

Soil and Water Management Plan

for the East Guyong Quarry



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1. Introduction

This *Soil and Water Management Plan* (the Plan) has been prepared by R.W. Corkery & Co. Pty Limited (RWC) on behalf of Hanson Construction Materials Pty Ltd (the Company) for the East Guyong Quarry (the Quarry). The Quarry is located approximately 22km southeast of Orange and 36km west of Bathurst (**Figure 1**).

This Plan has been prepared in satisfaction of Conditions 25 to 29 of Schedule 3 of Project Approval (PA) 06_0193¹ and describes the following.

- Activities approved under PA 06_0193.
- The consultation undertaken during preparation of this Plan.
- The legal and other requirements associated with management of sediment, erosion and water within the Site.
- The objectives and key performance outcomes for this Plan and the Quarry.
- Roles and responsibilities.
- Competence training and awareness.
- A site water balance.
- An erosion and sediment control plan.
- A surface water monitoring program.
- A groundwater monitoring program.
- Corrective and preventative actions that will be implemented should exceedance(s) of the relevant criteria be identified.
- Complaints handling and response procedures that will be implemented.
- Incident reporting procedures.
- Publication of monitoring information.
- Plan review.

The approved Quarry is fully described in the following documents noting that the Preferred Project Report includes details of the layout approved for construction. A brief description of the approved activities is provided in Section 2.

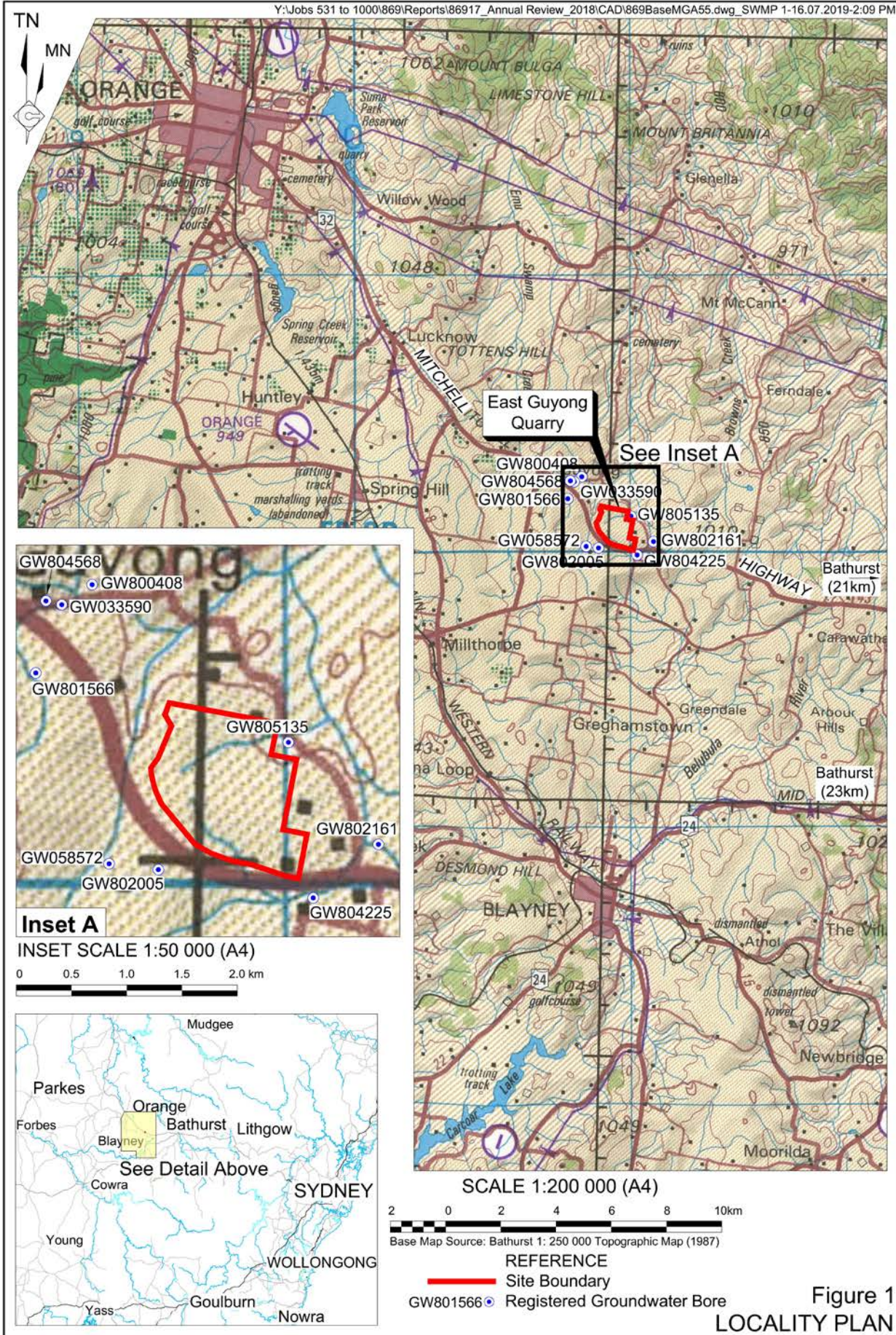
- *Environmental Assessment* dated September 2009 (hereafter referred to as EA 2009) and associated technical reports prepared to support the application for PA 06_193.
- Detailed Response to Public Exhibition Submissions (undated).
- Preferred Project Report (undated).
- *Environmental Assessment* dated September 2018 (hereafter referred to as EA 2018) and associated technical reports prepared to support Modification 2 (MOD 2) to PA 06_0193.
- Response to Submissions report Part A and Part B, dated November 2018 and December 2018 respectively (Referred to hereafter as RTS A 2018 and RTS B 2018).

In addition, a range of other management plans have also been prepared to guide operations within the Quarry. These include the following.

- | | |
|---|--|
| <ul style="list-style-type: none"> ▪ Environmental Management Strategy. ▪ Asbestos Management Plan. ▪ Noise Management Plan. ▪ Aboriginal Cultural Heritage Management Plan. ▪ Pollution Incident Response Management Plan | <ul style="list-style-type: none"> ▪ Air Quality Monitoring Program. ▪ Landscape Management Plan. ▪ Blast Management Plan ▪ Noise Management Plan. ▪ Traffic Management and Driver Conduct Plan |
|---|--|

¹ All conditions in Project Approval 06_0193 are referred to as *PA Condition*

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2. Approved Activities

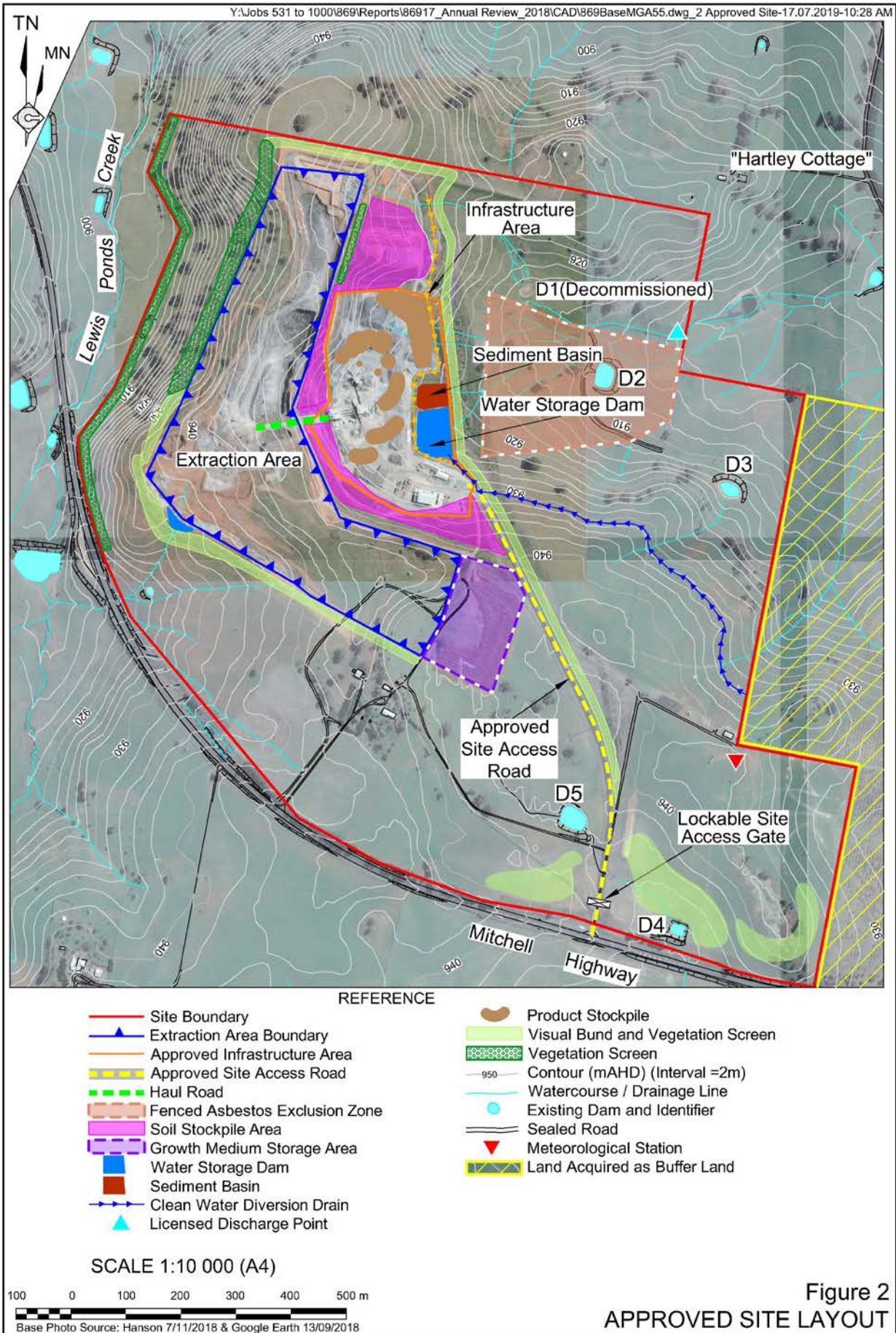
The approved activities at the Quarry comprise the following (**Figure 2**).

- Establishment of an Extraction Area to extract basalt using standard drill, blast, load and haul techniques.
- Construction and use of a processing plant within an identified Infrastructure Area to process the extracted basalt to produce a range of quarry products, including aggregates and road base, and stockpiling of the resulting products adjacent to the processing plant.
- Construction of a site access road and intersection with the Mitchell Highway.
- Transportation of up to 600 000t per year of quarry products via the Mitchell Highway using truck and dog and B Double trucks.
- No more than 30 laden trucks despatched from the Quarry in any hour, no more than 160 laden trucks despatched from the Quarry on any day (Monday to Friday) and no more than 60 laden trucks despatched from the Quarry on a Saturday.
- Construction of a range of visual bunds and establishment of native vegetation to provide visual screening for the quarry operations.

The approved quarry life is until 31 December 2042 and the approved hours of operation are as follows.

- Monday to Friday (non-daylight savings) – 6:00am to 6:00pm.
- Monday to Friday (daylight savings) – 6:00am to 8:00pm.
- Saturdays – 7:00am to 1:00pm.
- Sundays and public holidays – nil.

Product despatch between 5:00am and 10:00pm, Monday to Saturday is permitted following negotiation of agreements with the seven surrounding landholders nominated in Condition 6 of Schedule 3 of PA 06_0193 and the notification of the Department in writing of the terms of these agreements.



3. Legal and Other Requirements

The Company was granted Project Approval (PA) 06_0193 by the NSW Land and Environment Court on 21 May 2012 pursuant to Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). PA 06_0193 has been modified twice since that time. The approval includes the required criteria that the construction and operational activities of the Company must comply with and sets out the core requirements of this Plan. Relevant soil and water management-related conditions associated with this approval are reproduced in **Table 1** which includes an indication of where each has been addressed in this Plan.

**Table 1
Soil and Water Project Approval Requirements**

Page 1 of 4

Schedule	Condition	Section Where Addressed
SOIL AND WATER		
3(22)	Water Supply The Proponent must ensure that it has sufficient water for all stages of the project, and if necessary, adjust the scale of operations to match its water supply.	8
3(23)	Pollution of Waters Except as may be expressly provided for by an EPL, the Proponent must comply with section 120 of the Protection of the Environment Operations Act 1997 during the carrying out of the project.	Noted
3(24)	Wastewater Treatment The Proponent must manage on-site sewage to the satisfaction of Council and EPA. The facility must comply with the requirements of the Environment and Health Protection Guidelines - On-site Sewage Management for Single Households (1998), or most recent version of the relevant guidelines.	Noted
3(25)	Soil and Water Management The Proponent must prepare and implement a Soil and Water Management Plan for the project to the satisfaction of the Secretary. This plan must:	
	(a) be prepared in consultation with EPA and DoI L&W, and be submitted to the Secretary for approval prior to the commencement of construction activities; and	3
	(b) include a:	8
	▪ Site Water Balance;	
	▪ Erosion and Sediment Control Plan;	Appendix 1
	▪ Surface Water Monitoring Program; and	10
	▪ Ground Water Monitoring Program.	11
	The Proponent must implement the Soil and Water Management Plan as approved by the Secretary.	Noted
	<i>Note: The Department accepts that the initial Soil and Water Management Plan may not include a detailed Site Water Balance. However, the detailed Site Water Balance must be approved prior to the commencement of any processing activities.</i>	

**Table 1 (Cont'd)
Soil and Water Project Approval Required**

Schedule	Condition	Section Where Addressed
SOIL AND WATER		
3(26)	The Site Water Balance must:	
	(a) include details of: <ul style="list-style-type: none"> ▪ sources and security of water supply; 	8.4 and 8.8
	<ul style="list-style-type: none"> ▪ water use on site; 	8.5
	<ul style="list-style-type: none"> ▪ water management on site; 	8.3
	<ul style="list-style-type: none"> ▪ any off-site water transfers; 	8.6
	<ul style="list-style-type: none"> ▪ reporting procedures; and 	8.9
	(b) investigate and describe measures to minimise water use by the project.	8.8
3(27)	The Erosion and Sediment Control Plan must:	
	(a) be consistent with the requirements of <i>Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries</i> , (DECCW), or most recent version of the relevant guidelines;	Appendix 1 Sheet 1
	(b) identify activities that could cause soil erosion and generate sediment;	Appendix 1 Sheet 1
	(c) describe measures to minimise soil erosion and the potential for the transport of sediment off site;	Appendix 1 Sheet 1 to 3
	(d) describe the location, function, and capacity of erosion and sediment control structures; and	Appendix 1
(e) describe what measures would be implemented to maintain the structures over time.	Appendix 1 Sheet 3	
3(28)	The Surface Water Monitoring Program must include:	
	(a) baseline data on surface water quality, where available;	NA
	(b) surface water impact assessment criteria;	10.3
	(c) a program to monitor surface water quality (particularly in the project's sediment dam); and	10.4
	(d) a protocol for the investigation, notification and mitigation of identified exceedances of the surface water impact assessment criteria.	10.5 and 14
3(29)	The Ground Water Monitoring Program must include:	
	(a) baseline data on ground water levels and quality;	11.2
	(b) groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts;	11.3
	(c) a program to monitor groundwater levels and quality; and	11.4
	(d) a protocol for the investigation and notification of identified exceedances of the ground water impact assessment criteria.	11.7 and 14

**Table 1 (Cont'd)
Soil and Water Project Approval Required**

Schedule	Condition	Section Where Addressed
SOIL AND WATER (Cont'd)		
5(2)	<p>Management Plan Requirements</p> <p>The Proponent must ensure that the Management Plans required under this approval are prepared in accordance with any relevant guidelines, and include:</p>	
	(a) a summary of relevant background or baseline data;	10.2 and 11.2
	(b) a description of:	
	<ul style="list-style-type: none"> ▪ the relevant statutory requirements (including any relevant approval, licence or lease conditions); 	3
	<ul style="list-style-type: none"> ▪ any relevant limits or performance measures/criteria; and 	10.3 and 11.3
	<ul style="list-style-type: none"> ▪ the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; 	10.3 and 11.3
	(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	9, 10 and 11
	(d) a program to monitor and report on the:	10.4 and 11.4
	<ul style="list-style-type: none"> ▪ impacts and environmental performance of the project; and ▪ effectiveness of any management measures (see (c) above); 	10.4 and 11.4
	(e) a contingency plan to manage any unpredicted impacts and their consequences;	10.5, 11.7 and 12
	(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	16
	(g) a protocol for managing and reporting any:	14
	<ul style="list-style-type: none"> ▪ incidents; ▪ complaints; 	13
	<ul style="list-style-type: none"> ▪ non-compliances with statutory requirements; and 	10.5 and 11.7
	<ul style="list-style-type: none"> ▪ exceedances of the impact assessment criteria and/or 	10.5 and 11.7
	<ul style="list-style-type: none"> ▪ performance criteria; and 	10.3 and 11.3
	(g) a protocol for periodic review of the plan.	16
	<i>Note: At the discretion of the Secretary, some of these requirements may be waived where they are either not relevant or necessary.</i>	

**Table 1 (Cont'd)
Soil and Water Project Approval Required**

Schedule	Condition	Section Where Addressed
SOIL AND WATER (Cont'd)		
5(4)	<p>Revision of Strategies, Plans and Programs Within 3 months of:</p> <ul style="list-style-type: none"> (a) the submission of an annual review under condition 3 above; (b) the submission of an incident report under condition 6 below; (c) the submission of an independent environmental audit report under condition 8 below; and (d) the approval of any modification of the conditions of this approval, <p>the Proponent must review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary.</p> <p><i>Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.</i></p>	16
5(6)	<p>REPORTING AND AUDITING Incident Notification</p> <p>The proponent must immediately notify the Department any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the project (including the project application number and name) and set out the location and nature of the incident.</p>	14
5(7)	<p>Non-Compliance Notification</p> <p>Within seven days of becoming aware of a non-compliance, the proponent must notify the Department of the non-compliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the project (including the project application number and name), set out the conditions of this approval that the development is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.</p> <p><i>Note: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.</i></p>	14

Table 2 presents the relevant soil and water management-related commitments from the Statement of Commitments incorporated within PA 06_0193 and where each is addressed in this document. **Table 3** presents the relevant soil and water-related requirements from the Environment Protection Licence and Water Licences.

**Table 2
Soil and Water-related Statement of Commitments Requirements**

Appendix 2		Section Where Addressed
SOIL AND WATER		
Groundwater	<ul style="list-style-type: none"> A Groundwater Management Plan will be developed prior to any extraction activities to the satisfaction of the Department in consultation with EPA. The Plan will include a groundwater monitoring program that includes weekly monitoring of groundwater level and quarterly monitoring of groundwater quality (electrical conductivity, pH, turbidity, arsenic, manganese and iron). The results of the monitoring are to be kept on-site and made available to the relevant authority. 	11
Surface Water	<ul style="list-style-type: none"> Drainage controls will consist of diversion mounds, spoon drains, and shallow trenches (gutters) to divert runoff around the infrastructure area. Final details will be designed for a storm return period of one in ten years. As the first flush of runoff from disturbed areas contains the majority of suspended solids, the 3ML sediment dam controls will be designed to contain and treat these parts of the storm. 	Appendix 1
	<ul style="list-style-type: none"> To prevent clean water runoff (i.e. water from undisturbed areas) from entering the quarry and plant site (of disturbed areas) diversion mounds will be constructed around the infrastructure area. Any runoff from disturbed Rehabilitation will be carried out progressively following extractive operations to ensure a stable landform and to control soil erosion. 	Appendix 1
	<ul style="list-style-type: none"> Runoff from the quarry and work areas will be collected by a system of diversion mounds and drains and directed to sedimentation dams for water clarification as shown in Figure 1 of the Preferred Project Report. There will be no dry weather discharge. Storage and settlement dams shown on Figure 1 of the Preferred Project Report will be constructed prior to quarrying. These dams will be designed to handle storms of duration equal to the time of concentration of the catchments. The design and construction of the sedimentation dams will be completed in accordance with the technical requirements of the Relevant Authority. 	Appendix 1
SOIL AND WATER		
Surface Water (Cont'd)	<ul style="list-style-type: none"> A licensed discharged point will be established at the junction of the eastern drainage line and the adjoining property. Prior to construction of the processing plant background monitoring of water quality will be undertaken on the eastern drainage line during periods of flow or, alternatively at existing dams located on the drainage line, for the purposes of determine whether there is an existing load of NOA contained within stormwater. 	10.3
	<ul style="list-style-type: none"> Used oils and greases will be collected and removed by a licensed contractor for disposal off site or on an approved disposal area. Diesel will be stored on site in an above ground fuel storage tank located in a bunded area. All fuel storage will be conducted in accordance with Australian Standards for storage of fuels (AS 1940- 2004 5.8.2, AS 3780-1994 5.7.2, AS 4452-1997). 	Appendix 1

**Table 3
Soil and Water-related Licence Requirements**

Condition Number	Condition	Section Where Addressed																								
SOIL AND WATER																										
Environment Protection Licence – EPL 20190																										
P1.2	The following points referred to in the table are identified in this licence for the purposes of monitoring and/or setting the limits for discharges of pollutants to water from the point.	Noted																								
P1.3	<p>The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.</p> <p align="center">Water and Land</p> <table border="1"> <thead> <tr> <th>EPA Identification No.</th> <th>Type of Monitoring Point</th> <th>Type of Discharge Point</th> <th>Location Description</th> </tr> </thead> <tbody> <tr> <td>6</td> <td>Discharge to waters Discharge quality monitoring</td> <td>Discharge to waters Discharge quality monitoring</td> <td>Discharge and Monitoring Point "W1" as identified on "Figure 2 – Site Layout and Surface Water Catchment" as provided within the Soil and Water Management Plan dated 10/2012.</td> </tr> </tbody> </table>	EPA Identification No.	Type of Monitoring Point	Type of Discharge Point	Location Description	6	Discharge to waters Discharge quality monitoring	Discharge to waters Discharge quality monitoring	Discharge and Monitoring Point "W1" as identified on "Figure 2 – Site Layout and Surface Water Catchment" as provided within the Soil and Water Management Plan dated 10/2012.	10.4																
EPA Identification No.	Type of Monitoring Point	Type of Discharge Point	Location Description																							
6	Discharge to waters Discharge quality monitoring	Discharge to waters Discharge quality monitoring	Discharge and Monitoring Point "W1" as identified on "Figure 2 – Site Layout and Surface Water Catchment" as provided within the Soil and Water Management Plan dated 10/2012.																							
L1.1	<p>Pollution of Waters</p> <p>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.</p>	Noted																								
L2.1	<p>Concentration Limits</p> <p>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.</p>	10.3																								
L2.2	Where a pH quantity limit is specified in the table, the specified percentages of samples must be within the specified ranges.	10.3																								
L2.3	To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table/s.	Noted																								
L2.4	<p>Water and/or Land Concentration Limits</p> <p>Point 6</p> <table border="1"> <thead> <tr> <th>Pollutant</th> <th>Units of Measure</th> <th>50 Percentile concentration limit</th> <th>90 Percentile concentration limit</th> <th>3DGM concentration limit</th> <th>100 percentile concentration limit</th> </tr> </thead> <tbody> <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>Total suspended solids</td> <td>Milligram per litre</td> <td></td> <td></td> <td></td> <td>30</td> </tr> </tbody> </table>	Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit	Oil and Grease	Milligrams per litre				10	pH	pH				6.5 – 8.5	Total suspended solids	Milligram per litre				30	10.3
Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit																					
Oil and Grease	Milligrams per litre				10																					
pH	pH				6.5 – 8.5																					
Total suspended solids	Milligram per litre				30																					
M1.1	<p>Monitoring records</p> <p>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.</p>	Noted																								
M1.2	<p>All records required to be kept by this licence must be:</p> <p>(a) in a legible form, or in a form that can readily be reduced to a legible form;</p> <p>(b) kept for at least 4 years after the monitoring or event to which they relate took place; and</p> <p>(c) produced in a legible form to any authorised officer of the EPA who asks to see them.</p>	Noted																								

**Table 3 (Cont'd)
Soil and Water-related Licence Requirements**

Condition Number	Condition	Section Where Addressed																
SOIL AND WATER (Cont'd)																		
Environment Protection Licence – EPL 20190 (Cont'd)																		
M1.3	<p>The following records must be kept in respect of any samples required to be collected for the purposes of this licence:</p> <p>(a) the date(s) on which the sample was taken;</p> <p>(b) the time(s) at which the sample was collected;</p> <p>(c) the point at which the sample was taken; and</p> <p>(d) the name of the person who collected the sample.</p>	Noted																
M2.1	<p>Requirement to monitor concentration of pollutants discharged</p> <p>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:</p>	10.3																
M2.3	<p>Water and/or Land Monitoring Requirements</p> <p>Point 6</p> <table border="1"> <thead> <tr> <th>Pollutant</th> <th>Units of Measure</th> <th>Frequency</th> <th>Sampling Method</th> </tr> </thead> <tbody> <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>Total suspended solids</td> <td>Milligrams per litre</td> <td>Monthly during discharge</td> <td>Grab sample</td> </tr> </tbody> </table>	Pollutant	Units of Measure	Frequency	Sampling Method	Oil and Grease	Milligrams per litre	Monthly during discharge	Grab sample	pH	pH	Monthly during discharge	Grab sample	Total suspended solids	Milligrams per litre	Monthly during discharge	Grab sample	10.3
Pollutant	Units of Measure	Frequency	Sampling Method															
Oil and Grease	Milligrams per litre	Monthly during discharge	Grab sample															
pH	pH	Monthly during discharge	Grab sample															
Total suspended solids	Milligrams per litre	Monthly during discharge	Grab sample															
M3.2	<p>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.</p>	10.3																
M6.1	<p>Recording of pollution complaints</p> <p>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 the licence applies.</p>	13																
M6.2	<p>The record must include details of the following:</p> <p>(a) the date and time of the complaint;</p> <p>(b) the method by which the complaint was made;</p> <p>(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;</p> <p>(d) the nature of the complaint;</p> <p>(e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and</p> <p>(f) if no action was taken by the licensee, the reasons why no action was taken.</p>	13																
M6.3	<p>The record of the complaint must be kept for at least 4 years after the complaint was made.</p>	13																
M6.4	<p>The record must be produced to any authorised officer of the EPA who asks to see them.</p>	13																

**Table 3 (Cont'd)
Soil and Water-related Licence Requirements**

Condition Number	Condition	Section Where Addressed						
SOIL AND WATER (Cont'd)								
Environment Protection Licence – EPL 20190 (Cont'd)								
M8.1	<p>Requirement to monitor volume or mass For each discharge point or utilisation area specified below, the licensee must monitor:</p> <p>(a) the volume of liquids discharged to water or applied to the area; at the frequency and using the method and units of measure, specified below.</p> <p>Point 6</p> <table border="1"> <thead> <tr> <th>Frequency</th> <th>Unit of Measure</th> <th>Sampling Method</th> </tr> </thead> <tbody> <tr> <td>Continuous during discharge</td> <td>Kilolitres per day</td> <td>Flow metre and continuous logger</td> </tr> </tbody> </table>	Frequency	Unit of Measure	Sampling Method	Continuous during discharge	Kilolitres per day	Flow metre and continuous logger	8.6
Frequency	Unit of Measure	Sampling Method						
Continuous during discharge	Kilolitres per day	Flow metre and continuous logger						
R2.1	<p>Notification of environmental harm Notifications must be made by telephoning the Environmental Line service on 131 555.</p> <p><i>Note: the licensee or its employees 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 requirements of Part 5.7 of the Act.</i></p>	14						
R2.2	The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.	14						
Water Licences – WAL 36530								
1	<p>The licence holder must record the following in the logbook:</p> <p>(i) each date and period of time during which water is taken under this licence;</p> <p>(ii) the volume of water taken on that date;</p> <p>(iii) the water supply work approval number of the water supply work used to take the water on that date;</p> <p>(iv) the purpose or purposes for which the water was taken on that date.</p>	11.6						
2	The licence holder must retain the information required to be recorded in the logbook for 5 years from the date to which that information relates.	11.6						
3	<p>The maximum water allocation that may be carried over in the water allocation account for this access licence from one water year to the next is either:</p> <p>(a) 10% of the access licence share component for access licences with share components expressed as ML/year; or</p> <p>(b) 0.1 ML per unit share of access licence share component for access licences with share components expressed as a number of unit shares.</p>	Noted						
4	The licence holder must keep a log book, except where the access licence nominates only a metered work with a data logger. A “logbook” means a written record, kept in hard copy or electronic form, which accurately records all information required to be kept for this licence.	11.6						
5	<p>The licence holder must record the following in the logbook:</p> <p>(i) the volume of water taken in any water year from 1 July 2011, by comparison to the maximum volume of water permitted to be taken in that water year.</p>	11.6						
6	When directed by the Minister by notice in writing, the licence holder of an access licence that nominates only a metered water supply work with a data logger must keep a logbook in accordance with any requirements that are specified in the notice.	11.6						

**Table 3 (Cont'd)
Soil and Water-related Licence Requirements**

Condition Number	Condition	Section Where Addressed
SOIL AND WATER (Cont'd)		
Water Licences – WAL 36530 (Cont'd)		
7	The licence holder must notify the Minister, in writing, immediately upon becoming aware of a breach of any condition of this licence. Note: a notification does not authorise a breach, or continuing breach, of a condition of this licence.	14
8	Water must not be taken under this access licence otherwise than in compliance with the conditions of the nominated water supply work approval.	Noted
9	The maximum volume of water that may be taken under this licence in any water year must not exceed a volume equal to: (a) the sum of water allocations accrued to the water allocation account for this licence from available water determinations in that year; plus (b) the water allocations carried over from the water year prior to that water year; plus (c) the net amount of any water allocations assigned to or from the water allocation account for this licence under Section 71T of the Act; plus (d) any water allocations re-credited to the water allocation account for this licence in accordance with Section 76 of the Act in that water year.	8.5
10	The licence holder must produce the logbook to the Minister for inspection, when requested.	11.6

4. Consultation

The following government agency consultation was undertaken during the preparation of this Plan.

- Correspondence outlining planned updates to the Plan as well as consultation requirements was sent to DPE on 21 June 2019. Ms Melanie Hollis of DPE responded on 24 June 2019 advising that the Plan was to be submitted within 3 months of approval of Modification 2 and that any updates or consultation regarding the Plan should be forwarded to DPE at a later date.
- A draft version of this Plan was provided to the Environment Protection Agency and the Natural Resource Access Regulator on 17 July 2019 with a request to review the Plan and provide feedback.

This Plan will be updated to address any comments received from the above Agencies.

5. Objectives and Outcomes

Table 4 presents the objectives and key performance outcomes for this Plan and the Quarry.

Table 4
Objectives and Key Performance Outcomes

Page 1 of 2

OBJECTIVES	KEY PERFORMANCE OUTCOMES
(a) To ensure compliance with all relevant Project approval and Environmental Protection Licence criteria and reasonable community expectations.	(i) Compliance with all relevant criteria and reasonable community expectations, as determined in consultation with the relevant government agencies.
(b) To ensure sufficient water is available during all phases of the life of the Quarry for environmental and operation purposes	(ii) Sufficient water is available for all Quarry-related purposes, including for environmental and operational purposes.
(c) To ensure that appropriate sediment and erosion control measures are implemented and maintained.	(iii) All water management structures constructed and maintained in accordance with Landcom (2004) and DECC (2008).
(d) To ensure that appropriate chemical and hydrocarbon management is implemented and maintained.	(iv) All chemicals and hydrocarbons stored and used in accordance with manufactures instructions, Material Data Safety Sheet requirements and Australian Standards in a manner that ensure risk of water contamination is reduced to an acceptable level.
(e) To ensure that water within the Site is used in an efficient and environmentally responsible manner.	(v) Water resources are managed in a manner that maximises environmental flows and minimises the potential for adverse impacts to water resources.
(f) To ensure that an appropriate surface water and groundwater monitoring program is implemented throughout the life of the Quarry.	(vi) Water monitoring programs are sufficiently robust to detect any adverse water quality or quantity impacts associated with the Quarry and to allow appropriate adaptive management measures to be implemented.
(g) To ensure that impacts associated with the Quarry do not result in unacceptable impacts to surface and groundwater quality and availability.	(vii) Surface and groundwater monitoring results are assessed against the relevant assessment criteria as outlined in this Plan, with subsequent investigations and management actions undertaken in accordance with this plan (as required).
(h) To ensure that appropriate contingency and emergency management plans are in place and regularly reviewed.	(viii) Contingency and emergency management plans are prepared for all relevant contingencies and regularly reviewed and upgraded.

(i) To implement an appropriate incident reporting program, if required.	(ix) Incidents (if any) reported in an appropriate manner.
(j) To ensure that all relevant water-related information is made available in a timely and accessible manner.	(x) All water-related information is available in a timely manner on the Quarry website.

6. Roles and Responsibility

Table 5 presents the roles and responsibilities for the implementation of this Plan.

**Table 5
Roles and Responsibilities**

ROLES	RESPONSIBILITIES
Regional Manager	Must ensure adequate resources are available to enable implementation of the Plan.
Quarry Manager	Accountable for the overall environmental performance of Quarry operations, including the following outcomes of this Plan. <ul style="list-style-type: none"> ▪ Implementation of the competence training and awareness as outlined in Section 7. ▪ Implementation of relevant water-related controls outlined in Sections 8 and 9. ▪ Complaints handling and response as outlined in Section 13. ▪ Incident reporting as outlined in Section 14.
Quarry Supervisor	Manage the implementation of the following components of this Plan. <ul style="list-style-type: none"> ▪ Water-related monitoring and evaluation of compliance as outlined in Sections 10 and 11. ▪ Correction and preventative actions relating to soil and water management as outlined in Section 12. ▪ Publication of monitoring data and reports as outlined in Section 15. ▪ Review of this Program as outlined in Section 16.
All personnel	Ensure training and awareness induction has been undertaken. Compliance with this Plan.
Source: Hanson Construction Materials Pty Ltd.	

7. Competence Training and Awareness

All Company personnel and contractors and their employees will undergo Company and site-specific inductions, incorporating basic information in relation to the operation of this plan as a component of the site induction program. The following areas will be covered in the induction.

- The importance of appropriate management of water within the Site, including the sensitivity of the downstream receiving environment and the Company's obligations under PA 06_0193, its Environmental Protection Licence and its obligations under the *Protection of the Environment Operations Act 1997*.
- The location and significance of the contaminated, dirty and clean water catchments within the Project Site.
- The relevant management measures that are to be implemented within each of the identified catchments, including:
 - appropriate storage, management and use of all hydrocarbons and chemicals; and
 - the requirement to report all spills and other incidents with the potential to cause pollution to water.

8. Site Water Balance

8.1 Introduction

This site water balance has been prepared based in part on the surface water assessment prepared for the EA (2009) as well as the surface water assessment prepared for EA (2018). The surface water assessment for EA (2009) was prepared by Evans and Peck and is referred to hereafter as Evans and Peck (2009). The surface water assessment for EA (2018) was prepared by Umwelt and is hereafter referred to as Umwelt (2018).

Where gaps in the surface water assessments undertaken for the Quarry to date have been identified, this Plan has relied upon current operational procedures.

The following sub-sections provide a description of:

- the assessment methodology used to prepare this water balance;
- water management within the Site;
- water sources, storage, use, demand and discharge;
- the results of the site water balance and security of supply;
- programs to investigate minimisation of the use of water within the Site; and
- reporting of water use and management.

This site water balance has been prepared in satisfaction of Condition 26 of Schedule 3 of PA 06_0193.

8.2 Assessment Methodology

The original water balance assessment prepared by Evans and Peck (2009) was undertaken using the Australian Water Balance Model. This model uses daily rainfall and estimated evaporation data to estimate runoff on a catchment by catchment basis. Umwelt (2018) developed a daily time step water balance model for the Quarry using GoldSim software, with runoff estimates based on the Australian Water Balance Model and rainfall and evaporation data sourced from the Bureau of Meteorology (BoM) operated Millthorpe station (station No. 063053) and Orange Agricultural Centre station (station No. 063254).

The following assumptions were incorporated into the water balance model developed by Umwelt (2018).

- An annual production rate of 600 000t.
- Evaporation from water storages based on evaporation data from the Orange Agricultural Institute BOM weather station (no. 063254).
- Water loss associated with processing plant (i.e. loss with product) representing a demand of 208 L/tonne.
- Water demand associated with dust suppression via water cart use, assuming a maximum haul road dust suppression rate of 10 mm/day including rainfall.

8.3 Overview of Water Management

Figure 3 presents an overview of management of water within the Quarry Site. In summary, water would be managed as part of three circuits as follows.

- Contaminated water circuit – a bunded area within which all hydrocarbons and chemicals would be stored. All water within the contaminated water circuit will be passed through an oil/water separator prior to being used for dust suppression purposes within the processing plant.
- Dirty water circuit – this includes all areas of disturbed land within the Quarry Site with the potential to generate sediment-laden water. All water within the dirty water circuit will be directed to the Sediment Basin, the sump within the Extraction Area or appropriately designed management structures such as road-side table drains. Water will be transferred from the dirty water circuit to the Water Storage Dam when the concentration of suspended sediment is less than 30mg/L. In accordance with the Erosion and Sediment Control Plan (**Appendix 1**), the Sediment Basin will be maintained with a reduced water capacity, with accumulated water to be removed from the basin within days of a rainfall event.

- Clean water circuit – this includes all undisturbed areas and all areas of completed rehabilitation, including the soil stockpiles. Water within the clean water circuit will be used for dust suppression purposes or will be permitted to flow to natural drainage.

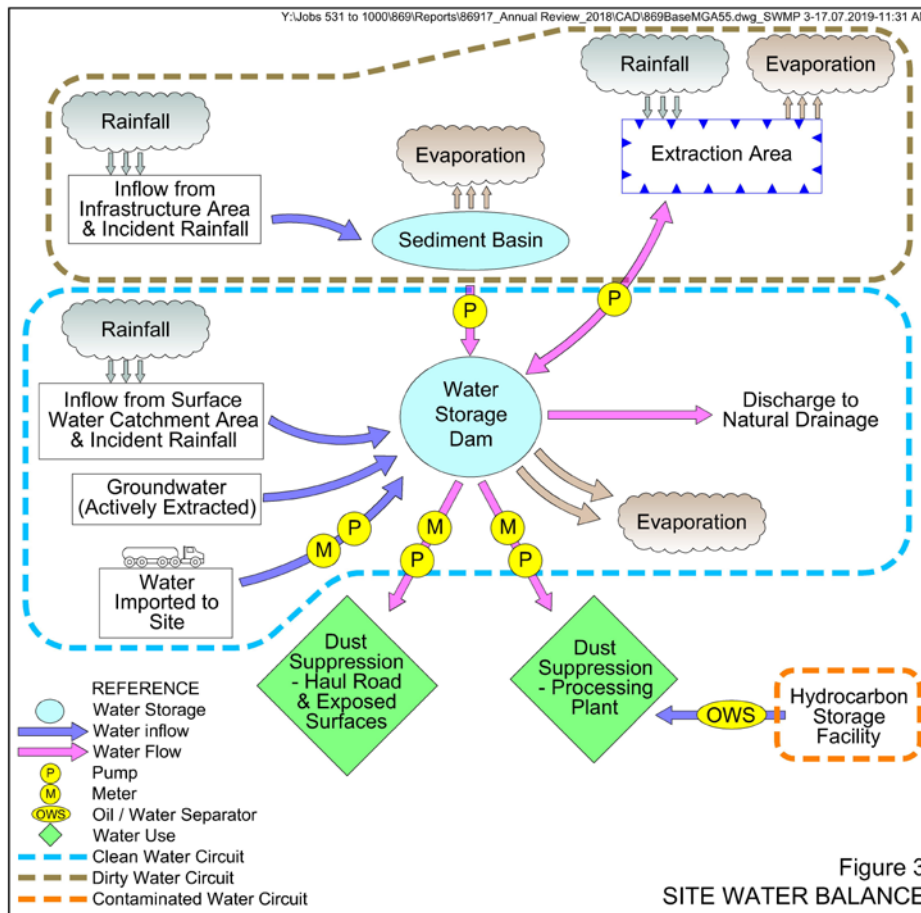


Figure 3
SITE WATER BALANCE

The water management system will consist of the following components.

- Inflow from incident rainfall and surface water runoff.
- Groundwater bore – 40 unit share from the Lachlan Fold Belt Murray-Darling Basin Groundwater Source (i.e. 40ML/year when each share has 100% allocation).
- Water would be purchased and transported to Site if no other water were available.
- Three water storages, namely the:
 - Sediment Basin;
 - Extraction Area; and
 - Water Storage Dam.
- Two water uses, namely:
 - dust suppression within disturbed sections of the Quarry Site; and
 - dust suppression within the processing plant.
- Discharge to Lewis Ponds Creek.

The following subsections describe each of these components and the site water balance prepared Umwelt (2018).

8.4 Water Storage

Three water storages would be used for storage of water for use for Quarry-related purposes, namely:

- the sump within the Extraction Area;
- the Sediment Basin; and
- the Water Storage Dam.

The Water Storage Dam and Sediment Basin have been constructed under the Company’s harvestable rights capacity under Section 53 of the *Water Management Act 2000*. Under the terms of that Section and the associated orders, the Company as landholder is permitted to capture and use a proportion of the total runoff from their land without requiring a licence. The harvestable right allows construction and use of dams (including existing dams) up to the capacity identified under the *Harvestable Rights Policy*. To establish the maximum capacity of dams, the area of the land holding, in this case 188.2ha, is multiplied by a factor determined under the Policy, in this case 0.08, to provide a maximum capacity in megalitres. In the case of the Quarry, the maximum permissible dam capacity under the *Harvestable Rights Policy* is 15.1ML.

Table 6 presents the capacity of the existing water storages within the Site. Since the commencement of operations at the Quarry, the Company has decommissioned farm dams D1 (0.2ML capacity) and D6 (0.8ML capacity) through either the removal of dam walls or the construction of up slope diversion bunds. The Company intends to retain the remaining harvestable rights farm dams for agricultural use, with water stored in these dams not being used for Quarry operations.

Following advice from the Department of Planning, Industry and Environment (DPIE), the Sediment Basin (3ML capacity) is not considered within the harvestable rights capacity as it only captures water from disturbed areas of the Site. Following rainfall events and once the concentrations of total suspended solids (TSS) falls below 30mg/L, a mobile pump is used to transfer water from the Sediment Basin to the Water Storage Dam to ensure that suitable capacity (3ML) is available to accommodate the 20 year average recurrence interval (ARI), 2 hour storm design rainfall event.

The Extraction Area sump represents a temporary water storage within the Extraction Area, with sediment-laden runoff from the Extraction Area being diverted to the sump to allow for the settling of solids. Once the concentration of TSS falls below 30mg/L, a mobile pump is used to transfer water from the Extraction Area sump to the Water Storage Dam providing capacity is available. The Extraction Area also provides significant buffer storage capacity in the event that no capacity exists in both the Extraction Area sump and Water Storage Dam.

**Table 6
Dam Capacity**

Water Storage ¹	Approximate Capacity (ML)
Water Storage Dam	10.0
D2	2.4
D3	0.9
D4	0.1
D5	1.2
Total	14.6
Exempt Harvestable Right Capacity	15.1
Note 1: See Figure 2.	
Source: RTS B (2018) – After Table 2.1.	

8.5 Water Inflow and Demands

The Extraction Area occurs on a ridge and will be excavated to a maximum final depth of 910mAHD. As the maximum extraction depth is above both the level of Lewis Ponds Creek and the local groundwater table, the only water inflows

into the Quarry Site are expected to be incident rainfall, rainfall runoff and groundwater actively imported from groundwater bores. **Table 7** presents the anticipated water inflows at the Quarry based on local rainfall data equivalent to the 50th percentile water year.

**Table 7
Anticipated 50th Percentile Year¹ Water Balance**

Parameter		Volume (ML)
Inflows	Rainfall and Runoff	84.4
	Groundwater Import	22.9
	Total Inflows	107.3
Outflows	Evaporation from Dam Surfaces	-7.3
	Processing Plant	-31.3
	Haul Road Dust Suppression	-31.8
	Discharges	-50.5
	Total Outflows	-121.1
Change in Water Storage		-13.8
Gross Water Balance		27.6
Net Water Balance		0.0
Note 1: Based on 51 years of rainfall data (1966 to 2016) recorded by the Bureau of Meteorology operated Millthorpe Station (Station No. 063254).		
Source: Appendix 5 of EA (2018) – After Table 4.2.		

Table 8 presents the predicted minimum, average, and maximum groundwater import demand and off site discharge volumes at the Quarry.

**Table 8
Predicted Groundwater Import and Off Site Discharge Volumes**

Groundwater Import Demand (ML)			Discharge Volume (ML)		
Minimum	Average	Maximum	Minimum	Average	Maximum
0.0	15.3	55.7	0.0	63.5	283.0
Source: Appendix 5 of EA (2018) – After Table 4.3.					

The principal water use within the Quarry is associated with dust suppression both within the processing plant and on unsealed roads. **Table 7** provides an overview of the anticipated water demands at the Quarry.

Drinking water and water for ablutions is collected from rooftops and stored in tanks or brought to site in 20L containers.

In the event that on site water storages, incident rainfall, and existing groundwater allocations are inadequate to supply the operational demands of the Quarry, additional water would be:

- purchased from a licenced source and transported to Site by truck or similar;
- sourced from one or more appropriately licenced groundwater bores under an appropriate allocation; or
- sourced from surrounding surface water sources under an appropriate licence.

8.6 Water Discharge

During rainfall events that exceed the design capacity of the Sediment Basin (20 year ARI, 2 hour storm), water overflows to the Water Storage Dam via an emergency spillway. During periods of high or prolonged rainfall, excess water overflows from the Water Storage Dam to natural drainage and Dam 2 via an engineered spillway.

Off-site discharges are sampled at monitoring location W1 (see **Figure 2**) in accordance with EPL 20190. The volume of discharge is recorded continuously during discharge by a flow meter and continuous logger.

The likelihood of discharges occurring at the Quarry is governed by both climatic conditions as well as the implementation of water inventory management practices. An average of 8.8 discharges are expected to occur at the Quarry each year, however RTS B (2018) note that this frequency represents a worst case scenario due to the assumption that water from the Extraction Area sump and Sediment Basin is immediately transferred to the Water Storage Dam once capacity is available.

8.7 Water Balance and Security

Table 7 and **Table 9** presents the results of the water balance outlined in EA (2018). In summary, water balance predictions indicate the following.

- The Quarry operational water balance demonstrates a surplus based on median gross water balance results.
- Despite a surplus gross water balance, median net results indicate a high groundwater import demand due to limited capacity to store incident rainfall and runoff within Quarry water storages during wet periods.
- Maximum groundwater import requirements are predicted to be lower than the groundwater licence extraction limit of 40ML/year for most rainfall scenarios.

**Table 9
Water Balance**

Water Year ¹	Gross Water Balance (ML/year)
10 th Percentile	28.8
50 th Percentile	129.5
90 th Percentile	143.3
Note 1: Percentiles based on 51 years of rainfall data (1966 to 2016) recorded by the Bureau of Meteorology operated Millthorpe Station (Station No. 063053).	
Source: Appendix 5 of EA (2016) – After Table 4.1.	

The Company will implement one, or a combination of, the following management measures in order to accommodate limited water availability during dry periods.

- Increase dam storage capacity to maximise harvestable rights allowances (i.e. increase storage capacity by 0.5ML).
- Limit processing plant operations to reduce water demand.
- Source additional licenced water allocations (groundwater or surface water) to ensure dust suppression demands can be met.
- Import water from a licenced supplier.

8.8 Water Use Minimisation Program

As indicated in Section 8.7, the water balance indicates that there will be periods during which water will not be available in the Water Storage Dam. During these periods, the Company has committed to importing water for dust suppression purposes or seeking water from alternative sources. As there is a cost associated with such importation and additional licencing, the Company will be seeking to maximise water use efficiency wherever possible. This will be implemented through a water use minimisation program as follows.

- Physical barriers and dust collections systems will be used within the processing plant wherever practicable to ensure that as much dust as possible is collected or retained at source to limit the amount of water required for dust suppression operations.

- Inactive sections of the Site with exposed surfaces, including sections of the Extraction and Infrastructure Areas, will be sprayed with suitable chemical dust suppressants to limit wind erosion in those areas.
- Active sections of the Site will be clearly identified and traffic restricted to those areas to minimise the area of the Site to be watered.
- The Site Access Road will be sealed from the intersection with the Mitchell Highway to the weighbridge, significantly reducing the volume of water required for dust suppression.
- Vegetation screens will be planted around the Extraction and Infrastructure Areas and adjacent to the Site Access Road, in part, to limit wind velocity and resulting wind erosion.

8.9 Reporting

The following measures will be implemented to record the Quarry's water use and progress against the water use minimisation program.

- The volume of water used for dust suppression purposes within the processing plant and on exposed surfaces within the Quarry will be measured using an in-line meter or, alternatively, pump hours and rate.
- The volume of water imported to site will be recorded either through the use of an in-line metre or through recording the number of truck loads of water delivered to site.
- Specific measures implemented as part of the water use reduction program, and their effectiveness, will be recorded.
- The above information will be tabulated, summarised and included in the *Annual Review*.

9. Erosion and Sediment Control Plan

Appendix 1 presents the Erosion and Sediment Control Plan.

10. Surface Water Monitoring Program

10.1 Introduction

This surface water monitoring program has been prepared based on information included with the surface water assessment prepared for EA (2018).

This surface water monitoring program has been prepared in satisfaction of Condition 28 of Schedule 3 of PA 06_0193 and provides a description of:

- background data on surface water quality;
- the surface water impact assessment criteria that will be applied;
- the location of monitoring points and frequency of monitoring at each;
- the monitoring parameters; and
- a program for the investigation, notification and mitigation of identified exceedances of the above criteria

10.2 Surface Water Monitoring Results

Discharge has only been on one occasion at the Quarry, with discharge from Dam D2 occurring on 15 September 2016 due to unusually high rainfall (194.2mm) in September which was more than double the long term average at the time (82.1mm). Analysis of samples taken on the day following discharge recorded a pH of 7.04, Total Suspended Solids (TSS) concentration of 8mg/L and oil and grease concentration of <5mg/L. These recorded values were within the relevant surface water assessment criteria requirements for the Quarry (see Section 10.3).

10.3 Surface Water Assessment Criteria

EPL 20190 outlines the following surface water quality assessment criteria.

- Total Suspended Solids - 30mg/L.
- pH – between 6.5 and 8.5.
- Oil and Grease - 10mg/L.

These criteria have been adopted as the relevant criteria for the life of the Quarry.

10.4 Surface Water Monitoring – Locations, Frequency, and Parameters

As outlined in EPL 20190, the Company will undertake monitoring of the surface water quality parameters at the location and frequency indicated in **Table 10**.

Table 10
Surface Water Monitoring Program

Location Identifier	Description	Pollutant	Unit of Measure	Sampling Method	Frequency
W1	Water Storage Dam discharge point.	Total Suspended Solids	mg/L	Grab sample	Monthly during discharge
		pH	pH		
		Oil and Grease	mg/L		

10.5 Triggers for Investigations and Response Actions

Following receipt of surface water monitoring results, the Company will review the data against the parameters identified in Section 10.3 and background data for the Quarry. In the event that one or more criteria are exceeded, the Company will immediately:

- arrange for further check sampling to be undertaken to confirm the initial monitoring result; and
- contact the Environment Protection Authority and DPIE and advise them of the preliminary results and timeframes for completion of further check sampling and reporting.

In the event that the initial surface water quality results indicate an exceedance of the identified parameters, the Company will immediately investigate and implement appropriate management measures to prevent a recurrence of the incident, in consultation with the relevant Government agencies.

A copy of the final investigation report will be provided to Environment Protection Authority and DPIE.

11. Groundwater Monitoring Program

11.1 Introduction

This groundwater monitoring program has been prepared based on information included with the groundwater assessment prepared for EA (2009) by Coffey Geotechnics Pty Ltd. That document, entitled *Groundwater Investigation Proposed Guyong Quarry Revised Report 2009* is presented as Technical Report 2 accompanying the EA (2009) and is referred to hereafter as Coffey (2009). This groundwater monitoring program has also been prepared based on information presented in EA (2018).

This groundwater monitoring program has been prepared in satisfaction of Condition 29 of Schedule 3 of PA 06_0193 and provides a description of:

- the existing groundwater environment within and surrounding the Site, including baseline data on groundwater levels and quality;
- the groundwater impact assessment criteria that will be applied, including trigger levels for investigating potential adverse impacts;
- the location of monitoring points and frequency of monitoring at each;
- the monitoring parameters; and
- a program for the investigation, notification and mitigation of identified exceedances of the above criteria.

11.2 Existing Groundwater Environment

11.2.1 Geology and Hydrogeology

Two principal aquifers exist within and surrounding the Site, namely a shallow weathered/colluvium-hosted aquifer and a deeper fractured rock aquifer.

On ridgelines, hill tops and upper slopes, the weathered profile consists of a thin layer of heavy clay soils overlying partially weathered basement rocks. On the lower slopes and drainage depressions, the weathered profile by contrast consists of topsoil over clays up to 15m thick. Groundwater within the weathered material in drainage depressions may be hosted in discreet horizons, however, yields are typically low.

Recharge of the shallow aquifers in the weathered horizon is through direct infiltration from rainfall as well as migration of water across the contact between the weathered material and fractured basalt particularly at the edge of more deeply weathered areas along drainage depressions.

Recharge of the deeper fractured rock aquifers is by direct infiltration of rainfall through fractures in exposed rock at the top of hills and migration of water from the overlying weathered aquifer into fractures.

Springs discharging groundwater from the fractured rock aquifer has been identified immediately to the west of the Site and within the Asbestos Exclusion Zone (**Figure 2**)

11.2.2 Existing Groundwater Bores, Levels and Yields

11.2.2.1 Regional Aquifers

A search for groundwater bores within 5kms of the Site was undertaken by Coffey (2009) using the DPIE *Natural Resource Atlas of NSW*. Thirty five registered bores were identified (see Figure 7 of Coffey (2009)). Those bores ranged in depth from 14m to 91m, with yields of between 0.2L/sec to 8.8L/sec from either fractured rock or, less commonly, weathered rock aquifers.

Coffey (2009) estimated that groundwater levels within the regional aquifers vary between 987mAHD and 927mAHD. An updated search of the Bureau of Meteorology (BoM) operated *Australian Groundwater Explorer* for registered bores within 2km of the Site was undertaken in 2019 during preparation of this document. That search identified nine registered bores within the search area as indicated in **Table 11** and **Figure 1**.

Table 11
Registered Bores within 2km of the Site

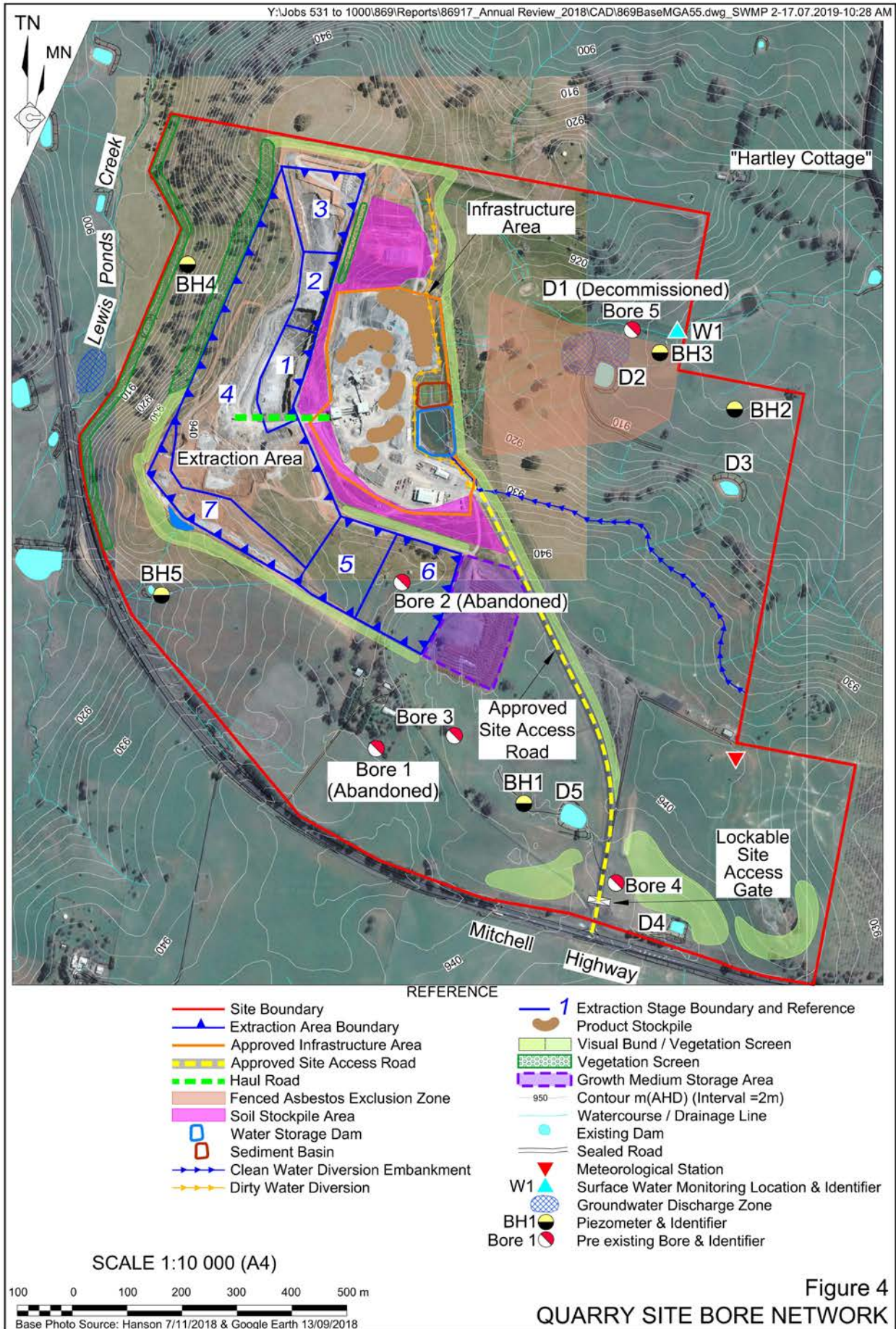
Bore Number	Location ¹		Purpose	Status	Depth (m)
	Easting	Northing			
GW805135	709890	6301455	Water Supply	Functioning	33
GW058572	708266	6300358	Water Supply	Unknown	45.7
GW800408	708112	6302882	Water Supply	Unknown	32
GW801566	707603	6302083	Water Supply	Functioning	49
GW804568	707695	6302735	Water Supply	Functioning	69
GW802005	708713	6300304	Water Supply	Functioning	69
GW802161	710704	6300533	Water Supply	Functioning	107
GW033590	707838	6302701	Water Supply	Functioning	53.3
GW804225	710114	6300049	Water Supply	Functioning	30

Note 1: Datum = MGA

Source: BoM Australian Groundwater Explorer, 2019

11.2.2.2 Site Aquifers

Table 12 present the location, depth and yield of bores within the Quarry Site. **Figure 4** presents the locations of the monitoring bore network and the locations of pre-existing bores. Only bores, BH1, BH2, BH3, BH4 and BH5 are maintained for the monitoring program. Other bores on site have been extracted out or are abandoned.



**Table 12
Quarry Site Bores**

Bore	Location ¹		Total Depth (m)	Yield (L/sec)	Approximate Water Level Elevation (m AHD)
	Easting	Northing			
Pre-existing Bores					
Bore 1 ²	-	-	64	<0.15	-
Bore 2 ²	-	-	18	nil	-
Bore 3	-	-	110	8.0	-
Bore 4	-	-	24	0.3	-
Bore 5	-	-	-	-	-
September 2002 Piezometers					
BH1	709478	6300545	15	-	927.80
BH2	709834	6301301	12	-	899.31
BH3	709712	6301391	12	-	899.94
BH4	708816	6301542	15	-	897.44
BH5	708754	6300902	10	-	910.61
Note 1: Datum = MGA					
Note 2: Bores 1 and 2 have been abandoned.					
Source: Coffey (2009) – After Tables 1 and 2					

11.2.2.3 Recorded Groundwater Levels

The results of long-term monitoring of groundwater levels at monitoring bores BH1 to BH5 are presented in **Figure 5** and summarised in **Table 13**.

**Table 13
Groundwater Standing Levels – 2013 to 2018**

Monitoring Bore	Groundwater Standing Level (mbgl) ¹		
	Average	10 th Percentile	90 th Percentile
BH1	7.08	4.90	8.54
BH2	2.82	0.96	4.12
BH3	3.77	2.19	4.71
BH4	5.14	3.24	6.40
BH5	2.01	1.02	4.57
Note 1: mbgl = metres below ground level.			
Source: Hanson Construction Materials Pty Ltd.			

The Company notes that variation in groundwater levels recorded at monitoring bore BH5 generally coincide with purging during manual water monitoring events, with water level results demonstrating relatively slow equilibration. Hydraulic testing of this bore conducted to support EA (2009) determined that the yield of this bore was significantly lower than that of the other four monitoring bores. This is assumed to be a result of the fractured rock aquifer in which it is located.

**Standing Water Levels (metres below ground level)
January 2013 - December 2018**

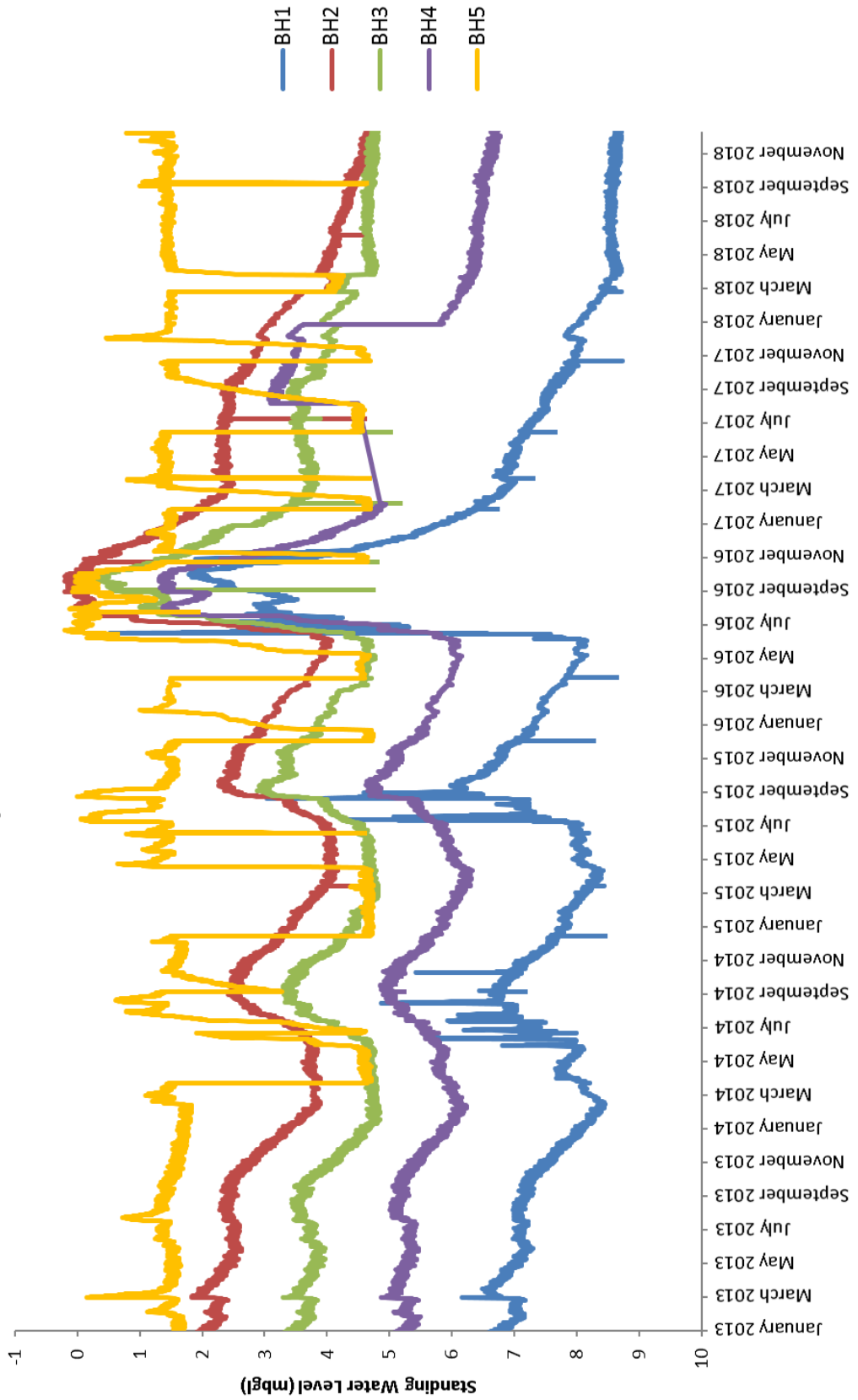


Figure 5
GROUNDWATER STANDING LEVELS – JANUARY 2013 TO DECEMBER 2018

11.2.3 Existing Groundwater Quality

Table 14 presents the results of annual groundwater quality monitoring undertaken at the Quarry between June 2015 and October 2018. In summary, recorded pH, electrical conductivity (EC) and concentrations of nitrate, total nitrogen, and phosphorous consistently exceed the relevant guideline trigger values across all groundwater monitoring bores. Additionally, concentrations of arsenic and nitrate repeatedly exceed the relevant guideline trigger values at monitoring bores BH2 and BH5 respectively.

11.2.4 Permeability

The results of falling head tests conducted by Coffey (2009) within the weathered aquifer indicate permeability's ranging from 0.02m/day to 0.2m/day. A falling head test within the fractured rock aquifer indicates a permeability of less than 0.0001m/day for that aquifer.

11.3 Groundwater Assessment Criteria

Specific groundwater quality assessment criteria are yet to be established due to limited data. **Table 14** presents the existing data which is compared to ANZECC (2000) criteria for slightly-moderately disturbed surface water ecosystems (95% species protection level). Where an exceedance of the ANZECC (2000) criteria is identified, the results are compared to the 90th percentile of historic records as described in **Table 15**.

In addition, the groundwater level assessment criteria include:

- standing water level 1m below 90th percentile of historic records: or
- standing water level below intake during normal operation of the bore.

**Table 14
Groundwater Quality Results – 2015 to 2018**

Analyte		Units	Guideline Trigger Value ²	Groundwater Monitoring Bore ¹																			
				BH1				BH2				BH3				BH4				BH5			
				Jun-15	Jul-16	Jul-17	Oct-18	Jun-15	Jul-16	Jul-17	Oct-18	Jun-15	Jul-16	Jul-17	Oct-18	Jun-15	Jul-16	Jul-17	Oct-18	Jun-15	Jul-16	Jul-17	Oct-18
Temperature (field)	°C	NA	14.0	13.5	15.2	-	14.4	14.7	15.5	-	14.3	14.3	15.2	-	14.3	14.8	15.4	-	15.2	12.9	14.8	-	
pH (lab)	pH units	6.5 - 8.0 ³	7.27	7.25	8.20	7.19	7.70	8.28	8.18	7.84	7.69	8.36	7.28	7.97	7.29	8.05	8.19	7.52	7.41	7.88	7.19	7.54	
pH (field)	pH units		7.75	6.27	6.82	-	7.55	6.71	6.46	-	7.90	7.03	6.55	-	7.45	6.33	6.92	-	7.4	7.43	6.69	-	
Elect. Cond (lab)	µS/cm	30 – 350 ³	390	190	658	580	641	639	581	701	691	690	316	786	376	316	741	422	320	383	389	376	
Elect. Cond (field)	µS/cm		496	295	736	-	726	765	752	-	820	817	803	-	486	435	486	-	-	394	407	-	
Hydroxide Alkalinity	mgCaCO ₃ /L	NA	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Carbonate Alkalinity	mgCaCO ₃ /L	NA	<1	<1	<1	<1	<1	<1	<1	<1	<1	19	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity	mgCaCO ₃ /L	NA	206	65	317	269	362	353	331	343	362	352	347	375	209	170	190	204	130	124	94	150	
Total Alkalinity	mgCaCO ₃ /L	NA	206	65	317	269	362	353	331	343	362	370	347	375	209	170	190	204	130	124	94	150	
Sulfate	mg/L	NA	<10	<5	3	<1	3	3	3	4	4	3	7	5	1	<1	2	2	6	3	2	2	
Chloride	mg/L	NA	18	13	11	20	11	10	11	11	14	14	16	16	7	6	9	9	4	9	13	13	
Calcium	mg/L	NA	28	18	30	37	37	37	26	36	40	42	15	42	28	22	31	26	19	23	22	20	
Magnesium	mg/L	NA	20	7	52	27	61	51	47	58	50	45	14	51	31	20	47	28	14	16	25	16	
Sodium	mg/L	NA	30	8	17	31	17	16	14	19	23	23	15	27	15	12	29	14	31	26	12	24	
Potassium	mg/L	NA	3	5	4	4	4	4	3	4	33	29	3	34	2	2	19	2	4	4	2	4	
Arsenic	mg/L	0.013	<0.001	<0.001	0.058	<0.001	0.072	0.068	0.054	0.071	0.008	0.006	<0.001	0.005	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	
Manganese	mg/L	1.9	0.353	0.022	0.011	1.06	<0.001	<0.001	<0.001	0.009	0.038	0.027	0.003	0.008	0.087	0.016	0.003	0.067	0.050	0.021	0.038	0.027	
Iron	mg/L	ID	0.72	0.08	<0.05	0.73	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Ammonia (as N)	mgN/L	0.9	0.40	0.07	0.02	4.78	0.02	<0.01	<0.01	<0.01	0.64	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.04	0.01	<0.01	0.01	0.11	
Nitrite (as N)	mgN/L	30 ⁴	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.16	0.12	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.01	
Nitrate (as N)	mgN/L	0.7	0.25	2.28	4.34	0.05	4.42	4.43	4.6	5.24	4.28	4.46	10.6	4.23	0.17	0.19	4.87	0.26	8.28	21.6	0.22	8.38	
Nitrite + Nitrate (as N)	mgN/L	400 ⁴	0.25	2.32	4.34	0.05	4.42	4.43	4.60	5.25	4.44	4.58	10.6	4.24	0.17	0.19	4.87	0.26	8.28	21.6	0.22	8.39	
Total Kjeldahl Nitrogen (as N)	mgN/L	NA	1.3	3.3	0.7	6.8	0.5	0.7	0.6	0.5	2	0.4	0.8	0.5	<0.1	0.3	0.5	<0.1	0.7	1.1	0.2	1.1	
Total Nitrogen (as N)	mgN/L	0.25 ³	1.6	5.6	5.0	6.8	4.9	5.1	5.2	5.8	6.4	5	11.4	4.7	0.2	0.5	5.4	0.3	9	22.7	0.4	9.5	

**Table 14
Groundwater Quality Results – 2015 to 2018**

		Guideline Trigger Value ²	Groundwater Monitoring Bore ¹																				
Analyte	Units		BH1				BH2				BH3				BH4				BH5				
			Jun-15	Jul-16	Jul-17	Oct-18	Jun-15	Jul-16	Jul-17	Oct-18	Jun-15	Jul-16	Jul-17	Oct-18	Jun-15	Jul-16	Jul-17	Oct-18	Jun-15	Jul-16	Jul-17	Oct-18	
Total Phosphorus (as P)	mgP/L	0.02 ³	0.35	0.6	0.11	1.4	0.09	0.1	0.08	0.13	1.22	0.48	0.03	0.18	0.01	0.09	0.20	0.01	0.1	0.08	0.03	0.01	
Total Anions	meq/L	NA	4.62	1.83	6.71	5.94	7.6	7.4	6.99	7.25	7.71	7.85	7.53	8.05	4.39	3.56	4.09	4.37	3.43	2.79	2.29	3.4	
Total Cations	meq/L	NA	4.42	1.95	6.62	5.52	7.71	6.84	5.85	7.5	7.96	7.54	7.16	8.34	4.65	3.32	3.73	4.26	3.55	3.7	2.63	3.46	
Ionic Balance	%	NA	2.21	-	0.66	3.66	0.65	3.92	8.84	1.71	1.55	2.01	2.5	1.77	2.83	3.63	4.64	1.27	1.73	-	6.99	0.81	
NA = Not Applicable			ID = Insufficient Data																Red = exceeds guideline trigger value.				
Note 1: See Figure 2 for monitoring bore locations.																							
Note 2: Guideline trigger values are ANZECC guideline values for slightly-moderately disturbed ecosystems (95% species protection level) unless otherwise specified.																							
Note 3: Values are NSW Water Quality Objectives for Upland Rivers – Macquarie-Bogan River.																							
Note 4: ANZECC guideline values for stock watering.																							
Source: Geolyse (2015 – 2018)																							

**Table 15
Groundwater Quality Assessment Criteria**

Parameter	Unit	Long-term Assessment Criteria
pH value	pH	6.5-8.0
Electrical Conductivity	µS/cm	Greater than 90 th percentile groundwater quality as determined by ongoing groundwater quality monitoring.
Bicarbonate Alkalinity as CaCO ₃	mg/L	
Carbonate Alkalinity as CaCO ₃	mg/L	
Hydroxide Alkalinity as CaCO ₃	mg/L	
Total Alkalinity as CaCO ₃	mg/L	
Chloride	mg/L	
Sulphate	mg/L	
Calcium	mg/L	
Magnesium	mg/L	
Sodium	mg/L	
Potassium	mg/L	
Nitrate as N	mg/L	
Nitrite as N	mg/L	
Total Oxidized Nit. As N	mg/L	
Total Phosphorus as P	mg/L	
Arsenic	mg/L	
Manganese	mg/L	
Iron	mg/L	

11.4 Groundwater Monitoring Locations and Frequency

The Company will monitor groundwater quality at the locations and frequency indicated in **Table 16** and on **Figures 1** and **2**. Additionally, groundwater levels in on site bores BH1 to BH5 will be monitored continuously using groundwater loggers.

**Table 16
Groundwater Quality Monitoring Locations and Frequency**

On Site Bores			Off Site Bores		
Bore	Field ¹	Laboratory ¹	Bore	Field ¹	Laboratory ¹
BH1	Quarterly	Annually	GW805135	Following complaint or suspected contamination.	
BH2	Quarterly	Annually	GW801566	Following complaint or suspected contamination.	
BH3	Quarterly	Annually	GW800408	Following complaint or suspected contamination.	
BH4	Quarterly	Annually	GW033590	Following complaint or suspected contamination.	
BH5	Quarterly	Annually	GW804568	Following complaint or suspected contamination.	
			GW058572	Following complaint or suspected contamination.	
			GW802005	Following complaint or suspected contamination.	
			GW804225	Following complaint or suspected contamination.	
			GW802161	Following complaint or suspected contamination.	

Note 1: See Section 11.5
 Note 2: Subject to landholder agreement, monitoring would be undertaken only in the event that Quarry-related groundwater contamination is suspected.

Additionally, groundwater extraction will be monitored in accordance with the conditions of WAL36530, including recording the following in a logbook or equivalent electronic system.

- The date and time during which extraction occurs.
- The volume of water extracted.
- The purpose(s) for which water was extracted.

11.5 Groundwater Monitoring Parameters

The following groundwater monitoring parameters would be implemented throughout the life of the Quarry.

- Field analysis.
 - Standing water level.
 - Electrical conductivity.
 - pH.
- Laboratory analysis.
 - As identified in **Table 16**.

11.6 Groundwater Monitoring Procedures

All groundwater monitoring, water level measurements and sample collection, storage and transportation will be undertaken in accordance with the procedures outlined in the document *Murray Darling Basin Groundwater Quality Sampling Guidelines, August 1997, Technical Report No. 3* published by the Murray Darling Basin Commission. In particular, three times the volume of the bore will be removed where possible prior to collecting the sample to ensure that the sample collected is representative of the quality of water within the aquifer rather than merely the quality of water within the bore which may have been influenced by exposure to air within the bore or by the bore casing. In some cases, identified sampling procedures may be required to be modified in some cases due to bore conditions, including restrictions on the volume of water that may be purged or the equipment that may be used.

11.7 Trigger for Investigations and Response Actions

Following receipt groundwater monitoring results, the Company will review the data against the parameters identified in Section 11.3.

Groundwater Level

In the event that the groundwater level criteria are exceeded, the Company will immediately:

- arrange for further check measurement to be undertaken to confirm the initial monitoring results;
- review other activities occurring in the vicinity that may also affect groundwater levels; and
- contact the owner of the bore (if non-Project related) and DPIE and advise them of the preliminary results and timeframes for completion of further check sampling and reporting.

In the event that the initial groundwater monitoring level results record below the 10th percentile and can be contributed to the quarrying operations, the Company would immediately contact the owner of each bore for which the significant changes have occurred to discuss the issue and negotiate an alternative water supply or compensation.

A copy of the final investigation report will be provided to DPIE.

Groundwater Quality

In the event that the groundwater quality criteria are exceeded, the Company will immediately:

- arrange for further check sampling to be undertaken to confirm the initial monitoring results; and
- contact Environment Protection Authority and DPIE and advise them of the preliminary results and timeframes for completion of further check sampling and reporting.

Should the check sampling indicate that groundwater quality remains outside the assessment criteria, the Company will immediately contact the above agencies to advise them of the result of the check sampling and determine, in consultation with the above agencies, appropriate management actions.

A copy of the final investigation report will be made available to Environment Protection Authority and DPIE.

Groundwater Inflow to the Quarry

In the unlikely event that sustained groundwater inflow is observed during the life of the Quarry, the Company acknowledges that a licence will be required. As a result, the Company will regularly inspect the Quarry as part of its standard operating procedures and any persistent groundwater discharges will be recorded and reported in the *Annual Review*. Where the observed flows are non-negligible, the Company will, in consultation with DPIE, undertake a program to determine the volume of water being discharged and ensure that an appropriate licence is obtained for that discharge.

12. Corrective and Preventative Actions

In the event that the procedures identified in Sections 10.5 and 11.7 identify exceedances of the relevant assessment criteria, the Company will implement the measures identified in those sections to determine whether the exceedances are Quarry related or otherwise. In the event that an investigation determines that the exceedances are Quarry-related, the Company will, in consultation with DPIE and Environment Protection Authority (as required), identify and implement relevant corrective and preventative actions.

13. Complaints Handling and Response

The *Environmental Management Strategy* as required by Condition 1 of Schedule 5 of PA 06_0193 includes a detailed complaints management procedure. This sub-section records the procedures that would be implemented following receipt of soil or water-related complaint.

Complaints may be received via one of the following methods.

- Directly via the 24-hour, 7 day per week Company's general Emergency Line (1800 882 478). This number will be advertised widely in the local media, on signage at the Site entrance and on the Company web site www.hanson.com.au.
- Directly via a dedicated email address which will be advertised in a similar manner to the Emergency Line.
- Indirectly via the relevant government agencies.

In addition, consultation will be held with the community as part of the Company's standard consultation procedures, namely informal meeting with surrounding landholders as required and meetings of the Community Consultative Committee. These meetings will provide a further forum at which complaints may be received.

Following receipt of any soil or water-related complaint, the Company will implement the following procedure.

1. The complaint will be reviewed by the Quarry Manager or their delegate to determine the nature, date and time of the complaint. This will include contacting and meeting with the complainant as required.
2. Relevant monitoring data will be reviewed.
3. Should the water monitoring results indicate that no exceedance of the water assessment criteria identified in Sections 10.3 and 11.3, the Quarry Manager will continue to consult with the complainant in relation to managing water-related impacts associated with the Quarry.
4. Should the water monitoring indicate an exceedance of the relevant criteria, the Quarry Manager will notify the DPIE and Environment Protection Authority and will implement the procedures identified in Section 12. In addition, the Quarry Manager will continue to consult with the complainant, as required, in relation to the complaint.
5. In the event that multiple complaints are received from the same individual(s) and the Company can demonstrate:
 - at least three water-related complaints from the complainant, with demonstrated compliance with the relevant criteria in each case; and
 - there is documented evidence of a genuine attempt by the Company to discuss the issue and seek a resolution with the complainant without success;then the Company may, in consultation with the relevant government agencies, limit responses to further complaints to Steps 1 and 2 above.

All complaints would be recorded using a proforma complaints record sheet, with a description of the nature and the outcome of the complaint and subsequent investigation provided in summary form to the Community Consultative Committee and in the Annual Review.

14. Incident Reporting

In the event that an initial investigation concludes that an exceedance of an environmental criterion was directly attributed to activities associated with the Quarry, as described in Section 12, the event will be reported to DPIE, Environment Protection Authority and the relevant landholder(s) within 24-hours of confirming the exceedance.

Within 7 days of identifying the exceedance, the Company will submit a written report with regular updates on the status of the additional mitigation actions to DPIE, Environment Protection Authority and, where relevant, the relevant landholder(s). In addition, a copy of all reports will be provided to the Community Consultative Committee, made publicly available on the Quarry website and will be included in the *Annual Review*.

The Quarry Manager will be responsible for incident reporting.

15. Publication of Monitoring Information

All water monitoring reports will be made publicly available on the Quarry website and will be included in the *Annual Review*.

All water-related exceedance investigation reports will be made publicly available on the Quarry website within 7 days of being finalised and accepted by the relevant government agencies.

Finally, the Company will also provide the Community Consultative Committee with a copy of all monitoring reports.

The Quarry Supervisor will be responsible for ensuring the relevant information is made publicly available.

16. Review

In accordance with Condition 4 of Schedule 5 of PA 06_0193, this *Soil and Water Management Plan* will be reviewed and, if required, revised within 3 months of:

- the submission of an annual review under condition 3 of Schedule 5 of PA 06_0193;
- the submission of an incident report under Condition 6 of Schedule 5 of PA 06_0193;
- the submission of an independent environmental audit report under Condition 8 of Schedule 5 of PA 06_0193; and
- the approval of any modification to the conditions of PA 06_0193.

The Quarry Manager will be responsible for the review of this Plan.

17. References

Coffey (2009), *Groundwater Investigation Proposed Guyong Quarry Revised Report 2009* is presented as Technical Report 2 accompanying the *Environmental Assessment*.

Landcom (2004), *Managing Urban Stormwater: Soils and construction*, NSW Government.

DECC (2008), *Soils and Construction: Volume 2E – Mines and Quarries*.

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Murray Darling Basin Commission (1997), *Murray Darling Basin Groundwater Quality Sampling Guidelines, August 1997, Technical Report No. 3*.

Umwelt (Australia) Pty Limited (EA 2018). *East Guyong Quarry Modification 2 – Environmental Assessment*, version dated September 2018.

Umwelt (Australia) Pty Limited (RTS A 2018). *Response to Submissions – East Guyong Quarry Modification 2, Part A*.

Umwelt (Australia) Pty Limited (RTS B 2018). *Response to Submissions – East Guyong Quarry Modification 2, Part B*.

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Appendix 1

Sediment and Erosion Control Plan

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