Strength. Performance. Passion

Holcim

ANNUAL REVIEW
1 January 2020 – 31 December 2020

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 2020
Annual review end date	31 December 2020
I, **Phillip Messenger**, 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 2020-31 DECEMBER 2020** 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	Phillip Messenger
Title of authorised reporting officer	Quarry Manager
Signature of authorised reporting officer	
Date	30/03/2021

1 STATEMENT OF COMPLIANCE

The statement of commitments for the 2020 reporting period for Teven Quarry is provided in **Table 1. Table 3** details the non-compliances of SSD 6422 identified within the 2020 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 – See **Table 3**
EPL 3293	YES

Table 2: DPIE 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 2020

<table>
<tr><th>Relevant Approval</th><th>Condition</th><th>Condition Description</th><th>Status</th><th>Relevant Section of the Annual Review/ Issue</th></tr>
<tr><td>SSD 6422</td><td>Schedule 3, Condition 4</td><td>The Applicant shall ensure that the noise generated by the development does not exceed the criteria in Table 2 at any residence on privately-owned land.

Table 2: Noise criteria dB(A)
<table><tr><th>Receiver</th><th>Day
dB(A) ($L_{Aeq(15\ min)}$)</th><th>Evening
dB(A) ($L_{Aeq(15\ min)}$)</th></tr><tr><td>R3, R4, R13, R15, R16, R17, R18, R20</td><td>38</td><td>35</td></tr><tr><td>All other residences</td><td>37</td><td>35</td></tr></table>Note: Receiver locations are shown on the figure in Appendix 4.</td><td>Low Risk Non-Compliant</td><td>Section 6.2 Noise

Exceedance of noise criteria on one occasion in May 2020 at R10. Mitigation measures now in place.</td></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

Exceedance of short term PM_{10} criteria on 1/03/2020. Reported to DPIE.</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 then New South Wales (NSW) Department of Planning and Environment (DPE) (now Department of Planning, Industry and Environment (DPIE)) on 15 July 2015.

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

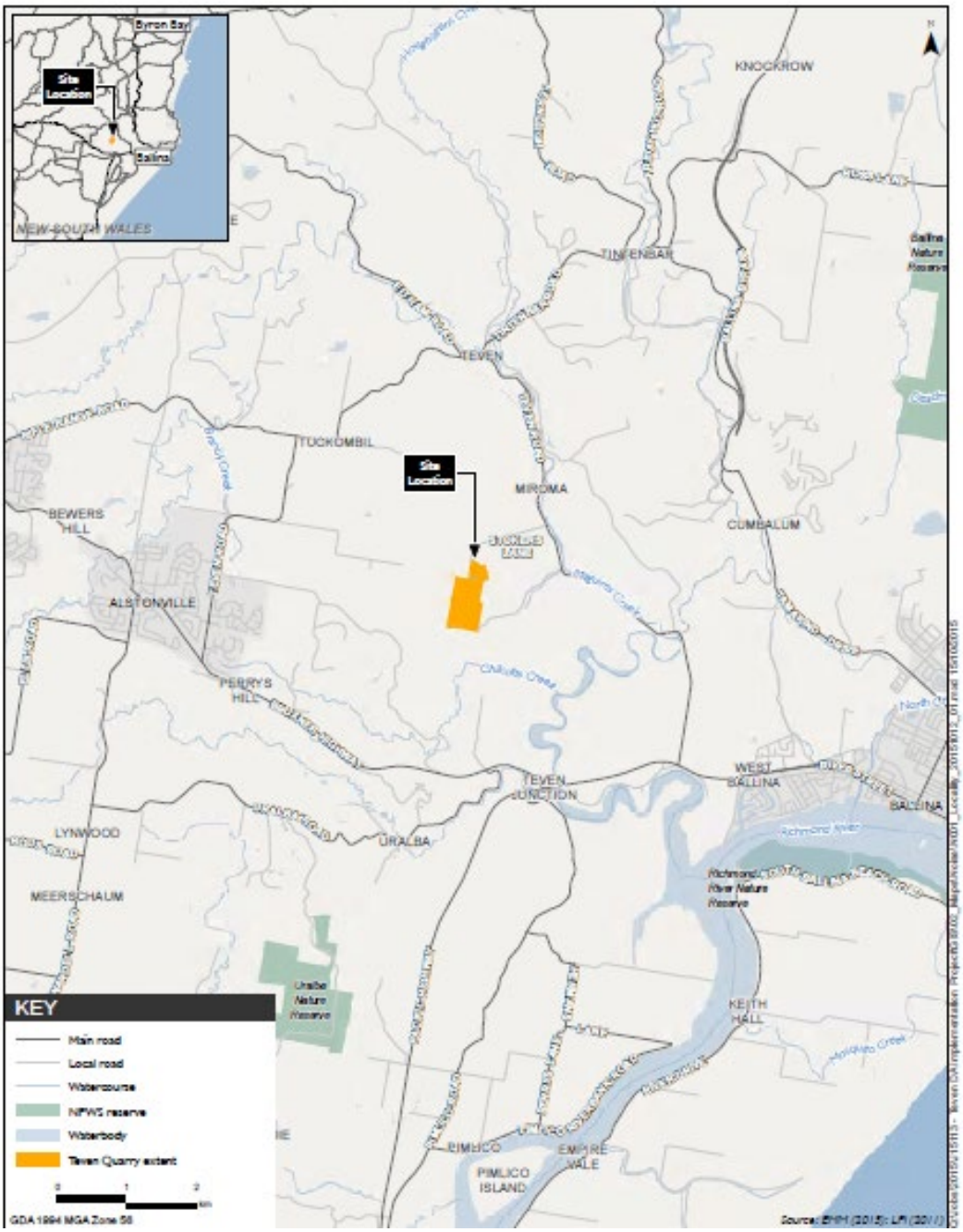

Figure 1: Regional Locality (Source EMM: 2016)

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 2020 to 31 December 2020.

2.1 Contact Details

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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 DPIE
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 were some minor upgrades done to the existing processing plant in the Annual Review period.

4.4 Quarry Operations

Operational activities undertaken at Teven Quarry in 2020 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 is 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 2020.

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 Annual Product Distributed (Holcim Teven Quarry)

Material	Approval Limit (Tonnes)	2018 (Tonnes)	2019 (Tonnes)	2020 (Tonnes)	Proposed 2021 Reporting Period (Tonnes)
Product Distributed - Total	500,000	372,640	458,679	292,701	320,000

4.5 Next Reporting Period

Development activities proposed to be carried out at Teven Quarry in 2021, 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

5.1 Actions from 2019 Annual Review – DPIE Actions

The 2019 Annual Review was submitted to DPIE on 3 April 2020. Holcim received a response on 1 May 2020 outlining DPIE's satisfaction with the Annual Review as well as request of Teven to improve compliance with the Development Consent in relation to air quality reporting (Schedule 3 Condition 11), incident reporting (Schedule 5 Condition 7), information made available for the public (Schedule 5 Conditions 8 and 11), and the timely submission of Independent Environmental Audits (Schedule 5 Condition 9).

5.2 Actions from 2019 Annual Review - Holcim Proposed Actions for 2020

Table 9 provides an update on the proposed actions from Holcim staff.

Table 9: Update on Holcim Proposed Actions for 2020

Improvement Actions from Previous Annual Review	Works Undertaken	Section
Management Plans to be sent to DPIE in Quarter 2 2020.	Management Plans continued to be revised in this report period. They were not approved by DPIE in Quarter 2 2020. Updated Management Plans are expected to be updated and approved in 2021.	Section 6 Environmental Performance & Section 7 Water Management.
Improve the PM_{10} sampling and analysis process in 2020 to operate as per the Development Consent requirements. Reduction in short term non compliances.	Maintenance of air quality monitoring program and implementation of the *Air Quality Management Plan*.	Section 6.3 Air Quality
Liaise with the EPA and DPIE about moving DDG1 and DDG2 to a more suitable location, where there is less likelihood of contamination.	Correspondence with EPA and DPIE initiated in the report period but no further actions were taken.	Section 7 Water Management
Weed spraying will continue at site during the next Annual Review period.	Continuation of spot spraying as required. Little evidence of weeds onsite.	Section 6.6 Biodiversity
Complete all weekly pH sampling during the Annual Review period. Continue with the expanded monitoring suite.	Surface water quality monitoring was undertaken in line with the *Water Management Plan*.	Section 7 Water Management
<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.	Groundwater seepage was negligible in the quarry void in the report period.	Section 7 Water Management

6 ENVIRONMENTAL PERFORMANCE

6.1 Meteorological Monitoring

Teven Quarry has meteorological monitoring stations on site to monitor meteorological conditions and adjust operations accordingly as per the Development Consent. Data collected from the on-site meteorological station was cross-referenced against local weather data collected from the Bureau of Meteorology's weather station located at Ballina Airport in 2020. This was done because the site continues to refine the process of summarising the site data into actionable, daily or monthly weather reports. A summary of the weather conditions at Ballina Airport as a representation of conditions at Teven Quarry is presented in **Table 9**.

Holcim continues to improve meteorological monitoring in consultation with Ramboll.

Table 8: Meteorological Monitoring Results 2020 (Ballina Airport AWS, station 058198)

Month	Total Rainfall (mm)	Minimum Temperature (°C)	Maximum Temperature (°C)
January	24.62	20.4	34.4
February	668.0	18.9	34.5
March	85.2	12.7	32.0
April	95.8	10.3	32.6
May	230.8	8.9	25.1
June	139.8	7.6	24.5
July	174.8	2.9	24.5
August	55.0	3.6	25.6
September	45.8	5.0	28.2
October	88.8	10.0	29.0
November	38.2	13.0	31.7
December	382.2	15.7	32.2
Annual TOTAL	2029.02		

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 9: 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 2020 in accordance with the requirements of the Schedule 3, Condition 4. Monitoring was completed by Muller Acoustic Consulting (MAC) on the following dates:

- 29th January 2020;
- 12th and 13th May 2020;
- 8th and 9th September 2020; and
- 25th and 26th November 2020.

Noise results at all locations were within the approved performance criteria for the site except for N4 in quarter 2 which exceeded the day criteria by between 3dBA and 6dBA as shown in **Table 11**. This exceedance was attributed to a significant reduction in the size of product stockpiles which usually acts as a noise barrier between the plant and receiver N4. This exceedance is a non-compliance with Schedule 5 Condition 7 and was reported by MAC to the Quarry Manager. Teven Quarry proceeded inform DPIE of this incident.

Copies of the quarterly noise monitoring reports for 2020 are attached as **Appendix 1**.

Table 10: Noise Compliance Assessment for Teven Quarry (Muller Acoustic Consultants, 2020)

Assessment Period	Receiver No.	Monitoring Location	Quarrying Noise Criteria	Q1 Jan-20		Q2 May-20		Q3 Sep-20		Q4 Nov-20	
			$LAeq_{(15min)}$	Quarry Noise Contribution (LAeq(15min))	Compliance	Quarry Noise Contribution (LAeq(15min))	Compliance	Quarry Noise Contribution (LAeq(15min))	Compliance	Quarry Noise Contribution (LAeq(15min))	Compliance
Day	R2	N3/NM3	37	<35	✓	32-33	✓	<30	✓	<35	✓
	R3/R4	N2/NM2	38	<35	✓	30-36	✓	<35	✓	<35	✓
	R7	N1/NM1	37	<30	✓	<30	✓	<35	✓	<35	✓
	R10	N4/NM4	37	33-36	✓	**40-43**	✗	34	✓	<37	✓
	R14	NM5	37	-	-	-	-	<30	✓	<35	✓
	R15	N5	38	<35	✓	<30	✓	-	-	-	-
Evening	R2	N3/NM3	35	Not operational	✓	Not operational	✓	Not operational	✓	Not operational	✓
	R3/R4	N2/NM2	35	Not operational	✓	Not operational	✓	Not operational	✓	Not operational	✓
	R7	N1/NM1	35	Not operational	✓	<30	✓	Not operational	✓	Not operational	✓
	R10	N4/NM4	35	Not operational	✓	Not operational	✓	Not operational	✓	Not operational	✓
	R14	NM5	35	-	-	-	-	Not operational	✓	Not operational	✓
	R15	N5	35	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.

Long-term Trends:

2020 is the fourth year of complete noise monitoring as per the Project Approval. The site was compliant in both 2017 and 2018. In both 2019 and 2020 an exceedance occurred at receiver N4 in quarter 2. These exceedances had different causes, with the 2019 exceedance being caused by changes in loading quantities at the plant at the time of monitoring while the 2020 exceedance was caused by a significant decrease in the size of quarry stockpiles functioning as a noise barrier between the site and receiver N4.

Comparison to EIS Predictions:

At the time of monitoring one exceedance occurred outside of the predicted limits of the EIS in 2020.

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.* The site will ensure that stockpiles are kept at a level to reduce noise from operations.

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 11: 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})

In 2020 dust monitoring was undertaken using a High Volume Air Sampler (HVAS) to monitor particulate matter (PM_{10}). PM_{10} monitoring results for 2020 are provided in **Table 14.**

Table 12: 2020 Dust Monitoring (PM_{10}) at Teven Quarry

Sample Date	TSP (µg/m^3)	HVAS PM_{10} (µg/m^3)	24-hour PM_{10} Criterion
	Actual Result	**Calculated Result**	
3/01/2020	81.0	32.4	Compliant
9/01/2020	23.0	9.2	Compliant
19/01/2020	166.0	66.4	Non-Compliant - Bushfires
25/01/2020	46.0	18.4	Compliant
31/01/2020	40.0	16.0	Compliant
6/02/2020	50.0	20.0	Compliant
12/02/2020	36.0	14.4	Compliant
	Calculated Result	**Actual Result**	
18/02/2020	55.2	23.0	Compliant
24/02/2020	55.2	23.0	Compliant
1/03/2020	121.2	50.5	Non-Compliant - Bushfires
8/03/2020	79.9	33.3	Compliant
14/03/2020	NS	NS	
20/03/2020	55.2	23.0	Compliant
26/03/2020	66.7	27.8	Compliant

Sample Date	TSP (μg/m^3)	HVAS PM_{10} (μg/m^3)	24-hour PM_{10} Criterion
1/04/2020	0.0	* 0.002	Compliant
7/04/2020	11.0	4.6	Compliant
13/04/2020	0.0	0.0	Compliant
19/04/2020	11.1	4.6	Compliant
25/04/2020	16.7	6.9	Compliant
1/05/2020	16.7	6.9	Compliant
7/05/2020	5.6	2.3	Compliant
13/05/2020	5.6	2.3	Compliant
19/05/2020	11.1	4.6	Compliant
25/05/2020	0.0	0.0	Compliant
31/05/2020	0.0	0.0	Compliant
6/06/2020	5.6	2.3	Compliant
12/06/2020	11.1	4.6	Compliant
18/06/2020	16.7	6.9	Compliant
24/06/2020	11.1	4.6	Compliant
30/06/2020	NS	NS	
6/07/2020	5.6	2.3	Compliant
12/07/2020	22.2	9.3	Compliant
18/07/2020	NS	NS	
24/07/2020	NS	NS	
30/07/2020	11.1	4.6	Compliant
5/08/2020	11.1	4.6	Compliant
11/08/2020	11.1	4.6	Compliant
17/08/2020	0.0	0.0	Compliant
23/08/2020	0.0	0.0	Compliant
29/08/2020	11.1	4.6	Compliant
4/09/2020	11.1	4.6	Compliant
10/09/2020	11.1	4.6	Compliant
10/09/2020	16.7	6.9	Compliant
16/09/2020	22.2	9.3	Compliant
22/09/2020	16.7	6.9	Compliant
28/09/2020	11.1	4.6	Compliant
4/10/2020	11.1	4.6	Compliant
16/10/2020	5.6	2.3	Compliant
22/10/2020	11.1	4.6	Compliant
28/10/2020	16.7	6.9	Compliant
3/11/2020	5.6	2.3	Compliant
9/11/2020	33.3	13.9	Compliant
15/11/2020	16.7	6.9	Compliant
21/11/2020	11.1	4.6	Compliant
27/11/2020	22.2	9.3	Compliant
3/12/2020	11.1	4.6	Compliant

Sample Date	TSP (µg/m^3)	HVAS PM_{10} (µg/m^3)	24-hour PM_{10} Criterion
9/12/2020	11.1	4.6	Compliant
15/12/2020	NS	NS	
21/12/2020	NS	NS	
27/12/2020	NS	NS	
Minimum	**0.0**	**0.0**	
Maximum	**166.0**	**66.4**	
Average	**24.8**	**10.4**	
Result	**Compliant**	**Compliant**	

Note: Results that include (*) are contaminated and have been removed from the annual average.

During the reporting period, TSP and PM_{10} were monitored during different periods with TSP being monitored for January and February 2020 and PM_{10} monitored for the remainder of the year. A conversion factor outlined in the Air Quality Management Plan was used to calculate from the actual monitoring result to a TSP or PM_{10} result.

60 sampling events took place in this report period. Sampling events for the end of December were missed due to the HVAS being contaminated by water and faulty equipment and are recorded in **Table 13** as NS.

The PM_{10} annual average for 2020 was 10.4 µg/m^3 which is below the annual criteria of 30 µg/m^3 and compliant with the Development Consent. A result of 50.5 µg/m^3 for PM_{10} on 1 March 2020 exceeded the 24-hour criteria. This sample was affected by severe bushfires in the region and discussed with DPIE.

The annual average TSP for 2020 was 24.8 µg/m^3 which is below the annual criteria of 90 µg/m^3 and meets conditions of the Development Consent. However, this is based on seven actual and 53 calculated results.

The PM_{10} annual average for 2020 was significantly less than for 2019 and 2018, at 32.4 µg/m^3 and 28.6 µg/m^3, respectively.

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 2020. Results for this monitoring are provided in **Table 14**.

Contamination of the depositional dust gauges by insects, leaves, bird faeces, and other organic material and its impact on depositional dust monitoring has been noted from 2017 to 2019. This trend continued into 2020, with contamination affecting results from all gauges. Three samples at DDG1, six samples from DDG2 and one sample from DDG3 (as shown in bold) were noted in monitoring reports as having been contaminated.

Samples from DDG2 were significantly impacted by contamination this report period, with 6 samples showing obvious signs from contamination by birds or water. Samples for August and October at DDG2 did not have field comments describing any contamination. However, this gauge has a history of contamination by birds and neighbouring agricultural activity. Since this report period DDG2 has been relocated to better represent depositional dust generated by the site.

It should also be noted that Australia experienced unprecedented bushfire events in early 2020 which is likely to have impacted the ash content of the depositional dust results at Teven Quarry.

Table 13: 2020 Dust Monitoring (Depositional Dust)

Sample Period	Insoluble Solids DDG1 (g/m^2/month)	Insoluble Solids DDG2 (g/m^2/month)	Insoluble Solids DDG3 (g/m^2/month)
January	5.2	*11.1	1.9
February	0.5	*98.3	0.8
March	2.1	***75.7**	0.5
April	***2.4**	***18**	***0.8**
May	3.5	***39**	0.1
June	***16**	***24**	0.4
July	0.5	2.8	1.1
August	1.8	***16**	3.6
September	0.8	***1.4**	1.3
October	1.9	*6.1	1
November	1.4	***1.1**	1.9
December	***3**	2.9	2.9
Annual Average	3.26	24.70	1.36
Annual Average - contaminated samples removed	1.97	**2.85**	1.41
Result	**Within Criteria**	**Within Criteria**	**Within Criteria**

Note: Contaminated results are marked with an asterisk (*).

The complete monitoring program was undertaken at Teven in this report period. DDG1, DDG2, and DDG 3 were within the annual average criteria of 4 g/m^2/month.

A comparison of depositional dust results (with contamination removed) from 2018 to 2020 is provided in **Table 15**.

Table 14: Comparison of Depositional Dust Data (with contamination removed)

Dust Depositional Gauge	Monitoring Summary for Annual Review Period	2018 (g/m/^{2}/month)	2019 (g/m/^{2}/month)	2020 (g/m/^{2}/month)
DDG1	Insoluble Solids Reporting Period Average	2.7	1.3	1.97
	Max. Insoluble Solids	5.0	3.9	5.2
	Min. Insoluble Solids	0.6	0.1	0.5
DDG2	Insoluble Solids Reporting Period Average	1.7	2.8	2.85
	Max. Insoluble Solids	2.1	5.5	2.9
	Min. Insoluble Solids	1.2	0.6	2.8
DDG3	Insoluble Solids Reporting Period Average	0.7	1.5	1.41
	Max. Insoluble Solids	1.6	3.8	0.1
	Min. Insoluble Solids	0.3	0.1	3.6

6.3.3.3 Long-term Trends:

During preparation of the 2016 Annual Review for Teven Quarry it was discovered that Holcim were receiving incorrect dust deposition results from ALS 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.

Trends analysis of depositional dust in 2020 is consistent with 2018 and 2019 monitoring. However, it is difficult to discuss trends for depositional dust considering the number of samples which are discarded from the annual average due to contamination.

The 2020 annual average for PM_{10} remains below long-term criteria which is consistent with 2017, 2018, and 2019 trends. Dust monitoring over this 2020 period changed from TSP monitoring with previous contractors to PM_{10} monitoring with the current monitoring contractors. As such, long-term results are not presented in this report. Historical issues with monitoring frequency for air quality was resolved in 2020.

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 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. 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. This short-term criteria prediction in the EIS was demonstrated by one exceedance for PM_{10} for all of 2020.

Key historical contributions to PM_{10} exceedances are bushfires and nearby agricultural activity such as cutting of cane and slashing. Previous laboratory analysis indicates outside dust sources are the major contributor to dust levels at DDG1 and DDG2.

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 Pla*n (2016).

6.3.5 Proposed Improvements

Holcim is committed to improving the PM_{10} sampling process in 2021 to ensure that sampling is conducted correctly and on the required timetable to ensure operation as per the Development Consent requirements.

Teven Quarry is continuing pursuits to making improvements to the locations of dust gauges DDG1 and DDG2 in order to decrease the occurrence of contaminated samples. *The Air Quality Management Plan* is expected to be updated and resubmitted to DPIE in 2021 with these revised locations.

Teven Quarry should also implement TSP in their air quality monitoring program.

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 2020 in accordance with the conditions of the Development Consent and EPL No. 3293. The criteria for blasting at the site are detailed in **Table 17.**

Table 15: Blast Monitoring Criteria from EPL 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 2020 are shown in **Table 18**.

The results for blasting at all monitoring locations were within the EPL 3293 and Development Consent criteria for 2020.

Table 16: 2020 Blast Monitoring Results

Location	Description	Upper Limit Criteria	Date											
			18-02-2020	25-03-2020	29/04/2020	01/06/2020	24/06/2020	06/07/2020	04/08/2020	19/08/2020	01/09/2020	15/10/2020	17/11/2020	03/12/2020
Barn on Stokers Ln BM1	Over Pressure - dB (Lin Peak)	120	DNT	DNT	DNT	DNT	DNT	DNT	108.5	DNT	DNT	-	-	-
	Ground Vibration - (mm/s)	10	DNT	DNT	DNT	DNT	DNT	DNT	0.06	DNT	DNT	-	-	-
Residence on Wellers Rd BM2	Over Pressure - dB (Lin Peak)	120	DNT	DNT	109.3	DNT	DNT	DNT	104.9	DNT	DNT	-	102.9	105.2
	Ground Vibration - (mm/s)	10	DNT	DNT	0.6	DNT	DNT	DNT	0.06	DNT	DNT	-	1.73	1.91

DNT – Did Not Trigger

Long-term Trends:

From 2015 – 2020 the blasting levels have been within the Development Consent and EPL criteria. Long term blast results are provided in **Table 18**. These show long-term consistency for overpressure results. There has been a notable increase in the vibration results for 2020 compared to previous years.

Table 17: Teven Quarry Long-term 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
2019	11	11	NT	NT	NT	NT
2020	12	7	109.3	106.2	1.9	0.9

Comparison to EIS Predictions:

The 2020 results for blasting were within the limits of the EIS predictions, with the EIS predicting blasts to be below criteria.

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* (2016).

6.4.5 Proposed Improvements

No further improvements to blast management are proposed for 2021.

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 2020 to ensure compliance with movements and volume requirements discussed above. A copy of these monitoring results has been included in **Table 19**.

Table 18: Average Truck Movements for 2020

Month	Total Truck Movements	Active days	Average Truck Movement per active day
January	886	22	40
February	915	25	36
March	1434	26	54
April	1021	24	41
May	1235	26	47
June	1544	25	60
July	1028	27	37
August	1229	25	45
September	1169	26	44
October	1414	26	53
November	1251	25	49
December	735	20	36
Total	**13,861**	**297**	**45**

Long term 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 per day, averaged over the total number of dispatch days in any calendar month.

The annual average for truck movements per active day was similar for 2018 and 2019 report periods with respective averages of 53 and 54 truck movements. This 2020 report period decreased to an average of 45 truck movements per active day.

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. No additional improvement measures outside those outlined in the 2016 *Transport Management Plan* are proposed to be implemented in 2021.

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

Teven Quarry conducted some grass stripping in 2020. No additional clearing occurred in the report period. This has had a limited impact on biodiversity.

No weed spraying or feral animal management occurred in the report period.

6.6.4 Management Measures

Teven Quarry implement biodiversity management measures from its updated Biodiversity and Rehabilitation Management Plan. The main procedures include:

- Weed management;
- Habitat reinstatement;
- Pre-clearance permit process; and
  Bushfire management.

6.6.5 Proposed Improvements

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

The Biodiversity and Rehabilitation Management Plan will be updated in the 2021 report period. There are no additional proposed improvements for the next reporting 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 2020 are detailed in **Table 20**.

Table 19: Environmental Performance at Teven Quarry in 2020

Aspect	Approval Criteria / EIS Prediction	Performance during 2020 reporting period	Trend / key management implications	Implemented / proposed management actions
Meteorological	Development Consent.	Within criteria.	Issues with station in both 2018 and 2019. Monthly inspections and quarterly calibration done on station in 2020.	Monitoring station fixed February 2020.
Noise	EIS predictions are all below Development Consent criteria.	Non-Compliant. One exceedance for Day criteria on 13th May 2020 at Receiver N4. Reported to DPIE.	Generally meets criteria. An exceedance in Quarter 2 2019 and 2020 at Receiver N4.	Implementation of specific management strategies, procedures, controls and monitoring programs within the Teven Quarry *Noise Management Plan* will continue in 2021.
Blasting	EIS predictions are all below Development Consent criteria.	Within criteria.	Consistently meets criteria. 2020 averages were consistent with long-term trends.	None required.
Air Quality	EIS predictions are all below Development Consent criteria.	Non-Compliant. The PM_{10} 24 hour criteria of 50 $\mu g/m^3$ was exceeded on one occasion, on 1 March 2020 due to bushfires. This was reported to DPIE.	PM_{10} is consistent with long term data. Depositional dust monitoring continued to be significantly impacted by contaminated samples in 2020.	New locations for the depositional dust monitors will continue to be investigated in consultation with the EPA and DPIE in 2021. Updated management measures will be outlined in a revised *Air Quality Management Plan* in 2021.
Traffic Management	EIS predictions are all below Development Consent criteria.	Within criteria.	Consistently meets criteria.	None required.

Aspect	Approval Criteria / EIS Prediction	Performance during 2020 reporting period	Trend / key management implications	Implemented / proposed management actions
Biodiversity	No proposed impacts. No Development Consent criteria.	As per criteria. No issues identified. Minor grass stripping. Minor weed management completed.	No long-term negative trends.	None required. Updated *Biodiversity and Rehabilitation Management Plan* proposed for 2021.
Heritage	No proposed impacts. No Development Consent criteria.	As per criteria. No issues identified.	No issues have been identified in recent years.	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 e.g. 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 licenced discharge points, in accordance with the requirements of EPL 3293 (provided in **Table 21** and **Table 22).**

Table 20: Water Monitoring Criteria (Teven Quarry EPL 3293) – LDP001

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 21: Discharge Sampling Measurement Requirements (Teven Quarry EPL 3293)

POINT 1

Pollutant	Units of measure	Frequency	Sampling Method
Oil and Grease	milligrams per litre	Special Frequency 1	Visual Inspection
pH	pH	Special Frequency 1	No method specified
Total suspended solids	milligrams per litre	Special Frequency 1	Grab sample

In addition to these requirements, the site has been requested by the NSW DPIE 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 cane field 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

Table 23 summarises the water quality results during discharge events at LDP001. A copy of the full data is included in **Appendix 2.**

Table 22: Summary of Water Quality Data at Teven Quarry – 2020

Location/ Frequency	Lower Limit	Upper Limit	Unit	Description	Average	Minimum	Maximum
Wet Weather Discharge - Special Frequency 1	6.5	8.5	pH	pH	6.9	6.5	7.82
		50	mg/L	Suspended Solids	1.4	0.5	4
		10	mg/L	Total Oil & Grease	0	0	0

The monitoring data at LDP001 in 2020 met the EPL criteria. This is consistent with EIS predictions.

7.5 Groundwater Results

Groundwater monitoring was not undertaken during the 2020 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.

Pumping of 1332 kL of surface water from the sump was undertaken in the 2019 the report period.

7.7 Water Management – Pollution Reduction Program

A Pollution Reduction Program (PRP) was prepared by EMM Consulting, dated 31 January 2019, in order to improve sediment basin management and stormwater management at Teven Quarry.

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 Improvements Completed

The following recommendations were outlined in the PRP were completed across 2019 and 2020:

- All Management Plans were updated in accordance with collaboration with DPIE and EPA by the 2020 report period.
- 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 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:

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.

In this Annual Review period, Holcim continued its revision of the Water Management Plan to improve water management measures at Teven Quarry.

7.7.3 Proposed Improvements

The finalisation of the *Water Management Plan* updates will occur in the 2021 report period.

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 23: 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 2020 at the site.

A summary of rehabilitation at the Teven Quarry is outlined in **Table 26**.

Table 24: Rehabilitation Performance in 2020

Guideline Requirement	Site Comment
Extent of the operations and rehabilitation at completion of the reporting period	There was no rehabilitation completed during the 2020 Annual Review period. Operations continued within the existing quarry footprint.
Agreed post-rehabilitation land use	In accordance with the *Biodiversity and Rehabilitation Management Plan*, vegetation communities will 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	There was no rehabilitation completed during the 2020 Annual Review period. Rehabilitation bonds will be reviewed in 2021.

Guideline Requirement	Site Comment
● the installation or maintenance of fences, bunds and any other works.	
Any rehabilitation areas which have received formal sign off from DRG	No rehabilitation received signoff during the 2020 Annual Review period.
Variations to activities undertaken to those proposed (including why there were variations and whether DRG was notified).	No rehabilitation was completed during the 2020 Annual Review period.
Outcomes of trials, research projects and other initiatives	No trials were conducted during the 2020 Annual Review period. Potential for rehabilitation in the 2021 report period, but this still needs to be confirmed based on quarry planning.
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 25: Rehabilitation and Disturbance Status

Quarry Area Type	2017 Annual Review Period (ha)	2018 Annual Review Period (ha)	2019 Annual Review Period (ha)	2020 Annual Review Period (ha)	Next 2021 Annual Review Period (ha)
	Actual				Forecast
A. Total Quarry Footprint[1]	17.1	17.1	17.1	17.1	17.1
B. Total Active Disturbance[2]	17.1	17.1	17,1	17.1	17.1
C. Land Being Prepared for Rehabilitation[3]	0	0	0	0	0
D. Land Under Active Rehabilitation[4]	0	0	0	0	0
E. Completed Rehabilitation[5]	0	0	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 2020 there was approximately 17.1 Ha of active disturbance. There is no active rehabilitation at Teven Quarry, and none proposed in 2021.

Figure 3: Teven Quarry Rehabilitation and Disturbance

There has been no change to this figure in the period, hence it hasn't been updated.

8.3 Actions for the Next Reporting Period

The DPIE 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 26: Rehabilitation and Closure Actions for the 2021 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.	Non-active benches will be assessed for rehabilitation preparation in 2021.

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 as required;
- 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 (approximately every three months) 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/cardboard (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 every month; and
- Wastewater 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 Complaints

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

There were no complaints in 2017, three complaints in 2018, one complaint in 2019, and three complaints in 2020. Of these three complaints for the reporting period, one was submitted 14/08/20 as a traffic complaint. The complainant experienced damage to a property veranda which was thought to be caused by passing quarry trucks. The second community complaint occurred on the 12/10/20. On the 15/10/20 a complaint concerning blasting was submitted. All three complaints for 2020 have been closed out.

11 INDEPENDENT AUDIT

The site undertook an Independent Environmental Audit (IEA) in late 2019 in accordance with the requirements of Schedule 5, Condition 9 of the Development Consent. The IEA Action Plan was sent to DPIE in 2020 and Teven continues to work to the actions outlined in this plan.

The next IEA is due in 2022.

12 INCIDENTS AND NON-COMPLIANCE

Table 29 summarises the incidents and non-compliances at Teven in 2020.

Table 27: Summary of Incidents and Non-Compliances

Date	Incident/Non-Compliance	Action
13th May 2020	**Schedule 3 Condition 4 - SSD 6422 – Noise Monitoring Criteria** The daytime $LAeq_{(15min)}$ noise criteria of 37 dBA at monitoring location N4 (receptor R10) was exceeded at the time of quarter 2 monitoring (13 May 2020).	Continue monitoring in 2021. Management in accordance with the Noise Management Plan. Inspect and/or maintain stockpile levels to ensure its function as a noise barrier.
	Schedule 5 Condition 7 - SSD 6422 – Incident Reporting Exceedance of noise criteria on the 13 May 2020 was not reported to DPIE within 7 days.	Breaches and exceedances to be closely monitored and reported as soon as the site is aware.
1st March 2020	**Schedule 3 Condition 11 – SSD 6422 – Air Quality Monitoring Criteria** A result of 50.5 µg/m^3 on 1 March 2020 exceeded the PM_{10} 24-hour criteria of 50 µg/m^3.	Breaches and exceedances to be closely monitored and reported as soon as the site is aware.
Throughout the period	**Schedule 3 Condition 11 - SSD 6422 – Dust Monitoring Criteria** Depositional Dust Monitoring ● DDG2 significantly exceeded the annual average criterion of 4 g/m^2/month with a result of 22.87 g/m^2/month for 2020. ● DDG2 exceeded the maximum increase in deposited dust levels of 2 g/m^2/month from 2019 to 2020. The annual average increased to 22.87 g/m^2/month from 2019's 2.8 g/m^2/month.	Continuation of monitoring in 2021 with a focus on maintaining the monitoring program. Determine effectiveness of alternate DDG locations. Update the *Air Quality Management Plan* to reflect any improvements on site.
Throughout the period	**Schedule 5 Condition 7 - SSD 6422 – Incident Reporting** Incomplete PM_{10} monitoring was not reported to DPIE within 7 days. Sampling events were missed throughout 2020, and in January in particular. There was no sample taken at several of the sampling events, with some instances being due to issues with equipment. These missed sampling events occurred on the 14 March, 1 April, 30 June, 18 July, 24 July, 15 December, 21 December, and 27 December 2020.	Breaches and exceedances to be closely monitored and reported as soon as the site is aware.

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 2021 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 30** outlines proposed actions for 2021.

Table 28: Improvement Actions for 2021

Improvement Measure	Activities
Management Plans	Management Plans to be revised and submitted for approval to DPIE in 2021.
PM_{10}	Continue the improvement of the air quality monitoring program through ensuring the reliability of internal processes and transparency through the presentation of monitoring data in the Holcim environmental monitoring portal. Maintain a HVAS monitoring program which meets Development Consent requirements. Manage dust control measures to reduce short term non-compliances.
Depositional dust	Liaise with the EPA and DPIE about moving DDG1 and DDG2 to a more suitable location, where there is less likelihood of contamination. Continue to monitor instances 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. Complete water sampling for at least the parameters pH, Total Suspended Solids, and Oil and grease.
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

Teven Quarry, Teven, NSW
Quarter 1 Ending March 2020.

Prepared for: Holcim (Australia) Pty Ltd
February 2020
MAC180611-06RP7

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 1 Ending March 2020

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
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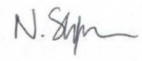
Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180611-06RP7	Final	10 February 2020	Nicholas Shipman		Oliver Muller	

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 the quarterly period ending March 2020 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, ending March 2020 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
	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$
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 are primarily rural. 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 (MGA56 Coordinates)

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. Measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 29 January 2020. Acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-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. It is noted that the quarry was not operating during the evening period, however two measurements were conducted at each monitoring location as per the requirements of the EPL.

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

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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}		
29/01/2020	07:34 (Day)	73	56	36	WD: N WS: 0.1m/s Rain: Nil	Insects <39 Birds 39-56 Distant traffic <39 Local traffic 39-73 Local residential noise 39-45 Aircraft 39-50 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
29/01/2020	07:49 (Day)	73	49	37	WD: N WS: 0.1m/s Rain: Nil	Insects <40 Birds 40-54 Local traffic 40-73 Aircraft 40-58 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
29/01/2020	18:08 (Evening)	69	54	42	WD: N WS: 1m/s Rain: Nil	Wind in trees <49 Birds <49 Local residential noise 49-58 Local traffic 50-69 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
29/01/2020	18:23 (Evening)	85	61	51	WD: N WS: 1m/s Rain: Nil	Local residential noise 48-59 Local traffic 50-85 Quarry Inaudible
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}		
29/01/2020	08:17 (Day)	89	66	55	WD: N WS: 0.1m/s Rain: Nil	Local traffic 55-89 Insects 55-58 Birds 56-60 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
29/01/2020	08:32 (Day)	96	68	54	WD: N WS: 0.1m/s Rain: Nil	Local traffic 55-96 Insects 55-58 Birds 55-59 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
29/01/2020	18:52 (Evening)	83	59	36	WD: N WS: 0.1m/s Rain: Nil	Insects 34-38 Birds 34-48 Local traffic 36-83 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
29/01/2020	19:07 (Evening)	85	60	41	WD: N WS: 0.1m/s Rain: Nil	Insects 36-38 Local traffic 36-85 Quarry Inaudible
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}		
29/01/2020	08:53 (Day)	72	64	62	WD: N WS: 0.1m/s Rain: Nil	Insects 61-63 Aircraft 61-64 Local traffic 60-72 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
29/01/2020	09:08 (Day)	66	63	62	WD: N WS: 0.1m/s Rain: Nil	Insects 61-66 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
29/01/2020	19:32 (Evening)	67	48	33	WD: N WS: 1m/s Rain: Nil	Insects <29 Birds 29-67 Aircraft 32-36 Distant traffic 29-33 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
29/01/2020	19:47 (Evening)	56	52	49	WD: N WS: 1m/s Rain: Nil	Insects 41-56 Distant traffic <41 Quarry Inaudible
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}		
29/01/2020	09:32 (Day)	86	60	47	WD: N WS: 0.1m/s Rain: Nil	Insects 54-58 Local traffic 54-86 Holcim reverse alarm <36 Holcim FEL & Plant <36
Teven Quarry $L_{Aeq(15min)}$ Contribution						36
29/01/2020	09:47 (Day)	81	59	42	WD: N WS: 0.1m/s Rain: Nil	Insects 36-53 Holcim FEL & Plant <33 Local traffic 36-81
Teven Quarry $L_{Aeq(15min)}$ Contribution						33
29/01/2020	20:09 (Evening)	72	59	41	WD: N WS: 0.1m/s Rain: Nil	Insects 44-63 Birds 61-72 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
29/01/2020	20:24 (Evening)	62	43	41	WD: N WS: 0.1m/s Rain: Nil	Insects 41-45 Distant traffic <41 Operator 43-62 Quarry Inaudible
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}		
29/01/2020	10:12 (Day)	84	59	48	WD: N WS: 0.1m/s Rain: Nil	Local traffic 48-84 Insects 52-56 Industrial noise 53-56 Birds 48-54 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
29/01/2020	10:27 (Day)	84	62	48	WD: N WS: 0.1m/s Rain: Nil	Traffic 46-84 Insects 46-49 Aircraft 48-53 Birds 48-54 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
29/01/2020	20:43 (Evening)	86	58	39	WD: N WS: 0.5m/s Rain: Nil	Insects 34-38 Distant traffic <36 Aircraft 36-50 Local traffic 42-86 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
29/01/2020	20:58 (Evening)	76	48	38	WD: N WS: 0.5m/s Rain: Nil	Insects 36-48 Local traffic 48-76 Quarry Inaudible
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 Discussion

Attended noise measurements were undertaken on Wednesday 29 January 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. It is noted that during this survey period, measurements were generally dominated by high levels of insect noise, with further discussion of assessment results shown below.

5.1 Discussion of Results - Location N1

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 29 January 2020. Quarry noise contributions were estimated to satisfy 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 insects, birds, local residential noise aircraft, wind in trees, local and distant traffic.

5.2 Discussion of Results - Location N2

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 29 January 2020. Quarry noise contributions were estimated to satisfy 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 insects, local traffic, and birds.

5.3 Discussion of Results - Location N3

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 29 January 2020. Quarry noise contributions were estimated to satisfy 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 insects, aircraft, local traffic and birds.

5.4 Discussion of Results - Location N4

Quarry noise emissions were audible during the two daytime measurements conducted on Wednesday 29 January 2020. Front end loader movements, truck loading activities and reverse alarms were audible during the two daytime measurements with an estimated contribution from 33dBA to 36dBA, therefore satisfying the daytime criteria. 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 insects, local traffic, birds and operator noise.

5.5 Discussion of Results - Location N5

Quarry noise emissions were inaudible during the two daytime measurements conducted on Wednesday 29 January 2020, therefore satisfying the relevant daytime and evening 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 local traffic, insects, industrial noise, birds, aircraft and distant traffic.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at 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 1, ending March 2020.

Attended noise measurements were undertaken on Wednesday 29 January 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. It is noted that during this survey period, measurements were generally dominated by high levels of insect noise. Notwithstanding, the assessment has identified that noise emissions generated by Teven Quarry complies with relevant noise criteria specified in the Development Consent at all assessed residential receivers.

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Appendix A - Glossary of Terms

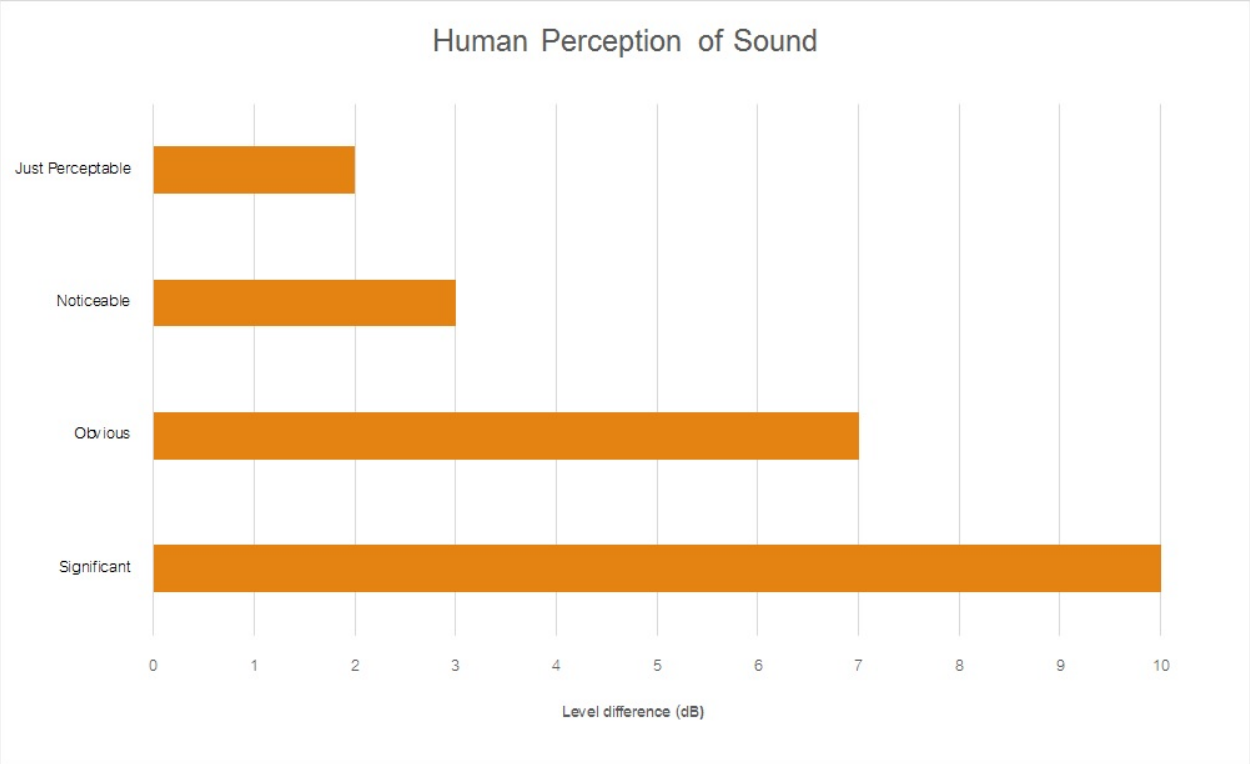
Table A1 provides a number of technical terms have been used in this report.

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



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Noise Monitoring Assessment

Teven Quarry, Teven, NSW
Quarter 2 Ending June 2020.

Prepared for: Holcim (Australia) Pty Ltd
May 2020
MAC180611-06RP8

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 2 Ending June 2020

Prepared for: Holcim (Australia) Pty Ltd

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Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180611-06RP8	Final	20 May 2020	Nicholas Shipman		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 the quarterly period ending June 2020 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, ending June 2020 and forms part of the noise monitoring program for the quarry.

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- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise.

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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

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	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$
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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 are primarily rural. 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.

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Location	Nearest Receiver	Easting, m	Northing, m
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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. Measurements were carried out using a Svantek Type 1, 971 noise analyser on Tuesday 12 May 2020 and Wednesday 13 May 2020. Acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-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. It is noted that the quarry was not operating during the evening period, however two measurements were conducted at each monitoring location as per the requirements of the EPL.

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}		
13/05/2020	09:53 (Day)	61	38	31	WD: W WS: 1m/s Rain: Nil	Birds 29-61 Insects <29 Traffic <30 Wind 29-38 Aircraft 32-48 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
13/05/2020	10:08 (Day)	74	47	30	WD: W WS: 1m/s Rain: Nil	Insects <29 Birds 28-65 Traffic 30-74 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
12/05/2020	18:12 (Evening)	74	50	40	WD: W WS: 1.5m/s Rain: Nil	Wind 41-44 Traffic 42-72 Aircraft 42-46 Insects <41 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
12/05/2020	18:27 (Evening)	74	52	42	WD: W WS: 1.5m/s Rain: Nil	Wind 44-48 Insects <44 Traffic 44-74 Aircraft <44 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30

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}		
13/05/2020	10:32 (Day)	89	66	36	WD: W WS: 0.5m/s Rain: Nil	Traffic 34-89 Birds 38-52 Dog 35-46 Aircraft 35-46 Holcim processing just audible ~36 Local residential noise 36-48
	Teven Quarry $L_{Aeq(15min)}$ Contribution					<36
13/05/2020	10:47 (Day)	88	65	37	WD: W WS: 0.5m/s Rain: Nil	Traffic 38-88 Birds 36-67 Local residential noise 38-56 Quarry Inaudible
	Teven Quarry $L_{Aeq(15min)}$ Contribution					<30
12/05/2020	18:57 (Evening)	81	54	35	WD: W WS: 0.1m/s Rain: Nil	Insects <34 Aircraft 36-44 Traffic 36-81 Quarry Inaudible
	Teven Quarry $L_{Aeq(15min)}$ Contribution					Quarry not operational
12/05/2020	19:12 (Evening)	81	54	34	WD: W WS: 0.1m/s Rain: Nil	Insects <36 Traffic 36-81 Quarry Inaudible
	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}		
13/05/2020	11:10 (Day)	55	37	26	WD: W WS: 0.5m/s Rain: Nil	Birds 27-38 Insects <27 Holcim tipping 30-34 Aircraft 32-54
Teven Quarry $L_{Aeq(15min)}$ Contribution						32
13/05/2020	11:26 (Day)	61	38	27	WD: W WS: 0.5m/s Rain: Nil	Birds 27-51 Insects <27 Holcim equipment 30-36 Traffic 32-61
Teven Quarry $L_{Aeq(15min)}$ Contribution						33
12/05/2020	19:32 (Evening)	52	41	39	WD: W WS: 0.1m/s Rain: Nil	Traffic 38-52 Insects <38 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
12/05/2020	19:47 (Evening)	45	40	37	WD: W WS: 0.1m/s Rain: Nil	Traffic 36-45 Insects <36 Quarry Inaudible
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}		
13/05/2020	11:48 (Day)	82	59	45	WD: W WS: 0.1m/s Rain: Nil	Holcim crushing 47-53 Traffic 45-82 Insects <45 Birds <45
Teven Quarry $L_{Aeq(15min)}$ Contribution						42-43
13/05/2020	12:03 (Day)	77	53	43	WD: W WS: 0.1m/s Rain: Nil	Holcim crushing 43-48 Insects <43 Traffic 43-77
Teven Quarry $L_{Aeq(15min)}$ Contribution						40-41
12/05/2020	20:10 (Evening)	53	36	32	WD: W WS: 0.1m/s Rain: Nil	Traffic 34-53 Insects <34 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
12/05/2020	20:25 (Evening)	47	35	32	WD: W WS: 0.1m/s Rain: Nil	Traffic 32-47 Insects <32 Quarry Inaudible
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}		
13/05/2020	12:23 (Day)	86	63	41	WD: W WS: 0.1m/s Rain: Nil	Traffic 38-86 Industrial noise 38-46 Insects <38 Quarry Inaudible
	Teven Quarry $L_{Aeq(15min)}$ Contribution					<30
13/05/2020	12:38 (Day)	86	63	36	WD: W WS: 0.1m/s Rain: Nil	Traffic 38-86 Birds 38-52 Aircraft 38-59 Insects <38 Industrial noise 38-48 Quarry Inaudible
	Teven Quarry $L_{Aeq(15min)}$ Contribution					<30
12/05/2020	20:45 (Evening)	85	56	34	WD: W WS: 0.1m/s Rain: Nil	Traffic 32-85 Insects <32 Quarry Inaudible
	Teven Quarry $L_{Aeq(15min)}$ Contribution					Quarry not operational
12/05/2020	21:00 (Evening)	51	36	33	WD: W WS: 0.1m/s Rain: Nil	Insects <34 Traffic 34-51 Quarry Inaudible
	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 Discussion

Attended noise measurements were undertaken on Tuesday 12 May 2020 and Wednesday 13 May 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. It is noted that during this survey period, measurements were generally dominated by high levels of insect noise, with further discussion of assessment results shown below.

5.1 Discussion of Results - Location N1

Quarry noise emissions were inaudible during the daytime measurements conducted on Tuesday 12 May 2020 and Wednesday 13 May 2020. Quarry noise contributions were estimated to satisfy 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 birds, insects, traffic, wind in trees and aircraft.

5.2 Discussion of Results - Location N2

Quarry noise emissions were audible during the daytime measurements conducted on Tuesday 12 May 2020 and Wednesday 13 May 2020. Quarry noise contributions satisfied 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 traffic, birds, dogs barking, aircraft, and local residential noise.

5.3 Discussion of Results - Location N3

Quarry noise emissions were audible during the daytime noise measurements conducted on Tuesday 12 May 2020 and Wednesday 13 May 2020. Quarry noise contributions satisfied 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 birds, insects, aircraft, and traffic.

5.4 Discussion of Results - Location N4

Quarry noise emissions were audible during the daytime measurements conducted on Tuesday 12 May 2020 and Wednesday 13 May 2020. Front end loader movements, truck loading activities, and processing plant were audible during the two daytime measurements with an estimated contribution from 40dBA to 43dBA, therefore exceeding the daytime criteria. It was observed that the stockpiles we significantly reduced (approximately 30% capacity)than previous surveys which act as a barrier between the plant and the receiver. Typically, the quarry stockpiles around 12,000 tonnes of material on site, however, due to a recent high demand the stockpile has been reduced to less than 5,000 tonnes and will take three to four weeks to replenish the stockpile to full capacity. The plant manager was notified of the exceedance and will investigate other potential factors such as the integrity of plant enclosures and whether access doors are being closed. Over the next quarterly period, stockpile levels will be monitored more frequently and potential permanent solutions will be investigated.

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 traffic, insects, and birds.

5.5 Discussion of Results - Location N5

Quarry noise emissions were inaudible during the daytime measurements conducted on Tuesday 12 May 2020 and Wednesday 13 May 2020, therefore satisfying the daytime 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 traffic, industrial noise, insects, birds, and aircraft.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at 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 2, ending June 2020.

Attended noise measurements were undertaken on Tuesday 12 May 2020 and Wednesday 13 May 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry generally complied with relevant noise criteria specified in the Development Consent at all assessed residential receivers, with the exception of N4 during the daytime period which had a noise contribution of 40dBA-43dBA for the daytime measurements over the next quarterly period, noise controls will be investigated including monitoring stockpile heights and integrity of plant enclosures to maintain compliance with noise goals.

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Appendix A - Glossary of Terms

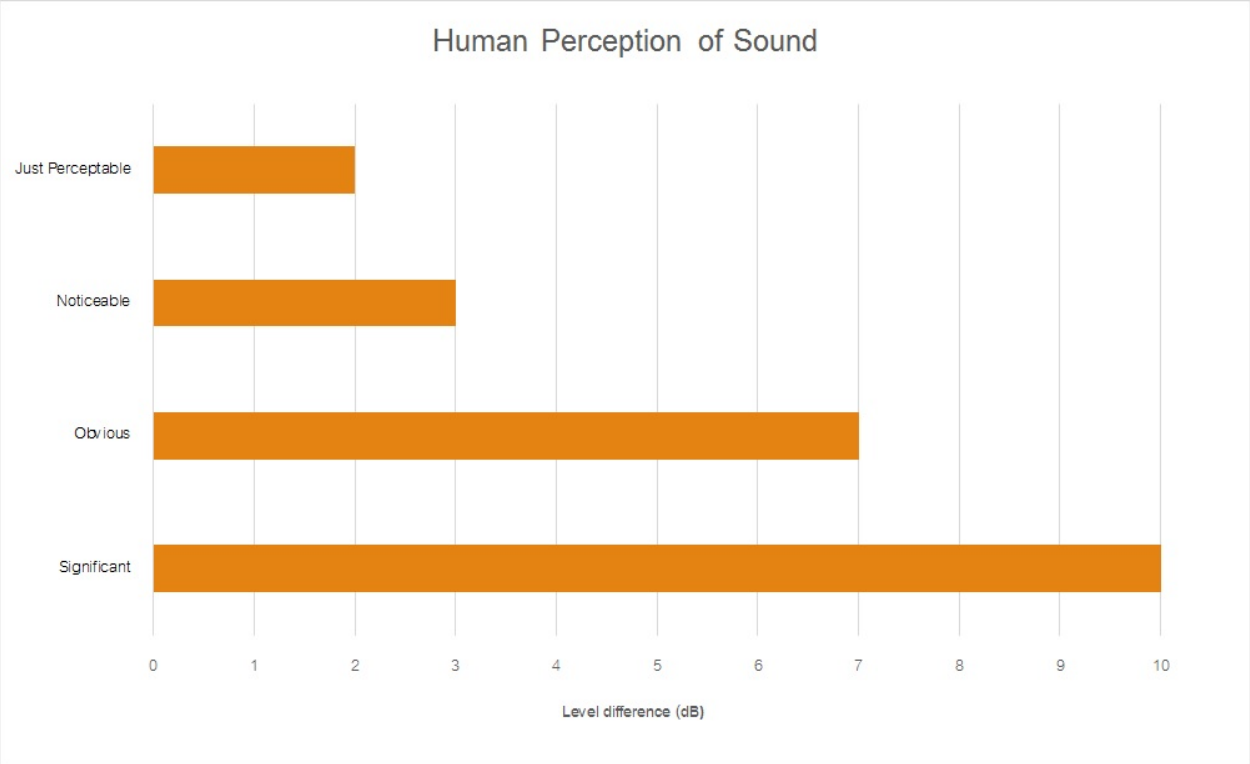
Table A1 provides a number of technical terms have been used in this report.

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



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Muller Acoustic Consulting

Noise Monitoring Assessment

Teven Quarry, Teven, NSW
Quarter 3 Ending September 2020.

Prepared for: Holcim (Australia) Pty Ltd
September 2020
MAC180611-06RP9

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 3 Ending September 2020

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
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Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180611-06RP9	Final	24 September 2020	Nicholas Shipman		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 the quarterly period ending September 2020 for Teven Quarry (the 'quarry'), Teven, NSW.

The monitoring has been conducted in accordance with the Teven Noise Management Plan (NMP) 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 3, ending September 2020 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 Environment Protection Authority (EPA), Environmental Protection Licence (EPL 3293);
- NSW Department of Planning and Environment, Development Consent (SSD 6422), 2015;
- Teven Quarry Noise Management Plan Revision 1, 4 May 2016 (EMM); 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
	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$
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 are primarily rural. 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 (MGA56 Coordinates)

Location	Nearest Receiver	Easting, m	Northing, m
NM1	R7	546737	6809918
NM2	R3/R4	548892	6810285
NM3	R2	547781	6808991
NM4	R10	547576	6810379
NM5	R14	548100	6810792

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. Measurements were carried out using a Svantek Type 1, 971 noise analyser on Tuesday 8 September 2020 and Wednesday 9 September 2020. Acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-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. It is noted that the quarry was not operating during the evening period, however two measurements were conducted at each monitoring location as per the requirements of the EPL.

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

Site Locality

MAC180611-06

Holcim Teven Quarry

KEY

Noise Monitoring Locations

0 100 200 300 400 500 m

N

MAC
Muller Acoustic Consulting

4 Results

4.1 Assessment Results - Location NM1

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM1 are presented in **Table 3**.

Table 3 Operator-Attended Noise Survey Results – Location NM1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
09/09/2020	07:14 (Day)	67	44	34	WD: S WS: 0.5m/s Rain: Nil	Birds 36-54 Wind 34-37 Traffic 34-67 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
09/09/2020	07:29 (Day)	70	46	33	WD: S WS: 0.5m/s Rain: Nil	Birds 33-63 Traffic 33-70 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
08/09/2020	18:18 (Evening)	48	36	33	WD: S WS: 0.1m/s Rain: Nil	Traffic 36-48 Insects <36 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
08/09/2020	18:33 (Evening)	70	43	29	WD: S WS: 0.1m/s Rain: Nil	Insects 28-30 Traffic 28-70 Dogs 28-34 Quarry Inaudible
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 NM2

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM2 are presented in **Table 4**.

Table 4 Operator-Attended Noise Survey Results – Location NM2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
09/09/2020	07:56 (Day)	87	65	38	WD: S WS: 0.1m/s Rain: Nil	Birds 35-56 Traffic 35-87 Dogs 35-44 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
09/09/2020	08:11 (Day)	85	65	36	WD: S WS: 0.1m/s Rain: Nil	Birds 38-54 Traffic 33-85 Aircraft 36-52 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
08/09/2020	19:01 (Evening)	83	59	34	WD: S WS: 0.1m/s Rain: Nil	Dogs 41-64 Birds 38-44 Traffic 37-83 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
08/09/2020	19:16 (Evening)	90	61	36	WD: S WS: 0.1m/s Rain: Nil	Traffic 34-90 Dogs 34-46 Insects <38 Quarry Inaudible
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 NM3

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM3 are presented in **Table 5**.

Table 5 Operator-Attended Noise Survey Results – Location NM3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
09/09/2020	08:31 (Day)	61	42	29	WD: S WS: 0.1m/s Rain: Nil	Birds 38-61 Traffic 29-36 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
09/09/2020	08:46 (Day)	58	40	26	WD: S WS: 0.1m/s Rain: Nil	Birds 25-58 Traffic 25-34 Aircraft 29-34 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
08/09/2020	19:37 (Evening)	55	36	34	WD: S WS: 0.1m/s Rain: Nil	Traffic 32-55 Insects 28-34 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
08/09/2020	19:52 (Evening)	48	37	33	WD: S WS: 0.1m/s Rain: Nil	Traffic 29-48 Insects 29-33 Quarry Inaudible
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 NM4

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM4 are presented in **Table 6**.

Table 6 Operator-Attended Noise Survey Results – Location NM4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
09/09/2020	09:09 (Day)	64	42	34	WD: S WS: 0.1m/s Rain: Nil	Birds 36-64 Traffic 34-36 Aircraft 36-50 Insects <32 Holcim crushing 32-36
Teven Quarry $L_{Aeq(15min)}$ Contribution						34
09/09/2020	09:24 (Day)	59	38	33	WD: S WS: 0.1m/s Rain: Nil	Birds 36-59 Traffic <33 Insects <31 Holcim crushing 31-37
Teven Quarry $L_{Aeq(15min)}$ Contribution						34
08/09/2020	20:14 (Evening)	60	56	53	WD: S WS: 0.1m/s Rain: Nil	Insects 30-54 Traffic 52-60 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
08/09/2020	20:29 (Evening)	60	56	54	WD: S WS: 0.1m/s Rain: Nil	Insects 47-52 Traffic 47-60 Quarry Inaudible
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 NM5

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM5 are presented in **Table 7**.

Table 7 Operator-Attended Noise Survey Results – Location NM5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
09/09/2020	09:49 (Day)	49	33	29	WD: S WS: 0.1m/s Rain: Nil	Birds 28-49 Insects <28 Traffic 28-42 Holcim loading 28-30 Holcim reverse alarms <29
		Teven Quarry $L_{Aeq(15min)}$ Contribution				<30
09/09/2020	10:04 (Day)	63	36	29	WD: S WS: 0.5m/s Rain: Nil	Birds 34-63 Insects <32 Traffic 28-34 Holcim loading 28-31 Holcim crushing <30
		Teven Quarry $L_{Aeq(15min)}$ Contribution				<30
08/09/2020	20:49 (Evening)	84	56	33	WD: S WS: 0.1m/s Rain: Nil	Traffic 29-84 Insects 29-31 Quarry Inaudible
		Teven Quarry $L_{Aeq(15min)}$ Contribution				Quarry not operational
08/09/2020	21:04 (Evening)	83	55	32	WD: S WS: 0.1m/s Rain: Nil	Traffic 28-83 Insects 28-30 Quarry Inaudible
		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 Discussion

5.1 Discussion of Results - Location NM1

Quarry noise emissions were inaudible during the daytime measurements conducted on Tuesday 8 September 2020 and Wednesday 9 September 2020. Quarry noise contributions were estimated to satisfy 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 birds, wind in trees, traffic, insects, and dogs barking.

5.2 Discussion of Results - Location NM2

Quarry noise emissions were inaudible during the daytime measurements conducted on Tuesday 8 September 2020 and Wednesday 9 September 2020. Quarry noise contributions were estimated to satisfy 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 birds, traffic, dogs barking, aircraft, and insects.

5.3 Discussion of Results - Location NM3

Quarry noise emissions were inaudible during the daytime noise measurements conducted on Tuesday 8 September 2020 and Wednesday 9 September 2020. Quarry noise contributions were estimated to satisfy 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 birds, traffic, aircraft, and insects.

5.4 Discussion of Results - Location NM4

Quarry noise emissions were audible during the daytime measurements conducted on Tuesday 8 September 2020 and Wednesday 9 September 2020. Front end loader movements, truck loading activities, and processing plant were audible during the two daytime measurements with an estimated

contribution of 34dBA during the measurement period, therefore satisfying the daytime criteria. 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 birds, traffic, aircraft, and insects.

5.5 Discussion of Results - Location NM5

Quarry noise emissions were audible during the daytime measurements conducted on Tuesday 8 September 2020 and Wednesday 9 September 2020. Front end loader movements, truck loading activities, and processing plant were audible during the two daytime measurements with an estimated contribution of <30dBA during the measurement period, therefore satisfying the daytime criteria. 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 birds, traffic, and insects.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at Teven Quarry, Teven, NSW. The assessment was completed to determine the quarry's compliance with the relevant criteria outlined in their Development Consent for the relevant surrounding residential receivers during Quarter 3, ending September 2020.

Attended noise measurements were undertaken on Tuesday 8 September 2020 and Wednesday 9 September 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry generally complied with relevant noise criteria specified in the Development Consent at all assessed residential receivers.

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Appendix A - Glossary of Terms

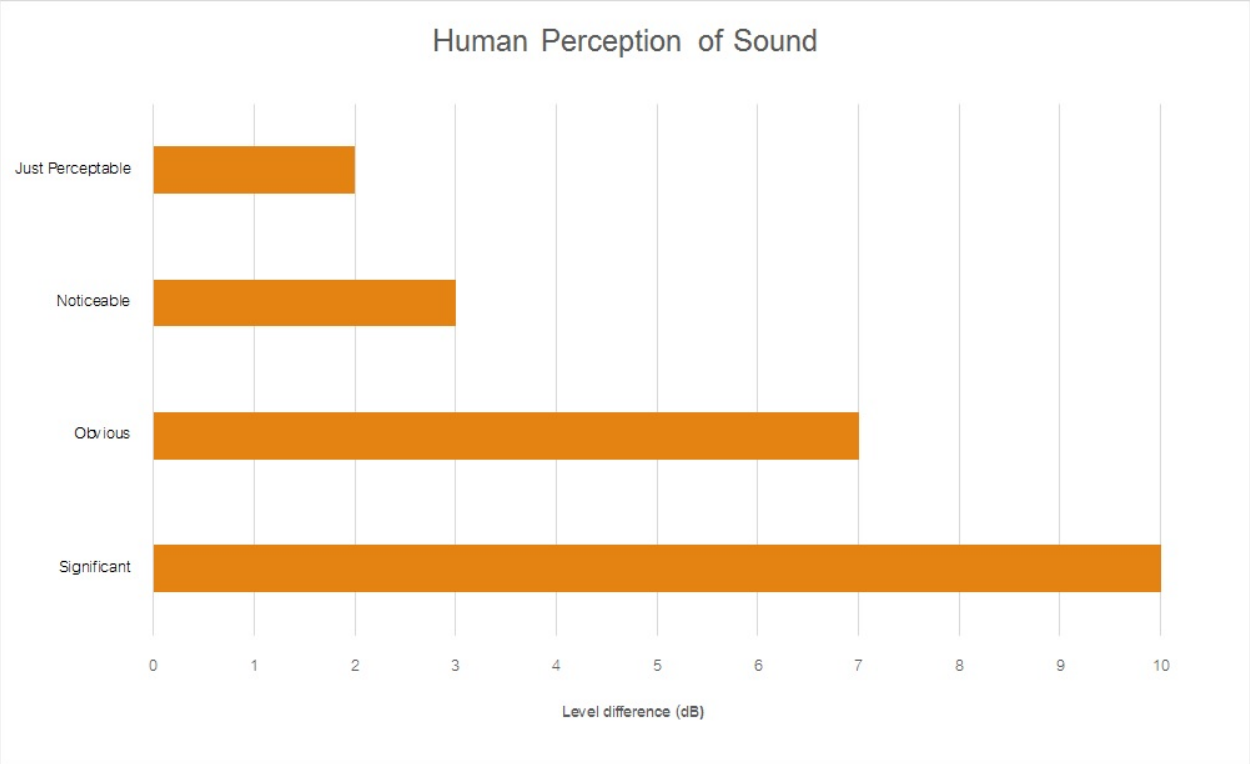
Table A1 provides a number of technical terms have been used in this report.

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



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Noise Monitoring Assessment

Teven Quarry, Teven, NSW
Quarter 4 Ending December 2020.

Prepared for: Holcim (Australia) Pty Ltd
December 2020
MAC180611-06RP10

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 4 Ending December 2020

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
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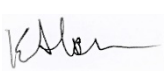
Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180611-06RP10	Final	23 December 2020	Kristian Allen		Rod Linnett	

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 the quarterly period ending December 2020 for Teven Quarry (the 'quarry'), Teven, NSW.

The monitoring has been conducted in accordance with the Teven Noise Management Plan (NMP) 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 4, ending December 2020 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 Environment Protection Authority (EPA), Environmental Protection Licence (EPL 3293);
- NSW Department of Planning and Environment, Development Consent (SSD 6422), 2015;
- Teven Quarry Noise Management Plan Revision 1, 4 May 2016 (EMM); 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
	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$
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 are primarily rural. 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 (MGA56 Coordinates)

Location	Nearest Receiver	Easting, m	Northing, m
NM1	R7	546737	6809918
NM2	R3/R4	548892	6810285
NM3	R2	547781	6808991
NM4	R10	547576	6810379
NM5	R14	548100	6810792

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. Measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 25 November 2020 and Thursday 26 November 2020. Acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-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. It is noted that the quarry was not operating during the evening period, however two measurements were conducted at each monitoring location as per the requirements of the EPL.

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

Site Locality

MAC180611-06

Holcim Teven Quarry

KEY

Noise Monitoring Locations

0 100 200 300 400 500 m

N

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Muller Acoustic Consulting

4 Results

4.1 Assessment Results - Location NM1

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM1 are presented in **Table 3**.

Table 3 Operator-Attended Noise Survey Results – Location NM1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
25/11/2020	12:12 (Day)	53	41	38	WD: S WS: 1.5m/s Rain: Nil	Birds 33-53 Wind 33-45 Insects 36-41 Distant Traffic <33-39 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	12:27 (Day)	66	43	38	WD: S WS: 1.5m/s Rain: Nil	Birds 33-54 Wind 33-46 Insects 36-41 Distant Traffic <33-37 Residential Noise 40-66 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	18:05 (Evening)	53	34	29	WD: E WS: 1.0m/s Rain: Nil	Wind 23-43 Distant Traffic 26-38 Residential Noise 35-53 Birds 23-46 Insects <23-26 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
25/11/2020	18:20 (Evening)	71	44	28	WD: E WS: 1.0m/s Rain: Nil	Wind 25-38 Distant Traffic 25-36 Residential Noise 25-71 Birds 25-33 Insects <25 Dogs 30-35 Aircraft 30-48 Quarry Inaudible
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 NM2

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM2 are presented in **Table 4**.

Table 4 Operator-Attended Noise Survey Results – Location NM2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
25/11/2020	09:48 (Day)	82	58	40	WD: SE WS: 2.0m/s Rain: Nil	Birds 34-74 Traffic 34-82 Wind 37-49 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	10:03 (Day)	82	59	41	WD: SE WS: 2.0m/s Rain: Nil	Birds 35-56 Traffic 35-82 Wind 38-51 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	20:02 (Evening)	74	54	47	WD: SE WS: <0.5m/s Rain: Nil	Birds 45-62 Insects <43 Traffic 45-74 Agricultural Noise 46-53 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
25/11/2020	20:17 (Evening)	75	54	46	WD: SE WS: <0.5m/s Rain: Nil	Insects <40 Traffic 40-75 Agricultural Noise 44-52 Quarry Inaudible
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 NM3

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM3 are presented in **Table 5**.

Table 5 Operator-Attended Noise Survey Results – Location NM3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
25/11/2020	09:09 (Day)	63	44	36	WD: SE WS: 1.5m/s Rain: Nil	Birds 30-63 Wind 30-45 Distant Traffic 33-40 Insects <30-36 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	09:24 (Day)	78	55	37	WD: SE WS: 2.0m/s Rain: Nil	Birds 32-68 Wind 32-49 Distant Traffic 35-40 Insects <32-36 Aircraft 38-78 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	20:39 (Evening)	54	48	43	WD: SE WS: <0.5m/s Rain: Nil	Insects 41-54 Distant Traffic 38-46 Agricultural Noise <38 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
25/11/2020	20:54 (Evening)	54	48	43	WD: SE WS: <0.5m/s Rain: Nil	Insects 41-54 Distant Traffic <38-44 Agricultural Noise <38 Quarry Inaudible
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 NM4

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM4 are presented in **Table 6**.

Table 6 Operator-Attended Noise Survey Results – Location NM4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
26/11/2020	07:35 (Day)	79	55	42	WD: NE WS: 0.5m/s Rain: Nil	Insects <38-42 Traffic 40-79 Birds 38-49 Agricultural Noise 40-68 Holcim Processing <35-42 (10-15 minute duration) Holcim Loader <38-44 (2-4 minute duration) Holcim Haul Truck <40-47 (1-2 minute duration) Holcim Reverse Alarms <38-44 (multiple 5-10 second durations)
Teven Quarry $L_{Aeq(15min)}$ Contribution						<37
26/11/2020	07:50 (Day)	82	62	43	WD: NE WS: 0.5m/s Rain: Nil	Insects 40-43 Traffic 40-82 Agricultural noise 45-60 Holcim Processing <35-40 (10-15 minute duration) Holcim Loader <40-44 (3-5 minute duration) Holcim Haul Truck <40-46 (2-4 minute duration) Holcim Reverse Alarms <39-43 (multiple 5-10 second durations)
Teven Quarry $L_{Aeq(15min)}$ Contribution						<37
25/11/2020	19:27 (Evening)	59	54	38	WD: SE WS: 0.5m/s Rain: Nil	Insects 36-59 Distant Traffic 33-38 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
25/11/2020	19:42 (Evening)	62	55	51	WD: SE WS: <0.5m/s Rain: Nil	Insects 44-62 Distant Traffic <40 Quarry Inaudible
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 NM5

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM5 are presented in **Table 7**.

Table 7 Operator-Attended Noise Survey Results – Location NM5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
25/11/2020	11:16 (Day)	66	45	39	WD: SE WS: 3.0m/s Rain: Nil	Wind 37-58 Insects <32 Traffic 34-51 Aircraft 38-66 Holcim Processing <35 (6-9 minute duration)
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	11:31 (Day)	61	42	37	WD: SE WS: 3.0m/s Rain: Nil	Wind 35-61 Insects <30 Traffic 32-46 Agricultural Noise 35-40 Birds 32-41 Holcim Processing <35 (6-9 minute duration)
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	18:51 (Evening)	55	38	33	WD: SE WS: 0.5m/s Rain: Nil	Birds 28-55 Traffic 31-41 Insects <28-36 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
25/11/2020	19:06 (Evening)	62	39	34	WD:SE WS: 0.5m/s Rain: Nil	Birds 28-62 Taffic31-37 Insects 28-36 Quarry Inaudible
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 Discussion

5.1 Discussion of Results - Location NM1

Quarry noise emissions were inaudible during the daytime measurements conducted on Wednesday 25 November 2020. Quarry noise contributions were estimated to satisfy 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 birds, wind in trees, distant traffic, insects, residential noise, aircraft, and dogs barking.

5.2 Discussion of Results - Location NM2

Quarry noise emissions were inaudible during the daytime measurements conducted on Wednesday 25 November 2020. Quarry noise contributions were estimated to satisfy 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 birds, traffic, wind in trees, agricultural activities, and insects.

5.3 Discussion of Results - Location NM3

Quarry noise emissions were inaudible during the daytime noise measurements conducted on Wednesday 25 November 2020. Quarry noise contributions were estimated to satisfy 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 birds, traffic, aircraft, wind in trees, agricultural activities and insects.

5.4 Discussion of Results - Location NM4

Quarry noise emissions were audible during the daytime measurements conducted on Wednesday 25 November 2020. However due to meteorological conditions being outside the EPL parameters (ie >3m/s @10m AGL) measurements were suspended. Measurements were resumed on Thursday 26 November 2020 when winds <3.0m/s allowing a contribution to be determined within the EPL parameters. Insect noise dominated background levels during both measurements, with an estimated quarry contribution of <37dBA during the measurement period, therefore satisfying the daytime criteria. 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.

Quarry noise sources observed during the measurements included front end loader and haul truck movements, vehicle reverse alarms and the processing plant. Non quarry noise sources included birds, aircraft, traffic, and insects.

5.5 Discussion of Results - Location NM5

Quarry noise emissions were audible during the daytime measurements conducted on Wednesday 25 November 2020. Although wind speeds at ground level exceeded 3m/s at times the estimated quarry contribution was below 35dBA during the measurement period, therefore satisfying the daytime criteria. 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.

Quarry noise sources observed during the measurements included the processing plant. Non-quarrying sources included insects, birds, traffic, and aircraft.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at Teven Quarry, Teven, NSW. The assessment was completed to determine the quarry's compliance with the relevant criteria outlined in their Development Consent for the relevant surrounding residential receivers during Quarter 4, ending December 2020.

Attended noise measurements were undertaken on Wednesday 25 November 2020 and Thursday 26 November 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry generally complied with relevant noise criteria specified in the Development Consent at all assessed residential receivers.

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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.
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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.

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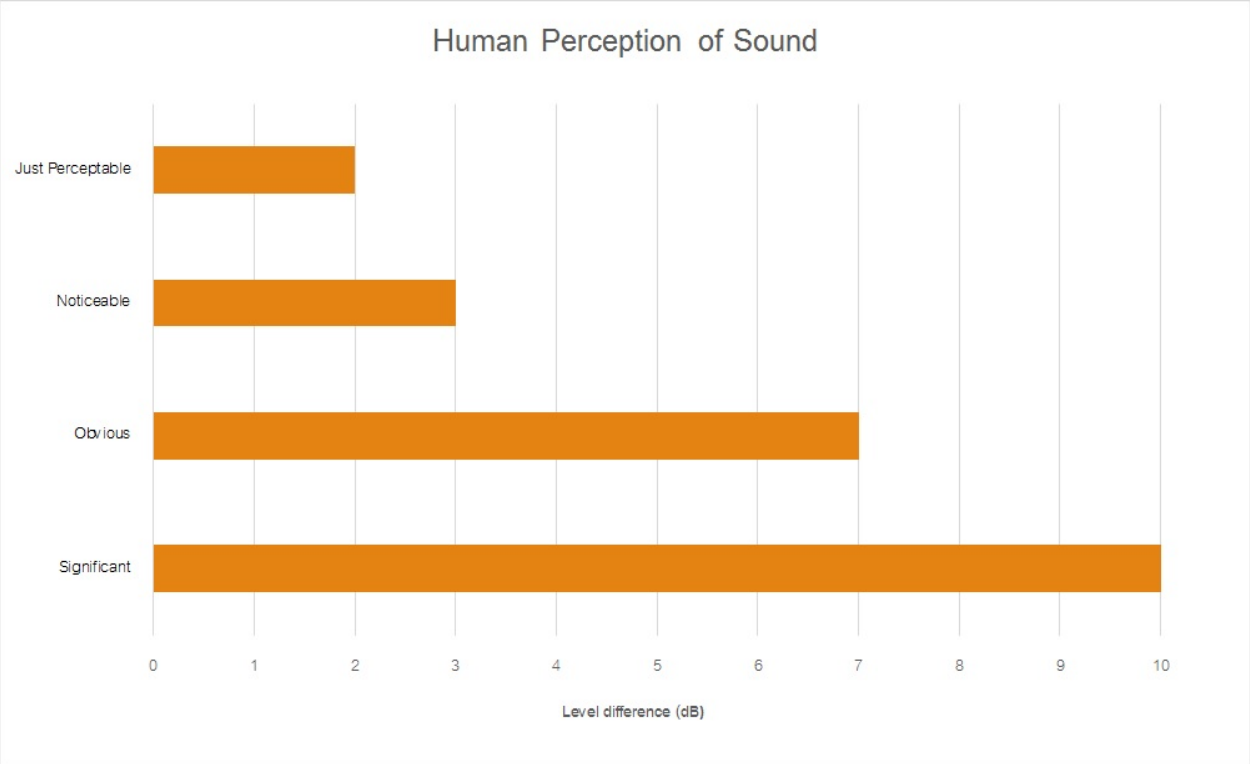
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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APPENDIX 2
SURFACE WATER QUALITY RESULTS

LDP1			
Date	**pH**	**Suspended Solids (mg/L)**	**Oil and Grease (mg/L)**
6/01/2020	7	-	-
13/01/2020	7.2	-	-
20/01/2020	7.1	-	-
28/01/2020	7.3	-	-
4/02/2020	7.5	-	-
12/02/2020	7	-	-
17/02/2020	6.7	1	0
18/02/2020	6.8	2	0
19/02/2020	6.9	1	0
20/02/2020	6.9	1	0
21/02/2020	6.6	1	0
22/02/2020	6.9	1	0
23/02/2020	7	1	0
24/02/2020	6.9	1	0
25/02/2020	7	1	0
26/02/2020	6.9	1	0
27/02/2020	6.7	1	0
28/02/2020	6.7	1	0
29/02/2020	6.6	1	0
1/03/2020	6.6	1	0
2/03/2020	6.6	1	0
3/03/2020	6.8	1	0
4/03/2020	6.6	0.5	0
5/03/2020	6.8	1	0
6/03/2020	6.7	1	0
7/03/2020	6.5	1	0
8/03/2020	6.7	4	0
9/03/2020	6.8	1	0
10/03/2020	6.9	2	0
1/07/2020	6.7	2	0
2/07/2020	7.72	3	0
2/07/2020	7.78	0.5	0
Discharge Point 2			
17/02/2020	6.5	7	0
18/02/2020	6.9	3	0
19/02/2020	6.8	2	0
20/02/2020	6.8	1	0
21/02/2020	6.5	2	0