MGO
MT OWEN/GLENDELL OPERATIONS
GLENCORE

MT OWEN/GLENDELL OPERATIONS

THE ANNUAL REVIEW

APPENDICIES

1 January 2019 – 31 December 2019

Environment

We are aware that our global operations can have direct and indirect impacts on the environment.

Our operations are geographically widespread and extremely diverse in nature, including prospecting, production, reclamation, processing, storage, transportation and marketing of natural resources. This means that our potential environmental impacts are complex and specific to different commodity groups or production sites.

We are aware of the increasing regulatory pressure and societal demand for a low emission economy to address the global climate change situation. We are working to integrate this into our existing resource efficiency programmes at our operations. We comply with applicable laws, regulations and other requirements for environmental management. Where these are less stringent than our own standards we seek to exceed the statutory requirements wherever possible.

We also participate in supply chains that are not under our direct control. Here we work in partnership with our customers, suppliers and service providers to limit the overall environmental impact along the entire supply chain, and promote environmental awareness.

Our managers are required to:

1. Identify, assess and monitor environmental impacts
2. Comply with applicable regulatory requirements and monitor relevant regulations for changes
3. Implement appropriate environmental management programmes and controls, including appropriate measures for emergency preparedness
4. Ensure competent staff and sufficient resources for environmental management
5. Involve contractors and service providers where appropriate
6. Implement programmes and targets for continuous improvement of our:
   - Efficient use of resources (eg energy, water and land)
   - Protection of biodiversity
   - Climate change impact
   - Pollution prevention (by addressing management of fresh water and effluent, waste, air emissions, hazardous materials and rehabilitation of land)
7. Track actual environmental performance

Compliance

Everyone who works for Glencore Xstrata must comply with or exceed the laws, regulations and best practice guidelines applicable in the jurisdictions where we operate.

We will not assist any third party in breaching the law in any country, or participate in any other criminal, fraudulent or corrupt practice. We seek to prevent such misconduct through strong leadership, internal policies and procedures.

Anyone acting on behalf of Glencore Xstrata, along our entire supply chain, must comply with applicable laws and corporate policies. Our managers and supervisors must ensure this is the case, and take appropriate action to prevent, detect and report any failures to comply.

You must follow the guidance and instructions regarding the corporate policies applicable to your duties, including related training. Where appropriate, you must confirm that you have received and understood the compliance policies, manuals and guidance. Local compliance co-ordinators have been appointed to support you in day-to-day business considerations.

Individual operations may implement their own policies in addition to the Glencore Xstrata corporate policies. These should be designed to address their specific requirements, while consistent with Our Values and principles as set out by the Code and Glencore Xstrata corporate policies.

Conflict of interest

A conflict of interest is a situation in which an individual has a private interest sufficient to appear to influence the objective exercise of his or her professional duties.

You must avoid actual conflicts of interest and avoid, wherever possible, apparent or potential conflicts or otherwise carefully manage them accordingly. Everyone working for Glencore Xstrata must carefully perform their professional duties and safeguard Glencore Xstrata's legitimate interests.

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Appendix A: Correspondence

Planning, Industry & Environment

Mr Ned Stephenson
Environment and Community Manager
Mt Owen Complex
PO Box 320
SINGLETON NSW 2330

Contact: Heidi Watters
Phone: (02) 6575 3401
Email: heidi.watters@planning.nsw.gov.au
compliance@planning.nsw.gov.au
Our Ref: SSD-5850 and DA 80/952

Email: ned.stephenson@glencore.com.au

Dear Mr Stephenson

Mt Owen Complex (SSD 5850 and DA 80/952)
2018 Annual Review

Reference is made to the revised Mt Owen Complex 2018 Annual Review for the period 1 January 2018 to 31 December 2018, prepared as required by Schedule 5 condition 5 of SSD-5850, as modified and DA 80/952, as modified (the approvals), and submitted to the Department of Planning, Industry and Environment (the Department) on 27 June 2019.

The Department has reviewed the revised 2018 Annual Review and considers that it satisfies the reporting requirements of the approvals and the Department's *Annual Review Guideline* (October 2015). As required by Schedule 6 condition 12 of the mining consent and Schedule 6 condition 8 of the rail consent, please make a copy of the 2018 Annual Review available on the project website by **31 July 2019**.

Please note that acceptance of the Annual Review is not an endorsement of the compliance status of the project. Non-compliances identified in the Annual Review may be investigated further by the Department.

Should you need to discuss the above, please contact Heidi Watters on the details above or email to compliance@planning.nsw.gov.au

Yours sincerely

8/7/19

Leah Cook
Team Leader Compliance
As nominee of the Secretary

Appendix B: Daily Train Movements

Table 1: Daily Train Movements and Tonnes Loaded 2019

Date	Number of Trains Per Day	Total Tonnes Loaded
1/01/2019	5	46,412.65
2/01/2019	5	46,141.85
3/01/2019	3	27,746.70
4/01/2019	3	27,574.75
5/01/2019	4	36,503.15
6/01/2019	3	27,980.65
7/01/2019	2	18,605.80
8/01/2019	0	0.00
9/01/2019	2	18,579.30
10/01/2019	2	18,584.05
11/01/2019	4	27,202.10
12/01/2019	2	8,592.80
13/01/2019	4	27,233.00
14/01/2019	2	13,176.40
15/01/2019	3	17,618.85
16/01/2019	2	8,594.25
17/01/2019	1	4,291.35
18/01/2019	2	8,575.45
19/01/2019	2	8,609.15
20/01/2019	2	13,530.15
21/01/2019	3	22,908.25
22/01/2019	2	13,621.85
23/01/2019	7	58,465.35
24/01/2019	2	18,594.90
25/01/2019	1	9,354.35
26/01/2019	4	36,673.15
27/01/2019	6	55,132.75
28/01/2019	6	55,113.70
29/01/2019	5	45,702.00
30/01/2019	7	64,261.35
31/01/2019	6	54,509.60
1/02/2019	4	36,846.70
2/02/2019	4	37,237.10
3/02/2019	3	27,732.15
4/02/2019	4	36,629.70
5/02/2019	3	27,497.35
6/02/2019	4	36,918.15
7/02/2019	3	27,781.80

Date	Number of Trains Per Day	Total Tonnes Loaded
8/02/2019	5	46,229.30
9/02/2019	3	27,772.70
10/02/2019	2	18,363.30
11/02/2019	2	18,511.95
12/02/2019	2	18,181.45
13/02/2019	2	18,626.70
14/02/2019	2	17,817.05
15/02/2019	2	18,566.20
17/02/2019	4	36,639.85
18/02/2019	1	9,270.30
19/02/2019	0	0.00
20/02/2019	0	0.00
21/02/2019	0	0.00
22/02/2019	4	36,892.65
23/02/2019	4	36,061.70
24/02/2019	4	36,608.55
25/02/2019	1	8,927.05
27/02/2019	1	9,155.10
28/02/2019	3	27,113.90
1/03/2019	4	36,747.25
2/03/2019	3	27,973.90
3/03/2019	6	54,827.20
4/03/2019	2	18,495.75
5/03/2019	2	18,037.15
6/03/2019	2	18,586.15
7/03/2019	2	18,630.00
8/03/2019	0	0.00
9/03/2019	2	18,111.90
10/03/2019	4	36,594.25
11/03/2019	4	36,618.45
12/03/2019	3	27,779.55
13/03/2019	2	18,434.75
14/03/2019	2	18,328.10
15/03/2019	3	22,640.55
16/03/2019	5	35,893.35
17/03/2019	7	49,272.65
18/03/2019	5	41,143.25
19/03/2019	3	17,660.75
20/03/2019	5	40,692.75
21/03/2019	4	27,153.55
22/03/2019	2	13,423.25
23/03/2019	2	8,552.30

Date	Number of Trains Per Day	Total Tonnes Loaded
24/03/2019	3	17,771.75
25/03/2019	2	8,574.25
26/03/2019	1	9,253.40
27/03/2019	2	18,073.65
28/03/2019	1	9,240.95
29/03/2019	3	27,572.10
30/03/2019	2	18,556.70
31/03/2019	6	55,213.15
1/04/2019	5	45,687.00
2/04/2019	2	17,770.75
3/04/2019	4	36,477.60
4/04/2019	2	18,383.25
5/04/2019	3	27,698.75
6/04/2019	2	17,826.85
7/04/2019	3	27,386.85
8/04/2019	5	44,752.60
9/04/2019	0	0.00
10/04/2019	0	0.00
11/04/2019	0	0.00
12/04/2019	2	18,598.30
13/04/2019	5	45,849.00
14/04/2019	0	0.00
15/04/2019	3	26,818.95
16/04/2019	1	9,299.45
17/04/2019	2	18,153.00
18/04/2019	1	9,061.55
19/04/2019	2	13,264.95
20/04/2019	3	17,667.40
21/04/2019	4	26,507.05
22/04/2019	2	8,538.20
23/04/2019	1	4,283.65
24/04/2019	0	0.00
25/04/2019	1	8,990.50
26/04/2019	0	0.00
27/04/2019	1	4,275.00
28/04/2019	2	13,512.10
29/04/2019	3	22,407.50
30/04/2019	1	9,223.60
1/05/2019	3	26,832.00
2/05/2019	4	35,356.15
3/05/2019	4	36,081.20
4/05/2019	3	27,592.90

Date	Number of Trains Per Day	Total Tonnes Loaded
5/05/2019	3	26,879.05
6/05/2019	2	17,659.25
7/05/2019	0	0.00
8/05/2019	3	26,646.25
9/05/2019	3	26,998.55
10/05/2019	4	35,728.05
11/05/2019	3	26,726.05
12/05/2019	4	35,674.55
13/05/2019	2	18,572.80
14/05/2019	2	18,312.35
15/05/2019	6	54,581.55
16/05/2019	1	9,148.60
17/05/2019	4	26,474.90
18/05/2019	2	13,073.50
19/05/2019	2	8,552.75
20/05/2019	3	22,535.40
21/05/2019	0	0.00
22/05/2019	0	0.00
23/05/2019	0	0.00
24/05/2019	4	31,722.95
25/05/2019	4	26,254.10
26/05/2019	2	8,563.75
27/05/2019	4	31,091.65
28/05/2019	3	17,785.15
29/05/2019	4	31,201.20
30/05/2019	4	31,441.15
31/05/2019	1	9,176.50
1/06/2019	1	9,294.05
2/06/2019	5	44,915.75
3/06/2019	2	18,155.75
4/06/2019	2	17,673.20
5/06/2019	3	26,668.85
6/06/2019	3	26,988.10
7/06/2019	0	0.00
8/06/2019	1	9,256.95
9/06/2019	2	18,660.65
10/06/2019	2	18,168.60
11/06/2019	2	13,498.45
12/06/2019	6	45,298.55
13/06/2019	1	9,256.95
14/06/2019	1	8,829.30
15/06/2019	1	9,108.50

Date	Number of Trains Per Day	Total Tonnes Loaded
16/06/2019	1	8,713.90
17/06/2019	2	17,894.85
18/06/2019	5	44,768.05
19/06/2019	3	27,361.05
20/06/2019	4	36,944.90
21/06/2019	2	18,146.85
22/06/2019	3	27,840.40
23/06/2019	1	9,144.20
24/06/2019	1	8,750.55
25/06/2019	0	0.00
26/06/2019	1	8,774.65
27/06/2019	1	8,746.80
28/06/2019	0	0.00
29/06/2019	3	26,322.05
30/06/2019	4	36,334.55
1/07/2019	0	0.00
2/07/2019	0	0.00
3/07/2019	2	17,914.05
4/07/2019	2	17,378.95
5/07/2019	3	27,631.60
6/07/2019	3	27,729.20
7/07/2019	3	27,476.55
8/07/2019	2	18,147.45
9/07/2019	0	0.00
10/07/2019	2	18,580.15
11/07/2019	3	27,195.75
12/07/2019	2	18,414.60
13/07/2019	5	46,097.30
14/07/2019	4	37,146.35
15/07/2019	4	36,997.65
16/07/2019	5	36,067.75
17/07/2019	2	13,251.00
18/07/2019	4	24,886.15
19/07/2019	4	31,527.40
20/07/2019	5	36,068.75
21/07/2019	5	46,308.65
22/07/2019	1	9,292.10
23/07/2019	2	18,345.30
24/07/2019	2	18,619.45
25/07/2019	3	27,474.45
26/07/2019	2	17,985.85
27/07/2019	6	55,348.10

Date	Number of Trains Per Day	Total Tonnes Loaded
28/07/2019	3	27,161.60
29/07/2019	1	9,036.15
30/07/2019	2	17,907.50
31/07/2019	2	18,438.55
1/08/2019	5	36,208.40
2/08/2019	4	31,879.40
3/08/2019	6	50,084.85
4/08/2019	4	27,164.80
5/08/2019	2	18,122.80
6/08/2019	0	0.00
7/08/2019	0	0.00
8/08/2019	0	0.00
9/08/2019	3	22,744.90
10/08/2019	4	31,553.20
11/08/2019	6	44,951.75
12/08/2019	4	26,811.20
13/08/2019	3	27,359.85
14/08/2019	4	26,900.05
15/08/2019	4	32,053.25
16/08/2019	2	18,413.20
17/08/2019	4	27,040.65
18/08/2019	3	17,608.80
19/08/2019	2	18,554.35
20/08/2019	1	9,327.70
21/08/2019	2	17,974.00
22/08/2019	4	36,820.05
23/08/2019	2	18,159.20
24/08/2019	3	27,522.00
25/08/2019	1	9,285.75
26/08/2019	1	9,318.90
27/08/2019	3	27,214.30
28/08/2019	3	24,104.70
29/08/2019	4	37,016.45
30/08/2019	1	8,978.95
31/08/2019	4	36,561.35
1/09/2019	3	27,558.05
2/09/2019	3	27,596.25
3/09/2019	5	45,872.70
4/09/2019	2	18,382.45
5/09/2019	1	9,230.10
6/09/2019	1	9,307.90
7/09/2019	6	45,108.35

Date	Number of Trains Per Day	Total Tonnes Loaded
8/09/2019	2	13,343.80
9/09/2019	3	17,672.65
10/09/2019	4	27,145.45
11/09/2019	1	4,292.15
12/09/2019	4	31,557.75
13/09/2019	5	35,715.35
14/09/2019	4	31,829.35
15/09/2019	3	22,745.70
16/09/2019	2	18,189.10
17/09/2019	2	18,291.25
18/09/2019	3	27,719.00
19/09/2019	0	0.00
20/09/2019	0	0.00
21/09/2019	1	9,349.30
22/09/2019	3	17,287.75
23/09/2019	3	17,735.05
24/09/2019	0	0.00
25/09/2019	0	0.00
26/09/2019	0	0.00
27/09/2019	3	22,656.70
28/09/2019	5	35,608.35
29/09/2019	4	26,346.40
30/09/2019	4	26,898.05
1/10/2019	1	9,344.60
2/10/2019	4	30,623.95
3/10/2019	5	35,371.84
4/10/2019	4	26,921.10
5/10/2019	5	35,732.35
6/10/2019	4	36,700.75
7/10/2019	3	27,007.65
8/10/2019	5	36,173.25
9/10/2019	4	36,575.25
10/10/2019	6	39,712.40
11/10/2019	5	41,077.75
12/10/2019	7	54,031.05
13/10/2019	7	54,677.00
14/10/2019	3	27,669.20
15/10/2019	3	22,783.00
16/10/2019	3	27,842.80
17/10/2019	3	26,991.50
18/10/2019	3	26,570.85
19/10/2019	2	18,147.40

Date	Number of Trains Per Day	Total Tonnes Loaded
20/10/2019	1	4,269.80
21/10/2019	2	8,529.75
22/10/2019	1	9,170.75
23/10/2019	3	27,153.85
24/10/2019	2	18,038.45
25/10/2019	3	27,132.40
26/10/2019	2	18,159.85
27/10/2019	2	18,645.70
28/10/2019	6	55,148.40
29/10/2019	3	27,671.30
30/10/2019	3	27,566.20
31/10/2019	5	45,437.60
1/11/2019	3	27,400.50
2/11/2019	0	0.00
3/11/2019	1	4,272.90
4/11/2019	2	8,576.90
5/11/2019	1	4,275.65
6/11/2019	1	4,278.20
7/11/2019	2	8,549.60
8/11/2019	2	13,622.30
9/11/2019	4	26,900.15
10/11/2019	3	27,611.95
11/11/2019	8	63,500.90
12/11/2019	3	22,671.70
13/11/2019	4	26,755.30
14/11/2019	3	17,506.40
15/11/2019	4	26,343.05
16/11/2019	1	4,175.35
17/11/2019	3	12,597.30
18/11/2019	2	13,243.95
19/11/2019	0	0.00
20/11/2019	0	0.00
21/11/2019	0	0.00
22/11/2019	4	36,306.40
23/11/2019	4	36,404.15
24/11/2019	4	36,496.75
25/11/2019	4	36,632.15
26/11/2019	2	18,008.30
27/11/2019	4	35,615.75
28/11/2019	5	35,579.30
29/11/2019	6	34,875.30
30/11/2019	8	62,769.05

Date	Number of Trains Per Day	Total Tonnes Loaded
1/12/2019	7	44,411.00
2/12/2019	5	30,796.10
3/12/2019	7	49,176.15
4/12/2019	4	21,832.60
5/12/2019	5	35,541.30
6/12/2019	5	35,748.60
7/12/2019	4	26,952.35
8/12/2019	3	22,483.10
9/12/2019	3	17,674.75
10/12/2019	3	17,712.90
11/12/2019	3	22,164.50
12/12/2019	4	26,549.95
13/12/2019	4	26,826.60
14/12/2019	5	36,431.60
15/12/2019	3	22,675.85
16/12/2019	7	54,492.35
17/12/2019	5	35,154.90
18/12/2019	1	4,274.55
19/12/2019	4	26,696.95
20/12/2019	7	53,924.10
21/12/2019	3	22,777.65
22/12/2019	4	36,606.05
23/12/2019	6	44,974.65
24/12/2019	0	0.00
25/12/2019	0	0.00
26/12/2019	1	9,011.85
27/12/2019	5	44,534.35
28/12/2019	5	34,911.55
29/12/2019	3	17,062.65
30/12/2019	1	4,036.05
31/12/2019	4	26,022.85
Total	**1039**	**8.39 MT**

Appendix C: Environmental Incidents

Environmental incidents at the MGO are classified into six categories (based on Glencore's Internal Incident Reporting):

- Nil Category: below category 1;
- Category 1: Negligible - An incident that causes negligible, reversible environmental impact, requiring very minor or no remediation;
- Category 2: Minor – An incident that causes minor, reversible environmental impacts, require minor remediation;
- Category 3: Significant – An incident that has caused moderate, reversible environmental impact with short-term effect, requiring moderate remediation;
- Category 4: Serious – An incident that has caused significant environmental impact, with medium-term effect, requiring significant remediation; and
- Category 5: Disastrous – An incident that has caused disastrous environmental impact, with long-term effect, requiring major remediation.

Table 2: Environmental Incidents 2019

No.	Incident Date	Incident Category	Incident Type	Response
Glendell and Ravensworth East				
1	07-Jan-19	1	Oil Spill O-ring Failure	Shut down machine. High Pressure O-ring had failed.
2	20-Feb-19	1	Waste	New lock installed on entry gate
3	26-Jan-19	Nil	Oil Spill Crack diff housing	Dozer diff housing condition monitored, planned maintenance and implemented.
4	26-Feb-19	1	Coolant Spill	Machine parked fundamentally stable, repairs carried out.
5	28-Feb-19	Nil	Oil Spill	Contaminated dirt removed and transported to bioremediation area.
6	14-Mar-19	1	Oil Spill Failed ram pin	Operator notified the OCE. A bund was set up to contain the oil leak.
7	18-Mar-19	Nil	Oil Spill	Leaks repaired and contaminated dirt removed from under ST35 and transported to bioremediation area.
8	25-Mar-19	1	Oil Spill	OCE isolated the truck and surrounding area Hard barricading installed. Product transported bioremediation area
9	26-Mar-19	1	Oil Leak	Machine isolated spill contained and cleaned up
10	27-Mar-19	1	Oil Spill Brake Hose Fail	Digger hut down, spill controlled and cleaned up.
11	29-Apr-19	1	Oil Spill	Leak repaired in digger spill mitigated
12	12-May-19	1	Oil Spill Hydraulic Hose Fail	Turned off hydraulic tank taps to prevent further spill. Replaced blown hose, fill hydraulics and tested.
13	20-Jun-19	1	Oil Leak	Machine stopped, area barricaded and oil contained. Oil was cleaned up using a front end loader and taken to bioremediation area
14	05-Jul-19	1	Oil Leak	Operator stopped excavator and called the OCE to inspect the damage.
15	06-Jul-19	1	Oil Spill Hydraulic Hose Fail	Westrac attended truck to inspect the leak, mitigated spill by using spill sorb.
16	24-Jul-19	1	Oil Spill Main driveshaft failure	Crusher dust used to contain the scene. Contaminated product taken to bioremediation area
17	04-Aug-19	1	Oil Spill Failed engine oil pump O-ring	Spill trailer was used to contain and collect the oil. Contaminated product taken to bioremediation area.
18	14-Aug-19	1	Oil Spill	Oil was contained, machine was moved from area. Skid steer loader was utilised to remove contaminated soil and placed in the remediation area.
19	20-Aug-19	1	Oil Leak Engine	Spill sorb used to clean up.
20	28-Aug-19	1	Oil Spill Failed boom hose	While parked up the hose was removed and replaced with a new one.

No.	Incident Date	Incident Category	Incident Type	Response
21	09-Sep-19	Nil	Air Quality Total Suspended Solid (TSP 2) Dust Sample destroyed	Reported to MGO task coordinator and CBE Projects Manager. Refer to App C_2019 Cbased Incident Investigation.
22	02-Oct-19	1	Oil Spill Failed boom hose	Shut down, contained spill where possible, changed hose and topped up oils
23	02-Nov-19	1	Fuel Spill Service tail damage	Fuel tap was turned off, the area was bunded, a 1000ltr pod used to contain fuel. Machine repaired and contaminated material sent to bioremediation area
24	03-Nov-19	1	Oil Spill 30w bulk oil tank overfilled	Oil spill cleaned up with dry sorb
25	11-Nov-19	1	Oil Spill Hydraulic	Machine shut down. Failed contamination sensor. A new contamination sensor was fitted to the pump.
26	21-Nov-19	1	Oil Leak Fan hose failure	Oil spill controlled until repairs and clean-up take place. Minimal remediation required.
27	03-Dec-19	1	Oil Leak Slew motor	Operator called supervisor to assist, machine walked into position for repair and clean up
28	06-Dec-19	1	Oil Leak Fan pipe	Minimal mitigation required. Fan pipe repaired
29	06-Dec-19	1	Oil Spill Joint hose O-ring	Machine shutdown. New O-ring found and fitted.
30	18-Dec-19	1	Oil Spill Lock-up hose failure	Machine isolated and oil spill controlled and contained to ensure minimal oil loss after failure.
31	19-Dec-19	1	Oil Spill Bunded fuel farm	The spill has been absorbed by the use of spill sorb
33	20-Dec-19	1	Oil Spill Park brake filter tube	Machine isolated and oil spill controlled and contained to ensure minimal oil loss after failure. Spill sorb used to mitigate
Mt Owen				
1	13-Feb-19	Nil	Oil Leak	Supervisor requested a subcontractor to clean-up the hydraulic oil stain and realign the hydraulic oil tray into place to capture all potential oil leaked.
2	23-Mar-19	1	Oil Leak Hydraulic - minor	The Operator of truck RD2743 immediately shut down the truck. Contaminated material was taken to the Bioremediation area.
3	28-Mar-19	1	Oil Spill	The Operator immediately lowered his bucket to the ground, shut the machine down and released the pressure valve: Contaminated material was recovered and taken to the bioremediation area
4	22-Apr-19	1	Diesel Spill	The fuel cart Operator immediately shut the refuelling truck off. The diesel spill was contained, the contaminated material was recovered and taken to the bioremediation pad
5	12-May-19	1	Oil Spill Hydraulic	Immediately shutdown the loader The hydraulic oil spill was contained and the contaminated material was taken to the bioremediation area
6	04-Jun-19	1	Spill Coolant Oil Spill	The Operator immediately shut down the grader The spills were contained within the reject material and removed to the bio remedial area and recorded.
7	20-Jun-19	1	Oil Spill Hydraulic	Immediately shutdown the drill The hydraulic oil spill was contained and the contaminated material was taken to the bioremediation area.
8	12-Aug-19	1	Oil Spill Hydraulic Oil	The spill was contained, contaminated material was relocated to the bioremediation area and recorded. The blown hose was replaced and hydraulic oil topped up.
9	26-Aug-19	Nil	Noise Attended noise monitoring loss of recording data.	In order to ensure adequate storage capacity is available for the buffer data, Umwelt's monitoring procedures have been updated, to include a step to download and clear all buffer data prior to the commencement of the each noise monitoring session, with noise data also downloaded daily from noise logger to ensure data is collected and the storage capacity within the noise logger is maximised.
10	21-Oct-19	Nil	Oil Leak Hydraulic - minor	The tank was inspected no signs of an active leakage were observed. Clean up of the hydraulic oil stain, implemented strategic options to prevent reoccurrence.
11	10-Nov-19	1	Oil Leak Hydraulic Oil	The operator immediately shut down the excavator The spill was contained contaminated material taken to the bioremediation area. -

Appendix D: Noise

Table 3: MGO Noise Monitoring Locations

Monitoring Location	Description of Monitoring Location	Property Location Reference
Sx1	Continuous noise unit located on Property 86	Mt Owen EIS
Sx4	Continuous noise unit located on Property 109	Mt Owen EIS
Sx5	Mt Owen reference continuous noise unit located south east of Mt Owen Mine on Property 66.	Mt Owen EIS
Sx6	Mobile Continuous Noise unit – used for targeted monitoring	-
Sx7	Continuous noise unit located to the south of the Glendell Pit	-
SX11	Refurbsed Mobile Continuous Noise unit – used for targeted monitoring	-
Sx12	Continuous noise unit located near Property 31	Glendell EA
Sx122	Mobile Continuous Noise unit – used for targeted monitoring	-
Sx13 M8	Meteorological station located to the west of Mt Owen Mine	-
Sx13 M1	Meteorological station located to the west of Glendell Mine	-
Sx13 M2	Meteorological station located to the east of Glendell Mine	-
N1	Greenlands, to the west of Property 54	Mt Owen EIS
N2	Falbrook Road, adjacent to Property 71	Mt Owen EIS
N3	Corner of Falbrook and Middle Falbrook Road	-
N4	Glennies Creek Road adjacent to Property 109	Mt Owen EIS
N8	South of Camberwell Village at Property 7a	Glendell EA
N9	Camberwell Village (central section) adjacent to Property R47	Glendell EA
N10	Camberwell Village (western section) adjacent to Property R27	Glendell EA
N11	Glennies Creek Road adjacent to Property R37a	Glendell EA
N17*	Representative of the rural residence on Scrumlo Road, Hebden near property R134	Mt Owen EIS

*Monioring point added to EPL 4460 on 19th of September 2019. MGO have included N17 on its recelty submitted (not yet approved) Noise Management Plan and results will be provided in the next annual report. Alternatively, EPL noise report has been made publicaly available on the MGO website

(https://www.mtowencomplex.com.au/en/environment/environmental-monitoring/Pages/mtowen-complex-noise-monitoring-report.aspx)

Table 4: Summary of Attended Noise Monitoring - Summer (January) 2019, dB(A)

Location	Start Time (15 min period)	Measured Noise Levels LA90, 15min	Measured Noise Levels LAeq, 15min	Measured Noise Levels LA1, 1 min	Estimated[1] Mt Owen Contribution LAeq, 15min	Estimated[1] Mt Owen Contribution LA1, 1 min	Estimated[1] Glendell Contribution LAeq, 15min	Estimated[1] Glendell Contribution LA1, 1 min	Local Meteorological Conditions[2]
Night-time Period – 22, 23, 28-29 January 2019									
N1	23:19:00	37.8	42.1	47.4	< 25.0	< 25.0	Not Audible	Not Audible	Wind NW at 4.9 m/s, 0/8 octa cloud cover, 32 °C, 46% RH
N2	23:54:00	28.1	29.5	39.0	< 30.0	33.0	Not Audible	Not Audible	Wind NW at 5.5 m/s, 0/8 octa cloud cover, 33 °C, 42% RH
N3	0:27:00	31.4	50.7	74.7	31.0	35.0	< 30.0	< 30.0	Wind NW at 4.6 m/s, 0/8 octa Cloud cover, 34 °C, 41% RH
N4	1:02:00	36.3	45.8	69.1	Not Audible	Not Audible	< 30.0	34.0	Wind W at 2.9 m/s, 0/8 octa Cloud cover, 35 °C, 38% RH
N8	23:34:00	38.6	43.7	53.7	Not Audible	Not Audible	< 30.0	33.0	Wind SSE at 4.1 m/s, 0/8 octa Cloud cover, 26 °C, 76% RH
N9	22:17:00	35.6	46.1	67.0	Not Audible	Not Audible	Not Audible	Not Audible	Wind SSE at 4.9 m/s, 0/8 octa Cloud cover, 26 °C , 75% RH
N10	22:49:00	32.3	38.3	48.4	Not Audible	Not Audible	Not Audible	Not Audible	Wind SSE at 4 m/s, 0/8 octa Cloud cover, 26 °C, 76% RH
N11	0:13:00	34.5	39.0	52.3	Not Audible	Not Audible	Not Audible	Not Audible	Wind SSE at 3.4 m/s; 0/8 octa Cloud cover, 25 °C, 77% RH

1 Assessed by the operator during the monitoring session.

2 Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 658027, positioned within 5 metres and at a corresponding height of the noise monitoring microphone.

Table 5: Summary of Attended Noise Monitoring - Summer (February) 2019, dB(A)

Location	Start Time	Measured Noise Levels			Estimated[1] Mt Owen Contribution		Estimated[1] Glendell Contribution		Local Meteorological Conditions[2]
	(15 min period)	LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	
Day Period – 26 February 2019									
N1	17:45	31.2	36.7	47.3	< 25.0	Not audible	Not audible	Not audible	Wind SE at 3.6 m/s, 5/8 octa cloud cover, 29 °C, 37% RH
N2	17:22	35.6	33.7	46.0	< 25.0	Not audible	Not audible	Not audible	Wind S at 2.5 m/s, 6/8 octa cloud cover, 29 °C, 36% RH
N3	16:58	25.8	58.2	77.6	Not audible	Not audible	Not audible	Not audible	Wind S at 3.6 m/s 6/8 octa cloud cover, 29 °C, RH 34% RH
Evening Period – 26 February 2019									
N1	21:14	37.3	38.5	44.2	< 25.0	Not audible	Not audible	Not audible	Wind S at 2.3 m/s; 2/8 octa cloud cover, 24 °C, 64% RH
N2	20:39	24.3	26.3	36.2	< 25.0	Not audible	Not audible	Not audible	Wind SSE at 2.9 m/s; 5/8 octa cloud cover, 25 °C, 59% RH
N3	20:09	31.4	46.3	65.2	Not audible	Not audible	Not audible	Not audible	Wind SE at 4.5 m/s; 5/8 octa cloud cover, 25 °C, 57% RH
Night-time Period – 25-27 February 2019									
N1	00:04	29.2	30.2	32.3	< 20.0	< 25.0	Not audible	Not audible	Wind S at 1.3 m/s; 2/8 octa cloud cover, 20 °C, 77% RH
N2	23:35	24.4	25.1	28.7	< 25.0	27.0	Not audible	Not audible	Wind S at 1.9 m/s; 1/8 octa cloud cover, 21 °C, 76% RH
N3	23:02	27.2	32.1	38.9	30.0	39.0	Not audible	Not audible	Wind S at 2.4 m/s; 1/8 octa cloud cover, 21 °C, 74% RH
N4	22:34	35.1	37.1	44.3	36.0	42.0	Not audible	Not audible	Wind S at 2.2 m/s; 1/8 octa cloud cover, 22 °C, 72% RH
N8	00:41	35.1	39.4	55.7	Not audible	Not audible	< 25.0	Not audible	Wind S at 2.4 m/s; 0/8 octa cloud cover, 18 °C, 80% RH
N9	23:35	33.0	42.3	51.0	Not audible	Not audible	< 25.0	Not audible	Wind SE at 3.3 m/s; 0/8 octa cloud cover, 19 °C, 76% RH
N10	22:26	36.7	42.9	54.4	Not audible	Not audible	Not audible	Not audible	Wind SE at 4.0 m/s; 0/8 octa cloud cover, 20 °C, 72% RH
N11	22:00	36.8	39.9	45.8	Not audible	Not audible	Not audible	41.7	Wind SE at 3.9 m/s; 0/8 octa cloud cover, 20 °C, 70% RH

1 Assessed by the operator during the monitoring session.

2 Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 655400, positioned within 5 metres and at a corresponding height of the noise monitoring microphone.

Table 6: Summary of Attended Noise Monitoring - Autumn (March) 2019 dB(A)

Location	Start Time (15 min period)	Measured Noise Levels			Estimated[1] Mt Owen Contribution		Estimated[1] Glendell Contribution		Local Meteorological Conditions[2]
		LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	
Night-time Period – 26 – 28 March 2019									
N1	0:20:00	25.0	28.0	41.0	< 25.0	45.0	Not audible	Not audible	Wind SE at 2.5 m/s; 1/8 octa cloud cover, 18 °C, 70% RH
N2	23:47:00	27.0	30.0	35.0	< 30.0	Not audible	Not audible	Not audible	Wind SE at 2.6 m/s; 0/8 octa cloud cover, 19 °C, 70% RH
N3	23:16:00	26.0	28.0	37.0	<25.0	45.0	Not audible	Not audible	Wind SE at 2.4 m/s; 0/8 octa cloud cover, 19 °C, 70% RH
N4	22:46:00	34.0	37.0	43.0	Not audible	50.0	Not audible	Not audible	Wind SE at 2.4 m/s; 2/8 octa cloud cover, 19 °C, 70% RH
N8	22:23:00	33.0	37.0	44.0	Not audible	Not audible	Not audible	Not audible	Wind E at 1.4 m/s; 1/8 octa cloud cover, 19 °C, 70% RH
N9	0:24:00	37.0	41.0	55.0	Not audible	45.0	Not audible	Not audible	Wind SE at 1.6 m/s; 0/8 octa cloud cover, 19 °C, 70% RH
N10	22:09:00	37.0	42.0	52.0	Not audible	45.0	Not audible	Not audible	Wind E at 1.3 m/s; 0/8 octa cloud cover, 18 °C, 70% RH
N11	0:20:00	25.0	28.0	41.0	< 25.0	45.0	Not audible	Not audible	Wind SEE at 2.7 m/s; 2/8 octa cloud cover, 20 °C, 70% RH

1 Assessed by the operator during the monitoring session.

2 Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 645400, positioned within 5 metres and at a corresponding height of the noise monitoring microphone.

Table 7: Summary of Attended Noise Monitoring - Autumn (April) 2019, dB(A)

Location	Start Time (15 min period)	Measured Noise Levels			Estimated[1] Mt Owen Contribution		Estimated[1] Glendell Contribution		Local Meteorological Conditions[2]
		LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	
Night-time Period – 16-17 April 2019									
N1	21:07:00	23.0	26.0	36.0	Not audible	Not audible	Not audible	Not audible	Wind S at 0.6 m/s; 0/8 octa cloud cover, 18 °C, 88% RH
N2	21:41:00	28.0	32.0	43.0	Not audible	Not audible	Not audible	Not audible	Wind S at 0. 0 m/s; 0/8 octa cloud cover, 17 °C, 89% RH
N3	22:08:00	26.0	42.0	65.0	Not audible	Not audible	Not audible	Not audible	Wind W at 0. 0 m/s; 0/8 octa cloud cover, 16 °C, 89% RH
N4	22:37:00	36.0	39.0	50.0	Not audible	Not audible	Not audible	Not audible	Wind SW at 1.3 m/s; 1/8 octa cloud cover, 16 °C, 90% RH
N8	22:56:00	35.0	40.0	52.0	Not audible	Not audible	<30.0	<30.0	Wind S at 0.4 m/s; 0/8 octa cloud cover, 17 °C, 88% RH
N9	21:56:00	39.0	45.0	54.0	Not audible	Not audible	<30.0	32.0	Wind S at 0.0 m/s; 0/8 octa cloud cover, 17 °C, 86% RH
N10	21:06:00	37.0	40.0	49.0	Not audible	Not audible	<30.0	<30.0	Wind S at 0.0 m/s; 0/8 octa cloud cover, 18 °C, 83% RH
N11	23:26:00	38.0	41.0	51.0	Not audible	Not audible	Not audible	Not audible	Wind SSW at 0.0 m/s; 1/8 octa cloud cover, 16 °C, 91% RH

1 Assessed by the operator during the monitoring session.

2 Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 658027, positioned within 5 metres and at a corresponding height of the noise monitoring microphone.

Table 8: Summary of Attended Noise Monitoring -Autumn (May) 2019, dB(A)

Location	Start Time	Measured Noise Levels			Estimated[1] Mt Owen Contribution		Estimated[1] Glendell Contribution		Local Meteorological Conditions[2]
	(15 min period)	LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	
Day Period – 30 May 2019									
N1	17:40	36.3	51.2	75.7	< 25.0	Not applicable	Not applicable	Not applicable	Wind NW at 5.6 m/s; 8/8 octa cloud cover, 12.8 ºC, 50% RH
N2	1710	38.2	40.6	47.1	40.0	Not applicable	Not applicable	Not applicable	Wind NW at 5.3 m/s; 8/8 octa cloud cover, 13.2 ºC, 48% RH
N3	16:43	41.8	55.6	75.2	< 32.0	Not applicable	Not applicable	Not applicable	Wind NW at 4.6 m/s; 8/8 octa cloud cover, 13.8 ºC, 45% RH
Evening Period 30 May 2019									
N1	18:54	39.2	52.9	78.0	< 30	Not applicable	Not applicable	Not applicable	Wind NW at 4.9 m/s; 8/8 octa cloud cover, 11.4 ºC, 54% RH
N2	18:20	40.4	42.1	48.2	41	Not applicable	Not applicable	Not applicable	Wind NW at 4.8 m/s; 8/8 octa cloud cover, 11.9 ºC, 52% RH
N3	19:26	42.3	56.6	75.7	< 32.0	Not applicable	Not applicable	Not applicable	Wind NW at 4.9 m/s; 8/8 octa cloud cover, 11.0 ºC, 54% RH
Night-time Period – 30-31 May 2018									
N1	23:23:00	40.0	44.0	51.0	< 30.0	39.0	Not applicable	Not applicable	Wind NW at 7.2 m/s; 8/8 octa cloud cover, 8.1 ºC, 67% RH
N2	23:58:00	39.0	42.0	51.0	39.0	51.0	Not applicable	Not applicable	Wind NW at 6.4 m/s; 8/8 octa cloud cover, 7.9 ºC, 67% RH
N3	0:28:00	43.0	55.0	78.0	< 32.0	43.0	Not applicable	Not applicable	Wind NW at 6 m/s; 8/8 octa cloud cover, 7.2 ºC, 68% RH
N4	0:59:00	40.0	44.0	53.0	< 30.0	46.0	< 30.0	< 45.0	Wind NW at 6.1 m/s; 8/8 octa cloud cover, 7.5 ºC, 68% RH
N8	2:27:00	38.0	41.0	48.0	Not applicable	Not applicable	< 35.0	43.0	Wind NW at 4.4 m/s; 8/8 octa cloud cover, 7.0 ºC, 70% RH
N9	21:00:00	42.0	50.0	70.0	Not applicable	Not applicable	< 42.0	45.0	Wind NW at 4.9 m/s; 8/8 octa cloud cover, 9.8 ºC, 58% RH
N10	21:31:00	39.0	43.0	49.0	< 20.0	33.0	39.0	45.0	Wind NW at 4.2 m/s; 8/8 octa cloud cover, 9.4 ºC, 60% RH
N11	23:23:00	40.0	44.0	51.0	< 30.0	39.0	Not applicable	Not applicable	Wind NW at 5.2 m/s; 8/8 octa cloud cover, 7.3 ºC, 69% RH

1 Assessed by the operator during the monitoring session.

2 Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 645400, positioned within 5 metres and at a corresponding height of the noise monitoring microphone

Table 9: Summary of Attended Noise Monitoring - Winter (June) 2019, dB(A)

Location	Start Time (15 min period)	Measured Noise Levels			Estimated[1] Mt Owen Contribution		Estimated[1] Glendell Contribution		Local Meteorological Conditions[2]
		LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	
Night-time Period – 19-20 and 26-27 June 2019									
N1	23:33:00	23.0	26.0	41.0	Not audible	Not audible	Not audible	Not audible	Wind NNW at 0.6 m/s; 8/8 octa cloud cover, 7.3 °C, 88% RH
N2	22:47:00	31.0	33.0	37.0	33.0	40.0	Not audible	Not audible	Wind N at 1.2 m/s; 8/8 octa cloud cover, 7.3 °C, 85% RH
N3	0:13:00	31.0	33.0	41.0	< 21.0	33.0	Not audible	Not audible	Wind NNE at 0.7 m/s; 8/8 octa cloud cover, 7.3 °C, 89% RH
N4	1:31:00	37.0	42.0	52.0	Not audible	Not audible	Not audible	Not audible	Wind SE at 1.3 m/s; 2/8 octa cloud cover, 7.3 °C, 99% RH
N8	0:15:00	35.0	38.0	45.0	Not audible	Not audible	Not audible	Not audible	Wind S at 1.8 m/s; 3/8 octa cloud cover, 7.3 °C, 97% RH
N9	22:41:00	35.0	45.0	54.0	Not audible	Not audible	Not audible	Not audible	Wind E at 0.5 m/s; 5/8 octa cloud cover, 7.3 °C, 93% RH
N10	23:40:00	38.0	41.0	50.0	Not audible	Not audible	Not audible	Not audible	Wind SE at 1.8 m/s; 5/8 octa cloud cover, 7.3 °C, 96% RH
N11	1:31:00	37.0	42.0	52.0	Not audible	Not audible	Not audible	Not audible	Wind E at 0.8 m/s; 2/8 octa cloud cover, 7.3 °C, 97% RH

1 Assessed by the operator during the monitoring session.

2 Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 658027, positioned within 5 metres and at a corresponding height of the noise monitoring microphone

Table 10: Summary of Attended Noise Monitoring - Winter (July) 2019, dB(A)

Location	Start Time (15 min period)	Measured Noise Levels			Estimated[1] Mt Owen Contribution		Estimated[1] Glendell Contribution		Local Meteorological Conditions[2]
		LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	
Night-time Period – 17, 19, and 24 July 2019									
N1	0:00:00	31.0	32.0	36.0	32.0	36.0	Not audible	Not audible	Wind NW at 4.1 m/s; 8/8 octa cloud cover, 11.8 ^{o}C, 53% RH
N2	0:34:00	38.0	42.0	48.0	42.0	55.0	Not audible	Not audible	Wind NW at 04.2 m/s; 8/8 octa cloud cover, 11.4 ^{o}C, 53% RH
N3	2:32:00	34.0	36.0	40.0	< 38.0	< 45.0	< 30	< 40.0	Wind NW at 2.4 m/s; 8/8 octa cloud cover, 10.5 ^{o}C, 64% RH
N4	1:06:00	40.0	48.0	54.0	Not audible	Not audible	Not audible	Not Audible0.0	Wind NW at 4.7 m/s; 8/8 octa cloud cover, 11.1 ^{o}C,55% RH
N8	21:56:00	32.0	33.0	38.0	Not audible	Not audible	Not audible	Not audible	Wind N at 1.4 m/s; 8/8 octa cloud cover, 12.0 ^{o}C, 56% RH
N9	21:24:00	32.0	48.0	56.0	Not audible	Not audible	< 30	31	Wind NNE at 0.6 m/s; 8/8 octa cloud cover, 12.4 ^{o}C, 55% RH
N10	23:57:00	34.0	44.0	51.0	Not audible	Not audible	< 25	< 30	Wind SE at 0.7 m/s; 8/8 octa cloud cover, 14.4 ^{o}C, 47% RH
N11	0:00:00	38.0	41.0	45.0	Not audible	Not audible	Not audible	Not audible	Wind NNW at 1.5 m/s; 8/8 octa cloud cover, 11.6 ^{o}C, 58% RH

1 Assessed by the operator during the monitoring session.
2 Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 658027, positioned within 5 metres and at a corresponding height of the noise monitoring microphone.

Table 11: Summary of Attended Noise Monitoring - Winter (August) 2019, dB(A)

Location	Start Time (15 min period)	Measured Noise Levels LA90, 15min	Measured Noise Levels LAeq, 15min	Measured Noise Levels LA1, 1 min	Estimated[1] Mt Owen Contribution LAeq, 15min	Estimated[1] Mt Owen Contribution LA1, 1 min	Estimated[1] Glendell Contribution LAeq, 15min	Estimated[1] Glendell Contribution LA1, 1 min	Local Meteorological Conditions[2]
Day Period – 31 August 2019									
N1	10:51	44	51	60	< 30.0	Not audible	Not audible	Not audible	Wind S at 4.9 m/s; 8/8 octa cloud cover, 13.2 °C, 91% RH
N2	11:26	44	51	63	32.0	Not audible	Not audible	Not audible	Wind S at 2.2 m/s; 8/8 octa cloud cover, 13.9 °C, 90% RH
N3	12:00	44	60	75	Not audible	Not audible	Not audible	Not audible	Wind S at 1.7 m/s; 8/8 octa cloud cover, 14.8 °C, 88.4% RH
Evening Period – 26 August 2019									
N1	21:44	26	29	45	< 20	Not audible	Not audible	Not audible	Wind SSE at 2.7 m/s; 6/8 octa cloud cover, 14.5 °C, 77% RH
N2	21:21	29	31	39	< 30	Not audible	Not audible	Not audible	Wind SSE at 2.3 m/s; 6/8 octa cloud cover, 14.6 °C, 77% RH
N3	20:58	28	30	36	Not audible	Not audible	Not audible	Not audible	Wind SSE at 3.1 m/s; 8/8 octa cloud cover, 14.4 °C, 78% RH
Night-time Period – 20,21,23,24 August 2019									
N1	22:05:00	26.0	27.0	38.0	< 20	25	Not audible	Not audible	Wind SSE at 2.5 m/s; 2/8 octa cloud cover, 14.5 °C, 77% RH
N2	22:35:00	25.0	29.0	36.0	< 25	< 25	< 25	32	Wind S at 3 m/s; 6/8 octa cloud cover, 14.4 °C, 78% RH
N3	23:04:00	27.0	31.0	43.0	Not audible	Not audible	Not audible	Not audible	Wind SSE at 2 m/s; 8/8 octa cloud cover, 14.4 °C, 78% RH
N4	23:34:00	31.0	38.0	58.0	Not audible	Not audible	Not audible	Not audible	Wind SSE at 1.6 m/s; 8/8 octa cloud cover, 14.3 °C, 78% RH
N8	23:02:00	30.0	35.0	53.0	Not audible	Not audible	Not audible	Not audible	Wind SSE at 0.4 m/s; 8/8 octa cloud cover, 10.6 °C, 69% RH
N9	21:39:00	37.0	50.0	62.0	Not audible	Not audible	Not audible	Not audible	Wind S at 0.2 m/s; 8/8 octa cloud cover, 11.5 °C, 64% RH
N10	21:12:00	33.0	39.0	51.0	Not audible	Not audible	Not audible	Not audible	Wind SSE at 0.6 m/s; 4/8 octa cloud cover, 12.5 °C, 762% RH
N11	0:06:00	33.0	39.0	57.0	Not audible	Not audible	Not audible	Not audible	Wind SSE at 2.1 m/s; 4/8 octa cloud cover, 14.3 °C, 79% RH

1 Assessed by the operator during the monitoring session.
2 Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 658027, positioned within 5 metres and at a corresponding height of the noise monitoring microphone

Table 12: Summary of Attended Noise Monitoring - Spring (September) 2019, dB(A)

Location	Start Time	Measured Noise Levels			Estimated[1] Mt Owen Contribution		Estimated[1] Glendell Contribution		Local Meteorological Conditions[2]
	(15 min period)	LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	
Day Period – 20 September 2019									
N1	11:32	34	56	74	Not audible	Not audible	Not audible	Not audible	Wind S at 1.8 m/s; 1/8 octa cloud cover, 23.2 °C, 91% RH
N2	12:06	33	42	60	< 30	Not audible	Not audible	Not audible	Wind E at 2.5 m/s; 1/8 octa cloud cover, 22.6 °C, 90% RH
N3	12:38	33	56	81	< 30	Not audible	Not audible	Not audible	Wind E at 2.4 m/s; 1/8 octa cloud cover, 23.2 °C, 88.4% RH
Evening Period – 19 September 2019									
N1	19:02	38	42	50	Not audible	Not audible	Not audible	Not audible	Wind SSE at 5 m/s; 8/8 octa cloud cover, 18.2 °C, 77% RH
N2	19:33	34	37	50	< 30	Not audible	Not audible	Not audible	Wind SSE at 4.9 m/s; 6/8 octa cloud cover, 18 °C, 78% RH
N3	20:04	33	55	78	< 30	Not audible	Not audible	Not audible	Wind SSE at 4.3 m/s; 4/8 octa cloud cover, 17.8 °C, 79% RH
Night-time Period – 19, 24-25 September 2019									
N1	21:00:00	35.0	42.0	63.0	Not audible	Not audible	Not audible	Not audible	Wind S at 3.9 m/s; 4/8 octa cloud cover, 17.5 °C, 81% RH
N2	21:29:00	33.0	35.0	45.0	< 25.0	< 25.0	Not audible	Not audible	Wind S at 4.2 m/s; 6/8 octa cloud cover, 17.5 °C, 81% RH
N3	22:00:00	32.0	33.0	39.0	< 25.0	< 25.0	Not audible	Not audible	Wind S at 3.5 m/s; 2/8 octa cloud cover, 17.34 °C, 81% RH
N4	23:16:00	36.0	38.0	45.0	Not audible	Not audible	< 30.0	< 35.0	Wind N at 1.1 m/s; 8/8 octa cloud cover, 10.9 °C,778% RH
N8	0:32:00	35.0	39.0	51.0	Not audible	Not audible	Not audible	Not audible	Wind N at 2.8 m/s; 8/8 octa cloud cover, 9.7 °C, 80% RH
N9	21:44:00	39.0	47.0	55.0	Not audible	Not audible	< 35.0	< 40.0	Wind S at 1.5 m/s; 8/8 octa cloud cover, 12.9 °C, 69% RH
N10	21:09:00	39.0	42.0	53.0	Not audible	Not audible	< 36.0	< 40.0	Wind S at 2.4 m/s; 8/8 octa cloud cover, 12.9 °C, 64% RH
N11	23:53:00	39.0	42.0	55.0	Not audible	Not audible	Not audible	Not audible	Wind NW at 2.3 m/s; 8/8 octa cloud cover, 10.3 °C, 78% RH

1 Assessed by the operator during the monitoring session.

2 Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 658027, positioned within 5 metres and at a corresponding height of the noise monitoring microphone.

Table 13: Summary of Attended Noise Monitoring - Spring (October) 2019, dB(A)

Location	Start Time (15 min period)	Measured Noise Levels			Estimated[1] Mt Owen Contribution		Estimated[1] Glendell Contribution		Local Meteorological Conditions[2]
		LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	
Night Period – 9-11 October 2019									
N1	22:51:00	23.0	34.0	56.0	Not Audible	Not Audible	Not Audible	Not Audible	Wind SE at 1.8 m/s, 2/8 octa cloud cover, 13.54 °C, 78% RH
N2	22:06:00	23.0	29.0	44.0	Not Audible	Not Audible	Not Audible	Not Audible	Wind SE at 3.1 m/s, 1/8 octa cloud cover,14.0 °C, 76% RH
N3	0:10:00	26.0	47.0	73.0	< 30.0	38.0	Not Audible	Not Audible	Wind S at 2.3 m/s, 1/8 octa cloud cover, 12.3 °C, 83% RH
N4	1:09:00	35.0	40.0	50.0	< 30.0	< 30.0	Not Audible	Not Audible	Wind S at 2.1m/s, 1/8 octa cloud cover, 12.2 °C, 86% RH
N8	23:23:00	30.0	37.0	50.0	Not Audible	Not Audible	Not Audible	Not Audible	Wind E at 1.5 m/s; 1/8 octa cloud cover, 13.3 °C, 72% RH
N9	21:44:00	33.0	44.0	59.0	Not Audible	Not Audible	Not Audible	Not Audible	Wind SE at 3 m/s, 1/8 octa cloud cover, 14.0 °C, 68% RH
N10	21:14:00	37.0	42.0	53.0	Not Audible	Not Audible	Not Audible	Not Audible	Wind SE at 6.2 m/s, 1/8 octa cloud cover, 15.0 °C, 63% RH
N11	2:24:00	32.0	38.0	52.0	< 30.0	34.0	Not Audible	Not Audible	Wind S at 2.4 m/s, 2/8 octa cloud cover, 11.7 °C, 87% RH

1 Assessed by the operator during the monitoring session.

2 Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 658027, positioned within 5 metres and at a corresponding height of the noise monitoring microphone

Table 14: Summary of Attended Noise Monitoring - Spring (November) 2019, dB(A)

Location	Start Time (15 min period)	Measured Noise Levels LA90, 15min	Measured Noise Levels LAeq, 15min	Measured Noise Levels LA1, 1 min	Estimated[1] Mt Owen Contribution LAeq, 15min	Estimated[1] Mt Owen Contribution LA1, 1 min	Estimated[1] Glendell Contribution LAeq, 15min	Estimated[1] Glendell Contribution LA1, 1 min	Local Meteorological Conditions[2]
Night Period – 11, 12, 14, 15 November 2019									
N1	0:19:00	31.0	41.0	57.0	< 25	< 30	Not audible	Not audible	Wind NW at 0.5 m/s, 1/8 octa cloud cover, 18.0 °C, 48% RH
N2	1:14:00	34.0	36.0	45.0	32	42	Not audible	Not audible	Wind NW at 1.2 m/s, 1/8 octa cloud cover, 18.0 °C, 50% RH
N3	1:47:00	35.0	38.0	44.0	37	44	Not Audible	Not Audible	Wind NW at 1.5 m/s, 1/8 octa cloud cover, 17.0 °C, 51% RH
N4	23:16:00	38.0	49.0	75.0	39	48	Not Audible	Not Audible	Wind NW at 0.5 m/s, 1/8 octa cloud cover, 20.0 °C,427% RH
N8	0:00:00	32.0	35.0	45.0	Not Audible	Not Audible	Not Audible	Not Audible	Wind NW at 2.4 m/s, 1/8 octa cloud cover, 22.0 °C, 39% RH
N9	21:45:00	42.0	49.0	59.0	Not Audible	Not Audible	<40.0	44.0	Wind NW at 5.1 m/s, 1/8 octa cloud cover, 25.0 °C, 31% RH
N10	2:10:00	36.0	39.0	50.0	Not Audible	Not Audible	<35.0	35.0	Wind NW at 4.3 m/s, 1/8 octa cloud cover, 26.0 °C, 31% RH
N11	23:22:00	34.0	39.0	51.0	Not Audible	Not Audible	Not audible	Not audible	Wind NW at 4.5 m/s, 1/8 octa cloud cover, 23.0 °C, 25% RH

Note 1: Assessed by the operator during the monitoring session.
Note 2: Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 weather monitor, Serial Number 658027, positioned within 5 metres and at a corresponding height of the noise monitoring microphone.

Table 15: Summary of Attended Noise Monitoring - Summer (December) 2019, dB(A)

Location	Start Time	Measured Noise Levels			Estimated[1] Mt Owen Contribution		Estimated[1] Glendell Contribution		Local Meteorological Conditions[2]
	(15 min period)	LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	
Night Period – 3-4 December 2019									
N1	1:03:00	35.0	57.0	62.0	<30.0	40.0	Not Audible	Not Audible	Wind NW at 3.3 m/s, 1/8 octa cloud cover, 21.0 °C, 37% RH
N2	1:55:00	38.0	40.0	46.0	39.0	49.0	Not Audible	Not Audible	Wind NW at 2.8 m/s, 1/8 octa cloud cover, 20.0 °C, 41% RH
N3	0:06:00	41.0	44.0	52.0	<30.0	35.0	<35.0	<35.0	Wind NW at 5.1 m/s, 1/8 octa cloud cover, 22.0 °C, 35% RH
N4	23:16:00	35.0	41.0	55.0	<35.0	<35.0	<35.0	<35.0	Wind NW at 5.5 m/s, 1/8 octa cloud cover, 23.0 °C, 32% RH
N8	23:41:00	32.0	34.0	43.0	Not Audible	Not Audible	<30.0	<30.0	Wind NW at 4 m/s, 1/8 octa cloud cover, 24.0 °C, 25% RH
N9	21:30:00	41.0	52.0	77.0	Not Audible	Not Audible	<40.0	<45.0	Wind NW at 5.9 m/s, 1/8 octa cloud cover, 26.0 °C, 20% RH
N10	21:01:00	39.0	44.0	54.0	Not Audible	Not Audible	<35.0	<35.0	Wind NW at 5.4 m/s, 1/8 octa cloud cover, 27.0 °C, 19% RH
N11	23:04:00	37.0	40.0	50.0	Not Audible	Not Audible	Not Audible	Not Audible	Wind W at 2.7 m/s, 1/8 octa cloud cover, 25.0 °C, 24% RH

Note 1: Assessed by the operator during the monitoring session.
Note 2: Meteorological conditions are a summary of meteorological data from the attended monitoring period from a Kestrel 4500 (and Kestrel 5500) weather monitor, Serial Number 658027 (and SN 2420169), positioned within 5 metres and at a corresponding height of the noise monitoring microphone.

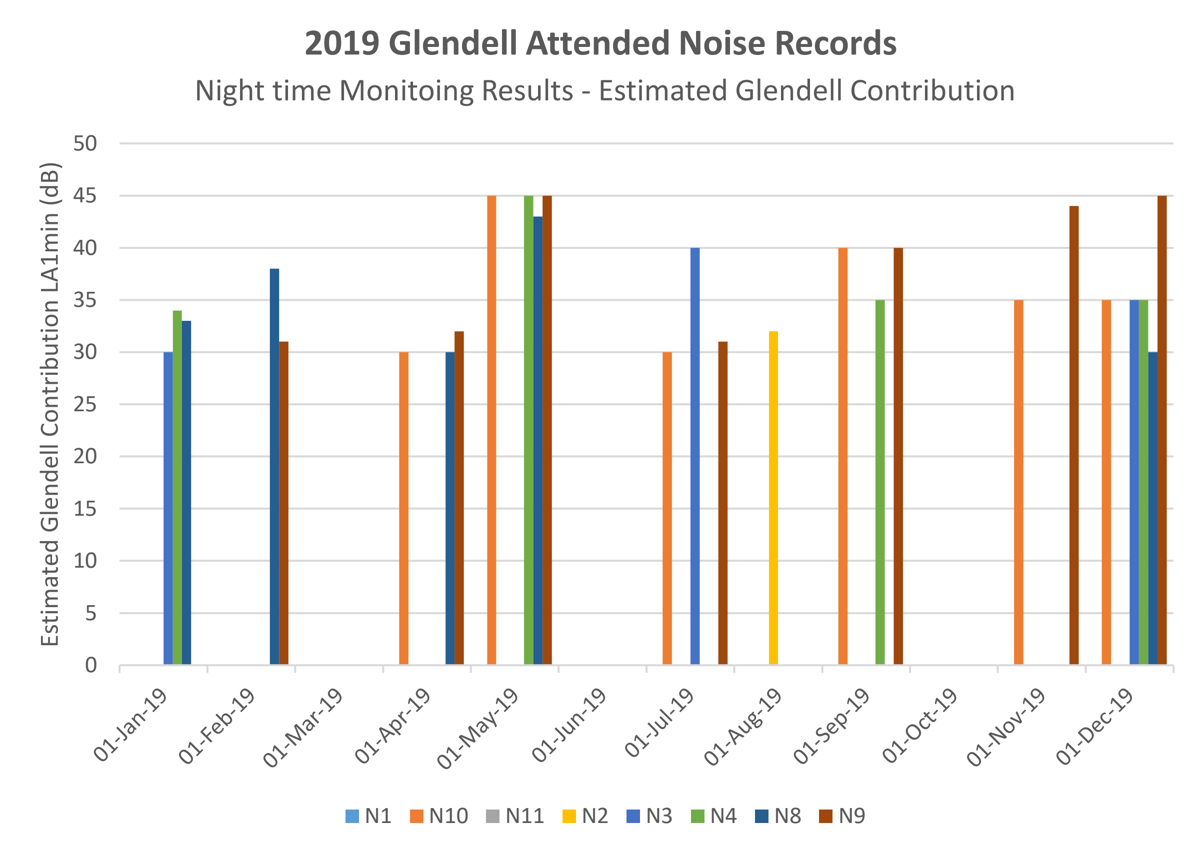

Figure 1: 2019 Attended Noise Records – Night time noise contribution – Glendell

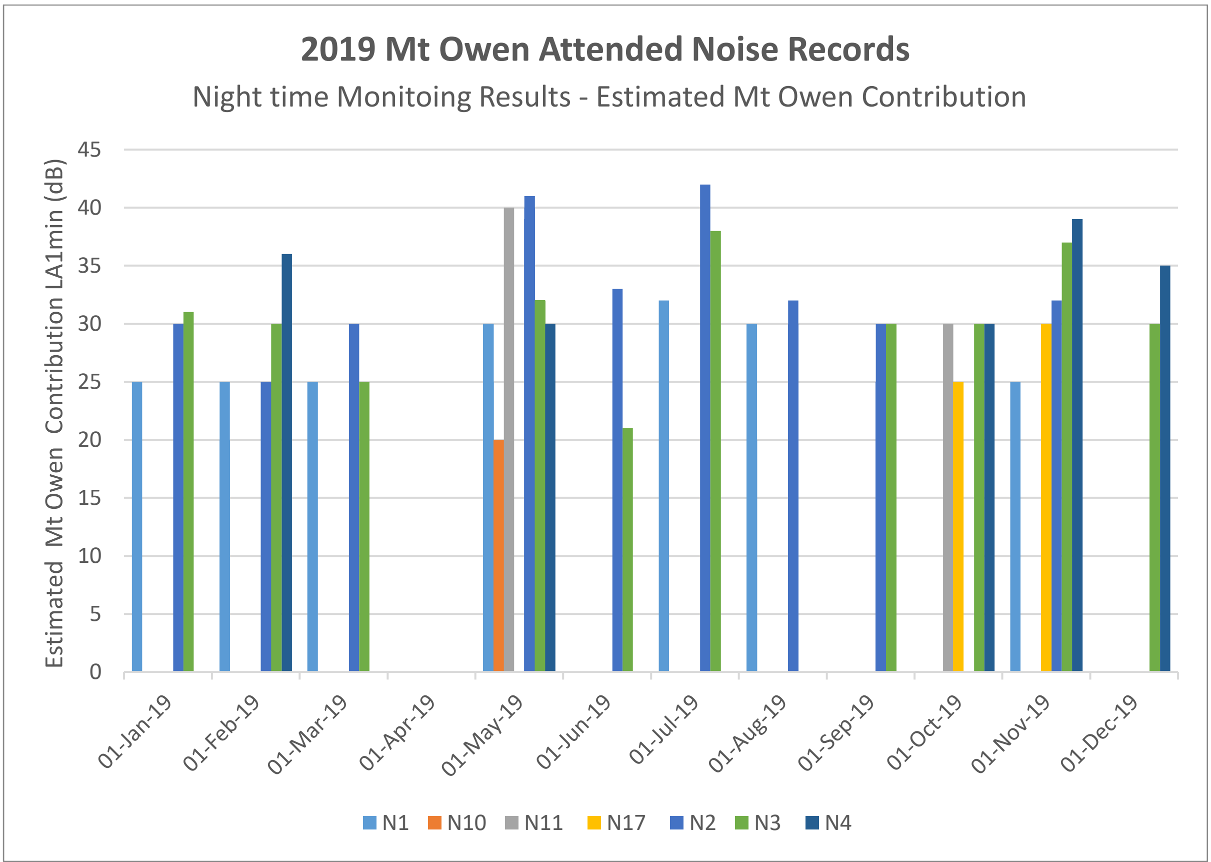

Figure 2: 2019 Attended Noise Records – Night time noise contribution – Mt Owen

Environmental & Social Consultants

GLENCORE

MACHINE SOUND POWER LEVEL TESTING

2019

Glendell Mine

FINAL

July 2019

GLENCORE

MACHINE SOUND POWER LEVEL TESTING

2019

Glendell Mine

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Tim Procter	04/07/2019	Luke Bettridge	05/07/2019

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Tables

Appendices

1.0 Introduction

As per Glendell Mine's DPE approved Noise Management Plan, Glendell Mine is required to conduct periodic review of the noise performance of its equipment fleet. It is recommended that all fleet should be tested within a five year period.

Umwelt Australia Pty Ltd was engaged by Glencore to undertake sound power level (SWL) testing of a selection of mobile machines, listed in **Table 1.1**. testing was conducted on 21 March and 13 May 2019 at Glendell Mine.

Table 1.1 Tested Machines

Plant Type	Unit Number	Model
Dozers	DZ 403	Cat D10T
	DZ 401	Cat D10T
	DZ 492	Cat 854K
Haul Truck	TR 205	Cat 793DXQ
Water Carts	WT 642	Cat 777F WC
	WT 643	Cat 777F WC

Dynamic SWL testing was undertaken generally in accordance with the methodology presented in ISO 6395 and ISO 6393 for stationary (static) testing. In accordance with these standards, sound power is determined in one-third octave bands from 25 Hz to 10 kHz. However, Glendell Mine requires assessment in one-third octave bands from 12.5 Hz to 10 kHz. The SWL testing methodology used at Glendell mine is summarised in **Appendix A**. The calibration certificates for the sound measurement equipment can be found in **Appendix B**. The results for each machine tested is presented in detail in **Appendix C.**

2.0 Results

2.1 Measured Sound Power Levels

Dynamic SWL testing of equipment included the measurement of the following machines in representative operating conditions:

- **dozers** in 1st and 2nd gear forward and reverse motion on flat surfaces
- **haul truck** laden up-ramp and unladen down-ramp
- **water carts** laden up-ramp and laden down-ramp
- static SWL testing of the equipment included stationary testing of machines at the same test site surface used from the dynamic test.

Table 2.1 summarises the sound power level test results for each item of equipment tested. The detailed sound power level results are presented as one-third octave graphs in **Appendix C.** Results are presented as Linear (Z – weighted) and A-weighted[1] sound power levels.

[1] A-weighting is an adjustment made to sound level measurement, by means of an electronic filter, to approximate the response of the human ear.

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Table 2.1 Sound Power Level Monitoring Results

Equipment Description			Mode of Operation	Dynamic				Static	
				Up or Forward		Down or Reverse			
				dB(Z)	dB(A)	dB(Z)	dB(A)	dB(Z)	dB(A)
Dozers	DZ 403	Cat D10T	1st gear	116	108	120	112	117	107
			2nd gear	123	117	123	118		
	DZ 401	Cat D10T	1st gear	122	110	123	110	121	109
			2nd gear	123	116	126	119		
	DZ 492	Cat 854K	1st gear	115	108	114	109	115	107
			2nd gear	114	107	115	110		
Haul Truck	TR 205	Cat 793 DXQ	1st up / 4th down	124	116	121	113	120	113
Water Carts	WT 642	Cat 777F WC	1st up / 4th down	127	116	120	114	127	116
	WT 643	Cat 777F WC	1st up / 4th down	124	115	119	112	128	114

2.2 Meteorological Conditions

The meteorological conditions at the time of the monitoring program are presented in **Table 2.2**.

Table 2.2 Local Meteorological Conditions (Sentinex13)

Date	Wind Speed (m/s)	Temperature (°C)	Relative Humidity (%)
21/03/2019	2.6 (0.0 – 8.6)	22.7 (18.5 – 28.3)	78.0 (50.7 - 93.9)
13/05/2019	1.0 (0.0 – 2.5)	15.2 (8.4 – 21.9)	78.7 (54.3 – 91.3)

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3.0 Discussion

The Z and A-weighted sound power levels for machines in different modes of operation are presented in **Table 2.1**. The one-third octave bands of the sound power spectrum for each machine are included in **Appendix C**. **Table 3.1** compares the measured Z and A-weighted sound power levels to the target in-service Z-weighted sound power levels nominated in Glencore Noise Management Protocol GCAA-625378177-10238 (GCAA NMP) and the A-weighted sound power level targets for the Year 9 targets nominated in the Glendell Environmental Assessment 2007 (GEA, 2007).

Table 3.1 Comparison of Sound Power Levels Results to In-service Targets Nominated in the GCAA NMP and the Year 9 Proposed Fleet Specification Targets in (GEA, 2007)

Equipment Description			Mode of Operation	Dynamic				GCAA NMP	GEA, 2007 *For/Rev*[a]
				Up or Forward		Down or Reverse			
				dB(Z)	dB(A)	dB(Z)	dB(A)	dB(Z)	dB(A)
Dozers	DZ 403	Cat D10T	1st gear	116	108	120	112	123	110/118
	DZ 401	Cat D10T	1st gear	122	110	123	110	123	110/118
	DZ 492	Cat 854K	1st gear	115	108	114	109	123	110/118
Haul Truck	TR 205	Cat 793 DXQ	1st up/4th down	124	116	121	113	123	115
Water Carts	WT 642	Cat 777F WC	1st up/4th down	127	116	120	114	125	114
	WT 643	Cat 777F WC	1st up/4th down	124	115	119	112	125	114

NOTE a – GEA, 2007 gives specific SWL targets for dozers in forward and reverse modes of operation. For other machines, only one SWL target is given for all modes of operation

DZ403 in 1st gear forward and 1st gear reverse is either at, or below both the GCAA NMP target for Z-weighted results and the GEA, 2007 targets for A-weighted results shown in **Table 3.1**. DZ403 results are also within a one-standard-deviation-envelope calculated from equivalent machines in Umwelt's sound power level database.

DZ401 in 1st gear forward and 1st gear reverse is either at, or below both the GCAA NMP target for Z-weighted results and the GEA, 2007 targets for A-weighted results shown in **Table 3.1.** DZ401 results are also within the one-standard-deviation-envelope for equivalent machines.

DZ492 in 1st gear forward and 1st gear reverse is either at, or below both the GCAA NMP target for Z-weighted results and the GEA, 2007 targets for A-weighted results shown in **Table 3.1.** DZ492 results are also within the one-standard-deviation-envelope for equivalent machines.

TR205 up-ramp laden Z-weighted and A-weighted results are both 1 dB above the GCAA NMP target and the GEA, 2007 target, respectively, but within the one-standard-deviation-envelope for equivalent machines. To reduce the Z and A-weighted level by 1 dB the sound power level of the exhaust side of the truck would have to be reduced by 3 dB in the 80 to 125 Hz frequency range. TR205 down-ramp unladen Z-weighted and A-weighted results are both below the GCAA NMP target and the GEA, 2007 target, respectively. TR205 down-ramp unladen is quieter than the one-standard-deviation-envelope of equivalent machines in the Z and A-weighting.

WT642 up-ramp laden Z-weighted and A-weighted results are both 2 dB above the GCAA NMP target and the GEA, 2007 target, respectively. The A-weighted results is largely within the one-standard-deviation-envelope for equivalent machines except for the 80 Hz one-third octave band. To reduce the Z and A-weighted level by 2 dB the sound power level of the front and exhaust side of the truck would have to be reduced by 4 dB in the 80 Hz range. The dominance of the 80 Hz one-third octave level is clearly shown in the laden up-ramp chart for WT642 in **Appendix C**.

WT642 down-ramp laden Z-weighted and A-weighted results are either at, or below both the GCAA NMP target and the GEA, 2007 target shown in **Table 3.1**.

WT643 up-ramp laden Z-weighted result is below the GCAA NMP target and the A-weighted result is 1 dB above the GEA 2007 target but within the one-standard-deviation-envelope for equivalent machines. WT643 down-ramp laden is either at, or below both the GCAA NMP target for Z-weighted results and the GEA 2007 targets for A-weighted results shown in **Table 3.1**

APPENDIX A

Methodology – Sound Power Level Testing of Mobile Equipment

A.1 Testing Standards

The monitoring program was conducted in accordance with:

MGD15 - Mobile and transportable plant for use on mines and petroleum sites (Amd. 2018)

ISO 6395:2008 – Earth-moving machinery - Determination of sound power level - Dynamic test conditions

ISO 6393:2008 – Earth-moving machinery - Determination of sound power level - Stationary test conditions

ISO 3744:2010 - Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane

ISO 4872 – Measurement of airborne noise emitted by construction equipment intended for outdoor use -- Method for determining compliance with noise limits

The monitoring program also took into consideration the requirements of:

AS 2012.2-1990 – Acoustics - Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors - Stationary test condition, Operator's position

AS/NZS 1269.1-2005 - Occupational noise management - Measurement and assessment of noise emission and exposure

A.2 Equipment Used

The monitoring program was conducted using the following equipment

SVAN958A (59838) - four (4) channel sound and vibration analyser

SVAN958A (59839) - four (4) channel sound and vibration analyser

SVAN SV36 (90131) – 94/114 dB calibrator

Kestrel 4500 – weather meter

Calibration certificates are included in **Appendix B**.

A.3 Sound Power Level Testing

The monitoring program methodology is outlines as follows:

- Sound power levels have been determined in one-third octave bands.
- Glencore Noise Management Protocol GCAA-625378177-10238 (GCAA NMP) requires the measurements to be from 25 Hz to 10 kHz to enable reporting of Linear (Z-weighted) and A-weighting sound power levels. Data capture data from 12.5 Hz to 20 Hz has been included in the reporting of the monitoring data but not the determination of sound power levels The 12.5 Hz to 20 Hz data can be used to assess low frequency noise and/or are often identifiable within the background acoustic environment.

- Measurements made from six ISO microphones. **Figure A.1** shows the horizontal (left image) and vertical (right image) positions of each microphone.
- The size of the measurement surface is determined as per ISO 6395:2008(E). This generally constitutes a radius of 16 – 20m to accommodate the tested haul trucks.

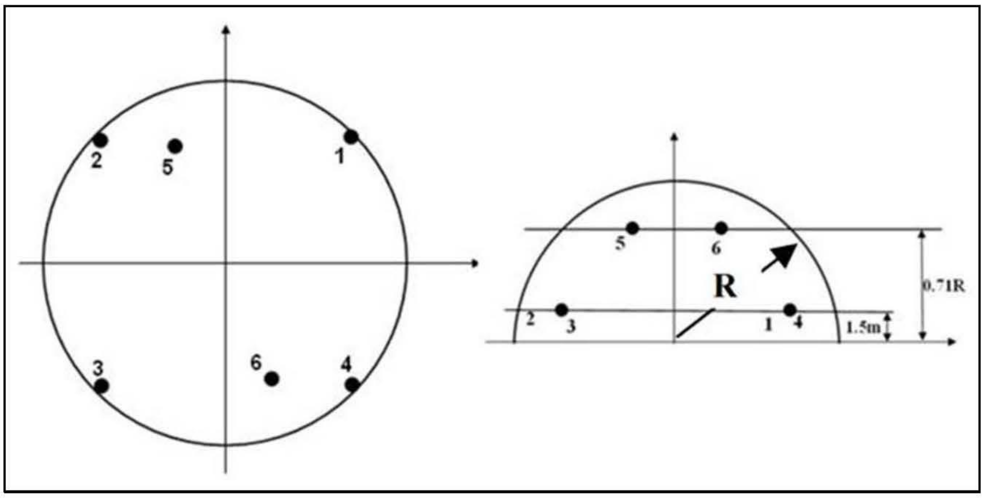

Figure A.1 - Microphone position for ISO Sound Power Level testing

A.4 Test Area Environment

The test areas included a haul road and flat dump area with sufficient length to allow machines to safely accelerate, pass through the test area and decelerate.

In accordance with ISO 6395 and GCAA NMP, the location of the test area was chosen to minimise the impacts of reflective surfaces such as highwalls and windrows.

Care was also taken to ensure that background noise levels were at least 6 dB less than measured equipment being tested. A correction is also applied for background levels between 6 dB – 15 dB less than measured dynamic levels to ensure that background noise has limited effect on measured levels. In addition to this, Mt Owen requires the background noise levels to be reported in one-third octave bands from 12.5 Hz to 10 kHz

The haul road test area had a nominal slope of approximately 10%. Testing consisted of uphill loaded test and a downhill unloaded test on the haul road. The dump area had a slope of approximately 0% to facilitate the forward and reverse testing of the bulldozers and rubber tyres dozer.

A.5 Mobile Equipment

Haul truck uphill loaded test

As per GCAA NMP, haul trucks are loaded with the nominal rated load and driven up hill through the test area while maintaining the manufacturers rated engine speed. Trucks progress at a consistent speed through the test area.

Haul truck downhill unloaded test

As per GCAA NMP, the unloaded haul truck moved downhill through the test area while maintaining the maximum descent speed considered safe (approximately 20-23 km/hr). Trucks progress at a consistent speed through the test area.

Water truck

As per GCAA NMP, uphill and downhill tests are conducted with the water truck operating with the maximum rated load

Bulldozer and loader 1st gear test forward and reverse

As per GCAA NMP, earthmoving machine moved through the test area unloaded in 1st gear/2nd gear at a constant speed with auxiliary equipment attached and raised to approximately 0.3 m above the test surface.

Bulldozer and loader 2nd gear test forward and reverse

To provided reference material for assessing machine performance and data for noise modelling purposes the earthmoving machine moved through the test area unloaded in 2nd gear at a constant speed with auxiliary equipment attached and raised to approximately 0.3 m above the test surface.

APPENDIX B

Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 22355 & FILT 4741

Equipment Description: Sound & Vibration Analyzer

Manufacturer: Svantek

Model No: SVAN-958A **Serial No:** 59838

Microphone Type: N/A **Serial No:** N/A

Preamplifier Type: N/A **Serial No:** N/A

Filter Type: 1/3 Octave **Serial No:** 59838

Comments: All tests passed for class 1.
(See over for details)

Owner: Umwelt (Australia) Pty Ltd
75 York Street
Teralba, NSW 2284

Ambient Pressure: 999 hPa ±1.5 hPa

Temperature: 25 °C ±2° C **Relative Humidity:** 61% ±5%

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: JK **AUTHORISED SIGNATURE:** Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

NATA
WORLD RECOGNISED ACCREDITATION

ACU-VIB
ELECTRONICS

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Accredited Lab. No. 9262
Acoustic and Vibration Measurements

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CERTIFICATE NO.: SLM 22355 & FILT 4741

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	N/A
Acoustical Frequency Weighting	12	N/A
Self Generated Noise	11.1	N/A
Electrical Noise	11.2	Entered
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.
A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Checked by: IK

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

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Acoustic and Vibration Measurements

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AVCERT10

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: **SLM 22356 & FILT 4740**

Equipment Description: Sound & Vibration Analyzer

Manufacturer: Svantek

Model No: SVAN-958A **Serial No:** 59839

Microphone Type: N/A **Serial No:** N/A

Preamplifier Type: N/A **Serial No:** N/A

Filter Type: 1/3 Octave **Serial No:** 59839

Comments: All tests passed for class 1.
(See over for details)

Owner: Umwelt (Australia) Pty Ltd
75 York Street
Teralba, NSW 2284

Ambient Pressure: 999 hPa ±1.5 hPa

Temperature: 24 °C ±2° C **Relative Humidity:** 54% ±5%

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: JK **AUTHORISED SIGNATURE:** .... Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

NATA
WORLD RECOGNISED ACCREDITATION

ACU-VIB ELECTRONICS

HEAD OFFICE
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
Tel: (02) 96808133 Fax: (02)96808233
Mobile: 0413 809806
web site: www.acu-vib.com.au

Accredited Lab. No. 9262
Acoustic and Vibration Measurements

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CERTIFICATE NO.: SLM 22356 & FILT 4740

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:

	Clause	Result
Absolute Calibration	10	N/A
Acoustical Frequency Weighting	12	N/A
Self Generated Noise	11.1	N/A
Electrical Noise	11.2	Entered
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.
A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Checked by: IK

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

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AVCERT10

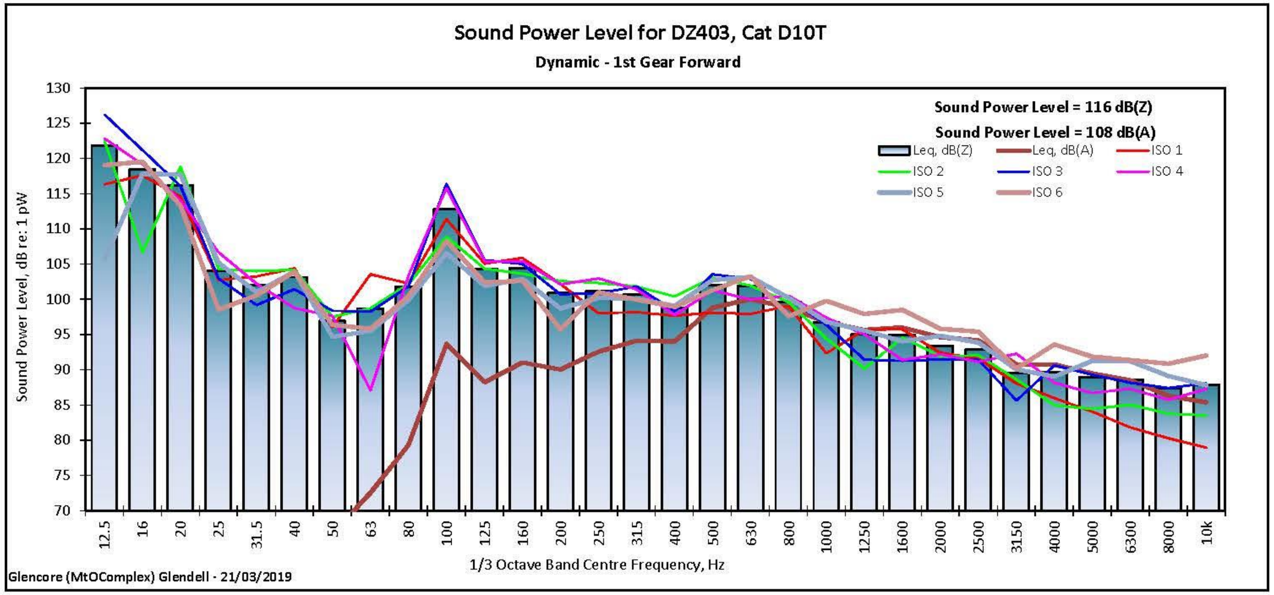
APPENDIX C

Sound Power Level Results

Measure Sound Power Level Report

Machine: Sound Power Level for DZ403, Cat D10T
Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 116 dB(Z)
Sound Power Level = 108 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

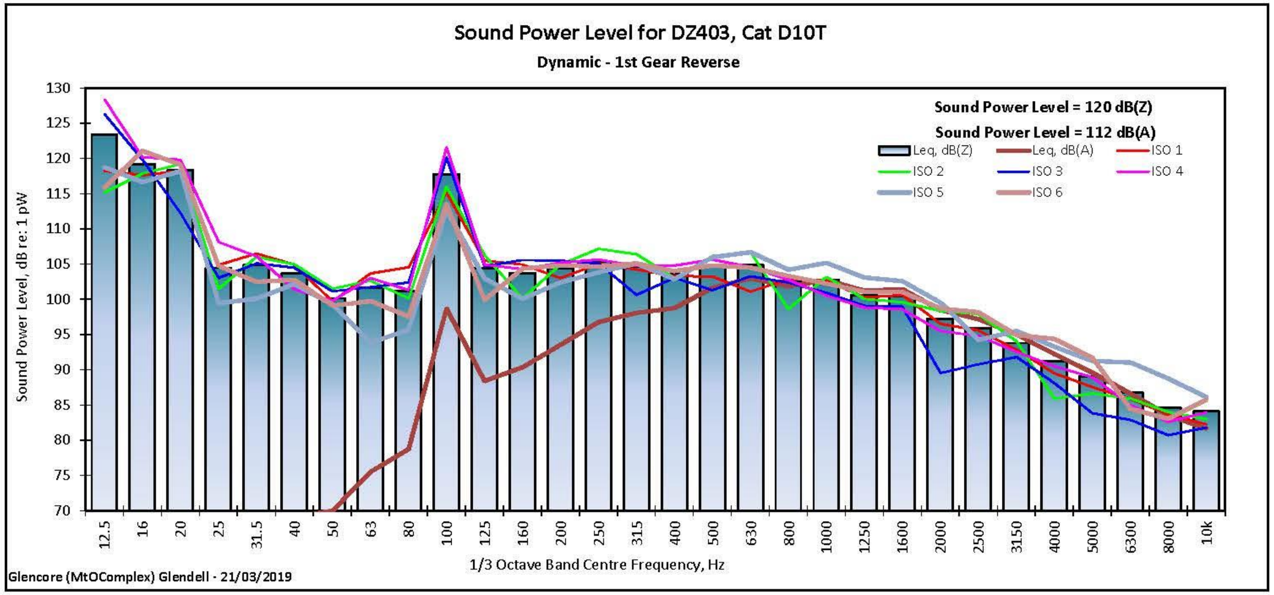


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	119	116	104	102	103	97	99	102	113	104	104	101	101	101	99	102	102	100	97	95	95	93	93	90	90	89	89	87	88
Leq, dB(A)	58	62	66	59	63	69	67	73	79	94	88	91	90	93	94	94	99	100	99	97	96	96	95	94	91	91	89	88	86	85

Measure Sound Power Level Report

Machine: Sound Power Level for DZ403, Cat D10T
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 120 dB(Z)
Sound Power Level = 112 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

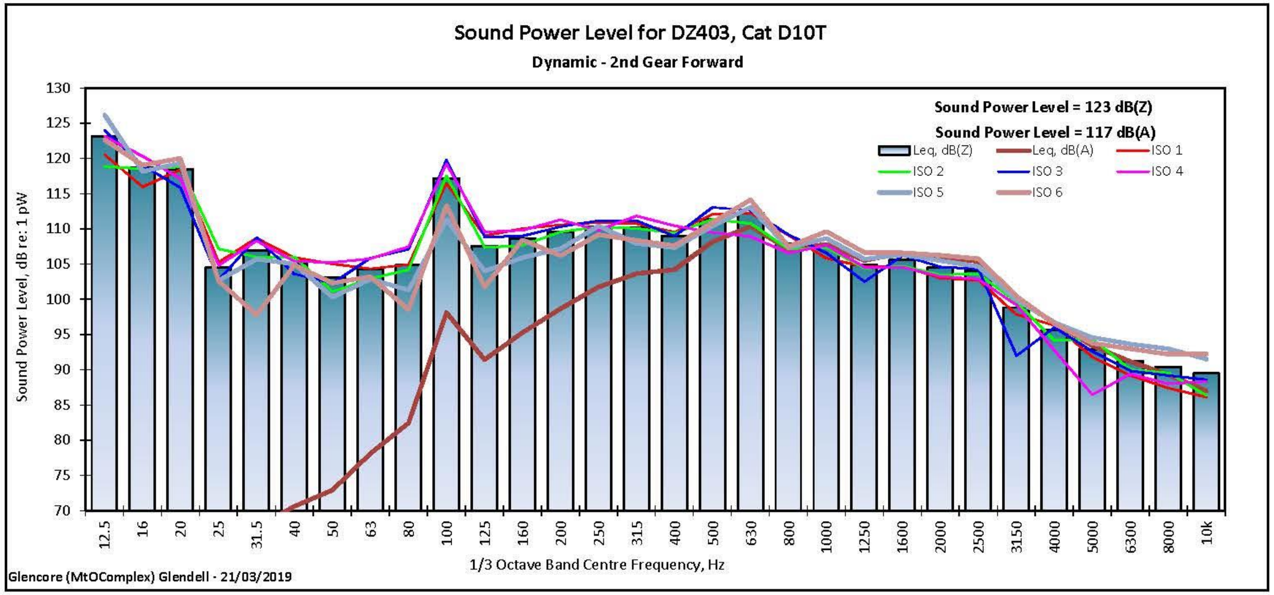


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	123	119	118	104	105	104	100	102	101	118	104	104	104	105	105	104	105	105	103	103	101	100	97	96	94	91	89	87	85	84
Leq, dB(A)	60	62	68	60	65	69	70	75	79	99	88	90	94	97	98	99	102	103	102	103	101	101	98	97	95	92	90	87	83	82

Measure Sound Power Level Report

Machine: Sound Power Level for DZ403, Cat D10T
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 123 dB(Z)
Sound Power Level = 117 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



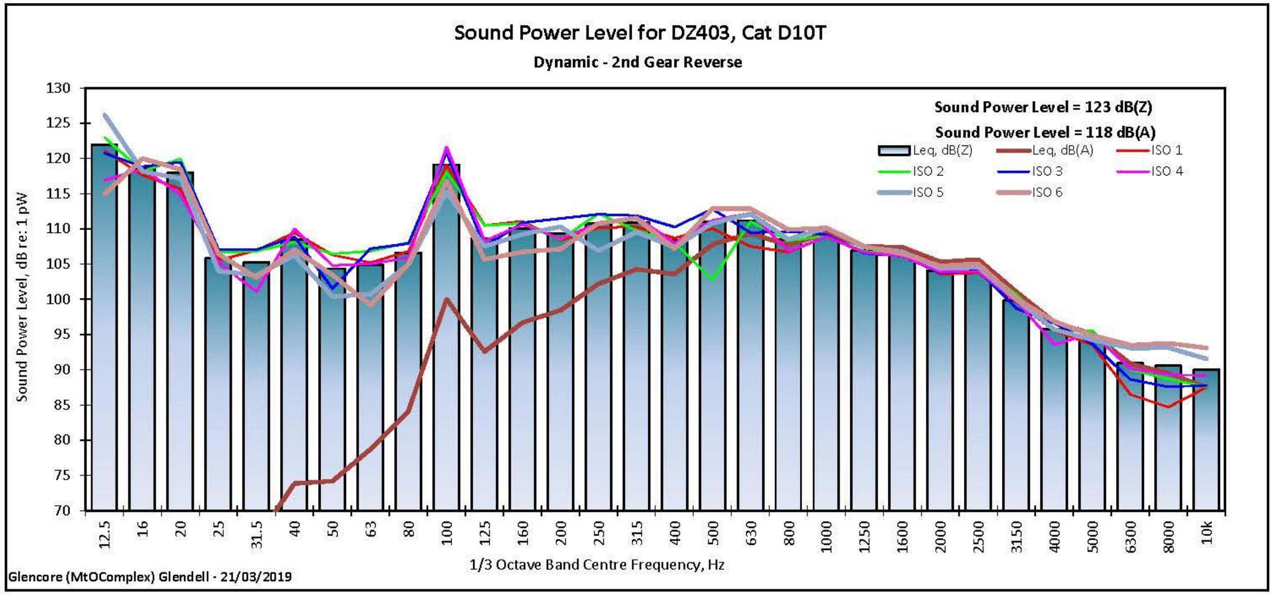
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	123	119	118	105	107	105	103	104	105	117	108	109	110	110	110
Leq, dB(A)	60	62	68	60	68	71	73	78	82	98	91	95	99	102	104

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	109	111	112	108	108	105	106	105	104	99	96	93	91	90	89
Leq, dB(A)	104	108	110	107	108	106	107	106	105	100	97	93	91	89	87

Measure Sound Power Level Report

Machine: Sound Power Level for DZ403, Cat D10T
Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 123 dB(Z)
Sound Power Level = 118 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

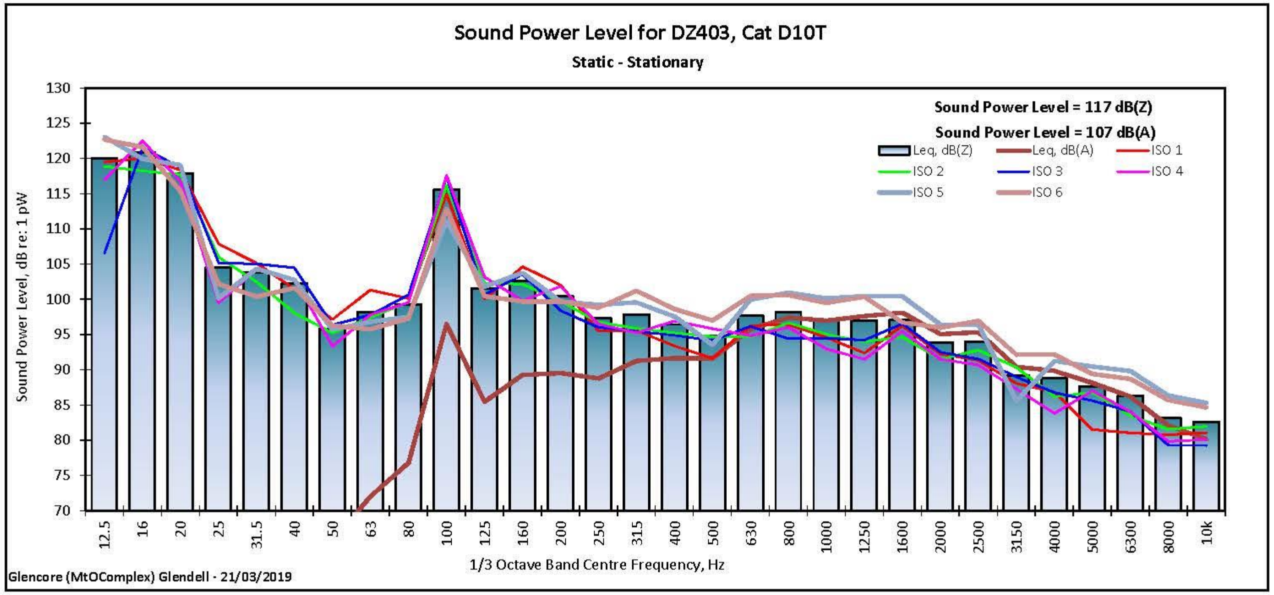


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	119	118	106	105	108	104	105	107	119	109	110	109	111	111	108	111	111	108	109	107	106	104	104	100	96	95	91	91	90
Leq, dB(A)	59	62	67	61	66	74	74	79	84	100	93	97	98	102	104	104	108	109	108	109	108	107	105	106	101	97	95	91	89	87

Measure Sound Power Level Report

Machine: Sound Power Level for DZ403, Cat D10T
Activity: Static - Stationary
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 117 dB(Z)
Sound Power Level = 107 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



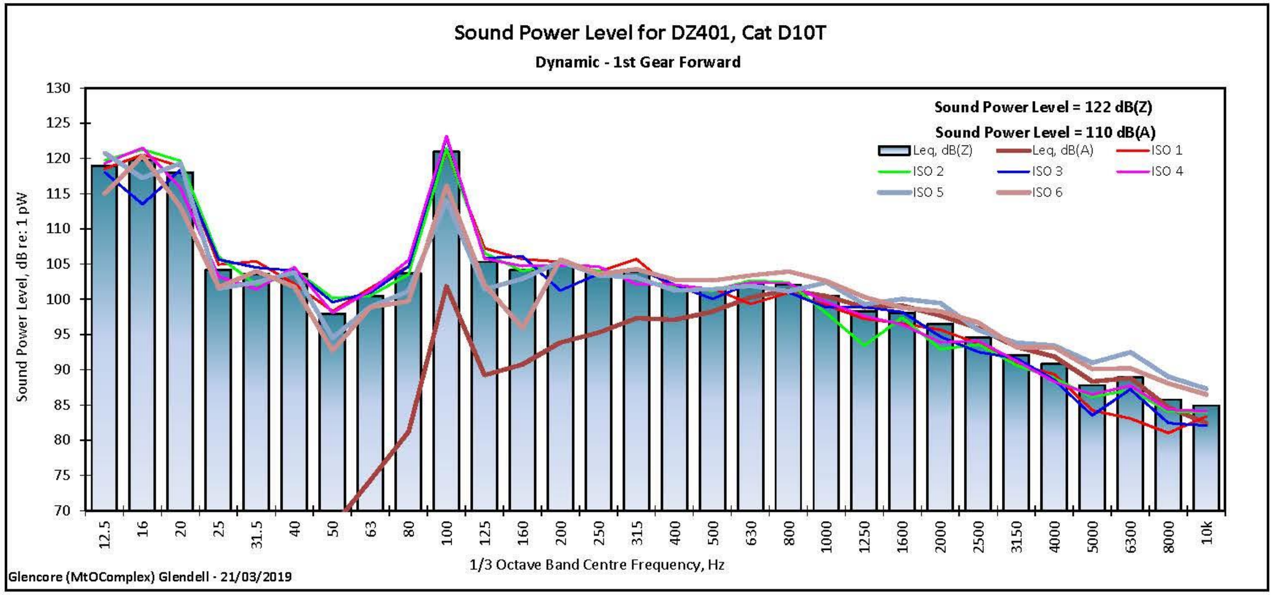
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	121	118	104	104	102	96	98	99	116	102	103	100	97	98	96	95	98	98	97	97	97	94	94	89	89	88	86	83	83
Leq, dB(A)	57	64	67	60	64	68	66	72	77	96	85	89	90	89	91	92	92	96	97	97	98	98	95	95	90	90	88	86	82	80

Measure Sound Power Level Report

Machine: Sound Power Level for DZ401, Cat D10T

Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 122 dB(Z)
Sound Power Level = 110 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	119	120	118	104	104	104	98	100	104	121	105	104	105	104	104	102	101	102	102	100	98	98	96	95	92	91	88	89	86	85
Leq, dB(A)	55	63	68	59	64	69	68	74	81	102	89	91	94	95	97	97	98	100	101	100	99	99	98	96	93	92	88	89	85	82

Measure Sound Power Level Report

Machine: Sound Power Level for DZ401, Cat D10T

Activity: Dynamic - 1st Gear Reverse

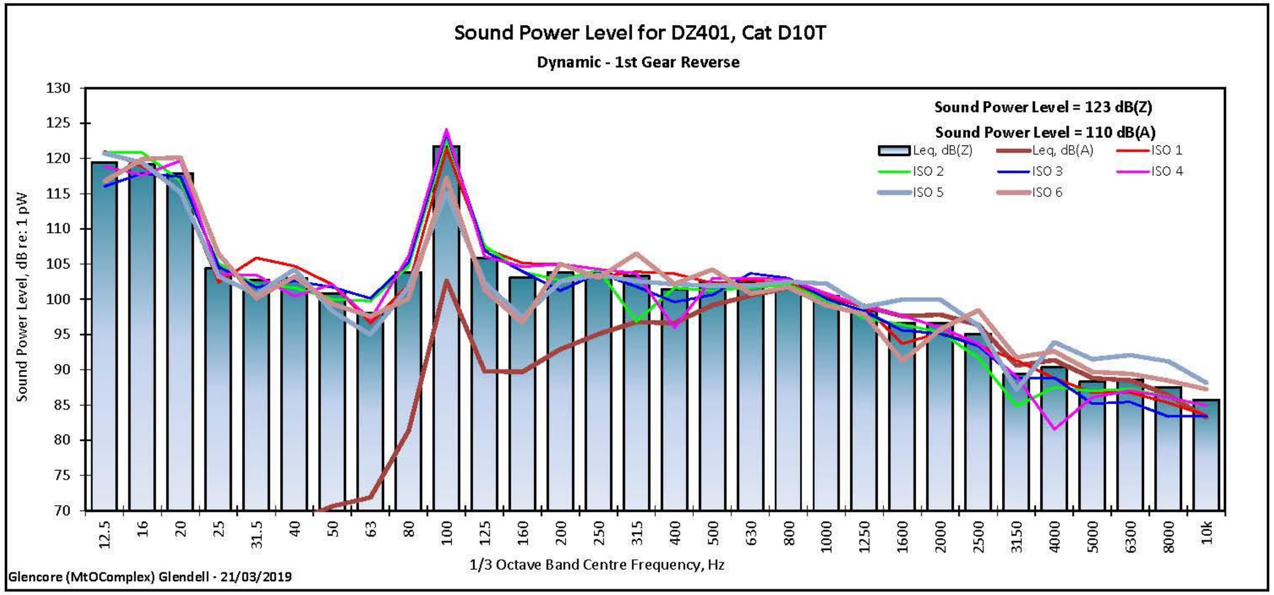
No. ISO Points (of 6) 6

Source: Glencore (MtOComplex) Glendell - 21/03/2019

Results: Sound Power Level = 123 dB(Z)

Sound Power Level = 110 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

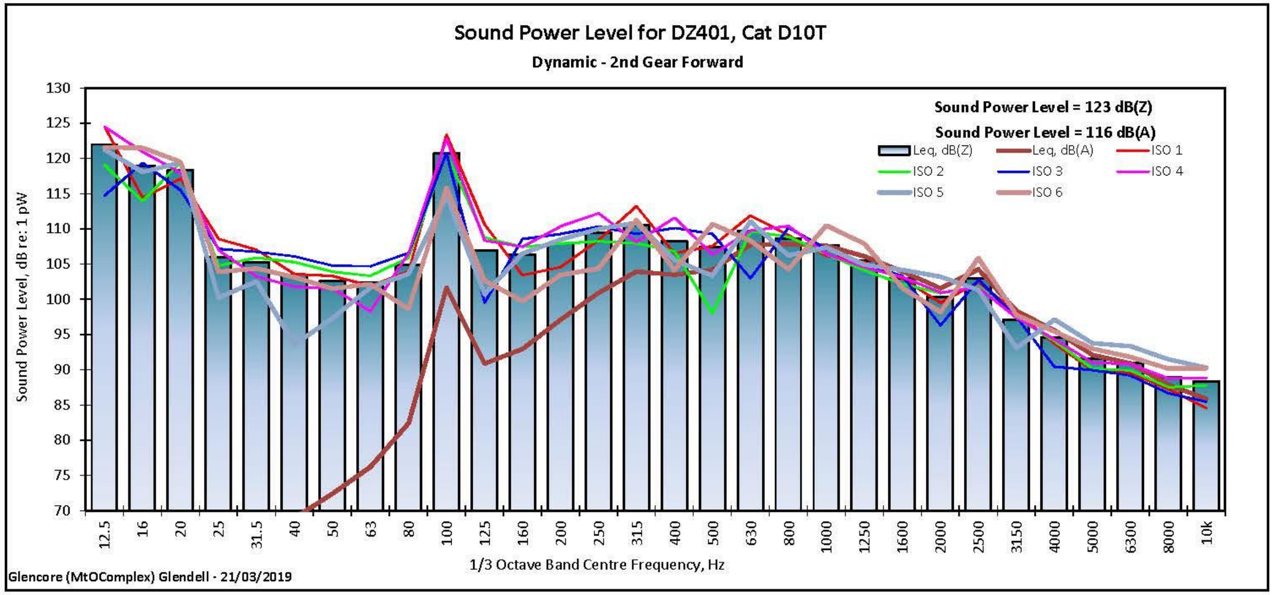


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	119	119	118	104	103	103	101	98	104	122	106	103	104	104	103	101	102	102	102	100	98	97	97	95	89	90	88	89	88	86
Leq, dB(A)	56	62	67	60	63	68	71	72	81	103	90	90	93	95	97	97	99	100	102	100	99	98	98	96	91	91	89	88	86	83

Measure Sound Power Level Report

Machine: Sound Power Level for DZ401, Cat D10T
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 123 dB(Z)
Sound Power Level = 116 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



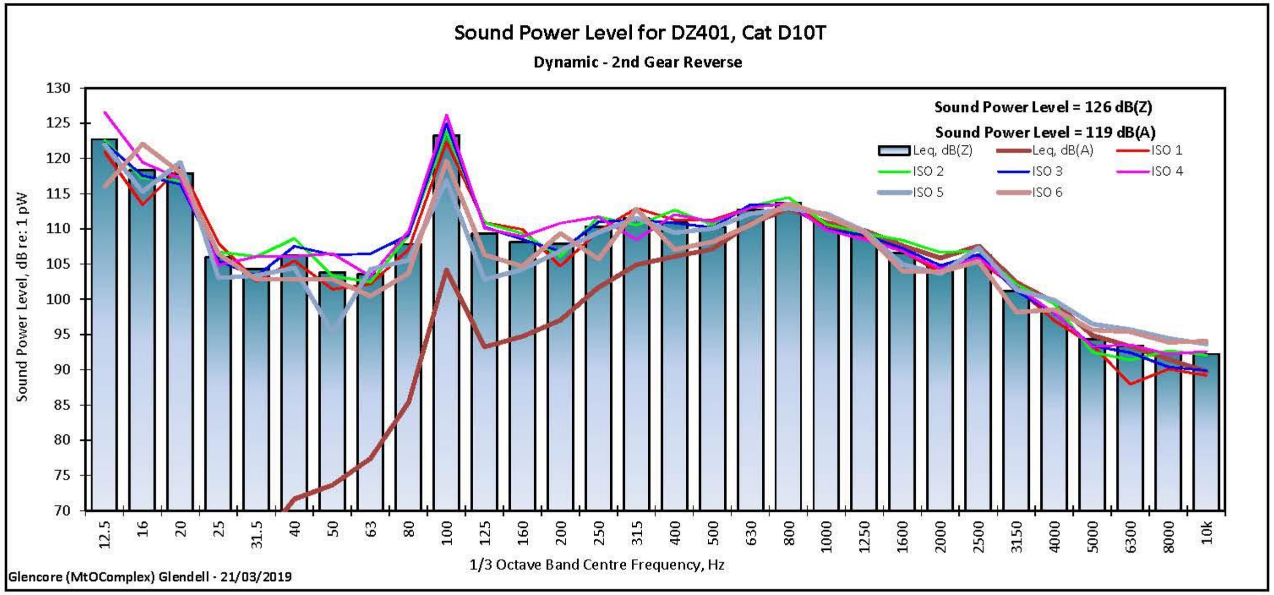
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	122	119	118	106	105	104	103	102	105	121	107	106	108	109	111
Leq, dB(A)	59	62	68	61	66	69	72	76	82	102	91	93	97	101	104

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	108	107	110	109	108	105	103	100	103	97	95	92	91	89	88
Leq, dB(A)	103	104	108	108	108	106	104	102	104	98	96	92	91	88	86

Measure Sound Power Level Report

Machine: Sound Power Level for DZ401, Cat D10T
Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 126 dB(Z)
Sound Power Level = 119 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

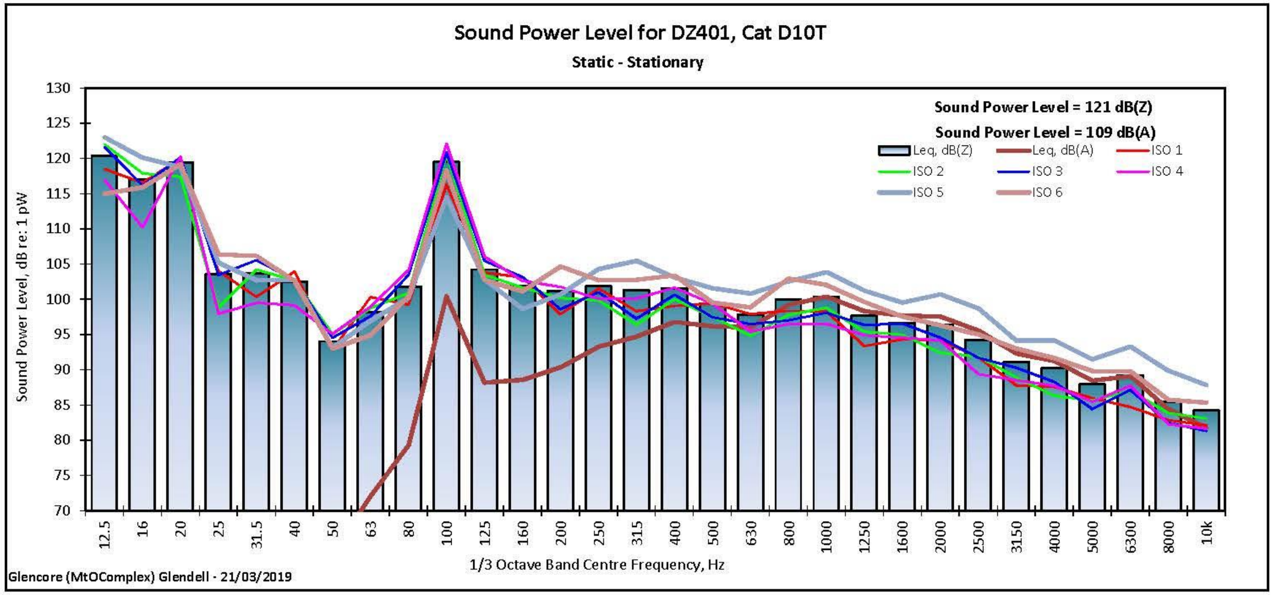


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	123	118	118	106	104	106	104	104	108	123	109	108	108	110	111	111	110	113	114	111	109	107	105	106	101	99	94	93	93	92
Leq, dB(A)	59	62	67	61	65	72	74	77	85	104	93	95	97	102	105	106	107	111	113	111	110	108	106	108	102	100	95	93	91	90

Measure Sound Power Level Report

Machine: Sound Power Level for DZ401, Cat D10T
Activity: Static - Stationary
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 121 dB(Z)
Sound Power Level = 109 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



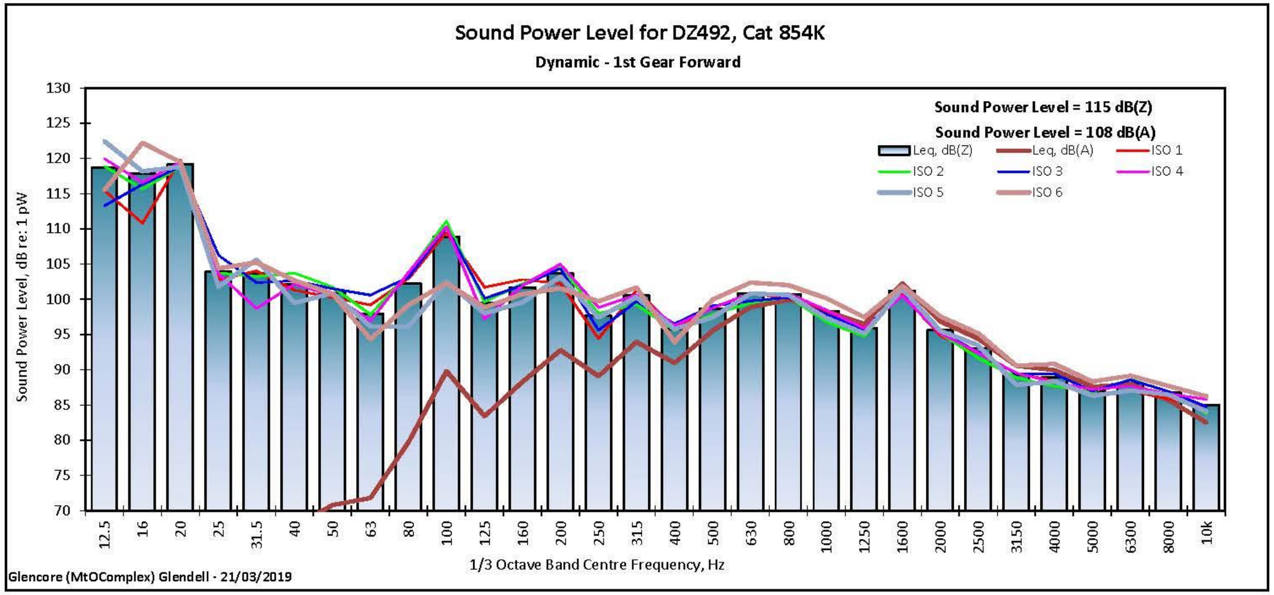
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	120	117	119	104	104	103	94	98	102	119	104	102	101	102	101
Leq, dB(A)	57	60	69	59	64	68	64	72	79	100	88	89	90	93	95

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	102	99	98	100	100	98	97	96	94	91	90	88	89	85	84
Leq, dB(A)	97	96	96	99	100	98	98	98	96	92	91	88	89	84	82

Measure Sound Power Level Report

Machine: Sound Power Level for DZ492, Cat 854K
Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 115 dB(Z)
Sound Power Level = 108 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



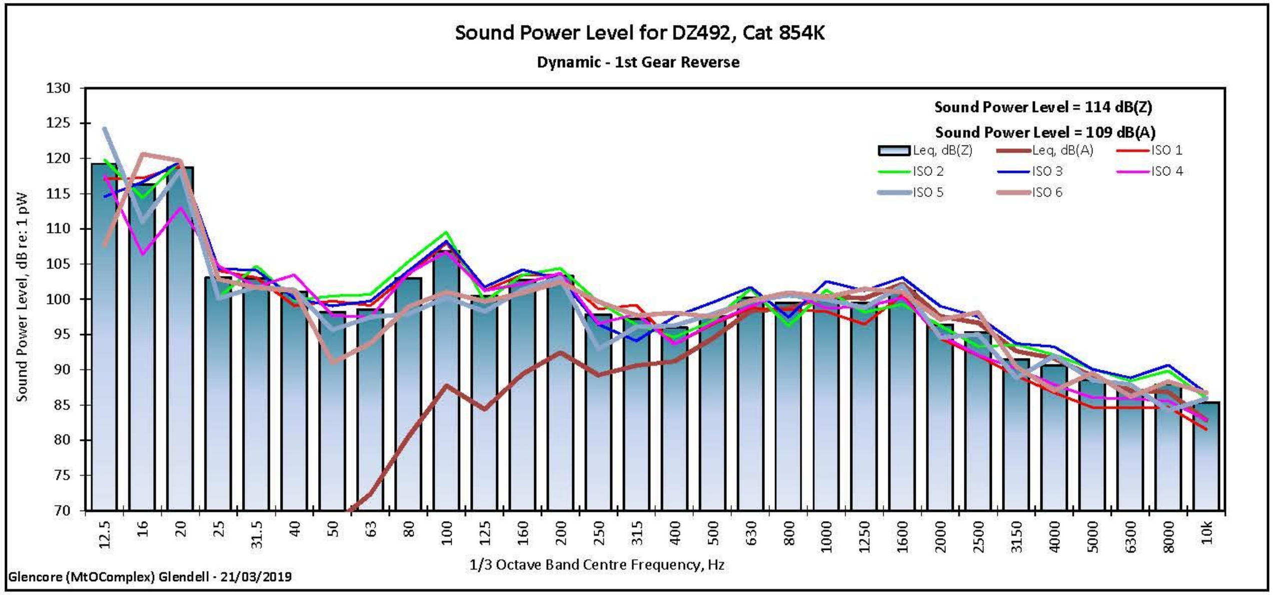
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	119	118	119	104	104	102	101	98	102	109	99	102	104	98	101
Leq, dB(A)	55	61	69	59	64	68	71	72	80	90	83	88	93	89	94

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	96	99	101	101	98	96	101	96	93	89	89	87	88	87	85
Leq, dB(A)	91	95	99	100	98	96	102	97	94	91	90	88	88	86	82

Measure Sound Power Level Report

Machine: Sound Power Level for DZ492, Cat 854K
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 114 dB(Z)
Sound Power Level = 109 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



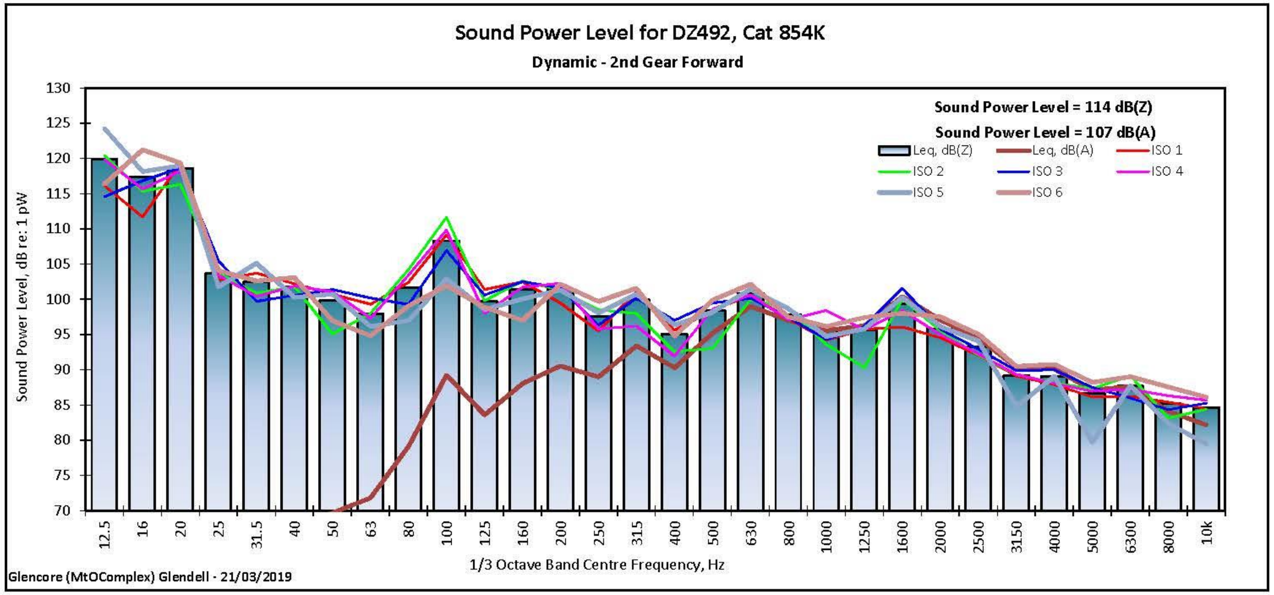
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	119	116	119	103	103	101	98	99	103	107	100	103	103	98	97
Leq, dB(A)	56	60	68	58	64	66	68	72	80	88	84	89	92	89	91

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	96	98	100	99	100	100	101	96	95	91	91	89	87	88	85
Leq, dB(A)	91	94	98	99	100	100	102	98	97	93	92	89	87	87	83

Measure Sound Power Level Report

Machine: Sound Power Level for DZ492, Cat 854K
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 114 dB(Z)
Sound Power Level = 107 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

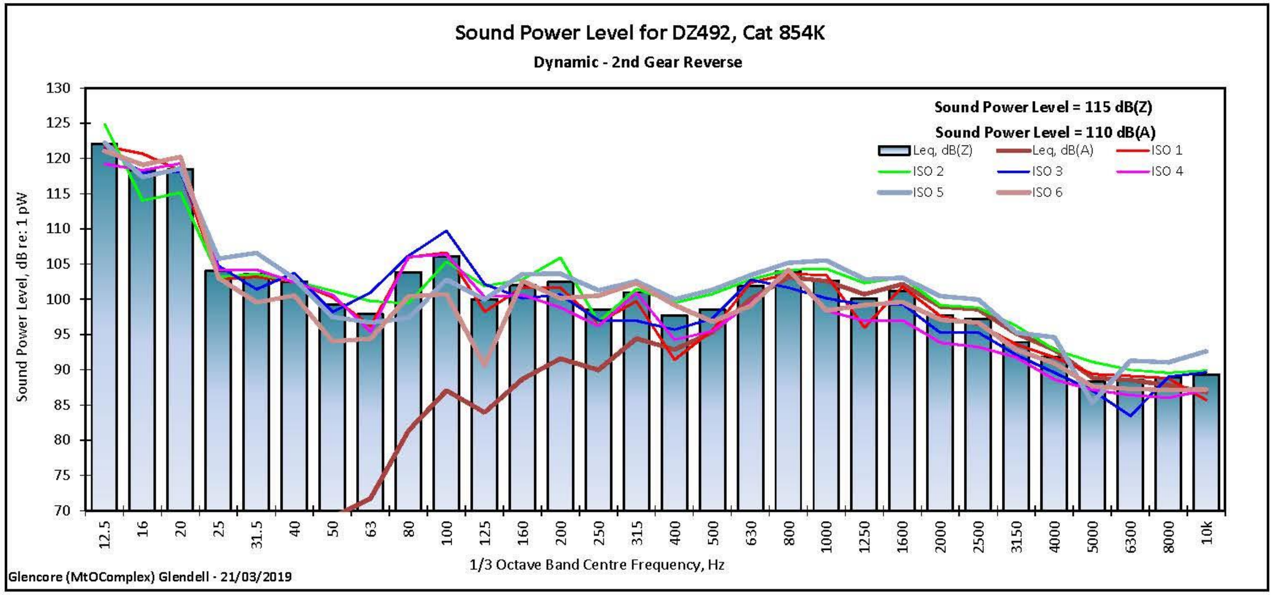


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	117	119	104	103	102	100	98	102	108	100	101	101	98	100	95	98	101	98	96	96	99	96	93	89	89	87	88	85	85
Leq, dB(A)	56	61	68	59	63	67	70	72	79	89	84	88	91	89	93	90	95	99	97	96	96	100	97	95	90	90	87	88	84	82

Measure Sound Power Level Report

Machine: Sound Power Level for DZ492, Cat 854K
Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 115 dB(Z)
Sound Power Level = 110 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

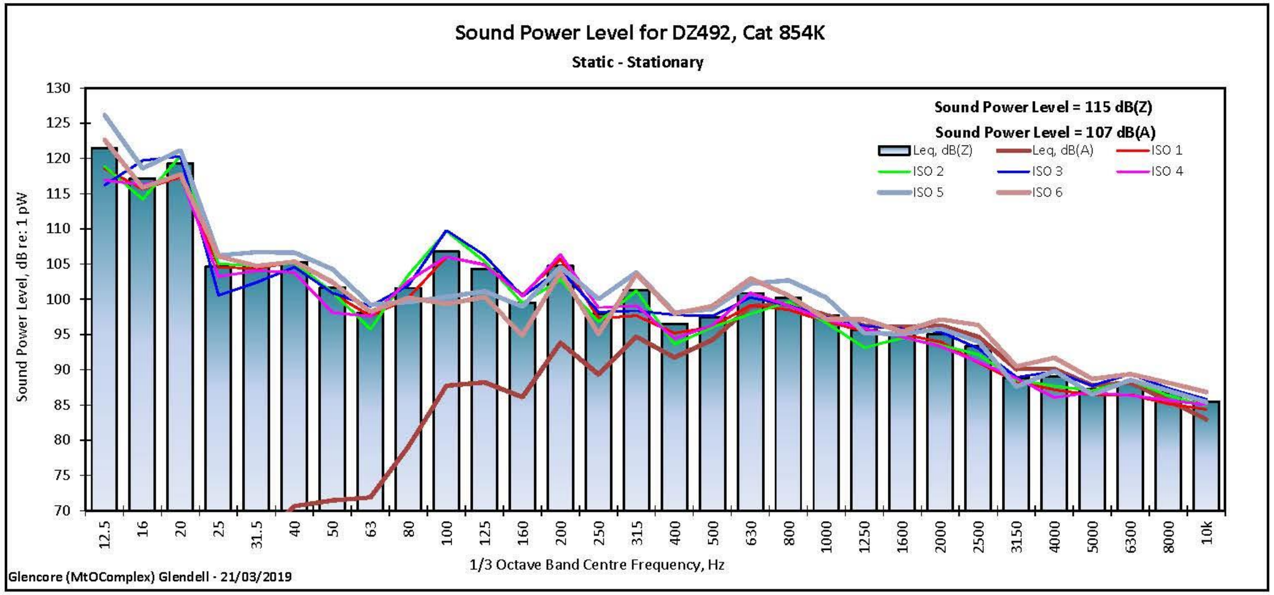


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	118	118	104	104	103	99	98	104	106	100	102	102	99	101	98	99	102	104	103	100	101	98	97	94	92	88	89	89	89
Leq, dB(A)	59	62	68	59	64	68	69	72	81	87	84	89	92	90	94	93	95	100	103	103	101	102	99	99	95	93	89	88	88	87

Measure Sound Power Level Report

Machine: Sound Power Level for DZ492, Cat 854K
Activity: Static - Stationary
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 21/03/2019
Results: Sound Power Level = 115 dB(Z)
Sound Power Level = 107 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

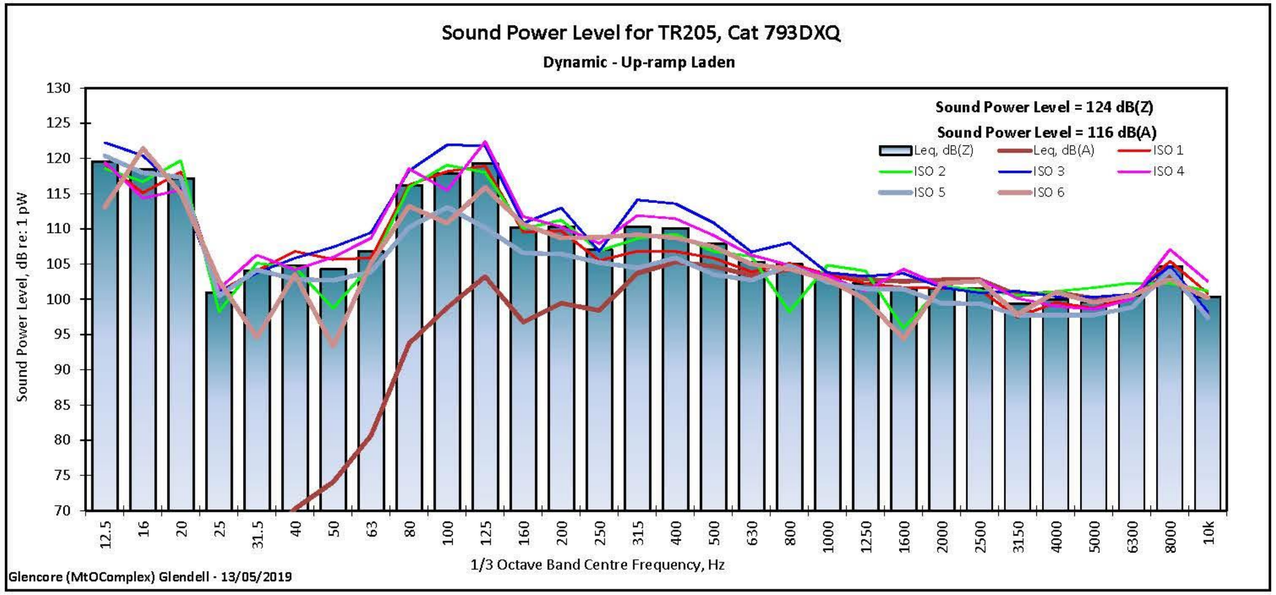


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	117	119	105	105	105	102	98	102	107	104	99	105	98	101	97	97	101	100	98	96	95	95	93	89	89	87	88	87	85
Leq, dB(A)	58	60	69	60	65	71	71	72	79	88	88	86	94	89	95	92	94	99	99	98	96	96	96	95	90	90	88	88	86	83

Measure Sound Power Level Report

Machine: Sound Power Level for TR205, Cat 793DXQ
Activity: Dynamic - Up-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 13/05/2019
Results: Sound Power Level = 124 dB(Z)
Sound Power Level = 116 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

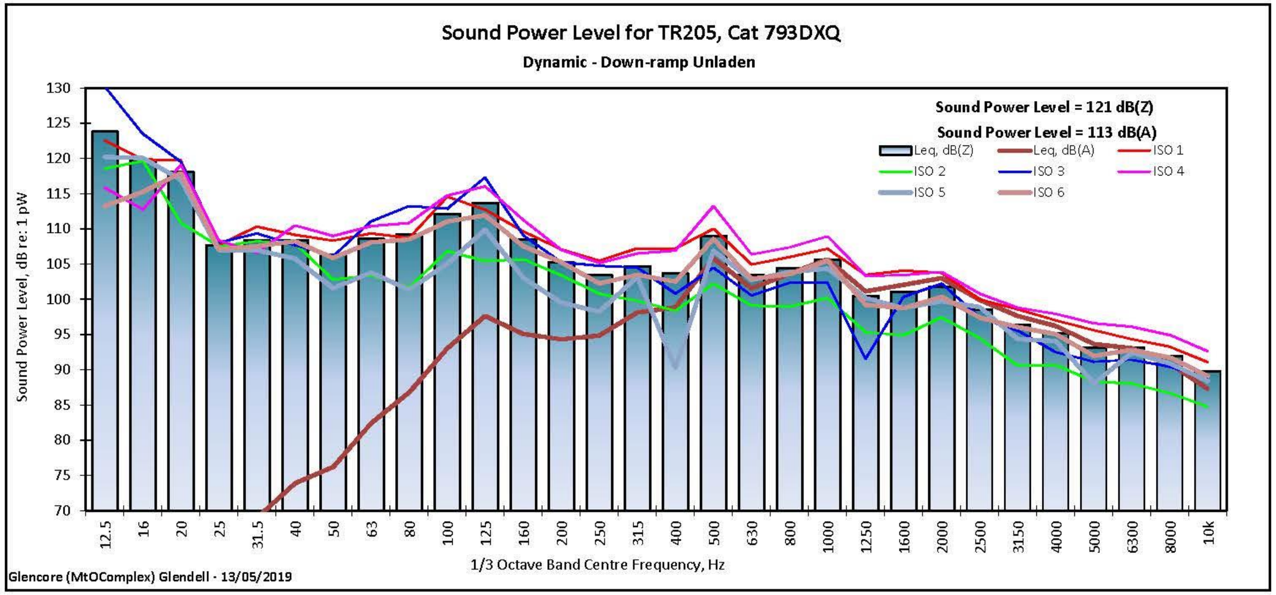


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	118	117	101	104	105	104	107	116	118	119	110	110	107	110	110	108	105	105	104	102	102	102	102	99	100	100	101	105	100
Leq, dB(A)	56	62	67	56	65	70	74	81	94	99	103	97	99	98	104	105	105	103	104	104	103	103	103	103	101	101	100	101	104	98

Measure Sound Power Level Report

Machine: Sound Power Level for TR205, Cat 793DXQ
Activity: Dynamic - Down-ramp Unladen
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 13/05/2019
Results: Sound Power Level = 121 dB(Z)
Sound Power Level = 113 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

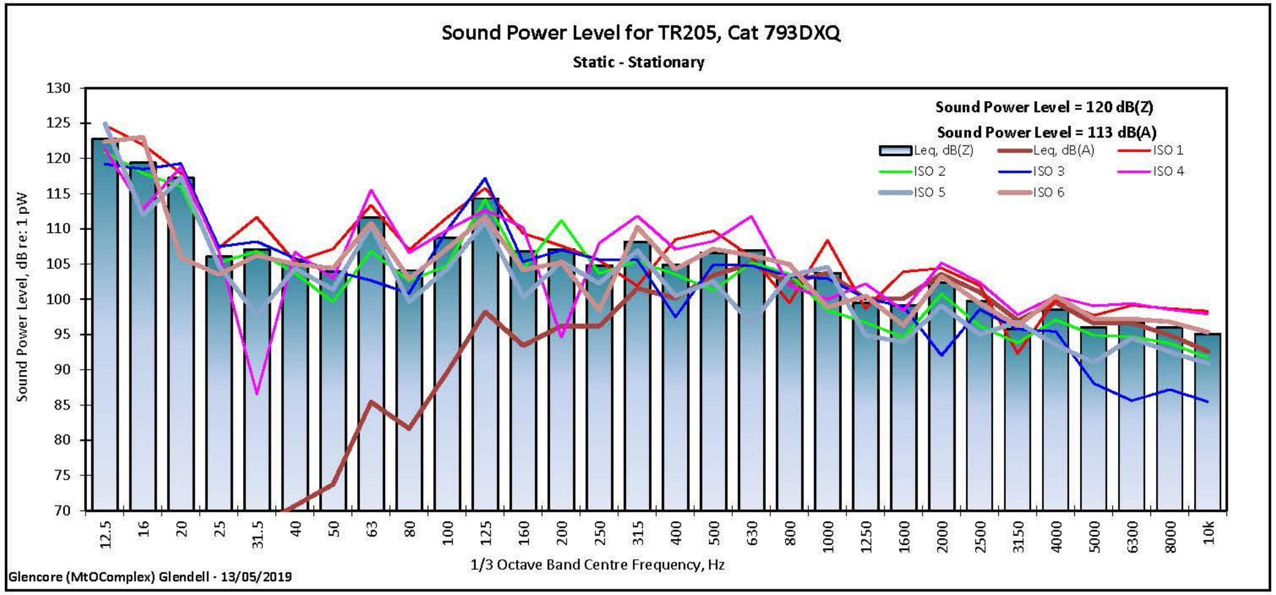


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	124	120	118	108	108	108	106	109	109	112	114	108	105	103	105	104	109	103	104	106	100	101	102	99	96	95	93	93	92	90
Leq, dB(A)	60	63	68	63	69	74	76	82	87	93	98	95	94	95	98	99	106	102	104	106	101	102	103	100	98	96	94	93	91	87

Measure Sound Power Level Report

Machine: Sound Power Level for TR205, Cat 793DXQ
Activity: Static - Stationary
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 13/05/2019
Results: Sound Power Level = 120 dB(Z)
Sound Power Level = 113 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

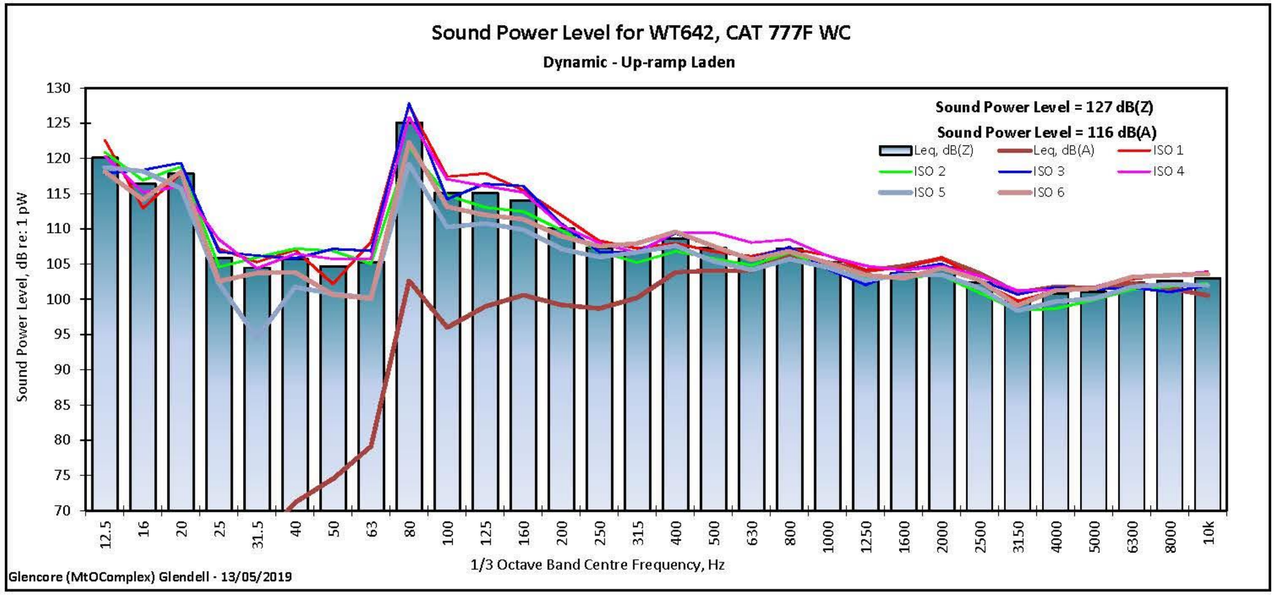


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	123	119	117	106	107	105	104	112	104	109	114	107	107	105	108	105	107	107	103	104	99	99	102	100	96	99	96	97	96	95
Leq, dB(A)	59	63	67	61	68	71	74	85	82	90	98	93	96	96	102	100	103	105	102	104	100	100	104	101	97	100	97	97	95	93

Measure Sound Power Level Report

Machine: Sound Power Level for WT642, CAT 777F WC
Activity: Dynamic - Up-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 13/05/2019
Results: Sound Power Level = 127 dB(Z)
Sound Power Level = 116 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

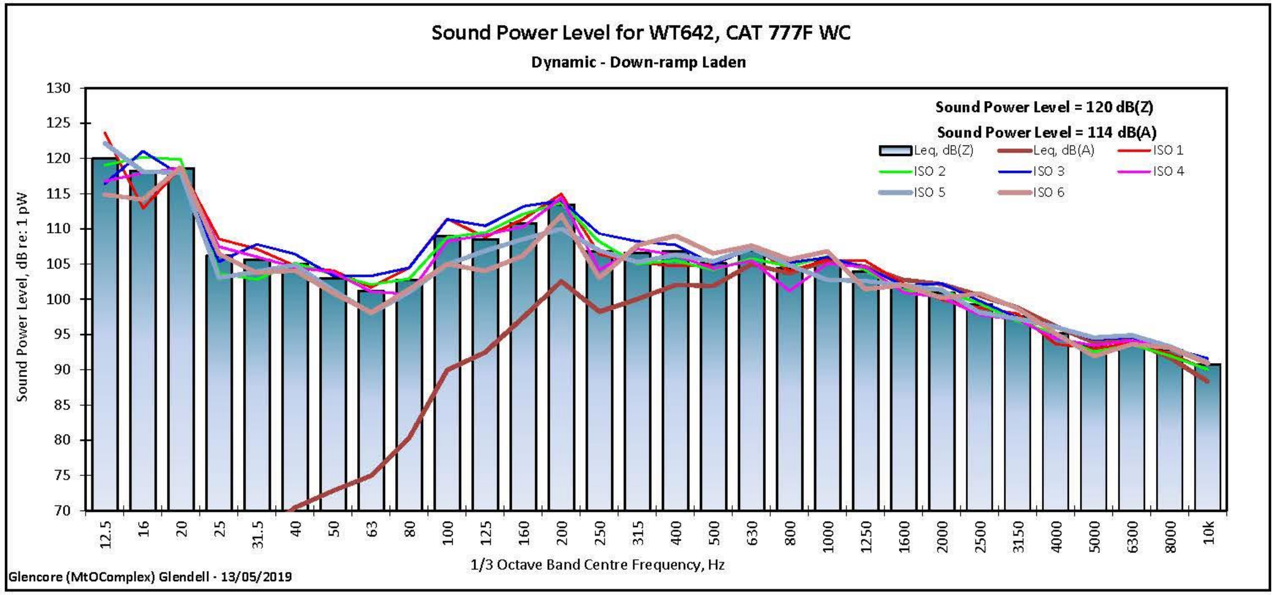


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	116	118	106	104	106	105	105	125	115	115	114	110	107	107	109	107	106	107	105	103	104	105	102	100	101	101	102	103	103
Leq, dB(A)	57	60	67	61	65	71	75	79	103	96	99	101	99	99	100	104	104	104	106	105	104	105	106	104	101	102	102	102	102	101

Measure Sound Power Level Report

Machine: Sound Power Level for WT642, CAT 777F WC
Activity: Dynamic - Down-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 13/05/2019
Results: Sound Power Level = 120 dB(Z)
Sound Power Level = 114 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

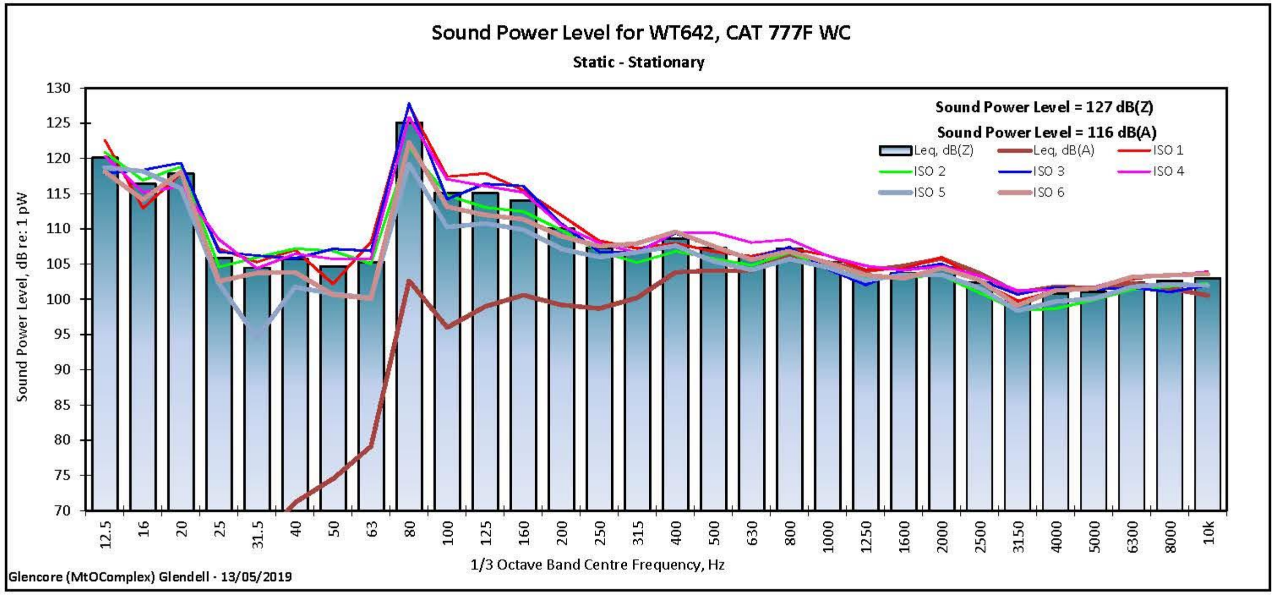


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	118	119	106	106	105	103	101	103	109	109	111	113	107	107	107	105	107	104	106	104	102	101	99	98	95	93	94	93	91
Leq, dB(A)	57	62	68	61	66	70	73	75	80	90	92	97	103	98	100	102	102	105	104	106	105	103	102	101	99	96	94	94	92	88

Measure Sound Power Level Report

Machine: Sound Power Level for WT642, CAT 777F WC
Activity: Static - Stationary
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 13/05/2019
Results: Sound Power Level = 127 dB(Z)
Sound Power Level = 116 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

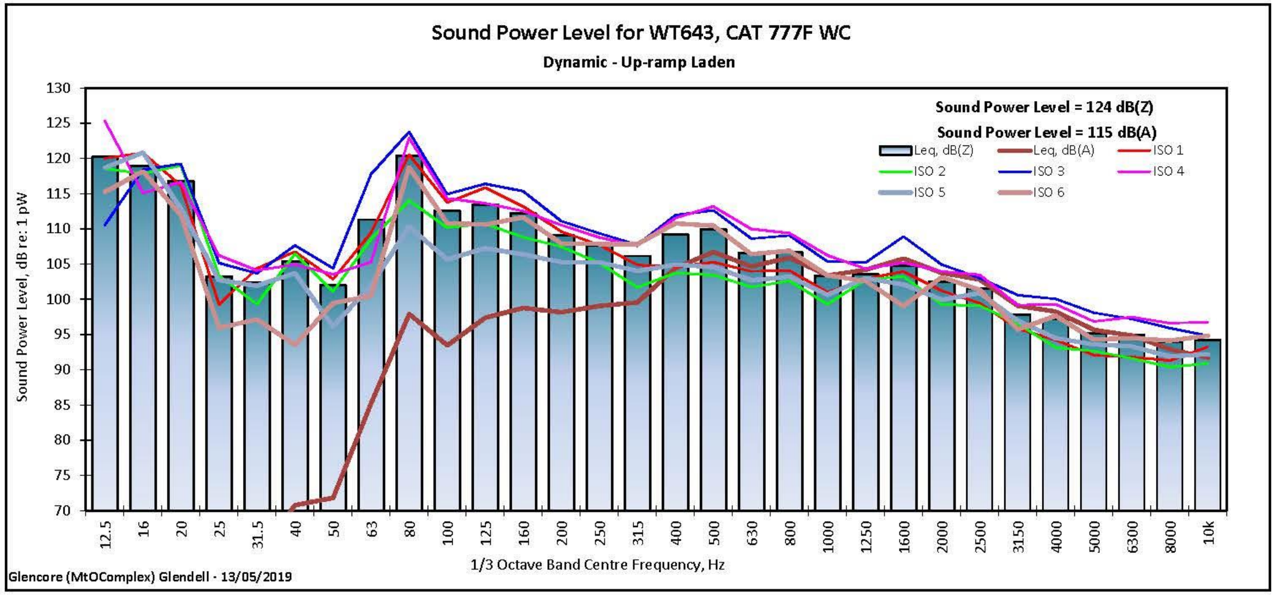


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	116	118	106	104	106	105	105	125	115	115	114	110	107	107	109	107	106	107	105	103	104	105	102	100	101	101	102	103	103
Leq, dB(A)	57	60	67	61	65	71	75	79	103	96	99	101	99	99	100	104	104	104	106	105	104	105	106	104	101	102	102	102	102	101

Measure Sound Power Level Report

Machine: Sound Power Level for WT643, CAT 777F WC
Activity: Dynamic - Up-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 13/05/2019
Results: Sound Power Level = 124 dB(Z)
Sound Power Level = 115 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

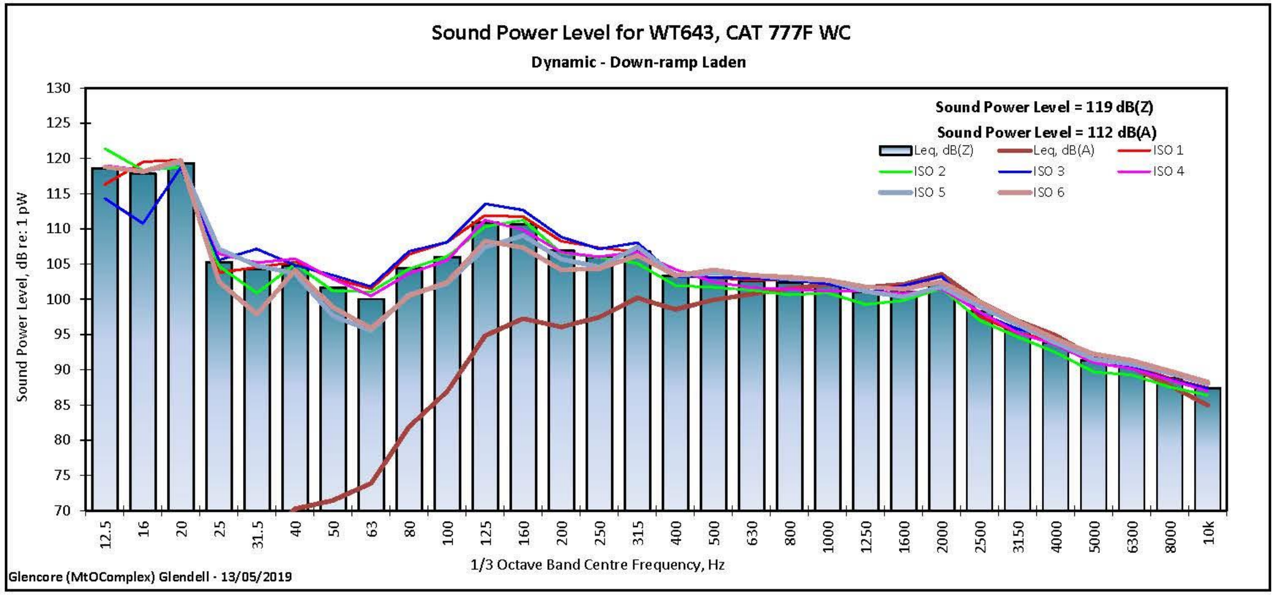


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	119	117	103	102	105	102	111	120	113	113	112	109	108	106	109	110	107	107	103	104	105	103	102	98	97	95	95	94	94
Leq, dB(A)	57	62	66	59	63	71	72	85	98	93	97	99	98	99	100	104	107	105	106	103	104	106	104	103	99	98	96	95	93	92

Measure Sound Power Level Report

Machine: Sound Power Level for WT643, CAT 777F WC
Activity: Dynamic - Down-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 13/05/2019
Results: Sound Power Level = 119 dB(Z)
Sound Power Level = 112 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

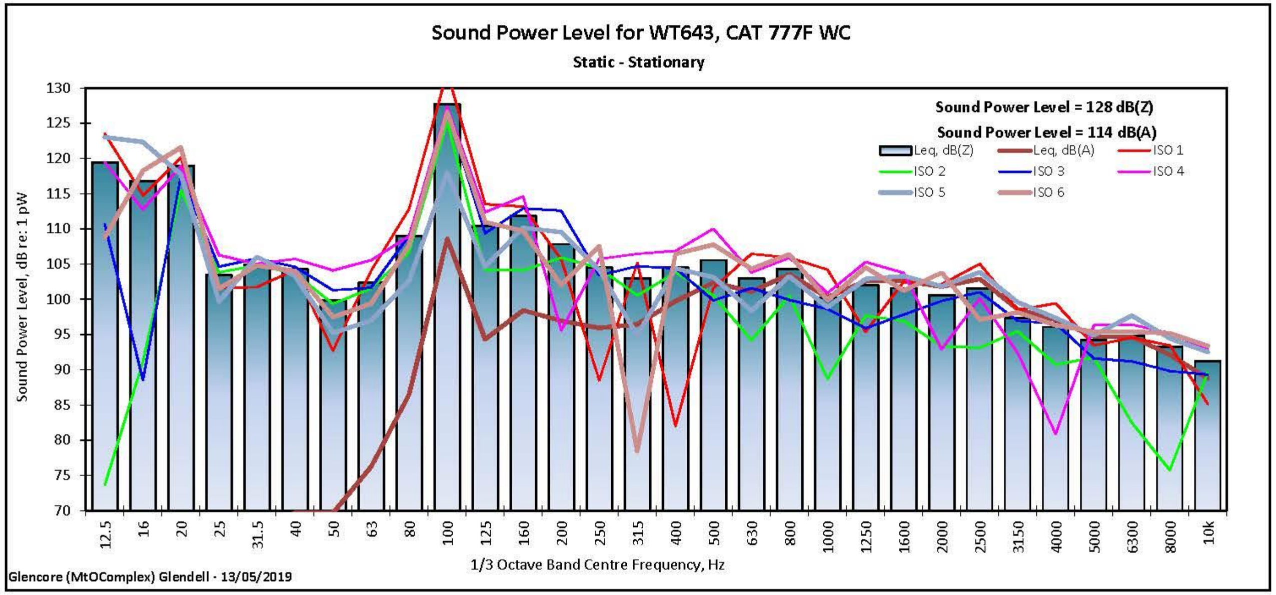


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	119	118	119	105	104	105	102	100	104	106	111	111	107	106	107	103	103	103	102	102	101	101	102	98	96	94	91	90	89	87
Leq, dB(A)	55	61	69	61	65	70	71	74	82	87	95	97	96	97	100	99	100	101	102	102	102	102	104	100	97	95	92	90	88	85

Measure Sound Power Level Report

Machine: Sound Power Level for WT643, CAT 777F WC
Activity: Static - Stationary
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 13/05/2019
Results: Sound Power Level = 128 dB(Z)
Sound Power Level = 114 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	119	117	119	103	105	104	100	102	109	128	110	112	108	105	103	105	106	103	104	100	102	102	101	102	97	96	94	95	93	91
Leq, dB(A)	56	60	68	59	65	70	70	76	86	109	94	98	97	96	96	100	102	101	104	100	103	103	102	103	99	97	95	95	92	89

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GLENCORE

MACHINE SOUND POWER LEVEL TESTING

2019

Glendell Mine

FINAL

December 2019

GLENCORE

MACHINE SOUND POWER LEVEL TESTING

2019

Glendell Mine

FINAL

Prepared by
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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
1	T Procter	6 December 2019	T Procter	6 December 2019
2	E Moore	16 December 2019	R Williams	16 December 2019

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2.0 Results

2.1 Measured Sound Power Levels

Dynamic SWL testing of equipment included the measurement of the following machines in representative operating conditions:

- **dozers** and **grader** in 1st and 2nd gear forward and reverse motion on flat surfaces
- **excavator** performing 90° swing

Static SWL testing of the equipment included stationary testing of machines at the same test site surface used from the dynamic test.

Table 2.1 summarises the sound power level test results for each item of equipment tested. The detailed sound power level results are presented as one-third octave graphs in **Appendix C**. Results are presented as Linear (Z – weighted) and A-weighted[1] sound power levels.

[1] A-weighting is an adjustment made to sound level measurement, by means of an electronic filter, to approximate the response of the human ear.

1.0 Introduction

As per Glendell Mine's DPIE approved Noise Management Plan, Glendell Mine is required to conduct periodic review of the noise performance of its equipment fleet. It is recommended that all fleet should be tested within a five-year period.

In 2019, Umwelt conducted noise performance tests on twelve of Glendell's equipment fleet (refer to Report No 4545/R01 for further details regarding these test results).

Umwelt Australia Pty Ltd was engaged by Glencore to undertake sound power level (SWL) testing of a selection of mobile machines, listed in **Table 1.1**. Testing was conducted on 16, 22 and 29 October 2019 at various locations at Glendell Mine.

Table 1.1 Tested Machines

Plant Type	Unit Number	Model
Dozers	DZ 406	Cat D10T
	DZ 453	CAT D11T
	DZ 472	CAT D11R (CHPP)
	DZ 473	CAT D11R (CHPP)
Grader	GR 611	CAT 24M
Excavator	EX 103	Hitachi 5500

Dynamic SWL testing was undertaken generally in accordance with the methodology presented in ISO 6395 and ISO 6393 for stationary (static) testing. In accordance with these standards, sound power is determined in one-third octave bands from 25 Hz to 10 kHz. However, Glendell Mine requires assessment in one-third octave bands from 12.5 Hz to 10 kHz. The SWL testing methodology used at Glendell mine is summarised in **Appendix A**. The calibration certificates for the sound measurement equipment can be found in **Appendix B**. The results for each machine tested is presented in detail in **Appendix C**.

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Table 2.1 Sound Power Level Monitoring Results

Machine ID	Make / Model	Transmission/ Mode of operation	Dynamic - Up or Forward		Dynamic - Down or Reverse		Static		Testing Date
			dB(Z)	dB(A)	dB(Z)	dB(A)	dB(Z)	dB(A)	
Dozers									
DZ 406	Cat D10T	1st gear	121	116	122	118	119	109	16/10/2019
		2nd gear	124	121	127	124	-	-	16/10/2019
DZ 453	CAT D11T	1st gear	123	118	124	120	119	109	16/10/2019
		2nd gear	127	124	129	127	-	-	16/10/2019
DZ 472	CAT D11R (CHPP)	1st gear	123	116	123	114	119	108	29/10/2019
		2nd gear	126	120	126	121	-	-	29/10/2019
DZ 473	CAT D11R (CHPP)	1st gear	120	115	122	117	119	112	29/10/2019
		2nd gear	125	121	126	123	-	-	29/10/2019
Grader									
GR 611	CAT 24M	1st gear	122	117	122	117	122	114	16/10/2019
		2nd gear	122	117	122	117			16/10/2019
Excavator									
EX 103	Hitachi 5500	90° Swing	120	113	NA	NA	120	113	22/10/2019

2.2 Meteorological Conditions

The meteorological conditions at the time of the monitoring program are presented in **Table 2.2**.

Table 2.2 Local Meteorological Conditions (Sentinex13)

Date	Wind Speed (m/s)	Temperature (°C)	Relative Humidity (%)
16/10/2019	1.7 (0.5 - 3.8)	31.4 (26.3 - 34.8)	32.3 (23.0 - 47.0)
22/10/2019	2.1 (0.7 - 4.1)	25.0 (20.9 - 28.9)	39.3 (29 - 55.0)
29/10/2019	1.3 (0.2 - 3.0)	24.6 (20.5 - 28.3)	51.7 (36.0 - 68.0)

3.0 Discussion

The Z and A-weighted sound power levels for machines in different modes of operation are presented in **Table 2.1**. The one-third octave bands of the sound power spectrum for each machine are included in **Appendix C**. **Table 3.1** compares the measured Z and A-weighted sound power levels to the target in-service Z-weighted sound power levels nominated in Glencore Noise Management Protocol GCAA-625378177-10238 (GCAA NMP) and the A-weighted sound power level targets for the Year 9 targets nominated in the Glendell Environmental Assessment 2007 (GEA, 2007).

Table 3.1 Comparison of Sound Power Levels Results to In-service Targets Nominated in the GCAA NMP and the Year 9 Proposed Fleet Specification Targets in (GEA, 2007)

Equipment Description			Mode of Operation	Dynamic				GCAA NMP	GEA, 2007 *For/Rev*[a]
				Up or Forward		Down or Reverse			
				dB(Z)	dB(A)	dB(Z)	dB(A)	dB(Z)	dB(A)
Dozers	DZ 406	Cat D10T	1st gear	121	116	122	118	123	110/118
	DZ 453	CAT D11T	1st gear	123	118	124	120	123	110/118
	DZ 472	CAT D11R (CHPP)	1st gear	123	116	123	114	123	110/118
	DZ 473	CAT D11R (CHPP)	1st gear	120	115	122	117	123	110/118
Grader	GR 611	CAT 24M	1st gear	120	114	122	117	117	104
Excavator	EX 103	Hitachi 5500	Dynamic	120	113	N/A	N/A	125	117

NOTE [a] GEA, 2007 gives specific SWL targets for dozers in forward and reverse modes of operation. For other machines, only one SWL target is given for all modes of operation

The results in **Table 3.1** indicate DZ406 in 1st gear forward is below the GCAA NMP Z-weighted target but 6 dB above the GEA 2007 A-weighted target. The high A-weighted result was due to a cyclic rattle in the 630 Hz to > 2000 Hz range in the rear left hand side of the machine. Elimination of this rattle would reduce the 1st gear forward sound power level to 120 dB(Z)/111 dB(A). This difference is shown in **Figure 3.1**.

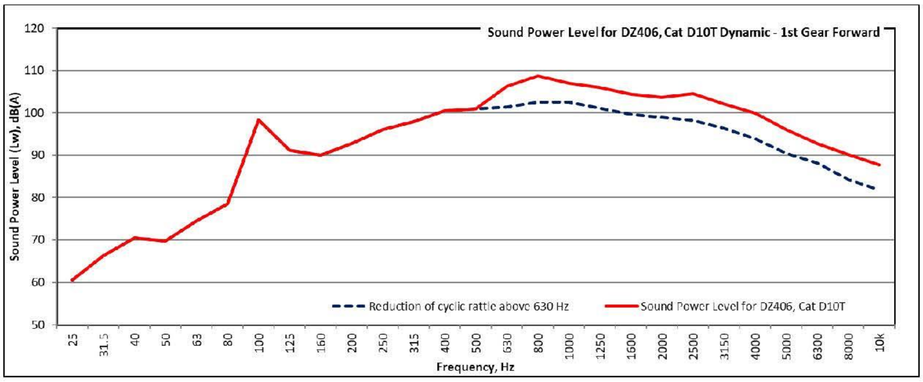

Figure 3.1 Comparison of DZ406 SWL results with reduction in cyclic rattle

The results in **Table 3.1** indicate DZ406 in 1st gear reverse is at or below the GCAA NMP Z-weighted and the GEA 2007 A-weighted targets. During the monitoring of 1st gear reverse the reversing beeper could not be isolated. Isolation of the reversing beeper would reduce the 1st gear reverse sound power level to 121 dB(Z)/114 dB(A).

The results in **Table 3.1** indicate DZ453 in 1st gear forward was at the GCAA NMP Z-weighted target but 8 dB above the GEA 2007 A-weighted target. Overall the measured sound power level of DZ453 in 1st gear forward was within the standard deviation of the sound power envelope of similar machines except in the 100 Hz and 630 Hz 1/3 octave bands. The 100 Hz is associated with the exhaust and the 630 Hz is apparent at all measurement locations while the machine was in motion (refer to difference between static results and dynamic results). The results in **Table 3.1** indicate DZ453 in 1st gear reverse was 1 dB above the GCAA NMP Z-weighted target and 2 dB above the GEA 2007 A-weighted target. Similar to the 1st gear forward results, the machine was within the standard deviation of the sound power envelope of similar machines except in the 100 Hz and 630 Hz 1/3 octave bands.

The results in **Table 3.1** indicate DZ472 in 1st gear forward was below the GCAA NMP Z-weighted target but 4 dB above the GEA 2007 A-weighted target. The results in **Table 3.1** indicate DZ406 in 1st gear reverse was at the GCAA NMP Z-weighted target and below the GEA 2007 A-weighted target. Overall the measured sound power level of DZ472 was within the standard deviation of the sound power envelope of similar machines.

The results in **Table 3.1** indicate DZ473 in 1st gear forward was below the GCAA NMP Z-weighted target but 5 dB above the GEA 2007 A-weighted target. The results in **Table 3.1** indicate DZ406 in 1st gear reverse was below the GCAA NMP Z-weighted and GEA 2007 A-weighted targets. Overall the measured sound power level of DZ472 was within the standard deviation of the sound power envelope of similar machines.

The results in **Table 3.1** indicate GR611 in 1st gear forward was 3 dB above the GCAA NMP Z-weighted target and 10 dB above the GEA 2007 A-weighted target. The results in **Table 3.1** also indicate GR611 in 1st gear reverse was 5 dB above the GCAA NMP Z-weighted target and 13 dB above the GEA 2007 A-weighted target. Comparison of the measured sound power level of GR611 with the standard deviation of the sound power envelope of similar machines indicates GR611 exceeded the upper +1 standard deviation by up to 1 to 2 dB. This is shown in **Figure 3.2**. It is also noted that the 2015 results for GR611 report a sound power level in 1st gear forward of 114 dB(Z) and 106 dB(A). It is recommended that Glendell review the maintenance records for GR611 for the period from 2015 to present, as this may indicate the cause of the difference between the 2015 and 2019 test results.

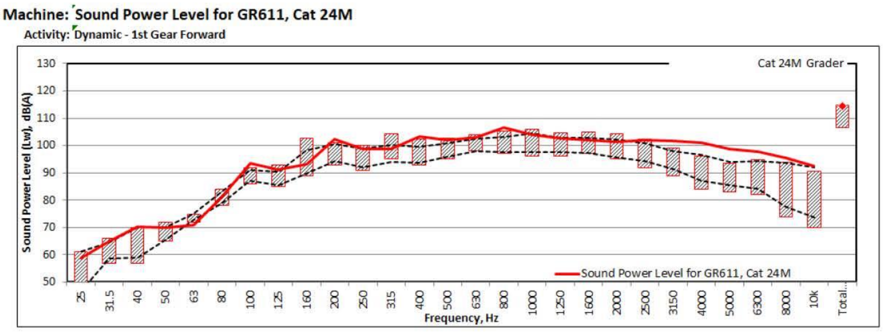

Figure 3.2 Comparison of GR611 SWL results with equivalent machines

The results in **Table 3.1** indicate EX103 in dynamic mode of operation is below the GCAA NMP Z-weighted and GEA 2007 A-weighted targets.

APPENDIX A

Methodology – Sound Power Level Testing of Mobile Equipment

A.1 Testing Standards

The monitoring program was conducted in accordance with:

MGD15 - Mobile and transportable plant for use on mines and petroleum sites (Amd. 2018)

ISO 6395:2008 – Earth-moving machinery - Determination of sound power level - Dynamic test conditions

ISO 6393:2008 – Earth-moving machinery - Determination of sound power level - Stationary test conditions

ISO 3744:2010 - Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane

ISO 4872 – Measurement of airborne noise emitted by construction equipment intended for outdoor use -- Method for determining compliance with noise limits

The monitoring program also took into consideration the requirements of:

AS 2012.2-1990 – Acoustics - Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors - Stationary test condition, Operator's position

AS/NZS 1269.1-2005 - Occupational noise management - Measurement and assessment of noise emission and exposure

A.2 Equipment Used

The monitoring program was conducted using the following equipment

SVAN958A (59838) - four (4) channel sound and vibration analyser

SVAN958A (59839) - four (4) channel sound and vibration analyser

SVAN SV36 (90131) – 94/114 dB calibrator

SVAN SV36 (90124) – 94/114 dB calibrator

Kestrel 4500 – weather meter

Calibration certificates are included in **Appendix B**.

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A.3 Sound Power Level Testing

The monitoring program methodology is outlines as follows:

- Sound power levels have been determined in one-third octave bands.
- Glencore Noise Management Protocol GCAA-625378177-10238 (GCAA NMP) requires the measurements to be from 25 Hz to 10 kHz to enable reporting of Linear (Z-weighted) and A-weighting sound power levels. Data capture data from 12.5 Hz to 20 Hz has been included in the reporting of the monitoring data but not the determination of sound power levels The 12.5 Hz to 20 Hz data can be used to assess low frequency noise and/or are often identifiable within the background acoustic environment.
- Measurements made from six ISO microphones. **Figure A.1** shows the horizontal (left image) and vertical (right image) positions of each microphone.
- The size of the measurement surface is determined as per ISO 6395:2008(E). This generally constitutes a radius of 16 – 20 m to accommodate the tested machines.

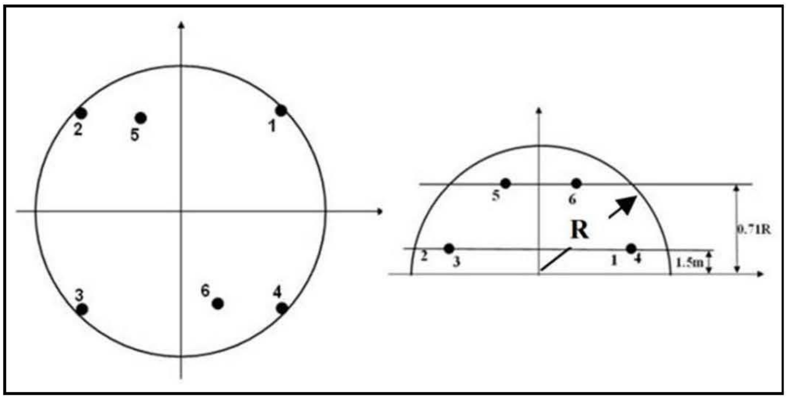

Figure A.1 - Microphone position for ISO Sound Power Level testing

A.4 Test Area Environment

The test areas included a haul road and flat dump area with sufficient length to allow machines to safely accelerate, pass through the test area and decelerate.

In accordance with ISO 6395 and GCAA NMP, the location of the test area was chosen to minimise the impacts of reflective surfaces such as highwalls and windrows.

Care was also taken to ensure that background noise levels were at least 6 dB less than measured equipment being tested. A correction is also applied for background levels between 6 dB – 15 dB less than measured dynamic levels to ensure that background noise has limited effect on measured levels. In addition to this, Mount Owen requires the background noise levels to be reported in one-third octave bands from 12.5 Hz to 10 kHz

All machines were tested on slope of approximately 0% to facilitate the forward and reverse testing of the bulldozers, grader and excavator.

APPENDIX B

Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: **SLM 22355 & FILT 4741**

Equipment Description: Sound & Vibration Analyzer

Manufacturer: Svantek

Model No: SVAN-958A **Serial No:** 59838

Microphone Type: N/A **Serial No:** N/A

Preamplifier Type: N/A **Serial No:** N/A

Filter Type: 1/3 Octave **Serial No:** 59838

Comments: All tests passed for class 1.
(See over for details)

Owner: Umwelt (Australia) Pty Ltd
75 York Street
Teralba, NSW 2284

Ambient Pressure: 999 hPa ±1.5 hPa

Temperature: 25 °C ±2° C **Relative Humidity:** 61% ±5%

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: JK **AUTHORISED SIGNATURE:** Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

NATA
WORLD RECOGNISED ACCREDITATION

ACU-VIB
ELECTRONICS

HEAD OFFICE
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
Tel: (02) 96808133 Fax: (02)96808233
Mobile: 0413 809806
web site: www.acu-vib.com.au

Accredited Lab. No. 9262
Acoustic and Vibration Measurements

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CERTIFICATE NO.: SLM 22355 & FILT 4741

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	N/A
Acoustical Frequency Weighting	12	N/A
Self Generated Noise	11.1	N/A
Electrical Noise	11.2	Entered
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.
A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Checked by: IK

Accredited for compliance with ISO/IEC 17025 - Calibration
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AVCERT10

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: **SLM 22356 & FILT 4740**

Equipment Description:	Sound & Vibration Analyzer		
Manufacturer:	Svantek		
Model No:	SVAN-958A	**Serial No:**	59839
Microphone Type:	N/A	**Serial No:**	N/A
Preamplifier Type:	N/A	**Serial No:**	N/A
Filter Type:	1/3 Octave	**Serial No:**	59839
Comments:	All tests passed for class 1. (See over for details)		
Owner:	Umwelt (Australia) Pty Ltd 75 York Street Teralba, NSW 2284		
Ambient Pressure:	999 hPa ±1.5 hPa		
Temperature:	24 °C ±2° C	**Relative Humidity:**	54% ±5%
Date of Calibration:	18/07/2018	**Issue Date:**	18/07/2018
Acu-Vib Test Procedure:	AVP10 (SLM) & AVP06 (Filters)		

CHECKED BY: ...JK... **AUTHORISED SIGNATURE:** ....
Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

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Accredited Lab. No. 9262
Acoustic and Vibration Measurements

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CERTIFICATE NO.: SLM 22356 & FILT 4740

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:

	Clause	Result
Absolute Calibration	10	N/A
Acoustical Frequency Weighting	12	N/A
Self Generated Noise	11.1	N/A
Electrical Noise	11.2	Entered
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.
A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Checked by: IK

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

NATA WORLD RECOGNISED ACCREDITATION

Accredited Lab. No. 9262
Acoustic and Vibration Measurements

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AVCERT10

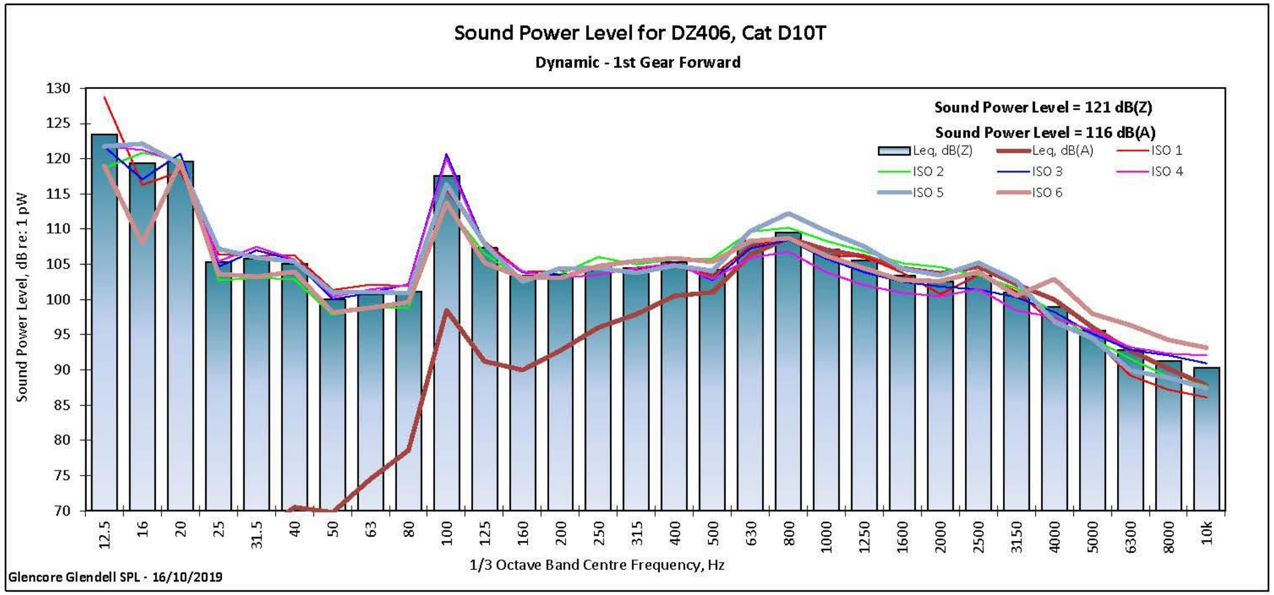
APPENDIX C

Sound Power Level Results

Measure Sound Power Level Report

Machine: Sound Power Level for DZ406, Cat D10T
Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 121 dB(Z)
Sound Power Level = 116 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

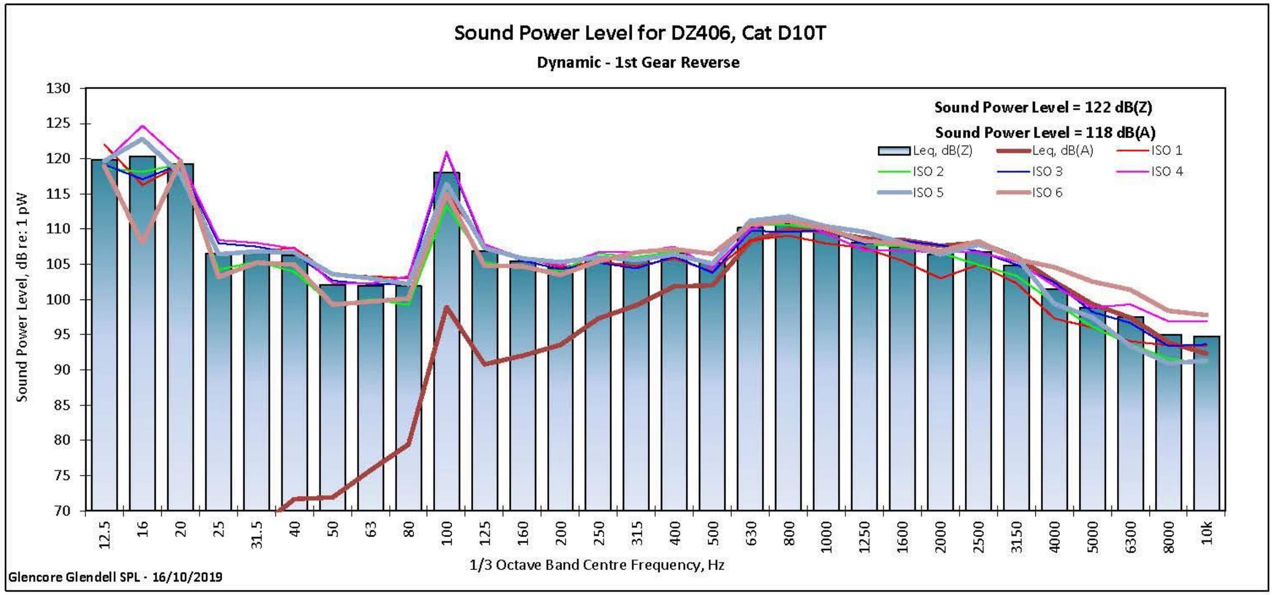


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	123	119	120	105	106	105	100	101	101	118	107	103	104	105	105	105	104	108	110	107	105	103	103	103	101	99	96	93	91	90
Leq, dB(A)	60	63	69	61	66	70	70	74	79	98	91	90	93	96	98	101	101	106	109	107	106	104	104	105	102	100	96	93	90	88

Measure Sound Power Level Report

Machine: Sound Power Level for DZ406, Cat D10T
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 122 dB(Z)
Sound Power Level = 118 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

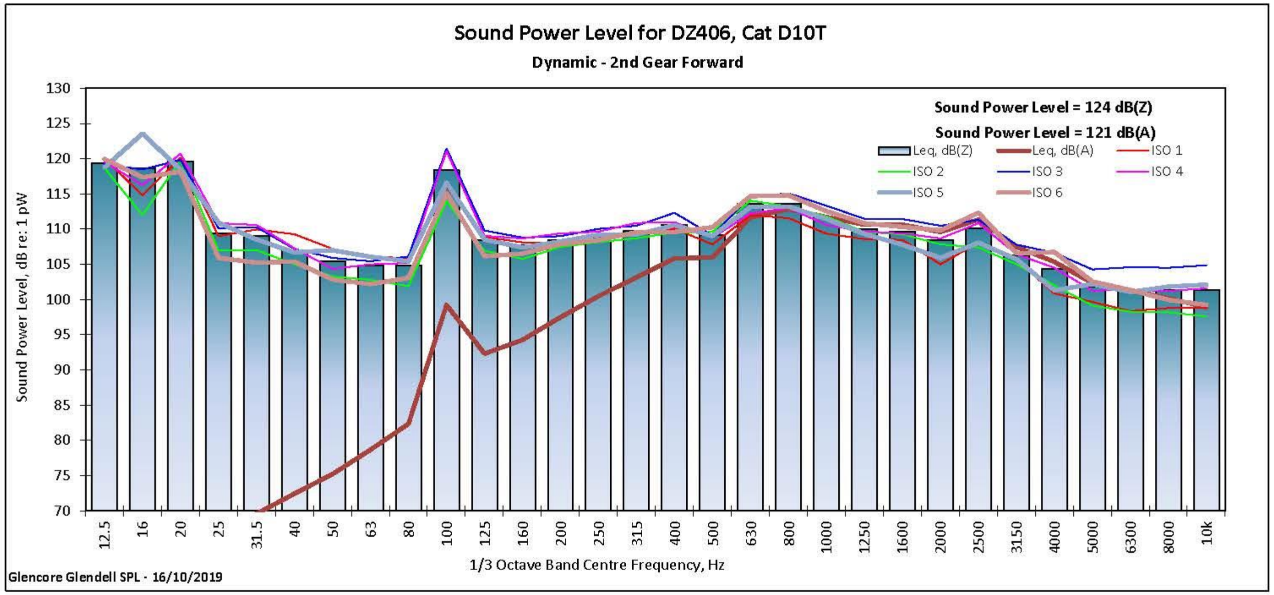


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	120	119	107	107	106	102	102	102	118	107	105	104	106	106	107	105	110	111	110	108	107	106	107	105	102	99	98	95	95
Leq, dB(A)	56	64	69	62	67	72	72	76	79	99	91	92	94	97	99	102	102	108	110	110	109	108	108	108	106	103	99	97	94	92

Measure Sound Power Level Report

Machine: Sound Power Level for DZ406, Cat D10T
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 124 dB(Z)
Sound Power Level = 121 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

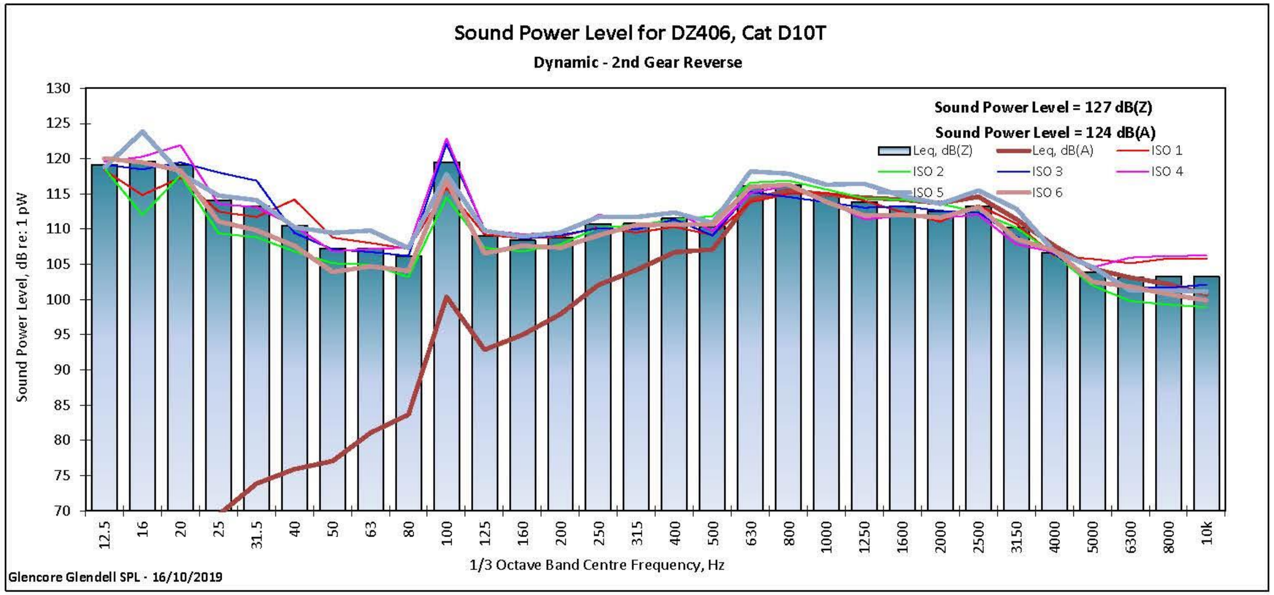


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	119	119	120	109	109	107	105	105	105	118	108	108	108	109	110	111	109	114	114	112	110	110	108	110	106	104	102	101	101	101
Leq, dB(A)	56	62	69	65	70	72	75	79	82	99	92	94	97	100	103	106	106	112	113	112	111	111	110	111	107	105	102	101	100	99

Measure Sound Power Level Report

Machine: Sound Power Level for DZ406, Cat D10T
Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 127 dB(Z)
Sound Power Level = 124 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

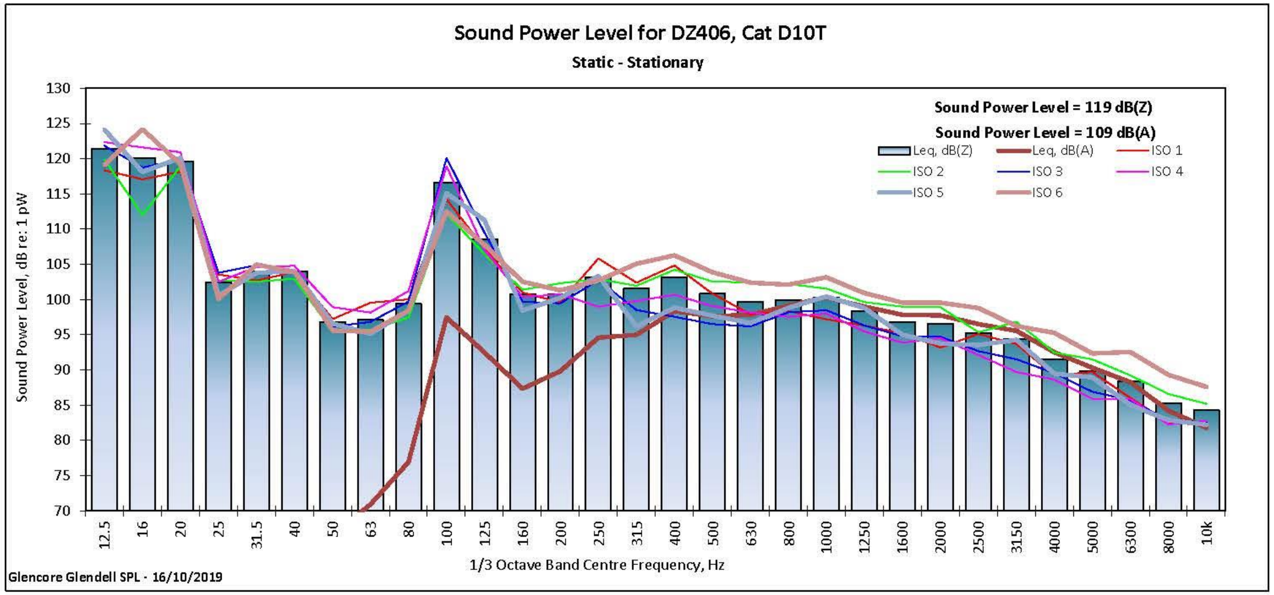


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	119	120	119	114	113	110	107	107	106	119	109	108	109	111	111	111	110	116	116	115	114	113	112	113	110	107	104	103	103	103
Leq, dB(A)	56	63	69	69	74	76	77	81	84	100	93	95	98	102	104	107	107	114	115	115	114	114	114	115	111	108	104	103	102	101

Measure Sound Power Level Report

Machine: Sound Power Level for DZ406, Cat D10T
Activity: Static - Stationary
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 119 dB(Z)
Sound Power Level = 109 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

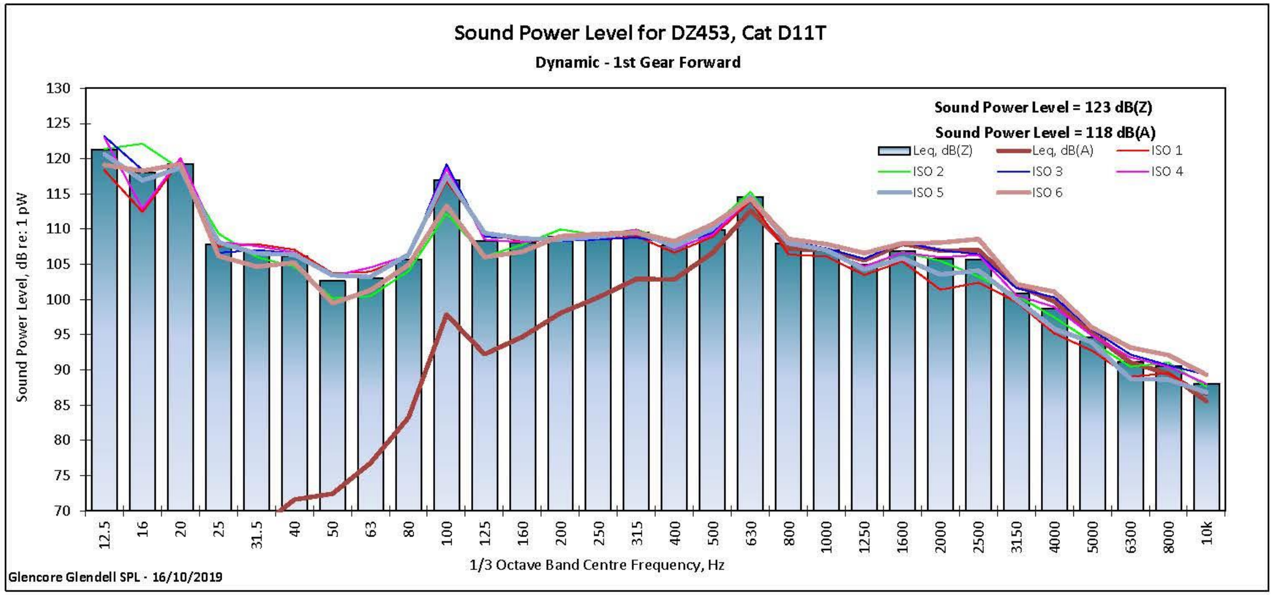


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	120	120	102	104	104	97	97	99	117	109	101	101	103	102	103	101	100	100	100	98	97	97	95	94	91	90	88	85	84
Leq, dB(A)	58	63	69	58	65	69	67	71	77	97	92	87	90	95	95	98	98	98	99	100	99	98	98	97	96	92	90	88	84	82

Measure Sound Power Level Report

Machine: Sound Power Level for DZ453, Cat D11T
Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 123 dB(Z)
Sound Power Level = 118 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

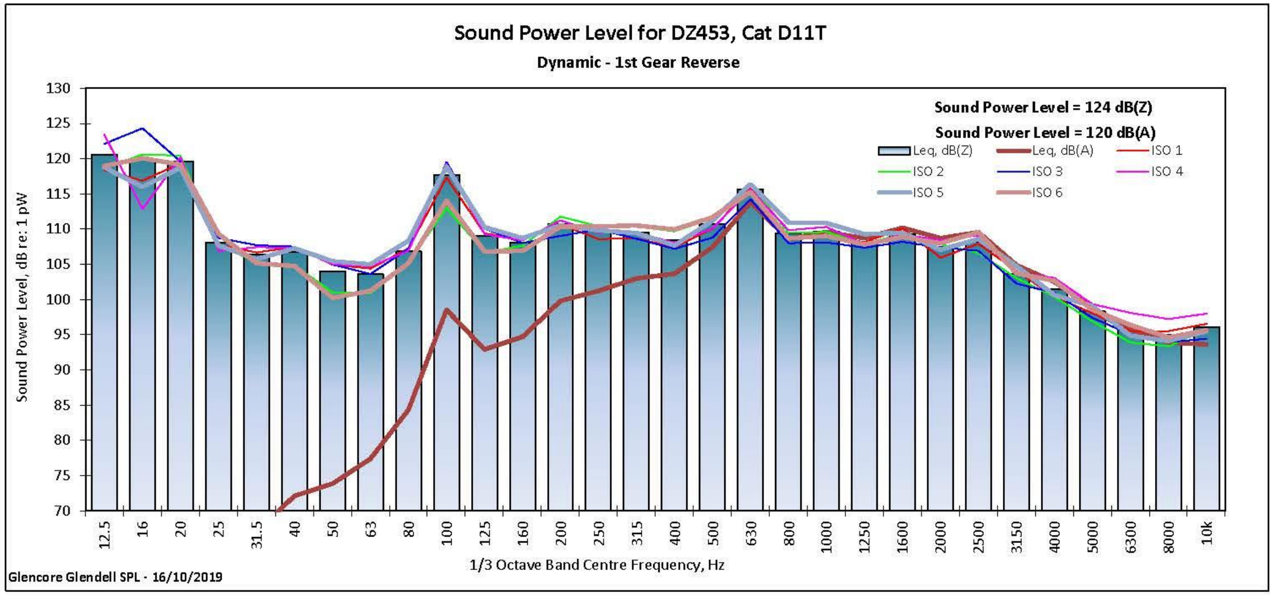


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	118	119	108	107	106	103	103	106	117	108	108	109	109	109	108	110	115	108	107	105	107	106	106	101	99	95	91	91	88
Leq, dB(A)	58	61	69	63	67	72	72	77	83	98	92	95	98	100	103	103	107	113	107	107	106	108	107	107	102	100	95	91	89	86

Measure Sound Power Level Report

Machine: Sound Power Level for DZ453, Cat D11T
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 124 dB(Z)
Sound Power Level = 120 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

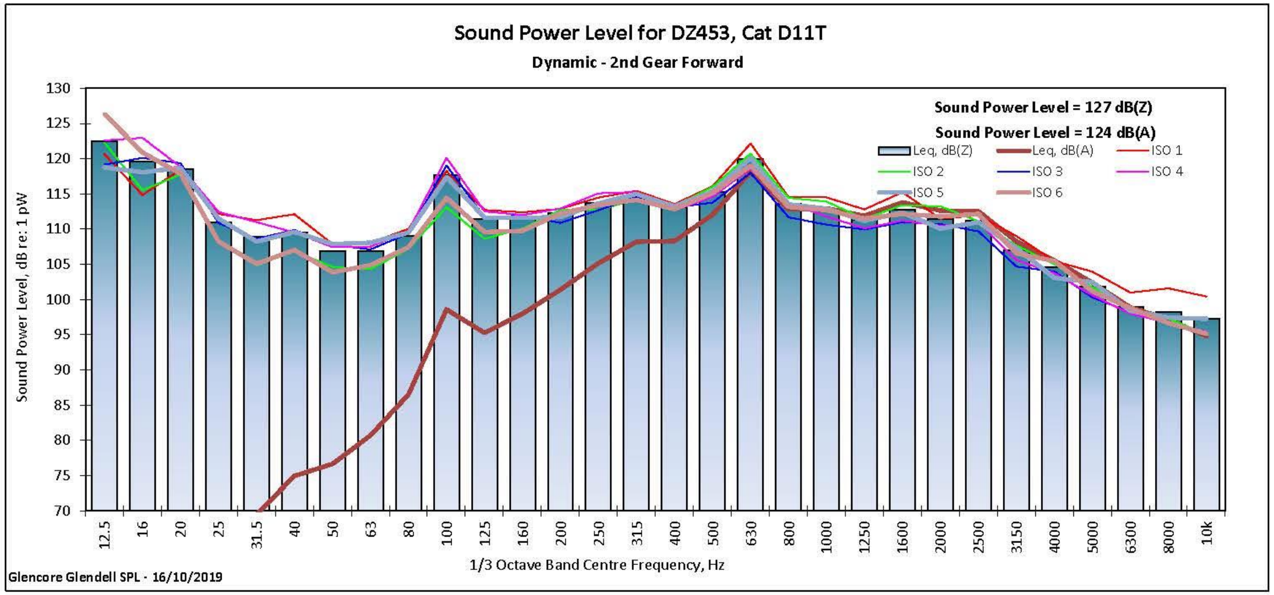


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	120	120	108	106	107	104	104	107	118	109	108	111	110	110	108	111	116	109	110	108	109	107	108	104	101	98	96	95	96
Leq, dB(A)	57	63	69	63	67	72	74	77	84	99	93	95	100	101	103	104	107	114	109	110	109	110	109	110	105	102	99	96	94	94

Measure Sound Power Level Report

Machine: Sound Power Level for DZ453, Cat D11T
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 127 dB(Z)
Sound Power Level = 124 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	120	119	111	109	110	107	107	109	118	111	111	112	114	115	113	115	120	114	113	111	113	111	111	107	105	102	99	98	97
Leq, dB(A)	59	63	68	66	69	75	77	81	87	99	95	98	101	105	108	108	112	118	113	113	112	114	113	112	108	106	102	99	97	95

Measure Sound Power Level Report

Machine: Sound Power Level for DZ453, Cat D11T

Activity: Dynamic - 2nd Gear Reverse

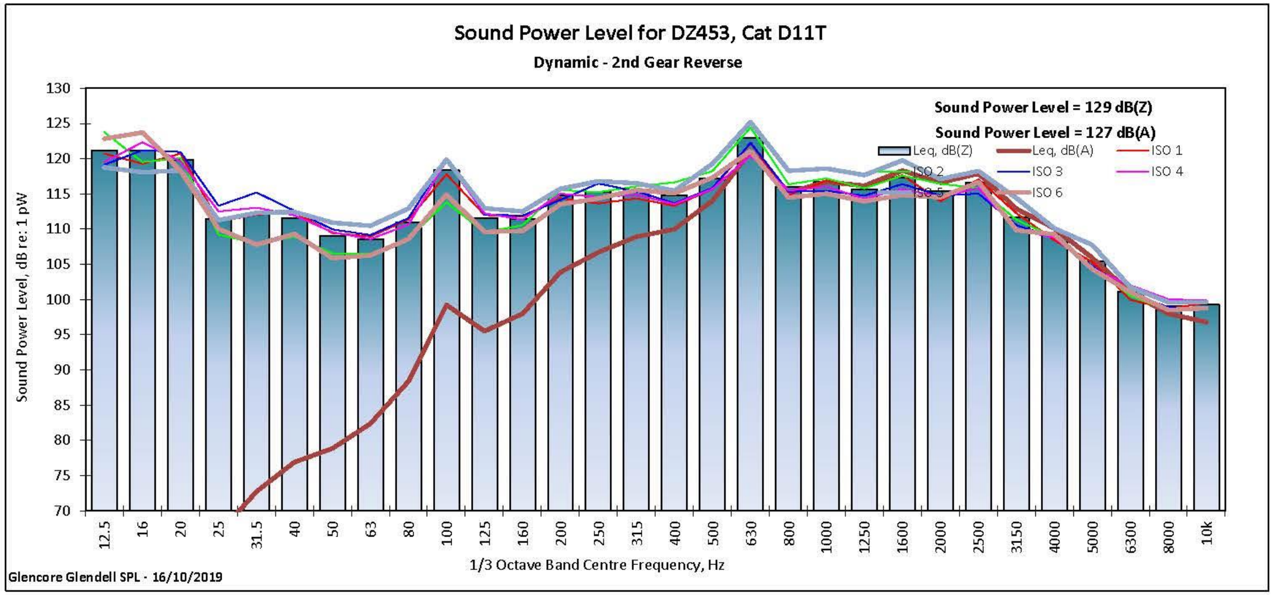
No. ISO Points (of 6) 6

Source: Glencore Glendell SPL - 16/10/2019

Results: Sound Power Level = 129 dB(Z)

Sound Power Level = 127 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

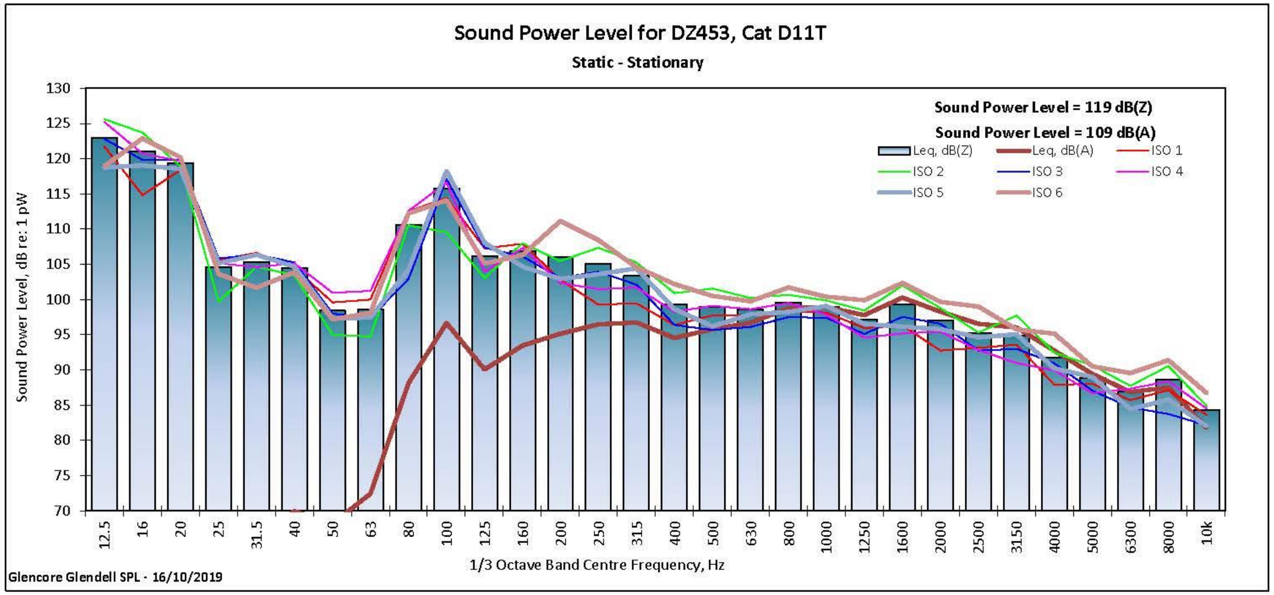


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	121	120	111	112	111	109	109	111	118	112	111	115	115	115	115	117	123	116	117	116	117	115	117	112	109	105	101	99	99
Leq, dB(A)	58	64	69	67	73	77	79	82	88	99	95	98	104	107	109	110	114	121	115	117	116	118	117	118	113	110	106	101	98	97

Measure Sound Power Level Report

Machine: Sound Power Level for DZ453, Cat D11T
Activity: Static - Stationary
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 119 dB(Z)
Sound Power Level = 109 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



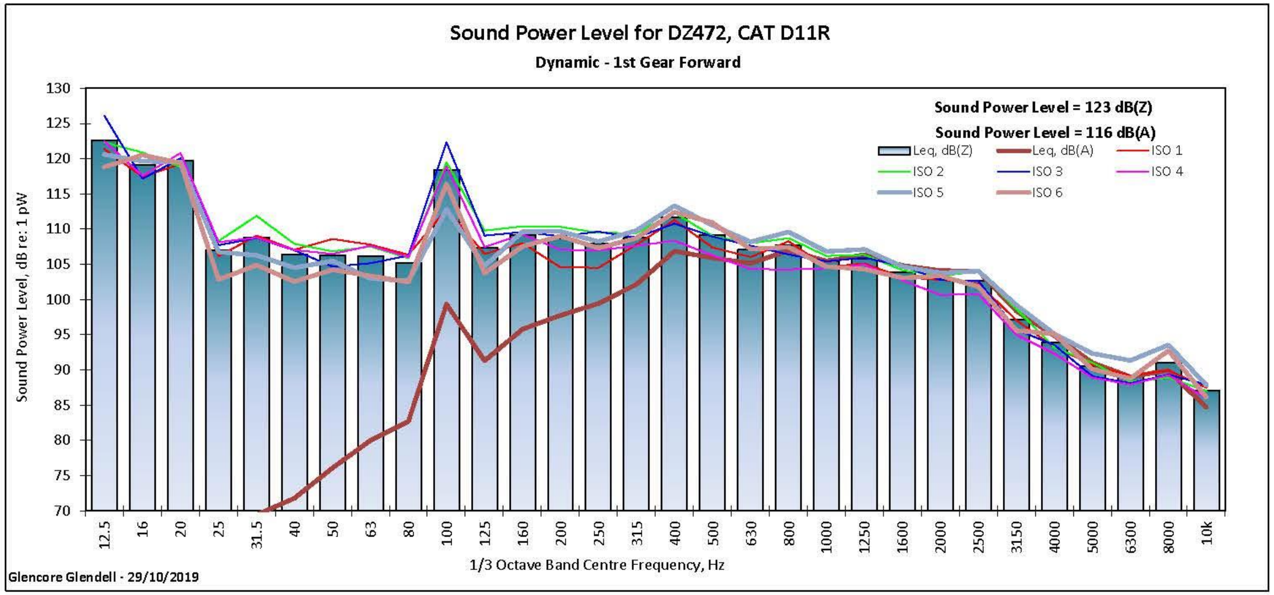
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	123	121	119	105	105	105	98	99	111	116	106	107	106	105	103
Leq, dB(A)	60	64	69	60	66	70	68	72	88	97	90	93	95	96	97

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	99	99	99	100	99	97	99	97	95	95	92	89	87	89	84
Leq, dB(A)	95	96	97	99	99	98	100	98	97	96	93	89	87	87	82

Measure Sound Power Level Report

Machine: Sound Power Level for DZ472, CAT D11R
Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore Glendell - 29/10/2019
Results: Sound Power Level = 123 dB(Z)
Sound Power Level = 116 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

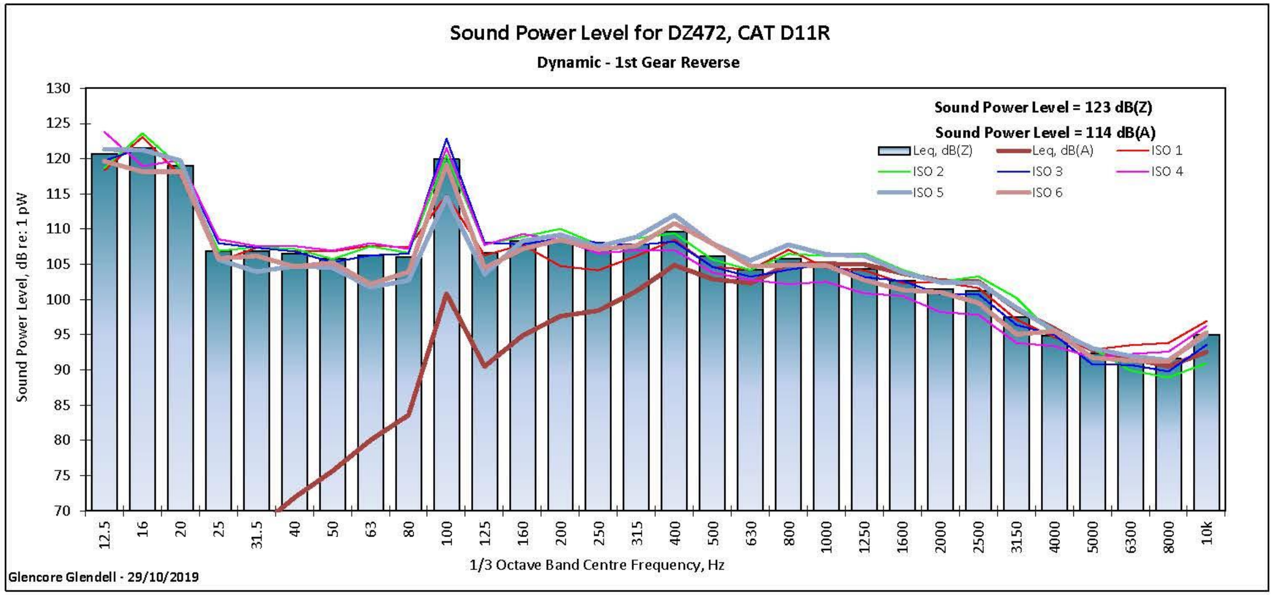


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	123	119	120	107	109	106	106	106	105	118	107	109	109	108	109	112	109	107	108	105	106	104	103	103	97	94	91	89	91	87
Leq, dB(A)	59	62	69	62	69	72	76	80	83	99	91	96	98	99	102	107	106	105	107	105	106	105	104	104	98	95	91	89	90	85

Measure Sound Power Level Report

Machine: Sound Power Level for DZ472, CAT D11R
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore Glendell - 29/10/2019
Results: Sound Power Level = 123 dB(Z)
Sound Power Level = 114 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

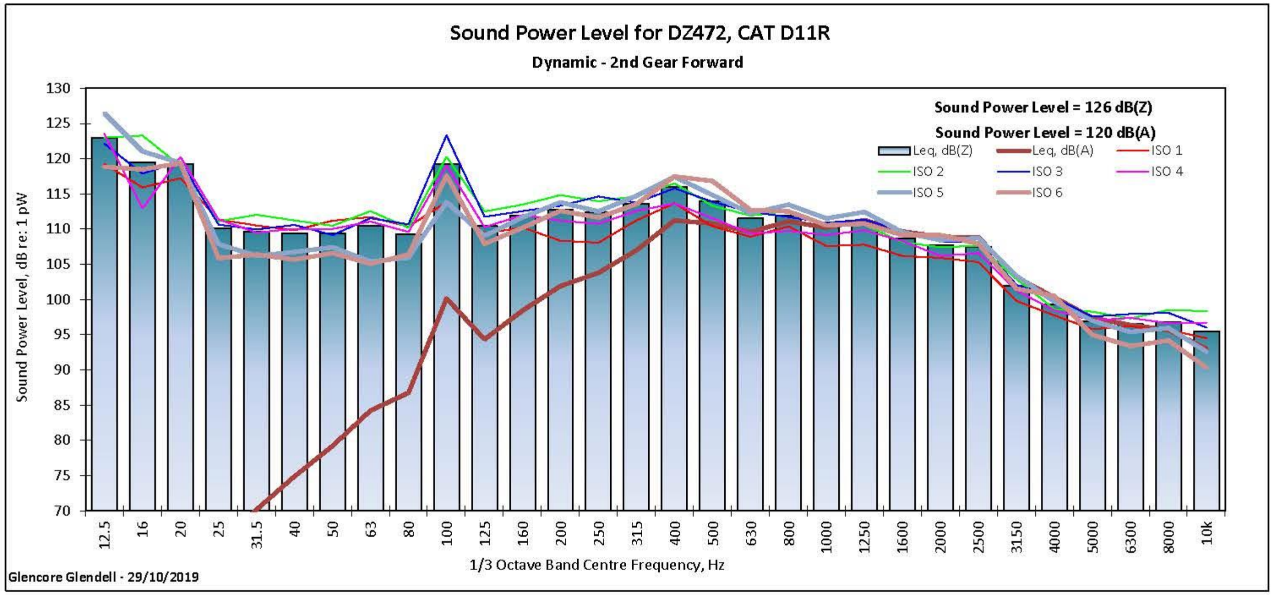


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	122	119	107	107	106	106	106	106	120	107	108	109	107	108	110	106	104	106	105	104	103	101	101	97	95	92	92	92	95
Leq, dB(A)	57	65	69	62	67	72	76	80	84	101	91	95	98	98	101	105	103	102	105	105	105	104	103	103	99	96	93	92	90	93

Measure Sound Power Level Report

Machine: Sound Power Level for DZ472, CAT D11R
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore Glendell - 29/10/2019
Results: Sound Power Level = 126 dB(Z)
Sound Power Level = 120 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



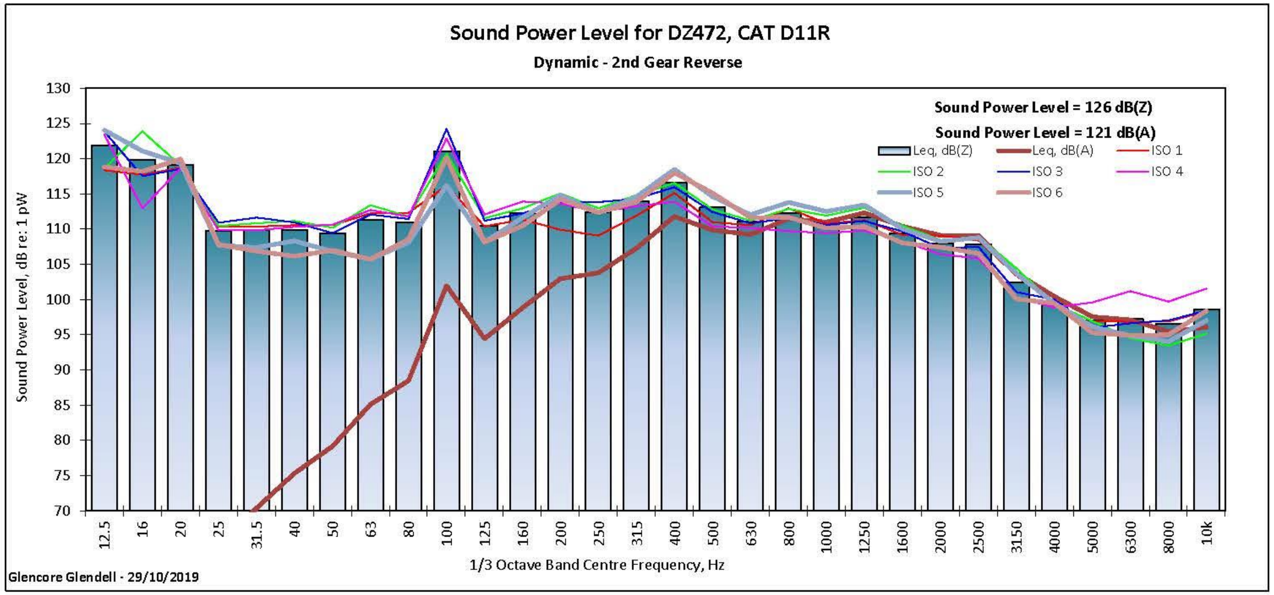
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	123	119	119	110	110	109	109	110	109	119	110	112	113	112	114	116	114	111	112	110	111	109	108	108	102	99	97	96	97	95
Leq, dB(A)	60	63	69	65	70	75	79	84	87	100	94	98	102	104	107	111	111	110	111	110	111	110	109	109	103	100	97	96	96	93

Measure Sound Power Level Report

Machine: Sound Power Level for DZ472, CAT D11R

Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore Glendell - 29/10/2019
Results: Sound Power Level = 126 dB(Z)
Sound Power Level = 121 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

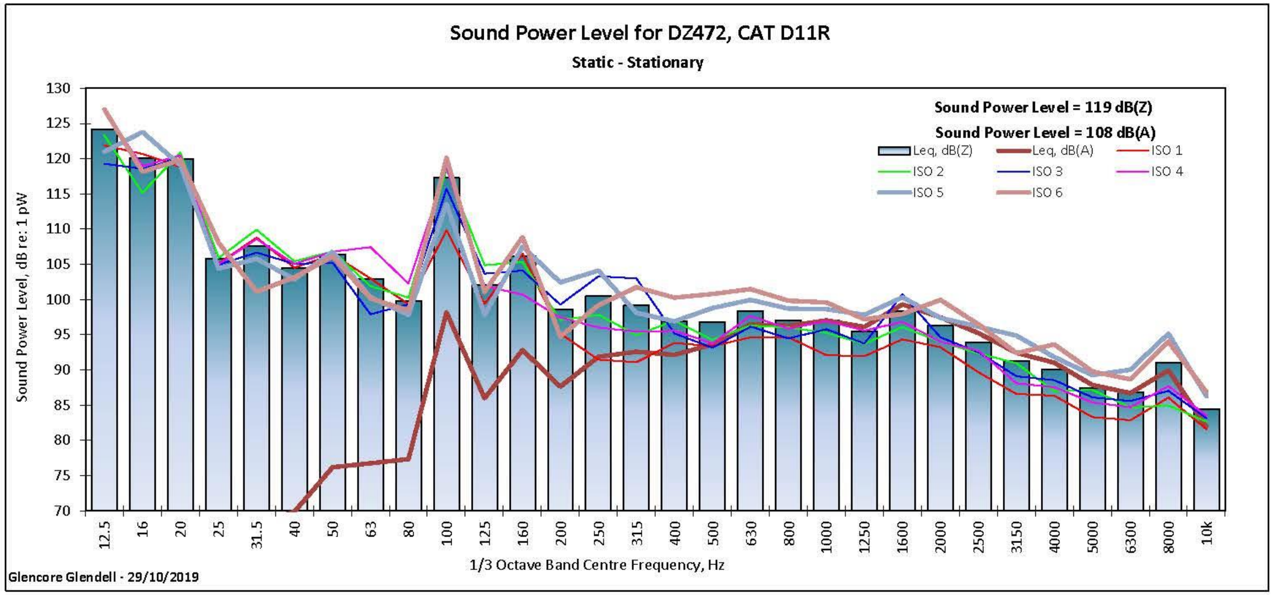


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	120	119	110	110	110	109	111	111	121	111	112	114	112	114	117	113	111	112	111	112	109	108	108	102	99	97	97	97	99
Leq, dB(A)	58	63	69	65	70	75	79	85	88	102	94	99	103	104	107	112	110	109	111	111	112	110	109	109	104	100	98	97	95	96

Measure Sound Power Level Report

Machine: Sound Power Level for DZ472, CAT D11R
Activity: Static - Stationary
No. ISO Points (of 6) 6
Source: Glencore Glendell - 29/10/2019
Results: Sound Power Level = 119 dB(Z)
Sound Power Level = 108 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	124	120	120	106	108	104	106	103	100	117	102	106	99	100	99
Leq, dB(A)	61	63	69	61	68	70	76	77	77	98	86	93	88	92	93

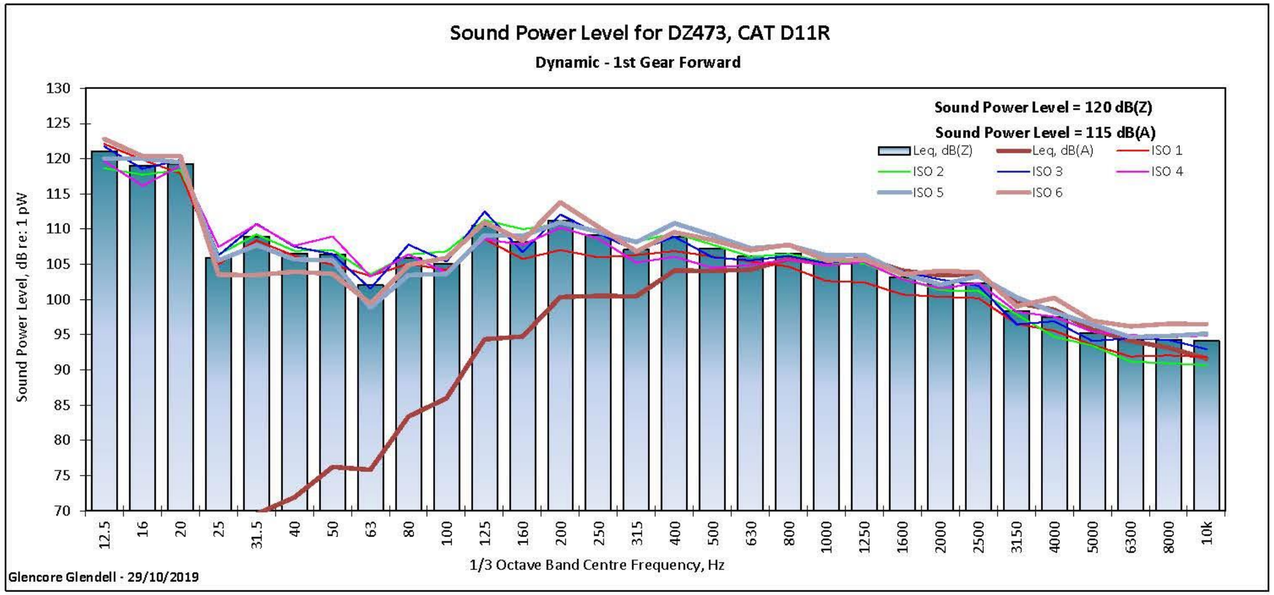
Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	97	97	98	97	97	95	98	96	94	91	90	87	87	91	84
Leq, dB(A)	92	94	96	96	97	96	99	97	95	92	91	88	87	90	82

Measure Sound Power Level Report

Machine: Sound Power Level for DZ473, CAT D11R

Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore Glendell - 29/10/2019
Results: Sound Power Level = 120 dB(Z)
Sound Power Level = 115 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



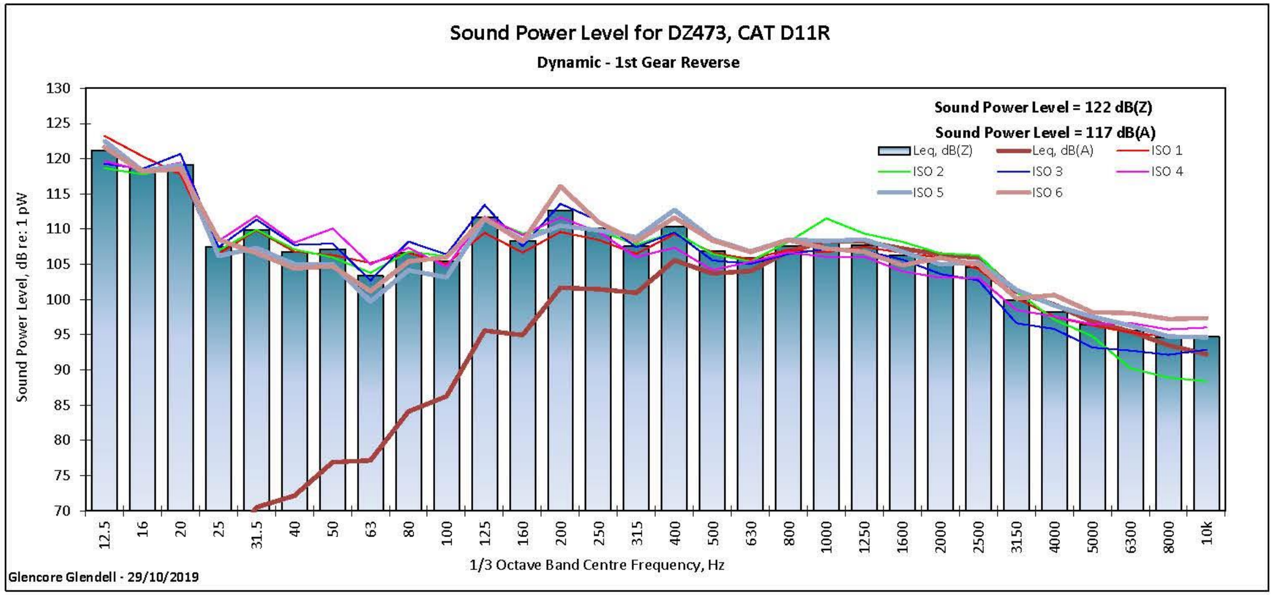
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	121	119	119	106	109	106	106	102	106	105	110	108	111	109	107
Leq, dB(A)	58	62	69	61	70	72	76	76	83	86	94	95	100	101	100

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	109	107	106	107	105	105	103	102	102	98	98	95	94	94	94
Leq, dB(A)	104	104	104	106	105	106	104	103	104	99	99	96	94	93	92

Measure Sound Power Level Report

Machine: Sound Power Level for DZ473, CAT D11R
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore Glendell - 29/10/2019
Results: Sound Power Level = 122 dB(Z)
Sound Power Level = 117 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



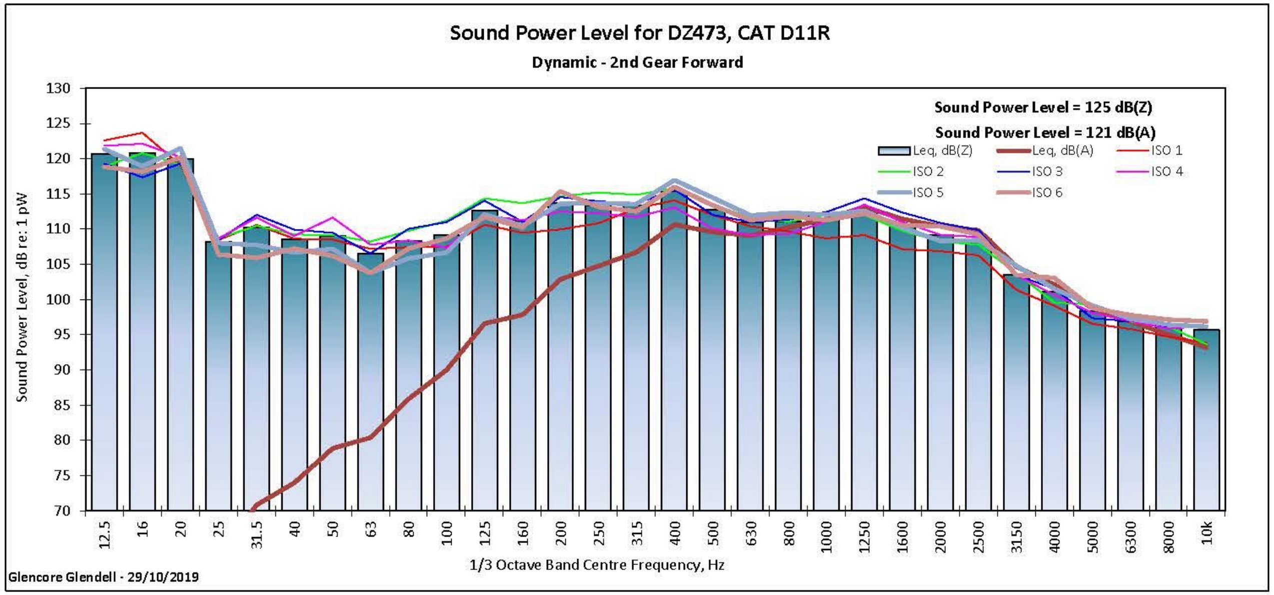
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	119	119	107	110	107	107	103	107	105	112	108	113	110	108	110	107	106	108	108	108	106	105	105	100	98	96	96	95	95
Leq, dB(A)	58	62	69	63	70	72	77	77	84	86	96	95	102	101	101	106	104	104	107	108	108	107	106	106	101	99	97	95	94	92

Measure Sound Power Level Report

Machine: Sound Power Level for DZ473, CAT D11R

Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore Glendell - 29/10/2019
Results: Sound Power Level = 125 dB(Z)
Sound Power Level = 121 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



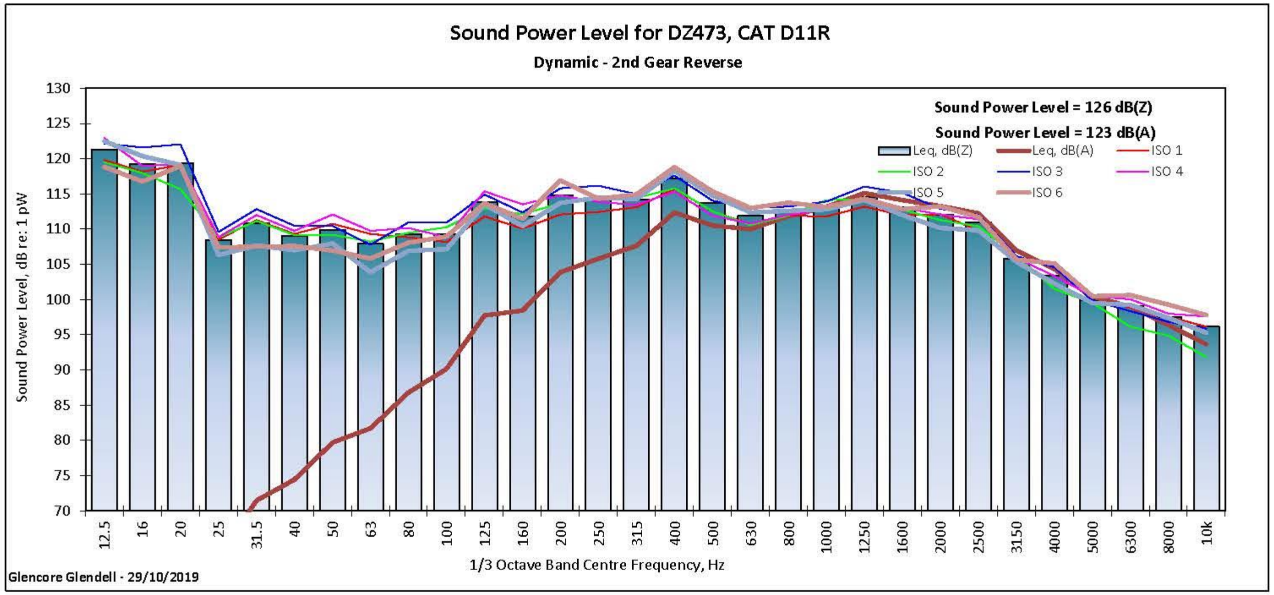
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	121	121	120	108	110	109	109	107	108	109	113	111	114	113	113
Leq, dB(A)	57	64	69	63	71	74	79	80	86	90	97	98	103	105	107

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	115	113	111	111	111	113	110	109	109	103	101	98	97	96	96
Leq, dB(A)	111	110	109	110	111	113	111	110	110	105	102	99	97	95	93

Measure Sound Power Level Report

Machine: Sound Power Level for DZ473, CAT D11R
Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore Glendell - 29/10/2019
Results: Sound Power Level = 126 dB(Z)
Sound Power Level = 123 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

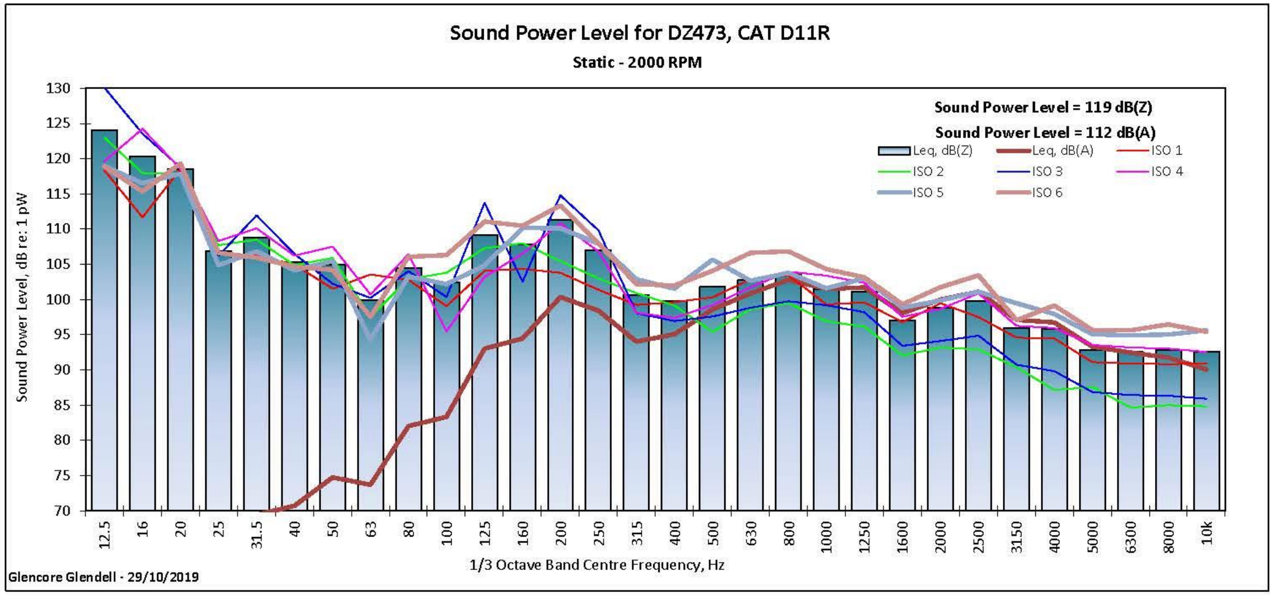


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	119	119	108	111	109	110	108	109	109	114	112	115	114	114	117	114	112	113	113	114	113	112	111	106	103	100	99	97	96
Leq, dB(A)	58	63	69	64	71	74	80	82	87	90	98	98	104	106	108	112	110	110	112	113	115	114	113	112	107	104	100	99	96	94

Measure Sound Power Level Report

Machine: Sound Power Level for DZ473, CAT D11R
Activity: Static - 2000 RPM
No. ISO Points (of 6) 6
Source: Glencore Glendell - 29/10/2019
Results: Sound Power Level = 119 dB(Z)
Sound Power Level = 112 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

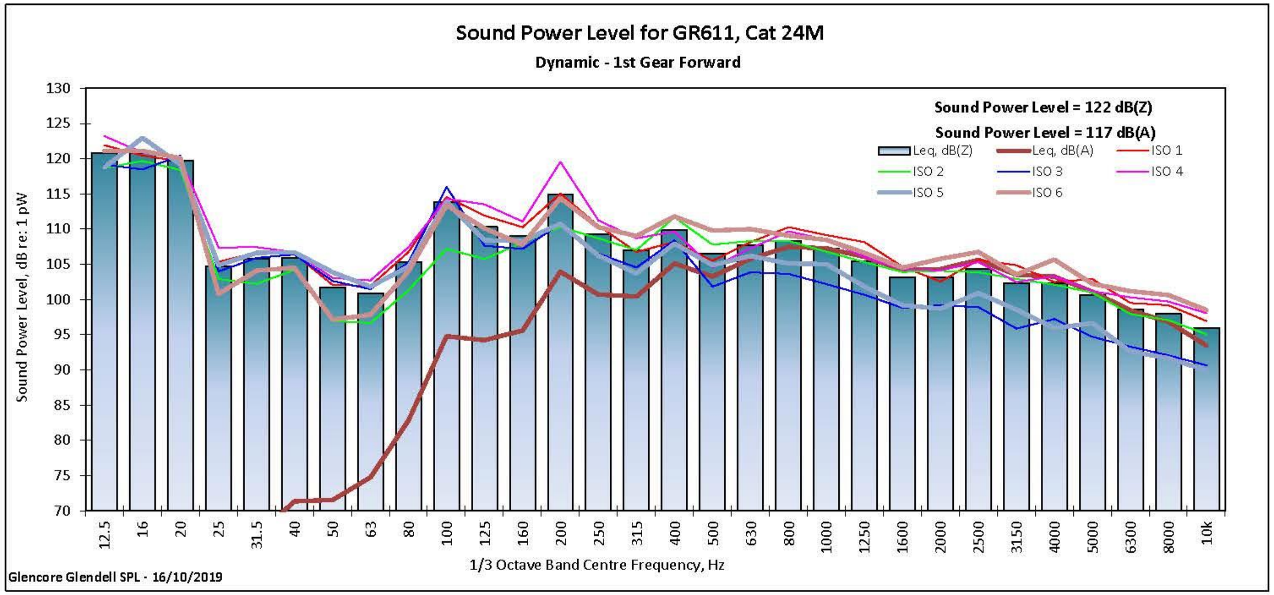


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	124	120	118	107	109	105	105	100	104	102	109	108	111	107	101	100	102	103	104	101	101	97	99	100	96	96	93	93	93	93
Leq, dB(A)	61	64	68	62	69	71	75	74	82	83	93	94	100	98	94	95	99	101	103	101	102	98	100	101	97	97	93	92	92	90

Measure Sound Power Level Report

Machine: Sound Power Level for GR611, Cat 24M
Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 122 dB(Z)
Sound Power Level = 117 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

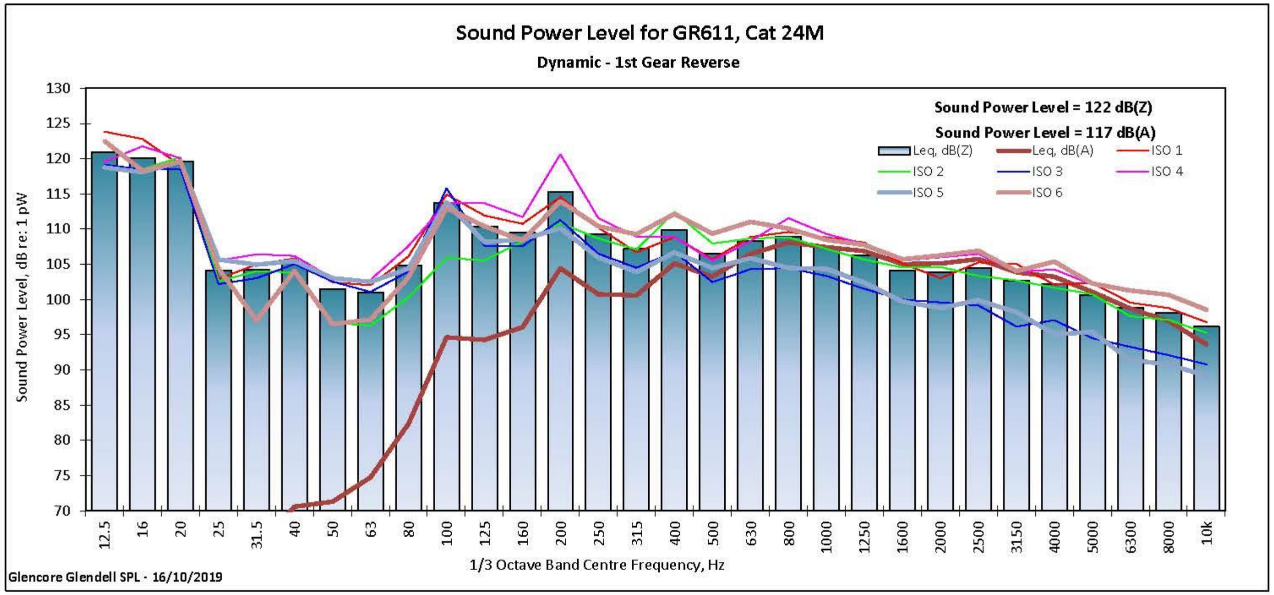


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	121	120	105	106	106	102	101	105	114	110	109	115	109	107	110	106	108	108	107	105	103	103	104	102	102	101	99	98	96
Leq, dB(A)	57	64	69	60	66	71	72	75	83	95	94	96	104	101	100	105	103	106	107	107	106	104	104	106	103	103	101	98	97	93

Measure Sound Power Level Report

Machine: Sound Power Level for GR611, Cat 24M
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 122 dB(Z)
Sound Power Level = 117 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



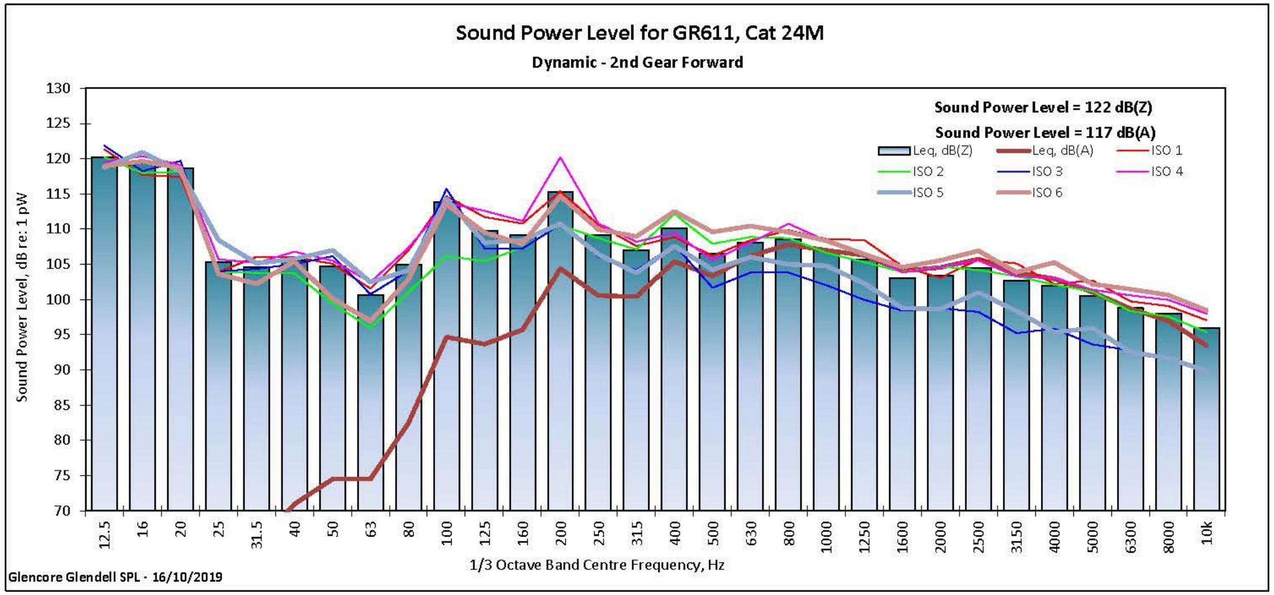
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	121	120	120	104	104	105	101	101	105	114	110	109	115	109	107
Leq, dB(A)	58	63	69	59	65	71	71	75	82	95	94	96	104	101	101

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	110	106	108	109	107	106	104	104	104	103	102	101	99	98	96
Leq, dB(A)	105	103	106	108	107	107	105	105	106	104	103	101	99	97	94

Measure Sound Power Level Report

Machine: Sound Power Level for GR611, Cat 24M
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 122 dB(Z)
Sound Power Level = 117 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



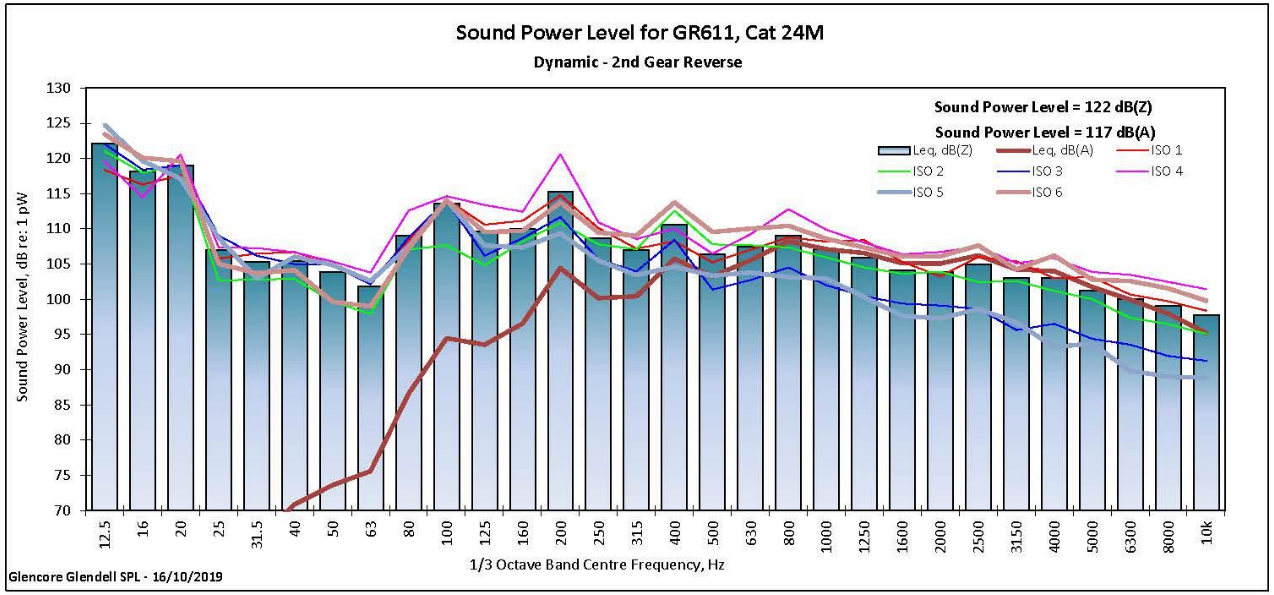
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	120	119	119	105	105	106	105	101	105	114	110	109	115	109	107
Leq, dB(A)	57	63	68	61	65	71	75	74	82	95	94	96	104	101	100

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	110	107	108	109	107	106	103	103	104	103	102	101	99	98	96
Leq, dB(A)	105	103	106	108	107	106	104	105	106	104	103	101	99	97	93

Measure Sound Power Level Report

Machine: Sound Power Level for GR611, Cat 24M
Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 122 dB(Z)
Sound Power Level = 117 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

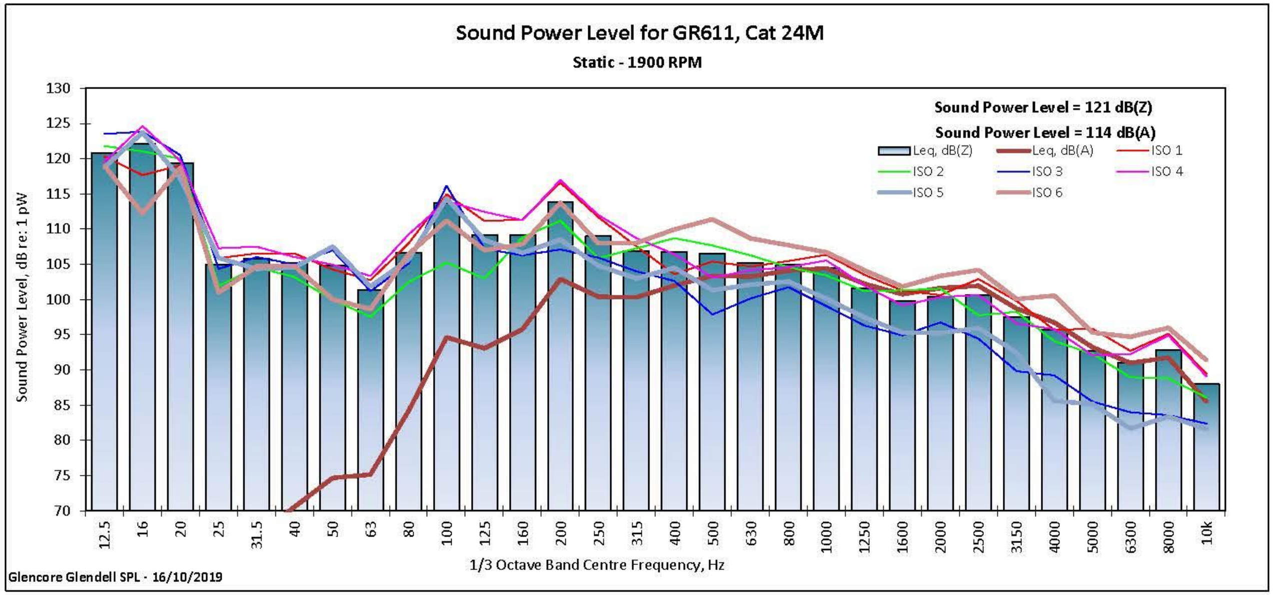


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	118	119	107	105	105	104	102	109	114	110	110	115	109	107	111	106	107	109	107	106	104	104	105	103	103	101	100	99	98
Leq, dB(A)	59	61	68	62	66	71	74	76	87	94	94	97	104	100	100	106	103	106	108	107	107	105	105	106	104	104	102	100	98	95

Measure Sound Power Level Report

Machine: Sound Power Level for GR611, Cat 24M
Activity: Static - 1900 RPM
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 16/10/2019
Results: Sound Power Level = 121 dB(Z)
Sound Power Level = 114 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



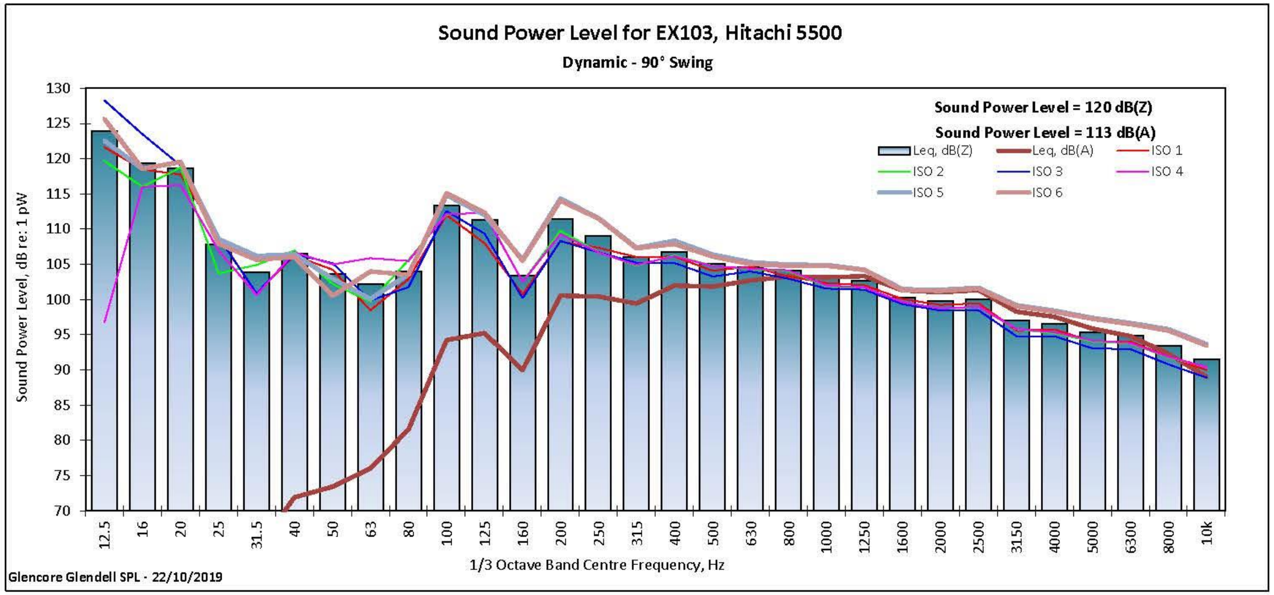
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	122	119	105	106	105	105	101	107	114	109	109	114	109	107	107	107	105	105	104	102	100	100	101	97	96	93	91	93	88
Leq, dB(A)	57	65	69	60	66	71	75	75	84	95	93	96	103	100	100	102	103	103	104	104	102	101	102	102	99	97	93	91	92	85

Measure Sound Power Level Report

Machine: Sound Power Level for EX103, Hitachi 5500

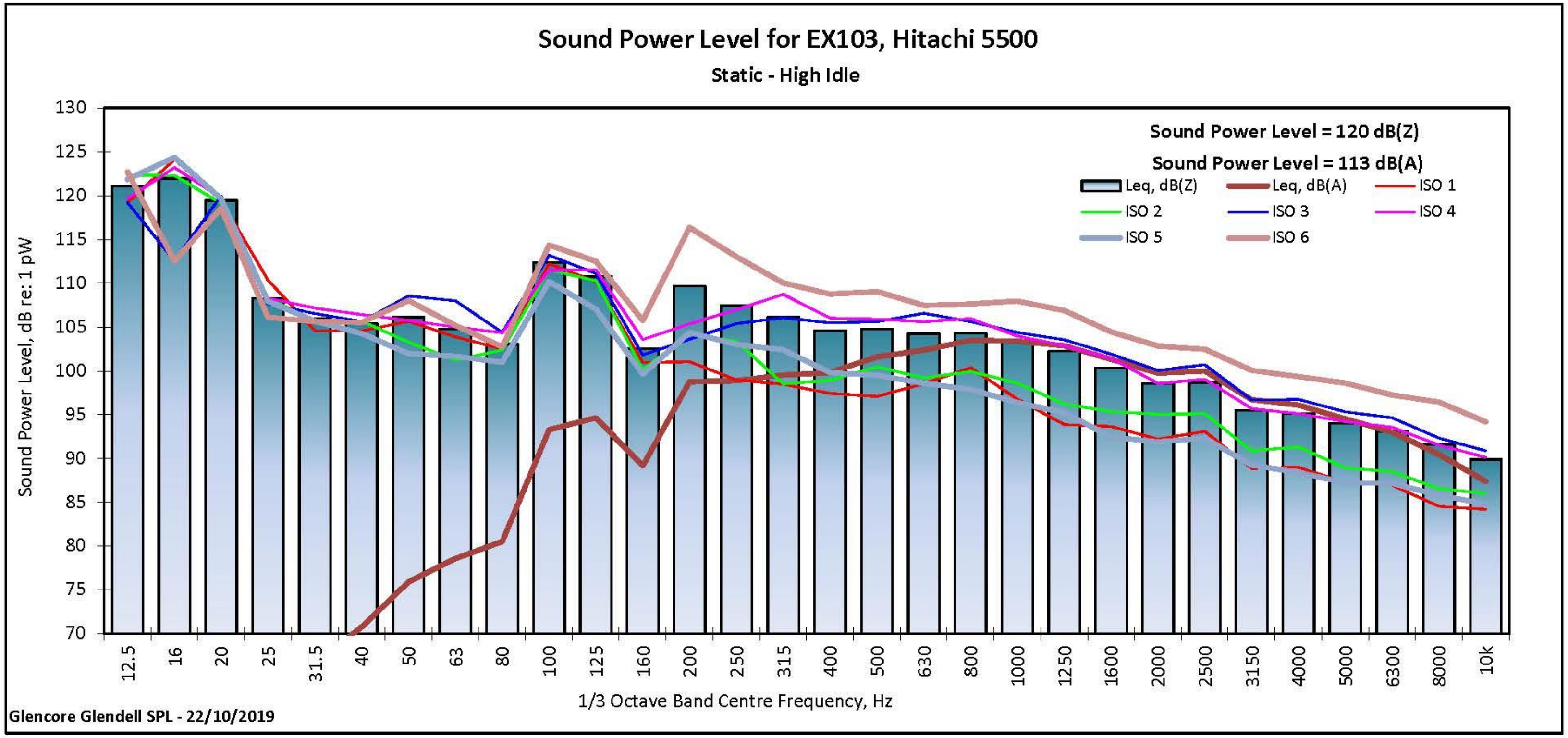
Activity: Dynamic - 90° Swing
No. ISO Points (of 6) 6
Source: Glencore Glendell SPL - 22/10/2019
Results: Sound Power Level = 120 dB(Z)
Sound Power Level = 113 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	124	119	119	108	104	106	104	102	104	113	111	103	111	109	106
Leq, dB(A)	60	63	68	63	64	72	73	76	82	94	95	90	101	100	99

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	107	105	105	104	103	103	100	100	100	97	97	95	95	93	92
Leq, dB(A)	102	102	103	103	103	103	101	101	101	98	98	96	95	92	89



Sound Power Level for EX103, Hitachi 5500
Static - High Idle
Sound Power Level = 120 dB(Z)
Sound Power Level = 113 dB(A)
Leq, dB(Z)
Leq, dB(A)
ISO 1
ISO 2
ISO 3
ISO 4
ISO 5
ISO 6
Sound Power Level, dB re: 1 pW
1/3 Octave Band Centre Frequency, Hz
12.5 16 20 25 31.5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000 10k
70 75 80 85 90 95 100 105 110 115 120 125 130
Glencore Glendell SPL - 22/10/2019

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MACHINE SOUND POWER LEVEL TESTING

2019

Mount Owen Mine

FINAL

September 2019

MACHINE SOUND POWER LEVEL TESTING

2019

Mount Owen Mine

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Thiess Mount Owen

Project Director: Tim Procter
Project Manager: Rod Williams
Technical Director: Tim Procter
Report No. 4609/R01
Date: September 2019

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
1 Draft	Tim Procter	14 August 2019	Rod Williams	15 August 20189
1 Final	Rod Williams	25 September 2019	Rod Williams	25 September 2019

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Figures

Tables

Appendices

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1.0 Introduction

As per the DPE approved Mount Owen/Glendell Noise Management Plan (MGOOC-1779562647-10975), ongoing monitoring requires periodic review of the equipment fleet, at a minimum review rate of 20% of the mobile fleet per year. Umwelt (Australia) Pty Limited (Umwelt) was engaged by Thiess to undertake sound power level (SWL) testing of a selection of mobile machines. **Table 1.1** lists the machines that were tested.

Table 1.1 Tested Machines

Machine Type	Machine ID	Make/Model
Dozers	DZ 1678	Caterpillar D10T
	DZ 1679	Caterpillar D10T
Graders	GR 1220	Caterpillar 24M
Loader	LO 1150	Caterpillar 992G
Haul Truck	RD 1757	Hitachi EH4500
	RD 1758	Hitachi EH4500
	RD 2744	Caterpillar 785C XQ
	RD 2728	Caterpillar 793F XQ
	RD 2741	Caterpillar 793F XQ
	RD 2738	Caterpillar 793F XQ
Water Carts	RD 2059	Caterpillar 777F
Drills	DR 0820	Drilltech D55SP
Excavators	EX 1850	Liebherr 996
	EX 8114	Liebherr 9100

Dynamic SWL was undertaken generally in accordance with the methodology presented in international standards ISO 6395 for dynamic testing and ISO 6393 for stationary (static) testing. In accordance with these standards, sound power is determined in one-third octave bands from 25 Hz to 10 kHz. However, Thiess requested assessment in one-third octave bands from 12.5 Hz to 10 kHz. The SWL testing methodology used is summarised in **Appendix A**. The calibration certificates for the sound measurement equipment can be found in **Appendix B**. The one-third octave results for each machine tested are presented in **Appendix C**.

Dynamic SWL testing of the equipment included their measurement in representative operating conditions, being:

- Dozers, graders and loaders in 1st and 2nd gear forward / reverse motion on relatively flat surfaces
- Haul truck laden up-ramp and unladen down-ramp directions
- Water carts laden up-ramp and laden down-ramp directions
- Drills while drilling
- Excavators through 90° swings.

Static SWL testing of the equipment included stationary testing of machines at the same test site surface used for the dynamic test.

2.0 Results

2.1 Meteorological Conditions

Meteorological conditions at the time of the monitoring program are presented in **Table 2.1** .

Table 2.1 Local Meteorological Conditions (Sentinex13)

Date	Wind Speed (m/s)	Temperature (°C)	Relative Humidity (%)
	Average (range)	Average (range)	Average (range)
16/05/2019	2.0 (0.0 - 5.2)	15.0 (8.3 – 22.1)	79.4 (51.4 – 94.0)
17/05/2019	1.2 (0.0 – 2.7)	15.6 (10.7 – 22.5)	79.2 (52.1 – 93.7)
23/05/2019	0.0 (1.4 – 3.0)	16.8 (12.4 – 23.4)	76.4 (52.0 – 90.1)

2.2 Measured Sound Power Levels

The Z and A-weighted sound power level results for machines in each operating condition are presented in **Table 2.2**. Detailed results for one-third octave bands of the sound power spectrum are included in **Appendix C**.

Table 2.3 lists the sound power level targets, including nominated A-weighted sound power targets from Mount Owen Continued Operations 2015 Environmental Impact Statement (MOCO EIS) and Z-weighted target in Glencore Noise Management Protocol GCAA-625378177-10238 (GCAA NMP). Delivered and in-service targets from GCAA NMP are regardless of mode or operation (i.e. both static and dynamic).

Table 2.4 compares the measured A and Z-weighted sound power levels against the relevant targets presented in

Table 2.2 2019 Sound Power Level Testing Results

Machine ID	Make / Model	Transmission/Mode of operation	Dynamic - Up/Forward		Dynamic - Down/Reverse		Static		Testing Date
			dB(Z)	dB(A)	dB(Z)	dB(A)	dB(Z)	dB(A)	
Dozers									
DZ 1678	Cat D10T	1st gear	121	110	122	116	120	110	17/05/2019
		2nd gear	124	120	128	125			
DZ 1679	Cat D10T	1st gear	121	113	123	117	120	109	17/05/2019
		2nd gear	125	122	128	126			
Graders									
GR 1220	Cat 24M	1st gear	118	111	117	111	118	112	17/05/2019
		2nd gear	119	112	118	112			
Loader									
LO 1150	Cat 992G	1st gear	119	113	116	110	118	113	16/05/2019
		2nd gear	116	111	116	111			
Haul Trucks									
RD 1757	Hitachi EH4500	1st up / -	126	115	122	110	129	112	17/05/2019
RD 1758	Hitachi EH4500	1st up / -	128	116	128	114	128	116	17/05/2019
RD 2744	Cat 785C XQ	1st up / 4th down	120	113	118	109	125	116	16/05/2019
RD 2728	Cat 793F XQ	1st up / 4th down	126	118	123	114	127	117	23/05/2019
RD 2741	Cat 793F XQ	1st up / 3rd down	127	119	127	118	126	119	17/05/2019
RD 2738	Cat 793F XQ	1st up / 4th down	126	117	123	114	129	119	23/05/2019
Water Carts									
RD 2059	Cat 777F	3rd up / 4th down	125	115	114	108	125	114	16/05/2019
Drills									
DR 0820	Drilltech D55SP	Drilling	116	112	-	-	115	112	23/05/2019
Excavators									
EX 1850	Liebherr 996	90° Swing	125	121	-	-	128	125	23/05/2019
EX 8114	Liebherr 9100	90° Swing	116	106	-	-	113	104	23/05/2019

Table 2.3 Sound Power Level Target Values for Mount Owen Machines

Equipment Description	Operation Mode	MOCO EIS[1]	GCAA NMP[2] Delivered		GCAA NMP[2] In Service	
		dB(A)	Full Attenuated, dB(Z)	No Attenuation, dB(Z)	Full Attenuated, dB(Z)	No Attenuation, dB(Z)
Dozer	Forward	112 - 113	121	127	123	129
	Reverse (1st/2nd gear)	118-120 / 120-122				
Grader Cat 16M	Static/Dynamic	108	115	121	117	123
Grader Cat 24M	Static/Dynamic	112	115	121	117	123
Loader	Static/Dynamic	113	121	127	123	129
Haul Truck	Up/Forward	116	121	130	123	132
Cat 793 equiv.	Down/Reverse	114				
	Static	113				
Haul Truck	Up/Forward	114	121	130	123	132
Cat 785 equiv.	Down/Reverse	111				
	Static	112				
Water Cart	Static/Dynamic	115	123	130	125	132
Drill	Static/Dynamic	114	117	125	119	127
Excavator Liebherr 996 equiv.	Static/Dynamic	117	123	130	125	132
Excavator Liebherr 9400 equiv.	Static/Dynamic	116	123	130	125	132

Note [1]: nominated A-weighted sound power targets from Mount Owen Continued Operations 2015 Environmental Impact Statement (MOCO EIS)

Note [2]: Z-weighted target in Glencore Noise Management Protocol GCAA-625378177-10238 (GCAA NMP). Delivered and in-service targets are regardless of mode or operation (i.e. both static and dynamic)

Table 2.4 Comparison of 2019 Sound Power Level Results Against Target Values

Machine ID	Make/Model	Transmission/Mode of operation	Comparison Machine (see Table 2.3)	Dynamic				MOCO EIS	GCAA NMP Delivered	GCAA NMP In-Service
				Up or Forward		Down or Reverse				
				dB(Z)	dB(A)	dB(Z)	dB(A)	dB(A)	dB(Z)	dB(Z)
Dozers										
DZ 1678	**Cat D10T**	1st gear forward 1st gear reverse	Dozer	121 -	110 -	- 122	- 116	Below Below	At +1 above	Below Below
DZ 1679	**Cat D10T**	1st gear forward 1st gear reverse	Dozer	121 -	113 -	- 123	- 117	At Below	At +2 above	Below At
Graders										
GR 1220	**Cat 24M**	1st gear forward 1st gear reverse	Grader Cat 24M	118 -	111 -	- 117	- 111	Below Below	+3 above +2 above	+1 above At
Loader										
LO 1150	**Cat 992G**	1st gear forward 1st gear reverse	Loader	119 -	113 -	- 116	- 110	At Below	Below Below	Below Below
Haul Trucks										
RD 1757	**Hitachi EH4500**	1st up ramp 4th down	Cat 793 equiv.	126 -	115 -	- 122	- 110	Below Below	+5 above +1 above	+3 above Below
RD 1758	**Hitachi EH4500**	1st up ramp down ramp	Cat 793 equiv.	128 -	116 -	- 128	- 114	At At	+7 above +7 above	+5 above +5 above
RD 2744	**Cat 785C XQ**	1st up ramp 4th down	Cat 785 equiv.	120 -	113 -	- 118	- 109	Below Below	Below Below	Below Below
RD 2728	**Cat 793F XQ**	1st up ramp 4th down	Cat 793 equiv.	126 -	118 -	- 123	- 114	+2 above At	+5 above +2 above	+3 above At
RD 2741	**Cat 793F XQ**	1st up ramp 4th down	Cat 793 equiv.	127 -	119 -	- 127	- 118	+3 above +4 above	+6 above +6 above	+4 above +4 above
RD 2738	**Cat 793F XQ**	1st up ramp 4th down	Cat 793 equiv.	126 -	117 -	- 123	- 114	+1 above At	+5 above +2 above	+3 above At
Water Carts										
RD 2059	**Cat 777F**	3rd up ramp 4th down	Water Cart	125 -	115 -	- 114	- 108	At Below	+2 above Below	At Below
Drills										
DR 0820	**Drilltech D55SP**	Drilling	Drill	116	112	-	-	Below	Below	Below
Excavators										
EX 1850	**Liebherr 996**	90° Swing	Liebherr 996 equiv.	125	121	-	-	+4 above	+2 above	At
EX 8114	**Liebherr 9100**	90° Swing	NO REF DATA	116	106[1]	-	-	NA	NA	NA

Note [1]: 10 dB below Liebherr 996 equivalent A-weighted

3.0 Discussion

A discussion of the results relative to the corresponding target values (refer to **Table 2.3**) is included below. Tested machines are considered as 'in-service' and are compared against the GCAA NMP 'in-service' target values. Reference is made to GCAA NMP 'delivered' targets where measured results were both at, or below the 'in-service' targets and the 'delivered' targets. Results for dozer, loaders and graders in second gear forward and second gear reverse are not compared against target values.

Dozers

DZ1678

DZ1678 1st gear forward and 1st gear reverse results were below the MOCO EIS target for A-weighted sound power levels and below both the GCAA 'in-service' Z-weighted sound power level targets for machines with full attenuation. The test data, including static results, show a dominant 100 Hz frequency associated with engine exhaust.

DZ1697

DZ1697 1st gear forward and 1st gear reverse results were either at, or below the MOCO EIS target for A-weighted sound power levels and were either at, or below the Z-weighted GCAA 'in-service' sound power level targets for machines with full attenuation. The test data, including static results, show a dominant 100 Hz frequency associated with engine exhaust. 1st gear reverse also reports a dominant frequency at 1250 Hz

Grader

GR1220 1st gear forward and 1st gear reverse results were below the MOCO EIS target for A-weighted sound power levels. 1st gear forward Z-weighted results was 1 dB above the GCAA 'in-service' target for machines with full attenuation but below the Z-weighted target for machines with no attenuation. 1st gear reverse Z-weighted was at the GCAA 'in-service' target for machines with full attenuation. The test data, including static results, show a dominant 200 Hz 1/3 octave level associated with engine noise.

Loader

LO1150 1st gear forward and 1st gear reverse results were either at, or below the MOCO EIS target for A-weighted sound power levels, and below the GCAA 'in-service' and 'delivered' Z-weighted sound power levels for machines with full attenuation.

Haul Trucks

RD1757

RD1757 1st gear up-ramp laden and 4th gear down-ramp unladen results were below the MOCO EIS target for A-weighted sound power levels. 1st gear up-ramp laden was 3 dB above the GCAA 'in-service' target for full-attenuation but below the Z-weighted target for no attenuation. 4th gear down-ramp unladen was below the GCAA 'in-service' target for machines with full attenuation. To reduce the Z-weighted by 3 dB, the sound power level from the rear of the truck would have to be reduce by 6 dB in the 50 and 80 Hz range. The dominance of the 50 to 80 Hz 1/3 octave level is clearly shown in the Laden Up-ramp chart for RD1757 in **Appendix C**.

RD1758

RD1758 1st gear up-ramp laden and 4th gear down-ramp unladen results were equal to the MOCO EIS target for A-weighted sound power levels. 1st gear up-ramp laden and 4th gear down-ramp unladen results were both 5 dB above the GCAA 'in-service' Z-weighted target for full-attenuation but below the Z-weighted target for no attenuation. To reduce the Z-weighted by 4 to 5 dB, the sound power level from the rear of the truck would have to be reduce by 8 dB in the 50 and 125 Hz range. The dominance of the 50 to 125 Hz 1/3 octave level from the rear of the truck is clearly shown in the up-ramp laden chart and the Static chart for RD1758 in **Appendix C**. Treatment of the truck to reduce the sound power emanating from the rear of the truck when traveling up-ramp laden would reduce the down-ramp unladen sound power by 4 dB.

RD2744

RD2744 1st gear up-ramp laden and 4th gear down-ramp unladen results were both below the MOCO EIS target values for A-weighted sound power levels and below both the GCAA 'delivered' and 'in-service' Z-weighted sound power targets for machines with full attenuation.

RD 2728

RD 2728 1st gear up-ramp laden is 2 dB above the MOCO EIS target A-weighted sound power levels while 4th gear down-ramp unladen is equal to the MOCO EIS target A-weighted sound power levels. 1st gear up-ramp laden is 3 dB above the GCAA 'in-service' Z-weighted sound power target for full-attenuation, while 4th gear down-ramp unladen is equal to the target. Both 1st gear laden up-ramp and 4th gear down-ramp unladen are below Z-weighted target for 'in-service' no attenuation. Reducing the dominant 2000 Hz 1/3 octave level from the rear of the truck, clearly shown in the up-ramp laden chart for RD2728 in **Appendix C**, by 6 dB would reduce the overall A-weighted sound power level by 2 dB. To reduce the Z-weighted by 3 dB the sound power level from the engine exhaust presenting at the rear and right-hand side of the truck would need to be reduce by 6 dB in the 50 and 100 Hz range. The dominance of the 50 and 100 Hz 1/3 octave level from the rear of the truck is clearly shown in the up-ramp laden chart for RD2728 in **Appendix C**.

RD2714

RD2714 1st gear up-ramp laden and 4th gear down-ramp unladen are 3 dB and 4 dB above the MOCO EIS target values for A-weighted sound power levels, respectively. 1st gear up-ramp laden and 4th gear down-ramp unladen are 4 dB above the GCAA 'in-service' Z-weighted sound power target for full-attenuation. Both 1st gear laden up-ramp and 4th gear down-ramp unladen are below Z-weighted target for 'in-service' no attenuation. Reducing the 800 to 2000 Hz 1/3 octave level from the rear and right-hand side of the truck, apparent in the up-ramp laden chart for RD2741 in **Appendix C**, by 6 dB and reducing the 160 Hz from the front of the tuck by at least 6 dB would reduce the overall A-weighted sound power level by 3 dB. Treatment of the truck to reduce the sound power emanating from the rear and right-hand side of the truck and the 160 Hz from the front would reduce the down-ramp unladen sound power by 4 dB. To reduce the Z-weighted by 4 dB the sound power level from the engine enclosure needs to be reduce by 6 dB in the 50 and 125 Hz range. The dominance of the 50 and 125 Hz 1/3 octave level from the rear of the truck is shown in the up-ramp laden chart for RD2741 in **Appendix C**. Treatment of the truck to reduce the sound power emanating from the engine enclosure would reduce the down-ramp unladen sound power by 4 dB

RD2738

RD2738 1st gear up-ramp laden is 1 dB above the MOCO EIS target A-weighted sound power level, while 4th gear down-ramp was equal to the target A-weighted sound power level. 1st gear up-ramp laden is 3 dB above GCAA 'in-service' Z-weighted sound power target for full-attenuation, while 4th gear down-ramp unladen is equal to the target. Both results are below the Z-weighted sound power levels for no attenuation. Reducing the 2000 Hz 1/3 octave level from the rear of the truck, shown in the up-ramp laden chart for RD2738 in **Appendix C**, by up to 6 dB would reduce the overall A-weighted sound power level by 1 dB. To reduce the Z-weighted by 3 dB the sound power level from the engine exhaust presenting at the in the 50 and 100 Hz range would need to be reduced by 6 dB. The presence of the 50 and 100 Hz 1/3 octave level are shown in the up-ramp laden chart for RD2738 in **Appendix C**.

Water Cart

RD2059 3rd gear up-ramp laden and 4th gear down-ramp laden were either at, or below the MOCO EIS target for A-weighted sound power levels and at, or below the GCAA NMP 'in-service' Z-weighted sound power levels for machines with full attenuation. The test data, including static results, show a dominant 80 Hz 1/3 octave level associated with the engine exhaust.

Drill

The dynamic results for DR0820 were below the MOCO EIS target for A-weighted sound power levels and below the GCAA 'in-service' Z-weighted sound power levels for machines with full attenuation.

Excavators

EX1850

The dynamic result was for EX1850 were 4 dB above the MOCO EIS target for A-weighted sound power level and equal to the GCAA NMP 'in-service' Z-weighted sound power levels for machines with full attenuation. The test data shows the presence of dominant frequencies in the 250 to 8000 Hz 1/3 octave level range. The test data, presented in **Figure 1** compared with the one standard deviation envelop of equivalent equipment, indicates the higher than anticipated sound power level is likely associated with the excavator fans. As the fan sound attenuation equipment was in place, it is likely the fan speeds were controlled to 75% of the maximum speed. Below 250 Hz the measured 1/3 octave sound power levels are within the one standard deviation envelop of equivalent equipment.

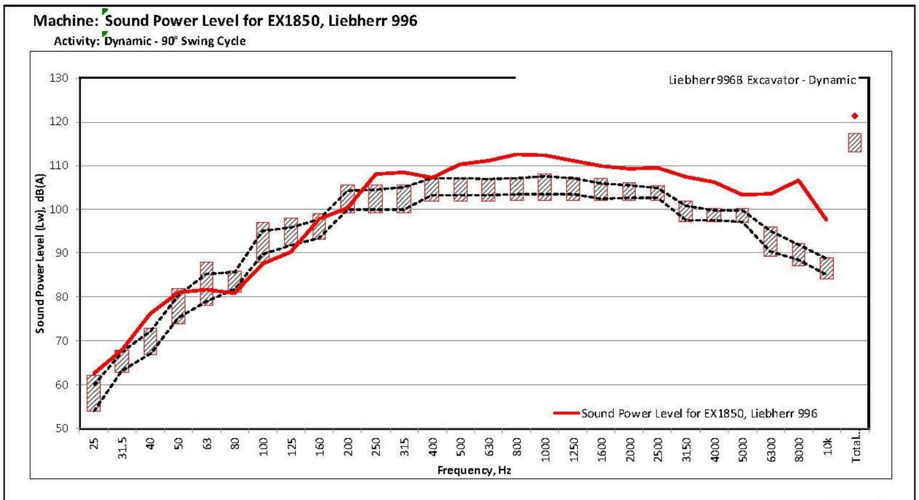

Figure 1
Comparison of measured A-weight EX1850 sound power level with the one standard deviation envelop of equivalent equipment

EX8114

The dynamic results for EX8114 were 10 dB below the MOCO EIS target for A-weighted sound power level of the larger waste excavators.

APPENDIX A

Methodology - Sound Power Level Testing of Mobile Equipment

A.1 Testing Standards

The monitoring program was conducted in accordance with:

MGD15 - Mobile and transportable plant for use on mines and petroleum sites (Amd. 2018)

ISO 6395:2008 – Earth-moving machinery - Determination of sound power level - Dynamic test conditions

ISO 6393:2008 – Earth-moving machinery - Determination of sound power level - Stationary test conditions

ISO 3744:2010 - Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane

ISO 4872 – Measurement of airborne noise emitted by construction equipment intended for outdoor use -- Method for determining compliance with noise limits

The monitoring program also took into consideration the requirements of:

AS 2012.2-1990 – Acoustics - Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors - Stationary test condition, Operator's position

AS/NZS 1269.1-2005 - Occupational noise management - Measurement and assessment of noise immission and exposure

A.2 Equipment Used

The monitoring program was conducted using the following equipment

SVAN958A (59838) - four (4) channel sound and vibration analyser

SVAN958A (59839) - four (4) channel sound and vibration analyser

SVAN SV36 (90131) – 94/114 dB calibrator

Kestrel 4500 – weather meter

Calibration certificates are included in **Appendix B**.

A.3 Sound Power Level Testing

The monitoring program methodology is outlines as follows:

- Sound power levels have been determined in one-third octave bands.
- Glencore Coal Assets Australia (GCAA) protocol GCAA 11.11 Noise Management requires the measurements to be from 25 Hz to 10 kHz to enable reporting of Linear (Z-weighted) and A-weighting sound power levels. Data capture data from 12.5 Hz to 20 Hz has been included in the reporting of the monitoring data but not the determination of sound power levels The 12.5 Hz to 20 Hz data can be used to assess low frequency noise and/or are often identifiable within the background acoustic environment.

- Measurements made from six ISO microphones. **Figure A.1** shows the horizontal (left image) and vertical (right image) positions of each microphone.
- The size of the measurement surface is determined as per ISO 6395:2008(E). This generally constitutes a radius of 16 – 20m to accommodate the tested haul trucks.

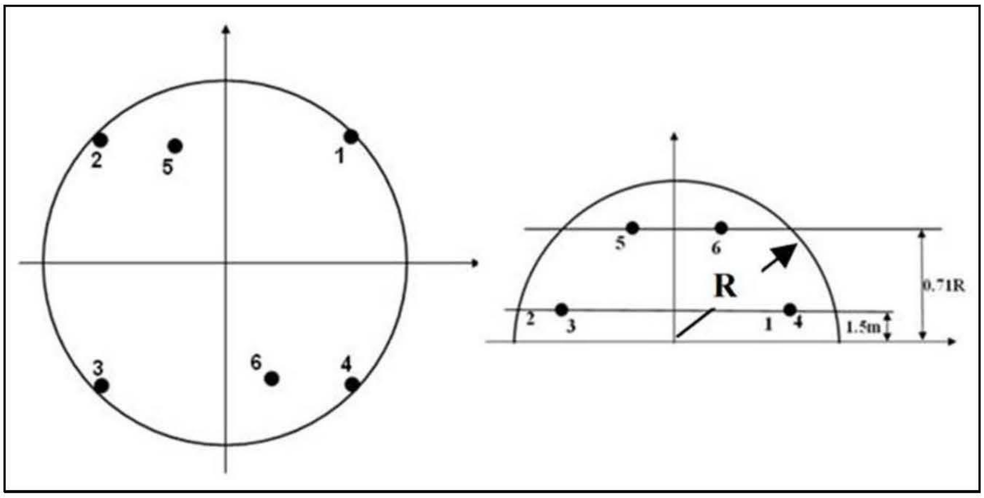

Figure A.1 - Microphone position for ISO Sound Power Level testing

A.4 Test Area Environment

The test areas included a haul road and flat dump area with sufficient length to allow machines to safely accelerate, pass through the test area and decelerate.

In accordance with ISO 6395 and GCAA 11.11 Noise Management Protocol, the location of the test area was chosen to minimise the impacts of reflective surfaces such as highwalls and windrows.

Care was also taken to ensure that background noise levels were at least 6 dB less than measured equipment being tested. A correction is also applied for background levels between 6 dB – 15 dB less than measured dynamic levels to ensure that background noise has limited effect on measured levels. In addition to this, Mount Owen requires the background noise levels to be reported in one-third octave bands from 12.5 Hz to 10 kHz

The haul road test area had a nominal slope of approximately 10%. Testing consisted of up-ramp loaded test and a down-ramp unloaded test on the haul road. The dump area had a slope of approximately 0% to facilitate the forward and reverse testing of the bulldozers and rubber tyres dozer.

A.5 Mobile Equipment

Haul truck up-ramp laden test

As per GCAA 11.11 Noise Management Protocol, haul trucks are loaded with the nominal rated load and driven up hill through the test area while maintaining the manufacturers rated engine speed. Trucks progress at a consistent speed through the test area.

Haul truck down-ramp unladen test

As per GCAA 11.11 Noise Management Protocol, the unloaded haul truck moved down-ramp through the test area while maintaining the maximum descent speed considered safe (approximately 20-23 km/hr). Trucks progress at a consistent speed through the test area.

Water truck

As per GCAA 11.11 Noise Management Protocol, up-ramp and down-ramp tests are conducted with the water truck operating with the maximum rated load

Bulldozer and loader 1st gear test forward and reverse

As per GCAA 11.11 Noise Management Protocol, earthmoving machine moved through the test area unloaded in 1st gear/2nd gear at a constant speed with auxiliary equipment attached and raised to approximately 0.3 m above the test surface.

Bulldozer and loader 2nd gear test forward and reverse

To provided reference material for assessing machine performance and data for noise modelling purposes the earthmoving machine moved through the test area unloaded in 2nd gear at a constant speed with auxiliary equipment attached and raised to approximately 0.3 m above the test surface.

APPENDIX B

Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 22355 & FILT 4741

Equipment Description: Sound & Vibration Analyzer

Manufacturer: Svantek

Model No: SVAN-958A **Serial No:** 59838

Microphone Type: N/A **Serial No:** N/A

Preamplifier Type: N/A **Serial No:** N/A

Filter Type: 1/3 Octave **Serial No:** 59838

Comments: All tests passed for class 1.
(See over for details)

Owner: Umwelt (Australia) Pty Ltd
75 York Street
Teralba, NSW 2284

Ambient Pressure: 999 hPa ±1.5 hPa

Temperature: 25 °C ±2° C **Relative Humidity:** 61% ±5%

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: JK ...... **AUTHORISED SIGNATURE:** ....
Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

NATA
WORLD RECOGNISED ACCREDITATION

ACU-VIB
ELECTRONICS

HEAD OFFICE
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
Tel: (02) 96808133 Fax: (02)96808233
Mobile: 0413 809806
web site: www.acu-vib.com.au

Accredited Lab. No. 9262
Acoustic and Vibration Measurements

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CERTIFICATE NO.: SLM 22355 & FILT 4741

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	N/A
Acoustical Frequency Weighting	12	N/A
Self Generated Noise	11.1	N/A
Electrical Noise	11.2	Entered
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.
A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Checked by: IK

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

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AVCERT10

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 22356 & FILT 4740

Equipment Description: Sound & Vibration Analyzer

Manufacturer: Svantek

Model No: SVAN-958A **Serial No:** 59839

Microphone Type: N/A **Serial No:** N/A

Preamplifier Type: N/A **Serial No:** N/A

Filter Type: 1/3 Octave **Serial No:** 59839

Comments: All tests passed for class 1.
(See over for details)

Owner: Umwelt (Australia) Pty Ltd
75 York Street
Teralba, NSW 2284

Ambient Pressure: 999 hPa ±1.5 hPa

Temperature: 24 °C ±2° C **Relative Humidity:** 54% ±5%

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..JK.. **AUTHORISED SIGNATURE:** ....
Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

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AVCERT10 Rev. 1.3 15.05.18

CERTIFICATE NO.: SLM 22356 & FILT 4740

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	Clause	Result
Absolute Calibration	10	N/A
Acoustical Frequency Weighting	12	N/A
Self Generated Noise	11.1	N/A
Electrical Noise	11.2	Entered
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.
A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

Date of Calibration: 18/07/2018 **Issue Date:** 18/07/2018

Checked by: IK

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

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Accredited Lab. No. 9262
Acoustic and Vibration Measurements

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Page 2 of 2 End of Calibration Certificate
AVCERT10

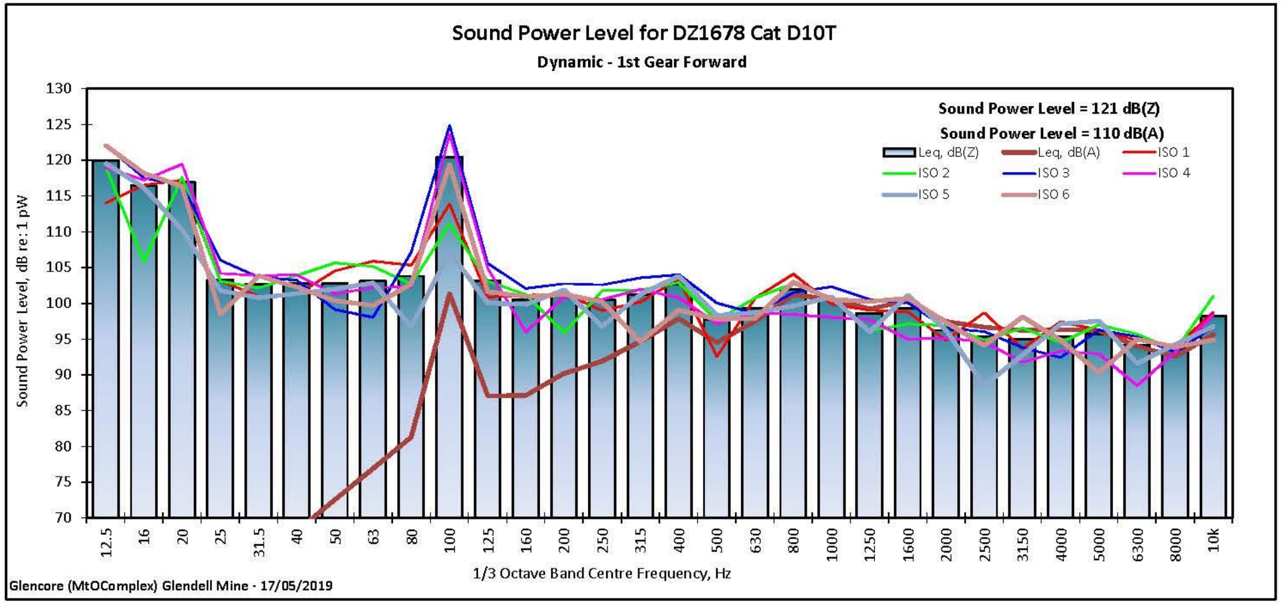
APPENDIX C

Sound Power Level Results

Measure Sound Power Level Report

Machine: Sound Power Level for DZ1678 Cat D10T
Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell Mine - 17/05/2019
Results: Sound Power Level = 121 dB(Z)
Sound Power Level = 110 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

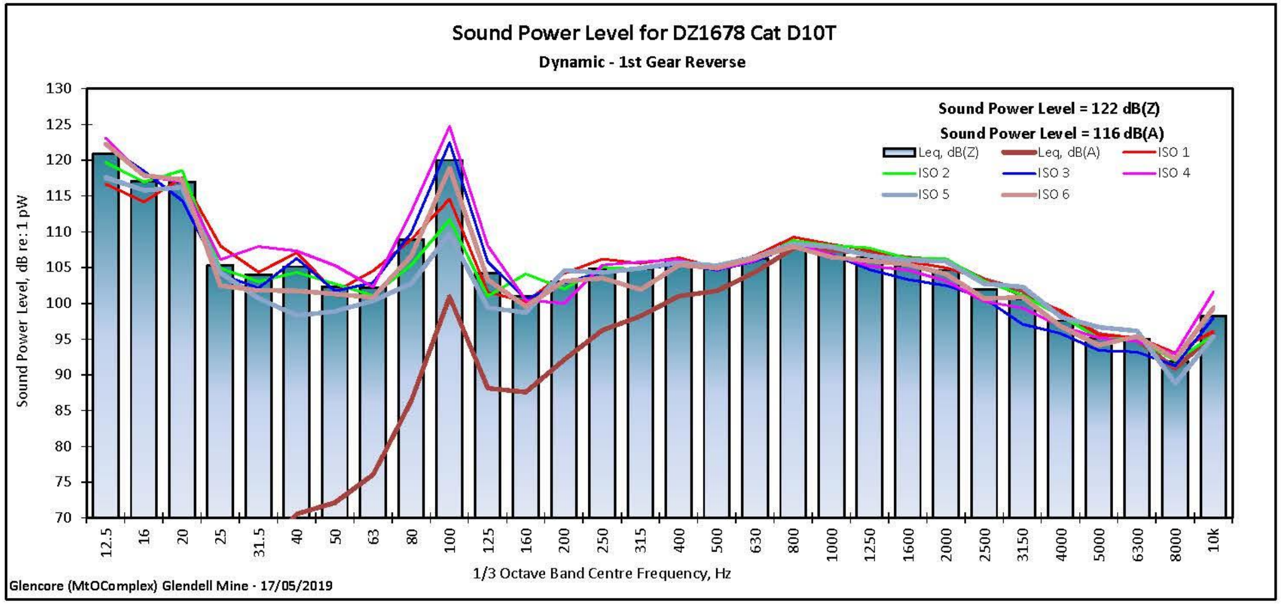


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	116	117	103	103	103	103	103	104	120	103	101	101	101	101	103	98	99	102	101	99	99	96	95	95	95	96	94	94	98
Leq, dB(A)	57	60	66	59	63	68	73	77	81	101	87	87	90	92	95	98	95	97	101	101	99	100	97	97	96	96	96	94	93	96

Measure Sound Power Level Report

Machine: Sound Power Level for DZ1678 Cat D10T
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell Mine - 17/05/2019
Results: Sound Power Level = 122 dB(Z)
Sound Power Level = 116 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



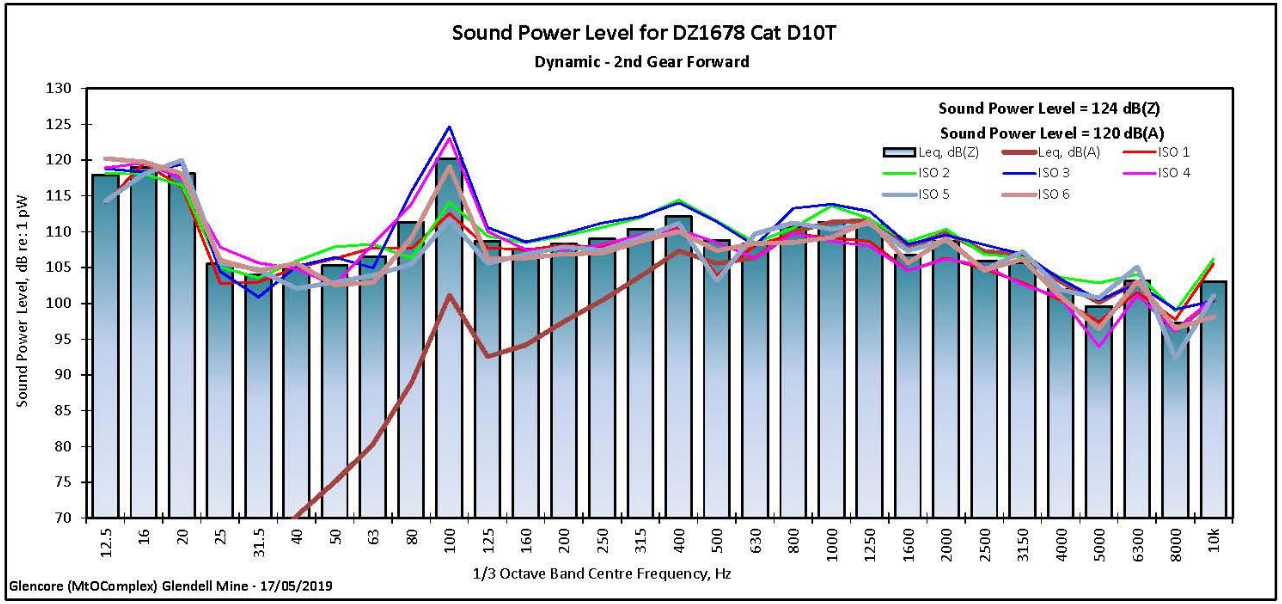
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	121	117	117	105	104	105	102	102	109	120	104	101	103	105	105
Leq, dB(A)	57	60	66	61	65	71	72	76	86	101	88	88	92	96	98

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	106	105	106	108	107	106	105	105	102	101	98	95	95	92	98
Leq, dB(A)	101	102	104	108	107	107	106	106	103	102	99	96	95	91	96

Measure Sound Power Level Report

Machine: Sound Power Level for DZ1678 Cat D10T
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell Mine - 17/05/2019
Results: Sound Power Level = 124 dB(Z)
Sound Power Level = 120 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



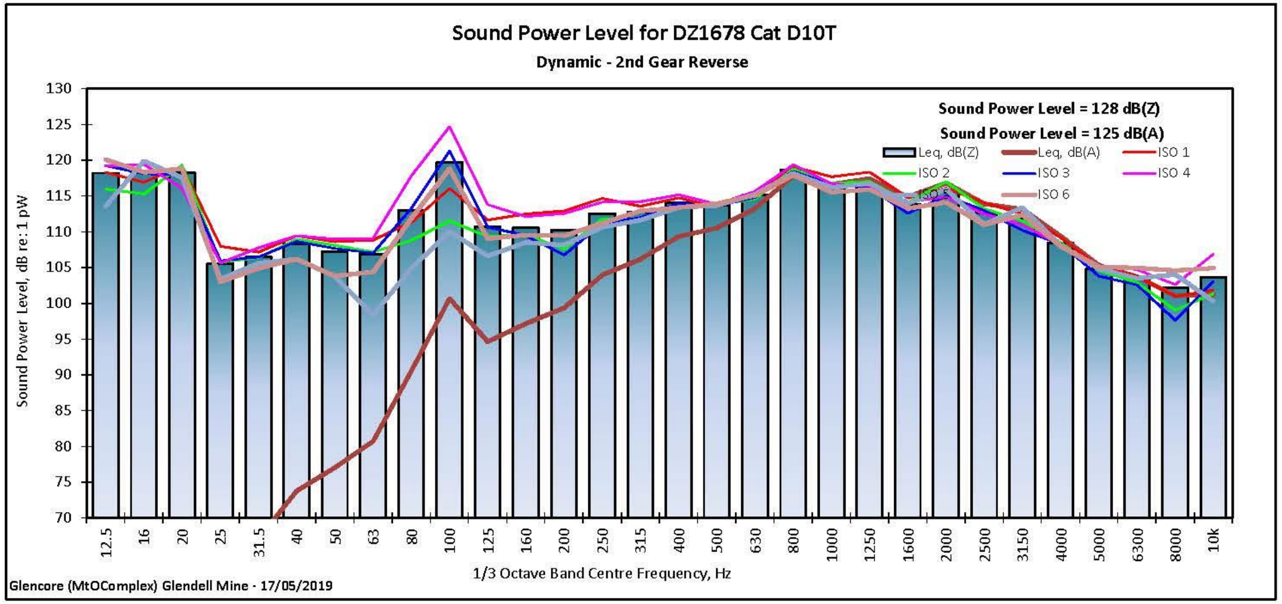
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	118	119	118	106	104	105	105	107	111	120	109	108	108	109	110	112	109	108	111	111	111	107	109	106	106	102	100	103	97	103
Leq, dB(A)	55	62	68	61	65	70	75	80	89	101	93	94	97	100	104	107	106	106	110	111	112	108	110	107	107	103	100	103	96	101

Measure Sound Power Level Report

Machine: Sound Power Level for DZ1678 Cat D10T

Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell Mine - 17/05/2019
Results: Sound Power Level = 128 dB(Z)
Sound Power Level = 125 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



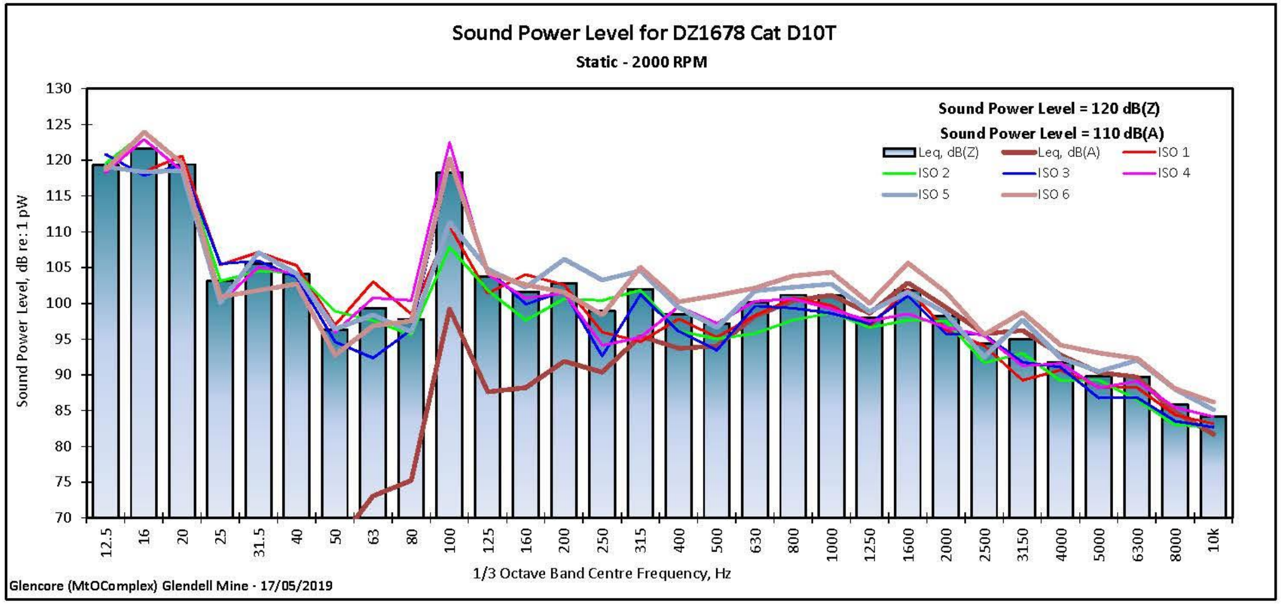
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	118	118	118	106	106	108	107	107	113	120	111	111	110	113	113
Leq, dB(A)	55	62	68	61	67	74	77	81	91	101	95	97	99	104	106

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	114	114	115	119	117	117	114	116	113	112	108	105	104	102	104
Leq, dB(A)	109	111	113	118	117	117	115	117	114	113	109	105	104	101	101

Measure Sound Power Level Report

Machine: Sound Power Level for DZ1678 Cat D10T
Activity: Static - 2000 RPM
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell Mine - 17/05/2019
Results: Sound Power Level = 120 dB(Z)
Sound Power Level = 110 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

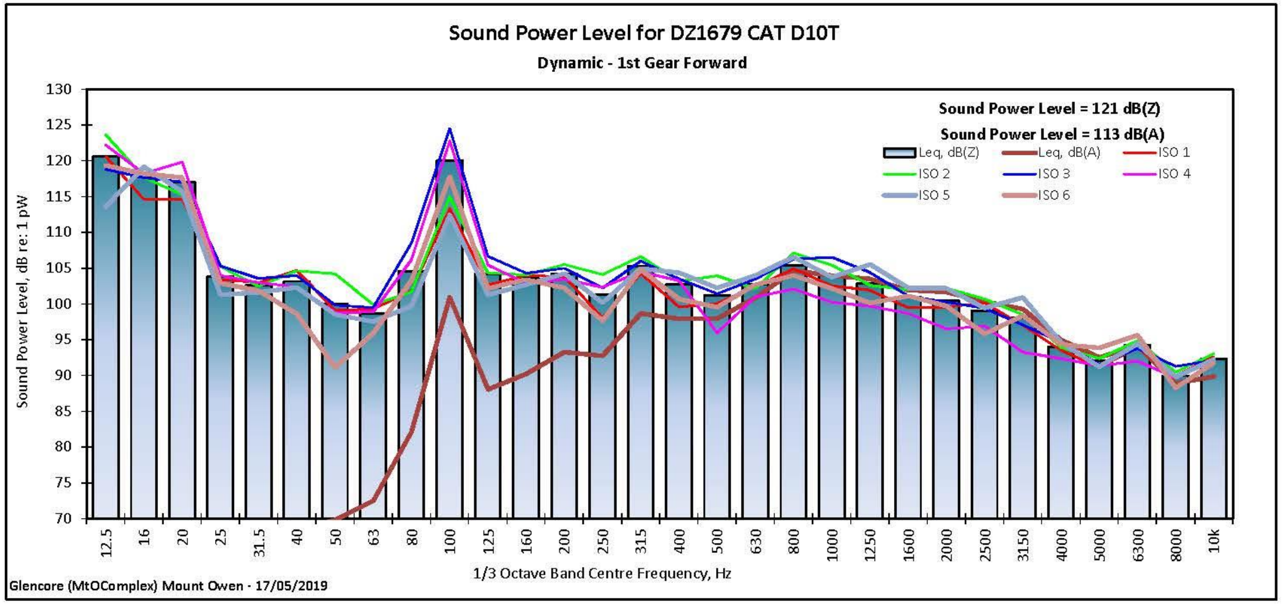


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	119	122	119	103	106	104	96	99	98	118	104	102	103	99	102	98	97	100	101	101	98	102	98	94	95	92	90	90	86	84
Leq, dB(A)	56	65	69	58	66	69	66	73	75	99	88	88	92	90	95	94	94	98	100	101	99	103	99	96	96	93	90	90	85	82

Measure Sound Power Level Report

Machine: Sound Power Level for DZ1679 CAT D10T
Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 121 dB(Z)
Sound Power Level = 113 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

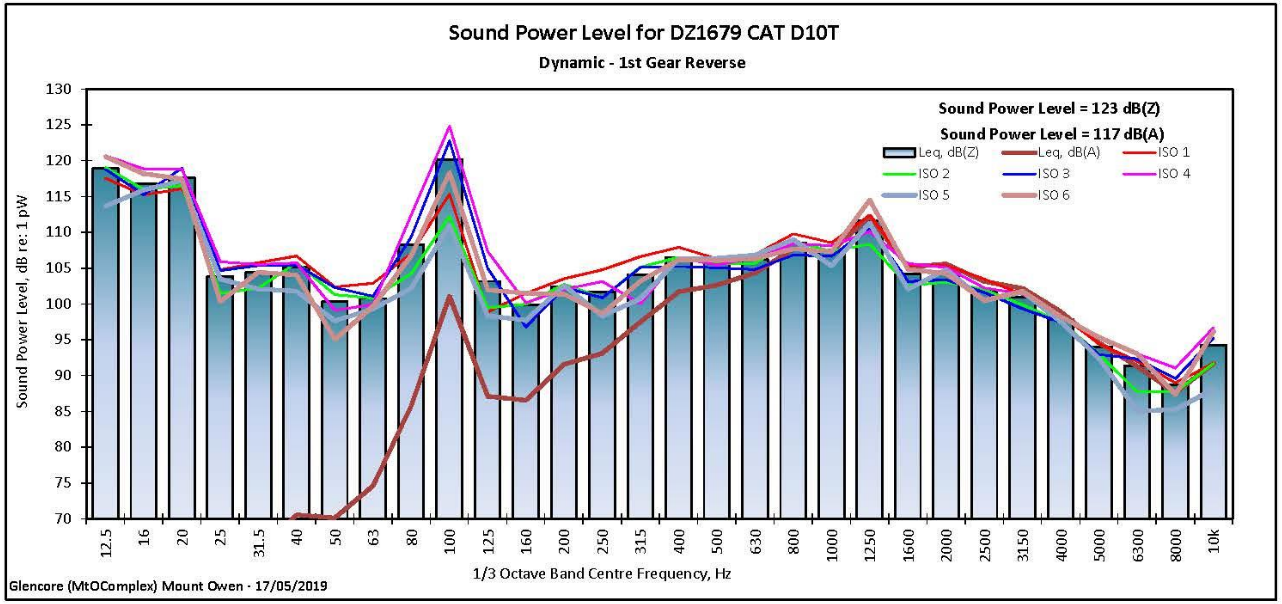


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	118	117	104	103	103	100	99	105	120	104	104	104	101	105	103	101	103	105	104	103	101	100	99	98	94	92	94	90	92
Leq, dB(A)	57	61	67	59	63	69	70	72	82	101	88	90	93	93	99	98	98	101	105	104	103	102	102	100	99	95	93	94	89	90

Measure Sound Power Level Report

Machine: Sound Power Level for DZ1679 CAT D10T
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 123 dB(Z)
Sound Power Level = 117 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

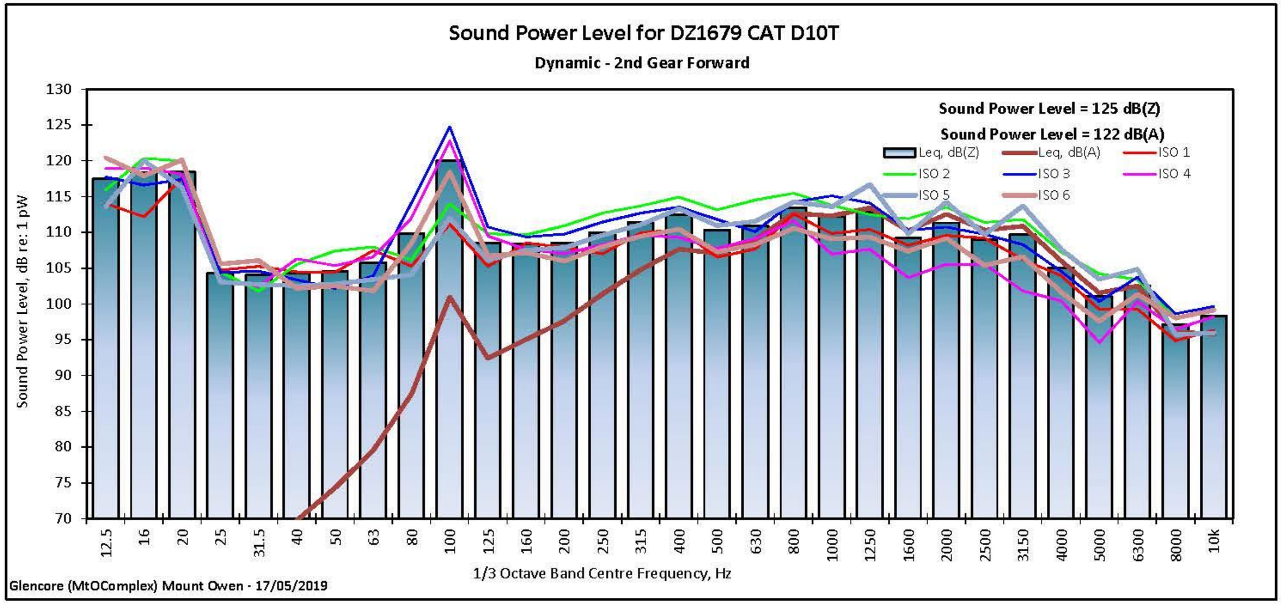


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	119	117	118	104	104	105	100	101	108	120	103	100	102	102	104	106	106	106	108	107	112	104	104	102	101	98	94	91	89	94
Leq, dB(A)	56	60	67	59	65	71	70	75	86	101	87	87	92	93	97	102	103	104	108	107	112	105	106	103	102	99	95	91	88	92

Measure Sound Power Level Report

Machine: Sound Power Level for DZ1679 CAT D10T
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 125 dB(Z)
Sound Power Level = 122 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

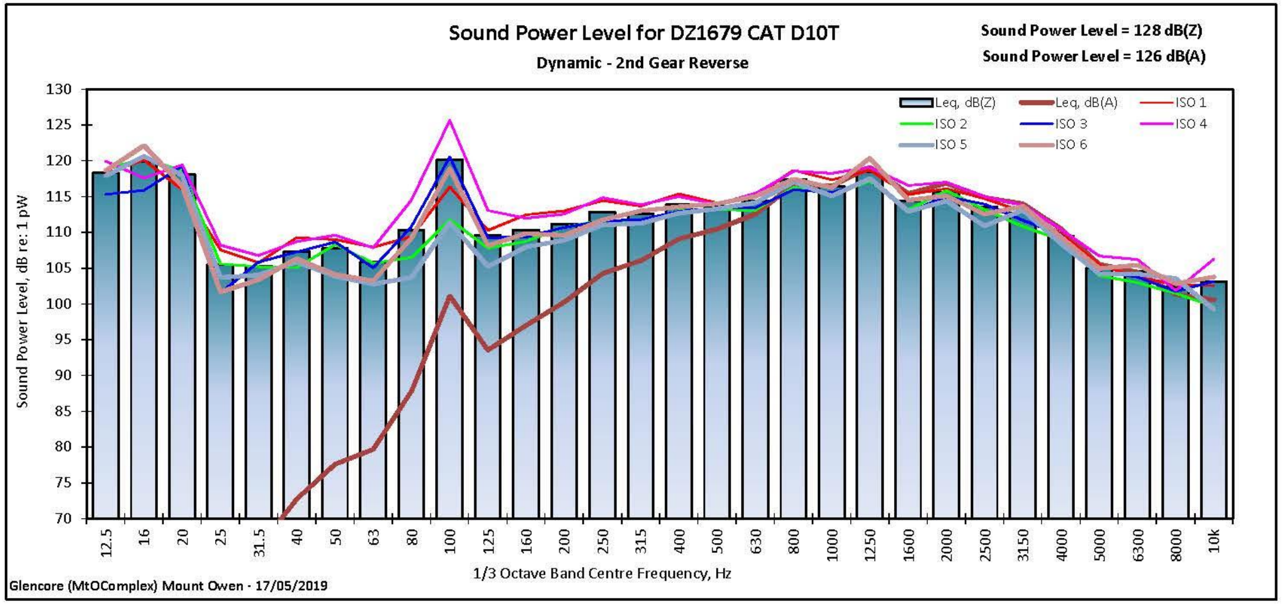


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	117	118	118	104	104	104	105	106	110	120	108	108	109	110	111	112	110	111	113	112	113	109	111	109	110	105	101	103	97	98
Leq, dB(A)	54	62	68	60	65	70	74	80	87	101	92	95	98	101	105	108	107	109	113	112	113	110	113	110	111	106	102	102	96	96

Measure Sound Power Level Report

Machine: Sound Power Level for DZ1679 CAT D10T
Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 128 dB(Z)
Sound Power Level = 126 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

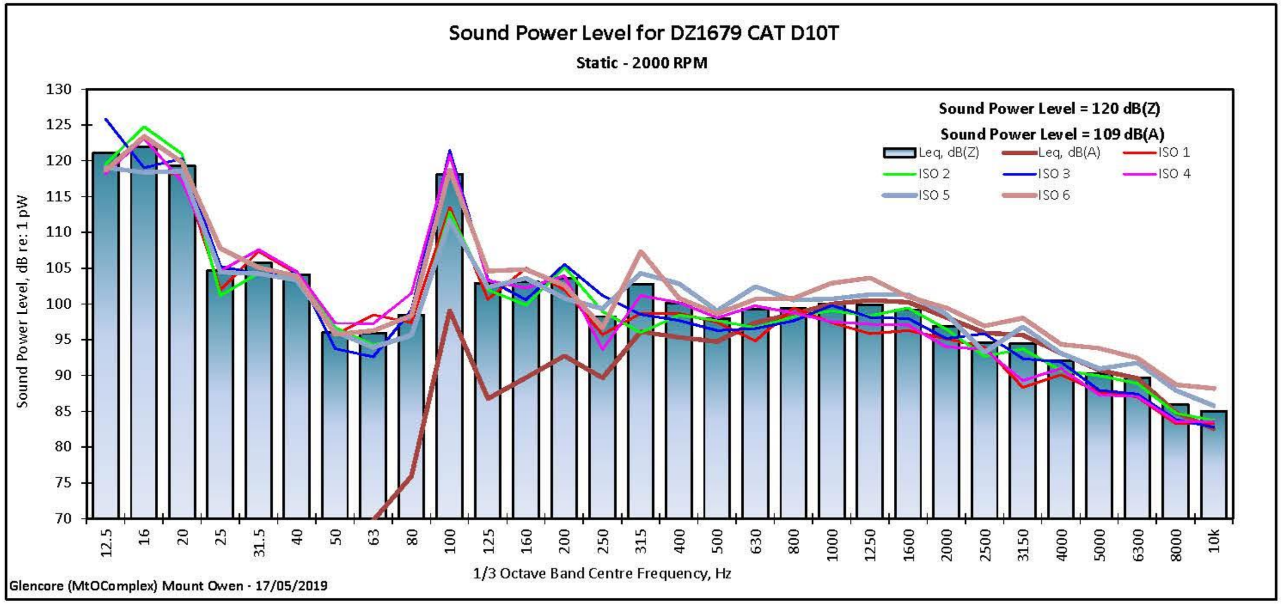


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	118	120	118	105	105	107	108	106	110	120	110	110	111	113	113	114	114	114	117	116	118	114	116	114	113	109	105	105	102	103
Leq, dB(A)	55	63	68	61	66	73	78	80	88	101	94	97	100	104	106	109	110	113	117	116	119	115	117	115	114	110	106	104	101	101

Measure Sound Power Level Report

Machine: Sound Power Level for DZ1679 CAT D10T
Activity: Static - 2000 RPM
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 120 dB(Z)
Sound Power Level = 109 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

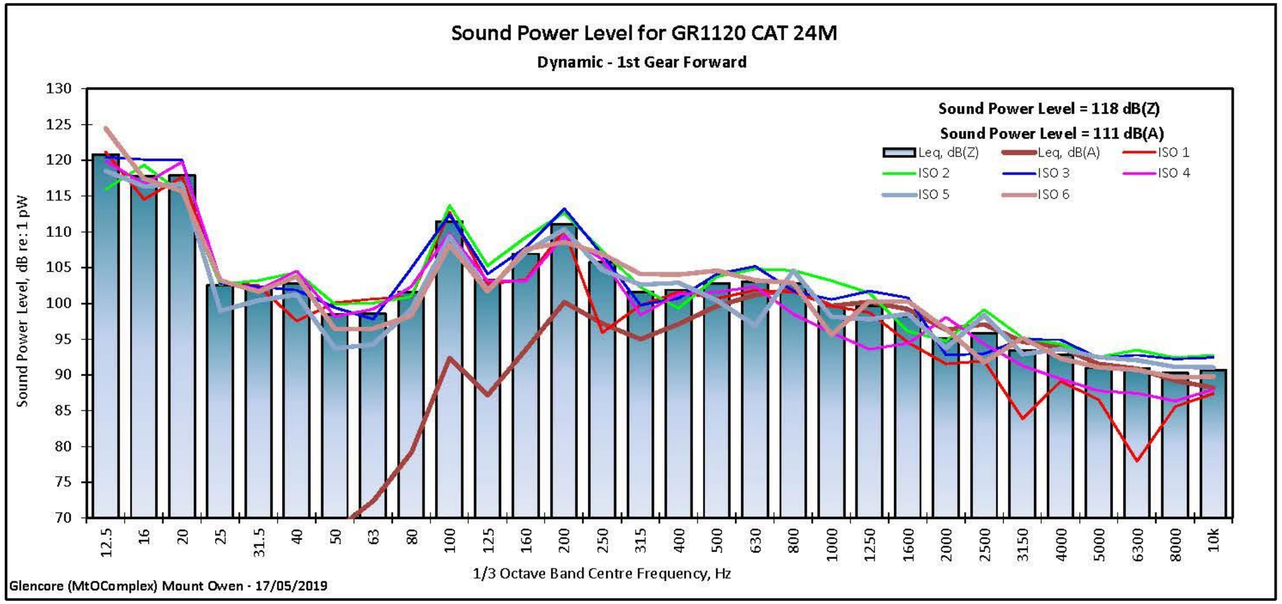


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	122	119	105	106	104	96	96	98	118	103	103	104	98	103	100	98	99	99	100	100	99	97	95	94	92	90	90	86	85
Leq, dB(A)	58	65	69	60	66	69	66	70	76	99	87	90	93	90	96	95	95	97	99	100	101	100	98	96	96	93	91	90	85	82

Measure Sound Power Level Report

Machine: Sound Power Level for GR1120 CAT 24M
Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 118 dB(Z)
Sound Power Level = 111 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

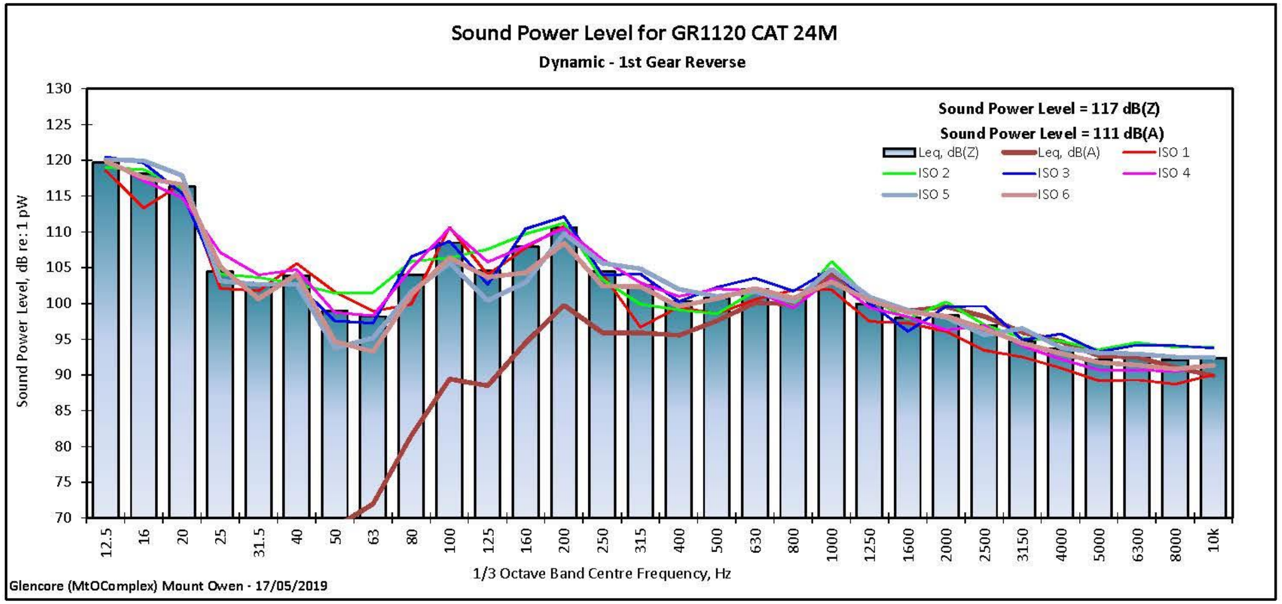


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	118	118	103	102	103	98	99	102	111	103	107	111	106	102	102	103	103	103	100	100	98	95	96	93	93	91	91	90	91
Leq, dB(A)	57	61	67	58	63	68	68	72	79	92	87	94	100	97	95	97	100	101	102	100	100	99	96	97	95	94	92	91	89	88

Measure Sound Power Level Report

Machine: Sound Power Level for GR1120 CAT 24M
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 117 dB(Z)
Sound Power Level = 111 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

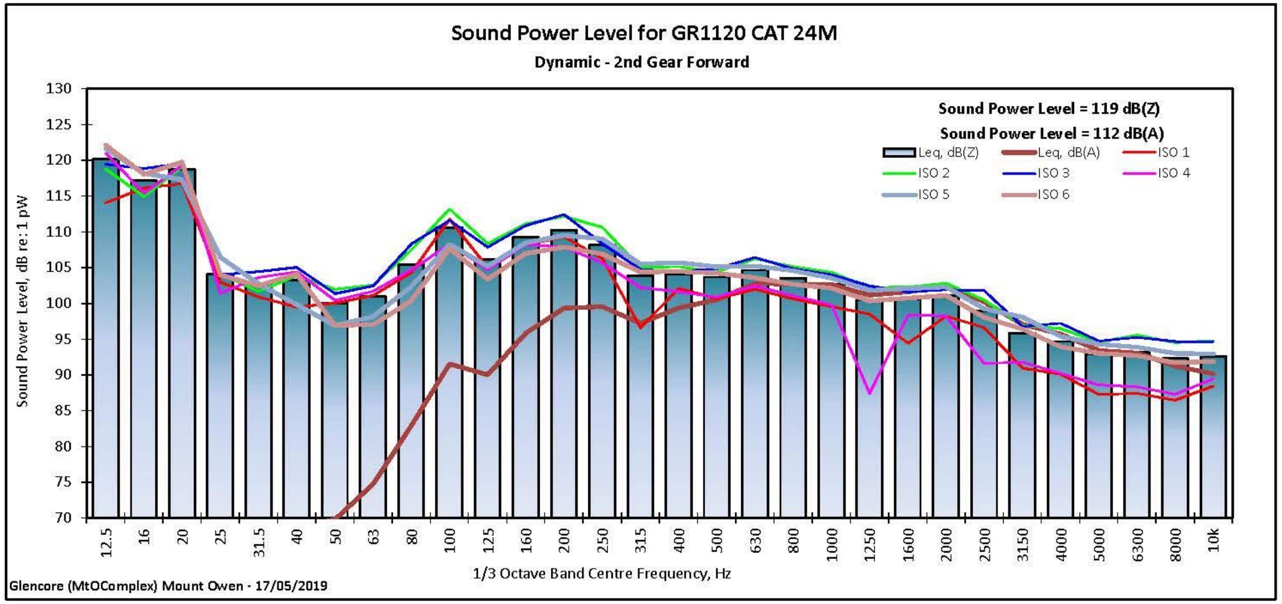


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	118	116	104	103	104	99	98	104	108	105	108	111	104	102	100	101	102	101	104	100	98	98	97	95	94	92	93	92	92
Leq, dB(A)	56	61	66	60	63	69	69	72	82	89	88	95	100	96	96	96	98	100	100	104	101	99	100	98	96	95	93	92	91	90

Measure Sound Power Level Report

Machine: Sound Power Level for GR1120 CAT 24M
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 119 dB(Z)
Sound Power Level = 112 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

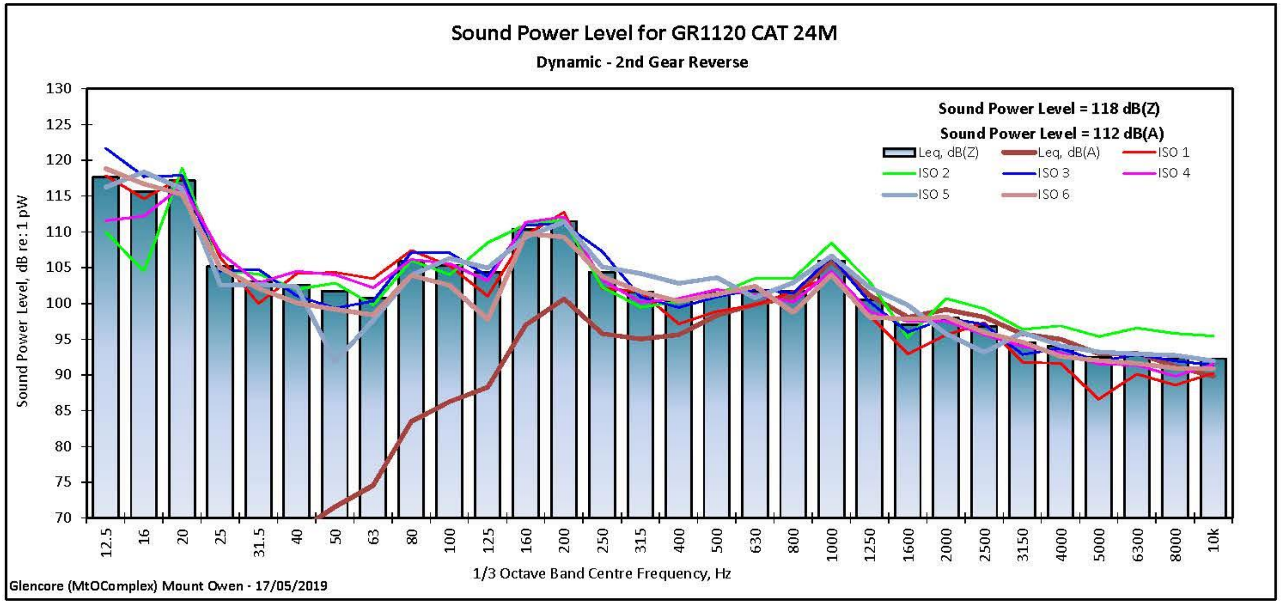


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	117	119	104	103	103	100	101	105	111	106	109	110	108	104	104	104	105	103	103	101	101	101	99	96	95	93	93	92	93
Leq, dB(A)	57	60	68	59	63	69	70	75	83	92	90	96	99	100	97	99	100	103	103	103	101	102	102	100	97	96	93	93	91	90

Measure Sound Power Level Report

Machine: Sound Power Level for GR1120 CAT 24M
Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 118 dB(Z)
Sound Power Level = 112 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

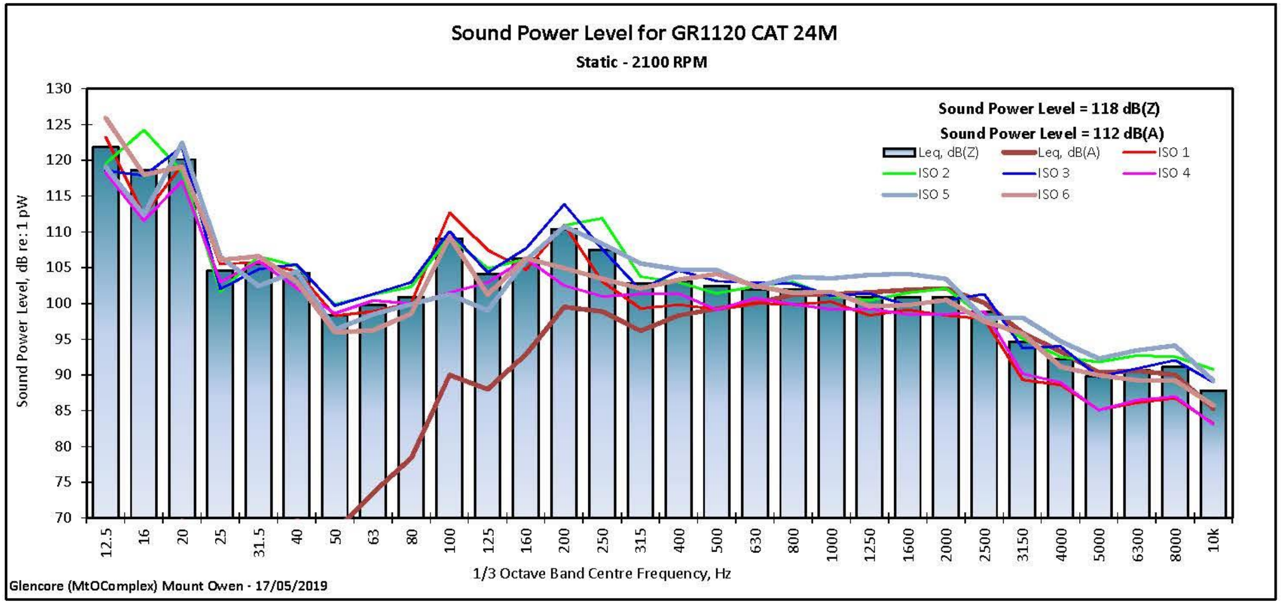


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	118	116	117	105	103	103	102	101	106	105	104	110	111	104	102	100	102	102	102	106	101	97	98	97	95	94	92	93	92	92
Leq, dB(A)	54	59	67	61	64	68	72	75	83	86	88	97	101	96	95	96	98	100	101	106	101	98	99	98	96	95	93	93	91	90

Measure Sound Power Level Report

Machine: **Sound Power Level for GR1120 CAT 24M**
Activity: Static - 2100 RPM
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 118 dB(Z)
Sound Power Level = 112 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

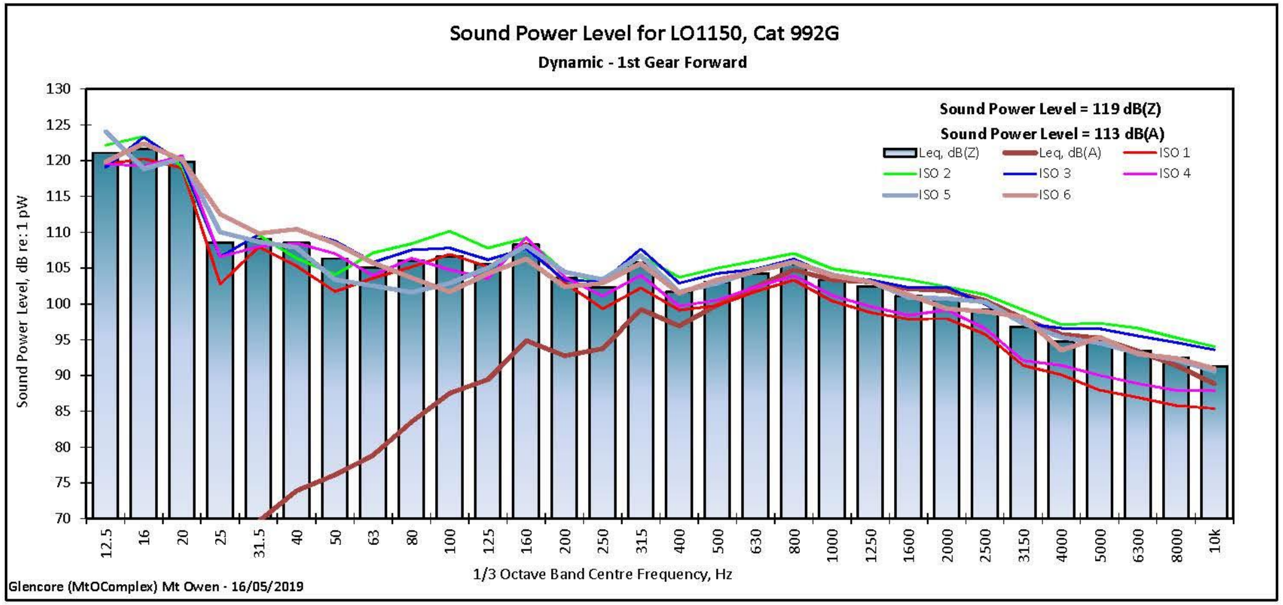


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	119	120	105	106	104	98	100	101	109	104	106	110	107	103	103	102	102	102	101	101	101	101	99	95	92	90	91	91	88
Leq, dB(A)	58	62	70	60	66	70	68	74	78	90	88	93	100	99	96	98	99	100	101	101	102	102	102	100	96	93	90	91	90	85

Measure Sound Power Level Report

Machine: Sound Power Level for LO1150, Cat 992G
Activity: Dynamic - 1st Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 16/05/2019
Results: Sound Power Level = 119 dB(Z)
Sound Power Level = 113 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



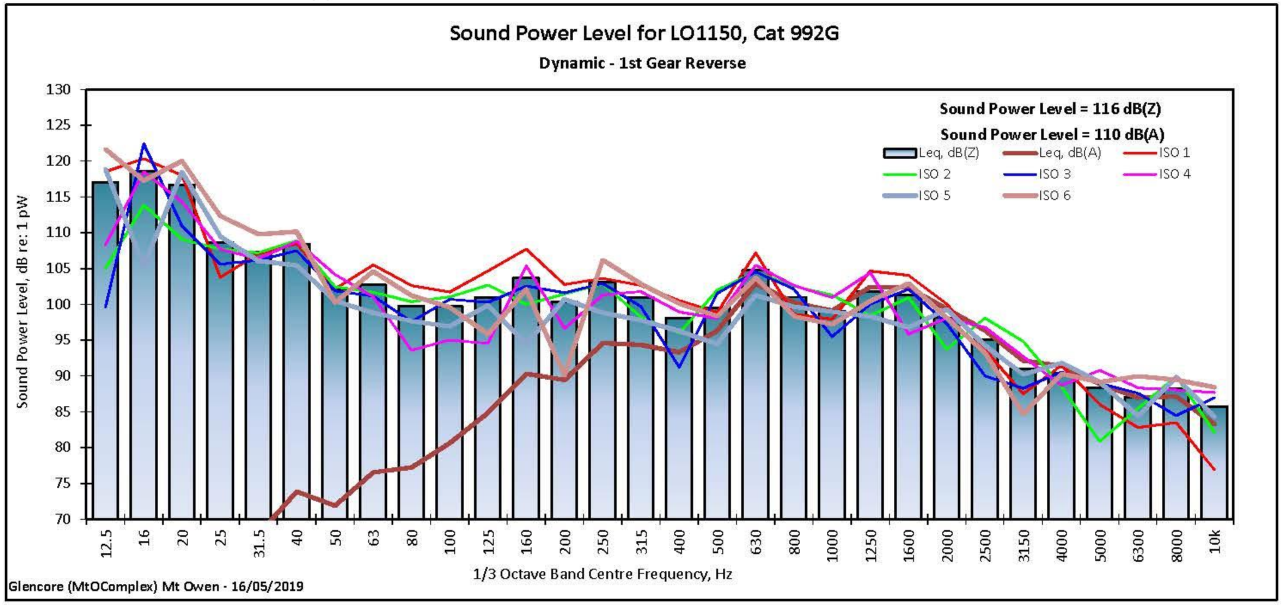
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	121	122	120	109	109	109	106	105	106	107	106	108	104	102	106
Leq, dB(A)	58	65	69	64	70	74	76	79	83	88	89	95	93	94	99

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	102	103	104	106	103	102	101	101	99	97	95	95	93	92	91
Leq, dB(A)	97	100	102	105	103	103	102	102	100	98	96	95	93	91	89

Measure Sound Power Level Report

Machine: Sound Power Level for LO1150, Cat 992G
Activity: Dynamic - 1st Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 16/05/2019
Results: Sound Power Level = 116 dB(Z)
Sound Power Level = 110 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

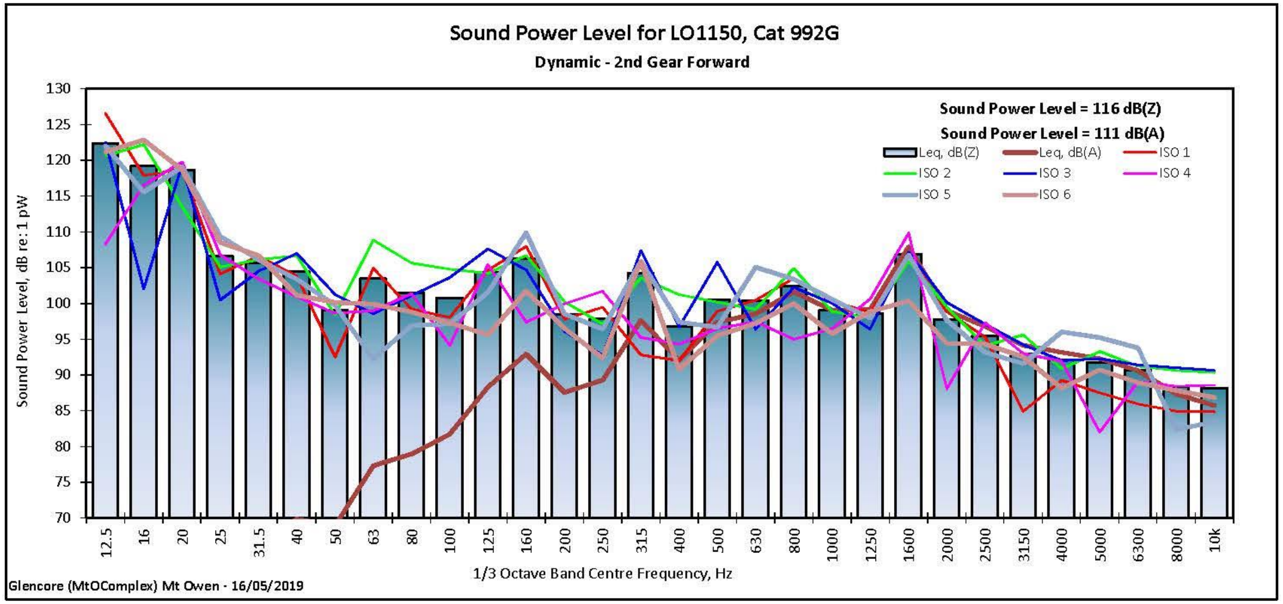


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	117	119	117	109	107	108	102	103	100	100	101	104	100	103	101	98	99	105	101	99	102	101	98	95	91	90	88	87	88	86
Leq, dB(A)	54	62	66	64	68	74	72	77	77	81	85	90	89	95	94	93	96	103	100	99	102	102	99	96	92	91	89	87	87	83

Measure Sound Power Level Report

Machine: Sound Power Level for LO1150, Cat 992G
Activity: Dynamic - 2nd Gear Forward
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 16/05/2019
Results: Sound Power Level = 116 dB(Z)
Sound Power Level = 111 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

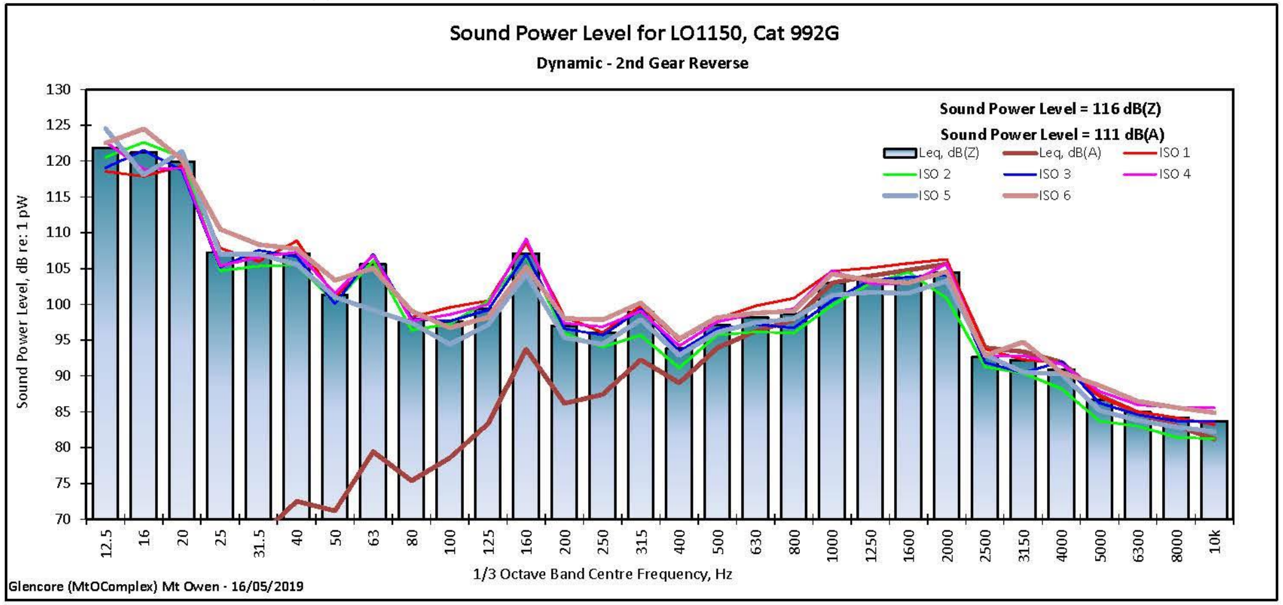


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	119	119	107	106	104	99	103	101	101	104	106	98	98	104	97	101	100	102	99	99	107	98	95	93	92	92	91	88	88
Leq, dB(A)	59	62	68	62	66	70	69	77	79	82	88	93	88	89	98	92	97	99	102	99	99	108	99	97	94	93	92	91	87	86

Measure Sound Power Level Report

Machine: Sound Power Level for LO1150, Cat 992G
Activity: Dynamic - 2nd Gear Reverse
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 16/05/2019
Results: Sound Power Level = 116 dB(Z)
Sound Power Level = 111 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

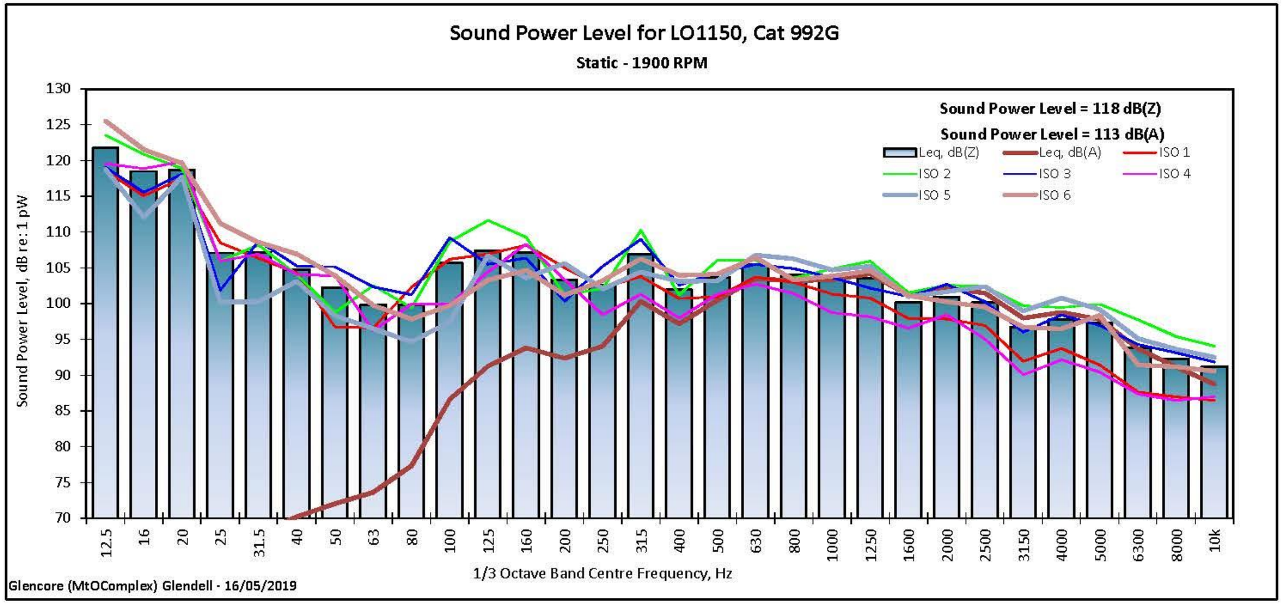


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	121	120	107	107	107	101	106	98	98	99	107	97	96	99	94	97	98	99	103	103	104	104	93	92	91	87	85	84	84
Leq, dB(A)	58	65	69	63	67	72	71	79	75	79	83	94	86	87	92	89	94	96	98	103	104	105	106	94	93	92	87	85	83	81

Measure Sound Power Level Report

Machine: Sound Power Level for LO1150, Cat 992G
Activity: Static - 1900 RPM
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Glendell - 16/05/2019
Results: Sound Power Level = 118 dB(Z)
Sound Power Level = 113 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

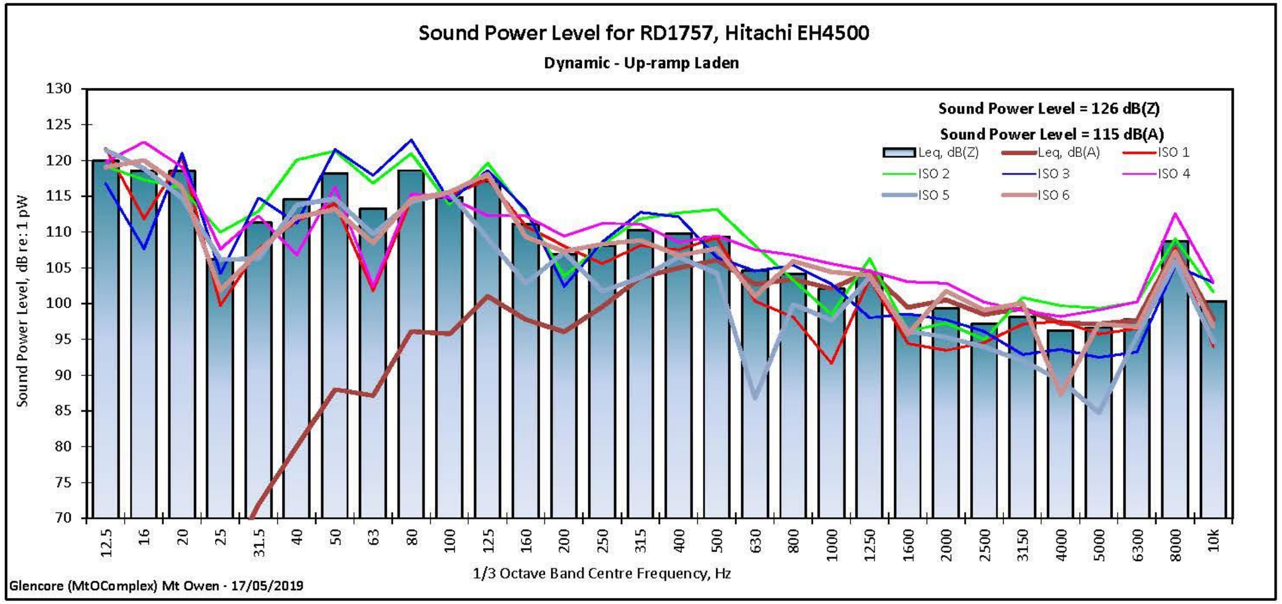


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	118	119	107	107	105	102	100	100	106	107	107	103	103	107	102	104	105	104	103	104	100	101	100	97	98	97	94	92	91
Leq, dB(A)	58	62	68	62	68	70	72	74	77	87	91	94	92	94	100	97	100	104	103	103	104	101	102	101	98	99	98	94	91	89

Measure Sound Power Level Report

Machine: Sound Power Level for RD1757, Hitachi EH4500
Activity: Dynamic - Up-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 17/05/2019
Results: Sound Power Level = 126 dB(Z)
Sound Power Level = 115 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

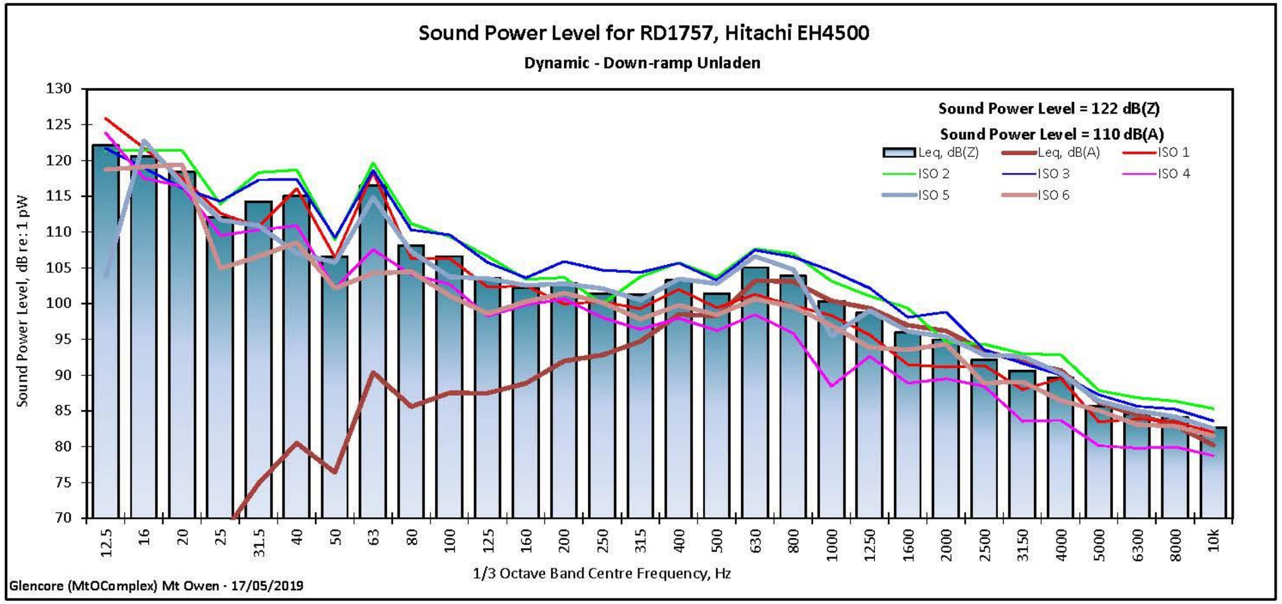


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	119	119	106	111	115	118	113	119	115	117	111	107	108	110	110	109	105	104	102	104	98	99	97	98	96	97	98	109	100
Leq, dB(A)	57	62	68	61	72	80	88	87	96	96	101	98	96	100	104	105	106	103	103	102	104	99	100	98	99	97	97	98	108	98

Measure Sound Power Level Report

Machine: Sound Power Level for RD1757, Hitachi EH4500
Activity: Dynamic - Down-ramp Unladen
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 17/05/2019
Results: Sound Power Level = 122 dB(Z)
Sound Power Level = 110 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	121	118	112	114	115	107	117	108	107	104	102	103	101	101	103	101	105	104	100	99	96	95	92	91	90	86	85	84	83
Leq, dB(A)	59	64	68	67	75	80	76	90	86	88	87	89	92	93	95	98	98	103	103	100	99	97	96	93	92	91	86	84	83	80

Measure Sound Power Level Report

Machine: Sound Power Level for RD1757, Hitachi EH4500

Activity: Static - 1920 RPM

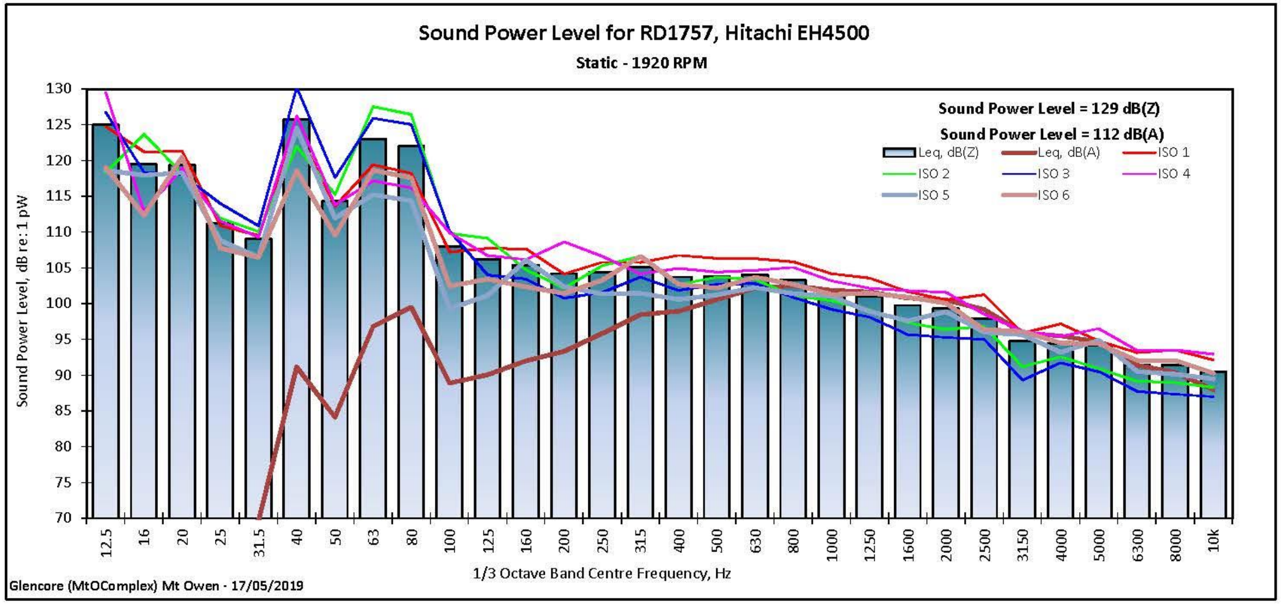
No. ISO Points (of 6) 6

Source: Glencore (MtOComplex) Mt Owen - 17/05/2019

Results: Sound Power Level = 129 dB(Z)

Sound Power Level = 112 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



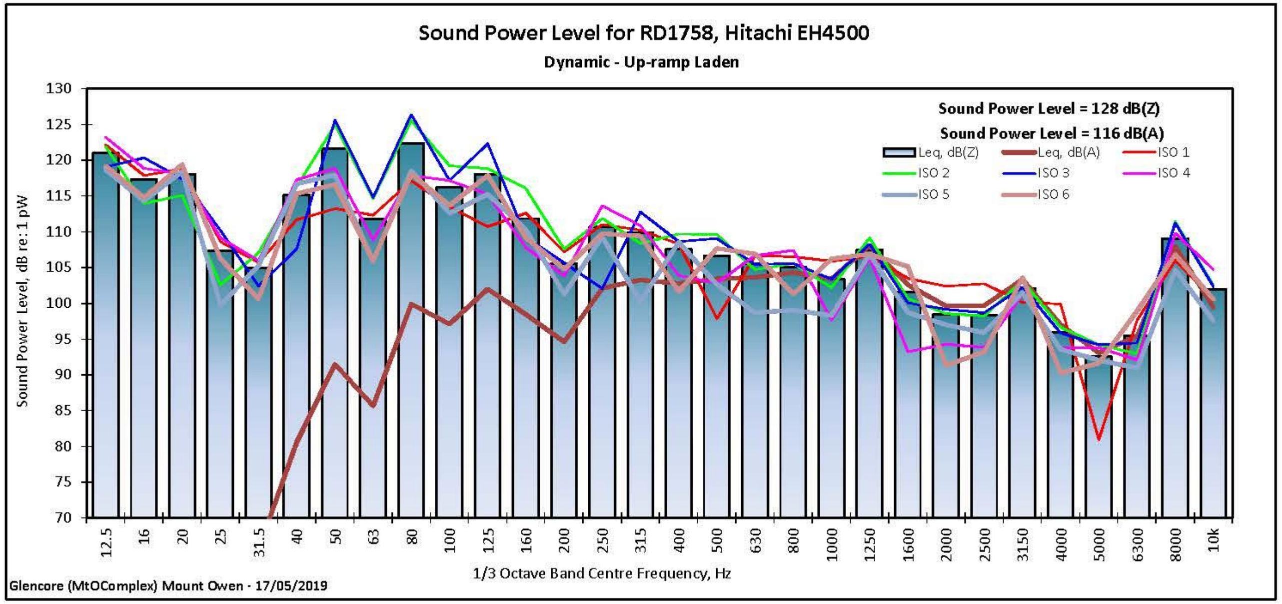
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	125	119	119	111	109	126	114	123	122	108	106	105	104	104	105	104	104	104	103	102	101	100	99	98	95	94	94	91	91	90
Leq, dB(A)	62	63	69	67	70	91	84	97	99	89	90	92	93	96	98	99	101	102	102	102	102	101	100	99	96	95	95	91	90	88

Measure Sound Power Level Report

Machine: Sound Power Level for RD1758, Hitachi EH4500

Activity: Dynamic - Up-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 128 dB(Z)
Sound Power Level = 116 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

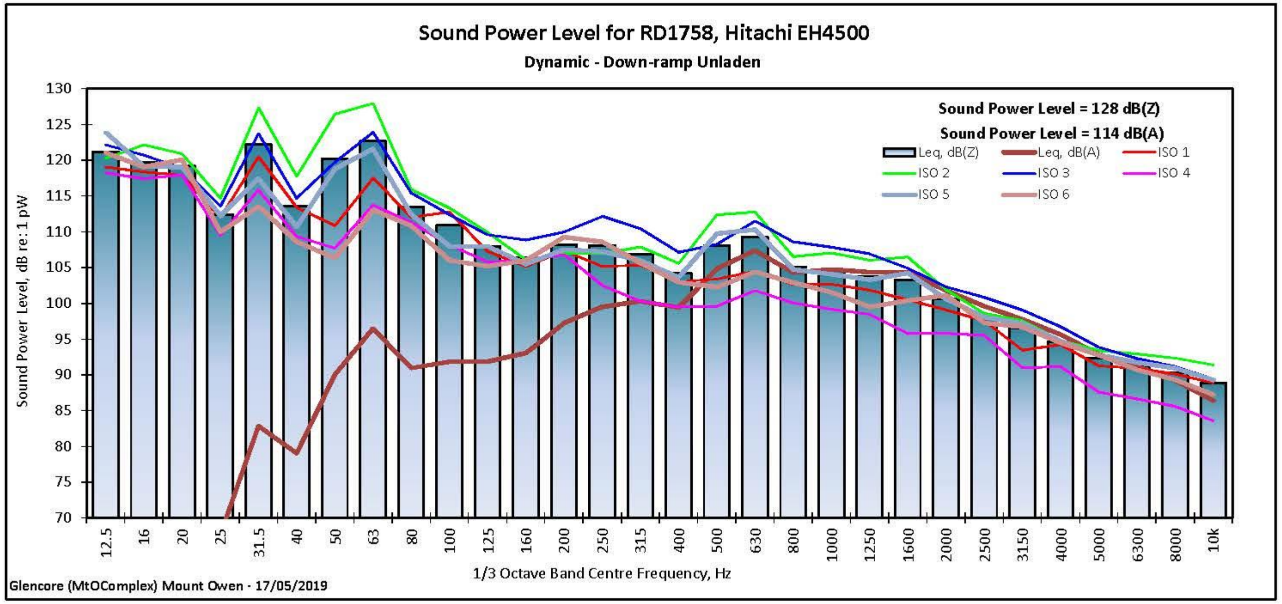


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	117	118	107	105	115	122	112	122	116	118	112	106	111	110	108	107	106	105	103	107	102	98	98	102	96	93	95	109	102
Leq, dB(A)	58	61	68	63	66	81	91	86	100	97	102	98	95	102	103	103	103	104	104	103	108	103	100	100	103	97	93	95	108	99

Measure Sound Power Level Report

Machine: Sound Power Level for RD1758, Hitachi EH4500
Activity: Dynamic - Down-ramp Unladen
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mount Owen - 17/05/2019
Results: Sound Power Level = 128 dB(Z)
Sound Power Level = 114 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	120	119	112	122	114	120	123	113	111	108	106	108	108	107	104	108	109	105	105	104	103	101	98	97	95	92	91	90	89
Leq, dB(A)	58	63	69	68	83	79	90	96	91	92	92	93	97	99	100	99	105	107	104	105	104	104	102	100	98	96	93	91	89	86

Measure Sound Power Level Report

Machine: Sound Power Level for RD1758, Hitachi EH4500

Activity: Static - 1920 RPM

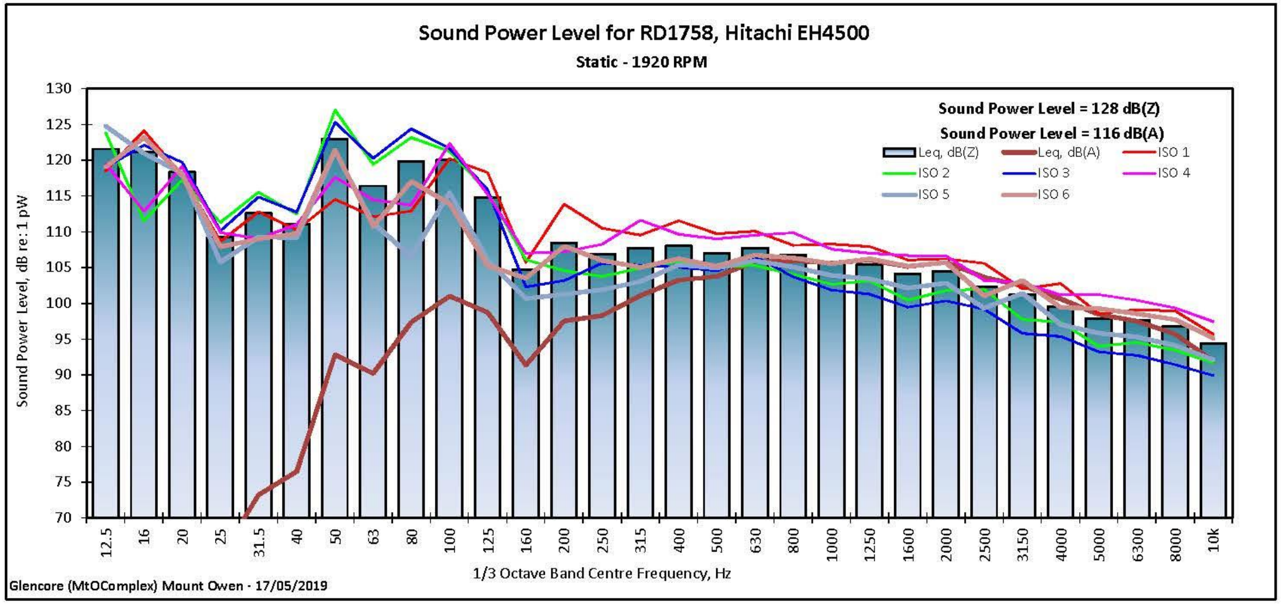
No. ISO Points (of 6) 6

Source: Glencore (MtOComplex) Mount Owen - 17/05/2019

Results: Sound Power Level = 128 dB(Z)

Sound Power Level = 116 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



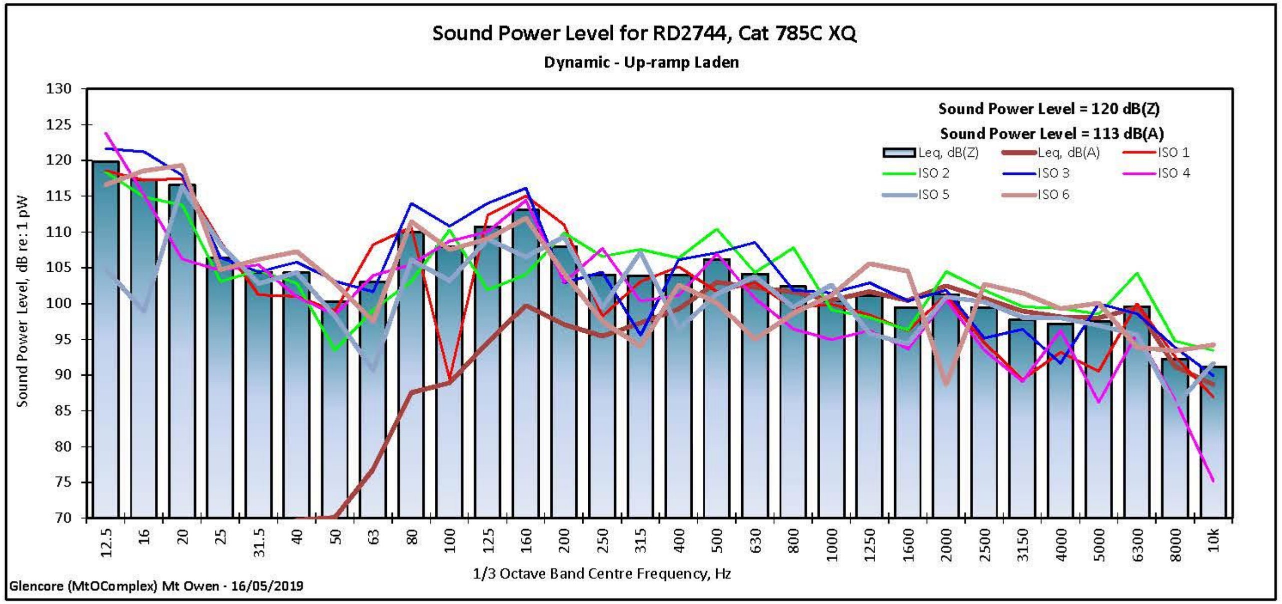
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	121	118	109	113	111	123	116	120	120	115	105	108	107	108	108	107	108	107	106	105	104	105	102	101	100	98	98	97	94
Leq, dB(A)	58	64	68	65	73	76	93	90	97	101	99	91	98	98	101	103	104	106	106	106	106	105	106	104	102	101	98	97	96	92

Measure Sound Power Level Report

Machine: Sound Power Level for RD2744, Cat 785C XQ

Activity: Dynamic - Up-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 16/05/2019
Results: Sound Power Level = 120 dB(Z)
Sound Power Level = 113 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

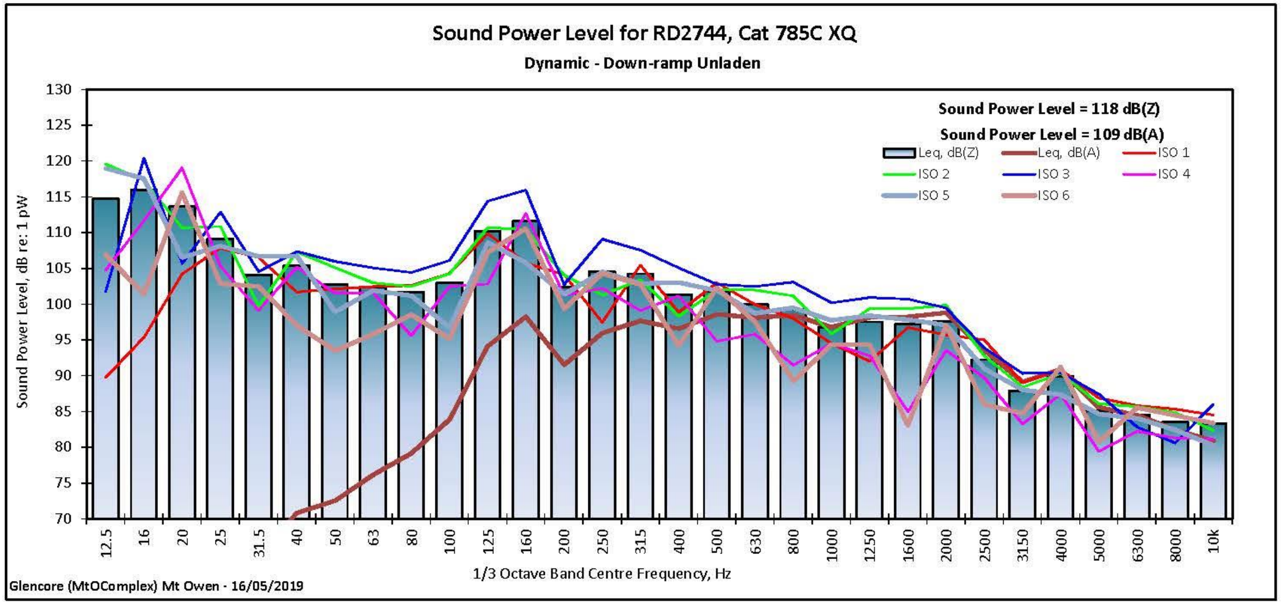


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	117	117	106	104	104	100	103	110	108	111	113	108	104	104	104	106	104	102	100	101	99	101	99	98	97	97	100	92	91
Leq, dB(A)	56	61	66	62	65	70	70	77	88	89	95	100	97	95	97	99	103	102	102	100	102	100	102	101	99	98	98	99	91	89

Measure Sound Power Level Report

Machine: **Sound Power Level for RD2744, Cat 785C XQ**
Activity: **Dynamic - Down-ramp Unladen**
No. ISO Points (of 6) **6**
Source: **Glencore (MtOComplex) Mt Owen - 16/05/2019**
Results: **Sound Power Level = 118 dB(Z)**
Sound Power Level = 109 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

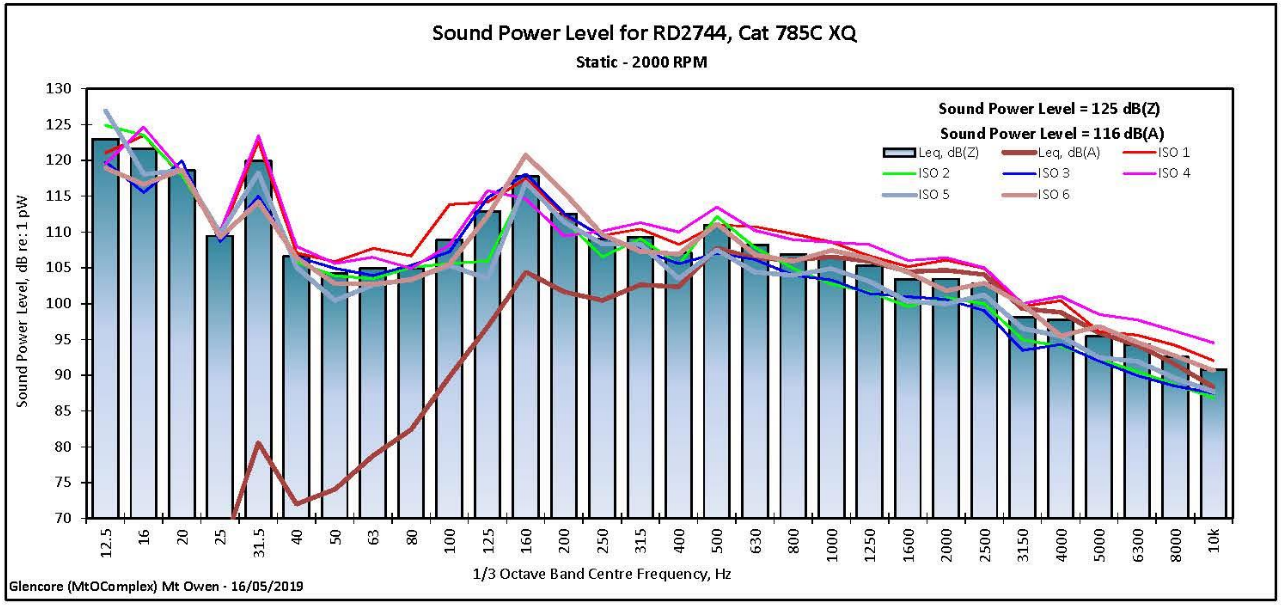


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	115	116	114	109	104	105	103	102	102	103	110	112	102	105	104	101	102	100	99	97	98	97	98	92	88	90	85	85	84	83
Leq, dB(A)	51	59	63	64	65	71	72	76	79	84	94	98	92	96	98	97	99	98	98	97	98	98	99	94	89	91	86	84	82	81

Measure Sound Power Level Report

Machine: Sound Power Level for RD2744, Cat 785C XQ
Activity: Static - 2000 RPM
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 16/05/2019
Results: Sound Power Level = 125 dB(Z)
Sound Power Level = 116 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



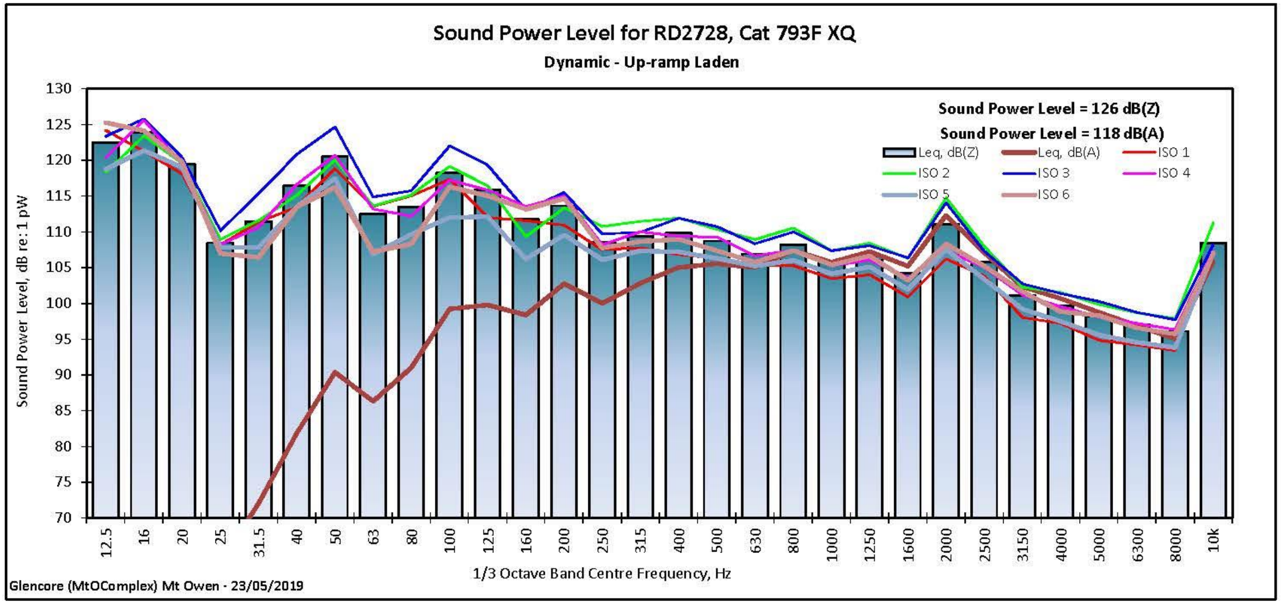
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	123	122	119	109	120	107	104	105	105	109	113	118	113	109	109
Leq, dB(A)	60	65	68	65	81	72	74	79	82	90	97	104	102	100	103

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	107	111	108	107	107	105	103	103	103	98	98	95	94	93	91
Leq, dB(A)	102	108	106	106	107	106	104	105	104	99	99	96	94	91	88

Measure Sound Power Level Report

Machine: Sound Power Level for RD2728, Cat 793F XQ
Activity: Dynamic - Up-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 23/05/2019
Results: Sound Power Level = 126 dB(Z)
Sound Power Level = 118 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

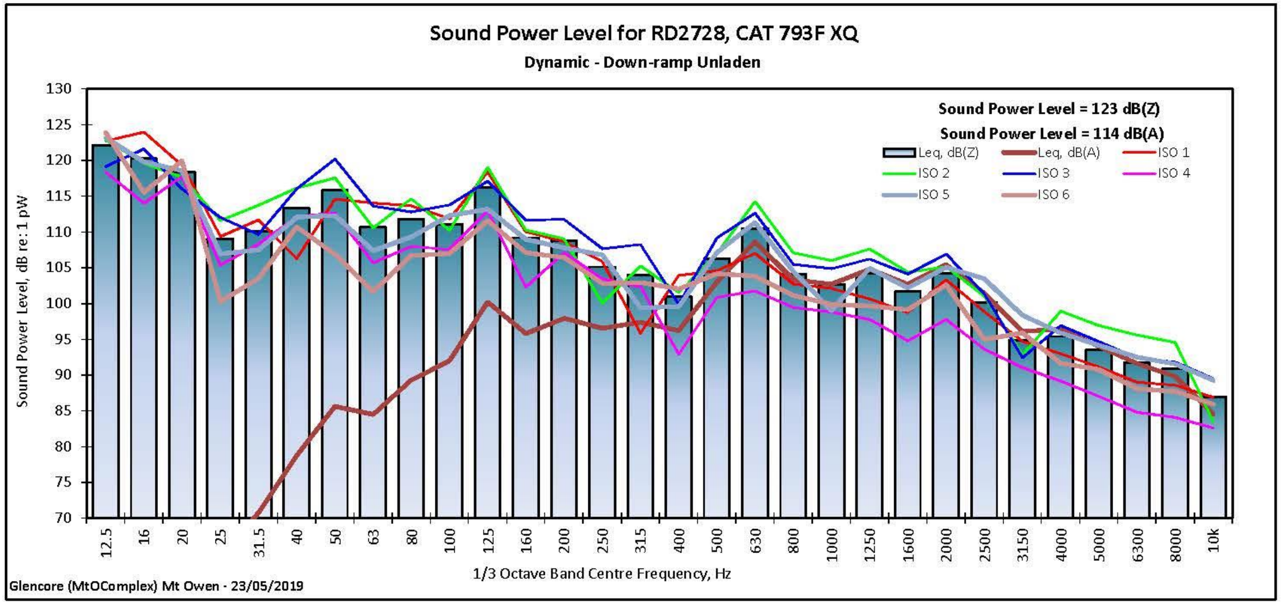


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	124	119	108	111	116	121	113	113	118	116	112	114	109	109	110	109	107	108	106	107	104	111	106	101	100	98	97	96	108
Leq, dB(A)	59	67	69	64	72	82	90	86	91	99	100	98	103	100	103	105	106	105	107	106	107	105	112	107	102	101	99	97	95	106

Measure Sound Power Level Report

Machine: Sound Power Level for RD2728, CAT 793F XQ
Activity: Dynamic - Down-ramp Unladen
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 23/05/2019
Results: Sound Power Level = 123 dB(Z)
Sound Power Level = 114 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

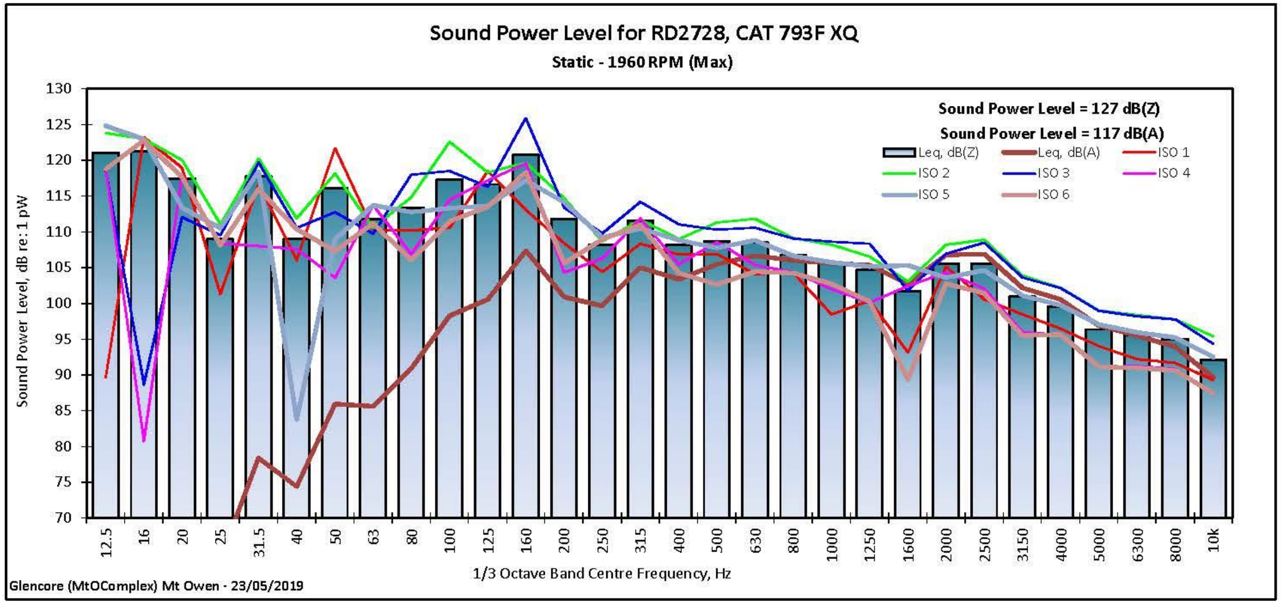


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	120	118	109	110	113	116	111	112	111	116	109	109	105	104	101	106	110	104	103	104	102	104	100	95	95	93	92	91	87
Leq, dB(A)	59	64	68	64	71	79	86	84	89	92	100	96	98	97	97	96	103	109	103	103	105	103	105	101	96	96	94	92	90	84

Measure Sound Power Level Report

Machine: Sound Power Level for RD2728, CAT 793F XQ
Activity: Static - 1960 RPM (Max)
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 23/05/2019
Results: Sound Power Level = 127 dB(Z)
Sound Power Level = 117 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

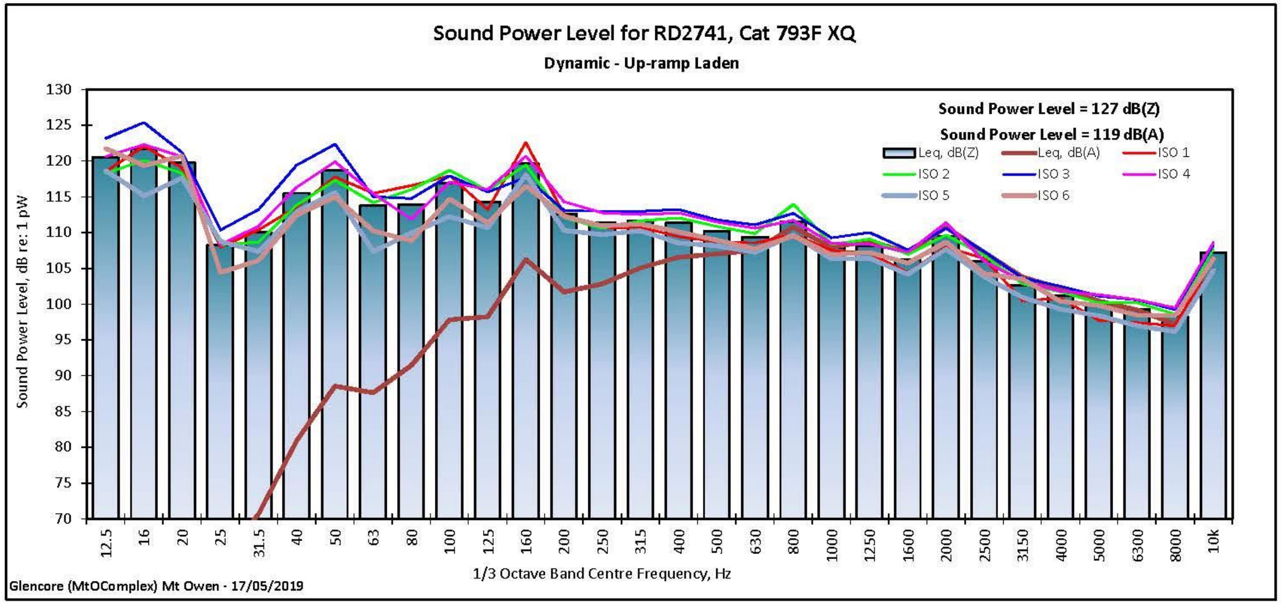


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	121	117	109	118	109	116	112	113	117	117	121	112	108	112	108	109	109	107	106	105	102	106	106	101	100	96	96	95	92
Leq, dB(A)	58	65	67	64	78	74	86	86	91	98	101	107	101	100	105	103	105	107	106	106	105	103	107	107	102	101	97	95	94	90

Measure Sound Power Level Report

Machine: Sound Power Level for RD2741, Cat 793F XQ
Activity: Dynamic - Up-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 17/05/2019
Results: Sound Power Level = 127 dB(Z)
Sound Power Level = 119 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



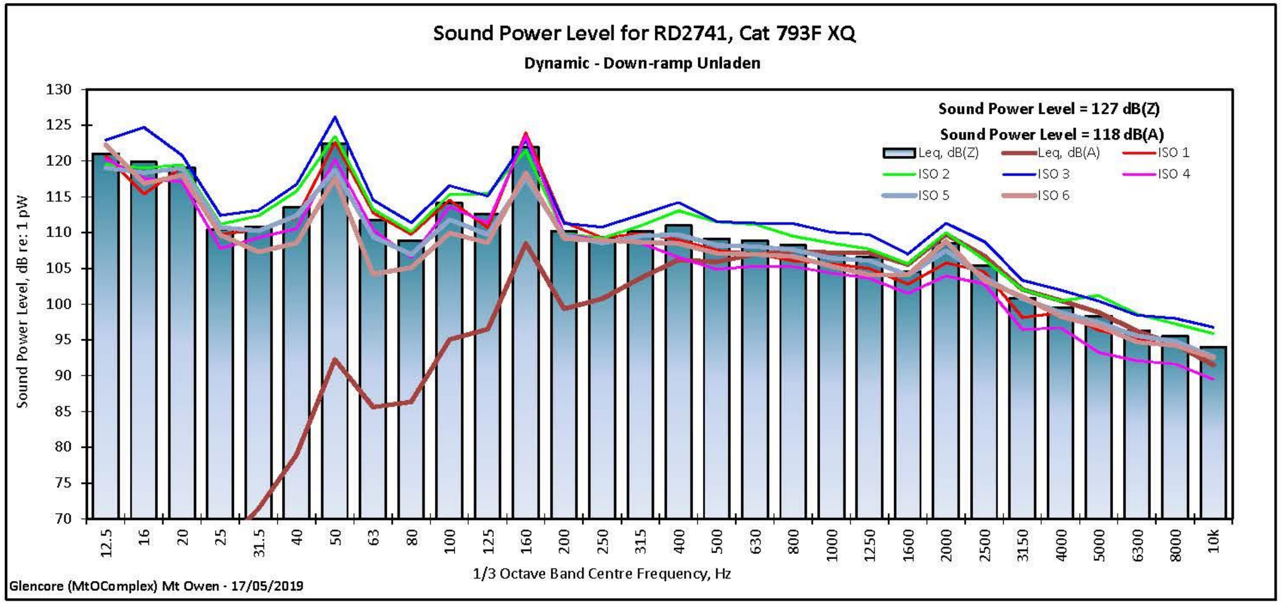
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	121	122	120	108	110	116	119	114	114	117	114	120	113	111	112
Leq, dB(A)	57	65	69	64	71	81	89	88	91	98	98	106	102	103	105

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	111	110	109	112	108	108	106	110	106	103	101	100	99	98	107
Leq, dB(A)	107	107	107	111	108	109	107	111	107	104	102	100	99	97	105

Measure Sound Power Level Report

Machine: Sound Power Level for RD2741, Cat 793F XQ
Activity: Dynamic - Down-ramp Unladen
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 17/05/2019
Results: Sound Power Level = 127 dB(Z)
Sound Power Level = 118 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

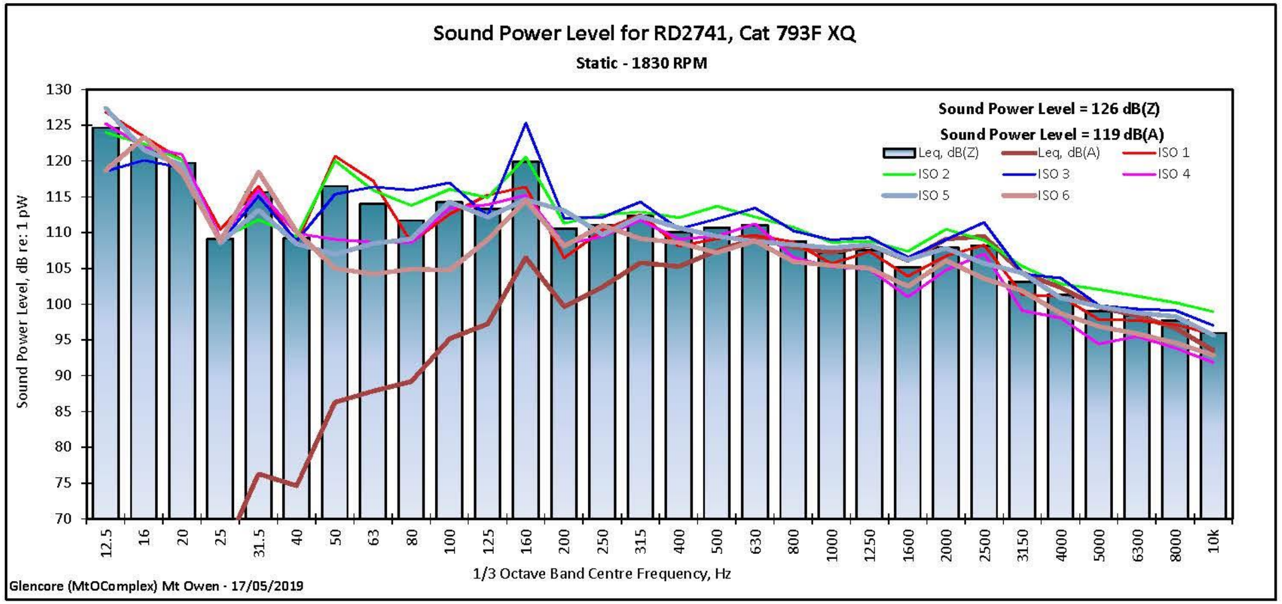


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	120	119	110	111	114	122	112	109	114	113	122	110	109	110	111	109	109	108	107	107	105	109	105	101	99	98	96	95	94
Leq, dB(A)	58	63	69	66	71	79	92	86	86	95	96	109	99	101	104	106	106	107	107	107	107	106	110	107	102	100	99	96	94	91

Measure Sound Power Level Report

Machine: Sound Power Level for RD2741, Cat 793F XQ
Activity: Static - 1830 RPM
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 17/05/2019
Results: Sound Power Level = 126 dB(Z)
Sound Power Level = 119 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	125	122	120	109	116	109	116	114	112	114	113	120	111	111	112	110	111	111	109	107	108	105	108	108	103	101	99	98	98	96
Leq, dB(A)	61	66	69	64	76	75	86	88	89	95	97	106	100	102	106	105	107	109	108	107	108	106	109	109	104	102	100	98	97	93

Measure Sound Power Level Report

Machine: Sound Power Level for RD2738, CAT 793F XQ

Activity: Dynamic - Up-ramp Laden

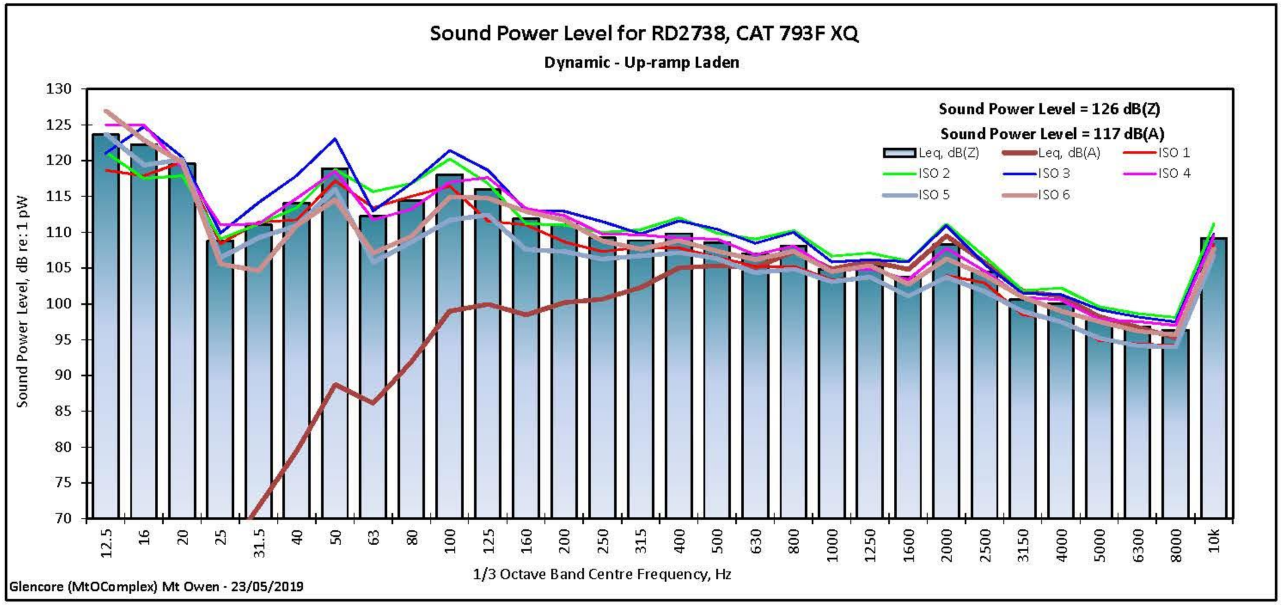
No. ISO Points (of 6) 6

Source: Glencore (MtOComplex) Mt Owen - 23/05/2019

Results: Sound Power Level = 126 dB(Z)

Sound Power Level = 117 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100
Leq, dB(Z)	124	122	120	109	111	114	119	112	114	118
Leq, dB(A)	60	66	69	64	72	79	89	86	92	99

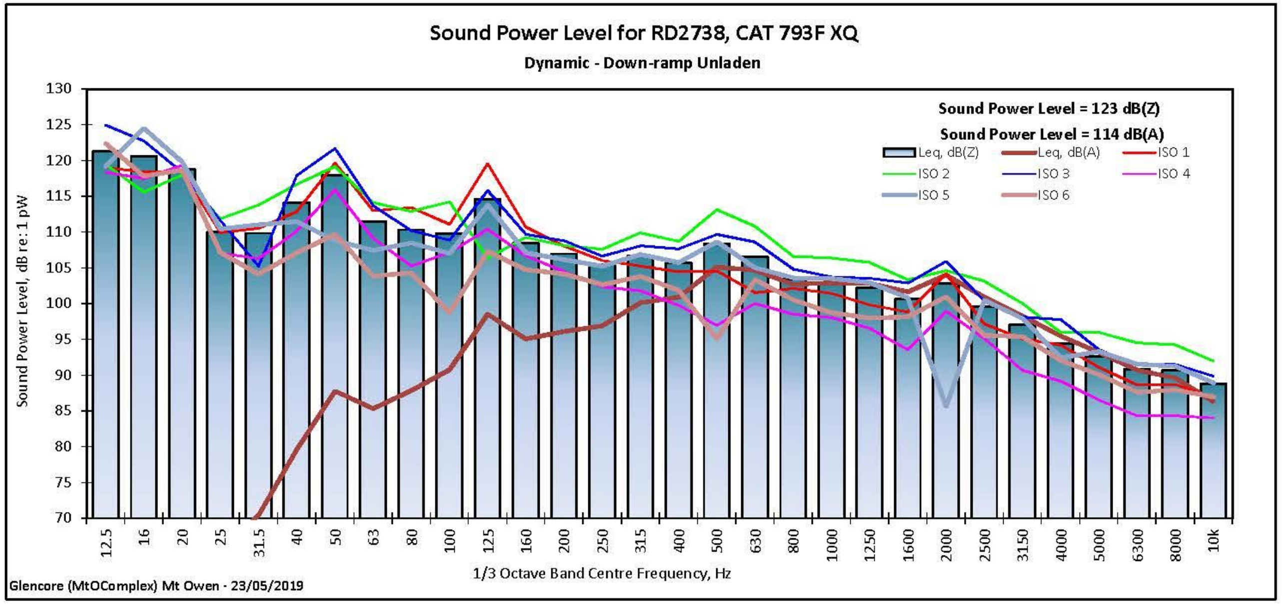
Frequency, Hz	125	160	200	250	315	400	500	630	800	1000
Leq, dB(Z)	116	112	111	109	109	110	109	107	108	105
Leq, dB(A)	100	98	100	101	102	105	105	105	107	105

Frequency, Hz	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	105	104	108	104	101	100	98	97	96	109
Leq, dB(A)	106	105	109	106	102	101	98	97	95	107

Measure Sound Power Level Report

Machine: Sound Power Level for RD2738, CAT 793F XQ
Activity: Dynamic - Down-ramp Unladen
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 23/05/2019
Results: Sound Power Level = 123 dB(Z)
Sound Power Level = 114 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

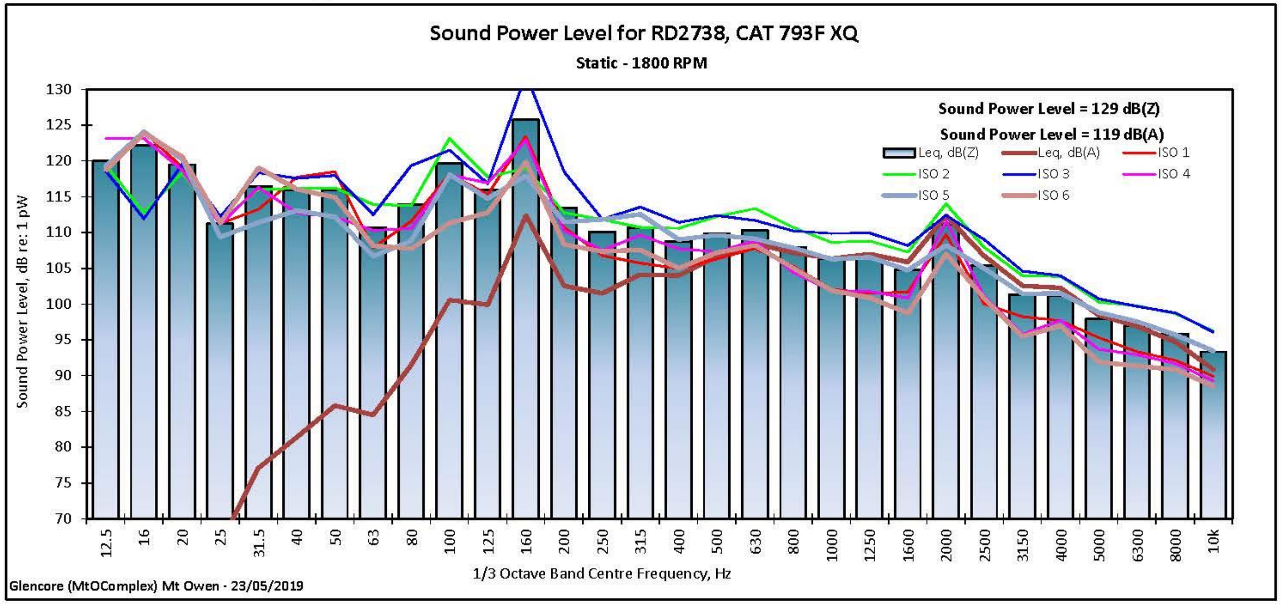


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	121	119	110	110	114	118	112	110	110	115	108	107	105	107	106	108	107	103	103	102	101	103	100	97	94	93	91	91	89
Leq, dB(A)	58	64	68	65	70	80	88	85	88	91	98	95	96	97	100	101	105	105	103	103	103	102	104	101	98	95	93	91	90	86

Measure Sound Power Level Report

Machine: Sound Power Level for RD2738, CAT 793F XQ
Activity: Static - 1800 RPM
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 23/05/2019
Results: Sound Power Level = 129 dB(Z)
Sound Power Level = 119 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

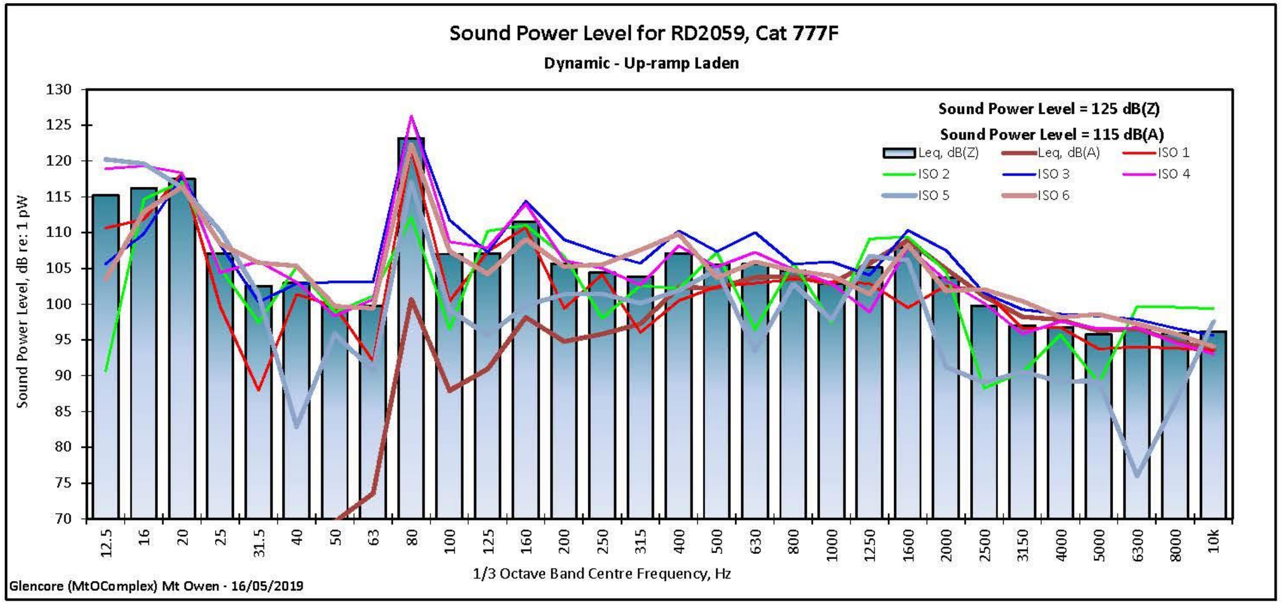


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	120	122	119	111	116	116	116	111	114	120	116	126	113	110	111	109	110	110	108	106	106	105	111	105	101	101	98	97	96	93
Leq, dB(A)	57	65	69	67	77	81	86	84	91	101	100	112	103	101	104	104	107	108	107	106	107	106	112	107	103	102	98	97	95	91

Measure Sound Power Level Report

Machine: Sound Power Level for RD2059, Cat 777F
Activity: Dynamic - Up-ramp Laden
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 16/05/2019
Results: Sound Power Level = 125 dB(Z)
Sound Power Level = 115 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

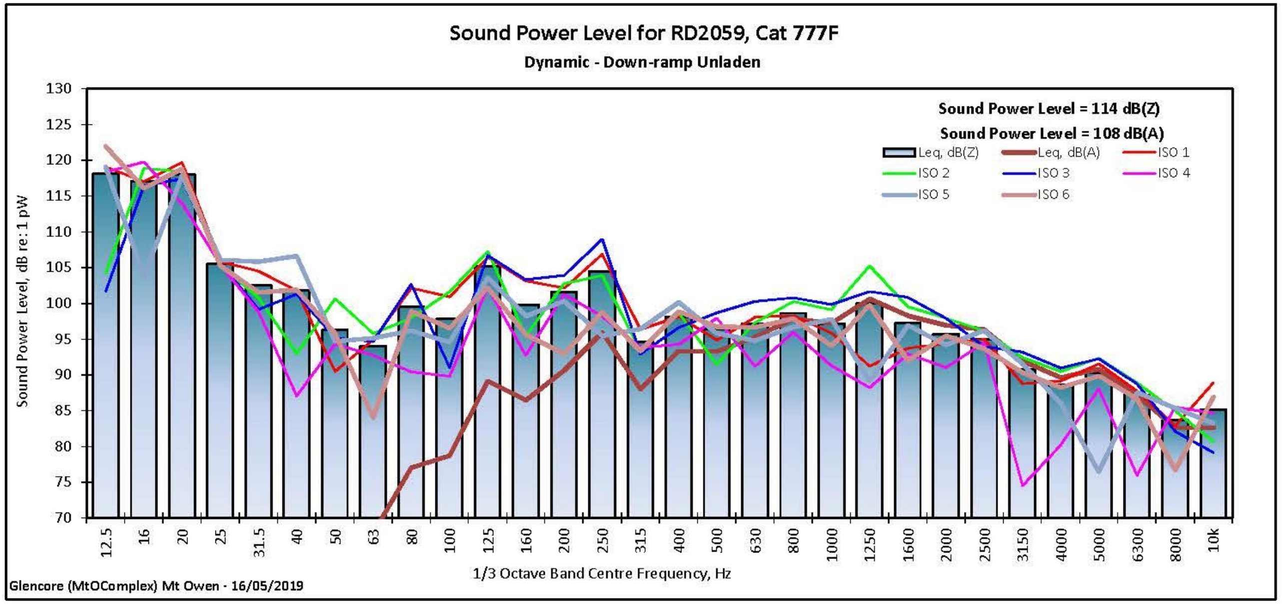


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	115	116	117	107	103	103	100	100	123	107	107	112	106	104	104	107	105	106	105	103	105	108	104	100	97	97	96	97	96	96
Leq, dB(A)	52	59	67	62	63	68	70	74	101	88	91	98	95	96	97	102	102	104	104	103	106	109	105	101	98	98	96	97	95	94

Measure Sound Power Level Report

Machine: **Sound Power Level for RD2059, Cat 777F**
Activity: **Dynamic - Down-ramp Unladen**
No. ISO Points (of 6) **6**
Source: **Glencore (MtOComplex) Mt Owen - 16/05/2019**
Results: **Sound Power Level = 114 dB(Z)**
Sound Power Level = 108 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

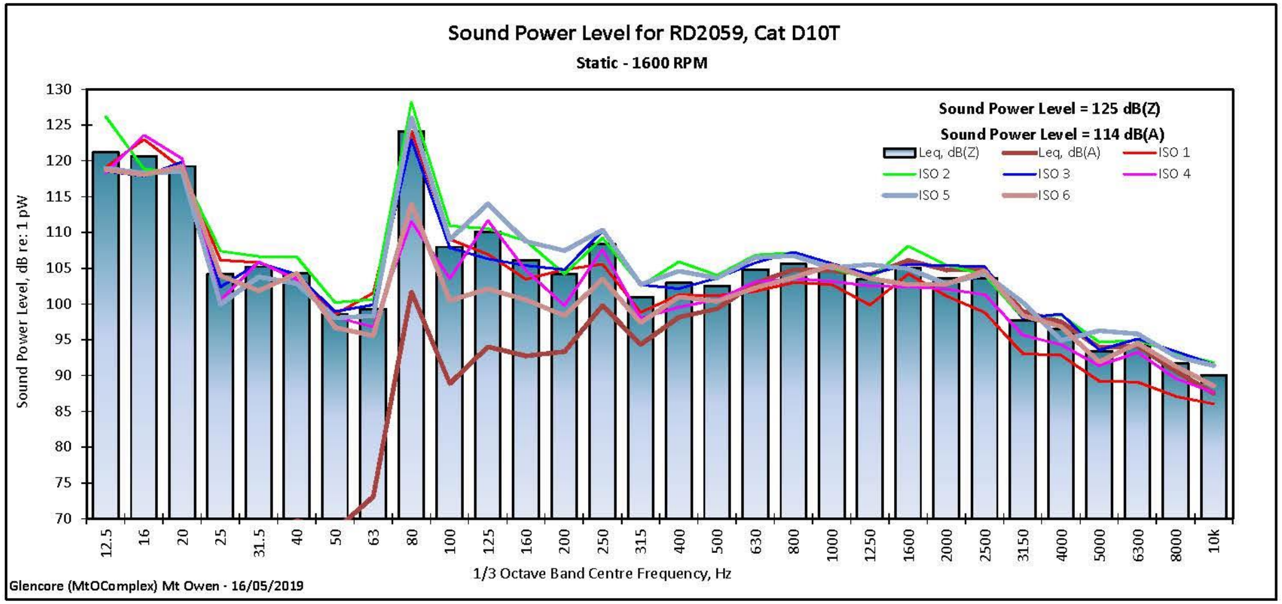


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	118	117	118	106	103	102	96	94	100	98	105	100	102	105	95	98	96	97	99	97	100	97	96	95	91	89	90	87	84	85
Leq, dB(A)	55	60	67	61	63	67	66	68	77	79	89	86	91	96	88	93	93	95	98	97	101	98	97	96	92	90	91	87	83	83

Measure Sound Power Level Report

Machine: Sound Power Level for RD2059, Cat D10T
Activity: Static - 1600 RPM
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 16/05/2019
Results: Sound Power Level = 125 dB(Z)
Sound Power Level = 114 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	121	121	119	104	105	104	99	99	124	108	110	106	104	108	101	103	102	105	106	105	103	105	104	104	98	96	93	94	92	90
Leq, dB(A)	58	64	69	60	66	70	68	73	102	89	94	93	93	100	94	98	99	103	105	105	104	106	105	105	99	97	94	94	91	87

Measure Sound Power Level Report

Machine: Sound Power Level for Drill820, Drilltech D55SP

Activity: Dynamic - Drilling

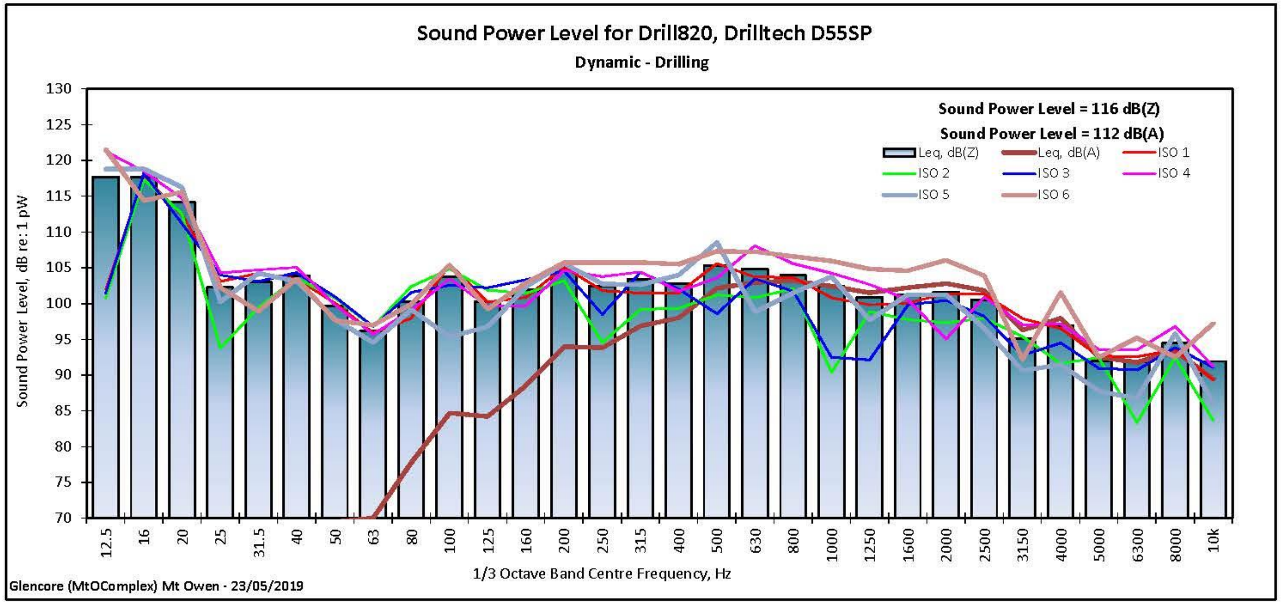
No. ISO Points (of 6) 6

Source: Glencore (MtOComplex) Mt Owen - 23/05/2019

Results: Sound Power Level = 116 dB(Z)

Sound Power Level = 112 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

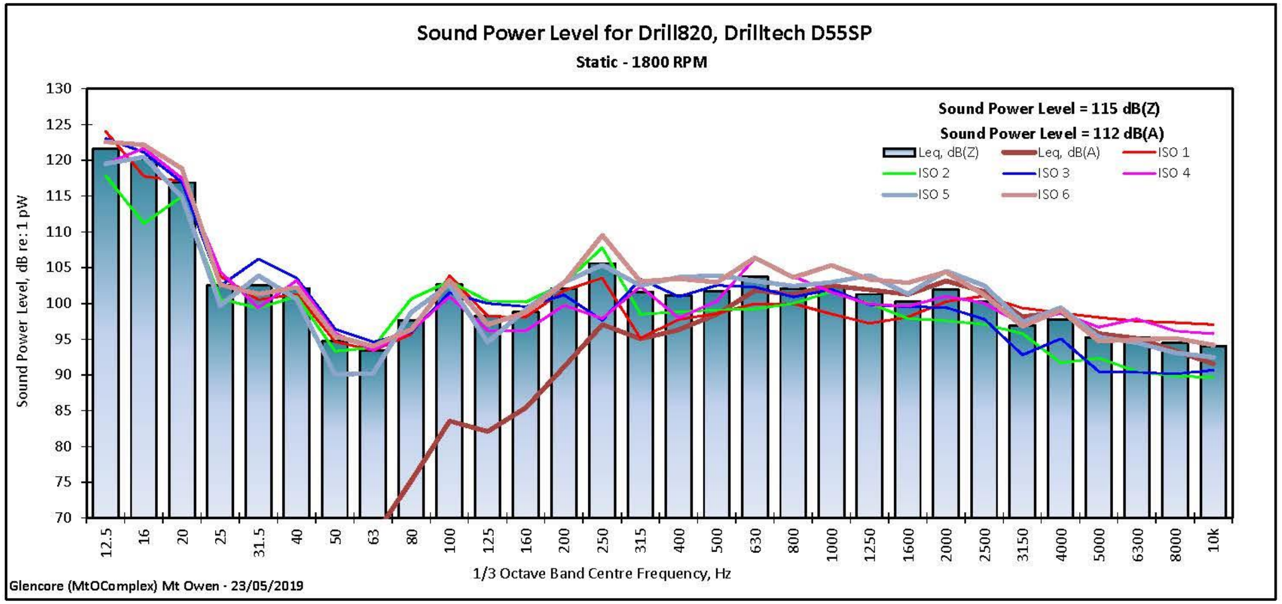


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	118	118	114	102	103	104	100	96	100	104	100	102	105	102	103	103	105	105	104	102	101	101	102	101	95	97	92	92	94	92
Leq, dB(A)	54	61	64	58	64	69	69	70	78	85	84	89	94	94	97	98	102	103	103	102	101	102	103	102	96	98	92	92	93	89

Measure Sound Power Level Report

Machine: Sound Power Level for Drill820, Drilltech D55SP
Activity: Static - 1800 RPM
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 23/05/2019
Results: Sound Power Level = 115 dB(Z)
Sound Power Level = 112 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

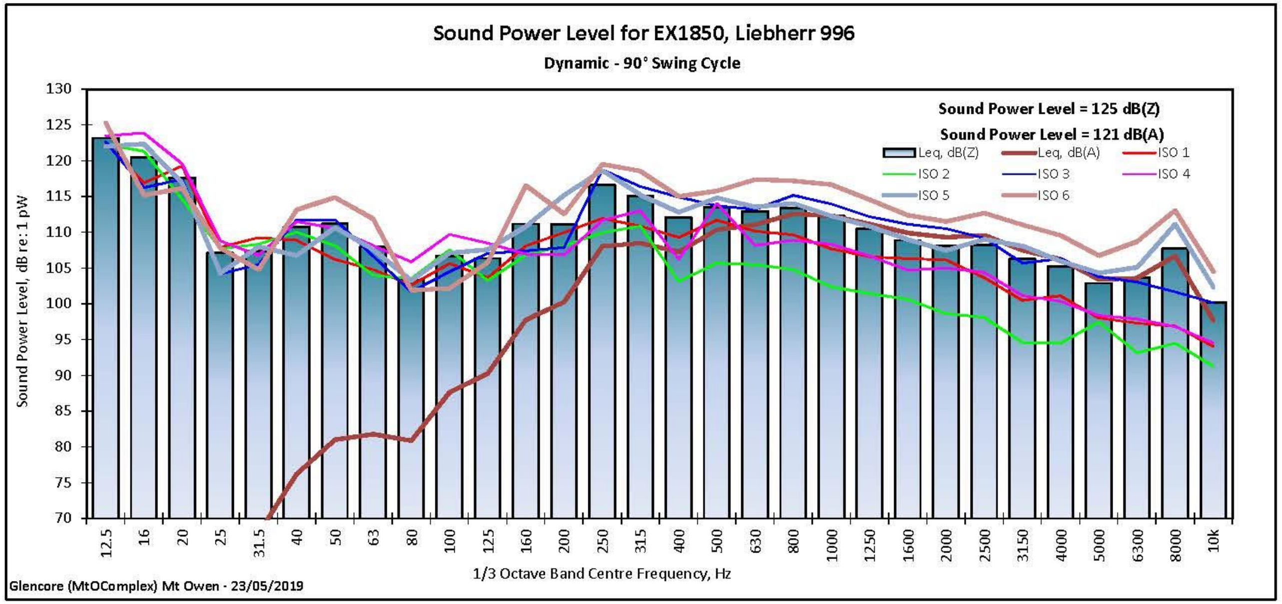


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	120	117	103	103	102	95	93	98	103	98	99	102	106	102	101	102	104	102	102	101	100	102	100	97	98	95	95	94	94
Leq, dB(A)	58	63	66	58	63	68	65	67	75	84	82	85	91	97	95	96	98	102	101	102	102	101	103	102	98	99	96	95	93	92

Measure Sound Power Level Report

Machine: Sound Power Level for EX1850, Liebherr 996
Activity: Dynamic - 90° Swing Cycle
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 23/05/2019
Results: Sound Power Level = 125 dB(Z)
Sound Power Level = 121 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008

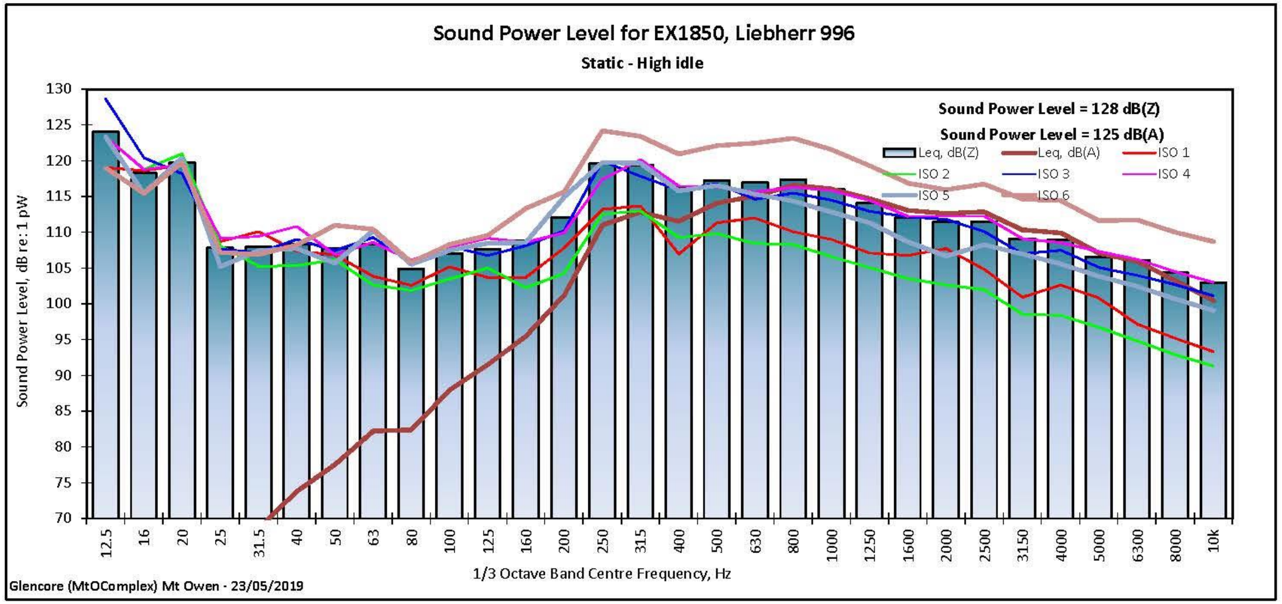


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	123	121	118	107	107	111	111	108	103	107	106	111	111	117	115	112	114	113	113	112	111	109	108	108	106	105	103	104	108	100
Leq, dB(A)	60	64	67	62	68	76	81	82	81	88	90	98	100	108	108	107	110	111	113	112	111	110	109	110	107	106	103	104	107	98

Measure Sound Power Level Report

Machine: Sound Power Level for EX1850, Liebherr 996
Activity: Static - High idle
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 23/05/2019
Results: Sound Power Level = 128 dB(Z)
Sound Power Level = 125 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008

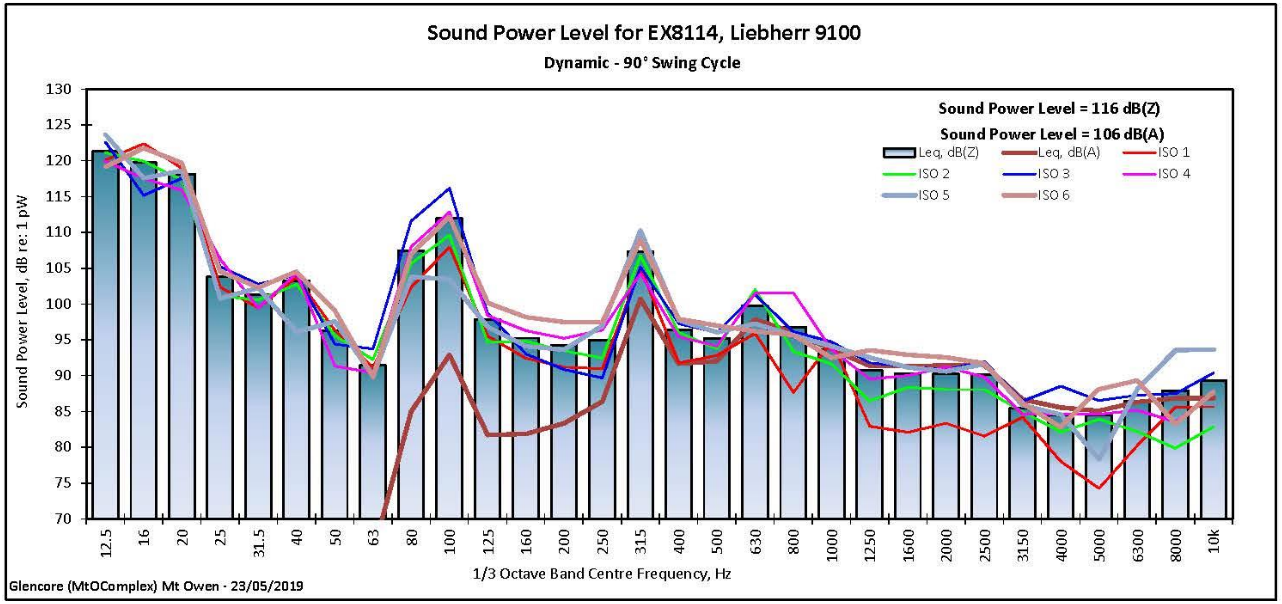


Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	124	118	120	108	108	108	108	108	105	107	108	109	112	120	119	116	117	117	117	116	114	112	111	112	109	109	107	106	104	103
Leq, dB(A)	61	62	69	63	69	74	78	82	82	88	91	95	101	111	113	112	114	115	117	116	115	113	113	113	110	110	107	106	103	100

Measure Sound Power Level Report

Machine: Sound Power Level for EX8114, Liebherr 9100
Activity: Dynamic - 90° Swing Cycle
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 23/05/2019
Results: Sound Power Level = 116 dB(Z)
Sound Power Level = 106 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6395:2008



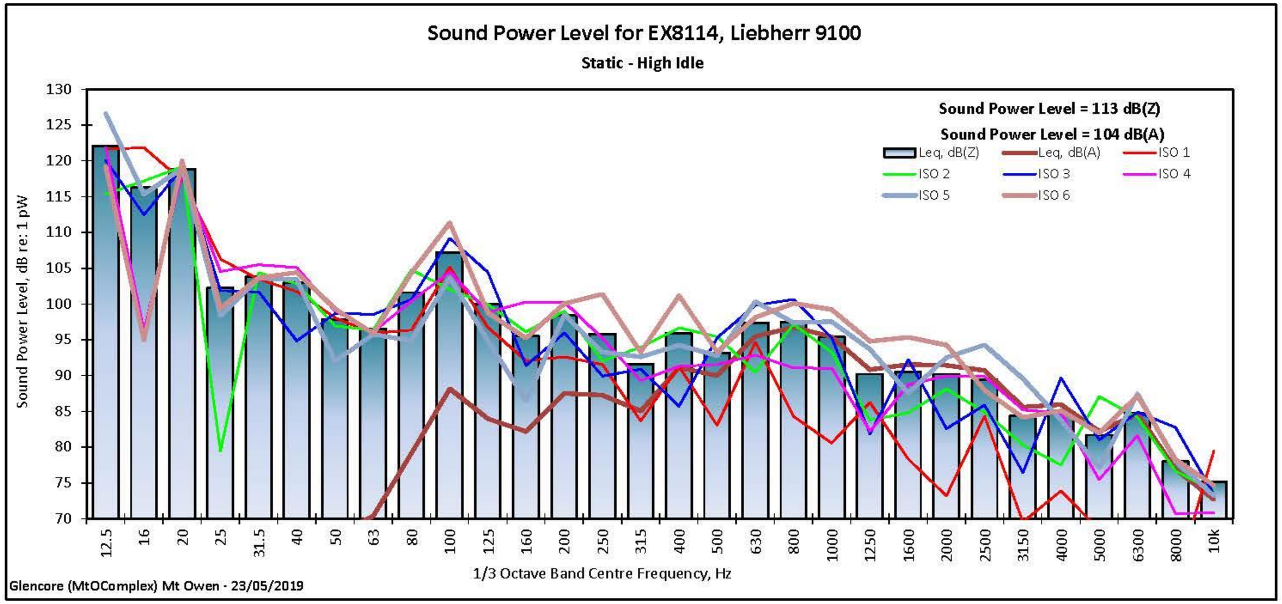
Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315
Leq, dB(Z)	121	120	118	104	101	103	96	91	107	112	98	95	94	95	107
Leq, dB(A)	58	63	68	59	62	69	66	65	85	93	82	82	83	86	101

Frequency, Hz	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	96	95	100	97	94	91	90	90	90	85	85	85	86	88	89
Leq, dB(A)	92	92	98	96	94	91	91	91	91	87	86	85	86	87	87

Measure Sound Power Level Report

Machine: Sound Power Level for EX8114, Liebherr 9100
Activity: Static - High Idle
No. ISO Points (of 6) 6
Source: Glencore (MtOComplex) Mt Owen - 23/05/2019
Results: Sound Power Level = 113 dB(Z)
Sound Power Level = 104 dB(A)

Note: 12.5 to 20Hz reported for information.
SWL calculated using 25Hz to 10kHz.
Measured in accordance with ISO6393:2008



Frequency, Hz	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10k
Leq, dB(Z)	122	116	119	102	104	103	98	97	102	107	100	96	98	96	92	96	93	97	98	95	90	91	90	89	84	85	82	85	78	75
Leq, dB(A)	59	60	68	58	64	68	68	70	79	88	84	82	87	87	85	91	90	95	97	95	91	92	91	91	86	86	82	85	77	73

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Appendix E: Blasting

Table 16: MGO Overpressure Blasting Compliance Summary

Blast Monitor	Location	Maximum Airblast (dB(L))	Average Airblast (dB(L))
Mt Owen			
MOC1	Glennies Ck Road	113.6	99.2
MOC2	Glennies Ck Road	114.1	97.6
MOC3	Glennie St Camberwell Village	115.0	92.4
MOC4	Middle Falbrook Area	111.8	94.7
MOC5	Goorangoola Area	114.8	97.9
Ravensworth Homestead	Ravensworth Homestead	115.5	95.7
Chain of Ponds Inn	Chain of Ponds Inn	110.5	93.1
Former Hebden Public School	Former Hebden Public School	112.9	94.4
Church	Camberwell Church	111.4	94.4
Integra Surface	Integra Surface	114.7	99.7
Integra Underground Workings	Integra Underground Workings	120.8	104.1
Glendell			
Ravensworth Homestead	Ravensworth Homestead	111.6	96.5
MOC3	Glennie St Camberwell Village	110.7	95.2
Church	Camberwell Church	117.7	89.0
Powerlines	Powerlines	115.1	105.6
ARTC 1	Main Northern Railway	114	104.8
ARTC 2	Main Northern Railway	120.7	106.3
ARTC 3	Main Northern Railway	111.3	102.7
ARTC 4	Main Northern Railway	114.5	100.0

MOC2	Glennies Creek Road	109.5	94.7
Integra Surface	Integra Surface	110.4	100.6
Ravensworth East			
MOC1	Glennies Ck Road	114.7	93.3
MOC2	Glennies Ck Road	111.6	95.8
MOC3	Glennie St Camberwell Village	107.7	88.0
MOC4	Middle Falbrook Area	106.0	86.7
MOC5	Goorangoola Area	108.3	92.4
Ravensworth Homestead	Ravensworth Homestead	113.7	99.2
Chain of Ponds Inn	Chain of Ponds Inn	114.4	94.1
Former Hebden Public School	Former Hebden Public School	111.9	102.1
Church	Camberwell Church	111.3	91.6

Table 17: MGO Vibration Blasting Compliance Summary

Blast Monitor	Location	Maximum Vibration (mm/s)	Average Vibration (mm/s)
Mt Owen			
MOC1	Glennies Ck Road	1.76	0.3
MOC2	Glennies Ck Road	0.76	0.3
MOC3	Glennie St Camberwell Village	0.33	0.1
MOC4	Middle Falbrook Area	0.77	0.3
MOC5	Goorangoola Area	0.59	0.2
Ravensworth Homestead	Ravensworth Homestead	0.57	0.2
Chain of Ponds Inn	Chain of Ponds Inn	0.46	0.1
Former Hebden Public School	Former Hebden Public School	0.61	0.2
Church	Camberwell Church	0.22	0.1

Integra Surface	Integra Surface	1.05	0.3
Integra Underground Workings	Integra Underground Workings	9.97	2.1
Glendell			
Ravensworth Homestead	Ravensworth Homestead	1.68	0.38
MOC3	Glennie St Camberwell Village	0.82	0.38
Church	Camberwell Church	0.61	2.21
MOC2	Glennies Creek Road	1.09	0.23
Powerlines	Powerlines	13.61	2.43
ARTC 1	Main Northern Railway	9.62	1.84
ARTC 2	Main Northern Railway	13.8	0.77
ARTC 3	Main Northern Railway	1.47	0.5
ARTC 4	Main Northern Railway	2.43	0.59
Integra Surface	Integra Surface	1.46	0.36
Ravensworth East			
MOC1	Glennies Ck Road	0.1	0.05
MOC2	Glennies Ck Road	0.24	0.11
MOC3	Glennie St Camberwell Village	1.08	0.07
MOC4	Middle Falbrook Area	0.13	0.05
MOC5	Goorangoola Area	0.14	0.05
Ravensworth Homestead	Ravensworth Homestead	1.09	0.53
Chain of Ponds Inn	Chain of Ponds Inn	0.27	1.15
Former Hebden Public School	Former Hebden Public School	1.12	0.56
Church	Camberwell Church	0.06	0.03
Integra Surface	Integra Surface	0.26	0.29
Integra Underground Workings	Integra Underground Workings	0.29	0.14

Table 18: Mt Owen Blast Monitoring Results – MOC 1 and MOC 2

Date Fired	Time Fired	MOC1		MOC2	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
2/01/2019	12:39	0.32	91.7	0.38	92.3
4/01/2019	10:58	0.17	99	0.22	95.4
7/01/2019	14:22	0.2	98.2	0.35	102.8
10/01/2019	9:41	0.17	96.3	0.17	92.3
11/01/2019	12:03	0.25	99	0.25	96.8
16/01/2019	14:09	0.37	100	0.49	97.5
18/01/2019	10:43	0.18	96.8	0.17	94.4
23/01/2019	13:20	0.19	97.8	0.38	94.5
25/01/2019	12:18	0.23	98	0.49	94.1
30/01/2019	16:00	0.15	91.8	0.14	92.1
01/02/2019	12:25	0.27	96.3	0.42	96.2
01/02/2019	12:27	0.18	107.2	0.3	93.7
05/02/2019	12:32	0.12	101.5	0.27	105
07/02/2019	13:06	0.17	98.3	0.13	91.3
07/02/2019	13:10	0.04	102.4	0.1	89.5
13/02/2019	12:44	0.27	96.9	0.29	95.4
15/02/2019	12:11	0.34	99.2	0.31	97.5
20/02/2019	15:57	0.36	107.1	0.39	109.2
22/02/2019	11:58	0.18	107.1	0.15	106.7
28/02/2019	13:13	0.26	104.5	0.4	102.1
5/03/2019	12:34	1.76	97	0.24	105.8
7/03/2019	12:37	0.24	97.9	0.23	97
12/03/2019	13:18	0.38	101.4	0.23	96
15/03/2019	12:03	0.51	99.1	0.36	94.6
21/03/2019	16:17	0.34	107.9	0.31	107.5
27/03/2019	12:46	0.26	112.8	0.25	97.5
29/03/2019	12:19	0.17	100.4	0.34	98.2
4/04/2019	13:15	0.2	103	0.15	103
5/04/2019	12:20	0.17	94.7	0.11	88.2
11/04/2019	13:01	0.47	99.8	0.36	99.4
17/04/2019	12:11	0.22	96.4	0.3	92.9
18/04/2019	13:05	0.11	90.9	0.14	91.8
23/04/2019	16:02	0.3	112.9	0.28	92.5
24/04/2019	14:05	0.17	88.7	0.25	88.5
26/04/2019	12:44	0.21	99.5	0.25	106.8
1/05/2019	12:14	0.37	96.6	0.23	93.3
3/05/2019	10:44	0.26	101.7	0.44	100.1
8/05/2019	11:53	0.53	111	0.75	103.9
10/05/2019	9:58	0.46	103.3	0.32	104.1
15/05/2019	12:06	0.24	92.7	0.26	88.9
16/05/2019	13:03	0.29	92.9	0.17	99.1

Date Fired	Time Fired	MOC1		MOC2	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
21/05/2019	13:17	0.28	97.9	0.35	94.3
24/05/2019	12:15	0.23	93.1	0.33	97.5
30/05/2019	16:17	0.23	103.1	0.29	98.1
31/05/2019	7:09	0.14	108.1	0.18	109.7
4/06/2019	12:52	0.14	104.8	0.22	101.6
7/06/2019	12:17	0.54	103	0.44	99.9
11/06/2019	16:02	0.2	95.6	0.23	96.9
12/06/2019	9:30	0.28	104.8	0.21	100.2
14/06/2019	12:22	0.38	97.1	0.31	91.2
19/06/2019	13:18	0.45	92.5	0.27	91.8
21/06/2019	12:18	0.22	98.1	0.25	98.3
28/06/2019	15:23	0.38	95.3	0.35	92.9
3/07/2019	12:47	0.24	102.6	0.19	95.5
5/07/2019	11:16	0.39	95.1	0.34	90.1
5/07/2019	11:18	0.11	110.7	0.12	83.5
11/07/2019	13:18	0.31	112.5	0.25	107.5
13/07/2019	8:57:53	0.16	104.5	0.22	97.4
19/07/2019	12:30	0.72	100.4	0.76	98.7
19/07/2019	12:58	0.27	98.9	0.26	101.6
24/07/2019	12:52	0.21	105.1	0.25	99.4
25/07/2019	13:24	0.17	92.7	0.16	89.1
30/07/2019	12:17	0.17	99.8	0.24	96.6
1/08/2019	12:36	0.25	91.1	0.36	87.3
6/08/2019	9:27	0.21	102.9	0.2	98.6
12/08/2019	12:24	0.16	103.4	0.25	105.3
13/08/2019	13:13	0.21	100.4	0.23	102.5
15/08/2019	12:48	0.26	97.6	0.38	92.9
20/08/2019	12:50	0.24	102	0.33	110
22/08/2019	14:37	0.79	96.4	0.63	100.9
27/08/2019	13:18	0.16	89.6	0.23	91.7
29/08/2019	13:10	0.61	101.9	0.15	107.5
30/08/2019	10:45	0.14	104	0.18	108.7
3/09/2019	12:02	0.34	95.1	0.24	92.9
5/09/2019	12:04	0.29	89.2	0.37	84.2
9/09/2019	12:21	0.26	113.6	0.39	112.2
11/09/2019	12:12	0.24	91	0.23	96.2
13/09/2019	12:01	0.36	94.7	0.43	86
13/09/2019	12:02	0.22	93.9	0.28	96.4
19/09/2019	13:06	0.19	97.1	0.35	98.6
24/09/2019	13:00	0.37	103.3	0.37	100.2
26/09/2019	13:26	0.16	93.7	0.18	94.4
1/10/2019	12:17	0.26	96.5	0.27	96.6
1/10/2019	12:17	0.07	95.8	0.09	94.8

Date Fired	Time Fired	MOC1		MOC2	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
3/10/2019	12:03	0.19	94.4	0.24	89.6
9/10/2019	12:18	0.56	97.6	0.26	96.5
11/10/2019	12:20	0.34	95.2	0.3	101.1
21/10/2019	13:23	0.49	92.5	0.37	96.9
29/10/2019	12:16	0.34	91.8	0.24	91.6
31/10/2019	12:17	0.28	87.6	0.32	97.3
5/11/2019	12:23	0.34	100.4	0.33	98.8
11/11/2019	12:22	0.32	95.2	0.32	108
13/11/2019	12:22	0.34	99.7	0.42	90.9
18/11/2019	12:21	0.54	99.6	0.51	101.2
20/11/2019	11:14	0.25	99.9	0.45	103.6
21/11/2019	13:29	0.28	100.5	0.39	90.7
29/11/2019	11:54	0.15	92.5	0.32	88.8
29/11/2019	11:57	0.16	98.2	0.25	96
4/12/2019	11:22	0.23	106.9	0.33	109.7
5/12/2019	12:32	0.19	102.4	0.34	101.9
5/12/2019	12:34	0.05	105.3	0.18	114.1
12/12/2019	12:13	0.39	103.7	0.37	102
18/12/2019	13:06	0.54	97.9	0.56	102.6

Table 19: Mt Owen Blast Monitoring Results – MOC 3 and MOC 4

Date Fired	Time Fired	MOC3		MOC4	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
2/01/2019	12:39	0.06	88.5	0.44	92.1
4/01/2019	10:58	0.07	91.3	0.17	96.4
7/01/2019	14:22	0.05	85	0.16	84.5
10/01/2019	9:41	0.08	91	0.28	89.1
11/01/2019	12:03	0.06	86.4	0.32	92.9
16/01/2019	14:09	0.33	95.3	0.37	95
18/01/2019	10:43	0.06	95.6	0.24	91
23/01/2019	13:20	0.1	89.7	0.17	97.6
25/01/2019	12:18	0.07	96.4	0.24	96.3
30/01/2019	16:00	0.04	87.9	0.17	95.8
01/02/2019	12:25	0.08	87.7	0.27	89.7
01/02/2019	12:27	0.08	92.4	0.11	87.4
05/02/2019	12:32	0.06	96.4	0.12	95
07/02/2019	13:06	0.04	89.2	0.16	95.3
07/02/2019	13:10	0.02	78.1	0.06	89.8
13/02/2019	12:44	0.08	95.1	0.37	94.4
15/02/2019	12:11	0.15	93.9	0.34	93.3
20/02/2019	15:57	0.13	102.6	0.4	95.1
22/02/2019	11:58	0.05	95.5	0.27	98.3
28/02/2019	13:13	0.09	96.3	0.29	101.2
5/03/2019	12:34	0.07	89.4	0.14	96.8
7/03/2019	12:37	0.07	90.5	0.33	87.7
12/03/2019	13:18	0.08	96	0.31	100.1
15/03/2019	12:03	0.15	91.5	0.77	92.2
21/03/2019	16:17	0.1	91.2	0.33	88.8
27/03/2019	12:46	0.07	87.9	0.36	91.1
29/03/2019	12:19	0.13	94.6	0.18	96.3
4/04/2019	13:15	0.05	86	0.27	84.7
5/04/2019	12:20	0.04	86.6	0.16	100.2
11/04/2019	13:01	0.08	96.1	0.3	92.2
17/04/2019	12:11	0.1	90.5	0.23	90.9
18/04/2019	13:05	0.05	87.5	0.12	89.9
23/04/2019	16:02	0.09	96.2	0.31	85.8
24/04/2019	14:05	0.08	82.5	0.15	87.9
26/04/2019	12:44	0.08	95.3	0.32	101.6
1/05/2019	12:14	0.08	93.5	0.3	102
3/05/2019	10:44	0.11	96.1	0.27	105.2
8/05/2019	11:53	0.19	96.4	0.51	96.2
10/05/2019	9:58	0.14	104.3	0.48	104.1
15/05/2019	12:06	0.07	89.9	0.39	89.1

Date Fired	Time Fired	MOC3		MOC4	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
16/05/2019	13:03	0.1	88.6	0.27	89.4
21/05/2019	13:17	0.09	91.5	0.3	97.4
24/05/2019	12:15	0.06	93	0.35	90.3
30/05/2019	16:17	0.1	90.3	0.26	97.6
31/05/2019	7:09	0.06	100	0.13	108.2
4/06/2019	12:52	0.05	89.9	0.19	90.4
7/06/2019	12:17	0.12	100.2	0.65	99.5
11/06/2019	16:02	0.08	91.1	0.24	99.7
12/06/2019	9:30	0.09	97.7	0.35	103.7
14/06/2019	12:22	0.1	89.6	0.47	93.2
19/06/2019	13:18	0.09	86.7	0.54	88.4
21/06/2019	12:18	0.06	93.5	0.25	99.8
28/06/2019	15:23	0.11	91	0.26	95.8
3/07/2019	12:47	0.07	87.8	0.24	94.3
5/07/2019	11:16	0.1	94.4	0.7	88.8
5/07/2019	11:18	0.04	88.7	0.09	84.5
11/07/2019	13:18	0.07	115	0.44	104.4
13/07/2019	8:57	0.07	93.2	0.44	104.6
19/07/2019	12:30	0.29	90.9	0.62	95.3
19/07/2019	12:58	0.07	90.5	0.37	94.8
24/07/2019	12:52	0.07	89.8	0.27	105.9
25/07/2019	13:24	0.05	86.7	0.27	86.8
30/07/2019	12:17	0.07	95.7	0.22	96.9
1/08/2019	12:36	0.12	88.1	0.27	87.4
6/08/2019	9:27	0.07	89.8	0.35	111.8
12/08/2019	12:24	0.07	92.8	0.18	98.2
13/08/2019	13:13	0.31	89.2	0.28	98.2
15/08/2019	12:48	0.08	100.2	0.33	101.8
20/08/2019	12:50	0.12	101	0.16	103
22/08/2019	14:37	0.31	109.6	0.66	95
27/08/2019	13:18	0.09	84.5	0.12	88.3
29/08/2019	13:10	0.04	96.7	0.24	97.4
30/08/2019	10:45	0.07	88.5	0.14	96.7
3/09/2019	12:02	0.09	90.6	0.57	89.1
5/09/2019	12:04	0.09	83.7	0.33	83.8
9/09/2019	12:21	0.15	105.9	0.35	97.8
11/09/2019	12:12	0.07	93.7	0.26	87.9
13/09/2019	12:01	0.12	91.3	0.32	90.6
13/09/2019	12:02	0.1	86.4	0.33	98.7
19/09/2019	13:06	0.08	94.7	0.34	93
24/09/2019	13:00	0.13	91	0.26	101.4
26/09/2019	13:26	0.06	84.5	0.24	90.9
1/10/2019	12:17	0.08	91.4	0.24	94.7

Date Fired	Time Fired	MOC3		MOC4	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
1/10/2019	12:17	0.05	91.4	0.09	90.3
3/10/2019	12:03	0.06	84.3	0.29	93.7
9/10/2019	12:18	0.11	90.1	0.32	90.8
11/10/2019	12:20	0.08	87.7	0.57	94.3
21/10/2019	13:23	0.1	88	0.6	97.3
29/10/2019	12:16	0.07	89.6	0.43	97.3
31/10/2019	12:17	0.08	86.6	0.43	89.8
5/11/2019	12:23	0.13	86.6	0.41	95.1
11/11/2019	12:22	0.06	87.8	0.31	91.9
13/11/2019	12:22	0.11	100.7	0.23	103.4
18/11/2019	12:21	0.1	91.6	0.64	94.9
20/11/2019	11:14	0.1	96.5	0.2	95.2
21/11/2019	13:29	0.14	87.1	0.51	100.8
29/11/2019	11:54	0.06	90.4	0.21	88.7
29/11/2019	11:57	0.08	96.8	0.31	94.2
4/12/2019	11:22	0.07	90.8	0.34	102.6
5/12/2019	12:32	0.08	105.9	0.29	92.7
5/12/2019	12:34	0.07	113	0.06	94.9
12/12/2019	12:13	0.13	97.3	0.37	95.8
18/12/2019	13:06	0.14	92.9	0.54	91

Table 20 Mt Owen Blast Monitoring Results – MOC 5 and Homestead

Date Fired	Time Fired	MOC5		Homestead	
		Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)
2/01/2019	12:39	93.1	0.21	90.4	0.14
4/01/2019	10:58	100.9	0.12	84.1	0.2
7/01/2019	14:22	95.8	0.23	96.6	0.18
10/01/2019	9:41	99.6	0.15	94.3	0.08
11/01/2019	12:03	95.8	0.14	88.7	0.1
16/01/2019	14:09	103.9	0.13	96.6	0.27
18/01/2019	10:43	97.7	0.15	93.8	0.2
23/01/2019	13:20	94.4	0.11	86.8	0.24
25/01/2019	12:18	100.6	0.17	90	0.29
30/01/2019	16:00	94.8	0.09	88.2	0.08
01/02/2019	12:25	100.6	0.2	93.9	0.25
01/02/2019	12:27	92.5	0.07	92.1	0.14
05/02/2019	12:32	97.8	0.06	94	0.15
07/02/2019	13:06	97.1	0.1	88.3	0.07
07/02/2019	13:10	95	0.01	83.2	0.04
13/02/2019	12:44	96	0.26	96.2	0.26
15/02/2019	12:11	109.6	0.15	103.7	0.23
20/02/2019	15:57	92.7	0.29	109.2	0.21
22/02/2019	11:58	106	0.12	109.4	0.09
28/02/2019	13:13	112.9	0.26	94.4	0.32
5/03/2019	12:34	99.5	0.12	94.5	0.18
7/03/2019	12:37	95.7	0.24	87.6	0.12
12/03/2019	13:18	100.8	0.14	98.5	0.14
15/03/2019	12:03	95.7	0.33	93.9	0.26
21/03/2019	16:17	105.9	0.21	107	0.14
27/03/2019	12:46	107.4	0.28	96.3	0.16
29/03/2019	12:19	99	0.13	92.3	0.17
4/04/2019	13:15	89.5	0.15	90.8	0.11
5/04/2019	12:20	95.4	0.09	88.2	0.06
11/04/2019	13:01	100.1	0.28	100	0.17
17/04/2019	12:11	99.4	0.11	93.2	0.16
18/04/2019	13:05	96.2	0.04	87	0.07
23/04/2019	16:02	100.1	0.32	98.6	0.2
24/04/2019	14:05	89.6	0.07	83.2	0.15
26/04/2019	12:44	97.4	0.14	102.2	0.21
1/05/2019	12:14	95.8	0.17	85.5	0.08
3/05/2019	10:44	99.7	0.17	95.9	0.29
8/05/2019	11:53	114.8	0.53	108.1	0.25
10/05/2019	9:58	94.7	0.22	92.5	0.08
15/05/2019	12:06	96.2	0.17	91.1	0.2
16/05/2019	13:03	94.6	0.21	89.6	0.1

21/05/2019	13:17	94.6	0.25	100.1	0.22
24/05/2019	12:15	97.6	0.24	96	0.15
30/05/2019	16:17	96.1	0.16	93.9	0.2
31/05/2019	7:09	107.5	0.06	88	0.08
4/06/2019	12:52	101.4	0.08	113.5	0.11
7/06/2019	12:17	94.9	0.31	91.6	0.23
11/06/2019	16:02	98	0.11	90	0.17
12/06/2019	9:30	93.9	0.12	93	0.09
14/06/2019	12:22	100.5	0.2	88.5	0.17
19/06/2019	13:18	90.5	0.33	86.9	0.18
21/06/2019	12:18	99.6	0.13	92.3	0.08
28/06/2019	15:23	97.1	0.17	92.3	0.31
3/07/2019	12:47	100.3	0.15	90.8	0.07
5/07/2019	11:16	92.8	0.27	95.3	0.35
5/07/2019	11:18	96	0.03	88.9	0.09
11/07/2019	13:18	102.9	0.24	108.8	0.12
13/07/2019	8:57	110.1	0.14	109.7	0.26
19/07/2019	12:30	97.7	0.59	94.4	0.57
19/07/2019	12:58	94.2	0.14	96.3	0.1
24/07/2019	12:52	98.4	0.14	97.1	0.2
25/07/2019	13:24	91.2	0.12	87.4	0.1
30/07/2019	12:17	105.3	0.15	97.6	0.24
1/08/2019	12:36	92.5	0.24	89	0.17
6/08/2019	9:27	96.2	0.13	88.9	0.06
12/08/2019	12:24	100.3	0.09	105.1	0.17
13/08/2019	13:13	97.3	0.17	103.3	0.13
15/08/2019	12:48	101	0.2	105.1	0.14
20/08/2019	12:50	104.5	0.09	102.1	0.23
22/08/2019	14:37	99.6	0.38	107.9	0.38
27/08/2019	13:18	89.3	0.09	90.9	0.3
29/08/2019	13:10	104.4	0.08	101	0.04
30/08/2019	10:45	101.8	0.05	97	0.11
3/09/2019	12:02	89.9	0.24	93.9	0.21
5/09/2019	12:04	92.5	0.24	89.3	0.23
9/09/2019	12:21	97.3	0.19	111.3	0.45
11/09/2019	12:12	88.5	0.13	93.2	0.18
13/09/2019	12:01	94.9	0.23	97.3	0.19
13/09/2019	12:02	94.9	0.23	90.8	0.46
19/09/2019	13:06	98.2	0.18	99.5	0.25
24/09/2019	13:00	96.3	0.12	92.1	0.18
26/09/2019	13:26	93.2	0.12	90	0.18
1/10/2019	12:17	100.4	0.09	98.6	0.08
1/10/2019	12:17	100.4	0.02	96.9	0.05
3/10/2019	12:03	95.8	0.17	85.7	0.11
9/10/2019	12:18	96.8	0.11	115.5	0.11
11/10/2019	12:20	102.8	0.16	105	0.13
21/10/2019	13:23	95.1	0.34	103.5	0.16

29/10/2019	12:16	95.1	0.31	98.5	0.11
31/10/2019	12:17	96.1	0.23	91.2	0.19
5/11/2019	12:23	98.9	0.1	88.5	0.15
11/11/2019	12:22	96.6	0.21	99.8	0.15
13/11/2019	12:22	97.3	0.2	105.6	0.28
18/11/2019	12:21	95.9	0.24	92	0.35
20/11/2019	11:14	100.9	0.13	97.4	0.24
21/11/2019	13:29	97.3	0.1	98.4	0.16
29/11/2019	11:57	94.3	0.15	89.2	0.2
4/12/2019	11:22	94.8	0.16	93.8	0.21
5/12/2019	12:32	104.6	0.23	107.1	0.17
5/12/2019	12:34	99.2	0.16	110	0.17
12/12/2019	12:13	96.8	0.06	99.8	0.05
18/12/2019	13:06	96.6	0.21	97.8	0.21

Table 21 Mt Owen Blast Monitoring Results – Chain of Ponds, Hebden School and Church

Date Fired	Time Fired	Chain of Ponds		Hebden School		Church	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
2/01/2019	12:39	0.09	88.4	0.18	89.5	0.08	93.8
4/01/2019	10:58	0.08	91.2	0.17	83.7	0.04	91.8
7/01/2019	14:22	0.09	90.6	0.12	104	0.04	95.2
10/01/2019	9:41	0.07	96.3	0.1	101	0.06	91.1
11/01/2019	12:03	0.08	88.8	0.1	93.3	0.06	87.3
16/01/2019	14:09	0.14	89.9	0.26	97.4	0.14	96.6
18/01/2019	10:43	0.11	91.5	0.18	98.9	0.06	95
23/01/2019	13:20	0.11	94.4	0.14	92	0.06	89.1
25/01/2019	12:18	0.13	89.9	0.21	93.4	0.05	94.1
30/01/2019	16:00	0.08	89.9	0.05	102.3	0.03	84.6
01/02/2019	12:25	0.19	90.9	0.17	95.6	0.06	107.4
01/02/2019	12:27	0.08	91.8	0.13	101.1	0.04	96.2
05/02/2019	12:32	0.1	92.6	0.11	97.3	0.04	104.1
07/02/2019	13:06	0.06	87.5	0.05	103.8	0.04	88.9
07/02/2019	13:10	0.05	87.1	0.05	97.5	0.01	85.7
13/02/2019	12:44	0.09	94	0.15	101.3	0.09	94.9
15/02/2019	12:11	0.12	95.2	0.16	106.9	0.08	94
20/02/2019	15:57	0.15	107.5	0.16	96.8	0.09	108.5
22/02/2019	11:58	0.06	91.2	0.04	112.9	0.05	108.2
28/02/2019	13:13	0.17	93.3	0.28	78.1	0.06	95.3
5/03/2019	12:34	0.11	96.3	0.13	78.1	0.06	99.4
7/03/2019	12:37	0.09	98	0.11	94.8	0.06	98.6
12/03/2019	13:18	0.12	103.4	0.11	103.2	0.08	99.3
15/03/2019	12:03	0.12	98.7	0.12	95.6	0.11	92.3
21/03/2019	16:17	0.11	102.6	0.17	99	0.08	101.9
27/03/2019	12:46	0.1	100.3	0.15	90.9	0.08	98.4
29/03/2019	12:19	0.11	88.8	0.17	95.3	0.05	94.4
4/04/2019	13:15	0.07	92.6	0.1	95.3	0.07	86.9
5/04/2019	12:20	0.06	86.6	0.05	95.1	0.03	86.2
11/04/2019	13:01	0.11	91.8	0.12	104.3	0.09	95.7
17/04/2019	12:11	0.13	91.8	0.18	97.1	0.06	90.1
18/04/2019	13:05	0.06	82	0.04	88.3	0.03	85.2
23/04/2019	16:02	0.13	92.1	0.09	94.2	0.06	102.2
24/04/2019	14:05	0.09	91.8	0.22	88.3	0.05	82.5
26/04/2019	12:44	0.1	95.6	0.22	98.2	0.05	104.6
1/05/2019	12:14	0.08	89.6	0.07	90.8	0.04	95
3/05/2019	10:44	0.14	95.2	0.27	101.7	0.09	94.7
8/05/2019	11:53	0.13	99.1	0.28	90.8	0.1	106.5
10/05/2019	9:58	0.1	88.4	0.09	94.2	0.1	111.4
15/05/2019	12:06	0.07	86.1	0.12	90.1	0.07	88.9
16/05/2019	13:03	0.09	88	0.1	95.4	0.06	87.3

21/05/2019	13:17	0.13	99.5	0.16	90.2	0.09	90.8
24/05/2019	12:15	0.13	95.8	0.14	103.5	0.05	93.9
30/05/2019	16:17	0.12	90.9	0.23	97.2	0.06	96.8
31/05/2019	7:09	0.07	91.8	0.06	98.3	0.06	100.5
4/06/2019	12:52	0.1	108.9	0.07	103.2	0.09	100.8*
7/06/2019	12:17	0.15	89.6	0.17	93.2	0.09	100.1
11/06/2019	16:02	0.11	86.6	0.18	95	0.04	91.3
12/06/2019	9:30	0.08	88	0.1	88.8	0.07	97.2
14/06/2019	12:22	0.09	92.3	0.16	98.2	0.09	94.6
19/06/2019	13:18	0.1	84.9	0.14	92.6	0.09	87.6
21/06/2019	12:18	0.07	90.6	0.09	98.7	0.08	92.2
28/06/2019	15:23	0.12	92.3	0.23	100.3	0.08	91.2
3/07/2019	12:47	0.07	89.6	0.07	96.2	0.04	88.3
5/07/2019	11:16	0.14	96.1	0.25	99.2	0.16	91.2
5/07/2019	11:18	0.06	85.5	0.07	87.5	0.03	104.1
11/07/2019	13:18	0.09	105.4	0.11	92.8	0.09	102.8
13/07/2019	8:57	0.07	103	0.13	80.4	0.05	97.4
19/07/2019	12:30	0.46	91.2	0.61	97	0.13	89
19/07/2019	12:58	0.07	93.8	0.09	88.3	0.06	84.8
24/07/2019	12:52	0.12	88.4	0.12	82.7	0.06	95.4
25/07/2019	13:24	0.07	84.9	0.09	88.6	0.06	83.6
30/07/2019	12:17	0.1	96.5	0.12	100.9	0.05	96.6
1/08/2019	12:36	0.1	88.4	0.31	97.1	0.08	87.1
6/08/2019	9:27	0.07	92.6	0.08	93.6	0.04	88.2
12/08/2019	12:24	0.11	103.7	0.12	92.2	0.06	97.6
13/08/2019	13:13	0.08	94.8	0.1	90.7	0.06	93.6
15/08/2019	12:48	0.11	107.3	0.13	87.8	0.05	106.5
20/08/2019	12:50	0.09	104.4	0.17	86.4	0.06	90.4
22/08/2019	14:37	0.26	104.2	0.31	103	0.22	101
27/08/2019	13:18	0.08	92.6	0.19	95.5	0.05	84.2
29/08/2019	13:10	0.06	95.2	0.06	97.3	0.04	107.8
30/08/2019	10:45	0.07	90.3	0.08	97.2	0.05	92.8
3/09/2019	12:02	0.19	89.9	0.18	89.9	0.07	91.8
5/09/2019	12:04	0.15	88.8	0.3	96.8	0.05	86.4
9/09/2019	12:21	0.11	88	0.39	92.4	0.1	98.8
11/09/2019	12:12	0.11	90.6	0.12	94.6	0.04	92.1
13/09/2019	12:01	0.1	94	0.18	90.6	0.05	87.4
13/09/2019	12:02	0.07	85.5	0.14	93	0.07	86.4
19/09/2019	13:06	0.11	90.9	0.19	96	0.05	95.4
24/09/2019	13:00	0.13	91.8	0.17	91.9	0.11	91.7
26/09/2019	13:26	0.09	84.9	0.11	94.7	0.06	90.9
1/10/2019	12:17	0.1	92.3	0.08	99.5	0.05	91.5
1/10/2019	12:17	0.06	92.3	0.04	99.5	0.03	91.5
3/10/2019	12:03	0.08	95	0.11	88.7	0.07	84.9
9/10/2019	12:18	0.11	93.8	0.09	93.1	0.07	91.3
11/10/2019	12:20	0.08	98	0.11	91.3	0.06	92.3
21/10/2019	13:23	0.11	84.9	0.1	94.3	0.08	88.4

29/10/2019	12:16	0.11	84.2	0.08	100.3	0.07	92.3
31/10/2019	12:17	0.13	88.4	0.14	91.2	0.05	88.1
5/11/2019	12:23	0.14	94.4	0.14	93.7	0.09	104.9
11/11/2019	12:22	0.13	103	0.19	90.2	0.04	93.9
13/11/2019	12:22	0.15	98.7	0.26	87.3	0.09	98.9
18/11/2019	12:21	0.15	89.9	0.27	100.4	0.09	87.8
20/11/2019	11:14	0.21	91.8	0.28	97	0.06	96.1
21/11/2019	13:29	0.13	86.6	0.09	93.9	0.08	94.5
29/11/2019	11:57	0.11	88.4	0.12	91.2	0.03	89.8
4/12/2019	11:22	0.14	88	0.17	95.2	0.05	95.2
5/12/2019	12:32	0.13	105.1	0.11	93.7	0.04	99.9
5/12/2019	12:34	0.12	99.6	0.16	84.7	0.05	100.5
12/12/2019	12:13	0.09	110.5	0.11	99.6	0.02	108.2
18/12/2019	13:06	0.18	91.5	0.19	98.5	0.08	98.4

*Calculated result – refer to App_E Enviro Strata – Review of Air Vibration Result

Table 22 Mt Owen Blast Monitoring Results – Integra Underground and Integra Surface*

Date Fired	Time Fired	Integra Underground*		Integra Surface*	
		Peak Vibration (mm/s)	Peak Overpressure dB(L)	Peak Vibration (mm/s)	Peak Overpressure dB(L)
2/01/2019	12:39	0.74	105.2	0.22	102.2
4/01/2019	10:58	1.98	109.2	0.18	102.3
7/01/2019	14:22	1.1	105.3	0.25	101.9
10/01/2019	9:41	0.47	110.1	0.15	97.1
11/01/2019	12:03	0.62	103.5	0.18	96.6
16/01/2019	14:09	8.39	120.8	0.68	101.5
18/01/2019	10:43	1.75	113.2	0.19	100.1
23/01/2019	13:20	6	112.6	0.27	99.7
25/01/2019	12:18	0.99	115.3	0.28	99.9
30/01/2019	16:00	0.92	106.6	0.15	95
01/02/2019	12:25	0.64	107	0.34	97.9
01/02/2019	12:27	6.13	112	0.2	96.6
05/02/2019	12:32	2.69	117.1	0.2	101.6
07/02/2019	13:06	0.31	104.7	0.12	96.8
07/02/2019	13:10	1.73	103	0.05	95.3
13/02/2019	12:44	0.71	114.1	0.25	99.6
15/02/2019	12:11	3.74	115.5	0.39	100.5
20/02/2019	15:57	1.83	107	0.35	105.6
22/02/2019	11:58	0.94	108.6	0.19	106.7
28/02/2019	13:13	2.11	116.7	0.33	102.4
5/03/2019	12:34	1.76	111	0.28	100.5
7/03/2019	12:37	0.42	107.7	0.19	95.8
12/03/2019	13:18	0.96	115.9	0.25	102.5
15/03/2019	12:03	0.84	108.9	0.32	97.8
21/03/2019	16:17	0.93	106.5	0.39	102
27/03/2019	12:46	0.82	108.2	0.31	98.8
29/03/2019	12:19	5.06	114	0.26	106.1
4/04/2019	13:15	0.87	106	0.17	102.6
5/04/2019	12:20	1.01	111.1	0.17	99.4
11/04/2019	13:01	0.79	112.7	0.27	101.6
17/04/2019	12:11	6.5	115.1	0.29	106
18/04/2019	13:05	2.03	115.7	0.18	101.6
23/04/2019	16:02	0.57	105.7	0.3	9.2
24/04/2019	14:05	6.99	106.3	0.2	98.8
26/04/2019	12:44	2.45	109.5	0.22	109
1/05/2019	12:14	0.68	107.5	0.16	105.2
3/05/2019	10:44	1.89	114.2	0.36	105
8/05/2019	11:53	1.46	108.4	0.61	106.7
10/05/2019	9:58	3.26	116.8	0.4	114.7
15/05/2019	12:06	1.83	108.3	0.17	100.7
16/05/2019	13:03	1.44	109.2	0.26	104.4
21/05/2019	13:17	0.8	107.3	0.28	99.9

24/05/2019	12:15	1.31	112.9	0.24	102.8
30/05/2019	16:17	0.98	111.7	0.3	103.7
31/05/2019	7:09	3.09	117.7	0.21	109.6
4/06/2019	12:52	0.91	109.3	0.17	107.2
7/06/2019	12:17	0.83	113.8	0.04	98.2
11/06/2019	16:02	4.37	112.9	0.28	101.8
12/06/2019	9:30	0.99	105.1	0.21	101.3
14/06/2019	12:22	1.55	105.9	0.35	99.4
19/06/2019	13:18	0.88	106.4	0.3	99.1
21/06/2019	12:18	0.98	113.7	0.22	102.9
28/06/2019	15:23	5.98	114.5	0.4	104
3/07/2019	12:47	1.07	109	0.3	104.1
5/07/2019	11:16	1.52	107.5	0.34	104.6
5/07/2019	11:18	2.25	104.4	0.14	104
11/07/2019	13:18	0.52	111	0.22	110.1
13/07/2019	8:57	2.6	110.8	0.15	105.9
19/07/2019	12:30	2.68	109.8	1.05	104.7
19/07/2019	12:58	4.36	111.7	0.3	103.4
24/07/2019	12:52	1.48	110.4	0.21	103.2
25/07/2019	13:24	1.57	106.1	0.23	99.8
30/07/2019	12:17	1.08	116.8	0.28	102.7
1/08/2019	12:36	0.73	105.9	0.38	99.8
6/08/2019	9:27	0.81	105.4	0.12	100.8
12/08/2019	12:24	1.46	114.3	0.24	101.7
13/08/2019	13:13	1.44	109.4	0.28	98.7
15/08/2019	12:48	0.7	109.8	0.27	98.2
20/08/2019	12:50	7.81	119.3	0.32	103.4
22/08/2019	14:37	1.29	111.6	0.67	96.1
27/08/2019	13:18	4.62	107.1	0.18	93.9
29/08/2019	13:10	0.66	111.3	0.16	98.8
30/08/2019	10:45	4.12	113.4	0.19	96.9
3/09/2019	12:02	0.45	108.1	0.21	96.5
5/09/2019	12:04	0.81	103.8	0.33	93.3
9/09/2019	12:21	3.95	110.1	0.35	97.1
11/09/2019	12:12	1.15	110.8	0.21	98
13/09/2019	12:01	0.81	106.9	0.38	0.96
13/09/2019	12:02	2.43	108.8	0.22	93.8
19/09/2019	13:06	0.54	110	0.26	99.1
24/09/2019	13:00	7.52	82.3	0.43	100.5
26/09/2019	13:26	1.79	73	0.16	92
1/10/2019	12:17	2.97	81.8	0.24	102.9
1/10/2019	12:17	0.95	68.8	0.1	102.9
3/10/2019	12:03	1.5	70.7	0.19	104.4
9/10/2019	12:18	0.71	77.9	0.28	103.8
11/10/2019	12:20	1.48	74.8	0.26	103.9
21/10/2019	13:23	1.29	75.8	0.35	97.8
29/10/2019	12:16	0.7	74.8	0.18	98.9

31/10/2019	12:17	0.81	71.5	0.23	100.2
5/11/2019	12:23	9.97	76.7	0.48	101.6
11/11/2019	12:22	0.52	70.7	0.26	103.8
13/11/2019	12:22	2.92	75.3	0.32	106.2
18/11/2019	12:21	1.31	73	0.36	103.3
20/11/2019	11:14	2.91	84.9	0.32	107.2
21/11/2019	13:29	4.97	78.7	0.49	100.4
29/11/2019	11:57	1.36	70.7	0.16	99.6
4/12/2019	11:22	1.53	79.3	0.2	100.3
5/12/2019	12:32	0.79	109.8	0.29	105.2
5/12/2019	12:34	0.47	109.2	0.27	109.5
12/12/2019	12:13	0.44	99.7	0.08	104
18/12/2019	13:06	1.78	112.9	0.41	108.5

*No Monitoring required at these sites under SSD-5850. Internal Purposes Only.

Table 23: Glendell Blast Monitoring Results – MOC 3, Church, MOC2, Ravensworth Homestead

Date Fired	Time Fired	MOC3		Church		MOC2		Ravensworth Homestead	
		Peak Overpressure (dBL)	Peak Vibration	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)
2/01/2019	13:47	97.8	0.18	101.3	0.1	87.6	0.11	101.8	0.18
2/02/2019	13:43	96.4	0.2	93.4	0.1	97.7	0.29	91.8	0.2
3/01/2019	13:36	95.5	0.36	94.4	0.24	99.8	0.23	107.6	0.42
3/01/2019	13:33	93.3	0.18	94.5	0.09	103.3	0.05	96.9	0.22
8/01/2019	13:41	92.9	0.21	93.4	0.09	88.3	0.05	92.6	0.07
9/01/2019	13:29	104.8	0.3	103.4	0.12	92.2	0.15	93.9	0.41
11/01/2019	13:27	95.1	0.31	90.4	0.24	90.5	0.19	90.2	0.26
14/01/2019	13:31	94.6	0.44	93.6	0.21	87.3	0.17	100.8	0.33
15/01/2019	13:34	99.5	0.17	94.4	0.13	91.6	0.13	93	0.39
15/01/2019	13:35	105.5	0.47	105.4	0.3	98.4	0.24	99.3	0.66
21/01/2019	13:30	94.4	0.48	90.6	0.3	94.1	0.41	93.5	0.49
24/01/2019	13:35	93.6	0.45	93.9	0.22	92.9	0.21	105.2	0.3
31/01/2019	14:00	97.5	0.52	93.7	0.16	94.3	0.2	98.5	0.25
6/02/2019	13:43	97.5	0.41	110.7	0.24	109.5	0.26	105.1	0.35
11/02/2019	13:32	94.2	0.4	96.3	0.24	102.5	0.08	97.2	0.04
14/02/2019	9:25	96.5	0.57	96.0	0.34	106.7	0.31	98.4	0.63
14/02/2019	9:27	89.6	0.4	88.6	0.2	108.5	0.1	107.7	0.25
15/02/2019	13:37	94.3	0.48	94.3	0.16	105.4	0.22	98.8	0.23
21/02/2019	13:30	82.9	0.21	88.2	0.13	93.4	0.07	97.8	0.31
21/02/2019	13:32	88.1	0.28	97.1	0.13	95.9	0.08	100	0.31
25/02/2019	13:40	102.8	0.39	97.7	0.35	89.2	0.18	101.8	0.49
1/03/2019	10:31	94.0	0.2	93.4	0.1	92.2	0.1	95.2	0.2
4/03/2019	13:36	95	0.67	94.4	0.38	93.8	0.45	96.6	0.75
7/03/2019	10:22	90.2	0.35	90.4	0.16	89.7	0.09	103	0.1
8/03/2019	13:30	97	0.17	95.1	0.09	91.5	0.1	90.2	0.22
14/03/2019	13:45	92.2	0.27	92.6	0.12	90.8	0.27	96.4	0.4
19/03/2019	9:22	100.6	0.59	99	0.2	97.3	0.4	89.2	0.21
21/03/2019	13:32	86.1	0.37	87	0.21	82.2	0.11	97.5	0.14
21/03/2019	13:42	89.9	0.23	91.9	0.08	85.8	0.16	93.1	0.11
26/03/2019	13:28	99.9	0.16	97.9	0.11	101.2	0.08	93.6	0.21
29/03/2019	11:22	90.5	0.29	90.4	0.14	88.5	0.08	86.2	0.23
29/03/2019	11:25	95.2	0.23	93.4	0.17	89.2	0.17	89.9	0.34
10/04/2019	13:53	93.4	0.34	90.7	0.18	107	0.24	107.1	0.47
11/04/2019	13:27	96.1	0.46	91.7	0.21	108.1	0.15	89.5	0.23
18/04/2019	14:30	94.1	0.54	92.6	0.42	95.1	0.26	95.6	0.3
24/04/2019	12:27	92.5	0.06	92.6	0.03	96.5	0.06	88.2	0.04
29/04/2019	11:26	93.9	0.2	97.2	0.15	96.5	0.1	96.7	0.27
1/05/2019	12:12	97.7	0.33	98	0.22	90.9	0.25	88.4	0.32
4/05/2019	10:39	89.6	0.28	88.6	0.2	90.9	0.23	97.5	0.15

9/05/2019	13:30	97.1	0.43	98	0.2	92.1	0.19	93.6	0.48
13/05/2019	13:29	93.3	0.33	92.7	0.21	92.5	0.22	91	0.69
16/05/2019	13:24	96.7	0.4	93.1	0.2	89.8	0.44	92.5	0.26
21/05/2019	13:33	96.5	0.41	102.6	0.26	99.6	0.34	90.8	0.53
29/05/2019	16:13	103.8	0.4	97.9	0.22	95.2	0.15	111.6	0.17
30/05/2019	13:24	96.7	0.58	99.5	0.25	105.6	0.3	101.2	0.38
1/06/2019	13:02	99.5	0.77	96.9	0.25	91.2	1.09	86.8	0.5
3/06/2019	13:41	97.4	0.21	103.4	0.13	100.8	0.12	92.5	0.23
7/06/2019	13:38	93	0.2	96.8	0.15	87.8	0.11	98.1	0.17
7/06/2019	13:41	96.1	0.36	97.8	0.24	91.5	0.16	96.7	0.37
14/06/2019	13:44	97.6	0.53	92.4	0.47	94.5	0.44	92.6	0.61
14/06/2019	13:47	97.4	0.57	96.7	0.24	91	0.33	86.6	0.51
19/06/2019	13:41	96	0.3	93.6	0.2	92.7	0.31	98.1	0.29
20/06/2019	13:34	93.6	0.43	92.8	0.29	93.9	0.21	88.4	0.25
27/06/2019	13:41	93.4	0.4	92.1	0.23	99.9	0.18	96.2	0.24
27/06/2019	13:44	101.9	0.21	95.7	0.09	93.7	0.06	91.2	0.22
2/07/2019	13:51	102.6	0.33	99.7	0.14	96.3	0.2	101.2	0.25
4/07/2019	11:19	98.4	0.34	96.2	0.16	89.6	0.24	102.8	0.35
15/07/2019	15:39	96.7	0.29	95.6	0.18	98.5	0.19	99	0.51
15/07/2019	15:41	100.4	0.58	99.2	0.27	94.3	0.78	94.9	0.5
18/07/2019	16:39	110.7	0.82	111.7	0.5	97.9	0.26	100.1	0.42
22/07/2019	11:54	99.3	0.25	99	0.19	91.6	0.25	93.4	0.49
25/07/2019	13:25	93.5	0.62	93.5	0.35	89.1	0.16	91.6	0.26
31/07/2019	13:25	88	0.46	88.2	0.34	85.9	0.28	90	0.31
1/08/2019	13:37	94.2	0.79	96.5	0.37	93	0.16	92.7	0.75
2/08/2019	10:53	94.7	0.33	93	0.15	90.1	0.23	88.6	0.29
7/08/2019	14:39	97.5	0.4	98.2	0.22	94.2	0.73	89.5	0.52
12/08/2019	13:23	97.3	0.24	96.2	0.1	93.7	0.14	106.4	0.28
23/08/2019	11:58	92.3	0.4	93.1	0.2	91.9	0.24	103.8	0.82
28/08/2019	13:30	96.2	0.32	96.3	0.22	93.5	0.24	94.9	0.24
28/08/2019	13:32	97.3	0.63	97.1	0.3	95.2	0.2	94.5	0.41
9/09/2019	13:28	93.9	0.37	101.6	0.2	97.8	0.18	105	0.44
11/09/2019	11:07	91.7	0.28	89.5	0.2	87.5	0.18	92.3	0.17
5/09/2019	13:33	86.7	0.01	74.0	0.0	83.3	0.01	77.3	0
19/09/2019	13:43	94.3	0.47	97.0	0.2	94.2	0.16	96.7	0.39
24/09/2019	10:33	93.9	0.33	91.8	0.2	87.9	0.18	90.3	0.25
30/09/2019	13:34	95.3	0.18	107.9	0.2	104.1	0.11	108.6	0.48
26/09/2019	13:28	94.7	0.58	95.5	0.36	103.5	0.91	89.7	1.68
1/10/2019	13:40	97.7	0.25	98.1	0.29	99.7	0.13	105.2	0.37
3/10/2019	13:29	92.5	0.35	92.3	0.29	85.5	0.12	95	0.4
3/10/2019	13:32	91.9	0.46	93.2	0.21	91.9	0.26	93.2	0.35
9/10/2019	10:51	97.9	0.22	95.6	0.21	90	0.21	100.9	1.61
10/10/2019	13:34	90	0.27	89.8	0.24	94.1	0.32	88.5	0.24
12/10/2019	9:25	92.8	0.29	91.8	0.17	97.7	0.19	109.6	0.72
18/10/2019	11:35	103	0.8	102.5	0.39	108.2	0.36	103.3	0.53
22/10/2019	13:25	92.3	0.33	94.7	0.15	101.9	0.12	90.2	0.27

23/10/2019	13:39	96.2	0.4	95.8	0.21	90.7	0.29	93.1	0.54
28/10/2019	15:24	93.6	0.37	105.8	0.18	93.2	0.12	107.1	0.45
31/10/2019	13:58	92.7	0.28	94.8	0.16	99.6	0.11	104.5	0.33
31/10/2019	14:01	97.6	0.44	96.7	0.25	85.8	0.18	101.1	0.22
5/11/2019	13:31	88.6	0.38	96.8	0.17	93.2	0.18	102.4	0.25
9/11/2019	9:06	97.6	0.45	100.1	0.31	95.6	0.2	103.6	0.64
18/11/2019	12:29	86.4	0.21	89.7	0.17	92.2	0.07	87.9	0.25
18/11/2019	12:31	99.3	0.46	94.9	0.35	102.3	0.31	92.9	0.42
20/11/2019	12:32	94.1	0.21	95.7	0.15	93	0.2	96.3	0.7
21/11/2019	13:32	95.8	0.52	94.5	0.31	92.1	0.55	94.5	0.45
28/11/2019	15:48	99.9	0.59	97.8	0.61	98.6	0.23	94.4	0.75
9/12/2019	11:16	94.3	0.27	91.5	0.19	90.9	0.14	104	0.36
9/12/2019	11:19	90.5	0.22	91.7	0.1	87.8	0.24	96.5	0.24
11/12/2019	10:58	92.1	0.57	92.5	0.2	93.7	0.25	90.5	0.43
13/12/2019	13:34	94.9	0.22	93.8	0.19	95.7	0.17	105.8	0.48
13/12/2019	13:37	92.3	0.51	101.8	0.19	103.7	0.41	105.3	0.38
18/12/2019	14:18	91	0.3	90.9	0.23	97.5	0.15	96.5	0.63
20/12/2019	13:46	95.9	0.49	93.9	0.23	100	0.14	93.8	0.59
20/12/2019	13:48	95.9	0.48	97.2	0.17	96.5	0.29	100	0.41

Table 24 Glendell Blast Monitoring Results – Powerlines

Date Fired	Time Fired	Powerlines	
		Peak Overpressure (dBL)	Peak Vibration (mm/s)
2/01/2019	13:47	108.2	1.34
2/02/2019	13:43	107	1.16
3/01/2019	13:36	105.6	1.43
3/01/2019	13:33	102.9	1.42
8/01/2019	13:41	102.9	0.3
9/01/2019	13:29	104.1	1.51
11/01/2019	13:27	105.8	4.01
14/01/2019	13:31	105.2	1.89
15/01/2019	13:34	110.8	1.12
15/01/2019	13:35	115.1	4.71
21/01/2019	13:30	108.3	4.93
24/01/2019	13:35	107.8	1.6
31/01/2019	14:00	102.4	1.04
6/02/2019	13:43	114.9	3.23
11/02/2019	13:32	105.8	1.7
14/02/2019	9:25	108.5	3.53
14/02/2019	9:27	100.8	0.89
15/02/2019	13:37	113.4	1.4
21/02/2019	13:30	94.5	1.82
21/02/2019	13:32	98.6	0.71
25/02/2019	13:40	112.6	2.15
1/03/2019	10:31	104.3	0.9
4/03/2019	13:36	109.1	5.21
7/03/2019	10:22	103.1	1.04
8/03/2019	13:30	104.4	0.62
14/03/2019	13:45	105.9	1.59
19/03/2019	9:22	104.7	1.31
21/03/2019	13:32	106.7	2.46
21/03/2019	13:42	103.3	1.18
26/03/2019	13:28	105	0.66
29/03/2019	11:22	97.8	0.7
29/03/2019	11:25	106.1	1.17
10/04/2019	13:53	108.9	1.74
11/04/2019	13:27	106.7	2.73
18/04/2019	14:30	110.2	10.35
24/04/2019	12:27	101.9	0.46
29/04/2019	11:26	103.3	0.84
1/05/2019	12:12	104.5	3.27
4/05/2019	10:39	104.2	3.21
9/05/2019	13:30	103.4	1.72
13/05/2019	13:29	101.8	1.68
16/05/2019	13:24	107.3	4.56
21/05/2019	13:33	101.9	1.98

29/05/2019	16:13	111.3	3.54
30/05/2019	13:24	106.1	1.47
1/06/2019	13:02	105.8	6.46
3/06/2019	13:41	105.3	0.94
7/06/2019	13:38	108.1	1.2
7/06/2019	13:41	106.6	3.12
14/06/2019	13:44	109.7	5.11
14/06/2019	13:47	105	1.28
19/06/2019	13:41	106.6	1.34
20/06/2019	13:34	108.6	3
27/06/2019	13:41	108.2	2.18
27/06/2019	13:44	100.8	0.35
2/07/2019	13:51	107.4	1.5
4/07/2019	11:19	109.4	1.85
15/07/2019	15:39	107.5	2.56
15/07/2019	15:41	108.1	3.42
18/07/2019	16:39	113.1	7.38
22/07/2019	11:54	108.8	1.42
25/07/2019	13:25	107.5	13.61
31/07/2019	13:25	107	10.54
1/08/2019	13:37	105.6	1.23
2/08/2019	10:53	103.7	2.6
7/08/2019	14:39	106.9	2.17
12/08/2019	13:23	106.5	1.03
23/08/2019	11:58	104.8	1.68
28/08/2019	13:30	105.8	1.88
28/08/2019	13:32	108.1	0.77
9/09/2019	13:28	105.1	2.97
11/09/2019	11:07	104.3	1.75
5/09/2019	13:33	89.6	0.11
19/09/2019	13:43	107.8	4.94
24/09/2019	10:33	103.7	1.86
30/09/2019	13:34	111.7	0.68
26/09/2019	13:28	105.5	2.73
1/10/2019	13:40	108.7	1.92
3/10/2019	13:29	114.2	3.78
3/10/2019	13:32	107.6	1.48
9/10/2019	10:51	111.7	1.48
10/10/2019	13:34	102.4	3.73
12/10/2019	9:25	102.5	0.82
18/10/2019	11:35	107.8	6.5
22/10/2019	13:25	101.3	0.67
23/10/2019	13:39	105.7	3.03
28/10/2019	15:24	107.1	0.8
31/10/2019	13:58	100	0.73
31/10/2019	14:01	103.5	2.8
5/11/2019	13:31	104.1	0.53

9/11/2019	9:06	104.1	3.21
18/11/2019	12:29	95.4	1.22
18/11/2019	12:31	104.8	5.32
20/11/2019	12:32	102.4	0.91
21/11/2019	13:32	104	7.1
28/11/2019	15:48	108.9	5.29
9/12/2019	11:16	100	0.82
9/12/2019	11:19	104.5	0.7
11/12/2019	10:58	103.2	1.23
13/12/2019	13:34	102.5	1.59
13/12/2019	13:37	104.5	1.43
18/12/2019	14:18	101.5	2.7
20/12/2019	13:46	99.9	0.93

Table 25: Glendell Main North Railway Blast Monitoring Results

		Peak Vibration (mm/s)				Peak Overpressure (dBL)			
Date Fired	**Time Fired**	**ARTC 1**	**ARTC 2**	**ARTC 3**	**ARTC 4**	**ARTC 1**	**ARTC 2**	**ARTC 3**	**ARTC 4**
2/01/2019	13:47	0.97	0.51	0.27	0.25	107.5	110.2	104.8	99.4
2/02/2019	13:43	1.04	0.39	0.54	0.54	109.2	109.9	102	98.1
3/01/2019	13:36	1.28	0.51	0.6	0.67	103.9	107.4	104.9	102
3/01/2019	13:33	1.03	0.24	0.18	0.16	102.9	102.7	99.3	93.1
8/01/2019	13:41	0.24	0.3	0.19	0.18	104.3	105.5	100.7	96.6
9/01/2019	13:29	1.02	0.45	0.52	0.73	103.1	113.4	109.9	103.8
11/01/2019	13:27	3.83	0.88	0.37	0.83	104.3	108.2	104.4	101.2
14/01/2019	13:31	0.99	0.65	0.62	0.73	108.7	108.2	102.4	99.6
15/01/2019	13:34	1.15	0.45	0.22	0.22	106.2	107.1	103.5	100.7
15/01/2019	13:35	2.85	0.68	0.42	0.62	111.5	111.1	111.3	107.1
21/01/2019	13:30	3.08	0.91	0.54	0.54	107.7	110	103.5	99.5
24/01/2019	13:35	1.35	0.73	0.58	0.47	106.1	109	101.6	97
31/01/2019	14:00	0.81	0.59	0.99	0.54	100.2	107.5	107.3	102.5
6/02/2019	13:43	2.17	0.76	0.47	0.71	113.2	110.9	107.8	109.5
11/02/2019	13:32	3.19	13.8	0.77	0.25	106.5	120.7	105.1	99.3
14/02/2019	9:25	3.45	0.97	0.69	1	111.4	108.8	107.2	103.8
14/02/2019	9:27	0.82	0.46	0.40	0.67	102.6	98	99.8	101.3
15/02/2019	13:37	1.43	0.48	0.84	0.71	110.4	107.3	101.6	101.6
21/02/2019	13:30	1.76	0.42	0.32	0.18	92.6	102.4	90.6	85.5
21/02/2019	13:32	0.66	0.36	0.3	0.23	96.9	99.6	95.1	95.3
25/02/2019	13:40	1.93	0.43	0.46	0.4	108.5	111	106.9	105.4
1/03/2019	10:31	0.59	0.4	0.22	0.19	102.6	99.3	97.7	94.6
4/03/2019	13:36	5.44	0.8	0.54	0.64	106.5	109.6	103.1	99.8
7/03/2019	10:22	1.31	0.57	0.29	0.37	101.5	109.4	99.5	95.8
8/03/2019	13:30	0.5	0.32	0.19	0.18	104.8	107.3	105.4	101.3
14/03/2019	13:45	1.62	0.45	0.38	0.34	103.6	106.6	101.4	97.6
19/03/2019	9:22	1.23	0.8	0.54	0.77	104.5	109.4	109.3	107.1
21/03/2019	13:32	2.4	0.56	0.4	0.23	106.4	104.5	101.4	95.5
21/03/2019	13:42	0.87	0.56	0.32	0.4	100.3	103.9	102.3	95.3
26/03/2019	13:28	0.45	0.25	0.25	0.27	105.3	104.3	106.4	104.9
29/03/2019	11:22	0.45	0.34	0.7	0.2	97.8	101	103.1	93
29/03/2019	11:25	1.1	0.33	0.41	0.86	103.1	104.5	103.6	99.7
10/04/2019	13:53	1.59	0.51	0.45	0.49	108.9	102.7	102.9	97.4
11/04/2019	13:27	2.95	1.28	0.38	0.57	106.5	106.1	105.2	100.5
18/04/2019	14:30	9.62	1.64	0.78	0.84	107.8	108.4	104.9	103.9
24/04/2019	12:27	0.27	0.22	0.12	0.11	101.8	100.7	98.7	93.9
29/04/2019	11:26	0.85	0.29	0.17	0.18	102.7	101	95.4	96.9
1/05/2019	12:12	2.65	0.88	0.42	0.63	105.3	109.2	108.3	104
4/05/2019	10:39	1.48	0.95	0.42	0.6	103.3	107.3	101.4	95.8
9/05/2019	13:30	0.99	0.55	0.63	0.69	104.2	104.5	104.3	99.6
13/05/2019	13:29	1.12	0.54	0.74	0.79	100.2	102	103	98.8
16/05/2019	13:24	3.56	1.07	0.47	1.27	107.5	110.1	104.6	97.9
21/05/2019	13:33	1.03	0.51	0.89	0.91	100.6	107.2	103.8	99.6

29/05/2019	16:13	2.69	1.42	0.48	0.63	103.2	109.6	107.3	114.5
30/05/2019	13:24	1	0.46	0.68	0.98	105.1	105.7	107.7	109.1
1/06/2019	13:02	3.57	1.04	1.02	2.43	106.1	111	106.3	101.1
3/06/2019	13:41	0.66	0.35	0.29	0.3	107.7	104.8	106.3	106.2
7/06/2019	13:38	0.78	0.32	0.23	0.19	107.8	103.9	100.2	97.9
7/06/2019	13:41	2.75	0.57	0.39	0.55	106.7	105.5	104.9	98.8
14/06/2019	13:44	4.67	2.43	0.96	1.21	108.8	108.9	104.9	101.8
14/06/2019	13:47	1.15	0.67	0.72	0.67	103	110.5	106.6	103.4
19/06/2019	13:41	0.65	0.33	0.3	0.36	106.6	104.2	104.5	100.3
20/06/2019	13:34	2.35	1.16	0.53	0.9	108.3	105.7	101.8	99.2
27/06/2019	13:41	1.8	0.72	0.42	0.41	102.8	103.9	100.2	92
27/06/2019	13:44	0.24	0.3	0.22	0.33	102.1	101.5	97.1	93.2
2/07/2019	13:51	1.14	0.47	0.49	0.52	106.5	110.3	110.7	107.8
4/07/2019	11:19	1.55	0.53	0.45	0.7	108.9	109.3	107.6	101
15/07/2019	15:39	1.67	0.36	0.32	0.34	105.2	108.9	103.2	100.4
15/07/2019	15:41	1.58	0.79	1.22	1.28	110.1	112.4	106.7	109.9
18/07/2019	16:39	5.91	1.68	0.63	1.11	114	118.4	111.2	107
22/07/2019	11:54	0.74	0.32	0.43	0.36	107.3	108.1	107.5	103
25/07/2019	13:25	7.03	2.67	0.79	0.69	110	108.2	105.2	100.3
31/07/2019	13:25	7.22	1.17	0.54	0.96	105.4	105.4	101.3	99.9
1/08/2019	13:37	1.14	0.93	0.64	0.53	104.9	104.8	105.1	105
2/08/2019	10:53	1.63	0.59	1.47	0.56	105	107.1	110.1	98.9
7/08/2019	14:39	1.08	0.57	0.54	0.48	105.9	105.8	101.9	99.7
12/08/2019	13:23	0.71	0.3	0.18	0.2	105	103.9	98.8	99.1
23/08/2019	11:58	1.51	0.59	0.49	0.57	104.7	103.8	99.7	97
28/08/2019	13:30	2.11	0.54	0.34	0.38	103.2	104.2	100.4	94.5
28/08/2019	13:32	0.95	0.53	0.48	0.47	106.1	107.9	108.1	101.8
9/09/2019	13:28	1.97	0.51	0.36	0.41	100.8	103.8	102.6	106.6
11/09/2019	11:07	1.48	0.67	0.40	0.51	104.6	109.2	101.8	97.5
5/09/2019	13:33	0.22	0.15	0.05	0.01	91.3	86.8	78.3	87.8
19/09/2019	13:43	2.81	0.71	0.36	0.31	110.1	113.0	104.5	99.7
24/09/2019	10:33	1.51	0.63	0.42	0.50	102.8	107.9	104.5	98.2
30/09/2019	13:34	0.49	0.39	0.37	0.27	108.4	106.9	102.2	109.9
26/09/2019	13:28	2.56	0.84	1.04	2.09	104.4	106.1	104.2	99.3
1/10/2019	13:40	1.6	0.89	0.46	0.5	107.6	104.7	102.7	98
3/10/2019	13:29	2.46	0.45	0.26	0.33	111.4	103.5	94.8	96.3
3/10/2019	13:32	1.17	0.57	0.95	1.01	108.1	105.6	101.6	95
9/10/2019	10:51	1.15	0.6	0.32	0.42	111.5	110.2	104.1	104.6
10/10/2019	13:34	2.64	1.02	0.41	0.69	103.2	103.2	99.9	94.9
12/10/2019	9:25	0.89	0.35	0.47	0.35	101.3	100.5	97	94.4
18/10/2019	11:35	3.79	1.2	0.74	1.1	107.7	112.6	106.3	107.8
22/10/2019	13:25	0.39	0.38	0.37	0.38	101.4	104.4	101.5	98.5
23/10/2019	13:39	2.15	0.83	0.5	0.56	103.9	108.1	104.2	97.2
28/10/2019	15:24	1.02	0.44	0.35	0.44	103.7	108.4	102.7	101.4
31/10/2019	13:58	0.54	0.49	0.32	0.36	99.4	98.8	99.7	104.4
31/10/2019	14:01	1.69	0.61	0.4	0.68	102.7	104.5	102.7	104.7
5/11/2019	13:31	0.51	0.46	0.56	0.96	100.4	107.4	104.5	99.8

9/11/2019	9:06	2.44	0.82	0.4	0.82	103.9	111.5	104.4	104.1
18/11/2019	12:29	1.06	0.33	0.41	0.23	97.5	95.7	92.6	93.1
18/11/2019	12:31	2.42	0.71	0.6	1.12	103.7	107.7	103.3	99.8
20/11/2019	12:32	0.87	0.41	0.33	0.42	103.1	107.9	102.6	97.6
21/11/2019	13:32	2.9	0.72	0.77	0.9	107.3	107	101.4	100.2
28/11/2019	15:48	6.31	0.82	0.52	0.55	106.8	112	105.1	101.3
9/12/2019	11:16	0.59	0.73	0.38	0.3	100	104.7	101.1	98.2
9/12/2019	11:19	0.44	0.29	0.36	0.3	102.5	103.8	97.1	95.3
11/12/2019	10:58	1.74	0.62	0.94	0.97	101.3	107	100.1	97.1
13/12/2019	13:34	1.01	0.33	0.57	0.43	104.2	103	100.8	98.1
13/12/2019	13:37	1.02	0.44	0.53	0.92	104.9	105.3	97.1	106.5
18/12/2019	14:18	2.26	0.38	0.28	0.47	100.8	101.7	100.4	94.2
20/12/2019	13:46	0.8	0.55	0.61	0.75	100	102.7	98.5	93.8

Table 26 Glendell Blast Monitoring Results – Integra Surface*

Date Fired	Time Fired	Integra Surface	
		Peak Overpressure dB(L)	Peak Vibration (mm/s)
2/01/2019	13:47	102.5	0.16
2/02/2019	13:43	102.2	0.21
3/01/2019	13:36	101.5	0.32
3/01/2019	13:33	103.4	0.09
8/01/2019	13:41	95	0.1
9/01/2019	13:29	97.1	0.32
11/01/2019	13:27	96.4	0.4
14/01/2019	13:31	96.9	0.36
15/01/2019	13:34	95.8	0.25
15/01/2019	13:35	102	0.46
21/01/2019	13:30	99.3	0.47
24/01/2019	13:35	96.6	0.37
31/01/2019	14:00	96.7	0.31
6/02/2019	13:43	99.7	0.57
11/02/2019	13:32	104.3	0.11
14/02/2019	9:25	98.6	0.71
14/02/2019	9:27	92.5	0.25
15/02/2019	13:37	95.5	0.37
21/02/2019	13:30	92	0.19
21/02/2019	13:32	93.4	0.13
25/02/2019	13:40	91.9	0.24
1/03/2019	10:31	94	0.12
4/03/2019	13:36	95.9	0.52
7/03/2019	10:22	99.6	0.24
8/03/2019	13:30	99.9	0.16
14/03/2019	13:45	98	0.29
19/03/2019	9:22	101.4	0.55
21/03/2019	13:32	100.5	0.14
21/03/2019	13:42	100.4	0.2
26/03/2019	13:28	100.2	0.13
29/03/2019	11:22	103.5	0.16
29/03/2019	11:25	105.7	0.23
10/04/2019	13:53	109	0.3
11/04/2019	13:27	100.4	0.44
18/04/2019	14:30	104.5	0.42
24/04/2019	12:27	97.8	0.05
29/04/2019	11:26	106.5	0.15
1/05/2019	12:12	103	0.4
4/05/2019	10:39	105.2	0.41
9/05/2019	13:30	103.8	0.35
13/05/2019	13:29	98.2	0.35
16/05/2019	13:24	105.9	0.62
21/05/2019	13:33	100.7	0.39

29/05/2019	16:13	106	0.34
30/05/2019	13:24	110.4	0.37
1/06/2019	13:02	107.4	1.46
3/06/2019	13:41	109.7	0.16
7/06/2019	13:38	101.9	0.15
7/06/2019	13:41	100.6	0.26
14/06/2019	13:44	100.4	0.77
14/06/2019	13:47	97.9	0.48
19/06/2019	13:41	98.7	0.25
20/06/2019	13:34	97.7	0.44
27/06/2019	13:41	103.6	0.25
27/06/2019	13:44	105.2	0.15
2/07/2019	13:51	106.5	0.4
4/07/2019	11:19	105.5	0.43
15/07/2019	15:39	105.9	0.26
15/07/2019	15:41	102.6	0.53
18/07/2019	16:39	105.1	0.51
22/07/2019	11:54	102.7	0.23
25/07/2019	13:25	100	0.3
31/07/2019	13:25	99.6	0.44
1/08/2019	13:37	99.9	0.42
2/08/2019	10:53	100.8	0.45
7/08/2019	14:39	100.7	0.45
12/08/2019	13:23	98.2	0.23
23/08/2019	11:58	94.7	0.34
28/08/2019	13:30	95.7	0.37
28/08/2019	13:32	100.5	0.38
9/09/2019	13:28	98.6	0.38
11/09/2019	11:07	94.0	0.33
5/09/2019	13:33	92.2	0.02
19/09/2019	13:43	94.0	0.34
24/09/2019	10:33	93.6	0.44
30/09/2019	13:34	101.7	0.18
26/09/2019	13:28	92.2	1.25
1/10/2019	13:40	100.5	0.19
3/10/2019	13:29	87.6	0.22
3/10/2019	13:32	91.7	0.55
9/10/2019	10:51	102.1	0.55
10/10/2019	13:34	105.8	0.4
12/10/2019	9:25	102.9	0.29
18/10/2019	11:35	104.8	1.11
22/10/2019	13:25	99.6	0.27
23/10/2019	13:39	96.6	0.82
28/10/2019	15:24	101.2	0.17
31/10/2019	13:58	100.4	0.19
31/10/2019	14:01	101.5	0.33
5/11/2019	13:31	99	0.38

9/11/2019	9:06	104.3	0.7
18/11/2019	12:29	103.6	0.15
18/11/2019	12:31	103.5	0.44
20/11/2019	12:32	102.7	0.38
21/11/2019	13:32	102.7	0.55
28/11/2019	15:48	102.3	0.42
9/12/2019	11:16	102	0.28
9/12/2019	11:19	101.2	0.22
11/12/2019	10:58	107.3	0.44
13/12/2019	13:34	105.7	0.21
13/12/2019	13:37	104.8	0.56
18/12/2019	14:18	107.3	0.25
20/12/2019	13:46	105.2	0.29

*No Monitoring required at these sites under SSD-5850. Internal Purposes Only

Table 27: Ravensworth East Blast Monitoring Results – MOC 1 and MOC 2

Date Fired	Time Fired	MOC1		MOC2	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
7/01/2019	9:14	0.04	77	0.07	84.4
16/01/2019	13:35	0.03	85.1	0.06	86.6
22/01/2019	13:27	0.07	97.9	0.13	89.7
25/01/2019	13:32	0.05	84.5	0.11	94.6
20/02/2019	13:41	0.08	105.8	0.18	104.9
7/03/2019	9:14	0.03	102.1	0.06	93.1
12/03/2019	13:28	0.08	100.4	0.14	105.1
26/03/2019	14:16	0.03	91.3	0.08	110.8
16/04/2019	12:22	0.06	98.5	0.16	81.8
24/04/2019	13:24	0.06	82.9	0.1	85
2/05/2019	13:34	0.05	82.2	0.08	85
7/05/2019	11:38	0.04	114.7	0.11	108.4
9/05/2019	14:28	0.04	84.8	0.06	90.3
15/05/2019	13:36	0.03	74.8	0.08	85
24/05/2019	13:38	0.09	99.6	0.24	89.4
14/06/2019	12:53	0.01	90.1	0.03	82.7
25/06/2019	13:33	0.03	82.2	0.08	83.8
1/07/2019	13:32	0.07	85.1	0.14	85.9
15/07/2019	13:25	0.06	101.4	0.15	102.7
17/07/2019	13:37	0.04	97.3	0.07	96.7
22/07/2019	13:36	0.05	77	0.1	82.2
30/07/2019	13:32	0.08	88.5	0.14	87.3
5/08/2019	13:30	0.08	83.6	0.12	103.1
12/08/2019	12:20	0.06	82.6	0.2	107.4
15/08/2019	13:33	0.07	109.2	0.11	104.8
21/08/2019	10:12	0.04	110.5	0.11	111
23/08/2019	13:49	0.04	79.1	0.09	91.3
23/08/2019	13:52	0.06	85.7	0.14	87.6
4/09/2019	13:36	0.04	94.2	0.08	94.4
16/09/2019	15:54	0.06	94.7	0.11	102.5
16/10/2019	13:25	0.01	107.5	0.02	106.8
18/10/2019	13:37	0.1	94.9	0.17	104.2
5/11/2019	12:36	0.03	96.9	0.04	101.1
13/11/2019	13:35	0.07	105.9	0.2	93.9
15/11/2019	12:32	0.08	112.5	0.11	104.7
20/11/2019	13:35	0.04	110.8	0.05	102.8
27/11/2019	13:47	0.05	75.3	0.13	94.2
29/11/2019	12:39	0.05	86.4	0.08	92.3
5/12/2019	13:26	0.08	102	0.19	111.6
11/12/2019	13:33	0.07	93.6	0.13	105.7
23/12/2019	13:20	0.06	95.2	0.11	93.6

Table 28 Ravensworth East Blast Monitoring Results – MOC 3 and MOC 4

Date Fired	Time Fired	MOC3		MOC4	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
7/01/2019	9:14	0.03	80.7	0.08	76.8
16/01/2019	13:35	0.02	83.9	0.03	80.2
22/01/2019	13:27	0.04	77.7	0.06	82
25/01/2019	13:32	0.03	83.3	0.08	89.2
20/02/2019	13:41	0.11	91	0.13	87.1
7/03/2019	9:14	0.03	85.2	0.04	79.3
12/03/2019	13:28	0.04	87	0.06	91
26/03/2019	14:16	0.02	93.2	0.04	86.5
16/04/2019	12:22	0.04	82.7	0.08	94.2
24/04/2019	13:24	0.04	83.9	0.05	80.5
2/05/2019	13:34	0.04	85.5	0.05	83
7/05/2019	11:38	0.04	90.5	0.04	94.4
9/05/2019	14:28	0.04	86	0.03	82
15/05/2019	13:36	0.03	80.4	0.03	78.7
24/05/2019	13:38	0.06	97.8	0.09	88.2
14/06/2019	12:53	0.02	84.3	0.02	82.6
25/06/2019	13:33	0.06	79.8	0.04	78
1/07/2019	13:32	0.04	85.2	0.09	79
15/07/2019	13:25	0.18	107.7	0.08	87.7
17/07/2019	13:37	0.04	104.2	0.04	98.5
22/07/2019	13:36	0.04	80.7	0.05	79.9
30/07/2019	13:32	0.05	76.9	0.05	85.5
5/08/2019	13:30	0.05	90.5	0.06	83.6
12/08/2019	12:20	0.04	85.00	0.06	84.3
15/08/2019	13:33	0.03	88	0.04	106
21/08/2019	10:12	0.05	94.7	0.07	92.7
23/08/2019	13:49	0.04	82	0.04	76.4
23/08/2019	13:52	0.06	85.8	0.07	83.4
4/09/2019	13:36	0.03	93.4	0.04	86.1
16/09/2019	15:54	0.05	87.9	0.04	89.1
16/10/2019	13:25	0.04	86.6	0.02	90.4
18/10/2019	13:37	0.05	91.1	0.06	94.2
5/11/2019	12:36	0.03	94.3	0.03	77.2
13/11/2019	13:35	0.06	81.2	0.09	95.5
15/11/2019	12:32	0.07	99.8	0.04	96.8
20/11/2019	13:35	0.06	83.3	0.03	87.4
27/11/2019	13:47	0.05	84.5	0.05	87.5
29/11/2019	12:39	1.08	93.2	0.03	91
5/12/2019	13:26	0.06	107.4	0.08	89.4
11/12/2019	13:33	0.04	86.6	0.05	92.7
23/12/2019	13:20	0.04	87.7	0.07	87.9

Table 29 Ravensworth East Blast Monitoring Results – MOC 5 and Homestead

Date Fired	Time Fired	MOC5		Homestead	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
7/01/2019	9:14	0.04	79.3	0.21	90.7
16/01/2019	13:35	0.02	86.7	0.18	105.1
22/01/2019	13:27	0.06	89.8	0.55	91.1
25/01/2019	13:32	0.04	89.7	0.37	95.8
20/02/2019	13:41	0.09	96.2	1.09	101.2
7/03/2019	9:14	0.03	102.4	0.25	96.4
12/03/2019	13:28	0.07	98.5	0.46	98.7
26/03/2019	14:16	0.04	95.9	0.33	103.3
16/04/2019	12:22	0.06	104.1	0.64	99.5
24/04/2019	13:24	0.05	81.7	0.46	94.2
2/05/2019	13:34	0.05	83.6	0.83	95.4
7/05/2019	11:38	0.06	102.1	0.5	108.7
9/05/2019	14:28	0.03	81.7	0.41	93.5
15/05/2019	13:36	0.04	97.7	0.14	105.6
24/05/2019	13:38	0.11	87.2	0.89	98.6
14/06/2019	12:53	0.02	90.9	0.14	94.1
25/06/2019	13:33	0.04	79	0.73	97.9
1/07/2019	13:32	0.07	84.2	0.46	99.6
15/07/2019	13:25	0.09	94	0.74	103.4
17/07/2019	13:37	0.05	101.2	0.19	102.2
22/07/2019	13:36	0.05	80.6	0.43	98
30/07/2019	13:32	0.07	79.8	0.46	94.6
5/08/2019	13:30	0.07	82.1	0.99	97.9
12/08/2019	12:20	0.06	100	0.34	91.3
15/08/2019	13:33	0.04	101.1	0.82	103.8
21/08/2019	10:12	0.06	108.9	0.45	104.9
23/08/2019	13:49	0.05	84.2	0.62	93.5
23/08/2019	13:52	0.08	85.3	0.53	96.1
4/09/2019	13:36	0.03	95.9	0.49	109.1
16/09/2019	15:54	0.06	95.8	0.63	102
16/10/2019	13:25	0.01	92.8	0.13	94.6
18/10/2019	13:37	0.07	98.8	1.08	100.9
5/11/2019	12:36	0.02	82.9	0.2	91
13/11/2019	13:35	0.14	97.8	1	98.4
15/11/2019	12:32	0.03	100.8	0.36	113.7
20/11/2019	13:35	0.02	90.6	0.33	111.2
27/11/2019	13:47	0.06	108.1	0.79	96.8
29/11/2019	12:39	0.02	84.6	0.23	85.8
5/12/2019	13:26	0.08	105.6	0.87	101.9
11/12/2019	13:33	0.06	89.2	0.59	104.7
23/12/2019	13:20	0.06	98.2	0.79	101.8

Table 30 Ravensworth East Blast Monitoring Results – Chain of Ponds, Hebden School and Church

Date Fired	Time Fired	Chain of Ponds		Hebden School		Church	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
7/01/2019	9:14	0.1	86.6	0.32	104.1	0.01	94.6
16/01/2019	13:35	0.1	95	0.29	105.9	0.01	83.6
22/01/2019	13:27	0.14	87.1	0.4	105.7	0.03	82.5
25/01/2019	13:32	0.13	88.8	0.21	100.4	0.02	81.6
20/02/2019	13:41	0.18	93.6	0.76	106.5	0.04	110.6
7/03/2019	9:14	0.11	91.2	0.48	106.1	0.02	91.5
12/03/2019	13:28	0.12	94.4	0.33	93.6	0.03	95.9
26/03/2019	14:16	0.08	92.6	0.44	94.4	0.02	95.3
16/04/2019	12:22	0.13	88.4	0.41	105.8	0.03	79.8
24/04/2019	13:24	0.16	87.5	0.5	102.5	0.03	81.2
2/05/2019	13:34	0.16	87.1	0.54	109	0.03	83.4
7/05/2019	11:38	0.15	103.5	0.47	95.1	0.02	99.2
9/05/2019	14:28	0.19	90.9	0.36	103.1	0.02	90.2
15/05/2019	13:36	0.1	91.8	0.81	107.8	0.03	86.8
24/05/2019	13:38	0.15	88.8	1	102.2	0.03	93.7
14/06/2019	12:53	0.07	86.1	0.18	101.8	0.01	80.3
25/06/2019	13:33	0.12	88.4	0.38	104.3	0.04	82.4
1/07/2019	13:32	0.14	90.9	0.65	107.1	0.03	83.4
15/07/2019	13:25	0.19	101	0.55	100.8	0.02	95.7
17/07/2019	13:37	0.11	110.1	0.43	95.7	0.02	102.3
22/07/2019	13:36	0.13	86.6	0.5	103.7	0.02	78.5
30/07/2019	13:32	0.2	92.8	1.11	111.9	0.04	95.9
5/08/2019	13:30	0.16	90.6	0.54	101.4	0.03	84.2
12/08/2019	12:20	0.11	99.4	0.38	94.3	0.03	95.4
15/08/2019	13:33	0.2	104.6	0.83	93.8	0.02	100.6
21/08/2019	10:12	0.18	114.4	0.96	100.7	0.03	110.1
23/08/2019	13:49	0.14	87.1	0.51	103.1	0.02	79.8
23/08/2019	13:52	0.18	90.3	0.65	109.5	0.04	85
4/09/2019	13:36	0.15	105.8	0.43	96.5	0.02	93.6
16/09/2019	15:54	0.2	101.7	0.91	103.2	0.03	92.8
16/10/2019	13:25	0.06	92.1	0.09	95	0.01	92.3
18/10/2019	13:37	0.21	92.8	0.81	96.1	0.03	84.5
5/11/2019	12:36	0.16	96.3	0.31	107	0.02	81.8
13/11/2019	13:35	0.18	96.8	0.93	97.9	0.04	95.9
15/11/2019	12:32	0.26	104.6	0.76	96.9	0.06	111.3
20/11/2019	13:35	0.22	93.6	0.37	106.1	0.02	99.3
27/11/2019	13:47	0.21	89.2	0.56	104.6	0.03	85.6
29/11/2019	12:39	0.12	87.1	0.28	96.4	0.03	91.9
5/12/2019	13:26	0.27	94.6	1.12	106.6	0.04	109.7
11/12/2019	13:33	0.2	95	0.68	103.5	0.04	108.3
23/12/2019	13:20	0.14	102.1	0.56	106.2	0.03	87.4

Table 31 Ravensworth East Blast Monitoring Results – Integra Underground and Integra Surface

Date Fired	Time Fired	Integra Underground*		Integra Surface*	
		Peak Vibration (mm/s)	Peak Overpressure (dBL)	Peak Vibration (mm/s)	Peak Overpressure (dBL)
7/01/2019	9:14	0.21	96.3	0.11	0.11
16/01/2019	13:35	0.1	101.2	0.06	0.06
22/01/2019	13:27	0.4	96.1	0.11	0.11
25/01/2019	13:32	0.29	99.5	0.09	0.09
20/02/2019	13:41	0.53	105.1	0.21	0.21
7/03/2019	9:14	0.16	93.9	0.09	0.09
12/03/2019	13:28	0.42	107.2	0.14	0.14
26/03/2019	14:16	0.21	100.4	0.11	0.11
16/04/2019	12:22	0.36	98.6	0.17	0.17
24/04/2019	13:24	0.45	95.9	0.16	0.16
2/05/2019	13:34	0.38	94.6	0.1	0.1
7/05/2019	11:38	0.32	109.4	0.16	0.16
9/05/2019	14:28	0.22	97.4	0.08	0.08
15/05/2019	13:36	0.1	99.6	0.1	0.1
24/05/2019	13:38	0.3	98.2	0.18	0.18
14/06/2019	12:53	0.11	93	0.05	0.05
25/06/2019	13:33	0.26	92.7	0.14	0.14
1/07/2019	13:32	0.41	96.2	0.16	0.16
15/07/2019	13:25	0.45	103.7	0.18	0.18
17/07/2019	13:37	0.24	106	0.09	0.09
22/07/2019	13:36	0.38	89.4	0.1	0.1
30/07/2019	13:32	0.46	101.3	0.14	0.14
5/08/2019	13:30	0.37	96.1	0.2	0.2
12/08/2019	12:20	0.44	96.1	0.14	0.14
15/08/2019	13:33	0.28	109.9	0.12	0.12
21/08/2019	10:12	0.3	116.9	0.13	0.13
23/08/2019	13:49	0.22	91.8	0.13	0.13
23/08/2019	13:52	0.42	98.5	0.14	0.14
4/09/2019	13:36	0.1	90	0.27	0.27
16/09/2019	15:54	0.11	92.2	0.29	0.29
16/10/2019	13:25	0.05	62.7	0.03	0.03
18/10/2019	13:37	0.5	69.8	0.17	0.17
5/11/2019	12:36	0.1	66.3	0.08	0.08
13/11/2019	13:35	0.49	66.3	0.18	0.18
15/11/2019	12:32	0.19	73.6	0.17	0.17
20/11/2019	13:35	0.14	76.7	0.09	0.09
27/11/2019	13:47	0.34	69.8	0.16	0.16
29/11/2019	12:39	0.16	62.7	0.11	0.11
5/12/2019	13:26	0.43	101.1	0.24	0.24
11/12/2019	13:33	0.27	93.4	0.15	0.15
23/12/2019	13:20	0.33	98.3	0.15	0.15

*No Monitoring required at these sites under SSD-5850. Internal Purposes Only.

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MOUNT OWEN COMPLEX

AIR VIBRATION DATA ANALYSIS FOR A BLAST FIRED ON THE 04th OF JUNE2019

REPORT NO. MO-1901-250619

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MOUNT OWEN COMPLEX

AIR VIBRATION DATA ANALYSIS FOR A BLAST FIRED ON THE 04th OF JUNE 2019

REPORT NO. MO-1901-250619

1. INTRODUCTION

Enviro Strata Consulting Pty Ltd (ESC) was engaged to undertake an independent environmental assessment of blast vibration resulting from through-seam blast C9W_3474 fired by Mount Owen mine on the 04th of June 2019. The request was instigated by an elevated level of air vibration measured by the permanent monitoring system located at Camberwell Church. The Church monitoring station recorded 118.5 dBL which is in excess of the 115 dBL vibration limit (allowed for 5 % of blasts) specified in the environmental licence conditions.

The report presents detailed analyses of the air vibration data generated by through-seam blast C9W_3474 fired on the 04th of June 2019 at 12:53 in the North Pit of the Mount Owen mine.

2. VIBRATION MONITORING RESULTS AND WEATHER CONDITIONS

The location of the blast and vibration monitoring results recorded by monitoring stations are presented in **Figure 1**. The vibration measurements and data files recorded during the blast are summarised in **Table 1.**

The environmental record corresponding to the blast period revealed windy conditions persisting on 04.06.19. The record at 12:50 pm measured as a 10 minute average, around the blast time; indicated a south-westerly wind direction (200 degrees) with a wind speed of approximately 4.2 m/s (average) and up to 8.3 m/s gust conditions, see **Figure 2A**. For completeness the review of the EnvMet results did not reveal any other weather impacts for the Church monitoring station, see **Figure 2B**.

Table 1: Vibration Monitoring Results – 04.06.19 Blast.

Monitoring Station	Distance (m)	Peak Air Vibration (dBL)	PPV (mm/s)	Wavetrace	File
Integra Surface	4,206	107.2	0.17	V	MTN1MOINS
MOC 4	4,046	90.4	0.19	V	MTN1MOMO4
Camberwell	6,868	89.9	0.05	V	MTN1MOCAM
Chain of Ponds	8,470	108.9	0.10	V	MTN1MOCOP
MOC 2Green Acres	4,244	101.6	0.22	V	MTN1MOMO2
Homestead	4,829	113.5	0.11	V	MTN1MOHOM
Church	**7,177**	**118.5***	**0.09**	V	MTN1MOCHU
MOC 1	4,279	104.8	0.14	V	MTN1MOMO1
Integra U/G	1,266	109.3	0.91	V	MTN1MOINU
MOC 5	4,704	101.4	0.08	V	MTN1MOMO5
Hebden School	5,488	103.2	0.07	V	MTN1MOHES

** In excess of the normal limit of 115 dBL (allowed for 5% of blasts) specified in the environmental licence conditions.*

3. BLAST DESIGN DETAILS

The blasting sequence included firing of the through-seam blast with an MIC of 1,132 kg and a maximum hole depth of 16 metres. The blast design details are summarised in **Table 2**.

Table 2: Blast Design Details – 04.06.19 12:53 Blast

Parameters	Details
Blast type:	Through-seam blast
Blast ID:	C9W_3474
Initiation Type:	Electronics
Blast Coordinates:	(322752; 6412223) R.L. 40
Hole diameter (mm):	229
Burden (m):	7.35
Spacing (m):	8.45
Hole depth (m):	16
Stemming height (m)	4.2
Stemming type:	14/20 mm gravel/aggregate
MIC (kg):	1,132
Blast duration (ms):	18,296

4. MONITORING DATAANALYSIS

Airblast Arrival Analysis

To assess the validity of the Ecotech system's results, wavetrace records from the Church and Integra U/G monitoring stations were analysed applying the airblast arrival technique. This technique utilises the fact that there are four different types of waves generated during a blast. Each wave travels at a different speed. The following velocities were used for ground vibration waves: 2,200 m/s for P wave, 1,200 m/s for S wave, and 700 m/s for Rayleigh – surface wave. The airblast wave travels at a speed of 340 m/s. The analysis of the data is shown in **Figures 3 - 4**. The time corresponding to the airblast arrival period is marked on each analysed wavetrace.

The Church monitoring station was 7,177 m from the blast. Analysis of the air vibration record from the Church monitoring station indicates gusty wind conditions characterised by the presence of positive and negative peaks; refer to **Figure 3**. The investigated air vibration peak of 118.5 dBL occurred during the airblast arrival period and was caused by a strong wind gust. As the whole air vibration record is affected by continuous wind activity the other type of assessment such as sonic decay law analysis needs to be undertaken, see section below.

To validate the above conclusion regarding wind influence on the recorded data, a supporting analysis from the closest monitoring station (Integra U/G) to the blast was undertaken, see **Figure 4.**

The Integra U/G station was approximately 1,266 m from the blast and recorded a maximum peak of 109.3 dBL. The wavetrace record confirmed lack of any blast abnormalities and relatively low airblast overpressure level for the considered distance (i.e. 1,266 m). Also, an inspection of the wavetrace indicates mild wind conditions, most likely due to localised wind shielding for this particular station.

Sonic Decay Law Analysis

To estimate air vibration level for the Church monitoring station, a sonic decay law analysis was undertaken. For that purpose, monitoring data from other stations and blast design parameters were used.

The results were plotted and used to generate a sonic decay law for the blast, see **Figure 5**. As indicated in the Australian Standard AS2187.2-2006 the sonic decay law analysis is based on the assumption that there is an 8.6 dBL decrease with the doubling of the distance.

The estimated sonic decay parameters were as follows:

- site exponent = -1.45
- site constant = 25

Therefore, based on the obtained sonic decay parameters, the estimated maximum airblast overpressure level was as follows:

- ChurchStation – 100.8 dBL for 7,177 metres distance

5. CONCLUSIONS

At the request of Mount Owen mine, detailed analyses of the air vibration monitoring data from through-seam blast C9W_3474 fired on the 04th of June 2019 at 12:53 were performed. The analyses revealed the following:

- The peak air vibration of 118.5 dBL recorded by the Church monitoring station (located at 7,177 m) was due to a wind gust. The maximum estimated airblast overpressure level for the Church monitoring station was 100.8dBL. This is based on sonic decay law and wavetrace analyses.
- An additional analysis of the monitoring data from the closest monitoring station (i.e. Integra U/G located at 1,266 m) confirmed a low airblast overpressure level (i.e. 109.3 dBL) generated by the blast and the lack of any blast abnormalities. The record confirmed some mild wind influence on the monitoring results.
- The environmental record confirmed windy conditions; which impacted on the measured air vibration levels (i.e. av. wind speed of 4.2 m/s and wind gust in the order of 8.3 m/s).

On the basis of the above it can be concluded that the airblast overpressure generated during the blast was adequate and there was no exceedance of the air vibration limit.

Thomas Lewandowski
25th June2019

FIGURE 1 - Blast Location and Vibration Monitoring Results – 04.06.19Blast

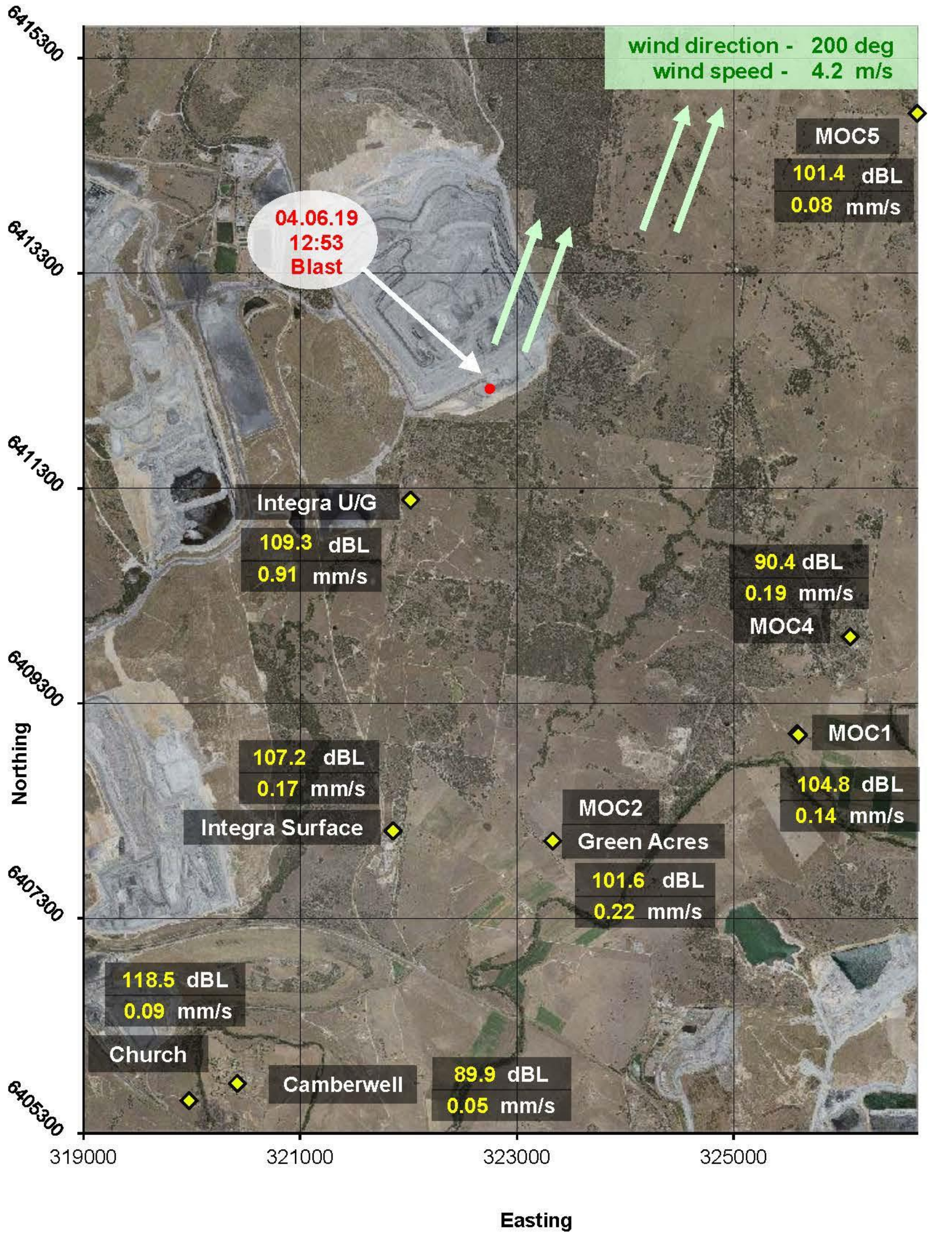


FIGURE 2A – Wind Speed Record – 04.06.19

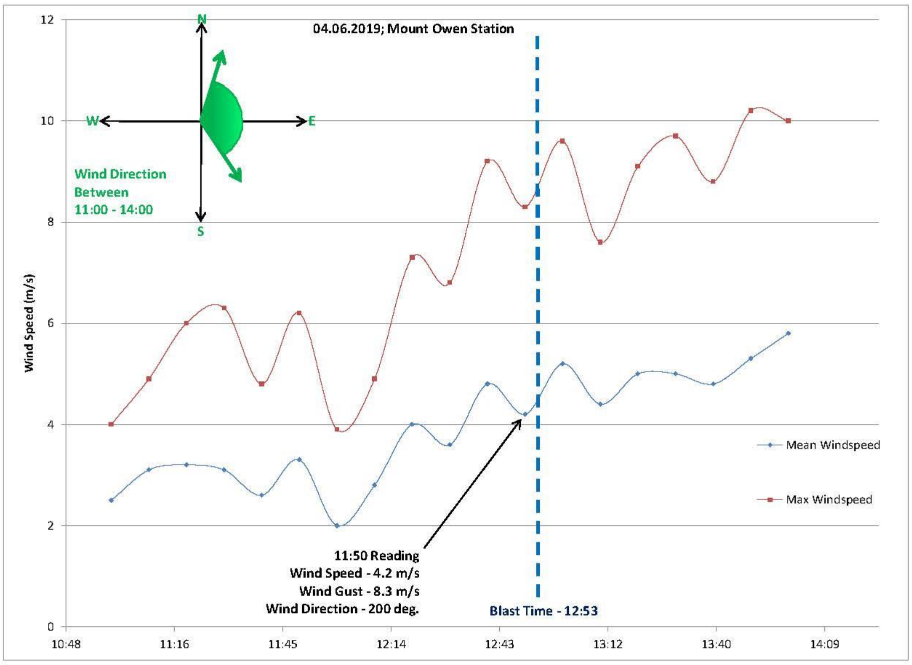
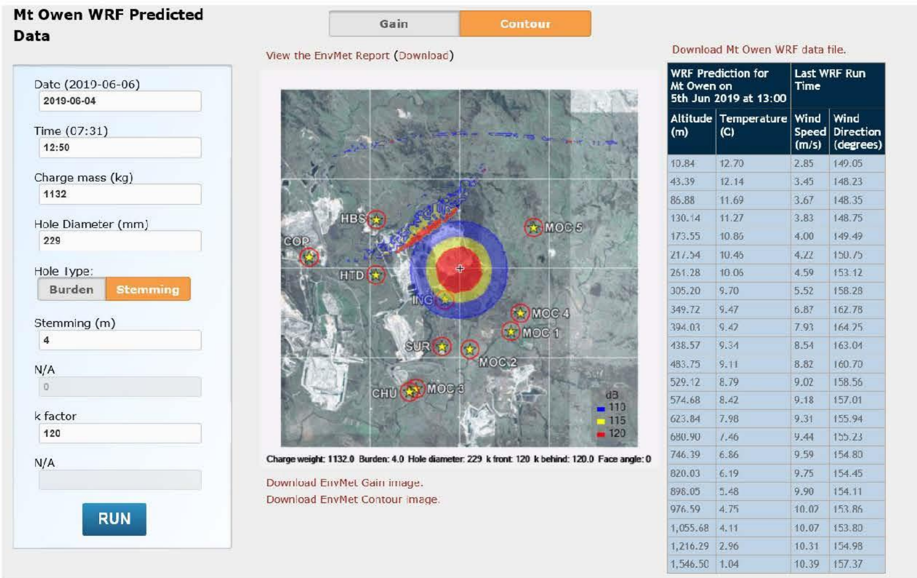
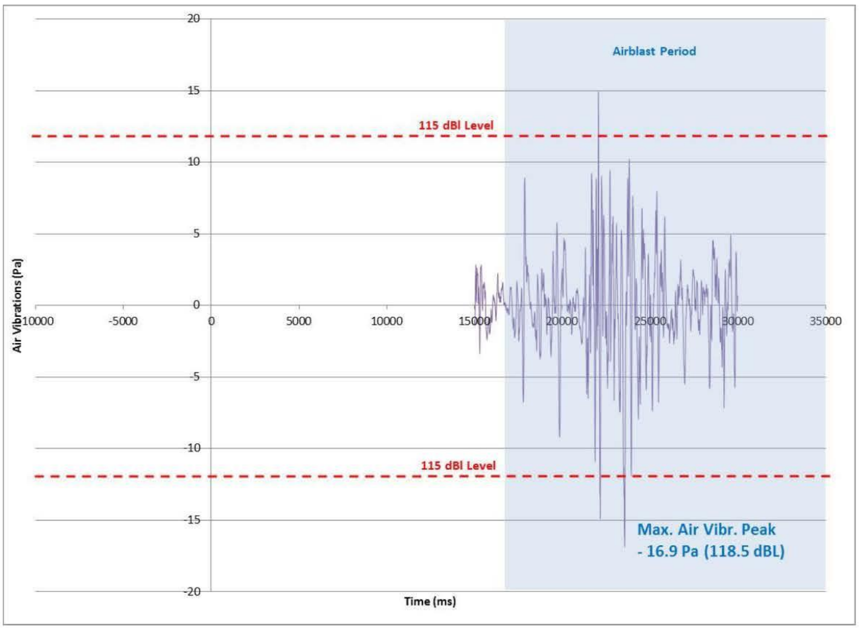


FIGURE 2B – EnvMet Record – 04.06.19



WRF Prediction for Mt Owen on 5th Jun 2019 at 13:00		Last WRF Run Time	
Altitude (m)	Temperature (C)	Wind Speed (m/s)	Wind Direction (degrees)
10.84	12.70	2.85	149.05
43.39	12.14	3.45	148.23
86.88	11.69	3.67	148.35
130.14	11.27	3.83	148.75
173.55	10.86	4.00	149.49
217.54	10.46	4.22	150.75
261.28	10.06	4.59	153.12
305.20	9.70	5.52	158.28
349.72	9.47	6.87	162.78
394.03	9.42	7.93	164.25
438.57	9.34	8.54	163.04
483.75	9.11	8.82	160.70
529.12	8.79	9.02	158.56
574.68	8.42	9.18	157.01
623.84	7.98	9.31	155.94
680.90	7.46	9.44	155.23
746.39	6.86	9.59	154.80
820.03	6.19	9.75	154.45
898.05	5.48	9.90	154.11
976.59	4.75	10.02	153.86
1,055.68	4.11	10.07	153.80
1,216.29	2.96	10.31	154.98
1,546.50	1.04	10.39	157.37

FIGURE 3 – Wavetrace Data Analysis –Church Monitoring Station



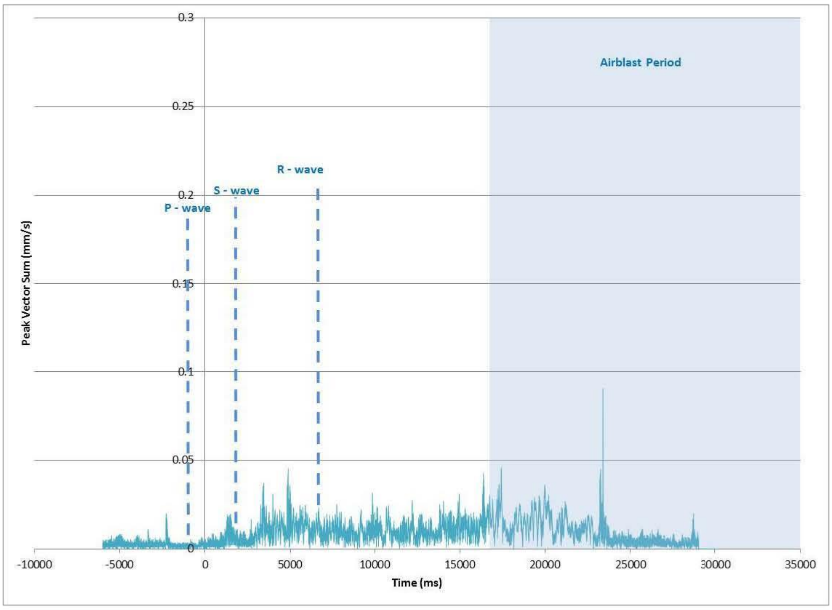
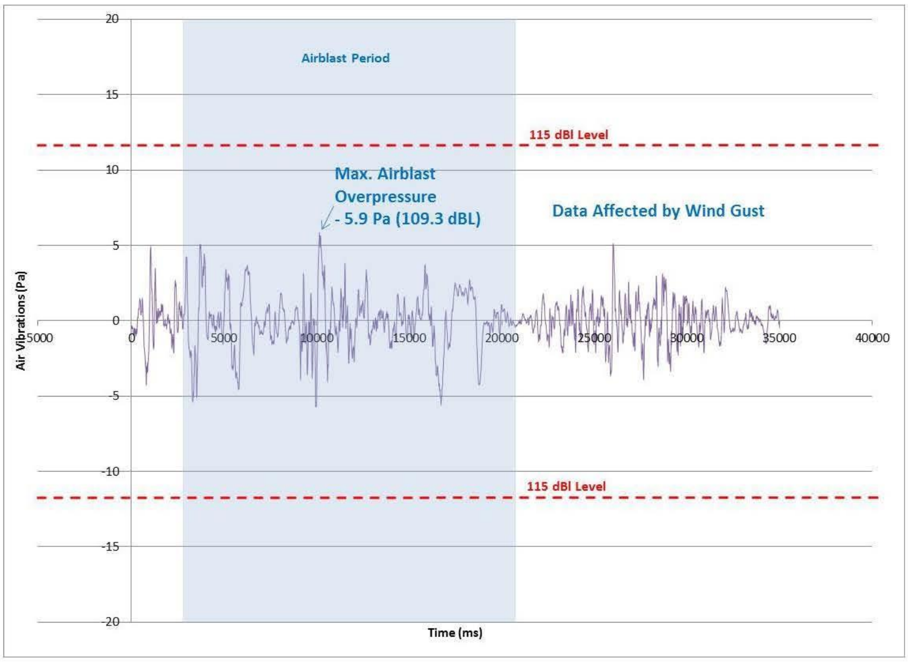


FIGURE 4 – Wavetrace Data Analysis – Integra U/G



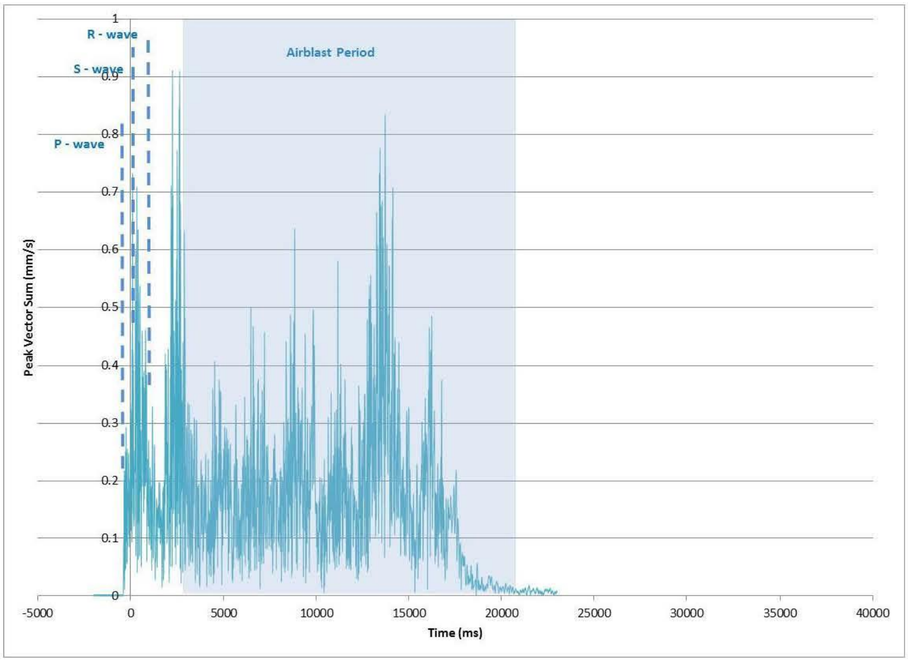
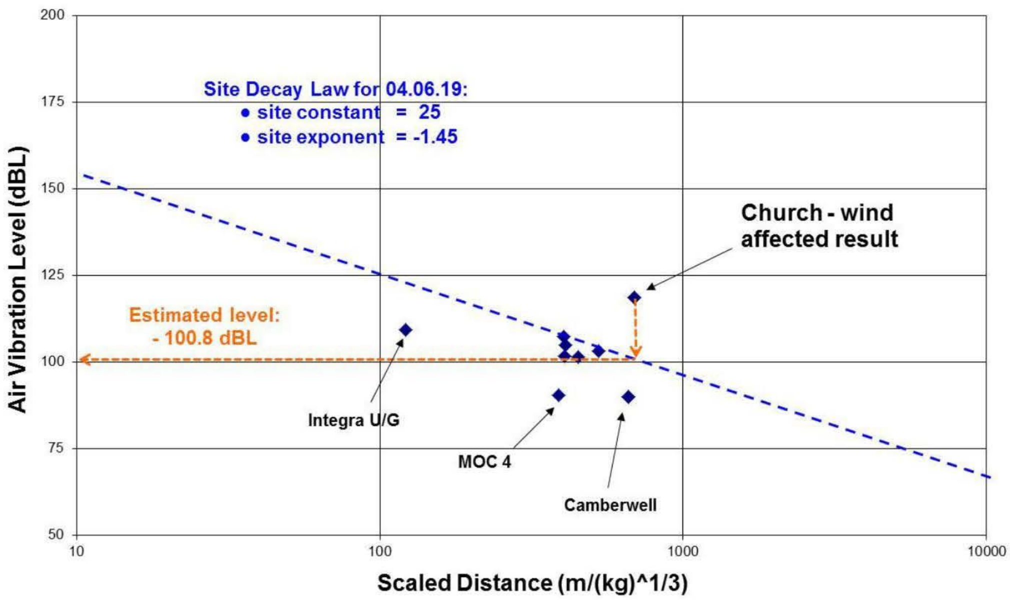


FIGURE 5 – Sonic Decay Law Analysis – 04.06.19 Blast



Appendix F: Air Quality

Table 32: MGO Depositional Dust Gauge Results 2019 (g/m2/month)

Gauge AQMP Ref.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mt Owen												
DD6	2.7	1.6	1.8	1.1	1	1.2	1	0.9	2	0.6	2.2	1.5
DD7 (DG2)	2.9	2.9	2.5	2.8	2.5	3.1	3.1	2.9	2.30	2.6	3.7	3.3
DD12	2.8	C	1.1	2.3	2.3	3.9	3.9	4.8	5.1	2.8	C	4.4
DD14	C	C	C	1.6	1.8	1.8	1.6	1.7	2	1.4	1.6	C
DD16	1.8	3.2	0.9	2.4	3.2	5.3	C	5.1	6.1	C	3.5	3.8
Glendell												
DG3	1.2	4.5	0.9	1.8	0.3	1.8	C	1.6	2.00	1.8	2.4	2.3
DG4 (DD15)	2	2.6	4.3	C	2.2	C	3	2.2	5.1	3.3	2.5	3
DG5	3.8	3.9	C	3.1	3.2	2.9	3.4	3.6	2.60	2.1	4	1.4
DG6	3.2	C	2.4	2.3	1.5	2.3	2.4	2.3	2.00	C	2	2
DG7	3.9	D	2.4	2.4	C	3.7	3.8	2.1	2.30	1.6	2.8	2.4
DG8	2.3	6.2	C	9	3.2	7.9	5.3	2.9	3.20	2.4	3.7	5.6

C – Dust gauge deemed contaminated after analysis of influencing factors. These factors include an ash residue result of <50%, the presence of bird droppings or other contaminants such as insects in the dust gauge and analysis of historical results from the dust gauge.

D – DG7 sample was knocked off in February 2019, due to strong winds impacting on gauge condition, a new gauge pole was installed in the same month.

Table 33: MGO Total Suspended Particulate Monitoring Results 2019 (µg/m³ 24hr period/wk)

Sampling Date	TSP 1 (Pictons In) (µg/m³)	TSP 2 (Middle Falbrook) (µg/m³)	TSP 3 (Camberwell) (µg/m³)
2/01/2019	90	44	183
8/01/2019	79	59	93
14/01/2019	86	30	49
20/01/2019	75	34	35
26/01/2019	83	137	86
1/02/2019	61	31	43
7/02/2019	83	23	30
13/02/2019	186	203	180
19/02/2019	137	127	120
25/02/2019	90	23	44
03/03/2019	66	16	31
9/03/2019	63	81	94
15/03/2019	76	27	45
21/03/2019	41	15	16
27/03/2019	68	32	46
2/04/2019	28	19	26
8/04/2019	63	139	171
14/04/2019	52	32	37
20/04/2019	51	18	20
26/04/2019	*90*	*175*	*190*
2/05/2019	78	58	26
8/05/2019	43	105	123
14/05/2019	41	91	111
20/05/2019	39	101	106
26/05/2019	39	165	103
1/06/2019	43	193	127
7/06/2019	36	116	115
13/06/2019	61	178	179
19/06/2019	54	105	67
25/06/2019	40	17	20
1/07/2019	55	83	79
7/07/2019	28	18	21
13/07/2019	22	112	88
19/07/2019	29	160	115
25/07/2019	57	79	108
31/07/2019	49	24	28
6/08/2019	43	112	195
12/08/2019	22	118	159

18/08/2019	54	80	84
24/08/2019	50	250	177
30/08/2019	53	23	31
5/09/2019	63	73	89
11/09/2019	57	99	13
17/09/2019	24	19	33
23/09/2019	41	54	81
29/09/2019	63	59	77
5/10/2019	60	37	48
11/10/2019	60	11	33
17/10/2019	116	148	150
23/10/2019	87	91	110
29/10/2019	138	87	106
4/11/2019	83	32	59
10/11/2019	92	139	61
16/11/2019	*125*	*138*	*137*
22/11/2019	*180*	*259*	*215*
28/11/2019	*150*	*110*	*120*
4/12/2019	*108*	*224*	*101*
10/12/2019	*176*	*197*	*206*
16/12/2019	*144*	*215*	*78*
22/12/2019	*113*	*91*	*101*
28/12/2019	*95*	*65*	*99*

Note: Days highlighted blue have been denoted as 'extraordinary events' as advised by DPIE. As advised by DPIE, days which were identified as 'extraordinary events' were not included in Long term impact assessment criteria.

Table 34: Continuous PM10 (µg/m3) Monitoring Results 2019

Date	DPIE PM10 Monitoring 24 Hr Avg				EPA PM10 Monitoring 24 Hr Avg*			
	Sx13D1 - Project Office	Sx13D4 - McInerney	Sx13D8 - Pictons In	Sx13D9 - Nobles In	Sx13D11 - Middle Falbrook	Sx13D10 - Cramps	Sx13D6 - EBAM 1	Sx13D5 - EBAM 2
1/01/2019	18.3	26.2	20.4	21.2	29.5	20.6	24.0	22.5
2/01/2019	23.0	23.1	35.8	23.4	23.4	24.0	18.3	25.9
3/01/2019	29.9	30.1	33.5	24.7	22.2	19.7	20.6	24.0
4/01/2019	29.9	31.0	35.2	27.8	22.9	25.9	32.8	27.8
5/01/2019	36.8	44.0	28.4	28.2	43.9	44.0	26.1	37.4
6/01/2019	6.7	7.4	10.9	8.2	44.7	7.3	20.2	8.6
7/01/2019	10.4	12.4	10.7	9.2	Maintenance performed	7.2	32.3	8.5
8/01/2019	19.9	25.9	27.0	25.3		21.3	21.1	22.5
9/01/2019	38.1	35.1	33.0	33.0	30.5	33.5	25.5	32.7
10/01/2019	23.7	27.1	28.7	24.8	22.2	21.2	29.2	23.0
11/01/2019	18.9	21.4	23.7	21.3	18.9	17.2	30.7	18.9
12/01/2019	20.3	25.8	22.8	24.4	23.5	22.3	25.7	93.0
13/01/2019	21.9	25.2	32.1	24.2	22.0	19.5	21.9	21.7
14/01/2019	17.2	19.4	28.4	18.3	18.3	14.7	18.9	17.0
15/01/2019	28.6	33.0	38.2	31.5	23.7	30.4	49.1	28.8
16/01/2019	*44.3*	*37.2*	*56.6*	*38.5*	*46.3*	*37.9*	*35.0*	*42.3*
17/01/2019	*29.4*	*32.1*	*41.1*	*29.3*	*40.6*	*23.6*	*31.2*	*28.9*
18/01/2019	34.1	47.9	38.2	37.8	24.6	31.3	26.3	35.2
19/01/2019	54.3	57.9	40.3	57.9	45.6	45.1	34.5	46.8
20/01/2019	13.0	17.2	18.6	14.0	13.6	12.2	29.9	13.7
21/01/2019	7.7	9.5	12.3	9.5	7.3	8.1	23.9	11.1
22/01/2019	25.1	21.8	25.8	21.3	18.8	23.1	17.3	26.8
23/01/2019	28.9	35.0	28.9	31.5	37.1	38.0	26.6	34.1
24/01/2019	27.0	25.4	34.6	28.1	24.6	25.3	25.5	29.5
25/01/2019	31.6	32.5	34.3	32.5	34.3	33.6	30.2	32.4
26/01/2019	32.2	33.1	35.1	39.4	47.2	47.6	29.2	33.4
27/01/2019	41.7	36.3	50.3	38.7	30.5	37.3	37.5	36.1
28/01/2019	27.0	27.0	37.0	29.3	27.8	26.3	26.1	47.2
29/01/2019	25.6	32.4	37.2	32.3	30.2	30.2	26.1	28.3
30/01/2019	24.2	31.0	43.4	29.8	Technical Issue - Circuit Breaker Malfunction	28.2	33.6	26.1
31/01/2019	47.6	48.5	41.5	37.6		44.9	37.6	40.6
1/02/2019	13.9	13.7	16.6	14.2	13.7	13.4	18.0	13.1
2/02/2019	7.8	9.6	11.6	9.1	7.2	8.1	45.0	10.8
3/02/2019	12.3	13.8	19.9	12.4	8.3	10.5	11.3	13.8
4/02/2019	30.5	28.5	31.2	25.7	25.6	25.3	21.1	36.8
5/02/2019	17.3	22.1	20.1	18.1	19.8	14.7	14.4	15.8
6/02/2019	9.2	13.5	18.3	9.3	9.8	8.5	13.7	10.4
7/02/2019	11.8	12.3	25.1	9.7	9.9	10.8	9.6	11.6
8/02/2019	26.2	29.0	29.8	24.9	23.5	25.8	23.5	22.3

9/02/2019	20.2	21.2	17.4	17.4	18.0	23.5	38.4	21.5
10/02/2019	61.7	53.0	60.2	56.6	55.4	55.3	33.0	50.5
11/02/2019	31.2	34.8	32.0	37.1	35.0	34.3	38.3	46.3
12/02/2019	43.2	57.1	42.0	53.1	64.0	83.2	49.9	45.5
13/02/2019	*66.1*	*59.4*	*76.1*	*62.5*	*53.3*	*58.4*	*42.0*	*62.9*
14/02/2019	19.8	25.9	22.4	21.6	24.0	21.0	13.7	15.9
15/02/2019	20.2	23.2	20.8	15.3	15.4	14.1	11.3	16.0
16/02/2019	10.1	10.6	17.7	12.3	12.4	11.0	12.9	10.8
17/02/2019	14.9	19.3	19.1	17.1	16.6	18.8	13.1	15.0
18/02/2019	36.0	34.4	34.5	33.2	25.5	29.8	29.9	31.3
19/02/2019	*55.5*	*64.3*	*63.4*	*59.4*	*51.2*	*61.3*	*47.7*	*43.9*
20/02/2019	17.6	18.3	22.4	19.6	14.5	16.0	21.9	17.0
21/02/2019	9.9	13.2	12.3	11.4	10.5	9.3	15.3	7.8
22/02/2019	16.8	17.1	17.0	12.5	12.1	11.0	25.4	15.8
23/02/2019	9.2	9.1	13.4	9.4	8.9	8.4	10.7	8.7
24/02/2019	18.0	17.9	21.5	16.2	16.6	14.5	20.7	17.0
25/02/2019	20.6	23.0	24.6	15.9	15.5	14.3	13.2	15.9
26/02/2019	16.7	22.2	21.6	17.7	18.2	16.7	12.5	14.0
27/02/2019	16.3	20.8	16.3	10.7	10.4	9.7	8.6	12.6
28/02/2019	11.4	11.5	13.7	8.9	8.4	7.8	9.8	8.7
1/03/2019	12.9	17.7	21.2	10.5	10.0	9.3	23.1	9.6
2/03/2019	15.6	18.8	22.4	11.1	10.3	9.5	11.5	11.5
3/03/2019	10.7	12.7	16.1	10.1	9.2	10.0	7.8	33.7
4/03/2019	20.8	23.2	24.2	16.0	14.1	14.9	20.3	16.0
5/03/2019	30.1	33.6	31.6	25.7	22.9	25.4	21.6	24.3
6/03/2019	*69.6*	*87.1*	*55.7*	*65.4*	*72.0*	*80.7*	*61.2*	*54.3*
7/03/2019	23.5	27.1	24.6	23.1	23.4	20.7	69.2	18.9
8/03/2019	21.0	21.3	24.6	20.7	18.5	20.2	14.0	16.0
9/03/2019	28.4	37.6	21.8	27.3	27.7	40.8	30.2	21.8
10/03/2019	18.4	24.7	15.4	16.0	Negative Results Excluded	15.8	32.0	18.4
11/03/2019	52.9	56.1	55.2	52.7	60.9	60.7	43.5	37.7
12/03/2019	33.0	41.6	36.4	33.7	34.2	45.1	34.5	29.5
13/03/2019	27.2	32.3	34.8	27.2	33.6	25.2	34.1	23.0
14/03/2019	25.1	27.5	31.5	24.5	23.0	22.5	39.0	18.5
15/03/2019	16.6	18.4	20.4	13.4	14.9	12.3	14.1	13.8
16/03/2019	11.5	11.8	15.9	11.8	10.6	10.3	33.0	Inconsistent flow – flow calibration performed
17/03/2019	4.6	11.2	7.0	7.9	7.9	10.5	25.5	
18/03/2019	8.4	12.3	9.3	8.7	10.5	10.9	31.5	
19/03/2019	12.0	11.7	13.6	13.0	12.5	11.9	26.0	
20/03/2019	14.2	16.0	16.3	14.1	13.6	12.2	20.2	13.5
21/03/2019	10.9	11.6	14.4	11.0	9.2	9.0	9.1	10.8
22/03/2019	11.5	11.2	11.8	8.4	10.3	6.8	24.8	12.0
23/03/2019	15.6	18.8	17.3	20.7	17.2	18.7	32.2	15.1
24/03/2019	19.0	26.5	19.3	23.9	22.4	23.1	36.0	17.4

25/03/2019	18.5	25.5	15.5	18.0	19.7	17.0	23.0	18.3
26/03/2019	35.2	38.4	43.4	36.4	42.8	43.2	58.0	31.3
27/03/2019	24.8	24.1	27.9	21.8	20.6	19.3	20.0	23.7
28/03/2019	16.4	18.6	17.7	15.0	13.6	12.6	51.4	23.2
29/03/2019	23.0	25.7	27.1	21.4	25.8	22.4	37.8	19.2
30/03/2019	16.3	21.9	17.4	13.6	21.6	20.7	24.5	17.7
31/03/2019	*63.1*	*69.5*	*68.9*	*72.5*	*71.3*	*76.1*	*45.0*	*44.9*
1/04/2019	11.3	18.0	18.8	15.6	13.6	16.6	20.1	7.0
2/04/2019	7.1	8.3	10.6	9.0	6.8	8.8	63.3	5.2
3/04/2019	7.3	10.8	7.7	4.0	8.1	5.7	10.3	18.8
4/04/2019	13.5	12.0	13.5	9.6	10.1	8.7	10.3	14.5
5/04/2019	11.2	12.3	14.5	10.8	10.5	7.9	17.3	8.9
6/04/2019	10.9	18.3	11.2	13.6	12.1	18.4	20.6	12.1
7/04/2019	24.8	35.3	16.1	24.1	29.8	39.1	26.3	22.2
8/04/2019	30.7	43.7	29.0	45.2	53.2	54.6	26.3	23.1
9/04/2019	48.5	52.2	37.2	51.3	49.4	46.4	39.1	30.9
10/04/2019	16.8	19.7	21.8	19.4	16.7	16.3	18.9	17.2
11/04/2019	12.9	15.8	18.7	11.7	10.4	10.2	15.7	11.3
12/04/2019	11.8	14.4	18.2	10.0	9.0	8.5	13.8	15.0
13/04/2019	21.4	28.6	17.0	19.9	19.3	21.9	24.8	17.9
14/04/2019	24.4	22.8	24.7	20.3	19.5	19.7	26.3	23.0
15/04/2019	16.2	16.9	19.0	14.6	16.1	16.1	38.2	14.4
16/04/2019	14.6	15.9	14.2	13.4	11.4	11.3	43.5	19.8
17/04/2019	9.3	9.9	11.5	7.5	8.2	11.2	31.7	8.0
18/04/2019	11.6	13.8	16.5	13.8	16.3	14.2	15.6	10.0
19/04/2019	12.5	17.7	17.0	12.8	12.0	11.0	48.7	12.7
20/04/2019	9.6	12.7	12.2	9.6	8.9	8.1	Unit stopped – technician completed checks	9.5
21/04/2019	9.4	11.1	10.5	10.1	11.7	10.7		10.0
22/04/2019	12.0	13.8	15.2	13.9	15.2	14.3	Planned Maintenance	9.3
23/04/2019	8.6	10.2	15.4	8.4	10.6	10.6		14.6
24/04/2019	10.5	11.1	16.8	10.5	13.2	13.2	18.6	9.7
25/04/2019	25.3	31.3	17.0	28.3	38.0	35.9	22.3	19.8
26/04/2019	28.4	55.5	38.2	43.0	55.2	90.3	33.6	25.5
27/04/2019	Low flow alarms received. Maintenance undertaken to address malfunction	33.1	33.9	34.7	37.1	34.2	23.2	23.5
28/04/2019		40.5	24.4	33.4	32.3	37.2	40.1	23.0
29/04/2019		28.4	32.9	23.0	29.6	31.9	21.3	19.0
30/04/2019		29.8	29.6	23.8	24.6	25.8	20.0	17.0
1/05/2019	59.6	28.2	33.2	30.9	43.4	40.9	33.7	19.7
2/05/2019	59.9	29.5	35.1	26.2	30.4	39.9	22.1	26.6
3/05/2019	Low flow alarms received. Additional maintenance undertaken to address malfunction	34.0	23.0	29.7	41.2	45.4	31.2	Insufficient data – Telstra outage
4/05/2019		8.7	7.9	9.0	9.3	9.5	31.6	
5/05/2019		10.6	9.2	11.6	11.9	10.2	18.5	10.3
6/05/2019		21.1	11.0	13.9	14.0	15.1	39.8	9.8

7/05/2019	15.4	33.4	12.6	22.0	24.3	26.2	33.0	13.7
8/05/2019	32.7	40.6	21.8	30.7	32.9	44.4	58.1	25.2
9/05/2019	31.3	26.8	16.2	29.4	30.1	26.8	27.2	29.0
10/05/2019	31.7	28.5	27.2	32.8	34.2	46.6	37.1	20.1
11/05/2019	21.5	22.0	12.8	17.6	24.2	44.8	25.1	15.9
12/05/2019	12.1	15.3	10.7	14.5	16.7	16.4	39.2	10.9
13/05/2019	19.5	26.4	20.2	24.7	35.5	32.6	22.3	17.7
14/05/2019	17.9	26.5	16.6	25.3	33.1	32.0	23.5	15.8
15/05/2019	18.7	21.8	16.2	16.6	16.6	16.8	38.7	15.8
16/05/2019	12.4	16.5	14.5	13.4	22.0	20.1	17.0	10.7
17/05/2019	27.1	25.6	22.7	22.5	20.1	26.9	36.4	20.1
18/05/2019	19.5	20.8	19.7	19.2	27.4	23.7	24.1	15.0
19/05/2019	15.0	19.2	12.3	13.4	13.8	13.2	27.3	21.4
20/05/2019	16.8	21.2	17.2	18.3	25.6	29.8	27.5	12.0
21/05/2019	22.8	29.3	15.6	33.5	41.2	36.3	29.4	15.9
22/05/2019	26.6	32.5	21.1	27.4	37.3	35.5	32.3	18.0
23/05/2019	27.2	32.1	26.9	25.8	31.9	27.6	24.6	20.0
24/05/2019	24.0	35.2	22.8	34.6	41.8	44.7	32.2	19.2
25/05/2019	22.5	33.2	13.9	33.9	47.7	54.8	31.4	18.2
26/05/2019	38.4	38.4	19.0	40.0	55.0	56.6	36.3	24.3
27/05/2019	62.5	66.1	21.0	36.4	67.4	110.6	103.4	51.6
28/05/2019	34.2	31.5	14.8	21.1	33.4	29.5	33.4	25.0
29/05/2019	12 Month Planned Maintenance	54.4	16.8	24.4	35.3	37.9	55.7	25.4
30/05/2019		22.0	12.0	20.1	27.8	50.0	35.0	19.4
31/05/2019	16.8	23.0	12.5	15.7	30.0	25.2	29.7	12.5
1/06/2019	26.7	32.9	22.5	29.4	35.8	37.9	34.4	19.7
2/06/2019	19.6	25.2	29.6	24.8	26.6	24.6	25.9	30.2
3/06/2019	20.1	23.2	6.9	17.2	21.6	24.4	19.1	21.5
4/06/2019	13.5	12.1	9.7	11.7	15.4	19.9	16.5	Battery not recharged - Solar Panels cleaned
5/06/2019	9.5	10.9	11.8	12.6	11.0	7.7	44.1	
6/06/2019	19.2	22.8	12.3	21.2	28.2	24.8	49.7	14.9
7/06/2019	23.6	35.5	16.5	43.2	64.6	44.5	30.0	17.0
8/06/2019	35.3	36.4	18.2	30.5	33.8	30.8	30.8	23.0
9/06/2019	17.0	23.6	9.9	20.0	21.6	24.9	34.6	12.6
10/06/2019	18.6	26.2	8.2	22.7	31.4	29.9	35.1	13.1
11/06/2019	23.6	25.6	20.5	25.2	31.7	28.4	29.8	14.4
12/06/2019	29.1	28.1	16.2	25.0	45.5	34.2	30.6	21.9
13/06/2019	44.1	51.1	34.6	37.4	41.6	39.5	49.5	27.2
14/06/2019	21.3	28.1	33.4	20.8	24.6	20.8	36.7	13.8
15/06/2019	16.2	22.7	14.4	26.5	54.7	42.8	42.3	13.0
16/06/2019	24.0	25.6	19.2	23.4	Filter Load alarm received. Data removed	40.7	45.7	16.1
17/06/2019	15.9	25.1	23.6	30.6	21.8	24.3	18.5	13.3
18/06/2019	11.2	21.9	7.4	13.2	Maintenance Performed	16.4	24.0	Solar Battery replaced

19/06/2019	13.5	17.5	16.7	12.3	19.5	25.1	38.2	
20/06/2019	15.4	19.2	15.4	16.4	46.4	29.4	51.4	11.8
21/06/2019	21.1	22.2	18.6	19.2	25.8	28.2	25.6	15.3
22/06/2019	24.2	26.1	10.3	19.2	45.9	33.0	27.1	17.0
23/06/2019	9.6	13.8	11.0	11.0	14.8	12.2	22.0	7.3
24/06/2019	8.1	7.6	7.8	5.2	5.2	5.5	42.4	4.3
25/06/2019	7.2	7.0	9.7	6.1	6.2	5.8	22.2	5.2
26/06/2019	7.8	9.7	9.2	6.5	6.2	6.4	11.5	Additional solar panel installed
27/06/2019	7.2	10.8	11.3	7.1	6.6	5.8	9.5	6.4
28/06/2019	10.1	12.7	9.3	8.1	11.5	13.5	14.3	17.0
29/06/2019	14.0	13.7	7.5	11.0	16.5	14.1	17.7	11.0
30/06/2019	26.3	26.1	18.5	22.5	33.7	39.0	21.0	17.1
1/07/2019	22.7	23.3	21.7	21.0	27.6	22.5	17.5	14.7
2/07/2019	26.1	35.3	30.0	33.6	49.8	39.8	21.2	16.9
3/07/2019	22.5	23.3	32.0	18.9	31.9	24.5	18.1	13.9
4/07/2019	9.5	9.7	12.2	10.2	7.7	8.1	13.5	7.7
5/07/2019	9.0	9.1	9.7	7.5	6.4	5.8	12.5	9.1
6/07/2019	5.1	6.4	8.9	6.0	5.5	4.8	10.8	7.1
7/07/2019	8.5	10.0	9.3	8.9	7.3	6.5	14.1	9.8
8/07/2019	9.7	15.4	7.5	11.2	14.9	15.6	15.1	7.5
9/07/2019	13.2	19.7	6.6	10.9	18.4	18.3	19.7	8.8
10/07/2019	15.4	21.2	13.2	14.6	27.7	18.9	17.1	10.6
11/07/2019	29.0	48.5	14.9	24.9	33.3	Invalid results - filter contaminated with insects	34.2	23.0
12/07/2019	26.7	43.8	13.4	20.7	29.7		23.9	20.2
13/07/2019	28.3	34.5	13.5	20.3	32.1	52.4	24.8	23.6
14/07/2019	28.7	45.7	9.7	17.6	34.5	33.6	18.8	22.5
15/07/2019	14.1	38.8	13.5	14.8	29.1	26.2	12.1	10.5
16/07/2019	17.3	39.4	10.8	16.3	25.4	23.9	14.9	13.2
17/07/2019	20.9	32.4	10.2	16.8	22.9	16.3	16.1	14.0
18/07/2019	24.2	44.4	9.4	17.0	28.6	24.1	14.9	16.4
19/07/2019	19.1	27.5	14.3	18.1	29.1	33.4	21.5	13.9
20/07/2019	20.1	32.6	13.6	32.0	61.6	55.6	19.7	15.4
21/07/2019	33.9	40.9	14.6	32.5	52.0	52.2	23.8	25.4
22/07/2019	37.2	36.8	46.5	35.8	32.5	32.2	20.0	25.4
23/07/2019	44.8	46.4	12 Month Planned Maintenance	32.4	61.0	51.8	44.1	32.1
24/07/2019	44.0	32.1		29.6	39.4	65.0	51.0	30.9
25/07/2019	21.6	26.6		21.7	26.6	25.3	17.1	14.2
26/07/2019	29.4	49.3	17.0	23.5	33.0	36.1	25.0	21.6
27/07/2019	32.7	33.9	19.5	30.1	36.6	34.8	23.6	22.6
28/07/2019	18.8	20.1	16.6	17.7	29.9	34.6	19.2	14.7
29/07/2019	28.4	33.1	30.8	29.6	38.0	39.6	23.3	19.9
30/07/2019	13.2	12.8	12.7	12.9	11.5	10.1	14.1	9.4
31/07/2019	13.1	11.9	12.4	10.0	10.3	8.3	10.6	10.5
1/08/2019	17.2	17.7	17.6	11.7			12.2	13.3

2/08/2019	18.2	16.4	16.8	12.4	12 Month Planned Maintenance	12 Month Planned Maintenance	Low flow – Vacuum pump cleaned	15.4
3/08/2019	30.0	53.4	14.1	23.3	47.9	46.1		29.4
4/08/2019	27.9	41.0	20.5	28.0	29.4	35.4	Inconsistent flow – DC converted replaced	22.4
5/08/2019	28.2	35.6	23.2	23.2	27.4	33.0	Low flow – Vacuum pump replaced	23.2
6/08/2019	35.0	47.6	Temporary Power Outage due to external electrical (Ausgrid) works	38.5	45.8	64.5		28.8
7/08/2019	33.7	46.4	25.6	53.9	53.1	62.9	38.6	25.9
8/08/2019	*65.7*	*100.3*	*49.6*	*66.3*	*69.9*	*101.1*	*60.3*	*47.6*
9/08/2019	*64.8*	*111.4*	*50.8*	*70.1*	*70.1*	*79.5*	*76.7*	*54.3*
10/08/2019	32.7	45.9	17.5	22.8	36.6	44.0	45.5	27.2
11/08/2019	33.0	35.5	11.2	17.8	26.6	31.9	25.0	21.9
12/08/2019	12.4	27.4	7.7	14.7	17.8	18.7	10.7	10.6
13/08/2019	16.0	31.2	20.4	17.9	23.7	32.7	21.2	22.9
14/08/2019	22.8	33.2	24.7	27.1	35.9	39.8	23.1	18.8
15/08/2019	26.4	36.0	17.8	37.4	57.2	73.3	38.9	26.8
16/08/2019	35.0	46.7	17.5	51.8	69.7	96.4	41.8	27.9
17/08/2019	35.3	51.6	23.7	51.9	44.4	44.8	29.2	24.9
18/08/2019	29.1	27.4	21.8	18.8	21.4	21.0	18.7	24.6
19/08/2019	52.9	57.8	50.8	61.0	64.4	90.4	66.5	42.5
20/08/2019	34.7	56.4	14.7	29.3	49.7	46.4	33.8	27.2
21/08/2019	40.6	57.9	16.3	31.8	44.6	53.4	38.3	32.2
22/08/2019	31.8	35.7	20.2	25.2	39.0	42.8	45.1	22.6
23/08/2019	32.0	24.7	35.1	22.7	21.1	21.9	21.8	21.9
24/08/2019	46.9	60.9	24.2	54.8	77.1	74.0	33.2	36.8
25/08/2019	37.6	44.2	40.5	43.8	47.2	62.1	43.2	23.9
26/08/2019	26.6	12 Month Planned Maintenance	32.3	23.2	22.8	21.5	19.0	10.3
27/08/2019	16.1		20.9	14.6	13.8	13.5	13.5	15.5
28/08/2019	24.7	32.9	31.8	25.5	21.4	39.8	28.6	22.0
29/08/2019	30.6	29.5	30.1	25.8	29.4	27.9	16.9	20.8
30/08/2019	2.2	7.6	10.0	9.1	7.2	8.8	7.9	2.0
31/08/2019	3.5	6.3	6.9	6.0	5.7	5.6	8.1	4.1
1/09/2019	10.4	14.9	9.7	12.6	13.7	13.2	8.4	8.4
2/09/2019	15.9	19.9	18.3	22.4	27.0	29.8	14.1	14.1
3/09/2019	20.2	23.4	23.3	21.4	25.3	26.3	18.5	18.5
4/09/2019	36.4	31.5	34.3	28.8	37.6	47.3	28.2	28.2
5/09/2019	25.6	33.9	30.4	27.7	30.9	31.9	20.1	20.1
6/09/2019	*56.1*	*84.1*	*73.9*	*51.2*	*65.8*	*64.0*	*70.2*	*70.2*
7/09/2019	39.4	50.6	24.8	36.4	44.0	100.0	37.1	37.1
8/09/2019	17.3	27.3	13.8	19.3	26.5	55.9	14.4	14.4
9/09/2019	16.0	23.6	22.3	16.2	19.7	41.7	16.9	16.9
10/09/2019	18.3	16.5	22.1	16.2	14.4	15.8	13.3	13.3

11/09/2019	23.9	25.2	34.8	21.7	24.0	21.9	16.9	16.9
12/09/2019	46.8	53.9	29.5	45.1	48.4	65.4	37.5	37.5
13/09/2019	53.3	64.1	39.5	53.8	46.8	57.6	39.5	39.5
14/09/2019	27.4	32.3	22.1	30.1	28.0	31.3	20.5	20.5
15/09/2019	19.7	31.7	12.3	21.7	23.0	25.4	18.1	18.1
16/09/2019	53.9	56.5	30.1	50.2	54.6	63.4	43.1	43.1
17/09/2019	9.5	11.5	9.1	10.5	9.6	10.2	6.3	6.3
18/09/2019	4.0	7.2	9.0	7.3	7.5	7.3	3.5	3.5
19/09/2019	11.5	12.7	13.6	12.9	11.3	10.9	37.2	37.2
20/09/2019	6.7	11.3	12.0	10.0	10.8	10.1	7.1	7.1
21/09/2019	18.4	24.4	19.8	23.0	25.6	26.7	17.9	17.9
22/09/2019	31.0	37.5	29.5	33.3	44.2	47.1	24.4	24.4
23/09/2019	18.3	22.6	20.2	16.3	19.5	35.4	16.4	16.4
24/09/2019	23.0	28.9	21.6	25.3	28.6	29.7	17.1	17.1
25/09/2019	25.4	22.2	23.2	20.6	21.1	20.8	16.7	16.7
26/09/2019	Temporary Power Outage due to external electrical (Ausgrid) works	25.7	Temporary Power Outage due to external electrical (Ausgrid) works	23.2	20.8	23.0	20.8	20.8
27/09/2019	37.9	54.9	21.2	32.6	33.5	53.1	33.7	33.7
28/09/2019	33.8	60.6	24.1	45.7	45.5	54.2	25.4	25.4
29/09/2019	26.2	26.4	21.4	23.1	22.1	22.4	18.9	18.9
30/09/2019	24.3	22.8	23.7	17.6	17.2	16.4	17.5	17.5
1/10/2019	18.6	18.8	19.1	15.5	14.3	14.4	17.3	15.7
2/10/2019	26.5	29.3	19.5	22.3	27.7	28.6	18.7	22.5
3/10/2019	38.9	45.7	28.5	45.5	49.9	44.7	25.6	29.7
4/10/2019	47.9	63.6	43.6	63.9	71.7	90.4	50.9	34.5
5/10/2019	14.7	19.4	19.2	17.5	17.7	17.2	17.9	12.3
6/10/2019	20.8	26.7	21.8	21.8	26.2	27.6	16.1	16.7
7/10/2019	*69.2*	*59.6*	*62.6*	*60.8*	*68.4*	*82.9*	*46.2*	Inconsistent flow – Vacuum pump replaced
8/10/2019	*38.2*	*48.8*	*43.9*	*47.4*	*34.9*	*72.4*	*54.1*	
9/10/2019	19.3	28.8	19.0	23.0	15.4	24.8	22.0	14.7
10/10/2019	17.2	19.3	20.4	15.5	11.8	12.2	12.4	12.4
11/10/2019	12.6	15.8	17.4	9.5	6.2	6.4	12.8	8.6
12/10/2019	3.9	7.4	11.4	6.5	4.9	4.8	7.1	2.6
13/10/2019	9.5	11.1	12.9	9.1	7.3	8.3	8.5	7.2
14/10/2019	15.1	19.4	23.1	18.5	21.0	26.7	15.7	11.7
15/10/2019	30.0	25.0	38.9	21.3	18.1	20.0	18.3	21.1
16/10/2019	38.5	Replacement of monitoring unit	51.2	44.2	45.7	40.7	32.0	30.3
17/10/2019	38.1	65.1	53.5	43.5	55.3	94.1	88.4	37.2
18/10/2019	*56.3*	*71.7*	*31.1*	*46.9*	*52.7*	*55.8*	*36.9*	*41.5*
19/10/2019	*62.3*	*60.4*	*43.5*	*56.6*	*58.8*	*78.2*	*43.3*	*46.9*
20/10/2019	20.7	21.8	30.6	24.1	18.5	17.6	16.5	16.3
21/10/2019	19.2	21.4	29.2	17.7	15.7	18.9	15.5	15.3

22/10/2019	17.4	17.5	31.1	16.9	13.6	13.3	13.1	13.1
23/10/2019	33.2	36.1	Technical Issue - Circuit Breaker Malfunction	28.2	28.2	30.1	26.1	28.2
24/10/2019	*54.3*	*59.7*	Temporary Power Outage due to external electrical (Ausgrid) works	*56.3*	*64.2*	*73.5*	*46.9*	*47.1*
25/10/2019	*61.6*	*59.0*	*36.5*	*55.6*	*79.4*	*65.8*	*64.2*	*49.3*
26/10/2019	*88.9*	*150.3*	*105.5*	*131.7*	*85.6*	*127.7*	*127.9*	*79.0*
27/10/2019	*58.1*	*50.4*	*57.6*	*64.6*	*59.1*	*71.5*	*34.0*	*45.2*
28/10/2019	*47.2*	*53.2*	*51.7*	*48.2*	*46.1*	*46.9*	*34.6*	*37.2*
29/10/2019	44.9	46.1	48.4	Maintenance Performed	42.0	41.9	40.4	43.0
30/10/2019	*87.7*	*100.6*	*85.2*	*46.1*	*97.8*	*103.1*	*78.8*	*69.7*
31/10/2019	*70.9*	*96.2*	*61.3*	*83.0*	*88.6*	*96.8*	*75.5*	*59.8*
1/11/2019	*63.7*	*72.5*	*94.1*	*67.8*	*73.9*	*71.7*	*65.0*	*61.7*
2/11/2019	*39.3*	*41.7*	*39.5*	*39.4*	*43.0*	*53.3*	*34.2*	*33.8*
3/11/2019	52.0	68.5	37.2	43.6	58.0	98.8	71.2	42.3
4/11/2019	11.9	18.4	7.5	10.0	18.3	19.5	24.5	11.8
5/11/2019	9.4	12.5	10.8	11.4	10.9	14.0	13.6	9.0
6/11/2019	29.2	35.6	15.0	25.1	29.4	37.6	63.0	27.9
7/11/2019	*85.5*	*125.4*	*88.6*	*89.7*	*106.5*	*154.2*	*214.0*	*78.5*
8/11/2019	*94.2*	*116.4*	*78.0*	*98.9*	*96.8*	*143.9*	*139.0*	*80.8*
9/11/2019	26.0	32.5	35.1	42.4	28.8	62.4	38.6	23.1
10/11/2019	33.5	50.2	32.6	28.8	40.4	60.4	28.1	25.8
11/11/2019	21.2	34.9	25.5	24.2	22.3	31.1	24.8	17.9
12/11/2019	*93.6*	*133.6*	*94.5*	*96.5*	*128.6*	*159.6*	*141.9*	*83.0*
13/11/2019	38.3	55.3	53.4	48.0	54.4	65.1	51.3	34.0
14/11/2019	42.7	52.9	39.5	43.5	48.6	56.0	44.0	37.2
15/11/2019	69.9	69.3	33.9	56.8	63.9	111.8	100.2	56.0
16/11/2019	*74.9*	*67.8*	*51.9*	*67.2*	*62.9*	*75.4*	*43.3*	*56.0*
17/11/2019	*55.2*	*67.6*	*54.0*	*58.8*	*57.7*	*56.3*	*55.3*	*53.0*
18/11/2019	42.2	64.6	46.5	45.2	45.1	49.4	46.0	41.6
19/11/2019	*53.6*	*62.3*	*45.2*	*49.0*	*47.3*	*66.2*	*61.2*	*44.7*
20/11/2019	*45.0*	*49.9*	*53.5*	*44.5*	Unit offline. Air Conditioner/ Cooling fault in unit.	*40.8*	*33.3*	*37.9*
21/11/2019	*91.4*	*107.9*	*98.3*	*102.3*		101.1	93.4	85.8
22/11/2019	*107.1*	*135.8*	*106.3*	*128.5*		124.6	101.5	92.9
23/11/2019	*48.1*	*52.5*	*67.4*	*49.0*		46.8	50.4	43.5
24/11/2019	17.7	20.4	22.5	19.4		19.3	22.4	17.4
25/11/2019	36.8	44.8	45.1	36.6		48.9	35.5	32.9
26/11/2019	*201.1*	*242.9*	220.6	*190.6*	175.4	*211.4*	*158.5*	*156.3*
27/11/2019	*82.5*	*71.9*	109.4	*88.7*	*43.0*	*84.9*	*44.4*	*59.3*
28/11/2019	*67.4*	*66.1*	Temporary Power Outage due to external electrical (Ausgrid) works	*61.9*	*46.4*	*56.6*	*58.6*	*59.2*

29/11/2019	*120.9*	*120.6*	*112.4*	*115.5*	*109.4*	*120.2*	*122.5*	*118.4*
30/11/2019	*93.3*	*119.7*	*71.3*	*88.7*	*52.9*	*86.7*	*70.6*	*67.9*
1/12/2019	*50.8*	*81.4*	*61.4*	*64.7*	*46.3*	*85.5*	*87.8*	*59.3*
2/12/2019	*91.7*	*186.4*	*108.0*	*111.3*	*77.9*	*158.6*	*151.5*	*83.8*
3/12/2019	*73.0*	*88.4*	*64.7*	*71.9*	*68.0*	*107.1*	*85.9*	*57.3*
4/12/2019	*53.6*	*86.8*	*54.3*	*45.5*	*54.3*	*105.3*	*77.1*	*45.2*
5/12/2019	*73.8*	*102.6*	*60.4*	*92.8*	*75.8*	*136.4*	*78.8*	*58.3*
6/12/2019	*84.5*	*128.9*	*98.7*	*120.9*	*83.7*	*178.1*	*129.9*	*66.2*
7/12/2019	*94.8*	*109.4*	*101.6*	*101.3*	*71.0*	*97.7*	*88.8*	*89.2*
8/12/2019	*51.9*	*47.2*	*48.4*	*39.1*	*18.5*	*36.1*	*36.4*	*47.4*
9/12/2019	*77.3*	*79.2*	*95.3*	*70.9*	*50.3*	*65.9*	*66.7*	*71.9*
10/12/2019	*102.6*	*114.1*	Maintenance Performed	Maintenance Performed	*82.2*	*105.9*	*98.8*	*94.4*
11/12/2019	*80.8*	*92.6*	*74.5*	*71.6*	*57.0*	*65.0*	*87.9*	*90.3*
12/12/2019	*39.2*	*42.2*	*49.2*	*38.0*	*23.4*	*36.0*	*35.6*	*39.8*
13/12/2019	*19.4*	*19.2*	*23.0*	*18.4*	*6.7*	*18.2*	*16.8*	*18.3*
14/12/2019	*56.1*	*71.5*	*52.9*	*57.6*	*44.2*	*57.3*	*52.0*	*56.3*
15/12/2019	*49.3*	*63.9*	*48.5*	*44.2*	*33.2*	*69.0*	*60.4*	*48.4*
16/12/2019	*66.7*	*78.9*	*74.2*	*67.8*	*67.2*	*101.4*	*51.6*	*56.9*
17/12/2019	*20.1*	*28.2*	*28.6*	*18.0*	*9.2*	*18.7*	*15.8*	*15.9*
18/12/2019	*30.5*	*30.0*	*36.0*	*20.2*	*9.2*	*19.7*	*16.6*	*22.6*
19/12/2019	*116.1*	*122.9*	*106.6*	*98.9*	*90.2*	*106.2*	*82.0*	*94.0*
20/12/2019	*40.0*	*51.3*	*44.9*	*35.7*	*26.1*	*36.5*	*33.1*	*35.2*
21/12/2019	*59.5*	*107.2*	*85.3*	*87.9*	*59.6*	*78.6*	*74.9*	*74.9*
22/12/2019	*40.2*	*45.8*	*42.6*	*43.5*	*24.1*	*52.4*	*33.8*	*35.8*
23/12/2019	*29.6*	*34.5*	*25.0*	*25.7*	*10.2*	*24.5*	*25.0*	*24.2*
24/12/2019	25.3	40.7	20.6	18.5	Maintenance performed following receipt of Temperature and Humidity Alarms	17.8	17.2	19.3
25/12/2019	14.4	28.1	19.2	19.4	3.8	18.7	18.4	15.0
26/12/2019	16.7	25.9	22.6	24.3	7.3	21.1	19.1	18.1
27/12/2019	*25.0*	*28.3*	*21.0*	*18.5*	Negative Results Excluded	*17.7*	*14.2*	*18.7*
28/12/2019	*38.5*	*52.7*	*44.4*	*37.1*	Negative Results Excluded	*36.8*	*41.6*	*35.0*
29/12/2019	*39.3*	*50.5*	*44.2*	*38.9*	*33.4*	*39.7*	*29.7*	*31.8*
30/12/2019	*57.5*	*72.2*	*72.0*	*62.8*	*60.4*	*68.3*	*47.6*	*46.8*
31/12/2019	*102.0*	*99.9*	*70.3*	*79.4*	*63.8*	*77.0*	*55.7*	*69.1*

Note: Days highlighted in blue have been denoted as 'extraordinary events' as advised by DPIE. As advised by DPIE, days which are identified as 'extraordinary events' are not included in Long term impact assessment criteria.

** Units used for management purposes as located on Mine Owned land and not representative of nearby neighbours.*

Table 34: 2015 to 2019 Depositional Dust Air Quality Monitoring Results (g/m2/month)

Dust Gauge Code	2015 Annual Average (g/m2/month)	2016 Annual Average (g/m2/month)	2017 Annual Average (g/m2/month)	2018 Annual Average (g/ m2/month)	2019 Annual Average (g/m2/month)
DD6	0.9	1.0	0.9	0.9	1.5
DD7	2.0	2.3	2.5	2.6	2.9
DD12	2.4	4.3	2.7	1.0	3.3
DD14	1.4	2.6	1.8	2.5	1.7
DD16	2.3	1.8	4.0	2.8	3.5
DG3	1.3	3.3	1.7	1.4	1.9
DG4	1.9	1.6	2.4	2.5	3
DG5	1.5	1.8	2.5	2.3	3.1
DG6	2.8	1.6	2.0	1.9	2.4
DG7	2.1	2.0	2.2	2.6	2.7
DG8	2.6	4.0	2.7	3.6	4.7*

*Refer to Jacobs - Review of 2019 Dust Deposition Data (IA005400) at the end of this appendix.

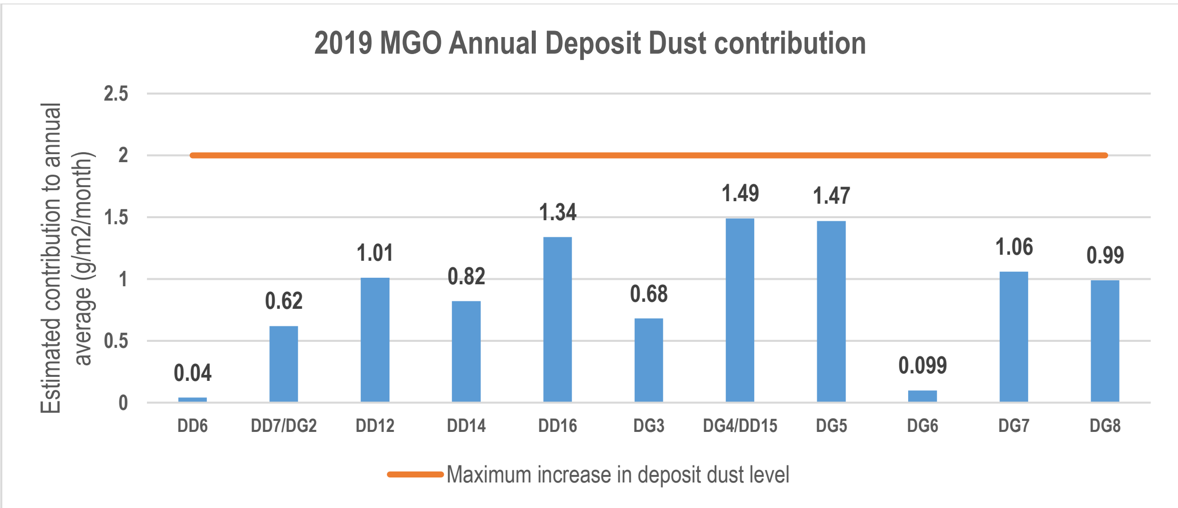


Figure 3 MGO Estimated Deposit Dust contribution to annual average

Table 35: 2015 to 2019 Continuous PM10 Monitoring Comparison

Year	Sx13D8 (Pictons In)	Sx13D1 (Project Office	Sx13D11 (Middle Falbrook)	Sx13D9 (Nobles In)	Sx13D4 (McInerney)	Criterion
Maximum 24-hour average in µg/m3						
2015	70	71	61	74	64	50
2016	51	56	61	76	54	
2017	111	63	86	66	79	
2018	168	144	163	166	210	
2019	220.6	201	175	191	243	
2019 (exlcuding extraordinary events)	60	70	77	64	69	
Number of days above 24-hour average criteria						
2015	7	6	2	4	3	N/A
2016	1	2	1	2	5	
2017	28	6	17	4	20	
2018	15	13	27	11	34	
2019	49	58	62	55	81	
2019 (exlcuding extraoridnary events)	7	11	22	14	28	
Annual average in µg/m3b						
2015	20	18	14	18	20	30**
2016	19	20	14	18	23	
2017	24	20	23	19	24	
2018	23	23	25	22	29	
2019*	22	23	27	23	28	
2019 (1 January 2019 – 3 September 2019 (SSD-5850)*	21	22	26	22	26	
4 September 2019 – 31 December 2019 (SSD-5850)*	26	27	28	27	33	25**

Note: Days have been denoted as 'extraordinary events' as advised by DPIE. As advised by DPIE, days which are identified as 'extraordinary events' are not included in Long term impact assessment criteria.
*** MOCO Mod 2 (SSD-5850) approved during September 2019. Long Term average criterion revised from 30 µg/m3 to 25 µg/m3 as part of modification. Long term average calculations for this report are based upon advice received from DPIE. Averages for the two periods (i.e. 1 January 2019 – 3 September 2019 and 4 September 2019 – 31 December 2019) do not represent an 'annual' average for comparison to assessment criteria. Therefore statisitics provided for these periods have been presented for information purposes only and not for detrmining compliance.*

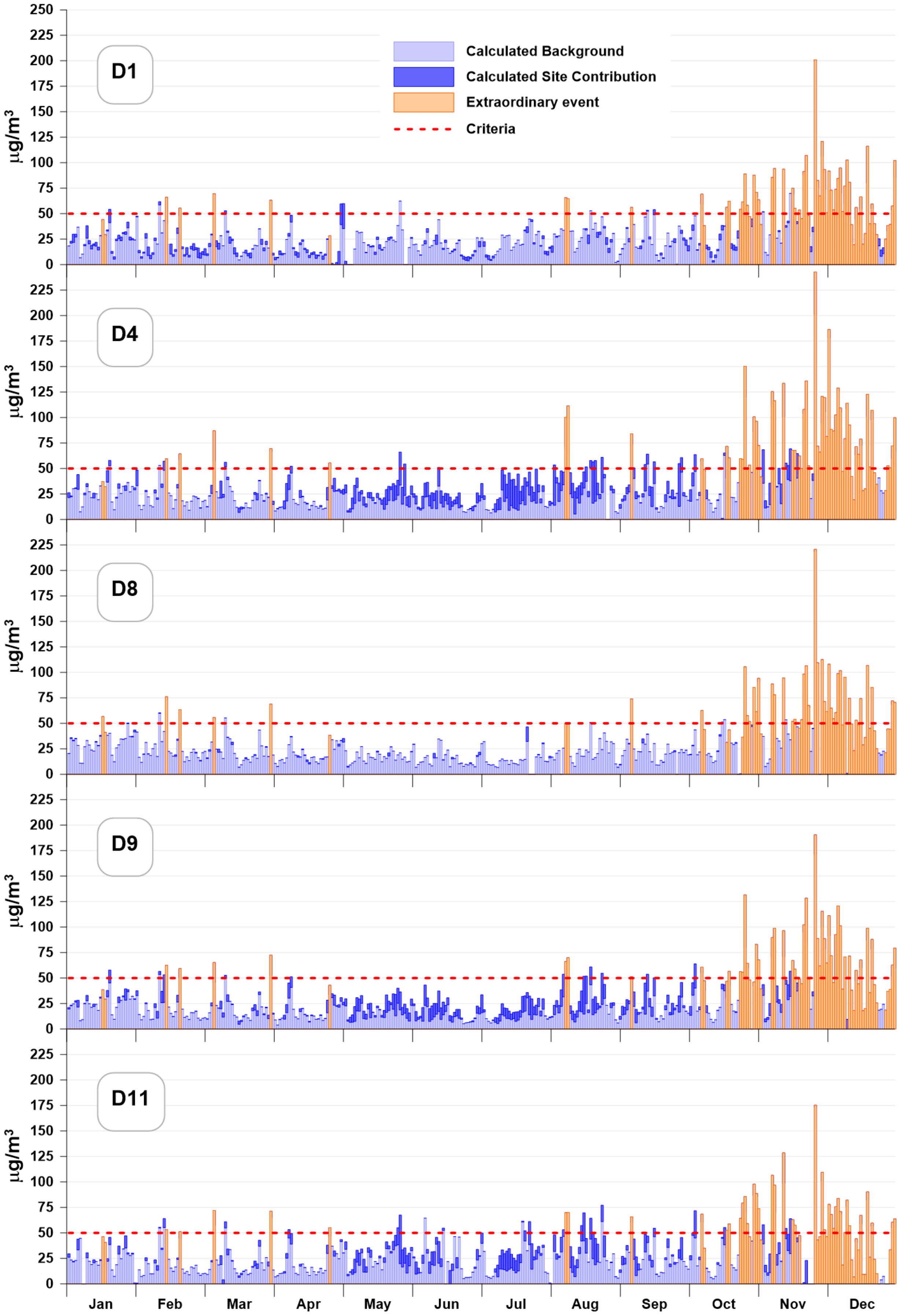


Figure 4 Measured 24-hour average PM_{10} summary 2019.

Table 36: 2015 to 2019 HVAS TSP Comparison

HVAS Site	Location	2015 Annual Average (µg/m³)	2016 Annual Average (µg/m³)	2017 Annual Average (µg/m³)	2018 Annual Average (µg/m³)	2019 Annual Average (µg/m³)
TSP 1	Picton	54.8	52.5	60	59.0	60
TSP 2	Falbrook Road	60.8	76.4	73	78.0	76
TSP 3	Camberwell Church	56.7	62.4	68	80.4	79

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Incident and Investigation Report

SECTION 1: INCIDENT REPORT	Incident Number: IR-084
Complete this section for all Incidents. **Note: If incident occurs on client's site, complete client's site specific report/investigations forms and submit a copy to CBased Environmental.**	
Date & Time of Incident:	**Date:** 9/9/19 **Time:** Approx. 3pm
Site/Location of Incident:	Mt Owen/Glendell TSP2 (Mid Falbrook)
Name of Employee/s involved:	Alex Smith, Michael Tracey
Type of Incident:	☐Injury ☐Near Miss ☐Equipment Damage ☑Quality ☐Other
Describe the Incident: *Include location of incident, sequence of events, contributing factors, witnesses, description of injury etc.*	On unlocking and opening the TSP2 sampler on 9/9/19, Alex noticed only part of the filter paper was still in the cassette. On looking around he noticed multiple pieces of the filter paper on the ground within a 50m radius of the sampler (which he subsequently collected and put in the filter bag) (see Photo 2). This damage to the filter paper invalidated the result for the TSP2 sampler on 5/9/19.
For Injuries Only:	**Injury / Illness type:** N/A **Part of Body:** N/A **First Aid Treatment Provided:** N/A ☐Return to Normal Duties ☐Referred to doctor/hospital/medical treatment
What immediate action was taken?	Reported to MGO task coordinator (Mike Pereira) and CBE Projects Manager (Renae Mikka).
Is there any Change of Management or Corrective Action required?	☑Yes If **YES**, complete a *Change Management (Corrective Action Request – CAR) Form* (F413) then submit to WHS Manager with this report. ☐No
Has the Incident been reported to the client?	☑Yes ☐No ☐N/A If **NO**, please inform client immediately!
What was the actual or potential incident severity?	☐High (1-6) ☐Medium (7-15) ☑Low (16-25) If **HIGH**, forward to WHS Manager for completion of **SECTION 2: Incident Investigation** *Note: For risk ranking and matrix, refer to the Risk Assessment Worksheet Form (F436)*
Name of employee filing report:	Renae Mikka
Signature of Employee:	RMikka **Date:** 9/9/19

Incident and Investigation Report

SECTION 2: INCIDENT INVESTIGATION

Investigator/Position: Renae Mikka (Projects Manager)	**Date Incident Report Received:** 9/9/19
DRE Notification Report completed and sent? (confirm with mine site owner): N/A	

Detailed Description of incident:
(attach photos, drawing etc)

On unlocking and opening the TSP2 sampler on 9/9/19, Alex noticed only part of the filter paper was still in the casette.

On looking around he noticed multiple pieces of the filter paper on the ground within a 50m radius he subsequently collected and put in the filter bag) (see Photo 2).

This damage to the filter paper invalidated the result for the TSP on 5/9/19.

Identify witnesses and obtain their version of events

Name/s of Witness	Contacted?	Date
Ryan Foggett (installed filter paper on 4/9/19)	☑Yes ☐No	11/9/19
Alex Smith (collected filter paper on 9/9/19)	☑Yes ☐No	11/9/19
Michael Tracey (collected filter paper on 9/9/19)	☑Yes ☐No	11/9/19
	☐Yes ☐No	
	☐Yes ☐No	

How exactly did the injury, accident or incident happen?

Two theories have been suggested by field staff involved; one is the filter paper coming loose from the cassette and escaping through the inlet, the other is interference with the sampler by a third party.

Ryan confirmed that the cassette was in place and the door locked before leaving on 4/9/19. Alex and Michael confirmed that the door was locked on arrival and cassette in place on 9/9/19 (though majority of filter paper was missing) and didn't notice any obvious signs of tampering to the sampler (including lock, door and inlet). Accordingly, it is not considered likely that the monitor was interfered with by a third party in this instance. However, we have seen numerous instances of interference with HVAS monitors previously (from switching the power off to physical removal of the monitors).

Regarding the first option of the paper coming loose from the cassette by itself, we have seen instances/ evidence of filter papers moving in the cassette, and sometimes lifting in the middle if not installed completely flat, but never coming loose from the cassette altogether. The cassette was inspected and although it was not significantly worn, it has been replaced to eliminate this as a factor in the future.

It was also identified that the muffler was missing its exhaust flap valve during follow-up inspection on 13/9/19 (see Photo 4). Although we don't have any evidence of this happening elsewhere, we consider it plausible that this, paired with the strong gusty W-NW winds on 6th & 7th September allowed air flow back through the sampler which pushed the filter paper free from the cassette. With the filter paper free it was

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able to break apart into smaller pieces (the filter material is quite fragile), which were then able to escape from the inlet.

The other factor that leads us to believe the damage occurred between the 6/9/19 and 9/9/19 is that on the run day, the volume of air running through the filter paper would act to hold the filter in place, as evident on Photo 2, the filter paper looks like a typical filter that has successfully completed a run.

Reconstruct the sequence of events that lead to the undesired event. As above.

1.	**4.**	**7.**
2.	**5.**	**8.**
3.	**6.**	**9.**

List any contributing factors:

Wear and tear of the cassette and rubber over time leading to insufficient grip of filter paper.
Strong W-NW winds on 6th & 7th September (gusts recorded up to 80km/h).
Broken muffler flap allowing air flow back through sampler.

Additional actions from investigation: Note: Complete a *Change Management (Corrective Action Request – CAR) Form* (F413) for additional actions.	**1.** Replace cassette – completed 13/9/19
	2. Replace muffler – completed 20/9/19
	3. Conduct make up run for sample run on 5/9/19 – completed 13/9/19
	4. Inspect TSP1 (Picton) to ensure cassette & muffler are compliant – to be completed 24/9/19
	5.
	6.
	7.
	8.
	9.

Estimated cost of incident: $ N/A	**Estimated cost of actions: $** N/A
WHS or Operations Manager Comments:	N/A
Feedback given to Employee:	N/A

Signature of Employee: N/A **Date:** N/A

Signature of Investigator: RAllen **Completion Date:** 20/9/19

Photo 1: Location of TSP2 (on left).

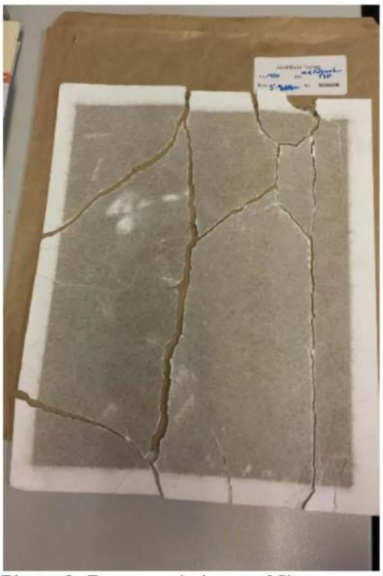

Photo 2: Recovered pieces of filter paper.

Photo 3: Filter paper casette.

Photo 4: TSP2 (note missing flap on muffler on left of side of sampler).

Photo 5: TSP2 with inlet open showing placement of filter cassette and inside of inlet.

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Change Management Form (Corrective Action Request – CAR)

SECTION 1 – Clarify Change Required		
Source of Problem or Suggested Change/Improvement ☐ Hazard ☐ Incident ☐ Injury ☐ Environment ☐ Customer complaint ☐ Supplier issue ☐ Potential issue ☐ Improvement ☐ Process review ☑ Quality		
Completed by: Renae Mikka	**Signed:**	**Date:** 20/9/19
Brief Description of Problem	HVAS filter paper appears to have come loose from cassette, invalidating sampling result (see IR-084).	
Cause of Problem	Most likely worn cassette rubber and/or missing muffler flap (and contributed to by strong and gusty wind conditions).	

Corrective Actions Required - To prevent the problem recurring or ensure change is permanent – Include each action/control, persons responsible for implementation and date required.

Action	By Who	By When
Replace filter paper cassette	Coordinated by R.Mikka	Completed 13/9/19
Replace muffler	Coordinated by R.Mikka	Completed 20/9/19
Undertake make up run for TSP2 run on 5/9/19	Coordinated by R.Mikka	Completed 13/9/19
Inspect TSP1 (Picton) to ensure cassette & muffler are compliant	Coordinated by R.Mikka	24/9/19

Changes communicated to relevant persons:	☑ YES ☐ N/A
CAR Number Assigned: CAR-124	**Nominated Follow Up Date:** 18/10/19

SECTION 2 – Follow up and Close Out		
Comments on Follow Up / Close Out. - To confirm corrective actions were effective		
CAR Register Updated:	☐ Yes – CAR Register must be updated	
Completed by:	**Signed:**	**Date:**

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28 January 2020

Attention: Mike Pereira
Environment and Community Officer
Mt Owen / Glendell Operations, Glencore

Project Name: 2019 Mt Owen Complex Annual Review
Project Number: IA005400

Dear Mike,

Review of 2019 Dust Deposition Data

I have completed a review of Mt Owen's dust deposition data for 2019. Please see attached for the outcomes of the analyses.

In summary, it has been concluded that Mt Owen was in compliance with its development consents in terms of total and incremental dust deposition impacts at all monitoring sites for data collected in 2019.

Yours sincerely

Shane Lakmaker
Principal (Air Quality)
(02) 4979 2663
shane.lakmaker@jacobs.com

Jacobs

28 January 2020

1. Background

Mt Owen Pt Ltd (Mt Owen) has a network of air quality and meteorological monitoring equipment around the Mt Owen Complex which is designed to meet relevant conditions under the development consents for Glendell Mine (DA 80/952) and Mt Owen Mine (SSD-5850).

Figure 1 shows the meteorological and air quality monitoring network. This network includes:

- Three (3) meteorological stations
- Three (3) high volume air samplers (HVAS) measuring TSP
- Six (6) tapered element oscillating microbalances (TEOM) measuring PM_{10}
- Two (2) EBAM units measuring PM_{10}
- Eleven (11) dust deposition gauges

A review of the dust deposition data that were collected in 2019 has been carried out. The main purpose of the review was to identify the likely factors for any elevated results, including estimating contributions from the Mt Owen Complex, and to determine whether Mt Owen had complied with the criteria specified in the development consents (DA 80/952 and SSD-5850). Table 1 shows the relevant development consent criteria.

Table 1 Development consent criteria

Substance	Averaging time	[d] Impact assessment criteria from Glendell Consent (DA 80/952)	[d] Impact assessment criteria from Mount Owen Consent (SSD-5850)
[c] Deposited dust	Annual (maximum increase)	[b] 2 g/m^2/month	[b] 2 g/m^2/month
	Annual (maximum total)	[a] 4 g/m^2/month	[a] 4 g/m^2/month

[a] Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).
[b] Incremental impact (i.e. incremental increase in concentrations due to the development on its own).
[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, fire incidents or any other activity agreed to by the Secretary.

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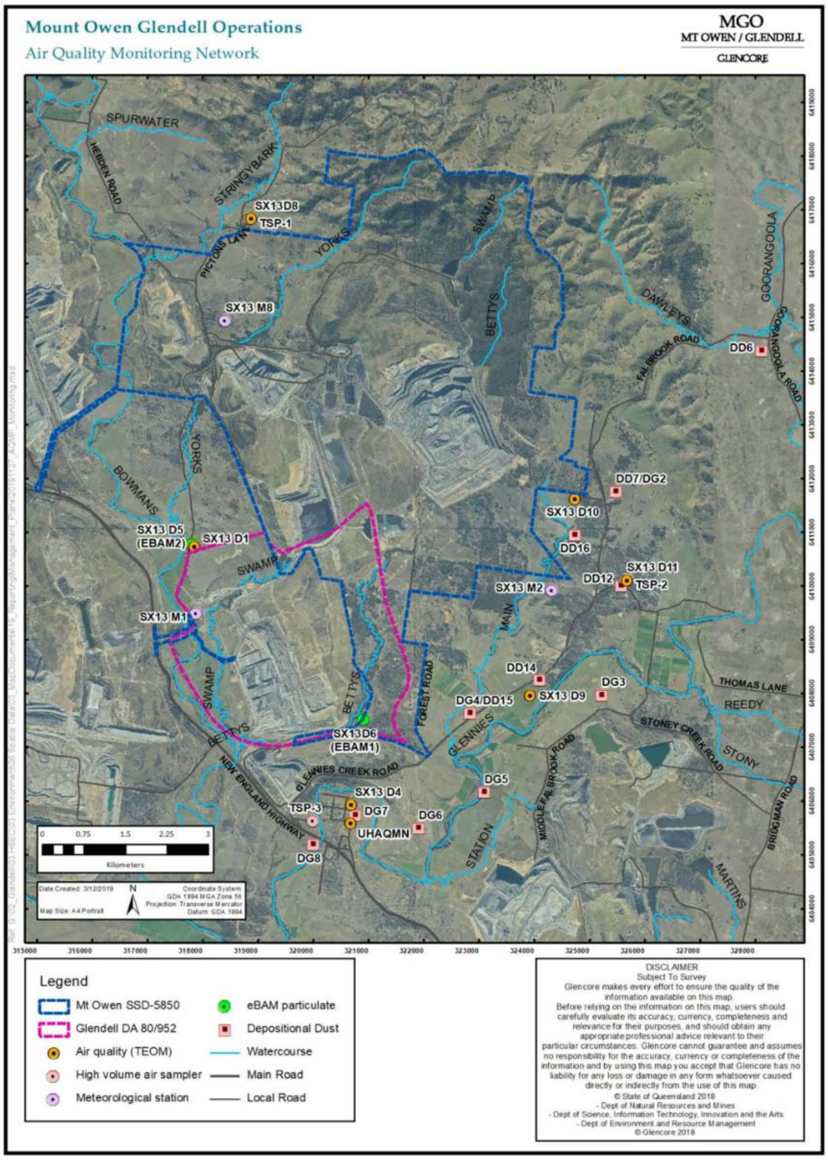

Figure 1 Location of monitoring stations around the Mt Owen Complex

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2. Approach to Review

The monitoring data review involved:

- Obtaining monthly dust deposition data from all monitoring sites for 2019 and calculating annual averages.
- Obtaining hourly meteorological data from the Mt Owen Complex weather stations for 2019 and calculating the frequency of winds towards each dust monitor to determine potential maximum contributions from the Mt Owen Complex to each dust deposition result.
- Summarising of all monitored dust deposition data, likely factors for elevated results and estimated contributions from the Mt Owen Complex.

In accordance with AS 5380.10-1, there is only one measurement of dust deposition each month, from each monitor. Consequently, it is not possible to determine whether a monthly measurement was being influenced by a single source over a few days, multiple sources over the entire month, or some other combination. This complicates the process for isolating and determining contributions from a source of interest, such as the Mt Owen Complex. In addition, there is no standard prescribed methodology for determining site contributions to air quality for mining operations, so an estimation technique had to be adopted.

The contribution of the Mount Owen Complex mining activities to each measured result was calculated by first determining the wind direction ranges which represent a wind direction from the operation towards each monitor. Table 2 shows the wind direction ranges that represented the direction to the Mt Owen Complex from each monitor.

Table 2 Wind directions to Mt Owen Complex mining activities

Monitoring site	Directions to Mt Owen Complex
DD6	Between 230 and 280 degrees from true north
DD7/DG2	Between 230 and 320 degrees from true north
DD12	Between 240 and 330 degrees from true north
DD14	Between 250 and 360 degrees from true north
DD16	Between 230 and 340 degrees from true north
DG3	Between 260 and 340 degrees from true north
DD15/DG4	Between 260 and 10 degrees from true north
DG5	Between 280 and 10 degrees from true north
DG6	Between 300 and 30 degrees from true north
DG7	Between 310 and 40 degrees from true north
DG8	Between 330 and 40 degrees from true north

The potential site contribution to each monitor was then calculated by multiplying the annual average dust deposition by the percentage of time that winds were in the direction of that monitor. This calculation assumes that the Mt Owen Complex was contributing to the measurements at all times when the wind was in the direction of the monitor, which may not necessarily be the case.

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3. Monitored Results

Table 3 shows the measured monthly dust deposition results from each monitor for data collected in 2019. Annual averages have been calculated for comparison with the development consent criteria. The annual average data presented in Table 3 excluded monthly results marked as contaminated ('C') by the monitoring contractor but did not exclude periods of extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed to by the Secretary, as per the provisions of the development consents.

Table 3 Measured dust deposition from Mt Owen Complex monitors in 2019

Month	g/m^2/month											
	DD6	DD7/DG2	DD12	DD14	DD16	DG3	DD15/DG4	DG5	DG6	DG7	DG8	Criterion
Jan	2.7	2.9	2.8	C	1.8	1.2	2.0	3.8	3.2	3.9	2.3	-
Feb	1.6	2.9	C	C	3.2	4.5	2.6	3.9	C	C	6.2	-
Mar	1.8	2.5	1.1	C	0.9	0.9	4.3	C	2.4	2.4	C	-
Apr	1.1	2.8	2.3	1.6	2.4	1.8	C	3.1	2.3	2.4	9.0	-
May	1.0	2.5	2.3	1.8	3.2	0.3	2.2	3.2	1.5	C	3.2	-
Jun	1.2	3.1	3.9	1.8	5.3	1.8	C	2.9	2.3	3.7	7.9	-
Jul	1.0	3.1	3.9	1.6	C	C	3.0	3.4	2.4	3.8	5.3	-
Aug	0.9	2.9	4.8	1.7	5.1	1.6	2.2	3.6	2.3	2.1	2.9	-
Sep	2.0	2.3	5.1	2.0	6.1	2.0	5.1	2.6	2.0	2.3	3.2	-
Oct	0.6	2.6	2.8	1.4	C	1.8	3.3	2.1	C	1.6	2.4	
Nov	2.2	3.7	C	1.6	3.5	2.4	2.5	4.0	2.0	2.8	3.7	
Dec	1.5	3.3	4.4	C	3.8	2.3	3.0	1.4	2.0	2.4	5.6	
Annual average	1.5	2.9	3.3	1.7	3.5	1.9	3.0	3.1	2.2	2.7	4.7	4

The annual average dust deposition results from Table 3 were below 4 g/m^2/month at all monitoring sites except at DG8 where the annual average result was 4.7 g/m^2/month. DG8 is located southwest of Camberwell Village, on the south side of the New England Highway. Further investigation of this result has therefore been carried out.

Table 4 shows the calculated site contributions to each monitor, including DG8, as per the methodology described in Section 2. The calculations show that the Mt Owen Complex was estimated to have contributed up to 1.0 g/m^2/month to the measured 4.7 g/m^2/month at DG8. This result demonstrates compliance with the "incremental impact" criteria from the development consent (that is, 2 g/m^2/month).

In addition, the data do not indicate that the Mt Owen Complex was the cause of an exceedance of the "total impact" criteria (4 g/m^2/month) at DG8. This is because the calculated contribution to DG8 (1.0 g/m^2/month) was within the range of contributions calculated for other monitoring sites, so the result is not unique. It is also useful to make comparisons to the results at other locations to assist with determining possible causes of elevated results. For example, DG7 is located closer to the Glendell Mine than DG8 and experienced a higher proportion of winds from Glendell Mine towards the monitor, however the dust deposition at DG7 was lower than at DG8. This suggests that there were local sources of dust near DG8 that contributed to the measured result.

Table 4 Estimated contributions of Mt Owen Complex to measured dust deposition

Parameter	DD6	DD7/DG2	DD12	DD14	DD16	DG3	DD15/DG4	DG5	DG6	DG7	DG8	Criterion
Lower bound of wind from MOC to monitor (degrees)	230	230	240	250	230	260	260	280	300	310	330	-
Upper bound of wind from MOC to monitor (degrees)	280	320	330	360	340	340	10	10	30	40	40	-
Percentage of time that wind was from MOC towards monitor (%)	3	21	30	48	38	36	49	48	44	39	21	-
Annual average dust deposition ($g/m^2/month$)	1.5	2.9	3.3	1.7	3.5	1.9	3.0	3.1	2.2	2.7	4.7	4
Estimated MOC contribution to annual average ($g/m^2/month$)	0.04	0.62	1.01	0.82	1.34	0.68	1.49	1.47	0.99	1.06	0.99	2

Finally, late 2019 coincided with a period of unprecedented bushfires in Australia, predominantly across southeast Australia, but also affecting a reported 5.2 million hectares of land in NSW since early November 2019. Additional detail can be found at:

- https://en.m.wikipedia.org/wiki/2019%E2%80%9320_Australian_bushfire_season

These bushfire events adversely affected air quality across large parts of NSW including the Upper and Lower Hunter Valley. The adverse air quality conditions were evident from monitoring data collected by the Department of Planning, Industry and Environment (DPIE). Figure 2 shows the measured PM_{10} concentrations at the Singleton, Muswellbrook and Newcastle monitoring stations in 2019. These data clearly show the increased PM_{10} concentrations in November and December and, based on the documented bushfire activity and bushfire locations, it would not be unreasonable to classify most days in these two months as related to extraordinary events in the Hunter Valley.

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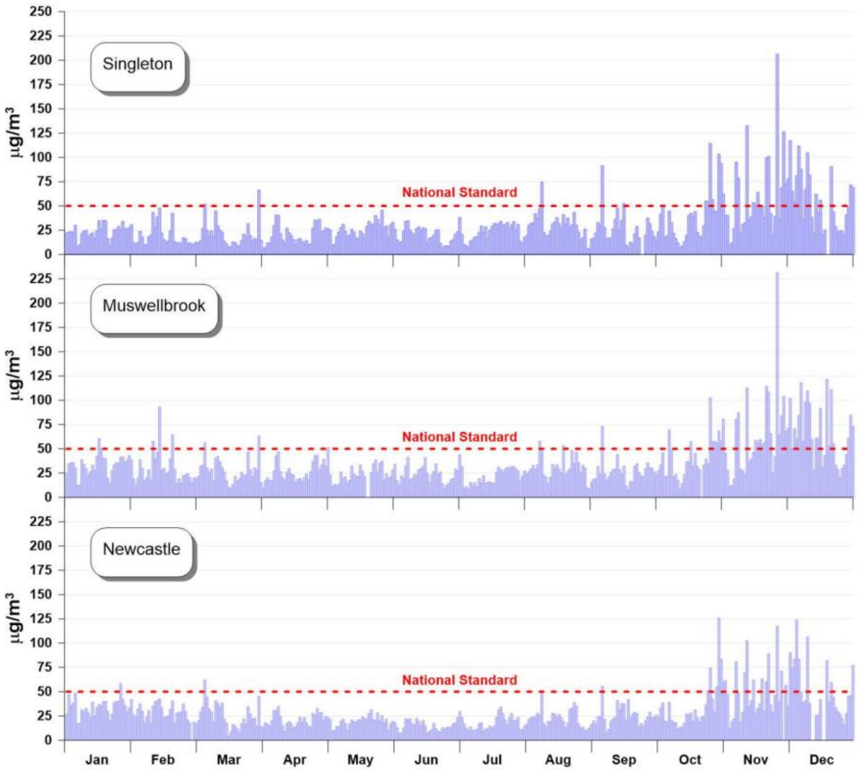

Figure 2 Measured 24-hour average PM_{10} concentrations in the Hunter Valley in 2019

4. Conclusion

Based on the analysis and estimated site contributions it has been concluded that Mt Owen was in compliance with its development consents in terms of total and incremental dust deposition impacts at all monitoring sites for data collected in 2019.

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3 March 2020

Attention: Mike Pereira
Environment and Community Officer
Mt Owen / Glendell Operations, Glencore

Project Name: 2019 Mt Owen Glendell Operations Annual Review
Project Number: IA005400

Dear Mike,

Review of 2019 Annual Average PM10 and TSP Data

I have completed a review of Mt Owen's annual average PM_{10} and TSP data for 2019. Please see attached for the outcomes of the analyses.

In summary, it has been concluded that Mt Owen Glendell Operations was in compliance with its development consents in terms of total PM_{10} and TSP impacts at all monitoring sites for data collected in 2019.

Yours sincerely

Shane Lakmaker
Principal (Air Quality)
(02) 4979 2663
shane.lakmaker@jacobs.com

Jacobs

3 March 2020

1. Background

Mt Owen Pt Ltd (Mt Owen) has a network of air quality and meteorological monitoring equipment around the Mt Owen Glendell Operations (MGO) which is designed to meet relevant conditions under the development consents for Glendell Mine (DA 80/952) and Mt Owen Mine (SSD-5850).

Figure 1 shows the meteorological and air quality monitoring network. This network includes:

- Three (3) meteorological stations.
- Six (6) tapered element oscillating microbalances (TEOM) measuring PM_{10}. Compliance is determined at SX13 D1, SX13 D4, SX13 D8, SX13 D9 and SX13 D11.
- Two (2) EBAM units measuring PM_{10}. Data from these units are used for operations management.
- Three (3) high volume air samplers (HVAS) measuring TSP. Compliance is determined at TSP 1 and TSP 2.
- Eleven (11) dust deposition gauges.

A review of the annual average PM_{10} and TSP data that were collected in 2019 has been carried out. The main purpose of the review was to estimate contributions from MGO, and to determine whether Mt Owen had complied with the criteria specified in the development consents (DA 80/952 and SSD-5850). Table 1 shows the relevant development consent criteria. The annual average PM_{10} criterion was revised from 30 µg/m^3 to 25 µg/m^3 on 4 September 2019 as part of SSD-5850 Modification 2.

Table 1 Development consent criteria

Substance	Averaging time	[d] Impact assessment criteria from Glendell Consent (DA 80/952)	[d] Impact assessment criteria from Mount Owen Consent (SSD-5850) up to 4 Sep 2019	[d] Impact assessment criteria from Mount Owen Consent (SSD-5850 Mod 2) from 4 Sep 2019
Particulate matter (PM_{10})	Annual	[a] 30 µg/m^3	[a] 30 µg/m^3	[a] 25 µg/m^3
Particulate matter (TSP)	Annual	[a] 90 µg/m^3	[a] 90 µg/m^3	[a] 90 µg/m^3

[a] Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).
[b] Incremental impact (i.e. incremental increase in concentrations due to the development on its own).
[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, fire incidents or any other activity agreed to by the Secretary.

It is understood that Mt Owen reports compliance against their 24-hour average PM_{10} criteria via a separate process established with the Department of Planning, Industry and Environment (DPIE).

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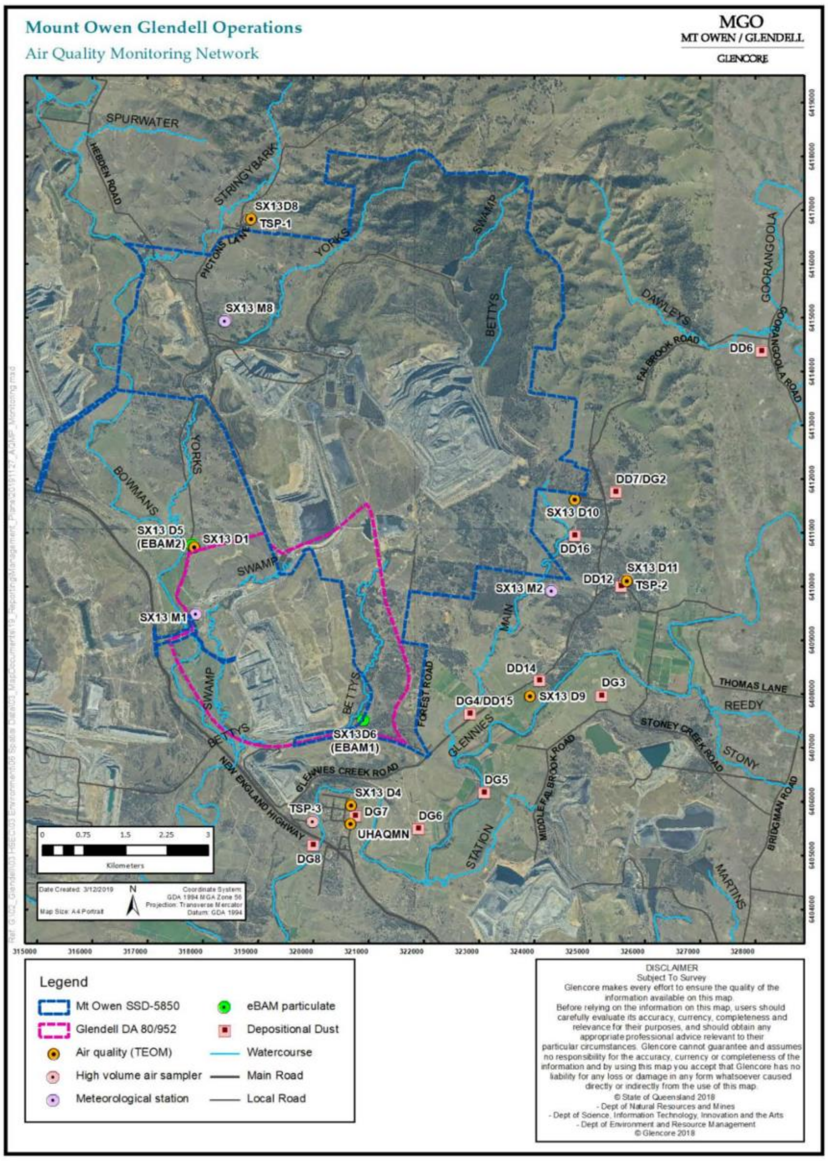

Figure 1 Location of monitoring stations around the MGO

2. Approach to Review

2.1 Extraordinary Events

Late 2019 coincided with a period of unprecedented bushfires in Australia, predominantly across southeast Australia, but also affecting a reported 4 million hectares of land in NSW since early November 2019. Additional detail can be found at:

- https://www.environment.nsw.gov.au/topics/air/air-quality-statement

The bushfires adversely affected air quality across many parts of NSW and a total of 66 days in 2019 were subsequently declared as extraordinary events, based on advice from Mt Owen who had been in consultation with the DPIE. Table 2 identifies the days that have been declared as extraordinary events.

Table 2 Days declared as extraordinary events in 2019

Month	Day(s)
Jan	16, 17
Feb	13, 19
Mar	6, 31
Apr	26
May	-
Jun	-
Jul	-
Aug	8, 9
Sep	6
Oct	7, 8, 18, 19, 24, 25, 26, 27, 28, 30, 31
Nov	1, 2, 7, 8, 12, 16, 17, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30
Dec	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, 30, 31

The reporting of Mt Owen's PM_{10} and TSP air quality monitoring data has excluded records from the days listed as extraordinary in Table 2 above, as per the provisions of the development consents.

2.2 Annual average PM_{10}

The analysis of PM_{10} data involved:

- Obtaining hourly average PM_{10} concentration data from all monitoring sites for 2019 and calculating annual averages.
- Obtaining hourly meteorological data from MGO weather stations for 2019 and calculating the contributions from MGO to each hourly PM_{10} concentration result.
- Summarising of all monitored PM_{10} concentration data and estimated annual contributions from MGO.

There is no standard prescribed methodology for determining site contributions to air quality for mining operations. The methodology described below is based on the use of concurrent hourly meteorological and air quality monitoring data from suitably located monitoring stations around the mine site to estimate site contributions. This method is referred to as an upwind / downwind calculation approach.

The contribution of MGO mining activities to the measured results was calculated by first determining the wind direction ranges which represent a wind direction from the operation towards each monitor. Table 5 shows the wind direction ranges that represented the direction to MGO from each monitor. Calculations of contributions from both Glendell mine and Mt Owen mine had been considered however it was determined that there are some wind directions for which the individual contributions could not be calculated due to overlap in the wind direction ranges to some monitors.

Table 3 Wind directions to MGO mining activities

Monitoring site	Directions to MGO
SX13 D1	Between 10 and 170 degrees from true north
SX13 D4	Between 310 and 40 degrees from true north
SX13 D8	Between 30 and 110 degrees from true north
SX13 D9	Between 250 and 360 degrees from true north
SX13 D11	Between 240 and 330 degrees from true north

The site contribution to each monitor was calculated for every 1-hour average record for every day based on the concurrent wind direction and from a downwind concentration minus upwind concentration calculation. Table 4 shows the data representing upwind and downwind conditions for each monitoring site. The downwind minus upwind result was only calculated downwind for hours with wind speeds greater than 0 m/s.

Table 4 Data for upwind and downwind calculations

Monitoring site	Data representing conditions upwind	Data representing conditions downwind
SX13 D1	SX13 D11	SX13 D1
SX13 D4	SX13 D8	SX13 D4
SX13 D8	SX13 D9	SX13 D8
SX13 D9	SX13 D8	SX13 D9
SX13 D11	SX13 D8	SX13 D11

The site contribution to each monitor was then calculated as an annual average (not including negative values) from the 8,760 hourly records.

2.3 Annual average TSP

The analysis of TSP data involved:

- Obtaining six day records of TSP concentration data from all monitoring sites for 2019 and calculating annual averages.

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- Obtaining hourly meteorological data from MGO weather stations for 2019 and calculating the frequency of winds towards each monitor to determine potential maximum contributions from MGO to each TSP concentration result.
- Summarising of all monitored TSP concentration data and estimated contributions from MGO.

In accordance with AS 3580.9.10, there is only one measurement of TSP concentration every six days, from each monitor. Consequently, it is not possible to determine whether a daily average was being influenced by a single source over a few hours, multiple sources over the entire day, or some other combination. This complicates the process for isolating and determining contributions from a source of interest, such as MGO. In addition, there is no standard prescribed methodology for determining site contributions to air quality for mining operations, so an estimation technique had to be adopted.

The contribution of MGO mining activities to each measured result was calculated by first determining the wind direction ranges which represent a wind direction from the operation towards each monitor. Table 5 shows the wind direction ranges that represented the direction to MGO from each monitor.

Table 5 Wind directions to MGO mining activities

Monitoring site	Directions to MGO
TSP 1	Between 30 and 110 degrees from true north
TSP 2	Between 240 and 330 degrees from true north
TSP 3	Between 330 and 40 degrees from true north

The potential site contribution to each monitor was then calculated by multiplying the annual average TSP concentration by the percentage of time that winds were in the direction of that monitor. This calculation assumes that MGO was contributing to the measurements at all times when the wind was in the direction of the monitor, which may not necessarily be the case.

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3. Monitored Results

3.1 Extraordinary Events

The bushfire events in late 2019 adversely affected air quality across large parts of NSW including the Upper and Lower Hunter Valley. The adverse air quality conditions were evident from monitoring data collected by the DPIE. Figure 2 shows the measured PM_{10} concentrations at the Singleton, Muswellbrook and Newcastle monitoring stations in 2019. These data clearly showed the increased PM_{10} concentrations in November and December and, as noted in Section 2.1, there were a total of 66 days declared as extraordinary events in the Hunter Valley.

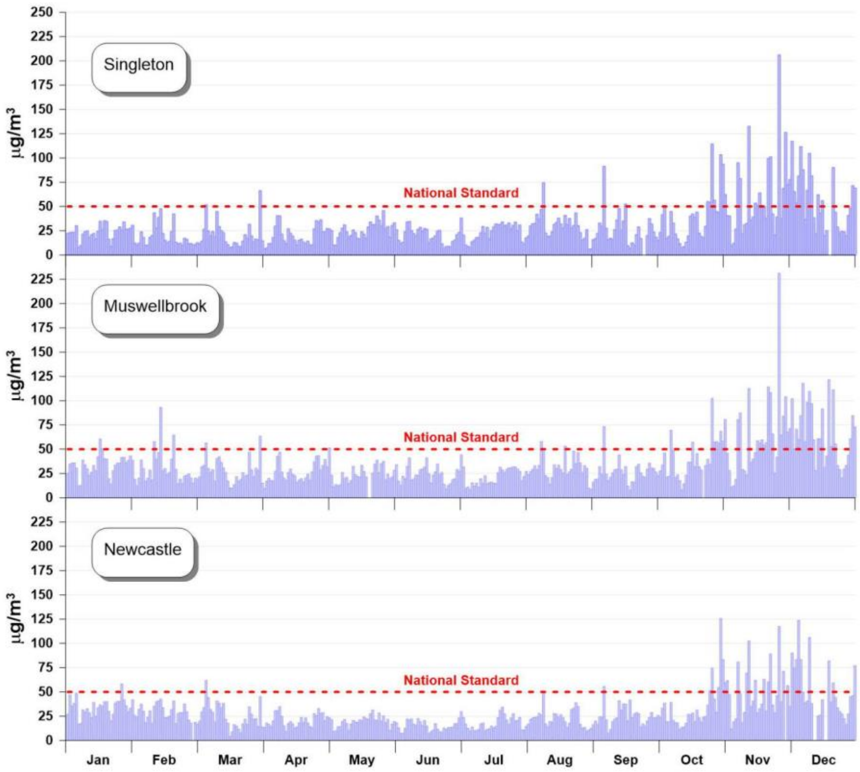

Figure 2 Measured 24-hour average PM_{10} concentrations in the Hunter Valley in 2019

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3.2 Annual average PM_{10}

Table 8 shows the measured annual average PM_{10} concentrations from each monitor for data collected in 2019. As noted in the development consents (DA 80/952 and SSD-5850), and reproduced in Table 1, determination of compliance against the impact assessment criteria is to exclude "extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed to by the Secretary". Therefore the annual averages have been calculated without extraordinary events. This means that the annual averages have been based on one year of records but only represents 82% of one year; that is, below the minimum 90% data capture rate that is required for applications of air quality data analysis (see for example EPA 2016 and US EPA 2000). However this data capture outcome could not have been avoided. The data in Table 8 show that, without extraordinary events, the PM_{10} concentrations at all five monitors (bold text) were below 30 µg/m³. Consequently the monitoring demonstrates compliance with DA 80/952 and SSD-5850 in terms of annual average particulate matter as PM_{10}.

As noted in Section 1 the annual average PM_{10} criterion in SSD-5850 was revised from 30 µg/m³ to 25 µg/m³ on 4 September 2019 as part of SSD-5850 Modification 2. The PM_{10} data have therefore been presented as averages for the 1 January to 3 September and 4 September to 31 December periods, excluding extraordinary events. The statistics represent even lower data capture rates (65% and 17% of one year respectively) so have been presented for information only, and not for determining compliance. Determination of compliance against the revised criterion (25 µg/m³) will need to be carried out once a full year of data is available.

Table 6 Measured PM_{10} concentrations from MGO monitors in 2019

Year	SX13 D1	SX13 D4	SX13 D8	SX13 D9	SX13 D11	Criterion
Annual average in µg/m³						
2019 (all data)	31	37	30	31	32	NA
2019 (without extraordinary events)	23	28	22	23	26	30
2019 (1 Jan to 3 Sep) (without extraordinary events) 237 days, 65% of one year	22	26	21	22	26	30
2019 (4 Sep to 31 Dec) (without extraordinary events) 62 days, 17% of one year	27	33	26	27	28	25

Table 7 shows the calculated site contributions to each monitor as per the methodology described in Section 2.

Table 7 Estimated contributions of MGO to measured PM_{10} concentrations

Parameter	SX13 D1	SX13 D4	SX13 D8	SX13 D9	SX13 D11	Criterion
Annual average PM_{10} concentration (µg/m³)	23	28	22	23	26	30
Estimated MOC contribution to annual average PM_{10} (µg/m³)	1	5	0	3	4	NA

The calculations from Table 7 show that, of all sites, the MGO was estimated to have contributed up to 5 µg/m^3; at SX13 D4. The basis for the calculated site contributions can be seen from Figure 3. This figure shows the measured 24-hour average PM_{10} concentration from each monitoring site, broken down into calculated background and calculated site contributions for each day of the year. The calculated higher site contributions at SX13 D4 can be seen to occur in the winter months when winds from the northwest are more common. As noted in Section 1 Mt Owen reports compliance against their 24-hour average PM_{10} criteria via a separate process established with the DPIE so these results are not discussed further.

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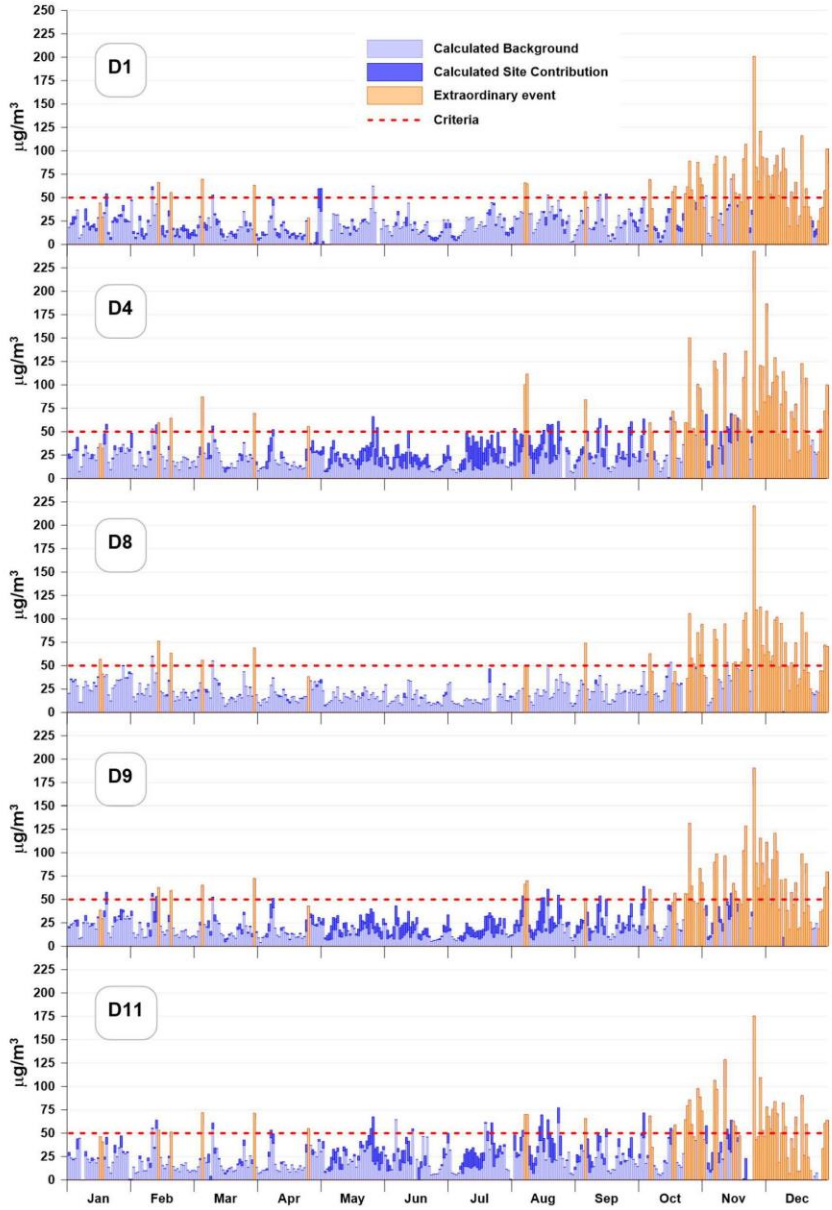

Figure 3 Measured 24-hour average PM_{10} concentrations at MGO monitoring sites in 2019

3.3 Annual average TSP

Table 8 shows the measured annual average TSP concentrations from each monitor for data collected in 2019. Annual averages have been calculated without extraordinary events for comparison with the development consent criteria. These data show that, without extraordinary events, the TSP concentrations at TSP 1 and TSP 2 were below 90 µg/m^3. Consequently the monitoring demonstrates compliance with the development consent in terms of particulate matter as TSP.

Table 8 Measured TSP concentrations from MGO monitors in 2019

Year	TSP 1	TSP 2	TSP 3	Criterion
Annual average in µg/m^3				
2019 (all data)	73	92	90	NA
2019 (without extraordinary events)	60	76	79	90

Table 9 shows the calculated site contributions to each monitor as per the methodology described in Section 2.

Table 9 Estimated contributions of MGO to measured TSP concentrations

Parameter	TSP 1	TSP 2	TSP 3	Criterion
Lower bound of wind from MOC to monitor (degrees)	30	240	330	-
Upper bound of wind from MOC to monitor (degrees)	110	330	40	-
Percentage of time that wind was from MOC towards monitor (%)	4	30	21	-
Annual average TSP concentration (µg/m^3)	60	76	79	90
Estimated MOC contribution to annual average TSP (µg/m^3)	3	23	17	-

The calculations from Table 9 show that the MGO was estimated to have contributed up to 3 µg/m^3 to the measured 60 µg/m^3 at TSP 1, up to 23 µg/m^3 to the measured 76 µg/m^3 at TSP 2, and up to 17 µg/m^3 to the measured 79 µg/m^3 at TSP 3. The higher potential contribution at TSP 2 would be expected since this monitor was located downwind of the MGO for a higher proportion of the year. There are no specific criteria for which to assess a calculated site contribution.

4. Conclusion

Based on the analysis and it has been concluded that Mt Owen was in compliance with its Glendell (DA 80/952) and Mount Owen (SSD-5850) development consents in terms of total PM_{10} and TSP impacts at all reportable monitoring sites for data collected in 2019.

5. References

EPA (2016) "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW". Environment Protection Authority.

US EPA (2000) "Meteorological Monitoring Guidance for Regulatory Modeling Applications". United States Environmental Protection Agency. Office of Air Quality, Planning and Standards, Research Triangle Park NC 27711. EPA-454/R-99-005, February 2000.

Appendix G: Water

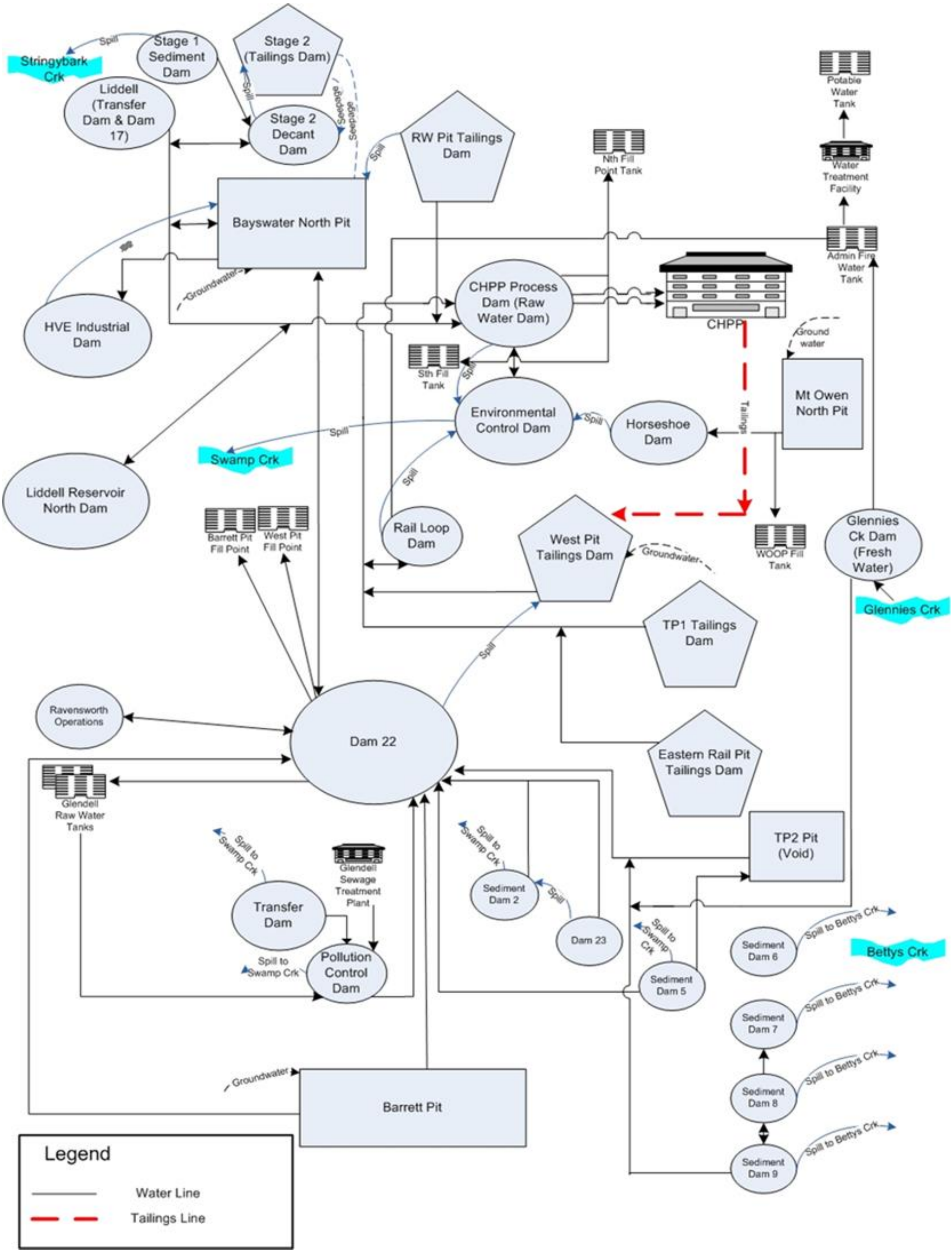

Figure 5: MGO Water Schematic

Surface Water

Table 35: Surface Monitoring Results Bowmans Creek

Sampling Date	BMC1 – Bowman's Creek Upstream				BMC2 – Bowman's Creek Midstream			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
18/01/2019	7.70	1,559	3	894	7.80	1,691	44	950
21/02/2019	8.10	1,636	2	1,190	8.30	1,652	82	1,050
26/03/2019	8.00	1,790	23	1,110	8.80	1,536	42	976
30/04/2019	7.60	2,170	11	1,400	7.20	1,728	27	1,150
20/05/2019	7.70	2,190	22	1,500	7.40	2,060	58	1,490
24/06/2019	7.10	1,699	1	1,280	7.20	1,982	36	1,460
23/07/2019	7.90	1,645	2	1,200	7.60	1,951	68	1,410
26/08/2019	8.00	1,743	3	1,510	8.00	2,320	60	1,480
23/09/2019	7.90	1,766	3	1,170	7.90	1,741	103	1,230
15/10/2019	7.90	1,901	1	1,200	7.50	2,820	642	1,780
19/11/2019	7.90	2,690	2	1,720				
20/12/2019	8.00	3,880	8	2,590				

Sampling Date	BMC3 – Bowman's Creek Downstream				BMC4 – Bowman's Creek (Hebden Road)			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
18/01/2019	8.40	2,410	134	1,380	7.80	1,316	5	773
21/02/2019	Dry				7.30	1,292	10	1,050
26/03/2019					7.40	1,391	14	919
30/04/2019					7.70	1,449	9	972
20/05/2019					7.20	1,382	16	922
24/06/2019	7.40	2,600	4	1,870	7.00	1,290	10	839
23/07/2019	Dry				7.20	1,318	18	845
26/08/2019					7.40	1,327	30	845
23/09/2019					7.70	1,386	20	900
15/10/2019					7.90	1,354	36	776
19/11/2019					7.50	1,429	41	886
20/12/2019					7.50	1,850	201	1,170

Sampling Date	BMC5 – Bowman's Creek NEH Bridge			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
7/01/2019	8.00	5,620	28	3,650
12/02/2019	Dry			
6/03/2019				
9/04/2019	7.60	3,930	5	2,380
6/05/2019	7.90	4,020	20	2,490
4/06/2019	8.00	4,090	18	2,800
9/07/2019	8.30	4,070	17	2,680
7/08/2019	Dry			
11/09/2019				
10/10/2019				
13/11/2019				
10/12/2019				

Table 36: Surface Water Monitoring Results Yorks Creek

Sampling Date	YC1 – Yorks Creek Upstream				YC2 – Yorks Creek Midstream			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
18/01/2019	Dry				Dry			
21/02/2019								
26/03/2019								
30/04/2019								
20/05/2019								
24/06/2019								
23/07/2019								
26/08/2019								
23/09/2019								
15/10/2019								
19/11/2019								
20/12/2019								

Sampling Date	YC3 – Yorks Creek Downstream			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
18/01/2019	Dry			
21/02/2019				
26/03/2019				
30/04/2019				
20/05/2019				
24/06/2019				
23/07/2019				
26/08/2019				
23/09/2019				
15/10/2019				
19/11/2019				
20/12/2019				

Table 37: Surface Water Monitoring Swamp Creek

Sampling Date	SC1 – Swamp Creek Upstream (Dam 5)				SC2 – Swamp Creek Midstream (Dam 1)			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
18/01/2019	8.90	503	6	254	8.30	675	57	389
21/02/2019	9.10	524	6	344	8.30	938	31	591
26/03/2019	9.10	524	5	350	8.50	930	33	561
30/04/2019	8.10	524	47	362	7.40	409	19	321
20/05/2019	7.30	421	39	331	8.10	522	3	329
24/06/2019	7.30	533	7	378	7.10	436	17	291
23/07/2019	8.70	536	1	338	7.80	445	16	275
26/08/2019	8.80	552	2	340	8.10	496	15	316
23/09/2019	9.20	539	3	355	7.30	462	39	340
15/10/2019	9.10	548	9	339	8.50	483	15	288
19/11/2019	9.40	572	2	345	9.50	596	17	417
20/12/2019	9.30	590	8	366	7.60	823	29	543

Sampling Date	SC3 – Swamp Creek Downstream				SC4 – Prior to Ashton			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
18/01/2019	Dry				Dry			
21/02/2019								
26/03/2019								
30/04/2019								
20/05/2019								
24/06/2019								
23/07/2019								
26/08/2019								
23/09/2019								
15/10/2019								
19/11/2019								
20/12/2019								

Table 38: Surface Water Monitoring Betty's Creek

Sampling Date	BC1 – Bettys Creek Upstream				BC2 – Bettys Creek Downstream			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
18/01/2019	Dry				Dry			
21/02/2019	Dry				Dry			
26/03/2019	Dry				Dry			
30/04/2019	Dry				Dry			
20/05/2019	Dry				Dry			
24/06/2019	Dry				Dry			
23/07/2019	Dry				Dry			
26/08/2019	Dry				Dry			
23/09/2019	Dry				Dry			
15/10/2019	Dry				Dry			
19/11/2019	Dry				Dry			
20/12/2019	Dry				Dry			

Sampling Date	BC3 – Bettys Creek Prior to Ashton				BC4 – Bettys Creek 4			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
18/01/2019	Dry				Dry			
21/02/2019	Dry				Dry			
26/03/2019	Dry				6.60	288	66	254
30/04/2019	Dry				6.80	354	35	320
20/05/2019	Dry				7.10	390	9	338
24/06/2019	Dry				6.90	408	23	356
23/07/2019	Dry				7.10	423	10	358
26/08/2019	Dry				7.30	465	9	399
23/09/2019	Dry				7.00	493	17	465
15/10/2019	Dry				Dry			
19/11/2019	Dry				Dry			
20/12/2019	Dry				6.70	276	54	291

Table 39: Surface Water Monitoring Main Creek

Sampling Date	MC1 – Main Creek Upstream				MC2 – Main Creek Downstream			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
18/01/2019	Dry				Dry			
21/02/2019								
26/03/2019								
30/04/2019								
20/05/2019								
24/06/2019								
23/07/2019								
26/08/2019								
23/09/2019	6.80	207	39	228				
15/10/2019	Dry							
19/11/2019								
20/12/2019								

Sampling Date	MC3 – Main Creek Upstream			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
18/01/2019	Dry			
21/02/2019				
26/03/2019				
30/04/2019				
20/05/2019				
24/06/2019				
23/07/2019				
26/08/2019				
23/09/2019				
15/10/2019				
19/11/2019				
20/12/2019				

Table 40: Historical Surface Water Data Comparison – pH

Site Name	Trigger Level		Annual Average						
	Lower	Upper	2013	2014	2015	2016	2017	2018	2019
Bowmans Creek									
BMC1	6.5	8.0	8	7.9	7.8	8.01	7.88	7.69	7.82
BMC2	6.5	8.0	8.1	8	7.9	7.99	7.96	7.78	7.77
BMC3	6.5	8.0	8	7.9	8	8.05	8.05	7.87	7.90
BMC4	6.5	8.0	7.9	7.7	7.7	7.87	7.63	7.40	7.47
BMC 5	6.5	8.0	N/A	N/A	7.9	7.76	7.78	8.11	7.96
Yorks Creek									
YC1	6.5	8.6	7.6	7.5	7.5	7.6	7.25	6.7	N/A
YC2	6.5	8.6	7.5	7.5	7.6	7.77	7.28	N/A	N/A
YC3	6.5	8.6	7.7	7.3	7.5	7.79	7.4	N/A	N/A
Swamp Creek									
SC1	6.5	8.6	N/A	8.1	8	8.16	8.18	9.13	8.69
SC2	6.5	8.6	N/A	7.5	7.7	7.88	7.42	7.64	8.04
SC3	6.5	8.6	8.1	8.1	8.1	8.03	7.3	N/A	N/A
SC4	6.5	8.6	7.3	N/A	7.2	7.27	6.75	N/A	N/A
Bettys Creek									
BC1	7.7	6.9	7.5	7.69	7.5	7.7	6.9	N/A	N/A
BC2	7.5	8.2	7.4	7.7	7.4	7.5	8.2	N/A	N/A
BC3	8	8.1	7.4	7.3	6.97	8	8.1	N/A	N/A
BC4	7.9	7.6	7.4	7.55	7.27	7.9	7.6	6.65	6.97
Main Creek									
MC1	N/A	N/A	7.4	7.49	7.24	N/A	N/A	7.10	6.8
MC2	N/A	N/A	7.5	7.49	7.55	N/A	N/A	7.00	N/A
MC3	N/A	N/A	N/A	N/A	7.46	N/A	N/A	N/A	N/A

Table 41: Historical Surface Water Data Comparison – Electrical Conductivity (µS/cm)

Site Name	Trigger Level	Annual Average						
		2013	2014	2015	2016	2017	2018	2019
Bowmans Creek								
BMC1	2,200	1,018	1,201	1,026	940	767	1,447	2,056
BMC2	2,200	1,204	1,353	1,114	964	860	1,293	1,948
BMC3	2,200	1,449	1,942	1,337	1,344	1,354	1,656	2,505
BMC4	2,200	1,044	1,356	1,065	1,124	1,115	1,274	1,399
BMC 5	2,200	N/A	N/A	1,415	1,179	1,461	3,888	4,306
Yorks Creek								
YC1	6,668	3,476	4,344	3,012	3,818	3,422	4,990	N/A
YC2	6,668	2,266	13,074	7,194	5,241	9,002	N/A	N/A
YC3	6,668	5,009	4,532	4,971	2,903	6,739	N/A	N/A
Swamp Creek								
SC1	6,668	N/A	396	392	351	393	524	531
SC2	6,668	N/A	241	265	315	227	469	601
SC3	6,668	4,997	6,608	4,184	5,075	7,180	N/A	N/A
SC4	6,668	688	N/A	898	720	281	N/A	N/A
Bettys Creek								
BC1	6,668	1,193	21	926	1,096	776	N/A	N/A
BC2	6,668	189	6,093	529	696	188	N/A	N/A
BC3	6,668	4,209	4,447	763	529	288	N/A	N/A
BC4	6,668	2,473	2,755	559	1,227	427	300	403
Main Creek								
MC1	6,668	N/A	N/A	1,253	1,207	872	1,321	207
MC2	6,668	N/A	N/A	1,634	1,311	1,968	1,720	N/A
MC3	6,668	N/A	N/A	N/A	N/A	1,103	N/A	N/A

Table 42: Historical Surface Water Data Comparison – TSS (mg/L)

Site Name	Trigger Level	Annual Average						
		2013	2014	2015	2016	2017	2018	2019
Bowmans Creek								
BMC1	21	12.3	6.3	10.3	9	26	5	7
BMC2	21	11.4	14.4	47.5	14.1	12	19	116
BMC3	21	28.2	23.9	13.4	17.3	13	33	69
BMC4	21	11.5	8.3	13.5	15.2	6	10	34
BMC 5	21	N/A	N/A	9.4	9.9	14	20	18
Yorks Creek								
YC1	68	22	7	48.6	32.7	12	14	N/A
YC2	68	21	11.3	58.5	17.4	9	N/A	N/A
YC3	68	54	12.5	38	35.3	33	N/A	N/A
Swamp Creek								
SC1	68	N/A	15	9.3	8.2	8	7.3	11
SC2	68	N/A	13.2	13.5	8	19	25.6	24
SC3	68	15.2	29	46.9	53.6	7	N/A	N/A
SC4	68	35.7	N/A	27.3	31	37	N/A	N/A
Bettys Creek								
BC1	68	7.3	21	9.5	64.5	6	N/A	N/A
BC2	68	9	2.6	41.1	11.5	7	N/A	N/A
BC3	68	13	51.7	106	37.7	14	N/A	N/A
BC4	68	168	61.7	38	21.6	46	56	24
Main Creek								
MC1	68	N/A	N/A	144.8	187.5	252	100	39
MC2	68	N/A	N/A	239.6	56.9	153	56	N/A
MC3	68	N/A	N/A	N/A	N/A	6.8	N/A	N/A

Table 43: Historical Surface Water Data Comparison – TDS (mg/L)

Site Name	Trigger Level	Annual Average						
		2013	2014	2015	2016	2017	2018	2019
Bowmans Creek								
BMC1	890	567	690.3	586.6	529.5	615	964	1,397
BMC2	890	682	782.5	649.3	557.7	636	827	1,298
BMC3	890	829	1,136	766.8	779.3	710	1,052	1,625
BMC4	890	591	746	575.7	651.4	687	781	908
BMC 5	890	N/A	N/A	902.9	714.6	721	2,463	2,800
Yorks Creek								
YC1	4,384	2,077	2,641	1822	2,278.2	2,013	3,240	N/A
YC2	4,384	1,233	8,500	4,797.3	3,375.4	6,476	N/A	N/A
YC3	4,384	3,035	2,814	3,051.3	1914	4,210	N/A	N/A
Swamp Creek								
SC1	4,384	N/A	297.9	236.8	218.4	295	344.2	342
SC2	4,384	N/A	253.9	179	211.1	199	331	388
SC3	4,384	3,378.9	3,954	2,204.3.	3,072.9	4,890	N/A	N/A
SC4	4,384	524	N/A	618.2	501.33	295	N/A	N/A
Bettys Creek								
BC1	4,384	685.8	568	513	644.8	515	N/A	N/A
BC2	4,384	194	3,932	338.6	473.3	187	N/A	N/A
BC3	4,384	2,861	2,726	530.4	277.7	293	N/A	N/A
BC4	4,384	1,543	1,743	342.3	797.7	322	265	338
Main Creek								
MC1	4,384	N/A	N/A	837.9	918.6	739	812	228
MC2	4,384	N/A	N/A	986.8	875.1	1,258	1,080	N/A
MC3	4,384	N/A	N/A	N/A	N/A	678	N/A	N/A

Ground Water

Table 44: MGO Ground Water Monitoring Results

Samplin g Date	BC-SP02			BC-SP03			BC-SP04			BC-SP05		
	Depth to Water (m)	pH	EC (µS/c m)	Depth to Water (m)	pH	EC (µS/cm)	Dept h to Wat er (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/c m)
Jan-19	7.70	6.8	5,000	7.71	7.3	8,100	7.59	7.2	8,930	7.63	7.21	9,720
Mar-19	7.80	6.8	6,060	7.83	7.2	11,440	7.68	7.1	9,950	7.72	7.16	9,900
Jun-19	7.84	6.9	6,030				7.73	7.1	11,9200	7.77	7.20	12,43 0
Sep-19	7.94	6.8	6,640	7.94			7.81	7.1	11,780	7.85	7.03	12,24 0

Sampling Date	BC-SP06			BC-SP07			BC-SP08			BC-SP09		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Jan-19	8.39	7.20	7,950				7.29	7.12	11,270	7.47	7.26	8,850
Mar-19	8.37	7.14	10,800				7.48	7.06	14,340	7.69		
Jun-19	8.44	7.18	10,440				7.61	7.10	14,120	7.79	7.23	11,360
Sep-19	8.51	7.11	9,970	10.09	7.02	11,030	7.78	7.05	14,370	7.87	7.26	11,070

Sampling Date	BC-SP10			BC-SP11			BC-SP12			BC-SP14		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Mar-19	5.97	7.55	7,540.00	5.45	6.36	6,560	5.81	6.74	5,250.00	5.26	7.31	8,670.00
Jun-19	6.02	7.40	8,220.00	5.39	6.53	8,230	5.92	6.84	5,590.00	5.34	7.36	6,210.00
Sep-19	6.23			5.64	6.58	6,210	6.21			5.44		
Dec-19	6.23			5.87	6.50	8,920						

Sampling Date	BC-SP15			BC-SP16			BC-SP17			BC-SP18		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Mar-19	Dry			Dry			Dry			Dry		
Jun-19												
Sep-19												
Dec-19												

Sampling Date	BC-SP20			BC-SP21			BC-SP22			GA1		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Mar-19	4.82	6.73	831	5.98	7.43	1,213	5.78	7.33	22,430	Dry		
Jun-19					6.47	7.65	1,760	5.71	7.64			
Sep-19	4.35			6.61	7.53	2,453	5.89	7.55	8,590			
Dec-19				6.75	7.52	5,530	5.94	7.43	15,380			

Sampling Date	GA2			GNPS-02			GNPS-06			NPZ101		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Jan-19	N/A	N/A	N/A	6.01	6.76	1,223	7.15	6.28	3,010	5.37	7.35	11,220
Mar-19	7.38	6.78	3,860	6.07	6.52	1,035	7.33	6.53	3,890	5.49	7.10	16,060
Jun-19	7.45	6.92	2,481	6.00	6.55	1,325	7.37	6.37	4,420	5.58	7.05	13,660
Sep-19	7.54	6.79	3,410	6.16	6.38	1,105	7.59	6.35	4,770	5.72	7.10	15,720
Dec-19	7.70	6.77	3,550	6.23	6.45	1,176	7.88	6.60	5,390	5.87	7.06	12,740

Sampling Date	NPZ102			NPZ103			NPZ104			NPZ106		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Jan-19	2.43	7.20	5,310	4.50	7.35	6,200						
Mar-19	2.70	7.08	7,740							7.50		
Jun-19	2.80	6.97	6,730	6.09	7.30	7,640			7.59			14,210
Sep-19	2.92	7.14	7,450	6.07	7.48	8,810			7.39			
Dec-19	3.22	7.07	6,000						7.45			

Sampling Date	NPZ1-Large			NPZ1-Small			NPZ3-Large			NPZ3-Small		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Jan-19	15.93	7.20	12,320	42.05	7.15	8,790	13.56	7.57	7,290	9.20	6.64	20,870
Mar-19	15.57	7.16	17,110	41.75	7.05	11,520	14.39	7.31	10,660	9.85	6.58	18,340
Jun-19	15.66	7.07	14,830	42.27	6.88	9,960	13.04	7.32	9,190	9.55	6.79	15,480
Sep-19	15.60	7.07	18,590	41.62	7.59	11,660	14.23	7.58	10,300	10.17	7.04	17,000
Dec-19	16.22	7.01	15,330	44.19	8.31	10,410	15.12	7.59	10,490	10.73	6.80	16,520

Sampling Date	NPZ4- Large			NPZ4- Small			NPZ6-Large			NPZ6-Small		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Jan-19	6.81	6.99	26,100	6.84	7.08	23,910						
Mar-19	6.02	7.00	27,810	6.48	7.07	24,940						
Jun-19	6.35	6.88	23,220	6.60	6.92	20,990						
Sep-19	6.60	7.26	27,630	6.67	7.24	24,900						
Dec-19	6.94	7.09	21,970	6.89	7.12	19,830						

Sampling Date	NPZ7 – Large			NPZ7 - Small			NPZ8 – Large			NPZ8 – Small		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Jan-19	14.95	7.57	6,870	35.84	7.36	7,170	10.02	7.82	13,950	35.40	7.41	2,640
Mar-19	15.27	7.42	9,980	35.33	7.42	8,610	10.20	7.63	20,730	35.50	7.37	3,180
Jun-19	15.49	7.39	8,740	36.76	7.38	7,330	10.11	7.51	17,620	35.94	7.26	2,701
Sep-19	15.69	7.46	9,550	37.08	7.46	7,960	10.08	7.66	19,840	35.91	7.43	2,757
Dec-19	16.33	7.37	7,900	38.13	7.42	6,800	10.38	7.70	15,950	36.06	7.44	2,448

Sampling Date	NPZ9- Large			NPZ9- Small			NPZ10-Large			NPZ10-Small		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Jan-19	4.29	7.11	7,230				26.65	7.72	4,140			
Mar-19	4.47	6.81	10,010				25.88	7.57	6,770			
Jun-19	4.60	6.73	9,940		Blocked		26.42	7.41	7,260	37.31	6.97	14,930
Sep-19	4.74	6.91	7,390				26.46	7.17	6,280	37.61	7.09	11,170
Dec-19	4.90	6.89	7,880				27.03	7.06	6,500	37.64	7.02	11,100

Sampling Date	NPZ11- Large			NPZ11- Small			NPZ12-Large			NPZ12-Small		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (ml)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Jan-19	24.07	7.23	9,830	57.02								
Mar-19	24.97	7.20	11,420									
Jun-19	24.76	7.42	11,690	57.20	8.51							
Sep-19	25.95	7.23	12,130	59.50	8.33							
Dec-19	26.21	7.13	11,240	59.91	8.25							

Sampling Date	NPZ13- Large			NPZ13- Small			NPZ16- Large			NPZ16- Small		
	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)	Depth to Water (m)	pH	EC (µS/cm)
Mar-19	17.41	7.16	12,270	51.96	7.31	13,280	11.48	7.28	14,230			
Jun-19	17.82	7.11	11,770	51.99	7.13	13,270	10.91	7.28	13,980			
Sep-19	18.53	7.11	11,860	52.50	7.18	13,100	12.47	7.27	13,940			
Dec-19	19.11	7.08	12,310	52.96	7.20	13,590	13.74	7.32	13,940			

Sampling Date	North		
	Depth to Water (m)	pH	EC (µS/cm)
Jan-19	10.53	7.48	3,770
Mar-19	10.80	7.32	6,080
Jun-19	11.00	7.22	4,470
Sep-19	11.34	7.28	5,220
Dec-19	11.69	7.41	4,710

Table 45: MGO Summary Ground Water Monitoring Results 2019

Piezometer	EC (µS/cm)			pH			Depth to Water (m)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
BC-SP01	ND	ND	ND	ND	ND	ND	ND	ND	ND
BC-SP02	5000	6640	6022.00	6.8	6.9	6.83	7.7	8.05	7.87
BC-SP03	8100	11440	9770.00	7.24	7.31	7.28	7.71	8	7.87
BC-SP04	8930	11920	10766.00	7.04	7.22	7.12	7.59	7.91	7.74
BC-SP05	9720	12430	11162.00	7.03	7.21	7.13	7.63	7.96	7.79
BC-SP06	7950	10800	9704.00	7.07	7.2	7.14	8.37	8.6	8.46
BC-SP07	11030	11030	11030.00	7.02	7.02	7.02	10.09	10.09	10.09
BC-SP08	11270	14370	13414.00	7	7.12	7.07	7.29	7.93	7.62
BC-SP09	8850	11360	10460.00	7.14	7.26	7.22	7.47	7.96	7.76
BC-SP10	7540	8220	7880.00	7.4	7.55	7.48	5.97	6.23	6.11
BC-SP11	6210	8920	7480.00	6.36	6.58	6.49	5.39	5.87	5.59
BC-SP12	5250	5590	5420.00	6.74	6.84	6.79	5.81	6.21	5.98
BC-SP13	ND	ND	ND	ND	ND	ND	ND	ND	ND
BC-SP14	6210	8670	7440.00	7.31	7.36	7.34	5.26	5.44	5.35
BC-SP15	ND	ND	ND	ND	ND	ND	ND	ND	ND
BC-SP16	ND	ND	ND	ND	ND	ND	ND	ND	ND
BC-SP17	ND	ND	ND	ND	ND	ND	ND	ND	ND
BC-SP18	ND	ND	ND	ND	ND	ND	ND	ND	ND
BC-SP19	ND	ND	ND	ND	ND	ND	ND	ND	ND
BC-SP20	831	831	831.00	6.73	6.73	6.73	4.35	4.82	4.59
BC-SP21	1213	5530	2739.00	7.43	7.65	7.53	5.98	6.75	6.45
BC-SP22	5590	22430	12997.50	7.33	7.64	7.49	5.71	5.94	5.83
BNO002	11170	18500	16170.00	6.72	6.92	6.82	15.04	15.66	15.30
BNO003	9490	14140	12181.00	6.82	7.22	6.98	15.12	16.96	15.94
BNO004	723	2539	1989.44	6.81	7.06	6.92	43.7	46.17	44.77
BNO006	ND	ND	ND	ND	ND	ND	ND	ND	ND
BNO007	ND	ND	ND	ND	ND	ND	ND	ND	ND
BNO008	ND	ND	ND	ND	ND	ND	ND	ND	ND
BNO009	10270	14730	12803.33	6.6	6.99	6.76	100.69	107.39	104.12
BNO011	ND	ND	ND	ND	ND	ND	106.59	112.6	109.85
GA1	ND	ND	ND	ND	ND	ND	ND	ND	ND
GA2	2481	3860	3325.25	6.77	6.92	6.82	7.38	7.7	7.52
GNP10D	990	1084	1042.00	7.31	7.66	7.52	5.62	6.08	5.82
GNP10S	1783	2062	1931.20	7.09	7.39	7.17	5.56	6.56	5.97

Piezometer	EC (µS/cm)			pH			Depth to Water (m)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
GNP11D	1164	1619	1406.25	6.93	7.67	7.30	5.83	6	5.90
GNP11S	ND	ND	ND	ND	ND	ND	5.75	5.98	5.83
GNP9D	1190	1539	1367.00	6.92	7	6.97	9.48	10.3	9.99
GNP9S	ND	ND	ND	ND	ND	ND	ND	ND	ND
GNPS-01	ND	ND	ND	ND	ND	ND	ND	ND	ND
GNPS-02	1035	1325	1172.80	6.38	6.76	6.53	6	6.23	6.09
GNPS-03	ND	ND	ND	ND	ND	ND	ND	ND	ND
GNPS-05	ND	ND	ND	ND	ND	ND	ND	ND	ND
GNPS-06	3010	5390	4296.00	6.28	6.6	6.43	7.15	7.88	7.46
GNPS-07	ND	ND	ND	ND	ND	ND	ND	ND	ND
North	3770	6080	4850.00	7.22	7.48	7.34	10.53	11.69	11.07
NPZ1	12320	18590	15636.00	7.01	7.2	7.10	15.57	16.22	15.80
NPZ10	4140	7260	6190.00	7.06	7.72	7.39	25.88	27.03	26.49
NPZ101	11220	16060	13880.00	7.05	7.35	7.13	5.37	5.87	5.61
NPZ102	5310	7740	6646.00	6.97	7.2	7.09	2.43	3.22	2.81
NPZ103	6200	8810	7550.00	7.3	7.48	7.38	4.5	6.09	5.55
NPZ104	ND	ND	ND	ND	ND	ND	ND	ND	ND
NPZ105	ND	ND	ND	ND	ND	ND	ND	ND	ND
NPZ106	ND	ND	ND	ND	ND	ND	7.39	7.59	7.48
NPZ107D	8070	10310	9178.00	11.85	13.4	12.31	18.66	19.73	19.04
NPZ107S	12620	16410	14368.00	6.79	7.89	7.06	6.92	7.67	7.28
NPZ108D	7860	9290	8710.00	11.09	11.35	11.24	7.76	8.14	7.91
NPZ108S	13480	16880	15442.50	7.04	7.16	7.10	7.51	7.8	7.64
NPZ109D	ND	ND	ND	ND	ND	ND	56.36	59.51	58.47
NPZ109S	ND	ND	ND	ND	ND	ND	5.96	5.96	5.96
NPZ10a	11100	14930	12400.00	6.97	7.09	7.03	37.31	37.64	37.52
NPZ11	9830	12130	11262.00	7.13	7.42	7.24	24.07	26.21	25.19
NPZ11a	10090	10860	10480.00	8.25	8.51	8.36	57.02	59.91	58.41
NPZ12	ND	ND	ND	ND	ND	ND	ND	ND	ND
NPZ12a	ND	ND	ND	ND	ND	ND	ND	ND	ND
NPZ13	11770	12310	12052.50	7.08	7.16	7.12	17.41	19.11	18.22
NPZ13a	13100	13590	13310.00	7.13	7.31	7.21	51.96	52.96	52.35
NPZ15	ND	ND	ND	ND	ND	ND	ND	ND	ND
NPZ15a	6420	13240	8780.00	6.99	7.27	7.12	126.78	127.01	126.90
NPZ16	13940	14230	14022.50	7.27	7.32	7.29	10.91	13.74	12.15
NPZ16a	ND	ND	ND	ND	ND	ND	ND	ND	ND

Piezometer	EC (µS/cm)			pH			Depth to Water (m)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
NPZ1a	8790	11660	10468.00	6.88	8.31	7.40	41.62	44.19	42.38
NPZ3	7290	10660	9586.00	7.31	7.59	7.47	13.04	15.12	14.07
NPZ3a	15480	20870	17642.00	6.58	7.04	6.77	9.2	10.73	9.90
NPZ4	21970	27810	25346.00	6.88	7.26	7.04	6.02	6.94	6.54
NPZ4a	19830	24940	22914.00	6.92	7.24	7.09	6.48	6.89	6.70
NPZ6	ND	ND	ND	ND	ND	ND	ND	ND	ND
NPZ6a	ND	ND	ND	ND	ND	ND	ND	ND	ND
NPZ7	6870	9980	8608.00	7.37	7.57	7.44	14.95	16.33	15.55
NPZ7a	6800	8610	7574.00	7.36	7.46	7.41	35.33	38.13	36.63
NPZ8	13950	20730	17618.00	7.51	7.82	7.66	10.02	10.38	10.16
NPZ8a	2448	3180	2745.20	7.26	7.44	7.38	35.4	36.06	35.76
NPZ9	7230	10010	8490.00	6.73	7.11	6.89	4.29	4.9	4.60
NPZ9a	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV10A	6230	6990	6510.00	6.84	6.89	6.86	16.5	16.95	16.72
NV10B	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV10C	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV11A	11090	11600	11415.00	6.56	6.68	6.63	23.01	23.37	23.16
NV11B	10950	15530	13227.00	6.79	6.98	6.89	23	23.35	23.14
NV11C	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV12A	7440	9960	8388.00	6.78	6.92	6.86	19.56	19.99	19.79
NV12B	8350	11030	9311.00	7	7.14	7.07	21.01	21.41	21.18
NV12C	ND	ND	ND	ND	ND	ND	1.38	1.38	1.38
NV13A	5270	11850	8975.00	6.81	6.92	6.88	19.56	19.96	19.762
NV13B	9510	13160	11004.00	6.8	6.99	6.94	20.94	21.35	21.104
NV13C	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV14A	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV14B	11090	15920	12670.00	6.69	7	6.85	21.37	21.75	21.521
NV14C	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV15A	4010	5810	4660.00	6.65	6.93	6.75	26.45	26.83	26.585
NV15B	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV16A	7440	9230	8086.67	6.88	6.89	6.88	21.17	21.58	21.38
NV16B	6990	9960	8476.00	6.87	7.09	6.98	21.25	21.66	21.463
NV16C	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV17A	6060	7970	6799.00	6.73	6.91	6.83	22.07	22.4	22.246
NV17B	7260	9580	8088.00	6.8	7.01	6.87	22.09	22.42	22.264
NV17C	ND	ND	ND	ND	ND	ND	ND	ND	ND

Piezometer	EC (µS/cm)			pH			Depth to Water (m)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
NV18A	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV18B	5570	8920	6873.00	6.68	6.98	6.88	26.73	27.63	26.981
NV19A	ND	ND	ND	ND	ND	ND	ND	ND	ND
NV19B	6510	8910	7468.00	6.53	6.75	6.65	27.03	28.46	27.893
RW1	7390	12450	9723.00	6.49	6.61	6.56	7.23	8.11	7.662
RW2	7970	10710	9118.00	6.39	6.56	6.46	7.56	8.41	7.986
RW3	1518	1518	1518.00	5.61	5.61	5.61	7.55	8.5	8.17
RW4	5870	7520	6694.00	5.56	5.9	5.76	8.82	10.09	9.462
RW5	4530	8520	6523.00	6.39	6.85	6.60	10.17	11.06	10.57
TPZ 01	6810	10450	9147.00	7.36	8	7.68	2.08	2.47	2.241
TPZ 02	8080	11740	10386.00	7.17	7.66	7.42	2.48	2.9	2.625
TPZ 03	5470	8650	7510.00	7.2	7.98	7.52	2.18	2.68	2.366
TPZ 04	7990	11820	10622.00	6.51	7.48	6.76	10.23	10.39	10.336
TPZ 05	5940	8780	7876.00	6.75	7.41	6.92	9.11	9.32	9.216
TPZ 06	10120	19560	16439.00	6.08	6.52	6.26	5.19	5.72	5.491
TPZ 07	12090	17630	15688.00	5.87	6.33	6.11	6.18	6.76	6.496
TPZ 08	11370	16340	14491.00	6.24	6.62	6.33	6.7	7.12	6.912
TPZ 09	11390	16140	14377.00	6.34	6.74	6.54	6.87	7.24	7.07
TPZ 10	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPZ 11	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix H: Community

Table 46: MGO Summary of Community Complaints (Glendell)

Date	Time	Site	Nature of Complaint	Company Response
January				
23/1/19	10:41am	Glendell	Noise and Dust	A complaint was received by the Department of Planning and Environment via email by a Camberwell community member regarding operational noise and dust between 12:00AM and 5:30AM on 23 Jan 2019. Mt Owen Complex Environment & Community personnel provided the requested information to DP&E. For the complaint period, no noise or dust related alarms were received from Sx12 or Sx13D4. The complainant did not wish to be contacted.
February				
18/2/19	7:39am	Glendell	Dust	A complaint was received via the Mt Owen Complex Complaints Hotline by a Camberwell community member regarding dust. The complainant stated that 'there was a lot of dust that you could taste in your mouth'. Mt Owen Complex Environment & Community personnel investigated the complaint to find no dust alarms were received during/prior to the complaint because the levels were below the compliance limits (50ug/m3). The complainant did not wish to be contacted.
19/2/19	7:47am	Glendell	Noise	A complaint was received via the Mt Owen Complex Complaints Hotline by a Camberwell community member regarding operational noise. The complainant described the noise as 'dozer/machinery noise started at 06:30am this morning, and is still going'. Mt Owen Complex Environment & Community personnel investigated the complaint to find no noise alarms were received during/prior to the complaint because the levels were below the compliance limits (40dB) being 38.2dB (LF) at 6:30AM and noise coming from the operation was 35dB in the area of influence. The complainant did not wish to be contacted.
March				
18/3/19	6:36pm	Glendell	Noise	A complaint was received via the Mt Owen Complex Complaints Hotline by a Camberwell community member regarding operational noise. The complainant described the noise as 'all she can hear is mining noise'. The Glendell Mining Supervisor reviewed the Noise Analysis Tool confirming the mining contribution was 5dB under the 40dB with valid meteorological conditions of 2.3m/s with NW winds. No Sx12 alarms located at Camberwell were received during/prior to the complaint. The complainant did not wish to be contacted.

Date	Time	Site	Nature of Complaint	Company Response
22/3/19	9:30pm	Glendell	Noise	A complaint was received via the Mt Owen Complex Complaints Hotline by a Camberwell community member regarding operational noise. The complainant described the noise as 'large amount of noise coming from the mine'. Mt Owen Complex Environment & Community personnel investigated the complaint to find no noise alarms were received during/prior to the complaint. The Glendell Mining Supervisor reviewed the Noise Analysis Tool noting mining contribution was 4dB over the 40dB criteria, however due to unlicensed conditions (high wind (3.8m/s)), no alarms were triggered. Even though unlicensed conditions were experienced, Mining Supervisor inspected the southern portion of the mine, replaced tracked with rubber dozer, instructed dozers to use first gear and changed dumping to the lowest RL available. Mining supervisor reviewed the Noise Analysis Tool noting mining contribution was 4dB over the 40dB criteria however due to unlicensed condition, high wind (3.8m/s), no alarms were trigged. The complainant did not wish to be contacted.
April				
07/04/2019	6.45am	Glendell	Noise	A complaint was received via the Mt Owen Complex Complaints Hotline by a Camberwell community member regarding operational noise. The complainant described the noise as 'it has been quiet but excessive noise has started suddenly noise'. No Noise alarms had been received at the time of the complaint. The Glendell Mining Supervisor reviewed the Noise Analysis Tool confirming the mining contribution was 1dB under the 40dB criteria with non-licensable conditions, high wind (3.3m/s) and still instructed trucks to slow down and dozer to use first gear only. After the complaint a single noise alarm was received because the wind had momentarily dropped below 3m/s. The Mining Supervisor reviewed the NAT, noting the mining contribution was 1dB below the criteria and the wind had picked up again (3.5m/s), so was non-licensable. Even with non-licensable conditions, the Mining Supervisor parked all trucks, excavators and dozers, listened to the live stream and continuing to monitor via the NAT tool. Equipment was gradually brought back online, and the NAT showed the mine contribution was compliant, and the wind had returned to licensable (2.7m/s).The complainant did not wish to be contacted.
28/4/2019	7.13pm	Glendell	Noise	A complaint was received via the Mt Owen Complex Complaints Hotline by a Camberwell community member regarding operational noise. The complainant described the noise as 'a very loud bang and machine noise'. No alarms were received prior to, or after the complaint, and the noise levels were within licences conditions. Mining supervisor reviewed the Noise Analysis Tool (NAT) and noted the there was an F-class temperature inversion in place but the mining contribution was under the 40dB criteria, even with the non-licensable conditions. The mining supervisor continued to monitor conditions and levels continued steady, no alarms received. Environmental officer listened to audio from the Camberwell monitor and identified background noise amplified by the F class inversion. The complainant did not wish to be contacted.
May				

Date	Time	Site	Nature of Complaint	Company Response
7/5/2019	5:30am, 7:00am & 7:51am	Glendell	Noise	Three complaints were received via the Mt Owen Complex Complaints Hotline by a Camberwell Community member regarding operational noise. The complainant generally noted "noise coming from both mines. Complainant said that the noise is coming from both directions and is very loud." In response to the first complaint, the Mining Supervisor reviewed the Noise Analysis Tool and noted that noise levels were non-licensable due to high wind conditions during this period. The Mining Supervisor further inspected operations and continued to monitor conditions. No alarms were received during this period. In response to the second complaint, the Mining Supervisor continue to consult the Noise Analysis Tool and noted that noise levels continued to be non-licensable due to high wind conditions. The Mining Supervisor further instructed operators to limit dozer and vehicle speeds. One alarm was received during this period at approximately 7:40am, the Mining Supervisor inspected the mine area and ensure all previously implemented controls were being implemented. In response to the third complaint, the Environmental Officer reviewed the Noise Analysis Tool and audio from the live stream noting high wind condition and general mine noise. A response was provided to the complainant via email.
20/5/2019		Glendell	Noise & Dust	A complaint was received via the Mt Owen Complex Complaints Hotline by a Camberwell Community member regarding operational noise and dust. The complainant noted “loud machinery noise inside the house and outside all I can taste is dust”. Noise levels were below compliance limits at the time and an F-Class temperature inversion was present prior to and at the time of the complaint. The Mining Supervisor reviewed operations and continued to monitor conditions. The Camberwell dust level at the time of the complaint was approximately 23.4µg/m^3. A response was provided to the complainant via email.
June				
10/6/19	20:50	Glendell	Noise	A complaint was received via the Mt Owen Complex Complaints Hotline and email via the EPA by a Camberwell Community member regarding operational noise. The complainant noted “loud banging noises coming from the mine site”. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly. Mt Owen Complex Environment and Community staff provided details of operations conducted during this period in a response to the EPA.
12/6/19	20:03	Glendell	Noise	A complaint was received via the Mt Owen Complex Community Complaints Hotline by an anonymous community member regarding operational noise. The complainant noted “large bangs, drone noise and very loud, numerous large bangs, machinery noise”. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly.
12/6/19	21:50	Glendell	Noise	A complaint was received via the Mt Owen Complex Community Complaints Hotline by an anonymous community member regarding operational noise. The complainant noted “mine machinery noise and a lot of banging coming from Glendell Mine. Mine are making large volumes of noise from heavy machinery that has not stopped all night. It has been going on for the last 3 hours”. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly. Mt Owen Complex Environment and Community staff provided details of operations conducted during this period in a response to the EPA.

Date	Time	Site	Nature of Complaint	Company Response
12/6/19	11:09	Glendell	Dust	A complaint was received via the EPA from a Camberwell Community member regarding a blast event at Glendell Mine on 7 June 2019. The blast event was undertaken in accordance with the Mount Owen Complex Blast Management Plan. Mount Owen Complex Environment and Community staff provided details of the blast event in a response to the EPA.
29/6/19	12:00 & 6:00	Glendell	Noise	A complaint was received via the Mt Owen Complex Community Complaints Hotline by an anonymous community member regarding operational noise. The complainant noted “noise at both sites”. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly.
July				
No Community Complaints Received				
August				
7/8/19	20:43	Glendell	Noise	A complaint was received via the Mt Owen Complex Community Complaints line by an anonymous community member regarding operational noise. The complainant noted “Loud Banging Noise in the Glendell Mine”. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly.
8/8/19	7:40	Glendell	Noise & Dust	A complaint was received via the Mt Owen Complex Community Complaints line by an anonymous community member regarding operational noise. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly.
13/8/19	21:39	Glendell	Noise	A complaint was received via the Mt Owen Complex Community Complaints line by an anonymous community member regarding operational noise. The complainant noted ’Heavy Machinery’. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly.
22/8/19	4:40	Glendell	Lighting & Dust	A complaint was received via the Mt Owen Complex Community Complaints line by a community member located in Middle Falbrook, NSW regarding operational Lighting and Dust. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly. A response was also provided to the EPA regarding operational dust controls during this period.
24/8/19	20:00	Glendell	Noise	A complaint was received via the Mt Owen Complex Community Complaints line by an anonymous community member regarding operational noise. The complainant noted ‘Industrial Noise’. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly.
24/8/19	7:25	Glendell	Noise & Dust	A complaint was received via the Mt Owen Complex Community Complaints line by a community member located in Camberwell, NSW regarding operational noise and dust. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly. The complainant did not wish to be contacted.
25/8/19	7:22	Glendell	Noise & Dust	A complaint was received via the Mt Owen Complex Community Complaints line by a community member located in Camberwell, NSW regarding operational noise and dust. The mining supervisor reviewed operations at the time of the complaint and amended operations accordingly. The complainant did not wish to be contacted.
September				

October				
7/10/19	8:25	Glendell	Noise	A complaint was received via the Mt Owen Complex Community Complaints line by a Camberwell Community member regarding operational noise. Specifically, the complainant noted 'it is ridiculous that you can't listen to a noise monitor in a village'. The mining supervisor reviewed operations at the time of the complaint, and amended operations accordingly.
November				
No Community Complaints Received				
December				
No Community Complaints Received				

Date	Time	Site	Nature of Complaint	Company Response
2/9/19	7:17	Glendell	Noise	A complaint was received via the Mt Owen Complex Community Complaints line by an anonymous community member regarding operational noise. The complainant noted 'Industrial Noise'. The mining supervisor reviewed operations at the time of the complaint, and amended operations accordingly.
3/9/19	7:20	Glendell	Noise	A complaint was received via the Mt Owen Complex Community Complaints line by a community member located in Camberwell, NSW regarding operational noise. No noise alarms had been received the mining supervisor reviewed operations at the time of the complaint, and amended operations accordingly.

Table 47: MGO Summary of Community Complaints (Mt Owen/Ravensworth East)

Date	Time	Site	Nature of Complaint	Company Response
January				
No Community Complaints Received				
February				
No Community Complaints Received				
March				
No Community Complaints Received				
April				
No Community Complaints Received				
May				
No Community Complaints Received				

June				
No Community Complaints Received				
July				
No Community Complaints Received				
August				
16 Aug 2019	12:08	Mt Owen	Air Quality	The MGO Environment and Community Manager received a complaint via a Department of Planning Industry and Environment (DPIE) Compliance Officer on Friday 16 August 2019 regarding dust emissions at Mt Owen. A response was provided to the DPIE Compliance Officer on 22 September 2019. A subsequent response was provided to DPIE on 6 September 2019.
September				
No Community Complaints Received				
October				
No Community Complaints Received				
November				
No Community Complaints Received				
December				
No Community Complaints Received				