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Lot 101 and 4, Ingleburn Gardens, Bardia

Noise Impact Assessment

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic assessment of traffic noise impacts on the proposed land subdivision as part of the Ingleburn Gardens development, Bardia.

The proposed subdivision is located parallel to the M5 motorway. Noise impacts have been assessed with consideration to the State Environment Planning Policy (SEPP) Infrastructure 2007.

This report is presented as an addendum to the previously submitted Acoustic Logic Consultancy document titled 'Lot 101 and 4, Ingleburn Gardens, Bardia – DA Noise and Vibration Assessment' dated 27 November 2015. Additional unattended noise monitoring has been conducted to assess traffic noise impacts to the proposed new residential lots. Acoustic treatments to mitigate noise impacts from the adjacent M5 motorway have been determined in accordance with the Infrastructure SEPP.

2 SITE BACKGROUND

The Ingleburn Gardens development is located along the M5 motorway, Bardia. The proposed land subdivision is located along the western boundary of the development adjoining the motorway. An acoustic barrier is proposed to run along the boundary between the M5 motorway and the new residential lots. It is proposed that the top of the barrier is a minimum of 2m above the RL of the freeway, approximately 5m above the RL of the lots.

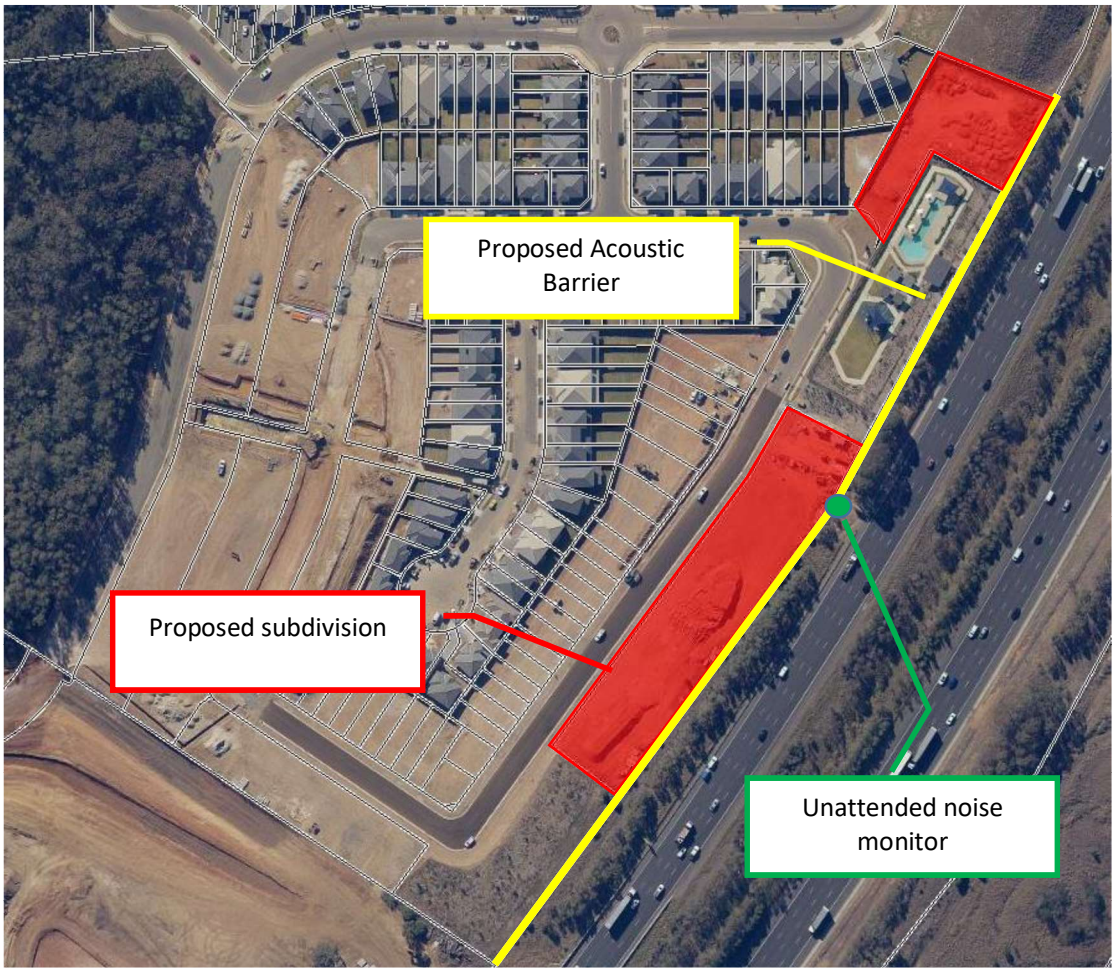


Figure 1: Site Location and Monitoring Positions

The parcel of land is currently zoned RE2 for private recreation. It is proposed to rezone the land (shown in red in Figure 1) to R3 medium density and subdivide into 23 new allotments, see Figure 2 below.

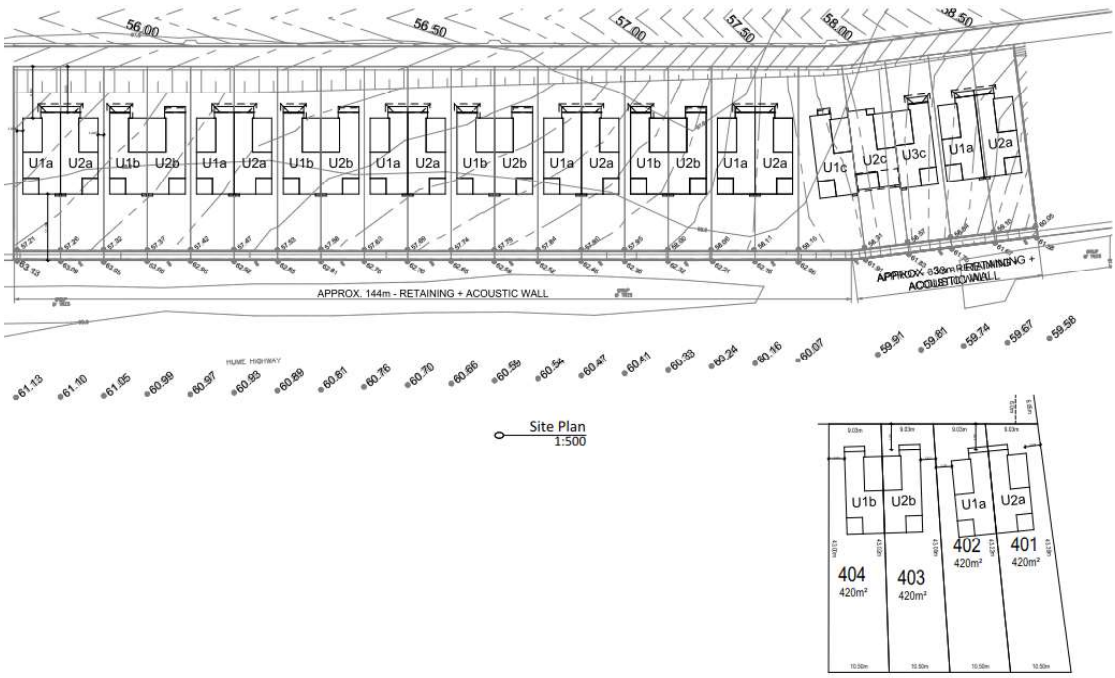


Figure 2: Proposed Land Subdivision and Acoustic Barrier

Figure 3: Proposed Land Subdivision

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced at the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 NOISE INTRUSION ASSESSMENT

Noise intrusion into the site has been assessed for the road noise from the M5 motorway. Acoustic treatment of the proposed subdivision will be designed in order to ensure compliance with the acoustic requirements of the infrastructure SEPP.

4.1.1 NSW SEPP Infrastructure (2007)

The NSW Department of Planning's policy, Development Near Rail Corridors and Busy Roads – Interim Guideline, sets out internal noise level criteria adapted from the State Environmental Planning Policy (Infrastructure) 2007 (the 'Infrastructure SEPP') for developments with the potential to be impacted by traffic or rail noise and vibration.

For rail noise and vibration, the following controls apply:

"87 Impact of rail noise or vibration on non-rail development

(1) This clause applies to development for any of the following purpose that is on land in or adjacent to a rail corridor and that the consent authority considers is likely to adversely affected by rail noise or vibration:

(a) a building for residential use,

(b) a place of public worship,

(c) a hospital,

(d) an educational establishment or child care centre.

(2) Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Director-General for the purpose of this clause and published in the Gazette.

(3) If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceed:

(a) in any bedroom in the building – 35 dB(A) at any time between 10.00 pm and 7.00 am,

(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time."

The governing project criteria are presented in Table 1.

Table 1 – Internal Noise Level Criteria

Internal Use	Traffic Noise Level, dB(A) $L_{eq\ 15\ hour}$	Traffic Noise Level, dB(A) $L_{eq\ 9\ hour}$
Bedroom	-	35
Living Room	40	40

4.2 EXTERNAL NOISE MEASUREMENTS

As part of this investigation, traffic noise from the M5 motorway has been measured. The results of these measurements will be used to determine the treatments required to reduce noise levels to within the project acoustic objectives.

4.2.1 Measurement Location

Measurements were conducted along the proposed eastern boundary as detailed in Figure 1 above.

4.2.2 Unattended Measurements

Unattended noise measurements were obtained using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The noises monitors were calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator. No significant drift was detected. All measurements were taken on A-weighted fast response mode.

The logger was on site from the 24th October 2019 to 1st November 2019. Refer to Appendix 1 for unmanned noise monitoring data.

4.2.3 Resultant Noise Levels

The following table presents the resultant noise levels at the proposed boundary of the development. The noise levels are based on both the attended and unattended noise measurement results conducted by this office.

Table 2 – Measured Existing Environmental Noise Levels

Locations	Traffic Noise Levels	
	Daytime (7am-10pm)	**Night-time (10pm- 7am)**
Eastern Boundary (Facing M5 Motorway)	73 dB(A)	71 dB(A)
Eastern Building Façade Ground Level (predicted*)	59 dB(A)	57 dB(A)
Eastern Building Façade Top Level (predicted*)	65 dB(A)	63 dB(A)

*prediction of noise levels at the facades take into account the attenuation from the proposed acoustic barrier

4.3 EVALUATION OF NOISE INTRUSION

Internal noise levels will primarily be as a result of noise transfer through the windows and doors and roof, as these are relatively light building elements that offer less resistance to the transmission of sound.

The construction recommendations to attenuate external noise impacts through windows and doors for the proposed residential development are discussed below. The recommendations have been based on the measured level and spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements to ensure compliance with the internal noise level criteria.

Calculations were performed taking into account the orientation of windows, barrier effects (where applicable), the total area of glazing, facade transmission loss and the likely room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

Table 3 - Typical Glazing Construction Recommendations

Site	Room	Façade	Glazing requirements
Southern Lots	Bedroom (Level 1)	East	10.38mm laminated
		South / North	6.38mm laminated
		West	5mm float
	Living Room (Ground Floor)	East	10mm float
		South / North	6mm float
		West	5mm float
Northern Lots (Lots 401-404)	Bedroom (Level 1)	North	12.38mm laminated
		East	10.38mm laminated
		South	6.38mm laminated
		West	5mm float
	Living Room (Ground Floor)	North	10.38mm laminated
		East	10mm float
		South	6mm float
		West	5mm float

The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

4.3.1 External Walls

External walls composed of concrete or masonry elements will not require upgrading. There should not be vents on the internal skin of external walls. All penetrations in the internal skin of external walls should be acoustically sealed. **Any lightweight constructions will need to be reviewed and assessed at a later stage.**

4.3.2 External Doors

The external doors to the residence will need to be 40mm solid core timber door, with Raven RP10 seals on the top and the sides and Raven RP38 drop seal at the bottom.

4.3.3 Roof/ ceiling constructions

Typical ceiling constructions have been presented in the table below. Any ceiling constructions will need to be reviewed and assessed at a later stage.

Penetrations in ceilings (such as for light fittings etc.) must be sealed gap free with a flexible sealant.

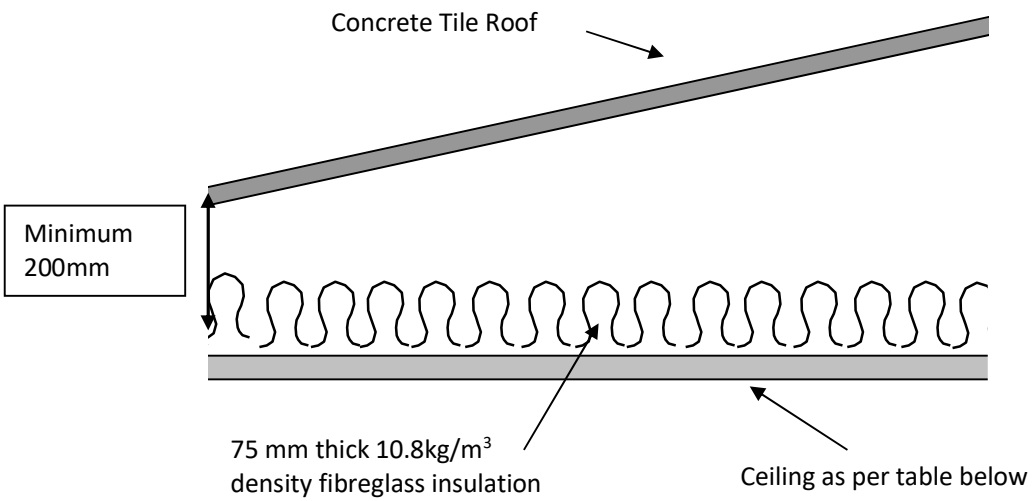


Figure 4: Roof / Ceiling Construction Houses

Table 4– Recommended Ceiling Construction

Room	Ceiling
Living / Lounge / Kitchen	1 x 13mm Plasterboard
Bedrooms	2 x 13mm Plasterboard

Note: Any ceiling constructions will need to be reviewed and assessed at a later stage.

4.4 VENTILATION REQUIREMENTS

The NSW Department of Planning document "Development near Busy Roads and Rail Corridors - Interim Guideline" dictates that:

> *"If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (ie – allowable level becomes 50 dB(A) in living rooms and 45 dB(A) in bedrooms at night).

Traffic noise levels on the east, north and south facades will exceed noise levels which would permit windows being open sufficient to satisfy ventilation requirements of the BCA. Alternative means of ventilation may be required.

5 CONCLUSION

This report presents the assessment of traffic noise impacts on the proposed rezoning of the lots currently provided for private recreation to residential use.

Traffic noise modelling has been conducted for the site based on recorded noise levels to determine acoustic treatments in compliance with the State Environmental Planning Policy (Infrastructure) 2007.

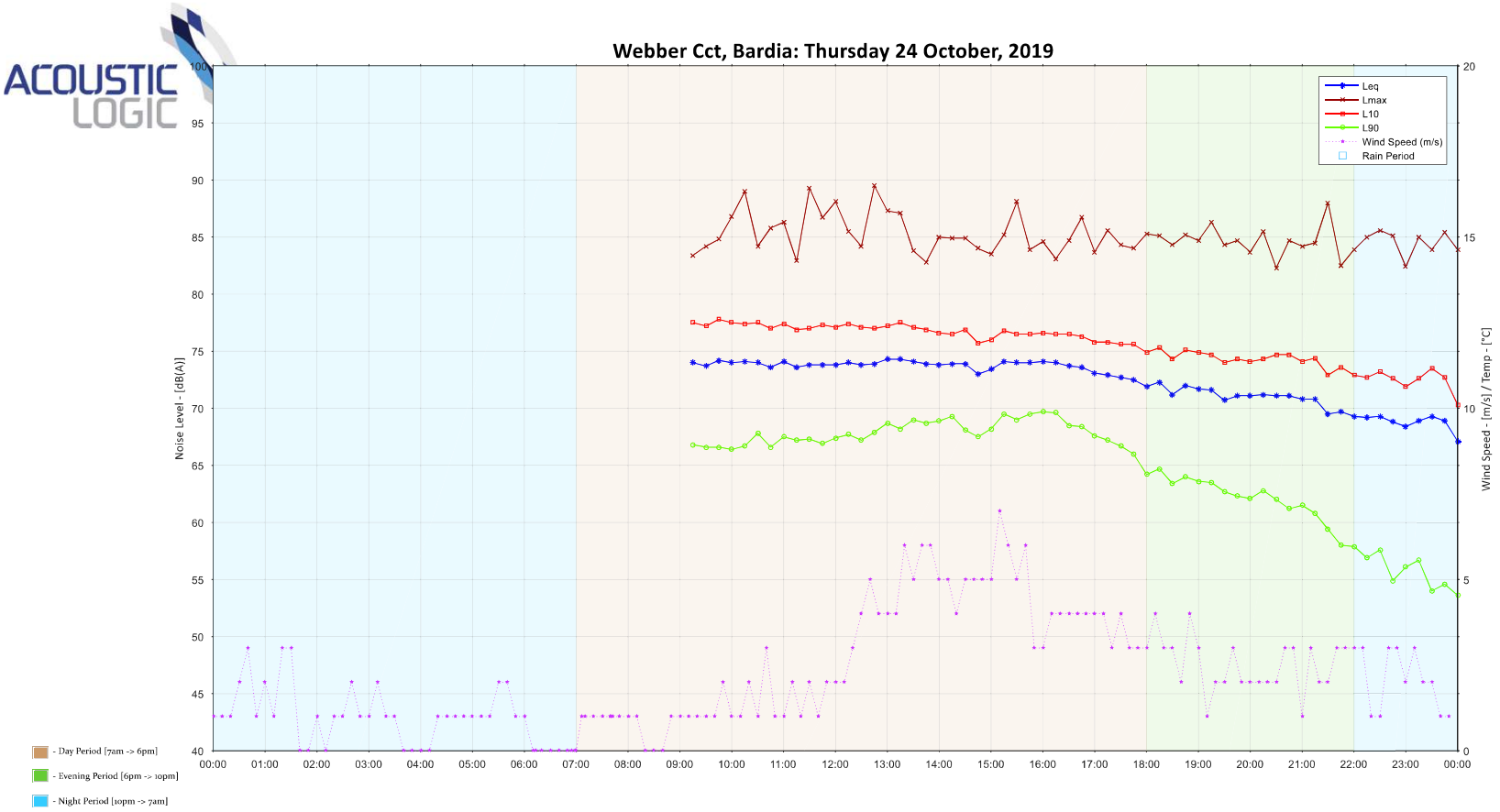
Acoustic treatments have been formulated to ensure compliance with the requirements of the SEPP (Infrastructure).

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Katherine Beeston
Acoustic Logic Consultancy

APPENDIX 1 – NOISE MONITOR DATA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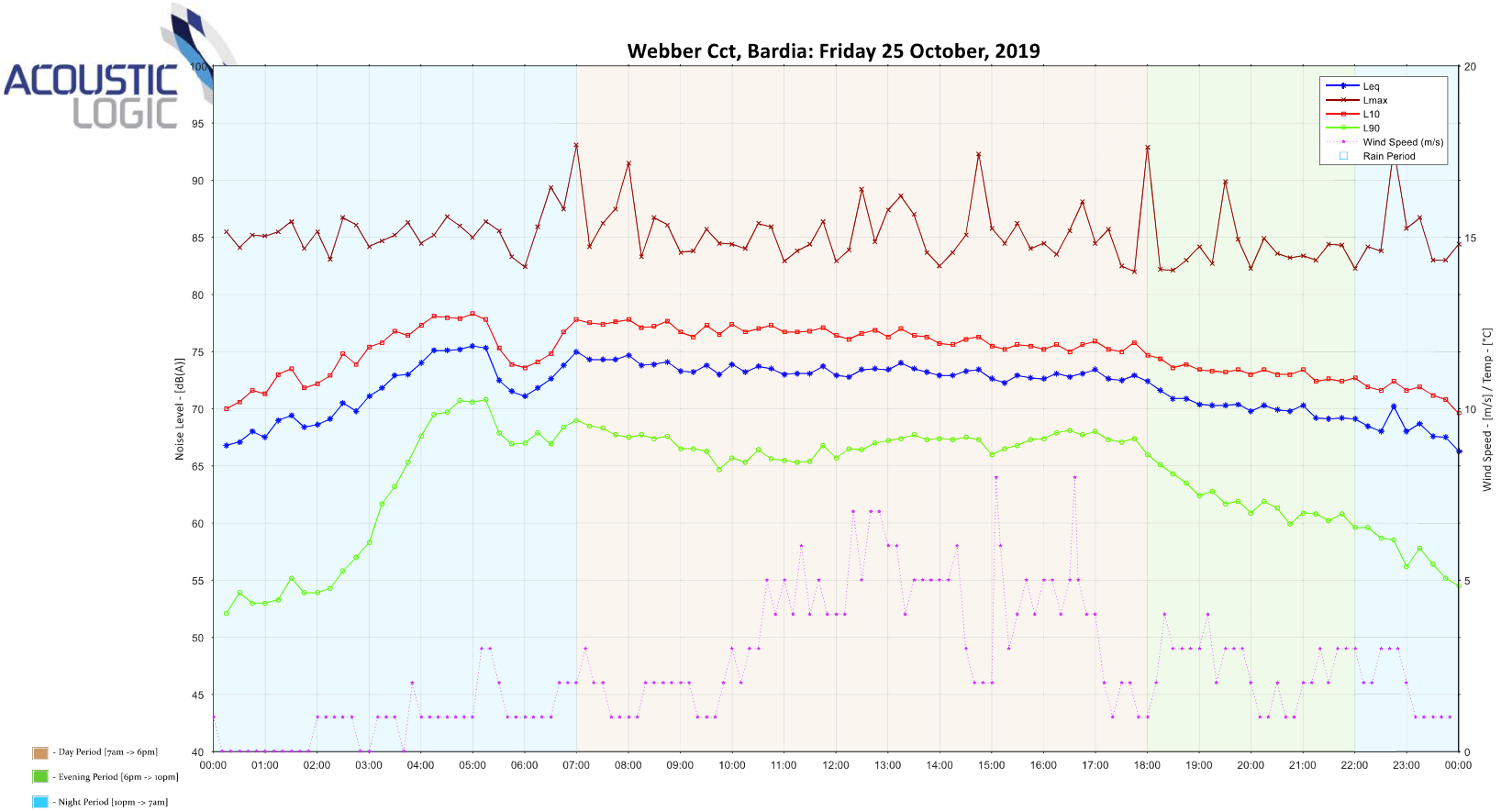
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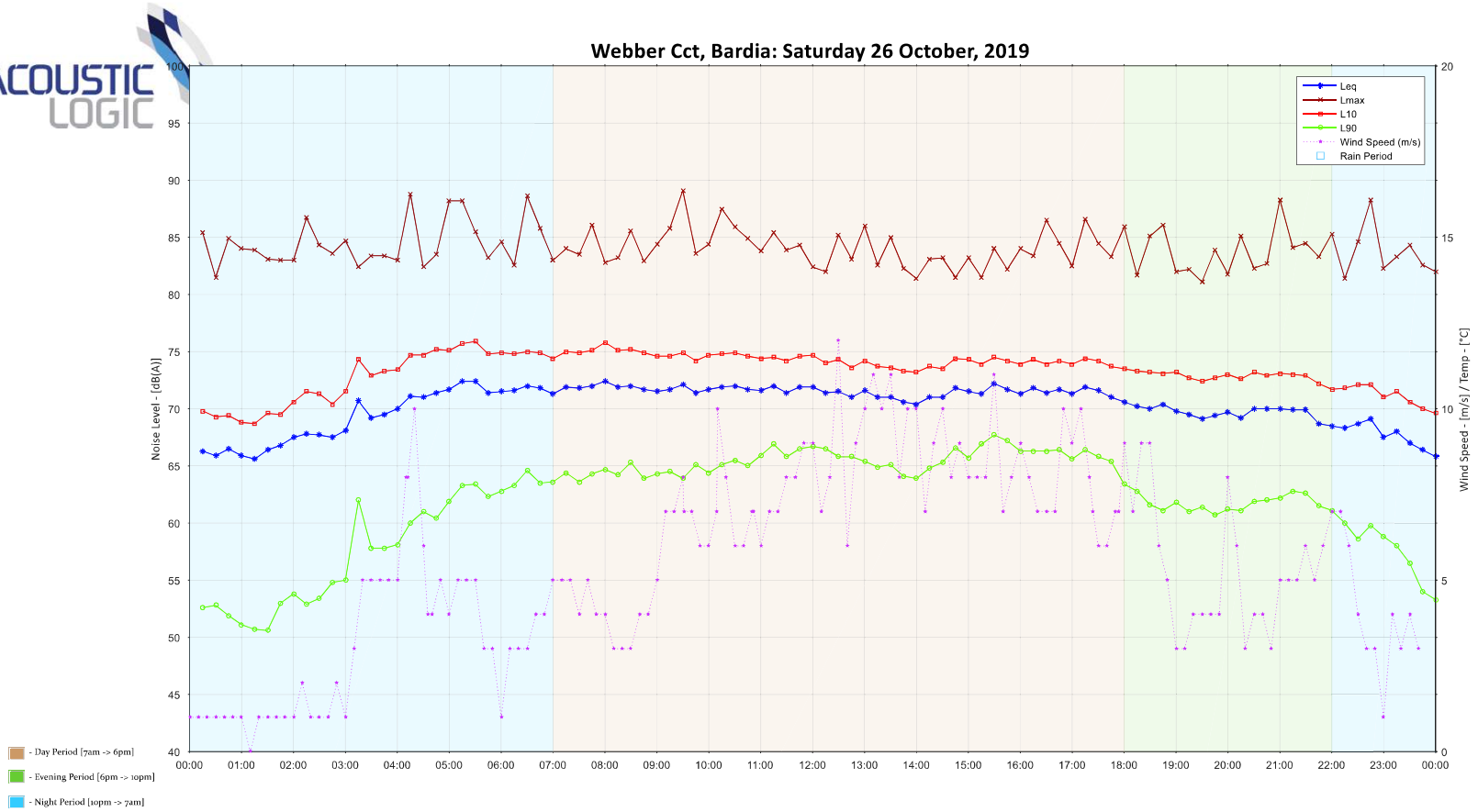
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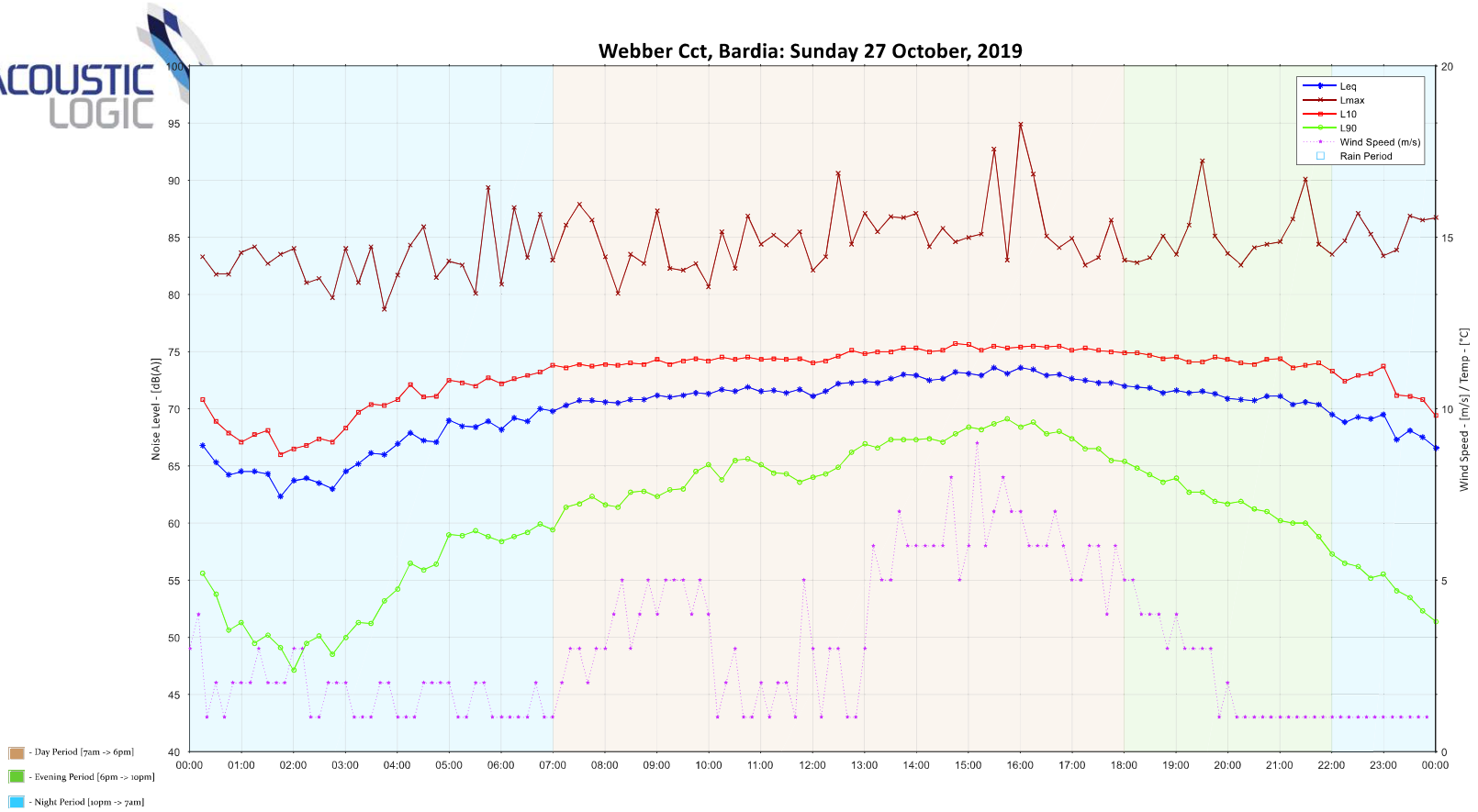
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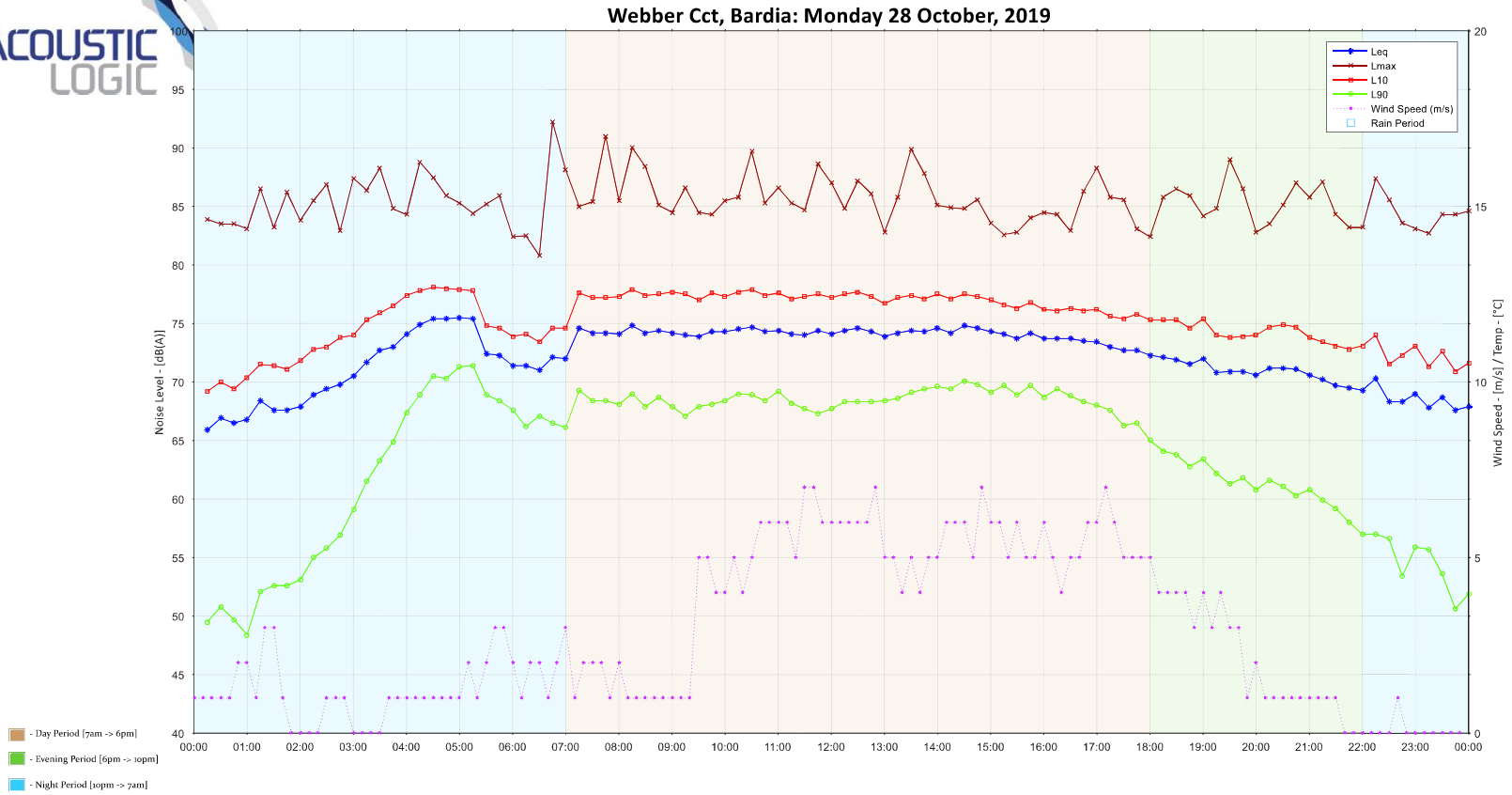
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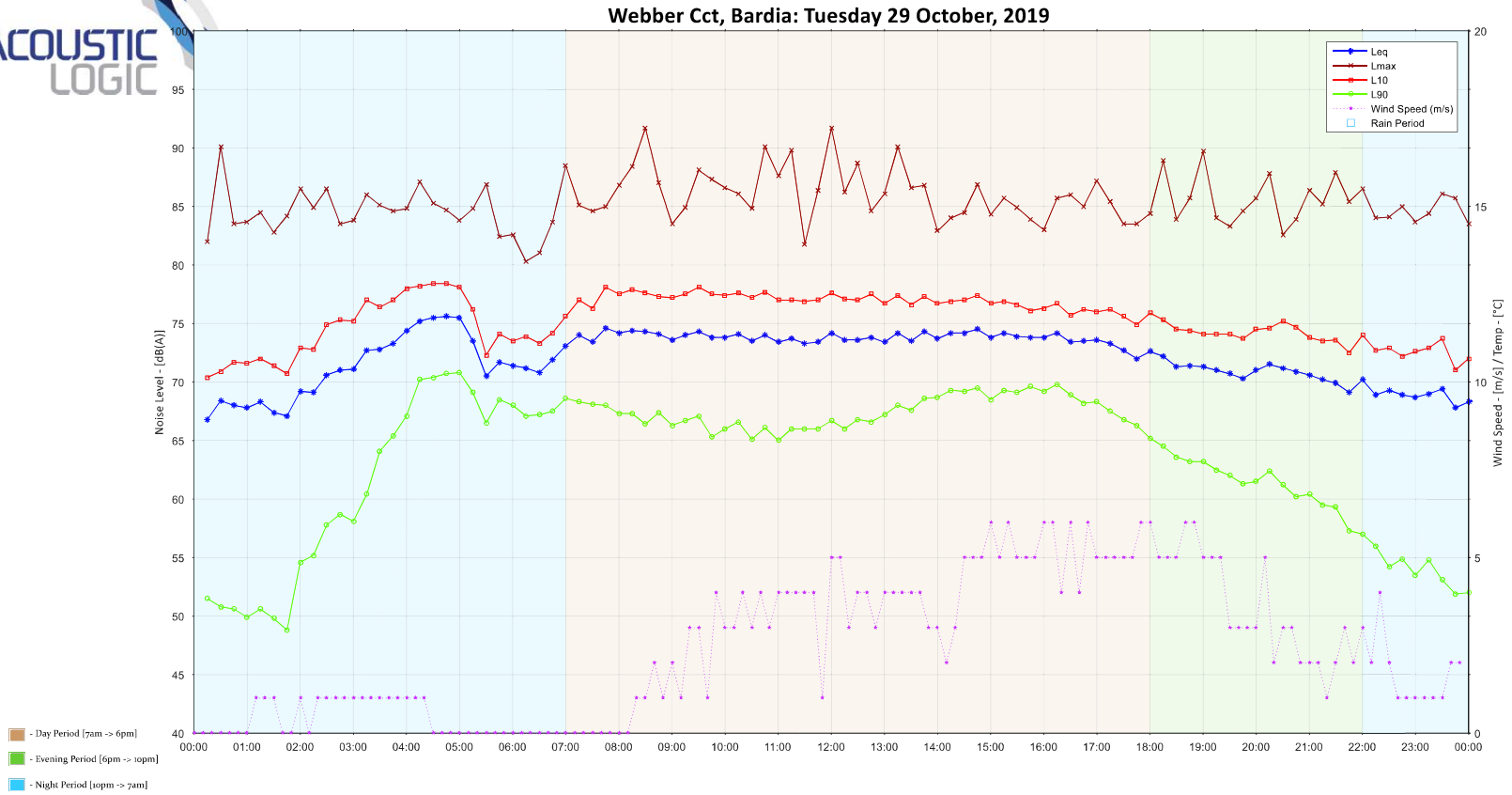
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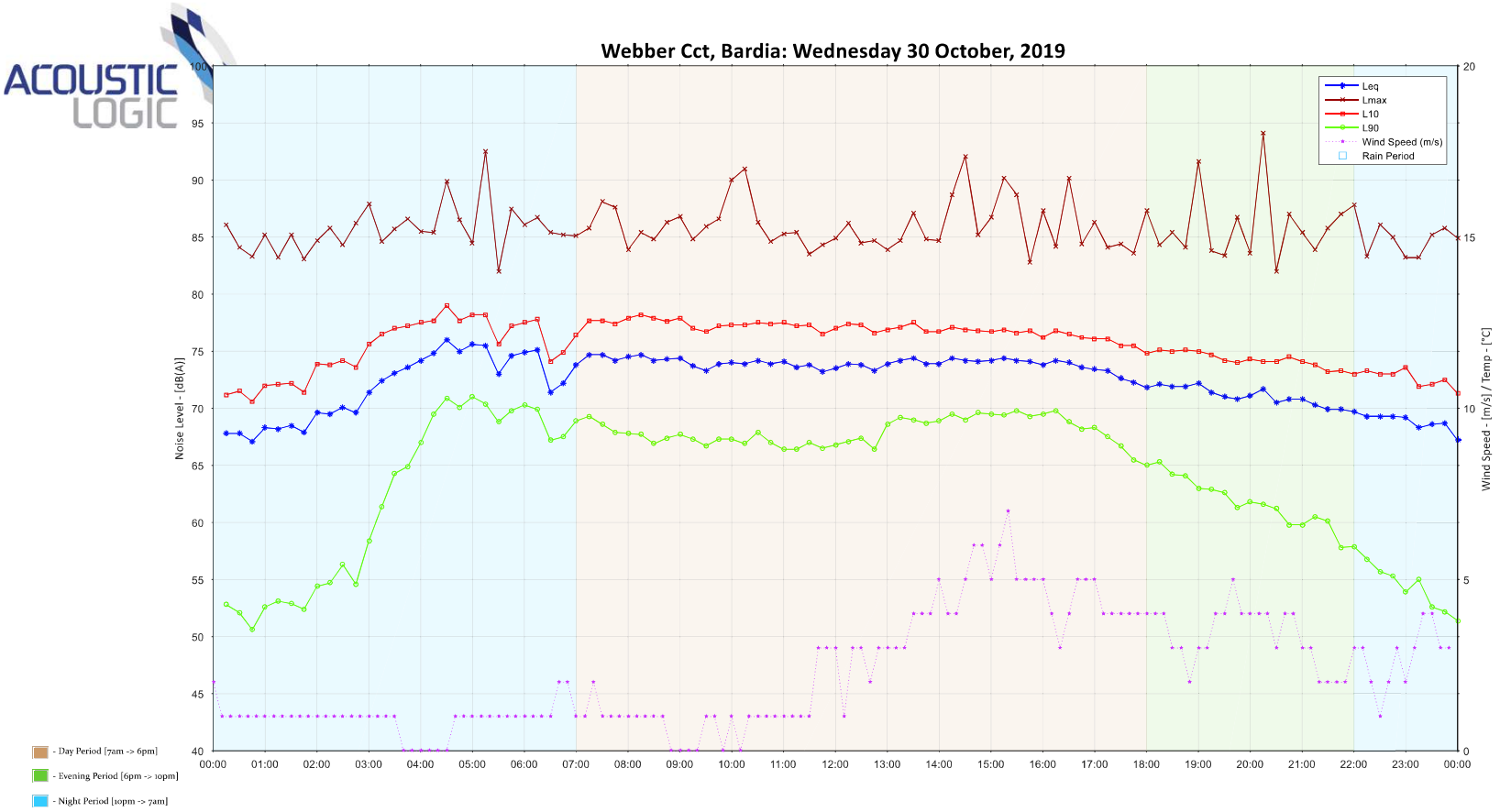
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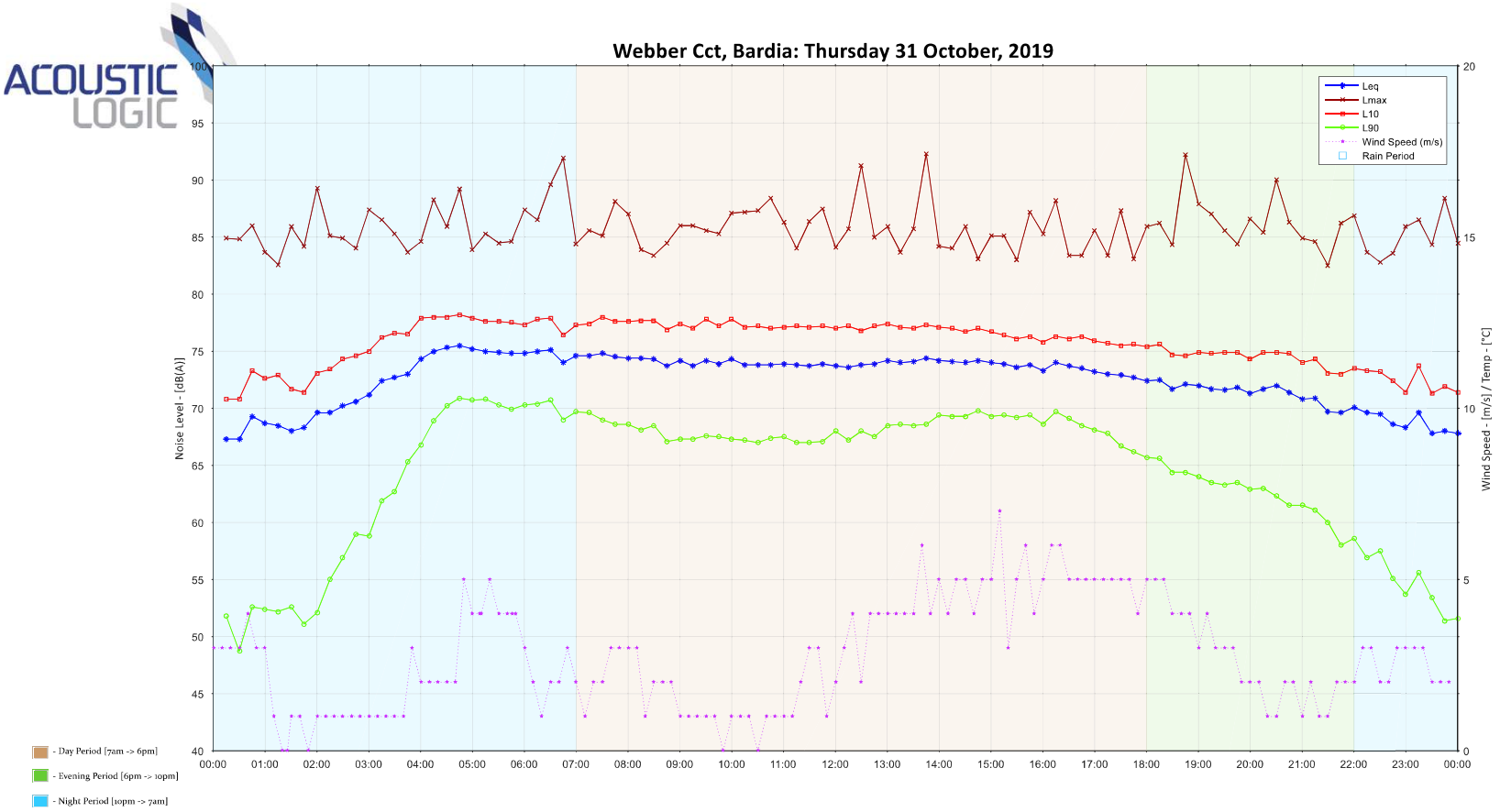
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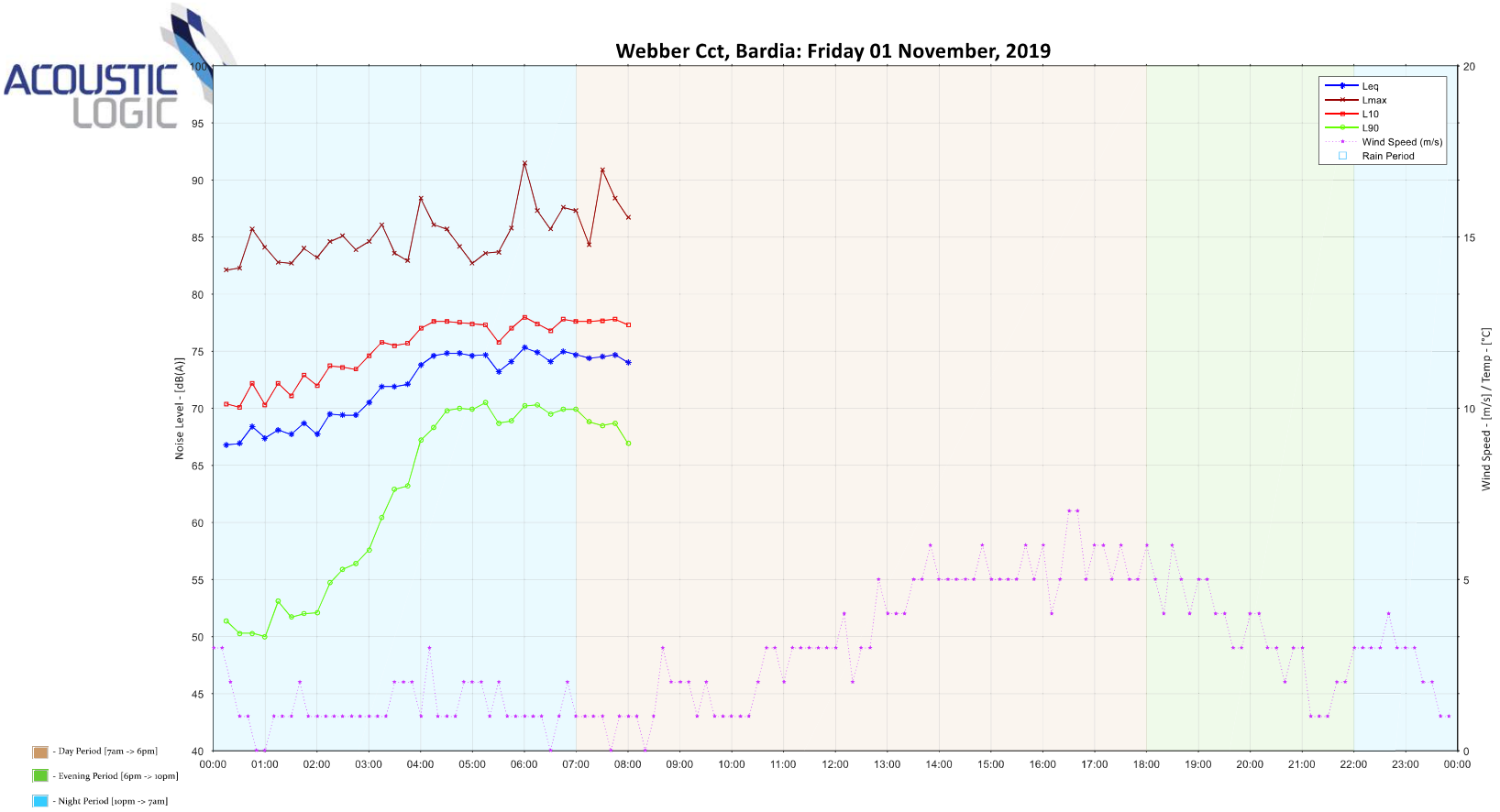
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L90
Wind Speed (m/s)
Rain Period
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

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A.B.N 73 168 303 071

18th June 2019

Dax McBurney,

Director of Development and Construction
Monarch Investments Group and Construction

Ref# 91023001NH

Dear Dax,

RE: Noise Walls – The Meadows, Bardia, NSW

Modular Walls has proposed the use of our widely used AcoustiMax100 panel for the noise attenuation requirements on this project.

This system is used right across Australia by commercial customers and roadway authorities for this exact purpose. It also provides a very aesthetically pleasing finish for both the road side, as well as the residential development.

This wall has an Rw rating of 28 (National Acoustic Laboratory Certified) and a composite density of 15.68 kg/m2, which is in line with noise wall guidelines for developments.

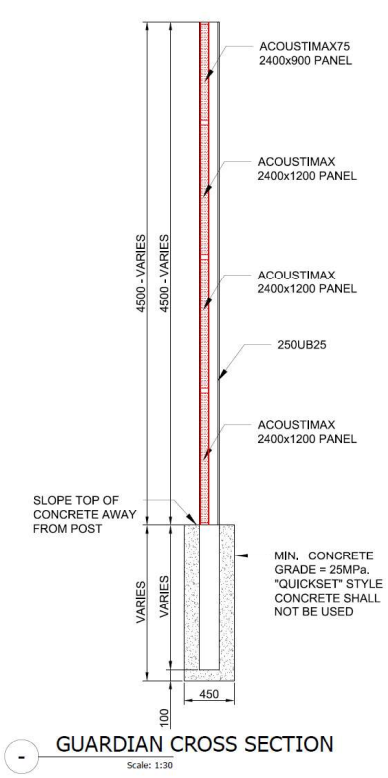
The height selected to allow a purposeful level of sound attenuation is indicated on the elevation drawings below which took into consideration the proposed cut and the road levels.

The noise wall is to be at least 2.0m above the road level to capture wheel and road noise from semi-trailers and cars. The homes being slightly lower will also be of benefit.

A sound reduction of around a 15- 20db is expected, which is ~ a fourfold audible reduction in laymen's terms. This will be signification reduction in noise for the residents.

AcoustiMax Technical Specifications

	AcoustiMax75	AcoustiMax100
Outer skin	Cementitious skin	Cementitious skin
Panel core	EPS	EPS
Available lengths (mm)	2400, 3000	2400, 3000,4200
Available heights (mm)	600, 900, 1200	600, 900, 1200
Thickness (mm)	75	100
Density	15.49 kg/m²	15.68 kg/m²
Soil retention	see TerraFirm specification sheet	see TerraFirm specification sheet
Rw	25	28
Compatible wall systems	VogueWall & EstateWall	GuardianWall



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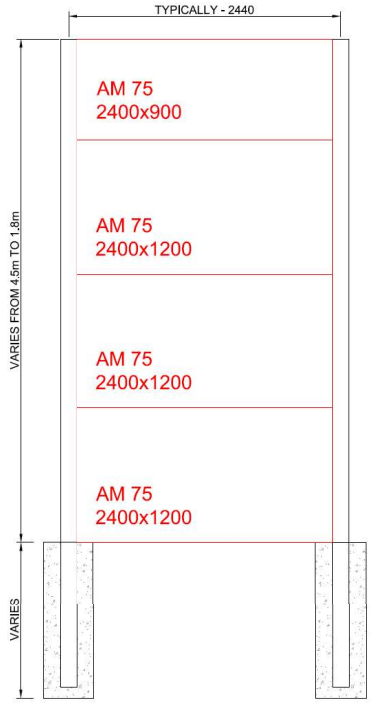

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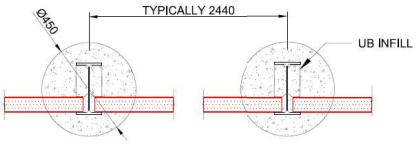

GUARDIAN WALL PLAN VIEW
Scale: 1:16

Should any further information be required, please don't hesitate to contact us at any time.

Regards

Nick Holden
Founder and Director of Innovation

P: 0417 414441
E: nick@modularwalls.com.au

NOT FOR CONSTRUCTION

AMENDMENT REGISTER

Rev.	Amendment Detail	EDITED BY:	CHECKED BY:	Date:
A	INITIAL ISSUE	CH	SS	26/02/19

MODULARWALLS
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email: info@modularwalls.com.au
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Project #
THE MEADOWS @ BARDIA

Drawing Title
WALL LOCATION

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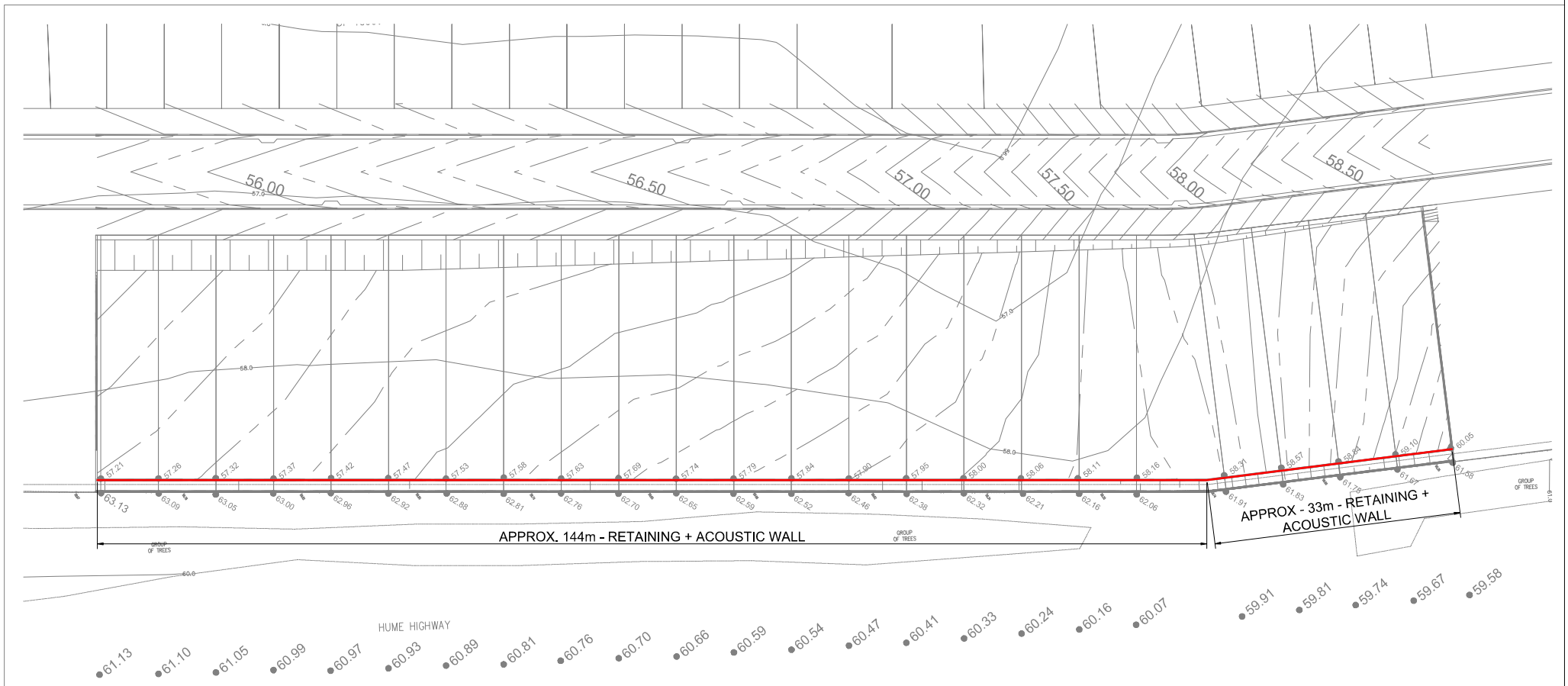
DRAWN BY: CH
CHECKED BY: SS
Date: 26/02/2019
Drawing Number: MW-L-01
Rev: A



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Project #
THE MEADOWS @ BARDIA

Drawing Title
WALL SECTION - OPTION 1

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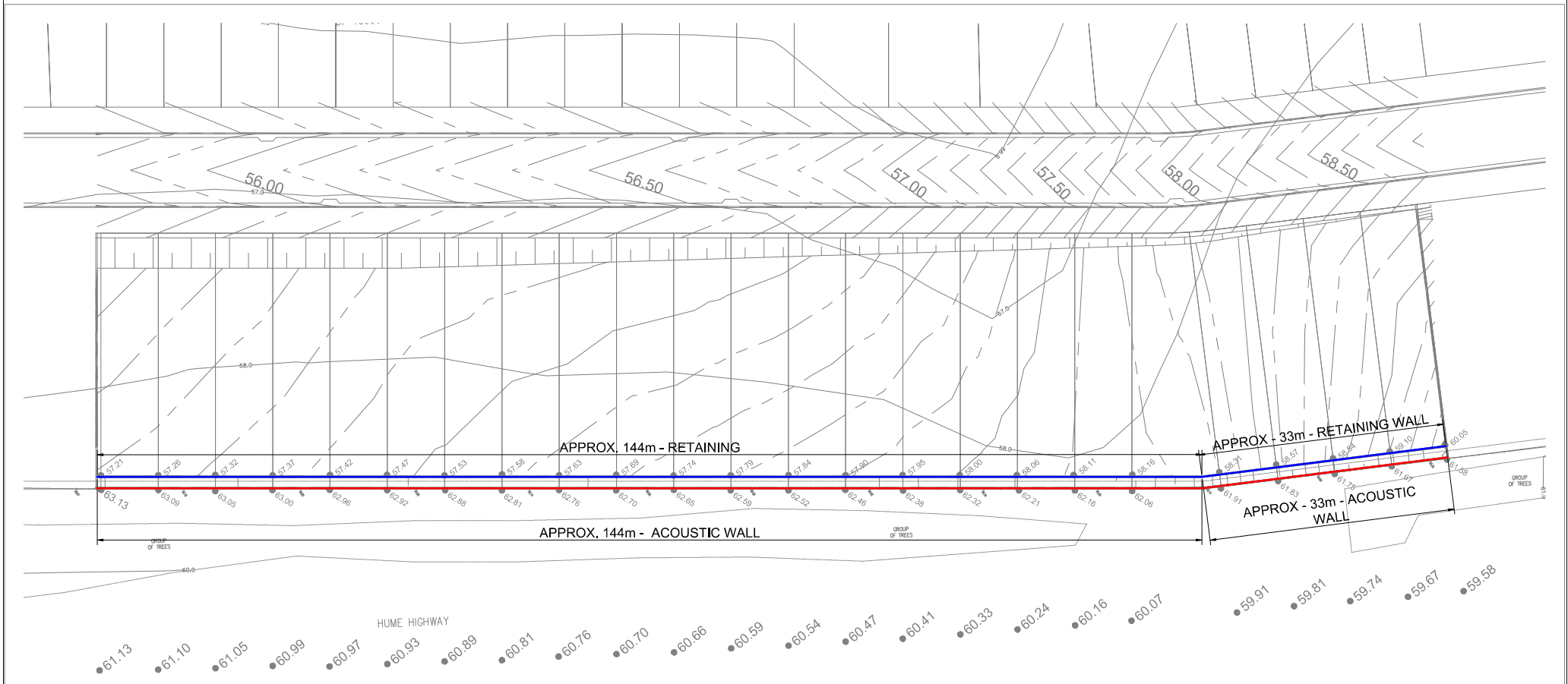
CHECKED BY: SS
Date: 26/02/2019
Drawing Number: MW-L-02
Rev: A



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Project #
THE MEADOWS @ BARDIA

Drawing Title
WALL SECTION - OPTION 2

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CHECKED BY: SS
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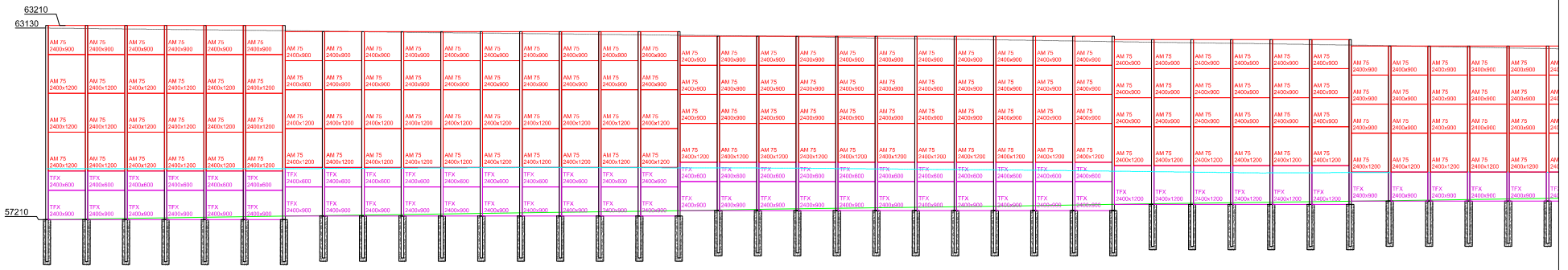
Drawing Number: MW-L-03
Rev: A



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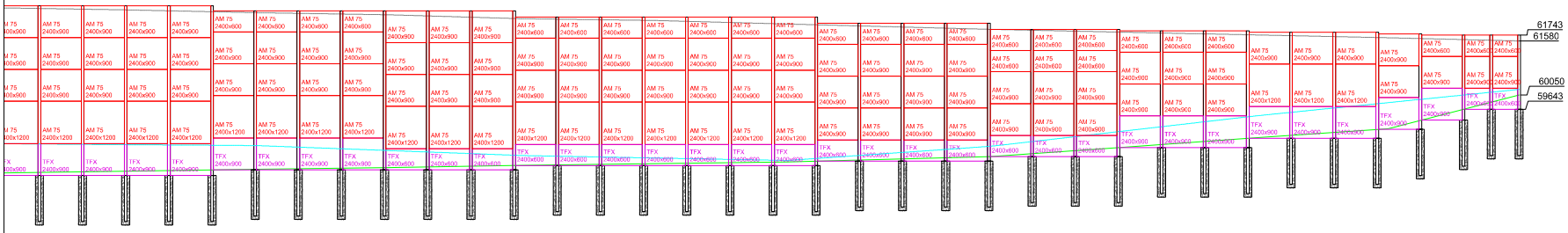
CHAINAGE (m)	0.00	2.44	4.88	7.32	9.76	12.20	14.64	17.08	19.52	21.96	24.40	26.84	29.28	31.72	34.16	36.60	39.04	41.48	43.92	46.36	48.80	51.24	53.68	56.12	58.56	61.00	63.44	65.88	68.32	70.76	73.20	75.64	78.08	80.52	82.96	85.40	87.84	90.28	92.72
POST SPACING (mm)	0	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440
POST TYPE	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32



P39	P40	P41	P42	P43	P44	P45	P46	P47	P48	P49	P50	P51	P52	P53	P54	P55	P56	P57	P58	P59	P60	P61	P62	P63	P64	P65	P66	P67	P68	P69	P70	P71	P72	P73	P74
92.72	95.16	97.60	100.04	102.48	104.92	107.36	109.80	112.24	114.68	117.12	119.56	122.00	124.44	126.88	129.32	131.76	134.20	136.64	139.08	141.52	143.96	146.40	148.84	151.28	153.72	156.16	158.60	161.04	163.48	165.92	168.36	170.80	173.24	175.12	177.00
2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	1880	1880
310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32	310UB32

NOT FOR CONSTRUCTION

AMENDMENT REGISTER

Rev.	Amendment Detail	EDITED BY:	CHECKED BY:	Date:
A	INITIAL ISSUE	CH	SS	26/02/19

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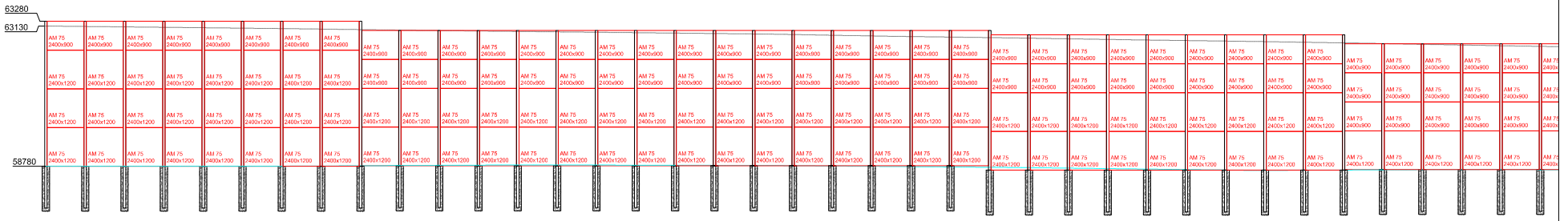
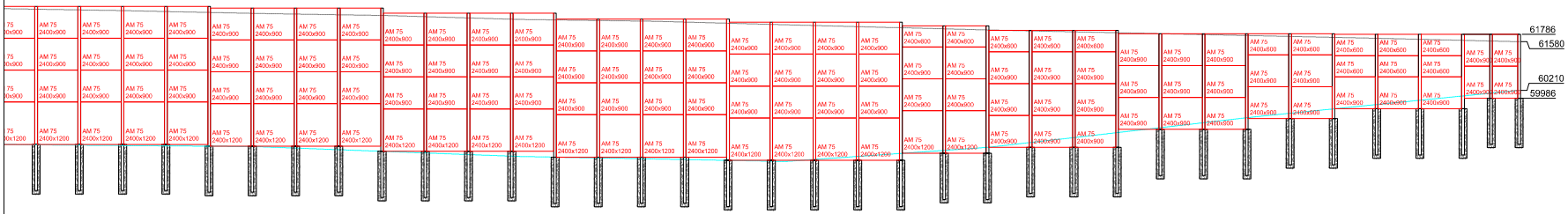
Project #
THE MEADOWS @ BARDIA

Drawing Title
LONG SECTION - OPTION 1

Scale: N.T.S.
DRAWN BY: CH
CHECKED BY: SS
Date: 26/02/2019
Drawing Number: MW-LS-01
Rev: A



POST	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28	P29	P30	P31	P32	P33	P34	P35	P36	P37	P38	P39
CHAINAGE (m)	0,00	2,44	4,88	7,32	9,76	12,20	14,64	17,08	19,52	21,96	24,40	26,84	29,28	31,72	34,16	36,60	39,04	41,48	43,92	46,36	48,80	51,24	53,68	56,12	58,56	61,00	63,44	65,88	68,32	70,76	73,20	75,64	78,08	80,52	82,96	85,40	87,84	90,28	92,72
POST SPACING (mm)	0	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440
POST TYPE	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25



P39	P40	P41	P42	P43	P44	P45	P46	P47	P48	P49	P50	P51	P52	P53	P54	P55	P56	P57	P58	P59	P60	P61	P62	P63	P64	P65	P66	P67	P68	P69	P70	P71	P72	P73	P74
92,72	95,16	97,60	100,04	102,48	104,92	107,36	109,80	112,24	114,68	117,12	119,56	122,00	124,44	126,88	129,32	131,76	134,20	136,64	139,08	141,52	143,96	146,40	148,84	151,28	153,72	156,16	158,60	161,04	163,48	165,92	168,36	170,80	173,24	175,12	177,00
2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	2440	1880	1880
250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25	250UB25

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AMENDMENT REGISTER

Rev.	Amendment Detail	EDITED BY:	CHECKED BY:	Date:
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Project #
THE MEADOWS @ BARDIA

Drawing Title
LONG SECTION - OPTION 2 ACOUSTIC WALL

Scale: N.T.S.
DRAWN BY: CH
CHECKED BY: SS
Date: 26/02/2019
Drawing Number: MW-LS-02
Rev: A