

Ventilation Fan Noise Assessment,
Proposed New Greenhouse
67 Howards Road, Burringbar

(Lot 3 on DP1191595)

ENVIRONMENTAL NOISE IMPACT REPORT

Prepared for

Pocket Herbs & Produce Pty Ltd

20 November 2018

crgref: 17053 report Sheds 1_2

1.0 INTRODUCTION

This report is further to our report dated 08/09/2017, and is required due to a proposal for another greenhouse located to the west of the existing greenhouse.

In undertaking this assessment, noise measurement of the installed fans in both greenhouses was conducted and through modelling, predictions of the fan noise emissions from operation of the two greenhouses were produced. Based upon the predicted noise impact levels, recommendations regarding acoustic treatment have been provided.

2.0 DESCRIPTION OF THE DEVELOPMENT

The parcel of land is described as Lot 3 on DP1191598 and is occupied by a plant nursery that produces edible herbs. A new greenhouse (Greenhouse 2) is located to the western boundary of the site, being a similar construction to the existing Greenhouse 1. The greenhouses are constructed of plastic, and have operable walls and roof to facilitate ventilation. Electric Horizontal Airflow Fans with variable speed drive are suspended above the production area, and operate 24 hours per day, with 4 fixed pedestal fans for improved airflow, and 3 freestanding personal pedestal fans for worker comfort are installed in Greenhouse 1. The fans in each greenhouse are as follows:

GREENHOUSE 1

- 17 Electric Horizontal Airflow Fans;
- 4 Fixed Pedestal Fans;
- 3 Personal Pedestal Fans.

GREENHOUSE 2

- 8 Electric Horizontal Airflow Fans.

The site is bounded by Howards Road to the northeast, agricultural land across Howards Road, with a dwelling immediately adjacent to the north west at 75 Howards Road on Lot 2 on DP848007. The topography of the site and surrounding parcels of land rises up towards the north. For site location refer to Figures 1 and 2 in Appendix A.

Noise testing was conducted in September 2018 of the new greenhouse, which resulted in a further reduction in fan speeds, to reduce noise emissions. A second round of testing in November 2018 of the fans was undertaken, following adjustments to the speed controllers. This second test took into account the additive effects of both Greenhouse 1 and Greenhouse 2.

Noise from operation of the ventilation fan systems in the two greenhouses has been assessed in accordance with the “*NSW Industrial Noise Policy*” to ensure compliance with the Policy. As the dwellings adjacent at 75 Howards Road is the nearest to the subject site, we have focussed on this receiver.

3.0 NOISE SURVEY

3.1 Instrumentation

The following equipment was used to record noise levels:

- Rion NC 73 Calibrator;
- BSWA 309 Sound Level Meter;
- Rion NL 21 Environmental Noise Logger.

All instrumentation used in this assessment hold current calibration certificate from a certified NATA calibration laboratory.

3.2 Background Noise Monitoring Methodology

A logger was located towards the northwestern boundary of the subject site. The microphone was in a free-field location, approximately 1.2m above ground and was chosen to reflect acoustical conditions at the adjacent dwelling. The logger was screened by an onsite shed to the greenhouse building, and fan noise was not audible. Refer to Figure 2 in Appendix A for the logger location.

The logger was set to record noise statistics in 15 minute blocks continually between Friday 17/03/2017 and Friday 22/03/2017. A major weather event occurred during the testing session, and the recorded shut down on the Sunday night. For this reason, we have assessed against the minima background noise levels. All measurements were conducted generally in accordance with Australian Standard AS 1055:1997 – “Acoustics-Description and measurement of environmental noise”. The operation of the sound level logging equipment was field calibrated before and after the measurement session with no significant drift from the reference signal recorded.

3.3 Background Noise Monitoring Results

Table 1 presents the measured noise levels at the logger location. Graphical presentation of the measured levels is in Appendix B. Rating Background Levels (RBLs) were not calculated in accordance with the “NSW Industrial Noise Policy” due to weather effects.

Background Noise	Measured Level L _{A90} dB(A)		
	Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
Friday 17/03/17	34	38	31
Saturday 18/03/17	36	32	23
Sunday 19/03/17	-	-	23
Determined Background	35	30	23

Table 1: Measured background noise levels at the logger location.

It is concluded that the daytime level of 35 dB(A) and evening level of 30 dB(A) are reasonable, and that the night time level of 23 should be adjusted up to 30 dB(A) in accordance with the requirements of the “NSW Industrial Noise Policy” (re: Section 3.1.2, Page 24 of the Policy see Appendix “A” for an extract of the Policy). It is noted that the *Noise Policy for Industry* states that if daytime background noise levels are below 35, then the daytime level be set to 35 dB(A).

The above levels when adjusted to reflect the *Industrial Noise Policy* are below the day and evening and equal to those cited for “Areas with negligible transportation” in Australian Standard AS 1055:1997 – “Acoustics-Description and measurement of environmental noise” (refer to Appendix “A” for an extract of the Standard).

3.4 Fan Noise Measurements

Fan noise levels were recorded at 30m from the dwelling at 75 Howards Road (in accordance with the measurement methodology detailed in Section 2.6 of the Noise Policy for Industry), which was approximately 9m from the nearest point of the greenhouse 2, and 46m from greenhouse 1. The following operational scenarios with Greenhouse 1 (GH 1) and Greenhouse 2 (GH2) were assessed:

Greenhouse 1 & 2, daytime mode. GH1 Horizontal Air Flow Fans at “55% speed” GH2 Horizontal Air Flow Fans at “Speed 3”, Fixed Pedestal Fan and Personal Fans operating Greenhouse 1. Roof/ walls closed.

Greenhouse 1 & 2, daytime mode. GH1 Horizontal Air Flow Fans at “55% speed” GH2 Horizontal Air Flow Fans at “Speed 3”, Fixed Pedestal Fan and Personal Fans operating Greenhouse 1. Roof/ walls open.

Greenhouse 1 & 2, night mode. GH1 Horizontal Air Flow Fans at “20% speed” GH2 Horizontal Air Flow Fans at “Speed 1”, Fixed Pedestal Fan and Personal Fans off. Roof/ walls open.

Greenhouse 1 & 2, night mode. GH1 Horizontal Air Flow Fans at “20% speed” GH2 Horizontal Air Flow Fans at “Speed 1”, Fixed Pedestal Fan and Personal Fans off. Roof/ walls closed.

Photographs of the Fixed Pedestal Fans and Personal Fans are presented in Photograph Sheet 1, attached.

Levels were not recorded at the dwelling to the north at 74 Howards Road, as moving further from the greenhouse resulted in noise levels being affected by extraneous noise typical of the locale (birdsong, wind in vegetation), and levels recorded were unreliable. We have assessed at the dwelling to the north at 74 Howards Road through noise predictions.

Note that to avoid extraneous noise from birdsong, in many cases, the LAmin level has been used. This is a reasonable measure of noise from the fans, as the noise is continuous.

It is concluded that as the fan noise is broadband and continuous in nature, that no corrections are required for tonality or impulsiveness, in accordance with Fact Sheet C of the *Noise Policy for Industry*.

Fan Mode	Measured Level LAeq LAmin dB(A) at 30m from Dwelling at 75 Howards Rd
GH 1 & GH 2 Daytime Mode Walls & Roof Closed	37
GH 1 & GH 2 Daytime Mode Walls & Roof Open	38
Daytime Criteria	40
GH 1 & GH 2 Night Mode Walls & Roof Open	31
GH 1 & GH 2 Night Mode Walls & Roof Closed	30
Evening & Night Criteria	35

Table 3: Measured noise level at 30m from the dwelling at 75 Howards Road.

It is noted that there is little overall noise reduction between the open and closed greenhouse mode, as the building external sheeting is relatively lightweight and has relatively low noise containment properties. There is an audible change in the sound between open and closed, but due to the fact that the sheet materials do control high frequencies (but not lower frequencies).

4.0 NOISE ASSESSMENT CRITERION

For consistency, noise associated with the proposed expansion of the operation has been assessed against the “NSW Industrial Noise Policy”, rather than the current version titled “Noise Policy for Industry” which has been issued since our involvement in this development began. The criteria under the NSW Industrial Noise Policy is as follows:

- Control of intrusive noise impacts – The limit criteria for this assessment is as follows:
 - $L_{Aeq, 15 \text{ min}} \leq \text{rating background level}^1 + 5 \text{ dB}$;
 - Daytime (7am – 6pm Mon-Sat; 8am – 6pm Sun) 40 (RBL 35 + 5) dB(A) L_{eq} ;
 - Evening (6pm – 10pm) 35 (RBL 30 + 5) dB(A) L_{eq} ;
 - Night (remaining periods) 35 (RBL 30 + 5) dB(A) L_{eq} .
- Maintaining noise level amenity for residential premises. This is achieved by ensuring that the proposed development complies with the noise limit criteria set in Table 2.1 of the Policy. If we assume that the area is within a Rural Area (as defined in the Policy), the following applies:

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level, dB(A) <i>(see Note 8 in Section 2.2.1)</i>	
<i>(see Notes in Section 2.2.1)</i>			Acceptable <i>(See Note 11)</i>	Recommended Maximum <i>(See Note 11)</i>
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45

Table 2: Amenity Criterion Prescribed in the New South Wales EPA “Industrial Noise Policy”.

The overall resulting criterion for the development is determined by comparing the amenity and intrusive noise criteria, and applying the lower of the two criteria. From the data and our calculations, the project noise assessment criterion is as follows:

- Daytime (7am – 6pm) 40 dB(A) L_{eq} ;
- Evening (6pm – 10pm) 35 dB(A) L_{eq} ;
- Night (10pm – 7am) 35 dB(A) L_{eq} .

Further to the above, Australian Standard AS2107: 2016 “Acoustics – Recommended design sound levels and reverberation times for building interiors” provides design targets for inside dwellings as follows:

Item	Type of occupancy/activity	Design sound level ($L_{Aeq,d}$) range	Design reverberation time (T) range, s
7	RESIDENTIAL BUILDINGS (see Note 5 and Clause 5.2)		
	Houses and apartments in inner city areas or entertainment districts or near major roads—		
	Apartment common areas (e.g. foyer, lift lobby)	45 to 50	—
	Living areas	35 to 45	—
	Sleeping areas (night time)	35 to 40	—
	Work areas	35 to 45	—
	Houses and apartments in suburban areas or near minor roads—		
	Apartment common areas (e.g. foyer, lift lobby)	45 to 50	—
	Living areas	30 to 40	—
	Sleeping areas (night time)	30 to 35	—
	Work areas	35 to 40	—
	Houses in rural areas with negligible transportation—		
	Sleeping areas (night time)	25 to 30	—

¹ The rating background level is the overall single figure background level representing each assessment period (day/evening/night over the whole monitoring period).

5.0 PREDICTED NOISE IMPACTS

Noise impacts have been assessed at the following receivers:

- 47 Howards Road, to the immediate southeast, approximately 100m from the existing greenhouse. This receiver is on land at the same relative level as the subject site.
- 74 Howards Road, to the north across the road, approximately 150m from the existing greenhouse. This receiver is on land elevated above the subject site.
- 75 Howards Road, to the immediate west, approximately 69m from the existing greenhouse. This is the nearest receiver, on land at the same relative level as the subject site.
- 76 Howards Road, to the east across the road, approximately 100m from the existing greenhouse. This receiver is on land elevated above the subject site.

The impact cited at 75 Howards Road is based upon measured levels, rather than predicted. Our assessment is viewed as a worst case scenario, due to the minimum distance separation applied (the external impact being 30m from the dwelling to the nearest point of the greenhouses), and assuming open windows for assessment of noise intruding inside dwellings. No screening in our prediction modelling has been included from buildings. Due to the close proximity to 75 Howards Road, we have not applied meteorological effects that affect noise propagation to that receptor.

An example calculation is attached to this report.

We predict the following impacts with all fans in both greenhouses in operation under both operational “Daytime” and “Night” speeds and configurations, with the greenhouses in “open” and “closed” roof / wall configuration (refer to Section 3.4 for fan speed information). We have also included assessment criteria under the *Industrial Noise Policy* (external impact), and levels inside dwellings from Australian Standard AS2107: 2016 “*Acoustics – Recommended design sound levels and reverberation times for building interiors*”.

Predicted External Impact Level, Shed Open SPL dB(A) Leq		
Receiver Location	Day Mode	Night Mode
30m from Dwelling 47 Howards Rd	34	27
30m from Dwelling 74 Howards Rd	28	21
30m from Dwelling 75 Howards Rd	38	31
30m from Dwelling 76 Howards Rd	26	19
Criteria	40	35
Predicted Indoor Impact Level, Shed Open SPL dB(A) Leq		
Receiver Location	Day Mode	Night Mode
Inside Dwelling 47 Howards Rd	28	21
Inside Dwelling 74 Howards Rd	21	14
Inside Dwelling 75 Howards Rd	25	18
Inside Dwelling 76 Howards Rd	20	13
Criteria	30 - 40	25 - 30

Table 3: Predicted Noise Impact Levels at External Receiver and Inside Dwellings, with Greenhouse Roof/ Walls Open.

Predicted External Impact Level, Shed Closed SPL dB(A) Leq		
Receiver Location	Day Mode	Night Mode
30m from Dwelling 47 Howards Rd	33	26
30m from Dwelling 74 Howards Rd	27	20
30m from Dwelling 75 Howards Rd	37	30
30m from Dwelling 76 Howards Rd	25	18
Criteria	40	35
Predicted Indoor Impact Level, Shed Closed SPL dB(A) Leq		
Receiver Location	Day Mode	Night Mode
Inside Dwelling 47 Howards Rd	28	21
Inside Dwelling 74 Howards Rd	21	14
Inside Dwelling 75 Howards Rd	25	18
Inside Dwelling 76 Howards Rd	20	13
Criteria	30 - 40	25 - 30

Table 4: Predicted Noise Impact Levels at External Receiver and Inside Dwellings, with Greenhouse Roof/ Walls Closed.

6.0 RECOMMENDED ACOUSTIC TREATMENTS

To ensure compliance with the noise limits, the following is recommended:

GREENHOUSE 1 (Eastern Greenhouse)

- During the evening and night period (between 6pm to 7am), all HAF fans may be in operation if run at VSD speed setting “20%”.
- During the day period (between 7am to 6pm), all HAF fans may be in operation if run at VSD speed setting “55%”.
- The HAF fans be controlled using a timer to control the different day and evening/night speeds.
- The HAF fan controller must hold the programming in the event of a power failure.
- The HAF fan controller settings must not be allowed to be altered without further acoustical assessment.
- The Fixed Pedestal Fan and Personal Fans may be used during the day period on “Low” speed setting (between 7am to 6pm).
- The Fixed Pedestal Fan and Personal Fans may be used during the day period on “Low” to “Medium” speed setting (between 7am to 6pm).

GREENHOUSE 2 (Western Greenhouse)

- During the evening and night period (between 6pm to 7am), all HAF fans may be in operation if run at speed setting “1”.
- During the day period (between 7am to 6pm), all HAF fans may be in operation if run at speed setting “3”.
- The HAF fans be controlled using a timer to control the different day and evening/night speeds.
- The HAF fan controller must hold the programming in the event of a power failure.
- The HAF fan controller settings must not be allowed to be altered without further acoustical assessment.
- No Fixed Pedestal Fan and Personal Fans may be used.

7.0 DISCUSSION & CONCLUSION

This report is further to our previous assessments and is required to assess the impacts from a new greenhouse located to the northwestern part of the Nursery site. This assessment takes into account the additive effect of both Greenhouses being in operation.

Subject to the recommended fan speeds and numbers being operated, noise from the ventilation system in the existing greenhouse will meet the determined noise limits of 35 dB(A) L_{eq} at night, and 40 dB(A) L_{eq} in the daytime.

We have also considered the benefits in construction of acoustical barriers, and note that for a barrier to be effective, it would need to be greater than 3m in height, as the HAF fans are elevated in the greenhouses. We also of the opinion that the barriers are not required to control noise from the fans, as through limiting speeds, the noise output can be accordingly reduced to acceptable levels.

Overall, assuming that the fans are controlled in accordance with the recommendations in Section 6 of this report, noise from operation of the two Greenhouses will comply with the requirements of the New South Wales EPA “*Industrial Noise Policy*”.

Report Compiled By:



JAY CARTER BSc
Director

APPENDIX A

Subject Site Location and Surrounds

Figure No. 1: Subject Site Location (Google Maps).

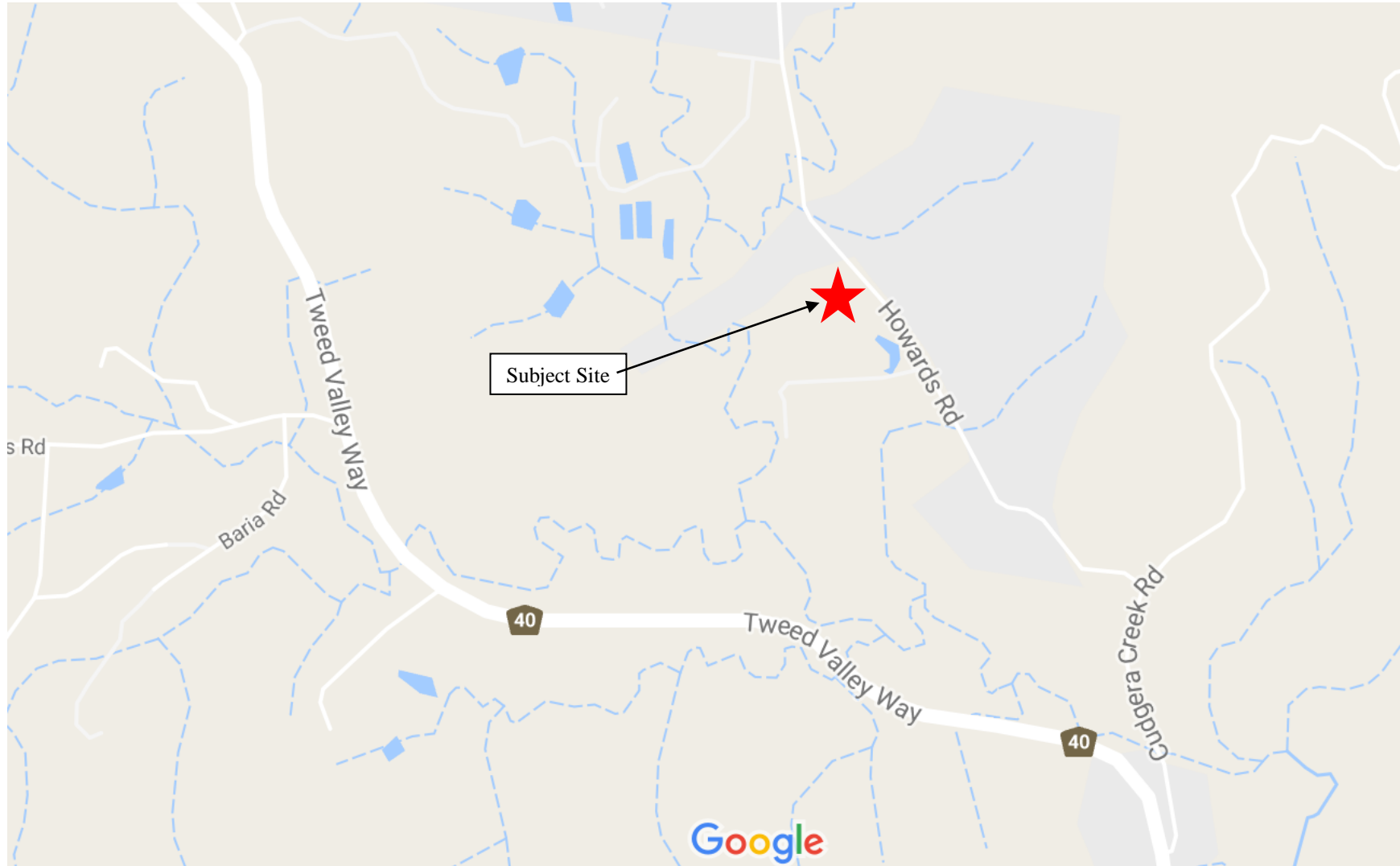
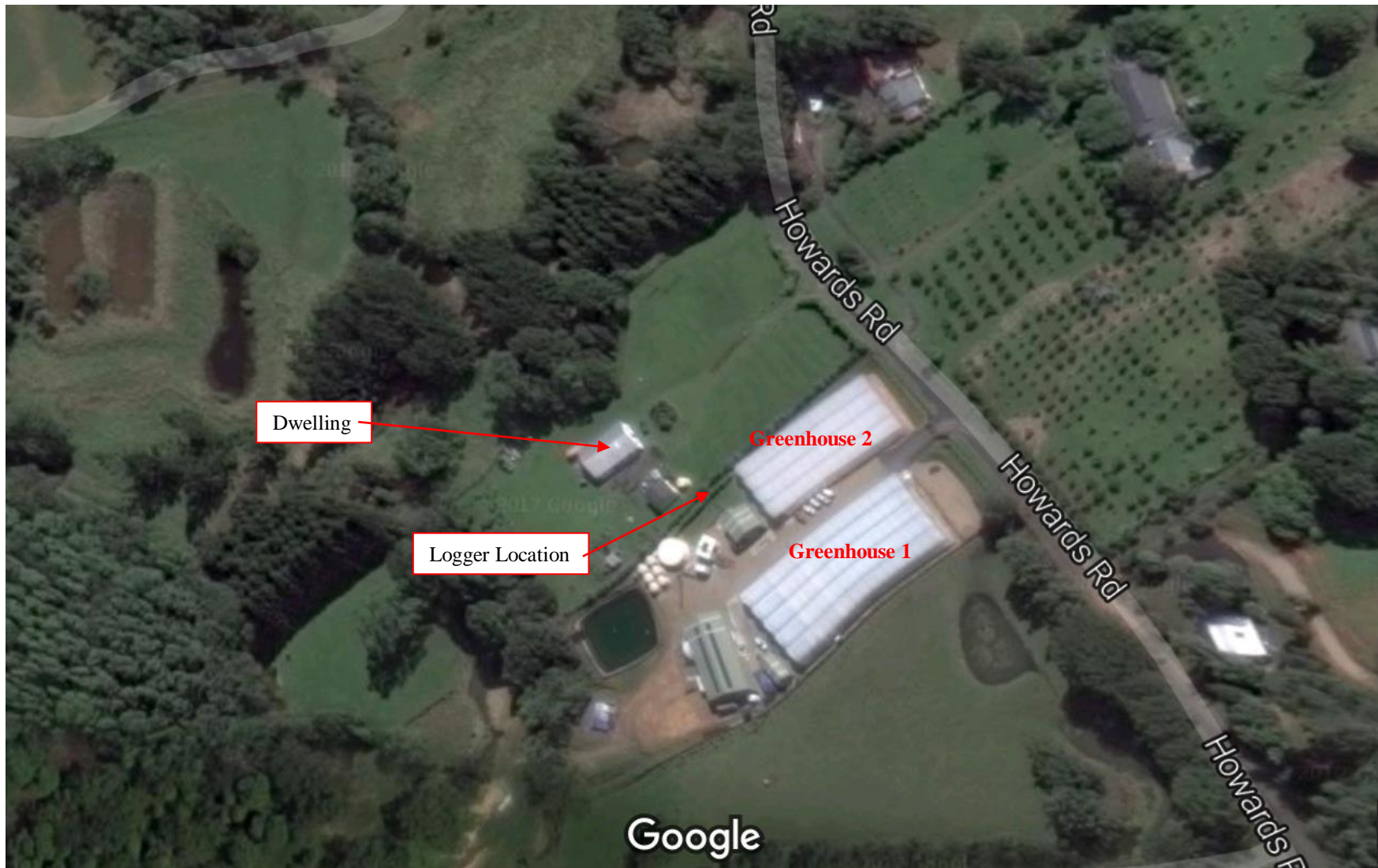


Figure No. 2: Subject Site, Surrounding Environs and Logger Location (Google Maps).



Photograph Sheet 1



Photograph 1: HAF fans installed in the facility



Photograph 2: Personal Fan



Photograph 3: Fixed Pedestal Fan

Extract from Australian Standard AS 1055:1997 – “Acoustics-Description and measurement of environmental noise”.

APPENDIX A
ESTIMATED AVERAGE BACKGROUND A-WEIGHTED SOUND PRESSURE LEVELS ($L_{A90,T}$) FOR DIFFERENT AREAS CONTAINING RESIDENCES IN AUSTRALIA

(Informative)

This Appendix may only be used as a guideline. Whenever possible values of $L_{A90,T}$ shall be measured in accordance with Clause 4.2.1. Where the measured values are obtainable, this Appendix shall not be used.

Noise area category (Notes 1 and 2)	Description of neighbourhood	Average background A-weighted sound pressure level, $L_{A90,T}$					
		Monday to Saturday			Sundays and public holidays		
		0700–1800	1800–2200	2200–0700	0900–1800	1800–2200	2200–0900
R1	Areas with negligible transportation	40	35	30	40	35	30
R2	Areas with low density transportation	45	40	35	45	40	35
R3	Areas with medium density transportation or some commerce or industry	50	45	40	50	45	40
R4	Areas with dense transportation or some commerce or industry	55	50	45	55	50	45
R5 (See Note 3)	Areas with very dense transportation or in commercial districts or bordering industrial districts	60	55	50	60	55	50
R6 (See Note 3)	Areas with extremely dense transportation or within predominantly industrial districts	65	60	55	65	60	55

NOTES:

- 1 The division into noise area categories is necessary in order to accommodate existing sound levels encountered at residential sites in predominantly commercial or industrial districts, or in areas located close to main land transport routes, i.e. road and rail.
- 2 The noise area category most appropriate should be selected irrespective of metropolitan or rural zoning and will vary from location to location.
- 3 Some industrial and commercial sites are not predominant sources of high background sound levels.

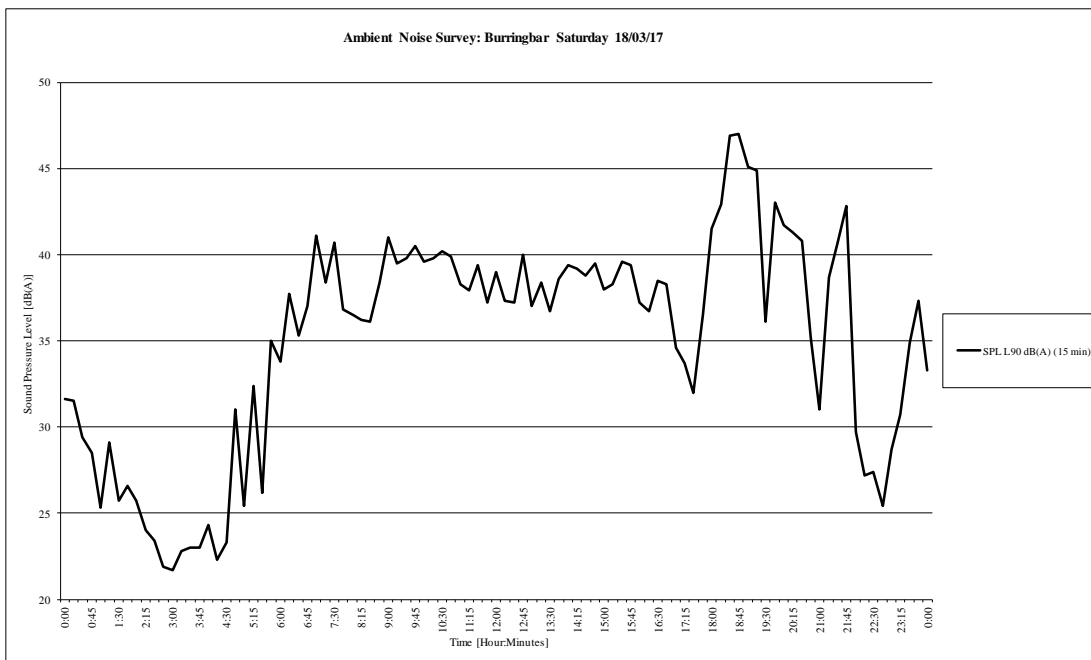
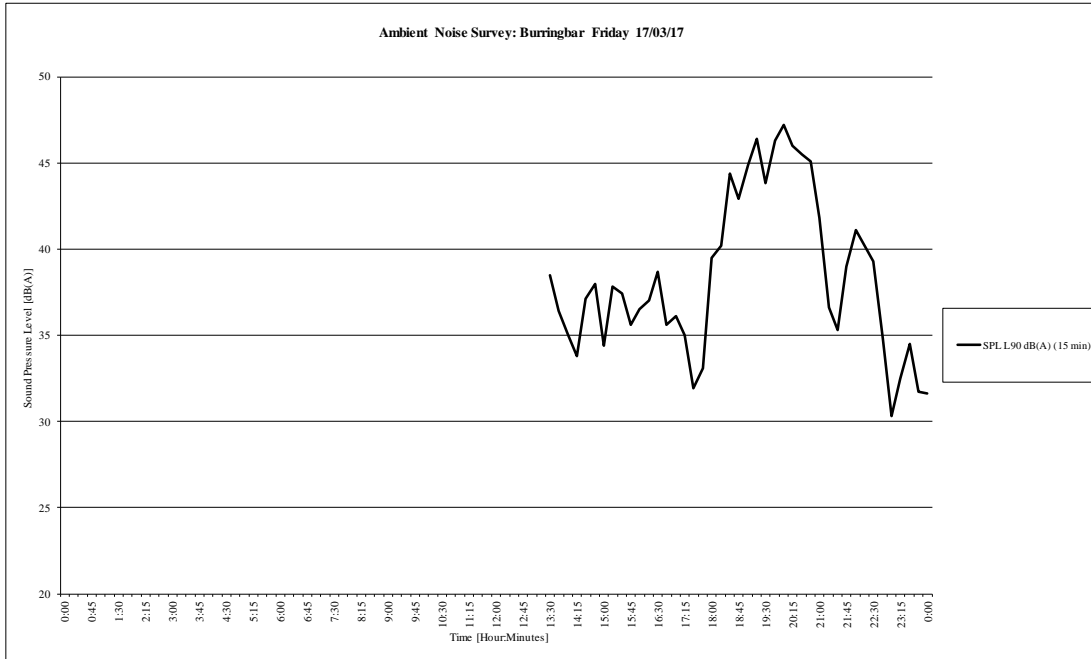
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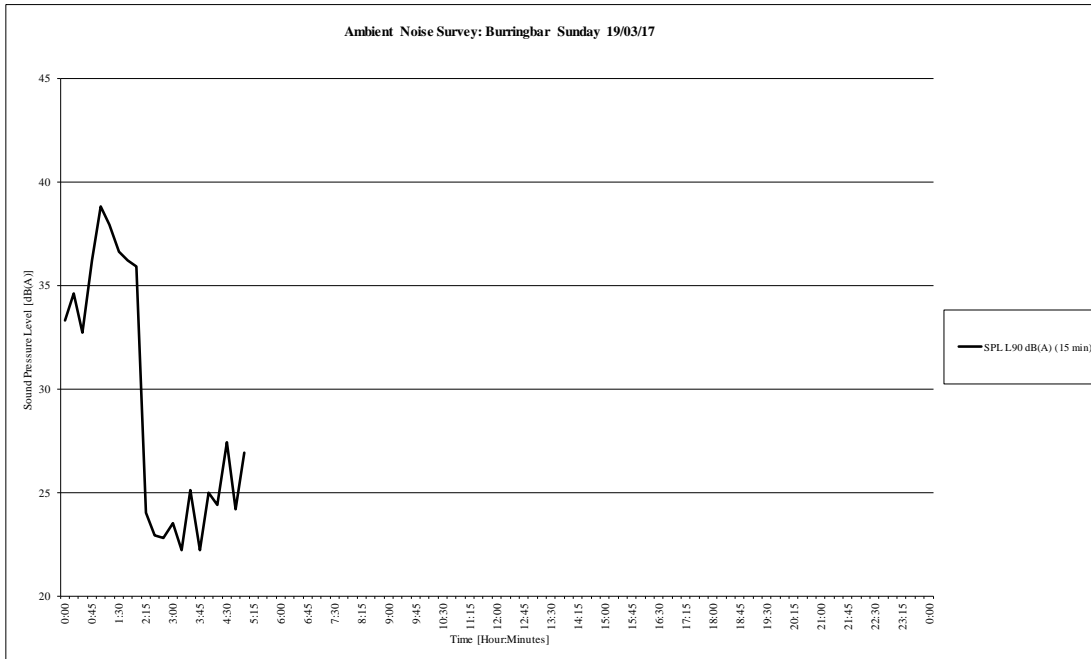
Extract from Section 3.1.2, Page 24 of the Industrial Noise Policy

Rating background level (RBL)—the overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). The rating background level is the level used for assessment purposes. Where the rating background level is found to be less than 30 dB(A), then it is set to 30 dB(A).

APPENDIX B

Measurement Results





Source level			
Day Mode Roof / Walls Open	38 dB(A)	at 9m	
Night Mode Roof / Walls Open	31 dB(A)	at 9m	
Distance to 47 Howards Rd	80 m		
Distance attenuation	-6 dB(A)		
Weather correction	2 dB(A)		
Impact at dwelling Day Mode	34 dB(A)		
Impact at dwelling Night Mode	27 dB(A)		
Distance to 74 Howards Rd	71 m		
Distance attenuation	-12 dB(A)		
Weather correction	2 dB(A)		
Impact at dwelling Day Mode	28 dB(A)		
Impact at dwelling Night Mode	21 dB(A)		
Distance to 75 Howards Rd	9 m		
Distance attenuation	0 dB(A)		
Weather correction	0 dB(A)		
Impact at dwelling Day Mode	38 dB(A)		
Impact at dwelling Night Mode	31 dB(A)		
Distance to 76 Howards Rd	103 m		
Distance attenuation	-14 dB(A)		
Weather correction	2 dB(A)		
Impact at dwelling Day Mode	26 dB(A)		
Impact at dwelling Night Mode	19 dB(A)		