APPENDIX 16

ACOUSTIC REPORT

Development Application Acoustic Report

Mainfreight - Lots 101&102 and Lot 2 30-50 Yarrawa Street, Prestons, 2013

Prepared for
McKenzie Group

16th April 2013

Cardno
Shaping the Future

Document Information

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1 Development Proposal

1.1 Proposal

This noise assessment was undertaken to determine the noise impacts on an expansion of the Mainfreight Distribution Centre Lots 101&102 and Lot 2, 30-50 Yarrawa Street Prestons. The existing Main-freight facility at 50 Yarrawa Street, Prestons and consists of 2 large warehouse buildings, administration offices, refuelling areas, entry and exits and a hardstand/car park area. The existing and proposed expansion will involve the pickup and delivery of dangerous goods, such as aerosols, acid products and alkaline products.

The immediate land surrounding the site consists of land which is zoned as Heavy Industrial (IN3), and truck accessibility to this industrial area has been enhanced, with the recent completion of the M7 Motorway and off-ramps.

The entire site has a rectangular configuration, with a site area of approximately 85,100m^2. The site has a northern frontage of approximately 425 metres to Yarrawa Street, with eastern and western frontages of approximately 200 metres adjoining vacant neighbouring lots. The southern frontage is approximately 425m in length to adjoining industrial properties.

The proposed warehouse expansion involves the addition of 13,260m^2 of new warehouse space that will be located adjoining the eastern elevation of the existing Mainfreight warehouse. Favco Cranes is located to the south-west of the site and Liverpool Electricity Substation is located immediately north across Yarrrawa Street. We understand that a wharf staging and container facility is proposed on Lot 11, on the southern boundary next Favco Cranes is proposed by Mainfreight.

To the east along Bernera Road and south along Yarrunga Street are a number of isolated residential locations, which we understand are the subject of sale, following the rezoning of area Industrial (IN3). The nearest affected receivers relevant to this assessment and relative distances are summarised in Table 1 below.

An additional car park/hardstand area will be provided north-east of the new extension for truck washing area, new driveways and maintenance access (see Figure 1), with provision for 114 spaces on the north-eastern corner of the site. The north-eastern corner of the site is currently cleared and is used as a temporary car parking area by existing staff and truck operators. During our inspection, it was also noted that industrial land immediately adjoining the site, on the corner of Yarrawa and Bermera Rd was currently for sale. At this stage, we have assumed that this land will not be purchased by Mainfreight and will be developed by an independent operator.

This development is subject to a separate noise impact assessment, which was undertaken in October 2012 (Acoustic Logic Consultancy, Report 20121029YKa_R0_Noise).

Mainfreight's proposed operations for the facility and 24 hours per day, seven days per week, with the total number of staff, following the expansion to 197 persons, consisting of 141 warehouse staff and 56 office staff.

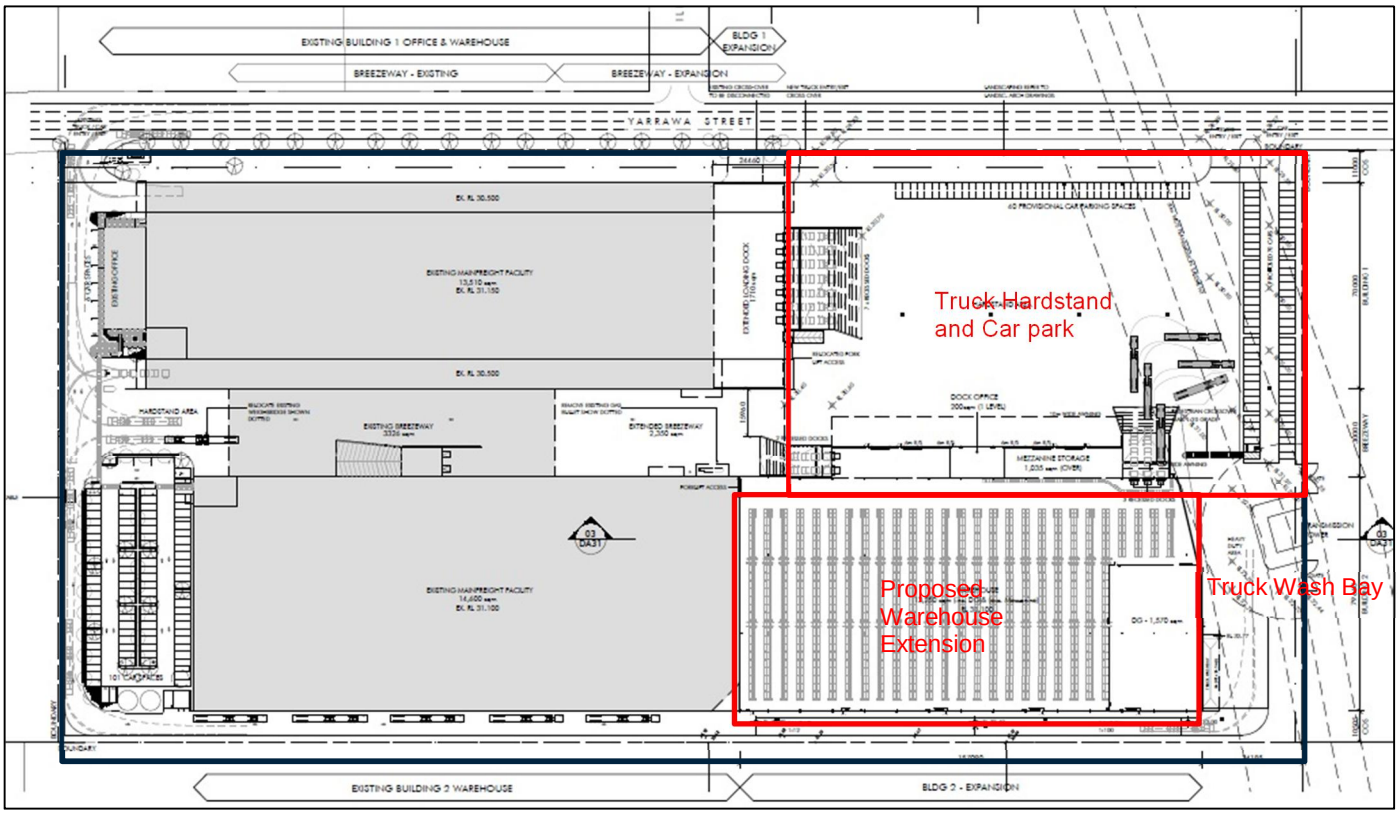
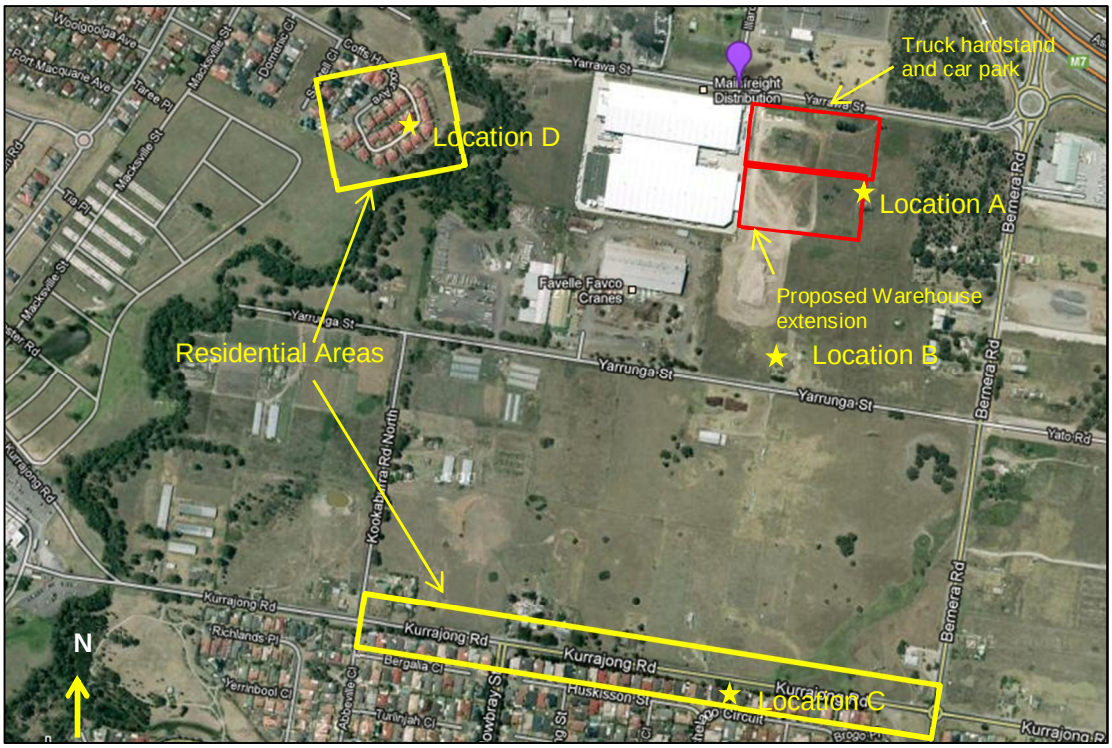


Figure 1: Proposed Mainfreight Extension, Prestons, NSW



Source: Google (2013)

Figure 2: Site Map showing proposed warehouse extension and relevant locations.

Table 1: Approximate distances to noise sensitive receiver zones to proposed development.

	Approximate distance, m	Approximate distance, m
Receiver Zone	**Proposed Warehouse Extension**	**Proposed Truck Hard Stand/Car park Area**
Industrial Boundary – North (Yarrawa Rd, Prestons)	130	50
Industrial Boundary – South (Yarrunga Street, Prestons)	250	350
Industrial Boundary – East	30	5 - 30*
Industrial Boundary – West	450	350
Kurrajong Rd, Residences, Prestons (near Location C)	670	720
Coffs Harbour Street Residences, Hoxton Park (near Location D)	450	510

'* The car park is located immediately next to the eastern industrial boundary, while typical truck movements are in the order of 30m.

'** Truck entering the site are approximately 250m from residences in Coffs Harbour Avenue.

2 Acoustic Requirements

2.1 NSW Department of Planning and Infrastructure (DPI) Requirements Director Generals Requirements

The NSW DPI have identified the following noise and vibration issues as being relevant to the construction and operation of the proposed development (SSD-5746).

Noise and Vibration - including:

- *a noise impact assessment, including an assessment of predicted noise impacts and road traffic noise during both construction and operation;*
- *the potential impacts of the proposal on any nearby sensitive receivers;*
- *consideration of vibration impacts during excavation works; and*
- *details of the proposed noise mitigation, monitoring and management measures.*

2.2 NSW Environmental Protection Agency – Licensing Requirements

The NSW EPA have required the following issues need to be addressed (where relevant) as part of the Environmental Assessment.

General

2. Construction noise associated with the proposed development should be assessed using the Interim Construction Noise Guideline (DECC2009);

3. Vibration from all activities (including construction and operation) to be undertaken on the premises should be assessed using the guidelines contained in the Australian and New Zealand Environment Council – Technical basis for guidelines to minimize annoyance due to blasting overpressure and ground vibration (ANZEC, 1990).

4. Vibration from all activities (including construction and operation) to be undertaken on the premises should be assessed using the guidelines contained in Australian and New Zealand Environment Council – Technical basis for guidelines to minimize annoyance due to blasting overpressure and ground vibration (ANZEC 1990).

Industry

5. Operational noise from all industrial activities (including private haul roads and private railway lines) to be undertaken on the premises should be assessed using the guidelines contained in the NSW Industrial Noise Policy Application Notes.

Road

6. Noise on public roads from increased road traffic generated by land use developments should be assessed using the guidelines contained in the Environmental Criteria for Road Traffic Noise (EPA 1999).

7. Noise from new or upgraded public roads should be assessed using the Environmental Criteria for Road Traffic Noise (EPA 1999).

2.3 NSW Industrial Noise Policy

In assessing the noise impacts from industrial sources, the INP requires the consideration of two separate criteria in developing the project specific criteria. These are the intrusiveness criteria and the amenity criteria. The application of these criteria are summarised below.

2.3.1 Intrusiveness Criteria

The Intrusiveness Criteria is used to evaluate the extent to which a noise intrudes above the background, particularly where the receiver is a dwelling. The INP considers that the L_{eq}, 15 minute level associate with a broad-band industrial noise source may be up to 5 dB(A) above the rating background noise level (L_{A90}) at a receiver without being considered offensive.

The rating background noise level is similar to the 10th percentile background L_{A90} however uses a different sampling technique to determine the value.

Where a noise source contains certain characteristics, such as tonality, intermittency, impulsiveness, irregularity or low-frequency dominance, correction factors may need to be applied to the noise annoyance criteria to determine the project specific criteria.

2.3.2 Amenity Criteria

The NSW INP also considers that there is a community expectation for a certain level of environmental noise amenity, depending on the type of area in which the noise sensitive receiver is located. The Industrial Noise Policy provides a table of recommended L_{Aeq} noise levels that, subject to the type of area and time of day, are considered desirable.

Depending on the level of existing industrial or commercial noise, these desirable levels are adjusted so as to require progressively more stringent amenity compliance levels. The objective of this approach is to prevent the background noise level from continually increasing as a result of each progressive new development.

For a 'suburban' amenity area, the INP proposes that the L_{eq} noise emission level should not exceed the following acceptable noise emission levels:

- Daytime (7am to 6pm): 55 dB(A);
- Evening (6pm to 10pm): 45 dB(A);
- Night (10pm to 7am): 40 dB(A);
- Industrial Premises (when in use): 70 dB(A).

2.4 Sleep Disturbance Criteria

In relation to sleep disturbance from occasional noisy events, the NSW Environmental Noise Control Manual (ENCM) provides useful guidelines regarding design criteria relevant to the control of sleep disturbance.

This document is officially withdrawn from circulation, however has not been replaced by alternative guiding documents in a number of areas, with wake-up effects being one.

The ENCM recommends that the night period L_{A1} noise level at a dwelling, due to external noise events, should not exceed the background L_{A90} by more than 15dB(A).

2.5 NSW Construction Noise Criteria

The NSW Office of Environment and Heritage provides guidance for assessing construction noise impacts in the document "Interim Construction Noise Guideline" dated July 2009.

Generally, the noise impact mitigation measures are determined by the timing and duration of the noise emissions and the perceived impact of the noise above existing background noise levels.

Based on the quantitative assessment method, the applicable noise criteria is summarised in Table 2.

Table 2: NSW Construction Noise Criteria

Time of Day	Management Level, $L_{Aeq\ (15min)}$	How to apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL+10dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining, regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) 2. If the community is prepared to accept longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5dB	• A strong justification would typically be required for work outside the recommended standard hours • The proponent should apply all feasible and reasonable work practices to meet the noise affected level • Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community • For guidance on negotiating agreements see Section 7.2.2 (NSW Interim Construction Noise Guideline)

Note: For adjoining industrial premises, an external noise level of $L_{Aeq\ 15min}$ 75 dB(A) is permissible.

2.6 Construction Vibration

Vibration from construction activities can impact on the amenity of the occupants of adjacent dwellings or buildings to the construction works and can commonly be summarised in two categories:

- Effect on human comfort; and
- Structural damage to buildings.

2.6.1 Human Comfort

Vibration criteria is not covered in the NSW Interim Construction Noise Guideline, however the document "Assessing Vibration: A Technical Guide" issued by the NSW outlines vibration limits in relation to human comfort. Criteria in this Guideline are based on the British Standard BS6472-1992, "Evaluation of human exposure to vibration in buildings (1-80Hz).

The guideline gives recommendations regarding the preferred and maximum allowable vibration levels in three axes for human comfort in building interiors. An excerpt from the guideline, allowable levels specified for 1 – 80 Hz is shown in Table 3.

Table 3: Allowable vibration acceleration levels (1-80 Hz), m/s^2.

Location	Assessment Period	Preferred values		Maximum values	
		z axis	x and y axes	z axis	x and y axes
Continuous Vibration					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Workshops	Day or night time	0.04	0.029	0.080	0.058
Impulsive vibration					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.010	0.0071	0.020	0.014
Workshops	Day or night time	0.64	0.46	1.28	0.92

2.6.2 Effect on Structures

The potential for damage during the construction phase is considered against the limits given within German Standard DIN 4150 Part 3. Table 4 presents guide values for vibration velocity limits for a typical dwelling.

Table 4: Transient Vibration Values ppv (mm/s).

Line	Type of Structure	Peak component particle velocity (mm/s) in frequency range of predominant pulse		
		1 - 10Hz	10 - 50Hz	50 - 100Hz
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design.	20	20 to 40	40 to 50
2	Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20
3	Structures that because of their particular sensitivity to vibration cannot be classified under lines 1 & 2 and are of great intrinsic value	3	3 to 8	8 to 10

Given the large operating distances involved in this project, construction vibration is anticipated to have negligible effects during construction phase. The above information has been issued for guidance purposes only. For the remainder subsequent assessment and recommendations will be limited to the impacts of construction noise only.

2.7 NSW Road Noise Policy

The NSW Office of Environment and Heritage (OEH) approved the use of a new road traffic noise policy, the NSW Road Noise Policy (RNP), which was enacted on 1 July, 2011. This policy supersedes the OEH Environmental Criteria for Road and Traffic Noise (ECRTN) and provides guidance for land use developments generating additional traffic on existing roads.

The NSW OEH provides consolidated criteria and guidelines on appropriate design objectives for road traffic noise and is published in the document "NSW Road Noise Policy (RNP)". Under this policy document, the OEH proposes the use of the L_{eq} for the assessment of significance of changes to road traffic noise.

The policy provides assessment criteria for residential land uses for Day and Night time criteria. In order to assess relative increases in road traffic noise, the most common method of prediction of road traffic noise is the CORTN (Calculation of Road Traffic Noise) procedure originally developed in the United Kingdom. Using the CORTN algorithms for freely flowing road traffic, the L_{eq} noise level generated by traffic movement may be calculated from the following general relationship:

$L_{eq} = 10 \text{ Log } (N) + K$

Where:

- N is the traffic flow volume;
- K is a site constant.

The site constant (K) is calculated from the actual site conditions, including distance from the road edge, the speed of traffic flow, and any site-specific factors such as shielding by fences etc.

Providing the site factors remain constant, as is the case with changes that do not alter the roadway itself, it is possible to calculate the change to road traffic noise levels as:

L_{eq} change $= 10 \log (N2/N1)$

Where:

- N1 is the initial traffic flow;
- N2 is the future traffic flow.

More relevantly, it is proposed by the INP that changes to land use, or the redevelopment of local roads, should be planned so that an increase to the existing L_{eq} resulting from the changed traffic patterns should be less than 2dB(A).

It is important to note that the road traffic noise criteria recommended by the OEH refer to vehicles on public roads.

For the purpose of this report, the design criteria adopted for assessment of environmental noise impact from all vehicular activities is to:

- Maintain, or if possible reduce, existing noise exposure levels to nearby dwelling areas;
- Where the criteria are not achievable through feasible and reasonable mitigation measures, the NSW RNP makes an allowance of an additional 2 dB, above that of the corresponding no-build option.

3 Methodology

3.1 Ambient Noise Monitoring

To determine appropriate criteria for the proposed development, ambient noise monitoring was conducted at Locations A and B on Thursday February 14th, 2013 to Monday 18th, 2013 shown in Figure 1. Noise Logging was conducted at Locations C and D from Monday 8th April until Monday 15th April, 2013.

Ambient noise was measured using Rion NL-21 Type 2 Environmental Noise Loggers. All instruments were calibrated before and after use using a 94dB(A), 1 kHz calibration tone, with no significant drift occurring. The level of drift over the monitoring period was determined to be less than 0.2 dB(A) on all noise loggers.

Additional attended readings of both Kurrajong Rd and Coffs Harbour Avenue were undertaken using a Rion NL-028 Type 1 integrating sound level meter on Monday 18th February 2013.

The measurement locations were selected with the following objectives in mind:

- Location A – on the eastern industrial boundary, at approximately 30m distance from the proposed shed extension and was considered representative of ambient noise conditions to the northern and eastern environment, and industrial zoned properties (which we understand are currently occupied by caretakers) to the north along Bernera Road.
- Location B – on the southern side of the development. This site was chosen primarily to assess noise impacts to the nearest industrial boundaries (which we understand from Mainfreight is currently occupied by warehouse caretakers) at Favco Cranes, which buffers the site from residential areas further south of the site.
- Location C – 22 Michelago Circuit, Prestons, located 720m from the proposed expansion further south in a relatively new housing development at approximately. This residence is separated from Kurrajong Rd by a noise wall, which is approximately 2.0-2.5m in height. The noise wall separates the residence from traffic along Kurrajong Road and borders an egress through the noise wall. During our site visit, it was noted that road works were being undertaken on Kuurajong Road during the assessment.
- Location D – 23 Coffs Harbour Avenue, Prestons located approximately 450m from the proposed development in a new residential location. This residence was located on the western side of Coffs Harbour Avenue, behind an additional row of two storey apartments. Typical noise and activity was limited to local traffic noise, neighbourhood activity (children playing, dogs barking)

  It should be noted that limited noise data was obtained from Location C, due to a faulty logger battery, which was showing battery connectivity problems. To offset factor, we have compared the results of this logger with previous readings undertaken by Acoustic Logic Consultancy (ALC) for Lot 11 at Yarrunga Street Prestons (October 2012) and have also undertaken supplementary reading along Kurrajong Rd, during the morning/daytime period. This information is summarised in Appendix B of the report.

  Overall night time RBL's from the ALC Report measured along Kurrajong Street and Location C within 1 dB(A) for Day Evening and Night time periods. For the purposes of this assessment this limited data was deemed to be consistent with current conditions for the site.

4 Acceptable Noise Levels

4.1 NSW Industrial Noise Policy (INP)

4.1.1 Intrusiveness Criteria

Following determination of the rating background level from the noise logger data, the Intrusiveness criteria for is summarised below in Table 5.

This criteria applies is to be assessed at the most affected point within the residential property boundary, and applies to residential properties located west and south of the site at distances greater than 600m. Location B was determined to be the most representative location of the surrounding residential areas, based upon validation against supplementary attended readings conducted during the study.

Table 5: Intrusiveness Criteria, $L_{eq\ 15\text{-}minute}$ dB(A)

Time of Day	RBL	Intrusiveness Criteria
Location C – 22 Michelago Circuit, Prestons		
Day (0700-1800)	39	(39+5)=43
Evening (1800-2200)	39	(39+5)=43
Night (2200-0700)	36	(36+5) =41
Location D – 23 Coffs Harbour Avenue, Hoxton Park		
Day (0700-1800)	37	(37+5) = 42
Evening (1800-2200)	37	(37+5) = 42
Night (2200-0700)	34	(34+5) = 39

4.1.2 Amenity Criteria

For a Suburban area, the INP proposes that the L_{eq} noise emission level should not exceed 55 dB(A) in the daytime (7 am to 6 pm), 45 dB(A) in the evening (6 pm to 10 pm) and 40 dB(A) during the night (10 pm to 7 am).

For an Industrial Premises an 'Acceptable Noise Level; of L_{eq} 70 dB(A) applies at the most affected point on the property boundary of the site.

Table 6: NSW INP Amenity Criteria, L_{eq}, dB(A).

Location	Location Descriptor	Time of Day	Acceptable Noise Level (ANL)	Existing Noise Level (ENL)	Amenity Criteria (INP Table 2.2)
A	Location A - Proposed Eastern Industrial Boundary	Day (0700-1800)	70 (when in use)	54	(ANL) = 70
		Evening (1800-2200)	70 (when in use)	52	(ANL) = 70
		Night (2200-0700)	70 (when in use)	48	(ANL) = 70
B	Location B - Proposed Southern Industrial Boundary	Day (0700-1800)	70 (when in use)	51	(ANL) = 70
		Evening (1800-2200)	70 (when in use)	51	(ANL) = 70
		Night (2200-0700)	70 (when in use)	47	(ANL) = 70
C	Kurrajong Rd, Residences, Prestons (near Location C)	Day (0700-1800)	55	54	(ENL-3) = 51
		Evening (1800-2200)	45	54	(ENL-10) = 44
		Night (2200-0700)	40	48	(ENL-10) = 38
D	Coffs Harbour Street Residences, Hoxton Park (near Location D)	Day (0700-1800)	55	59	(ENL-10) = 49
		Evening (1800-2200)	45	57	(ENL-10) = 47
		Night (2200-0700)	40	50	(ENL-10) = 40

4.1.3 NSW INP Project Specific Design Criteria

The project specific criteria for the development are determined as the most stringent of the intrusiveness and amenity criteria. These criteria relevant to the Mainfreight Development are summarised in Table 7.

Table 7: NSW INP Project Specific Criteria, L_{eq}, dB(A)

Time of Day	Intrusiveness	Amenity	Project Specific Noise Level
Location A - Proposed Eastern Industrial Boundary			
Day (0700-1800)	N/A	70	70
Evening (1800-2200)	N/A	70	70
Night (2200-0700)	N/A	70	70
Location B - Proposed Southern Industrial Boundary			
Day (0700-1800)	N/A	70	70
Evening (1800-2200)	N/A	70	70
Night (2200-0700)	N/A	70	70
Location C - 22 Michelago Circuit, Prestons			
Day (0700-1800)	42	51	42
Evening (1800-2200)	42	44	42
Night (2200-0700)	39	38	38
Location D - 23 Coffs Harbour Avenue, Hoxton Park			
Day (0700-1800)	42	49	42
Evening (1800-2200)	42	47	42
Night (2200-0700)	39	40	39

4.2 NSW ENCM Sleep Disturbance Criteria

Sleep Disturbance criteria associated with short-term noise events, which applies at residential locations only, is summarised in below in Table 8.

Table 8: NSW Sleep Disturbance Criteria L_1, dB(A)

Location	RBL, L_{90}	Sleep Disturbance Criteria L_1
Kurrajong Rd, Residences, Prestons (near Location C)	36	(36+15) = 51
Coffs Harbour Street Residences, Hoxton Park (near Location D)	34	(34+15) = 49

4.3 Construction Noise Criteria

For construction noise, the standard hours construction noise outlined in the NSW Construction Noise Policy are summarised below in Table 9. Typical plant items and predicted construction noise impacts are discussed further in Section 5 and Section 6 of this report.

Table 9: Criteria for standard hours during construction, L_{eq} dB(A).

Location	RBL	Construction Noise Criteria $L_{eq, 15min}$
Standard Hours: Monday to Friday 7am to 6pm; Saturday 8am to 1pm		
Adjoining Industrial Boundaries	-	75
Location C - 22 Michelago Circuit, Prestons (2200-0700)	37	(37+10) = 47
Location D – 23 Coffs Harbour Avenue, Hoxton Park (2200-0700)	37	(37+10) = 47

5 Predicted Noise Impacts

5.1 Warehousing and Hardstand Activity

For the purposes of this assessment, we have undertaken a separate assessment of warehouse activity and truck hardstand activity. For conservative purposes, we have based typical activity, based upon the typical worst case assumptions sound power levels (L_w) for proposed plant and equipment.

The proposed operating times for heavy vehicles to/from the facility is 5am until 7pm. As the 5am until 7am period is classified as night time, we have assessed the impacts of the Mainfreight extension to the Night time Assessment period. For the purposes of this assessment, we have calculated the following typical worst case, consisting of:

- Noise and Activity Inside the Warehouse,
- Activity from the Wash Bay Area;
- Activity from Trucks and Cars in the Vicinity of the Hardstand and Car park, located on the eastern boundary.

As a typical worst case, we have assumed the following activity inside the Warehouse extension.

- Two (2) B Doubles, with an estimated sound power level of L_w=105 dB(A), with slow manoeuvring and predominant idling;
- Two (4) Semi Trailers, with an estimated sound power level of L_w=105 dB(A),), with slow manoeuvring and predominant idling;
- Two (2) Forklifts Operating in the Warehouse, with an estimated sound power level of L_w=105 dB(A)
- Two (2) Spray Hoses located externally on the eastern side at the truck wash bay, using a measured sound power level of L_w=98 dB(A), based upon previous vehicle washing spray hose measurements;
- An assumed warehouse mid-frequency reverberation time of 2.5 seconds at 500 Hz;
- Typical precast concrete construction and galvanised metal deck roofing construction;
- Warehouse roller doors were assumed to be ‘open’;
- A 22 dB(A) calculated allowance for intervening building structures to the western and southern sides of the site.

Truck Hardstand and Car parking areas located on the north-eastern corner of the site, were assessed against the NSW INP. To assess typical worst case conditions during peak hour, we have used the following typical worst case assumptions:

- Five (5) B-doubles with an estimated L_w = 105 dB(A), traversing the hardstand/car park area, with slow manoeuvring and predominant idling;.
- Two (2) semi-trailers with an estimated L_w= 105 dB(A), traversing the hard stand/car park area, with slow manoeuvring and predominant idling;
- Typical event duration of 15 seconds for each truck movement;
- Assumed Twenty-eight (28) car trips with an Lw=89 dB(A) (or 25% of the proposed 110 new car spaces) in 15 minutes, at typical operating distances of 10m from the Eastern and Northern Boundaries;
- Seventeen (17) Pickup and Delivery Vehicles, traversing the car park hard stand area Lw=96 traversing the hard stand/car park area, with slow manoeuvring and predominant idling;
- Typical event duration of 15 seconds for each car movement.

- The existing noise wall to residences in Kurrajong Road conservatively provides 10 dB(A) attenuation to noise and activity from the site.
- The existing sheds were calculated provide 22 dB(A) attenuation to noise and activity from the site on the western boundary and residences at Coffs Harbour Avenue.

Table 10: Predicted Noise Emissions from warehouse and truck hard stand activities, L_{eq}

Location	Predicted Noise Level, dB(A) Assuming Neutral Conditions	Predicted Noise Level dB(A) Assuming Inversion Conditions 3 degree C/100m and winds 2m/s	INP Criteria (Night)	Complies with INP Neutral/Inversion Conditions
Industrial Boundary – North	65	67	70	Yes/ Yes
Industrial Boundary – South	44*	48*	70	Yes/Yes
Industrial Boundary – East	69	71	70	Yes/No
Industrial Boundary – West	38*	41*	70	Yes/Yes
Location C - 22 Michelago Circuit, Prestons (2200-0700)	32*	37*	38	Yes/Yes
Location D – 23 Coffs Harbour Avenue, Hoxton Park (2200-0700)	36*	39*	39	Yes/Yes

'* Includes 22 dBA allowance for shielding from existing/proposed warehouse sheds.

5.2 Mechanical Plant

At the time of this report, plant selections for the development were not selected or finalised. However, to comply with the NSW INP, noise emissions criteria. To control mechanical plant noise emissions it is anticipated that best practice engineering noise measures will be required. A detailed acoustic assessment of plant noise would be undertaken during the detailed design phase of the project to confirm actual required noise control measures. At this point we would require that noise emissions from the site are limited to a limiting aggregate sound power level of L_w=90 dB(A). Typical noise controls measures require to achieve the INP are outlined in Section 6 of this report.

5.3 Sleep Disturbance

Noise generation by activities within loading docks is a common issue in warehousing operations, based upon previous measurements in similar facilities. Previous assessment of similar activity determined the following typical L_1 sound power levels, which are summarised below in Table 11. For this assessment, we have based our assessment on previous L_{A1} measurements, which determined a typical sound power level of Lw=102 dB(A) for similar warehousing activity including engine start-ups, reversing alarms, truck movements and reversing alarms. As shown, there are anticipated to be minimal sleep disturbance issues from the proposed warehouse expansion.

Table 11: Sleep Disturbance Impacts, L_1 dB(A).

Location	Predicted L_1 (Neutral Conditions)	Predicted L_1 (Inversion Conditions)	Sleep Disturbance Criteria	Complies (Yes/No)
Location C - 22 Michelago Circuit, Prestons (2200-0700)	38*	43*	(36+15) = 51	Yes
Location D – 23 Coffs Harbour Avenue, Hoxton Park (2200-0700)	41*	45*	(34+15) = 49	Yes

'* Includes 22 dBA allowance for shielding from existing/proposed warehouse sheds.

5.4 Construction Noise

Estimate construction noise and vibration is, at this stage not yet known. However we have assumed that the construction based works will be undertaken in three main stages, as summarised in Table 12.

Table 12: Estimated Construction Stages

Construction Stage	Estimated General Activities
Site Establishment:	Minor site earthworks to create a building pad, construction of a retaining wall, storm water and other hydraulic services.
Earthworks:	Bulk earthworks including topsoil stripping, excavation of below grade car park, construction of batters and landscaping Removal of spoil and increased heavy vehicle movements are expected
Building Construction:	Delivery of construction materials and other consumables, mobile cranes/ hoists, formwork, erection of scaffolding, power tools, internal fit out works.

Based on the above stages, we would estimate the following quantity of plant, summarised in Table 13 below.

Table 13: Estimated construction plant

Construction Activity	Equipment Type	Quantity
Site establishment	30t Excavator	1
	Bobcat	1
	Tree Shredder and truck	1
Bulk excavation	30t Excavator	2
	5t Excavator	1
	Haulage trucks	2
	Concrete pump	1
	Piling rig	1
Building construction	Delivery trucks	2
	Mobile cranes	2
	Hand tools	Not known

Table 14 provides a summary of typical sound power levels for the anticipated construction equipment, based on previous projects, published data and with reference to the Australian Standard AS2436-2010 "Guide to Noise Control on Construction, Maintenance and Demolition Sites".

Table 14: Estimated construction plant items and associated sound power levels, L_{eq}

Equipment	Sound Power Level per Item, dB(A)	Estimated Quantity	Total Sound Power Level, L_{Aeq} dB(A)
30t Excavators (for bulk excavation)	108	2	111
5t Excavators (for detailed excavation)	102	1	102
Trucks	106	2	109
Impact Piling Rig	124	1	124
Cranes and hoists	110	2	113
Concrete pump trucks	106	1	106
Tree shredder (including truck)	118	1	118

Table 15: Predicted worst case construction noise levels $L_{eq,\ 15minutes}$.

Location	Assumed Operating Distance of nearest receivers, m	Predicted Noise Level, dB(A) (Assuming Neutral Conditions)	Construction Noise Criteria (Daytime)	Complies with Construction Noise Criteria
Standard Hours: Monday to Friday 7am to 6pm; Saturday 8am to 1pm				
Industrial Boundary – North	130	75	75	Yes
Industrial Boundary – South	250	70	75	Yes
Industrial Boundary – East	50	84	75	No
Industrial Boundary – West	450	43	75	Yes
22 Michelago Circuit, Prestons	670	39*	47	Yes
Coffs Harbour Avenue, Hoxton Park	600	40*	47	Yes

Predicted construction noise levels based upon typical plant items are presented below in Table 16. As shown in Table 16, the majority of construction activities are predicted to comply with the criteria at the residences, due to intervening shielding. Some exceedances are anticipated at neighboring industrial boundaries at distances less than 130m from the site boundaries. While piling activity is a relatively noise activity, we would anticipate that any activity of this nature can be easily controlled using best practice site measures outlined in AS2436-2010, such as the use of screw piling. Recommendations to mitigate the impacts of construction noise are discussed further in Section 6 of this report.

5.5 Road Traffic Noise Impacts

The Traffix Traffic Report dated February 2013 states that the proposed facility will generate an additional 110 parking spaces on site, to satisfy current demand for 150 spaces for staff and visitor use. The traffic report identified the main routes and existing traffic conditions to the Mainfreight facility as follows:

- Westlink WM7 Motorway – a Roads and Maritime Services (RMS) 40 km long four lane major motorway serving Sydney's west;
- Bernera Road – an RMS classified Regional Road that runs in a north-south direction in the vicinity of the subject site, connecting to the Westlink M7 Motorway to the north. 2005 Annual Average Daily Traffic Flow from RMS indicates that it carries about 10,300 vehicles per day. The road consists generally of a single traffic lane in each direction and has a sign-posted speed of 60 km/h.
- Yarrawa Street a local industrial access road that runs east to west to the north of the site and consists of a single lane of traffic in each direction.

It should be noted that no traffic counts were conducted as a part of the commissioned study and were not required as a part of the Director General's requirements for the traffic study.

To assess the relative change in traffic noise level and in the absence of traffic counts, we have conservatively assumed that all vehicles accessing Yarrawa Rd are Mainfreight vehicles.

It should be noted that additional vehicles to other industrial facilities (eg., 90 Yarrawa Rd) will also use Yarrawa Rd during the peak hour period. While the traffic report does not state existing traffic count data for this road, we would assume that the utilization of the Yarrawa Rd. Therefore the +2.1 dB(A) increase is unlikely to occur and the future upgraded facility.

As traffic does not pass along residential roads between the M7 and Yarrawa St, we anticipate that there will be no impact as a result of traffic noise on public roads.

Table 16: Predicted changes in traffic noise to Yarrawa Street, Prestons.

Net Hourly Traffic Volume Increase	Scenario	Staff	Operational	Total
Morning Peak	Existing	59	42	101*
	Future	73	89	162
Change		14	47	61
dB(A) Increase				**+2.1***
Evening Peak	Existing	54	95	149*
	Future	67	90	157
Change		13	-5	8
dB(A) Increase				**+0.2**

'* Conservatively assumes all Yarrawa St traffic is Mainfreight only.

6 Discussion

A noise impact assessment was conducted for the proposed expansion of an existing Mainfreight Facility on Lots 101&102 and Lot 2, 30-50 Yarrawa Street Prestons. The existing facility is located on land which has been zoned industrial (IN3) and is located at substantial distances from residential receivers. This assessment included an assessment of inversion conditions of the site. Overall, noise emissions from the site were determined to comply at the nearest affected residences, during the most critical period from 5am to 7am, which is still classified as a Night time period.

Investigation of sleep disturbance determined that L_{A1} noise levels will not result in adverse wakeup conditions at the nearest affected residences. Some marginal exceedances at the Eastern Industrial boundary were calculated, although this was largely influenced by trucks operating in close proximity to the boundary.

Information regarding proposed mechanical plant items was not known, however it is anticipated that the use of best practice engineering measures to attenuate noise from mechanical plant. At this stage we would nominate that mechanical plant and equipment from the site does not exceed a limiting aggregate sound power level of L_w= 90dB(A) would be sufficient to achieve the NSW INP criteria at the residential locations at night. Recommended practice engineering measures to achieve the limiting aggregate sound power level include:

- The application of acoustic silencers;
- Barrier screening and enclosures to rooftop plant;
- Location of noisy plant away from the affected boundaries;
- Use of screening and shielding for rooftop plant items;
- Preferential selection of “quiet” option plant and equipment.

For construction noise activity most typical plant items and activities associated with proposed works are anticipated to largely comply with NSW Construction Noise criteria.

Construction noise is predicted at distances of 130m or less to exceed the construction noise criteria at the industrial boundaries and residential locations. The use of percussive piling is likely to have the greatest impact upon residential areas. As the construction of the facility is anticipated to be undertaken by an independent construction contractor, the precise nature of the works plant and equipment is not yet know. However we recommend that the construction contractor undertakes best practice measures, as outlined in AS2436-2010 ‘Guide to noise and vibration control on construction, demolition and maintenance sites.’

Best practice construction noise mitigation measures may include:

- The selection screw piling, in lieu of percussive piling;
- Scheduling noisier activities for less sensitive periods;
- Selection of ‘quiet’ plant and equipment
- Erection of site hoardings;
- Use of intervening buildings to screen construction noise to the residential areas;
- Distance attenuation for noisy plant items (or safe operating distances);

Traffic noise impacts on the local road network were assessed against current and projected traffic flows for the proposed facility. It is anticipated that traffic noise are estimated not exceed 2dB(A) along Yarrawa Street and that no additional consideration of road traffic noise mitigation measures will be required for this development.

7 Conclusion

A proposed extension on the Mainfreight Facility has been proposed Lots 101&102 and Lot 2, 30-50 Yarrawa Street Prestons 30 to 50 Yarrawa Street, Prestons. Investigation of the proposed development was undertaken as per the DPI and INP requirements and has determined that impacts from the operation of the facility will generally comply with the project specific criteria under neutral and inversion conditions. Some exceedance of the construction noise criteria are anticipated, although it is anticipated that these will not be at the residential receivers. Best practice construction noise management measures should be applied, as required.

8 Glossary

A-weighted Level:
As per dB(A) defined below.

Ambient Sound:
Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far. Usually taken to mean the L_{Aeq} value.

Background Sound Level:
The average of the lowest levels of the sound levels measured in an affected area in the absence of noise from occupants and from unwanted external ambient noise sources. Usually taken to mean the L_{A90} value.

Decibel, dB:
Unit of acoustic measurement. Measurements of power, pressure and intensity may be expressed in dB relative to standard reference levels.

dB(A):
Unit of acoustic measurement electronically weighted to approximate the sensitivity of human hearing to sound frequency.

L_{90}, L_{10} etc:
A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, ie L_{90} is the level which is exceeded for 90 percent of an observation period. L_{90} is commonly referred to as a basis for measuring the background sound level.

$L_{Aeq, T}$:
Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

Sound Pressure Level, Lp, dB
Of a sound:
A measurement obtained directly obtained using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 microPascals.

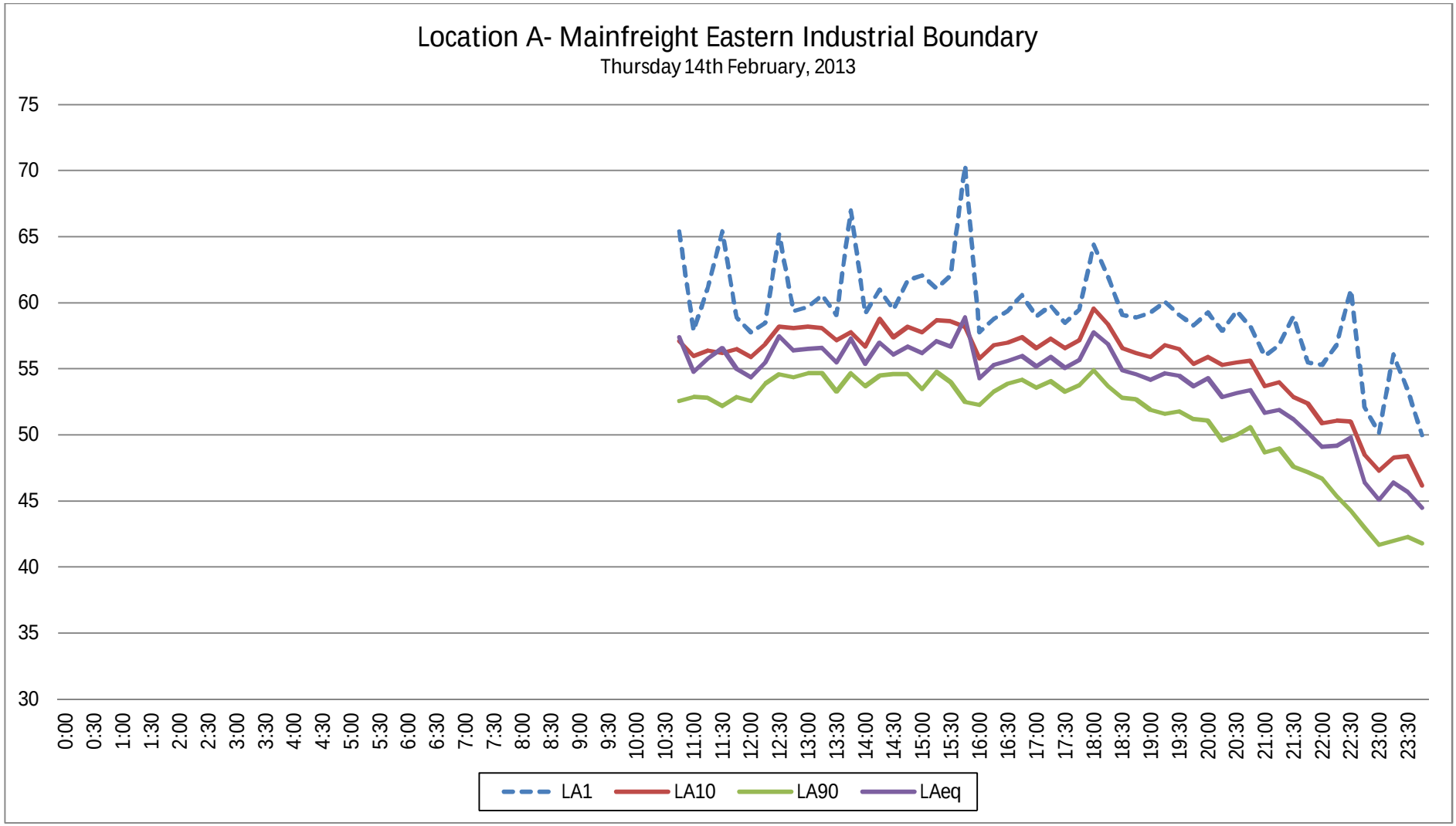
Sound Power Level, Lw, dB
Of a source:
Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power level is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt.

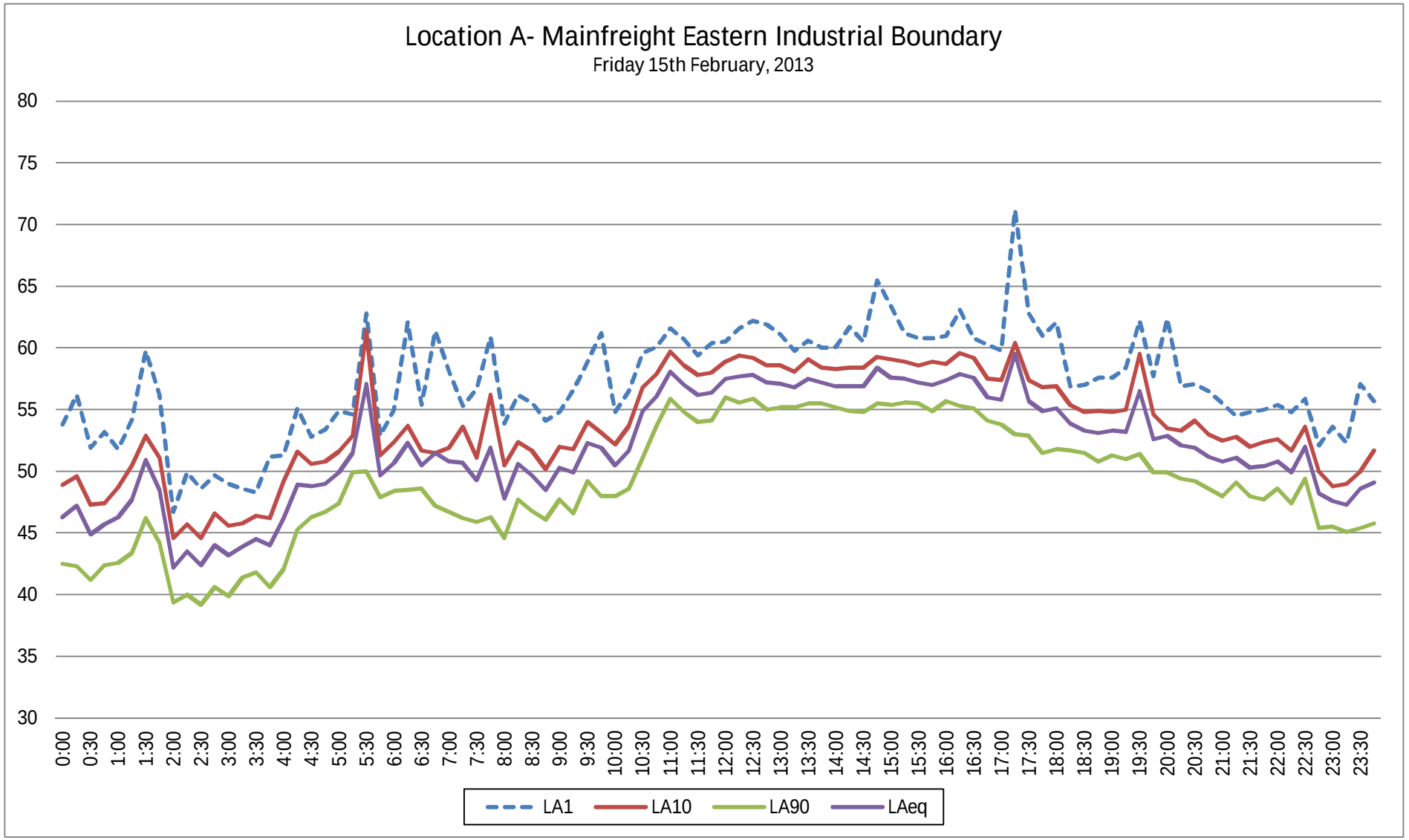
STC Rating (Sound Transmission Class:
A weighted number representing sound transmission loss of a building element as a single number so as to overcome the problem of comparing different constructions with different performance values at each frequency.

High STC values mean high sound transmission loss. STC is not a good basis for selecting or specifying facade glazing but does work well for partitions etc inside buildings. STC ratings have been superseded by the equivalent descriptor “weighted sound reduction index”, or Rw in the relevant Australian Standard. Rw will be referred to for this project. For most purposes, Rw and STC values can be interchanged.

9 Appendix A – Daily Logger Charts (values in dBA)

LOCATION A – Noise Monitoring Results

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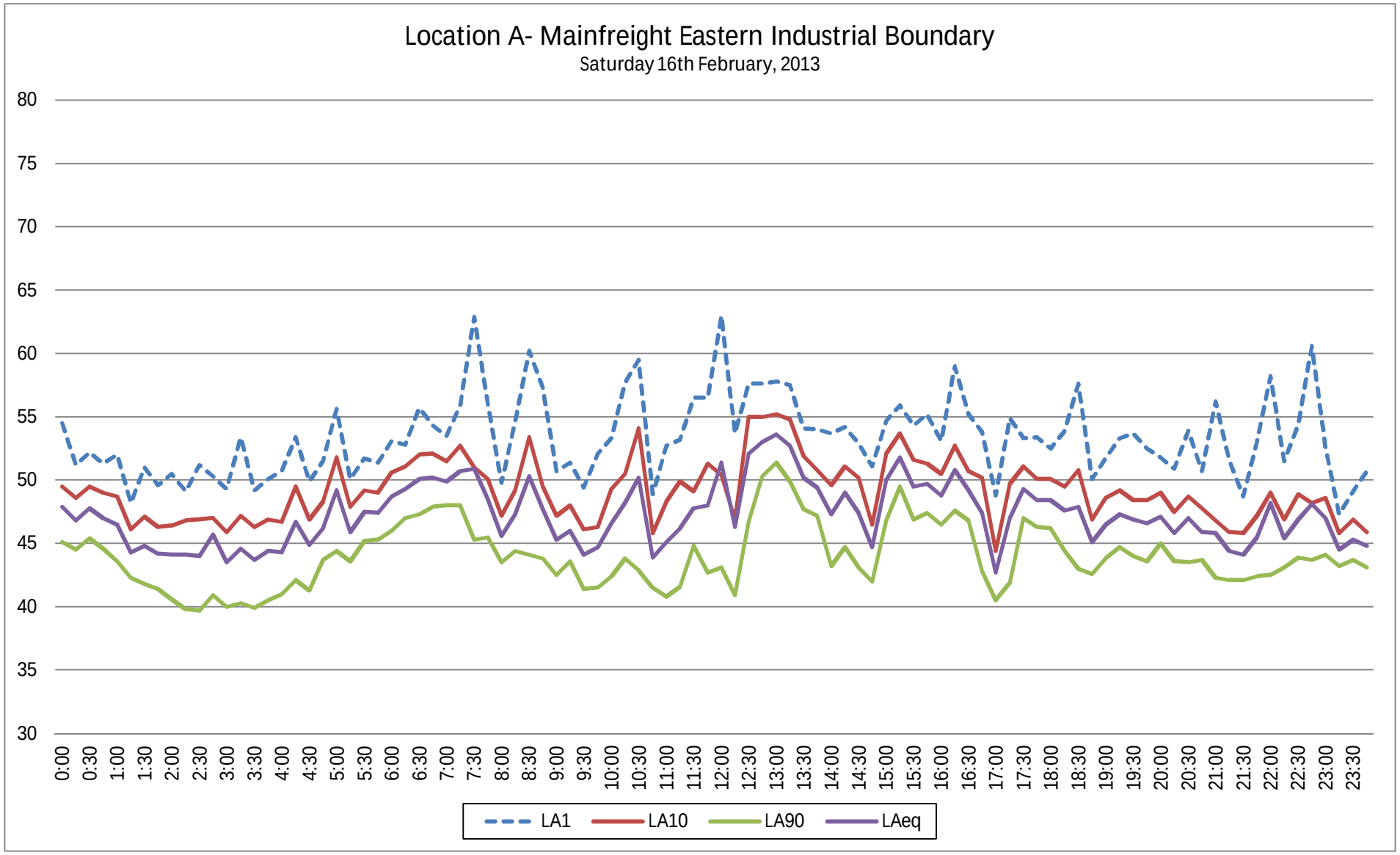
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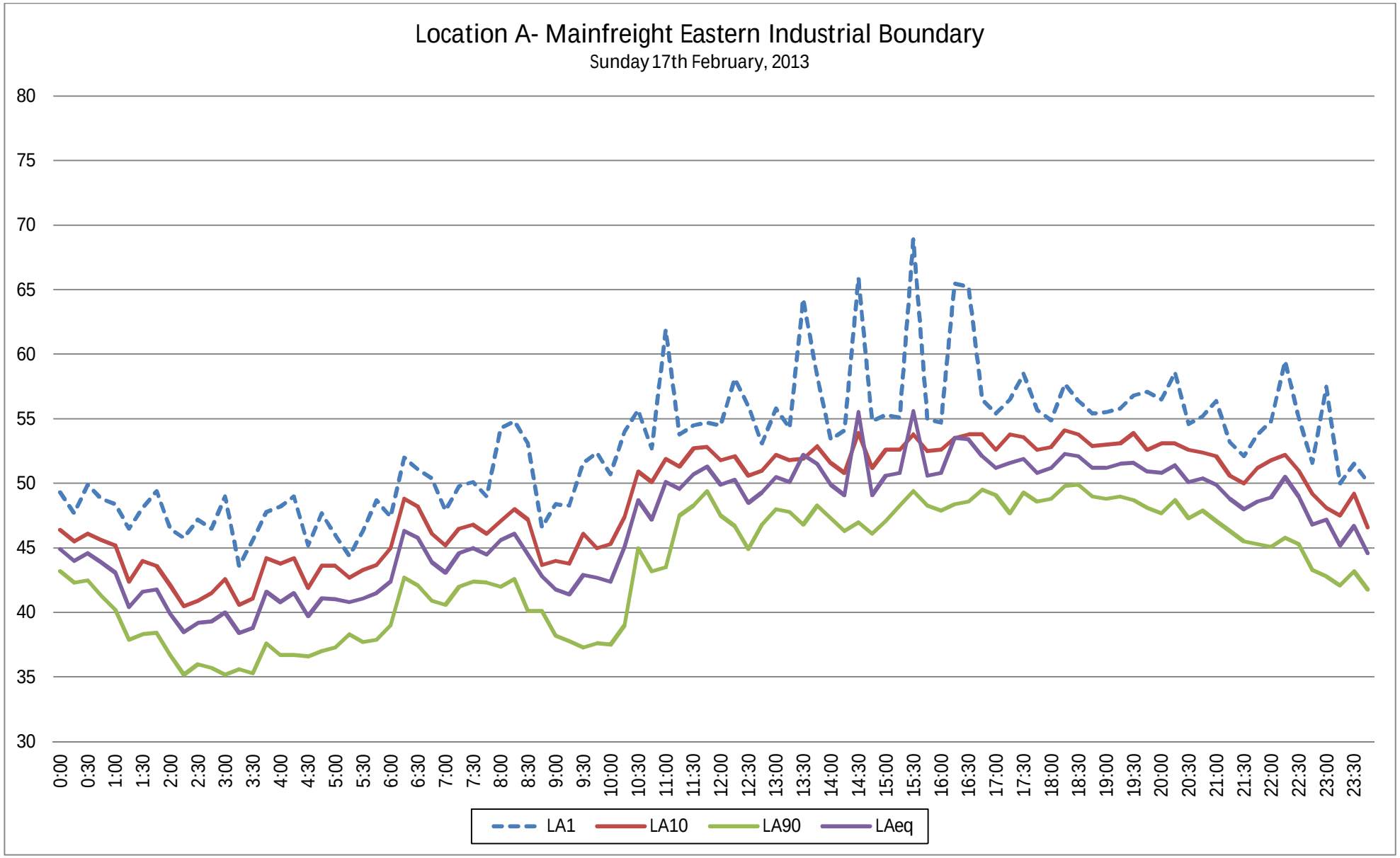
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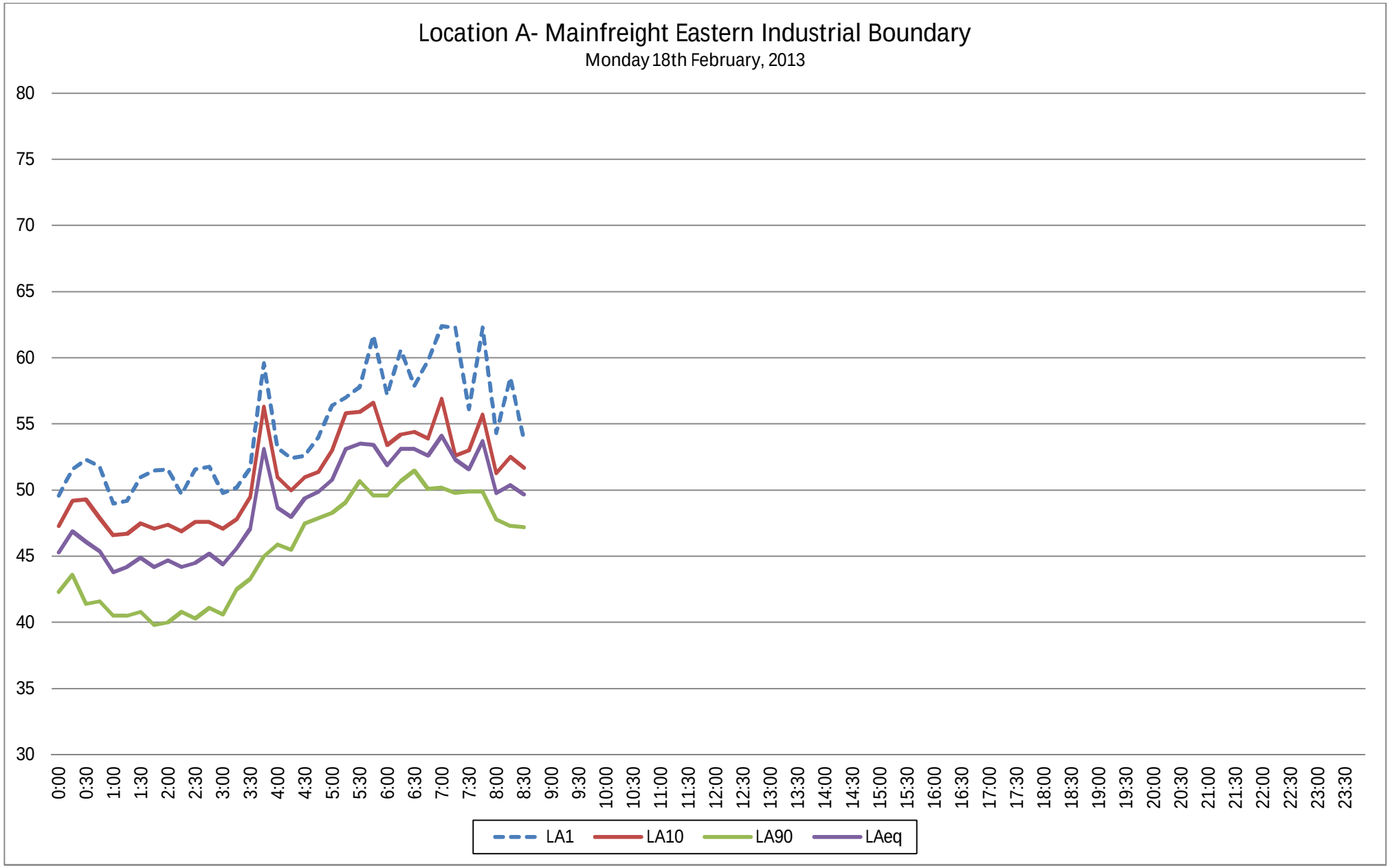
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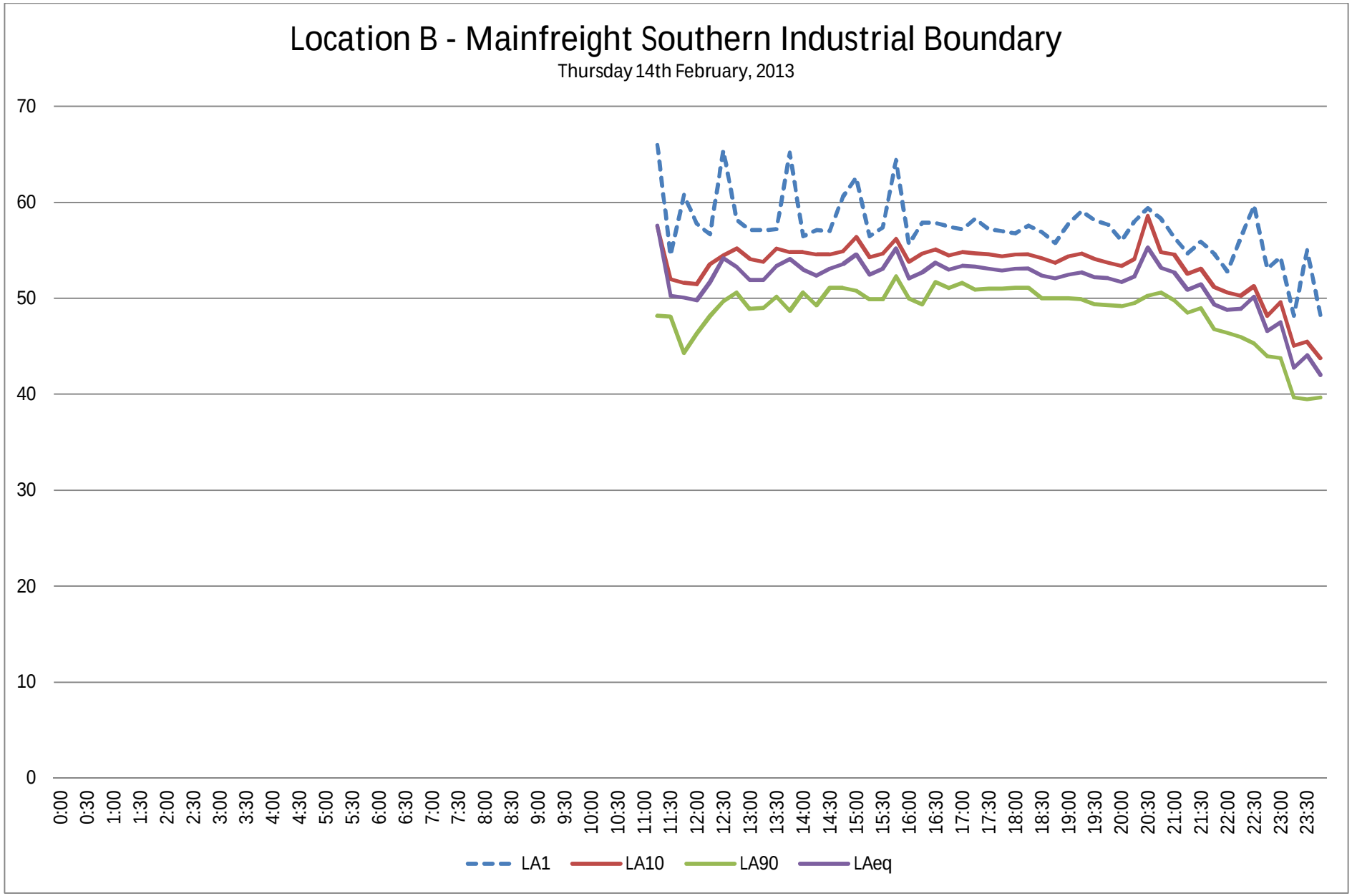
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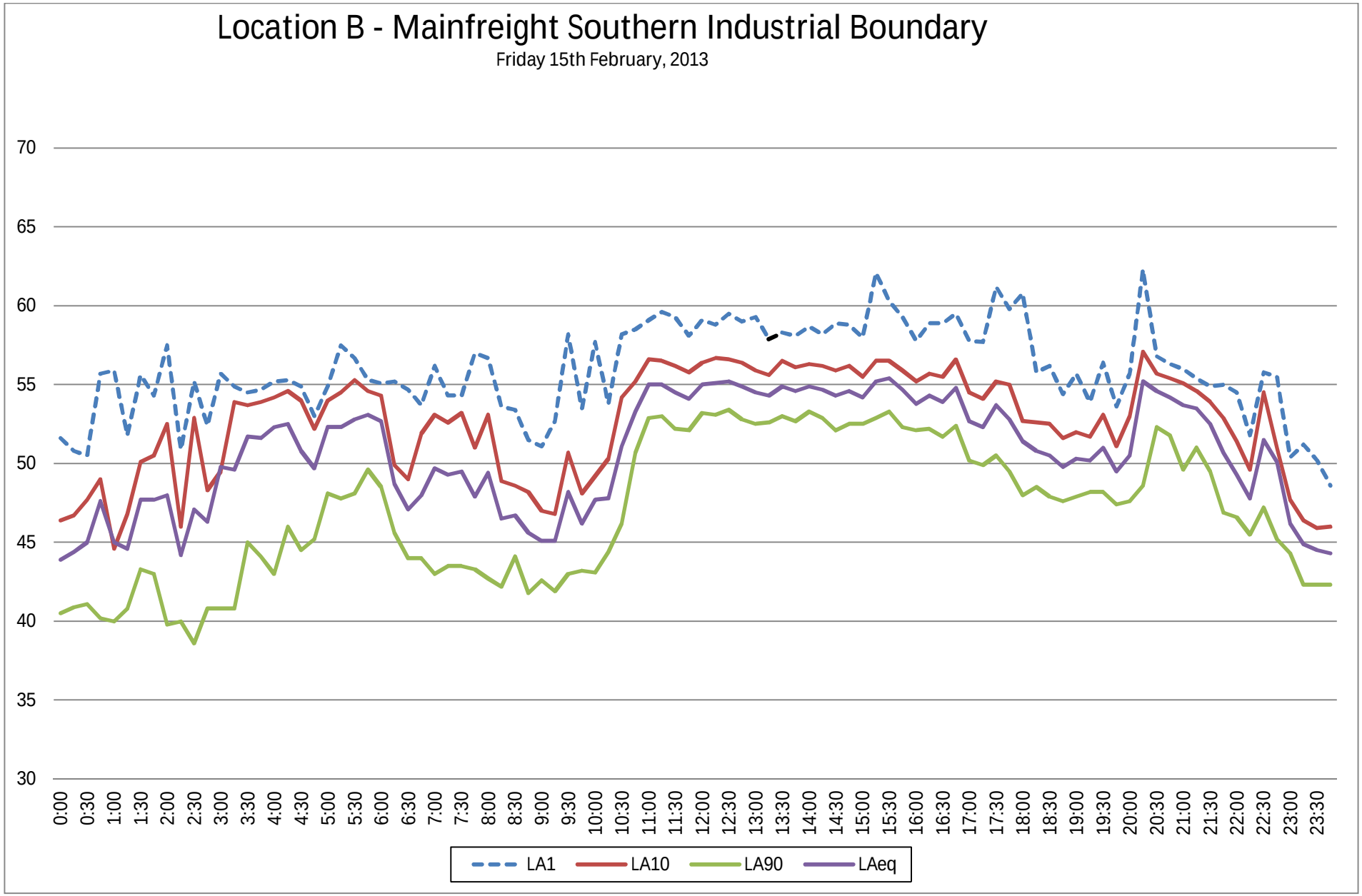
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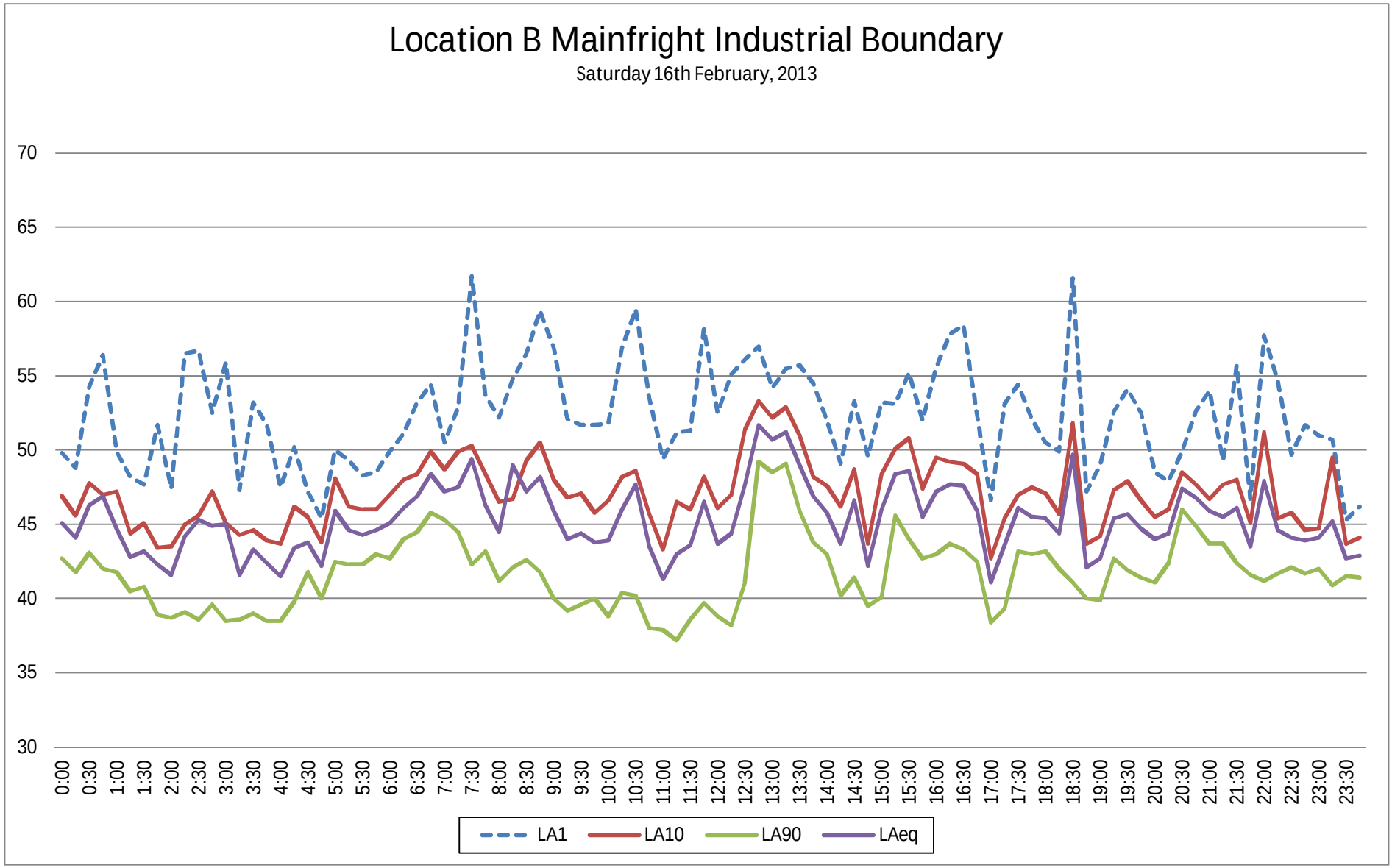
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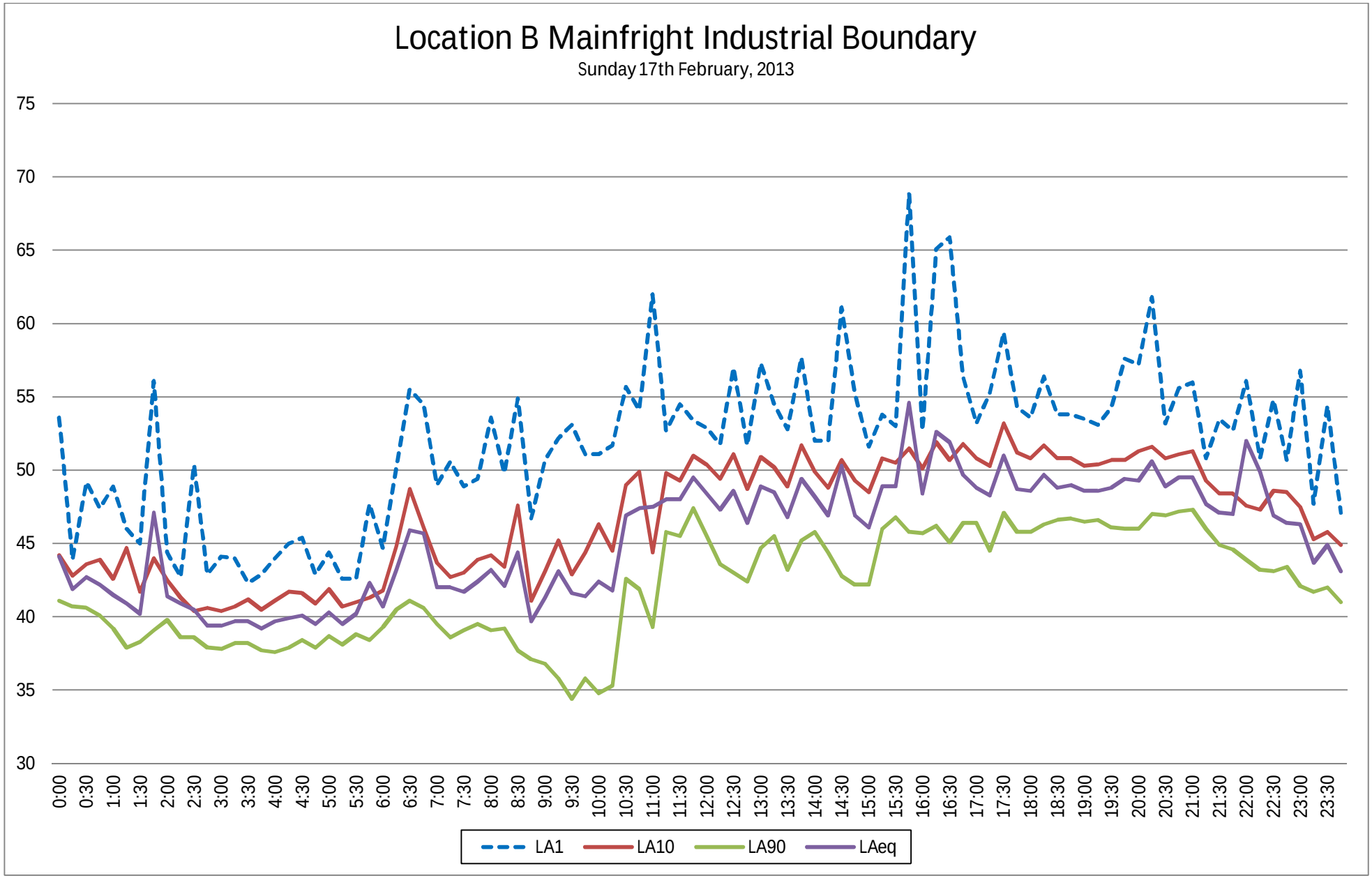
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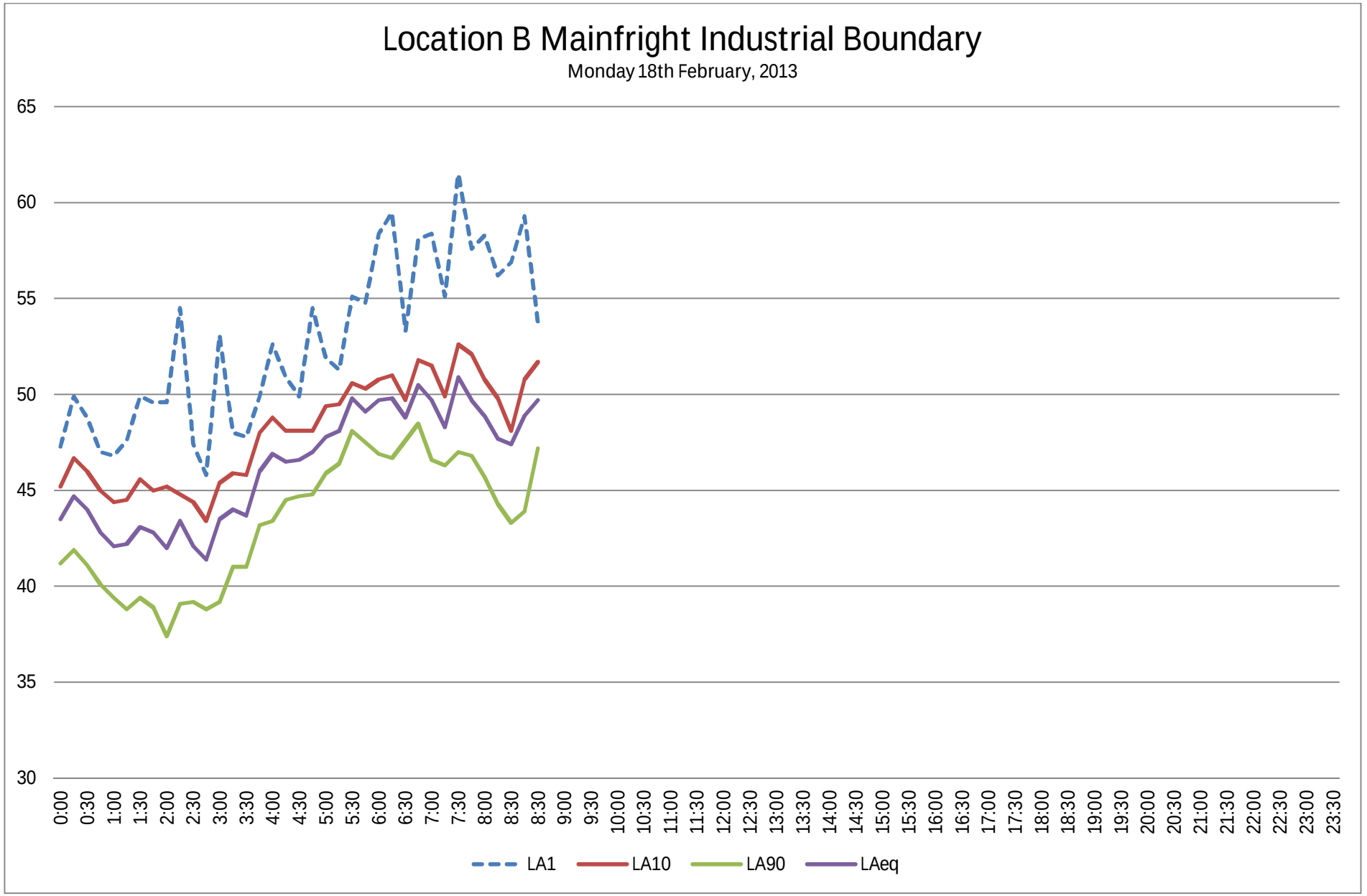
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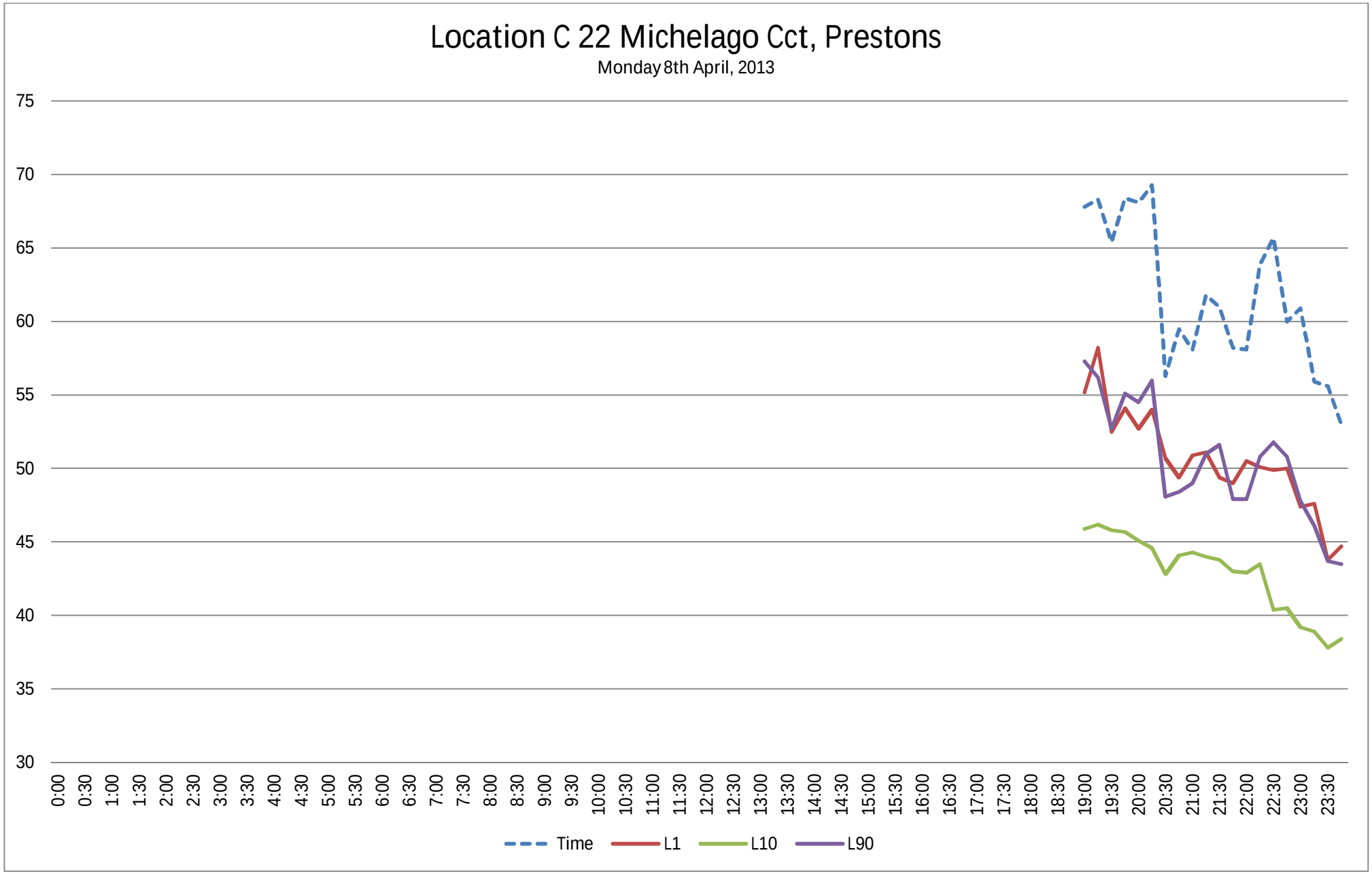
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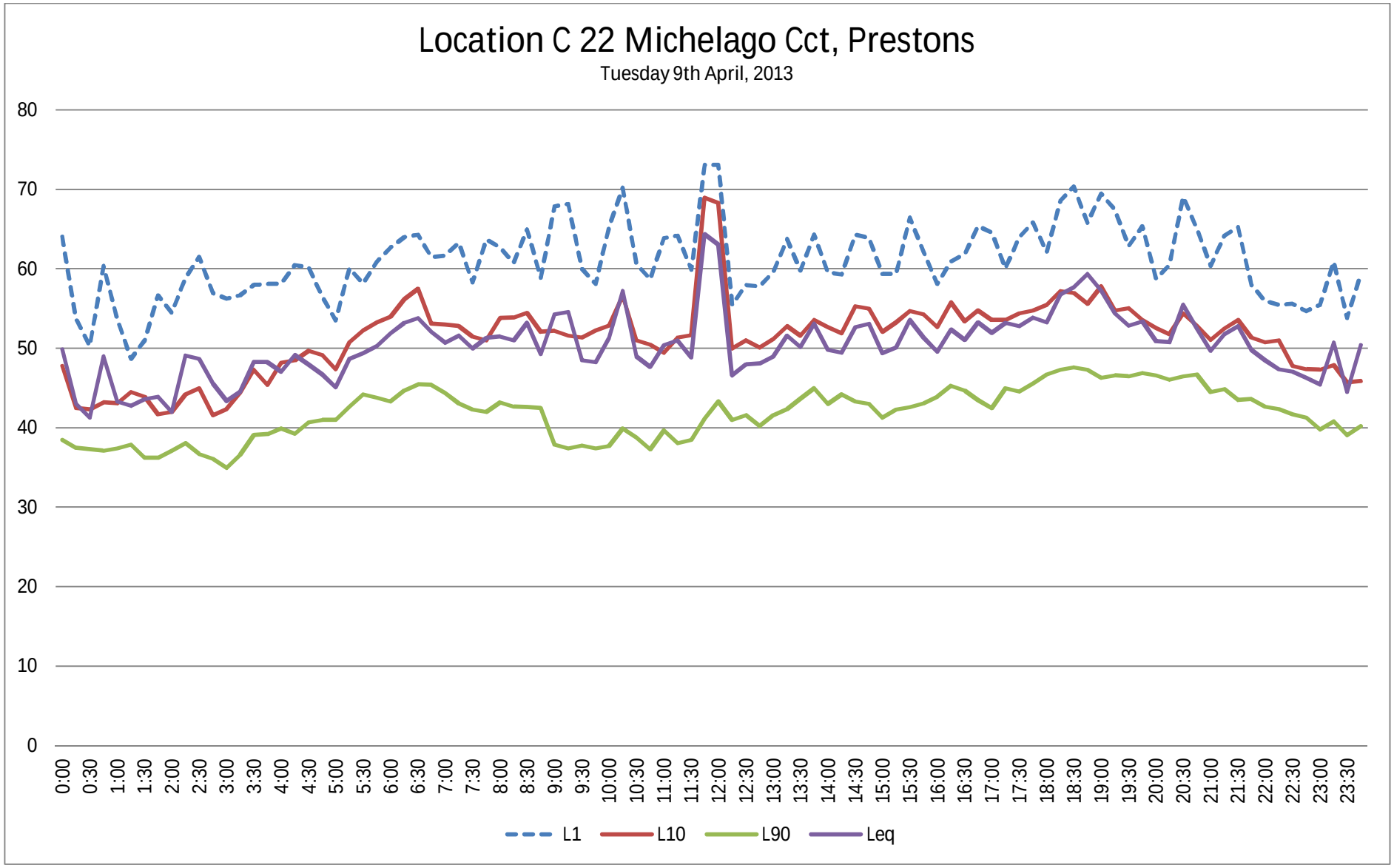
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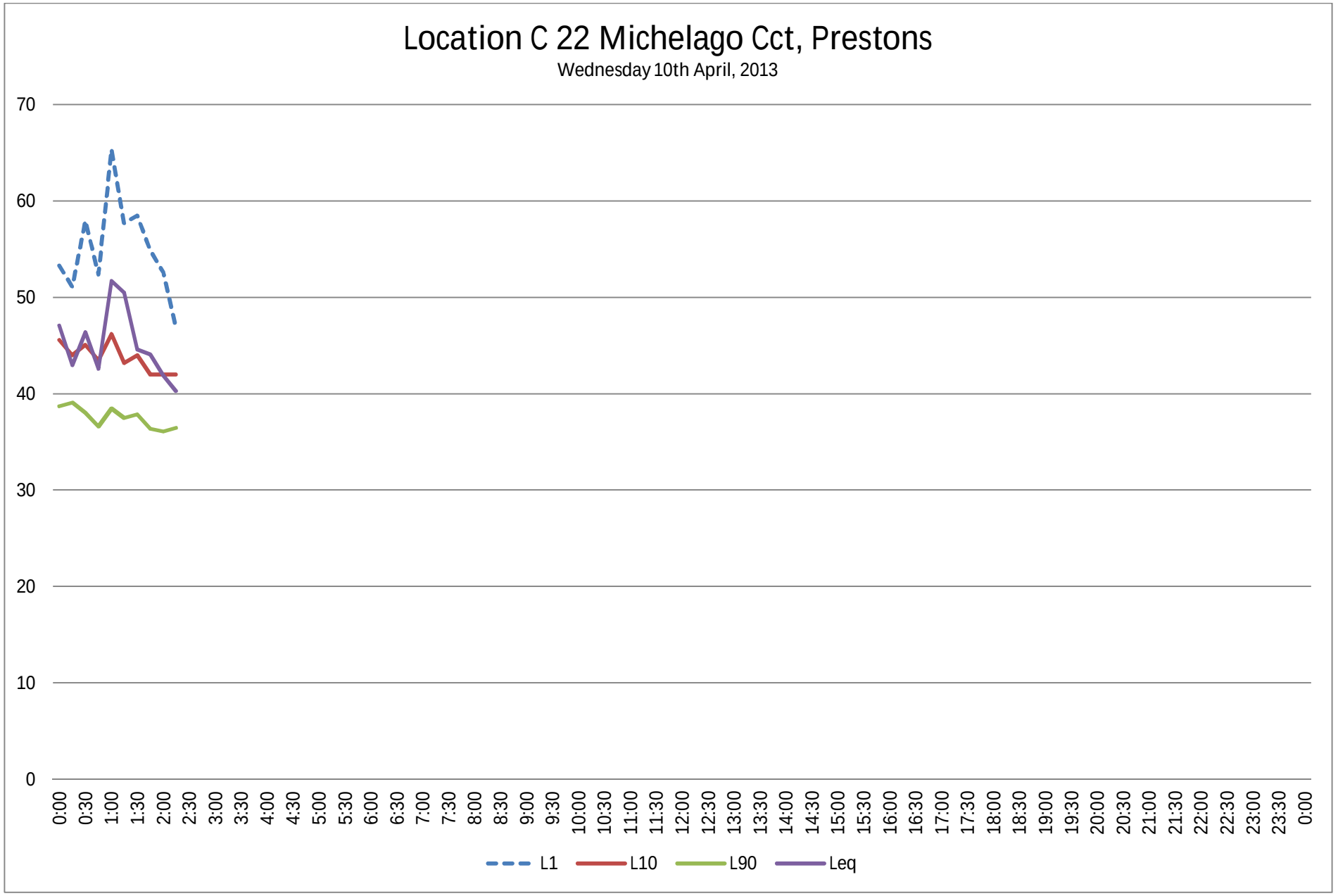
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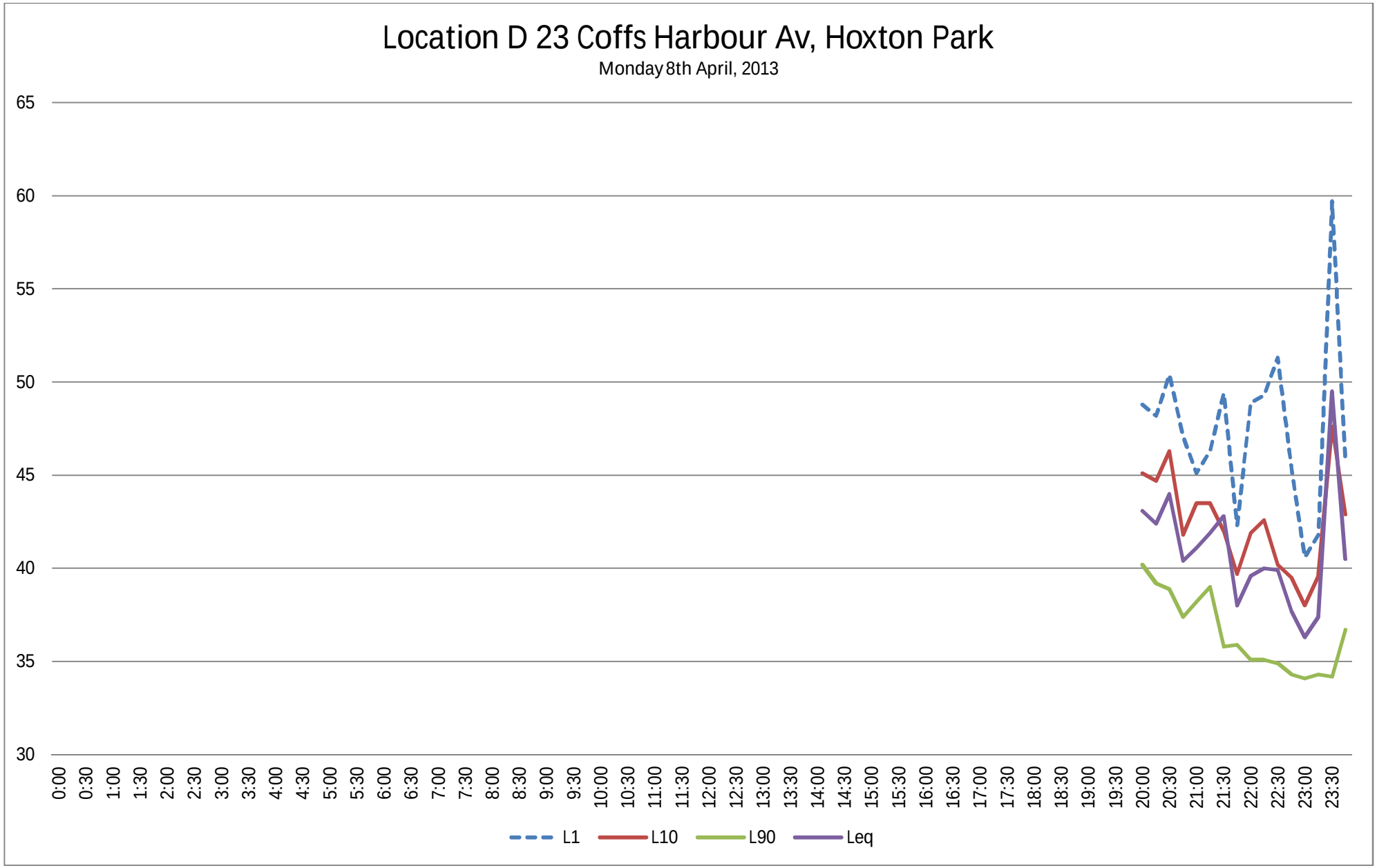
Location D 23 Coffs Harbour Av, Hoxton Park
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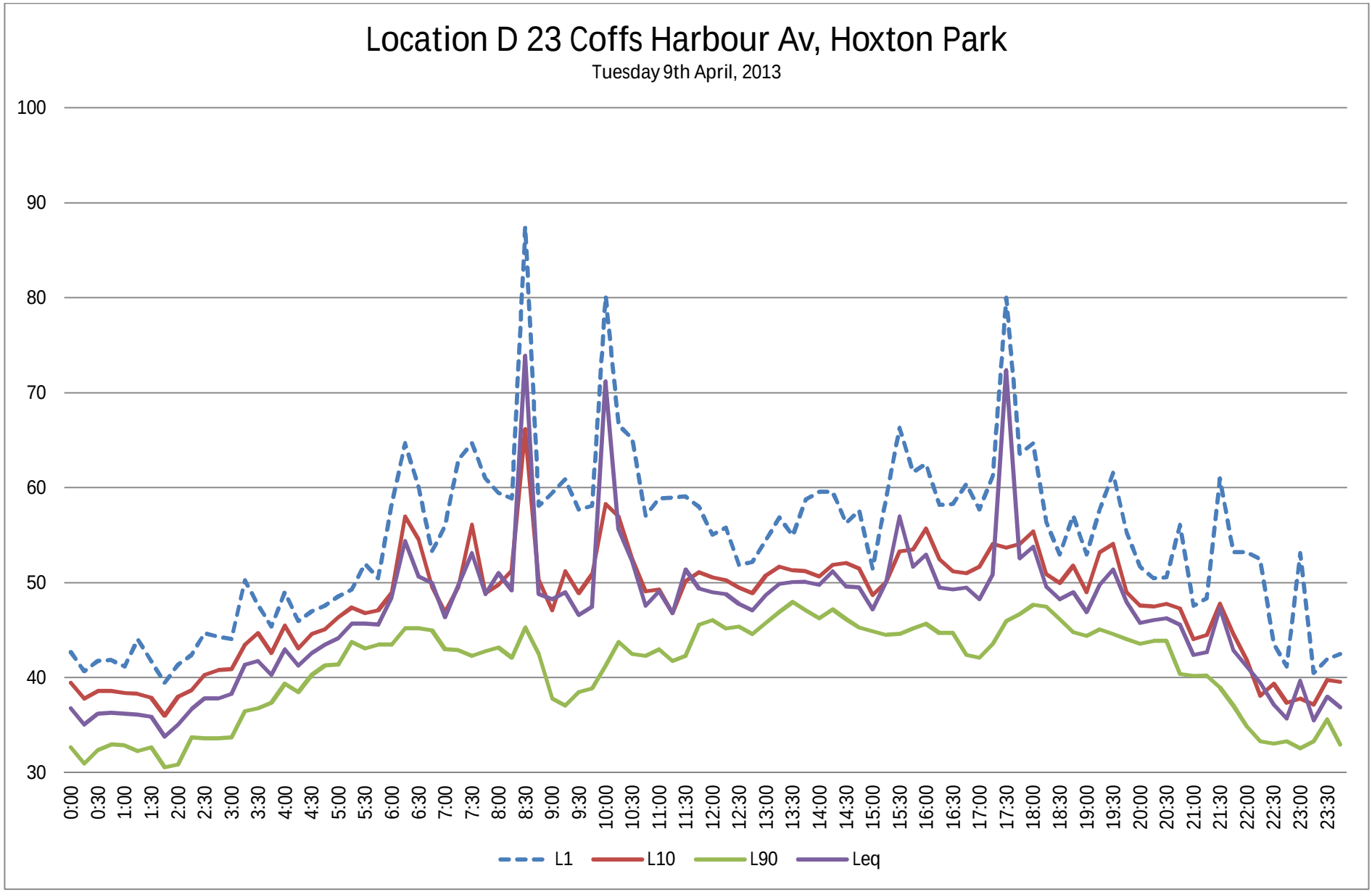
Location D 23 Coffs Harbour Av, Hoxton Park
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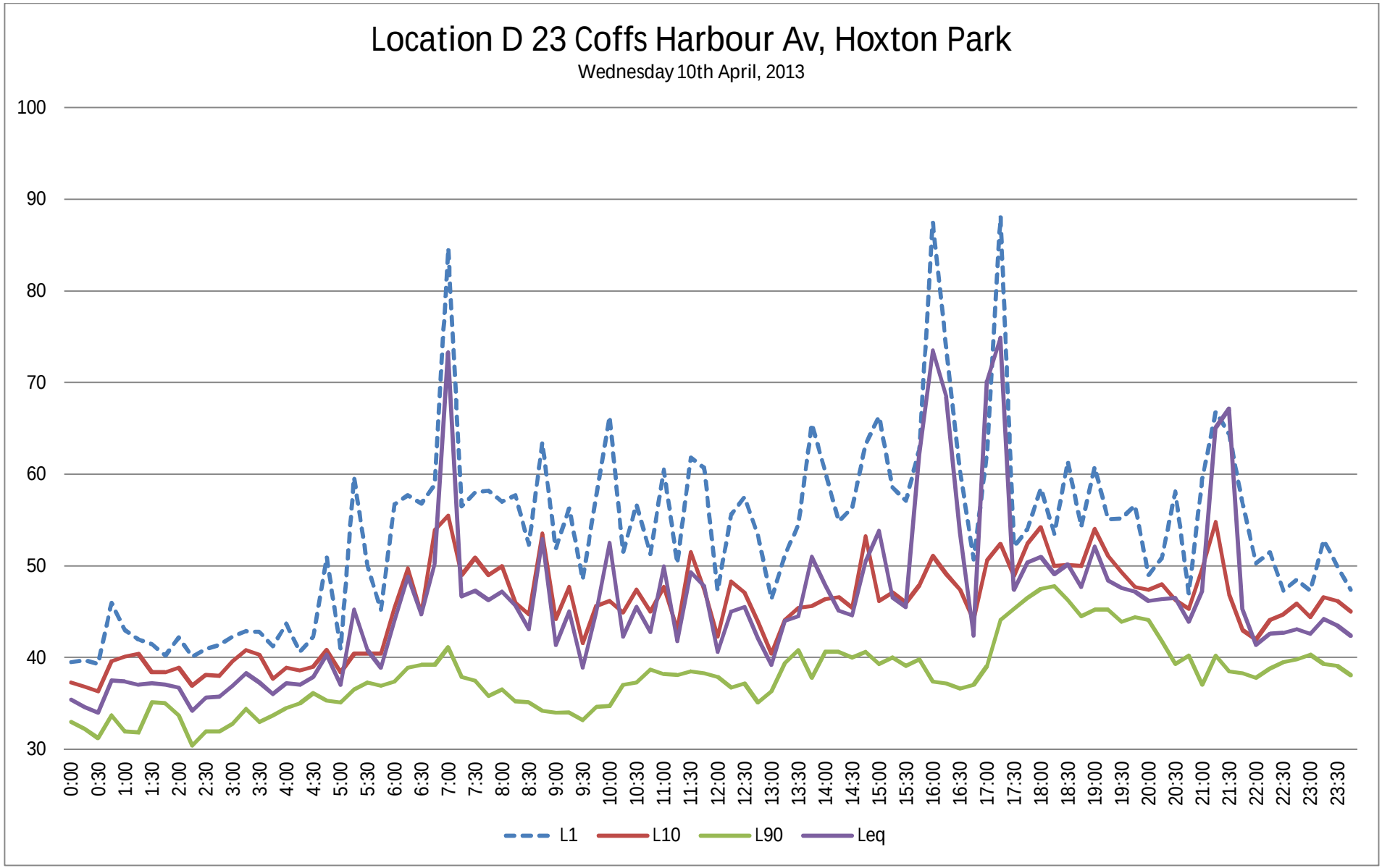
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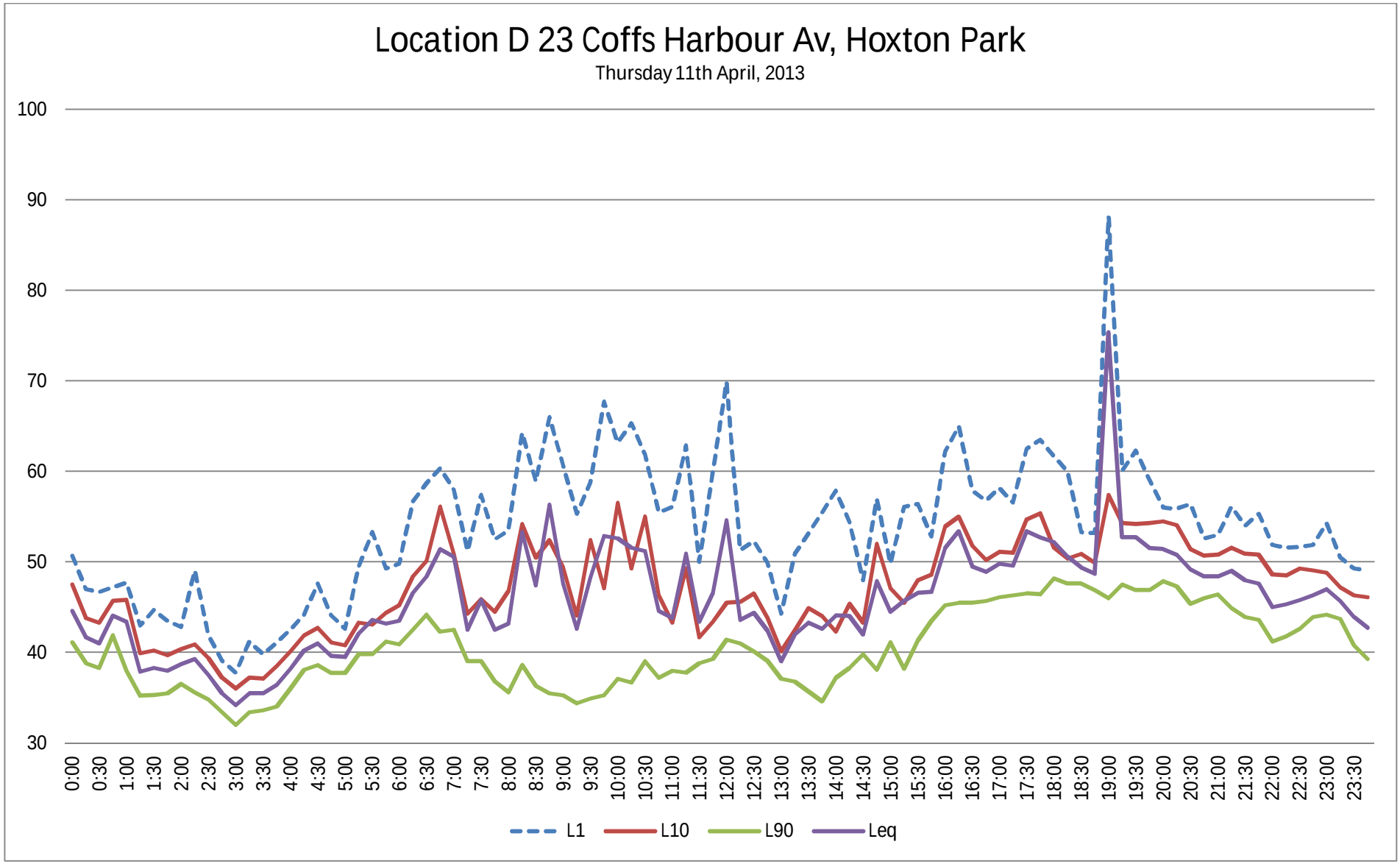
Location D 23 Coffs Harbour Av, Hoxton Park
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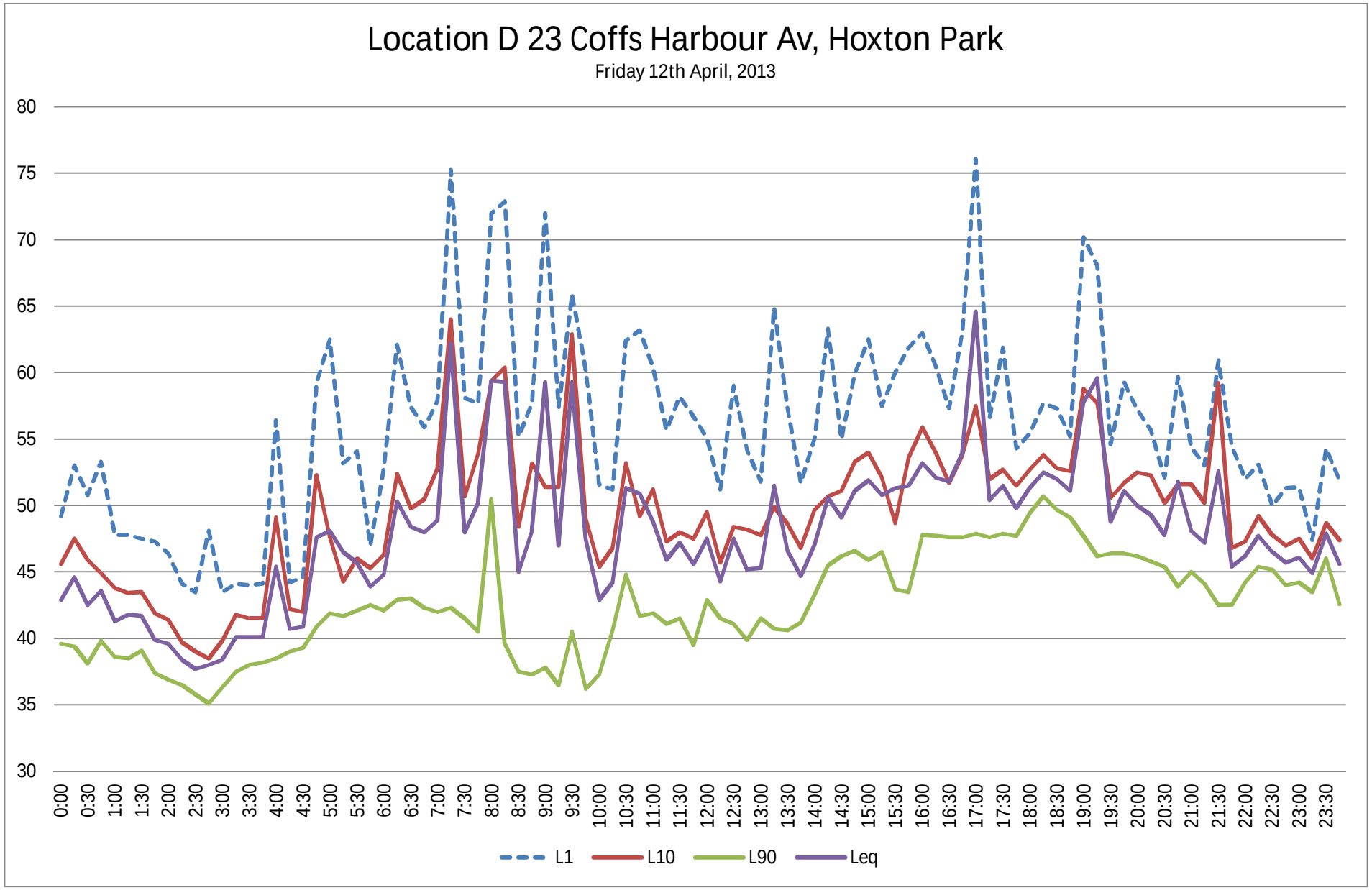
Location D 23 Coffs Harbour Av, Hoxton Park
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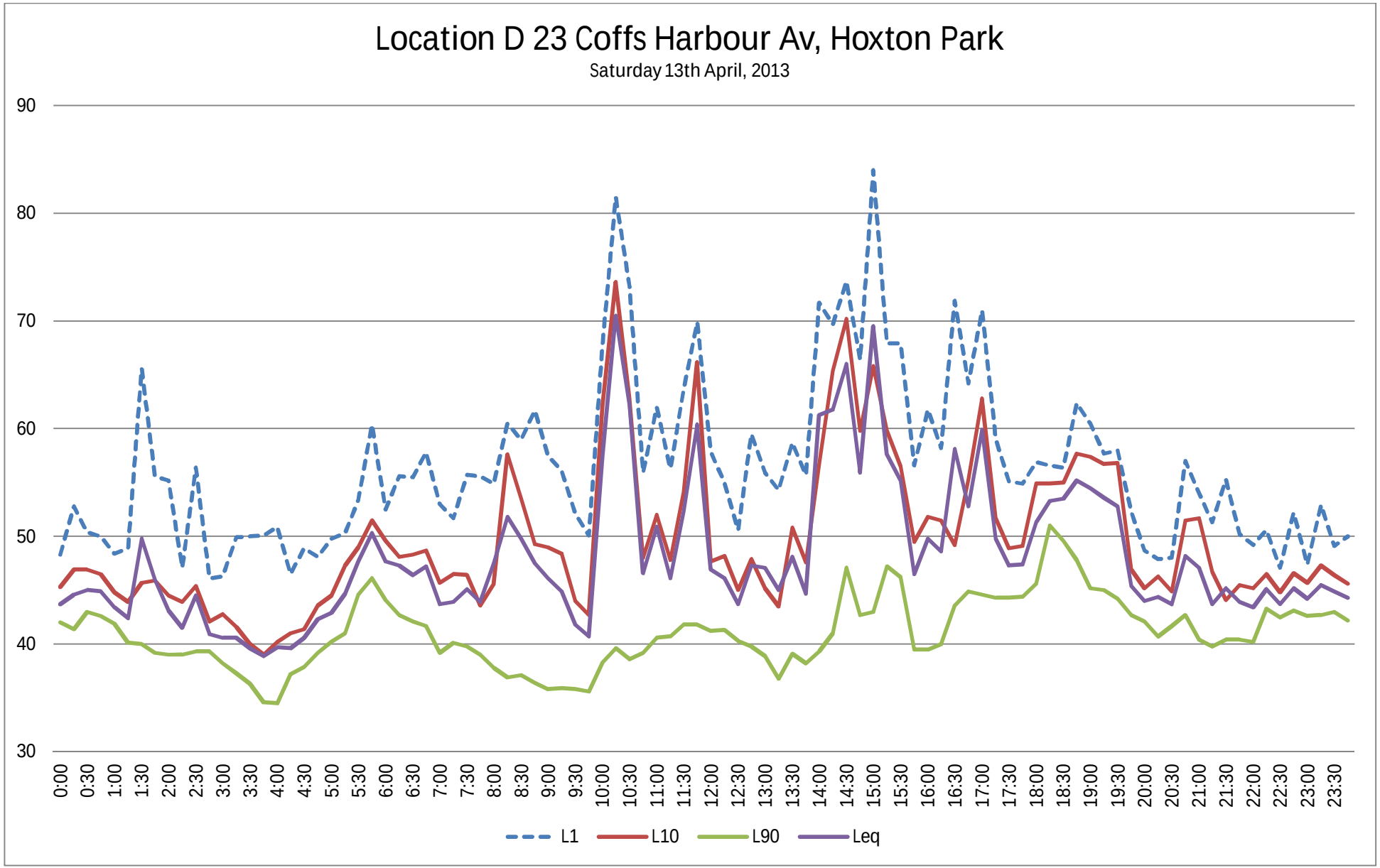
Location D 23 Coffs Harbour Av, Hoxton Park
Saturday 13th April, 2013
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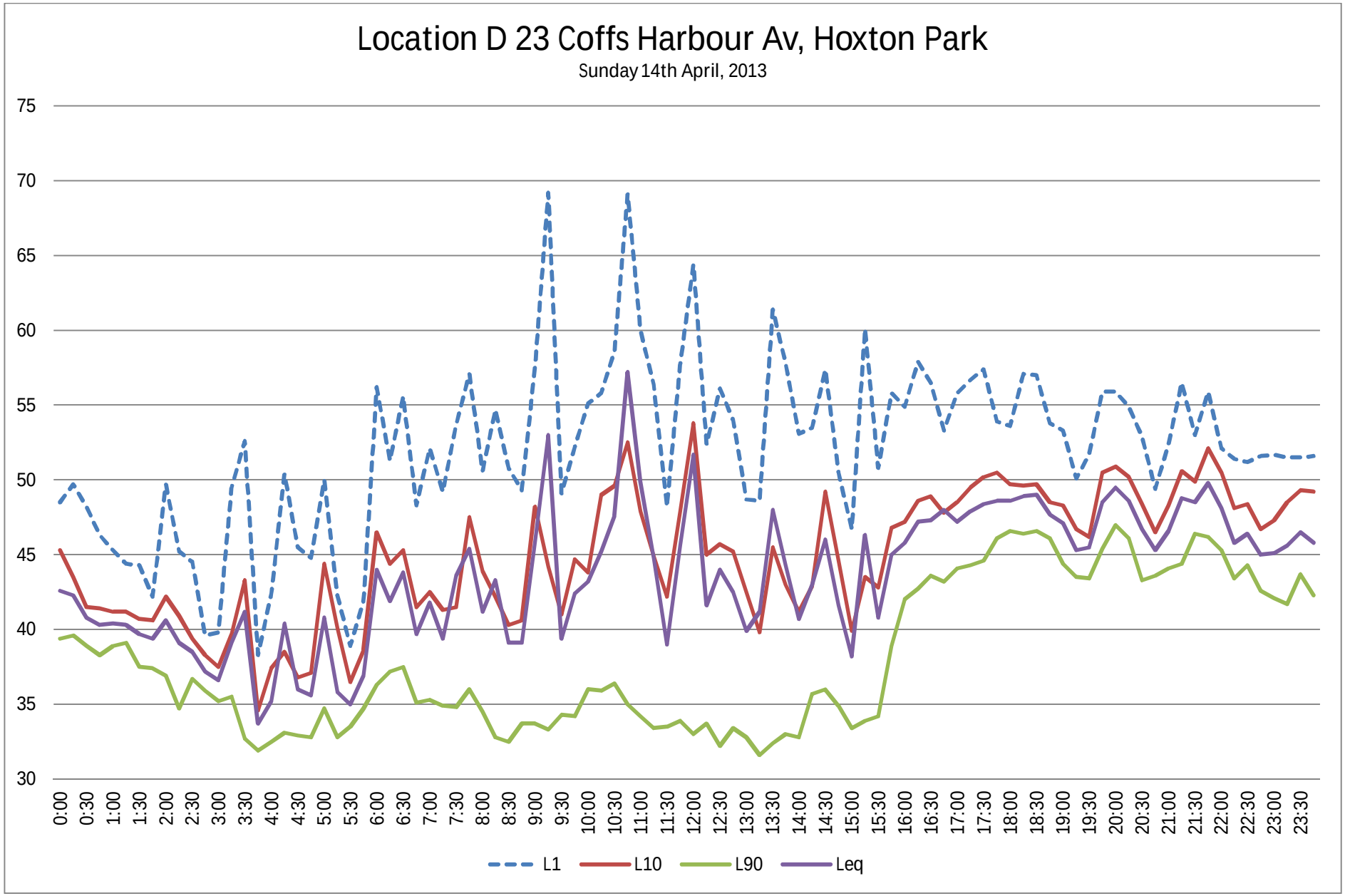
Location D 23 Coffs Harbour Av, Hoxton Park
Sunday 14th April, 2013
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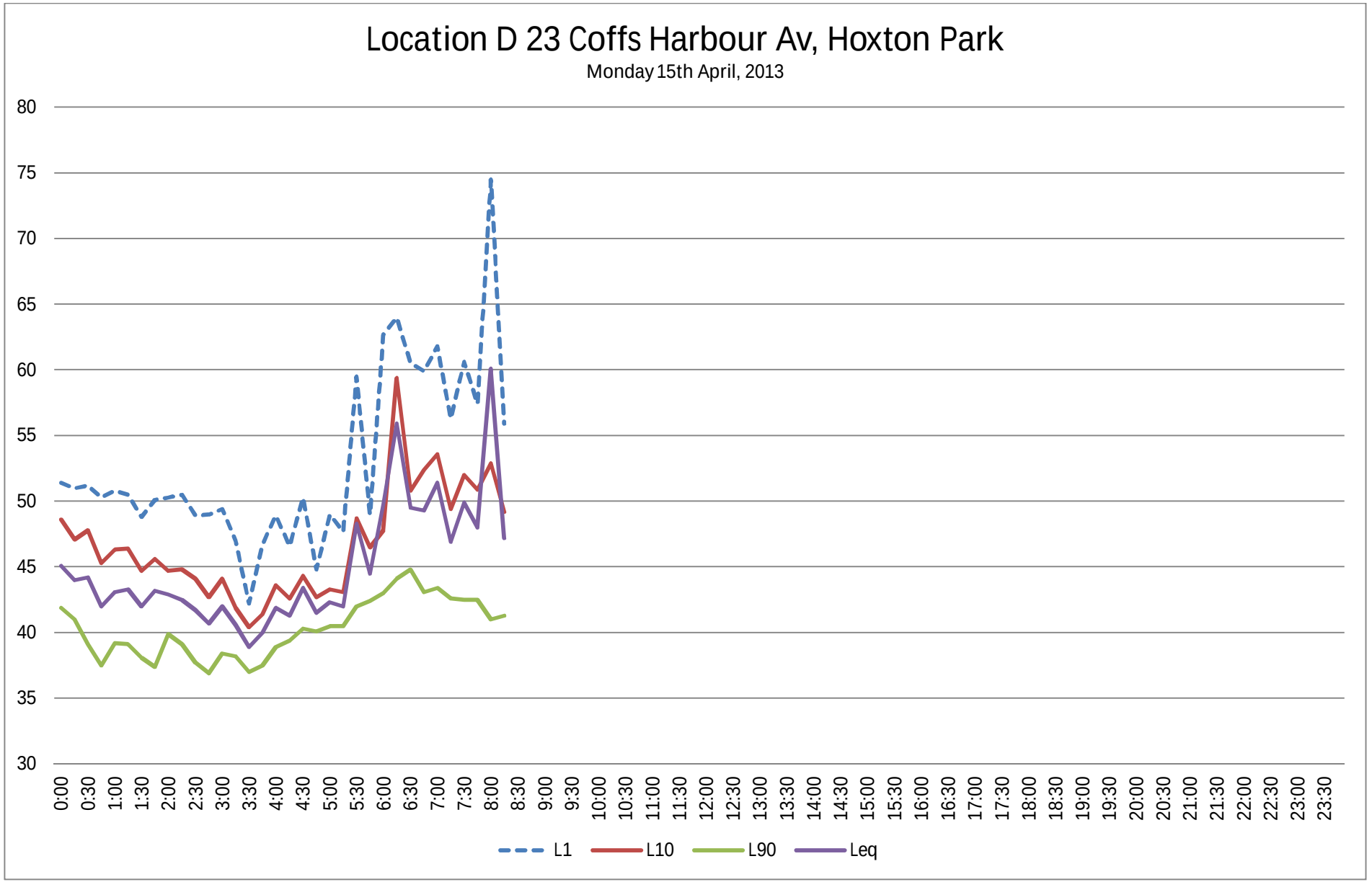
Location D 23 Coffs Harbour Av, Hoxton Park
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10 Appendix B – Attended Noise Readings

Location	Time	L_1	L_{10}	L_{90}	L_{eq}	Comments
Kurrajong Road – 100m east of Location C, outside noise wall on side of road	18.2.13, 0630-0645	74	64	47	59	Intermittent traffic noise, road workers in distance, birds
Kurrajong Road – next to Location C, outside noise wall on side of road	18.2.13, 0700-0715	76	70	48	65	Increasing traffic from east via round about, road workers setting up in distance, birds.
Kurrajong Road - 100m west of Location C, outside noise wall on side of road	18.2.13, 0715-0730	75	66	48	63	Local traffic, road workers setting up in distance, birds.
Coffs Harbour Avenue – approx. 100 north of Location D	18.2.13, 0715-0730	58	53	45	50	Traffic Noise, both local and distant, distant trucks from Yarrawa Street.