am having trouble seeing continuity in the document contents.

Hopefully you can provide some feedback to allow me to understand how sediment laden discharge water will be managed onsite for the next 6-9 months.

I have extracted text from the following sections:

Section 6.4.4 Sediment Settling Agents
Quarry previous used anionic acrylamide copolymer flocculent to allow water quality suitable to discharge.
Cease use of flocculent whilst 'review' is undertaken.
Complete the 'review' 6 months after obtaining water supply and use approval. When did the 'review' commence?

Section 7.3.3 Water Discharges
Table 7.2 SD1/SD1B discharge 41.4ML/year
Table 7.1 SD1/SD1B discharges 67 days a year

Conclusion
SWMP does not document what occurs on site in the interval between start and completion of 'review' and how discharge water quality is managed to below discharge criteria prior to discharge.

What occurs on site if water quality limits cannot be met and site needs to discharge as there is no capacity left? 41ML/year discharge is much larger than SD 4/8mL capacity?

I hope you can provide me with some feedback to better understand the SWMP.

Cheers Wayne

Wayne Jones
Team Leader - Post Approval
Energy, Industry and Compliance | Planning and Assessment
Department of Planning, Infrastructure & Environment | GPO Box 3145 | Singleton NSW 2330
T 02 65753406 M 0437 533 549
E wayne.jones@planning.nsw.gov.au

From: Alex Irwin <airwin@umwelt.com.au>
Sent on: Wednesday, September 21, 2022 1:19:17 AM
To: nrar.enquiries@nrar.nsw.gov.au
CC: Caroline Gazi <CGazi@umwelt.com.au>
Subject: 4433_Wallerawang Quarry_Consultation re: Soil and Water Management Plan

Good morning,

An update to the Soil and Water Management Plan (SWMP) for the Wallerawang Quarry was completed late last year and submitted to the Department of Planning & Environment (DPE) for approval.

It is noted that Condition 18 of Schedule 3 of DA 344-11-2001 requires that the SWMP is prepared in consultation with the Water NSW. It is noted we originally consulted with the Water NSW in March 2020 regarding the SWMP but were referred to NRAR.

DPE has requested we consult with Water NSW again and address any comments on the updated version of the MP provided by WaterNSW. Based on previous advice, we have referred to both WaterNSW and NRAR.

Please find a link to the updated version of the SWMP (including a version with tracked edits).

https://umwelt.sharefile.com/d-s3d14e444f3a24098996662e71fc01bc6

Based on our required response date to DPE, it is requested NRAR provide any comments, or confirm no comments at this time, by 7 October 2022.

Regards,

Alex Irwin
Principal Environmental Consultant- NSW Major Projects

Umwelt (Australia) Pty Limited
Phone: 1300 793 267
Mobile: 0436 606 529

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From: Alex Irwin <airwin@umwelt.com.a
Sent on: Wednesday, September 21, 2022 1:
To: Helpdesk@waternsw.com.au; wate u
CC: Caroline Gazi <CGazi@umwelt.co
Subject: 4433_Wallerawang Quarry_Consul nagement Plan

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https://umwelt.sharefile.com/d-s3d14e444f3a24098996662e71fc01bc6

Based on our required response date to DPE, it is requested WaterNSW provide any comments, or confirm no comments at this time, by 7 October 2022.

Regards,

Alex Irwin
Principal Environmental Consultant- NSW Major Projects

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From: Alex Irwin <airwin@umwelt.com.au>
Sent on: Wednesday, September 21, 2022 1:11:49 AM
To: info@epa.nsw.gov.au
CC: Caroline Gazi <CGazi@umwelt.com.au>
Subject: 4433_Wallerawang Quarry_Consultation re: Soil and Water Management Plan

Good morning,

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Please find a link to the updated version of the SWMP (including a version with tracked edits).

https://umwelt.sharefile.com/d-s3d14e444f3a24098996662e71fc01bc6

DPE has requested we address any comments on the updated version of the SWMP provided by EPA.

Based on our required response date to DPE, it is requested EPA provide any comments, or confirm no comments at this time, by 7 October 2022.

It is noted that an attempt to send to central.west@epa.nsw.gov.au was unsuccessful. The relevant EPA office would be Bathurst.

Regards,

Alex Irwin
Principal Environmental Consultant- NSW Major Projects

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From: Alex Irwin <airwin@umwelt.com.au>
Sent on: Wednesday, September 21, 2022 1:07:53 AM
To: EPA RSD Central West Mailbox <central.west@epa.nsw.gov.au>
CC: Caroline Gazi <CGazi@umwelt.com.au>
Subject: 4433_Wallerawang Quarry_Consultation re: Soil and Water Management Plan

Good morning,

An update to the Soil and Water Management Plan (SWMP) for the Wallerawang Quarry was completed late last year and submitted to the Department of Planning & Environment (DPE) for approval.

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Based on our required response date to DPE, it is requested EPA provide any comments, or confirm no comments at this time, by 7 October 2022.

Regards,

Alex Irwin
Principal Environmental Consultant- NSW Major Projects

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From: Ravi Sundaram <ravi.sundaram@waternsw.com.au>
Sent on: Friday, October 14, 2022 1:33:35 AM
To: Alex Irwin <airwin@umwelt.com.au>
CC: Wayne Jones <wayne.jones@planning.nsw.gov.au>; Girja Sharma <Girja.Sharma@waternsw.com.au>; Juri Jung <Juri.Jung@waternsw.com.au>
Subject: RE: 4433_Wallerawang Quarry Updated Soil and Water Management Plan 2022

Hello Alex
I
have reviewed and consider that this report was updated adequately, reflecting Water NSW's comments provided in 2020 on the previous version of the SWMP and Mod 3 environmental assessment.

However, the climatic conditions have changed since 2021 with wetter weather conditions due to La Nina phenomenon which is expected to continue well into 2023. These conditions may have potential for increased sediment and pollutant runoff with resulting water quality issues in the Upper Coxs river.

WaterNSW recommends that:

- A review of the soil and erosion controls especially the volumes of dirty and clean water dams be undertaken to ensure there is minimum risk of unplanned discharges from the quarry site.
- Another water quality monitoring site immediately downstream of the Wallerawang Quarry site in the Coxs River be considered in addition to site SW4 (WaterNSW gauging station, approximately 6.6 km downstream of Tributary A discharge point to the Coxs River). SW4 is located further downstream after the confluence of Marangaroo Creek and Coxs River and includes surface water runoff influence of cleared rural and residential land, the Lithgow Correctional Facility and Marrangaroo Quarry.

Please feel free to contact me if you need to discuss.
Please also send all future correspondence to environmental.assessments@waternsw.com.au to ensure prompt and timely responses from WaterNSW.

Regards
Ravi

Ravi Sundaram (he/him)
Mining Catchment Specialist

PO Box 398, Parramatta NSW 2124
Level 14, 169 Macquarie Street
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ravi.sundaram@waternsw.com.au
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On Wednesday 21, September 11:18:46 AM AEST, 'Alex Irwin <airwin@umwelt.com.au>' wrote:

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You have not previously corresponded with this sender.
Be careful opening emails, attachments and links from unknown senders.

Good morning,

An update to the Soil and Water Management Plan (SWMP) for the Wallerawang Quarry was completed late last year and submitted to the Department of Planning & Environment (DPE) for approval.

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Based on our required response date to DPE, it is requested WaterNSW provide any comments, or confirm no comments at this time, by 7 October 2022.

Regards,

Alex Irwin
Principal Environmental Consultant- NSW Major Projects

Umwelt (Australia) Pty Limited
Phone: 1300 793 267

DOC22/905888-1

Alex Irwin
Principal Environmental Consultant- NSW Major Projects
Umwelt (Australia) Pty Limited

Via email: airwin@umwelt.com.au
Cc: Wayne Chapman Quarry Manager waynec@walkerquarries.com.au

19 October 2022

Dear Mr Irwin,

Wallerawang Quarry Soil and Water Management Plan

I refer to your request received by the Environment Protection Authority (EPA) on 21 September 2022 seeking comment on the *Wallerawang Quarry Soil and Water Management Plan version 4 (November 2021)* (the Plan) for the Wallerawang Quarry operated by Walkers Quarries Pty Limited (the licensee).

The EPA notes the Plan has been prepared in accordance with the requirements of Schedule 3 Condition 18 of Development Consent (DA344-11-2001) and consultation with the EPA.

The EPA encourages the development of Environmental Management Plans/Programs to ensure that proponents have determined how they will meet their statutory obligations and environmental objectives as specified by any Project/Development Approval and/or the conditions of an environment protection licence. Please note, however, that it is not the EPA's role to endorse these plans, given the EPA sets conditions/criteria for environmental protection and management and, therefore, cannot be directly involved in the development of strategies to comply with such conditions/criteria.

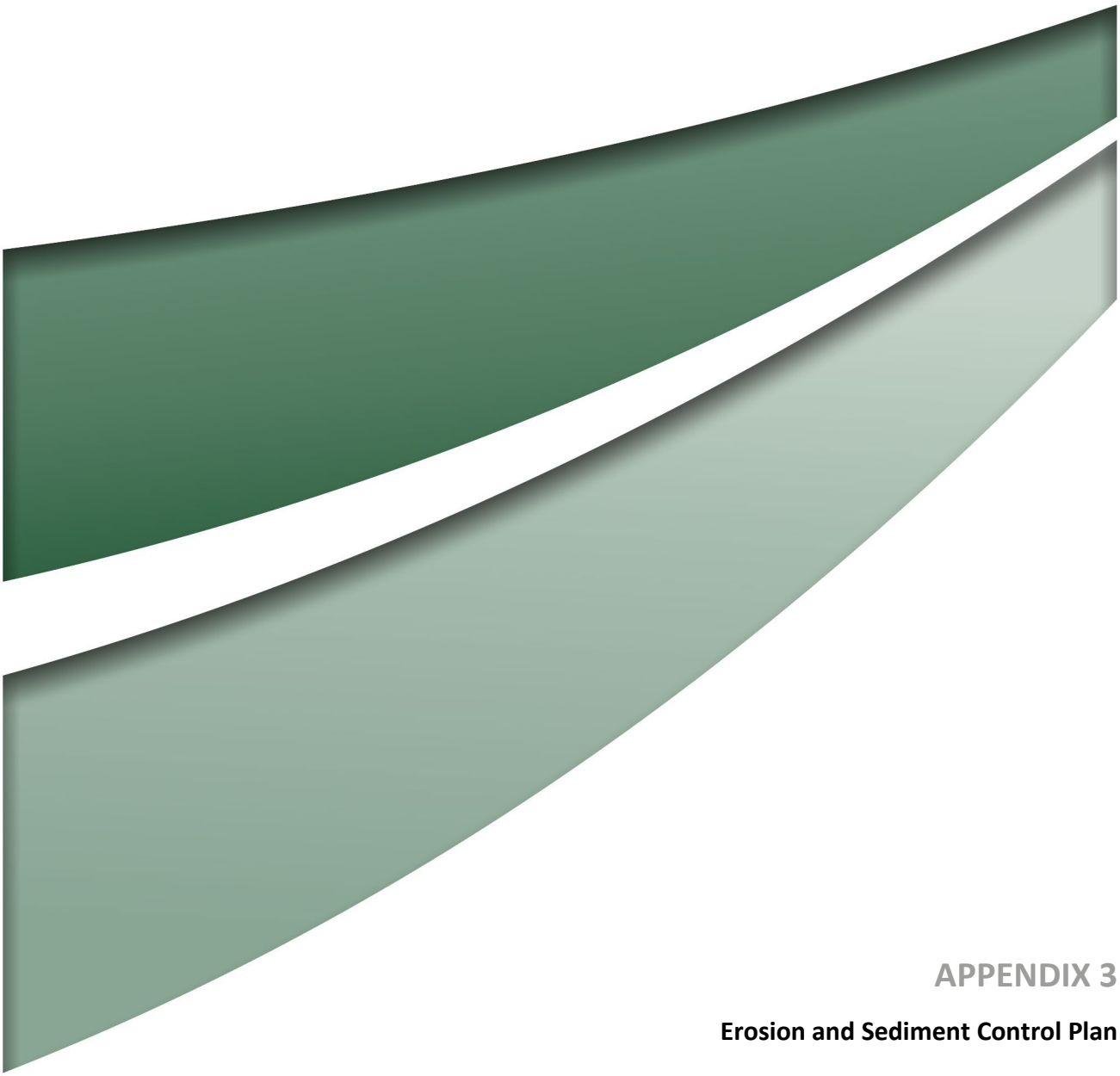
As a management tool, the Plan should assist the licensee in meeting their commitment to statutory compliance and wider environmental management and, where appropriate, should be integrated with other operational or management strategies.

In this instance, the EPA has reviewed the Plan. While the EPA has no specific comments to make about the content of the Plan, please note, the EPA concurs that Environment Protection Licence 13172 (the licence), in particular condition P1.3, will require variation to reference the updated Plan, should it be approved by the Department of Planning and Environment. The EPA recommends that the licensee applies to vary the licence as soon as possible post any approval to facilitate this change.

If you have any specific questions regarding this matter, please contact Mrs Samantha Hayes on (02) 6333 3806 or via e-mail at EPA.Southopsregional@epa.nsw.gov.au. For general enquiries to the EPA, please call (02) 9995 5000 or e-mail info@epa.nsw.gov.au.

Yours sincerely

SHERIDAN LEDGER
A/Manager
Regulatory Operations Regional South



APPENDIX 3

Erosion and Sediment Control Plan

Walker Quarries

EROSION AND SEDIMENT CONTROL PLAN

Wallerawang Quarry

FINAL

December 2020

umwelt
Environmental & Social Consultants

EROSION AND SEDIMENT CONTROL PLAN

Wallerawang Quarry

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Walker Quarries Pty Limited

Project Director:	Alex Irwin
Project Manager:	Alex Irwin
Report No.	4433/R16
Date:	December 2020

Lithgow

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
1	Alex Irwin	30/4/2020	Johann van der Merwe (Walker Quarries)	12/5/2020
2	Alex Irwin	10/12/2020	Johann van der Merwe (Walker Quarries)	11/12/2020

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EROSION AND SEDIMENT CONTROL PLAN

SCOPE

- This Erosion and Sediment Control Plan (ESCP) has been prepared to satisfy Schedule 3 Condition 18(d) of Development Consent DA 344-11-2001 for the Wallerawang Quarry ("the Quarry") of Walker Quarries.
- Specifically, this ESCP provides for a detailed description of the surface water management system on site.
- The ESCP provides for the management of rainfall and runoff (Stormwater Management), management of erosion and sediment control (Erosion and Sediment Control Management) and mitigation of associated impacts, during the operation of the Quarry.
- The ESCP has been prepared with reference to:
  - Managing Urban Stormwater: Soils and Construction, Vol. 1 Second ed., Landcom, NSW, Sydney (Landcom, 2004) ("the Blue Book"),
  - Managing Urban Stormwater: Soils and Construction, Volumes 2C and 2E (DECC, 2008), and
  - Managing Urban Stormwater: Council Handbook (EPA, 1997) ("the Council Handbook") (in lieu of a Stormwater Management Plan for the Coxs River Catchment).
- The ESCP describes the Best Management Practices (BMPs) that will be employed to minimise soil erosion and discharge of sediment and other pollutants to lands and/or waters associated with activities at the Quarry.
- The BMPs, i.e. diversion banks, sediment fencing, drains and sediment basin are to remain in place and be maintained for the life of the Quarry or unless otherwise instructed.
- The ESCP is valid for the Establishment and Modified Operations Phases (as defined by **Figures S1** and **S2** – refer to **Sheets 06** and **07**), however, will be reviewed (and updated as necessary) annually or:
  - in the event of progression to the Future Operations Phase (as defined by **Figure S2**),
  - following any incident resulting in water pollution,
  - on request by the Department of Planning, Industry & Environment or relevant government regulator.

MANAGEMENT OBJECTIVES

The objective of the ESCP are as follows.

- To facilitate the movement, storage and discharge of rainfall and runoff within and from the Quarry to:
  - prevent or minimise pollution,
  - maximise ecological sustainability, and
  - promote adaptive management.
- To minimise the water-quality impacts from erosion and sedimentation through implementing best practice management techniques. More specifically:
  - To minimise the loss of topsoil from areas disturbed by mining activities.
  - To ensure runoff from disturbed (and unrehabilitated) catchments is controlled and captured by sediment control systems.
  - To prevent active erosion of stabilised areas.
  - To ensure no increase in sediment deposition of receiving waters.
- To have no other detrimental impact on the water quality of downstream watercourses and water bodies.

PRINCIPLES OF SURFACE WATER MANAGEMENT

Stormwater Management

- The ESCP is based on the three broad management principles for stormwater management identified by *Table 4.1* of Managing Urban Stormwater: Council Handbook (EPA, 1997) ("the Council Handbook").
- These management principles are applied in a hierarchical manner, whereby valuable features of the natural environment are identified and retained or restored.
- Preventative measures are then implemented initially with 'end of pipe' measures only applied for residual impacts that cannot be cost-effectively mitigated by source control.

PRINCIPLES OF SURFACE WATER MANAGEMENT (Cont'd)

Erosion and Sediment Control Management

Erosion and Sediment Control Management is based on the broad management principals of *Section 3.2* of Volume 2E of the Blue Book.

Planning Phase

- Identify and assess the soil and water impacts during project planning.
- Plan for erosion and sediment control before any earthworks begin, including assessment of site constraints.

Operations Phase

- Minimise the area of soil disturbed and exposed to erosion.
- Conserve topsoil for later site rehabilitation or regeneration (in a stabilized stockpile).
- Control water flow through the project area by diverting up-slope 'clean' water away from disturbed areas and ensuring concentrated flows are below erosive levels and water exposed to disturbed (erodible) surfaces is captured.

PRINCIPLES OF SURFACE WATER MANAGEMENT (Cont'd)

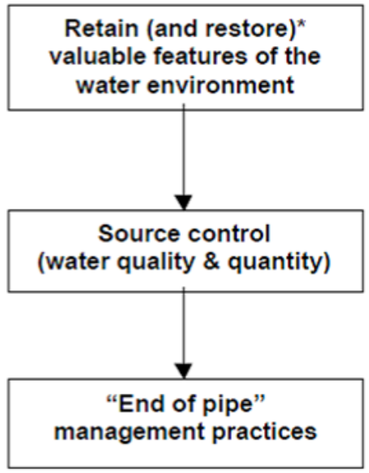
Erosion and Sediment Control Management (Cont'd)

Maintenance and Rehabilitation Phase

- Rehabilitate disturbed lands as soon as possible following disturbance.
- Maintain erosion and control measures appropriately.

STORMWATER MANAGEMENT TECHNIQUES

- Five broad management practices are applied as part of the ESCP.
- **Table S1** (refer to **Sheets 08** and **09**) identifies the stormwater management techniques to be applied for each of the five management practices and with reference to the principles of stormwater management hierarchy.



*if degraded

Table 4.1 – Stormwater Management Hierarchy

Source: EPA (1997)

REV	DATE	BY	APP.	REVISION DETAILS
1	12/5/2020	AI	JvdM	Update following MOD 3
2	11/12/2020	AI	JvdM	Update following consultation / site changes

DRAWING STATUS		
DESIGN BY:	N/A	
DRAWN BY:	N/A	
APPROVAL	N/A	

CLIENT: Walker Quarries

PROJECT TITLE: WALLERAWANG QUARRY

EROSION AND SEDIMENT CONTROL PLAN - NOTES 1

Sheet No. 01 | REV 2

EROSION AND SEDIMENT CONTROL PLAN

WATER USAGE, SOURCES AND DISTRIBUTION

Water Usage

Water is required at the Quarry for four principal purposes:

1. Dust suppression of active and exposed areas, e.g. internal roads, hardstand surface and stockpile areas. Between 14 ML and 16 ML is estimated to be used for general dust suppression, with approximately 70% of this volume required during the period of October to March (inclusive).
2. Dust suppression of crushing operations. Water is applied at the following rates.
   - 20 L/t of crushed aggregate.
   - 7 L/t of crushed road base.
3. Sand washing. Water is applied at a rate of approximately 1,500 L/t. While varying on seasonal conditions, approximately 85 % of the water added is recycled and returned.
4. Evaporative losses from water storages and stockpiles.

Water Sources

Water at the Quarry is collected and distributed from three sources as follows.

1. Rainfall and runoff from the disturbance footprint of the Quarry Site. This 'dirty water' runoff is directed as follows.
   - Extraction Area. Runoff is collected within sumps and pumped to the Main Storage Dam (SD1) as required.
   - Main Stockpile Area. Ruoff is directed to Sediment Basin 1 (SB1). Overflow is to SD1.
   - Western Stockpile Area. Runoff from the upper tier flows to SB6 with overflow discharging to the lower tier and to SB1 via overland flows and several coarse sediment retention basins.
   - Eastern Stockpile Area. Runoff is retained on this stockpile area by an earth bund. Accumulated water can be pumped to the water management system as required.
   - Office, Weighbridge and Carpark Area. Runoff is directed to SB5 with overflow to the clean water drainage which is aligned through the Quarry Site.

Water Sources (Cont'd)

   - Supplementary Stockpile Area. Runoff flows to the Bottom Working Dam (SB2) which also accepts runoff from uncleared areas below the Top Working Dam (SD2) and a small portion of the Great Western Highway.
2. Runoff from undisturbed areas of the Quarry Site or sources external to the Quarry Site.
   - Runoff from the Great Western Highway to the west of the Quarry Site office discharges to highway stormwater culverts which discharges onto the Quarry Site and is directed via pipes and stabilised drains through the Quarry Site.
   - A small portion of Great Western Highway runoff to the east of the Quarry Site office discharges to a highway stormwater culvert which is directed onto the Quarry Site and into SB2.
   - Runoff from a small area of undisturbed ground between SD2 and SB2 is directed to SB2.
3. Groundwater. Groundwater is pumped from a bore located on Lot 7 DP 872230 to a water tank located within the Eastern Stockpile Area.

Water Distribution and Transfer

- Water for dust suppression and washing is drawn from the SDs.
- Water used in the sand washing plant is discharged to a series of settlement ponds which ultimately discharge to SD2.
- Groundwater is periodically pumped from the groundwater bore to the water tank on the Eastern Stockpile Area. WAL 42390 allows for the extraction of up 100 ML per year.
- Water is pumped from the water tank on the Eastern Stockpile Area to the SDs as required (to ensure water is available for washing and dust suppression).

Water Distribution and Transfer (Cont'd)

- As water accumulates in the SBs and reaches the minimum settlement and storage capacity, water will be removed to another storage or use.
- Under conditions where rainfall is below the minimum design criteria of the sediment basins, i.e. 55.6 mm which is the 5-day 95th percentile rainfall event for the locality, the priority of transfer / usage options for water accumulated in the sediment basins is as follows.
  1. Transfer to SD1 or SD2.
  2. Transfer to another SB (which has capacity).
  3. Irrigation of the Quarry amenity bund or other areas of the Quarry where vegetation is being established.
  4. Discharge from SD1 or SB2, i.e. the Licensed Discharge Points (LDPs), subject to achieving water quality criteria of EPL 13172.
- Under conditions where rainfall exceeds 55.6 mm over 5 days, the priority of transfer/usage options is as follows.
  1. Transfer to SD1 or SD2.
  2. Discharge via either LDP.
- The construction of the Western Stockpile Area and Clean Water Dam 1 (CWD1) is beyond the term of this ESCP. The following represents the planned priority of distribution of water accumulated in CWD1.
  1. Transfer to SD1 / SD1B (subject to available capacity).
  2. Transfer to the Quarry Water Tank or Sand Washing Plant.
  3. Discharge via either LDP.

IMPLEMENTATION

GENERAL

1. All water management structures, i.e. erosion and sediment control structures, table drains and pipes, are to remain in place and be maintained for the duration of the Quarry unless otherwise instructed.
2. The ESCP has been split into two phases as follows.
   - The **Stage 1 Extraction Phase** (identified in **Figure S1**) refers to the incorporation of modifications associated with MOD 3 of DA 344-11-2001 and initial extension of the extraction area (Extraction Stage 1).
   - The **Future Operations Phase** (identified in **Figure S2**) refers to future operations of the Quarry considering the maximum impact footprint.

STAGING

Works are to proceed in the following order:

A. Install or maintain erosion and sediment control measures for the **Stage 1 Extraction Phase** (**Figure S1**).
B. Implement erosion and sediment control measures for the period of operations covered by **Figure S1**.
C. Review, adapt and update the ESCP as prior to extraction proceeding beyond the extents of **Figure S1**.
D. Install erosion and sediment control measures ahead of future extraction stages and additional stockpile area construction.
E. Progress towards the implementation of the final erosion and sediment control measures of the **Future Operations Phase** (identified in **Figure S2**).

REV	DATE	BY	APP.	REVISION DETAILS
1	12/5/2020	AI	JvdM	Update following MOD 3
2	11/12/2020	AI	JvdM	Update following consultation / site changes

DRAWING STATUS		
DESIGN BY:	N/A	
DRAWN BY:	N/A	
APPROVAL	N/A	

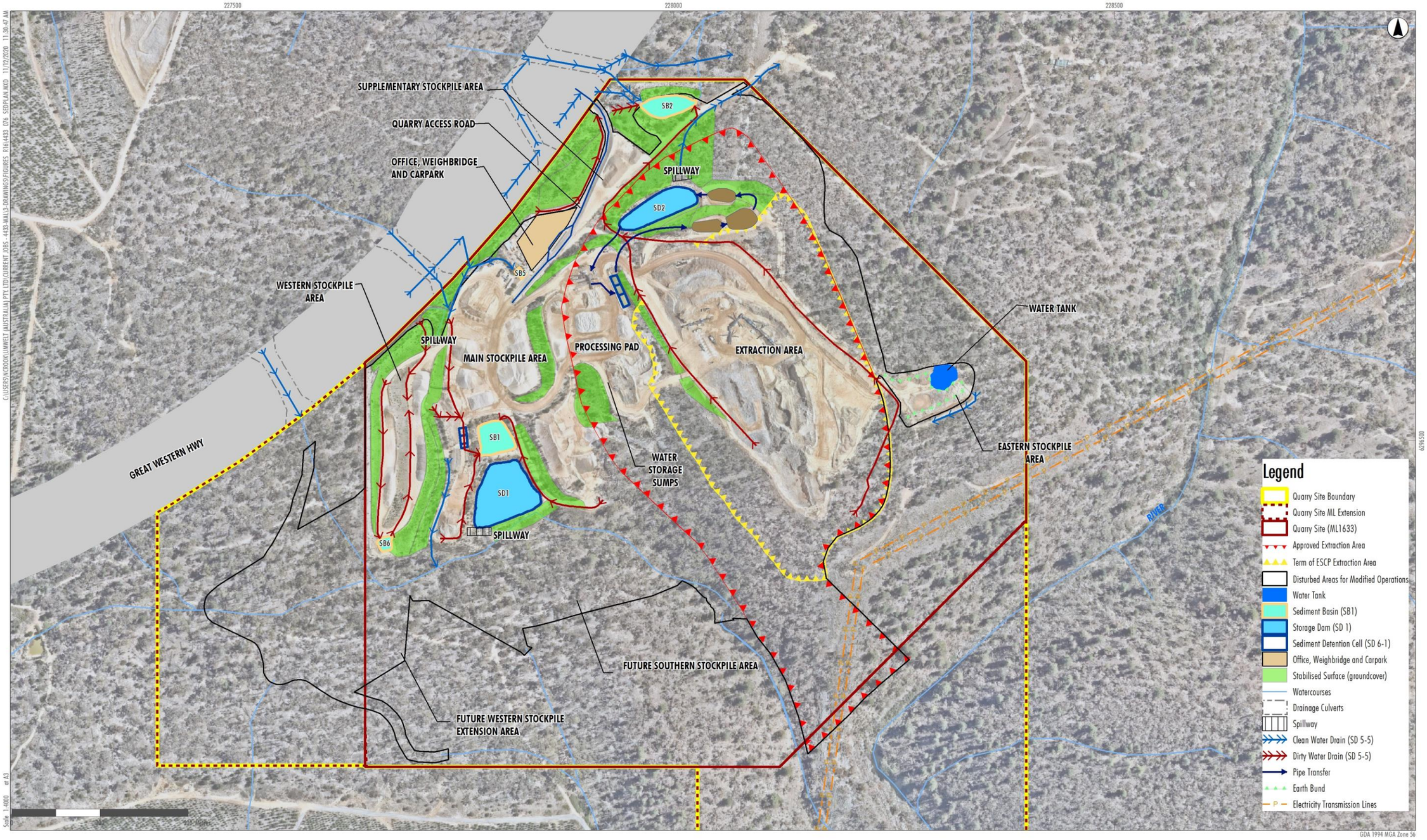
CLIENT: Walker Quarries

PROJECT TITLE: WALLERAWANG QUARRY

EROSION AND SEDIMENT CONTROL PLAN - NOTES 2

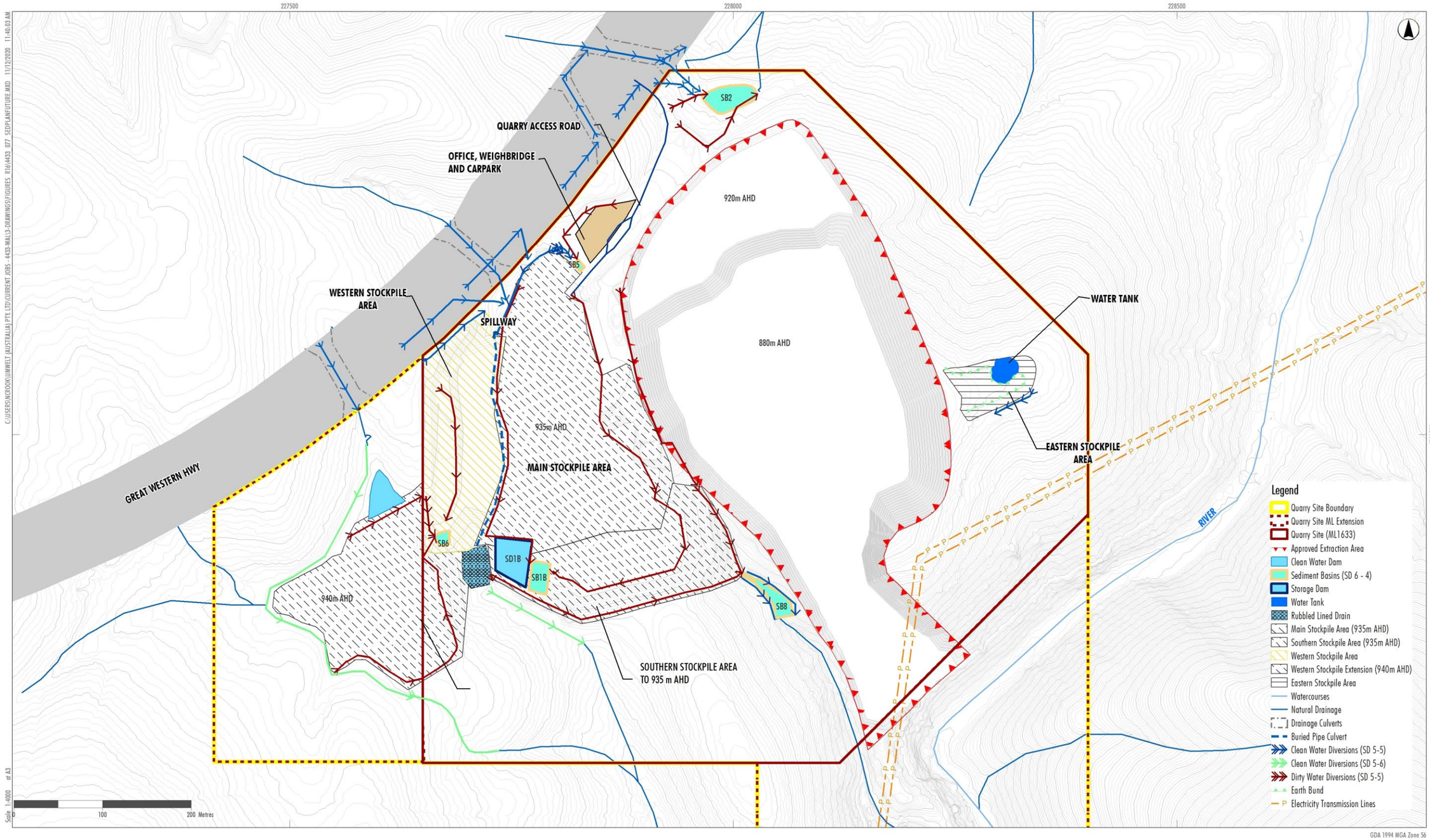
Sheet No. 02 | REV 2

EROSION AND SEDIMENT CONTROL PLAN



REV	DATE	BY	APP.	REVISION DETAILS	DRAWING STATUS			CLIENT		PROJECT TITLE	FIGURE S1
1	12/5/2020	AI	JvdM	Update following MOD 3	DESIGN BY:	AI	2018	Walker Quarries	umwelt	WALLERAWANG QUARRY	Erosion and Sediment Controls (Stage 1 Extraction Phase)
2	11/12/2020	AI	JvdM	Update following consultation / site changes	DRAWN BY:	MA	2018				
					APPROVAL	RS	2018				Sheet No. 03 / REV 2

EROSION AND SEDIMENT CONTROL PLAN



REV	DATE	BY	APP.	REVISION DETAILS	DRAWING STATUS			CLIENT		PROJECT TITLE	FIGURE S2
1	12/5/2020	AI	JvdM	Update following MOD 3	DESIGN BY:	AI	23/4/2020	Walker Quarries	umwelt	WALLERAWANG QUARRY	Erosion and Sediment Controls (Future Operations Phase)
2	11/12/2020	AI	JvdM	Update following consultation / site changes	DRAWN BY:	NC	30/4/2020				Sheet No. 04 / REV 2
					APPROVAL	JvdM	12/5/2020				

EROSION AND SEDIMENT CONTROL PLAN

IMPLEMENTATION

STAGE 1 EXTRACTION PHASE

Works are to proceed in the following order:

1. Maintain No Go Areas with barrier fence, sediment fence, tape, diversion bank or other suitable means in the areas nominated on **Figure S1** (refer to BMP Notes – Facility Access and Barrier Fencing).
2. Restrict access within the land defined by the ESCP as nominated in **Table S2** (refer to **Sheet 09**).
3. Ensure all fuel, oil and chemicals are stored with containment bunds.
4. Implement a Monitoring and Maintenance Program (refer to BMP Notes – Monitoring and Maintenance).
5. Continue to restrict access within the land defined by the ESCP as nominated in **Table S2**.
6. Delineate additional No Go Areas with barrier fence, sediment fence, tape, diversion bank or other suitable means in the areas nominated on **Figure S2** (refer to BMP Notes – Facility Access and Barrier Fencing).
7. Establish additional sediment fencing downslope of any new disturbance, unstabilised stockpiles or cleared areas in advance of extraction around the extraction area perimeter (refer to BMP Notes - Sediment Fencing and BMP Notes - Stockpiling).

   (The sediment fencing is to be retained until the stockpile or cleared area is stabilised with vegetation in accordance with **Table S3** – refer to **Sheet 09** and **Step 17**, or the extended extraction area drains to internal catchment).
8. Review and enlarge sediment basins to provide the minimum water settlement and sediment storage capacities of **Table S4**.

   (Changes to sediment basin minimum capacities reflect modified catchments and change to sediment storage capacity as 50% water settlement capacity).
9. Identify the minimum basin capacity requirements using vertical markers or other means (refer to BMP Notes - Sediment Basins).
10. Maintain outlet protection on the discharge point from sediment basins (refer to BMP Notes - Outlet Protection).

STAGE 1 EXTRACTION PHASE (Cont'd)

11. Maintain low flow drainage channels identified on **Figure S2** to divert disturbed catchment runoff to the sediment basins (refer to BMP Notes - Diversion Drains). Ensure drainage is to the nominated sediment basin.
12. Remediate and stabilise all drains and batters as nominated by BMP Notes - Diversion Drains.
13. Fell trees, clear groundcover and strip topsoil from the new areas of disturbance in accordance with the following protocols and procedures.
    - Implement vegetation clearing protocol of the Quarry *Biodiversity Management Plan*.
    - Strip when soils are moist (not dry or wet).
    - Place the combined groundcover and topsoil in windrow stockpiles within the approved disturbance footprint of the Quarry.
    - The locations of stockpiles are at the discretion of the Mine Manager but will be located away from steep slopes and concentrated runoff.
    - The stockpiles are to be constructed and maintained as nominated by SD 4-1 (refer to **Sheet 12**) (refer also to BMP Notes - Soil Stockpiling).
    - As works progress, ensure each stockpile is stabilised in accordance with **Table S3.**
    - Ensure all dirty water drains to the relevant sediment basin.

    Refer also to BMP Notes - Soil Stripping, Soil Stockpiling and Soil Respreading.
14. Construct and stabilize stockpiles. Establish a cover of vegetation on soil stockpiles equivalent to 70% coverage within 60 days of establishment (unless the soil is to be used in in rehabilitation within 6 months) (refer to BMP Notes - Soil Stockpiling).
15. Commence extraction (mining) in accordance with the Mining Operations Plan [MOP]).

STAGE 1 EXTRACTION PHASE (Cont'd)

16. Mine rehabilitation to be completed in accordance with the MOP. Install sediment fencing down-slope of rehabilitation under maintenance (see also SD 6-8 on **Sheet 14**) (refer to BMP Notes - Sediment Fencing).
17. On stabilisation of rehabilitated land (with 70% groundcover) (refer to BMP Notes - Soil Respreading), downslope sediment controls can be removed.

FUTURE OPERATIONS PHASE

Before commencing future extraction and stockpile area construction extraction (up to the maximum extent identified on **Figure S2**), the following additional erosion and sediment control measures are to be implemented.

Prior to commencement of disturbance beyond the extent of the Stage 1 Extraction Phase, the ESCP (and Soil and Water Management Plan) will be updated to provide more specific details on locations and technical specifications, e.g. basin sizes, drain design, of the referenced BMPs.

Key additional erosion and sediment control measures for the main additional disturbance areas are as follows.

Extraction Area Extension

18. Define the limit of extraction and delineate areas beyond as No Go (in accordance with limits set by **Table S2**).
19. Construct a low flow diversion bank and sediment basin immediately downslope of nominated disturbance area (refer to BMP Notes - Sediment Basins). The minimum capacity requirements to be defined based on nominated disturbance area and limitations imposed by topography.
20. Where construction of a diversion bank / sediment basin is not feasible dur to terrain, install sediment fencing immediately downslope of nominated disturbance area (refer to BMP Notes - Sediment Fencing).

Southern Stockpile Area

21. Extend the central drainage pipeline and construct the rubble lined drain at the discharge point.

FUTURE OPERATIONS PHASE (Cont'd)

22. Construct a clean water diversion drain from the rubble lined drain in accordance with SD 5-6 (refer to BMP Notes - Diversion Drains) to divert the discharge from the Central Drainage Line and drainage from Lidsdale State Forest to the west into a southerly aligned tributary of the Coxs River.
23. Construct SB8 beyond the toe of the stockpile area with parameters as nominated by **Table S4** (or as modified by future ESCPs) (refer to **Sheet 10**).
24. Commence vegetation clearing and soil stripping (in accordance with **Step 13** of Stage 12 Extraction Phase (or as modified by future ESCPs).
25. Commence placement of waste rock and construction of the Southern Stockpile Area.

Western Stockpile Area Extension

26. Construct clean water storage dam CWD1.
27. Construct a clean water diversion drain from CWD1 to divert water to the west and south of the stockpile area extension.
28. Commence vegetation clearing and soil stripping (in accordance with **Step 13** of Stage 1 Extraction Phase (or as modified by future ESCPs).
29. Increase the capacity of SB6 to accept runoff from the extension area
30. Commence placement of waste rock and construction of the Southern Stockpile Area.

ONGOING MANAGEMENT

31. Dust suppression is to be carried out as required (refer to Notes on Dust Suppression).
32. Ensure all monitoring and maintenance procedures are implemented and adhered to (Refer to BMP Notes - Monitoring and Maintenance).
33. Undertake a self-auditing program (refer to BMP Notes - Self-auditing Program).
34. On stabilisation of rehabilitated land (with 70% groundcover) (refer to BMP Notes - Soil Respreading), downslope sediment controls can be removed.

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PROJECT TITLE: WALLERAWANG QUARRY

EROSION AND SEDIMENT CONTROL PLAN - NOTES 3

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EROSION AND SEDIMENT CONTROL PLAN

BEST MANAGEMENT PRACTICES

FACILITY ACCESS AND BARRIER FENCING

- A sealed access road ensures all vehicles entering and leaving the Quarry use the designated site entrance.
- Internal access and haul roads delineate access to operational areas of the Quarry.
- Access beyond the defined impact footprint of the Quarry (No Go Areas) is defined by **Figure S1** and delineated by barrier fencing, sediment fencing, bunds or drains.
- Barrier fencing can simply be made from tape wound around star pickets or stakes. Alternatively, flagging, site fence or chain wire fences can be used for this purpose if so desired.
- The soil erosion hazard on the site will be kept as low as practicable by minimizing land disturbance and staging works (see **Table S2**).

SEDIMENT FENCING

- Sediment fencing is to be established down-slope of any new disturbance where earth bank diversion drains are not established.
- Install sediment fencing as described by SD 6-8 (see **Sheet 14**). Returns may be constructed every 100 m where slope <10%.
- Sediment fences must be firmly trenched into the ground for their entire length.

SOIL STRIPPING

- The area stripped of soil at any one time will be minimised consistent with operational requirements.
- Where a layer of soil is identified, this will be stripped to a depth of at least 200 mm ahead of excavation.
- All areas to be stripped of topsoil will be clearly identified in advance and the depth of topsoils and subsoils available determined.

SOIL STRIPPING (Cont'd)

- Soil stripping will not be undertaken during hot, windy conditions.
- Stripped topsoil will either be temporarily stockpiled (refer to BMP Notes - Soil Stockpiling) or immediately transferred to completed and profiled sections of the Extraction Area (refer to BMP Notes - Soil Respreading).

SOIL STOCKPILING

- All stockpiles will be constructed in accordance with SD 4-1 (refer to **Sheet 12**).
- Soil stockpiles will remain less than 2m in height.
- Slopes of the stockpiles will be battered to provide a 2:1 (H:V) slope.
- Stockpiles will have sediment fencing, straw bale protection or a grass buffer strip installed around the downslope base.
- Stockpiles will be at least 5m from a watercourse.
- Stockpiles will be stabilized to achieve a C-Factor of 0.1 within 60 days of formation (refer to **Table S3**).
- Stockpiles to be retained in excess of 60 days will be protected through installation of sediment fencing or straw bale protection (refer to BMP Notes - Sediment Fencing).
- Soil stockpiles will be located at the discretion of the Mine Manager within the defined disturbance footprint of the Quarry.

SOIL RESPREADING

- Wherever possible, topsoil will be directly transferred onto areas requiring rehabilitation. This approach will encourage the germination of the contained propagules, maximise the success of rehabilitation and reduce the need for soil stockpiling.
- Prior to respreading of the topsoil layer, the combined subsoil / imported soil profile layer will be ripped or scoured to allow keying of the topsoil.

SOIL RESPREADING (Cont'd)

- Sow with native species seed mix and water as seasonal conditions dictate. Seedbed preparation will be carried out, i.e. in accordance with SD 7-1 (see **Sheet 15**).

MITRE DRAINS

- The construction and compaction of Quarry haul roads will create drainage paths for runoff.
- To prevent concentrated flows, construct mitre drains in accordance with the following.
- Construct the mitre drain as illustrated by **Figure S3**.
  - The 'tail' of the mitre drain should extend at least 5m from the road.
  - Construct with V-shaped cross section and grade of 1% or less.
  - If erosion within the mitre drain is observed, install a rock check dam (see SD 5-4 of **Sheet 12**) approximately midway between the road and discharge point of the drain.

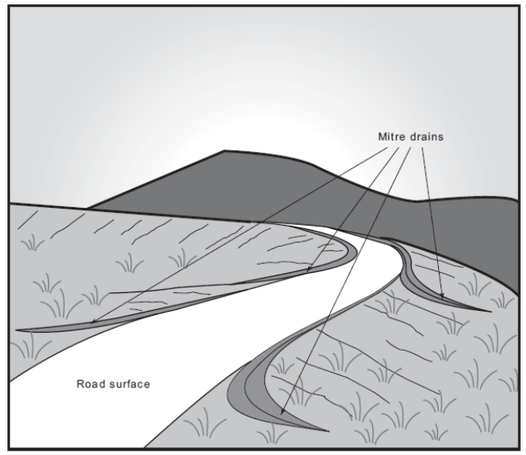

Figure 5.9 **Runoff dispersal using mitre drains** *(redrawn from Garden 1988)*

Figure S3

SCHEMATIC ILLUSTRATION OF MITRE DRAIN

Source: *Figure 5.9 of Managing Urban Stormwater: Soils and Construction Vol 2C*).

DIVERSION DRAINS

- Two types of diversion drains will be constructed.
  - Clean Water Diversion Drains will be constructed and maintained to divert surface flows from land undisturbed by the Quarry to the south.
  - Dirty Water Diversion Drains will be constructed and maintained to capture runoff from disturbed areas and divert to sediment basins (refer to Notes on Sediment Basins).
- Clean water from the Great Western Highway is diverted away from the disturbed Quarry catchment by rock lined drains.
- The discharge point of each Clean Water Diversion Drain will be constructed and maintained as a Level Spreader with dimensions meeting the design standards of SD 5-6 (see **Sheet 12**), namely:
  - drain slope of <1% for >6m on approach to discharge,
  - sill width of >4m,
  - sill grade of 0%, and
  - sill to be maintained with grass cover.
- Dirty water diversion drains will be constructed in accordance with SD 5-5 (see **Sheet 13**).
  - The channel and bank will be grassed where practical to achieve a C-Factor of 0.05 (see **Table S3**).
  - If grassing of channel and bank not possible, rock check dams (constructed in accordance with SD 5-4) will be constructed at regular intervals.
- Where the channel slope of the diversion drain exceeds 10% (~6°), rock check dams will be installed in accordance with SD 5-4 (see **Sheet 12**).

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EROSION AND SEDIMENT CONTROL PLAN

BEST MANAGEMENT PRACTICES

SEDIMENT BASINS

- Sediment Basins will be constructed and maintained to accept, store and settle (prior to reuse or discharge) runoff from the disturbed catchments of the Quarry in accordance with SD 6-4 (see **Sheet 14**).
- The design rainfall event considered for the purpose of sediment basin design (5-day, 95th percentile of 56.4 mm) assumes the receiving waters to be 'sensitive'.
- The volumetric runoff coefficient (Cv) for each catchment has assumed Soil Hydrologic Group D (high runoff potential) for the design rainfall even in accordance with *Appendix F* and *Table F2* of Vol. 1 of the Blue Book.
- **Table S4** provides the minimum storage and settlement capacities for the sediment basins of the Quarry Site (for the Stage 1 Extraction Stage).
- The calculation of the minimum Settling Zone and Sediment Storage Zone volumes are provided on **Sheets 16** and **17**).
- A marker will be maintained within each sediment basin near the discharge point / emergency identifying minimum freeboard requirement.
- The emergency spillway will have a C-factor of 0.05 (equivalent to a groundcover of >70%) or be lined with rock exceeding 100mm in diameter (where groundcover cannot be established).
- Except during, and for a maximum of five days after a rainfall event, the water level within each sediment basin will not exceed this mark.
- Accumulated water within the sediment basins will removed as nominated in Water Usage, Sources and Distribution Notes - Water Distribution and Transfer.
- If Flocculation is required prior to discharge, this will be undertaken in accordance with *Appendix E* of Vol. 1 of the Blue Book.
- If applied manually, the flocculating agent is to be spread evenly over the entire pond surface.
- Do not exceed manufacturer's recommended dosing rates or, if using gypsum, apply it at the rate of (initially) 30kg per 100m^3.

SEDIMENT BASINS (Cont'd)

- Accumulated sediment will be removed from the sediment basins periodically and placed within the stockpile area.
- Once dried, the accumulated sediment will be used in progressive rehabilitation of the site.
- A return to the minimum water settlement capacity requirements nominated in **Table S4** (and identified by the marker) will be achieved within 5 days of accumulation of water within each.
- Accumulated sediment will be periodically excavated and, subject to screening for contaminants, used elsewhere on the property.

SITE STABILISATION

- Progressive stabilisation of disturbed ground surfaces will be completed as these areas become inactive (refer to **Table S2**).
- Stabilisation measures and products will comply with *Table A3* of Landcom, 2004) (refer to **Sheet 11**).
- Appropriate seedbed preparation will be carried out, i.e. in accordance with SD 7-1 (refer to **Sheet 15**).
- Diversion drains will retain a C-Factor of 0.05 (refer to **Table S3**).
- As surfaces are stabilized, temporary water management structures can be removed, e.g. diversion drains (or portions of).

BMP DECOMMISSIONING AND REHABILITATION

Sediment Fencing

- Confirm C-factor ≤0.1 (refer to **Table S2**) established upslope of fencing.
- Remove fencing taking care not to damage the material (such that it can be reused if in suitable condition).
- Lightly scarify along the contour where required to level off surface and spread any vegetative debris.

BMP DECOMMISSIONING AND REHABILITATION (Cont'd)

Diversion Drains

- Gently push bank component of the drain into the channel and grade using dozer blade, excavator bucket or other means until level.
- Lightly scarify and allow to reseed naturally.

Sediment Basins

- Backfill with available screening reject or other stockpiled material and allow to consolidate.
- Cover with 100mm to 200mm of previously stockpiled soil and either sow with pasture species (or other species mix as agreed by the landowner).

MONITORING AND MAINTENANCE

Erosion and Sediment Control

- Erosion and sediment control structures constructed or installed to manage surface water flows will be inspected to ensure these have not been damaged, are not eroding or causing erosion.
- Inspections will be undertaken at least fortnightly or following significant rainfall.
- If erosion observed within drains, install rock check dams (see SD 5-4 of **Sheet 12**).
- Ensure there is no build-up of sediment or vegetation against sediment fencing. If present, remove as soon as practically possible.
- Confirm germination of seed sown over completed sections of the landform. If poor success, areas will be re-sown with additional water or fertiliser added.

Discharge Water Quality

- Discharge of water from the Quarry will be avoided by diversion of runoff to sediment basins (refer to BMP Notes - *Sediment Basins*).
- SD1 and SB2 are licensed as discharge points.
- Water discharged (to natural drainage) from the sediment basins will be sampled and analysed for the parameters identified in **Table S5** (see **Sheet 10**).

MONITORING AND MAINTENANCE (Cont'd)

Discharge Water Quality (Cont'd)

- As identified in **Table S5**, sampling and analysis of water is to be undertaken monthly when discharge occurs.
- In the event sampled water exceeds the criteria nominated above, this will be identified as a pollution incident and managed in accordance with a *Pollution Incident Response Management Plan*.

SELF-AUDITING PROGRAM

A self-auditing program will be initiated. The Mine Manager is to inspect the site at least fortnightly, or following significant rainfall, and maintain a written log of inspections.

Particular attention is to be paid to the following.

- Ensure the stability of the storages.
- Ensure barrier fencing is maintained and No Go Areas are being observed.
- Identify areas of localised soil erosion and take appropriate remedial measures. These might include:
  - planting additional stabilising vegetation or wind breaks,
  - stabilising soils with mulches or alternative soil binders,
  - taking steps to minimise any unnecessary concentrated stormwater flow, or
  - installing formalised drainage channels or pipes. Remove spilled soils or other materials and dispose to safe areas, e.g. stabilized stockpile.
- Maintain erosion and sediment control measures in their functioning condition for the duration of the excavation works.
- Construct additional erosion and/or sediment control works as might become necessary to ensure the desired water control is achieved.

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PROJECT TITLE	EROSION AND SEDIMENT CONTROL PLAN - NOTES 5	
WALLERAWANG QUARRY	Sheet No. 07	REV 2

Table S1 Stormwater Management Techniques

Management Practice	Management Principles			Monitoring and Maintenance
	Retention and Restoration	Source Control	End-of-Pipe Mitigation	
Flow	Reduce the catchment of the Quarry by diverting runoff around and through the Quarry.	Reduce the total disturbed catchment of the Quarry (reduction in flow) by only clearing in immediate advance of extraction.	Install rock-lining or other stabilizing medium at discharge points (refer to BMP Notes on Diversion Drains).	Implement a Self-Auditing Program to confirm the continued implementation of the nominated management techniques, in particular 'Source Control' and 'End-of-Pipe Mitigation' techniques (refer to BMP Notes - Self-Auditing Program). Inspect erosion and sediment control structures at least monthly and immediately following heavy rainfall. Implement maintenance measures in accordance with BMP Notes - Monitoring and Maintenance. If repeated failures of structures are identified, engage a qualified erosion and Sediment control specialist to review design and implement recommended modifications or additions.
		Construct clean water drains to control accumulated flow and allow for non-erosive discharge to the catchment.	Construct sediment basins in accordance with SD 6-4, i.e. wet basin (water retention) structure, in the locations nominated in **Figures S1** and **S2**, with the minimum capacities nominated in **Table S4** and in accordance with BMP Notes - Sediment Basins.	
Channel Morphology	Reduce the erosive force of flows within diversion drains and discharge points to natural drainage by establishing and maintaining ground cover.	Establishing ground cover to achieve the C-Factor nominated in **Table S2**.	Maintain diversion drains as identified on **Figures S1** and **S2** in accordance with design features nominated in BMP Notes on Diversion Drains.	
		Where groundcover cannot be established, install rock check dams to reduce flow velocity.	Install rock-lining or other stabilizing medium at discharge points (refer to BMP Notes on Diversion Drains).	
			Construct level spreader discharge points in accordance with SD 5-6 and in accordance with design features nominated in BMP Notes on Diversion Drains.	
Water Quality	Divert runoff away from disturbed ground of the Quarry.	Construct and maintain clean water diversion drains upslope of disturbance.	Install and maintain sediment fences downslope of disturbance areas in accordance with **Table S2** (refer to BMP Notes - Sediment Fencing).	Undertake monitoring and maintenance of activities and structures which form part of the ESCP for the Quarry (refer to BMP Notes - Monitoring and Maintenance). In the event of water quality exceeding quality criteria, the following contingency management would be implemented. 1. Transfer to SD2. If capacity unavailable then, 2. transfer to the silt cells and cease washing. If capacity unavailable then, 3. transfer to the open cut sump. If storage capacity is unavailable and a discharge is required, the contingency measures will vary based on the elevated parameter. 1. For TSS, dose the water with an EPA approved flocculent, resample, analyse and repeat as required. 2. For sulphate, does the water with hydrated lime ($Ca(OH)_2$), resample, analyse, and repeat as required. 3. For pH, buffer using appropriate alkaline or acidic reagent, resample, analyse and repeat as required. 4. For Grease and oil / EC, provide for dilution on discharge to reduce the effective concentration.
	Reduce runoff from disturbed catchments of the Quarry.	Reduce the total disturbed catchment of the Quarry (reduction in flow) by only clearing in immediate advance of mining or ancillary activities.	Establish No Go barriers (refer to BMP Notes on Facility Access and Barrier Fencing).	
			Progressively rehabilitate non-operational areas of the Quarry.	
	Ensure only water compliant with the water quality criteria of the WMP discharged from the Quarry (under rainfall conditions not exceeding 56.4 mm in 5 days).	Reduce the requirement for controlled discharge by storing and distributing water as discussed in Water Usage, Sources And Distribution - Water Distribution and Transfer (refer to **Sheet 02**).	Undertake sampling and analysis in accordance with a Surface Water Monitoring Program (refer also to BMP Notes - Monitoring and Maintenance).	
		Maximise the storage capacity in Quarry sediment basins and water storages above the minimum storage capacity requirements (of **Table S4**).		
		Sample and analyse water contained within SD1 and SB2 prior to 'controlled discharge'.		

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Table S1 (Cont'd) Stormwater Management Techniques

Management Practice	Management Principles			Monitoring and Maintenance
	Retention and Restoration	Source Control	End-of-Pipe Mitigation	
Riparian Vegetation	Retain and prevent disturbance to native vegetation external to disturbance areas nominated in the Mining Operations Plan.	None required.	Not applicable.	Not required.
Aquatic Habitat	Reduce the catchment of the Quarry by diverting clean water runoff.	Construct clean water drains in accordance with BMP Notes - *Diversion Drains* to control accumulated flow and allow for non-erosive discharge to the catchment.	Construct sediment basins in accordance with SD 6-4, with the minimum capacities nominated in **Table S4,** and in accordance with BMP Notes on Sediment Basins.	Implement maintenance measures in accordance with BMP Notes - Monitoring and Maintenance. If repeated failures of structures are identified, commission an appropriately qualified erosion and Sediment control specialist to review design and implement recommended modifications or additions.
	Ensure the quality of water discharged under conditions not exceeding 56.4mm in 5 days meets the water quality criteria of EPL 13172.	Sample and analyse water contained within SD1 and SB2 prior to 'controlled discharge'.	Undertake sampling and analysis in accordance with a Surface Water Monitoring Program.	Undertake sampling and analysis in accordance with a Surface Water Monitoring Program (refer also to BMP Notes - Monitoring and Maintenance).

Table S2 Limitations To Access During Construction

Land Use	Limitation	Remarks
Construction Areas	Limited to 5m from the edge of any essential construction activity as shown on the engineering plans	All site workers should clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope) or similar materials.
Access Areas	Limited to a maximum width of 5m.	The site manager will determine and mark the location of these zones on the site. They can vary in position so as to best conserve existing vegetation and protect downstream areas while being considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries.
Remaining lands including revegetation areas	Entry prohibited except for essential management works.	Thinning of growth might be necessary in accordance with bushfire management requirements or weed reduction strategies.

Table S3 Maximum Acceptable C-Factors At Nominated Times During Works

Lands	Maximum C-Factor	Remarks
Waterways and other areas subjected to concentrated flows e.g. drains, post construction and during operation.	0.05	Applies after ten working days from completion of formation and before they are allowed to carry any concentrated flows. Flows will be limited to those shown in *Table 5.2* of Vol. 1 of the Blue Book. Foot and vehicular traffic will be prohibited in these areas.
Stockpiles and batters, post construction and during operation.	0.10	Applies after ten working days from completion of formation. Maximum C-Factor of 0.10 equals 60% ground cover.
All lands, including waterways and stockpiles during construction and operation.	0.15	Applies after 90 working days of reseeding. Maximum C-Factor of 0.15 equals 50% ground cover. Modified after *Table 7.2* of Vol. 1 of the Blue Book.
All lands, including waterways and stockpiles during construction and operation.	0.05	Applies after 120 working days of reseeding Maximum C-Factor of 0.05 equals 70% ground cover. Modified after *Table 7.2* of Vol. 1 of the Blue Book.

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Table S4 Design Capacities For Sediment Basins (Stage 1 Extraction Phase)

Basin	Catchment		Basin Parameters		Minimum Capacity Requirement (m^3)		
	Reference (Catchment)	Area (ha)	Surface Area (m^2)	Basin Volume (m^3)	Water Settlement Zone	Sediment Storage Zone	Total
SB1	4A: Main Stockpile Area 5: Western Stockpile Area (Lower Tier)	6.6	2,300	4,500	2,755	1,377	4,132
SB2	1: Supplementary Stockpile Area and SD2 Batter GWH: Great Western Highway	3.5[1]	1,300	2,500	1,460	730	2,190
SB5	3: Office and Carpark Area	0.5	70	320	210	105	315
SB6	6: Western Stockpile Area (Upper Tier)	0.5	180	500	335	165	500
SB8	8: Southern Stockpile Area[2]	1.0	1,200	3,000	420	210	630

Note 1: Includes 1.0 ha of runoff from the Great Western Highway
Note 2: To be reviewed and updated in future versions of the ESCP.

Table S5 Water Monitoring

Pollutant	Unit	Limit	Frequency	Method
pH	pH unit	6.5-8.5	Monthly during discharge	Grab Sample
Total Suspended Solids (TSS)	mg/L	30		
Electrical Conductivity	µS/cm	1,500		
Grease and Oil	mg/L	10		
Turbidity	NTU	50		
Sulfate	mg/L	250		

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Table A3 Soil Stabilisation Control Matrix (adapted from various sources, including Meyer and Ports (1976), Israelson et al. (1980), Goldman et al. (1986), URS Greiner Woodward Clyde (1999) and the North American Green website).

Class	Type	Suitable for Vegetation Type [1]	Design Life (months)	Use in Concentrated Flow [2]	Availability (days) [3]	Relative Cost Bracket [4]	Residual Impact [5]	C -factor [6] <33%, <6m	C -factor <33%, 6-15m	C -factor <33%, >15m	C -factor 33-50%, <6m	C -factor 33-50%, 6-15m	C -factor 33-50%, >15m
BIODEGRADABLE MULCHES [7]													
Straw (anchored)	4.5 tonnes per hectare	Grass	1 to 6	No	< 5days	Low	Moderate	0.17	0.17	0.20	0.20	0.20	0.20
Wood Chip	16 tonnes per hectare	Grass/Shrubs	1 to 6	No	< 5days	Low	Moderate	0.08	0.08	0.08	No data		
Wood Chip	27 tonnes per hectare	Shrubs	1 to 6	No	< 5days	Low	Moderate	0.05	0.05	0.05	No data		
Wood Chip	56 tonnes per hectare	Shrubs	1 to 6	No	< 5days	Low	Moderate	0.02	0.02	0.02	0.02	0.02	0.02
Hydromulching	1.5 tonnes mulch + 300 litres binder per hectare	Grass	1 to 3	No	< 5days	Low	Low	0.00	0.03	0.07	0.03	0.06	0.10
Bonded Fibre	5 tonnes fibre per hectare	Grass	1 to 6	No	< 5days	Low	Moderate	0.00	0.03	0.07	0.03	0.06	0.10
ROLLED EROSION CONTROL PRODUCTS (RECPs) [7]													
Biodegradable	Jute mesh	Grass	6 to 12	Yes	< 5days	Low	Moderate	0.10	0.20	0.40	0.20	0.40	0.60
	Coconut fibre mesh	Grass	6 to 12	Yes	< 5days	Low	Moderate	0.10	0.20	0.40	0.20	0.40	0.60
	Curled wood fibre	Grass	6 to 12	Yes	< 5days	Medium	Moderate	0.01	0.05	0.10	0.10	0.15	0.20
	Jute matting (~350 gsm)	Grass	6 to 12	Yes	< 5days	Medium	Moderate	0.00	0.03	0.07	0.03	0.06	0.10
	Jute matting (~600 gsm)	Shrubs	6 to 12	Yes	< 5days	Medium	Moderate	0.00	0.03	0.07	0.03	0.06	0.10
	Coconut fibre matting (~450 gsm)	Grass	6 to 12	Yes	< 5days	Medium	Moderate	0.00	0.03	0.07	0.03	0.06	0.10
	Coconut fibre matting (~900 gsm)	Shrubs	6 to 12	Yes	< 5days	Medium	Moderate	0.00	0.03	0.07	0.03	0.06	0.10
Photodegradable	Mesh (< 5 mm openings)	Grass	1 to 6	Yes	< 5days	Low	Moderate	0.01	0.05	0.10	0.10	0.15	0.20
Non Biodegradable	Plastic fibres with netting	Grass	> 12	Yes	< 5days	High	High	0.00	0.05	0.10	0.03	0.05	0.10
	Composite with biodegradable	Grass/Shrubs	> 12	Yes	< 5days	High	High	0.00	0.03	0.07	0.03	0.06	0.10
HYDRAULIC SOIL STABILISERS [7]													
	Polymers/Polyacrylamide (rate depends on type)	Grass	1 to 6	No	< 5days	Low	Low	0.01	0.05	0.10	0.10	No data	
	Bitumen emulsion (12,000 l/ha)	Grass	1 to 6	No	< 5days	Low	Low	0.01	0.05	0.10	0.10	No data	
TEMPORARY SEEDING													
	Annual	NA	6 to 12	No	< 5days	Low	Low	0.05	0.05	0.10	0.10	No data	
	Perennial	NA	> 12	No	< 5days	Low	Low to moderate	0.05	0.05	0.10	0.10	No data	
INSTANT TURF [7]													
	Kikuyu	Grass	> 12	Yes	< 5days	Medium	Low	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Reinforced turf (pregrown)	Grass	> 12	Yes	5 - 15 days	High	High	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Notes

1 Whether vegetation is required and its type if so, will affect the technique used. Biodegradable mulches, RECPs and hydraulic soil stabilisers can all be used on their own to provide short term protection. However, their effectiveness is less when used in isolation than when used with vegetative growth. Most techniques are used to help establish vegetative growth using sown grasses. Should the client specify shrubs (primarily planted as tubestocks), then thicker mulches, RECPs or biodegradable mulches should be used. Non biodegradable RECP's are used to reinforce grasses (turf) permanently. They are not suitable for use with individual shrubs. They can work synergistically with the established grass to increase its resistance to shear stress and, therefore, increase its resistance to erosion by concentrated flow.

2 Products might or might not be suitable for use in areas of concentrated flow. All products are suitable for sheet flow conditions, although some would be over designed in such cases.

3 Whether or not a product is readily available is critical to the selection process. Many RECP and hydraulic soil stabiliser techniques use products that might be "off the shelf" and available from several suppliers. Biodegradable mulches can be affected by seasonal variation, although they might also be available on site after initial clearing and grubbing. Temporary seeding might also be seasonal.

4 For any given technique, cost can vary greatly depending on geographic location, size of project and installation requirements. In addition, costs can vary over time. Because of these factors, giving accurate installed costs is not possible. However, if a product is relatively inexpensive to purchase and install close to its point of manufacture, it will still be relatively inexpensive to purchase and install remote from it.

5 This criterion relates to the impact that a particular practice might have on construction activities once they are resumed on an area that was temporarily stabilised.

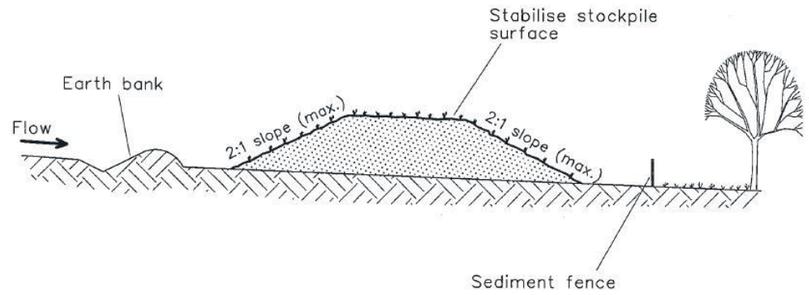
6 The performance of an erosion control technique is quantified by assigning it with a C-factor (Appendix A). The C-factor will vary from close to zero for full cover, to 1.0 for no cover on highly disturbed soils. The C-factor strongly affects the soil loss calculation (RUSLE) and users need to be careful in specifying its value, particularly when values <0,01 are quoted. Note that the C-factor does not apply to conentrated flow.

Values for the C-factor are given for various slopes gradients and lengths and show that it can change dramatically with them. The values given are compiled from existing data and from inference between products of a similar nature. They are given as a guide only and do not profess to be accurate in all respects. Overall, accurate C-factors are only available for manufactured products, primarily from the USA (RECP's in particular) where extensive independent testing has been undertaken. Unfortunately, very little data is available for the "lower cost" options such as biodegradable mulches, jute mesh and hydraulic soil stabilisers. Wherever possible, the manufactures should be contacted for their latest data on acceptable C-factors.

For the RECP's in particular, the C-factors given here are for the product as installed with no vegetation. Note however that lower C-factors can be expected if vegetation is promoted with many RECP's. Indeed, non biodegradable RECP's are designed to work synergistically with turf and must be used with it.

7 For information on trade names and suppliers of these products, please phone the office of Australasian Chapter of the International Erosion Control Association on 1800 354 322 or (+61 2) 4677 0901.

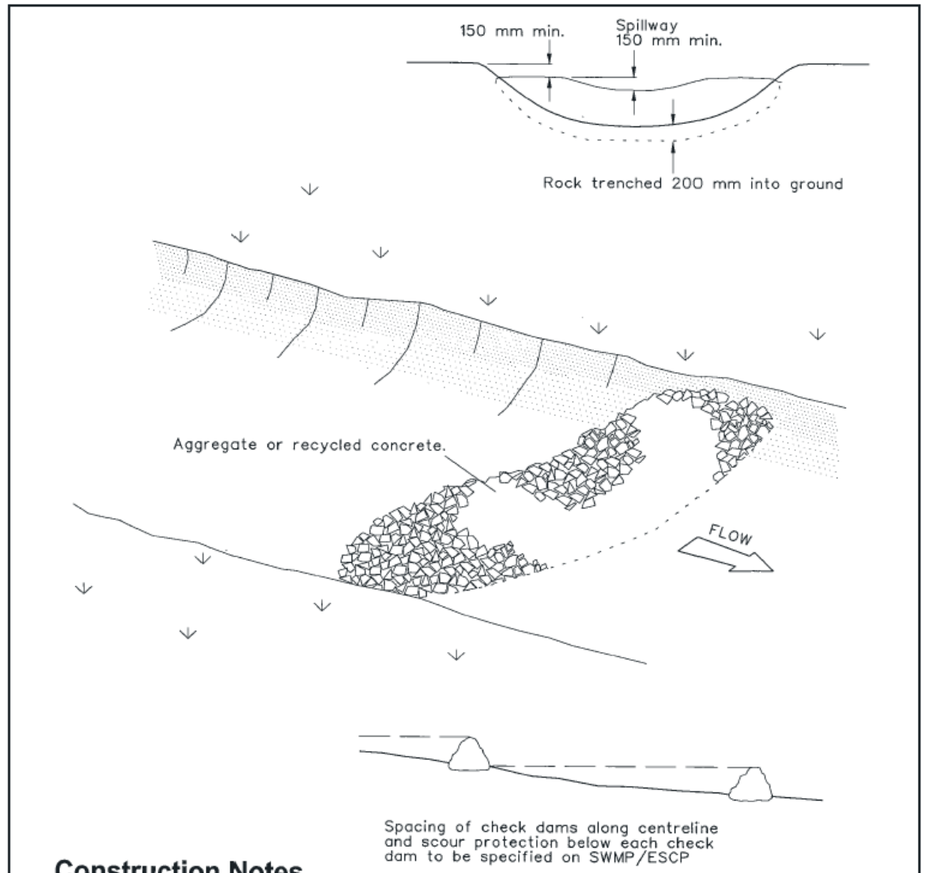
REV	DATE	BY	APP.	REVISION DETAILS	DRAWING STATUS			CLIENT		PROJECT TITLE	EROSION AND SEDIMENT CONTROL PLAN – TABLES 4	
1	12/5/2020	AI	JvdM	Update following MOD 3	DESIGN BY:	N/A		Walker Quarries		WALLERAWANG QUARRY		
2	11/12/2020	AI	JvdM	Update following consultation / site changes	DRAWN BY:	N/A						
					APPROVAL	N/A					Sheet No. 11	REV 2



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

STOCKPILES **SD 4-1**

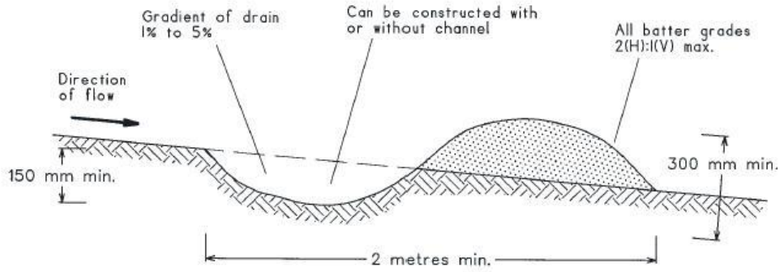


Construction Notes

1. Check dams can be built with various materials, including rocks, logs, sandbags and straw bales. The maintenance program should ensure their integrity is retained, especially where constructed with straw bales. In the case of bales, this might require their replacement each two to four months.
2. Trench the check dam 200 mm into the ground across its whole width. Where rock is used, fill the trenches to at least 100 mm above the ground surface to reduce the risk of undercutting.
3. Normally, their maximum height should not exceed 600 mm above the gully floor. The centre should act as a spillway, being at least 150 mm lower than the outer edges.
4. Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.

ROCK CHECK DAM **SD 5-4**

REV	DATE	BY	APP.	REVISION DETAILS	DRAWING STATUS			CLIENT		PROJECT TITLE	EROSION AND SEDIMENT CONTROL PLAN – STANDARD DRAWINGS 1	
1	12/5/2020	AI	JvdM	Update following MOD 3	DESIGN BY:	N/A		Walker Quarries	umwelt	WALLERAWANG QUARRY		
2	11/12/2020	AI	JvdM	Update following consultation / site changes	DRAWN BY:	N/A					Sheet No. 12	REV 2
					APPROVAL	N/A						

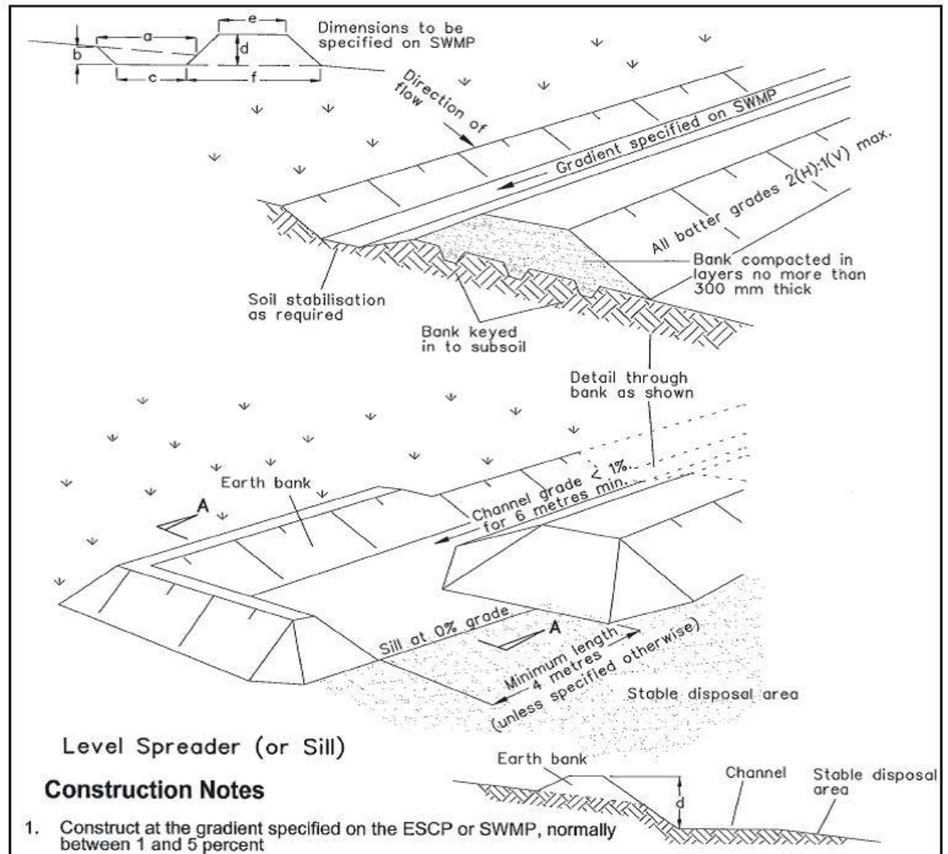


NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

EARTH BANK (LOW FLOW) **SD 5-5**



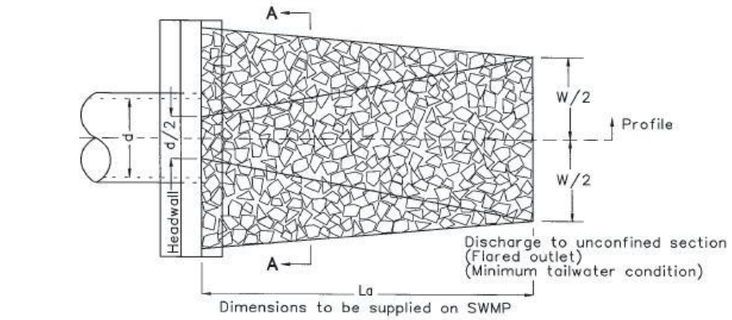
Level Spreader (or Sill)

Construction Notes

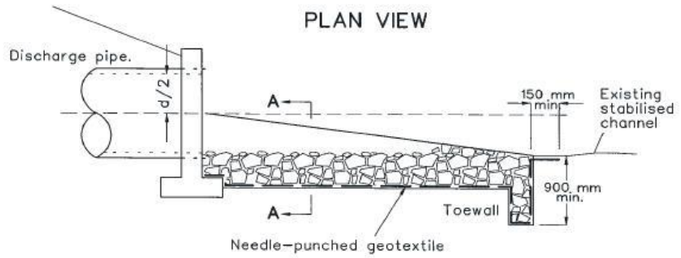
1. Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).
7. Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.
8. Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.
9. Where possible, ensure they discharge waters onto either stabilised or undisturbed disposal sites within the same subcatchment area from which the water originated. Approval might be required to discharge into other subcatchments.

EARTH BANK (HIGH FLOWS) **SD 5-6**

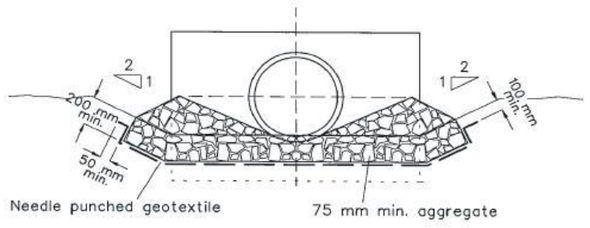
REV	DATE	BY	APP.	REVISION DETAILS	DRAWING STATUS			REV	DATE	PROJECT TITLE	EROSION AND SEDIMENT CONTROL PLAN – STANDARD DRAWINGS 2	
1	12/5/2020	AI	JvdM	Update following MOD 3	DESIGN BY:	N/A		Walker Quarries		WALLERAWANG QUARRY		
2	11/12/2020	AI	JvdM	Update following consultation / site changes	DRAWN BY:	N/A					Sheet No. 13	REV 2
					APPROVAL	N/A						



PLAN VIEW



PLAN VIEW

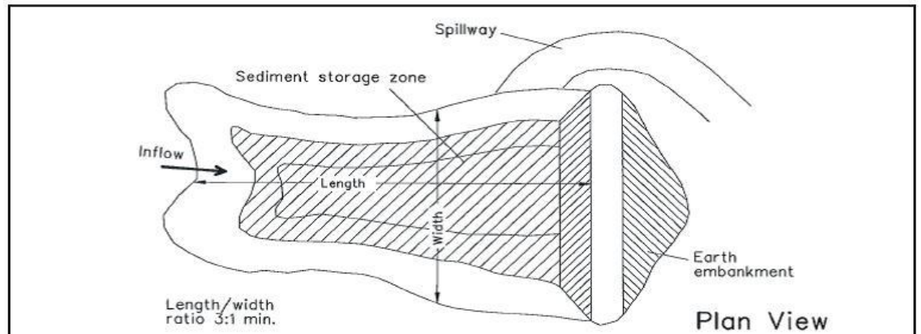


CROSS SECTION AA

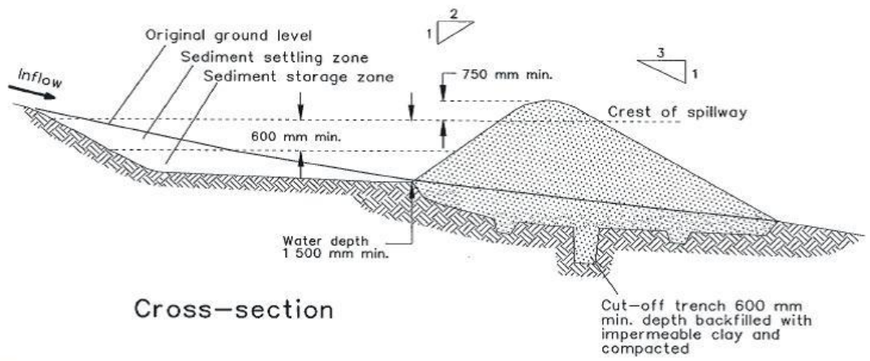
Construction Notes

1. Compact the subgrade fill to the density of the surrounding undisturbed material.
2. Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
3. Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
4. Lay rock following the drawing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
5. Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

ENERGY DISSIPATER **SD 5-8**



Plan View



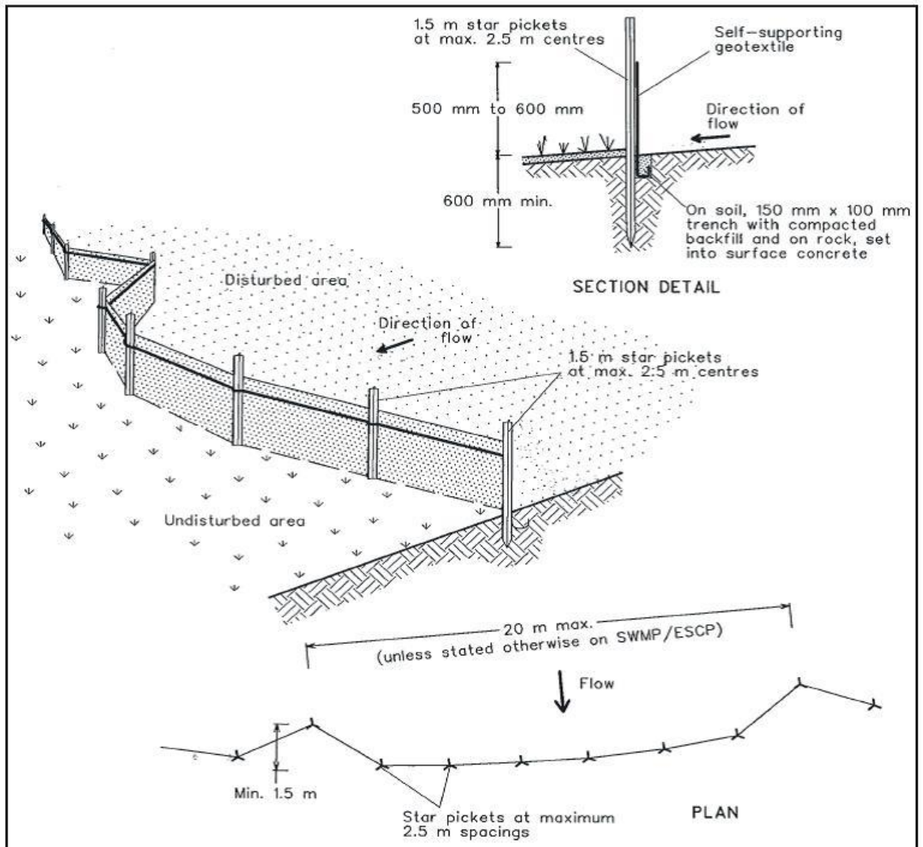
Cross–section

Construction Notes

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500 mm deep and 1,200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment as specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill following the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond compacted fill to the existing substrate.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Construct the emergency spillway.
8. Rehabilitate the structure following the SWMP.

EARTH BASIN - WET **SD 6-4**
(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)

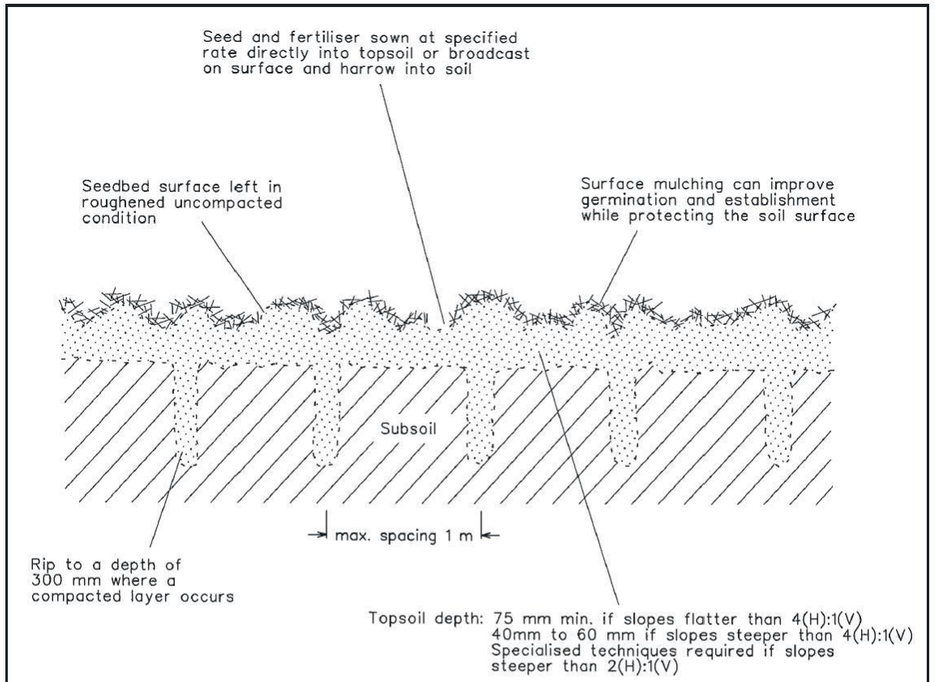
REV	DATE	BY	APP.	REVISION DETAILS	DRAWING STATUS			CLIENT		PROJECT TITLE	EROSION AND SEDIMENT CONTROL PLAN – STANDARD DRAWINGS 3	
1	12/5/2020	AI	JvdM	Update following MOD 3	DESIGN BY:	N/A		Walker Quarries	umwelt	WALLERAWANG QUARRY	Sheet No. 14	REV 2
2	11/12/2020	AI	JvdM	Update following consultation / site changes	DRAWN BY:	N/A						
					APPROVAL	N/A						



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE **SD 6-8**



Construction Notes

1. Loosen compacted soil before sowing any seed. If necessary, rip the soil to a depth of 300 mm. Avoid rotary hoe cultivation.
2. Work the ground only as much as necessary to achieve the desired tilth and prepare a good seedbed.
3. Avoid cultivation in very wet or very dry conditions.
4. Cultivate on or close to the contour where possible, not up and down the slope.

SEEDBED PREPARATION **SD 7-1**

REV	DATE	BY	APP.	REVISION DETAILS	DRAWING STATUS			CLIENT		PROJECT TITLE	EROSION AND SEDIMENT CONTROL PLAN – STANDARD DRAWINGS 4	
1	12/5/2020	AI	JvdM	Update following MOD 3	DESIGN BY:	N/A		Walker Quarries	umwelt	WALLERAWANG QUARRY		
2	11/12/2020	AI	JvdM	Update following consultation / site changes	DRAWN BY:	N/A					Sheet No. 15	REV 2
					APPROVAL	N/A						

1. Site Data Sheet

Site Name: Wallerawang Quarry

Site Location: Lot 6, Great Western Highway

Precinct: Lithgow LGA

Description of Site: Quartzite Quarry

Site area	Sub-catchments						Remarks
	SB1	SB2	SB5	SB6			
Total catchment area (ha)	6.6	3.5	0.5	0.8			
Disturbed catchment area (ha)	6.6	1.35	0.1	0.8			

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	D	D	D	D			From Appendix C
% sand (fraction 0.02 to 2.00 mm)							Soil texture should be assessed through mechanical dispersion only. Dispersing agents (e.g. Calgon) should not be used
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	D	D	D	D			Automatic calculation from above

Rainfall data

Design rainfall depth (days)	5	5	5	5			See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	95	95	95	95			See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	56.4	56.4	56.4	56.4			See Section 6.3.4 (h)
Rainfall R-factor (if known)	1500	1500	1500	1500			See Appendix B
IFD: 2-year, 6-hour storm (if known)							See IFD chart for the site

RUSLE Factors

Rainfall erosivity (*R*-factor)	1500	1500	1500	1500			Auto-filled from above
Soil erodibility (*K*-factor)	0.02	0.02	0.02	0.02			RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	100	80	40	160			
Slope gradient (%)	1	4	2	1			
Length/gradient (*LS*-factor)	0.20	0.91	0.31	0.23			
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3			
Ground cover (*C*-factor)	1	1	1	1			

Calculations

Soil loss (t/ha/yr)	8	36	12	9			
Soil Loss Class	1	1	1	1			See Section 4.4.2(b)
Soil loss (m^3/ha/yr)	6	27	9	7			
Sediment basin storage volume, m^3	7	6		1			See Sections 6.3.4(i) and 6.3.5 (e)

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$V = 10 \times C_v \times A \times R_{x\text{-day, y-\%ile}}$ (m^3)

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

$R_{x\text{-day, y-\%ile}}$ = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the detailed calculation on Soil Loss Classes 1 to 4 lands, the sediment storage zone can be taken as 50 percent of the settling zone capacity. Alternately designers can design the zone to store the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)). However, on Soil Loss Classes 5, 6 and 7 lands, the zone must contain the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(iii).

Place an "X" in the box below to show the sediment storage zone design parameters used here:

x	50% of settling zone capacity,
	2 months soil loss calculated by RUSLE

Total Basin Volume

Site	C_v	$R_{x\text{-day, y-\%ile}}$	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
SB1	0.74	56.4	6.6	2754.576	1377	4131.864
SB2	0.74	56.4	3.5	1460.76	730	2191.14
SB5	0.74	56.4	0.5	208.68	104	313.02
SB6	0.74	56.4	0.8	333.888	167	500.832

Note that designers should achieve a minimum 3:1 length:width ratio in Type D or F basins

REV	DATE	BY	APP.	REVISION DETAILS	DRAWING STATUS			CLIENT
1	12/5/2020	AI	JvdM	Update following MOD 3	DESIGN BY:	N/A		Walker Quarries
2	11/12/2020	AI	JvdM	Update following consultation / site changes	DRAWN BY:	N/A		
					APPROVAL	N/A		

umwelt

PROJECT TITLE: WALLERAWANG QUARRY

EROSION AND SEDIMENT CONTROL PLAN – SEDIMENT BASIN CALCULATIONS (EXTRACTION STAGE 1 PHASE)

Sheet No. 16 | REV 2

1. Site Data Sheet

Site Name: Wallerawang Quarry

Site Location: Lot 6, Great Western Highway

Precinct: Lithgow LGA

Description of Site: Quartzite Quarry

Site area	Sub-catchments						Remarks
	SB1B	SB2	SB5	SB6	SB8		
Total catchment area (ha)	5.8	2.2	0.5	3.3	1.1		
Disturbed catchment area (ha)	5.8	1.2	0.1	3.3	1.1		

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	D	D	D	D	D		From Appendix C
% sand (fraction 0.02 to 2.00 mm)							Soil texture should be assessed through mechanical dispersion only. Dispersing agents (e.g. Calgon) should not be used
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	D	D	D	D	D		Automatic calculation from above

Rainfall data

Design rainfall depth (days)	5	5	5	5	5		See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	95	95	95	95	95		See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	56.4	56.4	56.4	56.4	56.4		See Section 6.3.4 (h)
Rainfall R-factor (if known)	1500	1500	1500	1500	1500		See Appendix B
IFD: 2-year, 6-hour storm (if known)							See IFD chart for the site

RUSLE Factors

Rainfall erosivity (*R*-factor)	1500	1500	1500	1500	1500		Auto-filled from above
Soil erodibility (*K*-factor)	0.02	0.02	0.02	0.02	0.02		RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	100	80	40	160	50		
Slope gradient (%)	1	4	2	1	2		
Length/gradient (*LS*-factor)	0.20	0.91	0.31	0.23	0.34		
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3		
Ground cover (*C*-factor)	1	1	1	1	1		

Calculations

Soil loss (t/ha/yr)	8	36	12	9	13		
Soil Loss Class	1	1	1	1	1		See Section 4.4.2(b)
Soil loss (m^3/ha/yr)	6	27	9	7	10		
Sediment basin storage volume, m^3	6	6		4	2		See Sections 6.3.4(i) and 6.3.5 (e)

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$$V = 10 \times C_v \times A \times R_{x\text{-day, y-\%ile}} \ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

$R_{x\text{-day, y-\%ile}}$ = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the detailed calculation on Soil Loss Classes 1 to 4 lands, the sediment storage zone can be taken as 50 percent of the settling zone capacity. Alternately designers can design the zone to store the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)). However, on Soil Loss Classes 5, 6 and 7 lands, the zone must contain the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(iii).

Place an "X" in the box below to show the sediment storage zone design parameters used here:

x	50% of settling zone capacity,
	2 months soil loss calculated by RUSLE

Total Basin Volume

Site	C_v	$R_{x\text{-day, y-\%ile}}$	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
SB1B	0.74	56.4	5.8	2420.688	1210	3631.032
SB2	0.74	56.4	2.2	918.192	459	1377.288
SB5	0.74	56.4	0.5	208.68	104	313.02
SB6	0.74	56.4	3.3	1377.288	689	2065.932
SB8	0.74	56.4	1.1	459.096	230	688.644

Note that designers should achieve a minimum 3:1 length:width ratio in Type D or F basins

REV	DATE	BY	APP.	REVISION DETAILS	DRAWING STATUS			CLIENT
1	12/5/2020	AI	JvdM	Update following MOD 3	DESIGN BY:	N/A		Walker Quarries
2	11/12/2020	AI	JvdM	Update following consultation / site changes	DRAWN BY:	N/A		
					APPROVAL	N/A		

PROJECT TITLE: WALLERAWANG QUARRY

EROSION AND SEDIMENT CONTROL PLAN – SEDIMENT BASIN CALCULATIONS (FUTURE OPERATIONS)

Sheet No. 17 | REV 2

umwelt
Environmental & Social Consultants

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12 Prowse Street
West Perth WA 6005
PO Box 783
West Perth WA 6872

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Turner ACT 2612
PO Box 6135
O'Connor ACT 2602

Sydney
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Sydney NSW 2000

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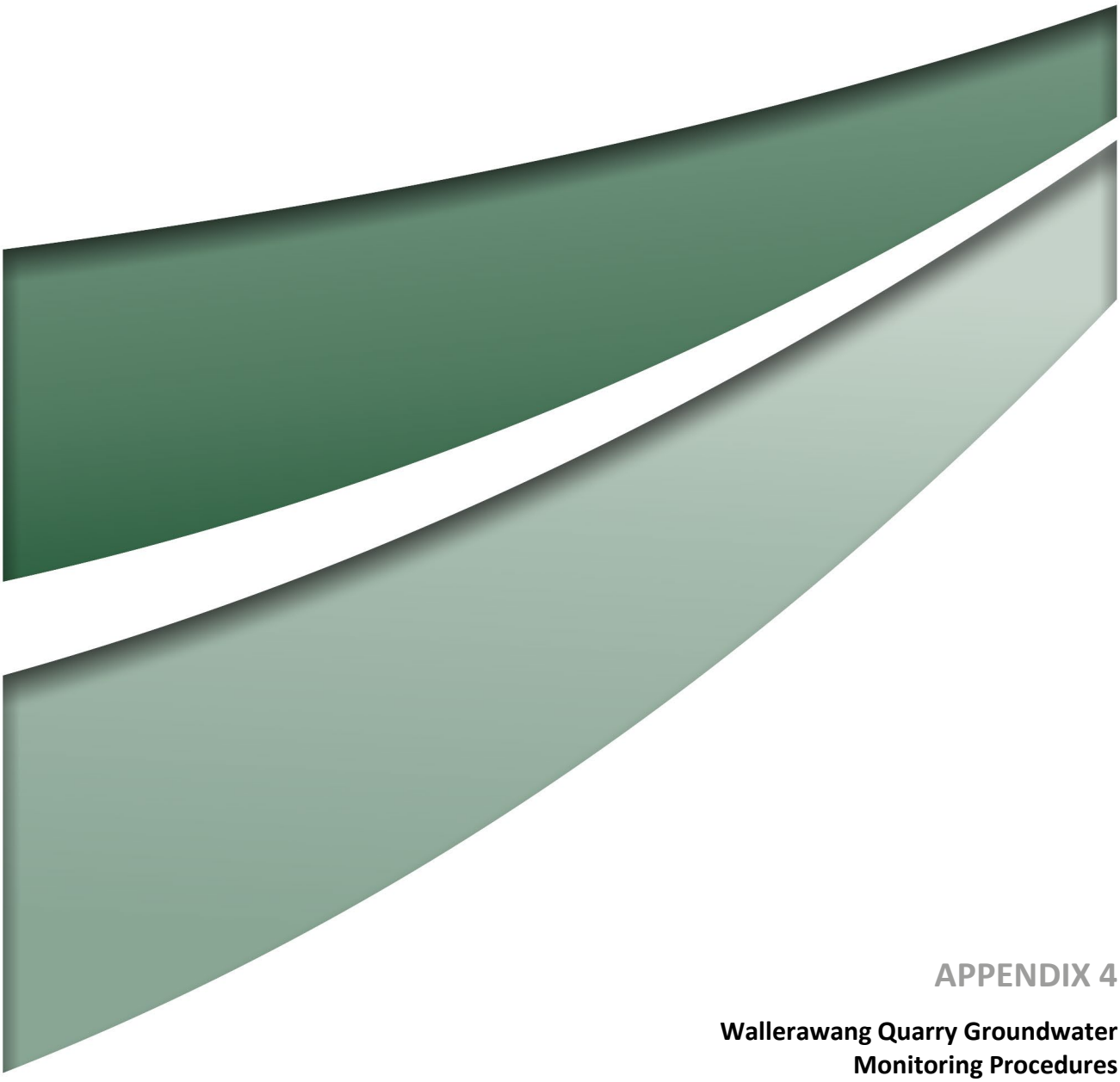


APPENDIX 4

Wallerawang Quarry Groundwater Monitoring Procedures

4433_Wallerawang Quarry – Groundwater Monitoring Procedures

1.0 Purpose

To provide procedures to download groundwater monitoring data from the groundwater monitoring bores installed at Walker Quarries Wallerawang Quarry.

2.0 General information

- Three groundwater bores to be monitored are GW1, GW2 and GW3 (see **Figure 1**).

- Two probes are installed at **GW1**. One is submerged within the bore at the end of the cable to monitor groundwater levels. The other is located under the bore cap at the top of the bore to monitor barometric pressure. Both probes are to be connected to the Rugged TROLL docking station to download data.

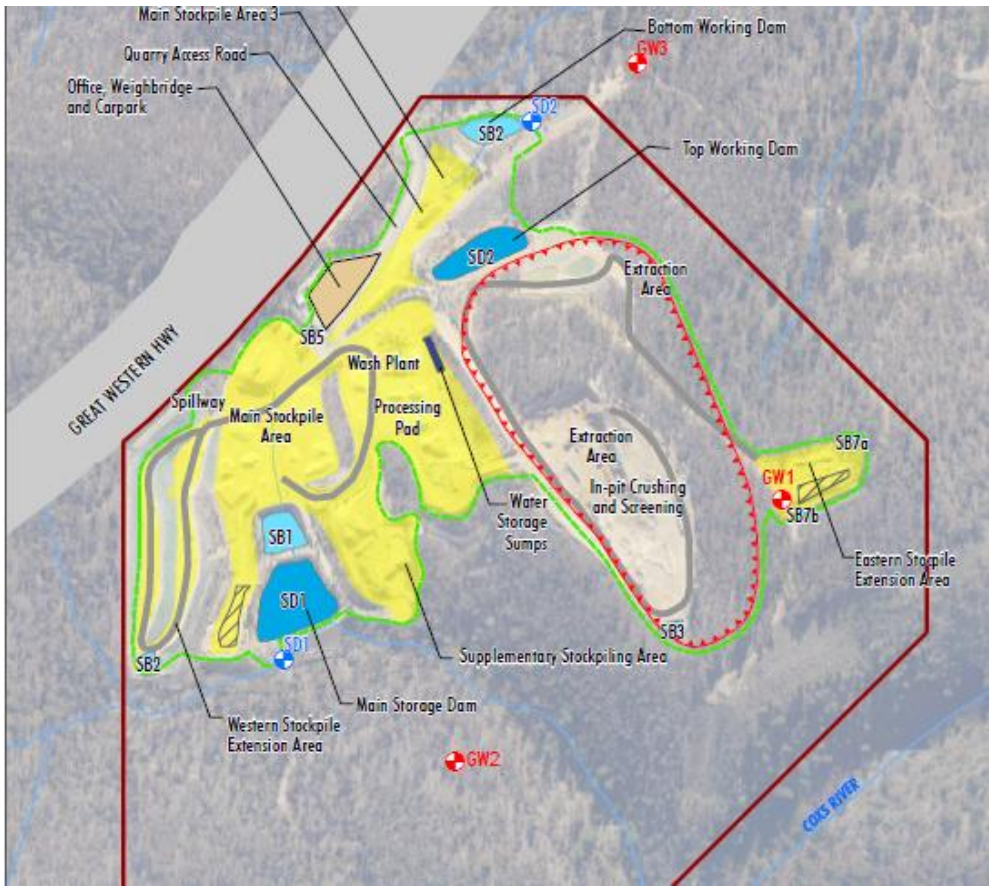


Figure 1 Groundwater Monitoring Locations

Newcastle
75 York Street
Teralba NSW 2284

Perth
Level 1
12 Prowse Street
West Perth WA 6005
PO Box 783
West Perth WA 6872

Canberra
2/99 Northbourne Avenue
Turner ACT 2612
PO Box 6135
O'Connor ACT 2602

Sydney
Level 3
50 York Street
Sydney, NSW, 2000

Brisbane
Level 13
500 Queen Street
Brisbane QLD 4000

Orange
Office 1
3 Hampden Avenue
Orange NSW 2800

T| 1300 793 267
E| info@umwelt.com.au
www.umwelt.com.au

Umwelt (Australia) Pty Limited
ABN: 18 059 519 041

This briefing note and any attachments are confidential and are intended to provide information for use in discussions between Umwelt and the named recipient(s) only.

3.0 Equipment

- The following equipment is stored at the Wallerawang Quarry main office:
  - Keys for bore padlocks.
  - In-Situ Rugged TROLL docking station.
  - Water level meter (100 m length).
- Laptop with Win-Situ 5 software and Baro Merge software installed:
  Win-Situ 5: https://in-situ.com/support/documents/win-situ-5-software/
  Baro Merge: https://in-situ.com/support/documents/baro-merge-software/
- Pen and paper.
- The following PPE is required:
  - Hard hat.
  - Steel-cap boots.
  - Long sleeves.

4.0 Connecting and Downloading Data

- Open the Win-Situ software on the laptop.
- Unlock and open bore.
- Retrieve cable with probe connected. Detach probe and connect to the Rugged TROLL docking station. Connect docking station USB to laptop (see image below). Ensure both the barometric probe and the groundwater probe for **GW1** are connected to the docking station for download.

Line up instrument tab with docking station slot.

Insert Rugged TROLL in docking station

Plug docking station into your PC's USB port.

- Select **No** when asked to **Connect to device now**.
- Click on the yellow connect button at the bottom right of the screen:
- Select **Yes** if prompted to sync device time with local system.
- Select the **Logging** icon in the toolbar (located to the right of the **Home** icon)
- Select log to download.
- Click the **Download** button
- Select one of three download options:
  - All data
  - New data (data logged since the last download)
  - Time interval to download

NB: New data is downloaded by default to a new log file. To append new data to the last download of this log, select the **Append logs on download** option in **General Settings** (**Preferences** > **General Settings**).

- Four logs (with .wsl extensions) will be created and saved under **Home** > **Site Data** > **Wallerawang** (one log for each bore and one log for barometric pressure).

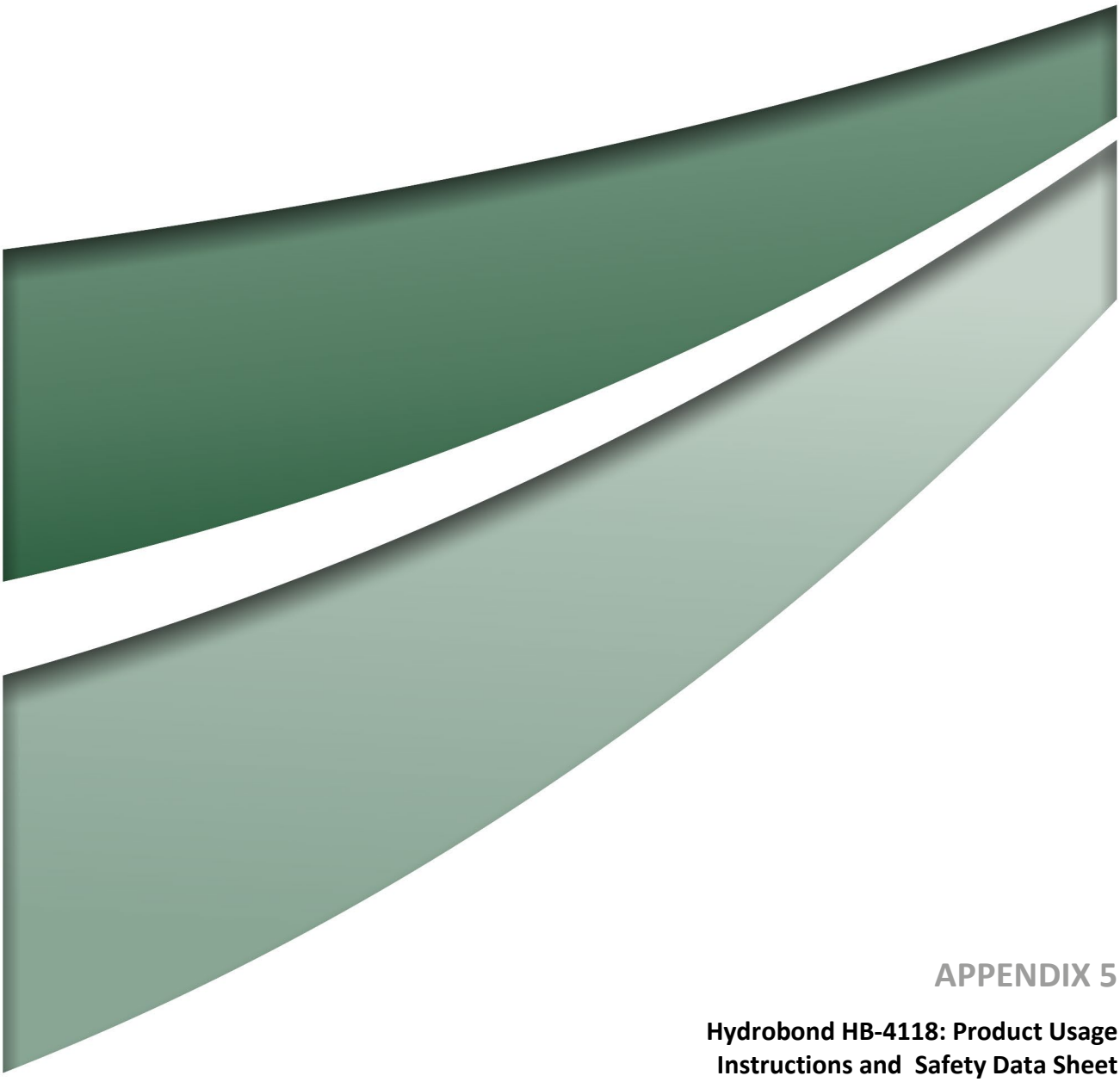
5.0 Baro Merge Software

- Baro Merge software can post-correct absolute (non-vented) level sensor data to eliminate barometric pressure effects from the measurements.
- To create the Baro Merge files, click on **Tools** in the top toolbar and select **Win-Situ Baro Merge.** A popup box will appear.
- Click on **Use a BaroTROLL file** button**.**
- Click on the ellipses and expand the menu to find and select the .wsl BaroTROLL file. Once the file is selected, click on the **Tick** button to close.
- Click on the **right arrow** to move to next screen.
- Ensure the **Select Units** are **kPa** and the **Save calculated barometric adjustments in new data files(s)** is selected.
- Click on the **right arrow** to move to next screen.
- Expand the menu to find and select the .wsl file for each bore.
- Click on the **Tick** to perform the function. **BaroMerge.wsl** files will be created under **Home** > **Site Data** > **Wallerawang** for each bore that was selected.

6.0 Exporting files from Win-Situ to Excel

- To save each file as a .csv file, right click on each newly created .wsl file (ending in BaroMerge.wsl) located under **Home** > **Site Data** > **Wallerawang** and select **Export to CSV**. This creates a .csv file under **Home** > **Exported Data** > **Wallerawang**.
- Double click on each .csv file under **Home** > **Exported Data** > **Wallerawang**. The spreadsheets contain the corrected data for each bore. Save the spreadsheets in a new folder in the following location:

  K:\Jobs\4433-wal\9-working_files\Monitoring\Groundwater
- Copy data from each spreadsheet to the **Master GW level and quality** spreadsheet. The spreadsheet is saved in the same file location as above.
- Add BOM rainfall data for the monitoring period to the **GW Logger Data** tab for BOM Station 631132.
- Ensure graphs in tabs **GW1**, **GW2** and **GW3** are updated with new data.



APPENDIX 5

Hydrobond HB-4118: Product Usage Instructions and Safety Data Sheet

Product Bulletin

HydraBond® HB-4118

Solid anionic polymer block for water treatment in remote locations

HYDROFLUX UTILITIES

Description

HydraBond® HB-4118 is a solid block containing anionic polymer used for general purpose water clarification in remote, hard-to-reach or unsupervised locations where polymer make-up or dosing equipment is unavailable. HB-4118 is non-toxic to fish and aquatic life and suitable for waters being discharged to EPA controlled water systems. HB-4118 is characterised as being a high molecular weight linear polymer of medium anionic charge in an inert carrier agent.

Product Benefits

- No make-up or dosing equipment required
- Non-toxic allowing the treated waters to be discharged to EPA controlled water systems
- Disperses slowly allowing high volumes of water to be treated with each block
- Helps capture both colloidal and larger solids by forming large & dense flocs that promotes high settling rates

Properties

Form:	3 kg solid rectangular block
Dimensions:	220 x 170 x 80 mm
Colour:	Off-white
Bulk density:	1.05 g/cm^3
pH:	6.5 ± 0.5 (0.2% solution)
Viscosity:	700 cP (0.2% solution)

Product Use

HydraBond HB-4118 is a solid block containing anionic polymer for use as a flocculant in water clarification. It is ideal for applications where there is no electrical or pneumatic power available for polymer make-up or polymer dosing.

HB-4118 can be used for waters discharging to an EPA controlled waterway, or where the water is reused. Applications include:

- stormwater drains before settling ponds
- run-off from construction sites, quarries, stockyards and industrial sites
- retention dams
- water from wheel and truck washing

Product Activation

HB-4118 is designed to slowly disperse and activate in the presence of turbulent, flowing water. The flowing water scours polymer from the block where it mixes with the rest of the water stream. The faster the flow, the more the block will be scoured and the faster it will be consumed. When the flow stops, HB-4118 stops being consumed.

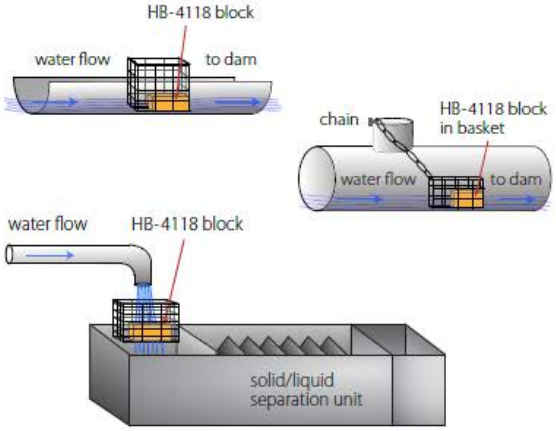
Leaving the HB-4118 block in non-flowing water is not ideal. The block will partially dissolve resulting in a gel forming on the block surface. If left for only a couple of hours in non-flowing water, when the flow starts again this gel will disperse and the block will return to its normal operation. If left for longer than about 12 hours in non-flowing water, the gel surrounding the block may become thick enough that the block becomes almost unusable.

The most suitable mode of operation is to have the block in flowing water, and when the flow stops then allow the block to dry. When the flow starts again and begins scouring the block, the block returns to normal operation with the flowing water scouring polymer from the block.

Product Application

The role of HB-4118 is to flocculate colloidal and suspended solids in the water before solids removal via a dam or clarifier. Thus once dosed, the resultant solids should be allowed to settle before the water is discharged or reused.

To treat an inflow of water to a dam, HB-4118 can be placed in a wire basket in a turbulent location such that the water flow will scour polymer from the block, allow it to mix with the rest of the water, and then enter the dam.



Product Bulletin

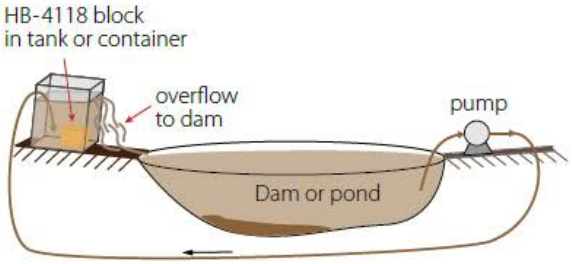
HydraBond® HB-4118

Solid anionic polymer block for water treatment in remote locations

HYDROFLUX UTILITIES

A small turbulent zone should be created after the HB-4118 block to allow good contact between the polymer and the suspended solids.

To treat a dam that already has cloudy water in it requires pumping the water from one end of the dam, passing the water over the HB-4118 block, and then releasing the water to the other end of the dam. One method used is to pump the water into a tank with a block secured inside and let the water scour polymer from the block and then overflow the tank back to the dam.



Under typical operating conditions a 3 kg HB-4118 block is expected to treat about 500,000 litres of water. Lower water temperatures and lower flows will reduce consumption, while higher flows and warmer water will increase consumption.

If your water is particularly turbid, or you have a large volumetric flow and you want to increase the dose rate, then add more HB-4118 blocks into the basket or container. Alternatively have a second or third basket with an HB-4118 block inside placed in series or alongside the first basket. Another option is to take one block of HB-4118 and break it into smaller pieces and then place in the basket. This will increase the surface area of the block available to dissolve, with the effect of increasing the dose rate.

HB-4118 will not affect the water pH nor will it add any salinity (total dissolved solids) to the treated water.

Basket dimensions (LxWxH) = 300 x 300 x 400 mm

The information contained in this bulletin is, to the best of our knowledge, true and accurate but made without guarantee. Hydroflux Utilities disclaims any liability incurred in connection with the use of this information.

HYDROFLUX UTILITIES

Safety Data Sheet
HydraBond® HB-4118

SECTION 1 - IDENTIFICATION: PRODUCT IDENTIFIER AND COMPANY INFORMATION

Product name	HydraBond® HB-4118
Product code	HB-4118
Product use	Water treatment flocculant
Company name	Hydroflux Utilities Pty Ltd Level 26, 44 Market Street, Sydney, NSW 2000 www.hydrofluxutilities.com.au e: info@hydrofluxutilities.com.au t: 61 2 9089 8833 f: 61 2 9089 8830
Emergency Number	13 11 26 (Poison Information Hotline)

SECTION 2 - HAZARD IDENTIFICATION

HAZARDS nil

LABEL ELEMENTS

Pictogram	nil
Signal word	nil

HAZARD STATEMENTS

nil

PRECAUTIONARY STATEMENTS

Prevention	nil
Response	nil
Storage	nil
Disposal	nil

SECTION 3 - COMPOSITION AND INFORMATION ON INGREDIENTS

DESCRIPTION Anionic acrylamide based copolymer blended with an inert carrier agent

INGREDIENTS

Chemical name	CAS No.	Proportion, %
ingredients not deemed to be hazardous	-	to 100

SECTION 4 - FIRST-AID MEASURES

SWALLOWED

- If swallowed do NOT induce vomiting.
- If conscious, washout mouth and give water to drink.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- If reflexive vomiting occurs, rinse mouth and repeat administration of water.
- Seek medical advice.

EYE

- Wipe or blot away excess material with clean cloth or paper towel.
- Wash out affected eye with fresh running water. Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Seek medical attention.

SKIN

- Wipe or blot away excess material with clean cloth or paper towel.
- Flush affected area with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

- Remove to fresh air, treat symptomatically.
- If symptoms develop, seek medical advice.

NOTES TO PHYSICIAN

- Ingestion of product may form a jelly-like mass which may result in an intestinal obstruction.

SECTION 5 - FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA

- Water, foam, carbon dioxide, dry powder.
- Use extinguishing media suitable for surrounding area.

HAZARDS FROM COMBUSTIBLE PRODUCTS

- May produce toxic fumes of carbon monoxide under fire conditions.
- May produce oxides of carbon and nitrogen under fire conditions.

PRECAUTIONS FOR FIRE-FIGHTERS AND SPECIAL PROTECTIVE EQUIPMENT

- Water in contact with the product will cause slippery floor conditions.
- In case of fire, wear a full face positive-pressure self-contained breathing apparatus and protective suit.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS

- Restrict access to area until clean-up operations are complete.
- Use personal protective equipment recommended in Section 8.
- Ventilate spill area if possible.
- Spill may be slippery when wet.

MINOR SPILLS

- Do not wash with water.
- Slippery when wet.
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Sweep and shovel into labelled containers suitable for disposal.

MAJOR SPILLS

- Do not wash with water.
- Slippery when wet.
- Alert Fire Brigade and tell them the location and nature of hazard.
- Prevent spillage from entering drains or water ways. Spilled product may pose a risk to the aquatic ecosystem if released. If contamination of drains or waterways occurs, advise emergency services.
- Sweep and shovel into labelled containers suitable for disposal.

SECTION 7 - HANDLING AND STORAGE

HANDLING

- Eliminate personal contact.
- Avoid generating dust.
- Keep the containers closed when not in use.
- Have emergency equipment (for fires, spills, etc.) readily available.
- Ensure all containers are labelled.

STORAGE CONDITIONS

- Store in suitable labelled containers.
- Store the containers tightly closed.
- Store separately from oxidizers.
- Store in a cool, dry, well-ventilated area.

SECTION 8 - EXPOSURE CONTROLS AND PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS

- None assigned.

ENGINEERING MEASURES

- General ventilation is recommended.
- Keep an eye wash fountain available.
- Where practicable, have a safety shower available.

PERSONAL PROTECTION

We recommend as a minimum precaution the use of safety glasses with side-shields and work clothes protecting arms, legs and body, fully enclosed safety boots/gumboots and gloves.

Respiratory Protection

- Respiratory protection is not normally needed.

Hand Protection

- Nitrile gloves, Viton gloves, PVC gloves, cloth gloves, rubber gloves.

Skin Protection

- Wear standard protective clothing.

Eye Protection

- At a minimum wear safety glasses with side shields.

Hygiene Recommendations

- Use good work and personal hygiene practices to avoid exposure.
- If clothing is contaminated, remove clothing and discard or launder. Launder contaminated clothing separately and before reuse.
- Always wash and clean yourself thoroughly after handling chemicals.
- When handling this product never eat, drink or smoke.

ENVIRONMENTAL EXPOSURE CONTROL PRECAUTIONS

- Consider the provision of containment around storage vessels.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Form	Solid
Appearance	Opaque to white
Odour	Nil
pH	6–7 (1% solution)
Melting point	no data available
Flash point	Not flammable
Upper explosive limit	Not flammable

Lower explosive limit	Not flammable
Auto-ignition temp.	not applicable
Bulk density	1.1 g/cm^3
Solubility in water	Dispersible

SECTION 10 - STABILITY AND REACTIVITY

STABILITY

- Stable under normal conditions.

HAZARDOUS POLYMERIZATION

- Hazardous polymerization will not occur.

CONDITIONS TO AVOID

- Extremes of temperature.
- Moisture and high humidity.

MATERIALS TO AVOID

- Addition of water results in gelling.
- Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapours.

HAZARDOUS DECOMPOSITION PRODUCTS

- Under fire conditions: Oxides of carbon and nitrogen.

SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA

- LD50 Oral rat >2,000 mg/kg
- LD50 Dermal rabbit >5,000 mg/kg

SENSITIZATION

- This product is not expected to be a sensitizer.

CARCINOGENICITY

- No information available.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION

- The effects by similar products on aquatic organisms are due to external (non-systemic) mode of action, e.g. suffocation or immobilization.

The following results have been conducted on products similar in nature to this product.

Acute Toxicity - Fish

Species	Exposure	LC50
Rainbow trout	96 hour	>100 mg/L

Acute Toxicity - Invertebrate Species

Species	Exposure	EC50
Daphnia magna	48 hour	>100 mg/L

BIOACCUMULATION POTENTIAL

- The potential for bioaccumulation is low. The number of carbon molecules in the polymer structure is very large and thus not able to transport across the cellular membrane.

MOBILITY

- The product is eliminated from the aqueous phase (>90%) via adsorption on suspended material.
- The effects of this product on aquatic organisms are rapidly and significantly mitigated by the presence of suspended material in the aquatic environment.

PERSISTENCE/DEGRADABILITY

- This product is not readily biodegradable.

HYDROLYSIS

- Does not hydrolyse.

SECTION 13 - DISPOSAL CONSIDERATIONS

- Dispose of in accordance with local, state and federal regulations.
- Dispose of wastes in an approved waste treatment/disposal site in accordance with applicable regulations.
- Do not dispose of wastes in local sewer or with normal garbage.
- Can be placed in landfill, when in compliance with local regulations.
- Do not reuse empty container for any purpose except to store this chemical.

SECTION 14 - TRANSPORT INFORMATION

Not classified as a dangerous good - Australian Code for the Transport of Dangerous Goods by Road & Rail.

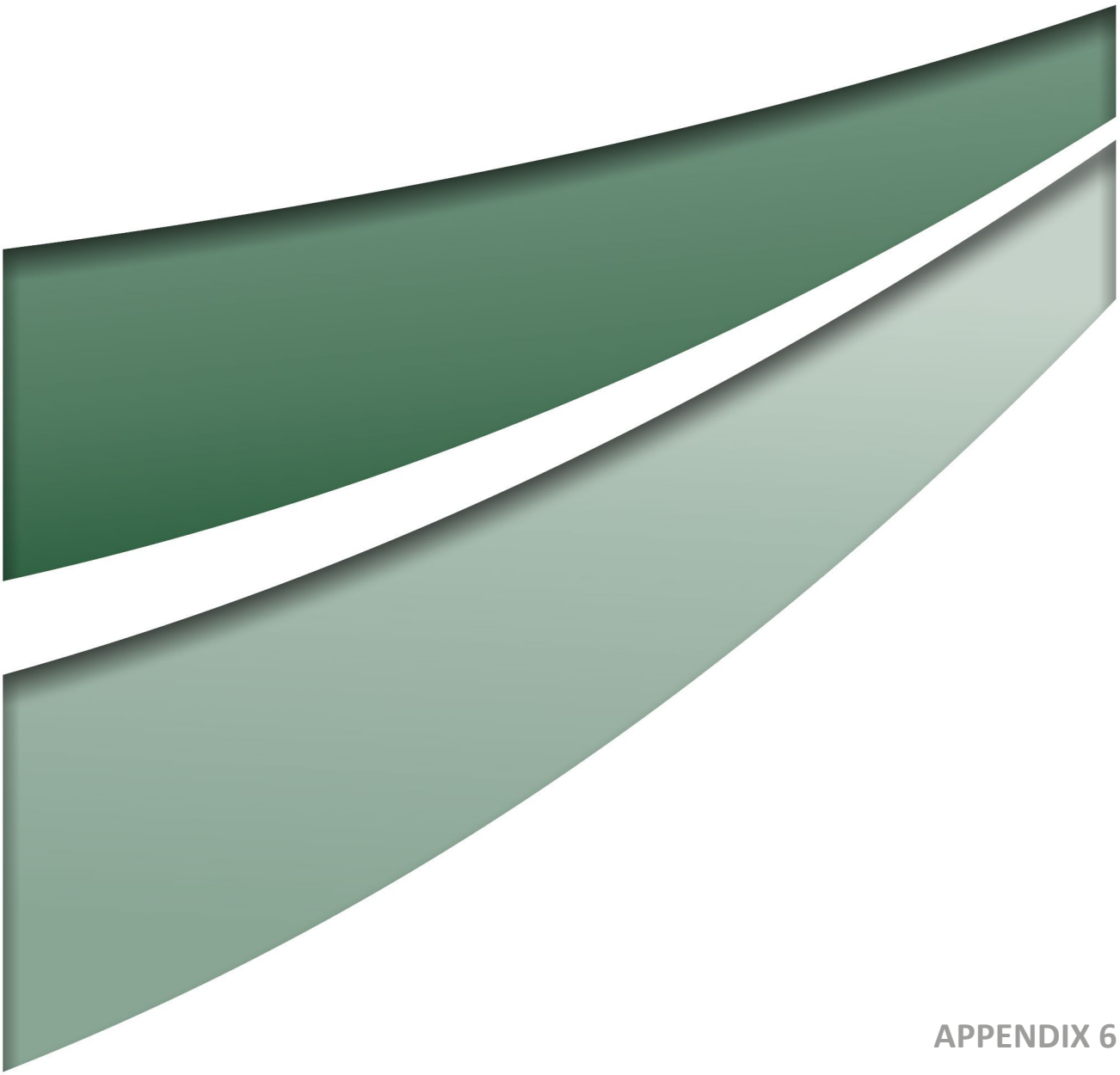
UN Number	-
Shipping name	-
Dangerous Goods Class	-
Packing Group	-
Subsidiary Risk	-
HAZCHEM	-
EPG	-

SECTION 15 - REGULATORY INFORMATION

Safe Work Australia	»	This product has been classified in accordance with the Globally Harmonised System of Classification and Labelling of Chemicals (GHS) - see Section 2 of this Safety Data Sheet.
NICNAS	»	All ingredients in this product comply as per The Australian National Industrial Chemicals Notification & Assessment Scheme (NICNAS).
AICS	»	All ingredients in this product are listed or are exempt from listing in the Australian Inventory of Chemical Substances (AICS).
POISON Schedule	»	Not scheduled as part of the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

SECTION 16 - OTHER RELEVANT INFORMATION

Preparation date	24 April 2015
Revision number	3.0 (updates to Section 11, 12, 15)
Information sources	» Preparation of Safety Data Sheets for Hazardous Chemicals Code of Practice, Dec 2011 (Safe Work Australia). » Australian Code for the Transport of Dangerous Goods by Road & Rail, 7th Edition. Oct 2011. » Safety Data Sheets from our suppliers of raw material. » Poisons Standard 2015 - Australian Government *Therapeutic Goods Act 1989.* » Hazardous Substance Information System (Safe Work Australia). » GHS Hazardous Chemical Information List. Version 0.2. August 2014, Safe Work Australia. » Globally Harmonised System of Classification and Labelling of Chemicals (GHS) 5th Edition, United Nations 2013.



APPENDIX 6

Response to DPIE-Water

Contact: Jane Curran
Email: jane.curran@nrar.nsw.gov.au

Uploaded to Major Projects Portal

Our ref: v15/3875-4#71, DOC21/8897
Your ref - DA344-11-2001-PA-14

Dear Sir/Madam,

8 February 2021

Re: Wallerawang Quarry Expansion – Water Management Plan

Thank you for giving the Department of Planning, Industry and Environment – Water (DPIE-Water) the opportunity to review the Wallerawang Quarry Expansion – Water Management Plan.

The DPIE-Water recommends the following:

1. The determination of the maximum groundwater level should be done in consultation with DPIE Water. Until this maximum groundwater height is established, the quarry floor cannot go lower than the previously approved 901 mAHD level.
2. The SWMP shall include groundwater quality monitoring as detailed in the SEE Section 9.3.
3. Documentation on the determination and implementation of "Make good provisions" for surrounding bores should be included in the SWMP. This should include monitoring of bores GW801271, GW111587, GW805211 as a minimum, enacting of provisions when an impact of 2m has been determined.

Should you have any further queries in relation to this submission please do not hesitate to contact the Natural Resources Access Regulator's Service Support Team at nrar.servicedesk@dpie.nsw.gov.au.

Yours sincerely

Alison Collaros
Licensing and Approvals Manager (East)
Natural Resources Access Regulator
Department of Planning, Industry and Environment

Inspired People
Dedicated Team
Quality Outcomes

Our Ref: 4433_R06_Response to SWMP Review_20210426

26 April 2021

Alison Collaros
Licensing and Approvals Manager (East)
Natural Resources Access Regulator
Department of Planning, Industry and Environment

E| nrar.servicedesk@dpie.nsw.gov.au / jane.curran@nrar.nsw.gov.au

Att: Jane Curran

Dear Jane

Re: Wallerawang Quarry – Water Management Plan

The response of the Department of Planning, Industry and Environment – Water (DPIE-Water) provided on 8 February 2021 following a review of the Wallerawang Quarry Soil and Water Management Plan has been considered and the SWMP updated accordingly.

With respect to the specific matters raised by DPIE-Water, the following response is provided.

1. The determination of the maximum groundwater level should be done in consultation with DPIE Water. Until this maximum groundwater height is established, the quarry floor cannot go lower than the previously approved 901 mAHD level.

   This is agreed and Section 9.4.2.1 has ben updated to confirm this as follows:

   > *The method for establishing the maximum groundwater level will be confirmed in consultation with DPIE-Water. Extraction below 901 mAHD will not be undertaken until DPIE-Water confirm satisfaction with the established maximum groundwater level.*

2. The SWMP shall include groundwater quality monitoring as detailed in the SEE Section 9.3.

   There is no SEE Section 9.3, however, **Section 9.3.2.2** has been added to the SWMP to provide for annual monitoring of groundwater quality as follows (see over page).

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The three groundwater bores will be sampled at least annually and analysed for the following parameters.

General	Metals	Anions / Cations	Alkalinity
• Electrical Conductivity	• Arsenic	• Sulphate	• Hydroxide
• pH	• Cadmium	• Chloride	• Carbonate
	• Chromium	• Calcium	• Bicarbonate
	• Copper	• Magnesium	
	• Nickel	• Sodium	
	• Lead	• Potassium	
	• Zinc		
	• Mercury		

3. Documentation on the determination and implementation of "Make good provisions" for surrounding bores should be included in the SWMP. This should include monitoring of bores GW801271, GW111587, GW805211 as a minimum, enacting of provisions when an impact of 2m has been determined.

   This has been considered, however, for the following reasons considered outside the reasonable scope of the SWMP.

   - The Quarry is limited to extraction remaining above the groundwater table and as such the potential for depressurisation of aquifers which could lead to drawdown in surrounding bores will not occur.
   - Walker Quarries currently monitor groundwater levels in bores immediately northeast, north and west of the extraction area to confirm extraction remains above the groundwater table and there are no significant changes to standing water levels which could have been influenced by quarrying operations. Over 2.5 years of data has been collected with all fluctuations in water level as anticipated given the rainfall record over that time.
   - The proximity of the refenced groundwater bores to the extraction area are as follows:
     - GW111587: located approximately 900 m to the north,
     - GW801271: located approximately 1,200 m to the northwest, and
     - GW805211: located approximately 900 m to the northeast and on the opposite side of the Coxs River.

     The location of these bores with respect to the Quarry is identified on **Figure A**.
   - Groundwater modelling completed for the most recent modification to Quarry operations (including an extension of the extraction area below the groundwater table) predicted a drawdown of <1 m within 1 km to the west, <750 m to the north and south-west. To the east and south, drawdown did not extend beyond the Coxs River.

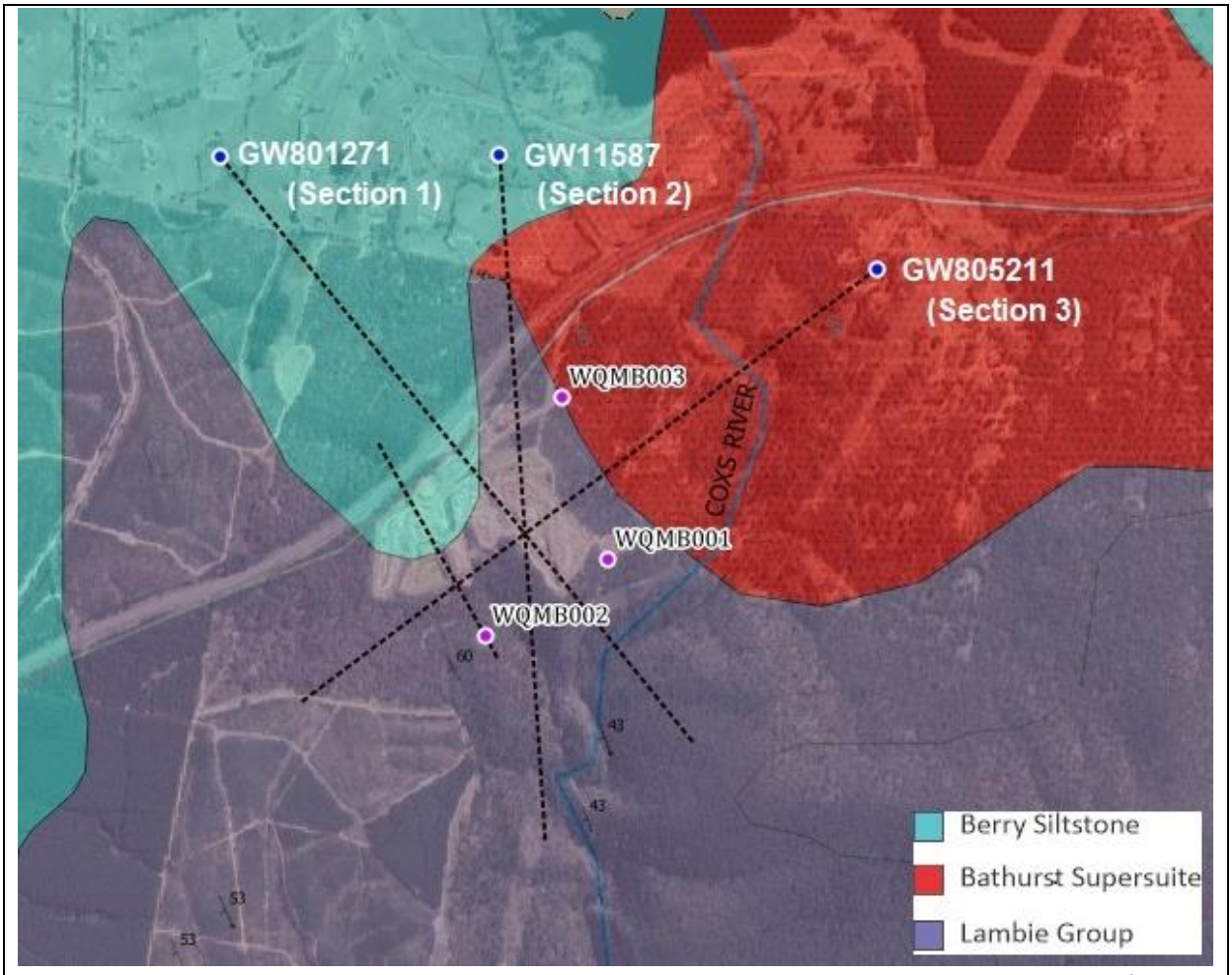
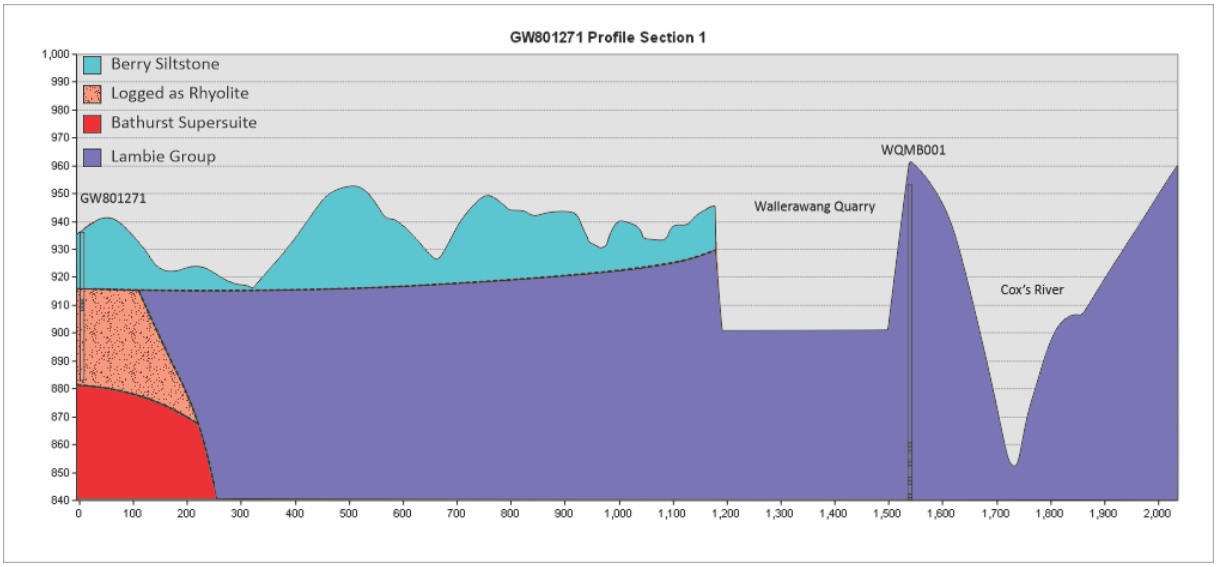
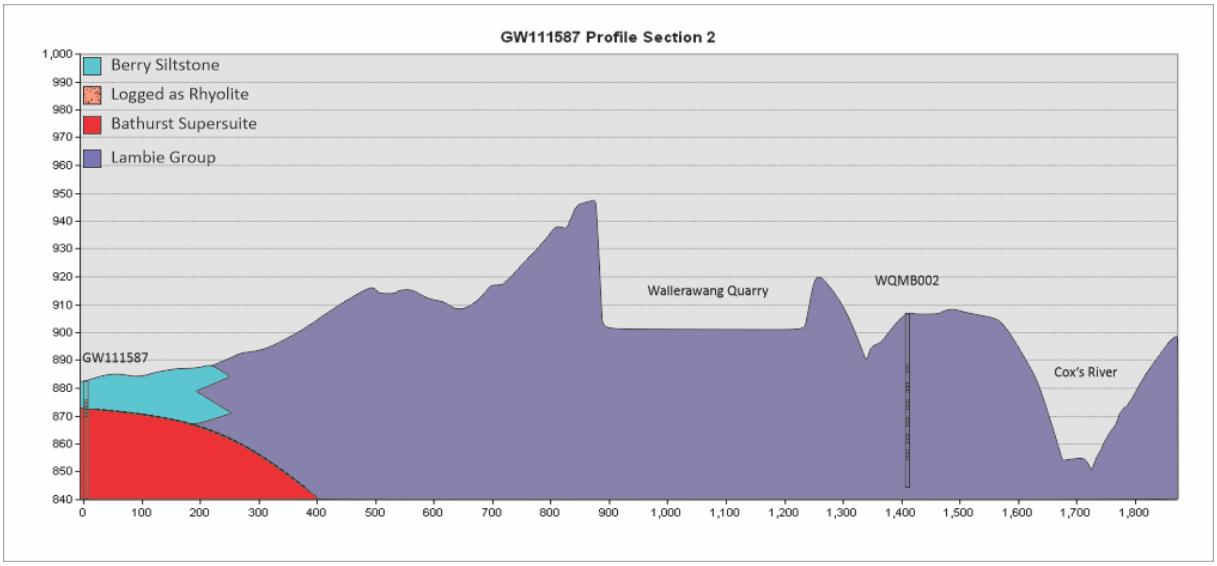


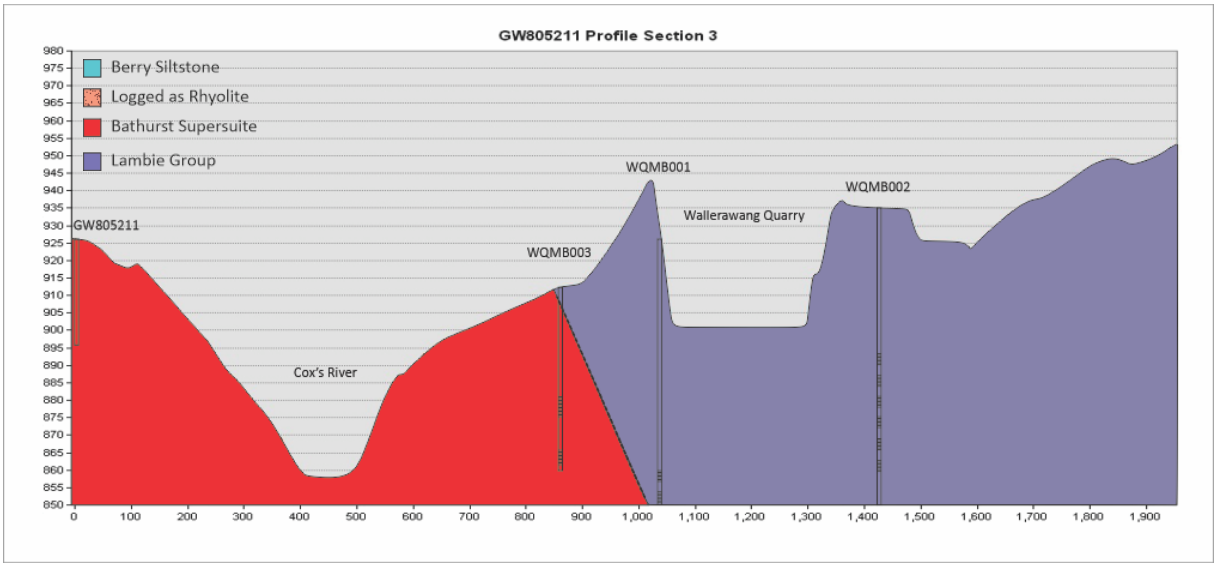
Figure A
Groundwater Bores and Sections

Even discounting the fact that the groundwater modelling considered extraction below the groundwater table, which is prohibited by DA 344-11-2001, these bores are beyond the extent of predicted drawdown.

- Cross-sections 1, 2 and 3 are provide for each of the referenced groundwater bores with respect to the extraction area, topography, geology and screened water level (where available).







The cross-sections, which present the extraction area void and maximum depth (901 mAHD) illustrate the following.

- GW805211 is located on the opposite side of the Coxs River which the groundwater model confirms is a barrier to drawdown.
- Both GW111587 and GW801271 are screened in separate geological formations (in shale/granite and rhyolite respectively) and therefore the potential for interference by quarry activities in the Lambie Group quartzite, hornfels, siltstone and conglomerate is minimal.

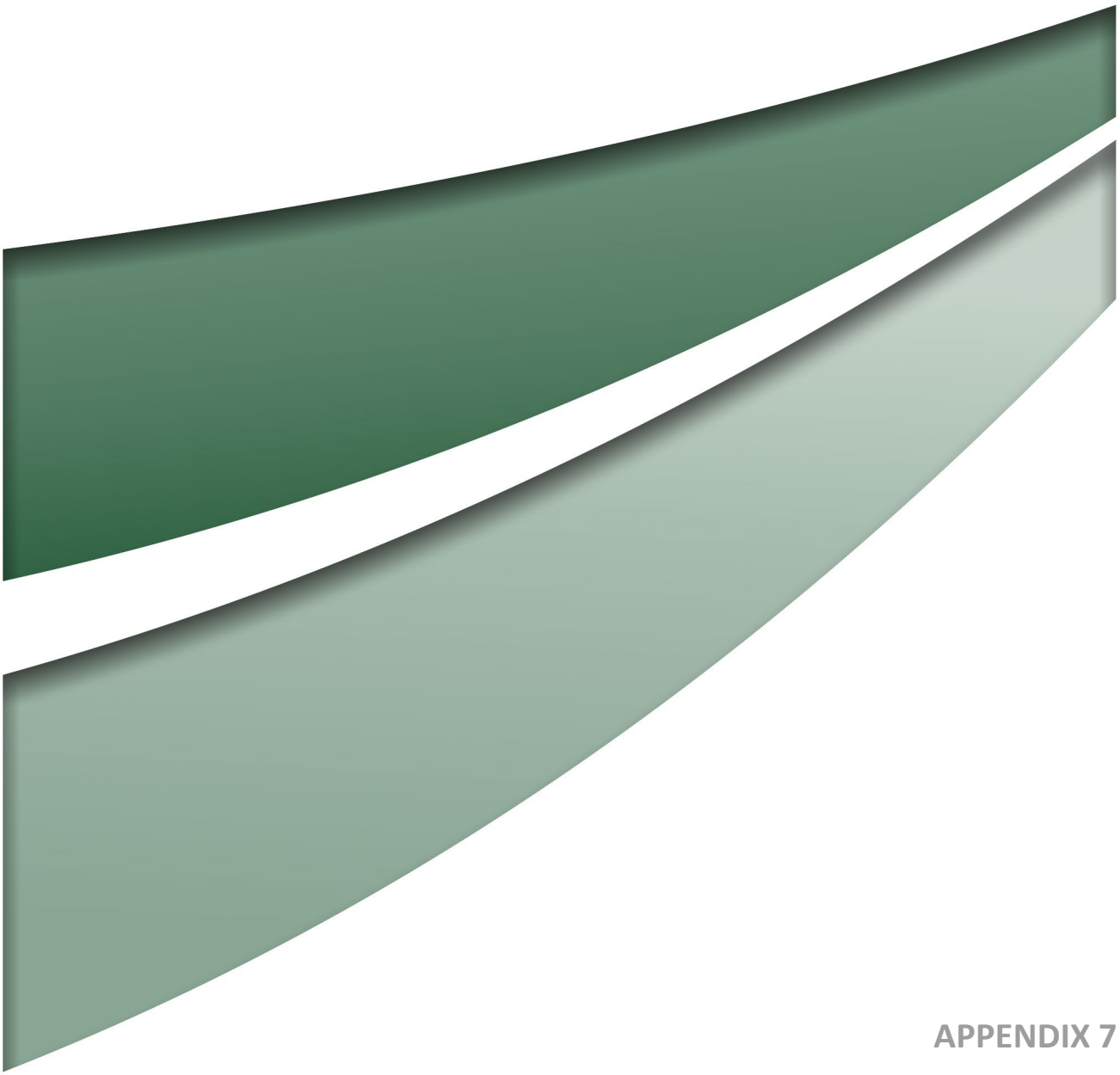
On the basis of the information provided Walker Quarries believes there to be minimal potential for impact on surrounding bores and therefore ongoing monitoring is not necessary.

This notwithstanding, in the event Walker Quarries is contacted by a surrounding landowner with a claim of adverse impact on their groundwater supply, these claims will be investigated and outcomes summarised in the relevant Annual Review. In the event the claims are not addressed to the satisfaction of the landowner, the dispute resolution procedures of *Section 7.2.2* the Quarry *Environmental Management Strategy* will be commenced. However, on the basis of the minimal risk of impact, no formal 'Make Good Provisions' are considered necessary.

We trust this information addresses the matters raised in your letter of 8 February 2021. Please do not hesitate to contact the undersigned on 1300 793 267 should you require clarification or further information.

Yours sincerely

Alex Irwin
Principal Environmental Consultant



APPENDIX 7

Summary of Updates (V4)

Table A7.1 Summary of SWMP Updates

Section / Reference	Update	Justification
Figure 6.1	Minor changes to layout (modification to SB1, removal of SB6 and resultant changes to catchment areas) reflecting operational changes (in accordance with development consent conditions)	Minimum water storage capacity requirements of 5-day 95th percentile rainfall event still maintained with catchment areas altered to reflect extension of the Main Stockpile Area to accommodate the placement of the wash plant on the Main Stockpile Area whilst upgraded wash plant installed on the processing pad.
Section 6.3 / SD1: Main Storage Dam	Additional text included to reflect management of SD1 as a supplementary storage of dirty water (identifying the potential for occasional discharge of water - subject to complying with water quality criteria). Note Section 6.4.4 includes details on use of flocculants	The additional text clarifies how SD1 is to be used and managed as a supplementary water storage for dirty water. Use of SD1 in this way will ultimately reduce the potential for discharge from the Quarry which is beneficial both from an operational perspective as well as mitigating risk of pollution incidents.
Table 6.4	SB6, whilst retained as a supplementary control of water flow velocity from the top tier of the Western Stockpile Area, is not included now as a formal sedimentation control structure as this water flow is included in Catchment 4 which is directed to SB1). The dimensions of SB1 have also been modified to accommodate the temporary location of the wash plant whilst the upgraded facility is installed on the Processing Pad.	Catchment areas have been modified slightly as a result of these changes and the calculated basin requirements updated as a result. Notably, the capacity of SB1 has not changed significantly (reduced from 4.5 to 4.2 ML)
Section 6.4.2 / SB1: Main Sediment Basin	Modified text to reflect the changes to catchments and dimensions of SB1. Modified text has been included to provide further instruction on management to ensure effective capacity of 3ML is maintained between SB1 / SD1.	The additional text clarifies how SD1 is to be used and managed as a supplementary water storage for dirty water. Use of SD1 in this way will ultimately reduce the potential for discharge from the Quarry which is beneficial both from an operational perspective as well as mitigating risk of pollution incidents.
6.4.4 Sediment Settling (Flocculant) Agents	Text for this section has been modified following a review of sediment settlement options nominated in the previous SWMP and discussed in this section.	The updated section addresses the proposed investigation of options contained in the previous SWMP and outlines implementation of flocculant application. to provide additional instruction on application of commercially available flocculant

Section / Reference	Update	Justification
7.3.3 Water Discharges	Section update to categorise and discuss controlled vs uncontrolled discharges. Minor edits to discussion of potential water discharges (change from 'will' to 'may' with respect to discharges noting we cannot be definitive as to number of discharges per year - which is affected by rainfall, intensity of rain and internal use of water) Additional text was included to provide more direct instruction on protocols for management of water to reduce the potential for discharge.	The modified and additional text better reflects potential for discharge and provides for better instruction on internal water management to reduce the potential for discharge.
7.3.4 Contingency Management	Additional text (sub-section) included to discuss water quality	Provides clear instruction of protocol in the event of non-compliant water quality in discharge.
9.2.2 Groundwater Monitoring	Additional text reflecting potential to monitor water levels in bores on properties surrounding the Quarry.	Response to previous correspondence from DPIE-Water
Table 9.3	Changes to frequency of parameter measurement	Provides for additional parameters to be included in monthly background site monitoring.
9.3.2 Groundwater Quality Monitoring	Change to layout	Clearer identification of analytes to monitor
9.4.2.1 Groundwater Criteria	Updated text	Clearer identification of criteria.
9.5.1 Surface Water Monitoring Procedures	Removal of in-field analyses	Equipment not available to complete in-field analyses. Parameters are subject of laboratory analyses.
9.7 Inspections and maintenance	Prescriptive details for inspections removed.	Inclusion of reference to more general observations considered more likely to result in identification of potential matters for remediation.
10.2.5 Local Bore Impacts	Additional section	Added in response to previous correspondence from DPIE-Water to consider external monitoring (refer to Appendix 6)

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