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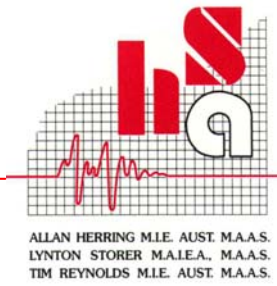

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ACOUSTIC ASSESSMENT

OF

FREIGHT TRAIN MOVEMENTS IN ESPERANCE IRON ORE EXPORT TO 8mtpa

FOR

AUSTRALIAN RAILROAD GROUP

BY

HERRING STORER ACOUSTICS

FEBRUARY 2005

REFERENCE: 4107-3-04219

CONTENTS

APPENDICES

1.0 INTRODUCTION

Herring Storer Acoustics (HSA) was commissioned by Australian Railroad Group (ARG) to provide a report assessing the noise impact associated with proposed changes to rail operations in the Western Australian town of Esperance. The changes in the rail operations are related to a proposed increase in iron ore exported from the Esperance Port (the Port) from approximately 6 million tonnes per annum (mtpa) to 8 mtpa. In addition, a review has been undertaken to assess rail noise associated with increases in rail operations since 2000 when iron ore exports were at the rate of 1.5 mtpa.
Previous related works by HSA are as noted below.

- *Acoustic Assessment of Freight Train Movements in Esperance for Australian Railroad Group*; December 2002, 11212-3-01105.
- *Esperance Port Trains (Email Transmittal) for Esperance Port Authority*; 14 May 2004, 3264-1-04119.

The findings of the above studies have also been utilised in this work.

An aerial photograph of the rail route is shown in Appendix A.

Only train movements between the Esperance yard and the Port have been considered, as this is the location of the majority of residences and worst-case noise levels. The reason the noise levels are “worst-case” are that due to room restrictions at the Port, iron ore trains are split into two (2) ”rakes” at the yard so that train movements are highest between the yard and the Port.

Seasonal grain trains are split at the Esperance yard and travel to and from the Port in four movements. All other trains travel to and from the Port in two movements (i.e. loaded to the Port, empty to the Yard).

2.0 APPLICABLE CRITERIA

In Western Australia, environmental noise is governed through the *Environmental Protection Act 1986* and regulated through the *Environmental Protection (Noise) Regulations 1997*. Under Regulation 3(b), noise emissions from trains are excluded, such that there are no regulatory criteria to be met. The Department of Environment (DoE) has developed a set of guidelines termed *EPA Statements for EIA No.14 (Version 3) Road and Rail Transportation Noise (Draft 10/05/00)*, which reflect best practice with respect to impact of noise at noise sensitive premises. The allowable noise level increase specified by the guidelines is shown below in Table 2.1.

TABLE 2.1 – ALLOWABLE NOISE LEVEL INCREASE

Rating Before Increase	Acceptable Increase
N0	4 dB, or to top of N0, whichever is greater
N1	3 dB
N2	1.5 dB
N3	0.5 dB
N4	0 dB

Where the Ratings are defined in Table 2.2.

TABLE 2.2 – NOISE AMENITY RATINGS

Rating	$L_{Aeq,Day}$	$L_{Aeq,Night}$
N0	< 50	< 40
N1	51 – 55	41 – 45
N2	56 – 60	46 – 50
N3	61 – 65	51 – 55
N4	66 – 70	56 – 60
N5	> 71	> 61

For instance, a residence that is currently in a Noise Amenity Rating of N2 has an allowable increase of 1.5 dB due to any change in noise associated with transportation.

Note that the above noise levels are assessed at 1 metre from the façade of a residence. At this assessment point, approximately 2.5 dB is attributed to noise reflected from the façade.

3.0 METHODOLOGY

As part of the 2001 study, an automatic noise data logger was set-up at three (3) different locations as follows:

Location 1 Fullerton Street, Esperance
26 to 28 October 2001

Location 2 Weigner Drive, Esperance
28 to 30 October 2001

Location 3 Hardy Street, Esperance
30 October to 01 November 2001

Location 1 is approximately 100 metres from the track, whilst Locations 2 & 3 are approximately 80 metres from the track. Locations 1 and 2 are separated from the rail by Harbour Road, which carries a significant amount of traffic including heavy vehicles.

During the 2001 study, a new residential development was noted under construction at Johns Street. These residences are approximately 40 metres from the railway and are the closest along the route.

For the 2005 study, a logger was located at 51 Johns Street, between 26 January and 29 January 2005.

Data from the noise loggers was downloaded and the L_{A0}[1], L_{Aeq}[2] and L_{A90}[3] values presented in graphical format. Each logger was set to record the noise levels at 15-minute intervals.

From the logger data, the $L_{Aeq,day}$[4] and $L_{Aeq,night}$[5] were calculated.

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1 L_{A0} is the noise level exceeded for 0% of the time (i.e. the maximum)
2 L_{Aeq} is the continuous equivalent noise level (generally referred to as the average level)
3 L_{A90} is the noise level exceeded for 90% of the time (considered to represent the ambient level)
4 $L_{Aeq,day}$ is the logarithmic average of the 15 minute L_{Aeq} values between 0700 and 2200 hours
5 $L_{Aeq,night}$ is the logarithmic average of the 15 minute L_{Aeq} values between 2200 and 0700 hours

Hand held noise level meter recordings were made as part of the 2001 study and these have been utilised in this report. The majority of these measurements were concentrated around Hardy Street, as these residences had previously identified the noise from trains as a concern, particularly when wheel squeal occurred.

Additional hand held measurements were undertaken in January 2005 at 51 Johns Street, including a trial train which had 60 wagons as its second rake, approximating the proposed 63 wagon train. During the January 2005 measurements, another new residential development was identified on Woolamai Place, which is adjacent the bend in the rail. This location is elevated compared to the rail and at its closest point the train is not visible.

Train movements up until the 8mtpa scenario are based on the information provided by the Port for the May 2004 study. Movements for the 8 mtpa scenario were provided by ARG. These are summarised below in Table 3.1.

TABLE 3.1 – ESPERANCE QUARTERLY TRAIN NUMBER INFORMATION

Time	Train Numbers									Total
	Iron Ore Trains			Nickel Trains			Grain Trains			
	0700-2200	2200-0700	Total	0700-2200	2200-0700	Total	0700-2200	2200-0700	Total	
Jan-Mar 2000	93	0	93 (1.55)	78	0	78	30	30	59	230
Apr-Jun 2000	96	0	96 (1.71)	78	0	78	46	46	91	265
Jul-Sep 2000	143	20	162 (2.57)	65	13	78	46	46	92	332
Oct-Dec 2000	144	20	163 (2.51)	65	13	78	16	16	31	272
Jan-Mar 2001	145	13	158 (2.35)	65	13	78	30	30	59	295
Apr-Jun 2001	147	40	187 (3.05)	65	13	78	46	46	91	356
Jul-Sep 2001	141	77	218 (3.86)	65	13	78	46	46	92	388
Oct-Dec 2001	144	46	190 (3.86)	65	13	78	16	16	31	299
Jan-Mar 2002	141	90	231 (4.23)	65	13	78	30	30	59	368
Apr-Jun 2002	155	104	259 (4.83)	65	13	78	46	46	91	428
Jul-Sep 2002	154	90	243 (4.96)	65	13	78	46	46	92	413
Oct-Dec 2002	144	66	210 (4.18)	65	13	78	16	16	31	319
Jan-Mar 2003	140	64	203 (4.36)	65	13	78	30	30	59	340
Apr-Jun 2003	143	58	201 (4.33)	65	13	78	46	46	91	370
Jul-Sep 2003	141	90	230 (5.14)	65	13	78	46	46	92	400
Oct-Dec 2003	142	84	226 (5.18)	65	13	78	16	16	31	335
Jan-Mar 2004	143	84	227 (5.20)	65	13	78	30	30	59	364
Apr-Jun 2004	143	84	227	65	13	78	30	30	59	364
Jul-Sep 2004	143	91	234	65	13	78	30	30	59	371
Oct-Dec 2004	143	91	234	65	13	78	30	30	59	371
Predicted 8 mtpa	143	91	234 (8.0)	65	13	78	46	46	91	403

Notes: One grain train assumed per day, if available, between February and October.
Numbers shown in brackets are the iron ore tonnage.

Nickel and grain trains have a total of four movements past a residence being:

- Loaded to the Port
- Locomotive ('light') to Yard
- Locomotive ('light') to Port
- Empty to the Yard

Nickel trains currently use a single L Class locomotive, whilst grain trains use a single Q Class locomotive. It is proposed that nickel trains will also use Q Class locomotives in the future (approximately 18-24 months).

Between the 3rd quarter in 2000 and 1st quarter in 2001, the iron ore trains had the same movements as listed above, with the number of wagons typically being in the order of 64 (around the maximum that the Port can accommodate). In the 1st and 2nd quarters of 2000 and 2nd quarter in 2001, half of the trains had four movements, whilst the other half had six movements consisting of:

- 1st rake loaded to the Port (approximately 25-35 wagons)
- Locomotive ('light') to Yard
- 2nd rake loaded to the Port (approximately 50-55 wagons)
- 1st rake empty to the Yard (approximately 25-35 wagons)
- Locomotive (light) to Port
- 2nd rake empty to the Yard (approximately 50-55 wagons)

Until the end of 2001, trains used Q and L class locomotives. After this point, only Q class locomotives have been in operation between the Yard and the Port. In some instances an L class locomotive is connected, however is not pulling the train and is only at idle.

The typical unloading time (time between the 1st rake leaving the yard and the 2nd rake returning to the yard) is approximately 4½ to 5 hours as follows:

- 25-30 minutes between 1st rake to Port and locomotives light to yard.
- 1¼ hours between locomotives light to yard and 2nd rake to Port.
- 40-45 minutes between 2nd rake to Port and 1st rake to yard.
- 1¾ hours between 1st rake to yard and locomotives light to Port.
- 30 minutes between locomotives light to Port and 2nd rake to yard.

To increase tonnages to 8 mtpa, the number of trains remains unchanged, however the length of the trains will increase to 126 wagons with 3 x Q Class locomotives. Additionally, the number of movements between the Yard and the Port will increase to eight (8) as follows:

- Loaded to the Port (63 wagons)
- Locomotives ('light') to Yard
- Locomotive ('light') to Port
- Empty to the Yard (63 wagons)
- Loaded to the Port (63 wagons)
- Locomotives ('light') to Yard
- Locomotive ('light') to Port
- Empty to the Yard (63 wagons)

The total duration of unloading the 8 mtpa iron ore trains will be 6 to 6½ hours as follows:

- 25-30 minutes between 1st rake to Port and locomotives light to yard.
- 1¾ hours between locomotives light to yard and locomotives light to Port.
- 25-30 minutes between locomotives light to Port and 1st rake to Yard.
- 40-45 minutes between 1st rake to yard and 2nd rake to Port.
- 30-35 minutes between 2nd rake to Port and locomotives light to yard.
- 1¾ hours between locomotives light to yard and locomotives light to Port.
- 25-30 minutes between locomotives light to Port and 2nd rake to yard.

From the 2001 study, the L_{Aeq} noise levels for the various movements are shown below. These relate to the Hardy Street residences and do not include wheel squeal.

Iron Ore

- Loaded to the Port (approximately 25-35 wagons) $L_{Aeq,5mins}$ 65 dB
- Locomotives ('light') to Yard $L_{Aeq,5mins}$ 50 dB
- Loaded to the Port (approximately 50-55 wagons) $L_{Aeq,5mins}$ 64 dB
- Empty to the Yard (approximately 25-35 wagons) $L_{Aeq,5mins}$ 62 dB
- Locomotives (light) to Port $L_{Aeq,5mins}$ 49 dB
- Empty to the Yard (approximately 50-55 wagons) $L_{Aeq,5mins}$ 62 dB
- Loaded to the Port (approximately 64 wagons) $L_{Aeq,5mins}$ 64 dB
- Empty to the Yard (approximately 64 wagons) $L_{Aeq,5mins}$ 65 dB

Nickel

- Loaded to the Port $L_{Aeq,5mins}$ 65 dB
- Locomotive ('light') to Yard $L_{Aeq,5mins}$ 60 dB
- Locomotive (light) to Port $L_{Aeq,5mins}$ 55 dB
- Empty to the Yard (approximately 64 wagons) $L_{Aeq,5mins}$ 65 dB

Grain

- Loaded to the Port $L_{Aeq,5mins}$ 60 dB
- Locomotive ('light') to Yard $L_{Aeq,5mins}$ 50 dB
- Locomotive (light) to Port $L_{Aeq,5mins}$ 50 dB
- Empty to the Yard (approximately 64 wagons) $L_{Aeq,5mins}$ 60 dB

In terms of an $L_{Aeq,1hour}$, incorporating all of the iron ore train movements, the noise from an existing train is 59 dB $L_{Aeq,1hour}$ and from a future train is 60 dB $L_{Aeq,1hour}$ (increase of 1.2 dB). It should be noted that the light locomotives have negligible contribution (0.1 dB) to the overall L_{Aeq} level.

Maximum noise levels for residences on Hardy Street are summarised below in Table 3.2.

TABLE 3.2 – MAXIMUM NOISE LEVELS – HARDY STREET

Train Type	Noise Level – L_{Amax}, dB		
	From Locomotive	From Horn	From Wheel Squeal
1st rake to Port	77	85	-
Locomotives light to Yard	70	87	-
2nd rake to Port	77	85	87
1st rake to yard	70	87	-
Locomotives light to Port	70	85	-
2nd rake to yard	73	87	-

Note that wheel squeal is generally only an issue for the longer trains going into the port. In recent years, driver training has resulted in minimal wheel squeal. The driver is required to gain enough speed to get the train up the hill alongside Johns Street and around the bend. If the driver has too much speed when heading down towards the Port after passing

the bend, using the locomotives to brake may not be sufficient. In this case, the brakes on the wagons are also applied and wheel squeal may occur. In most cases, the drivers are experienced enough to ensure adequate speed to ascend the rise, but not overrun when heading into the Port such that the braking power of the locomotives (termed dynamic braking) is sufficient.

Note that maximum noise levels for the future trains is expected to be the same as for the existing trains (55 wagons) as the power of 2 Q Class locomotives is sufficient to pull the 63 wagons, even though there may be 3 Q Class locomotives linked together. However, due to the additional movements, there will be additional occurrences. If an L Class locomotive were to form one of the 3 locomotives, the maximum noise levels may be in the order of 5-8 dB higher if this locomotive were active.

For the closest residences on Johns Street, the January 2005 measurements resulted in the following L_{Aeq} noise levels:

Iron Ore

- Loaded to the Port (35 wagons) $L_{Aeq,5mins}$ 66 dB
- Locomotives ('light') to Yard $L_{Aeq,5mins}$ 54 dB
- Loaded to the Port (48 wagons) $L_{Aeq,5mins}$ 65 dB
- Empty to the Yard (35 wagons) $L_{Aeq,5mins}$ 62 dB
- Locomotives (light) to Port $L_{Aeq,5mins}$ 54 dB
- Empty to the Yard (48 wagons) $L_{Aeq,5mins}$ 65 dB
- Loaded to the Port (approximately 63 wagons) $L_{Aeq,5mins}$ 67 dB
- Empty to the Yard (approximately 63 wagons) $L_{Aeq,5mins}$ 64 dB

Nickel

- Loaded to the Port $L_{Aeq,5mins}$ 64 dB
- Locomotive ('light') to Yard $L_{Aeq,5mins}$ 54 dB
- Locomotive (light) to Port $L_{Aeq,5mins}$ 54 dB
- Empty to the Yard (approximately 64 wagons) $L_{Aeq,5mins}$ 64 dB

Grain

- Loaded to the Port $L_{Aeq,5mins}$ 67 dB
- Locomotive ('light') to Yard $L_{Aeq,5mins}$ 60 dB
- Locomotive (light) to Port $L_{Aeq,5mins}$ 55 dB
- Empty to the Yard (approximately 64 wagons) $L_{Aeq,5mins}$ 67 dB

The existing $L_{Aeq,1hour}$ for an iron ore train is 60 dB, which will increase to 62 dB for the future, longer trains, assuming 3 x Q Class locomotives (increase of 1.4 dB). Note that if an L Class locomotive were used with 2 Q Class locomotives, the future $L_{Aeq,1hour}$ would be 65 dB (increase of 5.2 dB).

Maximum noise levels for residences on Johns Street are summarised below in Table 3.3.

TABLE 3.3 – MAXIMUM NOISE LEVELS – JOHNS STREET

Train Type	Noise Level – L_{Amax}, dB		
	From Locomotive	From Horn	From Wheel Squeal
1st rake to Port	81	63	-
Locomotives light to Yard	75	69	-
2nd rake to Port	80	63	-
1st rake to yard	76	69	-
Locomotives light to Port	72	63	-
2nd rake to yard	80	69	-

Wheel screech is not an issue at the Johns Street residences and therefore no figures are shown in the above table. Noise from the horns is also relatively low as there are no crossings in close proximity. On one of the observed train movements, a loud air release noise occurred, resulting in a level of 86 dB L_{Amax}. This occurs when drivers use the air brakes instead of dynamic braking and it is understood to not be the recommended driving technique. This may have occurred if the driver was less experienced or if the dynamic braking was not operational. This noise has not been included in the above table.

At the new development on Woolamai Place, average noise levels are relatively low with a calculated $L_{Aeq,1hour}$ of 46 dB. Due to this low noise level, the average noise levels at this location are not considered any further. Maximum noise levels at this location can be from the locomotive, from wheel squeal or from the horn. When the train is travelling to the port, wheel squeal can be apparent with levels of 64 dB L_{Amax}. The locomotive is generally at a level of around 59 dB L_{Amax} whilst horn noise was recorded at levels of 77 dB L_{Amax} (travelling to the yard) and 59 dB L_{Amax} travelling to the Port.

Note that all of the above do not include the + 2.5 dB correction for the reflection of a building façade.

4.0 RESULTS

4.1 Noise Data Logging

The results of the 2001 noise data logging are summarised below in Table 4.1 and shown graphically in Appendix B.

TABLE 4.1 - CALCULATED $L_{Aeq,day}$ AND $L_{Aeq,night}$ NOISE LEVELS - 2001, dB(A)

Period	Location 1 Fullerton Street	Location 2 Weigner Drive	Location 3 Hardy Street
Day 1 (Afternoon to Evening)	58	62	65
Night 1 (2200 to 0700 hrs)	53	53	52
Day 2 (0700 to 2200 hrs)	55	66	58
Night 2 (2200 to 0700 hrs)	52	49	52
Day 3 (Morning to Afternoon)	52	60	63
Average $L_{Aeq,Day}$	55	64	61
Average $L_{Aeq,Night}$	52	51	52

Note: Day 3 at Location 1, Night 2 at Location 2 and Night 1 at Location 3 had no train movements.

The railway runs alongside Harbour Road, which is a major road in Esperance and carries a significant percentage of heavy vehicles. Consequently, noise levels at residences are dominated by road traffic. Other general ambient noises (birds, wind etc) are also a significant influence on the ambient noise, particularly during the day.

Table 4.2 summarises the noise data logging undertaken in 2005, also shown graphically in Appendix B.

TABLE 4.2 - CALCULATED $L_{Aeq,day}$ AND $L_{Aeq,night}$ NOISE LEVELS - 2005, dB(A)

Period	51 Johns Street
Night 1 (2200 to 0700 hrs)	55 (53)
Day 2 (0700 to 2200 hrs)	59 (55)
Night 2 (2200 to 0700 hrs)	53 (50)
Day 3 (0700 to 2200 hrs)	57 (51)
Night 3 (2200 to 0700 hrs)	57 (52)
Average $L_{Aeq,Day}$	58 (53)
Average $L_{Aeq,Night}$	55 (52)

Note: Numbers shown in brackets are the L_{Aeq} value at times of iron ore train movements only.

The numbers shown in brackets are the levels recorded during iron ore train movements. However, these may still be influenced by other noises such as local road traffic, road traffic on Harbour Road, household noises, wind etc, particularly during the light locomotives movement.

Note that the above noise levels were measured at 1 metre from a building façade such that the reflected noise is included.

4.2 Calculated Noise Levels from Trains

Based on the measured $L_{Aeq,5mins}$ data in Section 3, the $L_{Aeq,1hour}$ values were calculated for the various trains as shown below.

Hardy Street

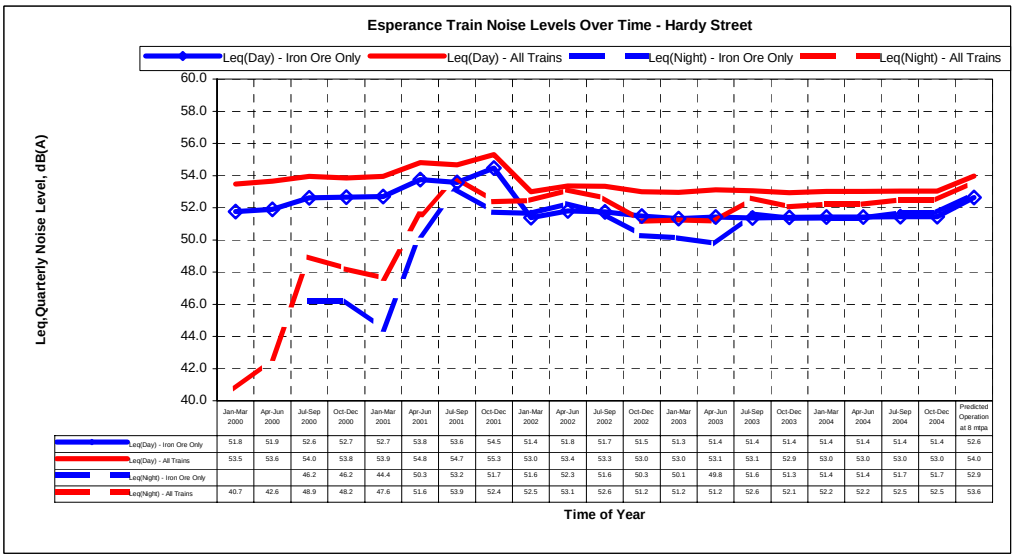
- Iron Ore Train – 6 movements $L_{Aeq,1hour}$ 59 dB
- Iron Ore Train – 4 movements $L_{Aeq,1hour}$ 57 dB
- Iron Ore Train – 8 movements $L_{Aeq,1hour}$ 60 dB
- Nickel Train $L_{Aeq,1hour}$ 53 dB
- Grain Train $L_{Aeq,1hour}$ 58 dB

Johns Street

- Iron Ore Train – 6 movements $L_{Aeq,1hour}$ 60 dB
- Iron Ore Train – 8 movements $L_{Aeq,1hour}$ 62 dB
- Nickel Train $L_{Aeq,1hour}$ 57 dB
- Grain Train $L_{Aeq,1hour}$ 60 dB

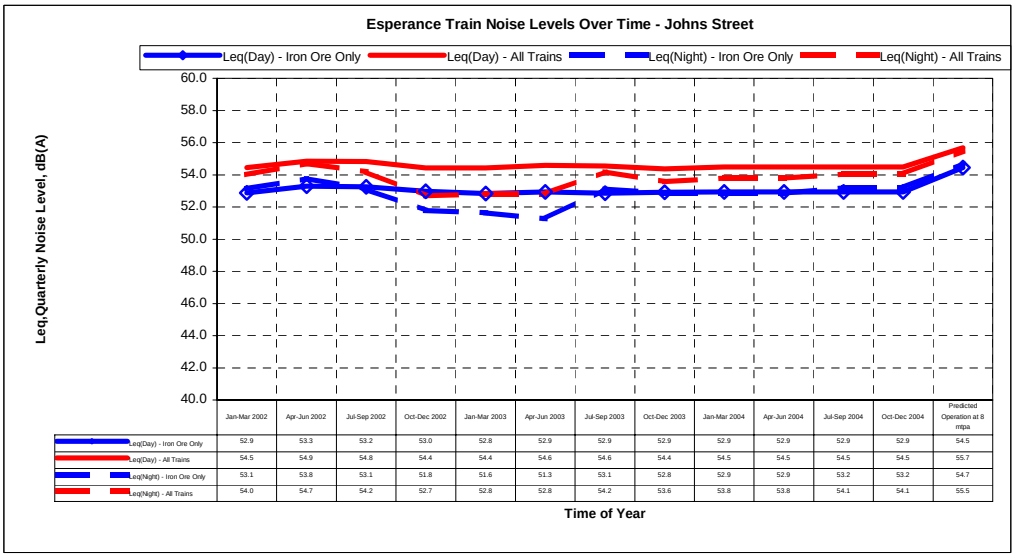
The $L_{Aeq,1hour}$ values were then combined with the train number information (Table 3.1) to obtain the $L_{Aeq,Day}$ and $L_{Aeq,Night}$. The results are shown below in Figures 4.1 and 4.2. These figures are also contained in Appendix C as full size A4 plots for clarity. Note that Figures 4.1 and 4.2 have been adjusted to include the + 2.5 dB façade correction.

FIGURE 4.1 – GRAPHICAL REPRESENTATION OF $L_{Aeq,day}$ AND $L_{Aeq,night}$ NOISE LEVELS HARDY STREET



	Jan-Mar 2000	Apr-Jun 2000	Jul-Sep 2000	Oct-Dec 2000	Jan-Mar 2001	Apr-Jun 2001	Jul-Sep 2001	Oct-Dec 2001	Jan-Mar 2002	Apr-Jun 2002	Jul-Sep 2002	Oct-Dec 2002	Jan-Mar 2003	Apr-Jun 2003	Jul-Sep 2003	Oct-Dec 2003	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Predicted Operation at 8 mtpa
Leq(Day) - Iron Ore Only	51.8	51.9	52.6	52.7	52.7	53.8	53.6	54.5	51.4	51.8	51.7	51.5	51.3	51.4	51.4	51.4	51.4	51.4	51.4	51.4	52.6
Leq(Day) - All Trains	53.5	53.6	54.0	53.8	53.9	54.8	54.7	55.3	53.0	53.4	53.3	53.0	53.0	53.1	53.1	52.9	53.0	53.0	53.0	53.0	54.0
Leq(Night) - Iron Ore Only			46.2	46.2	44.4	50.3	53.2	51.7	51.6	52.3	51.6	50.3	50.1	49.8	51.6	51.3	51.4	51.4	51.7	51.7	52.9
Leq(Night) - All Trains	40.7	42.6	48.9	48.2	47.6	51.6	53.9	52.4	52.5	53.1	52.6	51.2	51.2	51.2	52.6	52.1	52.2	52.2	52.5	52.5	53.6

FIGURE 4.2 – GRAPHICAL REPRESENTATION OF $L_{Aeq,day}$ AND $L_{Aeq,night}$ NOISE LEVELS JOHNS STREET



	Jan-Mar 2002	Apr-Jun 2002	Jul-Sep 2002	Oct-Dec 2002	Jan-Mar 2003	Apr-Jun 2003	Jul-Sep 2003	Oct-Dec 2003	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Predicted Operation at 8 mtpa
Leq(Day) - Iron Ore Only	52.9	53.3	53.2	53.0	52.8	52.9	52.9	52.9	52.9	52.9	52.9	52.9	54.5
Leq(Day) - All Trains	54.5	54.9	54.8	54.4	54.4	54.6	54.6	54.4	54.5	54.5	54.5	54.5	55.7
Leq(Night) - Iron Ore Only	53.1	53.8	53.1	51.8	51.6	51.3	53.1	52.8	52.9	52.9	53.2	53.2	54.7
Leq(Night) - All Trains	54.0	54.7	54.2	52.7	52.8	52.8	54.2	53.6	53.8	53.8	54.1	54.1	55.5

To also show the difference between the existing noise levels and the proposed noise levels from iron ore trains, four additional graphs were developed – refer Figures 4.3 to 4.6. Figures 4.3 and 4.4 are the L_{eq} and L_{max} noise levels at Hardy Street respectively and likewise, Figures 4.5 and 4.6 relate to Johns Street.

FIGURE 4.3 – COMPARISON OF EXISTING/PROPOSED L_{Aeq} NOISE LEVELS – HARDY STREET

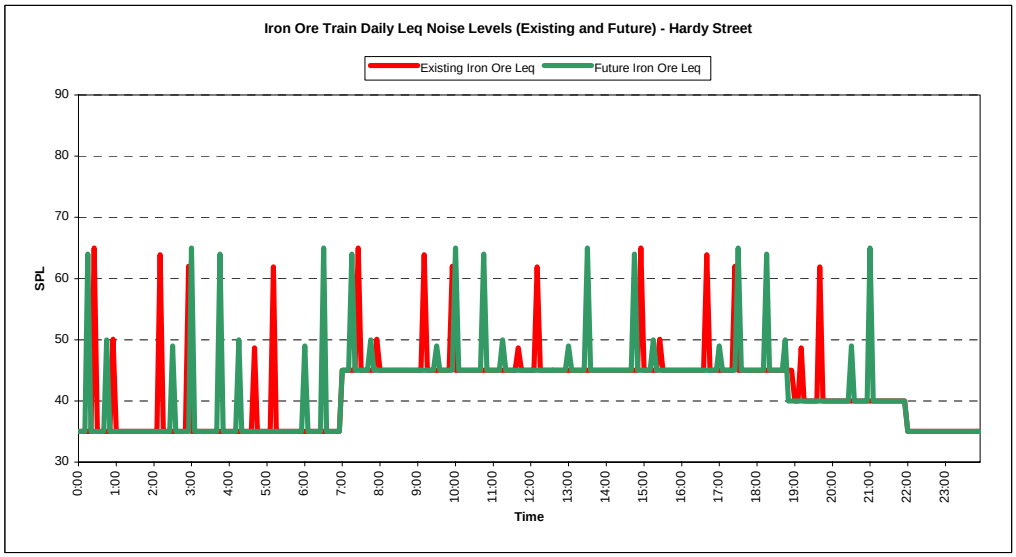


FIGURE 4.4 – COMPARISON OF EXISTING/PROPOSED L_{Amax} NOISE LEVELS – HARDY STREET

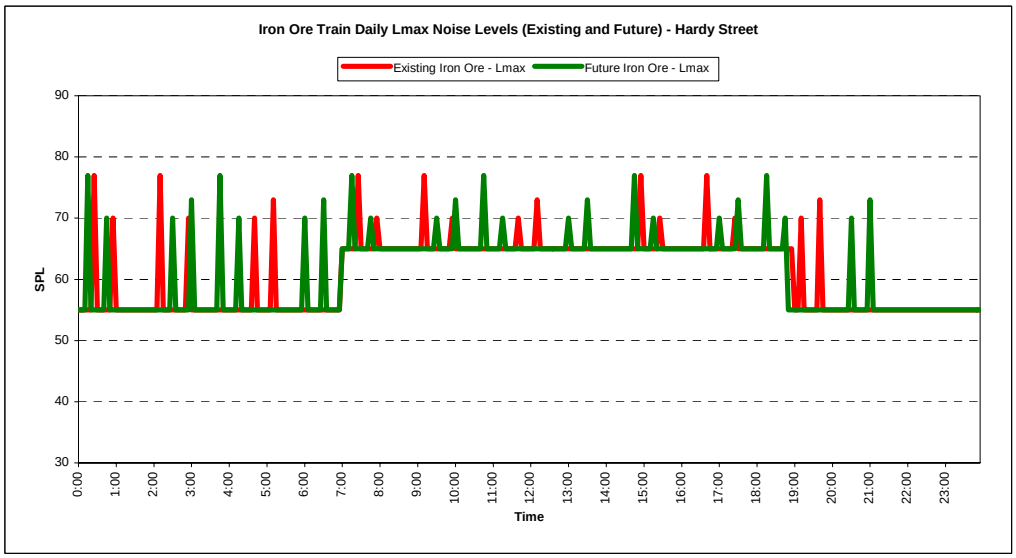


FIGURE 4.5 – COMPARISON OF EXISTING/PROPOSED L_{Aeq} NOISE LEVELS – JOHNS STREET

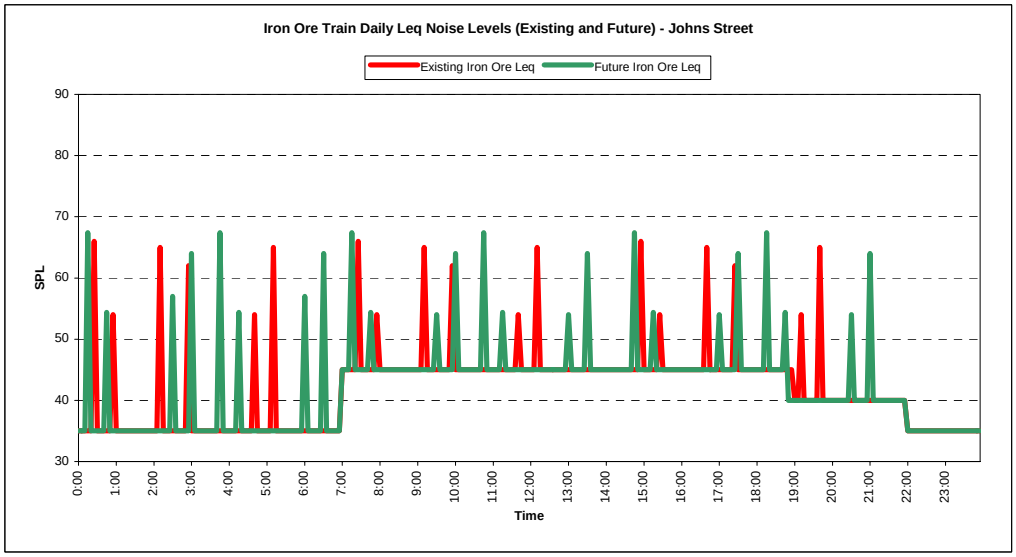
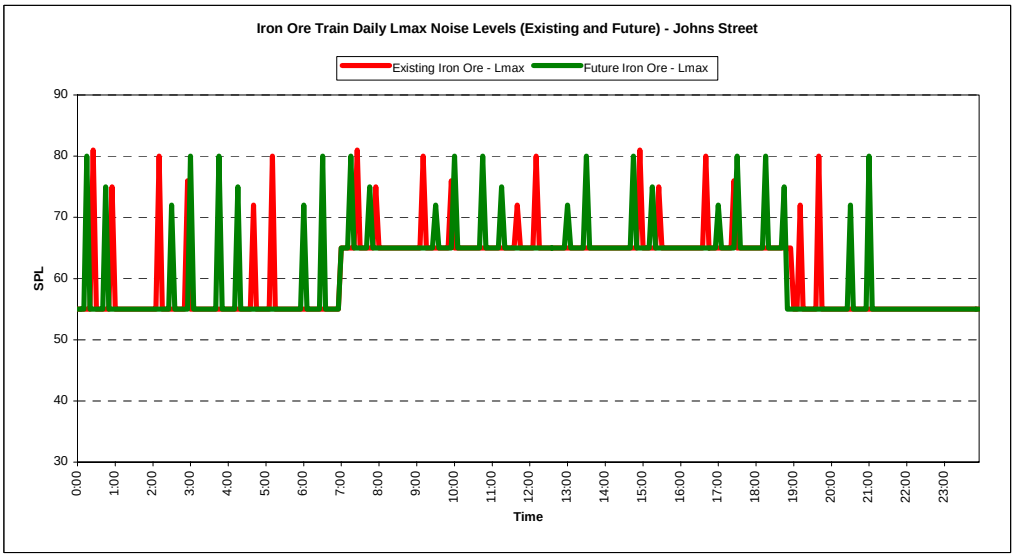


FIGURE 4.6 – COMPARISON OF EXISTING/PROPOSED L_{Amax} NOISE LEVELS – JOHNS STREET



5.0 DISCUSSION

The assessment of noise levels from trains and particularly from iron ore trains has focused on two main residential areas, being residences on Hardy Street (approximately 80 metres from the track and residences on Johns Street (approximately 40 metres from the track) and these are discussed separately below.

Hardy Street

Noise levels during the day gradually increased from the 1st quarter in 2000 to the end of 2001, where they increase to $L_{Aeq,Day}$ 54.5 dB for iron ore trains and $L_{Aeq,Day}$ 55.3 dB for all trains. Night-time noise levels peaked in the 3rd quarter in 2001. At the end of 2001, all iron ore trains change to using Q Class locomotives such that the daytime levels from iron ore trains decrease by 3.1 dB. Night-time noise levels decrease at the end of 2001 due to reduced movements and then remain unchanged as, although the number of movements has increased, the Q Class locomotives are used.

Since the change to Q Class locomotives on iron ore trains, noise levels during the day have not varied significantly, whilst during the night the number of trains dropped in mid 2003 resulting in reduced noise levels for this period. In July-Sep 2003 the number of trains returned to volumes similar to the start of 2002.

To increase the iron ore export to 8 mtpa, the number of trains remains unchanged, however the length of trains increase from around 80 wagons to 126 wagons. Space at the Port is restricted such that the maximum number of wagons at any one time is around 64. Thus, for the 8 mtpa scenario, two rakes of 63 wagons will be taken to the Port and this will be undertaken in a total of 8 movements between the Yard and the Port over a 6 hour period. The increase in wagon numbers results in an increase of 1.2 dB for iron ore trains only and 1.0 dB for all trains.

The existing ratings at 80 metres are N1 during the day and N3 during the night. Based on the DoE Guidance document, the allowable increase is 3.0 dB during the day and 0.5 dB during the night. The calculated increase complies with this document during the day, however is marginal at night.

Maximum noise levels from the locomotives are less than 80 dB L_{Amax} and therefore likely to be acceptable. Note that if L Class locomotives were used, the maximum noise level may increase to 85-88 dB L_{Amax}, which may be considered annoying by some residents.

The residences in this area are located near two crossings (The Esplanade and Watson Street) and are therefore subjected to two trains' horns with levels in the order of 85-87 dB L_{Amax}. This is significant and with the proposed increased number of movements may cause more annoyance.

Depending on the way the train is operated, the longer loaded trains going into the Port can have significant noise from wheel squeal if the wagons are used for braking (87 dB L_{Amax}). This is a high pitched noise and can be annoying to residents. Drivers have been and are continued to be trained in good neighbourly driving techniques and in particular to minimise wheel squeal noise by using the locomotives to slow the train. On some occasions, wheel squeal may occur if a driver has too much momentum coming around the bend. It is believed that driver training has generally removed this as an issue. With the proposed longer trains, driver training will be continued to ensure this is minimised.

Johns Street

Relatively new residences have been constructed on Johns Street, approximately 40 metres from the railway. As these were constructed in recent years, residents would have been aware of the railway and thus, have not been subject to dramatic increases in noise level over time. Additionally, with the knowledge of the railway, these residents would have had the opportunity to consider the design of their houses to minimise noise intrusion to sensitive areas.

Existing noise levels, from trains, at these residences result in ratings the same as those on Hardy Street, being N1 during the day and N3 during the night. Hence the allowable noise level increase is 3.0 dB during the day and 0.5 dB during the night. The calculated increase is 1.2 dB during the day and 1.5 dB during the night, such that the night-time noise levels are above the allowable increase noted in the draft document.

Taking into account all existing noise (both road and rail), the existing noise amenity ratings are N2 during the day and N3 during the night. The calculated increase to the overall existing noise levels, due to the proposed longer trains, is 0.6 dB during the day and 1.0 dB during the night. Hence, during the night-time, the calculated increase is marginally above that of the draft guidance document.

Maximum noise levels at these residences are governed by the locomotives and are typically no more than 80 dB L_{Amax}.

General

The increase in the average L_{Aeq} noise levels at residences is not the result of extra 'light' locomotive movements but due to the increase in the number of wagons. Although the additional locomotive movements do not significantly contribute to the average noise levels, they do result in additional maximum noise levels from both the locomotives and the horns.

In comparison to the *EPA Statements for EIA No.14 (Version 3) Road and Rail Transportation Noise (Draft 10/05/00)*, it is the night-time noise levels that are most critical.

Thus, to minimise the impact to residents, the following is recommended for consideration:

- Driver training is to continue and progress to be monitored, particularly in regards to the longer trains and wheel squeal noise coming into the Port.
- Where practicable, limit the notch settings on the locomotives. Since all three locomotives will be pulling the 63 wagons (rather than the 126), a lower notch setting may be practicable.
- Where locomotives are travelling light, it may be practicable to have 1 or 2 of the locomotives under no power or again, all under power but at low notch settings, depending on which is quieter.
- Locomotive drivers to use good neighbourly driving techniques. This includes minimum power settings, minimum braking etc, particularly during the night.
- Train scheduling to be reviewed in order to maximise train movements between 0700 and 2200 hours.
- Consideration to be given to keeping the locomotives at the Port rather than returning to the yard. Although this would not decrease the average noise levels, there would be less pass-by events and hence less maximum noise levels from the locomotives and train horns.
- Trains to comprise of Q Class locomotives. If an L Class locomotive is required due to a temporary shortfall of Q Class locomotives, this train is to be scheduled to operate during the day.

Yours faithfully,
For **HERRING STORER ACOUSTICS**

Terry George Checked: Lynton Storer

11 February 2005

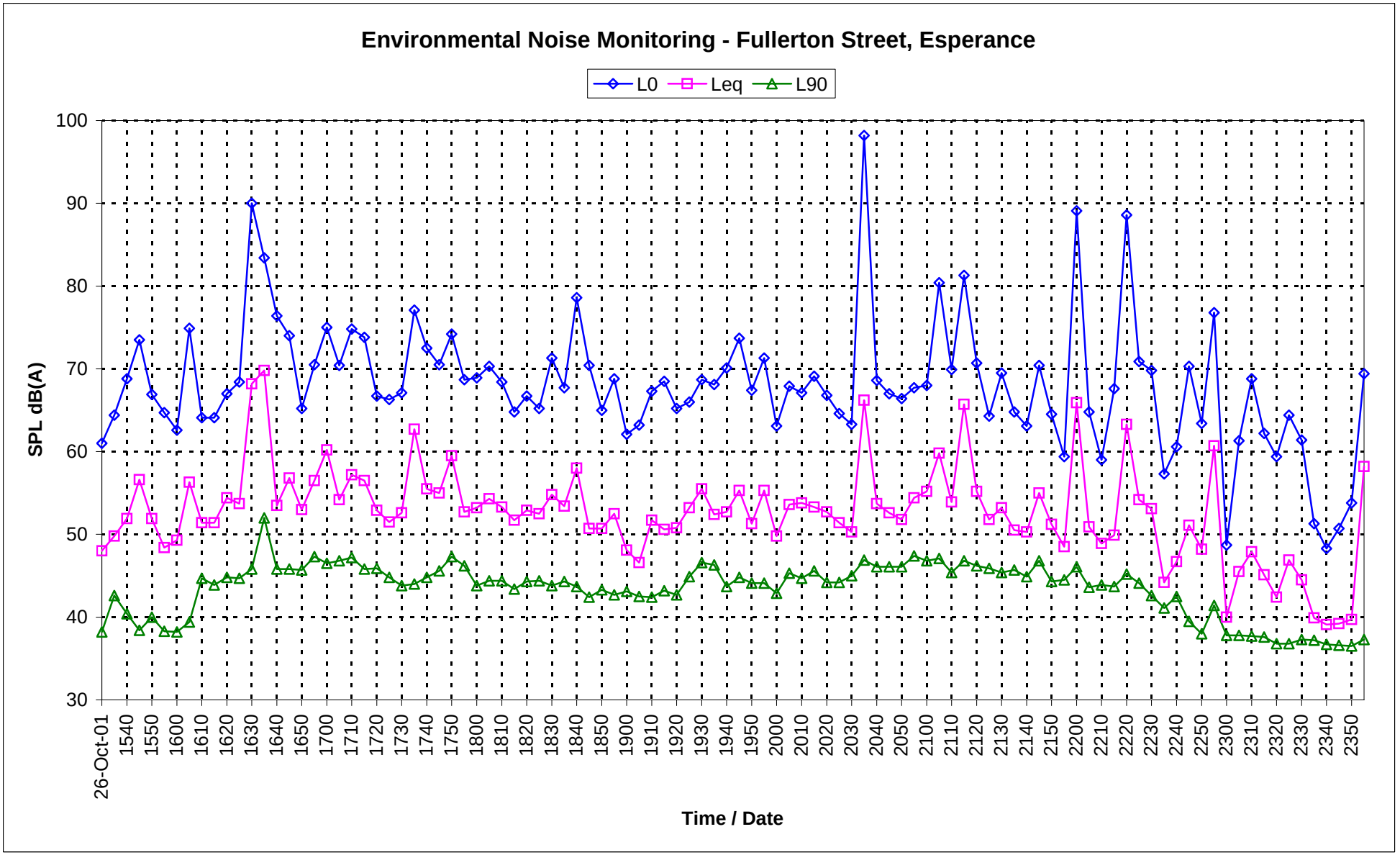
APPENDIX A

AERIAL PHOTOGRAPH


Location 4 – Johns Street
Location 2 – Weigner Drive
Location 1 – Fullerton Street
Location 5 – Woolamai Place
Location 3 – Hardy Street
N
W
E
S
0
400
800
1200 Meters
Esperance Townsite
DCDB boundaries are approximate only

APPENDIX B

NOISE LOGGING DATA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L0
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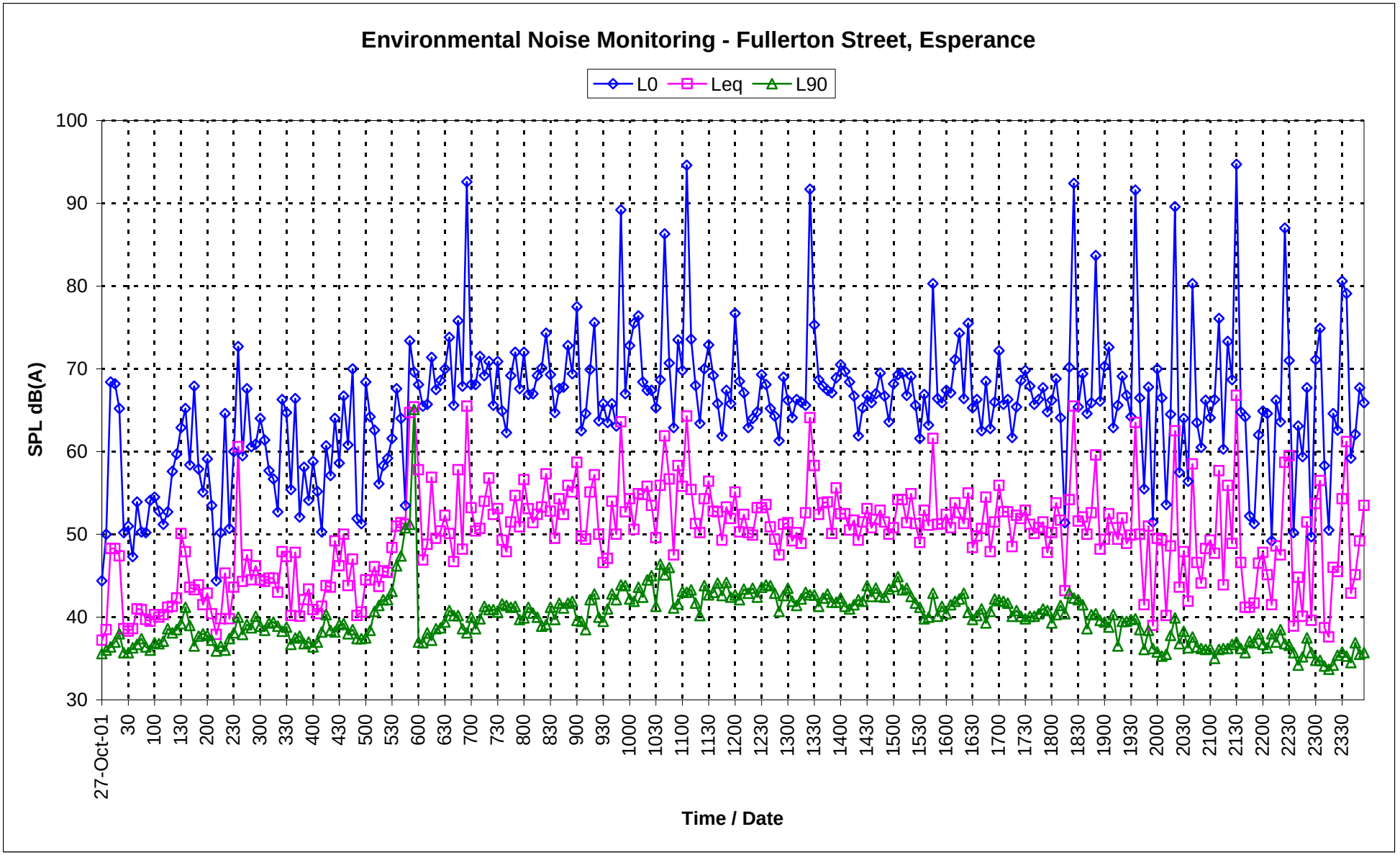
Time / Date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SPL dB(A)
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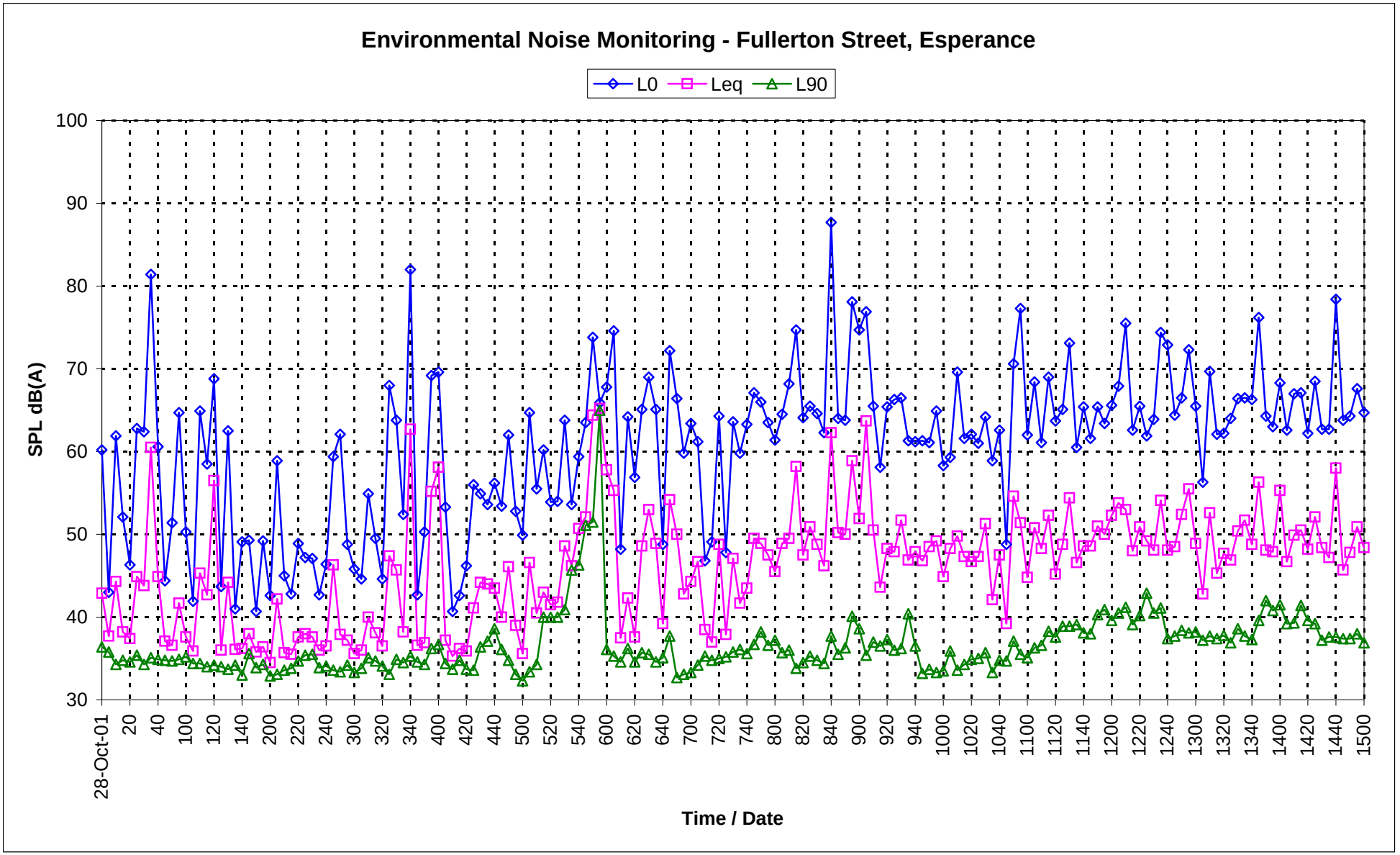
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SPL dB(A)
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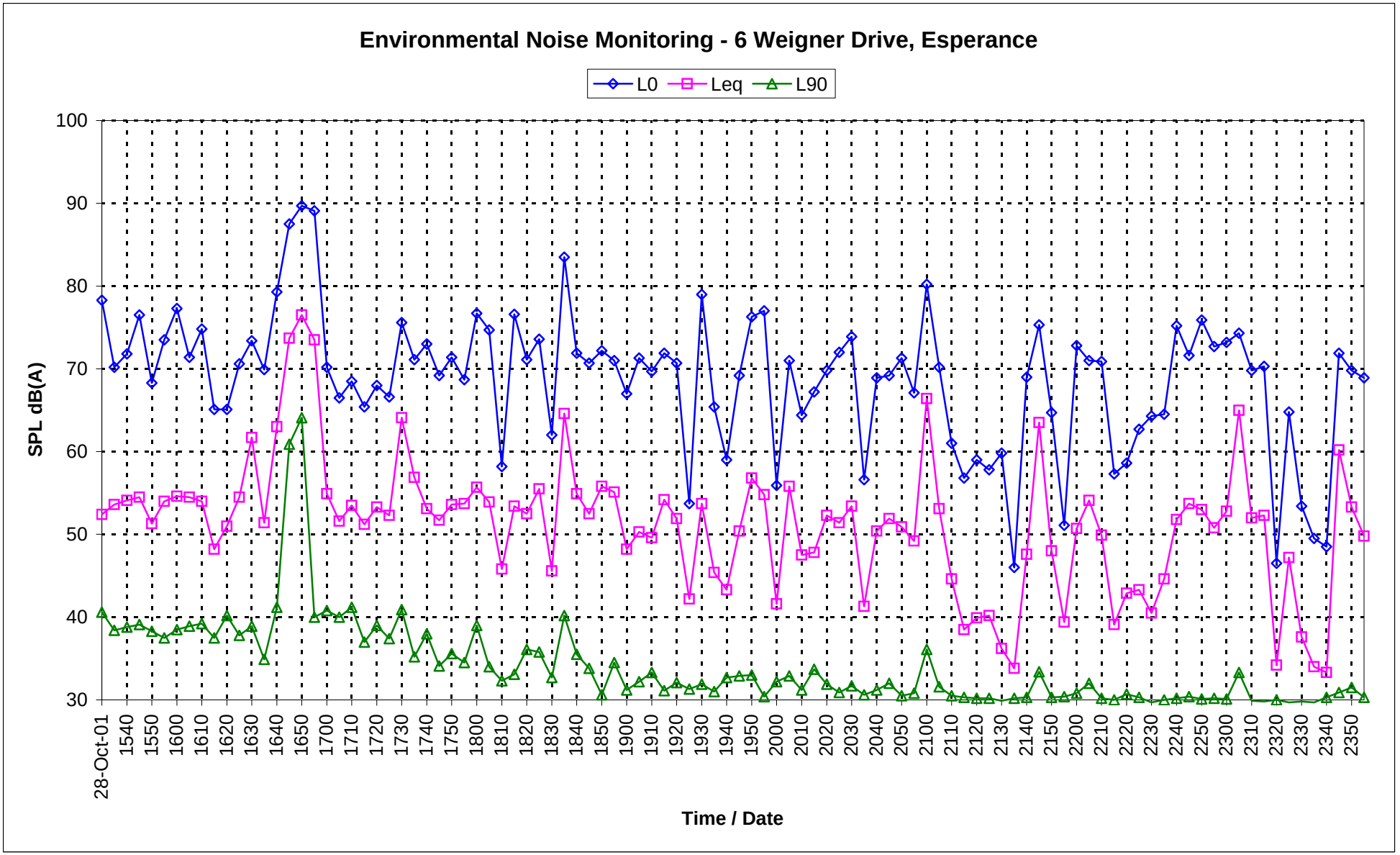
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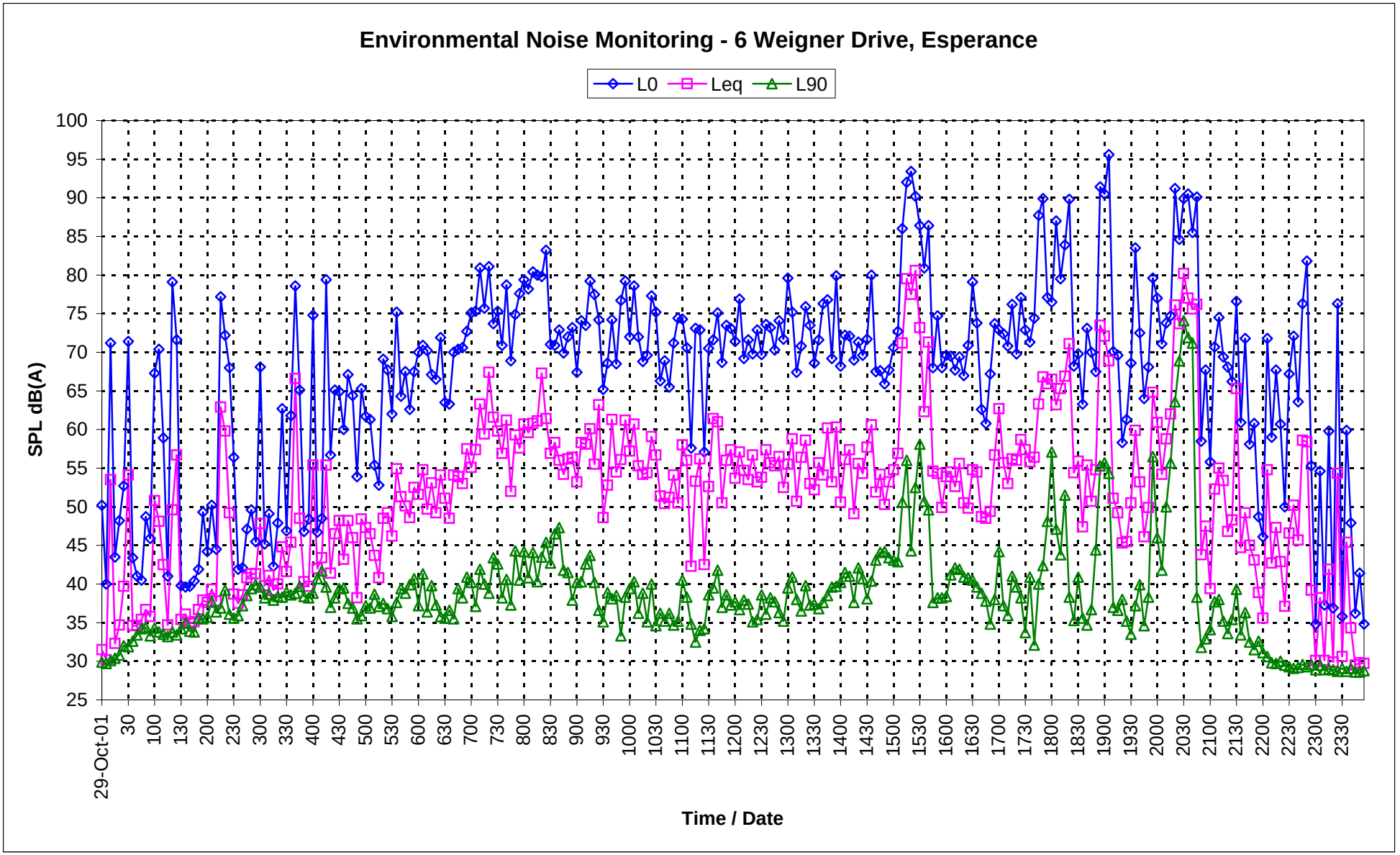
Time / Date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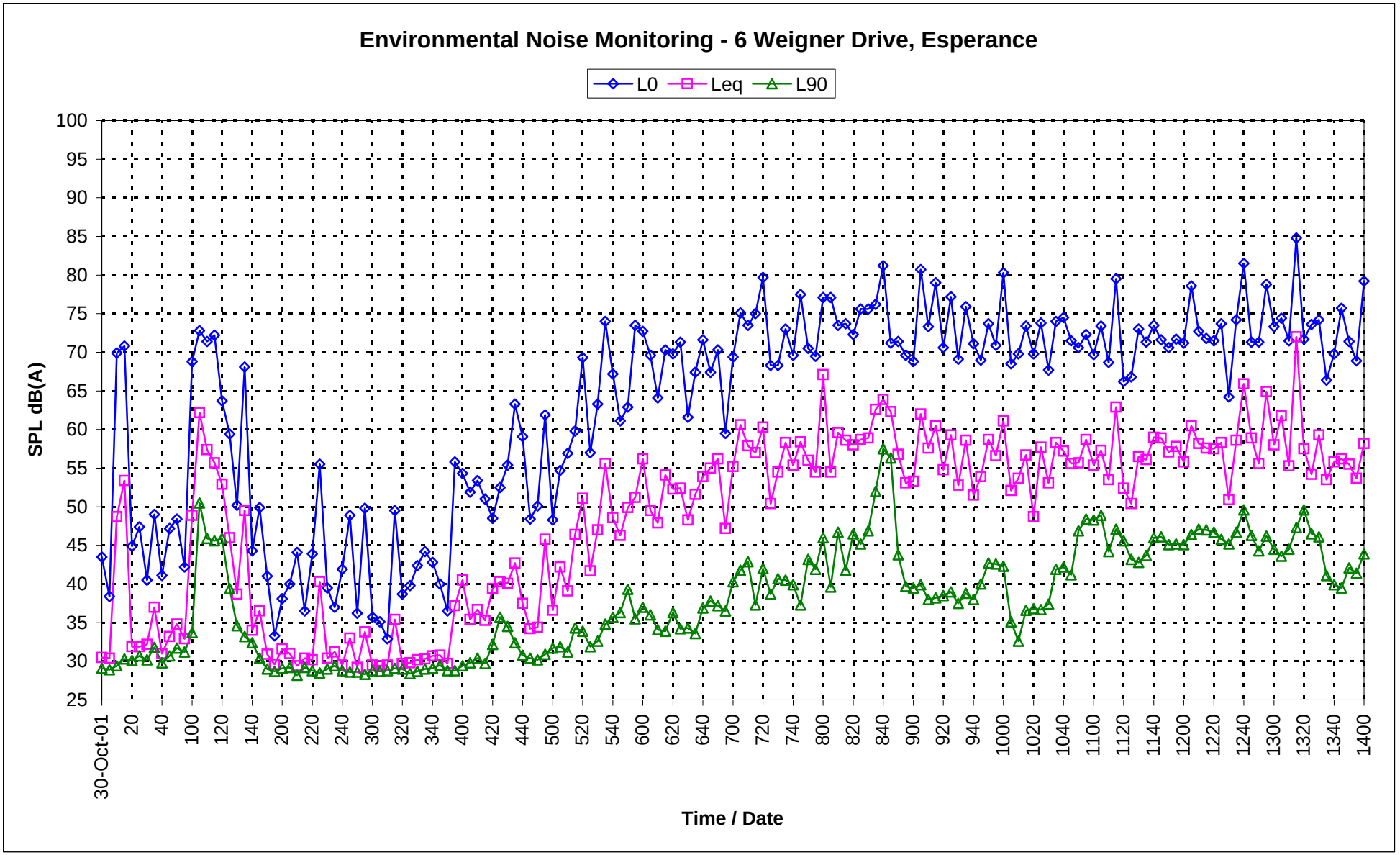
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SPL dB(A)
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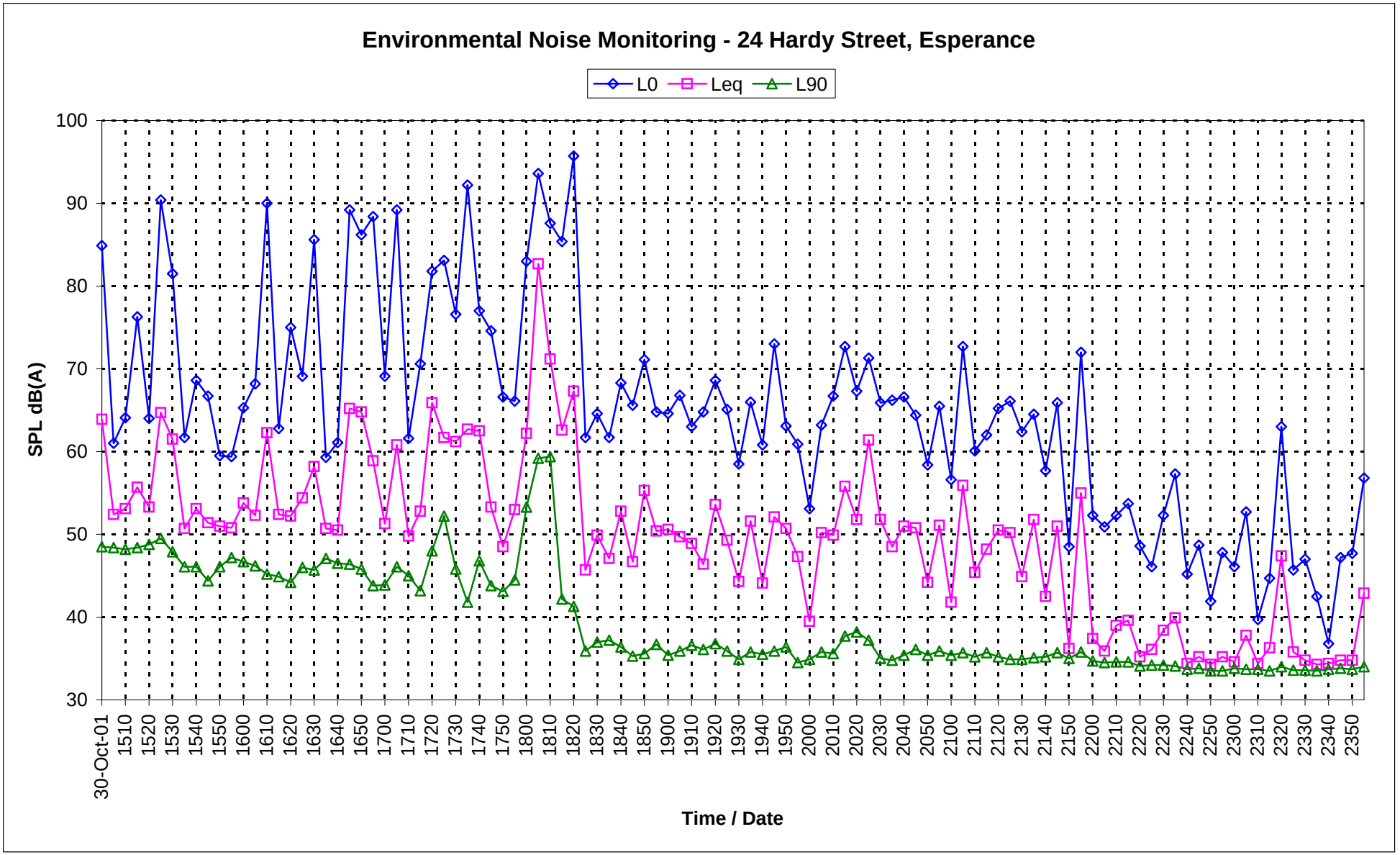
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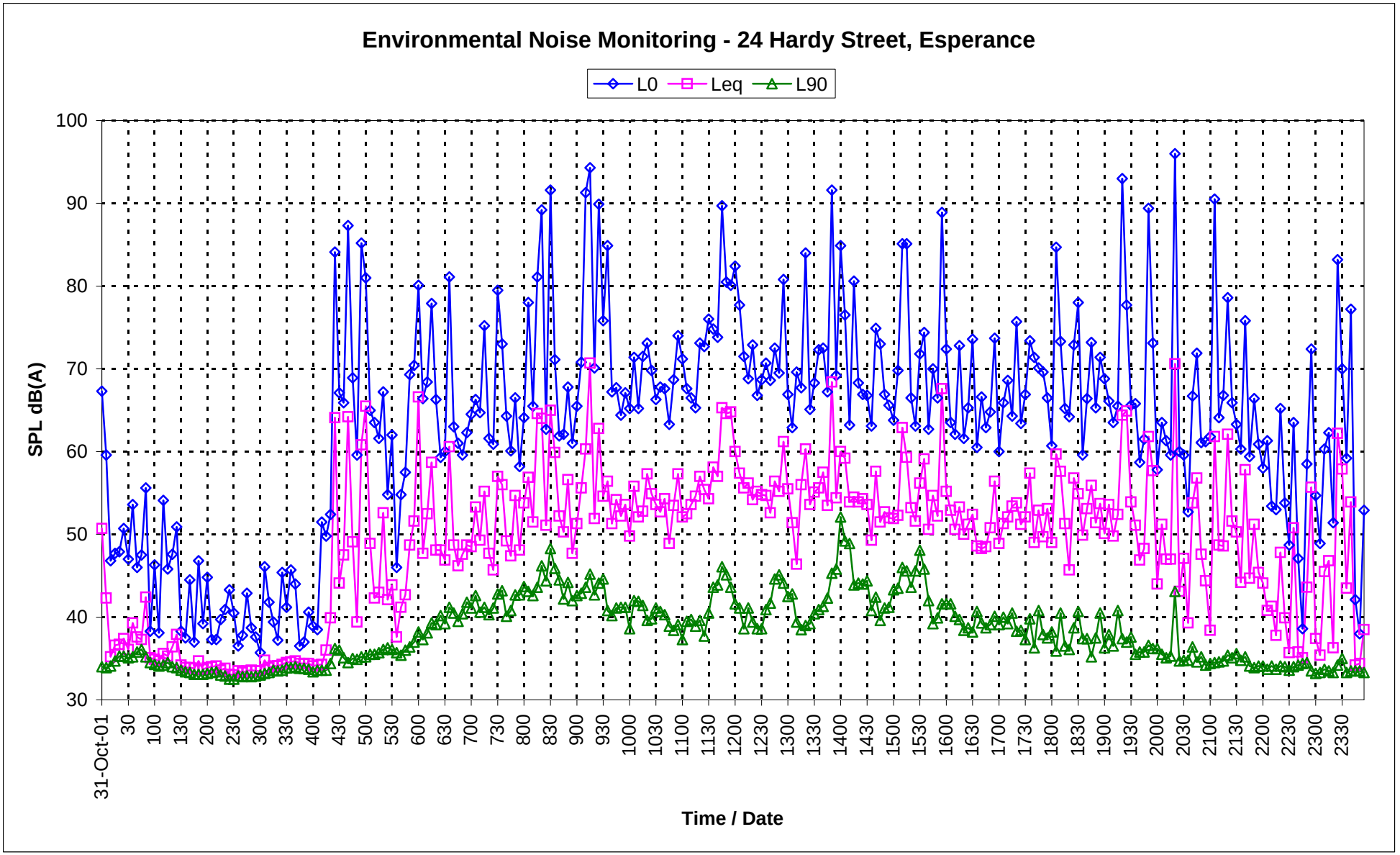
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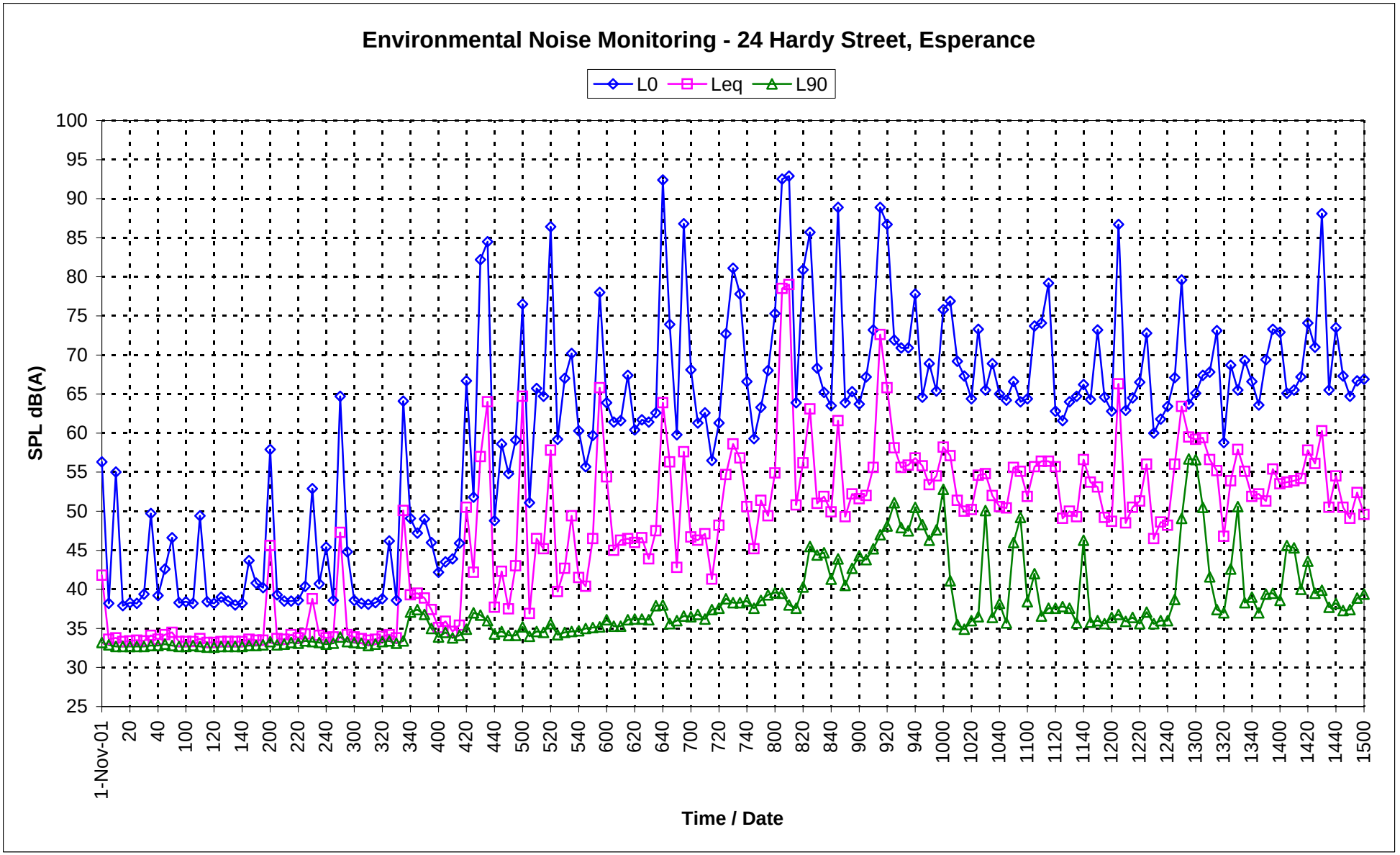
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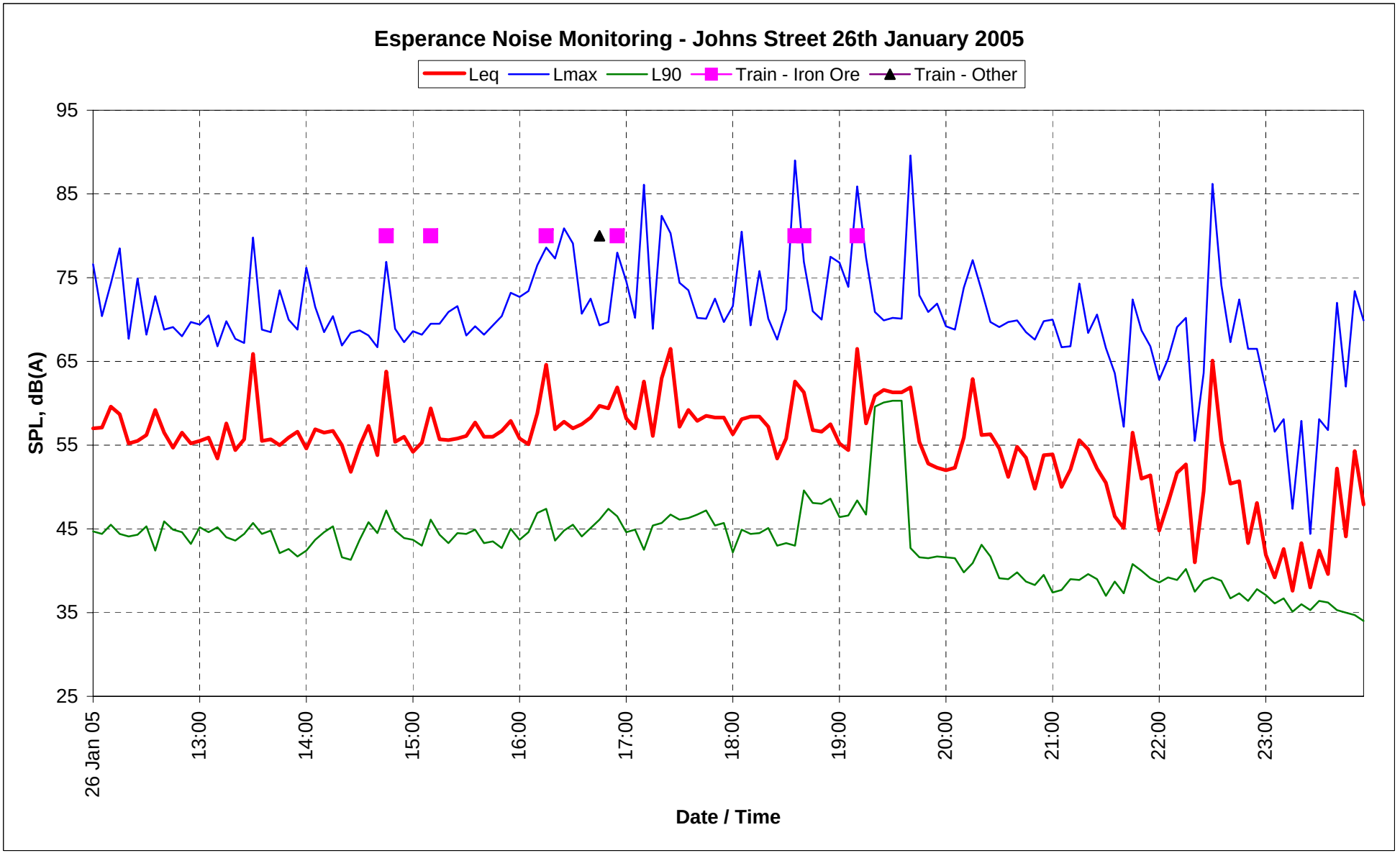
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Train - Iron Ore
Train - Other
SPL, dB(A)
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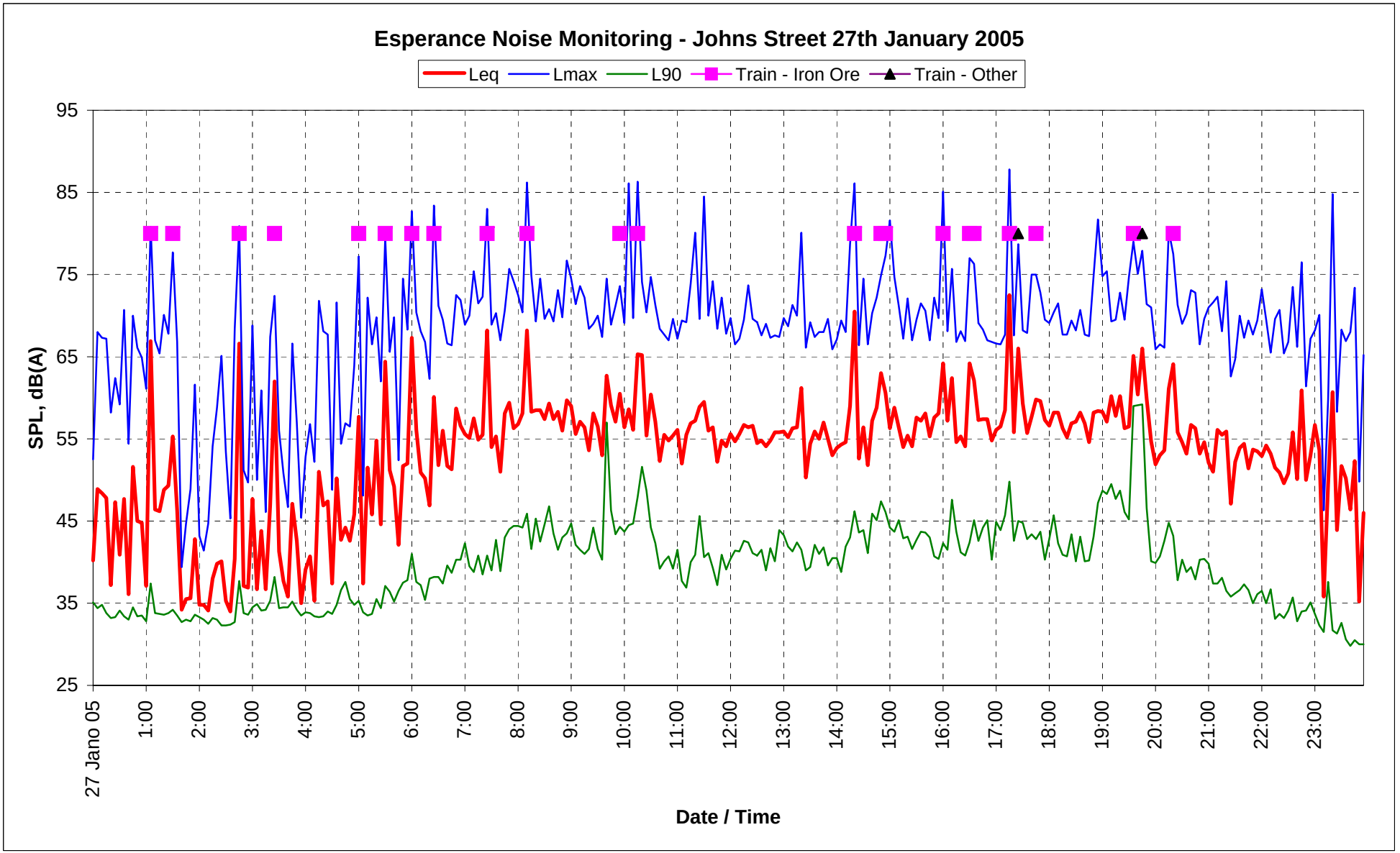
Date / Time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Train - Other
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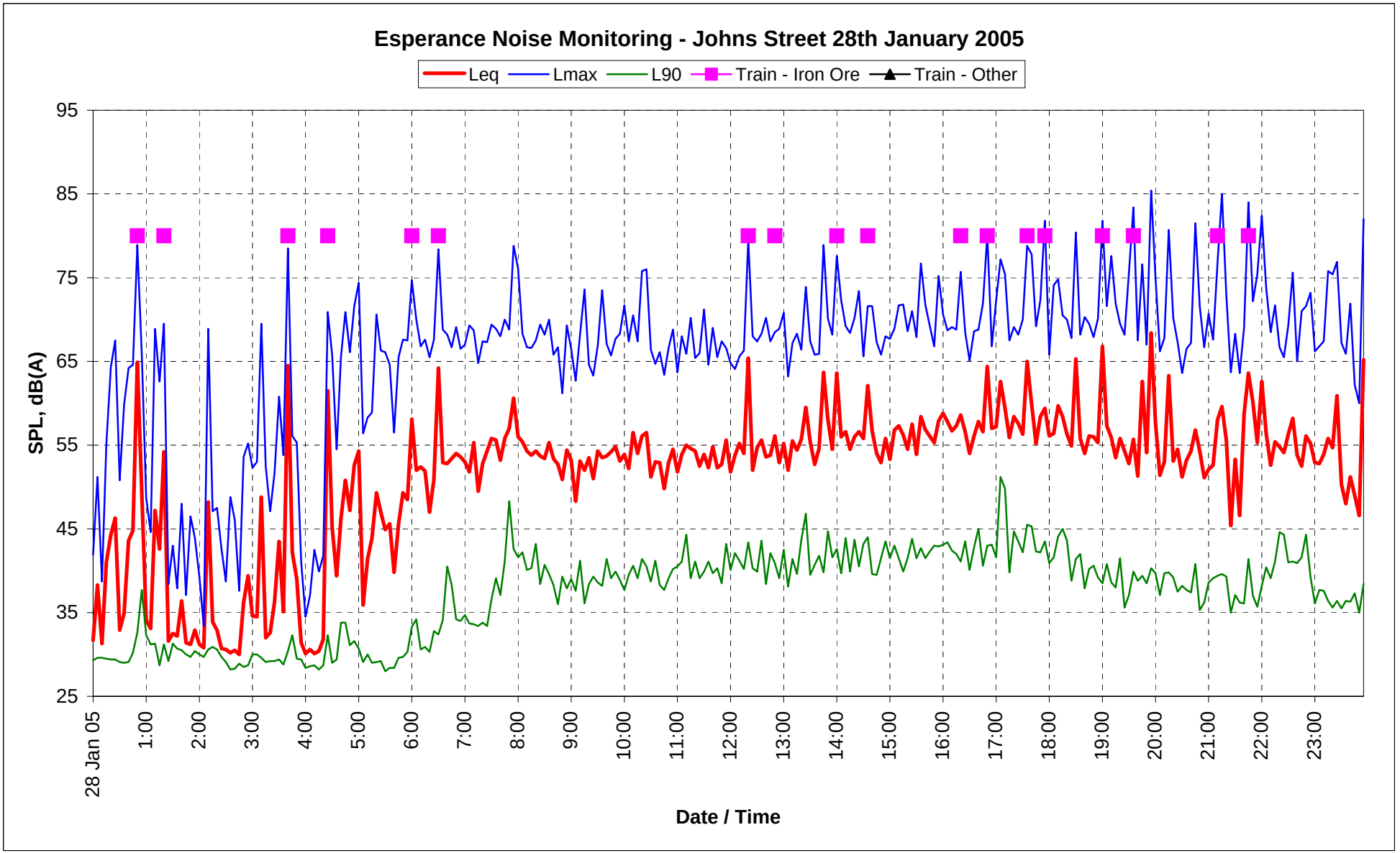
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Train - Other
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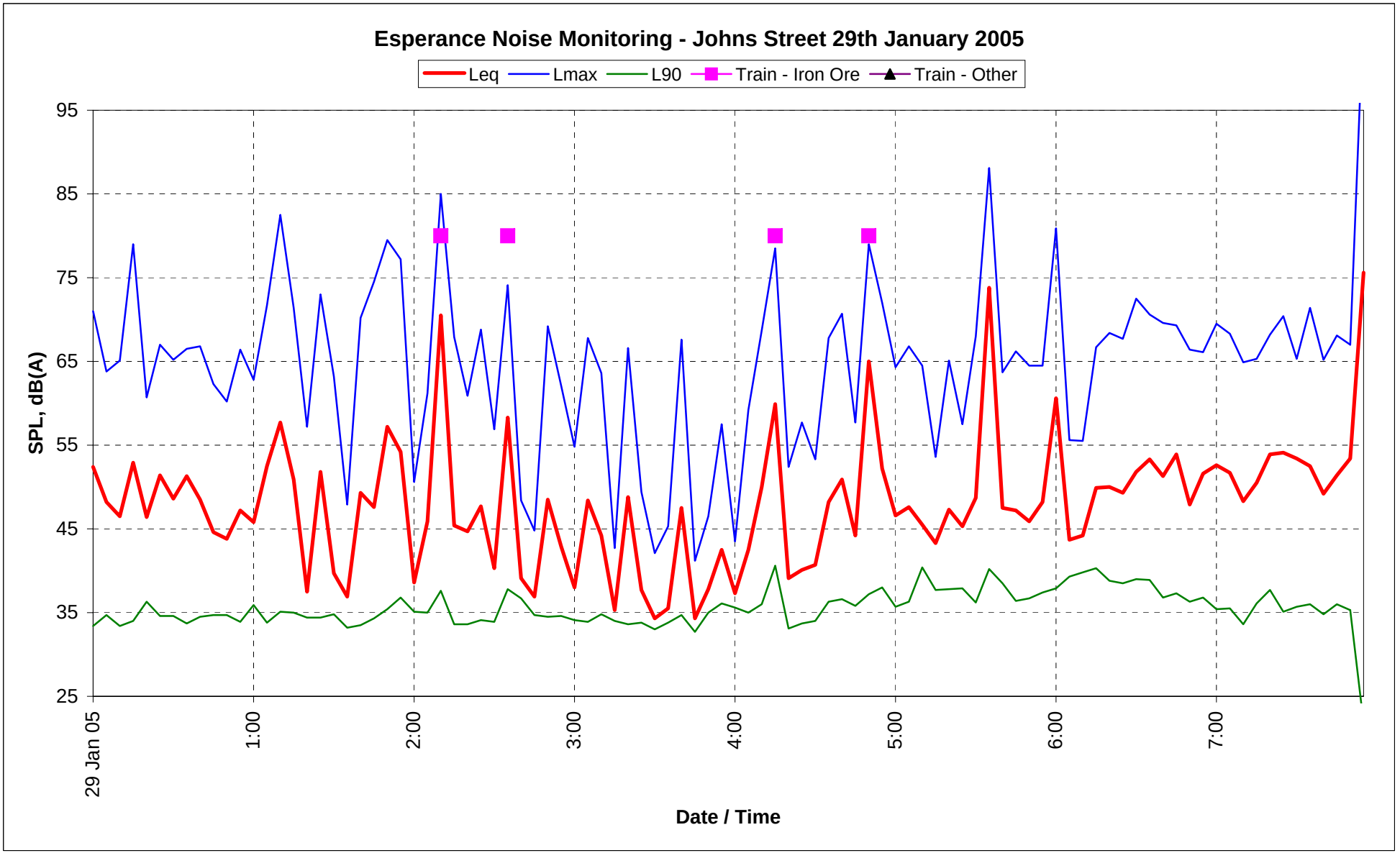
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Lmax
L90
Train - Iron Ore
Train - Other
SPL, dB(A)
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29 Jan 05
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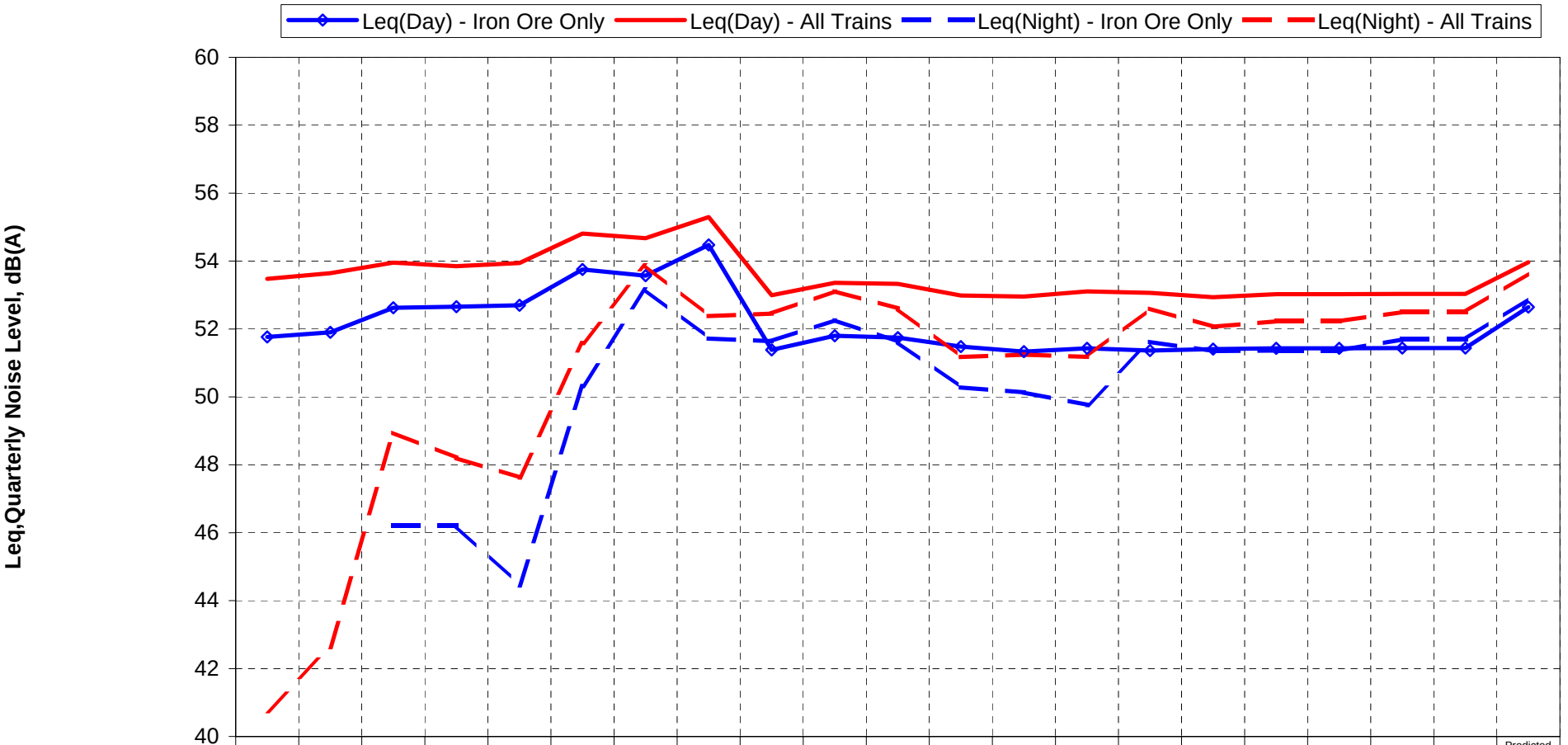
Date / Time

APPENDIX C

CALCULATED NOISE LEVELS
FIGURES 4.1 & 4.2

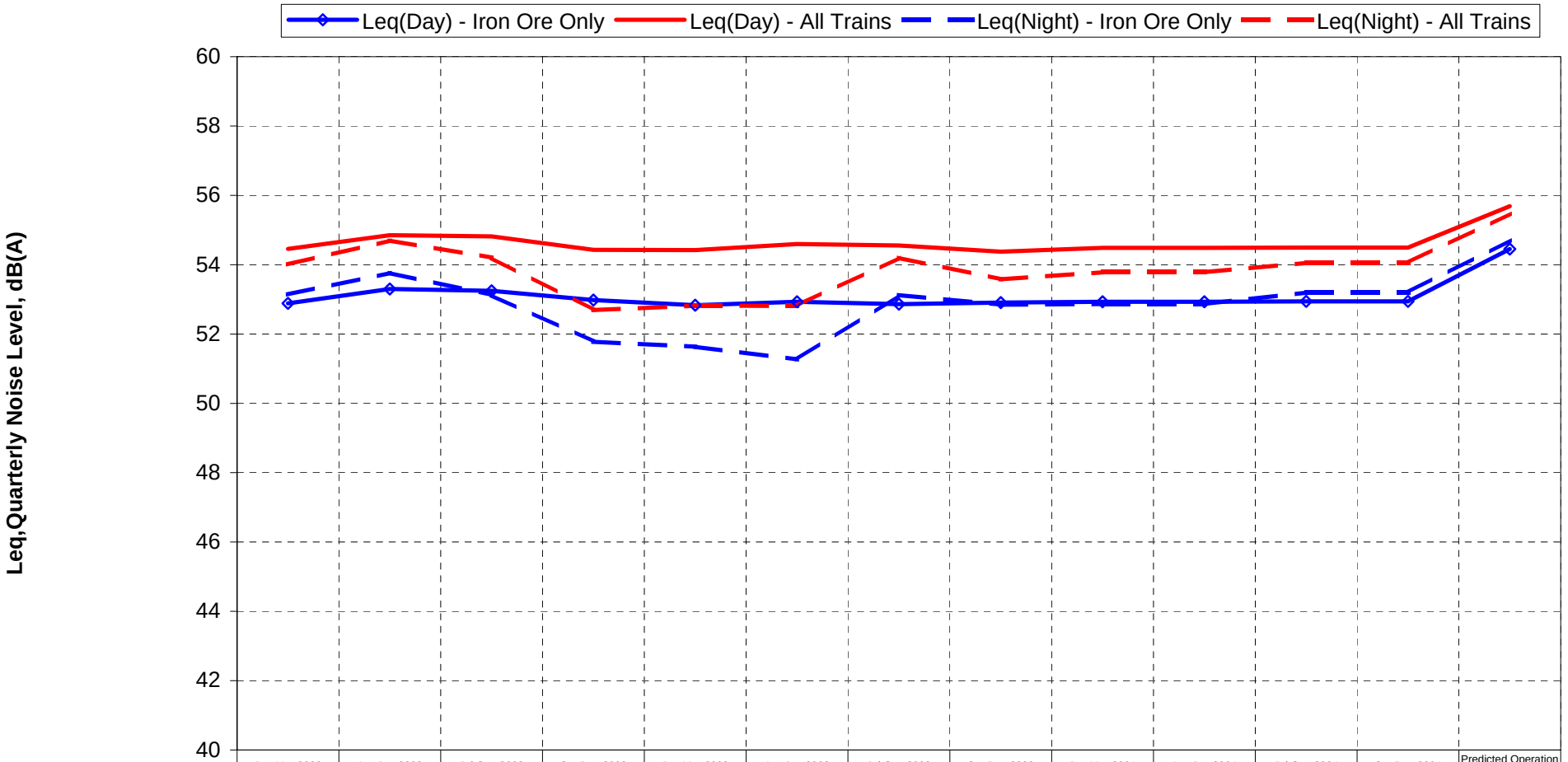
Esperance Train Noise Levels Over Time - Hardy Street



	Jan-Mar 2000	Apr-Jun 2000	Jul-Sep 2000	Oct-Dec 2000	Jan-Mar 2001	Apr-Jun 2001	Jul-Sep 2001	Oct-Dec 2001	Jan-Mar 2002	Apr-Jun 2002	Jul-Sep 2002	Oct-Dec 2002	Jan-Mar 2003	Apr-Jun 2003	Jul-Sep 2003	Oct-Dec 2003	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Predicted Operation at 8 mtpa
Leq(Day) - Iron Ore Only	51.7637866	51.9016695	52.6245532	52.6549233	52.7000839	53.7521305	53.5711483	54.4750385	51.3837401	51.79906	51.7474978	51.4800837	51.3321613	51.4296431	51.363182	51.4093016	51.4296431	51.4296431	51.4397782	51.4397782	52.6420588
Leq(Day) - All Trains	53.4761184	53.6427	53.9555017	53.8479536	53.9419583	54.8109746	54.6715833	55.2953782	52.992113	53.361172	53.3276896	52.9856527	52.9565634	53.1067077	53.0642379	52.9357268	53.0238607	53.0238607	53.0308843	53.0308843	53.96629
Leq(Night) - Iron Ore Only			46.205381	46.205381	44.4445609	50.3180445	53.1623519	51.7167163	51.639278	52.2612871	51.6231334	50.278372	50.132662	49.7640993	51.6231334	51.3476993	51.3648989	51.3648989	51.695316	51.695316	52.8975974
Leq(Night) - All Trains	40.7477352	42.6289431	48.9445857	48.2052819	47.6247107	51.5861553	53.8705753	52.3777586	52.4527368	53.1133662	52.6007873	51.1737327	51.2433397	51.1793032	52.6007873	52.062784	52.2264691	52.2264691	52.4992541	52.4992541	53.6429294

Time of Year

Esperance Train Noise Levels Over Time - Johns Street



	Jan-Mar 2002	Apr-Jun 2002	Jul-Sep 2002	Oct-Dec 2002	Jan-Mar 2003	Apr-Jun 2003	Jul-Sep 2003	Oct-Dec 2003	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Predicted Operation at 8 mtpa
Leq(Day) - Iron Ore Only	52.88372371	53.29904511	53.24748272	52.98006766	52.83214467	52.92962684	52.86316555	52.90928533	52.92962684	52.92962684	52.93976198	52.93976198	54.45005041
Leq(Day) - All Trains	54.45524747	54.85001897	54.81716304	54.42695159	54.4193936	54.59488079	54.55305221	54.37634231	54.4872648	54.4872648	54.49434783	54.49434783	55.68623595
Leq(Night) - Iron Ore Only	53.13926249	53.76127368	53.12311783	51.77835085	51.63264014	51.26407552	53.12311783	52.8476828	52.86488245	52.86488245	53.19530078	53.19530078	54.70558987
Leq(Night) - All Trains	54.00695817	54.69921742	54.19864476	52.69244709	52.81482954	52.81258509	54.19864476	53.57804012	53.7835713	53.7835713	54.05290135	54.05290135	55.4754707