

Document Control & Title Block

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Development consent / project approval #	Project Approval 94-4-2004
Name of holder of development consent / project approval	Hanson Construction Materials
Water licence #	
Name of holder of water licence	
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Title of authorised reporting officer	Graduate Environmental Planning and Compliance Coordinator
Signature of authorised reporting officer	
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List of Acronyms

ANZECC	Australian and New Zealand Environment Conservation Council
CCC	Community Consultative Committee
DPE	Department of Planning and Environment
DRE	Department of Resources and Energy
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EPA	Environmental Protection Authority
EPL	Environmental Protection Licence
GDE	Groundwater Dependent Ecosystem
SWL	Standing water level
SWMP	Site Water Management Plan
TSS	Total Suspended Solids
TSP	Total Suspended Particulates

1. STATEMENT OF COMPLIANCE

Table 1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
94-4-2004	NO

Table 2: 2018 Non-Compliances

Relevant Approval	Condition #	Condition description (summary)	Compliance status	Comment	Where addressed in Annual Review
94-4-2004 (Noise Management Plan)	Schedule 3, Condition 7A	Noise Management Plan requirements not completed.	Non-Compliant	Comparative sound level measurements of equipment had not been undertaken. Noise monitoring was conducted at CN-1, CN-2, CN-3, CN-6 but not CN-9.	Section 9
94-4-2004 (Specific Environmental Conditions)	Schedule 3, Condition 15	Groundwater Dependent Ecosystems requirements not completed (within Site Water Management Plan).	Non-Compliant	The approved SWMP does not include impact assessment criteria for groundwater dependent ecosystems (GDEs). The amended SWMP (which is awaiting approval) includes identification of and monitoring program for GDEs, but does not include impact assessment criteria.	Section 9
94-4-2004 (Specific Environmental Conditions)	Schedule 3, Condition 16	Groundwater monitoring requirements not completed.	Non-Compliant	A bore survey in 2015 identified 3 further bores within 500m of the quarry. Only one CP13 had been tested, CP14 and CP15 are not yet tested.	Section 9
94-4-2004 (Specific Environmental Conditions)	Schedule 3, Condition 16	Groundwater monitoring requirements not completed.	Non-Compliant	Key monitoring bores CQ4, CQ11S and CQ13 have defective continuous water level monitoring equipment installed. (bi-monthly manual water level monitoring was still being undertaken)	Section 9
94-4-2004 (Specific Environmental Conditions)	Schedule 3, Condition 16	Groundwater monitoring requirements not completed.	Non-Compliant	No water level or flow metering equipment as specified by MER (2005) has been installed on any private bore within 500m of quarry.	Section 9

94-4-2004 (Air Quality Management Plan)	AQMP Section 9.3.1 & 9.3.2	Investigation into monthly exceedance of DDG	Non-Compliant	No formal investigation has been undertaken to assess the cause of the exceedances.	Section 9
94-4-2004 (Air Quality Management Plan / Noise Management Plan)	AQMP Section 13.2 / NMP Section 7.4	Site induction not specific	Non-Compliant	Site specific environmental requirements have not been included within the quarry induction.	Section 9
94-4-2004 (Water Management Plan)	WMP Section 3.5	No record of discharge volume from EPL1	Non-Compliant	There is no record of discharge volume from EPL 1 or record of water levels.	Section 9
94-4-2004 (Rehabilitation and Landscape Management Plan)	Schedule 3, Condition 22	Rehabilitation and Landscape Management Plan requirement not completed.	Non-Compliant	Did not undertake commission of suitably qualified ecologist to conduct annual rehabilitation and threatened species monitoring.	Section 7.6
Water Licence	N/A	Monitoring requirements	Non-Compliant	Records of water taken had not been maintained. A logbook recording details of water taken was not available, and a meter had not been installed.	Section 9
94-4-2004 (Air Quality Management Plan)	Schedule 3, Condition 9A	Air Quality Management Plan requirement not completed.	Non-Compliant	Monitoring of particulate matter (PM10) had not been implemented 2018.	Section 9
94-4-2004 (Specific Environmental Conditions)	Schedule 3, Condition 16	Approved SWMP doesn't include GCS	Non-Compliant	The approved SWMP doesn't include requirements for a Groundwater Contingency Strategy.	Section 9
94-4-2004 (Specific Environmental Conditions)	Schedule 3, Condition 35	Waste monitoring.	Non-Compliant	The Quarry had not implemented a process to monitor waste generated. A waste register was not maintained.	Section 9
94-4-2004 (Air Quality Management Plan)	AQMP Section 13.2.3 / NMP Section 13.2	Toolbox meetings	Non-Compliant	No record of toolbox meetings discussing environmental requirements.	Section 9

94-4-2004 (Environmental Management Strategy)	Schedule 5, Condition 1	Recording of complaints received.	Non-Compliant	The register does not include personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect. Where complaints had been received, the following issues were identified: <ul style="list-style-type: none"> • Name of complainant not provided. • Details of who received the complaint were not recorded. • Person conducting the investigation was not recorded. 	Section 9
94-4-2004 (Noise Management Plan)	NMP Section 8.3.2	Noise monitoring	Non-Compliant	Noise monitoring had been conducted at CN-1, CN-2, CN-3, CN-6 but not at CN-9.	Section 9
94-4-2004 (Noise Management Plan)	NMP Section 8.4	Noise monitoring	Non-Compliant	Noise monitoring report doesn't include: <ul style="list-style-type: none"> • Anemometer use • Calibration data • Noise was substantially tonal, impulsive, intermittent or low frequency in nature. 	Section 9
94-4-2004 (Noise Management Plan)	NMP	Complaints	Non-Compliant	Complaints received had the following issues: <ul style="list-style-type: none"> • Name of complainant not provided • Complaints received were not responded to until 4 hours after • Details of who received the complaint not recorded. • Person conducting investigation was not recorded. 	Section 9
94-4-2004 (Site Water Management Plan & Erosion	SWMP Section 4.1	Copy of Blue Book not available	Non-Compliant	Erosion and sediment control drawings were not available. Erosion and sediment control structures have not been constructed	Section 9

and Sediment Control Plan)				in accordance with Blue Book.	
94-4-2004 (Site Water Management Plan)	Schedule 3, Condition 13	Inadequate referencing within management plan.	Non-Compliant	While erosion and sediment controls have been implemented, controls were not as described in the management plan. E.g. Cross fall and drainage, Outfall drainage, mitre drains and sand bag weirs have been installed, but actual operations are not as described in the management plan.	Section 9
94-4-2004 (Landscape and Rehabilitation Management Plan)	LRMP Section A2.1.1	Incorrect reference within management plan	Non-Compliant	The LRMP has not been updated to reflect current arrangements for managing vegetation clearance.	Section 9
94-4-2004 (Environmental Management Strategy)	EMS Section 5.1	Incorrect reference within management plan.	Non-Compliant	EMS has not been updated to reflect current requirements for independent external audits.	Section 9
94-4-2004 (Regular Reporting)	Schedule 3, Condition 9	Groundwater audit reports not provided on site.	Non-Compliant	Groundwater audit reports, though reported within the Annual Review which is available on the Hanson website, were not provided on the Hanson website.	Section 9

Table 3: Compliance Status for Table 2

Risk Level	Colour code	Description
High	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-Compliant	Non-compliance with: Potential for serious environmental consequences, but is unlikely to occur, or Potential for moderate environmental consequences, but is likely to occur
Low	Non-Compliant	Non-compliance with: Potential for moderate environmental consequences, but is unlikely to occur, or Potential for low environmental consequences, but is likely to occur

Administrative non-compliance	Non-Compliant	Only applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)
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2. INTRODUCTION

The Quarry is owned and operated by Hanson Construction Materials Pty Ltd. The Quarry is located on the Somersby Plateau, approximately 1.0km northwest of the Calga Interchange on the M1 Freeway (Figure 1). Figure 2 displays the existing layout including the boundary of Stage 3 extraction operations and designated sub-stages.

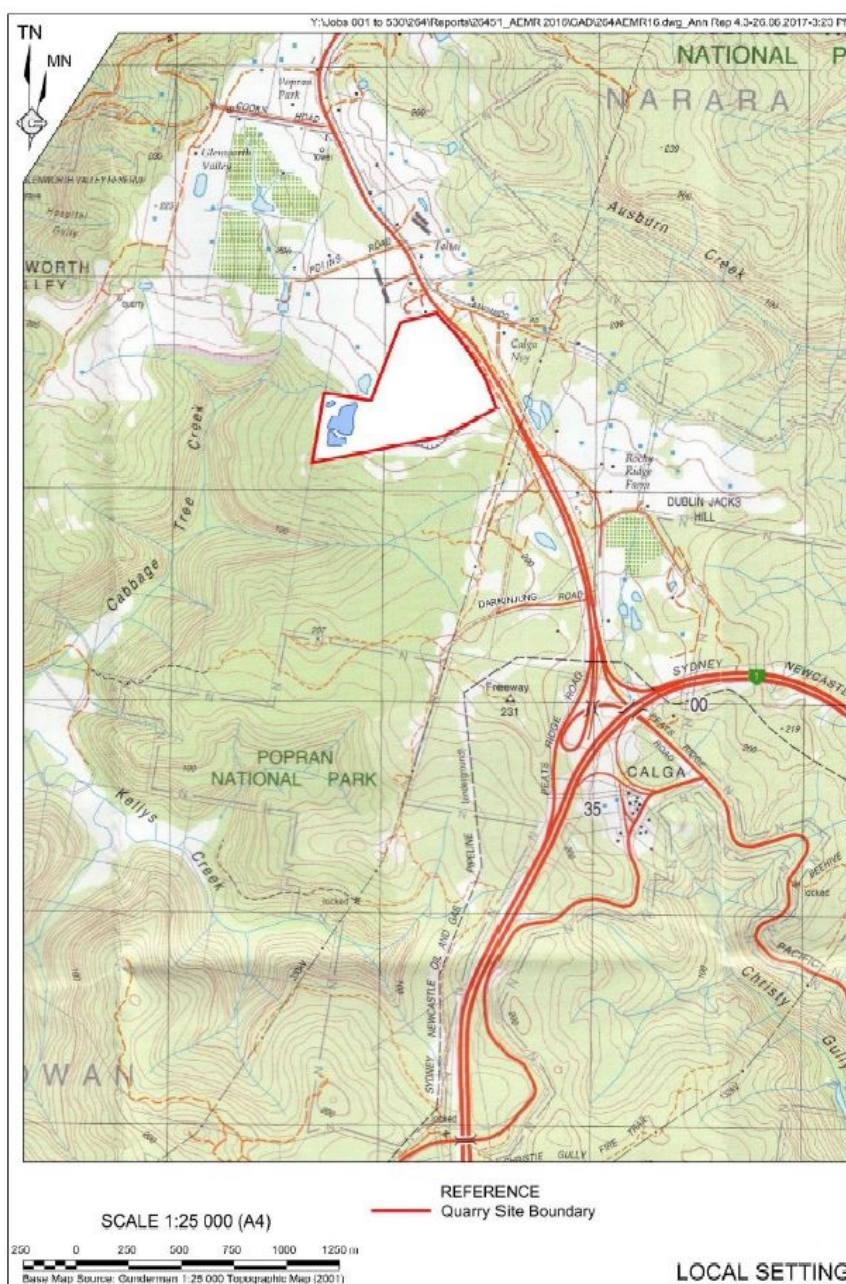


Figure 1: Local Setting

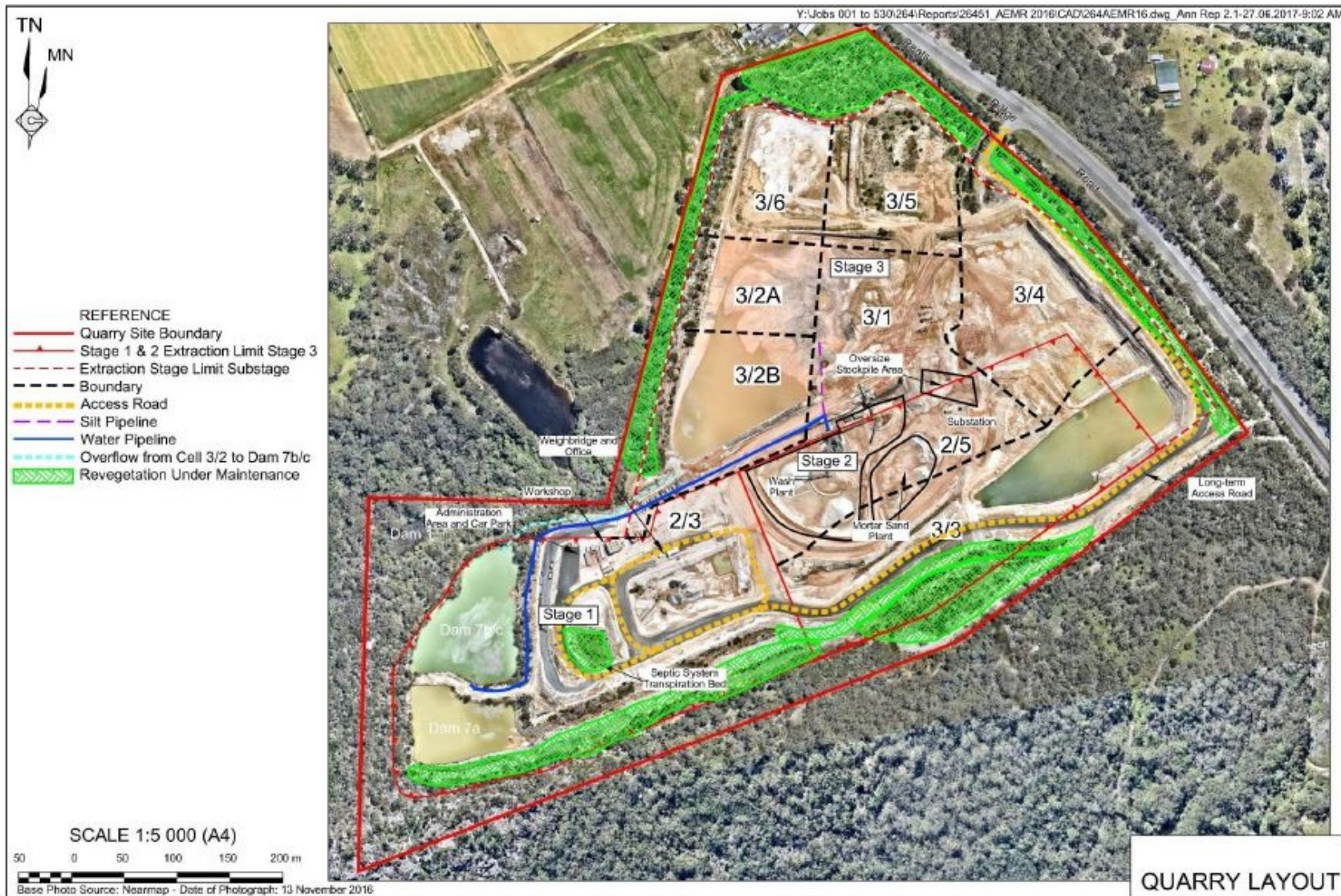


Figure 2: Quarry Layout

The following personnel are responsible for the ongoing management of the Calga Sand Quarry.

Table 4: Quarry Site personnel roles and responsibilities

Position	Name	Phone	Email
Operations Manager	Chris Dolden	0457738811	chris.dolden@hanson.com.au
Quarry Manager	Shane Pescud	0425 290 692	shane.pescud@hanson.com.au
Risk Manager	Ian Bradbury	0417 423 467	ian.bradbury@hanson.com.au
Development Manager	Andrew Driver	0417 234 774	andrew.driver@hanson.com.au
Graduate Environmental Planning and Compliance Coordinator	Belinda Pignone	0439 131 941	belinda.pignone@hanson.com.au

Other persons involved with site management and compilation of quarry-related documentation and monitoring data include:

- Mr Chris Whackett – Project Manager, Toolijooa Environmental Restoration – Mr Whackett is contracted to undertake ongoing weed management and revegetation throughout the Quarry Site; and
- Mr. Colin Davies – Carbon Based Environmental Pty Ltd – Mr Davies is contracted to undertake the monthly collection of water samples, recording of groundwater levels and collection/assembly of deposited dust and meteorological data.
- Mr Bryan Furchert – Cumberland Ecology Pty Ltd – Mr Furchert was contracted to undertake the annual Rehabilitation Monitoring Report.

3. APPROVALS

This Annual Environmental Management Report (AEMR) has been prepared in accordance with *Condition 5(4)* of Development Consent DA 94-4-2004 (**Appendix 1**) to record the activities and environmental monitoring undertaken within and surrounding the Calga Sand Quarry during the period 1 January to 31 December 2018 (the reporting period) and to outline the activities and environmental monitoring planned throughout 2019. This condition requires the preparation of a report that:

- Identifies the standards and performance measures that apply to the development (see Section 4);
- Describes the works carried out throughout the last 12 months (see Section 6);
- Describes the works that will be carried out throughout the next 12 months (see Section 11);
- Includes a summary of the complaints received during the past year, and compares this to the complaints received in previous years (see Section 8.2);

- Includes a summary of the monitoring results for the development during the past year (see Section 7);
- Includes an analysis of these monitoring results against the relevant:
 - Impact assessment criteria;
 - Monitoring results from previous years; and
 - Predictions in the EIS and Amendment Report (See Sections 7.1.1, 7.2.3, 7.4.3 and 7.5.3)
- Identifies any trends in the monitoring results over the life of the development (see Section 7.1.1, 7.2.3, 7.5.3 and 7.6.2);
- Identifies any non-compliance during the previous year (see Section 10); and
- Describes what actions were, or are being taken to ensure compliance (see Section 10)

In addition, the following conditions specifically request that the subject information incorporated in this document.

- 3(18) The results of the yearly Water Management Plan review including:
 - Details of the review for each sub-plan (see Sections 7.4, 7.4.1 and 7.5)
 - The results of monitoring (Appendices 2 and 3);
 - The results of the Independent Groundwater Audit (including a copy of the report) (Appendix 3); and
 - Details of the measures undertaken/proposed to address any identified issues (see Sections 7.5, 7.6 and Appendix 3).
- 3(32c) A progress report on the re-vegetation and maintenance of the acoustic barrier (Section 7.6 and Appendix 6).
- 3(35d) A report on waste management and minimisation (Section 6.5)
- 3(39b) Annual production data (Section 6.1)

Within one month of the completion of each AEMR, Condition 5(10) requests that the Applicant:

- Provide a copy of the AEMR to the Council, relevant agencies and the CCC;
- Ensure that a copy of the AEMR is made publically available at the quarry; and
- A copy of the document is placed on the Applicant's website;

to the satisfaction of the Director-General (now Secretary).

Throughout this document, the land on which the Calga Sand Quarry is located (Lot 1, DP229889) is referred to as the "Quarry Site".

4. STANDARDS AND PERFORMANCE MEASURES

Hanson Construction Materials Pty Ltd (Hanson) is required to operate the approved activities at the Calga Sand Quarry in accordance with the development consent and licences listed in Table 5.

Table 5: Project Summary

Consent / Licence		Issue Date	Expiry Date
Development Consent 94-4-2004		28 October 2005	1 July 2030
Environmental Protection Licence No 11295		16 December 2002	24 July
Water Supply Works Approval 20WA211660		5 July 2011	5 July 2021
Water Access Licence 17384	10 ML	27 February 2012	No Expiry
Water Access Licence 27185	51 ML	4 February 2014	No Expiry
Water Access Licence 20019	46 ML	4 February 2014	No Expiry
Water Access Licence 2541	6 ML	14 January 2010	No Expiry

Relevant conditions within DA 94-4-2004 which nominate specific environmental criteria are as follows.

- Condition 3(2): noise emissions (day, evening and night).
 - Each of the relevant criteria are presented in Section 7.1.1 in conjunction with the assembled monitoring results
- Condition 3(8): dust emissions (suspended and deposited).
 - Each of the relevant criteria are presented in Section 7.2.1 in conjunction with the assembled monitoring results

In addition, Condition 3(20) requires Hanson to establish and subsequently maintain a meteorological station in the vicinity of the Quarry, to the satisfaction of the then DEC (now EPA) and the Director-General of the Department of Planning (now Secretary of the NSW Department of Planning and Environment – DPE). The station is required as a minimum, unless otherwise authorised by the Director-General (now Secretary), to monitor daily rainfall and evaporation in accordance with the requirements in Approved Methods for the Sampling and analysis of Air Pollutants in NSW.

Environment Protection Licence (EPL) 11295 also nominates specific environmental criteria as follows, (as noted above, details of the relevant criteria are presented in Sections 7.1.1 and 7.2.1).

- Noise.
 - Condition L3.1 – noise emission limits (day, evening and night).
 - Condition L3.2 and L3.4 specify the monitoring locations, adjustments due to tonal noise and relevant meteorological conditions for compliance.
- Dust
 - EPL 11295 does not nominate any dust criteria; hence reliance is placed on the criteria nominated in Condition 3(8) within DA 9-4-2004.

The performance criteria relevant to assessing groundwater impacts are nominated either in the Site Water Management Plan (Section 8.6) or from the Freshwater Ecosystem Protection Guideline drawn from ANZECC (2000).

All surface water monitoring was undertaken pursuant to the Site Water Management Plan and, for the purposes of assessing compliance; reliance is placed upon the water quality limits nominated within this Plan.

Cumberland Ecology has established five monitoring plots within identified Groundwater Dependent Ecosystems (GDEs) approximately 500m south of the Quarry Site (see Section 8.7). Vegetation type and condition was recorded to establish a baseline for ongoing monitoring of these ecosystems and potential impacts as a result of quarrying activities. The baseline data recorded that the GDEs are in good condition with all species consisting of natives and no sign of nutrient enrichment or invasive species. Groundwater Dependent Ecosystem monitoring is discussed further in Section 8.7.

5. DOCUMENT PREPARATION

The information and data for this report has been drawn for the following documents commissioned or held by Hanson.

- Carbon Based Environmental Pty Limited – 2018 Monthly Dust Deposition, Surface and Ground Waters and Meteorological Station Monitoring Results Summaries (Appendix 1).
- Wilkinson Murray Pty Limited – Compliance Noise Monitoring (Appendix 2).
- Dundon Consulting Pty Limited – Calga Sand Quarry 2018 Annual Independent Groundwater Audit (Appendix 3).
- Toolijooa Pty Limited – Calga Sand Quarry, Rehabilitation Monitoring Report (Appendix 4).
- Correspondence (Appendix 5).
- Cumberland Ecology Pty Limited – 2018 Rehabilitation Monitoring Report (Appendix 6)

This document has been assembled by Ms. Belinda Pignone (B.Env.Sc.Mgmt) (Graduate Environmental Planning and Compliance Coordinator, Hanson). Mr Shane Pescud (Quarry Manager) provided technical input and information on Quarry operations and environmental performance during the reporting period.

6. OPERATIONS SUMMARY

Table 6 lists the principle activities / milestones that occurred at the Calga Sand Quarry throughout 2018. Figure presents the location(s) of the activities described reference to operational areas within the Calga Sand Quarry are to either “stages” for extraction areas, i.e. consistent with the

terminology in the 2004 EIS, or “cells” for the completed extraction stages used for silt storage. Figure to display the condition and active areas of the Quarry Site as at April 2018.

Table 6: Principal Activities / Milestones During 2018

Quarter	Activity
January – March	<p>Extraction within Stage 3/5, all tailings deposited within Stage 3 Cells 3&4.</p> <p>Conduct attended noise monitoring</p> <p>Conduct monthly dust deposition samples, surface water sampling and bi-monthly bore water level monitoring as part of the environmental monitoring.</p> <p>Horticulturist monthly weed control & revegetation maintenance activities to location 1 & 6.</p> <p>Overburden placement & rehabilitation within Stage 3 tailings Cells 2a&b.</p>
April – June	<p>Extraction within Stage 3/5, all tailings deposited within Stage 3 Cells 3&4.</p> <p>Conduct monthly dust deposition samples, surface water sampling and bi-monthly bore water level monitoring and bi-annual groundwater quality sampling as part of the environmental monitoring.</p> <p>Conduct attended noise monitoring</p> <p>Hold Community Consultative Committee meeting</p> <p>Horticulturist monthly weed control & revegetation maintenance activities to location 1 & 6.</p>
July – September	<p>Extraction within Stage 3/5, all tailings deposited within Stage 3 Cells 3&4. Conduct attended and unattended noise monitoring.</p> <p>Horticulturist monthly weed control & revegetation maintenance activities.</p> <p>Conduct monthly dust deposition samples, surface water sampling and bi-monthly bore water level monitoring as part of the environmental monitoring.</p> <p>Overburden placement & rehabilitation within Stage 3 tailings Cells 2a&b.</p>
October – December	<p>Extraction within Stage 3/5, all tailings deposited within Stage 3 Cells 3&4. Conduct attended noise monitoring.</p> <p>Conduct six monthly detailed groundwater monitoring report as per environmental monitoring program.</p> <p>Conduct monthly dust deposition samples, surface water sampling and bi-monthly bore water level monitoring and bi-annual groundwater quality sampling as part of the environmental monitoring.</p> <p>Hold Community Consultative Committee meeting.</p> <p>Horticulturist monthly weed control & revegetation maintenance activities.</p> <p>Overburden placement & rehabilitation within Stage 3 tailings Cells 2a&b.</p>

6.1 EXTRACTION OPERATIONS

During the reporting period, extraction was conducted in Stage 3/4. Extraction operations involved ripping and pushing up friable sandstone.

Table 7 records the monthly/annual sales of the various products produced at the Quarry during 2018. This data was provided to the Division of Resources & Energy (DRE) in accordance with the requirements of Condition 3(39b). Table 8 provides a summary of materials sold in the previous year, this reporting period and a forecast of the next reporting period.

Table 7: Calga Sand Quarry – 2018 Sales

2018	Monthly Sand Sales (tonnes)
January	24785.45
February	28468.79
March	32173.29
April	27360.43
May	35548.68
June	31686.99
July	37637.74
August	45976.95
September	35696.14
October	26198.46
November	27936.94
December	22404.55
Total	375,874

Table 8: Calga Sand Quarry – Summary of Materials

Material	Approved production limit (specify source)	Previous reporting period (actual)	This reporting period (actual)	Next reporting period (forecast)
Friable Sandstone	4000,000 tonnes (DA 94-4-2004)	384,689 tonnes	375,874 tonnes	393,416 tonnes

6.2 PROCESSING AND PRODUCT STOCKPILING

During the reporting period, sand processing was undertaken using the wash plant. All of the sand extracted was washed to produce a range of concrete sand products.

6.3 OVERBURDEN AND SILT MANAGEMENT

All silt produced from the sand washing process was placed in Stage 3 Cells 3&4 throughout the reporting period. All oversize material was stockpiled within the Quarry Site.

6.4 INFRASTRUCTURE DEVELOPMENT/UPGRADES

Minor alterations will be completed during the 2018 reporting period. This included minor landscaping activities.

6.5 WASTE MANAGEMENT

All wastes from the site office and amenities were collected in waste skips and removed from site by a waste contractor, as required. During 2018, the following waste was removed from the quarry.

- Approximately 3700 litres of oily waste and 10 tonnes of steel were removed for recycling.
- All waste batteries were removed for recycling.
- All oil and fuel filters and oil rags were removed to a licenced waste facility.

7. ENVIRONMENTAL PERFORMANCE

Hanson benchmarks environmental performance against the conditional requirements of DA 94-4-2004 and EPL 11295 as well as the approved environmental management plans. Generally environmental performance complies with expectations.

The Quarry is operated in accordance with an Environmental Management System and the following environmental management plans and monitoring programs.

- Noise Management Plan
- Air Quality Management Plan
- Transport Management Plan
- Surface Water Management Plan
- Groundwater Management Plan
- Landscape Management Plan

In addition, Table 9 provides a summary of environmental monitoring at the Quarry.

Table 9: Environmental Monitoring

Monitoring Parameter	Frequency
Meteorological Data	Continuous
Laden truck movements	Daily
Quarry products transported	Daily
Noise levels at closest residential receivers (attended)	Quarterly
Noise levels at closest residential receivers (unattended)	Yearly
Deposited dust	Monthly
Surface water monitoring (pH, EC, TDS, TSS and Oil & Grease)	Monthly
Surface water discharge (pH, EC, TSC, TSS, Oil & Grease)	Discharge
Groundwater quality (major anions and cations).	Quarterly
Groundwater level, pH and electrical conductivity	Bi-monthly
Water use	Daily

7.1 NOISE

Noise monitoring was undertaken by Wilkinson Murray (Sydney) Pty Ltd during the reporting period generally in accordance with the approved Noise Monitoring Program prepared in accordance with *Condition 3(7)* of the Development Consent 94-4-2004. Four periods of attended monitoring were conducted on 29 March, 17 July, 31 October and 21 December, which yielded valid measurements for inclusion in this report. A period of unattended monitoring was undertaken between 9 July and 17 July 2018. Monitoring was conducted at four surrounding residences, the locations of which are displayed on Figure 3.

7.1.1 Noise Criteria and Results

Table 10 displays the noise criteria for the Calga Sand Quarry together with the noise levels predicted at Residence 4 (CN-2), Residence 5 (CN-3) and Residence 6 (CN-4) in 2004 and the measured noise levels throughout 2011. It is noted in the Industrial Noise Policy that:

“A development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2dB above statutory noise limit specified in the consent or licence condition.”

A summary of the noise results is included in **Appendix 2** and full copies of all reports are included on Hanson’s website. The range of measured noise levels between 2006 and 2016 are also provided for comparative purposes. Table 11 identifies the applicable noise impact criterion for four residential locations, which have been adopted for the noise monitoring surveys (**Appendix 2**).

Table 10: Noise impact assessment criteria dB(A) L_{Aeq} (15 min)

Residential Location	Day	Evening	Night	Night (LA(1min))
Residence 3 (CN-1) – Power	41	35	35	45
Residence 4 (CN-2) – King	40	35	35	45
Residence 5 (CN-3) - Kashouli	39	35	35	45
Residence 8 (CN-6) - Cauchi	36	35	35	45
Other residences	35	35	35	45

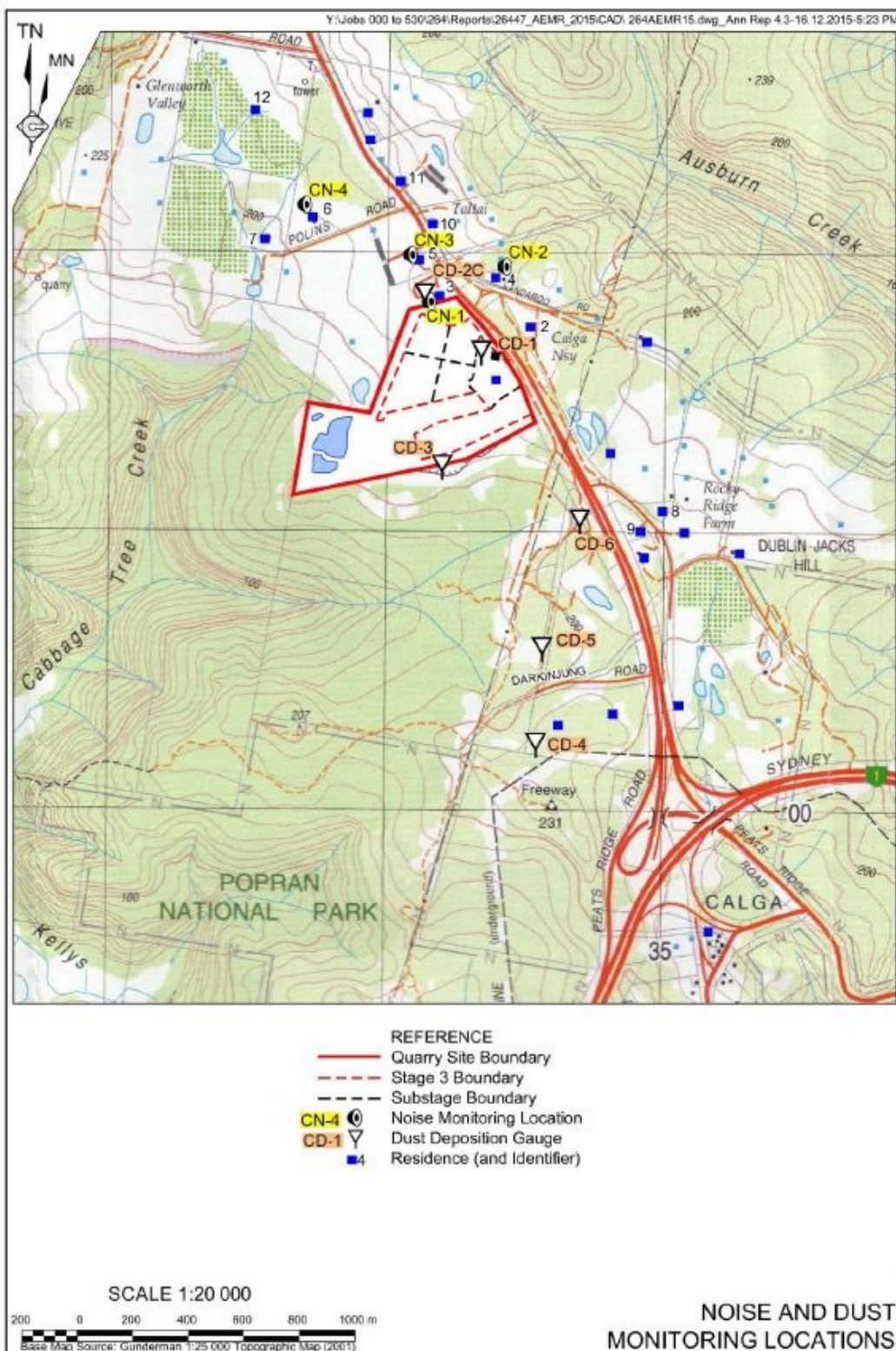


Figure 3: Noise and Dust Monitoring Locations

The noise monitoring conducted by Wilkinson Murray over 2017 has indicated that the Quarry's noise emissions comply with the acceptable noise levels prescribed in Project Approval 94-4-2004. The results are summarised in Table 11 below.

Table 11: Noise Limit Criteria and 2018 results

	Time Period		
	5:00am-7:00am	7:00am-6:00pm	6:00pm-10:00pm
Residence 3 (CN-1): Power			
Criterion			
Extraction, Processing and transportation @	44	41	38
Product Transportation only @	41	40	37
Predicted Noise Levels +			
Extraction, Processing and transportation	NP	NP	NP
Product Transportation only	NP	NP	NP
Monitoring Results			
10/03/16 Attended	-	36	-
19/07/16 Attended	-	33	-
01/07/16 to 19/07/16 Unattended	60-68	50-62	45-56
12/09/16 Attended	-	34	-
19/12/16 Attended	-	35	-
12/04/17 Attended	-	39	-
30/07/17 Attended	-	37	-
23/07/17 to 30/07/17 Unattended	47-54	38-51	58-71
19/12/17 Attended	-	40	-
29/03/18 Attended	-	33	-
17/07/18 Attended	-	35	-
9/07/18 to 17/07/18 Unattended	42-62	42-54	55-70
21/12/18 Attended	-	36	-
Residence 4 (CN-2): King			
Criterion			
Extraction, Processing and transportation	45	40	40
Product Transportation only	43	40	39
Predicted Noise Levels +			
Extraction, Processing and transportation	39	39	39
Product Transportation only	28	28	28
Monitoring Results			
10/03/16 Attended	-	37	-
19/07/16 Attended	-	Inaudible	-

01/07/16 to 19/07/16 Unattended	58-67	48-59	45-55
12/09/16 Attended	-	31	-
19/12/16 Attended	-	30	-
12/04/17 Attended	-	33	-
30/07/17 Attended	-	37	-
23//07/17 to 30/07/17 Unattended	49-57	47-64	55-73
19/12/17 Attended	-	Inaudible	-
29/03/18 Attended	-	Inaudible	-
17/07/18 Attended	-	Inaudible	-
9/07/18 to 17/07/18 Unattended	45-60	38-54	55-64
21/12/18 Attended	-	32	-
Residence 5 (CN-3): Kashouli			
Criterion			
Extraction, Processing and transportation	44	39	38
Product Transportation only	41	40	37
Predicted Noise Levels +			
Extraction, Processing and transportation	37	37	38
Product Transportation only	27	27	28
Monitoring Results			
10/03/16 Attended	-	32	-
19/07/16 Attended	-	Inaudible	-
01/07/16 to 19/07/16 Unattended	58-67	48-61	43-52
12/09/16 Attended	-	32	-
19/12/16 Attended	-	<30	-
12/04/17 Attended	-	35	-
30/07/17 Attended	-	33	-
23//07/17 to 30/07/17 Unattended	45-55	34-50	53-66
19/12/17 Attended	-	Inaudible	-
29/03/18 Attended	-	Inaudible	-
17/07/18 Attended	-	Inaudible	-
9/07/18 to 17/07/18 Unattended	48-65	39-54	55-68
21/12/18 Attended	-	32	-
Residence 6 (CN-6): Cauchi			
Criterion			
Extraction, Processing and transportation	35*	35*	35*
Product Transportation only	35*	35*	35*
Predicted Noise Levels +			
Extraction, Processing and transportation	33	32	35
Product Transportation only	27	27	28

Monitoring Results			
10/03/16 Attended	-	Inaudible	-
19/07/16 Attended	-	Inaudible	-
01/07/16 to 19/07/16 Unattended	36-65	31-60	30-46
12/09/16 Attended	-	32	-
19/12/2016 Attended	-	Inaudible	-
12/04/2017 Attended	-	Inaudible	-
30/07/17 Attended	-	31	-
23/07/17 to 30/07/17 Unattended	38-82	28-44	40-80
19/12/17 Attended	-	Inaudible	-
29/03/2018 Attended	-	Inaudible	-
17/07/18 Attended	-	Inaudible	-
9/07/18 to 17/07/18 Unattended	43-63	39-53	54-64
21/12/18 Attended	-	Inaudible	-
<p>Note: Bold results identify an exceedance of the nominated criterion – see Section 4.3.3 for discussion of results @ Criterion proposed are consistent with those determined for Residence 5 (CN-3). It is noted these are not specified in either Development Consent 94-4-2004 or EPL 11295</p> <p>* Condition 3(2) specifies that the noise criterion at non specified residences should be 35 dB(A)</p> <p>** Unattended results include all noise sources including traffic on Peats Ridge Road.</p> <p>+ Source: Tables 4.3 and 4-4 Noise Assessment by Wilkinson Murray (May 2004)</p>			

7.1.2 Analysis of Results

Measured noise levels were within the set noise limits indicated in the Noise Monitoring Program. As such, Calga Quarry noise emissions were compliant with the Quarry's Project Approval Conditions of Consent at all nominated noise sensitive monitoring locations that were assessed during all noise surveys.

In Comparison with Noise Impact Assessment Criteria

Attended noise monitoring was generally undertaken during the day time period at each receptor location between the hours of approximately 10:00am and 3:30pm. All measurements were carried out in accordance with Australian Standard AS 1055-1997 "*Acoustics - Description and measurement of environmental noise*".

There were no noise exceedances in 2018 during the three periods of noise monitoring attributing to the operations at Calga Quarry. However, as during previous years, the unattended monitoring established that LAeq,15min noise levels recorded at all assessment locations were substantially higher than that recorded during the attended noise monitoring, as the unattended monitoring did not distinguish between Quarry-related noise and other noise sources. The recorded elevated noise levels were attributed largely to traffic on Peats Ridge Road. Wilkinson Murray noted that the graphical presentation of the unattended measured noise data show that the measured noise levels do not fluctuate at the starting and finishing hours of the Quarry operations which would be expected if they were dominated by noise associated with quarry activities. The trend in noise

levels at each location was for a steady increase between 4:00am and 6:00am and gradual decrease between 6:00pm and 8:00pm; consistent with peak hour traffic noise.

In Comparison with Previous Years Results

Table 11 records the range of recorded noise levels during the years 2016 to 2018 at the four monitoring locations. In general, the noise levels recorded by attended monitoring during 2018 were within the range of results recorded between 2016 and 2018.

In Comparison with EIS Predictions

The measured noise levels at all monitoring locations were at, or immediately below, the predicted noise levels in the 2004 EIS for the four attended monitoring assessments. It is difficult to accurately assess the contribution of Quarry-related noise in the allotted 15 minute period of noise monitoring due to the local noise environment dominated by traffic noise generated from Peats Ridge Road.

7.1.3 Conclusion

Compliance with noise criteria continued throughout 2018 with noise levels comparable to monitored levels from previous years.

7.2 AIR QUALITY

Monitoring of air quality around the Calga Sand Quarry is currently confined to monitoring deposited dust with a PM10 monitor installed 2019. The Air Quality Monitoring Program nominates that in the event of a sustained annual average dust deposition level of >3.7g/m²/month at a non-project related residence; a program of PM10 monitoring would be introduced at the relevant location(s).

Since 2001, three dust deposition gauges (CD-1, CD-2a/2b, and CD-3), located at representative locations within and around the Calga Quarry, have been monitoring deposited dust levels attributable to the activities within the Calga Sand Quarry and other local sources. A further three gauges (CD-4, CD-5 and CD-6) were installed in 2006. Dust deposition gauge CD-2 was relocated in late January 2010 to avoid interference with results from a nearby access road on the adjoining property. The new site is referred to as “CD-2c”. **Figure 2** displays the locations of all gauges.

All samples are collected monthly by Carbon Based Environmental Pty Ltd and analysed by the ALS Laboratory Group.

7.2.1 Air Quality Criteria and Predicted Dust Levels

The full set of air quality goals for the Calga Sand Quarry are summarised in Table 12.

Table 12: Air Quality Goals

Pollutant	Averaging Period	Criteria
Total Solid Particulates (TSP)	Annual mean	90 µg/m ³

Particulate matter <10 µm (PM ₁₀)	Annual mean	30 µg/m ³
Particulate matter <10 µm (PM ₁₀)	24 hour maximum	50 µg/m ³
Particulate matter <10 µm (PM ₁₀)	(24-hour average, 5 exceedances permitted per year)	50 µg/m ³
Particulate matter <2.5 µm (PM _{2.5})	Annual mean	8 µg/m ³
Particulate matter <2.5 µm (PM _{2.5})	24 hour maximum	25 µg/m ³
Deposited Dust	Annual mean	4g/m ² /month

The only current applicable criterion is for deposited dust which is 2g/m²/month above the background level of 1.7 g/m²/month or a total of 3.7 g/m²/month.

Extraction within Stages 3/1 and 3/5 was considered to produce “worst-case” scenarios and modelled to predict the likely deposition levels of particulate material. Table 13 presents a summary of the model predictions at each of the Residences 1 to 14 for Stage 3/1. The level of activity within Stage 3/3 and 3/4 during the reporting period is considered to remain appropriate for the comparative assessment for the activities during the reporting period.

7.2.2 Results

Table 13 displays the monthly monitoring results at each monitoring site for 2018 and the annual average deposited dusts results from 2015 to 2018. Deposited dust monitoring at CD-2b ceased in January 2010, after samples were consistently contaminated by motorcycle activity on a nearby trail. A new monitoring location CD-2c replaced CD-2b in February 2010.

Table 13: Summary Dispersion Model Predictions due to Quarry Operations

	PM10 (µg/m ³)		TSP (µg/m ³)	Dust deposition (g/m ² /month)
Averaging period	24-hour	Annual	Annual	Month
Air quality goal	50	30	90	3.7
Residence ID	Stage 3/1			
1	15.8	5.1	10.9	0.63
2	21.6	4.1	8.4	0.44
3	11.8	2.2	4.2	0.21
4	14.2	2.1	4.2	0.21
5	5.0	0.9	1.7	0.08
6	6.3	0.8	1.7	0.08
7	8.4	1.3	2.6	0.14
8	4.4	0.6	1.1	0.06
9	9.4	1.4	2.6	0.13
10	4.8	0.6	1.1	0.06
11	2.9	0.4	0.8	0.04

12	1.9	0.3	0.5	0.02
13	2.2	0.3	0.6	0.03
14	1.4	0.2	0.4	0.02

Table 14: Deposited Dust Monitoring Results

	CD-1	CD-2c	CD-3	CD-4	CD-5	CD-6
Residence ID	1	3	5	13	NA	NA
2015 Average	1.2	1.3	0.8	0.6	0.6	0.6
2016 Average	1.4	0.9	1.2	0.6	0.5	0.9
2017 Average	2.9	0.9	1.1	0.6	0.6	0.8
Jan-18	3.8	2.0	1.1	1.1	0.6	0.8
Feb-18	5.4	1.6	0.8	0.7	1.2	1.0
Mar-18	5.9	2.1	1.5	1.2	0.9	1.3
Apr-18	6.4	0.6	0.7	0.2	0.4	0.6
May-18	7.1	0.7	0.8	0.7	0.3	0.6
Jun-18	2.5	0.4	0.4	0.2	0.3	0.4
Jul-18	1.3	1.0	0.8	0.8	1.3	1.2
Aug-18	1.8	1.3	1.5	0.7	0.6	0.8
Sep-18	2.2	1.2	1.0	1.2	0.6	0.8
Oct-18	0.8	1.8	0.9	0.8	0.8	0.3
Nov-18	4.1	3.1	2.1	1.6	1.1	1.3
Dec-18	3.2	2.2	2.9	2.6	2.8	2.7
2018 Average	3.7	1.5	1.2	1.0	0.9	1.0
Results marked with an * indicate an excessively contaminated gauge. Contamination calculation can include bird droppings, vegetation (such as plant matter, algae, pollen and seeds) and insects. NS = Not sampled- bottle/funnel burnt out. Gauge fixed and replaced.						

7.2.3 Analysis of Results

In Comparison with Air Quality Goals

The yearly averages for all monitoring locations were within the nominated goals for deposited dust. There were no occurrences when the monthly deposited dust level was in excess of the 4g/m²/month annual average criteria.

The relatively high samples recorded at monitoring location CD-1 in May 2018 is over 2 times the annual average for this location. However, the dust gauge is placed very close to the operations and conditions are not considered to be indicative of ambient conditions. The generally hot and dry period this year further contributed to the slightly elevated dust levels at all DDG locations.

In Comparison with Previous Years Results

Average deposited dust levels for all six locations were slightly higher or similar to those recorded in 2017, excluding CD-1.

In Comparison with EIS Predictions

The measured deposited dust levels outlined in Table 14 are comparatively low and within the nominated goals, hence air quality issues are within predicted limits.

7.3 TRANSPORT

Calga Quarry has remained compliant with stipulated limits regarding transportation of product and has hence remained compliant with the conditions of consent.

7.3.1 Transport Criteria and Results

Schedule 2, Condition 7 states the proponent shall limit product transport to 400,000 tonnes of product per year from the site. Table 15 provides a summary of the accumulated number of loads of products that were despatched on each week day during the remainder of the report period for the periods 5:00am to 7:00am, 7:00am to 12:00 noon, 12:00 noon to 5:00pm and 5:00pm to 10:00pm.

Table 15: Recorded truck loads throughout 2018

Days	Mon	Tue	Wed	Thu	Fri	Sat	Total
5:00am to 7:00am	468	380	317	377	353	319	2214
7:00am to 12:00 noon	888	831	780	885	865	796	5045
12:00 noon to 5:00pm	473	444	421	447	363	87	2235
5:00pm to 10:00pm	373	382	360	375	336	0	1826
Total	2202	2037	1878	2084	1917	1202	11320
* Based on an average load of 31.5t				# One load generates two truck movements			

The data in Table 15 reveals that 64.1% of the products were despatched between 5:00am and 12:00 noon and 16.1% of products were despatched after 5:00pm. Approximately 10.6% of the products were despatched on Saturdays.

Table 16: Truck Dispatch Yearly Comparison

Year (total)	Mon	Tue	Wed	Thu	Fri	Sat	Total
2016	2182	2297	2208	2207	2152	993	12009
2017	2279	2246	2160	2209	2091	985	11970
2018	2202	2037	1878	2084	1917	1202	11320

There were no traffic incidents in the 2018 reporting period, as seen in Table 17.

Table 17: Traffic incidents

Reporting period	Number of incidents	Details of Incident
2015	0	n/a
2016	0	n/a
2017	0	n/a
2018	0	n/a

7.3.2 Conclusion

The Quarry continued to operate the SAP counting system to monitor and manage truck dispatch numbers. New rules incorporated into the SAP reporting software have reduced the number of false positives such as split loads and internal deliveries.

7.4 GROUNDWATER

7.4.1 2018 Groundwater Monitoring

Groundwater monitoring throughout the reporting period was undertaken by Carbon Based Environmental Pty Ltd (CBE) and an audit of the results was undertaken by Dundon Consulting Pty Limited (Dundon, 2019) in accordance with the requirements of *Condition 3(18)*. The audit reporting is provided in full as **Appendix 3**, with a summary of the results provided as follows.

The approved monitoring network for the Quarry consists of 22 groundwater bores, both within the Quarry Site and on neighbouring properties. Bores CQ1 and CQ2 are no longer being monitored as they have been removed due to advancing extraction activities and bores CP3 and CQ6 have been removed by the respective landowners. Bore CQ9 remains accessible but the casing of the bore has been damaged and water level measurements are not possible. Monitoring during the reporting period involved collection of data on groundwater levels and quality and monitoring for any potential impacts from sand extraction on water supply bores on the neighbouring properties. The locations of the monitoring bores are shown on Figure 4. A groundwater bore census identified three additional water supply bores within 500m of the Quarry site. Landowner approval has been received for CP13 and CP15 with monitoring commencing 2019. Landowner of CP14 has refused access for monitoring purposes.

Access to bores, MW10, MW13, MW16 and MW17 were not monitored until October 2018 due to accessibility issues. The access track has been reinstated and MW10, MW13, MW16 and MW17 were monitored in October and December 2018. These bores are located within the property to the south and southwest of the Quarry site (see Figure 4). Monitoring from CP4 ceased after February 2017 to October 2018, as access has been blocked by landowners and was no longer accessible. It was able to be sampled again in October 2018 only.

In accordance with the Site Water Management Plan, standing water level (SWL) was measured manually on a bi-monthly basis, in all accessible bores, or automatically using automatic water level recorders installed in fourteen of the bores and set to record the water level every 6 hours.

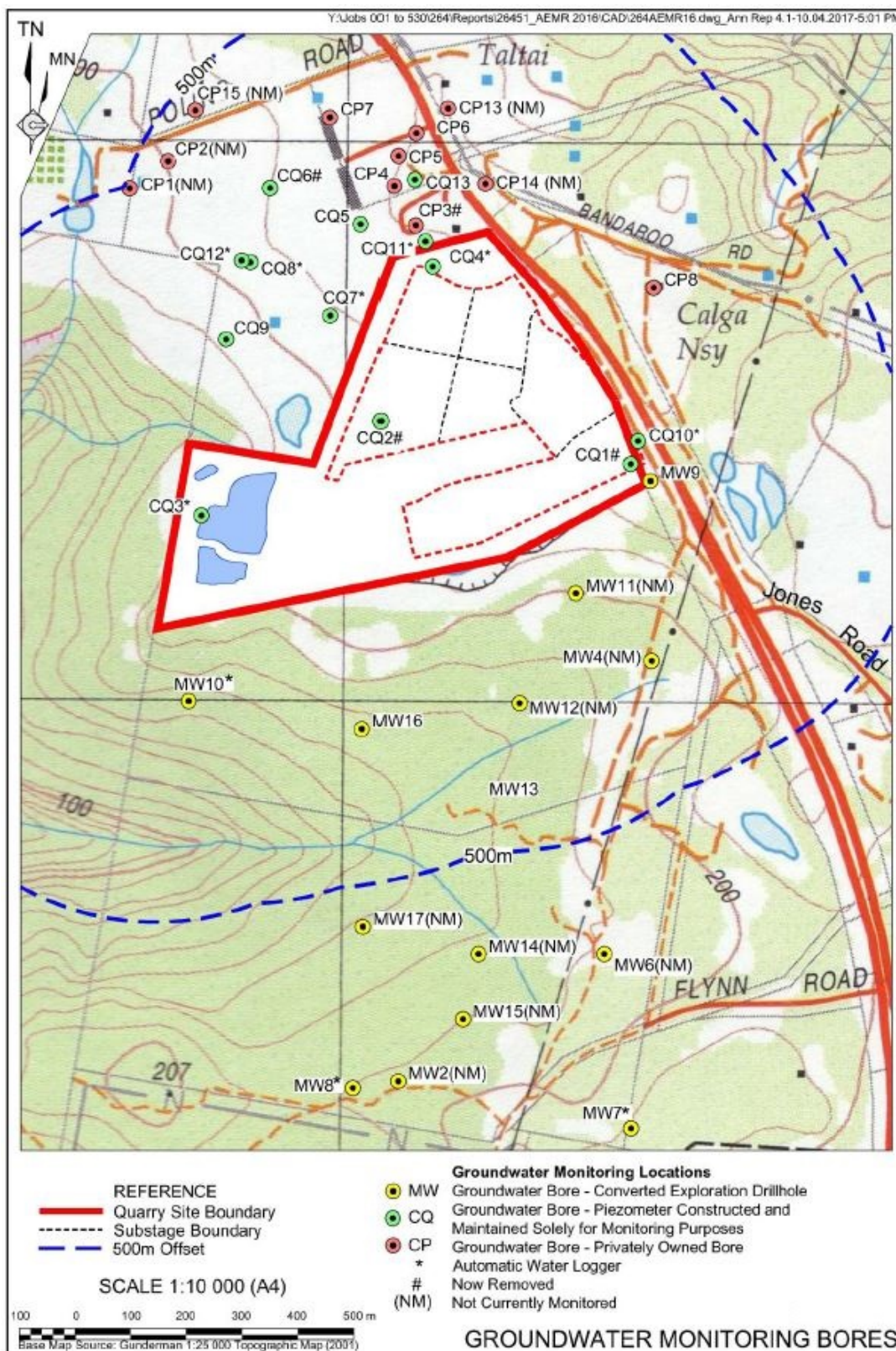


Figure 4: Groundwater monitoring bores located within 500m of Quarry site.

Each monitoring bore was sampled bi-monthly (where possible) to determine the electrical conductivity (EC) and pH, and six-monthly for comprehensive laboratory analysis of a full suite of anions, cations and metals. The monitoring results were compiled into monthly Environmental Monitoring Reports by CBE and posted on the Hanson website.

7.4.2 Groundwater Criteria and Results

Groundwater Levels

The criteria relevant to groundwater quality and levels are drawn from the approved Site Water Management Plan (SWMP), dated February 2006 (Section 7.4.1).

It is a requirement to establish that any recorded declining trend in groundwater levels is attributable to climatic conditions or other factors not related to sand extraction activities on the Quarry site. In the event groundwater levels at monitoring bores CQ10 and CQ11 experience drawdowns of >1.0m attributable to sand extraction activities on the Quarry site, then a range of response actions need to be undertaken.

If any private bore on adjoining properties within 500m of the extraction area experiences a loss of yield >10% attributable to the extraction operation on the Quarry site, a range of response actions are also applicable. Monitored groundwater levels are represented in **Appendix 2** and shown graphically as hydrographs, together with rainfall and evaporation data, in **Appendix 3**.

Groundwater Quality

The criteria relevant to groundwater quality are drawn from the site Water Management Plan, dated February 2006 (Section). It is nominated that if any private production bore within 500m of the approved extraction area experiences a sustained salinity increase of >20% measured in either EC or total dissolved solids, a range of response actions will be implemented. Field measurements of EC and pH were recorded bi-monthly from all accessible bores. The results of these measurements are tabulated in **Appendix 2**. Samples for comprehensive laboratory analysis were collected 3 April 2018 and 4 October 2018. The results of the laboratory analyses are presented in **Appendix 3**.

7.4.3 Analysis of Results

Groundwater Levels

Groundwater levels are presented graphically as hydrographs, together with rainfall and evaporation data, in **Appendix 3**.

Bores CQ3, CQ4, CQ7, CQ8, CD10, CQ11S and D, CQ12, CQ13, MW7, MW8, MW9 and MW10 are equipped with automatic dataloggers. For these bores, both datalogger and manual water levels are recorded, the dataloggers reading at 6 hourly intervals and the manual measurements taken every two months. All other bores are read manually every two months.

The 2018 Groundwater Audit (Dundon, 2019) has confirmed that the Quarry operations continue to have only a limited impact on the groundwater system. Water levels in most bores fluctuated throughout the year, consistent with rainfall patterns over 2018.

The water level in CQ3 has shown decline of ~1.5m over the 2018 period, relative to the pattern of previous years. It has been determined that this is not due to quarry impact due to a similar water level decline observed at bores MW7 and MW8 over the same period. Mw7 and MW8 are beyond the limit of impact from the quarry and are located in a separate groundwater catchment. Therefore the water level declines at the mentioned bores are considered climate-related.

CQ4 experienced drawdown believed to be in relation to the commencement of extraction from Stage 3/5 and completion of extraction down to 179 mAHD in Stage 3/4. CQ10 and MW9 also experienced drawdown believed to be in relation to active quarrying in Stage 3/4 during 2018.

CQ5, CQ7, CQ8 and CQ12 generally show water level fluctuations that appear to be totally related to the natural recharge-discharge cycle. However, in 2017-2018 bores CQ5, CQ8 and CQ12 show a possible additional drawdown that may be a possible quarry impact. However, similar to CQ3, declines were observed at MW7 and MW8 which are believed to be climate-related. Further monitoring is required to determine if the impacts on these four bores are quarry related – currently it is inconclusive.

CQ11S, CQ11D and CQ13 showed declining water levels in 2018 until October 2018 with a water level rise for the last three months of 2018. The declining water level cause could be a response to the extended below average rainfall conditions between April 2017 and September 2018 or whether it included a component of quarry impact.

The MW series of bores (excluding MW9) show consistency with RCD curve, and are considered to be responding only to climatic influences showing no indications of impact from the quarry operations with December 2018 water levels higher than those measured at the start of monitoring in 2006.

CO4, CP5, CP6 and CP7 show water levels at the end of 2018 were higher than at the commencement of monitoring in 2006. Fluctuations in all bores are generally consistent with the trends on the RCD curve, and no bore shows any indication of impact from quarry operations. CP8 is continuing its downward deviation away from the RCD trend which may be indicative of a quarry impact. CP13 and CP15 have received owner approval for monitoring which will commence 2019. CP1, CP2 and CP14 have not received approval from landowners.

Groundwater Quality

A number of exceedances of the ANZECC (2000) guideline values for freshwater ecosystem protection were recorded in 2018; however this remains consistent with records from previous years. These exceedances mostly relate to dissolved metals concentrations, with some exceedances of the nitrate guideline value. A full list of recorded exceedances is shown in Table 18. The results confirm that the operation of the Quarry has not affected groundwater quality at any neighbouring groundwater bores.

The ongoing exceedances for dissolved metals are considered to reflect the natural groundwater quality and are not related to the Quarry operations. Exceedances of nitrate, which ranged up to a maximum recorded value of 12.5mg/L in 2018, are believed to be due to the agricultural activities on the neighbouring properties and result either from fertilizer application or possibly from chicken farming. The highest values were detected in off-site monitoring bores or private water supply bores north of the Quarry site. As such, these exceedances are considered not to be related to the Quarry operations (Dundon, 2019).

Table 18: Exceedances of ANZECC (2000) Freshwater Ecosystem Protection Guidelines

Parameter	ANZECC (2000) Freshwater Ecosystem Protection Guideline (mg/L)	Reported Range (mg/L)	Exceedances*
Aluminium	0.055	0.06 – 4.35 (max MW9)	All bores
Copper	0.0014	<0.001 – 0.023 (max CQ10)	CQ3, CQ4, CQ5 (October), CQ7, CQ8, CQ10, CQ11S (October), CQ11D (April), CQ13 (October), MW9 (October), MW10, MW13, CP4, CP5 and CP6.
Lead	0.0034	<0.001 – 0.021 (max CQ11D)	CQ3 (October), CQ7 (October), CQ10 (October), CQ11D (April), CQ13 (October), MW9 (October), MW10, CP4, CP5 and CP6.
Manganese	1.9	<0.001 – 2.02 (max CQ3)	CQ3 (April)
Nickel	0.011	<0.001 – 0.021 (max CQ3)	CQ3 (April)
Zinc	0.008	0.010 – 0.261 (max CP4)	All bores except CQ5 (April), CQ7 (October) and, MW7.
Nitrate	0.7	<0.01 – 12.5 (max CP5)	CQ4 (October), CQ5, CQ7, CQ8, CQ11D (April), CQ13, MW13 (April), CP4, CP5, CP6, CP7 and CP8 (April).
* Dissolved metal and nitrate exceedances are considered to be reflective of natural groundwater quality and not a result of quarrying activities. Source: Dundon (2019) – Table 4			

The Annual Groundwater Audit (see Section 7.2 of Dundon, 2019) recommends modifications to the Site Water Management Plan to exclude arsenic, selenium, boron and mercury from ongoing analytical suite of tests of groundwater quality given the historical lack of exceedances of the ANZECC (2000) guidelines values for these parameters. Additionally it is also recommended that laboratory analysis for groundwater quality should be reduced from six-monthly to annually due to the lack of any seasonal trend in exceedances of metals or nitrates.

7.4.4 Recommendations

The Annual Groundwater Audit (Dundon, 2019) has reiterated several of the recommendations from previous years regarding the monitoring network and the groundwater monitoring program. These recommendations are summarised as follows.

- Monitoring should be discontinued at bores MW16 and MW17. These bores were established as monitoring bores for the formerly proposed southern quarry extension, and are no longer required. Monitoring should continue at MW8, as it serves an important function as a remote control bore for impact assessment purposes.
- The access track should be maintained to bores MW10 and MW13. These two bores should be equipped with dataloggers, in the event that access becomes lost at times in the future. It is suggested that the datalogger currently installed in MW8 be used to MW13. As MW13 and MW16 water levels respond almost identically on a seasonal and short-term basis, it is not necessary to monitor both MW13 and MW16.
- CQ6 no longer exists. It is not considered necessary to replace the bore, as the other bores in the network provide adequate coverage. CQ7 and CQ8 are screened at similar depth intervals to CQ6, and are located closer to the quarry than CQ6 was. Past monitoring has shown that CQ6 and CQ8 respond in almost identical ways to seasonal recharge, while CQ7 has a broadly similar response pattern.
- CQ9 has been damaged and is unable to be used for water level or water quality monitoring purposes. It has been removed from the monitoring network. It is not considered necessary to replace CQ9 as nearby bores CQ5 and CQ7 provide adequate coverage in this locality.
- CP13 and CP15 should be added to the monitoring network, and continue to be monitored into the future as part of the monitoring schedule for the private bores within 500m of the quarry. In the event that landowner agreement is provided, CP14 should also be monitored.
- Should the Rozmanecs wish to continue using their water supply bore CP8, subject to their approval, a monitoring bore should be installed at a site between Stage 3/4 of the quarry and the Rozmanec bore CP8, as recommended in previous annual groundwater audit reports. This bore should be located near the site marked 'A' on Figure 1. It is also recommended that the new monitoring bore be equipped with an automatic datalogger to record water levels at 6 hourly intervals.
- Detailed laboratory analysis for groundwater quality should be reduced from six-monthly to annually, as first recommended in the 2011 annual groundwater audit, due to the lack of any seasonal trend in exceedances of metals or nitrates. The metal concentrations are considered to be natural and unrelated to the quarry. High nitrate concentrations which have been detected only in bores off the quarry site are due to the land use practices on neighbouring properties, and are unrelated to the quarry.

- The laboratory water quality analysis does not need to include arsenic, boron, selenium and mercury, as there have been no reported detections of these analytes during the entire period of record.

7.4.5 Conclusion

The 2018 groundwater audit confirmed that the quarry operations continue to have only a limited impact on the groundwater system. Additionally no off-site water quality impacts attributable to the quarry operations have been observed. There have been no reports of loss of yield in any neighbouring production bore within 500m of the Quarry Site during 2018 which can be attributed to declining groundwater levels. Therefore this criterion was not affected.

7.5 SURFACE WATER

Monitoring of surface water quality was undertaken monthly by Carbon Based Environmental Pty Ltd. Samples collected were analysed by Australian Laboratory Services for pH, EC, total suspended solids (TSS) and total oil and grease at Site A (Dam 1), Site F (Dam 7b/c – at the overflow) and at Sites B to D when they were flowing (Figure 5). Samples are no longer taken at Site E following a request to discontinue sampling by the landowner of “Glenworth Valley”. In June 2016, two new sampling sites were introduced to the northwest of the Quarry Site at the end of Polins Road (Figure 5). C1 was placed at the northern end of the dam to measure upstream results, and C2 was placed at the southern end to measure downstream results. These results have been reported in this document, however, it is noted that these results are upstream of the Quarry and therefore the results are indicative of background conditions only.

7.5.1 Rainfall and Evaporation

Total rainfall recorded in 2018 (Table 19) at the site was 621.1mm though this is an incomplete total due to data missing from several days in January, February, July and November and all of August. Total rainfall recorded at Mangrove Mountain in 2018 was 981.0mm which is about 10% below the long-term average (1085.6mm). Overall 2018 was a slightly below average rainfall year. Daily evaporation data from the quarry site were only available up to 23 July 2018, and there were also several missing days in January and February.

Table 19: Monthly Rainfall and Evaporation for 2018

Month	Total Rainfall (mm)			Total Evaporation (mm)		
	Calga Quarry*	Mangrove Mountain BoM 061375	Mangrove Mountain Long-Term Average	Calga Quarry	Mangrove Mountain BoM 061375	Peats Ridge Long-Term Average
Jan 2018	17.6*	27.0	103.0	100.7**	NA	142.6
Feb 2018	52.2*	175.2	145.5	94.5**	NA	114.8
Mar 2018	85.6	121.8	137.2	107.5	NA	105.4
Apr 2018	41.8	41.8	83.2	96.8	NA	78
May 2018	10.8	15.0	80.6	79.8	NA	58.9
Jun 2018	61.0	111.4	114.8	52.9	NA	48
Jul 2018	7.2*	8.4	41.7	57.5**	NA	52.7
Aug 2018	NA*	2.2	55.4	NA**	NA	77.5
Sept 2018	47.2	46.2	62.5	NA**	NA	102
Oct 2018	150.2	203.4	76.1	NA**	NA	127.1
Nov 2018	77.2*	120.2	96.0	NA**	NA	132
Dec 2018	70.8	108.4	89.6	NA**	NA	148.8
Totals	621.1*	981.0	1085.6	589.7**	NA	1187.8
* Rainfall data missing from some days in January, February, July and November. No data from August						
** Evaporation data unavailable for August to December 2018, and some days in January, February, June and July						

7.5.2 2018 Site Water Use

The estimated water use for the quarry for 2018 is **172ML** based on the following:

- A maximum of 120ML of water lost through the retention of water in silt and sand product.
It is expected that 84.6ML was recycled within the water management system.
 - 26ML exiting the site as water retained in sand products (7% of 375,874t)
 - 94ML used in silt removal (25% of 375,874t equals up to 94,000t of silt washed from the raw sand in 2018 with 1,000L of water used to bind silt)
- 5ML used for dust suppression.
- 47ML lost as evaporation from storage dams and silt cells on site.
 - 47ML was determined by the total evaporation (1.1878L) times by the average total water surface area of 40,000m².
 - Peats Ridge long-term average was used (1187.8mm) due to incomplete data available for the site in 2018

It is estimated (with the removal of 84.6ML of water recycled through the site's water management system) that the 2018 volume of water used was 106.4ML.

The estimated water availability for 2018 is **194.8ML** based on the following:

- An average of 159.3ML of water captured from rainfall and runoff
 - 57ha x annual rainfall (621.1) equals 354ML. 45% of catchment for runoff is 159.3ML.

- 50% of runoff from Peats Ridge Road and the contributing catchment to the northeast of the site is diverted around Stage 3 and onto adjoining land. This catchment contributed 27ML of runoff, therefore about 13.5ML was diverted.
- Thus the annual runoff available for collection is approximately 145.8ML
- Up to 49ML/year of groundwater seepage.

Assuming, all water not lost through retention in sand and silt, evaporation or used in dust suppression is available for reuse, the total water use for the quarry is estimated to be 172ML and the total maximum water availability is estimated to be 194.8ML for 2018. This resulted in a net water gain of 22.8ML. It is acknowledged that there is variability in the numbers used to calculate this amount due to missing site rainfall and evaporation data for the 2018 period. Additionally the discharge event that occurred 29 November 2018 was not monitored.

7.5.3 Water Quality Limits and Results

Table 20 presents a compilation of the routine monthly surface water monitoring results collected throughout 2018, together with the water quality limits drawn from the approved Site Water Management Plan. Water monitoring was undertaken following one significant rainfall event in November 2018, the results of which are outlined in Table 21.

Table 20: Routine Surface Water Results - 2018

	pH	EC	TDS	TSS	O&G
Units	-	uS/cm	mg/L	mg/L	mg/L
Water Quality Limits	+/- unit	<1500	NA	<50	<5
A (Dam 1)					
No. of Samples	11	11	11	11	11
Minimum	4.37	95	68	<5	<5
Maximum	6.6	183	104	24	<5
Average #	5.77	132.73	87.82	10.75	<5
Standard Deviation #	0.63	23.76	14.41	8.92	0
B (Upstream from Dam 1 Overflow)					
No. of Samples	0	0	0	0	0
Minimum	0	0	0	0	0
Maximum	0	0	0	0	0
Average #	0	0	0	0	0
Standard Deviation #	0	0	0	0	0

C (Upstream – Background Site)					
C1 (Upstream – Polins Road)					
No. of Samples	12	12	12	12	12
Minimum	4.94	96	62	<5	<5
Maximum	7.48	152	87	18	<5
Average #	6.71	115.67	76.00	11.50	<5
Standard Deviation #	0.70	13.21	9.64	4.09	0
C2 (Downstream – Polins Road)					
No. of Samples	12	12	12	12	12
Minimum	6.07	97	63	<5	<5
Maximum	6.73	182	130	16	<5
Average #	6.54	128.83	83.75	7.90	<5
Standard Deviation #	0.17	26.18	17.87	3.84	0
D (Upstream – Background Site)					
No. of Samples	1	1	1	1	1
Minimum	6.37	104	72	<5	<5
Maximum	6.37	104	72	<5	<5
Average #	6.37	104	72	<5	<5
Standard Deviation #	N/A	N/A	N/A	0	0
F (Dam7 b/c)					
No. of Samples	12	12	12	12	12
Minimum	4.45	84	68	<5	<5
Maximum	5.52	154	102	22	<5
Average #	5.00	115.08	86.08	10.20	<5
Standard Deviation #	0.27	17.12	10.85	6.87	0
EC = Electrical Conductivity TDS = Total Dissolved Solids TSS = Total Suspended Solids O&G = Oil and Grease Samples in bold exceed the nominated for the Quarry Site (though may not necessarily relate to the Quarry Site) ¹ Where levels were below the measurable threshold (i.e. <5mg/L), the maximum value of 5mg/L has been assumed for the purpose of preparing a statistical analysis. # Rounded value					

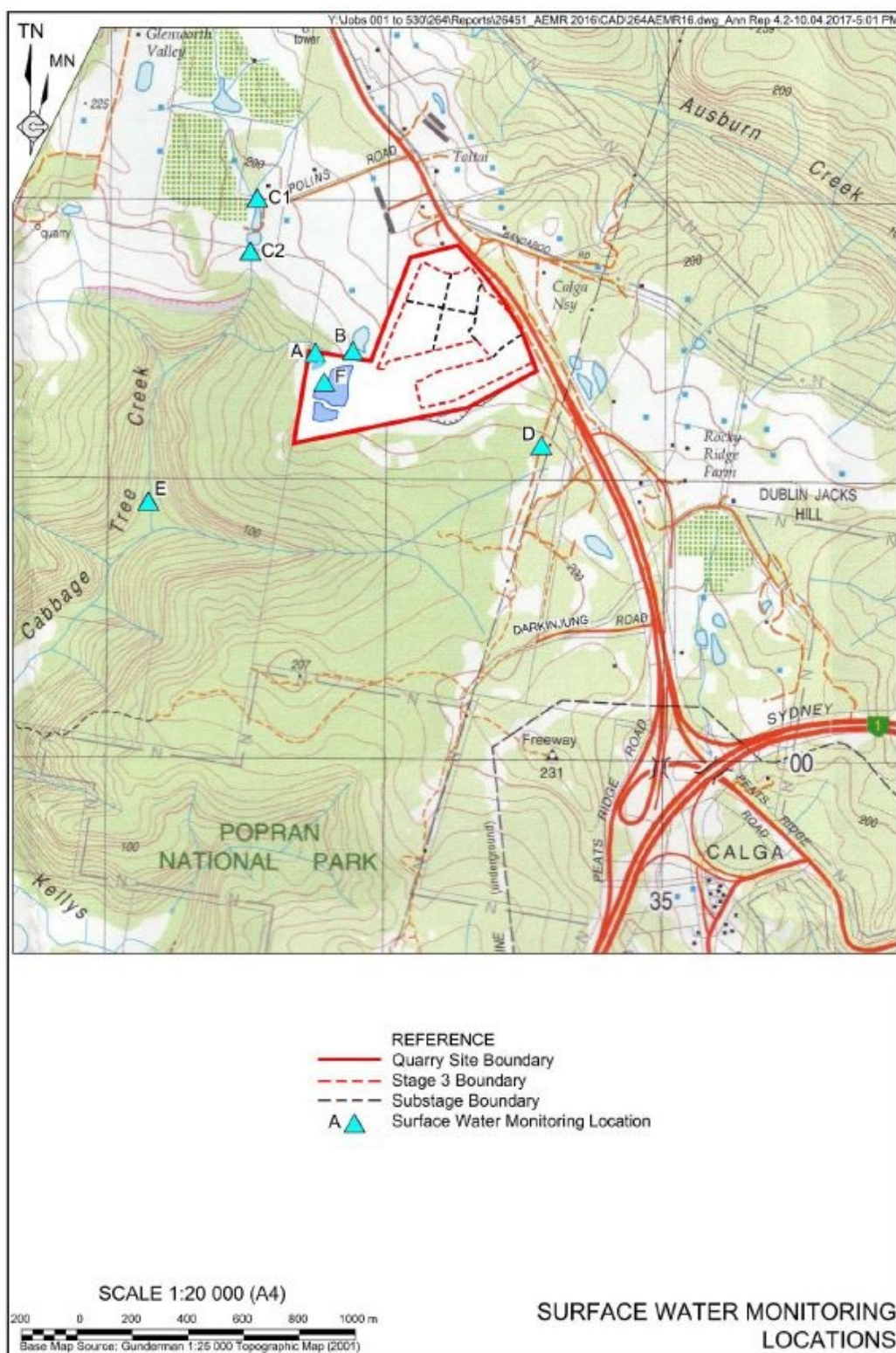


Figure 5: Surface Water Monitoring Locations

Table 21: Surface Water Monitoring Results – Significant Rainfall Events 2018

	pH	EC	TDS	TSS	O&G
Units	-	uS/cm	mg/L	mg/L	mg/L
Water Quality Limits	6.0 – 8.0	<1500	N/A	<50	<10
A (Dam 1)					
29/11/2018	6.39	132	83	<5	<5
B (Upstream from Dam 1 Overflow)					
29/11/2018	7.07	158	81	13	<5
C (Upstream)					
29/11/2018	6.58	100	45	13	<5
D (Upstream – Background Site)					
29/11/2018	5.53	89	78	<5	<5
F (Dam 7b/c) – no discharge, sample only					
29/11/2018	5.05	106	84	<5	<5
EC = Electrical Conductivity TDS = Total Dissolved Solids NR = Not Recorded TSS = Total Suspended Solids O&G = Oil and Grease Samples is bold exceed the nominated criteria for the Quarry Site (though may not necessarily relate to the Quarry site)					

7.5.4 Analysis of Results

In Comparison with Water Quality Limits

When compared to the water quality limits nominated at the top of Table 21, the following comments are relevant.

- pH values in Dam 1 range from 4.37 and 6.60. These values have a range of approximately ± 1.0 pH units, which is consistent with pH levels recorded elsewhere in the catchment, including at upstream locations not influenced by the quarrying operations. These results are within \pm pH units of the baseline pH range established at the upstream background Site D.
- EC values were always well below the 1500uS/c limit. Average Dam EC values were consistent with upstream measurements.
- TSS values were <50mg/L at all sampling sites with the highest level recorded was 24mg/L at Dam 1 during January 2018.
- No oil and grease concentrations were above the 10mg/L limit in 2018 and were generally below the limit of detection.

In Comparison with Previous Years Results

Appendix 2 lists the recorded surface water quality since 2006.

- pH and EC values were comparable throughout the period 2006 to 2018.
- TSS values recorded in 2018 were comparable to those recorded between 2008 and 2014 and generally slightly lower than 2015 and 2017.
- Oil and grease concentrations were generally low, and regularly below the detection limit throughout the period 2006 to 2018.

Significant Rainfall Events

The monitoring results recorded following a significant rainfall event (Table 21) were consistent with the monthly monitoring results recorded during 2018. The elevated levels for Total Suspended Solids recorded in Dam A, Dam B and Dam F following the rainfall event in November 2018 most likely occurred due to significant disturbance within the catchment as a result of heavy rainfall during the day of 29 November. Rainfall was recorded at 77.2mm on-site for the month of November with 53.4mm experienced on 29 November 2018, 69% of the total rainfall for November at the site.

In Comparison with EIS Predictions

The 2004 EIS included predictions that, with the adoption of the proposed design and operational safeguards, any discharge from the Quarry Site should satisfy the EIS predictions. Water Quality at Dam 1 during significant rainfall events was generally consistent with EIS predictions.

7.5.5 Conclusion

The monthly water monitoring undertaken during 2018 established that surface water quality was within the criteria established in the Site and Water Management Plan.

7.6 REHABILITATION AND LANDSCAPE

7.6.1 Introduction

The 2018 rehabilitation program involved regular work undertaken by an experienced horticulturalist on the areas identified in **Figure 6**. Activities include weed management, planting of native plant species using purchased tubestock or plants grown from seed, vegetation management and progressive maintenance of the existing visual and acoustic bund, as required. As part of this rehabilitation program, a seed bank, containing seeds collected from the existing Quarry Site as well as the immediately surrounding area, was established to aid in re-vegetation activities in the future. Table 22 lists the rehabilitation status of the Quarry Site. Table 23 provides a summary of the rehabilitation undertaken in each of the areas defined in Figure 6. A list of all activities completed during 2018 is included in **Appendix 2**.

Table 22: 2018 Rehabilitation Status

Quarry Area Type	Previous Report Period (Actual) Year 2017	This Reporting Period (Actual) Year 2018	Next Reporting Period (Forecast) Year 2019
Total Quarry Footprint	N/A	33.7 ha	33.7 ha
Total active disturbance	N/A	23.7 ha	23.7 ha
Land being prepared for rehabilitation	N/A	3.95 ha (Cells 3/1 and 3/2)	1.51 ha (cell 3/5)
Land under active rehabilitation	N/A	1.31 ha (bund wall above the active quarrying area: North West – North – North East)	3.95 ha (Cells 3/1 and 3/2)
Completed rehabilitation	N/A	7.75 ha (revegetated areas within Stage 1 and Stage 2 of the Quarry Site)	9.06 ha (land above the active quarrying area: North-West – North – North East)

Table 23: 2018 Rehabilitation Activities

Revegetation Area	Rehabilitation Undertaken During 2018
1	Low volume spraying to clear small areas, removal of large trees, high volume spraying targeting multiple invasive species. Cut-and-paint using chainsaw and Roundup targeting Radiata Pine. Removal of tree guards to encourage unrestricted growth. Tubestock planting occurred in Spring along the bund wall, focusing on the North East Corner. Species planted followed species list within the Quarry Site's Rehabilitation Landscape Management Plan.
2	Low volume spraying to clear small areas and targeting <i>B. pilosa</i> , <i>S. oleraceus</i> , <i>P. octandra</i> , <i>T. officiale</i> , and <i>A. virginicus</i> .
3	Low volume spraying to clear small areas and targeting <i>B. pilosa</i> , <i>S. oleraceus</i> , <i>P. octandra</i> , <i>T. officiale</i> , and <i>A. virginicus</i> . Brush-cutting on regrowing weed species. High volume spraying to clear small areas.
4	Low volume spraying was conducted in order to clear exotic ground covers and tall grasses.
5	Low volume spraying was conducted between the track and fenceline as well as the sandstone buns, targeting <i>B. pilosa</i> , <i>P. octandra</i> and <i>Conzya bonariensis</i> (Fleabane). Large trees were cut down using a chainsaw and neatly rafted out of sight. Brush-cutting was conducted on regrowing weed species within the revegetated area. Cut-and-paint was conducted on the lower slope using neat Roundup Biactive®, targeting <i>P. radiata</i>
6	Brush-cutting was conducted on regrowing weed species within the revegetated area

7	<p>Low volume spraying was conducted using a solution of 1% Roundup Biactive® targeting <i>B. pilosa</i>, <i>S. oleraceus</i>, <i>P. octandra</i>, <i>T. officiale</i>, and <i>A. virginicus</i>. Brush-cutting was conducted on regrowing weed species within the revegetated area.</p>
8	<p>Low volume spraying was conducted using a solution of 1% Roundup Biactive® targeting <i>B. pilosa</i>, <i>S. oleraceus</i>, <i>P. octandra</i>, <i>T. officiale</i>, and <i>A. virginicus</i>. Brush-cutting was conducted on regrowing weed species within the revegetated area. Brush-cutting was conducted along the road side, targeting dead perennial weeds. Low volume spraying was conducted along the road side, targeting emerging growths of <i>B. pilosa</i>, <i>C. bonariensis</i> and <i>Hypochoeris glabra</i> (Flatweed).</p>
9	<p>Low volume spraying was conducted in order to clear exotic ground covers and tall grasses. Brush-cutting was conducted between the road side and sandstone wall, targeting dead perennial weeds. Low volume spraying was conducted along the road side, targeting emerging growths of <i>B. pilosa</i>, <i>C. bonariensis</i>, <i>H. glabra</i>, and <i>Andropogon virginicus</i> (Whiskey Grass).</p>

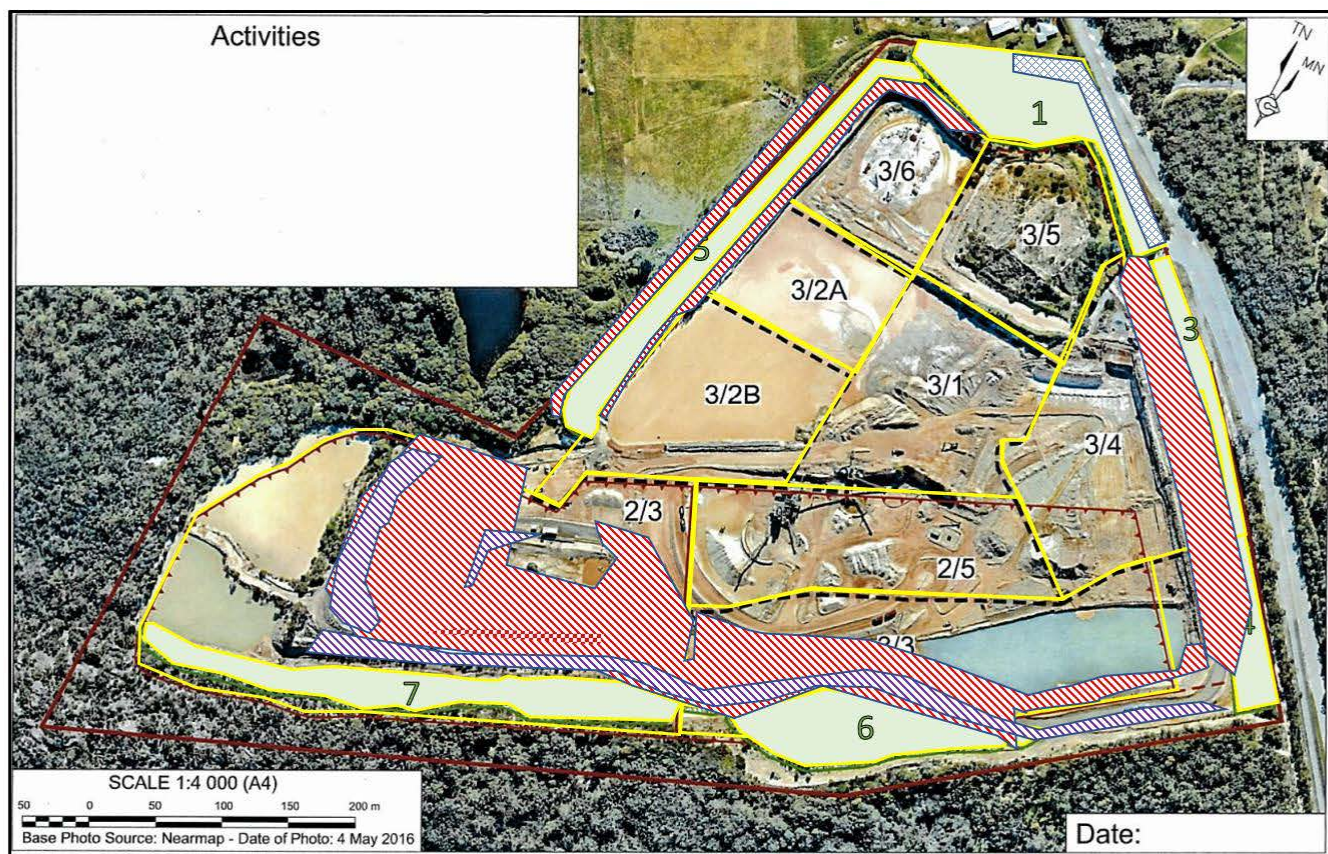


Image source: Hanson

Calga Weed Control

Date: January 2018 – December 2018



Calga Sand Quarry

NOT TO SCALE

NORTH

Site Boundary

	Woody	Herbaceous	Vines
Primary	[Red hatched box]	[Red hatched box]	[Red hatched box]
Secondary	[Purple hatched box]	[Purple hatched box]	[Purple hatched box]
Maintenance	[Yellow hatched box]	[Yellow hatched box]	[Yellow hatched box]

Other

Figure 6: Bush Regeneration and Related Activities

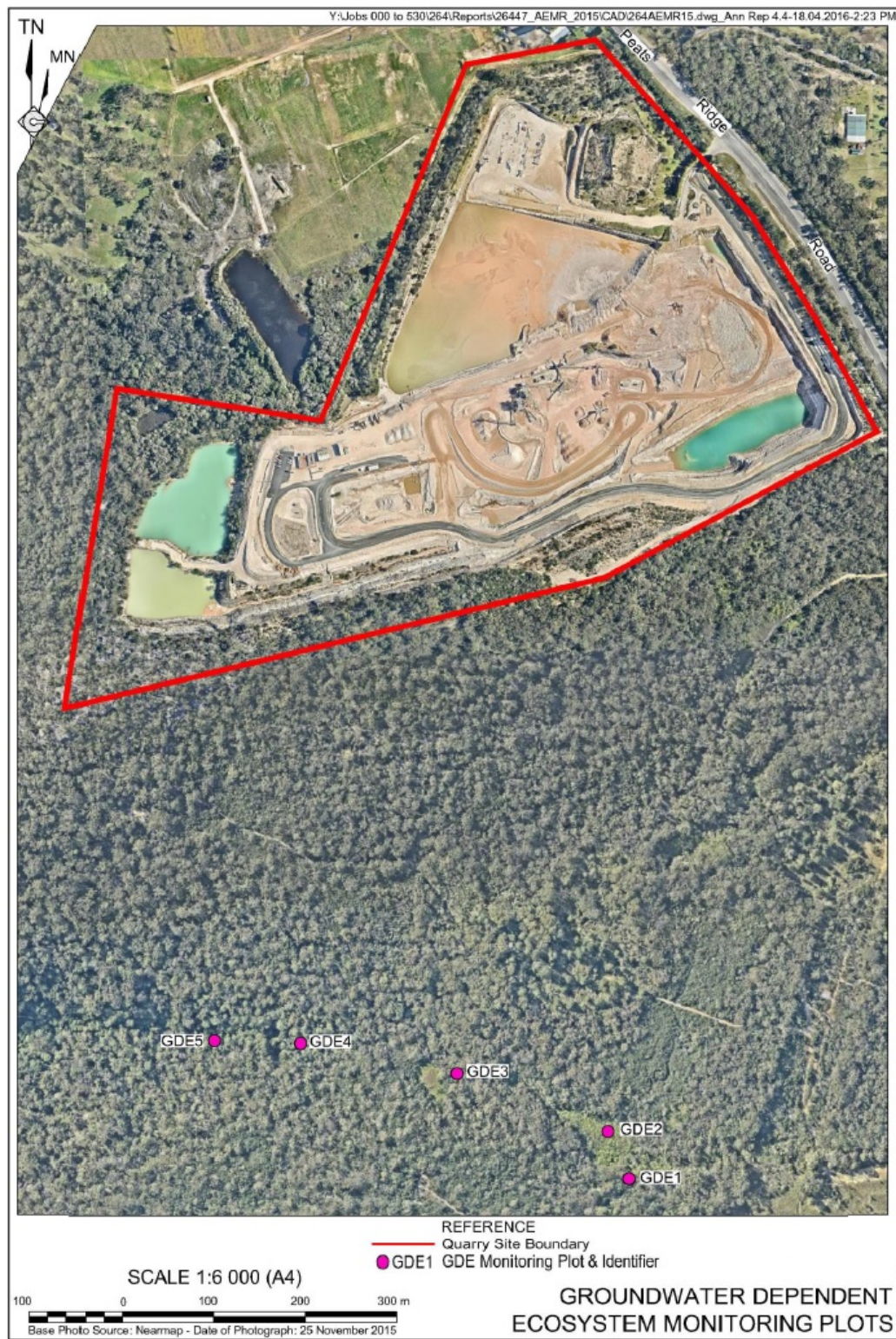


Figure 7: Groundwater dependent ecosystem monitoring plots

7.6.2 Criteria and Results

The Annual Rehabilitation Report indicates that there has been a general increase in weeds and decrease in native species richness since the 2017 monitoring survey. It is concluded this is due to a change in Bushland Regeneration Contractors. This has been rectified with another change in Bushland Regeneration Contractors to Toolijooa Pty Ltd. Mass weed control has been undertaken by Toolijooa with an expected result by the next monitoring survey to see an overall trend in weed coverage to have decreased.

Weed and Wildlife Species

The weed species targeted by the horticulturalist during the reporting period included Kikuyu, Tagets, African Love Grass, Paspalum, Coreopsis, Cynodon, Sida, Verbena, Setaria and Bidens. Revegetation activities were focused on Revegetation Area 5 with tubestock of mixed plantings planted in the area.

A report prepared by Toolijooa Environmental Services outlining the results of 2018 environmental restoration work is presented in **Appendix 6**. During the monthly visits, the revegetation status of previous rehabilitation/maintenance is continually assessed and vegetation monitoring within the Quarry Site undertaken. This report noted the following:

- Weed management appears to be effective. There has been noticeable native regrowth, with a number of *Acacia longifolia* (Sydney Golden Wattle) reclaiming areas previously worked.
- Further high-volume application of entire management zone and outside specified areas and follow up of frilling the larger trees in the sandstone bun areas would be beneficial of total removal of all vegetative matter.
- All weeds amongst revegetation zones, road edges and mustering areas have now been treated or removed, thus improving the visual aesthetic of the site greatly.
- Rehabilitation is generally being implemented in accordance with the performance criteria and the species required to be represented in the final landform are well represented.
- The presence of Priority Weeds (declared under NSW *Biosecurity Act 2016*) within the Quarry Site is much improved since 2012, with only a few individuals observed within rehabilitation areas in 2018.
- Fauna Recorded:
 - Wild Dog – *Canis lupus familiaris*
 - Red Brow Finch – *Neochemia temporalis*
 - Swamp Wallaby – *Wallabia bicolor*
 - Wedge Tail Eagle – *Aquila audax*

Threatened Flora Species

The report prepared by Cumberland Ecology (Appendix X) provides the results of monitoring at previously identified locations for the threatened flora species *Darwinia glaucophylla* and *Hibbertia procumbens*. In summary, the population of *D. glaucophylla* was found to be healthy and flowering with this species remaining unaffected by quarrying activities. The condition and number of plants identified has improved since 2017 with the species expanding into new habitat on the southern Quarry wall and below.

A healthy population of *H. procumbens* was located in the west of the Quarry Site in 2016 with individuals of the species that were previously recorded and rechecked are still present and healthy. Approximately ten new individuals were recorded in 2019 in the west (Cumberland Ecology 2019).

Groundwater Dependent Ecosystems

In January 2016 Cumberland Ecology were commissioned to survey the area to the south of the Quarry for the presence of GDEs and to establish monitoring plots that would be added to the annual vegetation monitoring undertaken within the Quarry Site. A total of five 20m square monitoring quadrats were established approximately 500m south of the Quarry Site. Three plots were established within Sandstone Hanging Swamps (Groundwater Dependent Wetlands) and two plots were established in Sandstone Ranges Gully Rainforest (baseflow stream). Figure 7 displays the location of the GDE monitoring plots.

The five monitoring quadrats were surveyed in January 2019 and the condition and composition of vegetation identified compared to the baseline conditions recorded in January 2016. A detailed assessment of vegetation is included in Section 4 of Cumberland (2019) and a complete list of flora species recorded is available as **Appendix X** of that document. Cumberland Ecology concluded that all quadrats had similar species compositions and coverages compared to the baseline surveys. No dieback of vegetation was occurring and no impacts as a result of extraction activities were observed.

7.6.3 Recommendations

Key recommendations (Cumberland Ecology, 2019) include:

- Eradicate all extant occurrences of Priority Weeds and other weeds of regional concern in quadrats and surrounding rehabilitation areas. *Lantana camara* individuals of a shrub-size were recorded in Quadrats 2, 4, and 5. These have been present since the 2013 survey and are now reproductively mature, and should be controlled immediately. The species is scattered throughout Rehabilitation Area 5 and Rehabilitation Area 1;
- Woody vegetation that has been removed along the fence line above Rehabilitation Area 5 has been felled into the rehabilitation area, and much of it is hung up in the branches of other planted vegetation. As this vegetation consisted of *Acacia* spp. which decompose quickly, its utility is negligible in the long term as fauna habitat, and in the short term poses a fire risk, as well as making the dense rehabilitation area further inaccessible to onsite bushland regenerators. This woody debris should be removed;

- Star pickets delineating the monitoring quadrats in Rehabilitation Area 5 which were removed during fence repair works need to be replaced in order to ensure future monitoring surveys are accurately undertaken;
- Continue weed control of other exotic groundcovers within rehabilitation areas, particularly the acoustic bund walls and northern fill area. Some weed species at the time of the survey were seeding, and this needs to be prevented during future regeneration works to break the cycle of weeds maturing and depositing new seed into the soil seed bank. In particular, species which are prolific seeders such as *Bidens pilosa*, *Coreopsis lanceolata*, and *Andropogon virginicus* should be prevented from reaching this stage of their life cycles. *Bidens pilosa* and *Coreopsis lanceolata* have consistently been recorded in prior years, and during the latest survey as seeding. These species currently dominate the ground layer in many areas, and will continue to inhibit germination of native seeds until prevented from seeding, and eliminated from the soil seed bank. Large infestations require regular monthly herbicide application for at least six months to a year, and potentially longer until eradicated;
- Weed control efforts requires more of a focus on the areas containing Quadrats 1, 2, and 5. Following a further 6 months of weed control in which weeds are not allowed to set seed, a larger range of native herbs and grasses need to be planted to inhibit weed growth in the future and to increase native species diversity;
- Review the species list provided in the RLMP. Include a wider range of local native plant species that inhabit varying habitats i.e. a range of species from moist to exposed habitats, particularly in Rehabilitation Area 5. If *Acacia* spp. are used in seed mix, implement measures to thin accordingly and plant out with secondary species to avoid dominance of one species (Cumberland Ecology 2019). It is recommended that *Acacia longifolia* subsp. *longifolia* is not used in future plantings as long as it continues to be abundant in older rehabilitation areas;
- Older rehabilitation areas with the exception of Rehabilitation Area 7 lack canopy species, which should be planted throughout these areas (Appendix D);
- Continue seed collection and spreading of local native seed;
- Continue to monitor vertebrate pest activity and implement control measures if these are observed in high numbers;
- During regular bushland regeneration activities the slump in Rehabilitation Area 5 should be monitored for further erosion. Where further erosion is observed the following should be implemented:
- Step 1: stabilise the bund wall using a series of staked logs or small benches along the contours and add topsoil;

- Step 2: once bund wall is stabilised and topsoil is spread, plant with tube stocks or spread native seed. Incorporate species that prefer exposed habitats as this wall faces west. Use species tolerant of moisture along the toe and next to the drain;
- Future rehabilitation areas should have soil stabilised prior to planting by using materials such as jute matting to prevent erosion;
- Continue to monitor the presence and condition of threatened species populations within the Quarry Site on an annual basis. A population of *H. procumbens* within the Quarry Site was located/relocated in 2016 and 2017. During the next monitoring period a small number of *H. procumbens* individuals should be tagged and monitored yearly to act as surrogates for assessing the health of the quarry population as is currently done for *D. glaucophylla*.

No actions are recommended concerning GDEs, as recorded vegetation appears to remain unchanged in the year since establishment of the monitoring quadrats, and there is no observable impact of Quarry activities. Vegetation communities in these areas are intact. Continued monitoring of established quadrats on an annual basis will determine if quarrying activities are impacting groundwater supply and the viability of GDEs.

8. COMMUNITY

8.1 STAKEHOLDER AND COMMUNITY CONSULTATION

8.1.1 Local Community

Figure 8 displays the land ownership and residences around the Calga Sand Quarry. The Quarry Manager, Mr Shane Pescud, maintained contact with neighbours throughout 2018 principally through direct one-to-one contact, occasional phone contact (call and SMS) and involvement in the Community Consultative Committee.

Two scheduled Community Consultative Committee (CCC) meetings were held at the Calga Sand Quarry on 7 May 2018 and 26 November 2018 to provide the committee with an update on the operation and discuss various issues raised by community members and Hanson personnel. The number of meetings held is consistent with the requirements on Condition 5(8)(c) for at least two meetings each year. The minutes of both meetings are reproduced as **Appendix 4**.

8.1.2 Community Involvement

During the reporting period, two visits from local community representatives and neighbours were hosted at the Quarry as part of the Community Consultative Committee Meetings (as discussed in 8.1.1).

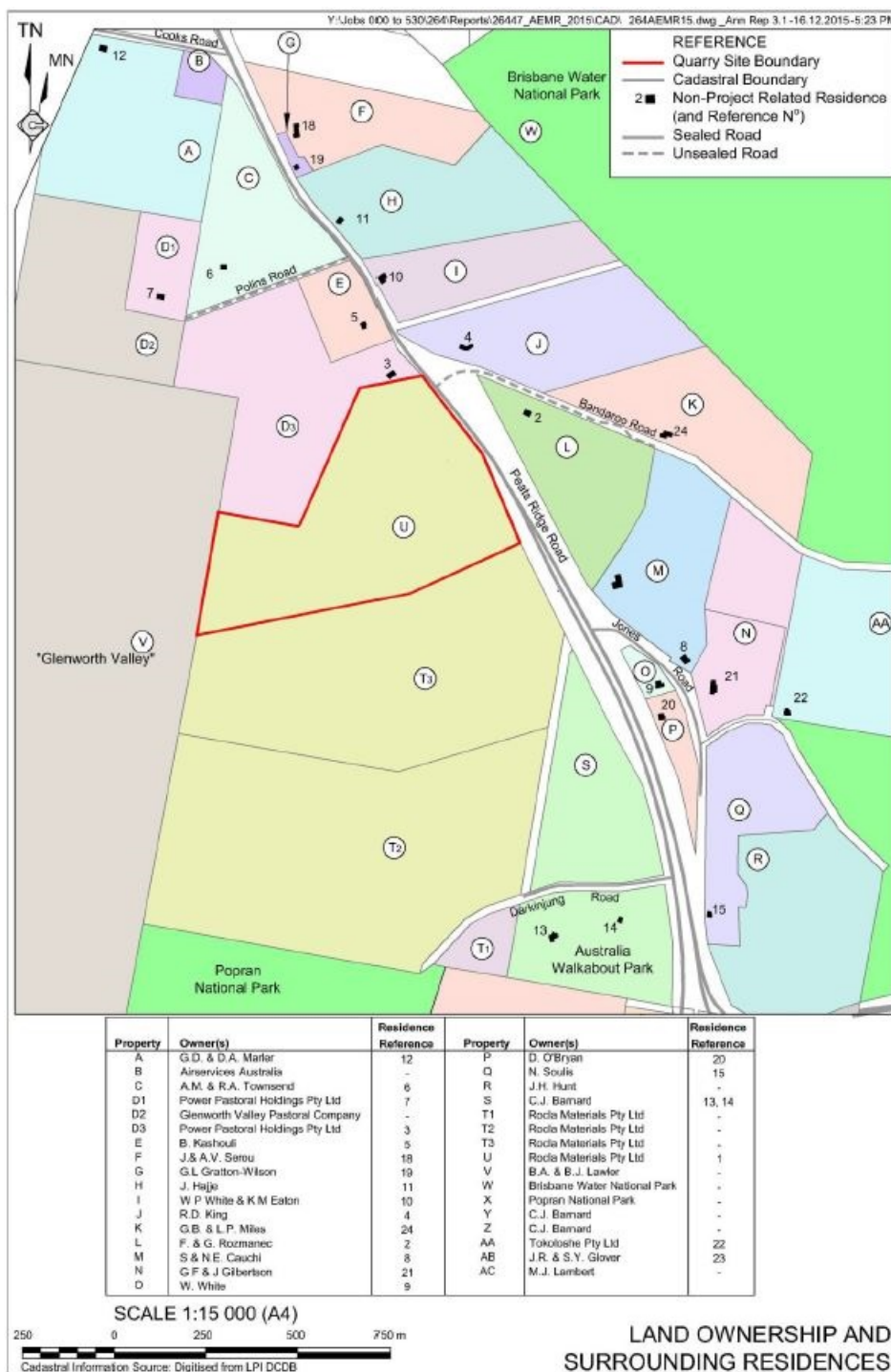


Figure 8: Land Ownership and Surrounding Residences

8.2 ENVIRONMENTAL COMPLAINTS

Complaints are addressed in accordance with Section 3.3.3 of the Environmental Management System. Complaints management includes the following procedures.

- Complaints may be received by phone, email or mail.
- The complaints phone line number is displayed on the signage at the Quarry entrance, in the Yellow Pages and on the Hanson website.
- Phone calls are connected to a call centre from where the caller is directed to a Regional Risk Manager for NSW or other suitable person.
- All complaints are recorded and referred to the Quarry Manager.
- The Quarry Manager responds immediately by identifying the area of concern and an investigation is commenced by the Quarry Manager or an appropriate delegate.
- If necessary, additional environmental monitoring will be commissioned to confirm compliance or investigate the source of the complaint.
- A summary of the investigation, results and actions taken is recorded in the complaints register and made available on the Hanson website. A copy of the results is also provided to the complainant.

One complaint was received during the reporting period for nearby residences. The complaint was related to noise emissions from the Quarry Site and was investigated following the complaint. No extraneous noise requiring adjustment of operations were evident during the reporting period. A summary of the complaints is reproduced in Table 24.

Table 24: List of complaints received in 2018

Date	Time	Mode of Complaint	Nature of Complaint	Action Taken
12/3/2018	08:29	Email	Noise Complaint - Transport movements on Peats Ridge Rd, not directly from Calga Quarry. Local resident complaint – Tow truck contractor was in the process of transporting a broken down Hanson tipper. The tow truck driver had parked outside a residence during the early hours of the morning with the engine & safety beacon active.	Hanson transport informed of incident. Transport manager has contacted the tow truck contractor & instructed them to avoid parking outside private homes when safe to do so. Controls have been implemented to minimise any future disruptions. Local resident notified of findings.

9. INDEPENDENT AUDIT

The first Independent Environmental Audit of Hanson operations under PA 08_0143 occurred in July 2018. The audit report identified the non-compliance issues listed in Table 25.

Table 25: 2018 Independent Environmental Audit Non-Compliances

Non-Compliance / Administrative Non-Compliance number	Comments	Hanson Action Details	Dates/Justification
N1	<p>The following practices haven't been implemented RE: minimising noise impacts</p> <ul style="list-style-type: none"> Comparative sound level measurements of equipment had not been undertaken Signs had not been displayed at the exit to the site to remind all drivers to leave in a quiet manner. 	<p>Update the requirements for noise monitoring with contractors.</p> <p>Sound power levels are to be monitored in Q4 noise monitoring.</p> <p>Transportation noise impact signage to be placed at quarry exit.</p>	<p>Noise monitoring contractors have been notified of the requirements under the Calga Noise Management Plan 2017.</p> <p>Transportation noise impact signage was installed November 2018.</p>
N2	The approved SWMP does not include impact assessment criteria for groundwater dependent ecosystems (GDEs). The amended SWMP which is awaiting approval includes identification of and monitoring program for GDEs, but does not include impact assessment criteria.	Revise the SWMP to include impact assessment criteria for groundwater dependent ecosystems (GDEs)	Have communicated with RW Corkerys to update this aspect of the management plan and will be included in the submission of the updated SWMP, estimated to be submitted April.
N3	A further bore survey in 2015 identified 3 further bores within 500m of the quarry. Only one of these (CP13) has been tested. CP14 and CP15 not yet tested.	<p>Hanson has received approval for monitoring of CP13 (White property) & CP15 (Glenworth Valley). Hydraulic testing to be performed by P. Dundon for bore CP15.</p> <p>Hanson has not received landowner approval for CP14 (King property).</p>	Approval for CP13 and CP15 completed January 2019. Still waiting on approval from CP14 but at this point in time Hanson might not receive approval from landowners.
N4	Defective continuous water level monitoring equipment not fulfilling monitoring requirements.	CBased have removed all faulty data loggers and replaced with new units February / early March 2019 (delay on supplier side).	All loggers tested November 2018. New units will be installed by end of March 2019.
N5	No water level or flow metering equipment as specified by MER (2005) has been installed on any private bore within 500m of quarry.	Hanson is still in discussion with Peter Dundon on feasibility to install equipment to private bores that require water level/flow monitoring equipment.	To be completed by 31 May 2019.
N6	Dust deposition results for CD1 show increasing trend, with monthly results from February 2018 exceeding 12 month annual average criteria,	<p>Monthly average over a year period is required in accordance with the conditions of consent. Quarry Management understood the reason of the increasing trend.</p> <p>Commencement of new extraction cell 5 within close proximity 920m) of CD1. As the formal</p>	Completed.

	although 12 month average has not exceeded criteria. No formal investigation has been undertaken to assess the cause of the exceedances.	investigation has been undertaken, the report will be generated and filed for future reference.	
N7	Quarry induction includes section on environmental management and controls, however site specific environmental requirements have not been included.	Contractor Induction documents to outline environmental requirements (noise & dust) have been completed.	Completed.
N8	There is no record of discharge volume from EPL 1 or record of water levels.	Discharge at Point 1, Dam F (licensed discharged point) on 3rd April 2018 as a result of heavy rainfall event. Samples sent to ALS for testing & shown to be below EPL concentration limits. After further investigation discharge water volume has never been recorded from this location. Process of calculating discharge volume to be implemented.	Completed.
N9	Records of water taken had not been maintained. A logbook recording details of water taken was not available, and a meter had not been installed.	Meter installed at production groundwater bore (amenities) & log book in use.	Completed.
N10	Records of water volumes or extraction rates had not been maintained.	Hanson will review the website and ensure the complaints register is uploaded quarterly.	Completed.
A1	While a monitor had been purchased for the site, monitoring of particulate matter (TSP and PM10) had not been implemented at the time of audit.	E-sampler has been installed. Data collection commenced Jan 2019 & to be uploaded onto web. Delay due to equipment failure of two units.	Completed.
A2	The GCS does not correctly describe the basis for provision of a compensatory water supply in accordance with the Consent. The revised SWMP submitted to the department in draft for approval also does not specifically describe a GCS, although the elements of the GCS are included.	SWMP is currently in draft and will be submitted by May 2019.	May 2019.
A3	The Driver's Code of Conduct had not been submitted to the Secretary by 28 July 2017.	Implement process to track compliance requirements. Tracking of compliance requirements developed.	Completed.
A4	While waste transport dockets were available for waste removed from site, the Quarry had not implemented a process to monitor waste generated. A waste register was not maintained.	Site waste reporting spreadsheet implemented.	Completed.

A5	Annual production data was included in the annual review. Annual production data had not been provided to the DRG.	The DRG form was submitted, a copy wasn't available on day of audit.	Completed.
A6	Annual review for 2017 had not been submitted within the required timeframe.	Noted.	Completed.
A7	While it was reported that toolbox meetings had been conducted which included environmental requirements, records sighted did not show evidence of inclusion of environmental issues in inductions.	Toolbox meetings to outline environmental requirements (noise & dust).	Completed.
A8	The register does not include personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect.	Complaints register has been revised to ensure that all required information is included.	Completed.
A9	Noise monitoring was conducted at CN-1, CN-2, CN-3, CN-6. Noise monitoring has not been conducted at CN-9.	Discussions with NMP author clarified the justification on the selection of CN-9 as a noise monitoring point for compliance noise monitoring. Monitoring will now include CN-9.	Completed.
A10	Where complaints had been received, the following issues were identified: • Name of complainant not provided. • Complaints received on 23/01/16 and 13/02/16 were not responded to until approximately 4 hours after the complaint was received (when the site had closed). • Details of who received the complaint were not recorded. • Person conducting the investigation was not recorded.	Complaints register has been revised to ensure that all required information is included.	Completed.
A11	Erosion and sediment control drawings were not available. Erosion and sediment control structures have not been constructed in accordance with DoH (2004).	Sediment drawings available on-site, management plan updated to reflect site restrictions resulting in control structures not being constructed in accordance with DoH (2004) but still providing the correct erosion and sediment control on-site.	To be completed 31 May 2019 (management plan updates within 3 months of Annual review submission).
A12	While erosion and sediment controls have been implemented, controls were not as	Management plan updated to reflect site restrictions resulting in control structures not being constructed in accordance with DoH (2004) but still providing the correct erosion and sediment control on-site.	To be completed 31 May 2019 (management plan updates within 3 months of Annual review submission).

	described in the management plan. E.g. Cross fall and drainage, Outfall drainage, mitre drains and sand bag weirs have been installed, but actual operations are not as described in the management plan.		
A13	The Landscape and Rehabilitation Management Plan has not been updated to reflect current arrangements for managing vegetation clearance.	The Landscape and Rehabilitation Management Plan is in draft stage and waiting on the Aboriginal Heritage Management Plan completion and approval, as agreed upon by DPE.	Will be completed once Aboriginal Heritage Management Plan is updated, as agreed upon by DPE.
A14	Environmental Management Strategy has not been updated to reflect the current IEA requirements within the development approval	EMS to be updated to reflect current requirement.	To be completed 31 May 2019 (management plan updates within 3 months of Annual review submission).
A15	Groundwater audit reports were not provided on the website.	Groundwater audit reports are provided within the Annual Review, as required by the SWMP.	Completed.
O1.	Community Consultative Committee meeting minutes had been uploaded into the complaints register section of the website.	CCC minutes have been moved to the correct section of the website.	Completed.
O2.	Daily inspections are carried out using the Daily Toolbox / Shift Handover Record Sheet. Viewed 12/6/18. Uses a tick against each aspect. Leading Hand fills in the report. Not the Quarry Manager.	SWMP will be updated to reflect correct terminology Monthly site inspection documents to include drainage & sediment control – complete. Monthly site inspection documents to include drainage & sediment control – complete. A monthly inspection has been created incorporating all inspection requirements as noted within the site management plans.	Completed.
O3.	The environmental protection licence for the site requires oil and grease to be monitored, while the Site Water Management Plan requires Total Grease.	SWMP will be updated to reflect correct terminology	To be completed 31 May 2019 (management plan updates within 3 months of Annual review submission).

The majority of non-compliances were addressed by Hanson following review of the audit results. A timeline for outstanding matters has been provided to DPE with the majority of non-compliances to be closed out by June 2019. The next Independent Environmental Audit will take place in the 2021 reporting period.

10. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

Hanson shall notify the relevant government authorities of any incident associated with the Quarry immediately after Hanson becomes aware of the incident, as per the Calga Sand Quarry Pollution Incident Response Management Plan. Within 7 days of the date of the incident, Hanson will provide the relevant agencies with a detailed report of the incident. There have been no reportable incidents in the last reporting period.

11. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

11.1 INTRODUCTION

The following section provides a brief summary of the operational activities planned throughout 2018 (Table 26).

Table 26: Summary of proposed Quarry activities

Quarter	Activity
January – March	Extraction within Stage 3/5, all tailings deposited within Stage 3 Cells 3&4. Conduct attended noise monitoring Conduct monthly dust deposition samples, surface water sampling s and bi-monthly bore water level monitoring as part of the environmental monitoring. Horticulturist monthly weed control & revegetation maintenance activities. Overburden placement & rehabilitation within Stage 3 tailings Cells 2a&b.
April – June	Extraction within Stage 3/5, all tailings deposited within Stage 3 Cells 3&4. Conduct attended noise monitoring Hold Community Consultative Committee meeting. Conduct monthly dust deposition samples, surface water sampling s and bi-monthly bore water level monitoring as part of the environmental monitoring. Horticulturist monthly weed control & revegetation maintenance activities. Overburden placement & rehabilitation within Stage 3 tailings Cells 2a&b.
July – September	Extraction within Stage 3/5, all tailings deposited within Stage 3 Cells 3&4. Conduct attended noise monitoring Conduct monthly dust deposition samples, surface water sampling s and bi-monthly bore water level monitoring as part of the environmental monitoring. Horticulturist monthly weed control & revegetation maintenance activities. Overburden placement & rehabilitation within Stage 3 tailings Cells 2a&b. Commence revegetation work to Cell 2a&b.
October – December	Extraction within Stage 3/5, all tailings deposited within Stage 3 Cells 3&4. Conduct attended noise monitoring Suitably qualified ecologist to conduct annual rehabilitation and threatened species monitoring, including feral animal survey and noxious weed survey.

	<p>Conduct monthly dust deposition samples, surface water sampling and bi-monthly bore water level monitoring and bi-annual groundwater quality sampling as part of the environmental monitoring.</p> <p>Hold Community Consultative Committee meeting.</p> <p>Overburden placement & rehabilitation within Stage 3 tailings Cell 1.</p> <p>Revegetation work to Cell 2a&b.</p>
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11.2 EXTRACTION OPERATIONS

Extraction of friable sandstone using mobile machinery will continue to be undertaken by standard ripping procedure and load and haul activities. No blasting is required or used at the Quarry.

Extraction operations will be undertaken in Stage 3/5.

11.3 PROCESSING AND PRODUCT STOCKPILING

Processing activities will continue to occur at the plant during 2018. Material is transported by mobile machines to the sand processing plant where the material is processed and moved into stockpiles where it is stored on site for both internal and external sales by road registered trucks. The processed sand resource is primarily used for the manufacture of concrete for the construction industry. A small proportion of sand is used for other purposes, including landscaping and filling.

11.4 OVERBURDEN MANAGEMENT

Overburden material will continue to be placed in Cells 3/1, 3/2A, 3/2B throughout the reporting period.

11.5 SITE INFRASTRUCTURE

It is anticipated that minor alterations will be completed during the 2019 reporting period. This includes minor landscaping activities.

11.6 COMMUNITY INVOLVEMENT

During the reporting period, Hanson personnel intend to again host various visits from local community representatives and neighbours, principally through the Community Consultative Committee meetings.

11.7 WATER MANAGEMENT

Water quality monitoring will be continued in accordance with the EPL, Project Approval Conditions and Water Management Plans. The existing water transfer/recovery system involving Dams 7a and 7b/c will be maintained. Silts will be pumped to Stages 3/3 and 3/4. Return water

will continue to be directed to Dam 7b/c where it will settle before being pumped to the wash plant using an electric pump.

The Site Water Management Plan is expected to be updated during the reporting period and water management will continue in accordance with this plan. Until that time, surface water sampling will continue on a monthly basis. Should there be any significant flows off site or rainfall is expected to be >50mm in a day, additional water sampling will also be undertaken.

11.8 AIR QUALITY MANAGEMENT

Hanson will continue to incorporate a range of design and operational safeguards, and operational procedures for the Quarry to ensure that the effectiveness of the air quality controls is optimised throughout all components of the quarry's operations. The Air Quality Monitoring Program requires the installation of a PM10 monitor, which will occur in the second quarter of 2018.

11.9 PRODUCT TRANSPORTATION

All product trucks will use the internal haul access road through the site. No changes to how the Quarry is accessed from Peats Ridge Road are proposed during the 2019 reporting period.

11.10 REHABILITATION

During 2019, Hanson will continue with the rehabilitation activities in the areas defined in Figure 2. These activities will largely involve planting of Stage 3/2 a&b and some additional native species on the existing acoustic bund and maintenance of previously revegetated areas. During 2018, emphasis will be placed upon continued thinning out the *Acacia longifolia*, additional planting in Revegetation Area 9 and spot spraying and hand weeding across all accessible Revegetation Areas.

11.11 MONITORING

Throughout 2019, the environmental monitoring programs will be continued in the same manner as those conducted throughout 2018 with the inclusion of monitoring of bores CP13 and CP15.