ATTENDED AND UNATTENDED COMPLIANCE NOISE MONITORING

AUSTEN QUARRY, HARTLEY NSW

Hy-Tec

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Job Number 16070588B

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1 INTRODUCTION

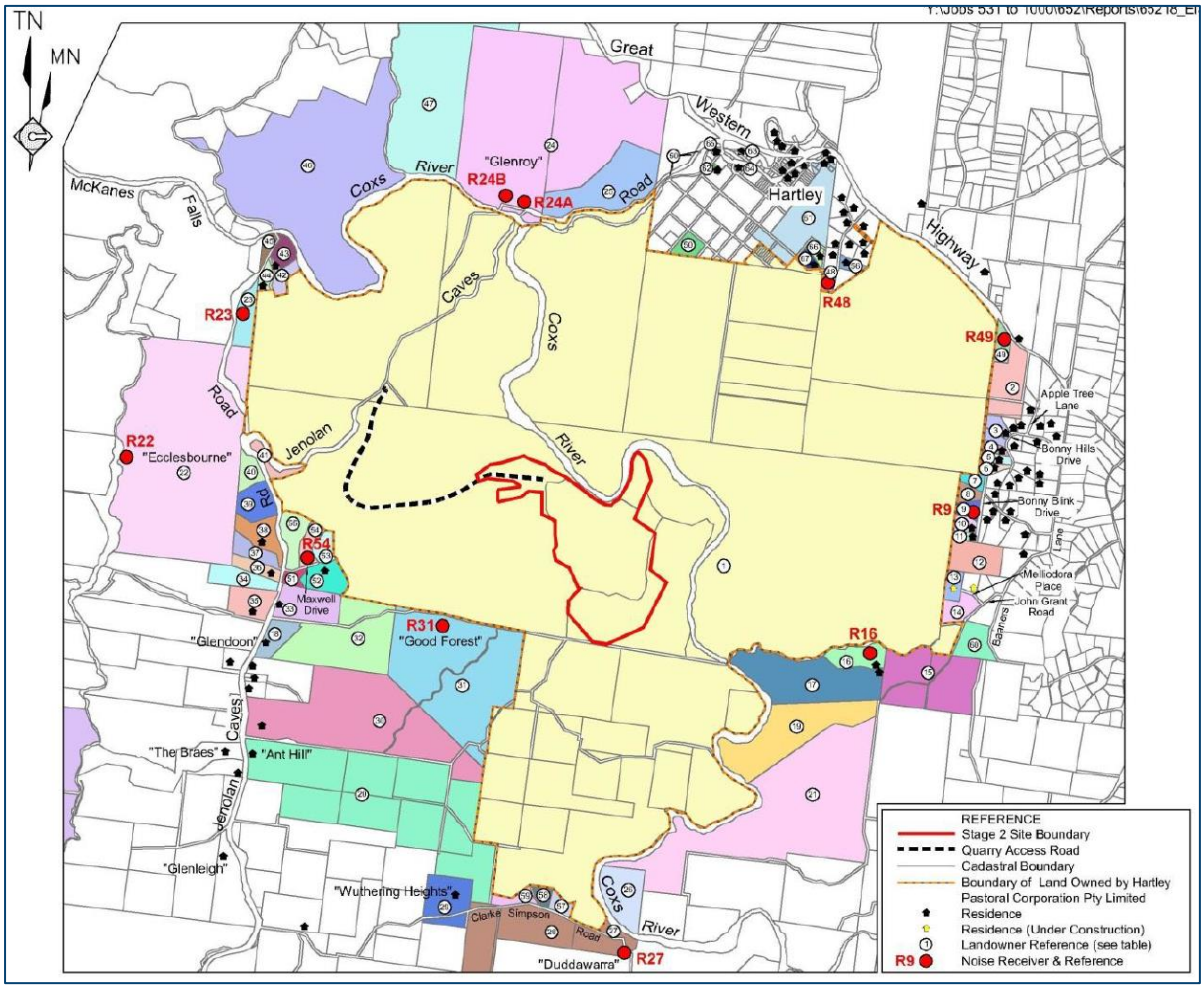
Todoroski Air Sciences have prepared this report on behalf of Hy-Tec Industries Pty Ltd (hereafter referred to as the Proponent). It presents the results of the attended and unattended noise monitoring campaign conducted in the vicinity of the Austen Quarry between 5 and 12 September 2016.

2 LOCAL SETTING

The Austen Quarry (see **Figure 2-1**Error! Reference source not found.) is located off Jenolan Caves Road, approximately 3.5 kilometres (km) south southwest of Hartley, New South Wales (NSW). The site is located in a valley near to the Cox's River, with the nearest receivers around the site ranging from approximately 1.7km to 3.1km away.

The local topography surrounding the Austen Quarry consists of rolling hills with the surrounding land use being predominantly rural agricultural with scattered residences.

The Austen Quarry development consent currently allows the extraction, screening and despatch of up to 1.1 million tonnes of rhyolite products per annum.



Source: **Benbow Environmental (2014)**

Figure 2-1: Austen Quarry location

3 NOISE MONITORING

Attended measurements were recorded on Wednesday, 5 September 2016 at the following receiver locations (shown in **Figure 2-1**):

- R31;
- R48; and,
- R24A.

Weather conditions on the day of attended monitoring were close to ideal with nearly calm winds for the majority of the day.

Unattended noise monitoring was undertaken at the nearest residential location R31 between Wednesday, 7 September 2016 and Monday, 12 September 2016.

The noise monitoring equipment used for these measurements consisted of environmental noise loggers set to A-weighted, fast response continuously monitoring over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the existing noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1%, 10% and 90% of the sample time respectively. The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. The L_{A90} level is normally taken as the background noise level. The L_{Aeq} level is the Equivalent Continuous Sound Level and has the same sound energy average over the sampling period as the actual noise environment with its fluctuating sound levels.

All measured noise levels obtained from the unattended monitoring equipment are graphically summarised in **Appendix A**.

4 OPERATIONAL NOISE CRITERIA

The Development Consent (SSD-6084) and Environment Protection Licence (EPL 12323) for the Austen Quarry define the noise impact assessment criteria.

Table 4-1 summarises the applicable operational noise criteria.

Table 4-1: Operational noise criteria

Receiver	Day dB(A)$L_{Aeq(15min)}$	Night dB(A)$L_{Aeq(15min)}$	Morning Shoulder dB(A)$L_{Aeq(15min)}$
All privately-owned residence	35	35	35

Table 4-2 outlines the permissible operating hours set out in the Development Consent (SSD-6084).

Table 4-2: Operating hours

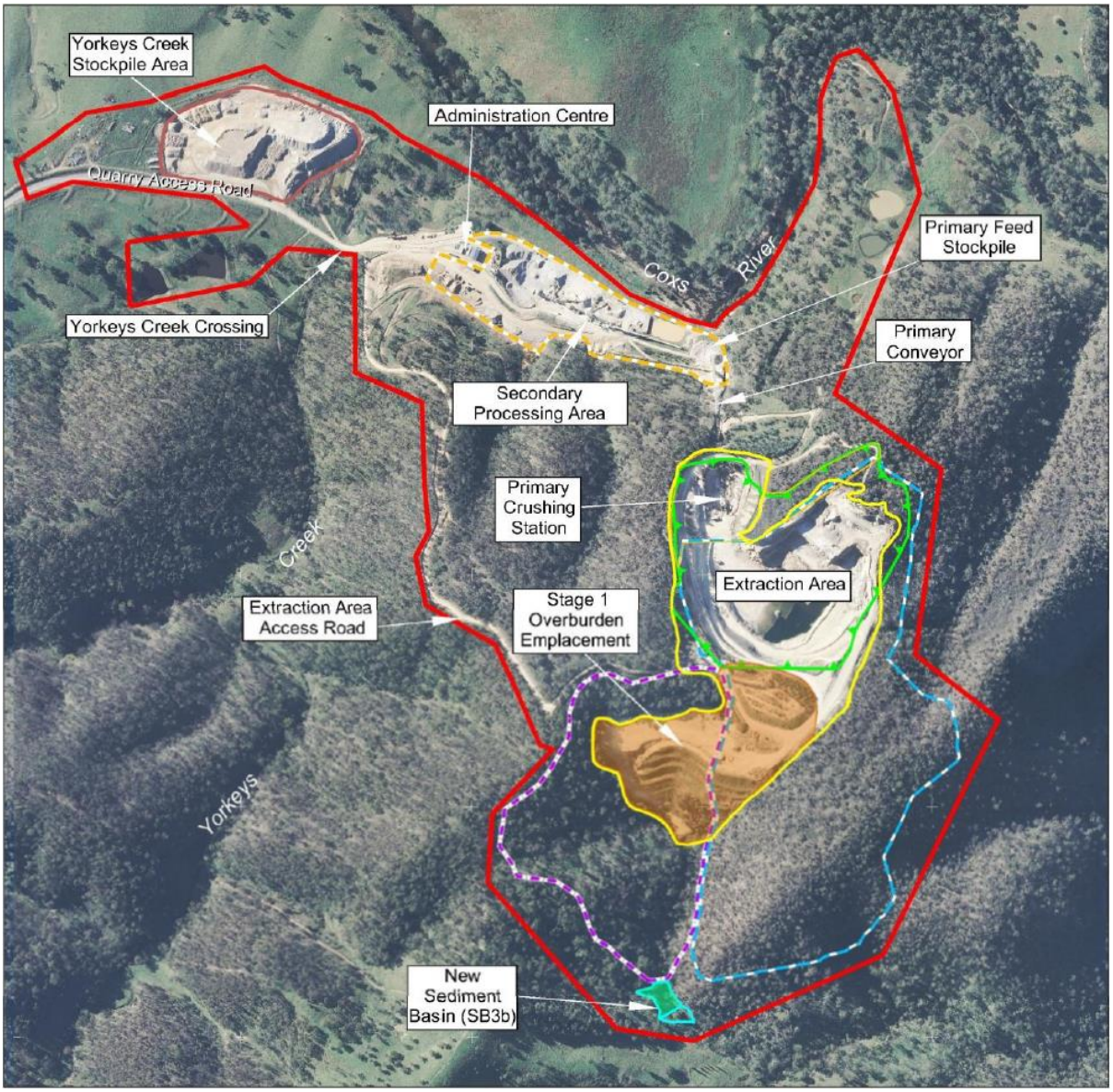
Activity	Permissible hours
Extraction operations Processing operations Overburden Management Stockpile Management	6am to 10pm Monday to Friday; 6am to 3pm Saturday; At no time on Sundays or public holidays.
Blasting	10am to 3pm Monday to Friday (except public holidays)
Loading and dispatch	5am to 10pm Monday to Friday; 5am to 3pm Saturdays; and At no time on Sundays or public holidays.
Maintenance	Anytime.

5 DESCRIPTION OF SITE OPERATIONS

Figure 5-1 presents the site layout and operational areas of the Austen Quarry.

During the time of the survey, the site was operating normally as confirmed through discussions with staff, and observations made when on-site.

When on-site, all equipment was observed to be operating normally, including the crushers, screens, excavators, trucks etc. From location R48, trucks could be seen entering and departing along the access road to the site during attended monitoring. Trucks hauling rejects up and over the rise were visually observed from location R31 during attended monitoring. Site activities could not be observed from the monitoring location R24A, but quarry trucks passed by along the public road adjacent to the site.



Source: **Benbow Environmental (2014)**

Figure 5-1: Site layout and operational areas

6 ASSESSMENT OF NOISE LEVELS

6.1 Attended Noise Monitoring

Based on site observations, weather conditions were suitable for conducting environmental noise measurements during the day of survey. The weather conditions were essentially calm or very light, intermittent winds from varying directions

Table 6-1 summarises the measurement results for the quarry noise and compares them against the relevant daytime noise criteria. L_{A90} levels are also shown in Appendix A, and in the table.

Table 6-1: Attended noise measurement results (5 September 2016)

Location	Time	$L_{Aeq,15min}$ due to Quarry Operations (dBA)	Criteria $L_{Aeq,15min}$ (dBA)	Comment
R48	5:47am to 6:02am	Inaudible	35	Highway traffic and individual vehicles could be distinctly heard along the Great Western Highway and Jenolan Caves Road. Birdsong and highway traffic dominate noise levels, 47.1dB(A), $L_{Aeq,15min}$, 41.5 dB(A), $L_{A90,15min}$ Engine braking on highway is clearly discernible.
R48	6:03am to 6:18am	Inaudible	35	As above, birdsong and highway traffic dominate noise levels, 45.8 dB(A), $L_{Aeq,15min}$, 40.1 dB(A), $L_{A90,15min}$. Trucks entering and leaving via the site access road were visually observed, but inaudible at all times. Fast moving vehicles on the public road near the quarry were visible and audible. Engine braking on highway is clearly discernible.
R24A	6:26am to 6:41am	Inaudible	35	Noise levels dominated by the rushing water of the river, Birdsong and highway traffic dominated noise levels, 64.7dB(A), $L_{Aeq,15min}$, and passing vehicles. Engine braking is clearly discernible, along with vehicle noise on the wooden bridge nearby , 58.0 dB(A), $L_{A90,15min}$
R31	6:57am to 7:12am	Inaudible	35	Measurement at the nearest and potentially most impacted receptor indicate no audible noise from the site. Bird noise dominates the soundscape 44.9 dB(A), $L_{Aeq,15min}$, 34.2 dB(A), $L_{A90,15min}$
R31	7:17am to 7:32am	<31*	35	As above, 44.4 dB(A), $L_{Aeq,15min}$ except that a haul truck carting rejects up and over a ridge was visually observed, and was barely audible for approx. 4secs, when meter readings were approx. 34 dB(A). Return trip was not audible, 36.9 dB(A), $L_{A90,15min}$.
R31	15:02pm to 15:17pm	Inaudible	35	Bird noise dominates the soundscape, 37.3 dB(A), $L_{Aeq,15min}$, 29.2 dB(A), $L_{A90,15min}$
R24A	15:30pm to 15:45pm	Inaudible	35	Noise levels dominated by the rushing water of the river, 64.9 $L_{Aeq,15min}$, and passing vehicles. Engine braking is clearly discernible, as is vehicle noise on the wooden bridge nearby. , 44.9 dB(A), $L_{A90,15min}$
R48	15:53pm to 16:08pm	Inaudible	35	Highway noise audible and constant, engine braking noise less dominant than in the morning, Bird call a significant source also, and some buzzing insects, 49.7 dB(A), $L_{Aeq,15min}$, 31.1 dB(A), $L_{A90,15min}$

* Estimated based on observed meter readings at the time and barely audible noise from the source.

The results of the attended measurements indicated that noise emissions from the Austen Quarry are within the applicable limits at all identified receivers.

It is noted that the results in **Table 6-1** show that the key noise of interest for site operational management, intrusive noise (i.e. from the quarry) was not sufficiently audible to allow any quantification or measurement of the maximum (L_{Amax}), or energy equivalent (L_{Aeq}) intrusive noise level over a 15 minute measurement period from the quarry to be made (other than to conclude that the level would be well below the measured levels set out in the table).

Consequently, other descriptors such as L_{A10}, L_{A50}, L_{A90}, L_{A99} and L_{Amin} would not be especially relevant however these levels, along with the recorded L_{A90} noise levels are presented in Appendix A.

6.1.1 Due to the absence of audible quarry noise under conditions likely to make such noise audible, the recorded L_{A90} levels are taken to represent the prevailing background noise level, also shown in **Table 6-1.** Other anthropogenic noise sources

Whilst undertaking the attended noise monitoring, noteworthy various other man made sources of noise were apparent. Truck engine brake noise on public roads was evident at two locations, and is commented on in this section.

At location R48, truck engine brake noise along the Great Western Highway was significant. Individual vehicles up to approximately 2.4km away could be seen (headlights and truck body lights) and heard on their downhill eastbound paths, and trucks approximately 1km away were not visible, but could be heard on their downhill westbound paths. A few of the trucks were much louder than others in this regard, possibly due to ineffective mufflers or exhaust design.

Engine braking noise was also evident along the Jenolan Caves Road on the downhill approaches both northbound and southbound towards the bridge near R24A. Loud rattling of the wooden bridge planks was also noticeable.

The observations made at R24A included a count of vehicles. Trucks made up a significant portion of the traffic, however most of the trucks were not associated with the operation. Whilst the count was only made over a limited 15-minute period, 23 of the 78 vehicles observed were trucks of various sizes, and two trucks were from the site. Other quarry trucks were observed, but carried the brand of other quarries and it was confirmed with the site that these other branded trucks are not associated with the site.

The observed engine braking noise was not associated with the site trucks that passed by, nor with some modern taut-liner trucks and B-doubles which also passed by. Engine braking noise was most apparent for older trucks with large bore twin exhaust pipes.

6.2 Unattended Noise Monitoring

Table 6-2 provides a summary of the noise results as $L_{Aeq,15min}$ levels recorded at R31 for the day, evening and night periods during operating hours. The complete results are plotted in **Appendix A**.

Table 6-2: Unattended noise measurement results during operating hours

Location	Measured ambient level during operating hours $L_{Aeq,15min}$ (dB(A))		
	Day (7 am-6pm Mon-Fri & 7am-3pm Sat)	Evening (6pm-10pm Mon-Fri)	Night (5am-7am Mon-Sat)
R31	48.6	38.3	48.5

The L_{90} levels shown in **Appendix A** indicate that generally low background levels prevail. Noting that the dominant noise sources on the site (crushers and screens) operate continuously from 7 am to 5pm, the data suggest that the site has no adverse effect on the local noise amenity as there is no discernible change in the noise levels recorded when the main noise sources either start or cease operating.

The L_1 and L_{eq} daytime levels shown in **Appendix A** indicate the potential effect of short, loud noises such as a barking dog or birdcalls made near to the monitor.

The results are consistent with the site observations which indicate that there is significant birdsong in the morning, and that the unattended monitoring location experiences noise from sources nearby such as vehicles, heavy plant and trucks, barking dogs and also natural noise associated with birds, wind in trees, insects and frogs. The residence at R31 is owned by a truck/ plant operator thus heavy vehicles are present at the location, with the driveway encircling the dwelling.

7 DISCUSSION AND CONCLUSIONS

A compliance noise monitoring survey was conducted between Monday 5 September 2016 and Monday, 12 September 2016 and included both attended and unattended measurements.

The attended measurements were conducted under conditions of likely noise enhancement (in the early morning). No audible noise from the site could be detected at any nearby residential location, except for a brief period (approx. 4 seconds) of barely detectable noise from a single truck movement up and over a ridge which was estimated to be below the applicable criteria of 35dB(A) (for approx. 4 seconds). The hauling of rejects up and over the ridge is an infrequent activity and is normally confined to a few movements during daytime hours. Discussions with the residents at R31 suggest that they have never heard noise from the site.

Traffic noise from individual, observable vehicles (not associated with the quarry) on the public road near the quarry could be heard at R48. The indication is that there was significant noise enhancement between the site and monitoring location, but this was insufficient to make the site activity audible, including truck movement on the site access road. It should be noted that trucks move relatively slowly on the site access road, and that the noisiest activities at the site (crushers, etc.) are situated low down in the terrain whereas the public road is elevated and carries traffic at higher speeds.

It was also observed that approximately one in three trucks observed on Jenolan Caves Road were using their engine brakes despite road signs to limit engine braking. It is noted that greater engine braking noise was associated with the Great Western Highway.

None of the trucks associated with the site were observed to generate engine braking noise.

It is concluded that the measurements and observations indicate that noise emissions from the Austen Quarry were within the limits set in the Development Consent and EPL at all of the assessed nearby receivers.

8 REFERENCES

Benbow Environmental (2014)

"Austen Quarry Stage 2 Extension Project Noise and Vibration Impact Assessment", prepared for Hy-Tec Industries by Benbow Environmental, September 2014.

Appendix A

Unattended Noise Measurement Results

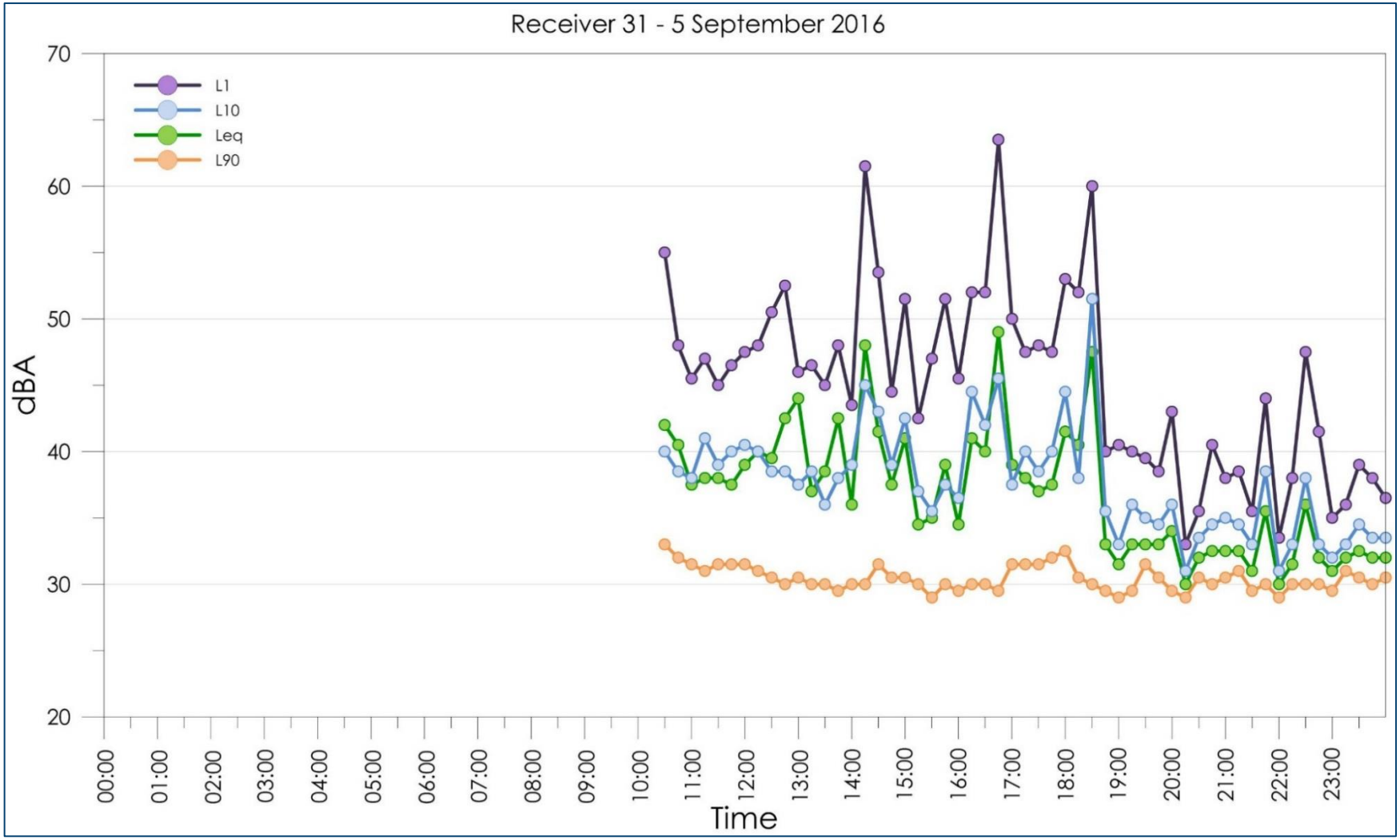


Figure A-1: Unattended noise monitoring results at R31 – 5 September 2016

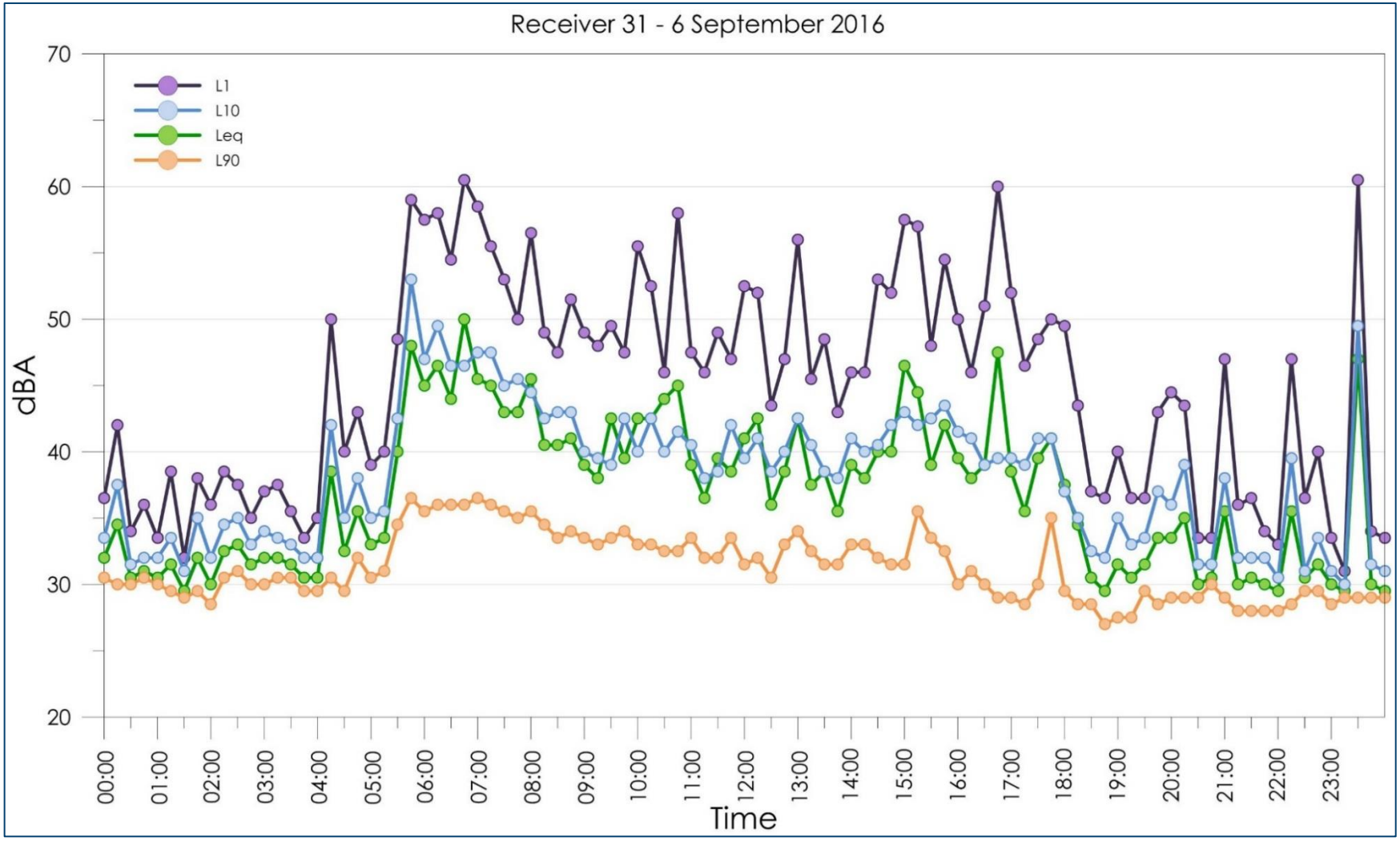


Figure A-2: Unattended noise monitoring results at R31 – 6 September 2016

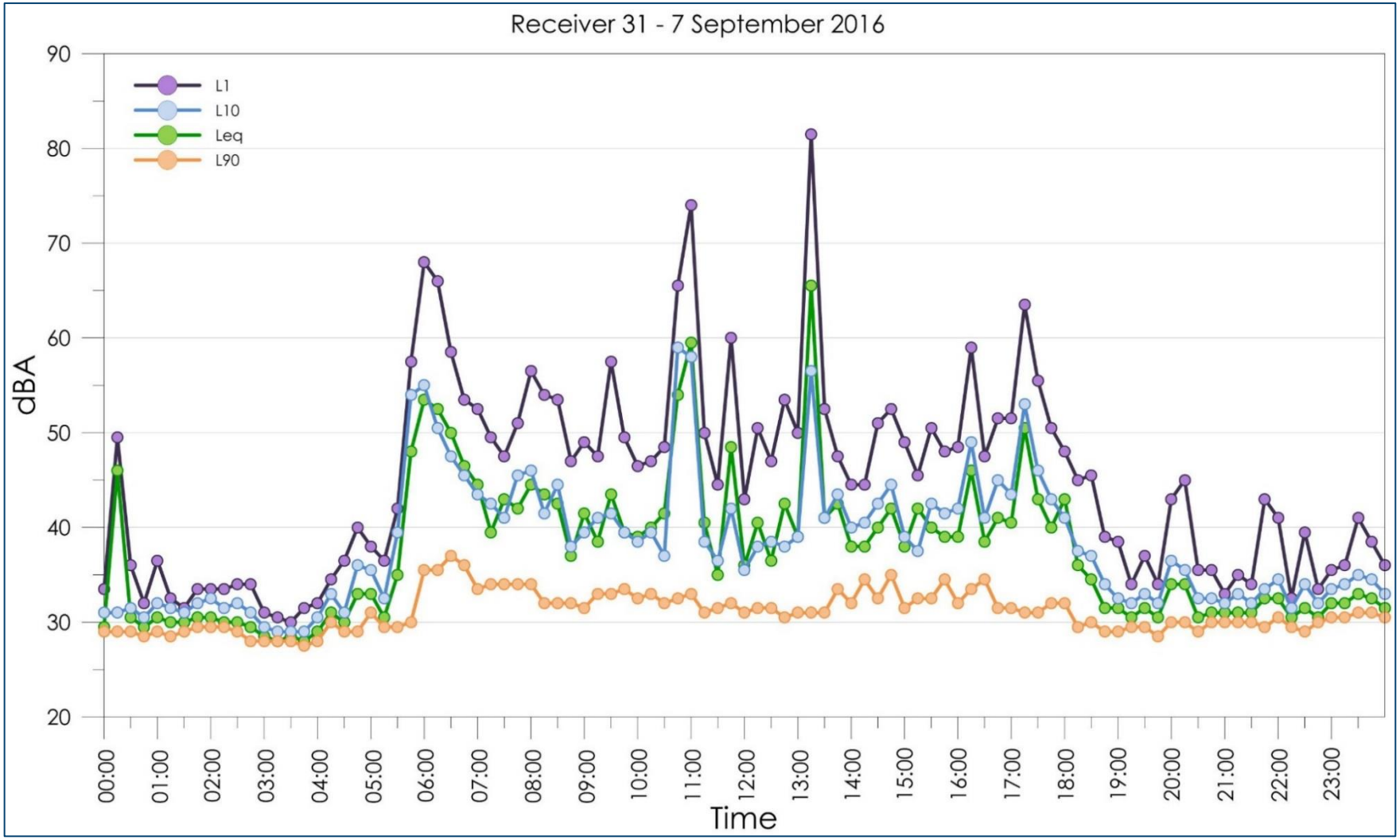


Figure A-3: Unattended noise monitoring results at R31 – 7 September 2016

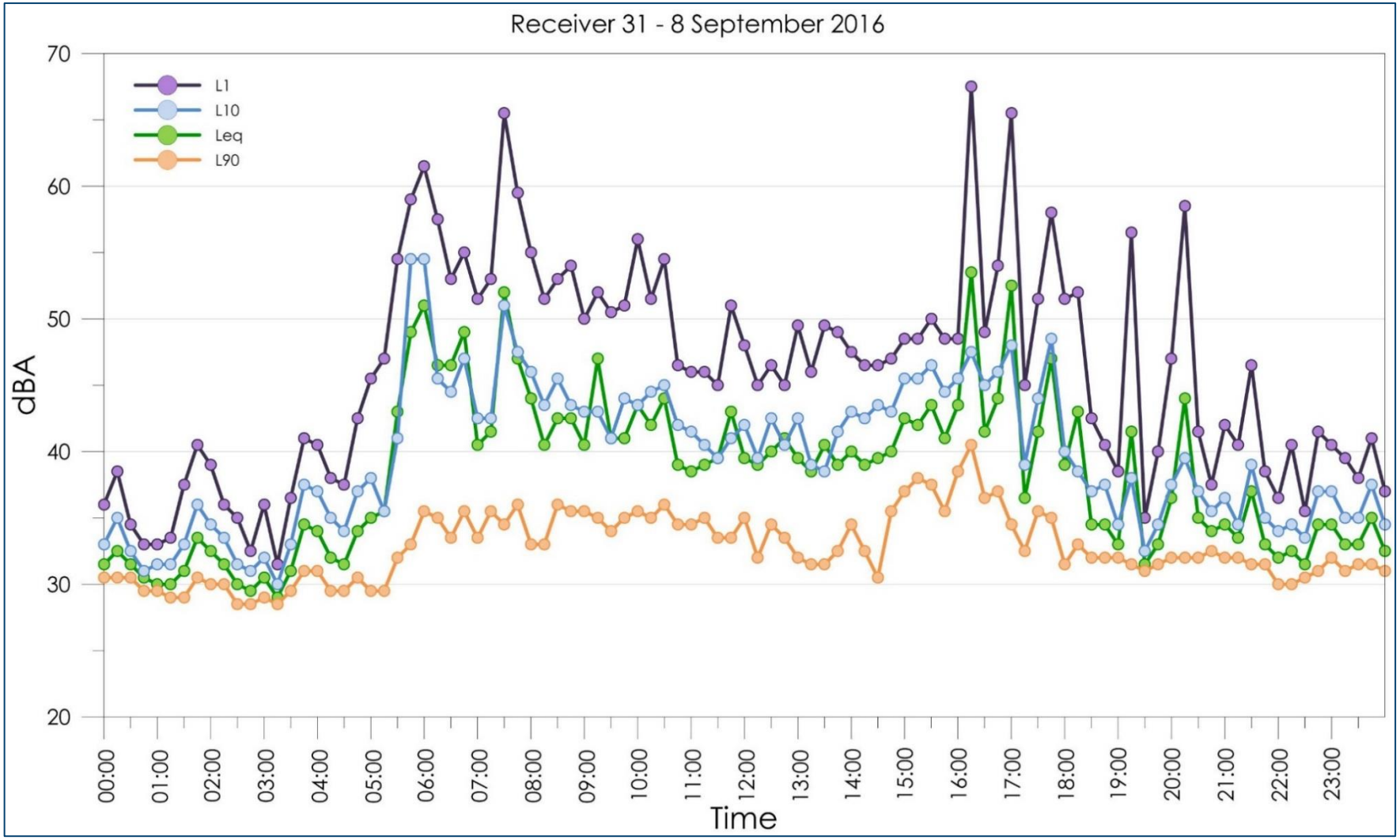


Figure A-4: Unattended noise monitoring results at R31 – 8 September 2016

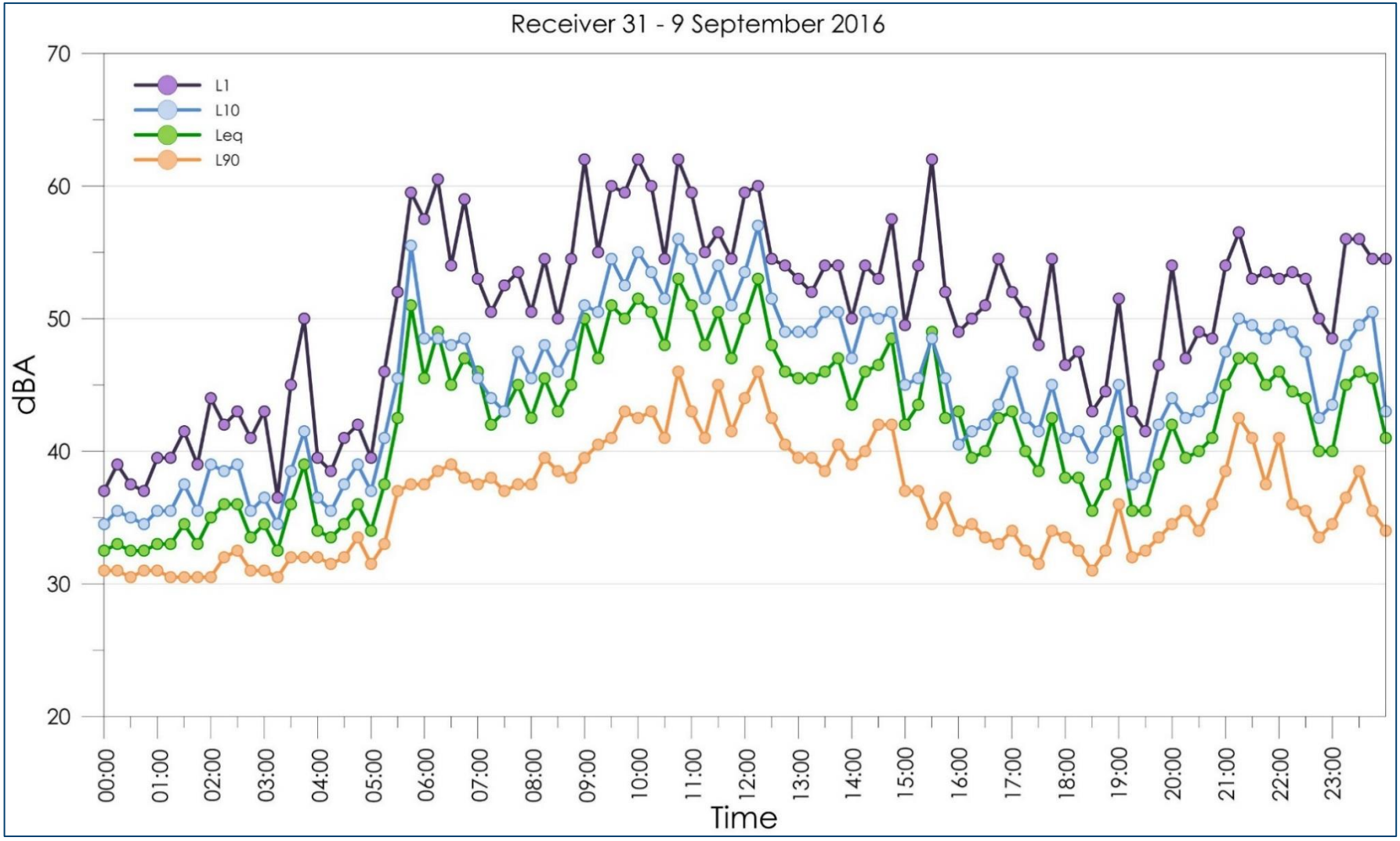


Figure A-5: Unattended noise monitoring results at R31 – 9 September 2016

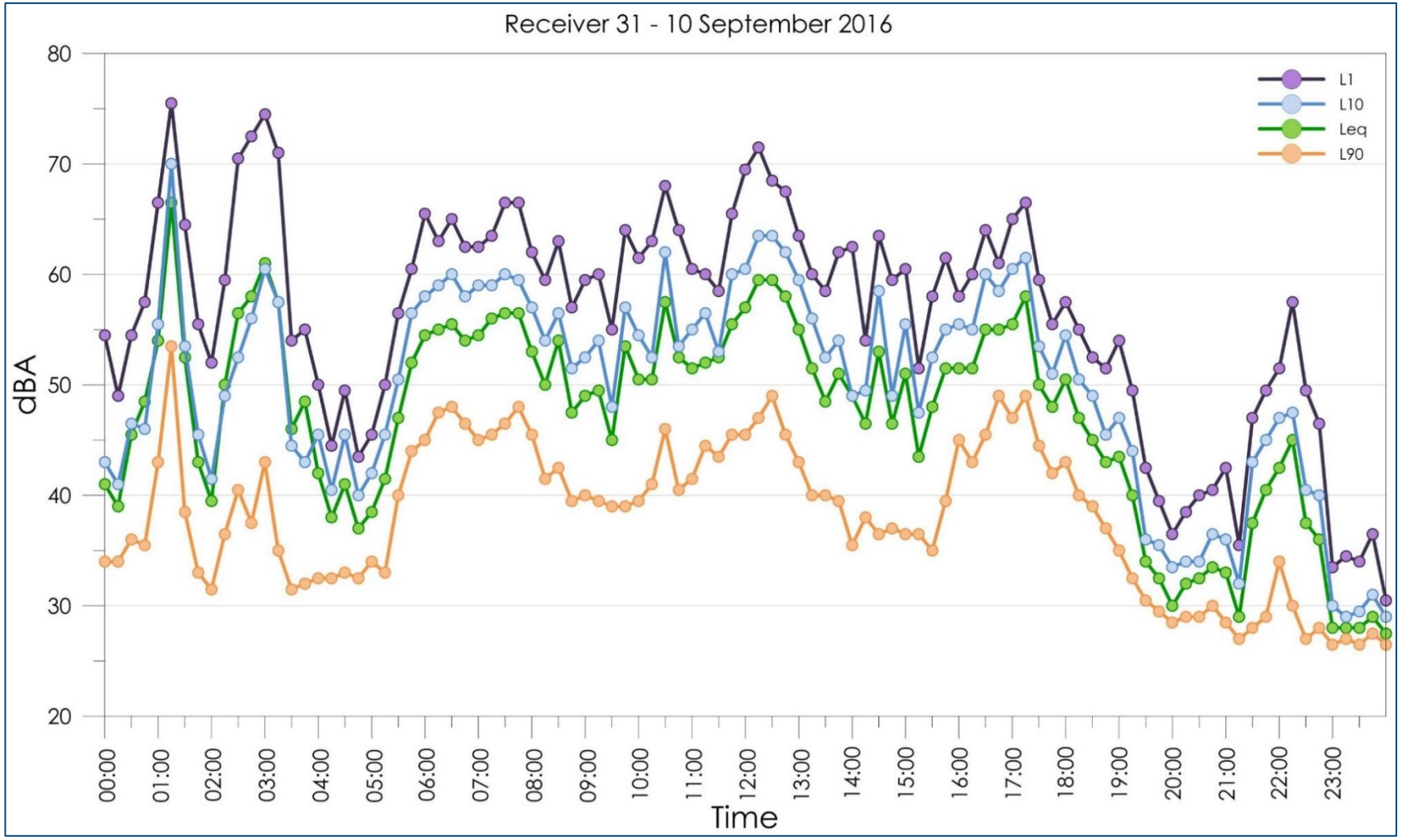


Figure A-6: Unattended noise monitoring results at R31 – 10 September 2016

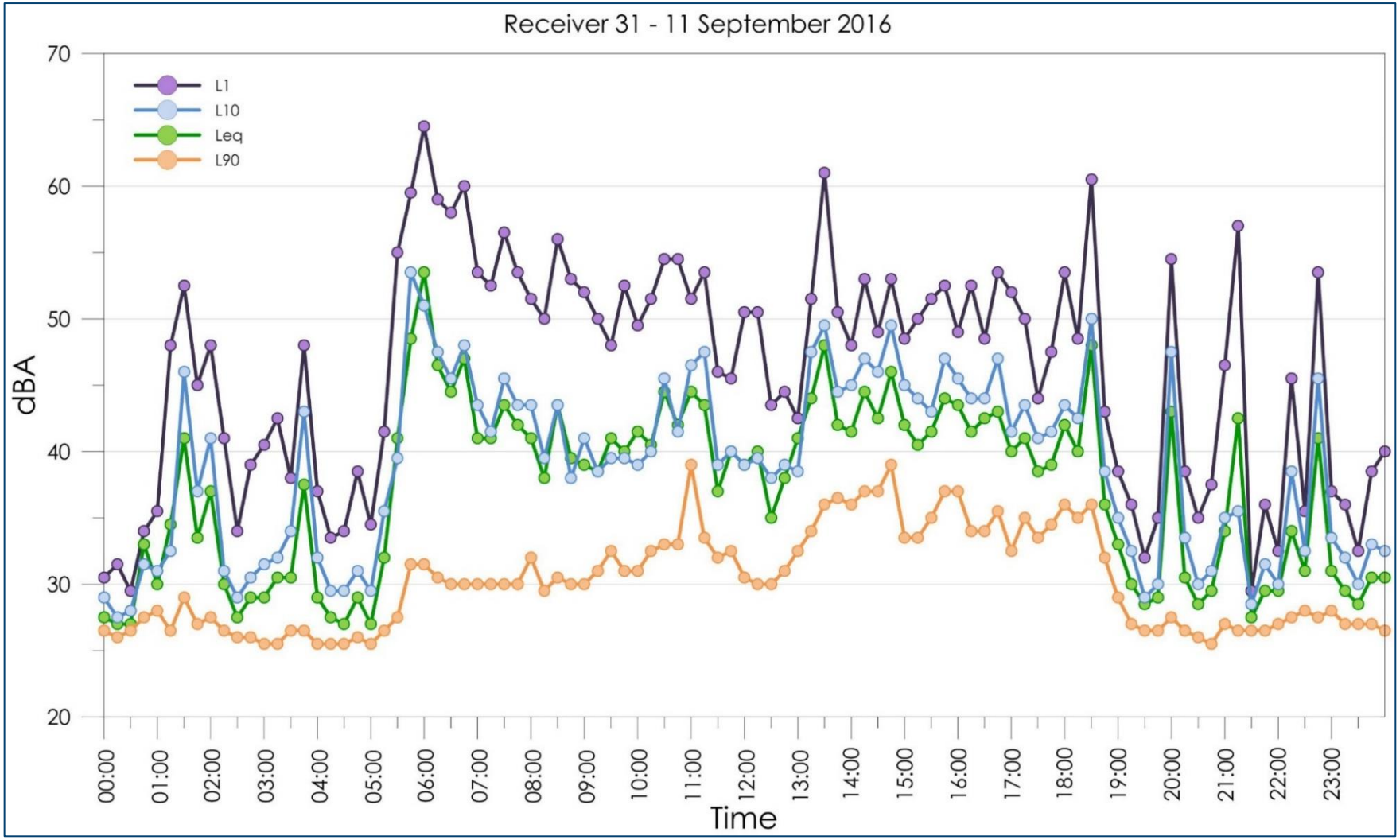


Figure A-7: Unattended noise monitoring results at R31 – 11 September 2016

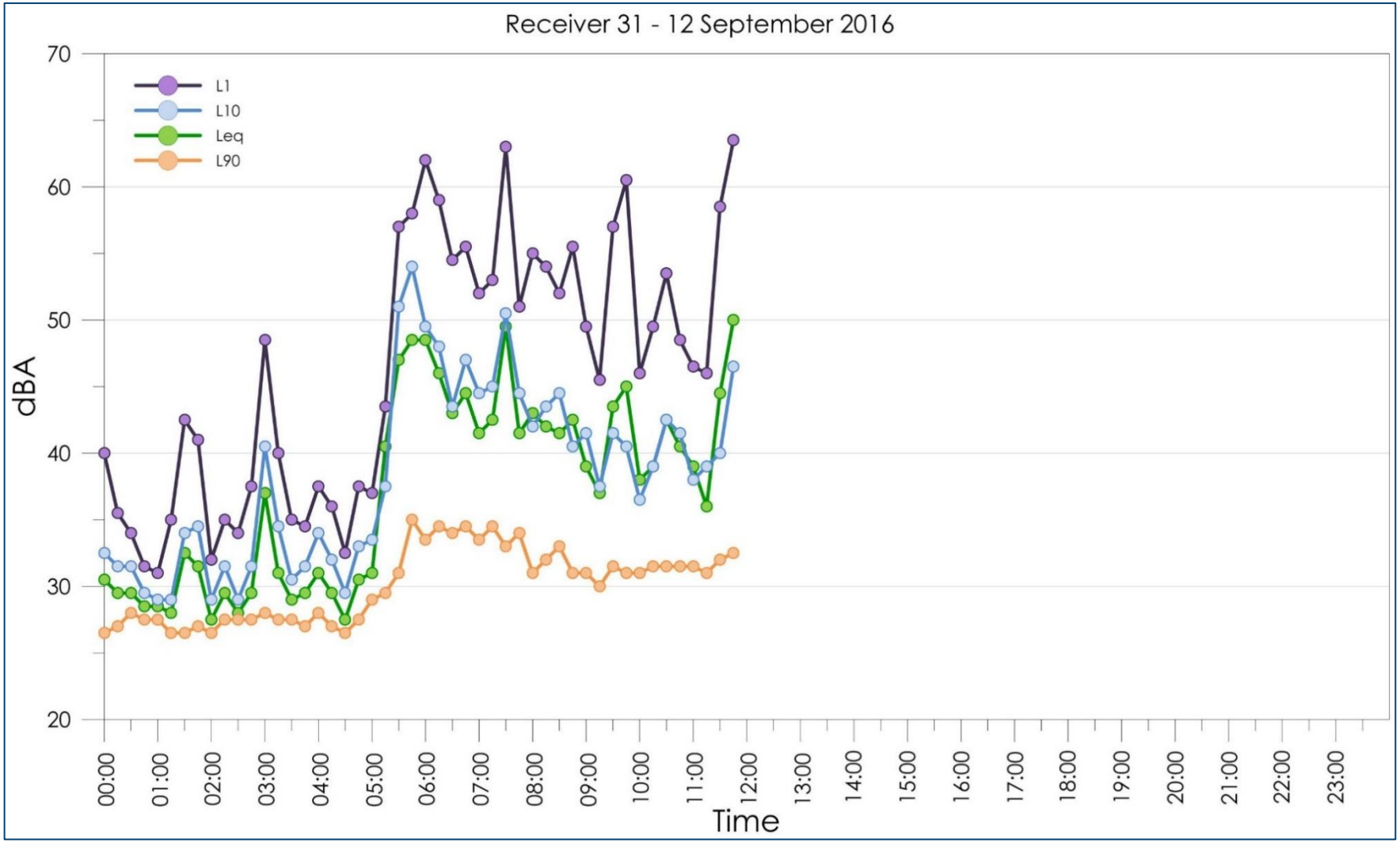


Figure A-8: Unattended noise monitoring results at R31 – 12 September 2016