Police Cottage / Kiosk Development Application

Planning Stage Acoustic Report

S200822RP1 Revision 0

Thursday, 4 February 2021

Resonate

Document Information

Project	Police Cottage / Kiosk Development Application
Client	McGregor Coxall Unit Trust
Report title	Planning Stage Acoustic Report
Project Number	S200822

Revision Table

Report revision	Date	Description	Author	Reviewer
0	04/02/2021	Draft for comment	Marc Schlussel	Sam Johnson

Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to approximate human hearing at lower noise levels. A-weighted levels are used as human hearing does not respond equally at all frequencies.
C-weighting	A spectrum adaption that is applied to measured noise levels to approximate human hearing at high noise levels. C-weighted levels are used as human hearing does not respond equally at all frequencies.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of loudness.
dB(A)	'A' Weighted sound level in dB.
dB(C)	'C' Weighted sound level in dB.
dB(Lin)	Linear (un-weighted) sound level in dB. A measure of the absolute pressure fluctuation in the air.
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.
L_{eq}	Equivalent noise level—Energy averaged noise level over the measurement period.
$L_{eq,\ (15\ min)}$	A-weighted energy averaged noise level over a 15-minute period. Used in the EPA Interim Construction Noise Guideline (ICNG).
Rating Background Level (RBL)	The Rating Background Level for each period is the median value of the average background values for the period over all of the days measured. There is an RBL value for each period (day, evening and night).

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1 Introduction

Resonate Consultants has been commissioned to provide noise impact advice for the refurbishment of the currently vacant Police Cottage into a restaurant. In addition, the noise impact from a Kiosk located inside Regatta Parks is included within this assessment. This assessment does not include the proposed event space adjacent to the Kiosk, which will be assessed in a separate noise impact assessment at a later stage of the project.

This report outlines the acoustic assessment for the proposed Police Cottage restaurant and Regatta Park Kiosk and is part of the Development Application (DA). It covers the noise impact from the new developments. Unattended and attended noise measurements were conducted by Resonate during the period 18th to 28th November 2019. The results of this noise survey have been used to inform this assessment.

1.1 Assessment aims

This is a noise impact assessment of the noise sources associated with the proposed Police Cottage restaurant, the Regatta Park Kiosk and their potential impact on the local environment/community. This report:

- Establishes relevant noise sensitive receivers.
- Establishes baseline conditions of the ambient noise environment at relevant selected noise sensitive receivers.
- Establishes relevant noise criteria to assess the potential impact against.
- Predicts noise levels at the noise sensitive receivers from noise sources from the built areas.
- Provides in-principle noise control/management advice to meet the noise criteria or minimise the noise impact.
- Confirm that the development proposal for the Police Cottage and Kiosk will not result in an unacceptable adverse noise impact to the community.

1.2 Project description

The refurbished Police Cottage includes the following areas:

- Outdoor seating area
- Front verandah
- Internal dining areas
- Mechanical services on the roof and under the verandah
- Car par including space for services vehicles
- Opening hours 7am – 10pm or potentially 12am on weekends during summer.

The Kiosk includes the following areas:

- Outdoor seating area
- Mechanical services
- Opening hours 7am – 4pm.

2 Site Description

The following assessment locations are presented in Figure 1 as well as potential noise sensitive receivers:

- Police Cottage
  - Located on the Great Western Highway and northwest from Regatta Park
  - The nearest sensitive receivers are opposite on the other side of the Great Western Highway (R4) and south from the Police Cottage in Regatta Park (R6)
- Kiosk
  - Located in Regatta Park
  - The nearest sensitive receiver is a park internal residential property (R6) located in a distance of 85 m. Other sensitive receivers are located in a distance of approximately 150 m.

Figure 1 Situation and nearest sensitive receivers

3 Existing Ambient Acoustic Environment

3.1 Noise monitoring

Noise monitoring was conducted during the period 18th to 28th November 2019. Unattended and attended noise measurements were undertaken to determine the existing noise levels at practical and secure locations on the Regatta Park site representative of the noise sensitive receivers.

Instrumentation

Noise logging was conducted using three Rion NL-42 noise loggers bearing the serial numbers 946984 and 946978. Field calibration was conducted at the commencement and conclusion of the logging period and no significant calibration drift was observed.

The noise loggers were configured to record all relevant noise indices, including background noise level (L_{A90}) and equivalent continuous noise levels (L_{Aeq}). Samples were accumulated at 15-minute intervals. The time response of the logger was set to 'fast'.

Attended measurements were conducted using a Rion NL-52 sound level meter bearing the serial number 820995. Field calibration was conducted before and after the measurements and no significant calibration drift was observed. Each measurement was for a period of 15 minutes with the meter response set to 'fast'. Noise measurements were taken in general accordance with AS1055.1[1].

Weather conditions

It is a requirement that noise data is captured during periods of favourable weather conditions avoiding adverse impacts of wind and rain on background noise levels. In order to assess weather conditions for the measurement period, half-hourly weather data was obtained from the Bureau of Meteorology (BOM) weather observation station ID 067113 at Penrith Lakes.

Noise data has been excluded from the processed results if:

- Rain was observed during a measurement period, and/or
- Wind speed exceeded 5 m/s (18 km/h) at the measurement height of 1.5 m above ground. Wind data obtained from the BOM is presented as the value at 10 m above ground.

The BOM wind speed data obtained for this report was measured at a height of 10 m above ground level. It is therefore necessary to apply a correction factor in order to estimate the wind speed at the height of the logger (1.5 m).

The methodology to formulate a correction factor has been derived[2]. The correction multiplier for the measured wind speed at 10 m is derived by the following formula:

$$W_{1.5} = W_{10} \times \left(\frac{M_{1.5,cat}}{M_{10,cat}} \right)$$

where: $W_{1.5}$ = Wind speed at height of 1.5 m
W_{10} = Wind speed at height of 10 m
$M_{1.5,cat}$ = AS 1170 multiplier for receiver height of 1.5 m and terrain category
$W_{10,cat}$ = AS 1170 multiplier for receiver height of 10 m and terrain category

[1] Australian Standard AS1055:2018 – Description and measurement of environmental noise

[2] Gowen, T., Karantonis, P. & Rofail, T. (2004), *Converting Bureau of Meteorology wind speed data to local wind speeds at 1.5m above ground level*, Proceedings of ACOUSTICS 2004

Noise logging data that has been excluded where adverse weather conditions occurred is identified in the overall summary and daily noise logging graphs presented in Appendix A.

Locations

Figure 2 shows the nearby sensitive receivers that represent the highest risk of an adverse noise impact from the newly proposed developments, the locations of the unattended background noise loggers (L1, L2) and the attended measurements (A1-A4). L2 is representative for locations near the Great Western Highway. Hence this location has been used for this assessment. Measurements were undertaken over a period of ten days to assess the relevant background noise levels in residential areas around Regatta Park. Further details and noise measurements of the existing ambient acoustic environment can be found in Section 3.2 and Section 3.3. The detailed logger graphs can be found in Appendix A.

Figure 2 Noise measurement and logging locations

3.2 Unattended noise monitoring

Unattended noise monitoring was conducted to establish the existing ambient noise environment representative of noise sensitive receivers close to the sites. Two noise loggers were deployed in Regatta Park for the park redevelopment process. For the assessment of the Police Cottage and Kiosk, Noise logger L2 is deemed representative as all receivers are close to the Great Western Highway corridor. The resultant ambient and background noise levels are summarised in Table 1.

Table 1 Unattended noise monitoring results

Noise logger location label	Rating Background Level, dB(A) L_{90}[1]			Ambient noise level, dB(A) L_{eq}		
	Day 7 am—6 pm	Evening 6 pm—10 pm	Night 10 pm—7 am	Day 7 am—6 pm	Evening 6 pm—10 pm	Night 10 pm—7 am
L2	45	44	34	52	51	48

(1) The Rating Background Level is a measure of the typical minimum steady background noise level for each time of day.

3.3 Attended noise measurements

Short-term operator-attended noise measurements were conducted at the end of the unattended noise logging survey period on 28th November 2019. Table 2 and Table 3 below provide a summary of the attended noise measurement results.

Table 2 Operator-attended short-term noise measurement results summary

Attended measurement location ref.	28th November 2019 Time	L_{eq} dB(A)	L_{Fmax} dB(A)	L_{10} dB(A)	L_{90} dB(A)
A2	17:06-17:21	69	91	73	52
A3	14:46-15:01	51	62	52	47
A4	15:32-15:47	50	69	53	45

Table 3 Notes taken during attended measurements

Attended measurement location	Notes
A1 - Residential Area	Medium density housing. The soundscape here was dominated the chirping of magpies and cockatoo screeches. Road noise was minimum with less than 6 cars passing during the 15-minute measurement window. Intermittent spikes in noise also caused by barking dogs.
A2 - River Road	Noise levels at this area was dominated by light cars and small trucks intermittently passing by in bursts. A car passing at 1 meter was approximately 70 dB(A). When no cars where driving on river road heavy load traffic was audible from the Great Western Highway.
A3 - Police Cottage	Soundscape dominated by road traffic noise form the Great Western Highway. Traffic noise mostly consisted of tire-road sound, with free-flowing moderate-heavy traffic which contained a relatively high portion of large trucks (65 dB(A) at logger site). Train noise from the railway tracks directly north east of the measurement site was also audible at approximately 60 dB(A).
A4 - Regatta Park Logger	The noise levels, measured in the free field, were controlled by distant traffic noise from the river road (45 dB(A) car passing) and was primarily composed of road-tire interaction noise. Traffic along river road was intermittent and dominated by small cars. Bird noise was also significant at this site with magpie chirps and cockatoo cries audible. Train noise was also audible from this location and was approximately 48 dB(A).

4 Noise Criteria

4.1 Operational noise criteria

4.1.1 Liquor and Gaming NSW for patron and music criteria

The NSW Office of Liquor, Gaming and Racing (OLGR) sets out three noise emission criteria for noise associated with the venue. It states:

'The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in an Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) by more than 5dB between 7:00am and 12:00 midnight at the boundary of any affected residence.

The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in an Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) between 12:00 midnight and 7:00am at the boundary of any affected residence.

Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 7:00am.'

The Rating Background Levels (RBL) on which the OLGR criteria are based are presented in Table 4. The calculated criteria are presented in Table 5. To establish the criteria, attended background noise spectra at Location A3 shown in Figure 2 were corrected to the measured evening period RBLs at L2 during the stated time period.

Table 4 RBL for OLGR octave band noise emission criteria

Period	Sound pressure level dB L_{A90} at Octave Band Centre Frequency (Hz)									Overall dB(A)
	31.5	63	125	250	500	1000	2000	4000	8000	
Daytime 7:00 – 0:00	18	33	36	34	36	39	35	30	26	44
Night-time 0:00 – 7:00	8	23	26	24	26	29	25	20	16	34

Table 5 Established OLGR criteria

Period	Sound pressure level dB L_{A90} at Octave Band Centre Frequency (Hz)									Overall dB(A)
	31.5	63	125	250	500	1000	2000	4000	8000	
Daytime 7:00 – 0:00	23	38	41	39	41	44	40	35	31	49
Night-time 0:00–7:00	8	23	26	24	26	29	25	20	16	34
	Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 7:00am.									

4.1.2 NSW Noise Policy for Industry for mechanical services criteria

The NPI sets two separate noise criteria to meet desirable environmental outcomes:

- **Intrusiveness** – steady-state noise from the site should be controlled to no more than 5 dB(A) above the background noise level in the area. In this case, the steady-state L_{eq} noise level should not exceed the RBL measured for different time periods in the environment. The intrusiveness criteria is measured over a 15 minute period.
- **Amenity** – amenity criteria are set based on the land use of an area. It requires noise levels from new industrial noise sources to consider the existing industrial noise level such that the cumulative effect of multiple sources does not produce noise levels that would significantly exceed the amenity criteria. As the amenity criteria is provided in the NPI document as a period level i.e. between 7am and 6pm for daytime activities, 3 dB is added to the amenity noise level to approximately represent a 15 minute period for direct comparison to the intrusiveness criterion. For new noise sources 5 dB must be subtracted from the amenity criterion to minimise noise creep over time as more noise sources are introduced to an area.

Internal and external noise criteria are also set by the NPI for non-residential land uses such as hospital wards, educational facilities and active recreation areas.

Both intrusiveness and amenity criteria are derived from the ambient noise survey and the NPI. They are then compared with each other and the lowest and most stringent noise level is adopted to represent the project specific noise criterion for the relevant time period, day, evening and night time.

Table 6 NPI noise emission criteria

Location	NPI Noise Level (dB re 20 µPa) during Period		
Residential receivers	**Daytime 07:00 – 18:00**	**Evening 18:00 – 22:00**	**Night-time 22:00 – 07:00**
Rating Background Level (RBL)	45	44	34
Intrusive criterion (RBL + 5 dB)	50	49	39
Amenity Criterion (NPI amenity level – 5 dB + 3 dB) (Suburban[1])	53	43	38
NPI Project specific criteria for residential land uses[2]	**50**	**43**	**38**

(1) A Suburban classification has been adopted for the site, described as an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristics: evening ambient noise levels defined by the natural environment and human activity.

(2) The project-specific criteria are the lowest of the Intrusive criterion and the Amenity criterion for new sources for each time period.

4.1.3 Car park noise emission

Emissions from car park noise have been assessed in Resonate's previous acoustic report (*Ref: S190486RP1A Dated: 18/03/2020*) for the Regatta Park redevelopment. Updates to the car park location have been made during the design process and there will be additional services vehicles delivering goods to the restaurant. These noise impacts are to be assessed against the NPI criteria shown in above Section 4.1.2.

4.2 Sleep disturbance noise criteria

As stated in the NPI the potential for sleep disturbance from maximum noise level events generated by premises during the night-time period needs to be considered. The term "sleep disturbance" is considered to be both awakenings and disturbance to sleep stages.

To evaluate potential sleep disturbance or awakening issues associated with the construction of the Project the NPI screening method has been adapted as follows. There is limited potential for sleep disturbance or awakening issues to occur, where:

- The predicted project night-time noise level ($L_{eq,\ 15\ minute}$ in dB(A)) at any residential receptor remains below 40 dB(A) (or the prevailing night-time background noise level plus 5 dB(A)), whichever is the greater.
- The predicted project night-time noise level (L_{max} in dB(A)) at any residential receptor remains below 52 dB(A) (or the prevailing night-time background noise level plus 15 dB(A)), whichever is the greater.

These screening method features have been adopted for likely maximum noise level events from garbage removal vehicles associated with the Police Cottage.

In accordance with the NPI, the sleep disturbance noise criteria for assessing the restaurants garbage removal are presented in Table 7 below.

Table 7 Sleep disturbance noise criteria

Receiver type	$L_{eq,\ 15minute}$ dB(A)	L_{max} dB(A)
Residential receivers	40	52

5 Noise Impact Assessment

5.1 Police Cottage

5.1.1 Patron noise

For the purpose of this assessment a number of assumptions have been made in predicting the potential noise emission from the operation of the Police Cottage. These assumptions form the basis of a worst-case scenario addressing the cumulative operational environmental noise emissions. Figure 3 shows the police cottage.

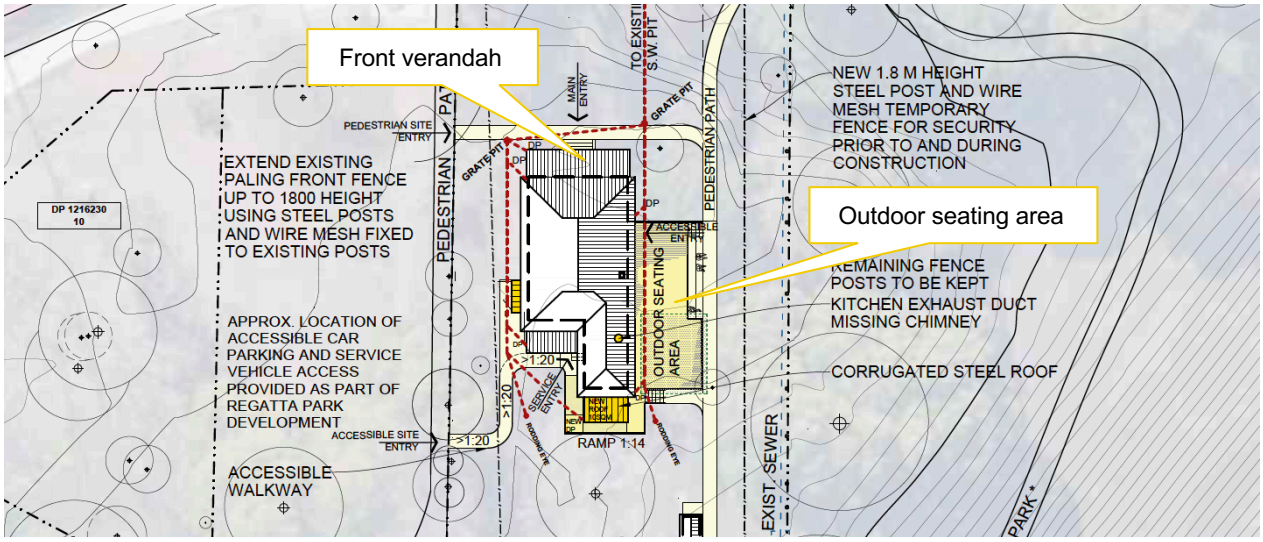


Figure 3 Proposed site showing outdoor seating area

Assumptions for calculations

The outdoor seating area has been modelled and levels at the nearest sensitive receivers have been predicted. The assumption made for the predictions are described below and do not represent restrictions or recommendations. Recommendations are presented in the Section *compliance with criteria and discussion* and Section 6. References to the utilised drawings for this assessment are shown in Appendix B.

- Opening hours 7am – 10pm or potentially 12am on weekends during summer.
- For patron noise, an L_{10} speech level of 78 dB(A) at 1 metre per person speaking[3] has been assumed.
- Outdoor seating area
  - 28 patrons dining in the outdoor seating area, of which half the occupants (14) are speaking.
  - Patrons talking are doing so with a loud voice speech effort.
  - Low-level background music is present within the space (a reference reverberant sound pressure level of 70 dB(A) has been assumed within the space).
- Front verandah
  - 16 patrons dining in the front verandah, of which half the occupants (8) are speaking.
  - Patrons talking are doing so with a loud voice speech effort.
  - Low-level background music is present within the space (a reference reverberant sound pressure level of 70 dB(A) has been assumed within the space).

[3] Source: Harris - Acoustical Measurements & Noise Control – Male and Female voice logarithmic average and 5 dB added to simulate L_{10} noise level

- Internal areas
  - Western façade: 32 patrons dining in Room 2 and Room 3, of which half the occupants (16) are speaking.
  - Eastern façade: 36 patrons dining in Room 1 and Room 5, of which half the occupants (18) are speaking.
  - Patrons talking are doing so with a loud voice speech effort.
  - Attenuation of 10 dB(A) through an open window has been used for the calculation.

Predicted noise levels

All operable elements such as windows have been modelled in the open position. Noise propagation from all areas has been calculated using a computer noise model (SoundPLAN 8.2). The predicted average maximum noise emission levels (L_{A10}) from the proposal, and comparison to criteria are shown in Table 8. The predicted noise levels presented are representative of those at the nearest most potentially affected residential receiver which is R5 at 37 Great Western Hwy, Emu Plains.

Table 8 Patron noise source emission

Description	dB(A)	Octave band Centre Frequency (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
External L_W noise level of outdoor seating area	89	48	60	70	80	87	86	82	75	68
External L_W noise level of front verandah	87	47	57	67	77	84	83	79	72	65
Internal L_{10} noise level of rooms along western façade	84	44	54	64	74	81	80	6	69	61
Internal L_{10} noise level of rooms along eastern facade	85	45	55	65	75	82	81	77	70	62
Predicted noise level at R5 37 Great Western Hwy, Emu Plains	43	6	16	23	30	39	39	37	28	14
Criteria Daytime (07:00 – 00:00)	49	23	38	41	39	41	44	40	35	31
Compliance ×/✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Compliance with criteria and discussion

Table 8 shows that compliance with the project specific noise criteria is expected to be achieved during the daytime period. No events are proposed after midnight; hence no assessment is required for this period.

5.1.2 Mechanical services noise

Specific mechanical services plant has not been selected at this stage of the project and therefore no detailed numerical assessment can be completed. However, a maximum allowable Sound Power Level (Lw) assessment has been undertaken to determine if noise mechanical plant items will have an adverse noise impact onto the community.

It is proposed that the following new mechanical service plant items to serve the project will be located on the roof:

- Kitchen exhaust
- Toilet exhaust fan

In addition, domestic scale condenser units required for air conditioning will be located under the verandah floor (Dish washer area).

Assumptions for calculations

To calculate the maximum allowable sound power levels for the cumulative plant on the rooftop the following has been assumed:

- Distance attenuation has been taken to be a point source and hemi-spherical propagation.
- It has been assumed that plant will be operational during the daytime and evening only. However, the maximum allowable sound power level is also shown for the night-time as there is potential that the restaurant will be open until midnight on weekends.
- Shielding of the plant may be required if the selected plant cannot meet the maximum allowable sound power level shown in Table 9.
- The noise contribution from the condenser units under the verandah are considered minimal due to the shielded location on ground level and domestic scale. However, an assessment is required during the detailed design stage when plant items are defined.
- The nearest sensitive receivers for the Police Cottage are R3, R4, R5 and R6. Other receiver are further away and therefore deemed compliant by meeting the criteria.

Table 9 Maximum allowable sound power level (Lw) for cumulative plant noise for day, evening and night-time periods

Receiver Reference	Attenuation		Maximum allowable sound power level dB(Lw_A) for cumulative plant on rooftop		
	~Distance (m)	Shielding ✓(-10dB)/ ✗(0dB)	To meet daytime criterion 50 dB $L_{Aeq,15min}$	To meet evening criterion 43 dB $L_{Aeq,15min}$	To meet night-time criterion 38 dB $L_{Aeq,15min}$
R3	100	✗	98	91	86
R4	80	✗	96	89	84
R5	80	✗	96	89	84
R6	100	✗	98	91	86

Compliance with criteria and discussion

Assuming there will be direct line of sight between the new plant items on the roof and the nearest sensitive receiver location, theoretically a maximum total sound power level of:

- 96 dB(A) during the daytime period
- 89 dB(A) during the evening period
- 84 dB(A) during night-time period

However, if the selected plant exceeds these levels then, by the provision of a solid noise barrier or acoustic louvres around the plant items wrapping around the corners on each end, the maximum allowable sound power levels can be increased by 10-15 dB(A).

It is expected that noise emissions from all mechanical services can comply with the relevant criteria with the implementation of appropriate control measures as necessary. Once plant selection have been made it is required to assess the noise impact during the detailed design stage.

5.1.3 Police Cottage car park

The noise impact from the Police Cottage car park has been assessed in the previous acoustic report S190486RP1A. Since then, the design has changed during the design development. Therefore, the updated assessment is presented below.

If compliance with the NPI criteria can be achieved at the nearest receiver to each car park, then compliance will be achieved at other receivers further away. Figure 4 shows the proposed car park areas and the nearest receiver R6 at 8 River Road.

Figure 4 Location of Police Cottage car park

Table 10 provides an overview of typical noise sources associated with the operation of the car park, which have been used to assess noise impact on the community.

Table 10 Typical noise sources associated with the car park

Parking area / Stage	Nearest receiver	Number of car spaces	Distance to nearest receiver, m		
			Car door closure	Car engine start	Car pass-by
Police Cottage car park	R6	20	55	55	55

5.1.4 Noise source levels

Table 11 presents the noise source levels and the number of events estimated for a 'peak' 15-minute time period providing a 'worst case scenario. The previously measured typical noise source levels, corrected for tonality and impulsiveness as per AS1055[4] have been converted to a sound exposure level (L_{AE}), which represents the sound energy condensed into one second. The L_{AE} is then used to calculate the 15 minute L_{Aeq}, which in turn is used to compare against the relevant day and evening criteria.

Table 11 Typical car park noise sources measured at 1m

Noise Source	Location	Duration	$L_{eq,T}$ dB	L_{AE} dB	Assumed maximum events per 15 minutes
					Police Cottage car park
Car door closure	1 m from source	2	75	78	20
Car engine start	1 m from source	3	72	77	10
Car pass-by	1 m from source	10	76	86	10

5.1.5 Noise prediction calculation assumptions

The following assumptions have been made for noise prediction calculations:

- Assumptions of noise events for all car parks are based on a reasonable expectation of noise events that may take place over a 15-minute period during events in relation to the total number of car parking spaces available in each car park.
- All noise sources including car door closures, engine starts and car pass-bys have been treated as if they all occur at the nearest car park location to the each of the sensitive receivers.
- The method of predicting vehicle noise from the nearest single location is conservative as the car door closures and ignition noise sources would be spread out across the car park at varying distances from the receiver.

The proposal includes provision of approximately 20 car parking spaces at the Police Cottage. The nearest residential receiver is R6 at 8 River Road, Emu Plains. It is assumed that peak traffic will occur before and after the busiest time. It is assumed that 10 cars will arrive within a 15-minute period before the busiest time, that there will be on average 2 people per car, and that during a peak arrival time, there are few cars departing. This would result in a predicted noise contribution of 33 dB(A) at the nearest residential receiver.

[4] Australian Standard AS1055.1 - Description and measurement of environmental noise – General procedures

Table 12 Police Cottage car park predicted noise impacts against NPI criterion

Receiver	Noise Source	Source Level dB L_{AE}[1]	Adjusted Source level[2] to $L_{Aeq,15mins}$	Distance attenuation dB(A)	Predicted External Noise Level L_{Aeq} dB(A)	Daytime criterion	Evening criterion	Night criterion
						50 dB $L_{Aeq,15min}$	43 dB $L_{Aeq,15min}$	38 dB $L_{Aeq,15min}$
R4	Car door closure	75	61	35	26	✓	✓	✓
	Car engine start	72	57	35	22	✓	✓	✓
	Car pass-by	76	66	35	31	✓	✓	✓
Total Combined					33	✓	✓	✓

Compliance with criteria and discussion

Table 12 shows that the expected car park noise generation from car door closures, car ignition and car pass-bys meet the NPI assessment criteria for all assessment periods.

5.1.6 Police Cottage deliveries and garbage removal

Garbage removal and deliveries are proposed to happen in the location shown in Figure 4. These noise impacts are occurring infrequent and it is assumed that food deliveries will only happen during the daytime period. The garbage removal could occur in the early morning before 7 am and is therefore assessed against the night-time sleep disturbance L_{Amax} criterion.

The following assumptions have been made for the calculation:

- Assumptions of noise events for garbage removal and delivery of goods are based on a reasonable expectation of noise events that may take place over a 15-minute period.
- The controlling noise source for the events is the truck engine.
- Distance attenuation has been taken to be a point source and hemi-spherical propagation.
- A sound pressure level of 70 dB(A) at 1 m has been assumed for the 15 minute assessment period for goods deliveries as shown in Table 13.
- A maximum sound pressure level of 98 dB(A) at one metre has been assumed for the garbage removal maximum noise events as shown in Table 14.

Table 13 Goods delivery predicted noise impacts against NPI criterion

Receiver Type assessment	Noise source at 1m $L_{eq,\ 15minute}$ dB(A)	Distance attenuation dB	Predicted External Noise Level L_{Aeq} / L_{Amax} dB(A)	Daytime criterion
				50 dB $L_{Aeq,15min}$
R6 – 8 River Road Goods delivery	70	36	34	✓

Table 14 Garbage removal predicted noise impacts against NPI sleep disturbance L_{Amax} criterion

Receiver Type assessment	Noise source at 1m L_{max} dB(A)	Distance attenuation dB	Predicted External Noise Level L_{Aeq} / L_{Amax} dB(A)	Night-time
				52 dB L_{Amax}
R6 – 8 River Road Garbage removal	98	36	62	✖

Compliance with criteria and discussion

No exceedance is predicted for the delivery of goods during the daytime period.

For the garbage removal which could occur in the early morning before 7am, an exceedance of the L_{Amax} sleep disturbance noise criteria by 10 dB(A) is expected. It is noted that is an infrequent noise event and could therefore be considered acceptable.

However, if council would receive complaints from local residents in regards to early morning garbage removal, it is recommended to mitigate the noise impact by restricting garbage removal to the hours between 7 am and 10 pm.

5.2 Kiosk

5.2.1 Patron noise

For the purpose of this assessment a number of assumptions have been made in predicting the potential noise emission from the operation of the Kiosk. These assumptions form the basis of a worst-case scenario addressing the cumulative operational environmental noise emissions. Figure 5 shows the outdoor seating area.

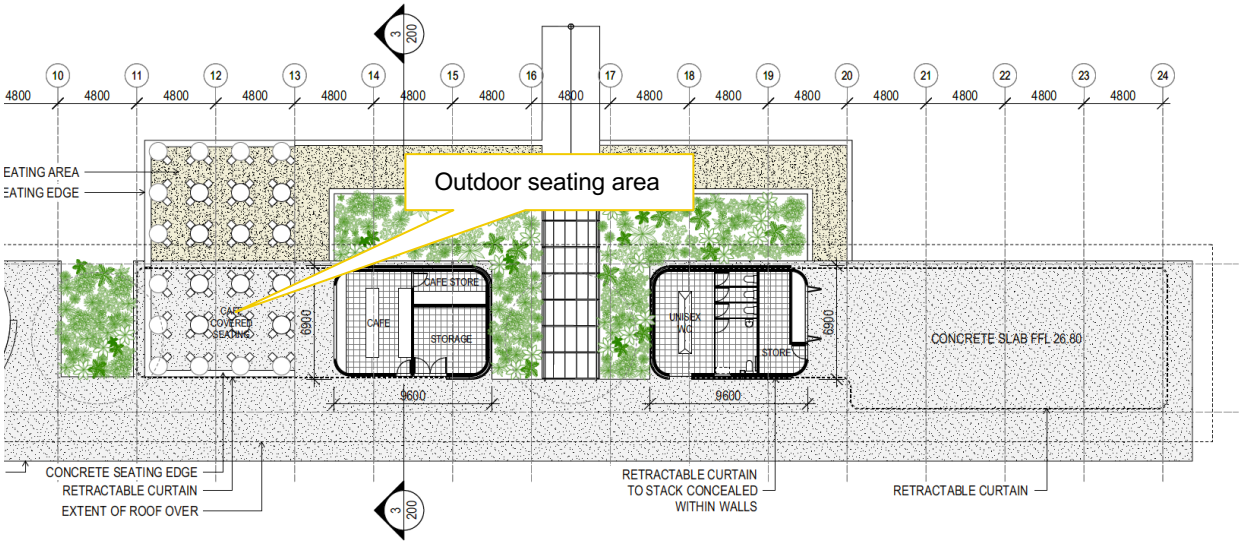


Figure 5 Proposed site showing outdoor seating area

Assumptions for calculations

The outdoor seating area has been modelled and levels at the nearest sensitive receivers have been predicted. The assumption made for the predictions are described below and do not represent restrictions or recommendations. Recommendations are presented in the Section *compliance with criteria and discussion* and the conclusion at the end of this report. References to the utilised drawings for this assessment are shown in Appendix B.

- Opening hours 7am – 4pm.
- For patron noise, a speech level of 78 dB(A) at 1 metre per person[5] has been assumed.
- Outdoor seating area:
  - 84 patrons dining in the outdoor seating area, of which half the occupants (42) are speaking.
  - Patrons talking are doing so with a loud voice speech effort.

Predicted noise levels

All operable elements such as windows have been modelled in the open position. Noise propagation from all areas has been calculated using a computer noise model (SoundPLAN 8.2). The predicted average maximum noise emission levels (L_{A10}) from the proposal, and comparison to criteria are shown in Table 15. The predicted noise levels presented are representative of those at the nearest most potentially affected residential receiver which is R6 at 8 River Road, Emu Plains.

Table 15 Patron noise source emission

Description	dB(A)	Octave band Centre Frequency (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
External L_W noise level of outdoor seating area	89	38	48	58	68	75	74	70	63	56
Predicted noise level at R6 8 River Rd, Emu Plains	44	7	17	24	32	40	41	37	28	13
Criteria Daytime (07:00 – 00:00)	49	23	38	41	39	41	44	40	35	31
Compliance ×/✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Compliance with criteria and discussion

Table 15 shows that compliance with the project specific noise criteria is expected to be achieved during the daytime period. No events are proposed after midnight; hence no assessment is required for this period.

[5] Source: Harris - Acoustical Measurements & Noise Control – Male and Female voice logarithmic average and 5 dB added to simulate L_{10} noise level

5.2.2 Mechanical services noise

Specific mechanical services plant has not been selected at this stage of the project and therefore no detailed numerical assessment can be completed. However, a maximum allowable Sound Power Level (Lw) assessment has been undertaken to determine if noise mechanical plant items will have an adverse noise impact onto the community.

Assumptions for calculations

To calculate the maximum allowable sound power levels for the cumulative plant on the rooftop the following has been assumed:

- Distance attenuation has been taken to be a point source and hemi-spherical propagation.
- It has been assumed that plant will be operational during the daytime and evening only. The maximum allowable sound power level is also shown for the night-time.
- Shielding of the plant may be required if the selected plant cannot meet the maximum allowable sound power level shown in Table 16.
- The nearest sensitive receiver for the Kiosk is R6. Other receivers are further away and therefore deemed compliant by meeting the criteria.

Table 16 Maximum allowable sound power level (Lw) for cumulative plant noise for day, evening and night-time periods

Receiver Reference	Attenuation		Maximum allowable sound power level dB(Lw_A) for cumulative plant on rooftop		
	~Distance (m)	Shielding ✓(-10dB)/ ✗(0dB)	To meet daytime criterion 50 dB $L_{Aeq,15min}$	To meet evening criterion 43 dB $L_{Aeq,15min}$	To meet night-time criterion 38 dB $L_{Aeq,15min}$
R6	75	✗	95	88	83

Compliance with criteria and discussion

Assuming there will be direct line of sight between the new plant items on the roof and the nearest sensitive receiver location, theoretically a maximum total sound power level of:

- 95 dB(A) during the daytime period
- 88 dB(A) during the evening period
- 83 dB(A) during night-time period

If the selected plant exceeds these levels then, by the provision of a solid noise barrier or acoustic louvres around the plant items wrapping around the corners on each end, the maximum allowable sound power levels can be increased by 10-15 dB(A).

It is expected that noise emissions from all mechanical services can comply with the relevant criteria with the implementation of appropriate control measures as necessary. Once plant selection are made it is required to assess the noise impact during the detailed design stage.

6 Recommendations / Conclusion

Resonate Consultants has assessed the noise impact from the proposed Police Cottage restaurant and Regatta Park Kiosk on the local community. There is also an Event Space planned which will be assessed in a separate noise assessment at a later stage.

Operational noise emission criteria have been developed and set in accordance with the Penrith Council DCP and the NSW NPI and apply to noise generated from patron noise, externally located mechanical plant, car park activity and service vehicles. The noise impact of these activities on noise sensitive receivers around the site has been assessed in accordance with the criteria. Generally, there are no areas of the assessed operations of the built facilities that warrant particular concern in relation to an adverse noise impact to the community.

A brief summary of the Police Cottage and Kiosk is provided below with in-principle recommendations where required. As the design progresses and more specific information becomes available, noise mitigation measures should be reviewed to ensure that the operational criteria are met.

Police Cottage

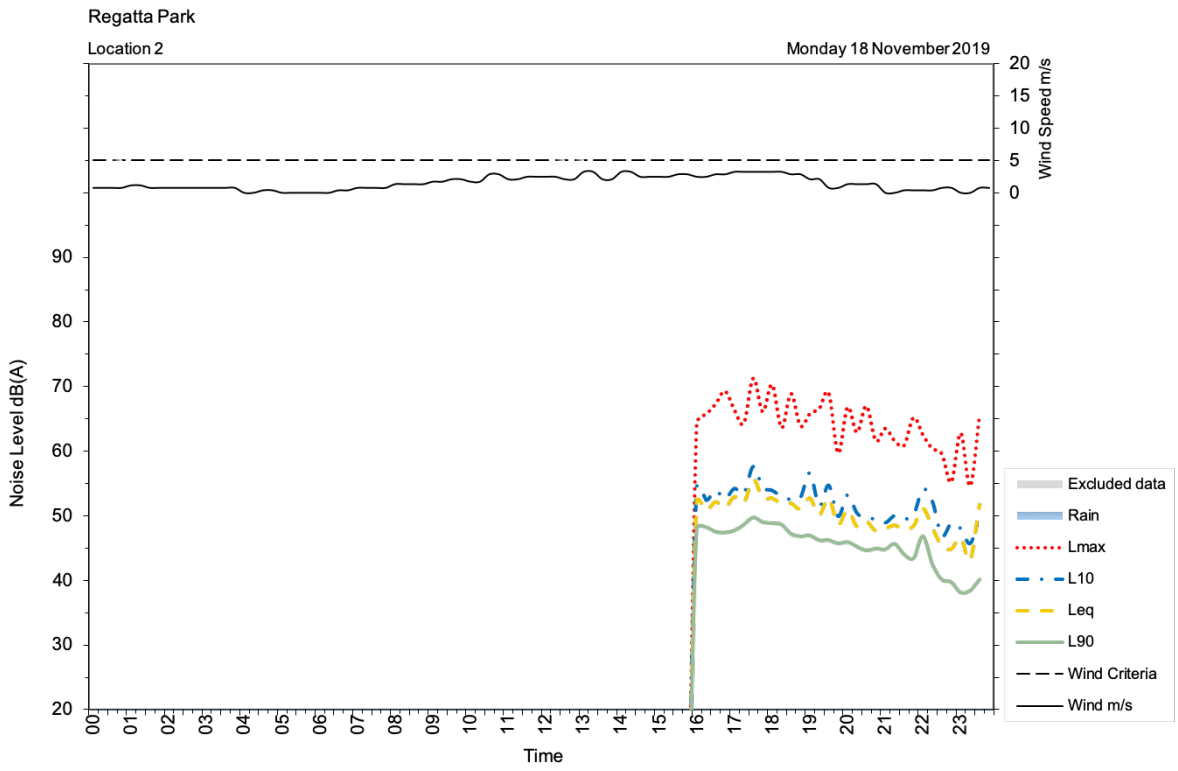
- Operational noise
  - Compliance with the project specific OLGR noise criteria is expected to be achieved during the daytime period. The restaurant is not operating after midnight; hence no assessment is required for this period.
- Mechanical services noise
  - It is expected that noise emissions from all mechanical services can comply with the relevant criteria with the implementation of appropriate control measures as necessary. Once plant selection have been made it is required to assess the noise impact during the detailed design stage.
  - External mechanical plant items may require the provision of a solid noise barrier or acoustic louvres around to reduce the noise impact by 10-15 dB(A) if the assumed maximum sound power level in the calculated scenario is exceeded.
- The expected Police Cottage car park noise generation from car door closures, car ignition and car pass-bys meet the NPI assessment criteria for all assessment periods.
- Deliveries and Garbage removal
  - No adverse noise impact above the NPI criteria is predicted for the delivery of goods during the daytime period.
  - An exceedance of the L_{Amax} sleep disturbance noise criteria by 10 dB at the nearest sensitive receiver at 8 River Road is predicted for garbage removal during the night-time period. It is noted that is an infrequent noise event and could therefore be considered acceptable.
  - If complaints due to garbage removal would arise, it is recommended to mitigate the noise impact by restricting garbage removal to the hours between 7 am and 10 pm.
  - No further measures (e.g. noise barrier) are proposed to mitigate the garbage removal due to the infrequent occurrence of the event.

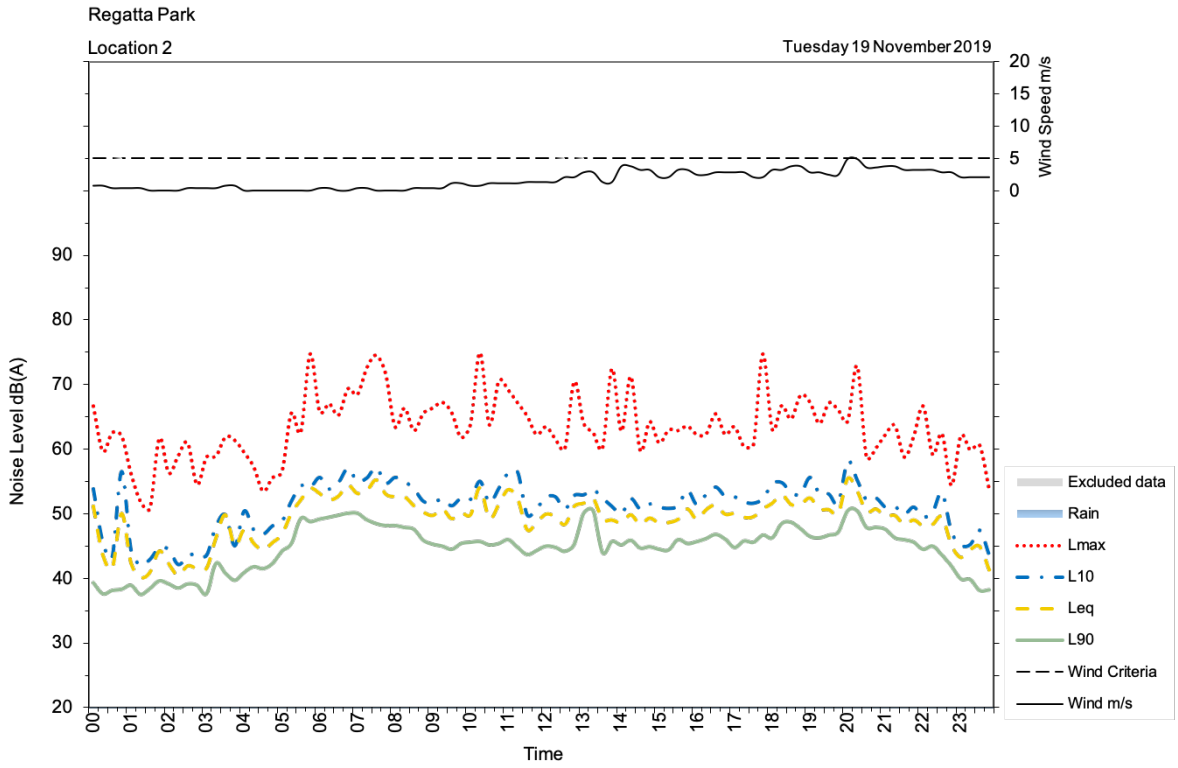
Kiosk

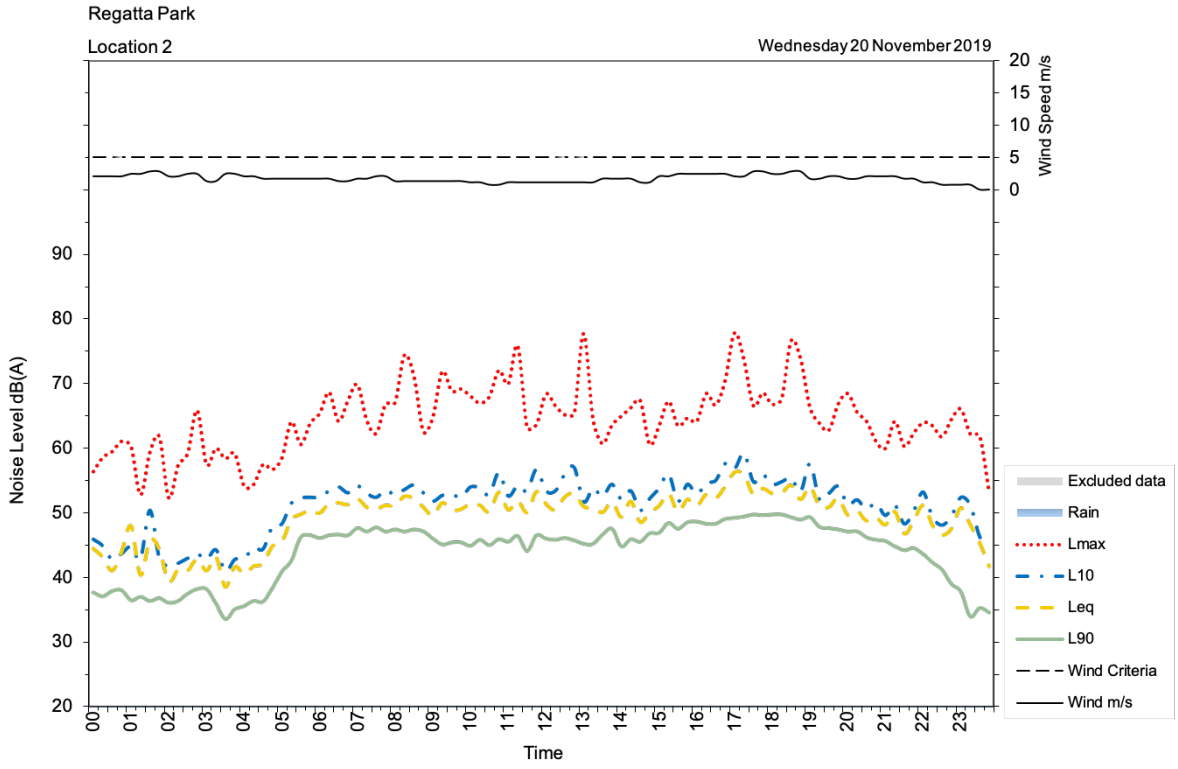
- Operational noise
  - Compliance with the project specific OLGR noise criteria is expected to be achieved during the daytime period. The Kiosk is not operating after midnight; hence no assessment is required for this period.
- Mechanical services noise
  - Maximum allowable Sound Power Levels for the external mechanical services (e.g. kitchen exhaust fan) to comply with the criteria have been calculated. Therefore, adverse noise impacts from the plant to the surrounding noise sensitive receivers are considered negligible.
  - Further assessment of the noise impact will be required during the detailed design stage, when mechanical plant and operational details are available. External mechanical plant items may require the provision of a solid noise barrier or acoustic louvres around to reduce the noise impact by 10-15 dB(A) if the assumed maximum sound power level in the calculated scenario is exceeded.

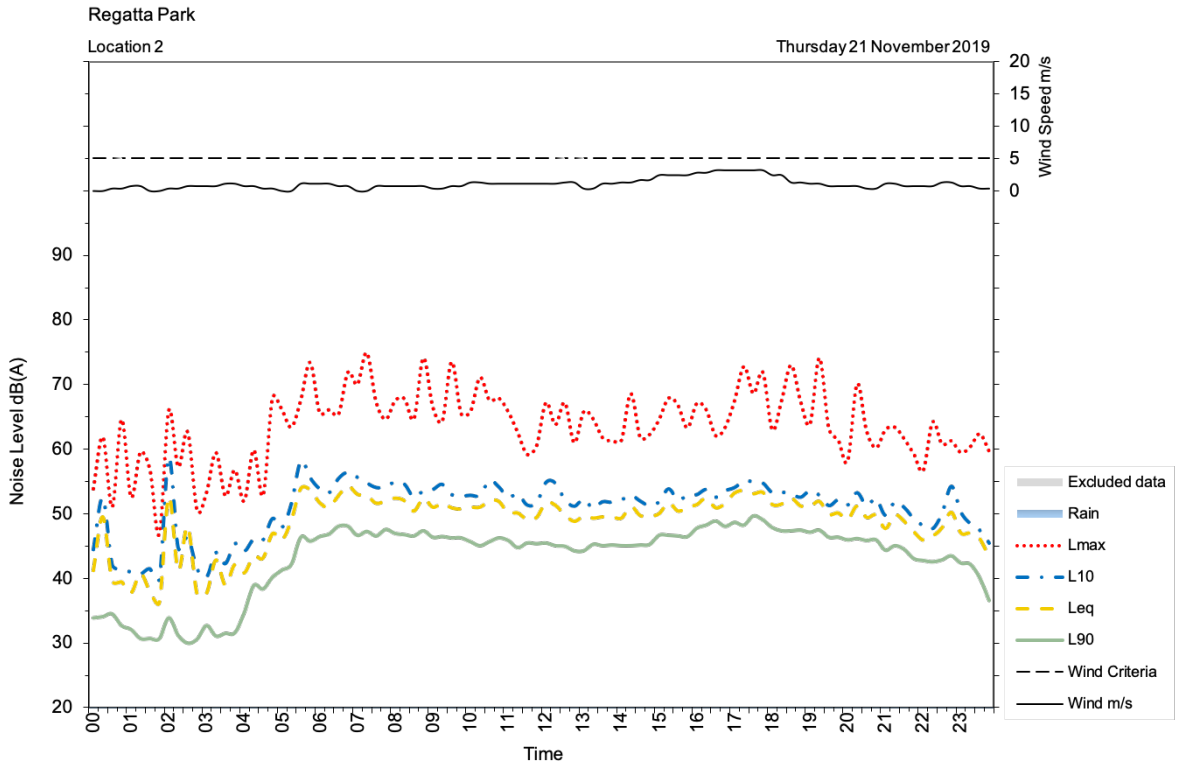
Appendix A – Logger results

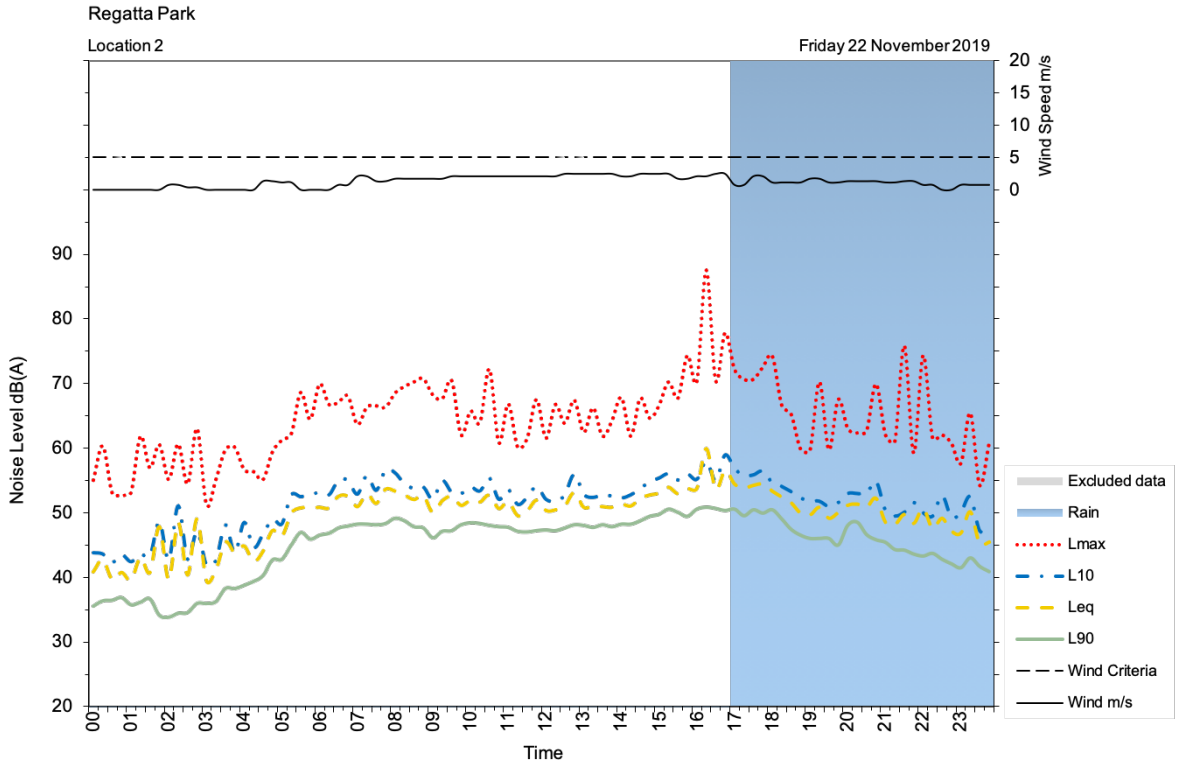
Logger location L2 – Police Cottage

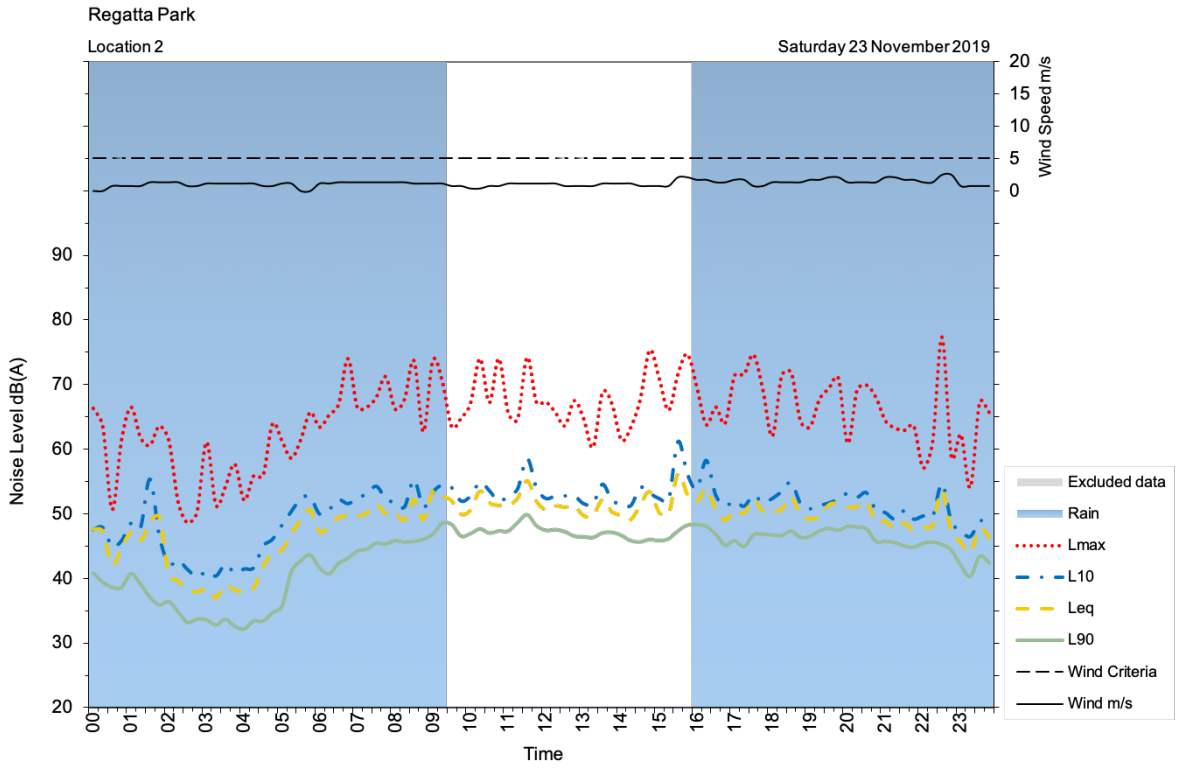


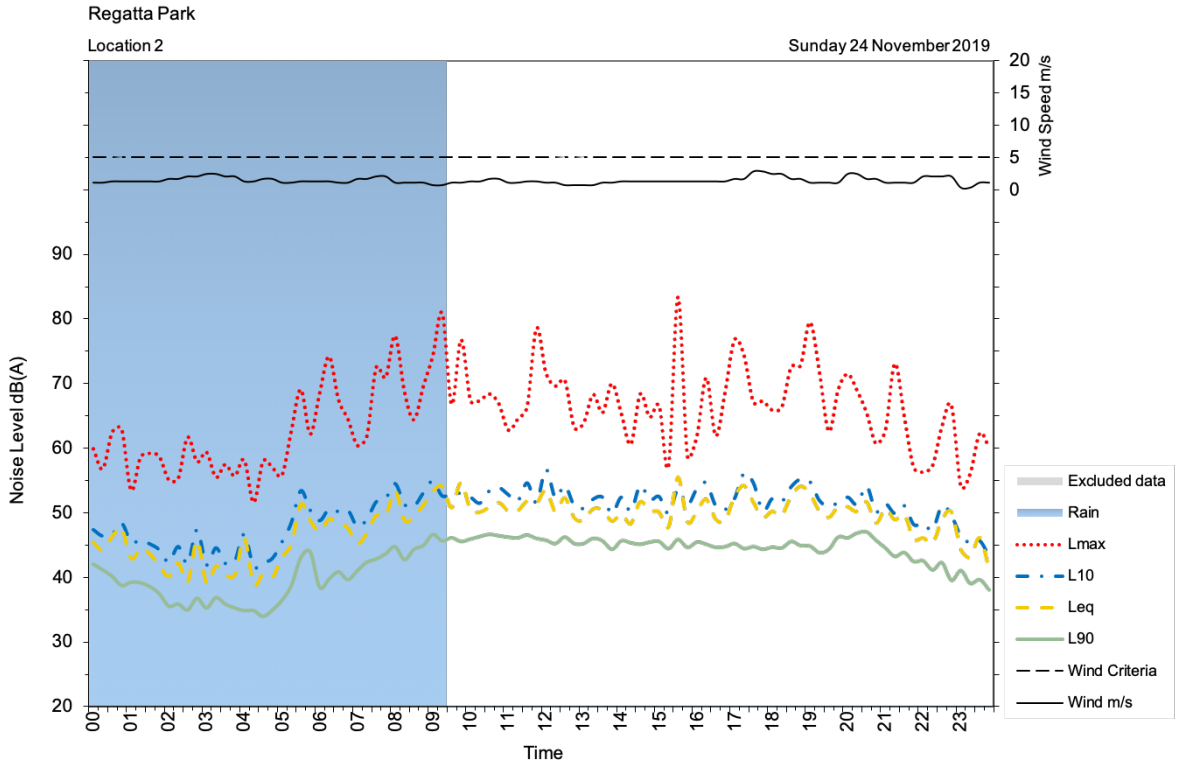


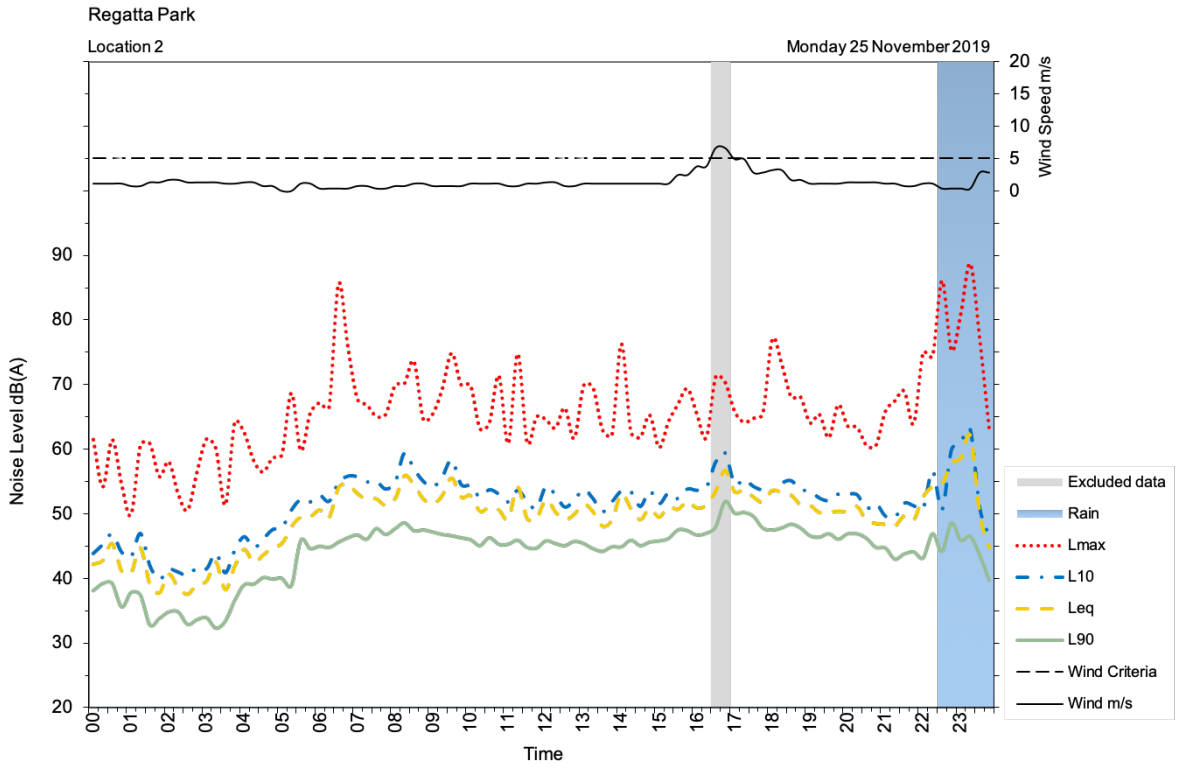


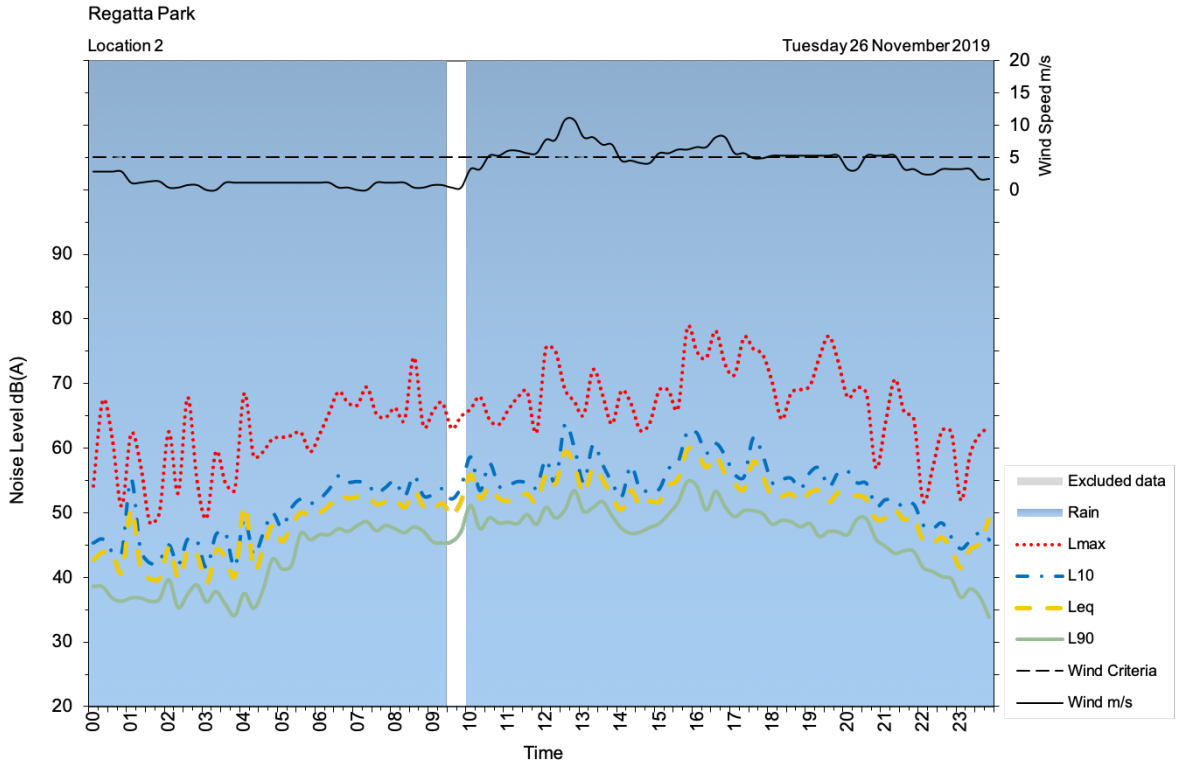


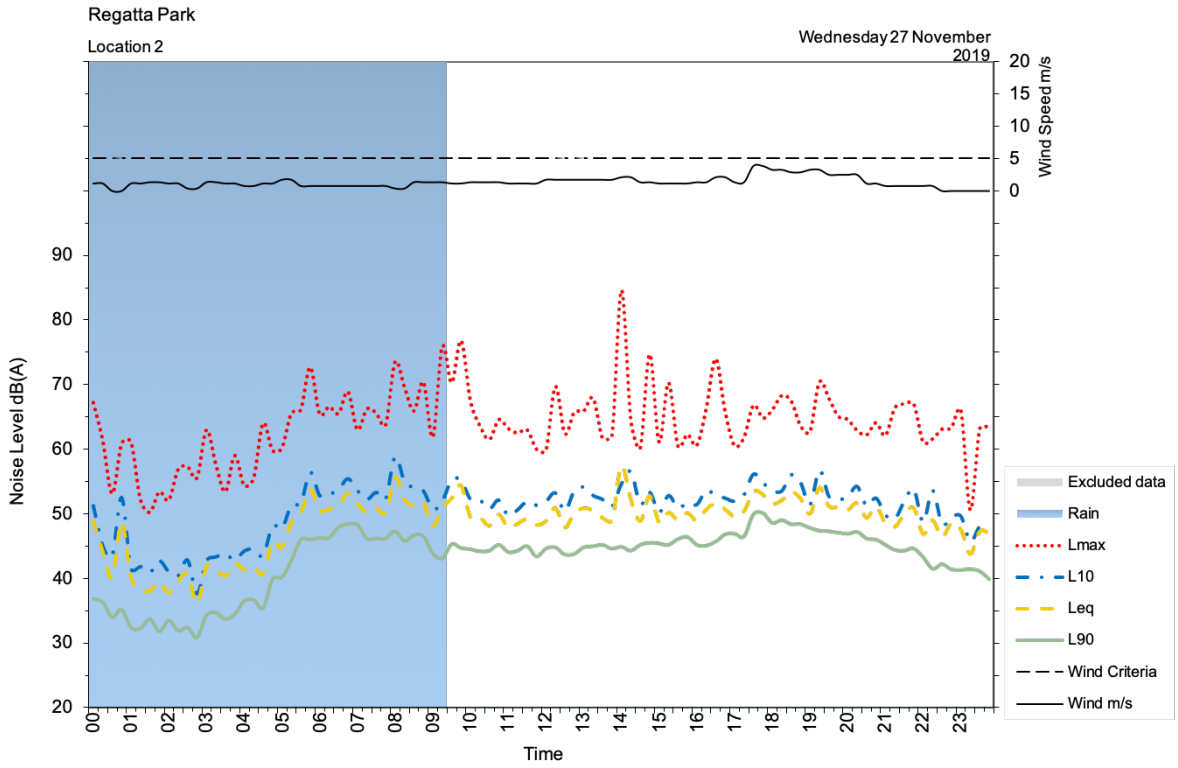


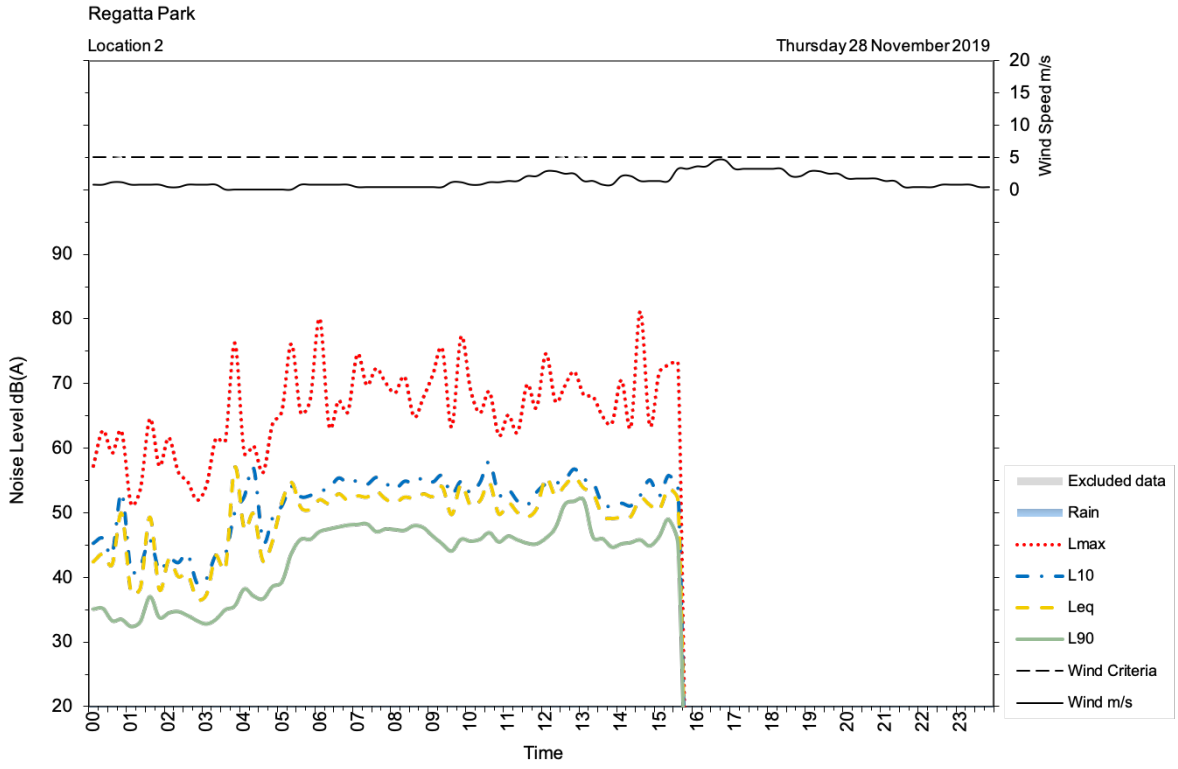












Appendix B – Drawings references

The following drawings and sketches have been used for the noise assessment.

Police Cottage

- LUCAS STAPLETON JOHNSON – ADAPTIVE REUSE OF FORMER POLICE STATION/RESIDENCE
  - PROPOSED SITE PLAN – Dwg No.124010/14/B (DATE 29.07.20)
  - PROPOSED PLAN – Dwg No. 124010/16 (DATE 29.09.20)
  - PROPOSED NORTH AND WEST ELEVATIONS - Dwg No.124010/19 (DATE 05.09.20)
  - PROPOSED EAST AND SOUTH ELEVATIONS – Dwg No. 124010/18 (DATE 05.09.20)
- MCGREGOR COXALL – REGATTA PARK
  - Parking Concept Police Cottage 4 – Sheet No. LD-CD-PC04 Rev B (DATE 12.01.21)

Kiosk

- BREAKSPEAR ARCHITECTES - REGATTA PARK KIOSK
  - SITE PLAN, SHEET NUMBER 100, ISSUE A (DATE 14.12.20)
  - FLOOR AND ROOF PLAN, SHEET NUMBER 101, ISSUE A (DATE 14.12.20)
  - RCP AND SLAB SETOUT PLANS, SHEET NUMBER 102, ISSUE A (DATE 14.12.20)
  - ELEVATIONS AND SECTION, SHEET NUMBER 200, ISSUE A (DATE 14.12.20)