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Noise Compliance Assessment
JR Richards & Sons Composting Facility
704 Armidale Road
Grafton NSW 2460

Prepared for

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25/09/2018

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1 INTRODUCTION

A noise compliance assessment was requested by Ecoteam Environmental Engineering Consultants for the composting facility at 704 Armidale Road Grafton operated by JR Richards & Sons. The request is in response for the composting facility to comply with condition L4.1 in the Environment Protection Licence (EPL 20137 – Variation Notice Number 1547031 – 17th May 2017) issued to the composting facility by the New South Wales Environment Protection Authority.

Noise monitoring limits and conditions in EPL 20137 are copied in Section 3 of this report.

This report assesses the measured noise levels of operations at the facility with the noise limits in Condition L4.1 of the EPL.

To assist with the interpretation of some of the terminology used in this report, Appendix A provides definitions of acoustic terms. Appendix B is a chart of everyday sound pressure levels.

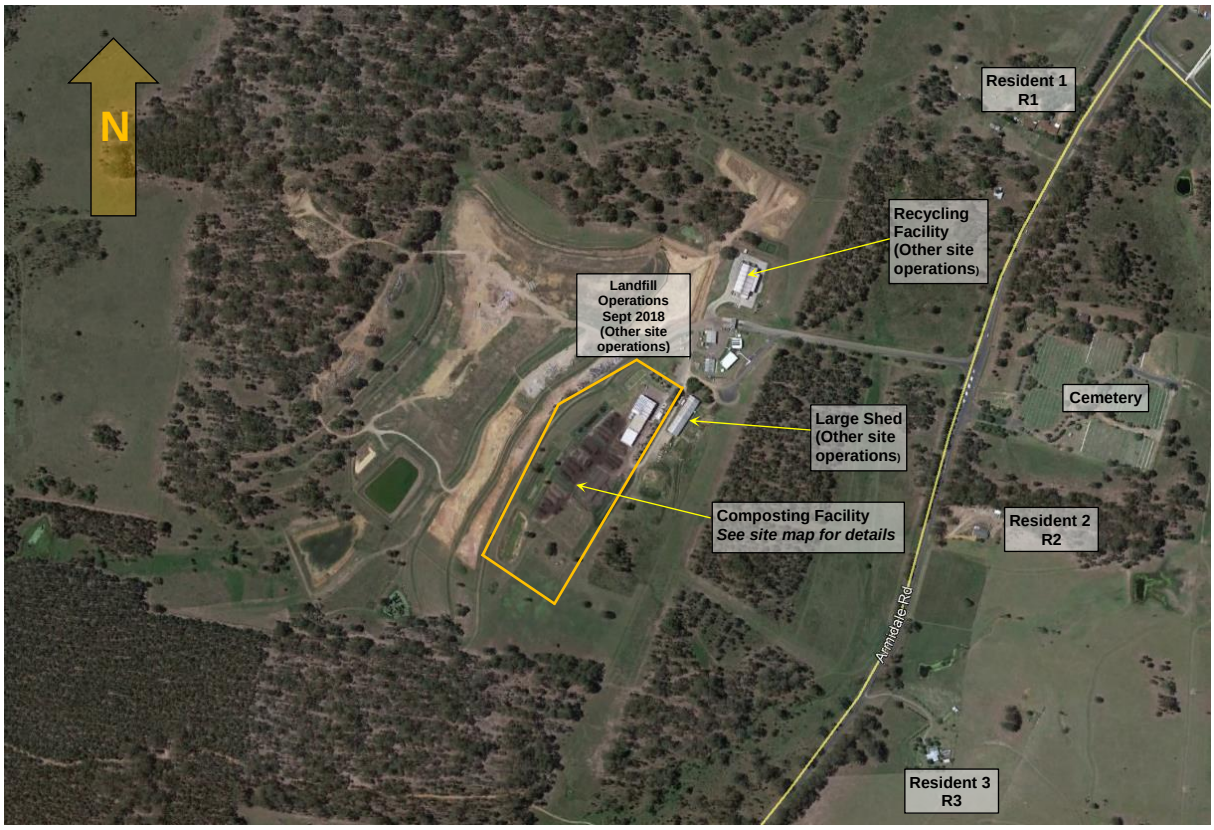
2 DESCRIPTION OF SITE AND OPERATIONS

The composting facility at 704 Armidale Road Grafton is operated by JR Richards & Sons. The composting facility is part of the Grafton Regional Landfill site at 704 Armidale Road. Other operations conducted at the site include a recycling facility, general waste landfill, e-waste, scrap metal and concrete recycling, oil waste storage, household hazardous waste storage and vehicle weighbridge.

The topography is undulating and mainly cleared with natural and planted tree areas surrounding the central area of the site. The surrounding land use is rural with rural residential lots and small farms (mainly cattle). A cemetery is located approximately 550 metres to the east of the composting facility.

There are 3 residential dwellings within 800m of the composting facility and have been identified by the NSW EPA as receiver locations for noise monitoring for the composting facility.

Location Map



Google Earth Image Date 14/12/2017

Table 2.1 Closest Residential Receiver Locations

Receiver	Address	Direction from Composting Facility	Distance from Shredder (m)	Distance from Compost Piles (m)
R1	694 Armidale Rd	NE	750	850
R2	765 Armidale Rd	East	550	550
R3	793 Armidale Rd	SE	700	650

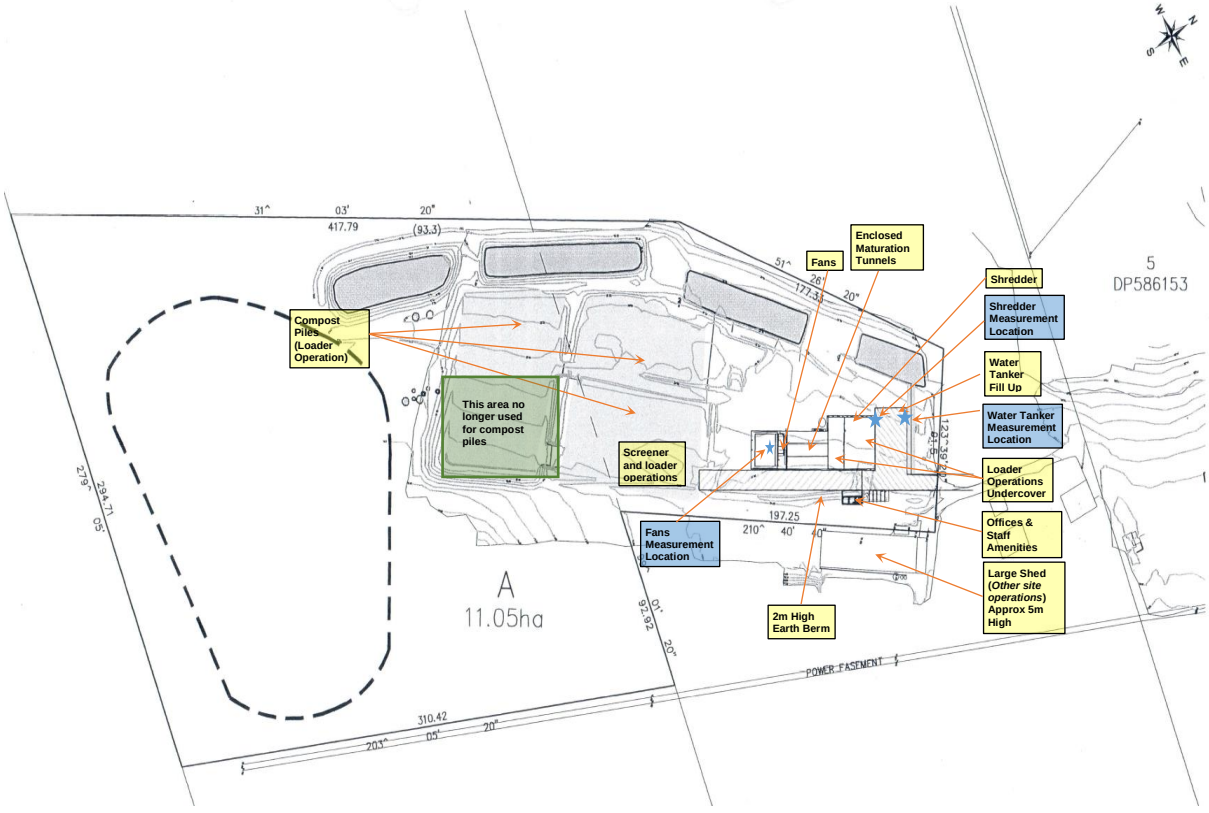
Processes and hours of operation are:

1. Shredding: 1 – 1 ½ hrs/day, generally occurs from 11am – 2:45pm.
2. Turning and movement of compost in maturation pad: 1 – 3 hrs/day 7am - 10 am
3. Loading and unloading tunnels:
    - Loading tunnels - occurs while shredding.
    - Unloading – occurs once the tunnel finishes its process one tunnel per week during summer months and one tunnel per 2 weeks during winter months.
    - Unloading of tunnels done during 7am – 9 am.
4. Screening – occurs during 7am - 9 am, depending on the requirement of the compost
5. Watering the roads for dust control – occurs during 7am - 9am or after 11am.
6. Sorting of green waste – 3 - 4 hrs/day after 11.30 am.
7. During the day, evening and night periods, the compost process and associated fans and blowers operates continuously.

All work involving machinery is conducted between the hours of 7am – 5pm Monday to Friday. Machinery operated at the composting facility includes:

Machine	Make/Model No	Unit No
Shredder	Jenz AZ 460 E	820
Front End Loader	Hyundai HL740-9 XTD	816
Pump Truck	INTERNATIONAL 1850D	763
Screener	Drum type screening machine T4	876

Site Map



3 NOISE CRITERIA

The noise criteria and conditions for noise monitoring and noise compliance for the composting facility are specified in Conditions L4 and M8 of EPL 20137 issued by the NSW EPA. Conditions L4 and M8 are reproduced below. A variation to EPL 20137 was issued by the NSW EPA in the 17th of May 2017 and is copied below.

BACKGROUND

A. J.R. & E.G. RICHARDS PTY LTD Trading as J.R. RICHARDS & SONS ("the licensee") is the holder of Environment Protection Licence No. 20137 ("the licence") issued under the *Protection of the Environment Operations Act 1997* ("the Act"). The licence authorises the carrying out of activities at 704 Armidale Road, GRAFTON, NSW, 2460 ("the premises").

VARIATION OF LICENCE NO. 20137

1. By this notice the EPA varies licence No. 20137. The attached licence document contains all variations that are made to the licence by this notice.
2. In summary the following variations have been made to the licence:
   - At condition L4.1 has been varied to state that noise emitted must be measured in accordance with section 11.1.2 of the NSW Industrial Noise Policy (NSW EPA, January 2000).
   - At condition M8.1, the requirement to complete evening and night noise monitoring has been removed.
   - At condition M8.2, the wording has been altered to include that the EPA may require licensee to conduct noise monitoring in accordance with the NSW Industrial Noise Policy if operations and/or management of the premises fans and biofilter change or noise complaints regarding operations at the premises are received

L4 Noise limits

L4.1 Noise emitted from the premises must not exceed the noise emission criterion in the table below measured or computed in accordance with section 11.1.2 of NSW Industrial Noise Policy (NSW EPA, January 2000).

L4.2 Noise emitted from the premises must not exceed the noise emission criterion in the table below measured or computed at 30m from the nearest residential dwellings from the north-east to south-east of the premises over a period of 15 minutes using "FAST" response on the sound level meter.

Time Period	Noise Emission Criterion	dB(A)
Day	LAeq (15 minute)	40
Evening	LAeq (15 minute)	35
Night	LAeq (15 minute)	35
Night	LA1 (1 minute)	45

L4.3 For the purpose of condition L4.1:
- Day is defined as the period from 7:00am to 6:00pm Monday to Saturday and 8:00am to 6:00pm Sunday and Public Holidays.
- Evening is defined as the period 6:00pm to 10:00pm.
- Night is defined as the period from 10:00pm to 7:00am Monday to Saturday and 10:00pm to 8:00am Sunday and Public Holidays.

L4.4 The noise limits set out in condition L4.1 apply under all meteorological conditions except for the following:
1. Wind speeds greater than 3 metres/second at 10 metres above ground level; or
2. Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
3. Stability category G temperature inversion conditions.

L4.5 For the purposes of condition L4.3:
1. Data recorded by the meteorological station must be used to determine meteorological conditions; and
2. Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.

L4.6 To determine compliance with the noise limits in condition L4.1, the noise equipment must be located at:

1. the most affected point at a location where there is no dwelling at the location; or
2. for LAeq(15 minute) noise limits:
- approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
- within 30 metres of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
- within approximately 50 metres of the boundary of a National Park or a Nature Reserve; and or
3. for LA1(1 minute) noise limits, the noise equipment must be located within 1 metre of a dwelling façade.

L4.7 A non-compliance of condition L4.1 will still occur where noise generated from the premises is in excess of the appropriate limit is measured:
1. at a location other than an area prescribed by conditions L4.5; and/or
2. at a point other than the most affected point at a location.

L4.8 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

M8 Noise monitoring

M8.1 To assess compliance with condition L4.1, noise monitoring must be undertaken in accordance with Conditions L4.5 and:

1. measured or computed at 30m from the nearest dwellings for north-east to south-east of the premises;
2. occur annually in a reporting period;
3. occur during each day as defined in the NSW Industrial Noise Policy for a minimum of 1.5 hours; and
4. occur for three consecutive operating days.

M8.2 Should operations and/or management of the premises fans and biofilter change or noise complaints regarding operations at the premises are received by the EPA or licensee, the EPA may require the licensee to conduct noise monitoring in accordance with the NSW Industrial Noise Policy. All noise complaints received by the licensee must be reported to the EPA immediately.

4 MEASUREMENT PROCEDURES

4.1 Instrumentation

Table 4.1 Instrumentation for Noise Monitoring

Instrument	Serial #	Calibration Date
Brüel and Kjær 2250 Sound Level Meter	2449940	October 2016
Brüel and Kjær 2250 Sound Level Meter	3008548	September 2017
Brüel and Kjær Acoustical Calibrator model 4231	2292735	October 2017

The sound level meters (SLM) used during the noise survey conform to Australian Standard 1259 "Acoustics - Sound Level Meters", (1990) as type 1 precision sound level meter and have an accuracy suitable for both field and laboratory use.

The meters' calibrations were checked before and after the measurement periods with a Brüel and Kjær acoustical calibrator model 4231. No significant system drift occurred over the measurement periods.

The SLMs and calibrator have been checked, adjusted and aligned to conform to the factory specifications and issued with conformance certificates.

4.2 Measurement Method

Measurements were made in general accordance with procedures laid down in:

1. Australian Standard AS 1055.1-1997: '*Acoustics – Description and measurement of environmental noise - General procedures'*

2. The NSW Government Industrial Noise Policy (2000) EPA 00/1 (INP).

Operator attended measurements were conducted at the composting facility and the 3 residential receiver locations for the period from 8am on the 17th to 2:30pm on the 19th of September 2018.

Attended measurements were conducted with the sound level meter mounted on a 1.3m high tripod. The sound level meter was set to record 15 minute periods with 1 second sampling periods with an "A' frequency weighting and Fast response.

The sound level meter was calibrated before and after each measurement period and showed no significant system drift. At the end of the monitoring periods, data was downloaded into Bruel 7 Kjaer 7815 environmental noise software and Microsoft Excel software for analysis.

Markers were used during each noise monitoring period to identify noise sources. The noise sources are identified with coloured bands at the top of each graph. *(see graphs D.1 – D.15 in Appendix D)*.

A portable weather monitor was used to observe weather conditions at the SLM during attended noise monitoring.

Attended noise monitoring was conducted at R1 at a vacant lot on the composting facility side of the residential dwelling. This location was chosen as it was on the composting facility side of the residential dwelling and avoided disturbing dogs at the residential dwelling.

Attended noise monitoring was conducted at receiver location R2 approximately 25m from the dwelling on the composting facility side. This location was slightly south of the dwelling and was chosen as there were fewer trees and was out of sight to dogs that were housed at the property that became agitated when people or vehicles were in sight on the property.

Attended noise monitoring was conducted at receiver location R3 approximately 20m from the dwelling on the composting facility side of the dwelling.

Where more than measurement was conducted for a particular operation or at a receiver location, the measurements are identified by a sequential number, e.g. M1 is measurement 1, M2 is measurement 2 and so forth.

A second logging sound level meter was set up near the screener and shredder during receiver monitoring to compare source noise levels with receiver location measurements. The sound level meter was set to Fast time response and ‘A’ frequency waiting with 1 second samples. The clocks on the 2 loggers were synchronised to enable a direct comparison of events.

5 MEASUREMENT RESULTS

Table 5.1 JR Richards South Grafton - Equipment Noise Measurement Summary										
Measurement	**Start Time**	**Elapsed Time** mm:ss	**LAImax** [dB]	**LAFmax** [dB]	**LAeq** [dB]	**LCeq** [dB]	**LAF10.0** [dB]	**LAF90.0** [dB]	**LCeq-LAeq** [dB]	**LAImax-LAFmax** [dB]
Loader 5m Rear	17/09/18 8:36	3:00:00	82.7	81.4	74.5	91.0	78.1	68.1	**16.5**	1.3
Screener 5m Exhaust End	17/09/18 9:05	0:03:00	78.4	77.8	76.8	85.0	77.1	76.4	8.3	0.6
Screener 4m 45 degrees discharge end	17/09/18 9:10	0:03:00	78.6	76.7	72.2	83.5	73.3	70.8	11.3	1.9
Screener 45 degrees chute side	17/09/18 9:14	0:03:00	84.1	80.7	69.9	84.8	71.4	68.3	14.9	**3.4**
Water Truck 4m Passengers side	17/09/18 9:36	0:03:00	86.4	85.3	84.3	91.4	84.7	84.0	7.1	1.1
Water Truck 4m Drivers side	17/09/18 9:41	0:03:00	83.6	82.6	81.6	91.3	81.9	81.3	9.7	1.1
Water Truck 4m 5km/hr forward and reverse	17/09/18 9:52	0:02:18	96.9	95.6	87.0	91.0	89.6	84.0	3.9	1.3
Shredder Operations including loader 8.5m	18/09/18 11:30	3:01:46	97.2	94.3	74.3	90.2	77.6	57.7	**15.8**	**2.9**
Screener Operations including loader 10m	19/09/18 8:14	2:12:30	77.1	74.9	65.6	82.5	67.3	48.4	**16.9**	**2.2**
Shredder Operations including loader 8.5m	19/09/18 10:32	3:49:28	98.1	95.8	73.2	89.3	76.9	56.6	**16.1**	**2.3**
Biofilter fans & Tunnel Fans 8m	19/09/18 14:13	0:05:00	68.0	67.2	64.5	66.1	65.8	62.9	1.6	0.9

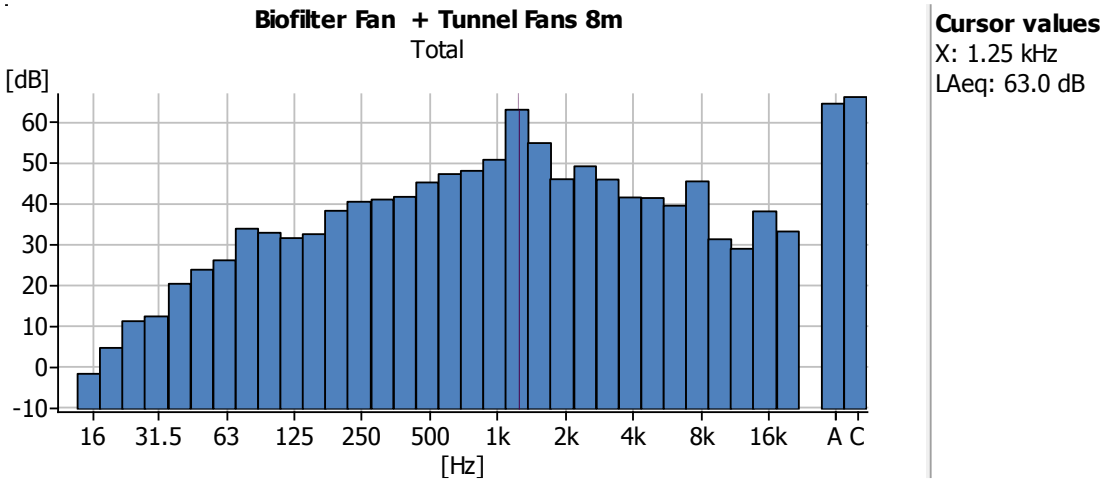
Table 5.2 JR Richards South Grafton - Receiver Noise Monitoring Summary										
Measurement	**Start Time**	**Elapsed Time** mm:ss	**LAImax** [dB]	**LAFmax** [dB]	**LAeq** [dB]	**LCeq** [dB]	**LAF10.0** [dB]	**LAF90.0** [dB]	**LCeq-LAeq** [dB]	**LAImax-LAFmax** [dB]
R1 170918 M1	17/09/2018 13:17	0:15:00	74.8	71.1	57.0	65.9	61.5	39.9	8.9	3.7
R2 170918 M1	17/09/2018 13:45	0:15:00	64.4	63.3	49.4	62.7	53.5	40.8	13.3	1.0
R3 170918 M1	17/09/2018 14:28	0:15:00	71.3	68.3	51.5	58.9	54.2	38.3	7.4	3.0
R3 180918 M1	18/09/2018 12:01	0:15:00	68.9	65.8	51.6	58.8	55.1	38.8	7.3	3.0
R3 180918 M2	18/09/2018 12:25	0:15:00	68.6	65.1	52.7	62.2	57.0	39.5	9.5	3.5
R2 180918 M1	18/09/2018 12:53	0:15:00	70.0	69.0	53.5	65.3	57.6	40.4	11.8	1.0
R2 180918 M2	18/09/2018 13:15	0:15:00	66.5	65.1	50.2	58.0	54.7	37.1	7.8	1.4
R2 190918 M1	19/09/2018 8:31	0:15:00	69.1	68.0	54.3	62.4	58.5	42.6	8.1	1.0
R2 190918 M2	19/09/2018 8:47	0:15:00	69.0	68.1	52.0	61.1	56.0	38.8	9.1	1.0
R3 190918 M1	19/09/2018 9:12	0:15:00	71.9	70.3	55.1	60.5	59.2	43.5	5.4	1.6
R3 190918 M2	19/09/2018 9:35	0:15:00	73.3	69.3	54.2	60.6	57.9	41.4	6.4	4.0
R1 190918 M1	19/09/2018 11:40	0:15:00	72.3	69.4	53.5	62.9	57.7	42.5	9.4	2.8
R1 190918 M2	19/09/2018 12:07	0:15:00	82.7	79.7	56.4	65.1	59.9	43.3	8.7	3.1
R2 190918 M3	19/09/2018 12:32	0:15:00	67.3	65.8	50.8	59.3	54.8	38.4	8.5	1.5
R3 190918 M3	19/09/2018 13:00	0:15:00	69.9	67.4	51.4	61.5	55.2	42.0	10.0	2.5

Note – Shaded Cells - Meteorological conditions were outside of the meteorological limits in Condition L4.4.

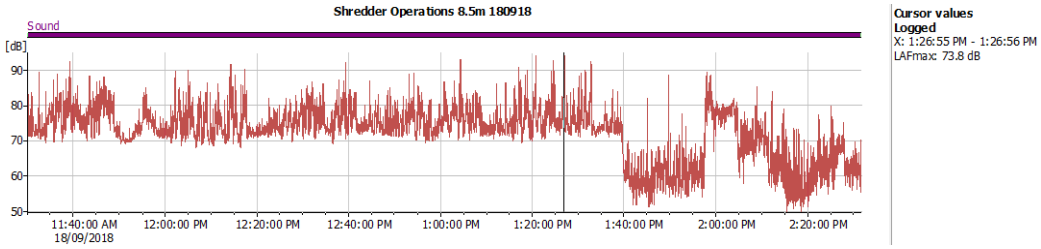
Table 5.3 Observations at Receiver locations

Observations at Receiver Locations – September 2018						
Location / Date /Time	**Temp °C**	**Humidity % RH**	**Wind Dir.**	**Wind Speed (m/s)**	**Cloud Cover**	**Notes**
R1 170918 M1 13:17	25	47	0.5 – 1.5	S	6/8	Shredder not audible. Traffic dominant, birds, wind in trees
R2 170918 M1 13:45			1.5 – 3	SE	6/8	Shredder not audible. Traffic dominant, birds, wind in trees
R3 170918 M1 14:28	23	41	1 – 2.5	SE	6/8	Shredder not audible. Traffic dominant, birds, wind in trees, occasional faint reversing beeper from landfill operations
R3 180918 M1 12:01						Shredder not audible. Traffic dominant, birds, wind in trees (distant)
R3 180918 M2 12:25	25	43	1-2	NE	2/8	Shredder not audible. Traffic dominant, birds, wind in trees (distant)
R2 180918 M1 12:53						Shredder not audible. Traffic dominant, birds, wind in trees, dog barking
R2 180918 M2 13:15	26	40	1.5 – 2.5	NE	2/8	Shredder not audible. Traffic dominant, birds, wind in trees, occasional faint reversing beeper from landfill operations
R2 190918 M1 8:31						Screener and loader not audible. Traffic dominant, birds, wind in trees, dog barking
R2 190918 M2 8:47	22	66		Calm	0/8	Screener and loader not audible. Traffic dominant, birds, dog barking, occasional faint reversing beeper from landfill operations
R3 190918 M1 9:12						Screener and loader not audible. Traffic dominant, birds, wind in trees, occasional faint reversing beeper from landfill operations
R3 190918 M2 9:35	22	60	NE	0.5 - 2	0/8	Screener and loader not audible. Traffic dominant, birds, wind in trees, distant dog barking, distant overhead aircraft
R1 190918 M1 11:40						Shredder not audible. Traffic dominant, birds, wind in trees, distant overhead aircraft
R1 190918 M2 12:07	27	45	N	1 – 3	0/8	Shredder not audible. Traffic dominant, birds, wind in trees, stock vehicles nearby, occasional faint reversing beeper
R2 190918 M3 12:32						Shredder not audible. Traffic dominant, birds, wind in trees, occasional faint reversing beeper from landfill operations, insects near SLM
R3 190918 M3 13:00	27	40	N	1 – 3.5	0/8	4 occasions shredder just audible. Traffic dominant, birds, wind in trees

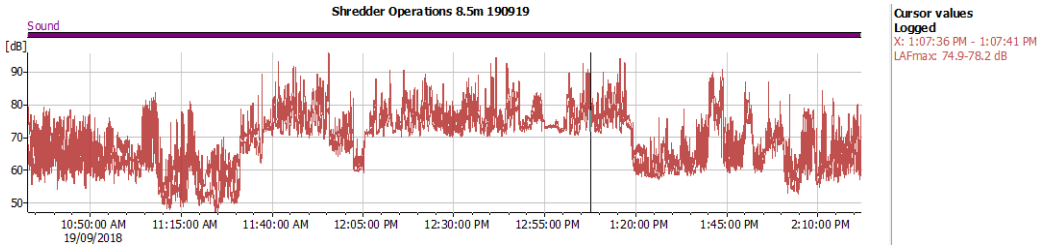
Graph 5.1 Biofilter and Tunnel Fans Spectrum Data



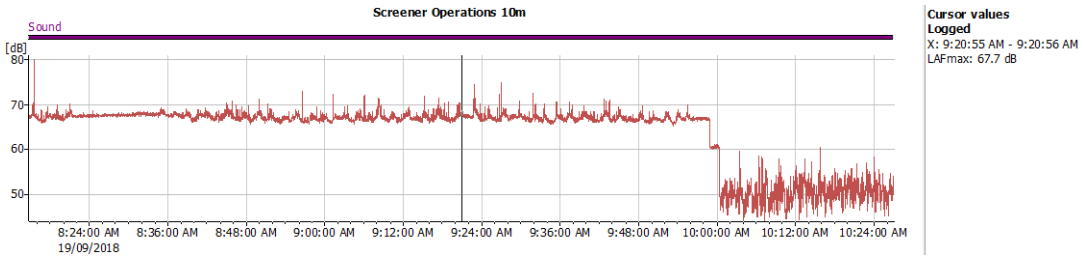
Graph 5.2 Shredder logged noise levels 18/09/2018



Graph 5.3 Shredder logged noise levels 19/09/2018



Graph 5.4 Screener logged noise levels 19/09/2018



6 DISCUSSION OF RESULTS AND ASSESSMENT

The time available each day to measure the shredder at the receiver locations was limited to the amount of material to be shredded each day. Generally there was approximately 1 – 1 ½ hours per day. Shredding is usually conducted between 11am – 2:45pm Monday to Friday. There is consistent traffic on Armidale Road for the day light hours with a peak period between 7:30am - 9:30am. Shredding for the noise monitoring was generally conducted outside of these times so that traffic noise was not as dominant and shredder noise could be observed during lulls in traffic flow.

The measured results at receiver locations are presented in Table 5.2. Approximately half the measurements (shaded grey) were conducted when wind conditions were greater than 3m/s at the permanent weather station at the composting facility. (*see Appendix C for weather details).* The observations at the receiver locations generally indicated that wind was below 3m/s as the receiver locations, which tended to be more sheltered at 1.5m depending on the wind direction.

The weather data from the permanent weather station was checked at the end of each day as the operator was operating equipment during the day. Investigations with the IT staff at JR Richards at the end of day 3, indicated that weather data is available for download every 15 minutes to the server at the composting facility and that the weather data could be downloaded to a mobile phone with the correct user name and password. It was agreed that for future noise monitoring measurements, that the acoustic consultant would be able to log in to monitor the weather data in real time. It was also agreed with the plant operator that the operations could be varied to allow for noise monitoring to occur during less windy conditions during the day that may be able to be predicted from the MetEye service of the Bureau of Meteorology. This would allow a lot more valid noise measurements to be conducted with the limited amount of time that the shredder operates each day.

The shredder, loader and screener were not audible at Receiver 1. Road traffic and birds were the main noise sources observed (Graphs D.1 – D.3 Appendix D). The reversing beeper of the compactor at the landfill operations was just audible at times. The measurements on the 18th could not be conducted as horse trainers were using the paddock next to monitoring location.

The shredder, screener and loader were not audible at Receiver 2. Wind tended to be not in the direction of the Receiver 2 during monitoring periods. Road traffic and birds were the main noise sources observed (Graphs D.4 – D.9 Appendix D). The reversing beeper of the compactor at the landfill operations was just audible at times.

The screener and loader were not audible at Receiver 3. Wind tended to be not in the direction of the Receiver 3. The shedder was just audible on 4 occasions during the measurement at 1pm on the 19th when the permanent weather station indicated that the wind direction was from source to receiver and occasional peaks from thicker pieces of timber going through the shredder. Road traffic and birds were the main noise sources observed. The reversing beeper of the compactor at the landfill operations was just audible at times.

The impulsive noise characteristic ($L_{AImax} - L_{AFmax} > 2dB$) observed at the receiver locations was due to nearby birds.

It was noted that the adjacent landfill operations had moved closer to Receiver 1 from the operations of August 2017.

Measurements of machinery and operations were conducted near the equipment under load conditions (Table 5.1). Low frequency noise characteristic ($L_{Ceq} - L_{Aeq} > 15dB$) was observed in the loader. Impulsive noise characteristic ($L_{AImax} - L_{AFmax} > 2dB$) was observed in the screener and shredder. Tonality at 1.25 kHz was observed in the biofilter and tunnel fans. The appropriate modifying factor has been added to the noise source level. The predicted noise level at receivers for spherical geometric spreading not taking into account topography, barriers, vegetation, air and ground absorption, is given in Table 6.1 below.

Table 6.1 Calculated Receiver Noise Levels - Point Source Inverse Square Law

Receiver		Fans 8m	Water Truck Filling	Shredder	Screener	Loader (Shredding)	Loader (Compost)
	Source SPL (L_{Aeq})	64.5	84.3	74.3	76.8	74.5	74.5
	Source Distance (m)	8	4	8.5	5	5	5
	Modifying Factor (dB)	5		2.9	3.4	5	5
	Corrected Source SPL (L_{Aeq})	69.5	84.3	77.2	80.2	79.5	79.5
R1	Receiver Distance (m)	750	750	750	750	750	850
	Receiver SPL (L_{Aeq})	30	39	38	37	36	35
R2	Receiver Distance (m)	550	550	550	550	550	550
	Receiver SPL (L_{Aeq})	33	42	41	39	39	39
R3	Receiver Distance (m)	700	700	700	700	700	650
	Receiver SPL (L_{Aeq})	31	39	39	37	37	37

The maturation tunnel fans and biofilter fan were not audible at the receiver locations and are below the evening and night time noise criteria of 35 dB(A) $L_{eq,15min}$.

The screener and loader were not audible at the receiver locations.

The shredder is the one of the noisiest machines at the compost facility. The calculated noise level for spherical geometric spreading level at the receiver locations is 38 - 41 dB(A). The shredder was generally not audible at the receiver locations.

The observation that machinery was generally not audible at the receiver locations compared to the calculated predicted noise level is mainly attenuation due to trees, buildings and earth bunds. There is a large stand of planted trees approximately 150 metres wide between the shredder and the receivers.

Receiver 2 is partly shielded by the offices and staff amenities approximately 35 metres to the east and a large shed approximately 5m high 60 metres to the east of the shredder.

Receiver 3 is shielded by the rear wall of the shed that the shredder is in. There will also be some reduction to due to atmospheric attenuation as the shredder has an increase in the frequency range between 800 and 2500Hz.

The wind speed and Sigma Theta data (*see Appendix C)* from the meteorological station monitoring at the composting facility and a portable weather meter near the receiver noise monitor were used to determine meteorological conditions during noise monitoring.

Condition L4.4 states:

L4.4 The noise limits set out in condition L4.1 apply under all meteorological conditions except for the following:
1. Wind speeds greater than 3 metres/second at 10 metres above ground level; or
2. Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
3. Stability category G temperature inversion conditions.

As noted in Section 5, approximately half the measurements were invalid due to wind conditions above 3m/s. Discussions with the plant operator on varying some of the operations and observing the permanent weather station data in real time should allow for more valid measurements for future noise monitoring.

The operations at JR Richards composting facility at South Grafton in September 2018 are similar to the operations in July 2017 when 3 consecutive days of noise monitoring was conducted. The observations and results are similar to previous years (shredder sometimes just audible at Receivers 2 and 3 in previous years depending on wind conditions).

7 SUMMARY

A noise assessment was conducted to assess compliance of noise levels of the composting facility at 704 Armidale Road operated by JR Richards and Sons.

Acoustic field measurements were conducted on-site with calibrated noise monitoring equipment to determine noise source characteristics and assess the noise levels at 3 residential receiver locations with the noise limits as specified in the Environment Protection Licence (EPL 20137) issued to the composting facility by the New South Wales Environment Protection Authority.

Valid measurement data at the residential receivers was limited due to limited resource of material to be shredded and wind conditions above 3m/s. Consistent traffic on Armidale Road and birds were the dominant noise sources during monitoring.

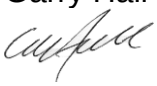
There was no audible industrial noise from the composting facility at Receiver R1 or Receiver 2.

Generally there was no industrial noise at Receiver R3. The shredder was just audible with wind from source to receiver and when large pieces of timber went through the shredder.

Low frequency noise characteristic was observed in the loader. Impulsive noise characteristics were observed in the screener and shredder.

Based on the limited valid results and observations and the results and observations of 2017 with similar operations, the noise levels of the operations at the composting facility at 704 Armidale Road operated by JR Richards & Sons are compliant with the Environment Protection Licence (EPL 20137) issued to the composting facility by the New South Wales Environment Protection Authority.

Garry Hall



Acoustic Consultant
Ambience Audio Services

APPENDIX A
Definitions of Terms

Sound pressure level (L_p): A measurable quantity of the size or amplitude of the pressure fluctuations (sound waves) above and below normal atmospheric pressure compared to a reference pressure. Sound pressure levels are measured in decibels whereas sound pressure is measured in pascals (N/m^2).

Decibels (dB): a ratio of energy flows. When used for sound measurement, it is the ratio between a measured quantity of sound pressure and an agreed reference sound pressure. The dB scale is logarithmic and uses the threshold of hearing of 20 μPa (micro pascals) as the reference pressure. This reference level is defined as 0 dB.

Frequency (Hz): The number of pressure variations per second (cycles per second) is called the **frequency** of sound and is measured in **Hertz (Hz)**. The rumble of distant thunder has a low frequency, while a whistle has a high frequency. The normal range of hearing for a healthy young person extends from approximately 20Hz up to 20 000 Hz (20 kHz) while the range from the lowest to highest note on a piano is approximately 27.5 Hz to 4.2 kHz.

Spectral characteristics: The frequency content of noise.

"A" frequency weighting: The method of frequency weighting the electrical signal within a noise-measuring instrument to give a very approximate simulate to the human perception of loudness. The symbols for the noise parameters often include the letter "A" (e.g., L_{Aeq}, dBA) to indicate that frequency weighting has been included in the measurement.

Fast, Slow and Impulse time weightings: Standardised root-mean-square (rms) averaging times to help define fluctuating noise levels. Impulsive noises have high peak levels with a very short duration (e.g., gunshot), or a sequence of such peaks. The 'Slow' time weighting averages the fluctuations over a one second time base whilst the 'Fast' time weighting averages the fluctuations over a one-eighth of a second time base. Environmental assessment standards usually specify the time weighting (**F**, **S**, or **I**) to be used.

L_{Aeq}: The A-weighted equivalent continuous noise level. A widely used noise descriptor which provides an average of the energy of a constant level of noise which is the same as the varying noise signal being measured. The time in minutes, which the measurement was sampled, is indicated with a subscripted number e.g. $L_{Aeq,\ 15\ minute}$ is a 15-minute sample.

L_{AN}: The A-weighted sound pressure level that is exceeded for N per cent of the time over which a given sound is measured. e.g. **L_{A90}** is the A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured.

L_{A90} is commonly used to describe the **background noise level** for community noise assessments.

Ambient noise: The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far.

Extraneous noise: Noise resulting from activities that are not typical of the area. A typical activities may include construction, and traffic generated by holiday periods and by events such as concerts or sporting events. Normal daily traffic is not to be considered extraneous.

Background noise: The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the $\mathbf{L_{A90}}$ descriptor, fast time weighting.

Intrusive Noise: Refers to noise that intrudes above the background level by more than 5 decibels.

Noise limits: Enforceable noise levels that appear in consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.

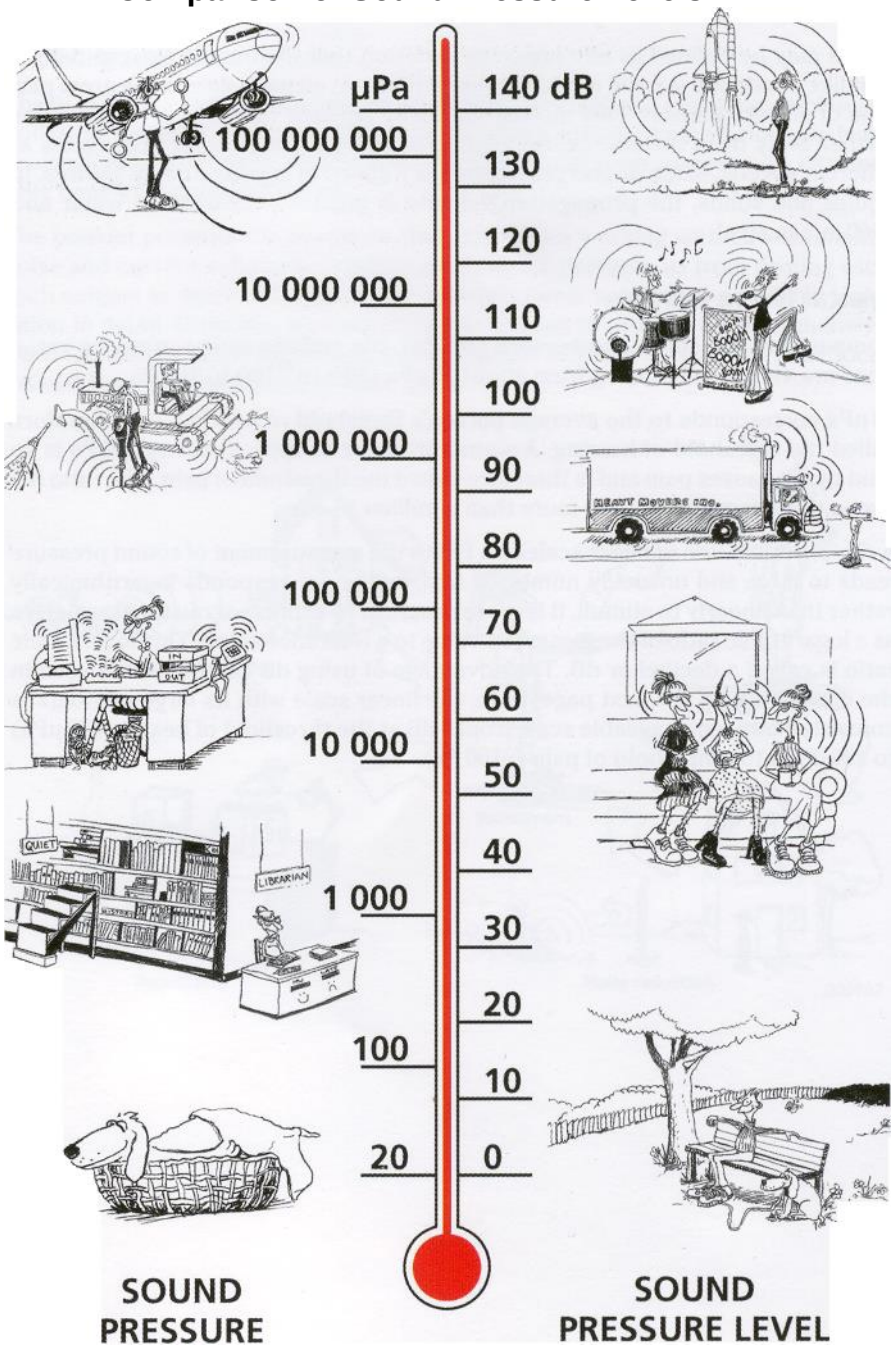
References:

Measuring Sound Brüel and Kjær Sound & Vibration Measurements A/S September 1984

Environmental Noise Brüel and Kjær Sound & Vibration Measurements A/S 2000, 2001

New South Wales Industrial Noise Policy NSW Environment Protection Authority January 2000

APPENDIX B
Comparison of Sound Pressure Levels



Our hearing covers a wide range of sound pressures – a ratio of over a million to one. The dB scale makes the numbers manageable.

Reproduced from

Environmental Noise Brüel and Kjær Sound & Vibration Measurements A/S 2000, 2001

APPENDIX C
Weather Conditions during Noise Monitoring
Data from Permanent Weather Station at Composting Facility

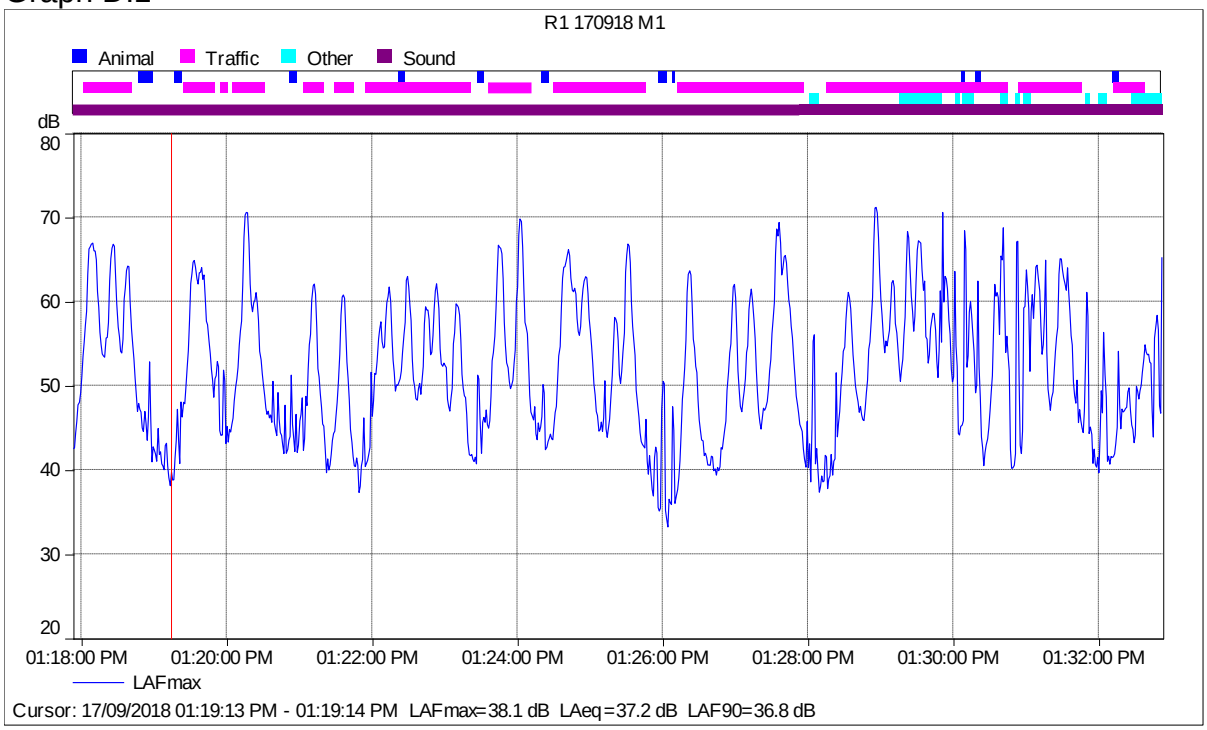
Table C.1 Weather Data JR Richards Weather Station South Grafton 17/09/2018						
End Time	Rain [mm]	Temp[°C]	Humidity[%RH]	Sigma Theta [Sigma]	Wind Direction[Â°]	Wind Speed [m/s]
8:00:04 AM	0	13.5	53.2	12.8	230	1.6
8:15:05 AM	0	14	49.9	21.3	270	2.9
8:30:02 AM	0	15	47.1	27.8	164	3.6
8:45:03 AM	0	15.8	47.4	37.4	166	1.4
9:00:04 AM	0	16.2	48	37.1	214	2.1
9:15:04 AM	0	17.1	46.8	35.8	214	2.8
9:30:04 AM	0	17.2	45.7	23.7	129	2.5
9:45:02 AM	0	17.9	46.3	40.6	187	2.4
10:00:03 AM	0	17.9	45.1	53.4	168	2.7
10:15:04 AM	0	18.1	43	31.7	133	2.6
10:30:05 AM	0	18.4	43.6	30.9	144	3.6
10:45:03 AM	0	18.4	43.6	36.3	162	4.3
11:00:03 AM	0	19.1	43.6	24	203	1.5
11:15:04 AM	0	17.7	45.5	25.1	101	0.8
11:30:04 AM	0	18.6	39.8	38.6	113	4.7
11:45:05 AM	0	19.2	43.9	36.6	80	0.5
12:00:05 PM	0	18.2	43.3	43.5	21	0.1
12:15:02 PM	0	18.7	42.7	58.4	150	2.5
12:30:03 PM	0	18.4	43.5	30.5	122	1.7
12:45:04 PM	0	18.2	43.4	36.4	95	1.8
1:00:05 PM	0	18.6	43.9	30	86	2.8
1:15:02 PM	0	18.8	42.6	26.5	120	2.7
1:30:04 PM	0	20	41.5	37.7	173	1.3
1:45:05 PM	0	18.8	43.5	25.1	104	3.6
2:00:02 PM	0	18.4	45.7	25.6	96	3.1
2:15:03 PM	0	18.2	44.8	24.2	78	1
2:30:04 PM	0	18.2	44.9	23.4	109	3.8
2:45:04 PM	0	18.6	45.1	25.6	102	2.6

Table C.2 Weather Data JR Richards Weather Station South Grafton 18/09/2018						
End Time	Rain [mm]	Temp[°C]	Humidity[%RH]	Sigma Theta [Sigma]	Wind Direction[Â°]	Wind Speed [m/s]
8:00:05 AM	0	15.4	66.4	39.6	250	1.9
8:15:03 AM	0	15.9	64.6	16.8	199	0.6
8:30:04 AM	0	16.9	60.1	32.2	231	1.7
8:45:04 AM	0	17.4	58.8	29.7	249	1
9:00:05 AM	0	17.7	55	39	274	3.4
9:15:02 AM	0	18.1	53.5	29.4	326	2.6
9:30:03 AM	0	18.6	50.6	32.9	266	1.1
9:45:04 AM	0	18.7	51.1	36.5	324	3.1
10:00:05 AM	0	19.2	51.1	34.2	321	2.7
10:15:03 AM	0	18.8	48.9	25.6	35	3
10:30:04 AM	0	19.6	48.5	37.9	288	3.8
10:45:05 AM	0	19.3	49.4	32.6	20	5
11:00:03 AM	0	19.9	47.8	32.4	294	4.8
11:15:02 AM	0	20.6	45.3	39.1	20	2.8
11:30:02 AM	0	20.2	47.1	44.4	340	1.3
11:45:07 AM	0	20.6	48.1	37.4	92	0.7
12:00:03 PM	0	20.6	47.2	56.8	60	2.2
12:15:04 PM	0	21.7	44.7	54	346	1.9
12:30:03 PM	0	22.3	43.3	41.3	334	2
12:45:05 PM	0	21.5	43.4	35.1	357	2.9
1:00:02 PM	0	22.3	41.5	30.9	22	3.3
1:15:03 PM	0	22.3	41.7	38.2	348	4.6
1:30:04 PM	0	22.8	40.4	29.5	24	2.8
1:45:02 PM	0	22.4	41.2	39	34	2
2:00:03 PM	0	22.7	39.8	31.9	38	2.3
2:15:05 PM	0	22.6	40.4	32.2	14	3.2
2:30:02 PM	0	22.7	41.7	29	43	5.3
2:45:02 PM	0	22.3	43.9	20.7	22	4.2

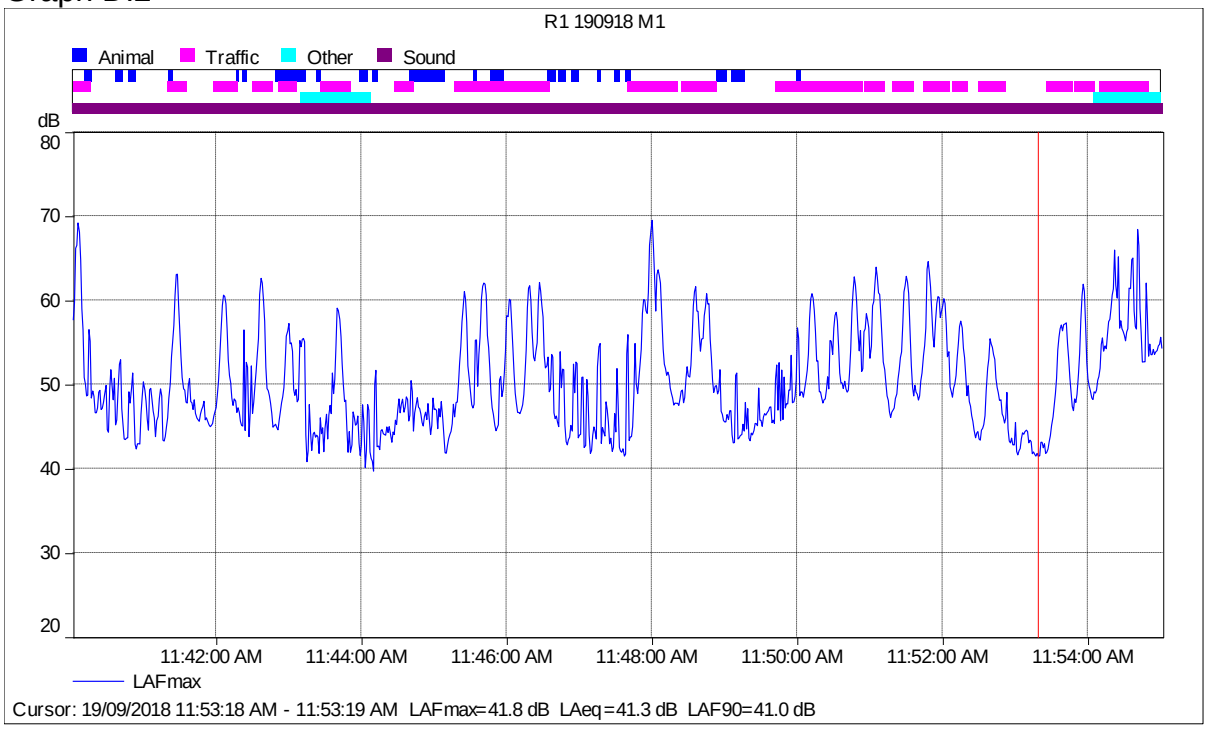
Table C.3 Weather Data JR Richards Weather Station South Grafton 19/09/2018						
End Time	Rain [mm]	Temp[°C]	Humidity[%RH]	Sigma Theta [Sigma]	Wind Direction[Â°]	Wind Speed [m/s]
8:00:02 AM	0	15.2	76.8	26.7	266	2.5
8:15:03 AM	0	15.7	76.2	21.7	246	2.3
8:30:04 AM	0	16.4	73	21.1	216	0.9
8:45:05 AM	0	17.6	68.8	35.4	254	0.3
9:00:03 AM	0	18.1	64.5	40.1	46	3.5
9:15:03 AM	0	18.1	63.6	30.7	11	3.2
9:30:04 AM	0	18.3	63.3	28.9	26	3.4
9:45:05 AM	0	19.1	61.4	33	325	1.7
10:00:02 AM	0	20	59.5	33.4	90	1.8
10:15:02 AM	0	20	59.1	24.8	88	1.7
10:30:04 AM	0	20.4	58.9	40.8	336	1.8
10:45:05 AM	0	20.9	55.8	30.1	23	1.1
11:00:02 AM	0	22.2	50	25.3	84	2.3
11:15:02 AM	0	23.2	49.6	42.3	40	2.6
11:30:02 AM	0	23.5	46.7	36.3	359	2.2
11:45:09 AM	0	23.6	45.9	20.9	58	4
12:00:05 PM	0	24.2	42.9	23.4	38	5.8
12:15:02 PM	0	24.5	42.2	25	354	3.3
12:30:04 PM	0	25.1	41	33.1	329	2.5
12:45:05 PM	0	25.5	39.7	32.8	327	3.1
1:00:02 PM	0	25.8	39.3	31.5	326	3.7
1:15:04 PM	0	26.1	37.9	30.1	324	5.1
1:30:02 PM	0	26.2	37.7	29	29	3
1:45:03 PM	0	26.8	36.7	28.5	338	4.3
2:00:05 PM	0	27.5	35.9	32.4	5	2.8
2:15:02 PM	0	27.4	35.3	28.4	23	3.8
2:30:02 PM	0	27.7	35.4	28.9	359	2.4
2:45:02 PM	0	27.6	35.7	20.5	45	4.9

APPENDIX D
Logged Noise Levels at Receiver Locations

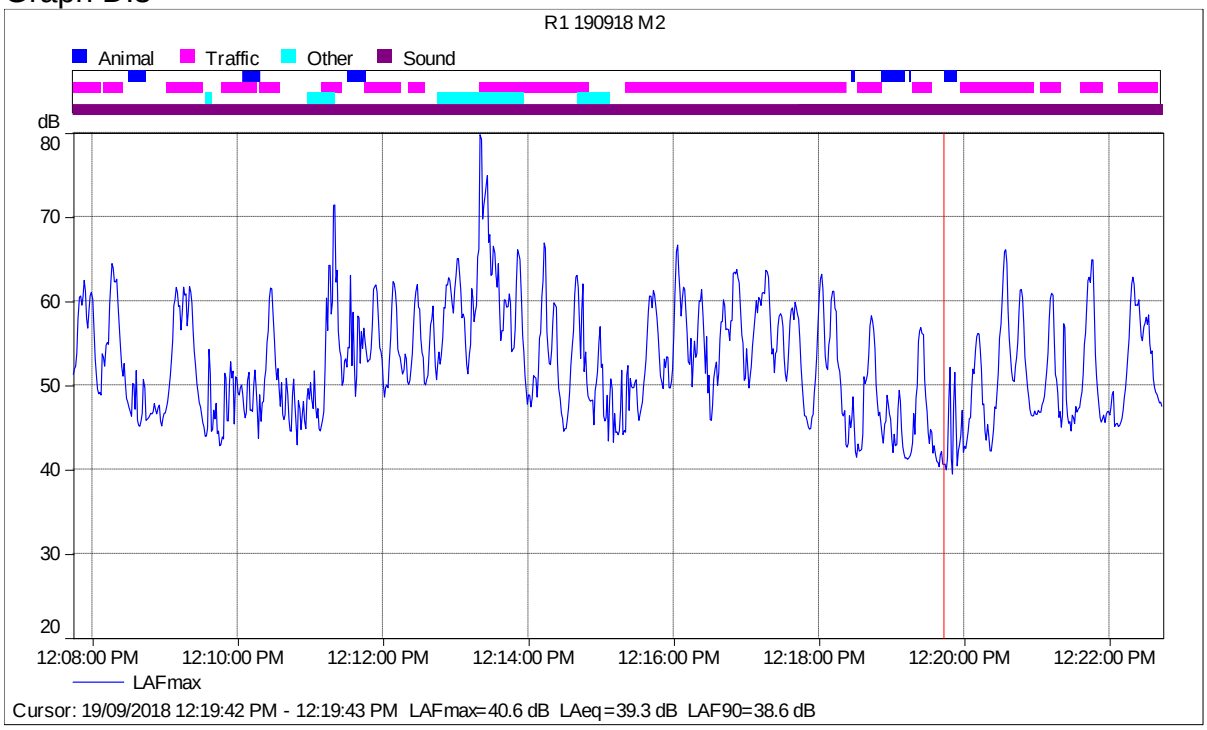
Graph D.1



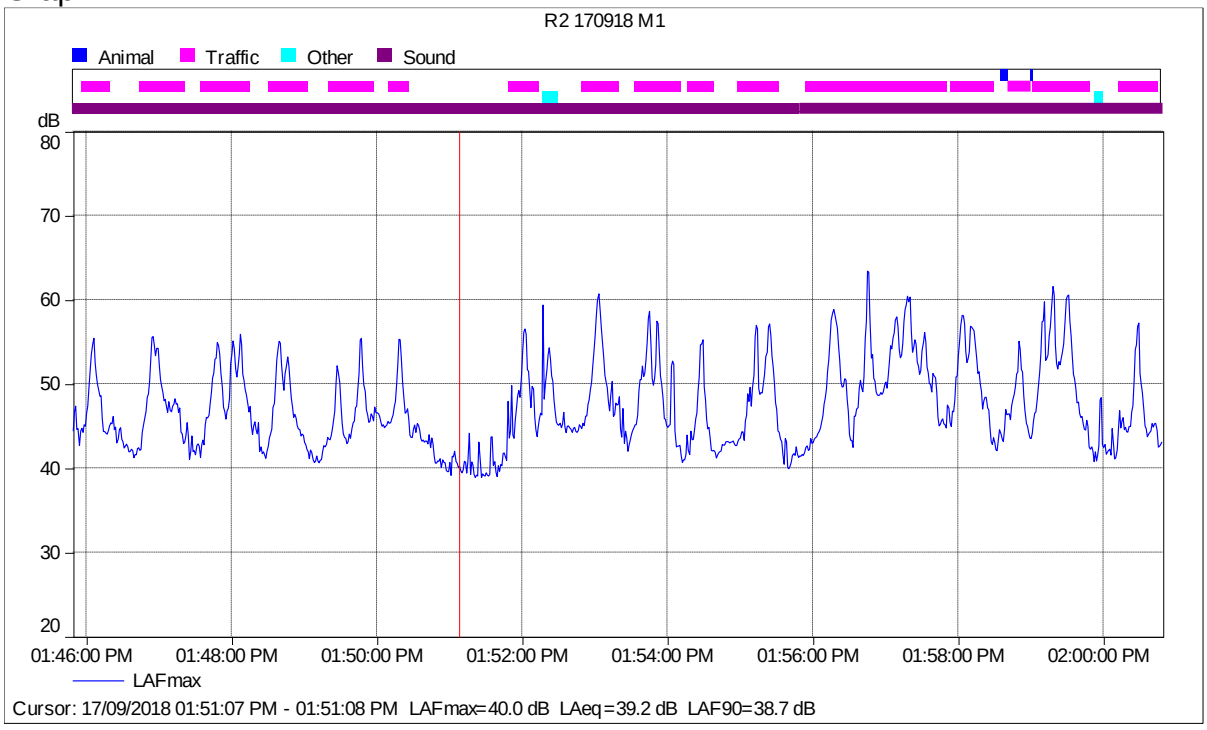
Graph D.2



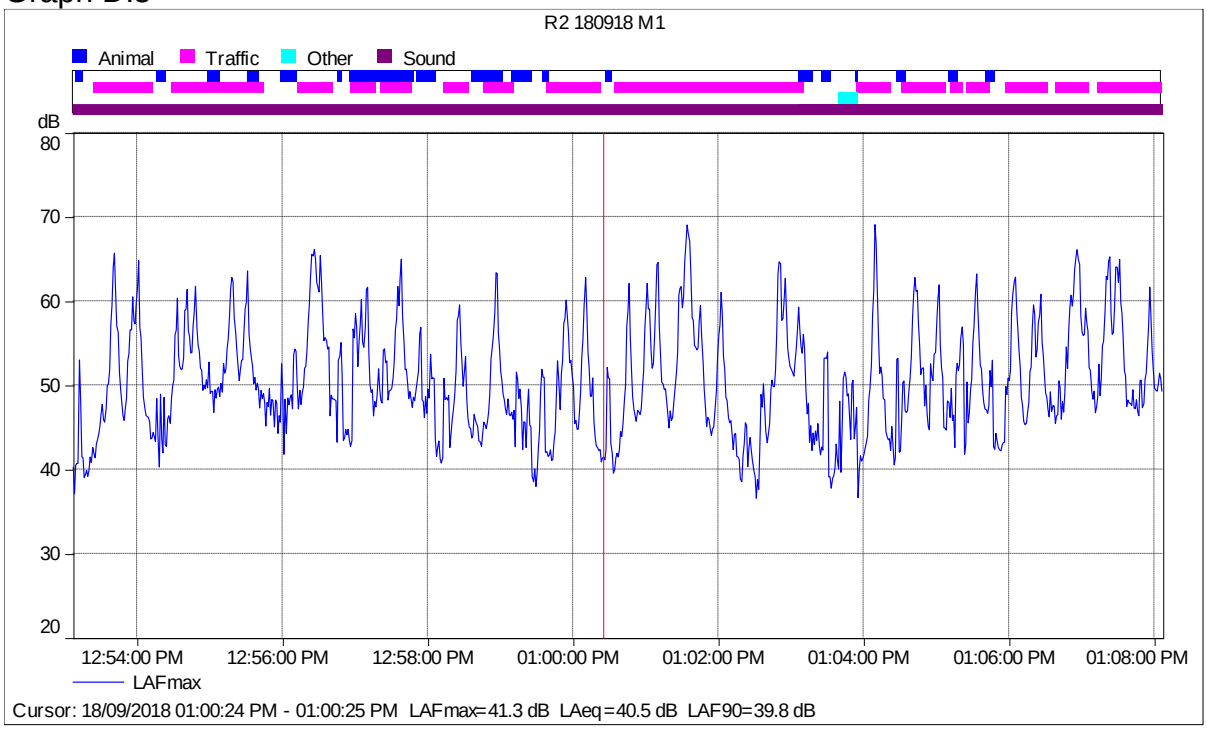
Graph D.3



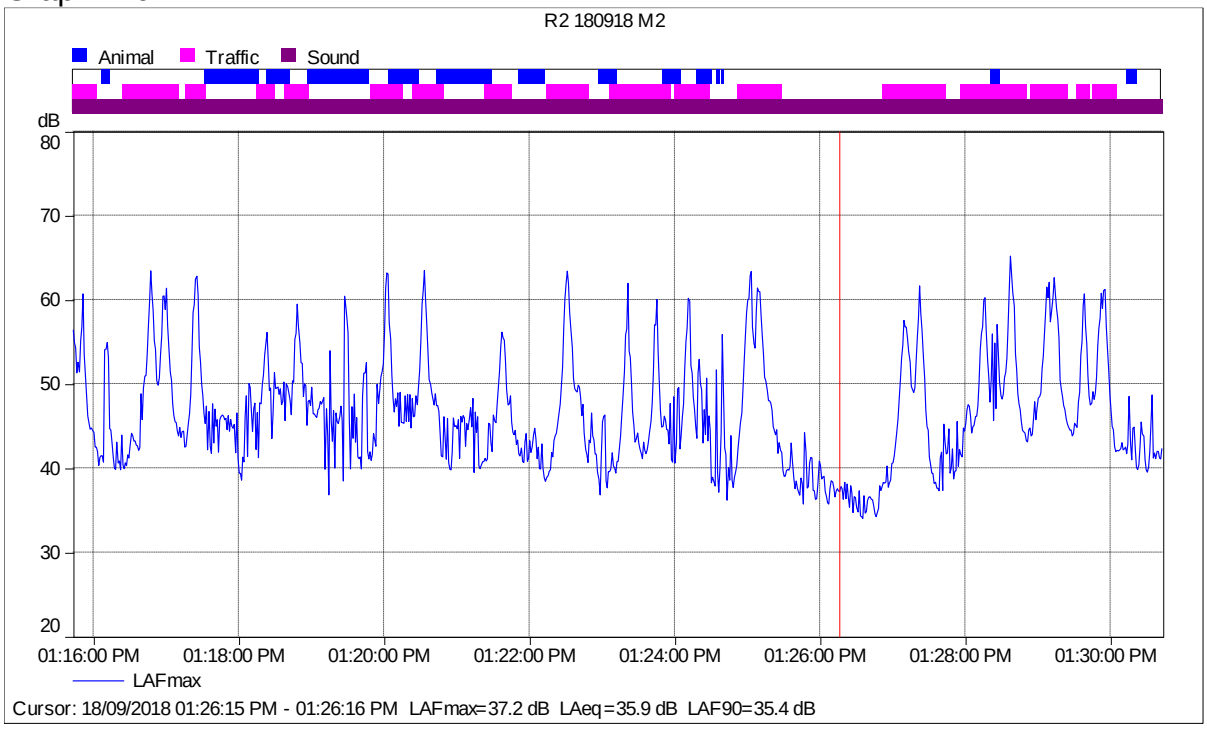
Graph D.4



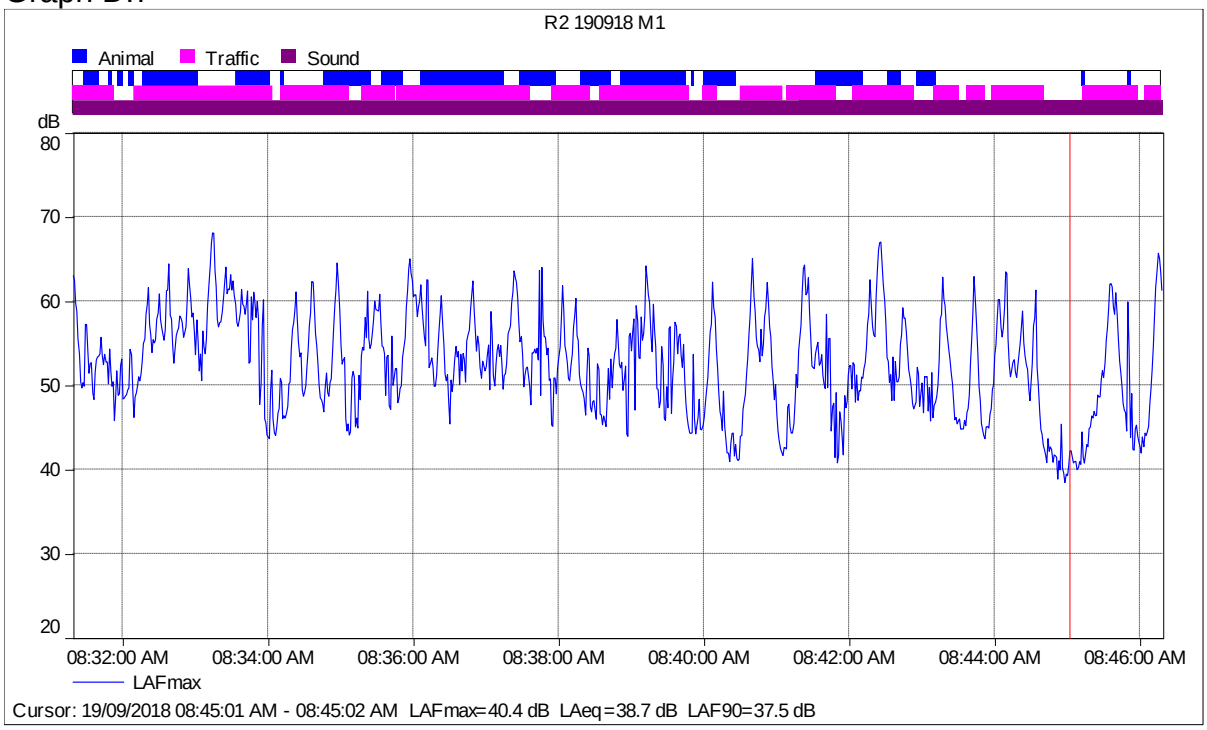
Graph D.5



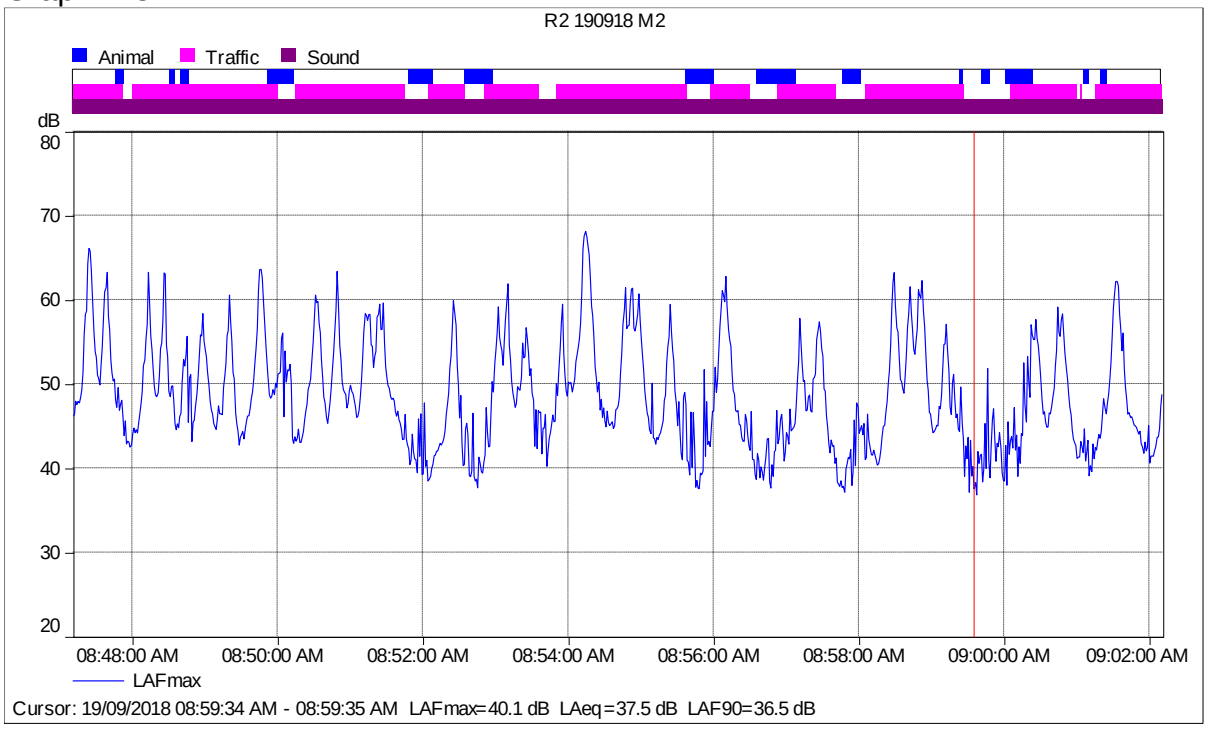
Graph D.6



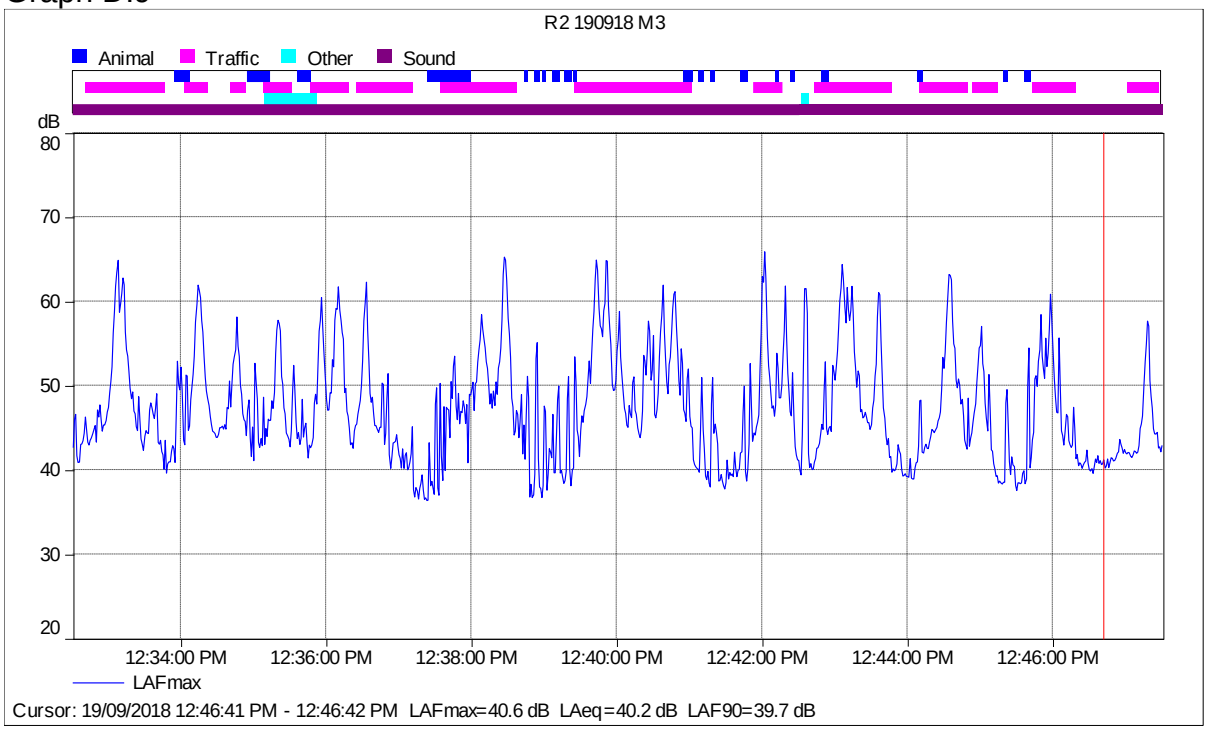
Graph D.7



Graph D.8



Graph D.9



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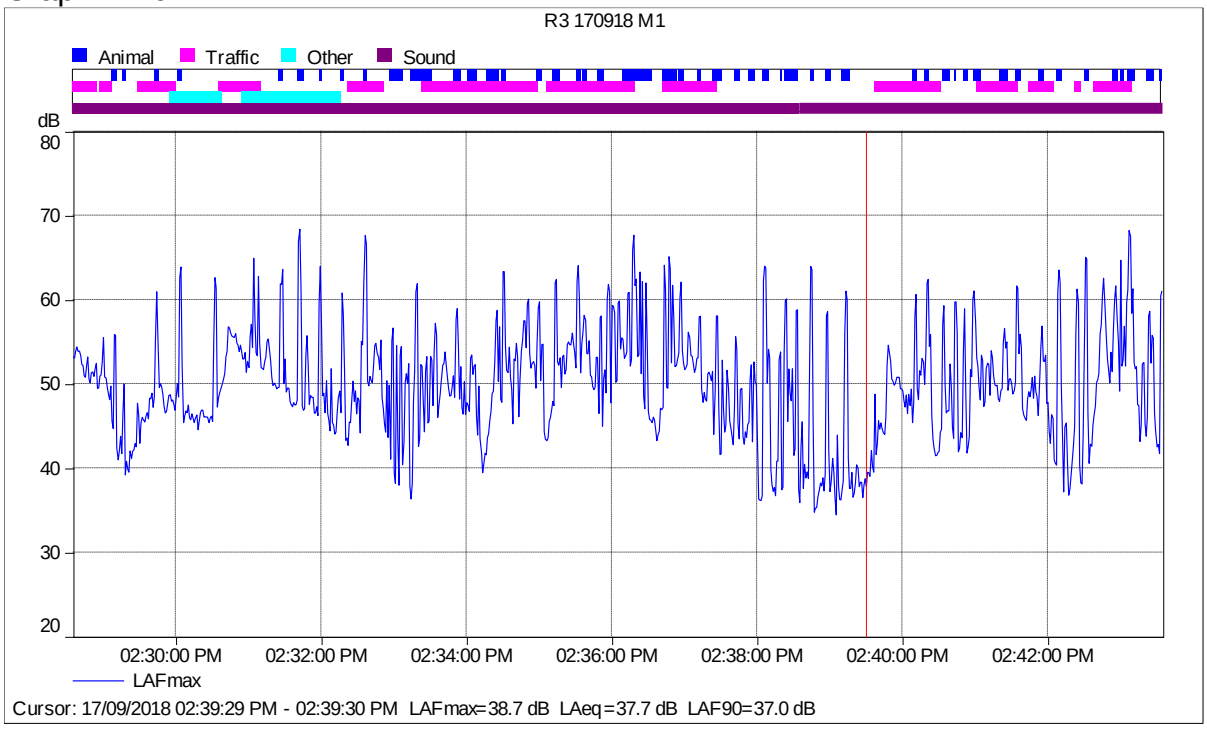

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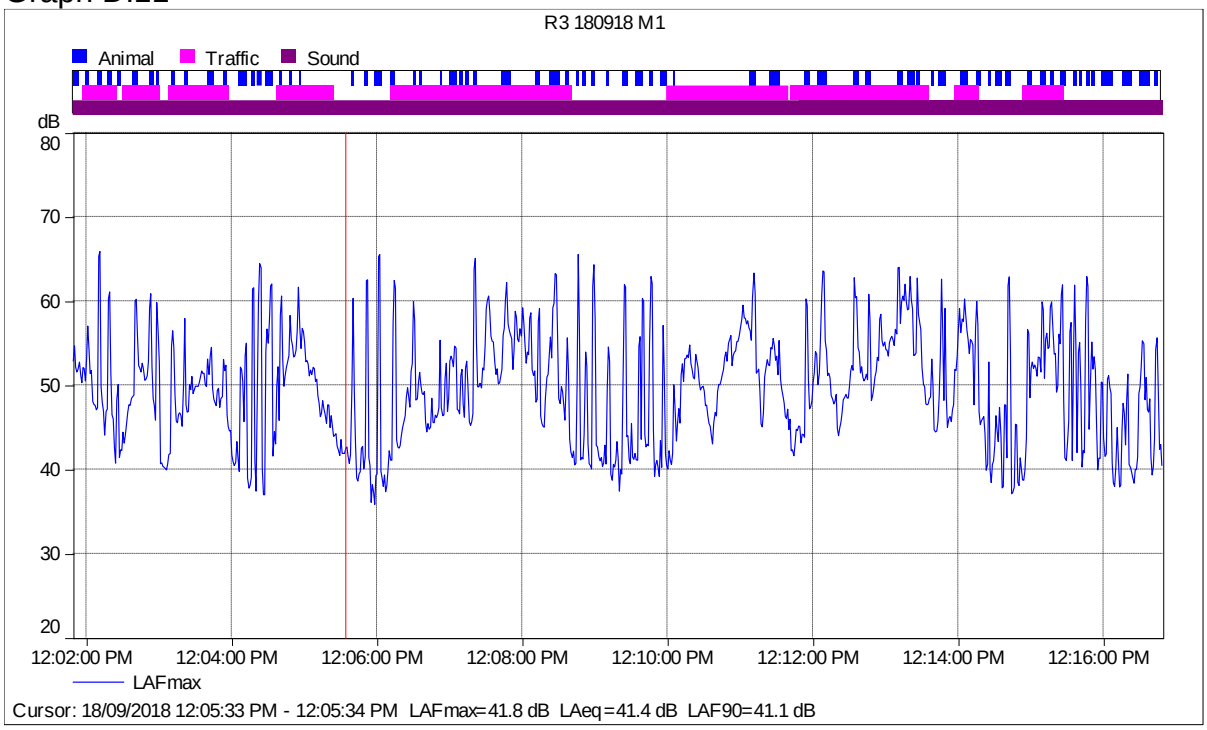
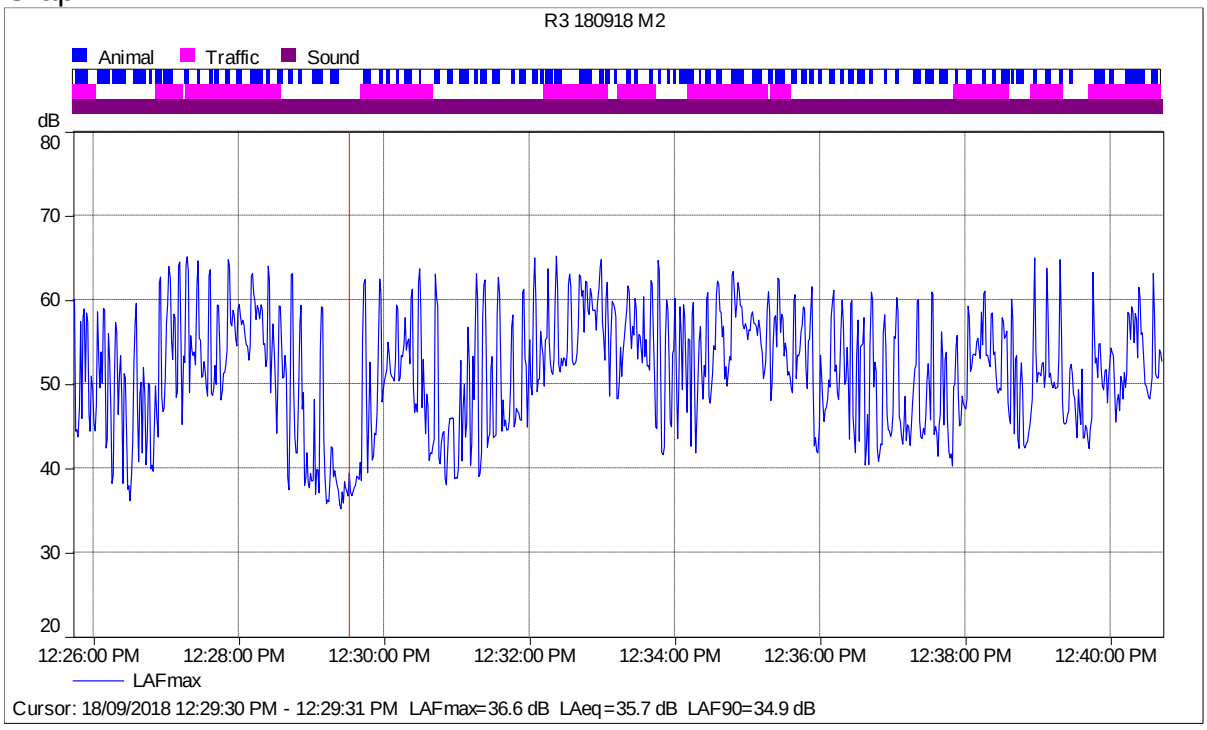


Graph D.12



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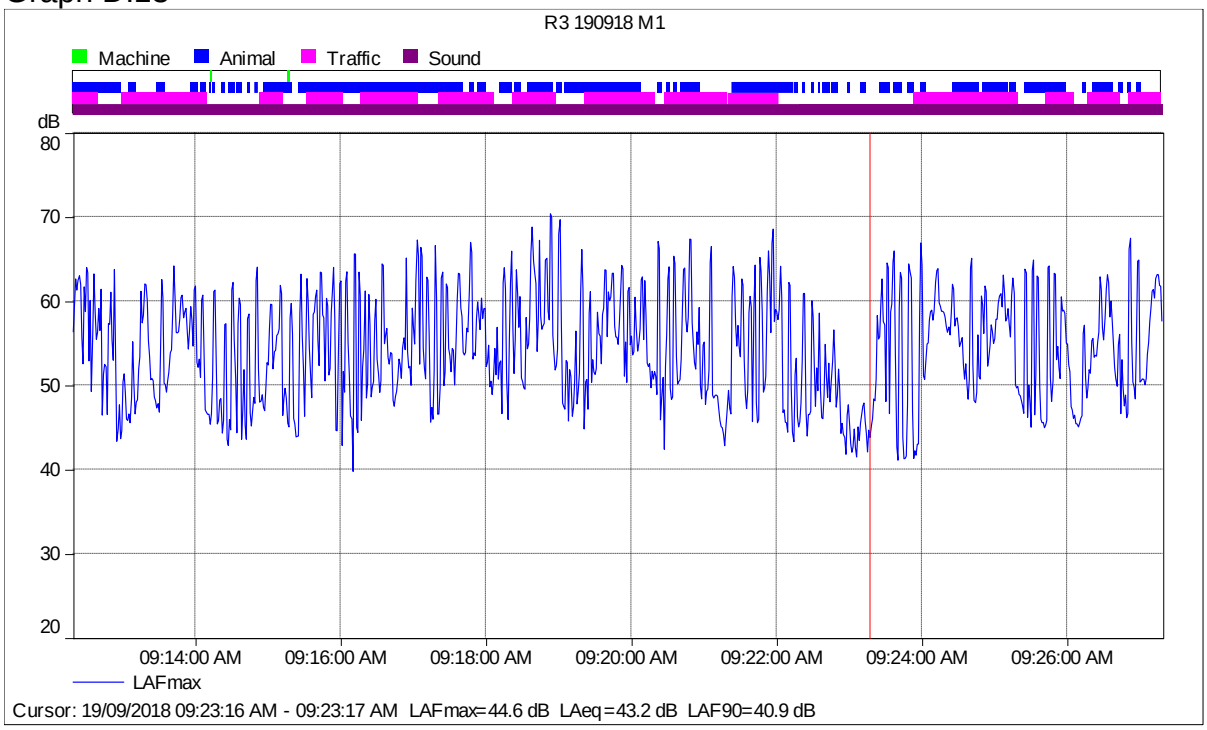
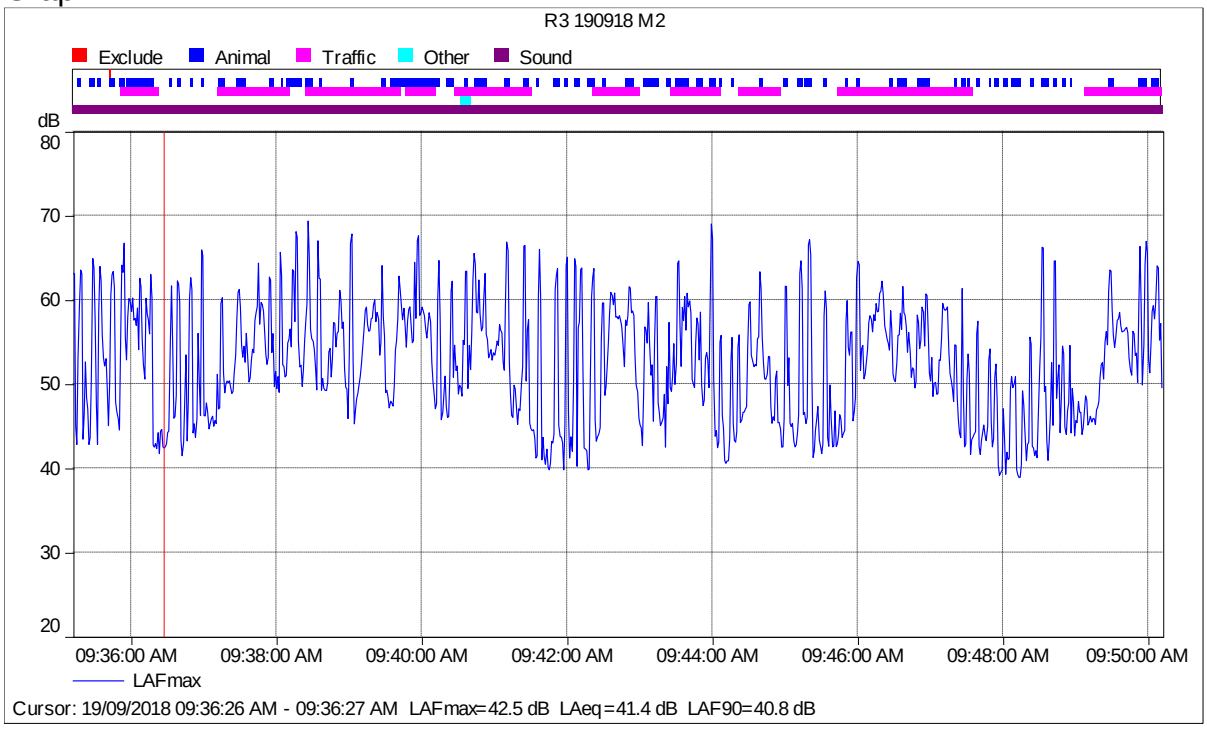


Graph D.14



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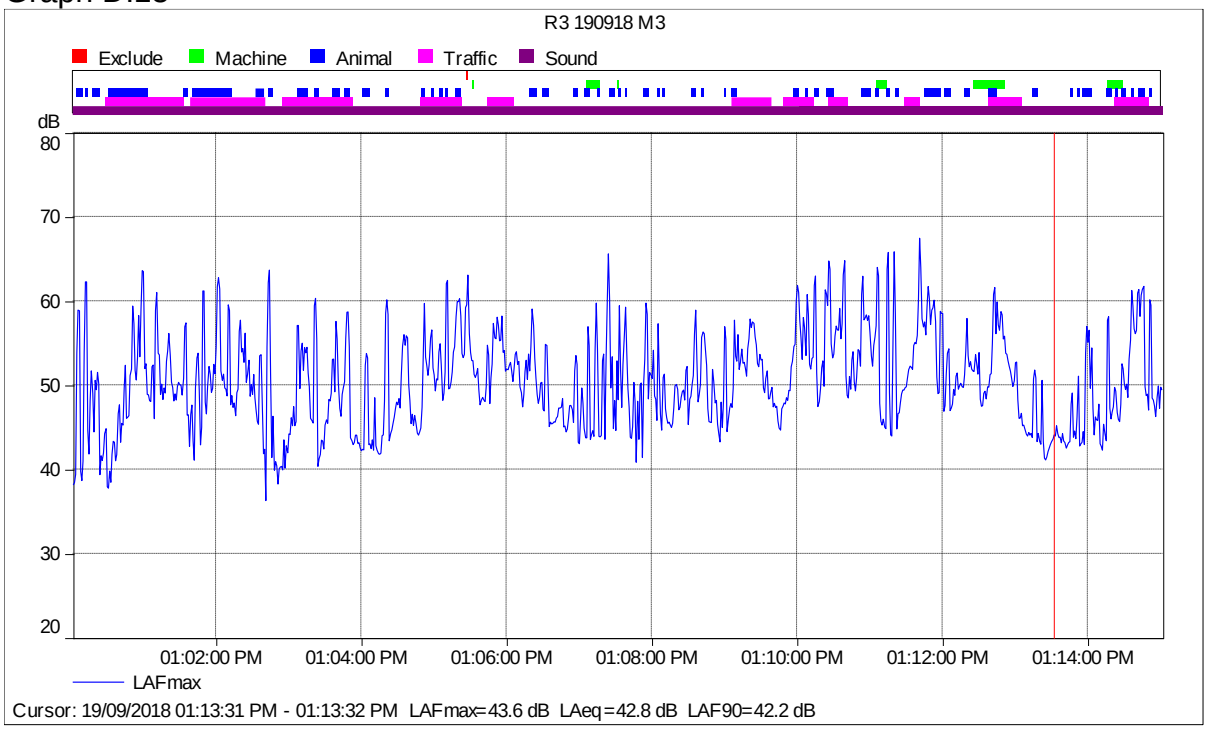
R3 190918 M3
Exclude
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LAFmax
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