Strength. Performance. Passion

Holcim

ANNUAL REVIEW
1 January 2018 – 31 December 2018

Teven Quarry

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SITE DETAILS

Name of operation	Teven Quarry
Name of operator	Holcim (Australia) Pty Ltd
Development consent / project approval #	SSD 6422
Name of holder of development consent / project approval	Holcim (Australia) Pty Ltd
Annual review start date	1 January 2018
Annual review end date	31 December 2018

I, **GARTH STACEY**, certify that this audit report is a true and accurate record of the compliance status of the **TEVEN QUARRY** for the period of **1 JANUARY 2018- 31 DECEMBER 2018** and that I am authorised to make this statement on behalf of **HOLCIM (AUSTRALIA) PTY LTD**.

Note.

a) *The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

b) *The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).*

Name of authorised reporting officer	Garth Stacey
Title of authorised reporting officer	Quarry Manager
Signature of authorised reporting officer	
Date	27 March 2019

1 STATEMENT OF COMPLIANCE

The statement of commitments for the 2018 reporting period for Teven Quarry is provided in **Table 1. Table 3** details the non-compliances of SSD 6422 identified within the 2018 reporting period, with the compliance status key provided in **Table 2**.

Table 1: Statement of Commitments

Were all conditions of the relevant approval(s) complied with?	
SSD 6422	NO
EPL 3293	NO

Table 2: DPE Compliance Status Key

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.
Admin NC	Non-compliant	Only to be 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)

Table 3: Non-Compliances of SSD 6422 for 2018

<table>
<tr><th>Relevant approval</th><th>Condition</th><th>Condition Description</th><th>Status</th><th>Relevant Section of the Annual Review</th></tr>
<tr><td>SSD 6422</td><td>Schedule 3 Condition 11</td><td>The Applicant shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not cause exceedances of the criteria in Table 4 at any residence on privately-owned land.

Table 4: Air quality criteria
<table><tr><th>Pollutant</th><th>Averaging Period</th><th colspan="2">Criterion</th></tr><tr><td>Particulate matter < 10 µm (PM_{10})</td><td>Annual</td><td colspan="2">[a,d] 30 µg/m^3</td></tr><tr><td>Particulate matter < 10 µm (PM_{10})</td><td>24 hour</td><td colspan="2">[b] 50 µg/m^3</td></tr><tr><td>Total suspended particulates (TSP)</td><td>Annual</td><td colspan="2">[a,d] 90 µg/m^3</td></tr><tr><td>[c] Deposited dust</td><td>Annual</td><td>[b] 2 g/m^2/month</td><td>[a,d] 4 g/m^2/month</td></tr></table></td><td>Low Risk Non - Compliant</td><td>Section 6.3 (Air Quality)</td></tr>
<tr><td>SSD 6422</td><td>Schedule 3 Condition 15</td><td>For the life of the development, the Applicant shall ensure that there is a suitable meteorological station operating in the vicinity of the site that complies with the requirements in the Approved Methods for Sampling of Air Pollutants in New South Wales guideline.</td><td>Low Risk Non - Compliant</td><td>Section 6.1</td></tr>
</table>

2 INTRODUCTION

Holcim (Australia) Pty Ltd (Holcim) operates Teven Quarry, a hard rock quarry located on Stokers Lane in the Ballina Shire Local Government Area (refer to **Figures 1** and **2**). The site operates under Development Consent (SSD 6422 as modified) approved by the New South Wales (NSW) Department of Planning and Environment (DPE) on July 15, 2015.

The site also operates in accordance with Environment Protection Licence (EPL) No. 3293 issued by the NSW Environmental Protection Authority (EPA).

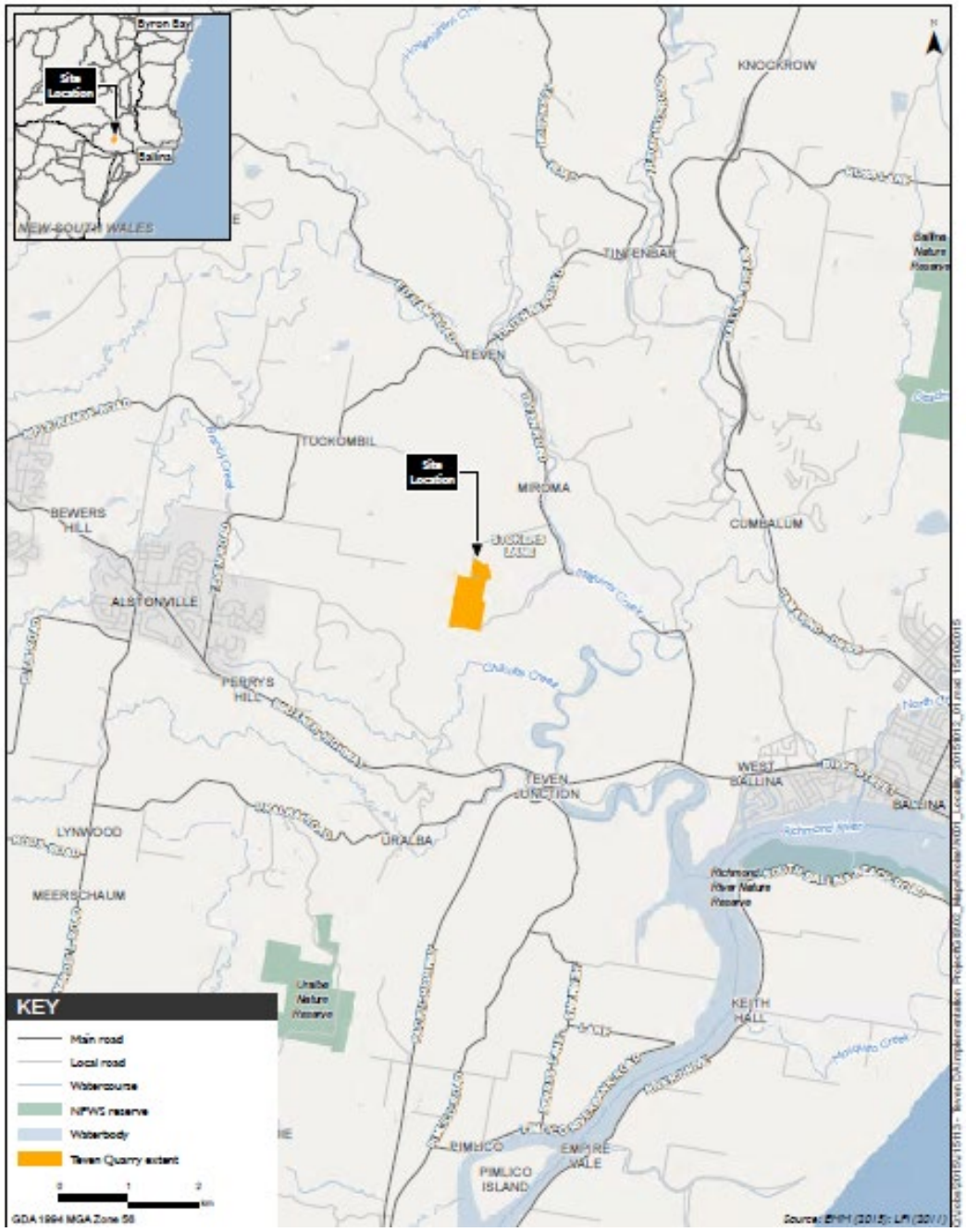

Figure 1: Regional Locality (Source EMM: 2016)

Figure 2: Aerial view of the Teven Quarry, located on Stokers Lane, Teven

In accordance with Schedule 5, Condition 4 of the modified Development Consent the site is required to undertake an Annual Review of the site in accordance with the conditions provided in **Table 4.**

Table 4: Annual Review Requirements

Condition	Section addressed in Annual Review
By the end of March each year, the Applicant shall review the environmental performance of the development to the satisfaction of the Secretary. This review must:	
a) describe the development (including rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;	Section 4 and 6
b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against the: - relevant statutory requirements, limits or performance measures/criteria; - the monitoring results of previous years; and - the relevant predictions in the EIS.	Section 6, 7 and 10.3
c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;	Section 1 and 11
d) identify any trends in the monitoring data over the life of the development	Section 6 and 7
e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and	Section 6
f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the development.	Section 13

This Annual Review has also been prepared in accordance with the *Annual Review Guideline: Post-approval Requirements for State Significance Mining Developments* (October 2015). This report documents the environmental performance of the site from 1 January to 31 December 2018.

2.1 Contact Details

Quarry Supervisor
Scott Callander
Mob: 0419 476 067
scott.callander@lafargeholcim.com

Quarry Manager
Garth Stacey
Work: +61 2 6687 8566
Mob: +61 429 790 217
garth.stacey@lafargeholcim.com

North NSW Aggregates Manager
Chris Hamilton
Work: +61 2 6656 8620
Mob: +61 429 790 213
chris.s.hamilton@lafargeholcim.com

Planning & Environment Manager NSW
Luke Edminson
Holcim (Australia) Pty Ltd
Mob +61 429 790 756
Email: luke.edminson@lafargeholcim.com

Planning and Environment Coordinator NSW
Shilpa Shashi
Mob: +61 (0)429 790 756
Email: shilpa.shashi@lafargeholcim.com

3 APPROVALS

The site operates under the approvals listed in **Table 5.**

Table 5: Approvals for Teven Quarry Operations

Approval	Regulatory Authority
SSD 6422	NSW DPE
EPL No. 3293	NSW EPA

4 OPERATIONS SUMMARY

4.1 Exploration

There was no exploration undertaken within the Annual Review period.

4.2 Land Preparation

There was no clearing undertaken during the Annual Review period.

4.3 Construction Activities

There was no construction undertaken during the Annual Review period.

4.4 Quarry Operations

Operational activities undertaken at Teven Quarry in 2018 included:

- Stripping of topsoil and overburden within the existing approved extraction limit boundary;
- Drill, blast, load and haul activities; and
- Crushing, screening and stockpiling of product.

A list of the permissible operating hours under Schedule 3 Condition 1 are outlined below.

Table 6: Operating Hours

Activity	Permissible Hours
Extraction operations Processing operations Overburden management	7 am to 6 pm Monday to Friday; 7 am to 4 pm Saturday; and At no time on Sundays or public holidays.
Blasting	10 am to 3 pm Monday to Friday; and At no time on Sundays or public holidays.
Loading and dispatch Stockpile management Maintenance of plant and equipment	7 am to 10 pm Monday to Friday; 7 am to 4 pm Saturdays; and At no time on Sundays or public holidays.

All activities took place within the approved operating hours in 2018.

Table 7 includes a summary of the operations undertaken during the reporting period against the Development Consent conditions regarding product transported from Teven Quarry.

Table 7: Total Product Distributed (Holcim Teven Quarry)

Material	Approval Limit (Tonnes)	Previous Reporting Period - 2017 (Tonnes)	Current Reporting Period - 2018 (Tonnes)
Product Distributed- Total	500,000	283,251	370,037

4.5 Next Reporting Period

Development activities proposed to be carried out at Teven Quarry in 2019, include:

- Stripping of topsoil and overburden within the existing approved extraction limit boundary;
- Drill, blast, load and haul activities; and
- Continuation of crushing, screening and stockpiling of product.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The DPE provided a letter to Holcim on 10 October 2018 requesting additional information on the 2017 Annual Review. Holcim provided a response to these queries and the DPE were satisfied with this response in a letter dated 10 December 2018.

An update on the proposed Holcim actions from the 2017 Annual Review are shown in **Table 8.**

Table 8: Status Update on Proposed Holcim Actions

Commitment	Compliance Status
Progressive Rehabilitation - The site will continue to progressively rehabilitate available areas	This has not been completed as areas did not become available in 2018.
PM_{10} and depositional dust monitoring - Improve the PM_{10} and depositional dust sampling process in 2018 to operate as per the Development Consent requirements.	There continued to be some issues with the PM_{10} in 2018. Holcim are committed to improving this in 2019.
Biodiversity - Weed spraying will continue at site during the next Annual Review period.	Completed. This will continue in 2019.
Water sampling - Complete all weekly pH sampling during the Annual Review period.	Completed. Note there were changes to the EPL in 2018 and also changes to the monitoring requirements following consultation with the EPA.
Groundwater Assessment <u>Condition 3, Schedule 19</u> *In the event that groundwater in excess of negligible quantities is intersected during extraction activities, the Applicant shall undertake a hydrogeological investigation, in consultation with NOW, to the satisfaction of the Secretary.* *The investigation must report on groundwater sources, levels, yield and quality; identify any risks to groundwater users or groundwater dependent ecosystems and propose recommended management measures. The Applicant must implement reasonable and feasible management measures to the satisfaction of the Secretary.* Holcim will continue to monitor the quarry void for groundwater seepage to ensure that groundwater quantities remain negligible.	Not required in 2018.

6 ENVIRONMENTAL PERFORMANCE

6.1 Meteorological Monitoring

A meteorological monitoring station was installed at Teven Quarry in late 2016 to obtain data in accordance with the requirements of Schedule 3 Condition 15 of the Development Consent. However, throughout 2018 there have been numerous issues with the station, therefore data from the Bureau of Meteorology Ballina Airport Weather Station (Station ID 058198) has been used for this Annual Review. Based on the issues with the meteorological station this is a non – compliance with Schedule 3 Condition 15.

Monthly rainfall, wind and temperature data for 2018 has been provided in **Table 9.**

Table 9: Weather Observations at Teven Quarry 2018 (Ballina Airport AWS 058198)

Month	Temperature		Rain			Wind
	Min Temp (°C)	Max Temp (°C)	Total (mm)	Max Daily (mm)	No rain days > 1 mm	Max Wind Gust (km/h)
Jan-18	12.5	33.3	91.2	34.2	7	102
Feb-18	15.1	31.8	233.8	41.4	19	59
Mar-18	16	32.6	121.8	38.2	12	59
Apr-18	13.4	31.9	222.8	46.8	12	72
May-18	7.7	26.6	109.0	30.4	11	56
Jun-18	5.4	23.9	139.6	56.8	8	63
Jul-18	3.2	26.6	43.0	12.2	6	59
Aug-18	1.7	26.5	46.0	19.4	4	65
Sep-18	7.3	27.5	281.0	100.0	10	52
Oct-17	9.3	29.8	218.4	73.6	15	70
Nov-18	11.7	32.7	106.0	96.8	4	57
Dec-18	13.5	34.2	36.6	20.2	5	74

6.2 Noise

6.2.1 EIS Predictions

The 2014 EIS found that the Project was not predicted to exceed the project specific noise levels at any privately owned residences surrounding the Project Area, with the exception of Receiver 9. Receiver 9 has since been purchased by Holcim.

Road traffic noise levels were predicted to increase at some receivers whilst decreasing at others, with the criteria proposed in the EIS predicted to be met.

6.2.2 Approved Criteria

In accordance with Schedule 3, Condition 5(c) of SSD 6422, *'the Applicant shall: carry out noise monitoring (at least every 3 months) to determine whether the development is complying with the relevant conditions of this consent.'*

Approved noise criteria from the Development Consent are outlined in **Table 10**.

Table 10: Noise Criteria for Teven Quarry (SSD 6422)

Table 2: Noise criteria dB(A)

Receiver	Day dB(A) ($L_{Aeq(15\ min)}$)	Evening dB(A) ($L_{Aeq(15\ min)}$)
R3, R4, R13, R15, R16, R17, R18, R20	38	35
All other residences	37	35

Note: Receiver locations are shown on the figure in Appendix 4.

6.2.3 Key Environmental Performance

Quarterly noise monitoring was undertaken 2018 in accordance with the requirements of the Schedule 3, Condition 4. Monitoring was completed on the following dates:

- 26 March 2018 (quarry was not operational);
- 20 June 2018;
- 10 and 11 September 2018; and
- 21 November 2018.

Noise results at all locations were within the approved performance criteria for the site as shown in **Table 11**. Copies of the quarterly noise monitoring reports for 2018 are attached as **Appendix 1**.

Table 11: Noise Compliance Assessment for Teven Quarry (Muller Acoustic Consultants, 2018)

Assessment Period	Receiver No.	Monitoring Location	Quarrying Noise Criteria	Q1 March 2018		Q2 June 2018		Q3 September 2018		Q4 November 2018	
			$LAeq_{(15min)}$	Quarry Noise Contribution	Compliance	Quarry Noise Contribution	Compliance	Quarry Noise Contribution	Compliance	Quarry Noise Contribution	Compliance
Daytime	R2	N1	37	Nil	✓	Nil	✓	<30	✓	<35	✓
	R3/R4	N2	38	Nil	✓	Nil	✓	<30	✓	<35	✓
	R7	N3	37	Nil	✓	Nil	✓	31	✓	<35	✓
	R10	N4	37	37	✓	Nil	✓	37	✓	<35	✓
	R14	N5	38	Nil	✓	Nil	✓	30	✓	<35	✓
Evening	R2	N1	35	Nil	✓	Nil	✓	Not operational	✓	Not operational	✓
	R3/R4	N2	35	Nil	✓	Nil	✓	Not operational	✓	Not operational	✓
	R7	N3	35	Nil	✓	Nil	✓	Not operational	✓	Not operational	✓
	R10	N4	35	Nil	✓	Nil	✓	Not operational	✓	Not operational	✓
	R14	N5	35	Nil	✓	Nil	✓	Not operational	✓	Not operational	✓

Note: Monday to Saturday; Day 7am to 6pm; Evening 6pm to 10pm; Night 10pm to 7am. On Sundays and Public Holidays, Day 8am to 6pm; Evening 6pm to 10pm; Night 10pm to 8am.

Longterm Trends:

2018 is the second year of full noise monitoring (four quarters of monitoring). There are no longterm trends yet available relating to noise compliance, however the site was compliant in both 2018 and 2017.

Comparison to EIS Predictions:

The results for noise in 2018 were within the predicted limits of the EIS predictions.

6.2.4 Management Measures

Noise impacts are managed in accordance with the specific management strategies, procedures, controls and monitoring programs within the Teven Quarry *Noise Management Plan.*

6.2.5 Proposed Improvements

There are no proposed improvements relating to noise.

6.3 Air Quality

6.3.1 EIS Predictions

The 2014 EIS predicted that the change in air quality impacts due to the Project when compared to existing approved operations was predicted to be negligible, with the results for all scenarios predicted to be very similar.

The Project is predicted to comply with the relevant air quality criteria at all nearby sensitive receiver locations under worst case operating conditions, with the exception of 24-hour average PM_{10} concentrations at two nearby sensitive receiver locations - Receiver 9 and Receiver 6. This exceedance is due to the combined effect of Teven Quarry activities and maximum background levels. Receiver 9 has since been purchased by Holcim. If, on any day, the background levels were average rather than at maximum levels, then no property would be predicted to experience 24-hour average PM_{10} concentrations above the criteria.

6.3.2 Approved Criteria

Air Quality monitoring conducted at Teven Quarry is compared with the monitoring criteria stipulated in Schedule 3, Condition 11 of SSD 6422 and reproduced in **Table 12**.

Table 12: Air Quality Monitoring Criteria (SSD 6422)

Table 4: Air quality criteria

Pollutant	*Averaging Period*	*Criterion*	
Particulate matter < 10 µm (PM_{10})	Annual	[a,d] 30 µg/m^3	
Particulate matter < 10 µm (PM_{10})	24 hour	[b] 50 µg/m^3	
Total suspended particulates (TSP)	Annual	[a,d] 90 µg/m^3	
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a,d] 4 g/m^2/month

Notes tor Table 4:

a. *Cumulative impact (ie increase in concentrations due to the development plus background concentrations due to all other sources).*
b. *Incremental impact (ie incremental increase in concentrations due to the development on its own, with zero allowable exceedances of the criteria over the life of the development).*
c. *Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.*
d. *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, or any other activity agreed to by the Secretary.*
e. *"Reasonable and feasible avoidance and mitigation measures" includes, but is not limited to, the operational requirements in conditions 12 and 13 to develop and implement a air quality management system that ensures operational responses to the risks of exceedance of the criteria.*

6.3.3 Key Environmental Performance

6.3.3.1 PM_{10} Monitoring

Condition 11, Schedule 3 (PM_{10})

A Low Volume Air Sampler (LVAS) was installed at Teven Quarry in September 2017 to monitor for particulate matter. PM_{10} monitoring results have been obtained from January – December 2018. These results are provided in **Table 13.**

Table 13: 2018 Dust Monitoring (PM_{10}) at Teven Quarry

Sample Date	LVAS - PM10 * (ug/m3)
01-01-2018	<23
07-01-2018	<23
13-01-2018	<23
19-01-2018	27
25-01-2018	<23
31-01-2018	24
06-02-2018	<23
12-02-2018	24
18-02-2018	<23
24-02-2018	<23
02-03-2018	33
08-03-2018	<23
14-03-2018	<23
20-03-2018	<29
26-03-2018	<23
01-04-2018	<23
07-04-2018	<23
13-04-2018	<23
19-04-2018	<23
25-04-2018	31
01-05-2018	<23
07-05-2018	<23
13-05-2018	<23
19-05-2018	<23
25-05-2018	<23
31-05-2018	<23
06-06-2018	<23
12-06-2018	<23
18-06-2018	<23
24-06-2018	<23
30-06-2018	<23
06-07-2018	<23
17-07-2018	No Sample. Power Outage
23-07-2018	28
29-07-2018	<23
05-08-2018	24
11-08-2018	**66**
17-08-2018	<23
23-08-2018	<23
29-08-2018	43
04-09-2018	<23
06-09-2018	**66**
11-09-2018	42
18-09-2018	24
25-09-2018	39
04-10-2018	<23
08-10-2018	43
12-10-2018	<23
06-11-2018	**58**
10-11-2018	**65**
16-11-2018	<23
22-11-2018	24
28-11-2018	<23
04-12-2018	**68**
07-12-2018	<23
10-12-2018	27
19-12-2018	<23
22-12-2018	26
28-12-2018	<23
Min	**<23**
Average	**28.6**
Max	**68**

In summary:

- The PM_{10} annual average was 28.6 µg/m^3 in 2018 compared to 24.8 µg/m^3 in 2017;
- The PM_{10} annual average was below the annual average criteria (30 µg/m^3) which is outlined in Schedule 2 Condition 11 of the Development Consent;
- The PM_{10} 24 hour criteria of 50 µg/m^3 was exceeded on 5 occasions during 2018. These are highlighted bold in the table above (11 August, 6 September, 10 November, 4 December and 6 November);
- 2018 is the first full year of monitoring, therefore it is not possible for a direct comparison to 2017; and
- There was no sample taken on the 17 July 2018. This was due to an issue with power supply.

6.3.3.2 Depositional Dust Monitoring

Condition 11, Schedule 3 (Dust Deposition)

Depositional dust continued to be monitored at three depositional dust gauges at Teven Quarry throughout 2018. Results for this monitoring are provided in **Table 14**.

As in 2017, contamination of depositional dust gauges by leaves and insects at DDG1 and DDG2 continued to be a problem in 2018. Ten of the twelve samples had contamination at DDG2 and have therefore been removed from the annual average.

Table 14: 2018 Dust Monitoring (Depositional Dust)

Start Date	Sample Collection Date	Insoluble Solids DDG1 (g/m^2/month)	Insoluble Solids DDG2 (g/m^2/month)	Insoluble Solids DDG3 (g/m^2/month)
29-12-2017	25-01-2018	5.9c	42.2c	0.8
25-01-2018	22-02-2018	24.2c	13.5c	0.9
22-02-2018	22-03-2018	5	34.3c	0.6
22-03-2018	19-04-2018	0.6	61c	0.3
19-04-2018	17-05-2018	1.5	1.2	0.4
17-05-2018	14-06-2018	1.9	8.7c	0.4
14-06-2018	12-07-2018	2.9	74.7c	0.7
12-07-2018	9-08-2018	1.5	14.4c	0.4
9-08-2018	05-09-2018	2.2	22.9c	0.5
05-09-2018	04-10-2018	2.1	4.5c	0.7
04-10-2018	06-11-2018	8	12.3c	0.6
06-11-2018	07-12-2018	1.6	2.1	1.6
Annual Average – contaminated samples removed ***contaminated samples (bird dropping, insects, vegetation)**		**2.7**	**1.7**	**0.7**
Result (Year to Date)		**Within Criteria**	**Within Criteria**	**Within Criteria**

Depositional dust monitoring commenced in March 2017, therefore we cannot compare overall annual averages from 2017 to 2018. A comparison of 2017 (March-December) and 2018 depositional dust results (with contamination removed) is provided in **Table 15**.

Table 15: Comparison of Depositional Dust Data (with contamination removed)

Dust Depositional Gauge	Monitoring Summary for Annual Review Period	Monitoring Results 2018 Period (g/m/^{2}/month)	Monitoring Results March – December 2017 Period (g/m/^{2}/month)
DDG1	Insoluble Solids Reporting Period Average	2.7	2.9
	Max. Insoluble Solids	5.0	7.6
	Min. Insoluble Solids	0.6	0.4
DDG2	Insoluble Solids Reporting Period Average	1.7	3.0
	Max. Insoluble Solids	2.1	4.0
	Min. Insoluble Solids	1.2	0.9
DDG3	Insoluble Solids Reporting Period Average	0.7	1.0
	Max. Insoluble Solids	1.6	2.1
	Min. Insoluble Solids	0.3	0.1

6.3.3.3 Longterm Trends:

During preparation of the 2016 Annual Review for Teven Quarry it was discovered that Holcim were receiving incorrect dust deposition results from EAL Laboratories. The results received by Holcim were found to be results for the Boral Teven Quarry.

Immediately upon identifying this non-compliance, Holcim commissioned VGT consultants in February 2017 to undertake monthly monitoring in accordance with the *Air Quality Management Plan* to ensure full compliance with this condition. As such, any trends analysis of depositional dust is not currently possible due to the lack of data available prior to 2017. It is also difficult to discuss trends for depositional dust considering the number of samples which are discarded from the annual average due to contamination.

As 2017 was the first year of PM_{10} monitoring there are also no longterm trends available for particulate matter.

6.3.3.4 Comparison to EIS Predictions:

The Project is predicted to comply with the relevant air quality criteria at all nearby sensitive receiver location under worst case operating conditions, with the exception of 24-hour average PM_{10} concentrations at two nearby sensitive receiver locations - Receiver 9 and Receiver 6. Predictions suggest that 24-hour average PM_{10} levels may exceed the criteria of 50µg/m^3 up to one day per year at these two receivers by between 1 and 7µg/m^3. The PM_{10} results for short term criteria were above some of the EIS predictions.

6.3.4 Management Measures

Teven Quarry is committed to implementing reasonable and feasible avoidance and mitigation measures and to continue to investigate ways to minimise any air quality impacts from the quarry.

Air quality management measures implemented at Teven Quarry are detailed in the *Air Quality Management Plan*.

6.3.5 Proposed Improvements

Holcim is committed to improving the PM_{10} sampling process in 2019 to ensure that sampling is conducted correctly and on the required timetable to ensure operation as per the Development

Consent requirements. The aim for 2019 is to reduce short term exceedances of PM_{10}. Holcim will investigate the causes of any exceedances.

Holcim will liaise with the EPA and DPE in 2019 about moving DDG2 to a more suitable location, where there is less likelihood of contamination.

6.4 Blasting

6.4.1 EIS Predictions

The 2014 EIS found that the Project can comply with relevant vibration and air blast criteria at all sensitive residential receivers through ongoing management of blast design and size.

6.4.2 Approved Criteria

Blasting was undertaken at Teven Quarry throughout 2018 in accordance with the conditions of the Development Consent and EPL No. 3293. The criteria for blasting at the site are detailed in **Table 16.**

Table 16: Blast Monitoring Criteria from EL 3293 for Teven Quarry

L4	**Blasting**
L4.1	Blasting operations at the premises may only take place between 09:00 to 15:00 Monday to Friday. (Where compelling safety reasons exist, the Authority may permit a blast to occur outside the abovementioned hours. Prior written (or facsimile) notification of any such blast must be made to the Authority).
L4.2	The airblast overpressure level from blasting operations in or on the premises must not exceed: a) 115 dB (Lin Peak) for more than 5% of the total number of blasts during each reporting period; and b) 120 dB (Lin Peak) at any time. At any point within 1 metre of any affected residential property or other sensitive noise location.
L4.3	The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed: a) 5 mm/s for more than 5% of the total number of blasts carried out on the premises during each

In accordance with Condition 1, Schedule 3 of the Development Consent, blasting is to be undertaken between 10am and 3pm Monday to Friday, with no blasting to occur on Sundays or public holidays.

6.4.3 Key Environmental Performance

Results of blasting undertaken in 2018 are shown in **Table 17**.

Table 17: Blast Monitoring Results from Teven Quarry – Monitoring Location: Wellers Road

Date	Time	Vibration – (5.0 mm/sec max)	Overpressure – 115 (dBL max)	Compliance with Approved Criteria
13-02-2018	12.24pm	No Trigger	110.7	Within Criteria
28-02-2018	12.53pm	No Trigger	No Trigger	Within Criteria
19-03-2018	1.29pm	No Trigger	No Trigger	Within Criteria
28-03-2018	12.42pm	No Trigger	No Trigger	Within Criteria

Date	Time	Vibration – (5.0 mm/sec max)	Overpressure – 115 (dBL max)	Compliance with Approved Criteria
19-04-2018	12.53pm	No Trigger	No Trigger	Within Criteria
08-06-2018	12.44pm	0.05	114.1	Within Criteria
19-07-2018	12.14pm	No Trigger	No Trigger	Within Criteria
29-08-2018	12.23pm	No Trigger	No Trigger	Within Criteria
27-09-2018	12.33pm	No Trigger	No Trigger	Within Criteria
08-11-2018	12.17pm	No Trigger	No Trigger	Within Criteria
27-11-2018	2.41pm	No Trigger	No Trigger	Within Criteria
11-12-2018	12.48pm	No Trigger	No Trigger	Within Criteria

The results for blasting at the site fell within the expected criteria of the EPL and Development Consent during the whole 2018 reporting period. Most blasts were below trigger levels.

Longterm Trends:

From 2015 – 2018 the blasting levels have been within the Development Consent and EPL criteria.

Table 18: Teven Quarry Longterm Blasting Trends

Year	Number of Blasts	No. of blasts below vibration or overpressure trigger level	Max. Overpressure (dBL)	Average Overpressure (dBL)	Max Vibration (mm/s)	Average Vibration (mm/s)
2015	14	10	113.1	109.3	0.66	0.44
2016	12	7	112.1	109.6	0.45	0.37
2017	15	8	114.0	106.9	0.5	0.33
2018	12	11	114.1	112.4	0.05	0.05

Comparison to EIS Predictions:

The 2018 results for blasting were within the limits of the EIS predictions.

6.4.4 Management Measures

Blast emission related impacts (vibration and air blast) are managed in accordance with the specific measures within the Teven Quarry *Blast Management Plan.*

6.4.5 Proposed Improvements

The *Blast Management Plan* will be updated in Quarter 2 2019 to include the relevant Blasting Protocol.

6.5 Traffic Management

6.5.1 EIS Predictions

The 2014 EIS assessment of traffic impacts associated with the Project found that impacts on the road network and principle intersections would be satisfactory and there was no requirement to upgrade the roads or intersections surrounding the site once minor improvements to Route 1 were undertaken.

A review of road safety conducted as part of the EIS recommended prioritising the use of Route 1 for product transport and recommended a number of minor improvements to Route 1 to improve the safety for night time haulage, including centre line marking, reflectors and maintenance of existing guard rails at locations along Route 1. Holcim has implemented these recommendations.

6.5.2 Approved Criteria

According to **Development Consent SSD 6422** the site is required to monitor transport in accordance with the following requirements:

Schedule 2, Condition 9: *The Applicant will not dispatch more than 73 laden trucks from the site per day, averaged over the total number of dispatch days in any calendar month.*

Schedule 3, Condition 23: *The Applicant shall keep accurate records of all laden truck movements to and from the site (hourly, daily, weekly, monthly and annually) and publish a summary of records on its website every 6 months.*

6.5.3 Key Environmental Performance

Teven Quarry undertook monitoring of truck movements on a daily basis throughout 2018 to ensure compliance with movements and volume requirements discussed above. A copy of these monitoring results has been included in the table below.

Table 19: Average Truck Movements for 2018

Month	Truck movements	Active days	Av Truck Movement per active day
January	1020	17	60
February	1092	22	50
March	1263	22	57
April	1288	22	59
May	1298	27	48
June	1223	25	49
July	1375	26	53
August	1439	27	53
September	1296	25	52
October	1391	26	54
November	1833	26	71
December	899	18	50
Total	**15417**	**283**	**54**

The annual average truck movements in 2018 was 54 truck movements per active day, which was a small increase from the average of 51 truck movements per active day in 2017.

Longterm Trends:

Review of truck transport data for Teven Quarry since 2015 indicates average daily truck movements have not exceeded the maximum of 73 laden trucks from the site. This is consistent with the EIS predictions.

6.5.4 Management Measures

Traffic and transport impacts are managed in accordance with the specific management strategies, procedures, controls and monitoring programs within the Teven Quarry *Transport Management Plan.*

6.5.5 Proposed Improvements

Truck movements will continue to be monitored and recorded in the oncoming reporting period to ensure that they remain within the approved criteria.

6.6 Biodiversity

6.6.1 EIS Predictions

The 2014 EIS found the Project is unlikely to result in a significant change to the existing noise, dust and water runoff impacts of Teven Quarry, therefore it is considered that any indirect impacts to ecology that occur will be minor and will be consistent with the existing approved impacts. The results of the impact assessments under the Environmental Planning and Assessment Act (EP&A Act) and the Environment Protection and Biodiversity Conservation Act (EPBC Act) conclude that the indirect impacts of the Project are unlikely to have a significant impact on any threatened flora or fauna species, migratory fauna species, endangered population or threatened ecological communities listed under the Threatened Species Conservation Act (TSC Act) and/or the EPBC Act.

6.6.2 Approved Criteria

There are no specific criteria associated with biodiversity management for the site.

6.6.3 Key Environmental Performance

As there was no additional clearance in 2018, there were no additional impacts to biodiversity. Weed spraying was completed along the internal haul road during the 2018 Annual Review reporting period.

6.6.4 Management Measures

The ongoing management of the ecological values of the Project area are conducted in accordance with the Teven Quarry *Environmental Management Plan* (EMP) and the *Biodiversity and Rehabilitation Management Plan*.

These plans describe the biodiversity management strategies, procedures, controls and monitoring programs implemented at Teven Quarry.

6.6.5 Proposed Improvements

Weed spraying will continue at site during the next Annual Review period.

6.7 Heritage (Aboriginal Archaeology and Historic Heritage)

6.7.1 EIS Predictions

6.7.1.1 Aboriginal Archaeology

No known Aboriginal cultural heritage sites occur within or in close proximity to the Teven Quarry Project Area. Given the terrain and history of extensive clearing, grazing and quarrying, the area is considered to have low archaeological potential.

No known items or places of Aboriginal heritage significance are located in or within 50 metres of the Project Area, as such, the potential for impacts on items of Aboriginal cultural heritage is limited to indirect impacts such as from blasting or runoff.

6.7.1.2 Historic Heritage

No known items of historic heritage significance occur within the Teven Quarry Project Area.

No historic heritage sites were found to be located within or in close proximity to the Project Area. The closest heritage item was located approximately three kilometres to the south east in Alstonville, a sufficient distance to not experience or be impacted by indirect impacts associated with the Project.

6.7.2 Approved Criteria

There are no specific criteria associated with heritage relating to the quarry.

6.7.3 Key Environmental Performance

There were no issues relating to Aboriginal and historic heritage during the reporting period.

6.7.4 Management Measures

If during the course of operations, Holcim becomes aware of any previously unknown Aboriginal archaeological material, all works likely to affect the material or site will cease immediately and Office of Environment and Heritage (OEH), relevant Aboriginal stakeholders and a suitably qualified archaeologist will be consulted to determine an appropriate course of action prior to the recommencement of work at the site.

6.7.5 Proposed Improvements

As there have been no heritage items located to date, no improvements to management measures are proposed.

6.8 Summary of Environmental Performance

A summary of the performance of environmental management measures and sampling results for 2018 are detailed in **Table 20**.

Table 20: Environmental Performance at Teven Quarry in 2018

Aspect	Approval Criteria / EIS Prediction	Performance during 2018 reporting period	Trend / key management implications	Implemented / proposed management actions
Noise	EIS predictions are all below Development Consent criteria.	Within criteria.	Consistently meets criteria.	None required.
Blasting	EIS predictions are all below Development Consent criteria.	Within criteria.	Consistently meets criteria.	None required.
Air Quality	EIS predictions are all below Development Consent criteria.	Sampling has not been undertaken in accordance with development consent criteria for PM_{10}. The PM_{10} 24 hour criteria of 50 µg/m^3 was exceeded on 5 occasions. These include 11 August, 6 September, 10 November, 4 December and 6 November. There was a power outage on 17 July 2018, therefore there was not a full year of data. Depositional dust within levels for the monitoring were below the Development Consent criteria.	Longterm trend data has not yet been determined due to the frequency of monitoring.	Improve data collection regarding the PM_{10} monitoring. Liaise with the EPA and DPE about moving DDG2 to a more suitable location, where there is less likelihood of contamination.
Traffic Management	EIS predictions are all below Development Consent criteria.	Teven Quarry met the Development Consent Criteria.	Consistently meets criteria.	None required.
Biodiversity	No proposed impacts. No Development Consent criteria.	No issues identified. Minor weed management completed.	No long-term negative trends.	None required.
Heritage	No proposed impacts. No Development Consent criteria.	No issues identified.	No issues identified.	None required.

7 WATER MANAGEMENT

7.1 EIS Predictions

7.1.1 Surface Water

The 2014 EIS stated the Project will not result in any changes to the quarry water management system or associated water management measures. The only potential changes in surface water impacts as a result of the Project are associated with the change in water demands eg. Requirement to use more water for dust suppression or processing.

7.1.2 Groundwater

The results of the hydrogeological assessment conducted during preparation of the 2014 EIS indicate that the local and regional groundwater table is located below the current and proposed elevation of the Teven Quarry pit floor. The quarry has been extracted to its maximum depth of 4mAHD without any evidence of groundwater inflows. For this reason, the assessment concludes that the Project will have a negligible impact on groundwater levels, groundwater quality, groundwater receptors, groundwater dependent ecosystems and groundwater users in the local area.

7.2 Approved Criteria

Holcim are required to monitor water quality from discharge events at the Teven Quarry licensed discharge points, in accordance with the requirements of EPL 3293 (provided in **Table 21** and **Table 22).**

Table 21: Water Monitoring Criteria (Teven Quarry EPL 3293) – LDP001 and 002

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Oil and Grease	milligrams per litre				10
pH	pH				6.5-8.5
Total suspended solids	milligrams per litre				50

Table 22: Discharge Sampling Measurement Requirements (Teven Quarry EPL 3293)

POINT 1,2

Pollutant	Units of measure	Frequency	Sampling Method
Oil and Grease	Visible	Special Frequency 1	Visual Inspection
pH	pH	Special Frequency 1	Probe
TSS	milligrams per litre	Special Frequency 1	Grab sample

In addition to these requirements, the site has been requested by the NSW DPE to undertake an assessment based on the condition below:

Schedule 19 Condition 3

In the event that groundwater in excess of negligible quantities is intersected during extraction activities, the Applicant shall undertake a hydrogeological investigation, in consultation with NOW, to the satisfaction of the Secretary.

The investigation must report on groundwater sources, levels, yield and quality; identify any risks to groundwater users or groundwater dependent ecosystems and propose recommended management measures. The Applicant must implement reasonable and feasible management measures to the satisfaction of the Secretary.

Teven Quarry is currently operating above the groundwater table. No groundwater seepage into the quarry void has been recorded. The quarry will continue to visually monitor the void for groundwater seepage and a detailed assessment will be undertaken in accordance with Schedule 19 Condition 3 of the Development Consent should groundwater in excess of negligible quantities be intercepted.

7.3 Water Usage and Storage

Clean upstream catchment runoff is diverted away from the quarry and conveyed to the canefield drains which flow to Maguire's Creek and Emigrant Creek. Runoff from disturbed areas within the quarry operations are managed within the water management system, with this outlined in the *Water Management Plan*.

The Teven Quarry water management system has two dams/storages, the Main Dam and the Pit Dam. Runoff within the quarry pit is managed in the primary siltation storage (Pit Dam), from which surplus water is pumped to the main silt retention storage (Main Dam) at the northern end of the quarry. The quarry water management system is designed to maximise sedimentation of pit runoff on site, prior to reuse on site or discharge via the licensed discharge point.

7.4 Surface Water Results

A detailed spreadsheet of discharge water quality results is attached as **Appendix 2**. In summary:

- pH was sampled weekly from Licenced Discharge Point 2 (Dredge Pond) during the Annual Review period;
- Following liaison with the EPA, they requested additional sampling to be undertaken at the site. From July 5, 2018, the following changes occurred:
  - Continuation of pH monitoring at Point 2, with the sampling time, total suspended solids (TSS), oil and grease levels and comments regarding discharge added to the monitoring spreadsheet; and
- Sampling of Licenced Discharge Point 1 (Silt Pond) from 10 September 2018 was added to the monitoring program, with this including TSS and pH.

For the 2019 Annual Review there will be a more detailed analysis due to there being a full year of data across Point 1 and 2. A summary of the data is outlined in **Table 23**.

Table 23: Summary of Water Quality Data at Teven Quarry – 2018

	Silt Pond Licence Discharge Point 1		Dredge Pond Licence Discharge Point 2		
	TSS (mg/L)	pH	TSS (mg/L)	pH	Oil and Grease (mg/L)
Average	4.9	7.4	2.6	7.5	Nil
Min	1	6.9	1	6.6	Nil
Max	29	7.9	8	8.4	Nil

All water quality results during discharge events were within the EPL criteria.

Longterm Trends:

pH results from 2017 and 2018 at Point 2 show that water samples taken at the Teven Quarry Licence Discharge Point have remained within the relevant EPL criteria. There is little variation between results in 2017 and 2018 with both years recording an average pH level of 7.5 (see **Table 24**).

Table 24: 2017 and 2018 pH Trends at Point 2

Year	pH average	pH maximum	pH minimum
2017	7.5	7.8	6.9
2018	7.5	8.4	6.6

Comparison to EIS Predictions:

The 2018 surface water results remain consistent with the predictions made in the 2014 EIS.

Compliance:

Discharge monitoring was completed in 2018 in accordance with the EPL requirements.

7.5 Groundwater Results

Groundwater monitoring was not undertaken during the 2018 reporting period. As per Schedule 19 Condition 3 of the Development Consent, in the event that groundwater in excess of negligible quantities is intersected during extraction activities, Holcim will undertake a hydrogeological investigation, in consultation with Department of Industry Water, to the satisfaction of the Secretary.

There are no groundwater trends or comparison to EIS predictions.

7.6 Water Take

There has been no groundwater take during the Annual Review period.

7.7 Water Management – Pollution Reduction Program

A Pollution Reduction Program (PRP) was prepared by EMM Consulting, dated 31 January 2019. This has been included as **Appendix 3** to this report.

7.7.1 Basis for PRP

On 7 June 2018, the EPA undertook an inspection of Teven Quarry and observed turbid water in the drainage line between the Main Dam and the current licensed discharge point (LDP 2). The EPA noted concern that water was being discharged from the Site when less than the five-day rainfall event has occurred and that, based on the presence of turbid water, there may be disturbed areas of the Site not draining to a sediment basin.

The EPA also noted concern that:

- Site personnel present at the time of inspection were not aware of the requirement to monitor discharges in accordance with EPL conditions; and
- The Teven Quarry *Water Management Plan* did not adequately reflect EPL conditions in relation to the correct monitoring location of the LDP, and that sampling was being undertaken in the cane drain adjacent to and downstream of the Site which does not accurately reflect the quality of water leaving the Site.

Subsequently the EPA varied EPL 3293 through addition of a PRP as Clause U1, which is reproduced below:

U1 Report – Review the current sediment basin management and stormwater management.

U1.1 The licensee is to review the current sediment basin management and stormwater management of the premise to ensure that:

1. *All disturbed areas on the quarry including run-off from access roads flows to a settlement basin.*

2. *The quarry has capacity to capture the five-day rain event.*

3. *Monitoring occurs for all discharge less than the five-day rain event of 82.5mm.*

A report is to be submitted to the EPA by the 3 September 2018 detailing the review the current sediment basin management and stormwater management.

7.7.2 2018 Completed Improvement Works

On receipt of initial feedback from the EPA following their inspection on 7 June 2018, various site works were undertaken in the vicinity of Stockpile #2 and the adjacent Main Drainage Channel to further improve erosion and sediment control in this part of the quarry. These works were undertaken in early August 2018 and comprised:

- Stabilisation and formalisation of bunding around Stockpile #2. This work involved reconstruction of selected areas of bunding with compacted earth core and rock rip rap lining, with suitable materials sourced on-site. The final bunding is continuous around the stockpile area and observed to be at least 0.5 m high. [Photo 9 of **Appendix 3** – the bunding can be seen in the background of this photo behind the 4WD]; and

- Rock lining and construction of check dams along the Main Drainage Channel. This work involved placement of concrete blocks, wrapped in geofabric and embedded into the ground, and placement of rock rip rap to create a series of check dams along the channel. The check dams were observed to be in the order of 0.5 to 1 m deep, with extensive rip rap lining of the lower channel reach approaching the LDP. [Photos 16 and 17 of **Appendix 3**].

Ongoing monitoring of erosion and sediment control measures, and improvement where necessary, is also evidenced by observation of the following works also recently constructed in September 2018:

- Concrete lining of selected catch drains subject to high velocity flows for erosion control within Catchment C1 [Photo 18 of **Appendix 3**]; and

- Construction of a diversion bund and cross-drain at a key location across the main access track within Catchment C1, with associated piped drainage to direct sediment laden runoff into the Pit Dam.

7.7.3 Improvements Proposed for 2019

The following recommendations were outlined in the PRP and are proposed for 2019:

- Review/audit of all existing bunding of various forms/construction around Catchment C5 should be undertaken to confirm that containment measures are continuous and effective at preventing offsite discharge. If necessary, improvement or enhancement of existing controls should then be undertaken.
- It is noted that bunding is considered to form an effective sediment control for this area, and with no prior evidence or history of uncontrolled discharge from the Site (including from recent rainfall in 2018 that was well in excess of the five-day rainfall event) a formal sediment basin is not considered necessary to manage the risk of discharge in this location.
- At the time of inspection in October 2018 low flows in the Main Drainage Channel were observed to be conveyed within the voids in the rock rip rap lining, and left the Site beneath the concrete block that forms the intended discharge weir. This created a situation where it was not possible to obtain consistency in sampling location. On this basis a preliminary recommendation was made that concrete lining of the channel at its downstream end was undertaken to effectively lift the invert of the channel up and match into the top of the concrete block weir, so that the full range of flow rates would be conveyed over the weir.
- These works were undertaken in early December 2018 [Photo 19] and appear effective in producing a consistent sampling point at the LDP and in restricting seepage behind the block weir. No further improvements are considered necessary at this location.
- Several improvements to water monitoring procedures and record keeping are recommended for capture in an updated version of the WMP (refer Section 7), including:
    - to ensure discharge sampling occurs at a consistent location at the LDP at all times; and
    - improvement of record keeping to capture additional details (eg. timing of sampling when undertaken, affirmation of oil/grease observations).

Further investigation of the source and potential remedial measures to address seepage and resulting continuous discharge below the Main Dam could also be contemplated if it is considered desirable to reduce EPL compliance costs. It is noted that more frequent water quality monitoring is currently required than would otherwise be needed if the seepage was able to be stopped.

7.7.4 Updates to the Water Management Plan

There will be some updates to the *Water Management Plan* as per Section 7 of the PRP (**Appendix 3**).

8 REHABILITATION AND LANDSCAPE MANAGEMENT

8.1 Rehabilitation Performance during the Reporting Period

The site is required to undertake biodiversity and rehabilitation in accordance with the requirements in **Table 25.**

Table 25: Biodiversity and Rehabilitation Requirements for Teven Quarry (SSD 6422)

27. The Applicant shall rehabilitate the site to the satisfaction of the Secretary. This rehabilitation must be generally consistent with the rehabilitation strategy in the EIS and the conceptual final landform in Appendix 2, and must comply with the objectives in Table 5.

Table 5: Biodiversity and Rehabilitation objectives

Feature	***Objective***
Site (as a whole)	• Safe, stable and non-polluting • Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and designed to minimise the visual impacts of the development when viewed from surrounding land • Restored with native, endemic vegetation
Surface Infrastructure	• Decommissioned and removed, unless the Secretary agrees otherwise
Quarry Benches	• Landscaped and vegetated using native tree and understorey species
Quarry Pit Floor	• Landscaped and revegetated using native tree and understorey species, above the final anticipated void water level

Progressive Rehabilitation

28. The Applicant shall rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim stabilisation measures must be implemented where reasonable and feasible to control dust emissions in disturbed areas that are not active and which are not ready for final rehabilitation.

Note: It is accepted that parts of the site that are progressively rehabilitated may be subject to further disturbance in future.

No rehabilitation was completed in 2018 at the site.

Table 26: Rehabilitation Performance in 2018

Guideline Requirement	Site Comment
Extent of the operations and rehabilitation at completion of the reporting period	There was no rehabilitation completed during the Annual Review period. Operations were completed within the existing quarry footprint.
Agreed post- rehabilitation land use	According to the *Biodiversity and Rehabilitation Management Plan*, vegetation communities consist of: ● Mixed Eucalyptus Forest; ● Brushbox Forest; and ● Subtropical Rainforest.
Key rehabilitation performance indicators	Key rehabilitation indicators are outlined within Section 7 of the *Biodiversity and Rehabilitation Management Plan*.
Renovation or removal of buildings	No building removal during the Annual Review period.
Any other Rehabilitation Taken including: ● Exploration activities; ● Infrastructure; ● Dams; and The installation or maintenance of fences, bunds and any other works.	There was no rehabilitation completed during the Annual Review period.
Any rehabilitation areas which have received formal sign off from DRG	No rehabilitation has received signoff during the Annual Review period.

Guideline Requirement	Site Comment
Variations to activities undertaken to those proposed (including why there were variations and whether DRG was notified)	No rehabilitation completed during the Annual Review period.
Outcomes of trials, research projects and other initiatives	No trials were conducted during the Annual Review period.
Key issues that may affect successful rehabilitation	There are several potential issues that can affect rehabilitation including availability of material, seed stock, climatic events and rehabilitation methodology.

8.2 Summary of Current Rehabilitation and Performance

A summary of the rehabilitation and disturbance status of Teven Quarry is outlined in **Table 27.** Current rehabilitation and disturbance are shown **on Figure 3.**

Table 27: Rehabilitation and Disturbance Status

Quarry Area Type	Previous 2017 Annual Review Period (ha)	Current 2018 Annual Review Period (ha)	Next 2019 Annual Review Period (ha)
A. Total Quarry Footprint[1]	17.1	17.1	17.1
B. Total Active Disturbance[2]	17.1	17.1	17.1
C. Land Being Prepared for Rehabilitation[3]	0	0	0
D. Land Under Active Rehabilitation[4]	0	0	0
E. Completed Rehabilitation[5]	0	0	0

1 Total disturbance and rehabilitation.
2 Total disturbance within the Project Approval boundary
3 Rehabilitation that is being shaped in a phase of decommissioning, landform establishment and growth medium development.
4 rehabilitation under a phase of ecosystem and land use establishment or ecosystem and land use sustainability
5 This refers to rehabilitation that has been signed off from the DRG.

At the end of 2018 there was approximately 17.1 Ha of active disturbance. There is no proposed additional disturbance in 2019 at Teven Quarry. There is no active rehabilitation at Teven Quarry, and none proposed in 2019.

Figure 3: Teven Quarry Rehabilitation and Disturbance

8.3 Actions for the Next Reporting Period

The DPE 2015 Annual Review Guidelines require the Annual Review to outline the rehabilitation actions proposed during the next reporting period. These actions are detailed in **Table 28**.

Table 28: Rehabilitation and Closure Actions for the Next Reporting Period

Requirement	Site Comment
Describe the steps to be undertaken to progress agreement during next reporting period, where final rehabilitation outcomes have not yet been agreed between stakeholders.	A program for progressive rehabilitation will be established once areas become available for rehabilitation.
Outline proposed rehabilitation trials, research projects and other initiatives to be undertaken during next reporting period.	No proposed rehabilitation trials.
Summary of rehabilitation activities proposed for next report period.	All benches will be active next reporting period and hence there will be no area in need of rehabilitation.

9 WASTE MANAGEMENT

9.1 Waste Streams

Waste streams produced at Teven Quarry are categorised as:

- Waste oil, filters, grease cartridges;
- Scrap metal;
- Tyres;
- Office paper and general rubbish;
- Silt (from aggregate washing); and
- Waste water from amenities and office.

9.2 Waste Management

All waste generated by Teven Quarry is managed by way of Council collection services, via licensed waste contractors or onsite treatment. No on-site disposal of general waste occurs. Teven Quarry is committed to reducing, reusing and recycling wastes prior to disposal.

Key components of waste management are:

- All waste oil is collected and stored in containers within a covered and bunded area and is removed from the site by an appropriately licensed contractor;
- All oil filters are separately stored and returned to the manufacturer for reuse by appropriately licensed contractor;
- Scrap metal is deposited into a dedicated skip bin for periodic collection and recycling by an appropriately licenced contractor;
- Diesel fuel is stored within a self-bunded, above-ground tank and all refuelling is undertaken on a hardstand area which drains to an oil/water separator (refer waste oil disposal);
- Silt is captured in on-site silt control structures and is periodically removed and placed/stored in the product stockpile area or overburden materials for use;
- All waste tyres are removed by the supplier of replacement tyres;
- All paper (1 x $3m^3$ bin) and general waste (2 x $3m^3$ bin) originating from the office and amenities buildings, as well as packaging from routine equipment is placed in the appropriate skips for collection by Council or a licensed contractor for disposal/ recycling at an appropriate waste management facility; and
- Waste water from amenities is treated and disposed of via an on-site septic tank with absorption trenches/pump out.

10 COMMUNITY

10.1 Community Engagement Activities

Holcim has maintained community engagement measures during the reporting period by undertaking the following activities:

- Maintenance of a website (containing publicly available documents;
- A telephone number, email and postal address (on the website) for community complaints and feedback;
- A copy of the Complaints Register is maintained on the company website; and
- All documents and items displayed on the website are regularly updated by Holcim staff.

10.2 Community Contributions

Holcim has maintained community contributions by sponsoring the following local sporting clubs and providing product to the local school.

10.3 Complaints

A review of the Holcim Safety, Health & Environment (SHE) reporting database (INX) identified four complaints from external stakeholders during the 2018 reporting period. A summary of complaints is outlined below:

Table 29 Complaints Summary

Date	Complaint	Response
21 May 2018	Noise complaint regarding truck breaks.	Liaison with complainant. Holcim reviewed data and this was not a Holcim truck. Holcim believe it was a council truck.
25 May 2018	Noise complaint regarding truck breaks.	Liaison with complainant. Holcim reviewed data and this was not a Holcim truck
25 June 2018	Blasting Complaint - EPA rang had a complaint concerning 505 Teven Road on Explosions within this area was it Holcim Teven Quarry - Holcim Teven quarry had no blasts on this day. The EPA were referred to Boral.	Liaison with EPA. No further actions.
19 June 2018	Water complaint – Ballina Council water inspector requested inspection of drains on quarry boundary as they had a complaint that water dirty was leaving an area nearby to the quarry.	Council inspector informed after inspection Quarry drains no concern and was the property next door - no action required.

A copy of the register, as well as all publicly listed information including contacts for locals in the community is available on the Teven Quarry webpage in accordance with the Development Consent requirements (http://www.holcim.com.au/about-us/community-link/teven-quarry-teven-ballina-nsw.html).

There were no complaints in 2017, with there being three complaints in 2018.

11 INDEPENDENT AUDIT

The site undertook an Independent Environmental Audit (IEA) in 2016 in accordance with the timeframes of the Development Consent. All recommendations raised in IEA have been actioned in accordance with the report prepared by GHD Consultants. According to the previous Annual Review, all actions have been closed out. The next IEA is due in 2019.

12 INCIDENTS AND NON-COMPLIANCE

Table 30 summarises the incidents and non - compliances at Teven in 2018.

Table 30: Summary of Incidents and Non Compliances

Date	Incident/Non Compliance	Action
Throughout the period	**Schedule 3 Condition 11 - SSD 6422 – Dust Monitoring Criteria** PM_{10} Monitoring • The PM_{10} 24 hour criteria of 50 µg/m^3 was exceeded on 5 occasions. These are highlighted bold in the table above (11 August, 6 September, 10 November, 4 December and 6 November); • There was no sample taken on the 17 July 2018. This was due to an issue with power supply	Continuation of monitoring in 2018. Determine if offsite dust sources are responsible for higher readings.
Throughout the period	**Schedule 3 Condition 15 – Meteorological Monitoring** A meteorological monitoring station was installed at Teven Quarry in late 2016 to obtain data in accordance with the requirements of Schedule 3, Condition 15 of the Development Consent. However there have been numerous issues with the station in 2018, therefore data from the Bureau of Meteorology Ballina Airport Weather Station has been used for this Annual Review.	Liaison with monitoring contractor to improve the capture of the meteorological station.

13 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Holcim staff will undertake the following works and improvement measures and projects at Teven Quarry in 2019 to ensure compliance with the Development Consent and EPL 3293, and to ensure that effective environmental management controls are in place and operating in accordance with the requirements of the Development Consent. **Table 31** outlines proposed actions for 2019.

Table 31: Improvement Actions for 2018

Improvement Measure	Activities
PM_{10}	Improve the PM_{10} sampling and analysis process in 2019 to operate as per the Development Consent requirements. Reduction in short term non compliances.
Depositional dust	Liaise with the EPA and DPE about moving DDG2 to a more suitable location, where there is less likelihood of contamination.
Biodiversity	Weed spraying will continue at site during the next Annual Review period.
Water sampling	Complete all weekly pH sampling during the Annual Review period. Continue with the expanded monitoring suite.
Groundwater Assessment	Condition 3, Schedule 19 *In the event that groundwater in excess of negligible quantities is intersected during extraction activities, the Applicant shall undertake a hydrogeological investigation, in consultation with NOW, to the satisfaction of the Secretary.* *The investigation must report on groundwater sources, levels, yield and quality; identify any risks to groundwater users or groundwater dependent ecosystems and propose recommended management measures. The Applicant must implement reasonable and feasible management measures to the satisfaction of the Secretary.* Holcim will continue to monitor the quarry void for groundwater seepage to ensure that groundwater quantities remain negligible.

APPENDIX 1
QUARTERLY NOISE RESULTS

Noise Monitoring Assessment Quarterly

Teven Quarry, Teven, NSW
March 2018.

Prepared for: VGT Pty Ltd
(on behalf of Holcim (Australia) Pty Ltd)
April 2018
MAC170439RP5

Muller Acoustic Consulting

Document Information

Quarterly Noise Monitoring Assessment

Teven Quarry, Teven, NSW

March 2018

Prepared for: VGT Pty Limited (on behalf of Holcim Pty Ltd)

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

Document ID	Status	Date	Prepared By	Signed
MAC170439RP5	Final	10 April 2018	Oliver Muller	

CONTENTS

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by VGT Pty Limited (VGT) on behalf of Holcim Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Teven Quarry ('the quarry'), Teven, NSW.

The monitoring has been conducted in accordance with the Teven Noise Management Plan and in general accordance with relevant conditions outlined in the Development Consent (ref: SSD 6422); at five representative monitoring locations. This assessment has been undertaken during Quarter 1, March 2018, and forms part of the noise monitoring program for the quarry.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Department of Planning and Environment, Development Consent (SSD 6422), 2015; and
- Standards Australia AS 1055.1:1997 - Acoustics - Description and measurement of environmental noise - General Procedures.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Noise Criteria

Schedule 3 of the Teven Quarry Development Consent (2015), outlines the applicable noise criteria for residential receivers surrounding the quarry site.

Table 1 reproduces relevant criteria for each of the receivers as outlined in Table 2 of the quarry's Development Consent.

Table 1 Noise Criteria

Location[1]	Quarry Operations	
	Period: Day	Period: Evening
	7am – 6pm	6pm – 10pm
	dBA, $L_{Aeq(15min)}$	dBA, $L_{Aeq(15min)}$
R3, R4, R13, R15, R16, R17, R18, R20	38	35
All other receivers	37	35

Note 1: Receiver locations are shown in Figure 1.

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3 Methodology

3.1 Locality

The quarry is located in Teven, NSW approximately 7km west of Ballina, NSW. Receivers in the locality surrounding the quarry are primarily rural. The surroundings of the quarry include bushland and farming pastures. The monitoring locations with respect to the quarry are presented in the locality plan shown in **Figure 1.**

3.2 Noise Monitoring Locations

Table 2 presents details of monitoring locations, representative to receiver locations.

Table 2 Monitoring Locations

Location	Nearest Receiver	Easting	Northing
N1	R7	547017	6810098
N2	R3/R4	548877	6810290
N3	R2	548642	6810801
N4	R10	547729	6810226
N5	R15	547793	6808998

3.3 Assessment Methodology

The attended noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055-1997, "Acoustics - Description and Measurement of Environmental Noise and the NPI. The measurements were carried out using a Svantek Type 1, 971 noise analyser on Monday 26 March 2018. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

As per the Noise Management Plan, two day and two evening measurements were conducted at each monitoring location. Measurements were of 15 minutes in duration and where possible, throughout each survey the operator quantified the contribution of each significant noise source. Extraneous noise sources were excluded from the analysis as to calculate the $LA_{eq(15min)}$ quarry noise contribution for comparison against the relevant noise criteria. It is noted that the quarry was not operational during the evening period therefore quarry noise contributions are not applicable.

FIGURE 1

LOCALITY PLAN

REF: MAC170439

0 150m

KEY

N1 RECEIVER LOCATION

SITE LOCATION

MAC
Muller Acoustic Consulting

*Imagery Source : nearmaps

4 Results

4.1 Assessment Results - Location N1

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N1 for Monday 26 March 2018 are presented in **Table 3**.

Table 3 Operator-Attended Noise Survey Results – Location N1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
26/03/2018	14:26 (Day)	60	41	36	Dir: NE Wind Speed: 0.5m/s Rain: Nil	Aircraft 35-57 Birds 36-46 Insects <36 Wind in trees 36-42
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	14:41 (Day)	66	44	36	Dir: NE Wind Speed: 0.1m/s Rain: Nil	Insects 36-43 Birds 36-45 Local traffic 36-66 Aircraft 35-46
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	18:00 (Evening)	78	53	41	Dir: NE Wind Speed: 1.5m/s Rain: Nil	Birds 46-75 Wind in trees 38-48 Local residential noise 46-52 Local traffic 43-54
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	18:15 (Evening)	69	49	43	Dir: NE Wind Speed: 1.5m/s Rain: Nil	Local traffic 44-52 Birds 42-48 Wind in trees 42-50
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2 Assessment Results - Location N2

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N2 for Monday 26 March 2018 are presented in **Table 4**.

Table 4 Operator-Attended Noise Survey Results – Location N2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
26/03/2018	15:10 (Day)	86	65	45	Dir: NE Wind Speed: 1m/s Rain: Nil	Local traffic 47-85 Local residential noise 43-47 Birds 44-46 Wind in trees <47
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	15:26 (Day)	86	66	48	Dir: NE Wind Speed: 1.5m/s Rain: Nil	Birds 42-46 Wind in trees <42 Local residential traffic 42-86 Local residential noise 42-46
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	18:41 (Evening)	79	59	41	Dir: NE Wind Speed: 1m/s Rain: Nil	Birds 39-46 Insects <39 Local residential traffic 39-78 Wind in trees 41-46 Aircraft 41-56
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	18:57 (Evening)	77	51	39	Dir: NE Wind Speed: 0.5m/s Rain: Nil	Birds 44-52 Insects <39 Local residential traffic 41-76 Aircraft 42-53 Wind in trees 42-46
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.3 Assessment Results - Location N3

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N3 for Monday 26 March 2018 are presented in **Table 5**.

Table 5 Operator-Attended Noise Survey Results – Location N3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
26/03/2018	15:48 (Day)	69	48	41	Dir: NE Wind Speed: 1m/s Rain: Nil	Wind in grass 42-49 Insects 42-44 Aircraft 46-67
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	16:04 (Day)	66	48	42	Dir: NE Wind Speed: 1.5m/s Rain: Nil	Insects <42 Wind in trees 42-52 Aircraft 45-62
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	19:15 (Evening)	64	48	45	Dir: NE Wind Speed: 1m/s Rain: Nil	Insects <39 Wind in trees 39-42 Distant traffic 37-41 Aircraft 39-52
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	19:30 (Evening)	62	51	50	Dir: NE Wind Speed: 1.5m/s Rain: Nil	Aircraft 39-52 Insects <39 Distant traffic 38-42
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.4 Assessment Results - Location N4

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N4 for Monday 26 March 2018 are presented in **Table 6**.

Table 6 Operator-Attended Noise Survey Results – Location N4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
26/03/2018	16:29 (Day)	73	48	41	Dir: NE Wind Speed: 1m/s Rain: Nil	Insects <38 Wind in grass 38-44 Quarry haul trucks 36-38 Distant traffic <40 Local traffic 42-71 Birds 45-48
Teven Quarry $L_{Aeq(15min)}$ Contribution						37
26/03/2018	16:45 (Day)	76	55	39	Dir: NE Wind Speed: 1m/s Rain: Nil	Wind in trees 38-44 Aircraft 42-62 Birds 40-46 Local residential traffic 42-75
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	19:49 (Evening)	53	49	47	Dir: NE Wind Speed: 1m/s Rain: Nil	Insects 39-50 Distant traffic <39 Aircraft 39-52
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible
26/03/2018	20:04 (Evening)	59	45	43	Dir: NE Wind Speed: 1m/s Rain: Nil	Insects 49-51 Aircraft 51-54 Distant traffic <49 Local residential traffic 46-54
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Inaudible

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.5 Assessment Results - Location N5

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N5 for Monday 26 March 2018 are presented in **Table 7**.

Table 7 Operator-Attended Noise Survey Results – Location N5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
26/03/2018	17:05 (Day)	85	64	40	Dir: NE Wind Speed: 1.5m/s Rain: Nil	Local residential noise <42 Wind in trees 42-48 Aircraft 44-50 Birds 42-52 Local residential traffic 36-81
		Teven Quarry $L_{Aeq(15min)}$ Contribution				Quarry Inaudible
26/03/2018	17:20 (Day)	86	62	42	Dir: NE Wind Speed: 1.5m/s Rain: Nil	Wind in trees 53-46 Local residential traffic 43-82 Birds 40-46 Aircraft 44-50
		Teven Quarry $L_{Aeq(15min)}$ Contribution				Quarry Inaudible
26/03/2018	20:23 (Evening)	84	57	39	Dir: NE Wind Speed: 1m/s Rain: Nil	Local traffic 42-76 Insects <42
		Teven Quarry $L_{Aeq(15min)}$ Contribution				Quarry Inaudible
26/03/2018	23:38 (Evening)	78	49	39	Dir: NE Wind Speed: 1m/s Rain: Nil	Local traffic 42-77 Insects <43
		Teven Quarry $L_{Aeq(15min)}$ Contribution				Quarry Inaudible

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

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5 Noise Compliance Assessment

The compliance assessment for each residential receiver R2, R3/R4, R7, R10 and R15 are presented in **Table 8** and **Table 9** for day and evening assessment periods.

Table 8 Daytime Noise Compliance Assessment

Receiver No.	Monitoring Locations	Quarry Noise Contribution	Quarry Noise Criteria	Compliant
		dBA, $L_{Aeq(15min)}$	dBA, $L_{Aeq(15min)}$	
R2	N3	Nil	37	✓
R3/R4	N2	Nil	38	✓
R7	N1	Nil	37	✓
R10	N4	37	37	✓
R15	N5	Nil	38	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Table 9 Evening Noise Compliance Assessment

Receiver No.	Monitoring Locations	Quarry Noise Contribution	Quarry Noise Criteria	Compliant
		dBA, $L_{Aeq(15min)}$	dBA, $L_{Aeq(15min)}$	
R2	N3	Nil	35	✓
R3/R4	N2	Nil	35	✓
R7	N1	Nil	35	✓
R10	N4	Nil	35	✓
R15	N5	Nil	35	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

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6 Discussion

6.1 Discussion of Results - Location N1

Monitoring on 26 March 2018 identified that Teven Quarry noise was inaudible during all four measurements, and therefore satisfied the daytime noise limits of 37dBA. It is noted that the quarry was not operational during the evening period however background measurements were undertaken for completeness and as per the EPL. Extraneous sources audible during the four attended surveys included aircraft, birds, insects, wind in trees, local residential noise and local traffic.

6.2 Discussion of Results - Location N2

Monitoring results for N2 during the March 2018 quarter were dominated by local traffic that was mostly constant during all four measurements. Quarry emissions were inaudible on all four occasions, therefore satisfying the relevant daytime noise limit of 38dBA. The quarry was not operational during the evening period therefore satisfying the evening noise limit of 35dBA. Extraneous sources measured include local residential traffic, local residential noise, birds, wind in trees, insects and aircraft.

6.3 Discussion of Results - Location N3

Quarry noise was inaudible during all four measurements during the March 2018 survey period, therefore satisfying the daytime criteria of 37dBA. The quarry was not operational during the evening period therefore satisfying the evening criteria of 35dBA. Non-quarrying noise sources included wind in grass, insects, aircraft and distant traffic.

6.4 Discussion of Results - Location N4

Quarry noise was audible during one of four noise measurements at N4 for the March 2018 quarter with the one audible measurement contributing to 37dBA and therefore the relevant daytime noise limit of 37dBA was satisfied. It is noted that the quarry was not operational during the evening period, therefore satisfying the evening noise limit of 35dBA. Non-quarrying sources include insects, wind in grass, distant traffic, local traffic, birds and aircraft all audible throughout the four noise measurements.

6.5 Discussion of Results - Location N5

Quarry noise was inaudible during all four measurements throughout the March 2018 monitoring quarter at N5. Therefore, quarry emissions satisfied the relevant daytime noise limit of 38dBA. It is noted that the quarry was not operational during the evening period and therefore satisfied the evening noise limit of 35dBA. Local traffic was the dominant source at this receiver with other non-quarrying sources including local residential noise, aircraft, wind in trees, birds, local residential traffic and insects all audible during the March 2018 quarter.

7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) for VGT Pty Ltd on behalf of Holcim Pty Ltd at the Teven Quarry, Teven, NSW. The assessment was completed to assess the quarry's compliance with the relevant criteria outlined in their Conditions of Consent for relevant surrounding residential receivers. It is again reiterated that the quarry was not operational during the evening period on 26 March 2018 although measurements were completed as per the EPL which is considered a comprehensive assessment approach.

Attended noise measurements were undertaken on 26 March 2018 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry comply with relevant statutory noise criteria specified in the Conditions of Consent at all assessed residential receivers.

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Appendix A - Glossary of Terms

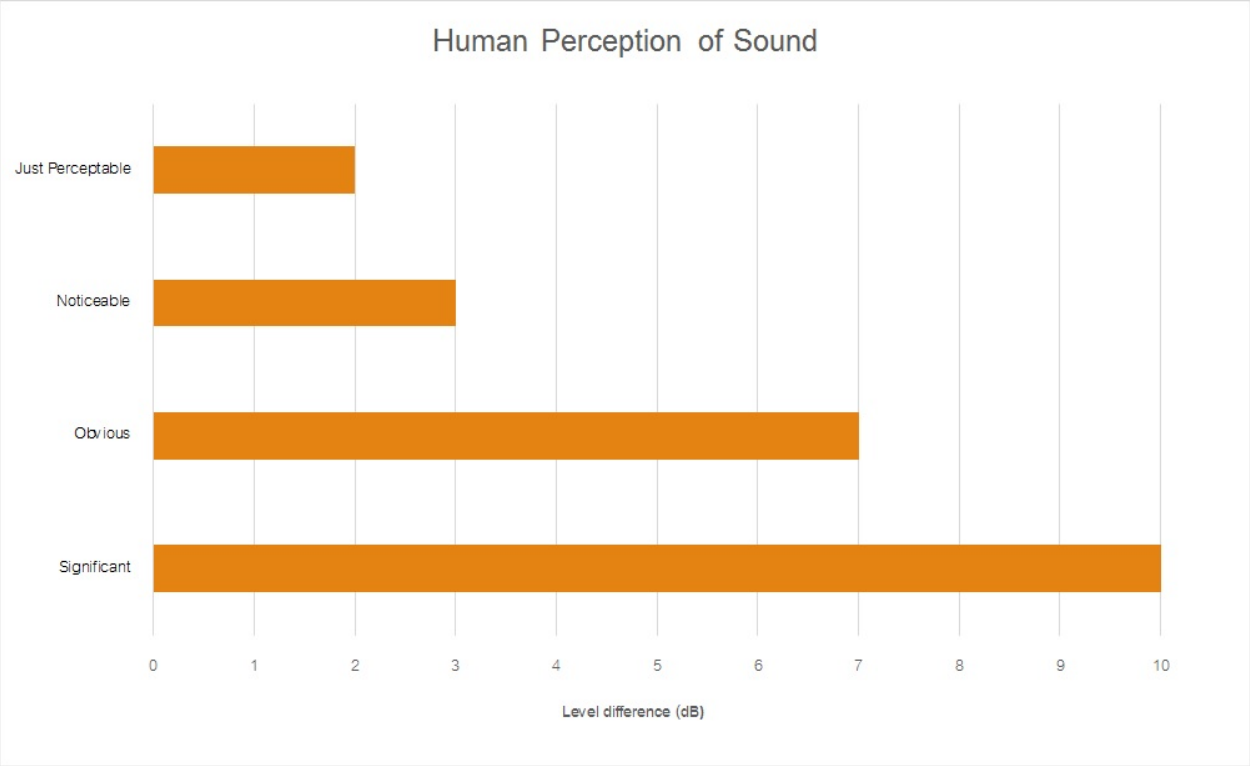
Table A1 provides a number of technical terms have been used in this report.

Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

MAC
Muller Acoustic Consulting

Noise Monitoring Assessment Quarterly

Teven Quarry, Teven, NSW
June 2018.

Prepared for: VGT Laboratories Pty Ltd
(on behalf of Holcim (Australia) Pty Ltd)
June 2018
MAC170439RP6

Muller Acoustic Consulting

Document Information

Quarterly Noise Monitoring Assessment

Teven Quarry, Teven, NSW

June 2018

Prepared for: VGT Laboratories Pty Limited (on behalf of Holcim (Australia) Pty Ltd)

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

Document ID	Status	Date	Prepared By	Signed
MAC170439RP6	Final	27 June 2018	Oliver Muller	

CONTENTS

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by VGT Laboratories Pty Limited (VGT) on behalf of Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Teven Quarry ('the quarry'), Teven, NSW.

The monitoring has been conducted in accordance with the Teven Noise Management Plan and in general accordance with relevant conditions outlined in the Development Consent (ref: SSD 6422); at five representative monitoring locations. This assessment has been undertaken during Quarter 2, June 2018, and forms part of the noise monitoring program for the quarry.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Department of Planning and Environment, Development Consent (SSD 6422), 2015; and
- Standards Australia AS 1055.1:1997 - Acoustics - Description and measurement of environmental noise - General Procedures.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Noise Criteria

Schedule 3 of the Teven Quarry Development Consent (2015), outlines the applicable noise criteria for residential receivers surrounding the quarry site.

Table 1 reproduces relevant criteria for each of the receivers as outlined in Table 2 of the quarry's Development Consent.

Table 1 Noise Criteria

Location[1]	Quarry Operations	
	Period: Day	Period: Evening
	7am – 6pm	6pm – 10pm
	dBA, $L_{Aeq(15\text{-}min)}$	dBA, $L_{Aeq(15\text{-}min)}$
R3, R4, R13, R15, R16, R17, R18, R20	38	35
All other receivers	37	35

Note 1: Receiver locations are shown in Figure 1.

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3 Methodology

3.1 Locality

The quarry is located in Teven, NSW approximately 7km west of Ballina, NSW. Receivers in the locality surrounding the quarry are primarily rural. The surroundings of the quarry include bushland and farming pastures. The monitoring locations with respect to the quarry are presented in the locality plan shown in **Figure 1.**

3.2 Noise Monitoring Locations

Table 2 presents details of monitoring locations, representative to receiver locations.

Table 2 Monitoring Locations

Location	Nearest Receiver	Easting	Northing
N1	R7	547017	6810098
N2	R3/R4	548877	6810290
N3	R2	548642	6810801
N4	R10	547729	6810226
N5	R15	547793	6808998

3.3 Assessment Methodology

The attended noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055-1997, "Acoustics - Description and Measurement of Environmental Noise and the NPI. The measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 20 June 2018. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

As per the Noise Management Plan, two day and two evening measurements were conducted at each monitoring location. Measurements were of 15 minutes in duration and where possible, throughout each survey the operator quantified the contribution of each significant noise source. Extraneous noise sources were excluded from the analysis as to calculate the $LA_{eq(15\text{-}min)}$ quarry noise contribution for comparison against the relevant noise criteria. It is noted that the quarry was not operational during the evening period therefore quarry noise contributions are not applicable.

FIGURE 1

LOCALITY PLAN

REF: MAC170439

0 150m

KEY

N1 RECEIVER LOCATION

SITE LOCATION

MAC
Muller Acoustic Consulting

*Imagery Source : nearmaps

4 Results

4.1 Assessment Results - Location N1

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N1 for Wednesday 20 June 2018 are presented in **Table 3**.

Table 3 Operator-Attended Noise Survey Results – Location N1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
20/06/2018	09:09 (Day)	69	56	50	Dir: SW Wind Speed: 2.5 m/s Rain: Nil	Wind in trees 46-60 Local traffic 44-64 Aircraft 48-69 Birds 49-51
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	09:25 (Day)	77	57	48	Dir: SW Wind Speed: 2.5 m/s Rain: Nil	Wind in trees 44-58 Local traffic 52-62 Aircraft 47-77 Local residential noise 46-51
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	18:12 (Evening)	74	51	41	Dir: SW Wind Speed: 2 m/s Rain: Nil	Wind in trees 46-60 Distant traffic <42 Local traffic 44-74
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	18:28 (Evening)	79	53	41	Dir: SW Wind Speed: 2 m/s Rain: Nil	Wind in trees 38-56 Distant traffic <38 Local traffic 41-79
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2 Assessment Results - Location N2

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N2 for Wednesday 20 June 2018 are presented in **Table 4**.

Table 4 Operator-Attended Noise Survey Results – Location N2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
20/06/2018	09:53 (Day)	85	61	47	Dir: SW Wind Speed: 2 m/s Rain: Nil	Birds 48-57 Wind in trees 42-48 Local traffic 46-84 Dog bark 49-51 Local residential noise 49-56
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	10:09 (Day)	92	66	53	Dir: SW Wind Speed: 2 m/s Rain: Nil	Wind in trees 46-61 Birds 49-58 Local traffic 46-92 Dog bark 48-51 Aircraft 52- 68
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	18:56 (Evening)	82	55	40	Dir: SW Wind Speed: 1.5 m/s Rain: Nil	Wind in trees 36-46 Local traffic 48-82 Distant traffic <39
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	19:12 (Evening)	81	53	41	Dir: SW Wind Speed: 1.5 m/s Rain: Nil	Wind in grass 34-46 Distant traffic <38 Local traffic 36-81 Aircraft 38-46
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.3 Assessment Results - Location N3

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N3 for Wednesday 20 June 2018 are presented in **Table 5**.

Table 5 Operator-Attended Noise Survey Results – Location N3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
20/06/2018	10:34 (Day)	81	58	49	Dir: SW Wind Speed: 3 m/s Rain: Nil	Wind in grass 42-81
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	10:49 (Day)	78	58	50	Dir: SW Wind Speed: 3 m/s Rain: Nil	Wind in grass 44-78 Local residential noise 50-65
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	19:29 (Evening)	55	41	38	Dir: SW Wind Speed: 1 m/s Rain: Nil	Distant traffic 34-38 Wind in grass 36-55 Insects <34 Aircraft 38-44
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	19:44 (Evening)	59	41	37	Dir: SW Wind Speed: 1 m/s Rain: Nil	Wind in trees 38-59 Distant traffic 36-40 Aircraft 39-46
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.4 Assessment Results - Location N4

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N4 for Wednesday 20 June 2018 are presented in **Table 6**.

Table 6 Operator-Attended Noise Survey Results – Location N4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
20/06/2018	11:15 (Day)	81	62	53	Dir: SW Wind Speed: 3 m/s Rain: Nil	Wind in trees 46-73 Birds <58 Local traffic 58-81
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	11:30 (Day)	84	62	52	Dir: SW Wind Speed: 3 m/s Rain: Nil	Local traffic 62-84 Wind in grass 48-68 Aircraft 54-66
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	20:05 (Evening)	51	38	36	Dir: SW Wind Speed: 0.5 m/s Rain: Nil	Insects <32 Distant traffic 32-38 Wind in trees 36-51
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	20:21 (Evening)	54	37	34	Dir: SW Wind Speed: 0.5 m/s Rain: Nil	Insects <32 Distant traffic 32-38 Aircraft 38-54
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.5 Assessment Results - Location N5

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N5 for Wednesday 20 June 2018 are presented in **Table 7**.

Table 7 Operator-Attended Noise Survey Results – Location N5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
20/06/2018	11:53 (Day)	87	65	56	Dir: SW Wind Speed: 2.5 m/s Rain: Nil	Local traffic 48-87 Wind in trees 42-58 Local residential noise 56-63
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	12:08 (Day)	84	64	55	Dir: SW Wind Speed: 2.5 m/s Rain: Nil	Wind in trees 42-63 Local traffic 46-84 Birds <46
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	20:44 (Evening)	86	58	35	Dir: SW Wind Speed: 0.5 m/s Rain: Nil	Local traffic 36-86 Insects <32 Distant traffic 32-38 Wind in grass 32-36 Birds 32-36
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible
20/06/2018	20:59 (Evening)	88	60	35	Dir: SW Wind Speed: 0.5 m/s Rain: Nil	Insects <32 Distant traffic 32-36 Local traffic 38-88
Teven Quarry $L_{Aeq(15\text{-}min)}$ Contribution						Quarry Inaudible

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

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5 Noise Compliance Assessment

The compliance assessment for each residential receiver R2, R3/R4, R7, R10 and R15 are presented in **Table 8** and **Table 9** for day and evening assessment periods.

Table 8 Daytime Noise Compliance Assessment

Receiver No.	Monitoring Locations	Quarry Noise Contribution	Quarry Noise Criteria	Compliant
		dBA, $L_{Aeq(15\text{-}min)}$	dBA, $L_{Aeq(15\text{-}min)}$	
R2	N3	Nil	37	✓
R3/R4	N2	Nil	38	✓
R7	N1	Nil	37	✓
R10	N4	Nil	37	✓
R15	N5	Nil	38	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Table 9 Evening Noise Compliance Assessment

Receiver No.	Monitoring Locations	Quarry Noise Contribution	Quarry Noise Criteria	Compliant
		dBA, $L_{Aeq(15\text{-}min)}$	dBA, $L_{Aeq(15\text{-}min)}$	
R2	N3	Nil	35	✓
R3/R4	N2	Nil	35	✓
R7	N1	Nil	35	✓
R10	N4	Nil	35	✓
R15	N5	Nil	35	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

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6 Discussion

6.1 Discussion of Results - Location N1

Monitoring on 20 June 2018 identified that Teven Quarry noise was inaudible during all four measurements, and therefore satisfied the daytime noise limit of 37dBA $L_{Aeq(15\text{-}min)}$. It is noted that the quarry was not operational during the evening period however background measurements were undertaken for completeness and as per the EPL. Extraneous sources audible during the four attended surveys included wind in trees, local residential noise, aircraft, birds, local and distant traffic.

6.2 Discussion of Results - Location N2

Monitoring results for N2 during the June 2018 quarter were dominated by local traffic that was generally constant during all four measurements. Quarry emissions were inaudible on all four occasions, therefore satisfying the relevant daytime noise limit of 38dBA $L_{Aeq(15\text{-}min)}$. The quarry was not operational during the evening period therefore satisfying the evening noise limit of 35dBA $L_{Aeq(15\text{-}min)}$. Extraneous sources measured include birds, wind in trees, local traffic, local residential noise, dog bark and aircraft noise.

6.3 Discussion of Results - Location N3

Quarry noise was inaudible during all four measurements during the June 2018 survey period, therefore satisfying the daytime criteria of 37dBA $L_{Aeq(15\text{-}min)}$. The quarry was not operational during the evening period therefore satisfying the evening criteria of 35dBA $L_{Aeq(15\text{-}min)}$. Non-quarrying noise sources included wind in grass, local residential noise, distant traffic, insects and aircraft noise.

6.4 Discussion of Results - Location N4

Quarry noise was inaudible during all four noise measurements at N4 for the June 2018 quarter therefore the relevant daytime noise limit of 37dBA $L_{Aeq(15\text{-}min)}$ was satisfied. It is noted that the quarry was not operational during the evening period, therefore satisfying the evening noise limit of 35dBA $L_{Aeq(15\text{-}min)}$. Non-quarrying sources include wind in trees, birds, aircraft, insects, local and distant traffic audible throughout the four noise measurements.

6.5 Discussion of Results - Location N5

Quarry noise was inaudible during all four measurements throughout the June 2018 monitoring quarter at N5. Therefore, quarry emissions satisfied the relevant daytime noise limit of 38dBA $LA_{eq(15\text{-}min)}$. It is noted that the quarry was not operational during the evening period and therefore satisfied the evening noise limit of 35dBA $LA_{eq(15\text{-}min)}$. Local traffic was the dominant source at this receiver with other non-quarrying sources including wind in trees, local residential noise, birds, insects and distant traffic all audible during the June 2018 quarter.

7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) for VGT Laboratories Pty Ltd on behalf of Holcim (Australia) Pty Ltd at the Teven Quarry, Teven, NSW. The assessment was completed to assess the quarry's compliance with the relevant criteria outlined in their Conditions of Consent for relevant surrounding residential receivers. It is reiterated that the quarry was not operational during the evening period on 20 June 2018 although measurements were completed as per the EPL which is considered a comprehensive assessment approach.

Attended noise measurements were undertaken on 20 June 2018 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry comply with relevant noise criteria specified in the Conditions of Consent at all assessed residential receivers.

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Appendix A - Glossary of Terms

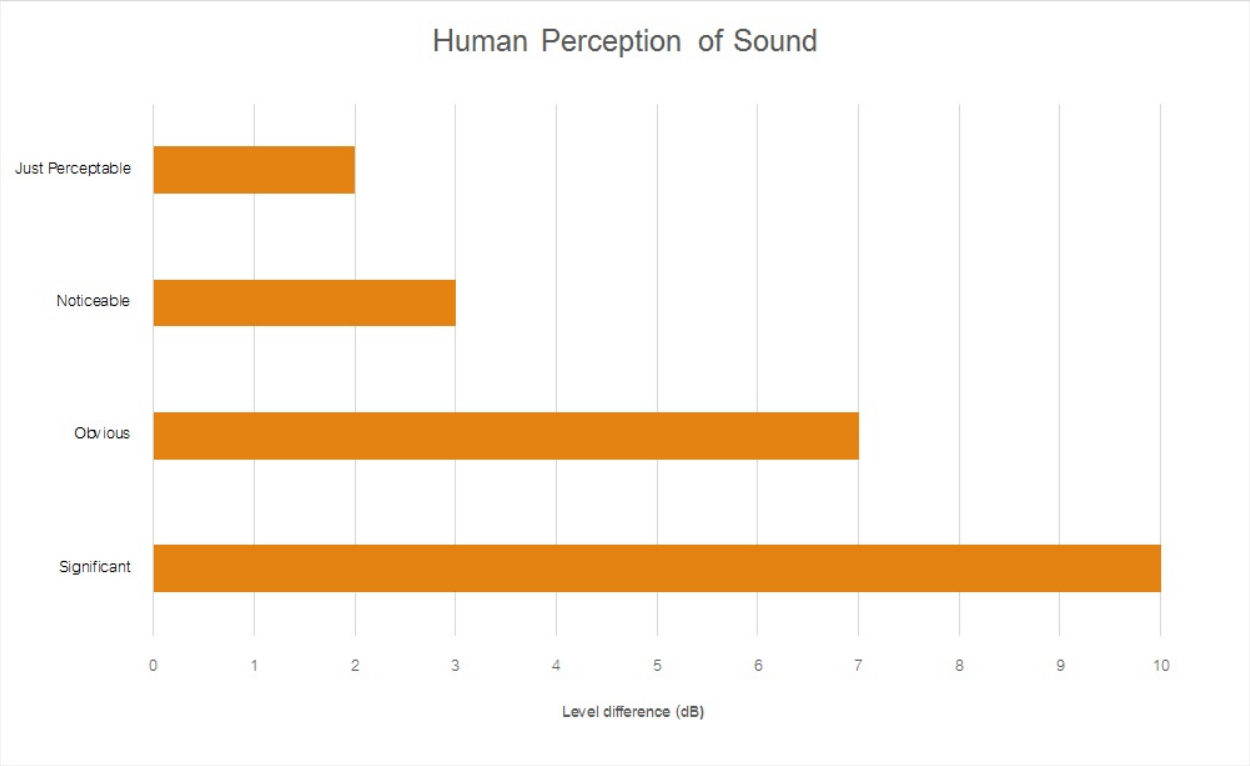
Table A1 provides a number of technical terms have been used in this report.

Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

MAC
Muller Acoustic Consulting

Noise Monitoring Assessment

Teven Quarry, Teven, NSW
Quarter 3 Ending September 2018.

Prepared for: Holcim (Australia) Pty Ltd
September 2018
MAC180611-06RP1

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 3 Ending September 2018

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180611-06RP1	Final	19 September 2018	Robin Heaton		Rod Linnett	

CONTENTS

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Teven Quarry (the 'quarry'), Teven, NSW.

The monitoring has been conducted in accordance with the Teven Noise Management Plan and in general accordance with relevant conditions outlined in the Development Consent (ref: SSD 6422); at five representative monitoring locations. This assessment has been undertaken during quarterly period ending September 2018, and forms part of the noise monitoring program for the quarry.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Department of Planning and Environment, Development Consent (SSD 6422), 2015; and
- Australian Standard AS 1055.1:1997 - Acoustics - Description and measurement of environmental noise - General Procedures.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Noise Criteria

Schedule 3 of the Teven Quarry Development Consent (2015), outlines the applicable noise criteria for residential receivers surrounding the quarry site.

Table 1 reproduces relevant criteria for each of the receivers as outlined in the quarry's Development Consent.

Table 1 Noise Criteria

Location[1]	Quarry Operations	
	Period: Day	Period: Evening
	7am – 6pm	6pm – 10pm
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$
R3, R4, R13, R15, R16, R17, R18, R20	38	35
All other receivers	37	35

Note 1: Receiver locations are shown in Figure 1.

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3 Methodology

3.1 Locality

The quarry is located in Teven, NSW approximately 7km west of Ballina, NSW. Receivers in the locality surrounding the quarry are primarily rural residential. The surroundings of the quarry include bushland and farming pastures. The monitoring locations with respect to the quarry are presented in the locality plan shown in **Figure 1.**

3.2 Noise Monitoring Locations

Five monitoring locations have been selected as part of the NMA in accordance with the NMP. The selected monitoring locations are presented in **Table 2** along with the noise sensitive receivers they represent.

Table 2 Monitoring Locations

Location	Nearest Receiver	Easting	Northing
N1	R7	547017	6810098
N2	R3/R4	548877	6810290
N3	R2	548642	6810801
N4	R10	547729	6810226
N5	R15	547793	6808998

3.3 Assessment Methodology

Attended noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055-1997, "Acoustics - Description and Measurement of Environmental Noise and the NPI. The measurements were carried out using a Svantek Type 1, 971 noise analyser on Monday 10 September 2018 and Tuesday 11 September 2018. Acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

As per the Noise Management Plan, two day and two evening measurements were conducted at each monitoring location. Measurements were of 15 minutes in duration and where possible, throughout each survey the operator quantified the contribution of each significant noise source.

Extraneous noise sources were excluded from the analysis to determine the $LA_{eq(15min)}$ noise contribution for comparison against the relevant criteria. Where the quarry was inaudible, the contribution is estimated to be at least 10dB below the ambient noise level.

FIGURE 1

LOCALITY PLAN

REF: MAC180611-06

0 150m

KEY

N1 RECEIVER LOCATION

SITE LOCATION

MAC
Muller Acoustic Consulting

*Imagery Source : nearmaps

4 Results

4.1 Assessment Results - Location N1

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N1 are presented in **Table 3**.

Table 3 Operator-Attended Noise Survey Results – Location N1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
11/09/2018	15:06 (Day)	62	43	35	Dir: S Wind Speed: 1.5m/s Rain: Nil	Wind in Trees 40-45 Birds 42-62 Distant Traffic 38-40 Aircraft 40-43 Quarry Hum 30-35
Teven Quarry $L_{Aeq(15min)}$ Contribution						31
11/09/2018	15:21 (Day)	77	48	35	Dir: S Wind Speed: 2.2m/s Rain: Nil	Wind in trees 42-46 Local Traffic 42-77 Helicopter 40-43 Bucket Bang 30
Teven Quarry $L_{Aeq(15min)}$ Contribution						30
10/09/2018	20:34 (Evening)	52	35	31	Dir: SW Wind Speed: 1.0m/s Rain: Nil	Wind in Trees 30-52 Distant traffic 24-26 Insects 30-33
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Not Operational
10/09/2018	20:50 (Evening)	70	42	31	Dir: SW Wind Speed: 1.1m/s Rain: Nil	Wind in trees 33-41 Distant Traffic 27-30 Local Traffic 50-70 Insects 30-31
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Not Operational

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2 Assessment Results - Location N2

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N2 are presented in **Table 4**.

Table 4 Operator-Attended Noise Survey Results – Location N2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
11/09/2018	13:09 (Day)	88	65	40	Dir: S Wind Speed: 1.8m/s Rain: Nil	Passing Traffic 50-88 Birds 34-47 Aircraft 30-40 Leaves in Trees 40-43 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
11/09/2018	13:24 (Day)	88	65	39	Dir: S Wind Speed: 1.7m/s Rain: Nil	Passing Traffic 52-88 Leaves Rustling 40-44 Birds 48-53 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
10/09/2018	18:38 (Evening)	71	44	34	Dir: N Wind Speed: 0.1m/s Rain: Nil	Passing Traffic 50-71 Domestic Noise 34-39 Aircraft 33-38
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Not Operational
10/09/2018	18:54 (Evening)	83	53	34	Dir: N Wind Speed: 0.0m/s Rain: Nil	Passing Traffic 60-83 Birds 30-35 Frogs 29-36 Distant Traffic 28-34
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Not Operational

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.3 Assessment Results - Location N3

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N3 are presented in **Table 5**.

Table 5 Operator-Attended Noise Survey Results – Location N3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
11/09/2018	12:35 (Day)	59	43	38	Dir: S Wind Speed: 1.6m/s Rain: Nil	Leaves Rustling 40-42 Helicopter 42-46 Birds 40-59 Aircraft 44-46 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
11/09/2018	12:50 (Day)	58	43	38	Dir: S Wind Speed: 1.4m/s Rain: Nil	Leaves Rustling 42-46 Birds 40-58 Distant Traffic 30-36 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
10/09/2018	18:02 (Evening)	63	44	37	Dir: N Wind Speed: 0.2m/s Rain: Nil	Frogs 36-44 Distant Traffic 34-38 Aircraft 33-49 Car at house 54-63
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Not Operational
10/09/2018	18:17 (Evening)	47	38	36	Dir: N Wind Speed: 0.1m/s Rain: Nil	Frogs 33-40 Distant Traffic 37-48 Aircraft 37-39 Wind turbulence40-47
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Not Operational

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.4 Assessment Results - Location N4

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N4 are presented in **Table 6**.

Table 6 Operator-Attended Noise Survey Results – Location N4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
11/09/2018	13:43 (Day)	74	53	45	Dir: S Wind Speed: 2.2m/s Rain: Nil	Leaves Rustling 40-47 Birds 47-50 Passing Traffic 50-74 Quarry Operations 30-45
Teven Quarry $L_{Aeq(15min)}$ Contribution						37
11/09/2018	13:59 (Day)	73	53	45	Dir: S Wind Speed: 2.0m/s Rain: Nil	Passing Traffic 60-73 Leaves Rustling 40-48 Quarry Operations 34-48 Aircraft 39-41
Teven Quarry $L_{Aeq(15min)}$ Contribution						37
10/09/2018	19:12 (Evening)	52	36	34	Dir: NW Wind Speed: 0.5m/s Rain: Nil	Aircraft 35-43 Birds 30-37 Distant traffic 25-28 Motor bike 34-52
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Not Operational
10/09/2018	19:28 (Evening)	57	37	33	Dir: NW Wind Speed: 0.3m/s Rain: Nil	Insects 30-34 Distant Traffic 27-32 Birds 40-57
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Not Operational

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.5 Assessment Results - Location N5

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N5 are presented in **Table 7**.

Table 7 Operator-Attended Noise Survey Results – Location N5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
11/09/2018	14:20 (Day)	88	65	38	Dir: S Wind Speed: 1.5m/s Rain: Nil	Passing Traffic 64-88 Distant Traffic 30-35 Birds 38-41 Leaves Rustling 30-40 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
11/09/2018	14:35 (Day)	85	64	39	Dir: S Wind Speed: 1.4m/s Rain: Nil	Leaves Rustling 38-40 Distant Traffic 35-38 Birds 40-53 Passing Traffic 60-85 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
10/09/2018	19:47 (Evening)	82	55	35	Dir: NW Wind Speed: 0.2m/s Rain: Nil	Distant Traffic 36-37 Insects 34-36 Passing Traffic 50-82
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Not Operational
10/09/2018	20:02 (Evening)	82	56	34	Dir: NW Wind Speed: 0.1m/s Rain: Nil	Passing Traffic 50-82 Distant Traffic 33-37 Insects 34-36
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry Not Operational

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

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5 Noise Compliance Assessment

The compliance assessment for each residential receiver (R2, R3/R4, R7, R10 and R15) are presented in **Table 8** and **Table 9** for day and evening assessment periods respectively.

Table 8 Daytime Noise Compliance Assessment

Receiver No.	Monitoring Location	Quarry Noise Contribution	Quarry Noise Criteria	
		$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	Compliant
R2	N3	<30	37	✓
R3/R4	N2	<30	38	✓
R7	N1	31	37	✓
R10	N4	37	37	✓
R15	N5	<30	38	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Table 9 Evening Noise Compliance Assessment

Receiver No.	Monitoring Location	Quarry Noise Contribution	Quarry Noise Criteria	
		$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	Compliant
R2	N3	Quarry Not Operational	35	✓
R3/R4	N2	Quarry Not Operational	35	✓
R7	N1	Quarry Not Operational	35	✓
R10	N4	Quarry Not Operational	35	✓
R15	N5	Quarry Not Operational	35	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

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6 Discussion

6.1 Discussion of Results - Location N1

Quarry noise emissions were audible during the two daytime noise measurements conducted on Tuesday 11 September 2018. Audible quarry noise sources included engine noise and reverse alarms from mobile equipment. Notwithstanding, the monitored quarry noise contribution satisfied the daytime noise limits for both measurements. The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Extraneous sources audible during the measurements included wind in trees, local residential noise, aircraft, birds, local and distant traffic.

6.2 Discussion of Results - Location N2

Monitoring results were dominated by local traffic that was generally constant during all four measurements on Monday 10 September 2018 and Tuesday 11 September 2018. Quarry emissions were inaudible on all four occasions, therefore satisfying the relevant daytime and evening noise limits. The quarry was not operational during the evening period however background measurements were completed as per the requirements of the EPL.

Extraneous sources measured include birds, wind in trees, local traffic, local residential noise, dog bark and aircraft noise.

6.3 Discussion of Results - Location N3

Quarry noise emissions were inaudible during measurements conducted on Monday 10 September 2018 and Tuesday 11 September 2018, therefore satisfying the daytime and evening criteria. The quarry was not operational during the evening period however background measurements were completed as per the requirements of the EPL.

Non-quarrying noise sources included wind in grass, local residential noise, distant traffic, insects and aircraft noise.

6.4 Discussion of Results - Location N4

Quarry noise emissions were audible during both daytime noise measurements on Monday 10 September 2018. Audible quarry noise sources included the operation of screens, front end loader and reverse alarms. Notwithstanding, the monitored quarry noise contribution satisfied the daytime noise limits for both measurements. The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Non-quarrying sources include wind in trees, birds, aircraft, insects, local and distant traffic audible throughout the four noise measurements.

6.5 Discussion of Results - Location N5

Quarry noise emissions were inaudible during all four measurements conducted on Monday 10 September 2018 and Tuesday 11 September 2018. Therefore, quarry emissions satisfied the relevant daytime and evening noise limits. The quarry was not operational during the evening period however background measurements were completed as per the requirements of the EPL.

Local traffic was the dominant source at this receiver with other non-quarrying sources including wind in trees, local residential noise, birds, insects and distant traffic all audible during the September 2018 monitoring period.

7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at the Teven Quarry, Teven, NSW. The assessment was completed to determine the quarry's compliance with the relevant criteria outlined in their Development Consent for relevant surrounding residential receivers during Quarter 3, period ending September 2018.

Attended noise measurements were undertaken on Monday 10 September 2018 and Tuesday 11 September 2018 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry comply with relevant noise criteria specified in the Development Consent at all assessed residential receivers.

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Appendix A - Glossary of Terms

Table A1 provides a number of technical terms have been used in this report.

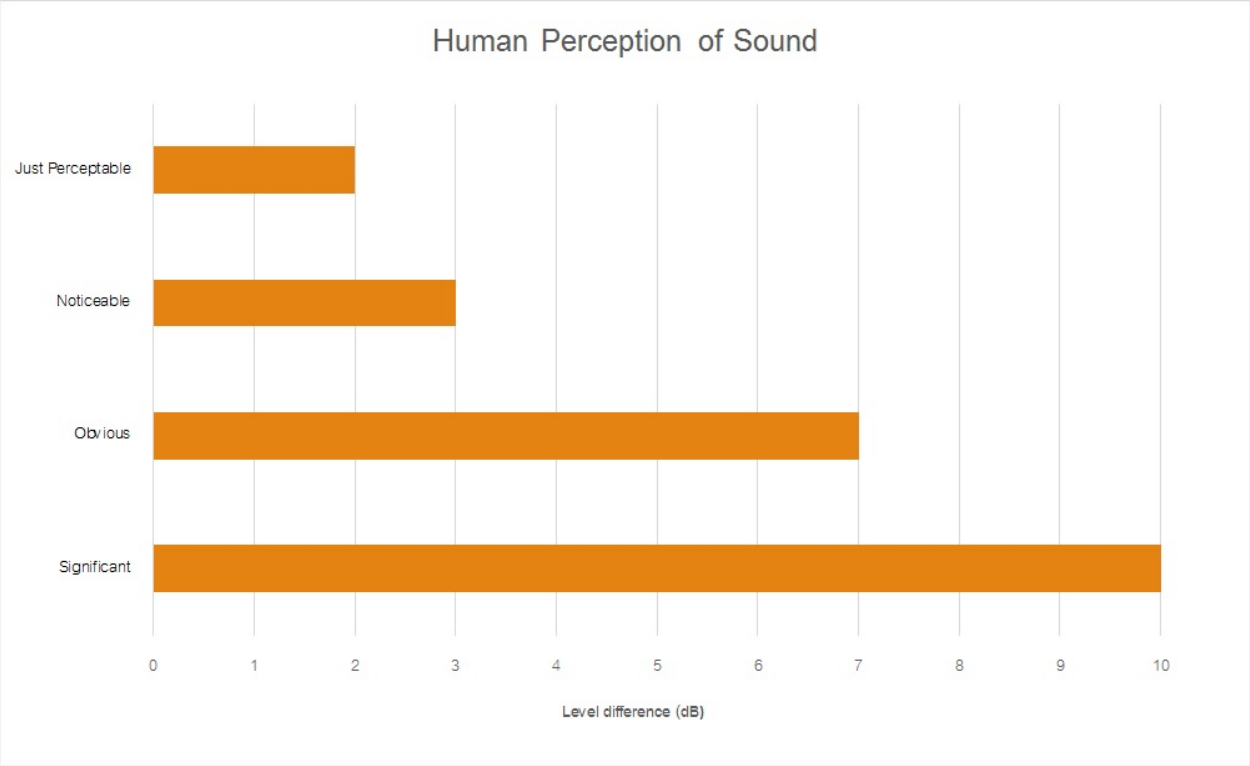
Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

MAC
Muller Acoustic Consulting

Noise Monitoring Assessment

Teven Quarry, Teven, NSW
Quarter 4 Ending December 2018.

Prepared for: Holcim (Australia) Pty Ltd
December 2018
MAC180611-06RP2

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 4 Ending December 2018

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180611-06RP2	Final	10 December 2018	Robin Heaton		Rod Linnett	

CONTENTS

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Teven Quarry (the 'quarry'), Teven, NSW.

The monitoring has been conducted in accordance with the Teven Noise Management Plan and in general accordance with relevant conditions outlined in the Development Consent (ref: SSD 6422); at five representative monitoring locations. This assessment has been undertaken during quarterly period ending December 2018, and forms part of the noise monitoring program for the quarry.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Department of Planning and Environment, Development Consent (SSD 6422), 2015; and
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Noise Criteria

Schedule 3 of the Teven Quarry Development Consent (2015), outlines the applicable noise criteria for residential receivers surrounding the quarry site.

Table 1 reproduces relevant criteria for each of the receivers as outlined in the quarry's Development Consent.

Table 1 Noise Criteria

Location[1]	Quarry Operations	
	Period: Day	Period: Evening
	7am – 6pm	6pm – 10pm
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$
R3, R4, R13, R15, R16, R17, R18, R20	38	35
All other receivers	37	35

Note 1: Receiver locations are shown in Figure 1.

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3 Methodology

3.1 Locality

The quarry is located in Teven, NSW approximately 7km west of Ballina, NSW. Receivers in the locality surrounding the quarry are primarily rural residential. The surroundings of the quarry include bushland and farming pastures. The monitoring locations with respect to the quarry are presented in the locality plan shown in **Figure 1.**

3.2 Noise Monitoring Locations

Five monitoring locations have been selected as part of the NMA in accordance with the NMP. The selected monitoring locations are presented in **Table 2** along with the noise sensitive receivers they represent.

Table 2 Monitoring Locations

Location	Nearest Receiver	Easting, m	Northing, m
N1	R7	547017	6810098
N2	R3/R4	548877	6810290
N3	R2	548642	6810801
N4	R10	547729	6810226
N5	R15	547793	6808998

3.3 Assessment Methodology

Attended noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise and the NPI. The measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 21 November 2018. Acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

As per the Noise Management Plan, two daytime measurements were conducted at each monitoring location. Two evening measurements were conducted at Location 1, however due to unsuitable weather conditions, one evening measurement was conducted at locations N2, N3, N4 and N5. It is noted that the quarry was not operating during the evening period.

Measurements were of 15 minutes in duration and where possible, throughout each survey the operator quantified the contribution of each significant noise source.

Extraneous noise sources were excluded from the analysis to determine the $LA_{eq(15min)}$ noise contribution for comparison against the relevant criteria. Where the quarry was inaudible, the contribution is estimated to be at least 10dB below the ambient noise level.

FIGURE 1

LOCALITY PLAN

REF: MAC180611-06

0 150m

KEY

N1 RECEIVER LOCATION

SITE LOCATION

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*Imagery Source : nearmaps

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4 Results

4.1 Assessment Results - Location N1

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N1 are presented in **Table 3**.

Table 3 Operator-Attended Noise Survey Results – Location N1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
21/11/2018	09:07 (Day)	62	44	37	WD: N WS: 0.5m/s Rain: Nil	Insects 30-34 Birds 38-62 Aircraft 36-40 Wind in trees 34-36 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
21/11/2018	09:22 (Day)	63	45	37	WD: N WS: 0.5m/s Rain: Nil	Aircraft 43-63 Wind in trees 34-38 Birds 38-42 Insects 30-34 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
21/11/2018	19:33 (Evening)	64	61	60	WD: N WS: 0.1m/s Rain: Nil	Insects 59-64 Birds 50-59
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not Operational
21/11/2018	19:48 (Evening)	71	55	48	WD: N WS: 0.1m/s Rain: Nil	Insects 55-71 Distant traffic 50-56 Aircraft 48-58
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not Operational

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2 Assessment Results - Location N2

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N2 are presented in **Table 4**.

Table 4 Operator-Attended Noise Survey Results – Location N2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
21/11/2018	09:50 (Day)	84	59	42	WD: N WS: 0.5m/s Rain: Nil	Local traffic 46-84 Birds 46-56 Wind in trees 40-46 Insects 40-43 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
21/11/2018	10:05 (Day)	82	61	42	WD: N WS: 0.5m/s Rain: Nil	Birds 38-78 Local traffic 38-82 Aircraft 38-46 Insects 40-42 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
21/11/2018	18:09 (Evening)	79	54	36	WD: N WS: 0.5m/s Rain: Nil	Birds 36-53 Insects 30-36 Local traffic 42-79 Aircraft 38-47
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not Operational

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.3 Assessment Results - Location N3

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N3 are presented in **Table 5**.

Table 5 Operator-Attended Noise Survey Results – Location N3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
21/11/2018	10:23 (Day)	62	44	42	WD: N WS: 1.5m/s Rain: Nil	Wind in trees 36-45 Birds 38-62 Distant traffic 36-46 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
21/11/2018	10:39 (Day)	57	45	42	WD: N WS: 1.5m/s Rain: Nil	Wind in trees 36-42 Distant traffic 36-46 Birds 38-57 Insects 35-40 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
21/11/2018	18:27 (Evening)	53	41	37	WD: N WS: 0.5m/s Rain: Nil	Birds 36-53 Insects 36-38 Dog barking 36-39 Distant traffic 35-38 Aircraft 38-46
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not Operational

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.4 Assessment Results - Location N4

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N4 are presented in **Table 6**.

Table 6 Operator-Attended Noise Survey Results – Location N4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
21/11/2018	10:57 (Day)	76	49	40	WD: N WS: 1.5m/s Rain: Nil	Traffic 43-76 Birds 42-48 Insects 40-42 Wind in trees 40-41 Aircraft 41-52 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
21/11/2018	11:13 (Day)	85	59	42	WD: N WS: 1.5m/s Rain: Nil	Traffic 42-85 Birds 43-47 Insects 40-42 Aircraft 41-49 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
21/11/2018	18:45 (Evening)	64	52	40	WD: N WS: 0.1m/s Rain: Nil	Insects 42-63 Traffic 38-44 Birds 42-64
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not Operational

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.5 Assessment Results - Location N5

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N5 are presented in **Table 7**.

Table 7 Operator-Attended Noise Survey Results – Location N5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
21/11/2018	11:31 (Day)	87	62	43	WD: N WS: 1.0m/s Rain: Nil	Birds 39-51 Traffic 42-87 Wind in trees 39-46 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
21/11/2018	11:46 (Day)	85	63	44	WD: N WS: 1.0m/s Rain: Nil	Birds 40-46 Traffic 44-85 Aircraft 42-50 Wind in trees 38-48 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
21/11/2018	19:06 (Evening)	74	51	39	WD: N WS: 0.1m/s Rain: Nil	Birds 36-46 Traffic 46-74 Aircraft 40-46
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not Operational

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

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5 Noise Compliance Assessment

The compliance assessment for each residential receiver (R2, R3/R4, R7, R10 and R15) are presented in **Table 8** and **Table 9** for day and evening assessment periods respectively.

Table 8 Daytime Noise Compliance Assessment

Receiver No.	Monitoring Location	Quarry Noise Contribution	Quarry Noise Criteria	
		$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	Compliant
R2	N3	<35	37	✓
R3/R4	N2	<35	38	✓
R7	N1	<35	37	✓
R10	N4	<35	37	✓
R15	N5	<35	38	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Table 9 Evening Noise Compliance Assessment

Receiver No.	Monitoring Location	Quarry Noise Contribution	Quarry Noise Criteria	
		$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	Compliant
R2	N3	Quarry Not Operational	35	✓
R3/R4	N2	Quarry Not Operational	35	✓
R7	N1	Quarry Not Operational	35	✓
R10	N4	Quarry Not Operational	35	✓
R15	N5	Quarry Not Operational	35	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

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6 Discussion

6.1 Discussion of Results - Location N1

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 21 November 2018, therefore satisfying the daytime noise limits. The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Non quarry noise sources observed during the measurements included wind in trees, aircraft, birds, local and distant traffic.

6.2 Discussion of Results - Location N2

Quarry emissions were inaudible during the two daytime measurements on Wednesday 21 November 2018, therefore satisfying the relevant daytime and evening noise limits.

During the evening period, one background measurement was completed as per the requirements of the EPL, however due to unsuitable weather conditions a second measurement was not conducted. The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Extraneous sources measured include birds, wind in trees, local traffic, insects and aircraft noise.

6.3 Discussion of Results - Location N3

Quarry noise emissions were inaudible during the two daytime measurements conducted on Wednesday 21 November 2018, therefore satisfying the daytime criteria.

During the evening period, one background measurement was completed as per the requirements of the EPL, however due to unsuitable weather conditions a second measurement was not conducted. The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Non-quarrying noise sources observed during the measurements included wind in trees, traffic, insects and aircraft noise.

6.4 Discussion of Results - Location N4

Quarry noise emissions were inaudible during the two daytime measurements conducted on Wednesday 21 November 2018, therefore satisfying the daytime criteria.

During the evening period, one background measurement was completed as per the requirements of the EPL, however due to unsuitable weather conditions a second measurement was not conducted. The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Non-quarrying sources observed during the measurements included wind in trees, birds, aircraft, insects, local and distant traffic audible throughout the noise measurements.

6.5 Discussion of Results - Location N5

Quarry noise emissions were inaudible during the two daytime measurements conducted on Wednesday 21 November 2018, therefore satisfying the daytime criteria.

During the evening period, one background measurement was completed as per the requirements of the EPL, however due to unsuitable weather conditions a second measurement was not conducted. The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Local traffic was the dominant source audible throughout the survey at this location. Other non-quarrying sources including wind in trees, birds, insects and traffic noise all audible during the December 2018 monitoring period.

7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at the Teven Quarry, Teven, NSW. The assessment was completed to determine the quarry's compliance with the relevant criteria outlined in their Development Consent for relevant surrounding residential receivers during Quarter 4, period ending December 2018.

Attended noise measurements were undertaken on Wednesday 21 November 2018 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry comply with relevant noise criteria specified in the Development Consent at all assessed residential receivers.

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dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
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LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
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Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

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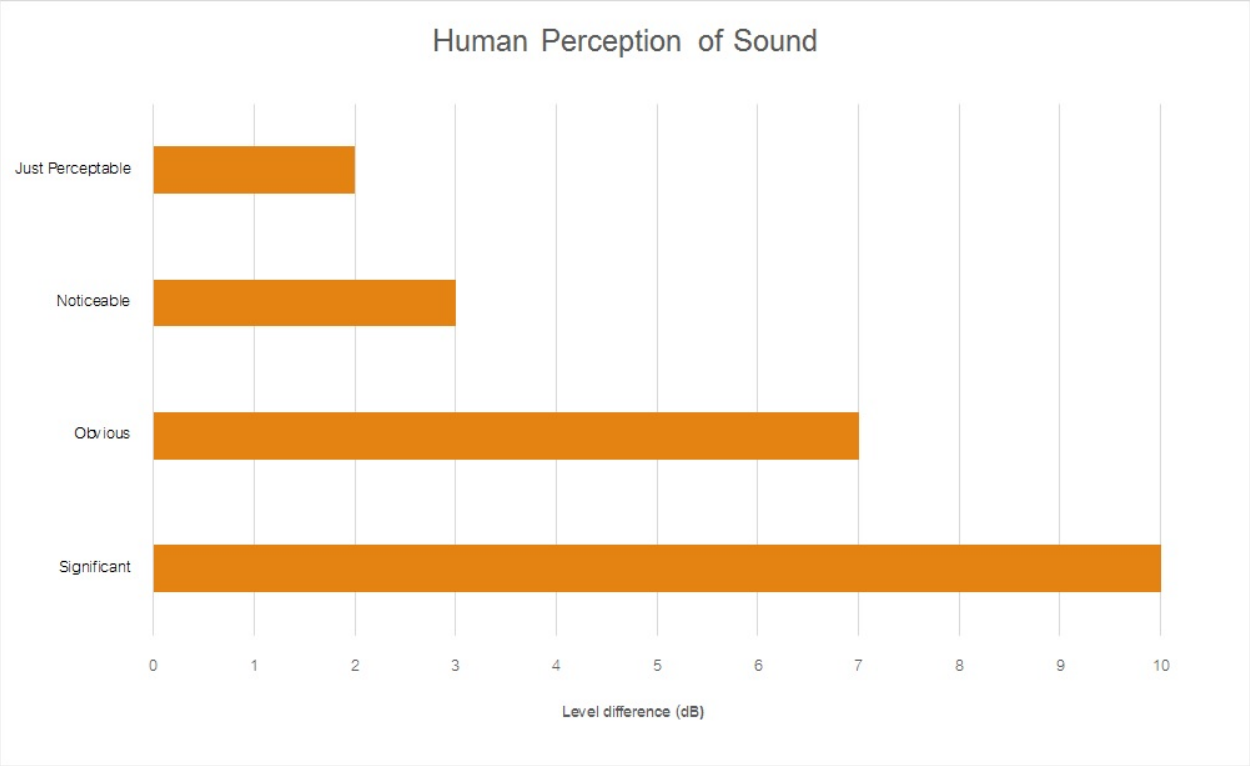
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

MAC
Muller Acoustic Consulting

APPENDIX 2

WATER MONITORING SUMMARY - DISCHARGES

Teven 2018 water discharge and rain log.

Test Date	Point 1-TSS	PH - Pt 1	LD Point 2 -TSS	PH Pt-2	Oil & Grease	Time	Teven Water Sampling Comments	Rain fall	Rain mm
01-01-2018									
02-01-2018								Y	34.2
03-01-2018								Y	32.6
04-01-2018								Y	2.2
05-01-2018									0
06-01-2018									0
07-01-2018									0
08-01-2018				7.74					0
09-01-2018									0
10-01-2018									0
11-01-2018									0
12-01-2018									0
13-01-2018									0
14-01-2018									0
15-01-2018				7.73					0
16-01-2018									0
17-01-2018									0
18-01-2018									0
19-01-2018									0
20-01-2018									0
21-01-2018									0
22-01-2018				7.9					0
23-01-2018									0
24-01-2018									0
25-01-2018									0
26-01-2018									0
27-01-2018								Y	4.8
28-01-2018									0
29-01-2018				7.8				Y	8
30-01-2018								Y	7
31-01-2018								Y	1.6
01-02-2018								Y	38.6
02-02-2018								Y	41.4
03-02-2018								Y	15.2
04-02-2018								Y	13
05-02-2018				8.2				Y	10
06-02-2018								Y	3.8
07-02-2018									0
08-02-2018								Y	1.2
09-02-2018								Y	0.2

10-02-2018									0
11-02-2018								Y	1.6
12-02-2018				8.1				Y	1.8
13-02-2018								Y	1.6
14-02-2018								Y	1.4
15-02-2018									0
16-02-2018									0
17-02-2018									0
18-02-2018									0
19-02-2018				8.1					0
20-02-2018								Y	3
21-02-2018								Y	6.4
22-02-2018								Y	0
23-02-2018								Y	24.4
24-02-2018								Y	19.6
25-02-2018								Y	30.6
26-02-2018				7.9				Y	3.2
27-02-2018								Y	13.8
28-02-2018								Y	3
01-03-2018									0
02-03-2018								Y	3
03-03-2018								Y	0.2
04-03-2018								Y	0.6
05-03-2018				8.1				Y	0.2
06-03-2018								Y	11.6
07-03-2018								Y	3.8
08-03-2018								Y	0.4
09-03-2018									0
10-03-2018								Y	4.4
11-03-2018								Y	7.6
12-03-2018				8.1				Y	2
13-03-2018								Y	0.8
14-03-2018								Y	2.8
15-03-2018									0
16-03-2018									0
17-03-2018									0
18-03-2018									0
19-03-2018				8.2					0
20-03-2018									0
21-03-2018									0
22-03-2018								Y	5.6
23-03-2018								Y	38.2
24-03-2018								Y	26.6
25-03-2018									0

26-03-2018				8.2						0
27-03-2018										0
28-03-2018									Y	9
29-03-2018									Y	0.8
30-03-2018									Y	4.2
31-03-2018										0
01-04-2018										0
02-04-2018									Y	11
03-04-2018				8.2					Y	2.6
04-04-2018										0
05-04-2018									Y	7.2
06-04-2018									Y	5.4
07-04-2018									Y	0.6
08-04-2018									Y	0.2
09-04-2018				8.2						0
10-04-2018										0
11-04-2018										0
12-04-2018										0
13-04-2018										0
14-04-2018										0
15-04-2018										0
16-04-2018										0
17-04-2018				8						0
18-04-2018									Y	7.4
19-04-2018									Y	0.2
20-04-2018										0
21-04-2018									Y	8
22-04-2018									Y	46.8
23-04-2018				8.3					Y	28.2
24-04-2018									Y	0.2
25-04-2018									Y	12.2
26-04-2018									Y	0.4
27-04-2018									Y	0.4
28-04-2018									Y	21.8
29-04-2018									Y	45.2
30-04-2018				8.3					Y	25
01-05-2018									Y	30.4
02-05-2018										0
03-05-2018										0
04-05-2018										0
05-05-2018										0
06-05-2018										0
07-05-2018				8.3						0
08-05-2018									Y	13.4

09-05-2018								Y	22.4
10-05-2018									0
11-05-2018								Y	0.4
12-05-2018									0
13-05-2018									0
14-05-2018				8.2					0
15-05-2018								Y	1.8
16-05-2018									0
17-05-2018								Y	6.4
18-05-2018								Y	4.8
19-05-2018									0
20-05-2018									0
21-05-2018				8.3					0
22-05-2018									0
23-05-2018									0
24-05-2018								Y	9.8
25-05-2018									0
26-05-2018								Y	7.8
27-05-2018								Y	2.8
28-05-2018				7.9				Y	6.8
29-05-2018								Y	2
30-05-2018									0
31-05-2018				8.4				Y	0.2
01-06-2018									0
02-06-2018									0
03-06-2018									0
04-06-2018				8.3				Y	13.6
05-06-2018								Y	10
06-06-2018								Y	30
07-06-2018								Y	56.8
08-06-2018								Y	0.2
09-06-2018									0
10-06-2018								Y	0.8
11-06-2018								Y	1.6
12-06-2018				8.3					0
13-06-2018									0
14-06-2018									0
15-06-2018									0
16-06-2018									0
17-06-2018									0
18-06-2018									0
19-06-2018				7.7					0
20-06-2018									0
21-06-2018									0

22-06-2018			2	7.69				Y	3.6
23-06-2018								Y	0.2
24-06-2018									0
25-06-2018				7.4					0
26-06-2018									0
27-06-2018								Y	17.6
28-06-2018								Y	5
29-06-2018									0
30-06-2018								Y	0.2
01-07-2018									0
02-07-2018								Y	0.2
03-07-2018								Y	3.2
04-07-2018			3	7.5				Y	11.4

From July 5th every discharge Time ,PH, Oil & Grease added

05-07-2018								Y	12.2
06-07-2018			3	6.9	Nil	7.05	Discharge seeping from recycle dam due to RF	Y	8.4
07-07-2018					Nil	7.1	Saturday no production.	Y	0.6
08-07-2018					Nil	7.3	Sunday no prodution.	N	0
09-07-2018			3	7.1	Nil	7.3	Discharge seeping from recycle dam due to RF	N	0
10-07-2018							No discharge	N	0
11-07-2018							No discharge	Y	2.8
12-07-2018							No discharge	Y	3.6
13-07-2018							No discharge	Y	0.2
14-07-2018							No discharge	N	0
15-07-2018							No discharge	N	0
16-07-2018							No discharge	N	0
17-07-2018							No discharge	N	0
18-07-2018			1	7	Nil	8	Discharge from recycle dam. Pump on to seepage level	N	0
21-07-2018			4	6.6	Nil	8	Discharge from recycle dam.	N	0
22-07-2018							No discharge	N	0
23-07-2018							No discharge	N	0
24-07-2018				7.3			No discharge	N	0
25-07-2018							No discharge	N	0
26-07-2018							No discharge	N	0
27-07-2018							No discharge	N	0
28-07-2018							No discharge	N	0
29-07-2018							No discharge. Pump turned on to fill top pond.	N	0
30-07-2018							No discharge. Pump turned on to fill top pond.	Y	0.4
31-07-2018							No discharge	N	0
01-08-2018			3	6.7	Nil	7.45	discharge seeping through Recyle dam almost at discharge Pipe level	N	0
02-08-2018			1	7.1	Nil	7.22	discharge seeping through Recyle dam almost at Discharge Pipe level.	N	0
03-08-2018			2	7.2	Nil	7.2	discharge seeping through Recycle dam almost at discharge pipe level.	N	0
04-08-2018					Nil	7.3	No discharge	N	0

05-08-2018							Sunday no prodution.	N	0
06-08-2018			1	7.6	Nil	7.4	discharge seeping through Recyle dam almost at DPLevel. Pump on	N	0
07-08-2018			2	7.5	Nil	7.1	discharge seeping through Recycle dam almost at DPLevel.	N	0
08-08-2018			4	7.4	Nil	7.1	discharge seeping through Recyle dam almost at DPLevel.	N	0
09-08-2018			4	7.4	Nil	7.2	discharge seeping through Recycle dam almost at DPLevel.	N	0
10-08-2018			3	7.3	Nil	7.22	discharge seeping through Recycle dam almost at DPLevel.	N	0
11-08-2018							No discharge	N	0
12-08-2018							Sunday no prodution.	N	0
13-08-2018							No discharge	N	0
14-08-2018							No discharge. Pump turned on to fill top pond. Kept below seepage leve	N	0
15-08-2018							No discharge	N	0
16-08-2018							No discharge	N	0
17-08-2018				7.4			No discharge	N	0
18-08-2018							No discharge	N	0
19-08-2018							Sunday no prodution.	N	0
20-08-2018							No discharge	N	0
21-08-2018							No discharge	N	0
22-08-2018							No discharge	N	0
23-08-2018							No discharge	N	0
24-08-2018				7.5			No discharge	N	0
25-08-2018							No discharge. Pump turned on to fill top pond.Below seepage level in dam	Y	19.4
26-08-2018							Sunday no prodution.	Y	9.2
27-08-2018			2	6.9	Nil	7.18	Discharge seeping through Recycle dam due to rain fall.	Y	13.8
28-08-2018			2	7.2	Nil	7.15	Discharge seeping through Recycle dam due to rain fall.	Y	3.6
29-08-2018			1	7	Nil	7.07	Discharge seeping through Recycle dam due to rain fall.	N	0
30-08-2018							No discharge	N	0
31-08-2018							No discharge	N	0
01-09-2018							No discharge	Y	1
02-09-2018							Sunday no prodution.	N	0
03-09-2018			8	7.3	Nil	7.15	Rain - Discharge seeping from top Recycle dam due to RF	Y	23.6
04-09-2018			7	7.5	Nil	7.35	Rain - Discharge seeping from Top Recycle dam due to RF	Y	79.4
05-09-2018			8	7.1	Nil	7.11	Rain- Discharge seeping from Top RD due to RF	Y	100
06-09-2018			3	7.6	Nil	7.4	Rain - Discharge seeping from Top RD due to RF	Y	31.8
07-09-2018			1	7.5	Nil	7.5	no rain - Discharge seeping from Top RD due to RF	N	0
08-09-2018							Saturday no prodution.	Y	1
09-09-2018							Sunday no prodution.	N	0

Point 1 TSS & Point 1 PH added to testing plan.

10-09-2018	5	7.1	2	7.2	Nil	7.15	2 water sampling Points 1&2 to monitor from 10/9/18 - slight discharge/no rain	N	0
11-09-2018	29	7.4	1	7.1	Nil	7.18	Discharge seeping from Recycle Dam - Pump on bottom sump	N	0
12-09-2018	2	7	1	7.4	Nil	7.3	Discharge seeping from Recycle Dam	N	0
13-09-2018	2	6.9	2	7.1	Nil	7.3	Discharge seeping from Recycle Dam	N	0
14-09-2018	1	7.3	1	7.2	Nil	7.3	Discharge seeping from Recycle Dam - reducing	N	0

15-09-2018								N	0
16-09-2018								N	0
17-09-2018	3	7.2	2	7.1	Nil	7.26	Discharge seeping from Recycle Dam - reducing	Y	6
18-09-2018	11	7	2	7.3	Nil	7.21	Discharge seeping from Recycle Dam - reducing	N	0
19-09-2018							No discharge	N	0
20-09-2018							No discharge	N	0
21-09-2018							No discharge	Y	16.6
22-09-2018							No discharge	N	0
23-09-2018							No discharge	N	0
24-09-2018							No discharge	N	0
25-09-2018	24	7.4	2	7.1	Nil	7.38	Heavy rain - Discharge from Recycle dam	Y	20.2
26-09-2018	7	7.3	6	7	Nil	7.45	Discharge - reducing	Y	0
27-09-2018	8	7.4	6	7.2	Nil	8	Discharge - reducing	Y	
28-09-2018							No discharge	N	0
29-09-2018							No discharge	N	0
30-09-2018							No discharge	N	0
01-10-2018							No discharge	Y	5.4
02-10-2018				7.3			No discharge	N	0
03-10-2018							No discharge	N	0
04-10-2018							No discharge	N	0
05-10-2018							No discharge	N	0
06-10-2018							No discharge	Y	3.6
07-10-2018							No discharge	Y	6
08-10-2018							No discharge	N	0
09-10-2018							No discharge	N	0
10-10-2018							No discharge	N	0
11-10-2018							No discharge	Y	73.6
12-10-2018	2	7.6	1	7.4	Nil	7.3	Discharge after heavy rain -	Y	17.8
13-10-2018							Discharge after heavy rain	Y	8
14-10-2018							Discharge after heavy rain	Y	17.2
15-10-2018	1	7.8	2	7.7	Nil	7.2	Discharge after heavy rain - over the 82.5 - 5 day event	Y	34.6
16-10-2018	8	7.9	6	7.6	Nil	7.15	Discharge after heavy rain	Y	26.8
17-10-2018	3	7.5	4	7.4	Nil	7.11	Discharge after heavy rain	Y	7.8
18-10-2018	10	7.2	5	7.1	Nil	7.05	Discharge after heavy rain	Y	1.4
19-10-2018	3	7.4	3	7.3	Nil	7.15	Discharge after heavy rain	Y	0.2
20-10-2018								N	0
21-10-2018								Y	1.2
22-10-2018	1	7.6	1	7.3	Nil	7.05	Discharge after heavy rain - reducing - Added O&G , time.	Y	8.8
23-10-2018	1	7.4	1	7	Nil	7.12	Discharge after heavy rain - reducing	N	0
24-10-2018	1	7.1	1	6.9	Nil	7.15	Discharge after heavy rain - reducing	N	0
25-10-2018	1	7.5	1	7.4	Nil	7.11	Discharge after heavy rain - reducing	N	0
26-10-2018	1	7.1	1	6.8	Nil	7.08	Discharge after heavy rain - reducing	Y	2.4
27-10-2018								N	0
28-10-2018								N	0

29-10-2018				7			No discharge	Y	2.8
30-10-2018							No discharge	Y	0.4
31-10-2018							No discharge	N	
01-11-2018							No discharge	N	
02-11-2018							No discharge	N	
03-11-2018								N	
04-11-2018								N	
05-11-2018	3	7.5	2	7.6	Nil	9.3	Controled discharge.	N	
06-11-2018	1	7.7	1	7.4	Nil	11.3	Controled discharge.	N	
07-11-2018	1	7.5	1	7.6	Nil	4	Controled discharge.	N	
08-11-2018	1	7.2	2	7.4	Nil	7.15	Controled discharge.	N	
09-11-2018							No discharge.	Y	0.8
10-11-2018							No discharge.	N	
11-11-2018							No discharge.	Y	3
12-11-2018				7.5			No discharge.	N	
13-11-2018							No discharge.	y	2.2
14-11-2018							No discharge.	N	
15-11-2018							No discharge.	N	
16-11-2018							No discharge.	N	
17-11-2018							No discharge.	N	
18-11-2018							No discharge.	y	96.8
19-11-2018	1	7.1	4	7.4	Nil	9.3		y	0.2
20-11-2018	1	7.5	1	7.6	Nil	11		n	
21-11-2018							No discharge.	n	
22-11-2018							No discharge.	Y	0.2
23-11-2018							No discharge.	Y	2.8
24-11-2018							No discharge.	N	
25-11-2018							No discharge.	N	
26-11-2018				7.3			No discharge.	N	
27-11-2018							No discharge.	N	
28-11-2018							No discharge.	N	
29-11-2018							No discharge.	N	
30-11-2018							No discharge.	N	
01-12-2018							No discharge.	N	
02-12-2018							No discharge.	N	
03-12-2018				7.2			No discharge.	N	
04-12-2018							No discharge.	N	
05-12-2018							No discharge.	N	
06-12-2018							No discharge.	N	
07-12-2018							No discharge.	N	
08-12-2018							No discharge.	N	
09-12-2018							No discharge.	N	
10-12-2018				7.2			No discharge.	N	
11-12-2018							No discharge.	N	

12-12-2018							No discharge.	N	
13-12-2018							No discharge.	N	
14-12-2018							No discharge.	N	
15-12-2018							No discharge.	Y	0.7
16-12-2018							No discharge.	Y	0.6
17-12-2018				7.5			No discharge.	Y	1.6
18-12-2018							No discharge.	Y	0.4
19-12-2018							No discharge.	Y	0.2
20-12-2018							No discharge.	Y	1
21-12-2018							No discharge.	Y	0.6
22-12-2018							No discharge.	Y	20.2
23-12-2018							No discharge.	Y	4.6
24-12-2018				7.1			No discharge.	Y	0.2
25-12-2018							No discharge.	N	
26-12-2018							No discharge.	Y	0.2
27-12-2018							No discharge.	N	
28-12-2018							No discharge.	N	
29-12-2018							No discharge.	N	
30-12-2018							No discharge.	N	
31-12-2018				7			No discharge.	N	

APPENDIX 3
POLLUTION REDUCTION PROGRAM

31 January 2019

Ground Floor, Suite 01, 20 Chandos Street
St Leonards, NSW, 2065
PO Box 21
St Leonards, NSW, 1590

T +61 2 9493 9500
F +61 2 9493 9599
E info@emmconsulting.com.au

www.emmconsulting.com.au

Victoria Musgrove
Planning Approvals Manager – Queensland
Holcim (Australia) Pty Ltd
18 Little Cribb St
Milton QLD 4064

Re: Holcim Teven Quarry – Review of Current Sediment Basin Management and Stormwater Management

Dear Victoria,

1 Introduction

This report presents the findings of a review of current sediment basin management and stormwater management generally for Holcim's Teven Quarry (herein referred to as the Site). The review is intended to address a Pollution Reduction Program (PRP) that has been recently added to Environment Protection Licence (EPL) 3293 that applies to the Site.

It is understood that Holcim will engage with the Environment Protection Authority (EPA), supported by this report, to close out the PRP. EMM will then update the Water Management Plan (WMP) for the Site, to reflect the outcomes of the review. Recommended updates to the WMP are provided as part of this review.

This report is structured as follows:

- Section 1 outlines the purpose and scope of the report.
- Section 2 describes relevant background to the PRP and issues of concern to the EPA.
- Section 3 summarises the methodology and available data used to inform the review.
- Section 4 describes existing water management infrastructure and practices for the Site.
- Section 5 assesses the performance of existing water management dams and other Site controls.
- Section 6 provides recommendations to review and improve the effectiveness of existing water management practices and measures.
- Section 7 provides recommendations for update of the WMP.

Figure 1 shows a plan of the site including catchment areas and key water management features referred to herein.

2 Background

2.1 EPA inspection and PRP

On 7 June 2018, the EPA undertook an inspection of the Site and observed turbid water in the drainage line between the Main Dam and the current licensed discharge point (LDP). The EPA noted concern that water was being discharged from the Site when less than the five-day rainfall event has occurred and that, based on the presence of turbid water, there may be disturbed areas of the Site not draining to a sediment basin.

The EPA also noted concern that:

- site personnel present at the time of inspection were not aware of the requirement to monitor discharges in accordance with EPL conditions; and
- the WMP did not adequately reflect EPL conditions in relation to the correct monitoring location of the LDP, and that sampling was being undertaken in the cane drain adjacent to and downstream of the Site which does not accurately reflect the quality of water leaving the Site.

Subsequently the EPA varied EPL 3293 through addition of a PRP as Clause U1, which is reproduced below:

> ***U1 Report – Review the current sediment basin management and stormwater management.***
>
> *U1.1 The licensee is to review the current sediment basin management and stormwater management of the premise to ensure that:*
>
> 1. *All disturbed areas on the quarry including run-off from access roads flows to a settlement basin.*
> 2. *The quarry has capacity to capture the five-day rain event.*
> 3. *Monitoring occurs for all discharge less than the five-day rain event of 82.5mm.*
>
> *A report is to be submitted to the EPA by the 3 September 2018 detailing the review the current sediment basin management and stormwater management.*

This report responds to Clause U1 and the aforementioned concerns raised by the EPA.

2.2 Existing EPL water-related conditions

The current version of EPL 3293 dated 25 July 2018 includes several water-related conditions relevant to the PRP, including:

- *Section 2 – Discharges to Air and Water and Applications to Land*
  - establishes the LDP.
- *Section 3 – Limit Conditions*
  - sets the five-day rainfall depth (82.5 mm); and
  - sets concentration limits on oil/grease, pH and total suspended solids for discharges at the LDP where less than the five-day rainfall depth has occurred.
- *Section 4 – Operating Conditions*

- describes principles for water management and associated process/management related requirements.

- *Section 5 – Monitoring and Recording Conditions*
  - establishes relevant water quality sampling and associated record keeping requirements for monitoring of discharges from the Site.

- *Section 8 – Pollution Studies and Reduction Programs*
  - lists any PRP currently applying to the Site.

3 Methodology and available data

3.1 Site inspection

To inform an understanding of current site conditions and stormwater management practices, site inspection was undertaken on Friday 26 October 2018, between approximately 10:30-14:00. Whilst on site, discussions were held with the Quarry Manager Garth Stacey.

Weather conditions on the day of inspection were warm and sunny. Rainfall at Ballina Airport measured 2.4 mm for the prior 24 hours to 09:00, with zero measured rainfall for the prior 3 days.

3.2 Available data

The following information and data was also used to inform the review:

- the current WMP for the Site (Version 7 dated 6 September 2018);
- water quality monitoring data for the Site, provided by Holcim; and
- various spatial datasets, including aerial imagery and terrain data, held by EMM from previous involvement in preparation of the WMP and various other management plans for the Site.

4 Existing site water management

4.1 Overview

Key elements and context for the existing Site water management system are shown on **Figure 1**, including:

- recent aerial imagery;
- contours generated from LiDAR data;
- primary catchment areas;
- water management dams (Pit Dam and Main Dam);
- internal piped and open drainage systems;
- EPL monitoring location; and
- location of current water monitoring points where sampling is undertaken.

4.2 Catchment areas

Table 1 provides further information for each of the primary catchment areas, including a description of internal drainage and water management practices and associated infrastructure. The referenced photographs are provided in **Attachment A**.

Table **1** Catchment Description

Catchment	Description
C1	• Catchment area of 11.6 ha comprising main quarry area, increasing to 15.3 ha at ultimate development. • Catchment drains to the Pit Dam [Photo 1] located in quarry floor. • Water is pumped out to the Main Dam [Photo 2], with water levels maintained to avoid flooding of the adjacent quarry floor access track.
C2	• Catchment area of 0.9 ha comprising area surrounding Main Dam. • Catchment drains to the Main Dam. • Water extracted from Main Dam via pump to supply processing plant and dust suppression sprinkler system. • Sediment accumulation in the Main Dam is monitored against a red marker block, with desilting undertaken as required. • Main Dam gravity drains via piped [Photo 3] and open [Photo 4] drainage system, discharging to the Main Drainage Channel. • Water quality is currently monitored at the upstream end of the Main Drainage Channel, immediately downstream of the existing pipe outlet [Photo 5]. • Main Drainage Channel receives runoff from the adjacent vegetated/undisturbed area immediately to the west before discharging offsite to the receiving cane drain system [Photo 6] at the LDP [Photo 7]. *Recent improvement works along the Main Drainage Channel are described further in Section 4.3.* • Water quality is also currently monitored at the downstream end of the Main Drainage Channel at the LDP [Photo 7]. • A small, steady discharge of clear water (around 0.5 L/s from visual observation) in the Main Drainage Channel was observed on the day of inspection, which followed a substantially dry period with rainfall well below the 5-day rainfall depth. The source of this continuous discharge was traced to the reach of piped drainage immediately downstream of the Main Dam, and it is considered most likely that seepage through fractures in the rock in which the Main Dam has been excavated is entering the pipe at an unknown location along its length. Site personnel noted that the continuous discharge typically occurs following rainfall that raises the level in the dam, and abates several days after rainfall has stopped.
C3	• Catchment area of 0.8 ha comprising area surrounding Stockpile Area #2 [Photos 8 and 9]. • Stockpile Area #2 is used only for select 'cleaner' product sourced from fresh rock with low fines content. • Catchment is gravel-lined and appears fully contained via bunding with no discharge point, nor evidence of recent discharge. Accumulated runoff is lost via infiltration or evaporation only. *Recent improvement works to bunding surrounding the stockpile area are described further in Section 4.3.*
C4	• Catchment area of 1.0 ha comprising area surrounding processing facilities, primary feed bin, fuel storage and refuelling area, and workshop. • Catchment drains to 2 wedge pits [Photo 10], which provide primary sedimentation. • Water is pumped out of the wedge pits to the Main Dam, with automated pump operation via float switch. • Wedge pits are desilted typically multiple times per day, with removed sediment blended back into suitable product. • Concrete lined drains collect runoff from adjacent processing and workshop areas [Photo 11]. Oil/grease 'snakes' are used to bund off and capture hydrocarbons from these drains in the case of a leakage or spill. Trailer-mounted spill kits are on hand for spill management [Photo 12].
C5	• Catchment area of 2.4 ha comprising area surrounding Stockpile Area #1, the main entrance and driveway, weighbridge, office and laboratory [Photos 13, 14 and 15]. • Catchment is predominantly gravel-lined and appears fully contained via bunding with no clear discharge point, nor evidence of recent discharge. Accumulated runoff is lost via infiltration or evaporation only.

Key observations in relation to the PRP are as follows:

- The Main Dam and the Pit Dam are the primary water management controls for the Site and control the bulk of the disturbed quarry catchment area, comprising Catchments C1, C2 and C4.

- Catchments C3 and C5 do not drain to a sediment basin. Runoff from these disturbed areas is managed by alternative measures, primarily through containment via bunding to prevent discharge of runoff from leaving the Site.

- The continuous discharge that occurs in the Main Drainage Channel over a period of days following even minor rainfall events means that the quarry does not technically capture the five-day rainfall event. Monitoring is however undertaken on a daily basis for all discharges when less than the five-day rainfall event has occurred.

4.3 Recent improvement works

On receipt of initial feedback from the EPA following their inspection of 7 June 2018, various site works were undertaken in the vicinity of Stockpile #2 and the adjacent Main Drainage Channel to further improve erosion and sediment control in this part of the quarry. These works were undertaken in early August 2018 and comprised:

- Stabilisation and formalisation of bunding around Stockpile #2. This work involved reconstruction of selected areas of bunding with compacted earth core and rock rip rap lining, with suitable materials sourced on-site. The final bunding is continuous around the stockpile area and observed to be at least 0.5 m high. [Photo 9 – the bunding can be seen in the background of this photo behind the 4WD]

- Rock lining and construction of check dams along the Main Drainage Channel. This work involved placement of concrete blocks, wrapped in geofabric and embedded into the ground, and placement of rock rip rap to create a series of check dams along the channel. The check dams were observed to be in the order of 0.5 to 1 m deep, with extensive rip rap lining of the lower channel reach approaching the LDP. [Photos 16 and 17]

Ongoing monitoring of erosion and sediment control measures, and improvement where necessary, is also evidenced by observation of the following works also recently constructed in September 2018:

- concrete lining of selected catch drains subject to high velocity flows for erosion control within Catchment C1 [Photo 18]; and

- construction of a diversion bund and cross-drain at a key location across the main access track within Catchment C1, with associated piped drainage to direct sediment laden runoff into the Pit Dam.

5 Performance of water management dams and controls

5.1 Review of water quality monitoring results

Holcim provided water quality monitoring results for the Site for the recent period June to October 2018 which followed the EPA inspection. Over this time, monitoring at the LDP has been supplemented by a second monitoring location at the upstream end of Main Drainage Channel to help assess whether the adjacent Stockpile Area #2 is potentially contributing to any increased turbidity in runoff conveyed within the channel.

Monitoring results are presented in **Figure 2**, which shows that water quality at both sampling points is consistently within the EPL concentration limits, with no exceedances recorded over the monitoring period.

On this basis, it is recommended that Holcim cease monitoring at the Water Monitoring Point #1 and continue to monitor water quality only at the LDP per EPL requirements.

5.2 Assessment of Pit Dam and Main Dam

The Main Dam and the Pit Dam are operated as sediment basins and control the bulk of the disturbed quarry catchment area comprising Catchments C1, C2 and C4. Both dams are understood to have been excavated in hard rock.

The WMP provided a comparison of available dam storage against the 'Guideline Volume' calculated using the methods detailed in *Managing Urban Stormwater: Soils and Construction, Volume 2E – Mines and Quarries* (DECC 2008). This comparison has been updated and is presented in **Table 2**, which shows that current dam volumes are well in excess of the Guideline Volumes.

Table 2 Water Management Dam Volumes

Dam	Settling Volume (m^3)	Sediment Zone (m^3)	Guideline Volume (m^3)	Current Dam Volume (m^3)
Main Dam	1,252	626	1,878	5,125
Pit Dam	7,541	3,771	11,312	37,753
Pit Dam[1]	9,962	4,981	14,943	NA[2]

Notes: 1. Anticipated volumes when the quarry reaches the maximum extraction extent.

2. Dam volume will depend on quarry dimensions which vary with time.

5.3 Operational water requirements and sources

It is understood that all water required for operational needs including processing, wash down and dust suppression is sourced from the Main Dam, which is a reliable source of water that has not required mains top up in recent history.

Rainwater from the office roof is also harvested for non-potable internal uses such as toilet flushing.

Imported water is limited to bottled water for drinking purposes.

In summary, there is no clear need for improvement of any aspect of current operational water management.

6 Recommended improvements

The following recommendations are made to review, and if necessary improve, the effectiveness of existing water management measures, practices and procedures:

- Review/audit of all existing bunding of various forms/construction around Catchment C5 should be undertaken to confirm that containment measures are continuous and effective at preventing offsite discharge. If necessary, improvement or enhancement of existing controls should then be undertaken.

  It is noted that bunding is considered to form an effective sediment control for this area, and with no prior evidence or history of uncontrolled discharge from the Site (including from recent rainfall in 2018 that was well in excess of the five-day rainfall event) a formal sediment basin is not considered necessary to manage the risk of discharge in this location.

- At the time of inspection in October 2018 low flows in the Main Drainage Channel were observed to be conveyed within the voids in the rock rip rap lining, and left the Site beneath the concrete block that forms the intended discharge weir. This created a situation where it was not possible to obtain consistency in sampling location. On this basis a preliminary recommendation was made that concrete lining of the channel at its downstream end was undertaken to effectively lift the invert of the channel up and match into the top of the concrete block weir, so that the full range of flow rates would be conveyed over the weir.

  These works were undertaken in early December 2018 [Photo 19] and appear effective in producing a consistent sampling point at the LDP and in restricting seepage behind the block weir. No further improvements are considered necessary at this location.

- Several improvements to water monitoring procedures and record keeping are recommended for capture in an updated version of the WMP (refer Section 7), including:

  - to ensure discharge sampling occurs at a consistent location at the LDP at all times; and

  - improvement of record keeping to capture additional details (eg. timing of sampling when undertaken, affirmation of oil/grease observations).

Further investigation of the source and potential remedial measures to address seepage and resulting continuous discharge below the Main Dam could also be contemplated if it is considered desirable to reduce EPL compliance costs. It is noted that more frequent water quality monitoring is currently required than would otherwise be needed if the seepage was able to be stopped.

7 Recommendations for WMP update

Based on the above, no substantial changes to the WMP are warranted. However, the following updates should be incorporated to reflect current water management practices, recent works undertaken and the key findings and recommendations from the review:

- Update to reflect the **recommended improvements** noted in Section 6, as appropriate.

- Sections and figures of the WMP that refer to **water monitoring locations** should be updated to retain just the single monitoring point at the LDP.

- There is a need to clarify the **water monitoring requirements** in Section 6.3 of the WMP to ensure that all relevant requirements in terms of location, frequency, timing, parameters and protocols to be observed are clear and readily understood.

- Section 5.4 of the WMP infers that monthly **water balance monitoring** and six-monthly **site water balance model updates** will be undertaken, which is understood to be not occurring nor required to effectively manage water use and discharge from the Site. It is recommended that this section is revised to reduce the frequency of monitoring to reflect current practice, and to remove model balance model updates unless a significant change to water management is required.

Updates to the WMP should be undertaken once in-principle agreement on the PRP response is reached with the EPA.

8 Closing

I trust this adequately addresses the EPA's concerns in regards to stormwater management generally, and in particular the specific issues noted along the Main Drainage Channel, but please don't hesitate to call me to discuss should you require any further information or clarification.

Yours sincerely

Nick Bartho
Associates Water Resources Engineer

nbartho@emmconsuting.com.au
P: 0411 100 998

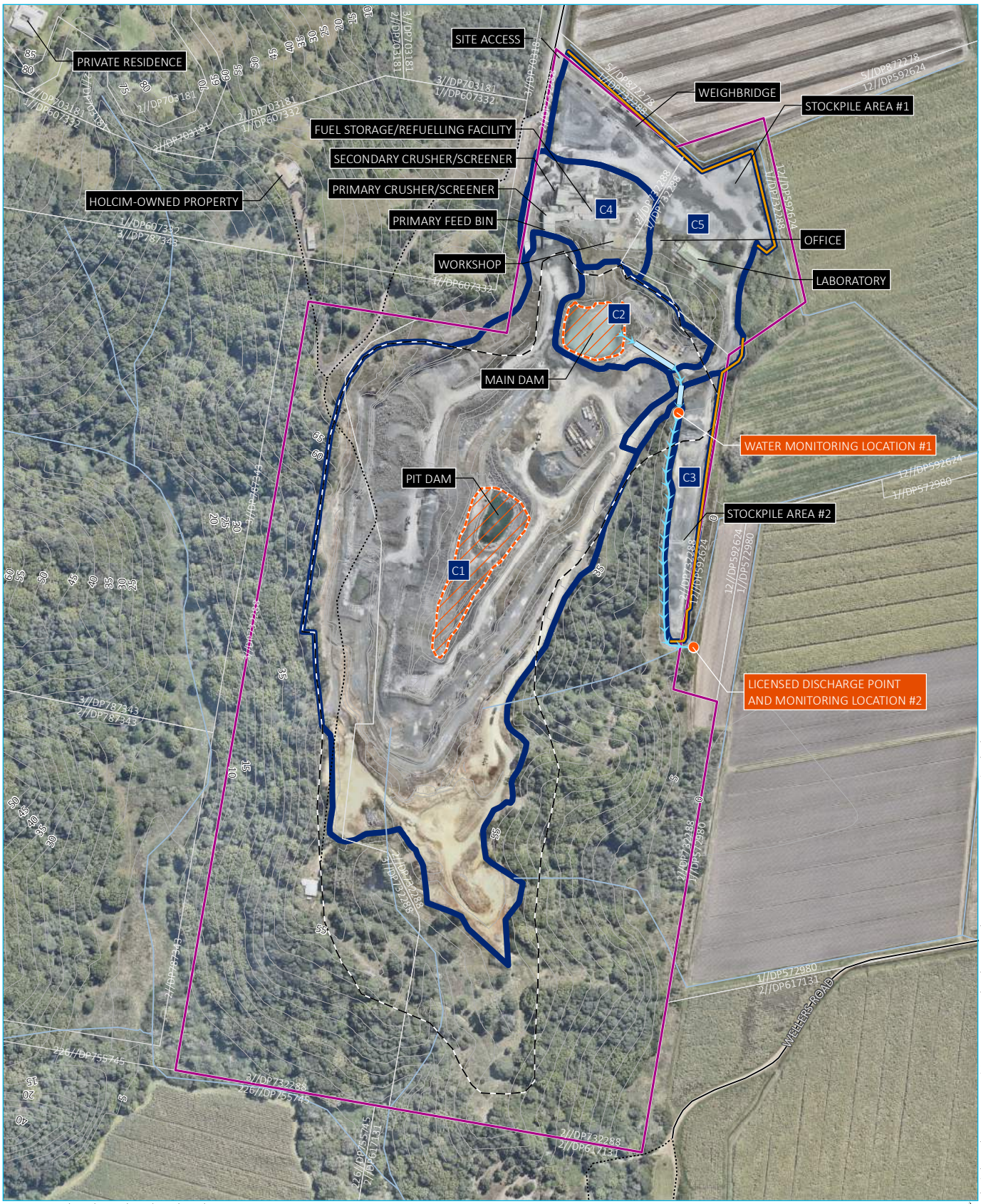
Figures

1 Water management overview

2 Assessment of water quality monitoring data

Attachments

A Photographs



Source: EMM (2018); DFSI (2017); GA (2015)

0 100 200 m

GDA 1994 MGA Zone 56

N

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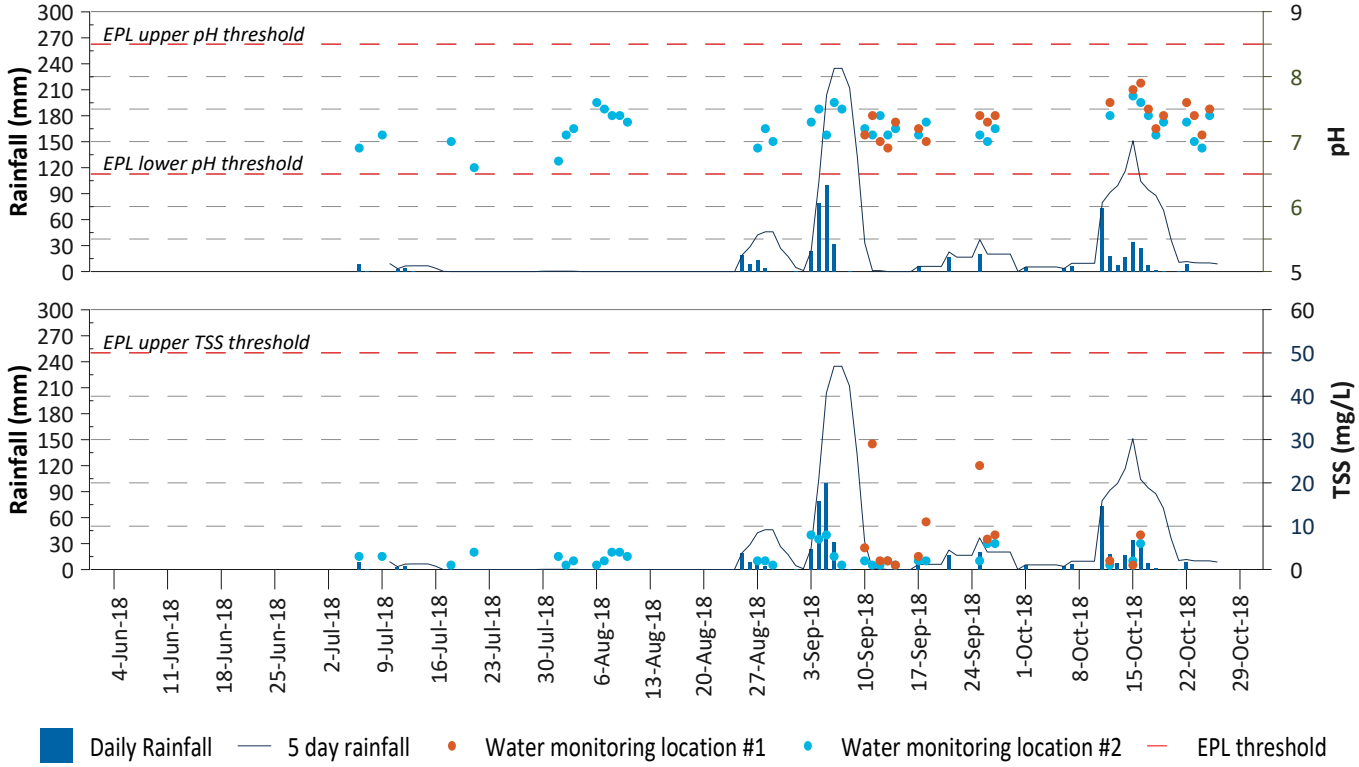
KEY

- Teven Quarry extent
- Approved extraction extent
- Water monitoring point
- Bund
- Open channel
- Pipe
- Final dam location
- Local road
- Vehicular track
- Watercourse/drainage line
- Topographic contour (5 m)
- Cadastral boundary
- Current catchments

Water Management Overview

Teven Quarry
Water Management Review
Figure 1

EMM
creating opportunities



Assessment of water quality monitoring data
Teven Quarry
Water Management Review
Figure 2

Attachment A - Photographs

Photograph 1: Pit Dam – view to south with pump and rising main shown in foreground

Photograph 2: Main Dam – view to north across dam

Photograph 3: pipe outlet from Main Dam

Photograph 4: open channel reach downstream of Main Dam, upstream of access track crossing

Photograph 5: Water Monitoring Location #1 at the upstream end of the Main Drainage Channel

Photograph 6: receiving cane drain system

Photograph 7: concrete block weir located at the LDP at Site boundary, corresponding to Water Monitoring Location #2

Photograph 8: Stockpile Area #2 – view to south. Main Drainage Channel to right of photograph.

Photograph 9: Stockpile Area #2 – view to north. Main Drainage Channel to left of photograph.

Photograph 10: Wedge pits adjacent to main processing facilities and workshop

Photograph 11: Concrete lined drains draining to wedge pits

Photograph 12: Trailer-mounted spill kit located near workshop

Photograph 13: Main entrance driveway, kerb shown to left of photograph which contains and directs runoff towards weighbridge and truck wash area

Photograph 14: Dust suppression sprinkler in operation on main driveway

Photograph 15: Main stockpile area showing ponded runoff and concrete block bunding located along northern site boundary

Photograph 16: Check dam constructed along Main Drainage Channel

Photograph 17: Check dam constructed along Main Drainage Channel

Photograph 18: Concrete lining of catch drains along upper access road

Photograph 19: Concrete lining of Main Drainage Channel immediately upstream of the LDP