18 July 2018

Ref: 171356/7956

Muswellbrook Coal Company Limited
PO Box 123
Muswellbrook NSW 2333

RE: PLANT NOISE TEST RESULTS – JULY 2017

This letter report presents the results of plant noise testing conducted for the Muswellbrook Coal Company (MCC) during July 2017 as required in Section 4.2 of the MCC Noise Management Plan (November 2017).

MONITORING PROCEDURES

Dynamic testing was conducted using a modified version of ISO 6395:2008 that utilises two microphones to capture the same data as the four ground level points in the standard. The layout of the machinery path of motion and measurement points in the Standard are shown in Figure 1. When applied to dump trucks in motion, the forward measurement path is from point A to point B and then from B to A so that the microphones positions record both the left and right side of the vehicle.

Figure 1. Measurement points for ISO 6395 dynamic tests (points 10 and 12 omitted).

Measurement points 2 and 4 (6 and 8) were combined into a single point and the measurement zone extended to approximately 2.8 $r$ to allow for an approach distance of 1.4 $r$ to represent the measurement at point 2 (4) and a departure distance of 1.4 $r$ to represent the measurement at point 6 (8). NATA calibration certificates for the measurement equipment are attached to this report.

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RESULTS

Calculated sound power levels (Lw, dB(A)) are presented in Table 1 below, with the test procedure (Stationary, dynamic or operational) noted. Also listed are the Lw values used in the most recent (2016) noise modelling conducted for MCC. All values are rounded to the nearest whole number with the method uncertainty error as defined in Annex N of ISO 6395.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Action/Mode</th>
<th>Test condition</th>
<th>Lw (2016)</th>
<th>Lw, dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavator no. 210</td>
<td>Dynamic (rotation)</td>
<td>Stationary (operation)</td>
<td>104 ± 1</td>
<td>103 ± 1</td>
</tr>
<tr>
<td>Excavator no. 211</td>
<td>Dynamic (rotation)</td>
<td>Stationary (operation)</td>
<td>117 ± 1</td>
<td>116 ± 1</td>
</tr>
<tr>
<td>Water Cart 1115</td>
<td>Dynamic (forward)</td>
<td>Travel on incline</td>
<td>117 ± 1</td>
<td>116 ± 1</td>
</tr>
<tr>
<td>Grader 1547</td>
<td>Dynamic (fwd / rev)</td>
<td>Travel on flat</td>
<td>108 ± 1</td>
<td>108 ± 1</td>
</tr>
<tr>
<td>CAT 777 truck 1216</td>
<td>Dynamic (forward)</td>
<td>Travel on flat</td>
<td>116 ± 1</td>
<td>118 ± 1</td>
</tr>
<tr>
<td>CAT 777 truck 1219</td>
<td>Dynamic (forward)</td>
<td>Travel on flat</td>
<td>119 ± 1</td>
<td>117 ± 1</td>
</tr>
<tr>
<td>Dozer 1436</td>
<td>Dynamic fwd/rev¹</td>
<td>Drive-by</td>
<td>121 ± 1</td>
<td>123 ± 1</td>
</tr>
<tr>
<td>Dozer 1438</td>
<td>Dynamic fwd/rev¹</td>
<td>Drive-by</td>
<td>119 ± 1</td>
<td>121 ± 1</td>
</tr>
<tr>
<td>Dozer 1451</td>
<td>Dynamic fwd/rev¹</td>
<td>Drive-by</td>
<td>n/a²</td>
<td>120 ± 1</td>
</tr>
<tr>
<td>Rotary Breaker</td>
<td>Operating</td>
<td>Stationary</td>
<td>116 ± 1</td>
<td>114 ± 1</td>
</tr>
<tr>
<td>Preparation Plant</td>
<td>Operating</td>
<td>Stationary</td>
<td>119 ± 1</td>
<td>110 ± 1</td>
</tr>
</tbody>
</table>

¹ Geometric average of results for first and second gears.
² See text below

Section 4.2 of the site Noise Management Plan (NMP, November 2017) states: “MCC conducts a survey of significant noise sources to determine the noise levels from the equipment. This survey will be completed so that all significant noise generating equipment is surveyed over a 3 year period. The results of this monitoring will be compared to previous results and if there is an increase of more than 2dB an investigation into the changes will be conducted to identify if any further mitigation on the equipment is required. As part of this investigation the attended noise monitoring results and complaints history will be considered.”

All items in Table 1 satisfy this requirement with respect to the data used in the 2016 noise modelling. Note that dozer #1451 was not included in the list of modelled plant items from 2016. The modelled noise level for all of the four dozers included in the 2016 report, however, ranged from 119 to 123 dB(A) (as an average for forward and reverse motion). The measured noise level for dozer #1451 falls within this range.

In summary, we advise that MCC mobile plant sound power levels do not exceed the levels measured in 2016 by more than 2 dB. Further targeted noise monitoring of individual plant measured during this survey is not warranted at this stage.
We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please do not hesitate to contact the undersigned.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author: Neil Pennington MAIP, MAAS
Acoustical Consultant

Review: Ross Hodge MAAS
Acoustical Consultant

This document was prepared for the sole use of Muswellbrook Coal Limited and the regulatory agencies that are directly involved in this project, the only intended beneficiaries of our work. No other party should rely on the information contained herein without the prior written consent of Spectrum Acoustics Pty Limited and Muswellbrook Coal Limited.
# Certificate of Calibration

**Brüel & Kjær**

Australian Calibration Laboratory

Site 2, 6-10 Talara Road, North Ryde NSW 2113, Australia

Accredited for compliance with ISO/IEC 17025 - Calibration Laboratory No. 1301

**Certificate of Calibration**

<table>
<thead>
<tr>
<th>Calibration of:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound Level Meter:</td>
<td>Bruel &amp; Kjaer</td>
<td>22.50</td>
<td>No: 2741794</td>
</tr>
<tr>
<td>Microphone:</td>
<td>Bruel &amp; Kjaer</td>
<td>4189</td>
<td>No: 2733511</td>
</tr>
<tr>
<td>Preamplifier:</td>
<td>Bruel &amp; Kjaer</td>
<td>ZC-0032</td>
<td>No: 15359</td>
</tr>
<tr>
<td>Supplied Calibrator:</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Software version:</td>
<td>BZ7224 Version 4.5</td>
<td>Pattern Approval:</td>
<td>PTB</td>
</tr>
<tr>
<td>Instruction Manual:</td>
<td>BE1712-22</td>
<td>Identification:</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Customer:** Spectrum Acoustics Pty Ltd, 30 Veronica Street, Cardiff NSW 2285

**Calibration Conditions:**

- Preconditioning: 4 hours at 23 °C
- Environmental conditions: *see actual values in Environmental conditions section*

**Specifications:**

The Sound Level Meter has been calibrated in accordance with the requirements as specified in IEC61672-1:2013 class 1. Procedures from IEC 61672-3:2011 were used to perform the periodic tests.

**Procedure:**

The measurements have been performed with the assistance of Bruel & Kjaer Sound Level Meter Calibration System B&K 2630 with application software type 7763 (version 7.2 - DB: 7.20) and test procedure 2256-4189.

**Results:**

<table>
<thead>
<tr>
<th>Initial Calibration</th>
<th>Calibration Prior to Repair/Adjustment</th>
<th>Calibration after Repair/Adjustment</th>
</tr>
</thead>
</table>

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

**Date of Calibration:** 25/06/2018

**Certificate issued:** 26/06/2018

Sajeed Tharayil
Calibration Technician

Jan Rasmussen
Approved Signatory

Reproduction of the complete certificate is allowed. Part of the certificate may only be reproduced after written permission.
CERTIFICATE OF CALIBRATION

Brüel & Kjær
Australian Calibration Laboratory
Suite 2, 6-10 Taltavera Road, North Ryde NSW 2113, Australia

Certificate No: CAU1700839
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CALIBRATION OF:

Sound Level Meter: Brüel & Kjaer 2250 No: 2653961
Microphone: Brüel & Kjaer 4189 No: 3087490
Pre-amplifier: Brüel & Kjaer ZC-0032 No: 25104
Supplied Calibrator: N/A N/A
Software version: BZ7222 Version 4.5.1 Pattern Approval: PTB
Instruction manual: BE1712-22 Identification: N/A

CUSTOMER:
Spectrum Acoustics Pty Ltd
30 Veronica Street
Cardiff NSW 2285

CALIBRATION CONDITIONS:
Preconditioning: 4 hours at 23 °C
Environment conditions: see actual values in Environmental conditions sections

SPECIFICATIONS:
The Sound Level Meter has been calibrated in accordance with the requirements as specified in IEC61672-3:2006 class 1.
Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

PROCEDURE:
The measurements have been performed with the assistance of Brüel & Kjaer Sound Level Meter Calibration System B&K 3630 with application software type 7763 (version 6.0 - DB: 6.00) and test procedure 2250-4189.

RESULTS:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial calibration</td>
<td></td>
</tr>
<tr>
<td>Calibration prior to repair/adjustment</td>
<td></td>
</tr>
<tr>
<td>Calibration without repair/adjustment</td>
<td>X</td>
</tr>
<tr>
<td>Calibration after repair/adjustment</td>
<td></td>
</tr>
</tbody>
</table>

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor k = 2 providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of Calibration: 04/09/2017
Certificate issued: 04/09/2017

Sajeeb Tharayil
Calibration Technician

Jan Rasmussen
Approved signatory

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