Lochard Energy

JANUARY 2023

Winton Energy Reserve 1 Facility

Noise Impact Assessment

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Winton Energy Reserve 1 Facility
Noise Impact Assessment

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WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Executive summary

WSP Australia Pty Ltd (WSP) has been engaged to undertake an operational noise impact assessment for the Energy Reserve 1 Facility (the Project) at 386 Lee Road, Winton, Victoria.

The Project proposes to develop a power station that will utilise hybrid technology including Lithium-Ion (Li-Ion) batteries and fast-start high-efficiency dual-fuel gas reciprocating engines.

Operational noise limits have been set in line with *EPA 1826 - Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (EPA 1826) with the potential for annoyance from low-frequency noise considered in line with *Noise Policy for Industry, NSW EPA 2017* (NPfI).

Noise Sensitive Areas (NSAs) in the form of residential properties were identified within 1km distance from the Project. A site survey was carried out to establish the existing background noise levels at two NSAs surrounding the facility using unattended noise loggers. The results of the survey were used to set noise limits in accordance with EPA 1826. Meteorological data has been analysed to consider the frequency of noise-enhancing weather conditions occurring at the Project site.

Operational Noise Impact Assessment

The potential for noise generated by the combined operation of the Project has been assessed, which involves Battery Energy Storage Systems (BESS) and Gas-fired Power Generation (GPG) operating simultaneously.

Two different Battery Energy Storage Systems (BESS); a Fluence system and a Tesla system, have been assessed separately. The noise source of the BESS is primarily controlled by the thermal system, specifically dominated by the fan tip speed of the cooling fans. The expected fan speed and associated sound power level of the cooling fans is dependent on ambient temperatures and discharge profiles. Conservative thermal operation scenarios have been adopted for the day and night periods of the assessment, which have been based on proprietary supplier data of worst-case ambient heat modelling.

The GPG is predicted to be the dominant noise source when considering operation of all noise sources on site, >10dB above the predicted noise levels from the combined BESS operation. Therefore, the predicted contribution from the BESS operation is considered acoustically negligible in comparison to the GPG emissions. Results have been itemised in Section 4.2 for clarity of predicted noise output from each plant item.

Results and Discussion Summary

Predicted noise levels generated by either BESS system is >10 dB below the operational noise limits at the nearest NSAs and therefore does not contribute to any exceedances.

Noise levels from GPG are predicted to exceed at all receivers during all periods without at-source noise mitigation controls, with an exceedance of up to 43 dB at the most impacted receiver (R2) during the most stringent period (night).

The following at-source noise mitigation treatments are recommended for the GPG plant to reduce predicted noise impacts to comply with EPA operational noise criteria:

- The building fabric of the engine hall (all walls and roof sections) is to be constructed of a pre-fabricated masonry panel, such as Speed panel (400 kg/m^3). The internal walls and roof are to be lined with 50mm of rockwool insulation (60 kg/m^3) with perforated steel sheeting.
- The exhaust gas stacks and intake air filters are to be fitted with high-performance silencers to achieve the sound power levels outlined in Table 4.2.
- All associated engine radiators are to be fitted with low-noise fans to achieve the sound power levels outlined in Table 4.2.

Identified risks and constraints, including recommended further studies, are outlined in Section 4.3.

1 Introduction

1.1 Project description

Lochard Energy (Iona Operations) Pty Ltd, an energy infrastructure company based in Australia, is seeking to develop the land for an energy hub at 386 Lee Road, Winton (the subject site). The proposed energy hub is known as Winton Energy Reserve 1 facility (the project).

The project will utilise hybrid technology with Li-Ion batteries and fast-start high-efficiency duel-fuel gas reciprocating engines and will comprise:

- A 200-megawatt (MW) Gas-Powered Generator (GPG) facility and adjoining ~200 metre (m) gas pipeline including metering station.
- A Battery Energy Storage System (BESS) facility. The BESS facility will supply and absorb 200MW real power with 400-megawatt-hour (MWh) energy storage capacity.
- A single electrical substation for both battery and GPG which then feeds into the local network.
- A ~3 kilometre (km) 220-kilovolt (kV) underground transmission line from the Glenrowan Terminal Station (GTS) to the subject site. The transmission line will cross the Hume Freeway and follow the existing AusNet easement northwest from the GTS. It will then head east within the road reserve of Lee Road before entering the subject site

The project is located approximately 9 km north east of Benalla and 175 km north east of Melbourne within the Rural City of Benalla (Local Government Area). A concept layout plan for the project is provided at Figure 1.1

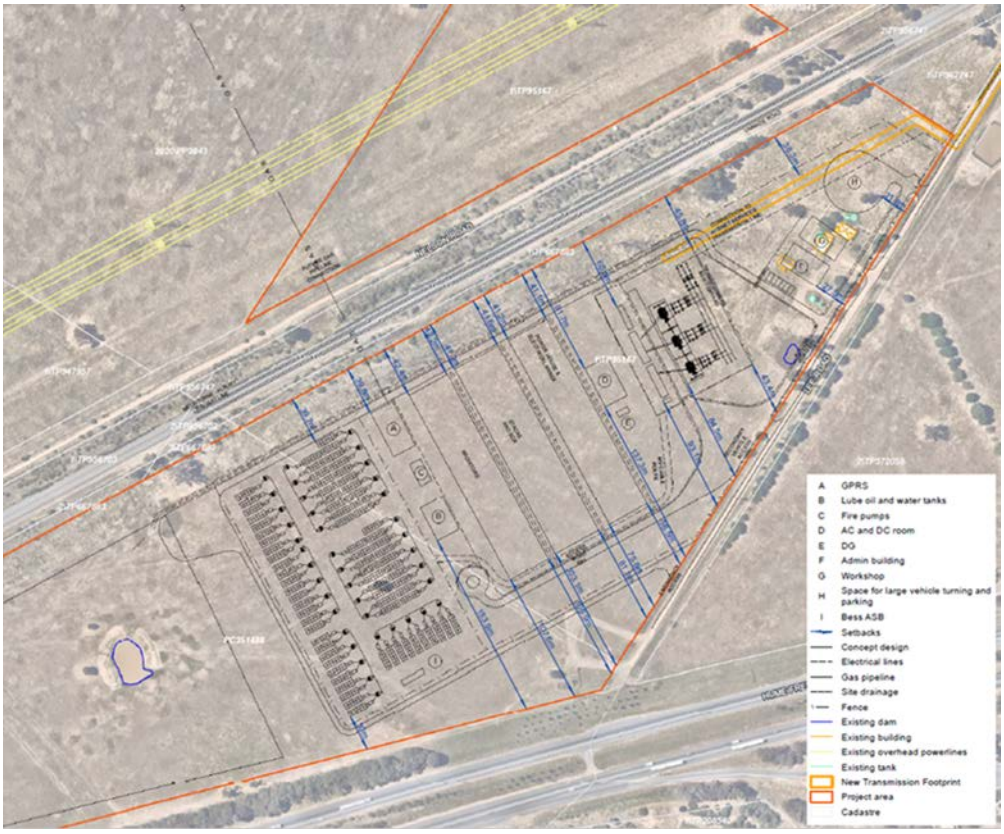

Figure 1.1 – Concept layout plan

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1.2 Purpose of this assessment

This noise impact assessment covers the following aspects:

- Undertake ambient noise monitoring at sensitive localities in the area surrounding the site in accordance with *AS1055.1-2018 Acoustics – Description and measurement of environmental noise* (AS 1055) and *EPA 1826 - Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (EPA 1826).
- Provide a review of long-term meteorological observation data from the nearest Bureau of Meteorology (BoM) observation site to gain an understanding of the prevailing noise propagation conditions at the site.
- Establish operational noise limits for the facility in accordance with EPA 1826.
- Using provided Sound Power Levels (SWLs) of plant items, create a 3D noise model of the proposed Site, which will calculate predicted Sound Pressure Levels (SPLs) at the nearest NSAs and produce noise contours.
- Assess predicted SPLs at the nearest NSAs according to EPA 1826, including consideration of meteorological conditions and modifying factors such as low frequency noise.
- Provide high level advice and recommendations for noise mitigation treatments where required.

2 Existing Environment

NSAs have been identified in proximity to the proposed facility.

The prevailing background and ambient noise levels surrounding the site were determined through a combination of unattended and operator attended noise surveys in accordance with AS 1055 and EPA 1826.

2.1 Noise sensitive areas

The Project has the potential to impact nearby properties that are considered sensitive to noise.

Receivers potentially sensitive to noise (aka NSAs) have been identified in the area surrounding the facility in line with EPA 1826. These NSAs are listed in Table 2.1 and presented in Figure 2.1.

Table 2.1 Classification of representative NSA receivers.

RECEIVER ID	RECEIVER TYPE	ADDRESS	APPROXIMATE DISTANCE TO PROPOSAL
R1	Residential	21 Bowers Road, Winton	1200 m
R2	Residential	255 Winton-Glenrowan Road, Winton	800 m
R3	Residential	168 Winton-Glenrowan Road, Winton	1600 m

2.2 Noise monitoring locations

Two noise monitoring locations were chosen to characterise the existing noise environment at representative receivers R1 and R2 on either side of the proposed facility, presented in Table 2.2 and shown in Figure 2.1.

Table 2.2 Noise monitoring locations

NOISE MONITORING LOCATION	RECEIVER ID	SURVEY METHOD	ADDRESS
NM01	R1	Unattended measurement / Attended measurement	21 Bowers Road, Winton
NM02	R2	Unattended measurement / Attended measurement	255 Winton-Glenrowan Road, Winton

2.3 Instrumentation and quality control

The monitoring equipment was fitted with windshields and were field calibrated before and after monitoring. No significant drifts in calibration (± 0.5 dB) were noted.

All the monitoring equipment has a current certified calibration certificate (National Association of Testing Authorities, NATA) at the time of use. Details of all equipment used to conduct the noise survey are presented in Table 2.3. Copies of the calibration certificates can be provided upon request.

Table 2.3 Noise monitoring equipment

LOCATION	SURVEY METHOD	MANUFACTURER AND MODEL NO.	SERIAL NO.	DATE OF CALIBRATION
NM01	Unattended measurement	Rion NL-42	296510	09/06/2021
NM02	Unattended measurement	NTI-XL2	18160	20/12/2020
NM01 and NM02	Attended measurement	NTI-XL2	18160	20/12/2020

2.4 Unattended noise survey

Unattended noise monitoring was carried out by WSP between 16 September 2021 and 27 September 2021 at NM01 and NM02, to capture background noise levels in the vicinity of the proposed facility

Analysis of the BoM's 30 minute weather data for Wangaratta Aerodrome during the monitoring period indicated that conditions were generally dry with some periods of high winds (greater than 5m/s) which have been excluded from this assessment.

The results are summarised in Table 2.4 and detailed daily plot of data are presented for NM01 and NM02 in Appendix A.

Table 2.4 Summary of unattended noise monitoring results

LOCATION	MEASURED AVERAGE BACKGROUND NOISE LEVELS L_{90}, dBA TIME PERIOD		
	DAY	EVENING	NIGHT
NM01	47	47	42
NM02	46	46	43

2.5 Operator attended noise survey

WSP carried out operator attended measurements to characterise the noise environment and identify the contributors to the acoustic environment. Attended measurements were carried out at NM01 and NM02 on 16 September 2021.

At NM01 and NM02, the background noise and prevailing noise environment were characterised by vehicle traffic travelling along the Hume Freeway. It is noted that the rail freight line to the north of NM01 has line of sight to the receiver however no train passbys were observed during the attended survey. The landowner at NM02 noted that the Winton Motor Raceway was a significant source of noise at the receiver when in use, however the raceway was not in operation during the attended survey.

During the surveys, the weather was noted as being dry with no wind and suitable for noise monitoring.

The results of the attended noise surveys and observations are detailed in Table 2.5.

Table 2.5 Summary of attended noise measurement results

LOCATION	TIME	AMBIENT NOISE LEVEL dBA $L_{EQ(15MIN)}$	BACKGROUND NOISE LEVEL dBA $L_{90(15min)}$	OBSERVATIONS
NM01	12:30 pm to 12:45 pm	49	45	The background noise at the site was dominated by vehicle traffic along the Hume Freeway. Intermittent natural noises were present during the survey. A freight rail line was noted ~450m to the north of the receiver, however no passbys were recorded during the survey.
NM02	1:15 pm to 1:30 pm	52	45	The background noise at the site was dominated by vehicle traffic along the Hume Freeway. Intermittent natural noises were present during the survey. The Winton Motor Raceway is located ~500m to the south-west of the receiver, however the raceway was not in operation during the survey.

2.6 Noise enhancing meteorological conditions

Certain meteorological conditions such as wind and temperature inversions can allow sound to travel further in the right conditions, increasing noise levels at sensitive receivers. The frequency of these meteorological conditions has been considered in accordance with the NSW EPA's 2017 Noise Policy for Industry (NPfI).

2.6.1 Frequency of temperature inversions

To determine whether the meteorological conditions in the surrounding environment are noise-enhancing, the Pasquill-Gifford stability classification scheme was used as per Fact Sheet D of the NPfI. This assessment utilises cloud cover, wind speed and solar elevation measurements to determine the noise-enhancing significance of the surrounding environment. The Pasquill-Gifford stability classification scheme classifies cloud cover into seven stability categories named from A to G. Where F and G stability categories occur at least 30% of the time at night during winter (when temperature inversions occur most frequently), the project area is considered to be significantly affected by temperature inversions, warranting noise-enhancing meteorological conditions for the noise assessment.

Cloud cover and wind speed data from Wangaratta Aerodrome weather station, recorded over 3-hour intervals between 1 June 2021 and 31 August 2021, was used to assess the count of time periods which fell under each of the seven stability categories outlined above. Table 2.6 below presents the results of this assessment.

Table 2.6 Count of night-time winter periods experiencing given meteorological conditions

WIND SPEED	TIME PERIODS COUNT	
	≥ 4/8 CLOUD COVER	≤ 3/8 CLOUD COVER
< 2	160 (F)	18 (G)
2-3	65 (E)	10 (F)
3-5	60 (D)	11 (E)
5-6	16 (D)	1 (D)
> 6	17 (D)	0 (D)

Note: The stability class for each wind speed/cloud cover combination is noted in brackets

The total number of time periods classified as category F or G accounts for 40.9% of all night-time periods sampled in winter. As this exceeds the 30% threshold, the project area is considered to be significantly affected by temperature inversions, warranting noise-enhancing meteorological conditions for the noise assessment.

2.6.2 *Frequency of winds*

Winds which could enhance noise are defined as being between 0.5m/s and 3.0m/s in the direction of the receiver from the noise source ± 45°. Where these conditions occur for more than 30% of any time period, noise-enhancing wind conditions will be adopted for the assessment.

The significance of windspeeds was assessed as per Section D2 of NPfI's Fact Sheet D. The NSW EPA's Noise Enhancement Wind Analysis (NEWA) Program was used to determine the significance of wind conditions based on one year of meteorological data from Wangaratta Aerodrome weather station, recorded over 3 hour intervals between 1 January 2021 and 20 January 2022.

Following NPfI guidelines, data of wind speed and direction is organised into their respective seasons and Day/Evening/Night periods. The percentage of noise-enhancing winds for each time period for each receiver are detailed in Table 2.7 below. As shown, no single period experiences noise-enhancing wind conditions 30% of the time or greater, noise-enhancing wind conditions have not been adopted for the assessment.

Table 2.7 Frequency of Noise-enhancing Meteorological Conditions at nearby Residential Receivers

RECEIVER	**SEASON**	**FREQUENCY OF NOISE-ENHANCING WIND CONDITIONS (%)**		
		DAY (7AM-6PM)	EVENING (6PM-10PM)	NIGHT (10PM-7AM)
R1 (21 Bowers Road, Winton)	Summer	7.3	7.3	23
	Autumn	14.5	23.9	18.2
	Winter	8.7	21.7	19.6
	Spring	10.7	16.5	24.2
R2 (255 Winton-Glenrowan Road, Winton)	Summer	10	13.8	5.2
	Autumn	15.1	5.7	3.8
	Winter	18.8	4.3	11.2
	Spring	13.2	11	5.5
R3 (168 Winton-Glenrowan Road, Winton)	Summer	10.7	14.7	5.5
	Autumn	13.1	3.4	2.3
	Winter	17.9	8.7	13.4
	Spring	14.8	7.7	5.9

3 Operational noise criteria

Noise limits for the Project have been derived in line with EPA 1826. These limits are informed by background noise measurements undertaken and summarised in Section 2.

Low frequency trigger levels outlined in the NPfI have been adopted to provide context around the potential for low frequency noise impacts at nearby sensitive receivers.

3.1 Environmental Noise Emissions (EPA 1826)

EPA 1826 is the applicable legislative document for the assessment of environmental noise from commercial, industrial, and trade premises within Victoria, both in metropolitan areas and regional Victoria. As the Project and identified NSAs are located outside a metropolitan area, the rural noise limit method will apply.

The protocol prescribes a methodology to determine noise limits to protect people from noise emissions from the Project. It particularly refers to noise emissions that may affect normal domestic or recreational activities, such as sleep during the night period.

Definitions adopted by EPA 1826 are outlined in Section 5.3 (Noise) of the *Environment Protection Regulations* (EPR), which is subordinate legislation to support the *Environment Protection Act 2017*.

A Noise Sensitive Area (NSA) is defined in the EPR as that part of the land within the apparent boundaries of any piece of land, which is within a distance of 10m outside the external walls of a noise sensitive building (such as residential buildings or building with similar types of accommodation, and sensitive educational uses). The noise limits are to be determined for the noise sensitive area that may be the worst affected by noise emitted from the proposed development.

The EPA 1826 method for setting noise limits in rural areas is based on:

- The time of day: different noise limits apply for different periods of the day, i.e. day, evening and night.
- Distance adjusted zoning levels: calculated based on the relevant planning scheme zoning designations and adjusted to account for distance between the noise generating zone and the receiving zone.
- The background noise level (L_{A90}): the measured background noise level within the noise sensitive area (or a derived point), in the absence of noise from commercial, industrial or trade operations.

Noise from the source under consideration is measured (or predicted) to determine its equivalent sound level over a continuous 30-minute period. Adjustments to the measured noise level are applied to account for the effects of duration, tonality and impulsiveness to determine the effective noise level. Different limits are applicable for different times of the day. Time periods defined by the EPR are presented in Table 3.1.

Table 3.1 Time Period Definitions

WEEKDAY	TIME PERIOD		
	DAY	EVENING	NIGHT
Monday to Saturday	0700 to 1800 hours	1800 to 2200 hours	2200 to 0700 hours
Sundays and Public Holidays	-	0700 to 2200 hours	

3.1.1 Noise limits – Rural Area Method

Noise limits have been established in accordance with EPA 1826 Part I.A.2 *Noise Limits – Rural Area Method*. The noise limit depends on a zoning level adjusted to account for distance between source and receiver and a background noise level check. The noise limit for each noise sensitive area is determined by comparing the distance adjusted zoning levels and background noise levels as follows:

- Day - the greater of:
  - the distance-adjusted level
  - the day background level plus 8 dB
- Evening - the greater of:
  - the distance-adjusted level
  - the evening background level plus 5 dB
- Night - the greater of:
  - the distance-adjusted level
  - the night background level plus 5 dB

  Noise limits for the night period must not be greater than 55 dB(A)

The established noise limits applicable to noise emissions from the proposed development at surrounding noise sensitive areas are presented in Table 3.2 and Table 3.3. Noise limits set for R2 are considered representative of R3.

Table 3.2: Noise Limits – R1, 21 Bowers Road, Winton

DESCRIPTOR	NOISE LIMITS		
	DAY	EVENING	NIGHT
Distance Adjusted Zoning Level, dBA	44	39	34
Background Level Check L_{A90}, dBA	55	52	47
Noise Limit, $L_{Aeq,30min}$ dBA	**55**	**52**	**47**

Table 3.3: Noise Limits – R2, 255 Winton-Glenrowan Road, Winton

DESCRIPTOR	NOISE LIMITS		
	DAY	EVENING	NIGHT
Distance Adjusted Zoning Level, dBA	46	41	36
Background Level Check L_{A90}, dBA	54	52	48
Noise Limit, $L_{Aeq,30min}$ dBA	**54**	**52**	**48**

3.2 Low frequency trigger

To appropriately assess noise from the facility, the potential for adverse impacts from Low Frequency Noise (LFN) should be considered. Low-frequency noise is typically considered in terms of C-weighted decibels (dBC) as this weighting includes more energy at low frequencies than the A-weighting. Currently, there are no regulatory criteria to assess LFN in Victoria.

Typically, where industrial projects with LFN risks are identified, the NPfI is adopted as it documents a specific low frequency noise assessment procedure. From this document, the presence of a low frequency noise characteristic is defined as '*A difference of 15 dB or more between C and A-weighted measurements identifies the potential for an unbalanced spectrum and potential increased annoyance.*' This trigger shall be considered for this assessment to identify potential annoyance from LFN.

4 Operational noise assessment

The Project includes noise generating plant associated with the Battery Energy Storage System (BESS) and Gas-fired Powered Generation (GPG). This noise generating plant introduces the risk of noise to nearby NSAs during operation of the site. An assessment has been undertaken to quantify potential noise impacts and provide mitigation recommendations where required.

4.1 Noise modelling methodology

To determine the noise emissions from the proposed facility, a noise model was prepared using SoundPLAN 8.2 implementing the CONCAWE[1] calculation method.

A three-dimensional representation of the physical environment surrounding the proposed facility site was modelled. The model considers the distance between noise sources and receivers, geometrical spread of noise (divergence), atmospheric absorption, ground absorption effects, meteorological effects, barriers and in-plant screening, and reflections from surfaces.

The following assumptions were used in the modelling:

- Topography for the area has been sourced from *Elvis - Elevation and Depth - Foundation Spatial Data* at 10m intervals
- A ground absorption factor of 0.75.
- Receivers are located where the maximum effective noise level occurs within an NSA at 1.5 metres above ground level.
- Noise-enhancing meteorological conditions have been adopted as outlined in Section 2.6 (F/G class temperature inversions during night, and D class temperature inversions during day/evening).

4.1.1 Noise source levels

The noise source levels for the BESS and GPG systems are outlined in the following section.

Equipment selections and system layouts are yet to be finalised. Therefore, Sound Power Level (SWL) data has been based on indicative plant selections and layout. Furthermore, at this stage of the design, indicative octave band data is only available for the gas-powered generation plant. Hence, the potential for low-frequency noise impacts has only been assessed for gas-powered generation. Further acoustic study should be undertaken during the detailed design of the facility to refine the predicted noise levels and identify low-frequency/tonal and modulation impacts.

4.1.1.1 Battery Energy Storage Systems (BESS)

Two different Battery Energy Storage Systems (BESS), a Fluence system and a Tesla system, have been assessed separately. The modelled Fluence system contains 912 cube battery enclosures, 76 inverters, 40 MV Transformers, and one HV Transformer. There are 76 battery racks in the Fluence system with each containing 12 cube battery enclosures and an inverter. An MV transformer serves two racks.

The modelled Tesla Megapack system contains 192 battery packs, 53 MV Transformers, and one HV Transformers. Each MV Transformer serves 4 battery packs.

[1] CONCAWE, The Propagation of Noise from Petrochemical Complexes to Neighbouring Communities, CJ Manning 1981

The noise source of the Tesla Megapacks is controlled by the thermal system, specifically dominated by the fan tip speed of the cooling fans located at the top of the Megapack structure. The expected fan speed and associated sound power level of the cooling fans is dependent on ambient temperatures and discharge profiles. Conservative thermal operation scenarios have been adopted for the day and night periods.

Noise sources have been modelled at 2 metres above the ground. The noise source levels for plant items associated with the site are summarised in Table 4.1. It is noted that the exact layout and selection of equipment has not been finalised and as such, further acoustic study should be undertaken during the detailed design of the facility.

Table 4.1 BESS plant item sound power levels

NOISE SOURCE	PROVIDED NOISE SOURCE LEVEL	ADOPTED $L_{eq,\ 30min}$ SOUND POWER LEVEL	COMMENTS
FLUENCE system			
Battery pack system	71 dBA per cube battery	71 dBA per cube battery	Assuming a Fluence Gen 6 Cube Battery Enclosure
Inverter	<79 dBA at 1m	86 dBA	Assuming a Freemaq Multi PCSK inverter
MV Transformer (6MVA)	-	78 dBA	Estimated as outlined in Chapter 11 of *Engineering Noise Control* (Bies & Hansen, 2003)
HV Transformer (220MVA)	-	107 dBA	Maximum allowable noise level as per *AS2374-2003: Power transformers Minimum Energy Performance Standard (MEPS) requirements for distribution transformers*
Tesla Megapack system			
Tesla Megapack (daytime thermal load)	80.8 dBA at 20% fan speed 85.6 dBA at 40% fan speed	86 dBA	— 50°C ambient case — 250MW discharge for 30 mins — Fan speed 5 mins at 20%, 25 mins at 40%
Tesla Megapack (nighttime thermal load)	80.8 dBA at 20% fan speed	81 dBA	— 35°C ambient case — 300MW discharge for 30 mins — Fan speed at 20%
MV Transformer (6MVA)	-	78 dBA	Estimated as outlined in Chapter 11 of *Engineering Noise Control* (Bies & Hansen, 2003)
HV Transformer (220MVA)	-	107 dBA	Maximum allowable noise level as per *AS2374-2003: Power transformers Minimum Energy Performance Standard (MEPS) requirements for distribution transformers*

4.1.1.2 Gas-Powered Generation (GPG)

The main noise generating plant associated with GPG has been identified as gas engines located within an engine hall and the associated exhaust gas stacks, intake air filters, and radiator coolers. The assessment has assumed 23 9MW gas engines operating simultaneously to supply 200 MW. The operation of these gas engines includes 23 exhaust gas stacks, 46 air intake filters, 69 cooling radiators, and two 200 MVA transformers.

Radiators and intake air filters have been modelled 5 metres above the ground, and exhaust gas stacks at 25 metres above the ground. A directivity correction has been applied to noise from the exhaust gas stacks in line with *Directivity Loss at a Duct Termination* (Potente et al, 2006).

Three scenarios have been considered to compare varying degrees of noise mitigation as follows:

Scenario 1: Unmitigated

— The building envelope of the engine hall has been assumed to be constructed of 0.48mm steel with 50mm of rockwool insulation (60 kg/m^3) lining the internal walls, covered with perforated sheet steel.

— No silencers fitted on the exhaust gas stacks or intake air filters

— Radiators fitted with typical fans have been adopted.

Scenario 2: Moderate Mitigation

— The building fabric of the engine hall (all walls and roof sections) is to be constructed of a pre-fabricated masonry panel, such as Speed panel (400 kg/m^3). The internal walls and roof are to be lined with 50mm of rockwool insulation (60 kg/m^3) with perforated steel sheeting.

— The exhaust gas stacks and intake air filters are to be fitted with moderate-performance silencers.

— Radiators fitted with typical fans have been adopted.

Scenario 3: High-Performance Mitigation

— The building fabric of the engine hall (all walls and roof sections) is to be constructed of a pre-fabricated masonry panel, such as Speed panel (400 kg/m^3). The internal walls and roof are to be lined with 50mm of rockwool insulation (60 kg/m^3) with perforated steel sheeting.

— The exhaust gas stacks and intake air filters are to be fitted with high-performance silencers to achieve the sound power levels outlined in Table 4.2.

— All associated engine radiators are to be fitted with low-noise fans to achieve the sound power levels outlined in Table 4.2.

It is noted that data for the engine hall ventilation units and roof monitors is unavailable at this stage of the design and therefore has not been considered in this assessment. The considered layout and equipment selections have also not yet been finalised, and as a result further acoustic study should be undertaken during the detailed design of the facility.

The noise source levels for plant items associated with gas-powered generation are summarised in Table 4.2. Silencer performances are presented in Table 4.3.

Table 4.2 GPG plant item sound power levels

NOISE SOURCE	OCTAVE BAND CENTRE FREQUENCY, Hz (dB)								ADOPTED $L_{eq,\ 30\ minute}$ SOUND POWER LEVEL (dBA)
	63	125	250	500	1K	2K	4K	8K	
Gas engine	127	125	129	128	129	123	125	120	**133**
Transformer (220MVA)	107	113	108	108	98	87	79	67	**107**
Scenario 1: Unmitigated									
Exhaust gas stack	150	142	138	136	135	134	132	131	**141**
Intake air filter	135	133	131	132	148	148	143	141	**153**
Radiator	85	93	100	104	105	103	100	95	**109**

NOISE SOURCE	OCTAVE BAND CENTRE FREQUENCY, Hz (dB)								ADOPTED $L_{eq,\ 30\ minute}$ SOUND POWER LEVEL (dBA)
	63	125	250	500	1K	2K	4K	8K	
Scenario 2: Moderate Mitigation									
Exhaust gas stack w/ silencer	133	123	115	110	107	105	106	108	**116**
Intake air filter w/ silencer	130	120	112	107	100	102	102	105	**112**
Radiator	85	93	100	104	105	103	100	95	**109**
Scenario 3: High-Performance Mitigation									
Exhaust gas stack w/ high-performance silencer	123	113	105	100	97	95	96	98	**106**
Intake air filter w/ high-performance silencer	119	109	102	96	93	92	92	94	**103**
Radiator w/ low-noise fan	79	87	94	98	99	97	94	89	**103**

Table 4.3 GPG exhaust gas and intake air silencer performance

SCENARIO	OCTAVE BAND CENTRE FREQUENCY, Hz (dB)							
	63	125	250	500	1K	2K	4K	8K
Exhaust gas silencers								
Moderate mitigation	17	19	23	26	28	29	26	23
High Performance mitigation	27	29	33	36	38	39	36	33
Intake air silencers								
Moderate mitigation	5	13	19	25	45	46	41	36
High Performance mitigation	16	24	29	36	55	56	51	47

4.2 Predicted noise levels

Table 4.4 outlines the predicted noise levels at each of the nearby NSAs for the day, evening and night periods. Noise contours are presented for the most stringent period (night) in Appendix B. Table 4.5 outlines the low-frequency assessment for the gas-powered generation during the night-time period.

The GPG noise sources are split into mitigation categories as defined in Section 4.1.1.2. Compliance demonstrated with the GPG noise emissions imply compliance from the overall operational of the Project, as the BESS system is predicted to produce significantly lower noise levels (≥ 10dB below).

Table 4.4 Predicted operational noise levels at nearby noise sensitive receivers

NOISE SOURCE	NOISE LIMIT, dBA $L_{eq,30\ min}$			PREDICTED NOISE LEVEL, dBA $L_{eq,30\ min}$			COMPLIES?		
	DAY	EVENING	NIGHT	DAY	EVENING	NIGHT	DAY	EVENING	NIGHT
R1 - 21 Bowers Road, Winton									
BESS (FLUENCE)				< 30	< 30	< 30	Yes	Yes	Yes
BESS (Tesla)				< 30	< 30	< 30	Yes	Yes	Yes
GPG (Unmitigated)	55	52	47	65	68	68	No	No	No
GPG (Moderate Mitigation)				45	47	47	Yes	Yes	Yes
GPG (High-Performance Mitigation)				37	41	41	Yes	Yes	Yes
R2 - 255 Winton-Glenrowan Road, Winton									
BESS (FLUENCE)				33	33	35	Yes	Yes	Yes
BESS (Tesla)				31	31	35	Yes	Yes	Yes
GPG (Unmitigated)	54	52	48	87	91	91	No	No	No
GPG (Moderate Mitigation)				53	56	56	Yes	No	No
GPG (High-Performance Mitigation)				45	48	48	Yes	Yes	Yes
R3 - 168 Winton-Glenrowan Road, Winton									
BESS (FLUENCE)				< 30	< 30	< 30	Yes	Yes	Yes
BESS (Tesla)				< 30	< 30	< 30	Yes	Yes	Yes
GPG (Unmitigated)	54	52	48	78	83	83	No	No	No
GPG (Moderate Mitigation)				46	50	50	Yes	Yes	No
GPG (High-Performance Mitigation)				36	40	40	Yes	Yes	Yes

Table 4.5 Gas powered generation low-frequency noise assessment

RECEIVER	PREDICTED NOISE LEVEL dBA $L_{eq,30\ min}$ (Night)	PREDICTED NOISE LEVEL dBC $L_{eq,30\ min}$ (Night)	DIFFERENCE, dB
R1 - 21 Bowers Road, Winton			
GPG (Unmitigated)	68	87	19
GPG (Moderate Mitigation)	47	70	23
GPG (High-Performance Mitigation)	41	61	20
R2 - 255 Winton-Glenrowan Road, Winton			
GPG (Unmitigated)	91	93	2
GPG (Moderate Mitigation)	56	78	22
GPG (High-Performance Mitigation)	47	70	23
R3 - 168 Winton-Glenrowan Road, Winton			
GPG (Unmitigated)	83	87	4
GPG (Moderate Mitigation)	50	72	22
GPG (High-Performance Mitigation)	40	63	23

4.2.1 Discussion

Noise from the BESS layout is expected to comply with EPA1826 noise limits at all receivers during all periods. The BESS system is >10 dB below the noise limits at the nearest representative sensitive receivers and will therefore have a negligible contribution towards predicted exceedances.

Noise levels from GPG are predicted to exceed EPA1826 noise limits unless high-performance mitigation is applied. Where the GPG is unmitigated, exceedances are predicted at all receivers during all periods, with an exceedance of up to 43 dB at the most impacted receiver (R2) during the night period. Implementing silencers on the exhaust gas stacks / intake air filters and increasing the sound insulation performance of the engine hall reduces noise impacts at receivers, with receiver R1 no longer exceeding noise limits and receivers R1 and R2 only exceeding night-time limits. The exceedance at the most impacted receiver is reduced to 13 dB during the night period. Fitting the GPG plant with high-performance silencers and low-noise radiator fan models respectively further reduces noise impacts, with all receivers expected to comply with the noise limits.

The analysis of low-frequency noise from GPG shows that the difference between dBC and dBA levels exceeds the NPfI trigger. It is noted that there are no regulatory criteria to consider low-frequency noise in Victoria, however this assessment identifies the potential for an unbalanced spectrum and potentially increased annoyance. Further assessment is required during detailed design to determine if low frequency energy emitted from the GPG plant can be reduced further.

4.2.2 Recommended mitigation measures

The BESS system is >10 dB below the noise limits at the nearest representative sensitive receivers and therefore do not contribute to any exceedances. Therefore, mitigation is not considered for the BESS system.

If not mitigated, the GPG system causes exceedances of the EPA noise limits. To reduce noise impacts, it is recommended that the mitigation measures outlined in ‘Scenario 3: High-Performance Mitigation’ are adopted. This includes:

- The building fabric of the engine hall (all walls and roof sections) is to be constructed of a pre-fabricated masonry panel, such as Speed panel (400 kg/m^3). The internal walls and roof are to be lined with 50mm of rockwool insulation (60 kg/m^3) with perforated steel sheeting.
- The exhaust gas stacks and intake air filters are to be fitted with high-performance silencers to achieve the sound power levels outlined in Table 4.2.
- All associated engine radiators are to be fitted with low-noise fans to achieve the sound power levels outlined in Table 4.2.
- Include low frequency noise limits to the plant specification and allow manufacturers to provide solutions. This may take the form of noise levels being specified in terms of dBC $L_{eq, 30 min}$, as well as dBA $L_{eq, 30 min}$.

Mitigation measures should be revisited and refined during the detailed design of the project as equipment selections and layouts are finalised.

4.3 Identified risks and constraints

Identified risks and constraints are presented in Table 4.6 to assist with management of potential noise impacts for the Energy Reserve 1 facility.

Table 4.6 Identified Risks/Constraints

RISK NO.	AREA OF CONCERN	RISK DESCRIPTION (INCL. POTENTIAL IMPACTS)	RISK LEVEL	CONTROLS
1	Detailed design of the Project through acoustic modelling	Equipment selections and system layout has not yet been finalised at this stage of the design. Modelled sound power levels have been based on indicative data and subject to change as the design of the facility progresses. Updated equipment selections and layouts may lead to additional mitigation requirements to meet noise limits.	High	— Further work to refine the noise model and validate the modelling assumptions including detailed noise emissions (e.g. spectra) once manufactures have been engaged and equipment selections finalised.
2	Low frequency and tonal noise	The low frequency noise characteristics from GPG have been predicted, potentially increasing annoyance at affected receivers. Low frequency has not been assessed for BESS system, as the indicative sound power specifications do not include octave band data. Tonal characteristics have not been assessed as the indicative sound power specifications do not include 1/3 octave band data. Further mitigation may be required to reduce low frequency/tonal noise impacts.	Medium	— Further work to refine the noise model and validate the modelling assumptions including detailed noise emissions (e.g. spectra) once manufactures have been engaged and equipment selections finalised. — Penalties to the EPA 1826 noise limits may apply if tonal, modulation or intrusive noise characteristics are predicted.
3	Frequency of noise-enhancing meteorological conditions	The frequency of noise-enhancing wind conditions has been classified as not significant in line with the NPfI. However, noise-enhancing wind conditions may still occur. Where noise-enhancing wind conditions occur, noise levels at sensitive receivers may increase by ~1 dB. As a 1-2 dB increase in noise is considered imperceptible, there is a minimal risk of residents experiencing increased annoyance.	Low	— N/A

RISK NO.	AREA OF CONCERN	RISK DESCRIPTION (INCL. POTENTIAL IMPACTS)	RISK LEVEL	CONTROLS
4	Understanding construction related noise impacts	Construction activities have the potential to cause noise impacts at nearby sensitive receivers. Currently, no noise assessment for construction activities has been conducted. This is unlikely to cause project setbacks or health concerns and is considered low risk.	Low	— Undertake construction feasibility assessments for the proposed site.

5 Conclusion

This report documents the noise impact assessment undertaken for Energy Reserve 1 Facility (the Project) to provide regulators and stakeholders with information about potential noise impacts from the proposal and how they will be managed.

The prevailing background noise levels surrounding the proposal were determined through a combination of unattended and attended noise surveys in accordance with AS 1055 and EPA1826. The existing noise environment is characterised by vehicle traffic travelling along the Hume Freeway, the Winton Motor Raceway, and the rail freight line running along the north of the proposal. Meteorological conditions at the proposal have been assessed in line with the NPfI, with noise-enhancing temperature inversions being identified as a significant feature of the surrounding environment.

Operational noise associated with the proposal has been assessed. Noise levels from the BESS layout is expected to comply with EPA1826 noise limits at all receivers during all periods. Noise levels from the GPG plant are predicted at all receivers during all periods, with an exceedance of up to 43 dB at the most impacted receiver (R2) during the night period. Analysis of low-frequency noise from GPG plant is predicted to exceed the NPfI trigger, identifying the potential for an unbalanced spectrum and potentially increased annoyance.

Mitigation measures for the GPG plant have been recommended including:

- The building fabric of the engine hall (all walls and roof sections) is to be constructed of a pre-fabricated masonry panel, such as Speed panel (400 kg/m^3). The internal walls and roof are to be lined with 50mm of rockwool insulation (60 kg/m^3) with perforated steel sheeting.
- The exhaust gas stacks and intake air filters are to be fitted with high-performance silencers.
- All associated engine radiators are to be fitted with low-noise fans.

Risks associated with noise have been highlighted and categorised. Non-finalised equipment selections and system layouts have been highlighted as a high risk, as changes in equipment sound power levels may result in additional mitigation requirements.

6 Limitations

This Report is provided by WSP Australia Pty Limited (*WSP*) to Lochard Energy (*Client*) in response to specific instructions from the Client and in accordance with WSP's proposal under the Consultancy Agreement between WSP and the Client signed 10-9-2019.

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Appendix A

Noise monitoring graphs

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Project No.	PS125526	Date	08 February 2022	Sheet	2
Project Title	Lochard Winton Energy Hub Enviro Approvals	Engineer	TG	Rev	1
Description	NM1			Type	LG

Logger Location	21 Bowers Rd, Winton
Microphone Position	

		Thu, 16 Sep 2021			Fri, 17 Sep 2021			Sat, 18 Sep 2021			Sun, 19 Sep 2021			Mon, 20 Sep 2021			Tue, 21 Sep 2021			Wed, 22 Sep 2021			Thu, 23 Sep 2021		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	44.3	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	58.3			53.4			56.9			51.4			61.1			61.1			59.1			57.4		
	LAeq,24h		58.2			53.5			54.1			50.7			57.6			57.6			55.9			56.4	
	LAeq,16h		58.2			51.3			55.0			51.0			58.7			58.4			56.0			57.2	
	LAeq,8h		57.0			51.9			50.9			51.6			55.9			54.1			56.2			55.3	
	LA90 Day			44.3			46.2			49.6						53.0			52.8			49.5			46.0
	LA90 Evening			53.9			44.4			46.1			42.0			50.6			49.9			50.1			50.9
	LA90 Night			48.9			42.9			37.6			41.5			47.2			45.8			44.7			44.0
Hourly Values	00:00 to 01:00				61.4	57.9	47.6	52.3	50.9	41.8	55.2	51.1	37.3	44.7	41.4	33.6	59.8	56.5	46.0	56.6	54.9	44.0	61.5	57.8	45.6
	01:00 to 02:00				60.7	57.2	47.3	49.8	51.2	40.4	56.1	53.6	36.0	47.0	43.6	36.3	59.9	56.2	46.3	54.0	51.0	43.2	59.7	56.0	44.2
	02:00 to 03:00				59.7	56.1	47.8	53.0	48.9	39.3	52.4	48.5	34.6	51.3	47.7	39.1	57.7	54.3	42.8	54.2	51.3	43.1	56.2	53.9	41.2
	03:00 to 04:00				58.4	55.1	48.1	54.3	50.4	39.0	53.3	49.0	33.1	52.5	48.9	39.6	58.4	54.7	44.9	52.1	49.1	43.2	52.2	48.8	40.9
	04:00 to 05:00				58.9	56.0	50.4	55.6	52.3	44.1	54.0	50.4	39.3	58.9	56.2	50.1	58.5	55.5	49.6	54.8	52.7	46.7	52.9	49.8	43.7
	05:00 to 06:00				59.6	57.0	51.8	56.3	53.0	45.7	52.9	49.3	40.1	59.5	56.5	50.5	56.4	53.9	49.9	57.6	55.2	49.2	51.3	49.5	44.5
	06:00 to 07:00				57.4	54.8	49.6	57.3	54.4	47.2	50.1	47.2	40.0	59.4	56.6	52.2	56.9	54.0	49.4	58.6	56.2	51.0	49.6	47.1	41.8
	07:00 to 08:00				53.4	50.9	45.5	58.0	55.0	49.2	49.2	47.5	38.1	58.9	56.3	51.8	59.1	56.5	50.8	57.6	54.7	49.0	48.9	47.9	40.3
	08:00 to 09:00				50.9	48.4	43.6	57.9	55.7	50.4	52.5	51.0	40.7	59.9	57.0	52.0	59.2	56.3	50.9	57.4	54.4	49.4	46.9	44.7	39.2
	09:00 to 10:00				51.4	48.7	43.6	56.5	53.9	49.5	53.2	51.2	42.3	60.4	57.9	53.2	60.2	57.2	51.5	58.1	55.1	49.1	48.2	46.3	40.0
	10:00 to 11:00				52.8	50.8	46.2	56.9	54.7	50.2	54.6	51.7	44.5	60.8	58.5	51.9	61.3	58.5	52.5	57.7	54.8	48.8	68.5	63.7	42.8
	11:00 to 12:00	49.1	47.7	39.6	51.3	48.9	45.0	56.6	54.2	49.2	55.1	53.8	45.8	59.7	57.0	52.0	61.7	58.9	52.9	56.7	53.7	48.0	56.9	55.7	44.4
	12:00 to 13:00	49.6	48.1	40.6	53.6	51.0	46.5	56.8	54.0	49.3	50.9	48.3	43.3	60.2	57.6	53.3	61.5	58.6	53.3	55.6	52.7	46.7	55.8	54.8	48.1
	13:00 to 14:00	52.3	52.2	42.6	55.0	52.4	48.5	60.5	57.9	51.6	53.4	53.9	43.5	60.7	58.1	53.6	62.3	59.6	54.4	56.3	53.7	48.7	56.9	54.3	49.5
	14:00 to 15:00	52.5	51.0	43.6	54.0	51.5	47.1	58.9	56.9	51.0	53.0	53.6	44.7	64.9	63.0	55.2	62.1	59.1	53.9	56.6	54.6	49.7	57.1	54.5	48.7
	15:00 to 16:00	52.2	50.0	44.9	54.2	52.5	48.4	59.7	57.1	50.5	52.1	51.6	42.0	63.9	60.7	54.6	61.9	59.0	53.9	58.0	55.3	50.3	61.1	59.2	50.3
	16:00 to 17:00	56.7	53.2	46.1	54.4	51.8	47.5	58.2	55.6	46.7	53.3	54.7	42.3	61.0	58.1	53.0	62.4	59.5	53.8	59.9	57.3	52.3	58.2	55.3	50.2
	17:00 to 18:00	64.0	60.2	52.6	53.3	50.8	46.5	56.7	54.6	45.7	51.2	48.4	43.4	61.7	58.8	52.8	62.2	59.2	53.3	61.2	58.1	52.0	62.5	59.6	52.4
	18:00 to 19:00	62.5	59.3	52.4	51.8	49.0	44.2	55.1	54.9	43.3	49.5	46.5	40.8	60.9	57.7	51.5	61.3	58.0	51.3	61.1	57.8	51.0	61.5	58.1	51.2
	19:00 to 20:00	66.3	62.6	54.1	50.6	50.5	44.4	55.0	51.3	41.8	46.6	43.9	39.2	62.1	58.8	51.4	62.3	58.9	51.1	61.2	58.0	52.2	62.7	59.4	52.4
	20:00 to 21:00	65.1	61.9	55.8	50.8	48.4	44.0	56.1	52.1	41.5	47.7	45.0	40.0	61.7	58.2	48.9	62.2	58.6	49.3	60.5	56.7	48.9	59.9	56.6	49.9
	21:00 to 22:00	64.7	61.3	53.3	55.4	53.6	45.1	55.6	51.5	42.4	51.9	51.0	39.4	62.1	58.9	50.4	62.6	58.6	47.7	61.2	57.3	48.1	61.2	57.7	50.1
	22:00 to 23:00	60.4	57.0	49.5	55.2	53.4	44.3	53.9	50.3	41.6	52.5	48.7	37.1	61.0	57.3	48.3	61.0	57.3	46.4	63.3	59.6	49.8	58.8	55.0	46.0
	23:00 to 0:00	62.3	58.4	48.3	55.2	53.0	43.9	54.9	52.6	36.4	49.1	45.4	34.7	61.3	57.6	47.3	59.5	55.7	45.8	63.2	59.5	50.3	58.8	55.1	44.6

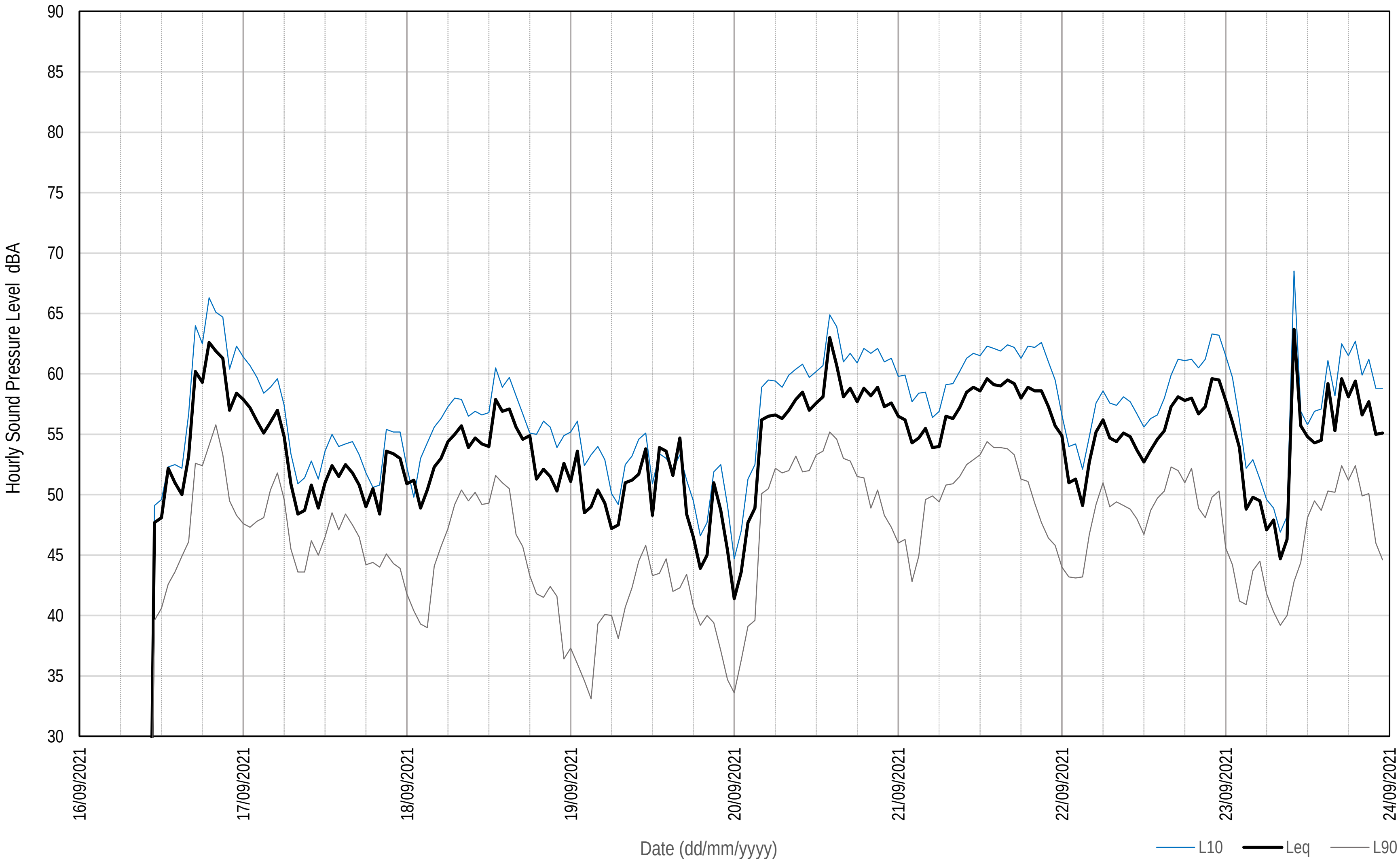
ADVERTISED PLAN

Project No.	PS125526	Date	08 February 2022	Sheet	3
Project Title	Lochard Winton Energy Hub Enviro Approvals	Engineer	TG	Rev	1
Description	NM1			Type	LG

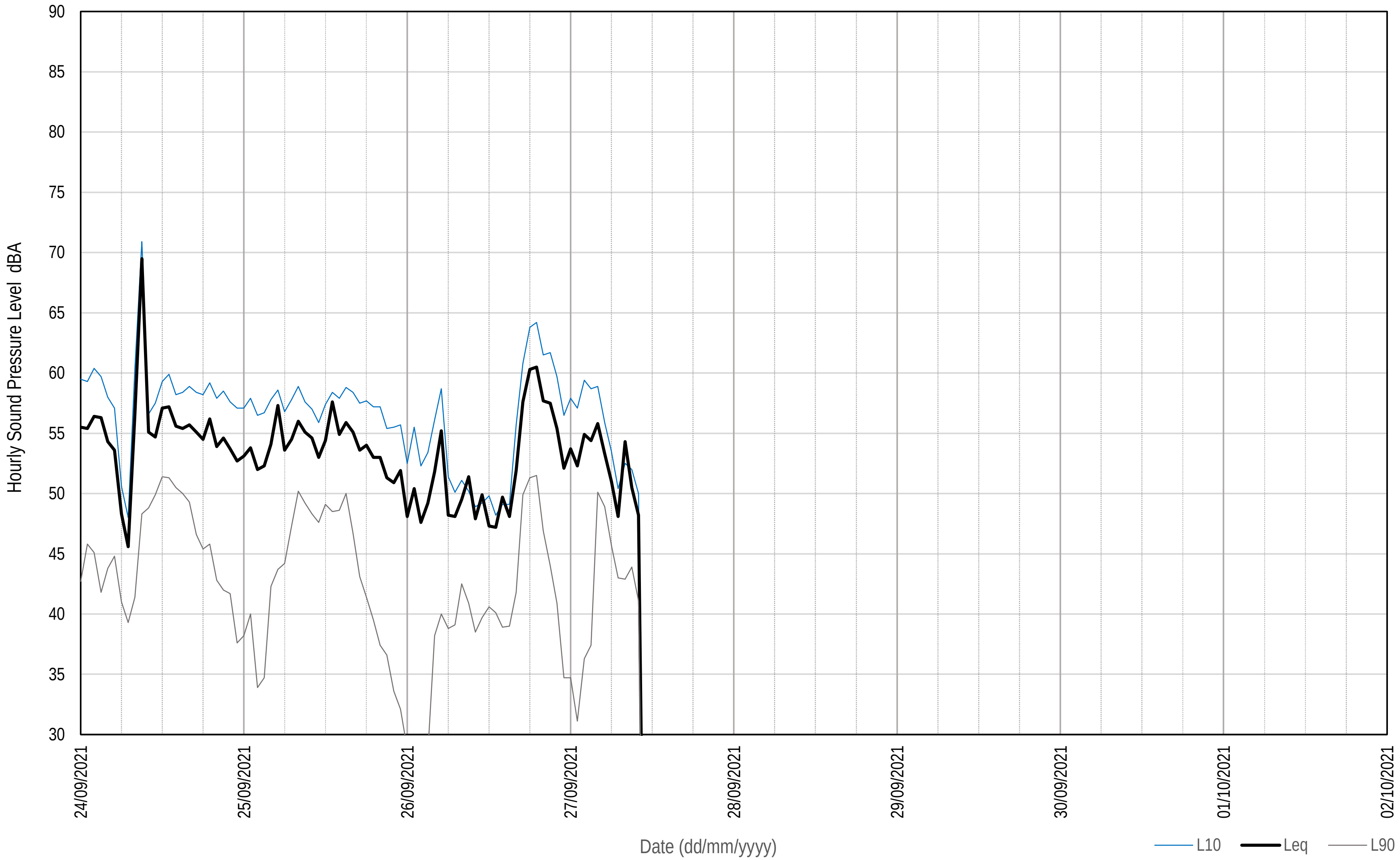
Logger Location	21 Bowers Rd, Winton
Microphone Position	

		Fri, 24 Sep 2021			Sat, 25 Sep 2021			Sun, 26 Sep 2021			Mon, 27 Sep 2021														
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	58.1			57.3			54.5			51.7														
	LAeq,24h		58.3			54.3			54.1			53.1													
	LAeq,16h		59.3			54.6			54.8			51.1													
	LAeq,8h		54.0			51.3			54.2																
	LA90 Day			47.9			48.1			41.0			42.7												
	LA90 Evening			44.0			38.7			48.4															
	LA90 Night			39.6			32.9			40.0															
Hourly Values	00:00 to 01:00	59.5	55.5	42.7	57.1	53.1	38.2	52.5	48.1	28.8	57.9	53.7	34.7												
	01:00 to 02:00	59.3	55.4	45.8	57.9	53.8	40.0	55.5	50.4	29.1	57.1	52.3	31.1												
	02:00 to 03:00	60.4	56.4	45.1	56.5	52.0	33.9	52.3	47.6	26.8	59.4	54.9	36.3												
	03:00 to 04:00	59.7	56.3	41.8	56.7	52.3	34.7	53.4	49.2	28.5	58.7	54.4	37.4												
	04:00 to 05:00	58.0	54.3	43.8	57.8	54.1	42.3	56.1	51.8	38.2	58.9	55.8	50.1												
	05:00 to 06:00	57.1	53.6	44.8	58.6	57.3	43.7	58.7	55.2	40.0	55.9	53.3	48.9												
	06:00 to 07:00	50.6	48.3	41.0	56.8	53.6	44.2	51.4	48.2	38.8	53.5	51.0	45.7												
	07:00 to 08:00	48.0	45.6	39.3	57.8	54.5	47.3	50.1	48.1	39.1	50.4	48.1	43.0												
	08:00 to 09:00	60.4	56.6	41.4	58.9	56.0	50.2	51.1	49.5	42.5	52.5	54.3	42.9												
	09:00 to 10:00	70.9	69.5	48.3	57.6	55.1	49.2	50.2	51.4	40.9	52.0	50.5	43.9												
	10:00 to 11:00	56.6	55.1	48.8	57.0	54.6	48.3	48.9	47.9	38.5	50.0	48.2	41.1												
	11:00 to 12:00	57.5	54.7	49.9	55.9	53.0	47.6	49.2	49.9	39.7															
	12:00 to 13:00	59.3	57.1	51.4	57.4	54.4	49.1	49.8	47.3	40.6															
	13:00 to 14:00	59.9	57.2	51.3	58.4	57.6	48.5	48.2	47.2	40.1															
	14:00 to 15:00	58.2	55.6	50.5	57.9	54.9	48.6	49.1	49.7	38.9															
	15:00 to 16:00	58.4	55.4	50.0	58.8	55.9	50.0	49.1	48.1	39.0															
	16:00 to 17:00	58.9	55.7	49.3	58.4	55.1	46.7	55.7	51.9	41.8															
	17:00 to 18:00	58.4	55.1	46.6	57.5	53.6	43.1	60.8	57.6	49.9															
	18:00 to 19:00	58.2	54.5	45.4	57.7	54.0	41.4	63.8	60.3	51.3															
	19:00 to 20:00	59.2	56.2	45.8	57.2	53.0	39.5	64.2	60.5	51.5															
	20:00 to 21:00	57.9	53.9	42.8	57.2	53.0	37.4	61.5	57.7	46.9															
	21:00 to 22:00	58.5	54.6	42.0	55.4	51.3	36.6	61.7	57.5	44.0															
	22:00 to 23:00	57.6	53.7	41.7	55.5	50.9	33.6	59.7	55.4	40.9															
	23:00 to 0:00	57.1	52.7	37.6	55.7	51.9	32.1	56.5	52.1	34.7															

Logger Summary - 21 Bowers Rd, Winton



Logger Summary - 21 Bowers Rd, Winton



Project No.	PS125526	Date	08 February 2022	Sheet	2
Project Title	Lochard Winton Energy Hub Enviro Approvals	Engineer	TG	Rev	1
Description	NM2			Type	LG

Logger Location	255 Winton-Glenrowan Road, Winton
Microphone Position	

		Thu, 16 Sep 2021			Fri, 17 Sep 2021			Sat, 18 Sep 2021			Sun, 19 Sep 2021			Mon, 20 Sep 2021			Tue, 21 Sep 2021			Wed, 22 Sep 2021			Thu, 23 Sep 2021		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	45.7	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	57.5			57.6			50.6			53.4			54.3			54.9			56.2			55.1		
	LAeq,24h		67.4			55.7			49.3			51.8			52.2			52.0			54.3			53.2	
	LAeq,16h		68.2			55.9			49.4			52.8			53.0			52.3			53.9			53.1	
	LAeq,8h		54.7			53.1			46.6			49.8			50.1			54.5			54.5			53.3	
	LA90 Day			45.7			49.5			40.7						47.3			44.3			47.7			47.9
	LA90 Evening			51.2			51.2			43.2			44.4			47.6			47.0			50.0			48.5
	LA90 Night			48.0			41.4			33.7			39.9			44.9			46.9			47.2			45.3
Hourly Values	00:00 to 01:00				58.6	55.6	49.3	56.5	54.3	48.1	51.2	48.2	33.1	51.7	47.8	36.2	52.2	49.6	44.8	59.3	56.3	49.1	57.8	55.3	50.4
	01:00 to 02:00				58.2	54.8	46.7	53.3	50.2	43.4	48.5	44.1	32.9	50.4	46.8	34.2	52.8	50.2	45.3	57.8	55.0	47.1	58.0	55.0	47.3
	02:00 to 03:00				56.5	53.8	46.9	49.9	46.6	38.9	49.6	45.5	33.0	52.5	48.5	37.9	51.8	49.0	43.5	57.6	54.9	46.5	58.1	55.2	49.4
	03:00 to 04:00				54.8	51.8	45.4	46.8	43.2	34.1	48.5	45.9	30.8	54.3	50.6	39.3	51.2	48.7	42.6	56.2	52.8	43.2	56.8	54.2	45.2
	04:00 to 05:00				54.7	51.6	44.0	44.4	40.8	32.1	47.9	43.8	30.0	50.3	47.0	39.5	50.9	48.2	42.6	54.9	51.6	43.8	50.5	47.8	41.9
	05:00 to 06:00				57.3	56.3	47.7	53.3	51.4	35.3	55.4	50.7	34.9	56.4	52.9	45.5	54.7	51.6	45.4	58.0	55.2	49.2	54.3	51.0	43.9
	06:00 to 07:00				58.0	56.0	50.6	52.3	50.8	38.7	52.9	51.9	37.8	52.3	49.8	45.2	53.5	51.3	46.8	54.7	52.8	46.3	52.7	50.6	46.0
	07:00 to 08:00				56.9	55.2	50.3	47.6	46.4	37.8	46.8	45.7	36.4	53.3	51.2	47.0	52.9	51.9	44.6	52.0	53.4	44.6	51.8	49.6	44.7
	08:00 to 09:00				54.6	52.8	47.3	46.3	46.4	38.9	47.0	46.0	37.4	53.3	51.9	46.3	51.3	48.7	39.6	51.1	48.8	43.9	53.5	51.2	43.9
	09:00 to 10:00				53.8	51.2	46.0	46.9	48.0	39.3	50.9	58.6	39.5	53.3	55.9	45.8	52.4	49.4	39.5	56.2	53.4	47.5	53.7	51.7	46.1
	10:00 to 11:00				55.6	53.6	48.4	47.8	47.1	40.8	54.1	52.3	45.6	53.6	51.4	47.5	55.7	52.3	42.4	56.9	54.1	48.1	55.7	54.0	48.5
	11:00 to 12:00				63.9	62.3	49.7	49.5	47.8	43.4	55.0	52.7	47.8	54.7	53.9	48.3	55.8	52.7	45.2	55.1	52.5	47.2	56.4	54.4	50.2
	12:00 to 13:00	63.4	78.0	44.7	56.8	54.6	50.6	50.7	48.2	43.9	55.2	53.0	47.6	54.0	51.7	47.1	56.9	53.6	44.4	54.9	52.3	46.0	54.6	52.3	48.1
	13:00 to 14:00	54.4	55.4	45.7	55.7	53.6	49.9	51.6	49.3	43.8	53.5	50.7	44.7	55.4	53.3	48.5	55.5	52.3	45.2	56.1	53.5	46.8	56.2	54.1	50.2
	14:00 to 15:00	55.7	54.0	47.7	56.4	54.2	50.5	54.7	51.8	46.5	55.6	53.5	46.8	54.3	53.0	47.9	56.8	54.1	46.2	57.0	55.0	49.3	55.0	53.2	48.5
	15:00 to 16:00	55.6	53.1	46.5	56.9	54.4	49.8	52.9	50.2	45.1	54.5	52.8	46.4	60.0	55.9	46.6	57.3	54.2	47.2	56.0	53.7	50.0	54.1	53.1	48.0
	16:00 to 17:00	54.8	51.9	45.3	56.5	54.3	50.9	53.6	51.4	46.9	53.6	50.7	44.8	54.7	53.2	47.3	55.3	52.6	46.7	56.3	54.0	49.6	56.8	54.4	49.2
	17:00 to 18:00	54.7	52.3	44.4	56.8	54.4	50.6	51.8	49.6	43.2	54.5	52.5	45.2	57.0	54.3	47.8	52.4	51.1	46.1	57.7	55.4	51.5	56.0	53.9	49.8
	18:00 to 19:00	57.8	55.4	50.0	58.0	55.6	51.1	53.5	50.7	42.8	54.6	52.2	45.6	54.0	51.8	48.2	51.3	49.2	45.1	57.1	54.8	50.5	56.1	53.9	49.8
	19:00 to 20:00	57.0	54.7	50.9	58.9	56.0	51.3	54.5	51.8	43.6	55.0	52.1	46.0	54.2	52.0	47.9	54.4	51.8	46.7	57.8	55.4	51.1	56.7	54.0	49.5
	20:00 to 21:00	59.1	56.5	50.8	59.7	57.1	52.2	51.9	48.7	40.4	55.3	52.2	45.9	54.1	51.8	48.1	56.4	53.8	48.9	56.5	53.8	49.1	56.5	53.6	47.8
	21:00 to 22:00	60.1	57.6	52.9	59.1	56.2	50.2	48.1	44.8	36.8	56.9	53.6	45.7	53.2	50.8	46.2	55.4	52.6	47.2	58.9	55.8	49.4	54.6	52.1	46.9
	22:00 to 23:00	58.4	55.9	51.0	61.3	58.4	52.6	48.6	45.3	37.2	56.4	52.6	43.3	53.6	51.3	46.9	56.2	53.6	48.5	59.2	56.2	50.4	56.3	53.2	46.7
	23:00 to 0:00	58.5	55.7	50.1	58.7	55.6	49.6	48.8	44.5	33.9	49.8	46.3	37.6	53.1	50.8	46.3	57.9	55.0	48.5	58.7	55.9	50.7	55.2	52.1	44.2

ADVERTISED PLAN

Project No.	PS125526	Date	08 February 2022	Sheet	3
Project Title	Lochard Winton Energy Hub Enviro Approvals	Engineer	TG	Rev	1
Description	NM2			Type	LG

Logger Location	255 Winton-Glenrowan Road, Winton
Microphone Position	

		Fri, 24 Sep 2021																							
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	54.6																							
	LAeq,24h		53.1																						
	LAeq,16h		52.8																						
	LAeq,8h																								
	LA90 Day			46.7																					
	LA90 Evening																								
	LA90 Night																								
Hourly Values	00:00 to 01:00	55.2	52.1	44.9																					
	01:00 to 02:00	54.6	51.5	44.9																					
	02:00 to 03:00	57.8	54.6	46.4																					
	03:00 to 04:00	57.9	54.8	45.9																					
	04:00 to 05:00	56.2	52.7	42.6																					
	05:00 to 06:00	56.9	54.1	45.9																					
	06:00 to 07:00	55.7	52.9	45.8																					
	07:00 to 08:00	55.3	51.7	45.2																					
	08:00 to 09:00	50.2	48.9	43.2																					
	09:00 to 10:00	52.5	49.8	44.9																					
	10:00 to 11:00	57.8	55.7	49.8																					
	11:00 to 12:00	56.1	53.9	50.3																					
	12:00 to 13:00																								
	13:00 to 14:00																								
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	15:00 to 16:00																								
	16:00 to 17:00																								
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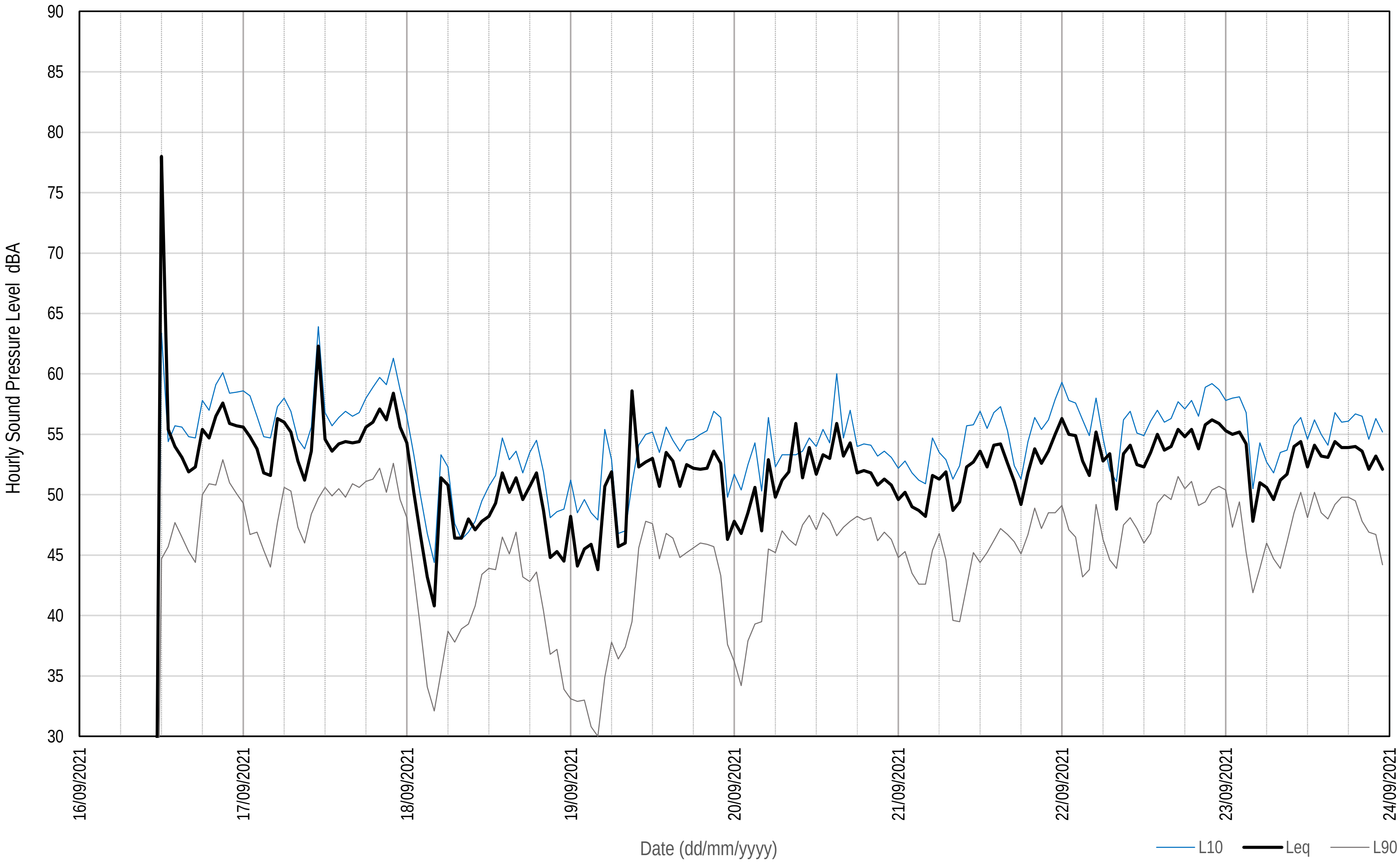
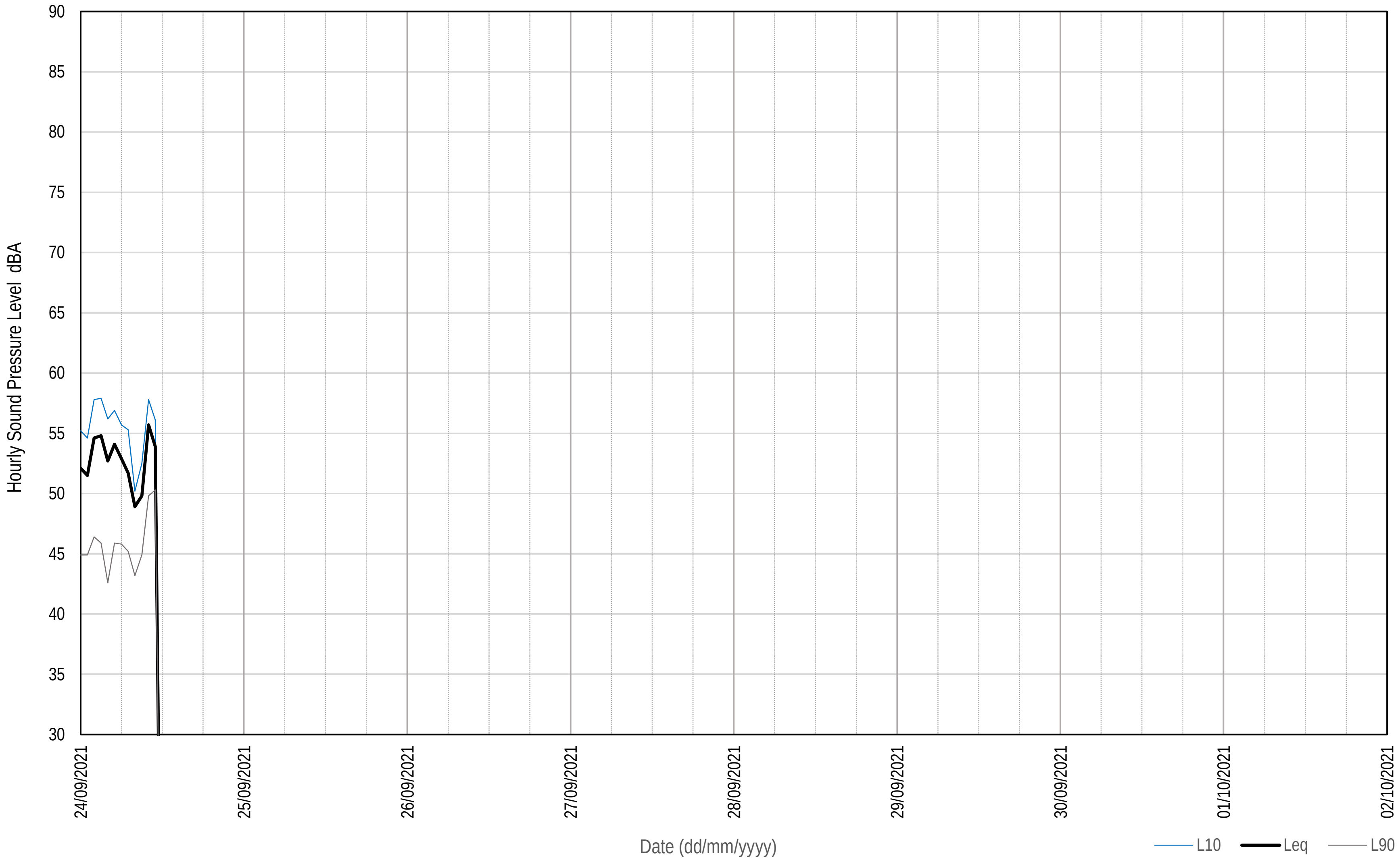
	19:00 to 20:00																								
	20:00 to 21:00																								
	21:00 to 22:00																								
	22:00 to 23:00																								
	23:00 to 0:00																								

Logger Summary - 255 Winton-Glenrowan Road, Winton



Logger Summary - 255 Winton-Glenrowan Road, Winton



Appendix B

Predicted noise contours

ADVERTISED
PLAN

Map: MAP_ID_0	Author: TG	N
Date: 04/03/2022	Approved by: TR	

To be read in conjunction with WSP document: PS125526-LochardNVIA-Rev1

Map Source: NSW SIX Maps

0 200 400 600 m

1:15,000 at A3

Legend

- Site outline
- Sensitive receivers

Predicted noise level (dBA)

- 55
- 65
- 75
- 85
- 95

ADVERTISED PLAN

Energy Reserve 1 Facility - Lochard Energy

GPG - unmitigated

wsp

www.wsp.com

Map: MAP_ID_1	Author: TG
Date: 04/03/2022	Approved by: TR

N

To be read in conjunction with WSP document: PS125526-LochardNVIA-Rev1

Map Source: NSW SIX Maps

0 100 200 300 m

1:12,500 at A3

Legend

- Site outline
- Sensitive receivers

Exceeds EPA 1826 criteria (night)

- 47 dBA (R1 criteria)
- 48 dBA (R2 & R3 criteria)

Energy Reserve 1 Facility - Lochard Energy

BESS (Tesla)

wsp

Map: MAP_ID_2	Author: TG
Date: 04/03/2022	Approved by: TR

To be read in conjunction with WSP document: PS125526-LochardNVIA-Rev1

Map Source: NSW SIX Maps

1:12,500 at A3

Legend

- Site outline
- Sensitive receivers

Exceeds EPA 1826 criteria (night)

- 47 dBA (R1 criteria)
- 48 dBA (R2 & R3 criteria)

ADVERTISED PLAN

Energy Reserve 1 Facility - Lochard Energy

BESS (Fluence)

wsp

Map: MAP_ID_3

Author: TG

Date: 04/03/2022

Approved by: TR

N

0 100 200 300 m

1:12,500 at A3

To be read in conjunction with WSP document: PS125526-LochardNVIA-Rev1

Map Source: NSW SIX Maps

Legend

- Site outline
- Sensitive receivers

Exceeds EPA 1826 criteria (night)

- 47 dBA (R1 criteria)
- 48 dBA (R2 & R3 criteria)

ADVERTISED PLAN

Energy Reserve 1 Facility - Lochard Energy

GPG (mitigated)

wsp

www.wsp.com

Map: MAP_ID_4	Author: TG
Date: 04/03/2022	Approved by: TR

N

To be read in conjunction with WSP document: PS125526-LochardNVIA-Rev1

Map Source: NSW SIX Maps

0 100 200 300 m

1:12,500 at A3

Legend

- Site outline
- Sensitive receivers

Exceeds EPA 1826 criteria (night)

- 47 dBA (R1 criteria)
- 48 dBA (R2 & R3 criteria)

ADVERTISED PLAN

Energy Reserve 1 Facility - Lochard Energy

GPG (mitigated high-performance)

wsp

Map: MAP_ID_5	Author: TG	N
Date: 04/03/2022	Approved by: TR	

To be read in conjunction with WSP document: PS125526-LochardNVIA-Rev1

Map Source: NSW SIX Maps

0 100 200 300 m

1:12,500 at A3

Legend

- Site outline
- Sensitive receivers

Exceeds EPA 1826 criteria (night)

- 47 dBA (R1 criteria)
- 48 dBA (R2 & R3 criteria)

ADVERTISED PLAN

Energy Reserve 1 Facility - Lochard Energy

H2

wsp