

7. Road traffic noise and vibration assessment

7.1 Road traffic impacts during the construction phase

To accommodate the construction traffic on Woodlands Close the Tarro Interchange will be upgraded and a connecting road to Woodlands Close constructed.

Estimated construction traffic movements on Woodlands Close, detailed in Table 7.1, have been referenced from the *Hexham Relief Roads Traffic Impact Assessment* (PR_3130, Parsons Brinckerhoff). Traffic movements are the total vehicle arrivals and departures.

Peak light vehicle movements will occur between 6am and 7am for staff mobilisation and 6pm and 7pm for staff departure with heavy vehicles will operating between 7am and 6pm.

Table 7.1 Total construction hourly road traffic movements

Peak traffic period	Construction activity	Hourly traffic movements	
		Light vehicles	Heavy vehicles
6am to 7am	Staff arrival prior to commencement of construction works	70	0
7am to 6pm	Delivery and departure of materials	10	22
6pm to 7pm	Staff departure at end of day time works	70	0

Note: Construction traffic movements referenced from Hexham Relief Roads Traffic Impact Assessment, 2012

Sound exposure levels (SEL) of 78 dB(A) L_{Aeq} at 1 metre for light vehicles and 102 dB(A) L_{Aeq} at 1 metre for heavy vehicles have been applied to assess potential construction road traffic pass by noise at the façade of receiver R1 Woodlands Close, the nearest residential receiver located 30 metres from the construction traffic route.

The SELs have been referenced from Parsons Brinckerhoff database of measured road traffic pass by noise levels.

Table 7.2 Predicted construction traffic noise impacts

Nearest receiver	Construction stage	Derived 1-hr L_{Aeq} noise dB(A)
Receiver R1 Woodlands Close	Staff arrival 6am to 7am	33
	Delivery and departure 7am to 6pm	50
	Staff departure 6pm to 7pm	33

Notes Values expressed as A-weighted dB and rounded to nearest dB(A)

L_{Aeq} = equivalent continuous (energy average) A-weighted sound pressure level

During standard day time construction hours the predicted construction traffic noise impacts of 33 to 50 dB(A) $L_{Aeq,1hour}$ at R1 Woodlands Close during staff arrival, deliveries and staff departure comply with the 55 dB(A) $L_{Aeq,1hour}$ construction traffic noise goal.

Where road traffic movements are required outside of standard construction hours the predicted construction traffic noise impacts comply with the 50 dB(A) $L_{Aeq,1hour}$ construction traffic noise goal for all arrival, departure and deliveries.

Receiver R1 is located at the intersection of Woodlands Close and the New England Highway; heavy vehicle operations at the intersection may result in intermittent noise impacts at the residence.

Adopting a 110 dB(A) $L_{A_{Max}}$ source noise level for air braking and tailgates, predicted noise impacts of 73 dB(A) $L_{A_{eq}}$ at receiver R1 from individual heavy vehicles may be audible above an existing measured day time ambient noise level of 70 dB(A) $L_{A_{eq}}$.

The daily road traffic volumes in Table 7.1 would not result in a greater than 2 dB(A) increase in existing $L_{A_{eq}}$ 15 hour daytime road traffic noise from the New England Highway and would comply with the ECRTN noise goal of 67 dB(A) $L_{A_{eq},15hr}$ for traffic on freeways.

A range of feasible noise management measures for construction road traffic have been recommended in Section 8.

7.2 Road traffic impacts during Relief Roads operation

During the operation of the Relief Roads one or two light vehicles per day on the Tarro Interchange or Woodlands Close may access the site for maintenance activity.

Road traffic noise from light vehicles on Woodlands Close would comply with the adopted 55 dB(A) $L_{A_{eq},1hour}$ road traffic noise goal. Based on the high road traffic volumes on the New England Highway, potential maintenance traffic will not influence day time road traffic noise levels in Hexham and comply with the ECRTN noise goal of 67 dB(A) $L_{A_{eq},15hr}$ for traffic on freeways.

7.3 Road traffic vibration impacts

Potential road traffic vibration would be minimised on Woodlands Close and where all vehicles adhere to sign-posted traffic speeds and implement responsible driving practices to minimise unnecessary acceleration and braking events and continuous traffic flows (convoy)

Based on a separation distance of at least 30 metres to receiver R1 on Woodlands Close, construction and operational road traffic movements are not expected to result in an exceedance of the perceptible (Table 3.4) and cosmetic damage criteria (Table 3.5).

8. Recommended noise and vibration management and mitigation measures

8.1 Operational rail noise

Based on the predicted rail noise levels at the assessed receivers for project opening in 2014 and future network operation in 2024; no noise management or mitigation measures are required to control potential noise impacts of the Proposed Project at residential, commercial or recreational receivers and land use in Hexham in accordance with IGANRIP.

The predicted day time and night time rail noise levels exceed the noise objectives for a place of worship at the Church on Old Maitland Road. To comply with the noise trigger levels a noise reduction of 2 dB(A) L_{Aeq} to the day time and night time noise levels would be required.

Noise mitigation management and mitigation measures such as rail noise barriers, noise bunds, reducing daily train operations or reducing train speeds are not feasible, reasonable or practical for the control of noise at one receiver 225 metres from the Proposed Project that is occupied intermittently.

Architectural acoustic treatments to the Church building façade is not feasible or reasonable to reduce worst-case noise levels by 2 dB(A) L_{Aeq} . Architectural treatment is typically only feasible where a noise reduction of at least 5 to 10 dB(A) L_{Aeq} is required.

8.2 Construction noise and vibration management

A Construction Environmental Management Plan (CEMP) will be prepared prior to commencement of works and be implemented through all phases of construction. The CEMP will provide the framework for the management and mitigation of all potential noise and vibration impacts from the construction works.

The CEMP will document mechanisms for demonstrating compliance with the project approvals and commitments made in the Project EIS including the recommended construction noise and vibration management and mitigation measures provided in this assessment.

A series of management and mitigation measures designed to control and reduce noise levels are detailed below.

The recommended measures promote the principles of best management practice and community engagement and are considerate of the predicted noise impacts in Section 6 and the proposed construction activity.

8.2.1 Planning and implementation of construction works

During the detailed planning, scheduling and design of the construction works the following noise and vibration management and mitigation measures are to be investigated and, as required, implemented prior to the commencement of noise generating works:

- Standard construction working hours will be restricted to 7 am and 6 pm (Monday to Friday) and Saturdays 8 am and 1 pm, with no works on Sundays or public holidays, unless health and safety or site conditions such as delivery of oversized loads expressly require works outside these times.
- All site workers (including subcontractors and temporary workforce) will be made aware of the potential for noise and vibration impacts upon local residents and encouraged to take practical, feasible and reasonable measures to minimise noise during the course of their activities.
- Where measured construction noise levels trigger the residential and non-residential noise NMLs identified in this report; dominant noise generating mechanical plant will be fitted with feasible noise mitigation controls such as exhaust mufflers and engine shrouds.
- Quieter and less vibration emitting construction methods will be applied where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts.
- The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible.
- Where work is proposed in the vicinity of residences, potentially affected residents would be advised in advance of the proposed construction period at least 2 weeks prior to the commencement of works.
- Fixed equipment (i.e. pumps, generators, compressors) should be located to maximise the practical separation distance away from nearest residences.
- Temporary stockpiles should be located away from the nearest residences.
- Whenever possible, loading and unloading areas should be located away from the nearest residences.
- Broadband reversing alarms should be used instead of tonal reversing alarms, in particular outside standard working hours (night-time track possession works). Sub-contractors should also be notified of this requirement and where possible (particularly for night works) this should be included as a contractual requirement.
- Equipment which is used intermittently should be shut down when not in use.
- All engine covers should be kept close while equipment is operating.
- Specific work method statements and directives will be prepared to prohibit unnecessary dropping of materials from heights in/out of vehicles.
- Where possible, trucks associated with the work should not be left standing with their engine operating in a street adjacent to a residential area.
- Where practicable simultaneous operations of loader, Bobcat, 30T excavator, rail tamper and ballast regulator plant is to not occur in the same local area.
- Sign-posted traffic speeds will be adhered to and all drivers will implement responsible driving practices to minimise unnecessary acceleration and braking events. Traffic movements will be scheduled to minimise continuous traffic flows (convoy).

- At the commencement of works ground vibration monitoring will determine safe working distances for all vibration generating plant to minimise potential for disturbance and cosmetic issues at all receivers and property.
- The planning and scheduling of vibration generating works will include safe working distances to minimise potential disturbance and cosmetic structural damage impacts. Table 8.1 provides recommended safe working distances for vibration generating plant.

Table 8.1 Safe working distances for construction plant

Plant item	Description	Safe working distances, meters	
		Cosmetic damage	Human disturbance
Vibratory roller	1-2T	5	15-20
	2-4T	6	20
	4-6T	12	40
	7-13T	15	100
	13-18T	20	100
	>18T	25	100
Small hydraulic hammer	5-12T excavator	2	7
Medium hydraulic hammer	12-18T excavator	7	23
Large hydraulic hammer	18-34T excavator	22	73
Vibratory pile driver	Sheet piles	2-20	20
Pile boring	≤800mm diameter	2	-
Jackhammer	Hand held	1	Avoid contact with structure

Source Transport Construction Authority – Construction Noise Strategy (Rail Projects) October 2010

- Prior to the commencement of construction, condition surveys of residences on Clark Street, Fenwick Street, Merchant Street and at/ off Woodlands Close and the Hexham Station are to be undertaken to determine the current integrity and visible damage. The surveys are to be used to manage vibration through safe working practices to prevent further or new cosmetic damage.
- All plant on site should be operated in accordance with the manufacturer's instructions
- The constructor (as appropriate) will establish contact with the local residents and communicate, particularly when noisy or vibration generating activities are planned.
- The constructor or site developer (as appropriate) is to provide a community liaison phone number and permanent site contact so that noise and/or vibration related complaints, if any, can be received and addressed in a timely manner.

Consultation and cooperation between the site(s) and neighbours to the site(s) would assist in limiting uncertainty, misconceptions and adverse reactions to noise and vibration.

- Where measured construction noise levels from the Proposed Project at nearest residences are greater than 75 dB(A) $L_{Aeq,15min}$ the following would be considered:
 - ▶ respite periods of 1 hour are recommended for every continuous 3 hour period of work, or
 - ▶ works should be scheduled between 9 am – 12 pm and 2 pm – 5 pm.
- Attended noise and ground vibration measurements are to be undertaken at monthly intervals and upon receipt of adverse comment/ complaints during the construction programme to confirm the noise and vibration levels at adjacent communities and receivers are consistent with the prediction in this assessment and any approval and/or licence conditions.

All noise measurements are to be undertaken at the most exposed/ affected receivers and be carried out consistent with Australian Standard AS1055.1-1997 *Acoustics - Description and Measurement of Environmental Noise - General Procedures*.

Vibration measurements shall be undertaken in accordance with the procedures documented in the DECCW's Assessing Vibration - a technical guideline (2006) and BS7385 Part 2-1993 Evaluation and measurement for vibration in buildings.

In the event of any non-conformance to the project objectives and/or conditions, the current noise and vibration management measures would be reviewed and additional feasible and reasonable control implemented to reduce impacts where it is practical.

Consistent with the ICNG, where the above measures are implemented the noise and vibration impacts from construction are considered acceptable and typical of construction activities in close proximity to receivers.

8.2.2 Construction works out of standard day time working

Where construction works are required outside of the standard day time construction hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturdays; the following additional noise mitigation measures are to be implemented.

- All works undertaken during rail possession are to be managed in accordance with Environmental Protection Licence for the Proposed Project.
- Where feasible high noise generating works will be avoided during morning, evening and night time services at the Church on Woodlands Close.
- Where feasible consideration will be given to a mass loaded absorptive acoustic curtain being installed on localised wire fencing around noise generating plant and machinery.
- High noise generating works for vegetation clearance with chainsaw and chipper will not be undertaken during the 10pm to 7am night time period.
- Where feasible noise generating works for the project will be scheduled to be completed outside of the 10pm to 7am night time period.

9. Queensland Rail National Train Support Facility

Queensland Rail National (QR National) is currently preparing plans for a Train Support Facility (TSF) and adjoining industrial development located immediately to the west of the Relief Roads. The layout and key features of both projects are shown in Volume 1 of the EIS. QR National is liaising with ARTC to co-ordinate the design and approval processes.

As part of this study and report, the QR National 2008 Environmental Assessment Report has been reviewed. Where updated (2011) reports are available, these have also been reviewed. Relevant documents reviewed include the noise impact assessment report and appendices of the *Hexham Redevelopment Project Incorporating a Train Support Facility, Industrial Subdivision and Intermodal Facility* (30-1858-R2, Revision 1) prepared by SLR Consulting Australia in March 2011 (hereafter referred to as the QR National TSF report).

The predicted noise levels from the QR National TSF report have been directly referenced to provide an assessment of potential noise and vibration impacts where construction and operation stages of the two Proposed Projects simultaneously occur.

To provide a consistent approach the cumulative assessment has been based on the receivers adopted in the QR National TSF report.

9.1 Assessment of cumulative impacts

9.1.1 Cumulative operational noise

The proposed Hexham Relief Roads project has been assessed to the IGANRIP; Section 1.4 of the IGANRIP states the guidelines does not apply to *projects involving maintenance facilities for rolling stock which should be assessed in accordance with the NSW Industrial Noise Policy (EPA 2000), or to development where railway systems activities are not being undertaken.*

The QR National TSF project has been assessed in accordance with the NSW INP; in Section 1.3 of the NSW INP the guideline states *the policy is focused on the noise emitted from industrial sites and examples of noise sources that are NOT dealt with by the policy are; transportation corridors (roadways, railways and air corridors).*

In lieu of specific noise goals, the assessment of cumulative impacts has focused on the potential for cumulative noise to be greater than the individual influence of each Proposed Project. Commentary on potential disturbance and annoyance issues at noise sensitive receivers has been provided.

9.1.2 Cumulative construction noise goals

The ICNG applies to the construction of both Proposed Projects; as such the construction noise management levels in Table 4.4 (residential) and Table 4.5 (other noise sensitive) have been applied to assess impacts from potential simultaneous construction activity.

9.2 Potential noise impacts from cumulative operations

Table 9.1 day time, Table 9.2 night time and Table 9.3 maximum detail estimated cumulative noise levels assuming the predicted impacts referenced from the QR National TSF report are indicative of continuous operation during a 24 hour period.

Table 9.1 Potential cumulative day time operational noise impacts

Residential receiver	Predicted day time rail noise, $L_{Aeq,15hr}$ dB(A)		
	Hexham Relief Roads	QR National TSF	Cumulative both projects
R1 Woodlands Close	54	<30	54
R2 Hain Residence	49	31	49
R5 Old Maitland Rd	53	38	53
R11 Clark Street	62	32	62

Notes Values expressed as A-weighted dB and rounded to nearest dB(A)

Table 9.2 Potential cumulative night time operational noise impacts

Residential receiver	Predicted day time rail noise, $L_{Aeq,9hr}$ dB(A)		
	Hexham Relief Roads	QR National TSF	Cumulative both projects
R1 Woodlands Close	54	<30	54
R2 Hain Residence	48	31	48
R5 Old Maitland Rd	53	38	53
R11 Clark Street	61	32	61

Notes Values expressed as A-weighted dB and rounded to nearest dB(A)

Table 9.3 Potential cumulative maximum operational noise impacts

Residential receiver	Predicted day time rail noise, L_{Amax} dB(A)		
	Hexham Relief Roads	QR National TSF	Cumulative both projects
R1 Woodlands Close	73	36	73
R2 Hain Residence	64	44	64
R5 Old Maitland Rd	70	50	70
R11 Clark Street	80	56	80

Notes Values expressed as A-weighted dB and rounded to nearest dB(A);

L_{Amax} = maximum noise level

Based on the predicted noise levels the Hexham Relief Roads would be the dominant influence to received noise levels. The influence of QR National TSF operations is predicted to not result in cumulative noise levels being greater than the day time, night time or maximum noise from the proposed Hexham Relief Roads project.

This is due to the proximity of proposed Hexham Relief Roads operations to the nearest receivers. The separation distance between the QR National TSF project site and the assessed residences provides greater attenuation to operational noise than with the Relief Roads project.

9.2.1 Commentary on the perception of cumulative noise

The potential for cumulative noise to result in disturbance or annoyance is not specific to the total received noise level. The perception and reaction to noise characteristics will vary based upon the nature of noise at each receiver and an individual's subjective response to noise.

The characteristics of noise from rail operations (Hexham Relief Roads) and industrial noise (QR National TSF) are noticeably different. Rail operations are short term events with potential for instantaneous maximum events such as wagon bunching, wheel squeal and horn blasts. Industrial noise is often continuous and can be characterised by low frequency or tonal noise emissions.

Existing receivers are already exposed to rail noise from Main Line operations which can result in familiarity with specific rail noise characteristics. Where the recommendations in Section 8.1 are implemented the potential for annoyance is expected to be minimised.

Currently there are no industrial developments of similar nature to the proposed QR National TSF project at Hexham. Audible operational noise from the QR National TSF may be more readily discernible as a new noise source in the ambient environment. The QR National TSF project will be expected to assess and manage potentially disturbing noise characteristics consistent with the NSW INP.

9.3 Potential noise impacts from simultaneous construction works

In lieu of a detailed program for potential cumulative construction works, cumulative noise impacts have been estimated in Table 9.4 based on worst case (highest) predicted noise impacts from Table 6.2 and the QR National TSF report.

The QR National assessment included two rail construction phases. Potential cumulative and individual project noise impacts predicted to trigger the construction NMLs are shown in *italics*.

Table 9.4 Predicted cumulative construction noise impacts

Construction works	Estimated cumulative construction noise $L_{Aeq, 15min}$			
	Hain Residence (R2)	Old Maitland Road (R5)	Woodlands Close (R1)	Off Pacific Highway (R12)
Rail construction				
Hexham Relief Roads	45	59	37	59
QR National TSF	39	38	38	38
Cumulative both projects	46	59	41	59
Building works				
Hexham Relief Roads	45	50	28	49
QR National TSF	38	39	38	38
Cumulative both projects	46	50	38	49
Road construction				
Hexham Relief Roads	45	22	70	18
QR National TSF	57	57	58	57
Cumulative both projects	57	57	70	57

Construction works	Estimated cumulative construction noise $L_{Aeq, 15min}$			
	Hain Residence (R2)	Old Maitland Road (R5)	Woodlands Close (R1)	Off Pacific Highway (R12)
Rail Construction				
Hexham Relief Roads	38	54	30	58
QR National TSF	58	58	58	59
Cumulative both projects	58	60	58	62

Notes Values expressed as A-weighted dB and rounded to nearest dB(A)

L_{Aeq} = equivalent continuous (energy average) A-weighted sound pressure level

Note QR National TSF report includes two rail construction work stages

Standard day time construction works

Potential cumulative construction works during standard day time hours are predicted to trigger the NMLs at up to 3 residential receivers during initial rail construction works and site set up, road construction and final rail construction.

The proposed building construction works are predicted to comply with the NMLs at all of the assessed receivers.

Depending on the work locations and the assessed receivers the Proposed Project and the QR National TSF project would be a dominant influence to received cumulative impacts throughout the construction programme and both projects will need to manage cumulative noise impacts.

Outside of standard day time construction works

At all assessed receivers the potential impacts the receiver specific NMLs of 47 dB(A) $L_{Aeq,15min}$, 52 dB(A) $L_{Aeq,15min}$ and 55 dB(A) $L_{Aeq,15min}$ are likely to be triggered during cumulative construction works outside the day time hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturdays.

Depending on the work locations and the nearest receivers the Proposed Project and the QR National TSF project would be a dominant influence to received cumulative impacts throughout the construction programme and both projects will need to manage cumulative noise impacts.

9.4 Potential cumulative road traffic noise impacts

The proposed Hexham Relief Roads project will have minimal road traffic operations; as such road traffic noise during operations will not be a cumulative noise issue. Operational road traffic noise will be managed specific to individual projects.

During the construction program both Proposed Projects may access the New England Highway from Woodlands Close via the Tarro Interchange. Table 9.5 details estimated worst case cumulative noise impacts from construction road traffic.

Table 9.5 Cumulative construction road traffic noise

Nearest receiver	Predicted 1-hour L_{Aeq} noise dB(A)		
	Hexham Relief Roads	QR National TSF	Cumulative
Receiver R1 Woodlands Close	53	44	54

Notes Values expressed as A-weighted dB and rounded to nearest dB(A)

L_{Aeq} = equivalent continuous (energy average) A-weighted sound pressure level

Cumulative construction road traffic noise of 54 dB(A) $L_{Aeq,1hr}$ is predicted to comply with the 55 dB(A) $L_{Aeq,1hr}$ road traffic noise goal at nearest residences.

The QR National assessment has included noise attenuation from a proposed earth bund at Woodlands Close. Predicted road traffic noise impacts for the Hexham Relief Roads have not considered the potential noise attenuation achievable by the proposed earth bund.

9.5 Potential cumulative ground vibration impacts

Potential ground vibration impacts from the operation and construction of each project in isolation are expected to be within the disturbance and structural damage goals detailed in Section 4.

Due to the requirements for safe working practice of individual construction activity it is unlikely that vibration generating construction plant such as rock breakers and bulldozers will be in simultaneous operation within 30 metres of nearest receivers. The likelihood of cumulative vibration levels triggering the disturbance and structural damage goals is low.

Potential vibration issues would be a result of individual plant items and readily controlled through management measures discussed in Section 8 of this report.

Potential vibration from operations of both projects is predicted to comply with the disturbance and structural damage goals detailed in Section 4. The separation distance from operations of each Proposed Project to nearest receivers (>100 metres) is expected to be sufficient to limit the likelihood of perception vibration, and comply with the disturbance and structural goals.

9.6 Recommended management of potential cumulative impacts

Based on the predicted IGANRIP compliance at the assessed residences no noise management or mitigation measures will be required. QR National will be expected to manage and control noise from the QR TSF project consistent with the requirements of the NSW INP.

During construction ARTC and QR National commits to participate in regular coordination meetings with QR National to review potential simultaneous construction works, potential off site construction noise and vibration impacts and, as required, construction noise and vibration management measures.

Construction noise and vibration management measures to address potential cumulative impacts will be referenced in the Construction Environmental Management Plans for each project.

10. Conclusion

Parsons Brinckerhoff has undertaken an assessment of potential noise and vibration impacts from the proposed Hexham Relief Roads Project.

Potential operational rail noise levels at project opening (2014) and for future (2024) rail movements are predicted to comply with the IGANRIP at the nearest residential receivers to the Proposed Project. Predicted noise impacts comply at nearest commercial and recreational land uses.

Existing rail noise levels are predicted to be reduced at a total of 7 residential receivers on Woodlands Close, Clark Street, Merchant Street and Fenwick Street. This is a positive outcome of the Proposed Project.

Day time and night time rail noise levels at project opening and for future operations have been predicted to trigger IGANRIP at the Church on Old Maitland Road. To achieve IGANRIP a 2 dB(A) L_{Aeq} reduction to day time and night time noise levels would be required.

Considerate of the required noise reduction, the intermittent occupancy of the Church and the isolation of the receiver; measures including rail noise barriers, reduction in operations and architectural treatment are not feasible or reasonable to mitigate noise levels.

During the construction phase potential construction noise impacts are predicted to trigger ICNG noise management levels at up to 6 of the 16 assessed residential receivers.

Where construction works are required during rail possession, noise impacts at 6 of the 16 assessed residential receivers are predicted to trigger night time noise management levels and may cause disturbance to occupants.

Ground vibration impacts are expected to be within recommended goals to minimise potential disturbance and structural (cosmetic) damage at all receivers where vibration management measures such as safe working distances are implemented.

It is recommended a CEMP is implemented throughout the construction programme. The management plan will include measures to reduce and control potential construction noise including, the application of low noise plant, increasing separation distance to nearest receivers and limiting the simultaneous operation of noise generating plant.

Potential road traffic noise from the construction and operational phases of the Proposed Project are predicted to comply with the ECRTN day time and night time road traffic noise goals at nearest residences.

11. References

Australian Standard AS2107: *Acoustics – Recommended Design Sound Levels and Reverberation Time for Building Interiors* (2000, AS 2107)

Office of Environment and Heritage (formerly DECCW), 2007, *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects*.

Office of Environment and Heritage (formerly EPA) 1999, *Environmental Criteria for Road Traffic Noise*

Office of Environment and Heritage (formerly DECCW), 2009, *Interim Construction Noise Guidelines*.

Office of Environment and Heritage (formerly DECCW), 2006, *Environmental Noise Management Assessing Vibration: a technical guideline*.

Office of Environment and Heritage (formerly EPA), 2000, *Industrial Noise Policy*.

SLR Consulting Australia Pty Ltd, 2011, 30-1858-R2, Revision 1, *Hexham Redevelopment Project Incorporating a Train Support Facility, Industrial Subdivision and Intermodal Facility*

12. Limitations

12.1 Scope of services and reliance of data

This noise impact study ('the study') has been prepared in accordance with the scope of work/services set out in the contract, or as otherwise agreed, between Parsons Brinckerhoff and the Client. In preparing this noise impact study, Parsons Brinckerhoff has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the noise impact study ('the data'). Except as otherwise stated in the noise impact study, Parsons Brinckerhoff has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this noise impact study ('conclusions') are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Parsons Brinckerhoff will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Parsons Brinckerhoff.

12.2 Study for benefit of client

This noise impact study has been prepared for the exclusive benefit of the Client and no other party. Parsons Brinckerhoff assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with in this noise impact study, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in this noise impact study (including without limitation matters arising from any negligent act or omission of Parsons Brinckerhoff or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in this noise impact study). Other parties should not rely upon the noise impact study or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

12.3 Other limitations

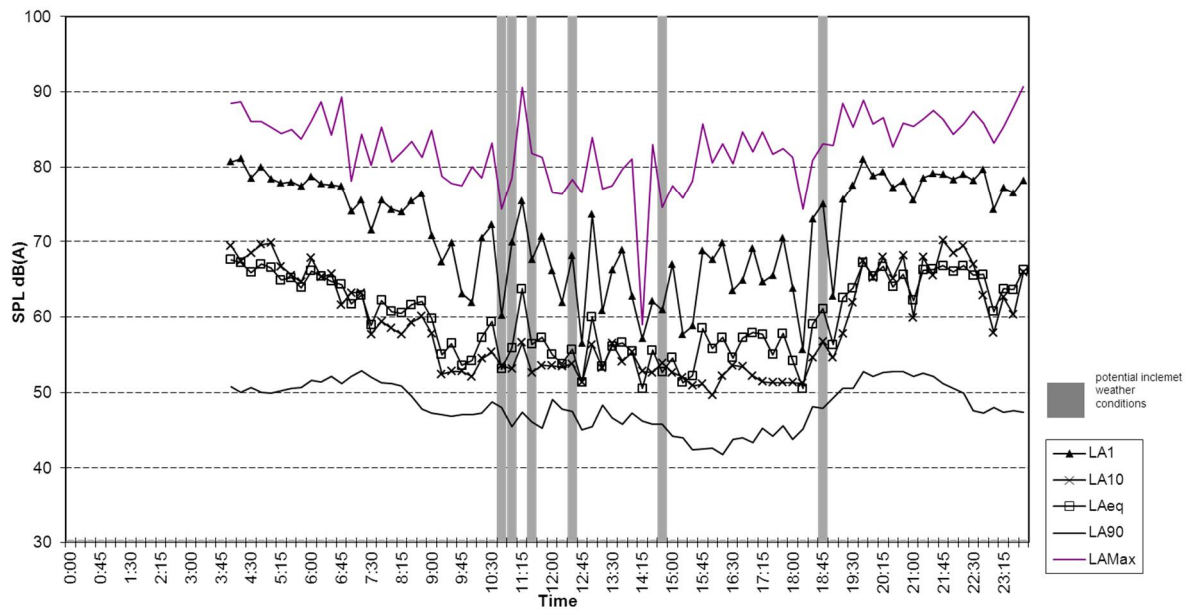
To the best of Parsons Brinckerhoff's knowledge, the Proposed Project presented and the facts and matters described in this noise impact study reasonably represent the Client's intentions at the time of printing of the noise impact study. However, the passage of time, the manifestation of latent conditions or the impact of future events (including a change in applicable law) may have resulted in a variation of the Proposed Project and of its possible noise impact.

Parsons Brinckerhoff will not be liable to update or revise the noise impact study to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the noise impact study.

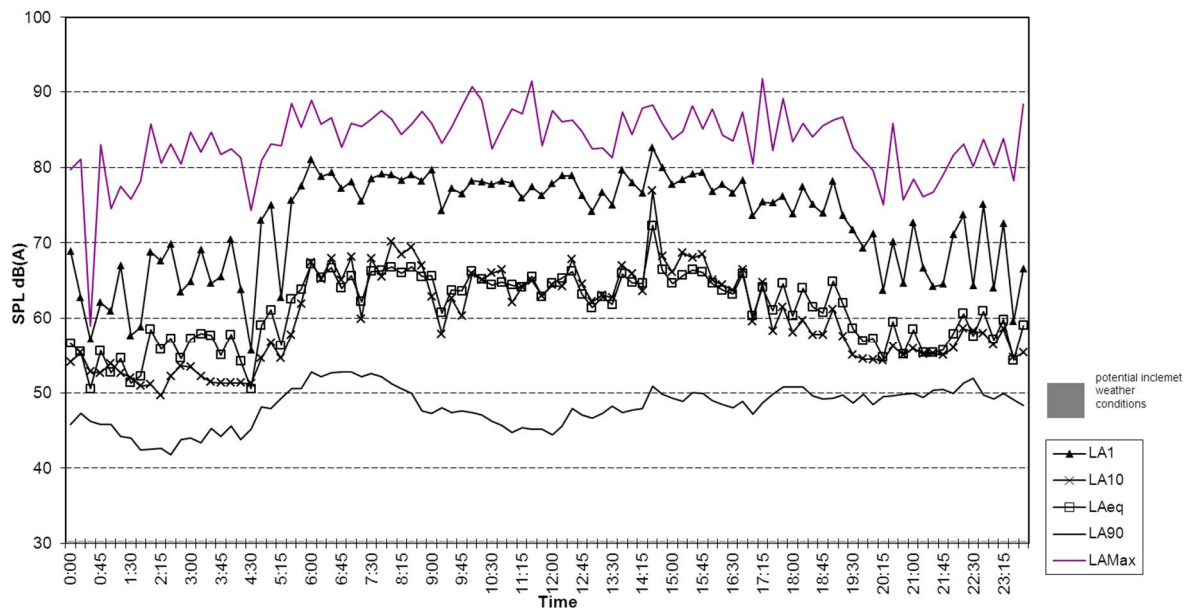
Appendix A

Baseline noise levels

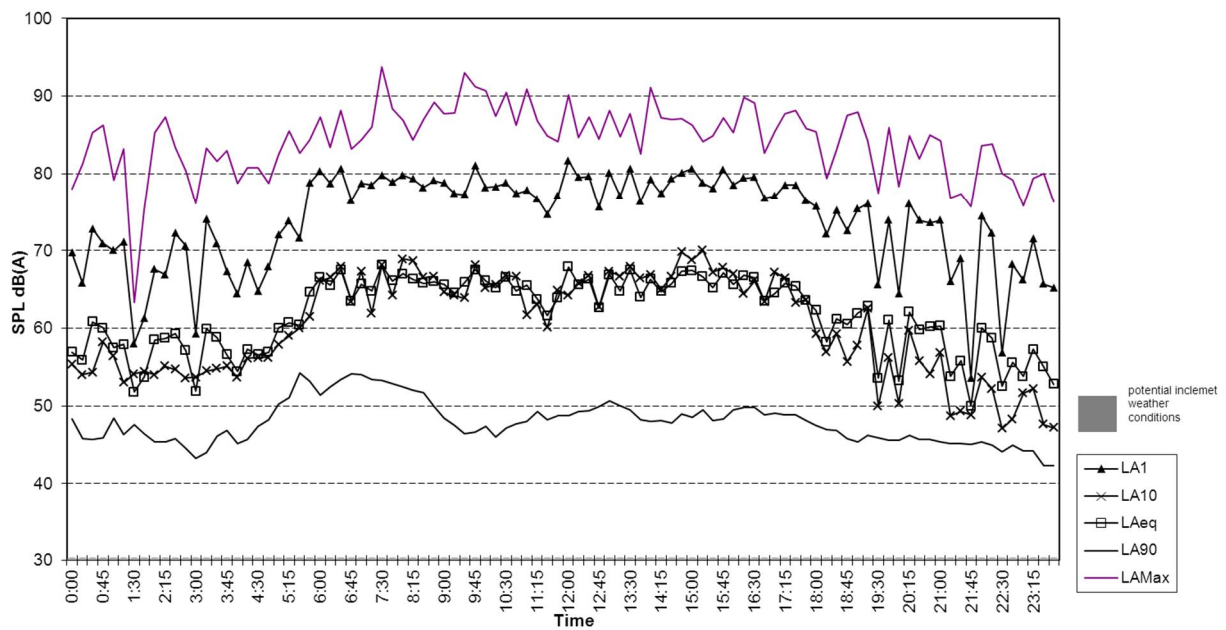
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Measured Noise Levels - Monday 15/08/2011



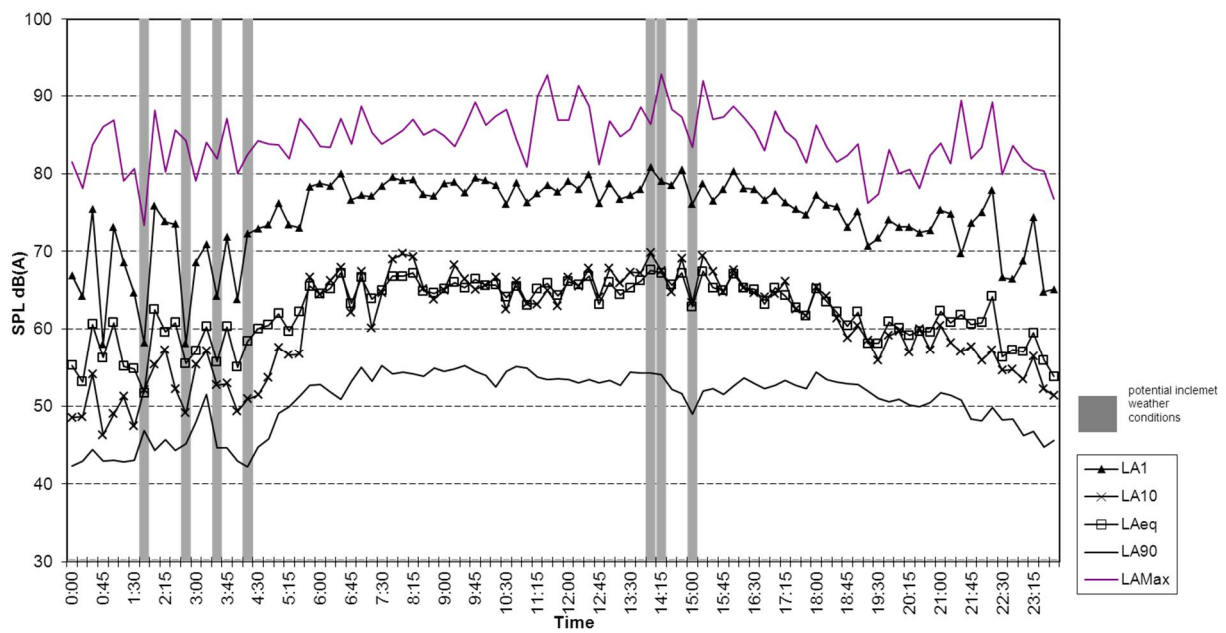
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Measured Noise Levels - Tuesday 16/08/2011



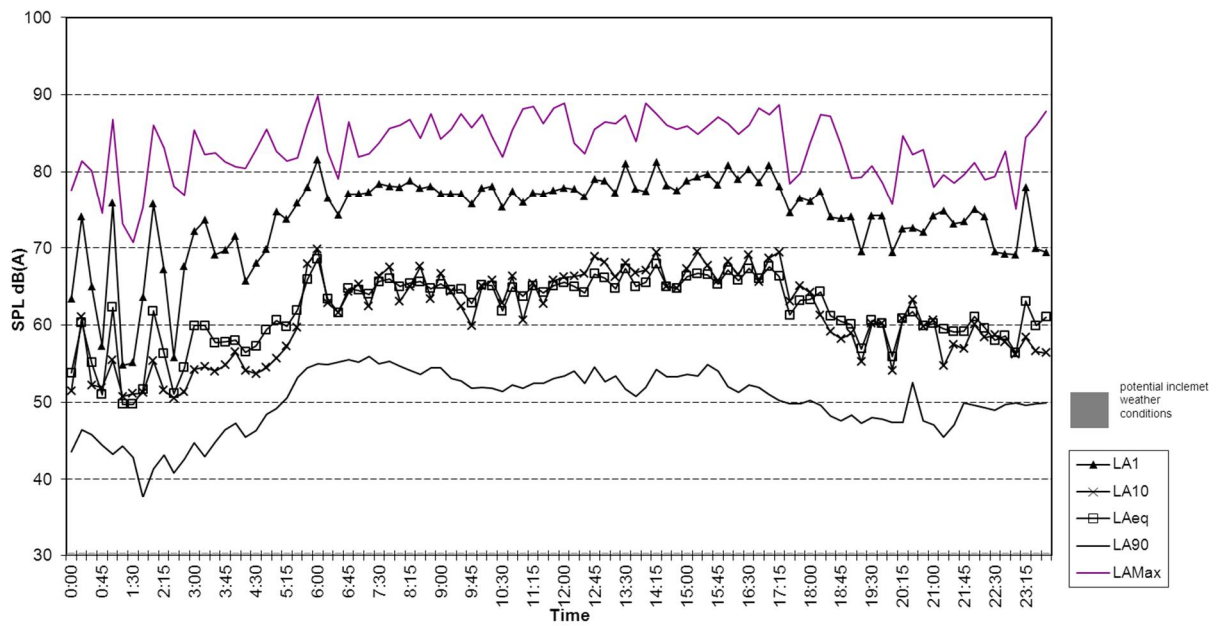
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Measured Noise Levels - Wednesday 17/08/2011



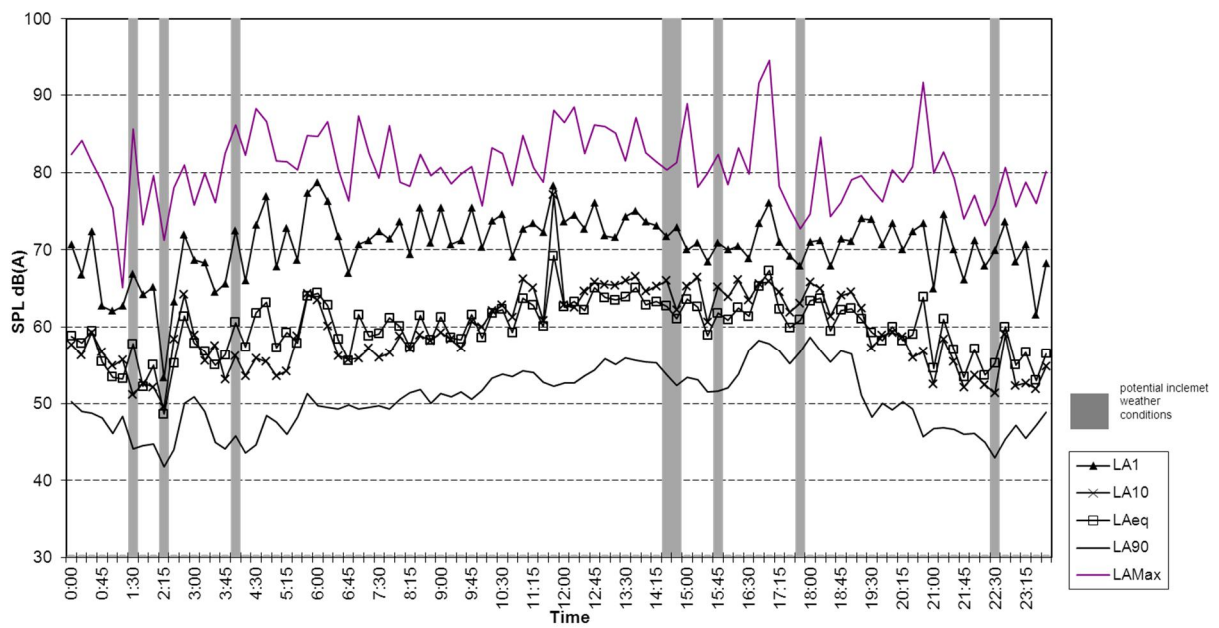
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Measured Noise Levels - Thursday 18/08/2011



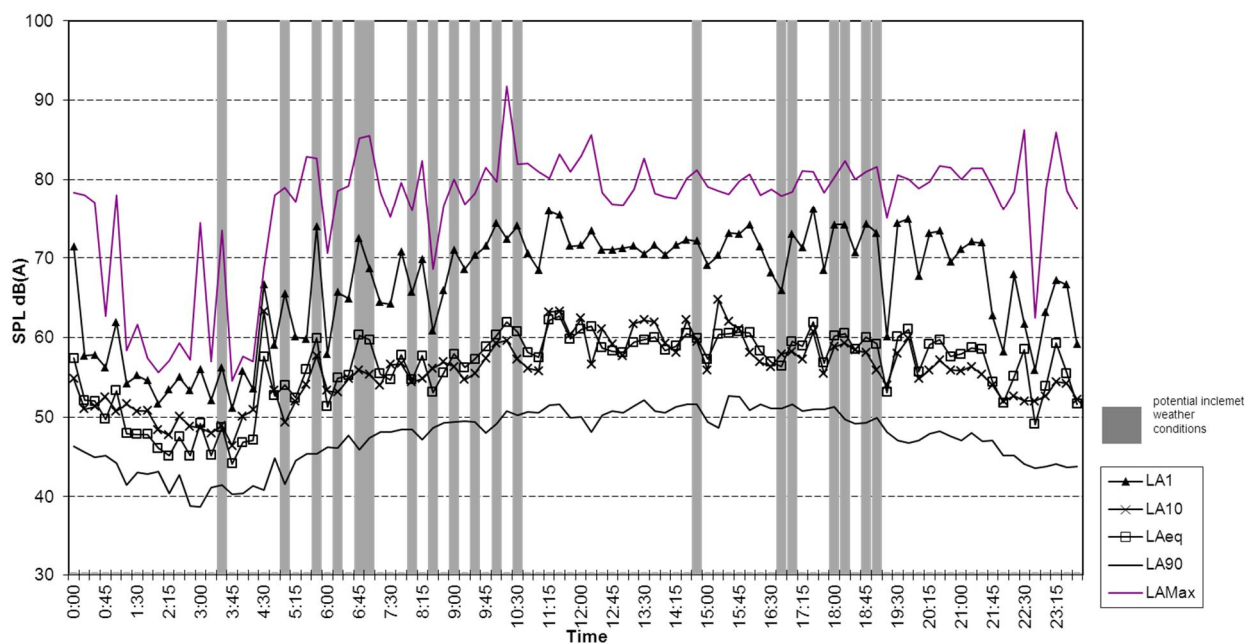
Location A - 65 Old Maitland Road, Hexham
Measured Noise Levels - Friday 19/08/2011



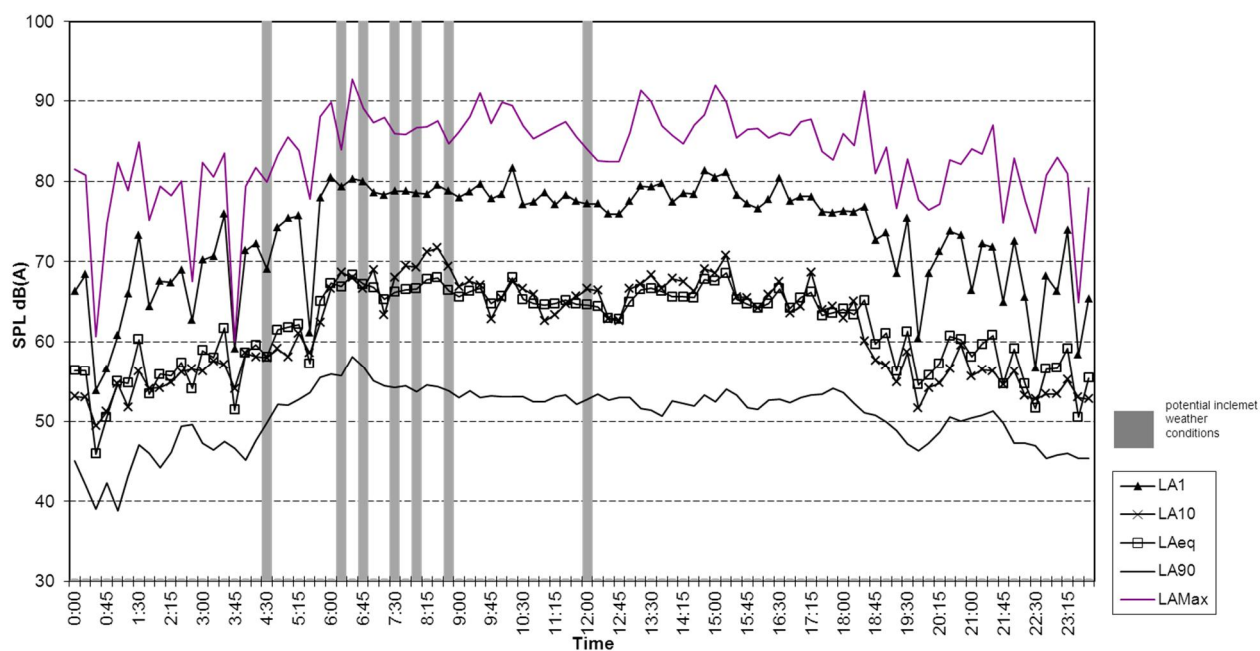
Location A - 65 Old Maitland Road, Hexham
Measured Noise Levels - Saturday 20/08/2011



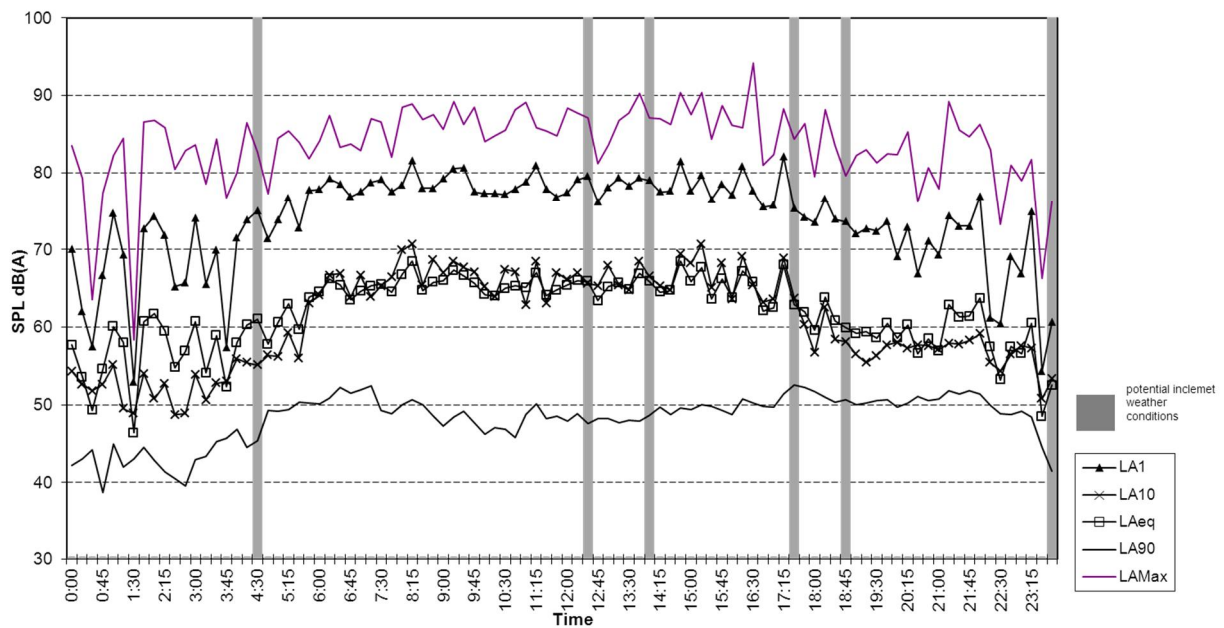
Location A - 65 Old Maitland Road, Hexham
Measured Noise Levels - Sunday 21/08/2011



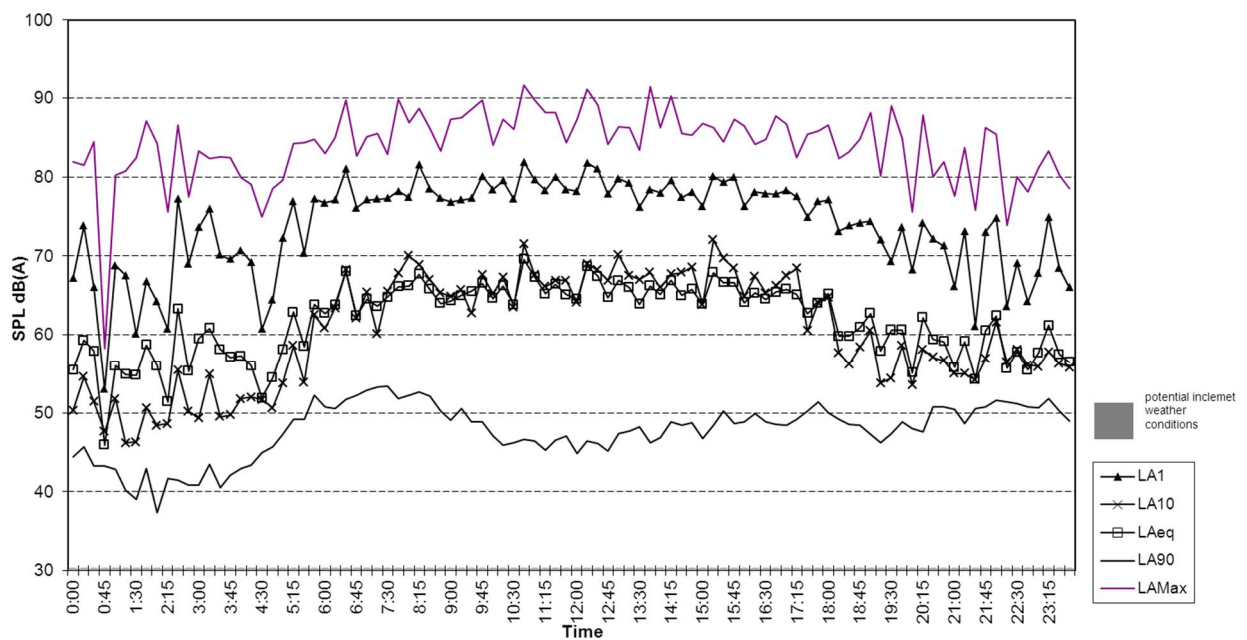
Location A - 65 Old Maitland Road, Hexham
Measured Noise Levels - Monday 22/08/2011



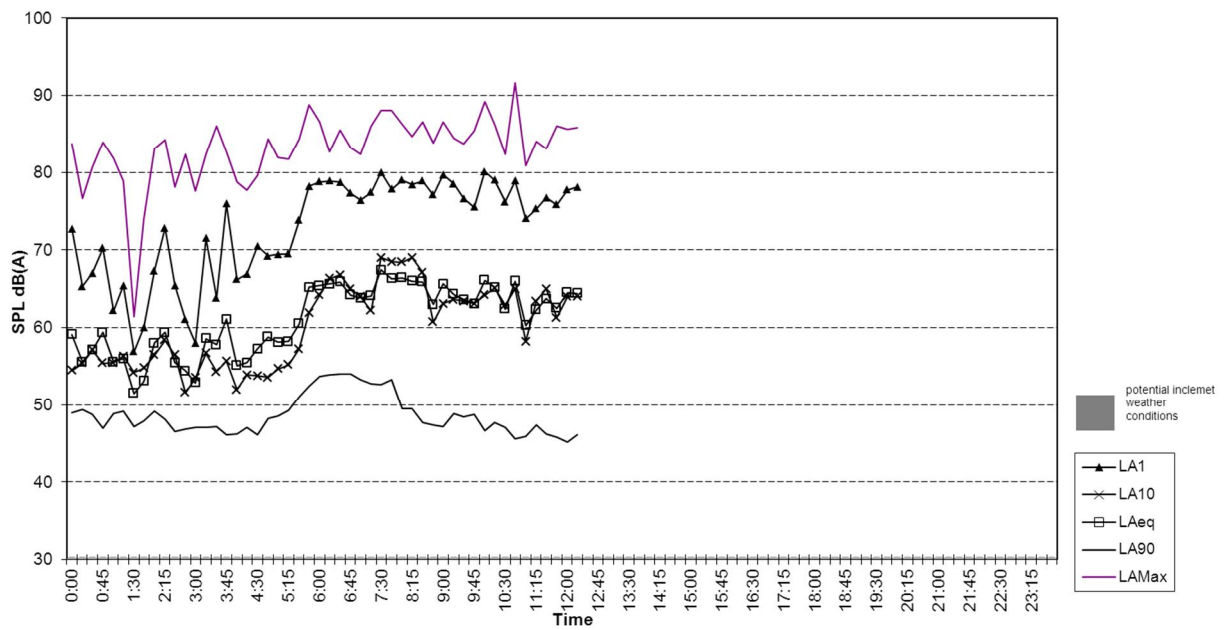
Location A - 65 Old Maitland Road, Hexham
Measured Noise Levels - Tuesday 23/08/2011



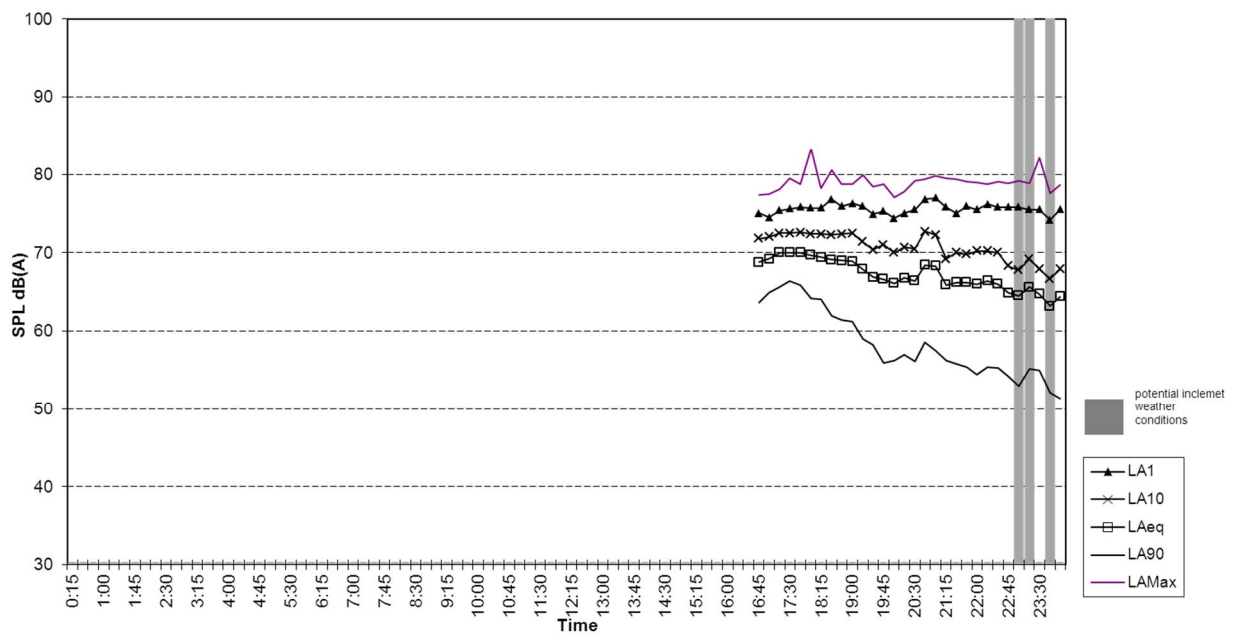
Location A - 65 Old Maitland Road, Hexham
Measured Noise Levels - Wednesday 24/08/2011



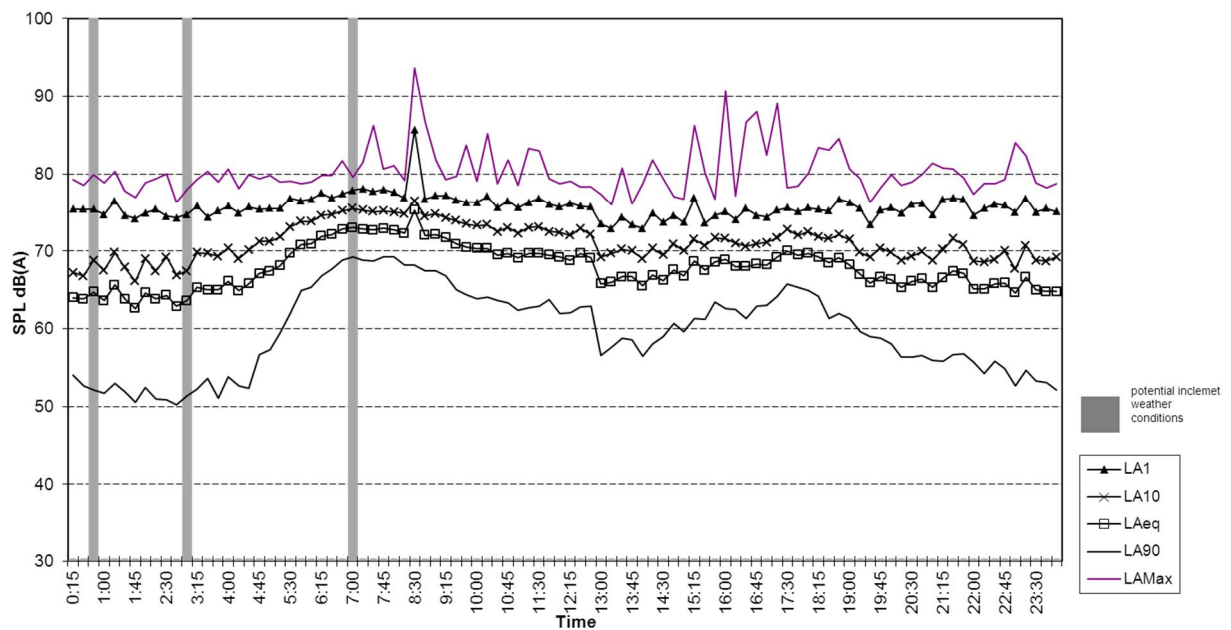
Location A - 65 Old Maitland Road, Hexham
Measured Noise Levels - Thursday 25/08/2011



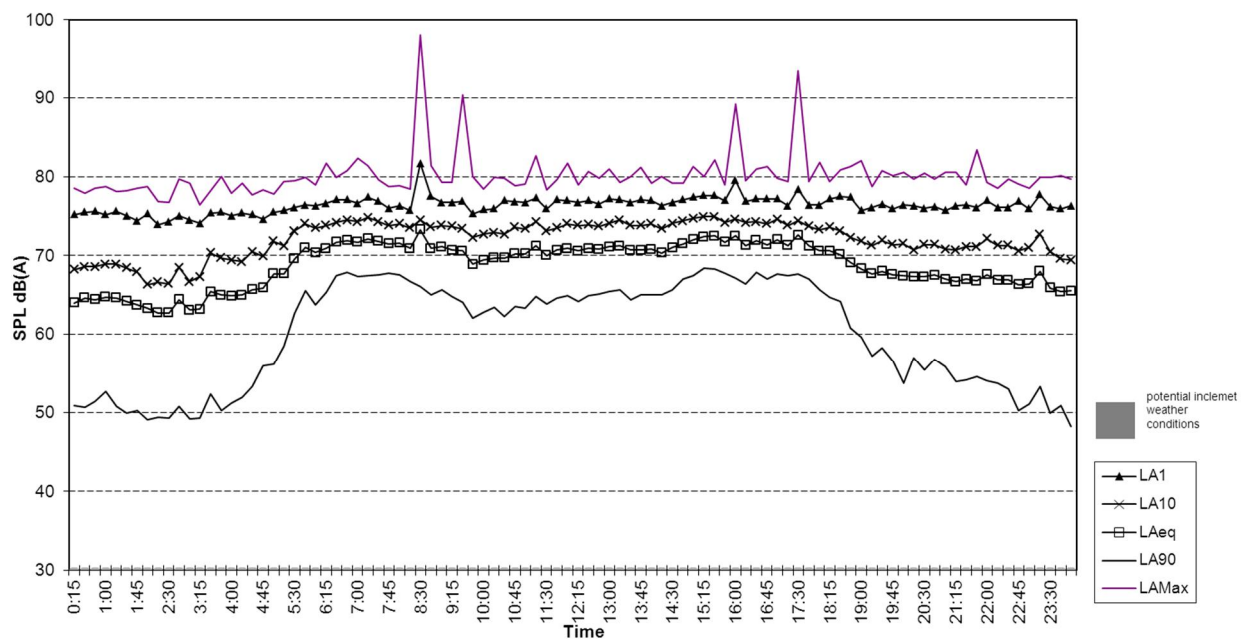
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Monday 15/08/2011



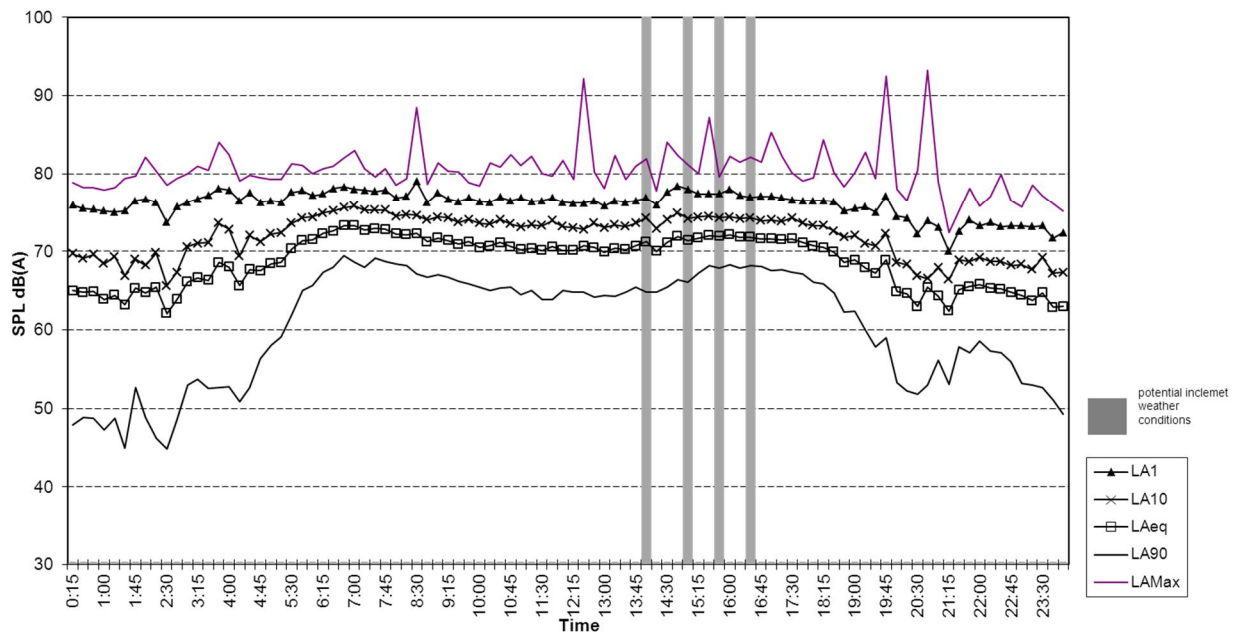
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Tuesday 16/08/2011



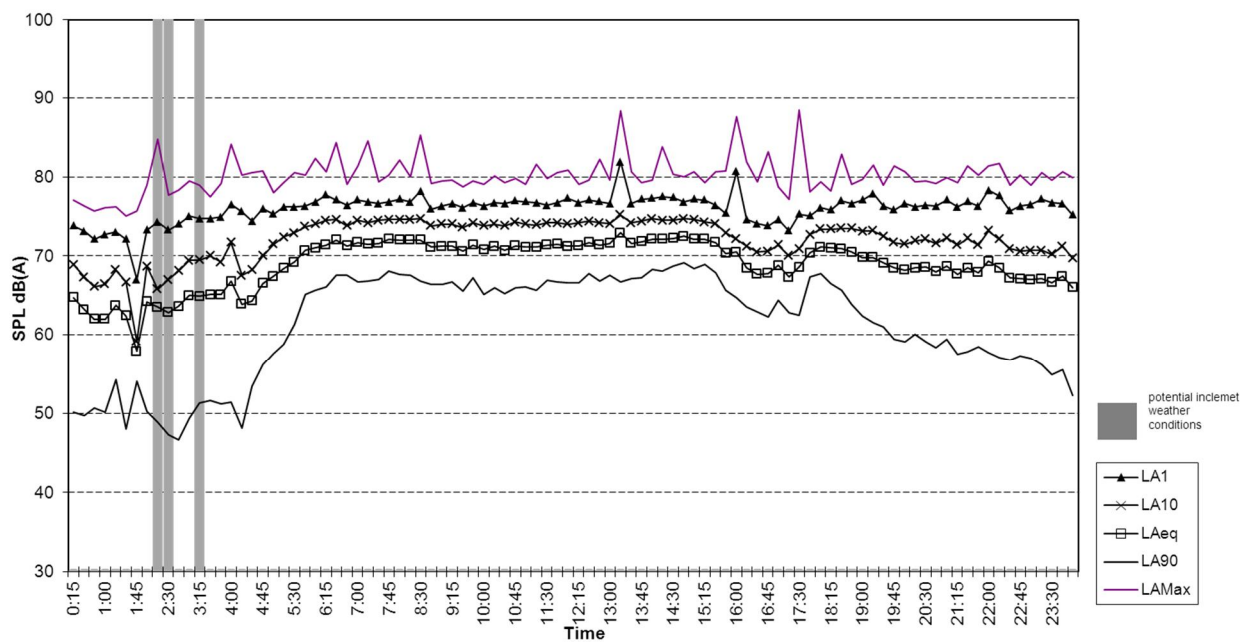
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Wednesday 17/08/2011



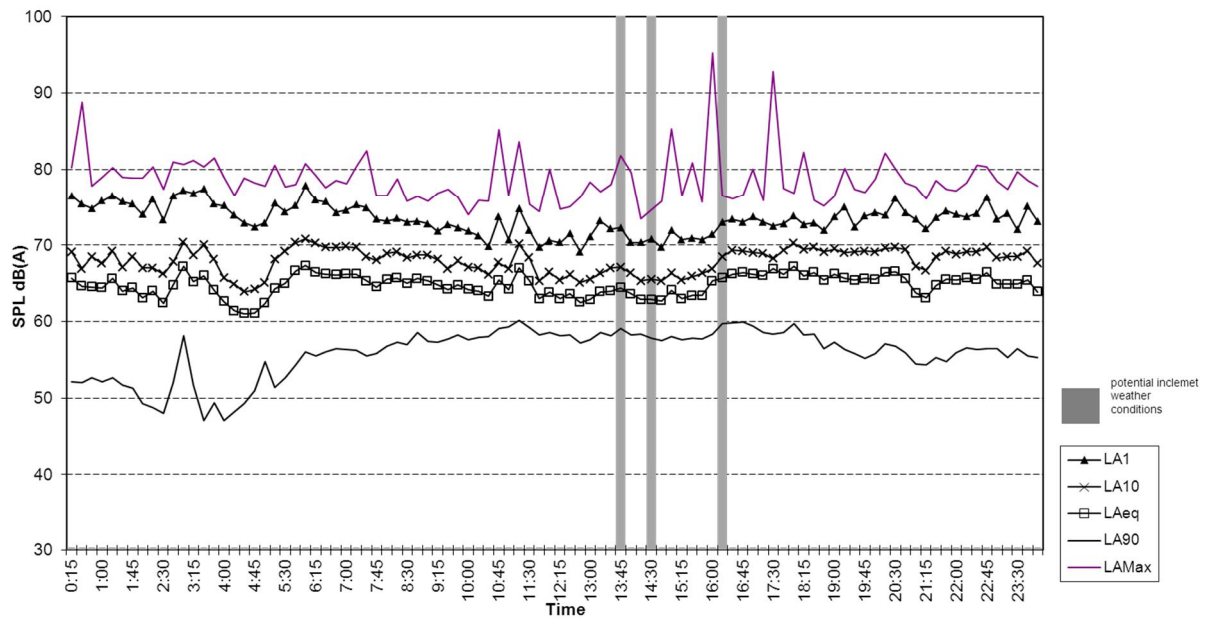
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Thursday 18/08/2011



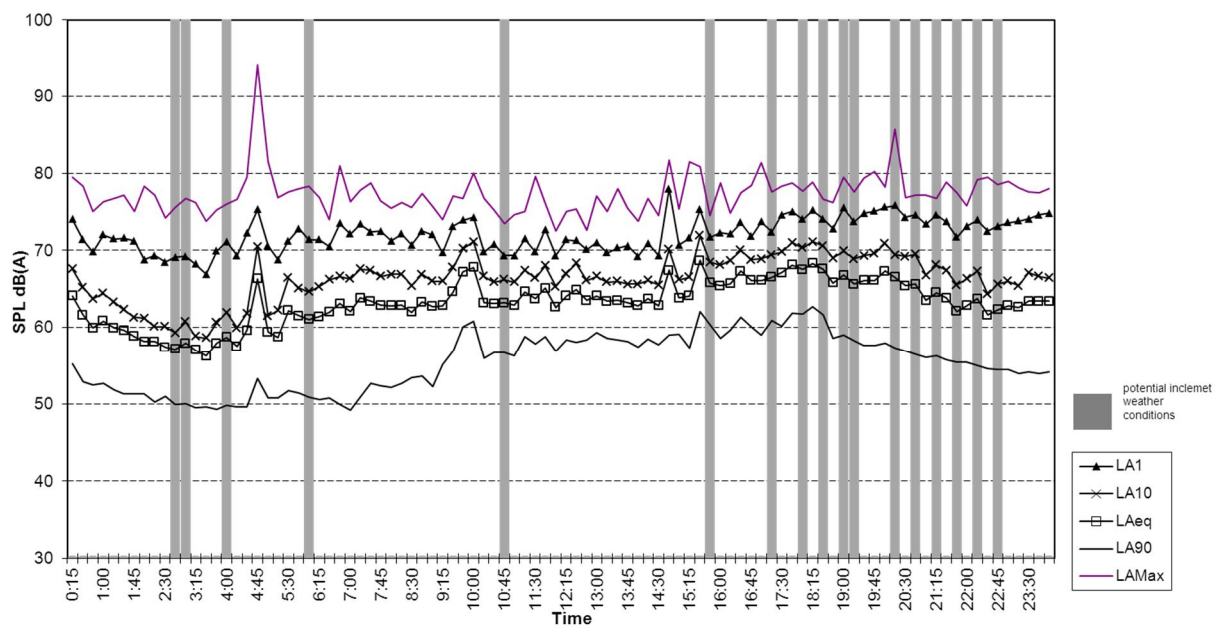
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Friday 19/08/2011



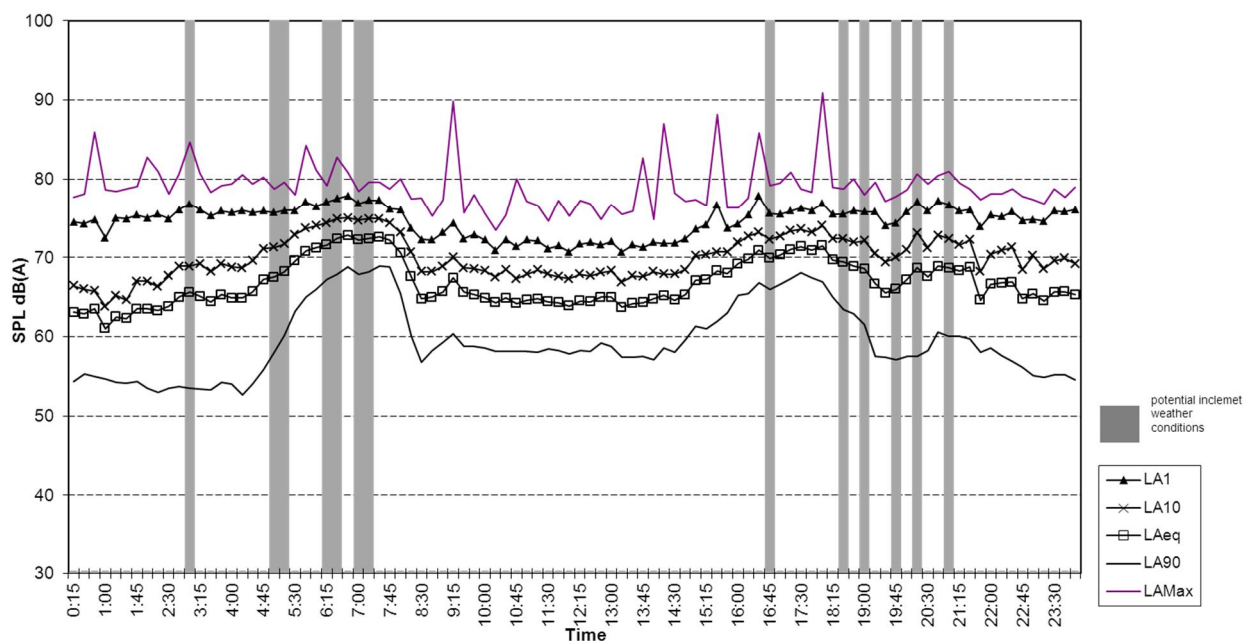
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Saturday 20/08/2011



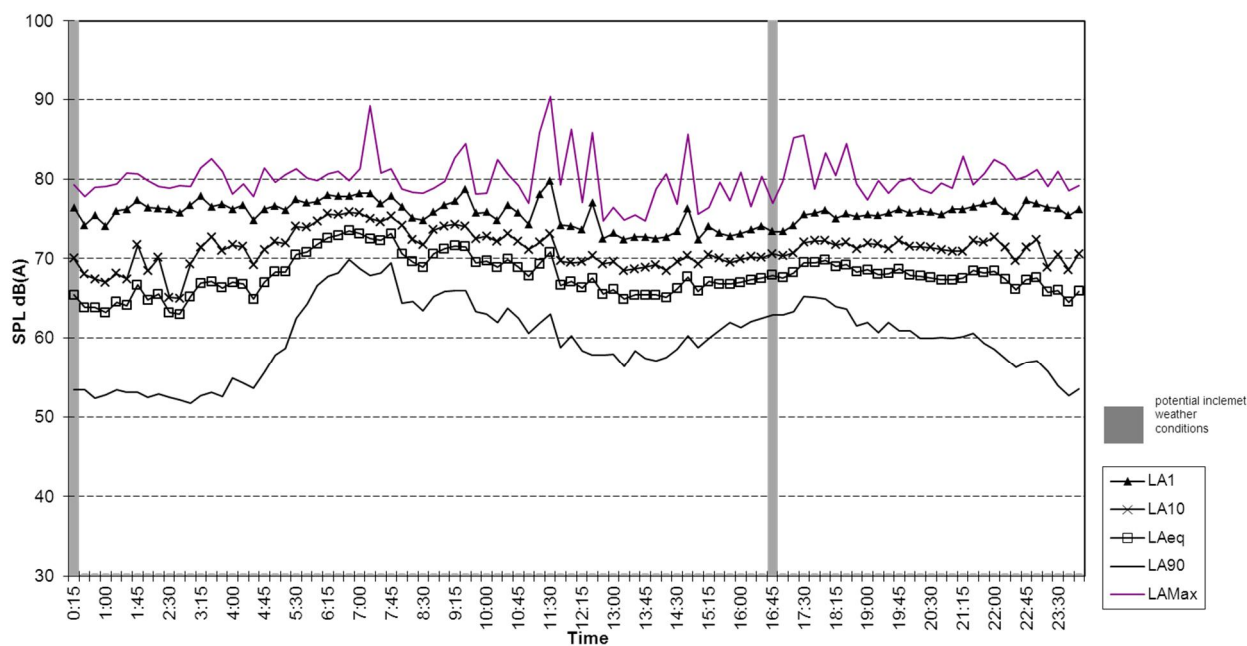
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Sunday 21/08/2011



Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Monday 22/08/2011



Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Tuesday 23/08/2011



Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Wednesday 24/08/2011



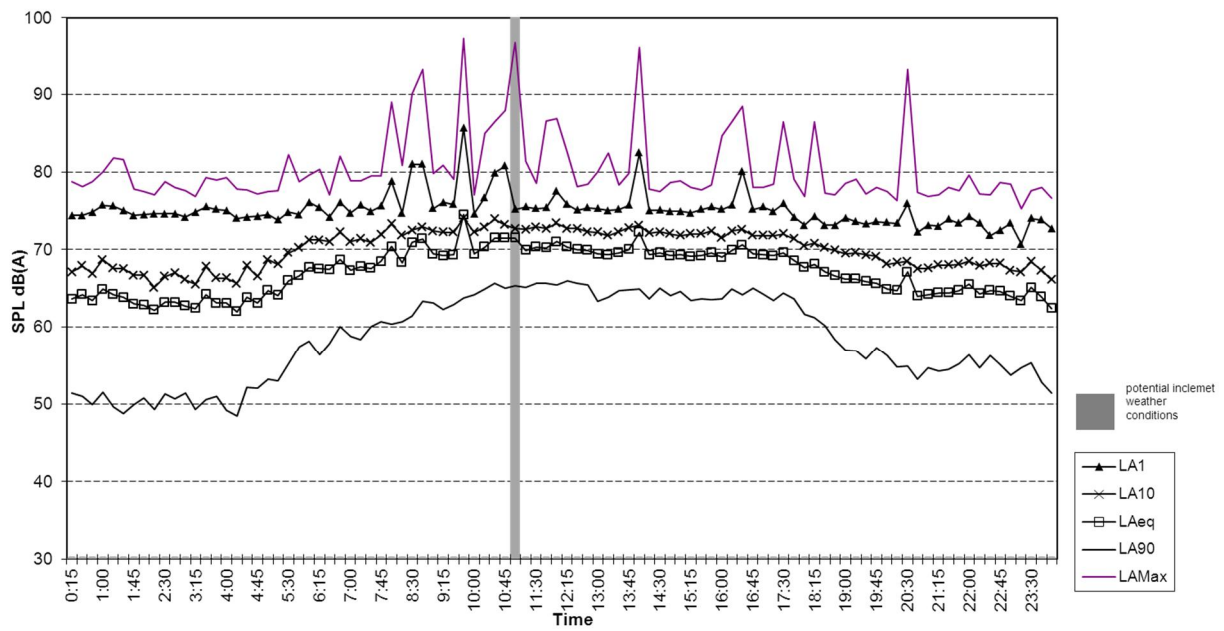
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Thursday 25/08/2011



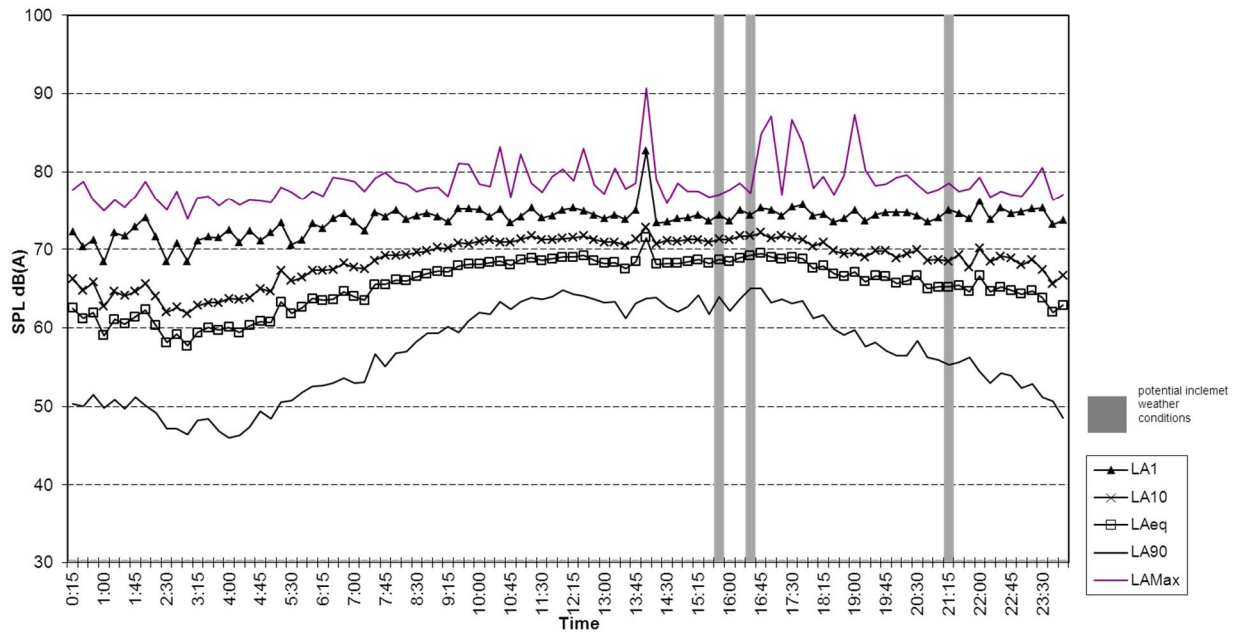
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Friday 26/08/2011



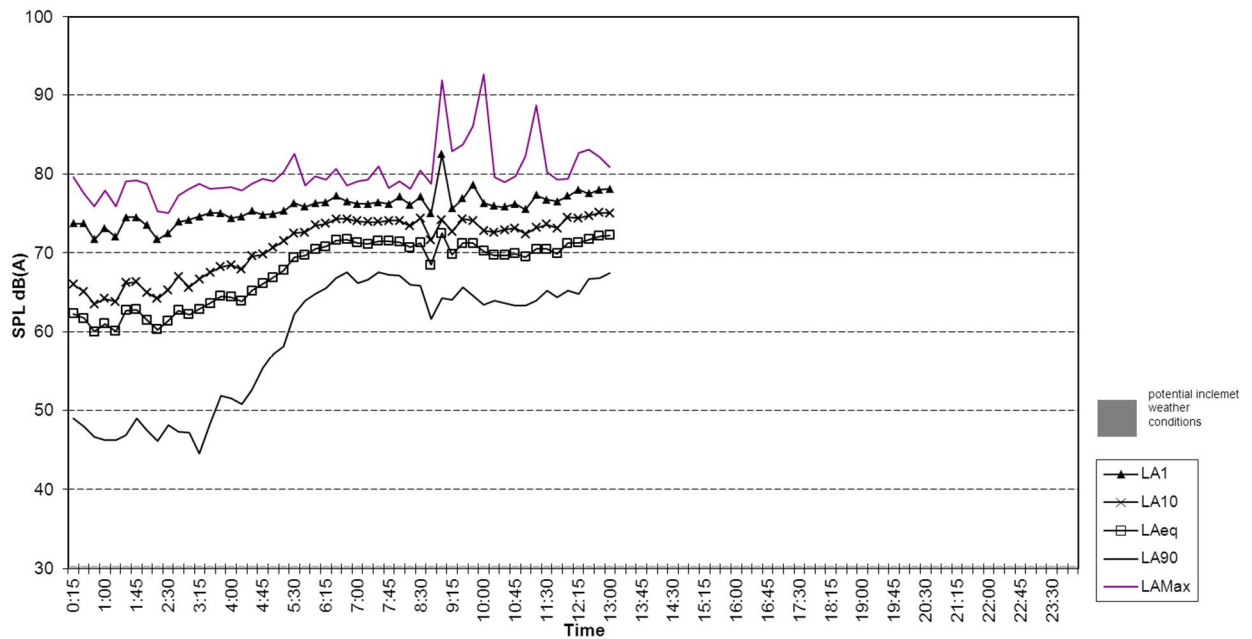
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Saturday 27/08/2011



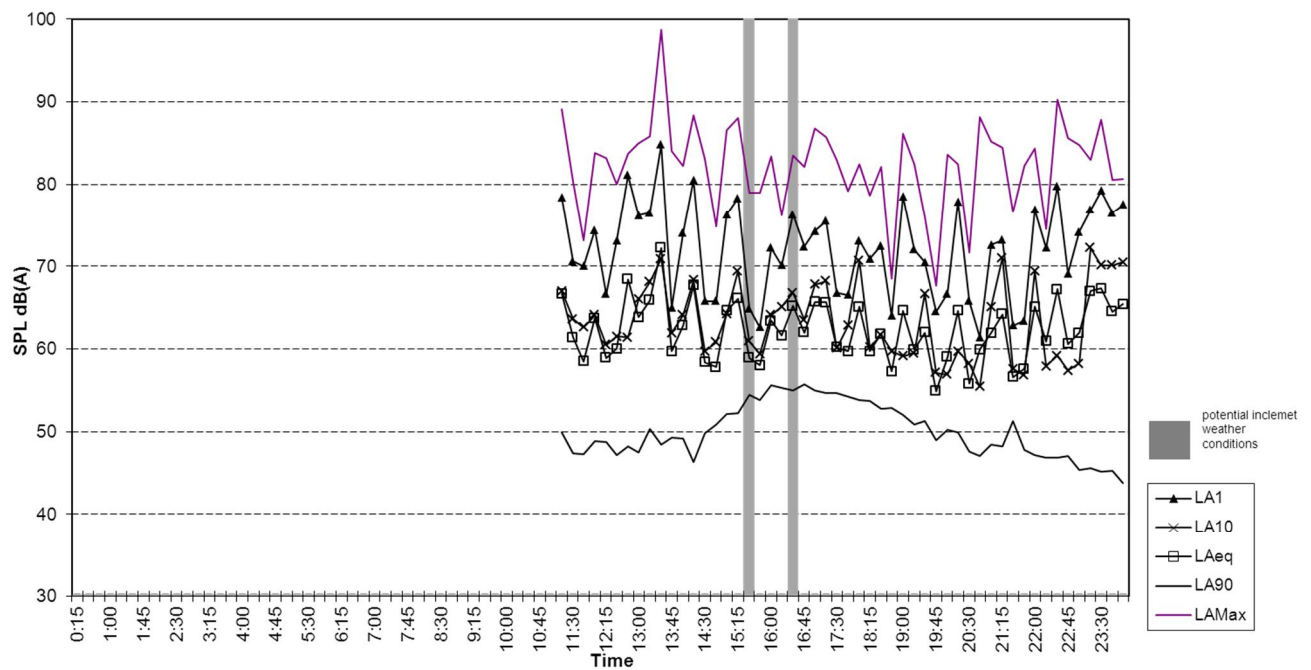
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Sunday 28/08/2011



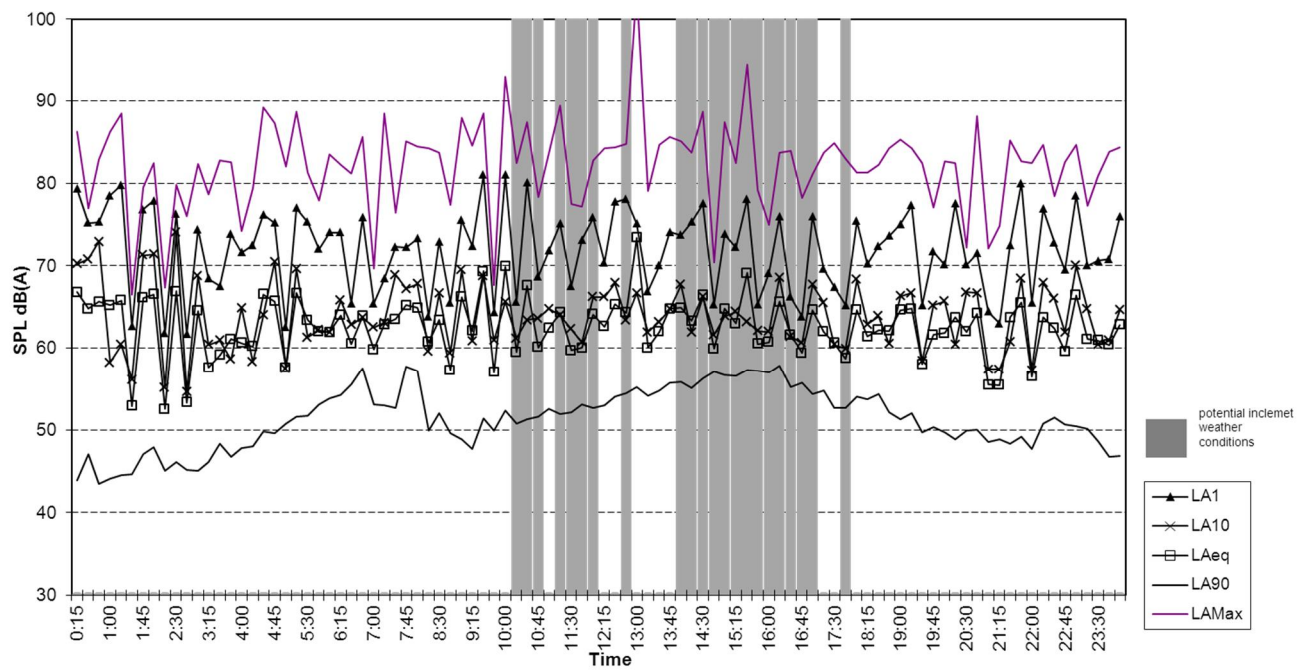
Location B - 1 Woodlands Close, Hexham
Measured Noise Levels - Monday 29/08/2011



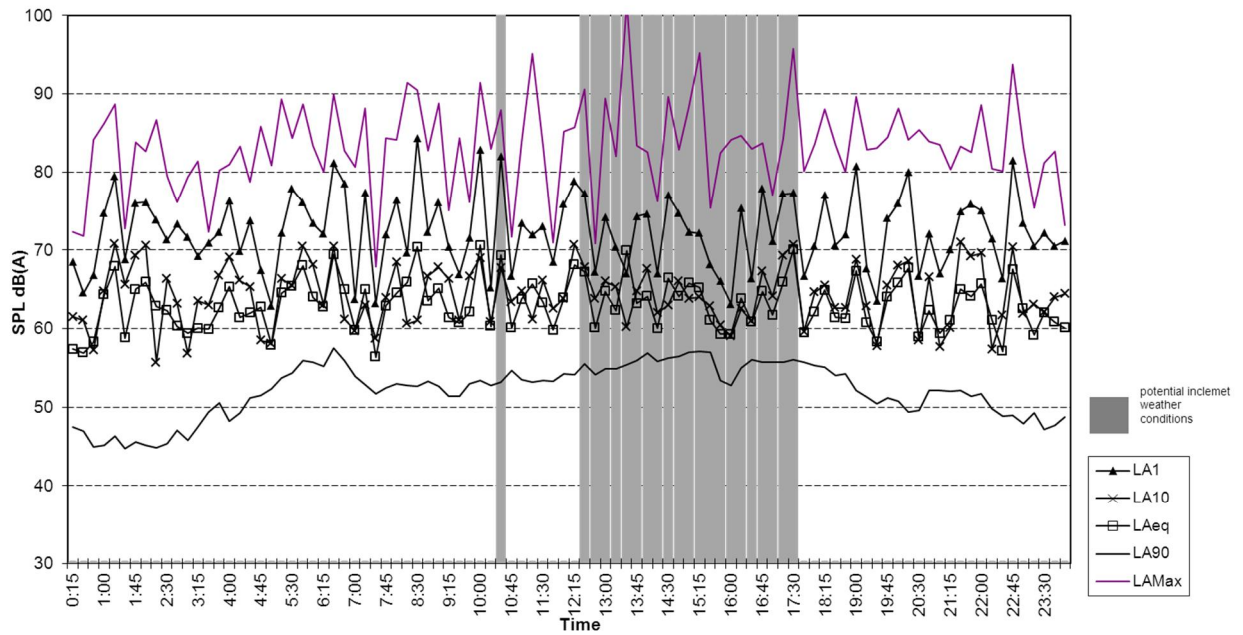
Location C Clark Street , Hexham
Measured Noise Levels - Tuesday 03/04/2012



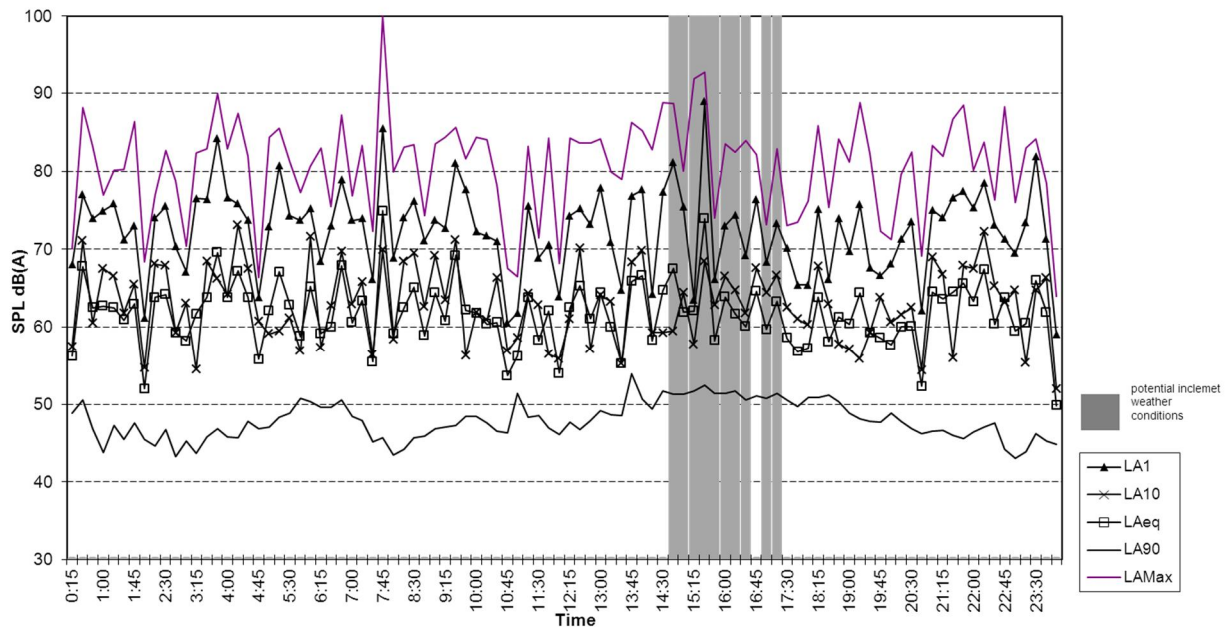
Location C Clark Street , Hexham
Measured Noise Levels - Wednesday 04/04/2012



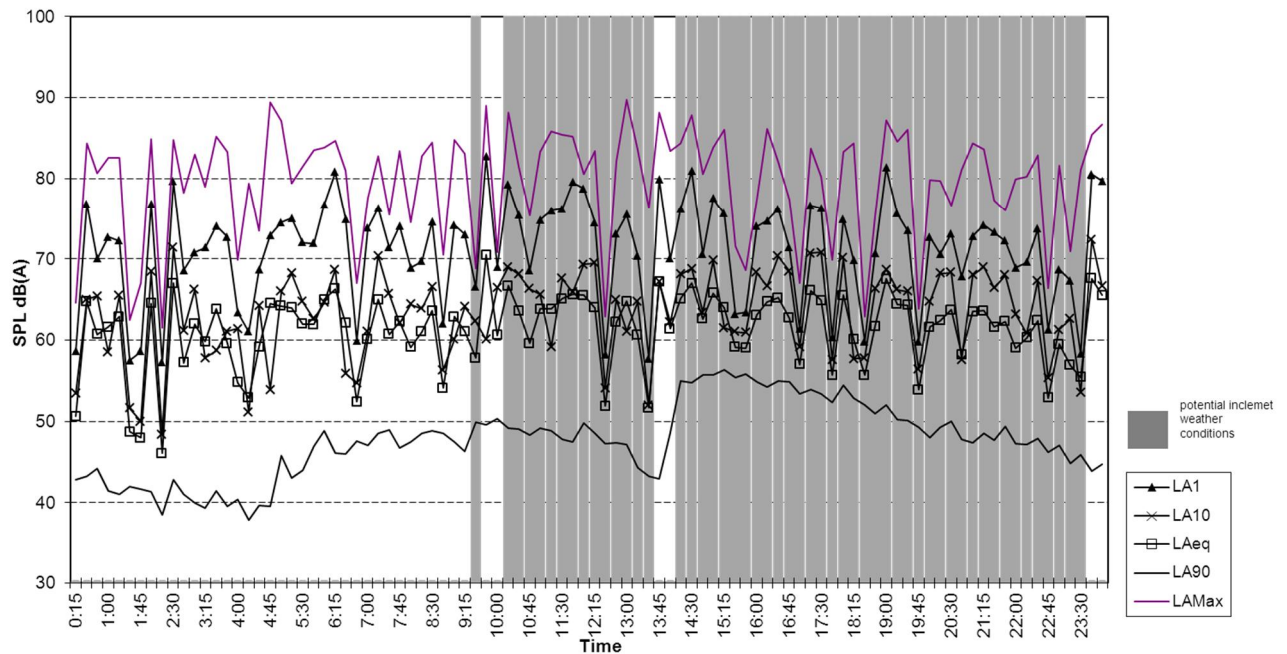
Location C Clark Street , Hexham
Measured Noise Levels - Thursday 05/04/2012



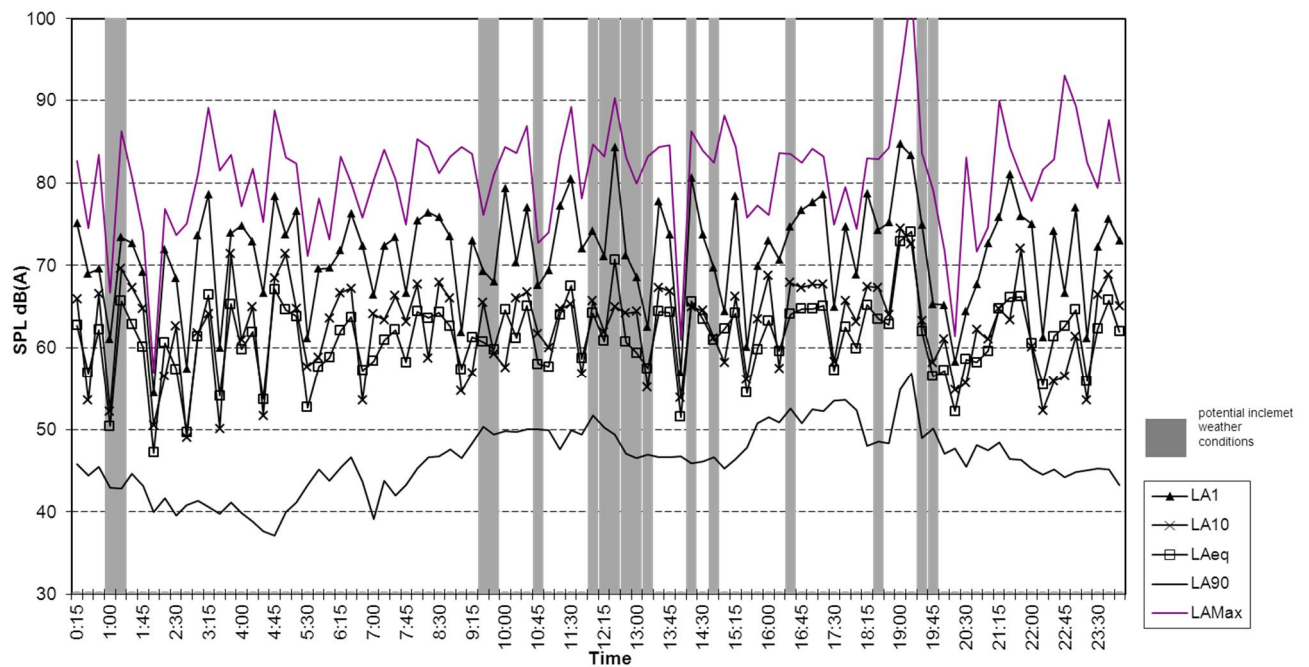
Location C Clark Street , Hexham
Measured Noise Levels - Friday 06/04/2012



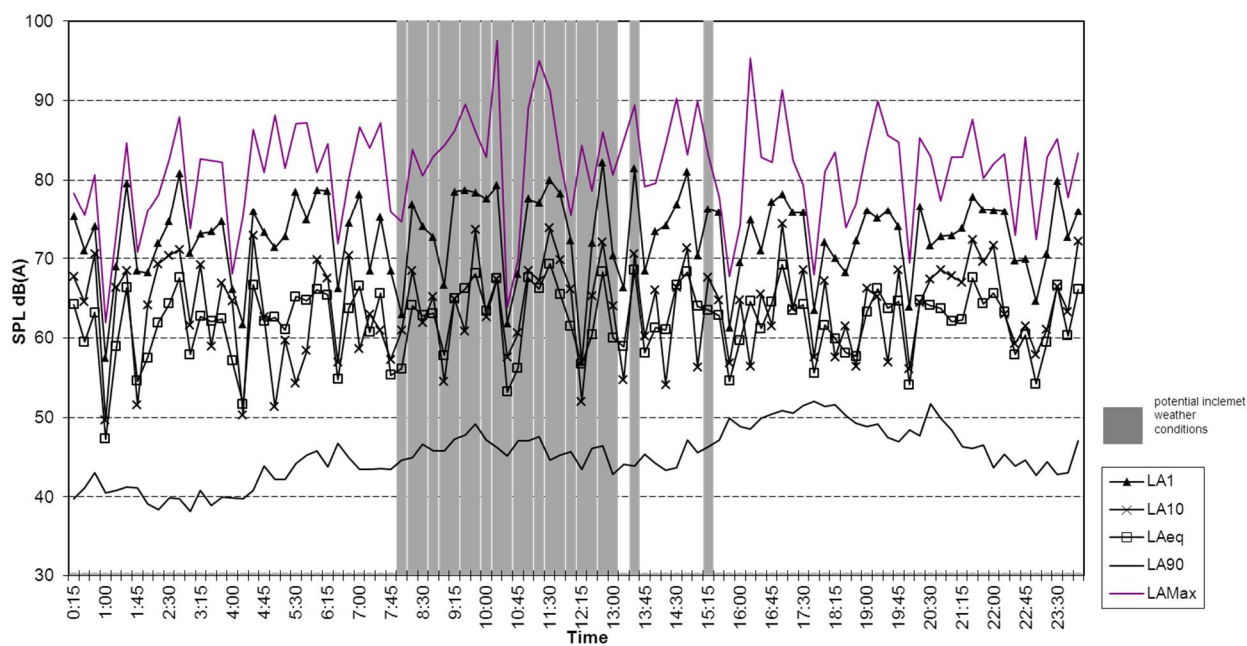
Location C Clark Street , Hexham
Measured Noise Levels - Saturday 07/04/2012



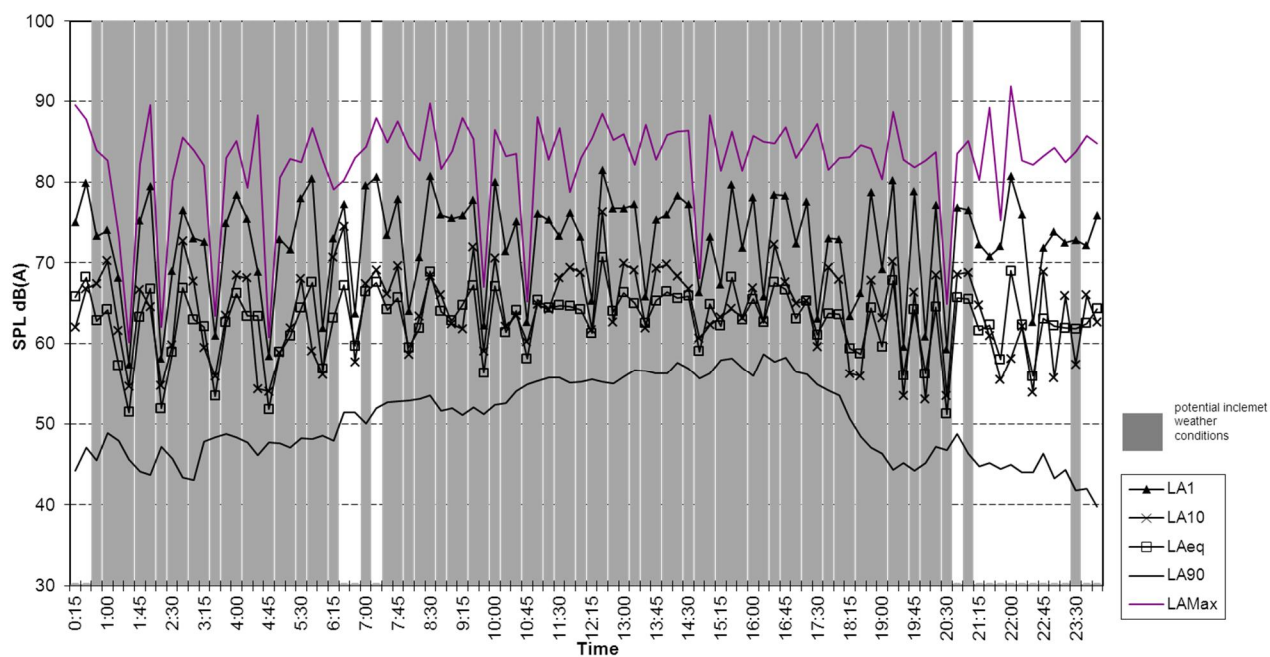
Location C Clark Street , Hexham
Measured Noise Levels - Sunday 08/04/2012



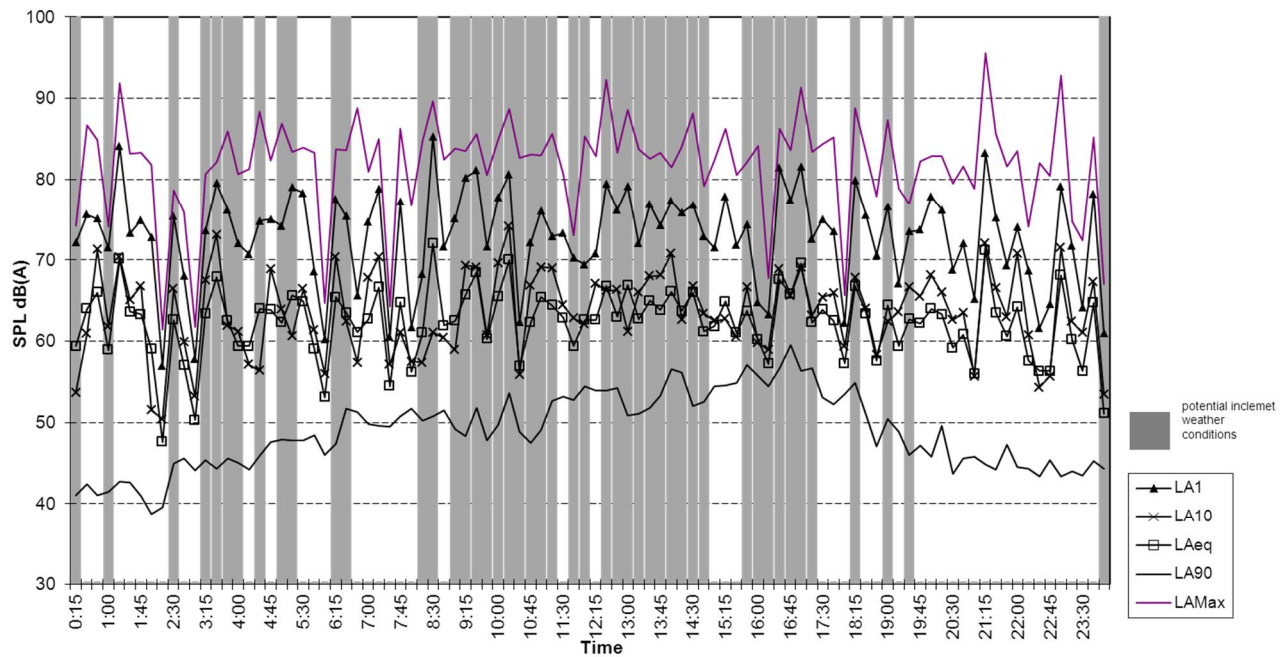
Location C Clark Street, Hexham
Measured Noise Levels - Monday 09/04/2012



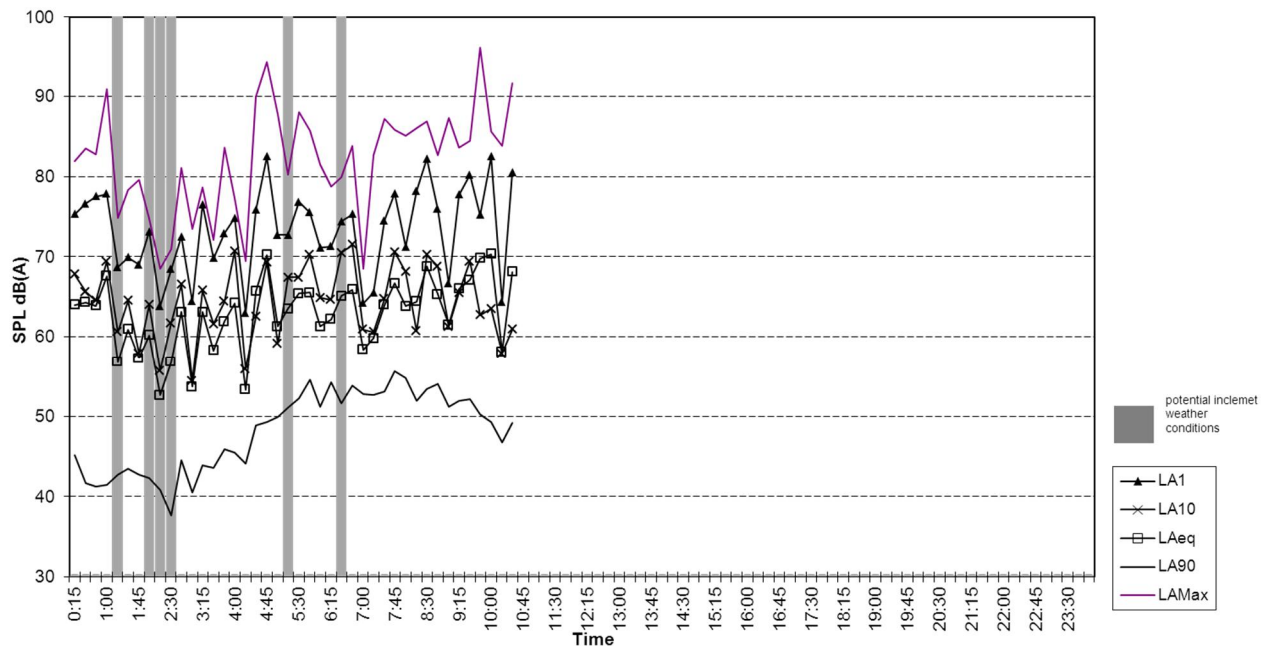
Location C Clark Street, Hexham
Measured Noise Levels - Tuesday 10/04/2012



Location C Clark Street , Hexham
Measured Noise Levels - Wednesday 11/04/2012



Location C Clark Street , Hexham
Measured Noise Levels - Thursday 12/04/2012



Appendix B

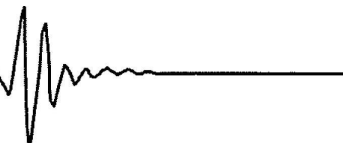
Calibration certification

Acoustic Research Laboratories

Proprietary Limited

A.B.N. 47 050 100 804

Noise and Vibration Monitoring Instrumentation for Industry and the Environment



Sound Level Meter Test Report

Report Number : C11407

Date of Test : 29/07/2011

Report Issue Date : 29/07/2011

Equipment Tested/ Model Number: Rion NA-27 Sound Level Meter

Instrument Serial Number: 10552408

Microphone Serial Number: 307952

Preamplifier Serial Number: 46324

Client Name : Parsons Brinckerhoff

Level 27 Ernst & Young Centre, 680 George
Street

Sydney NSW 2000

Contact Name : Raymond Sim

Tested by : Adrian Walker

Approved Signatory :

Date : 29/07/2011



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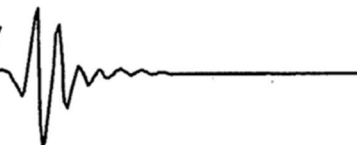
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Acoustic Research Laboratories

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Noise and Vibration Monitoring Instrumentation for Industry and the Environment



Sound Level Meter Test Report

Report Number : C11323

Date of Test : 21/07/2011

Report Issue Date : 25/07/2011

Equipment Tested/ Model Number: EL-316 Environmental Noise Logger

Instrument Serial Number: 16-004-003

Microphone Serial Number: 306950

Preamplifier Serial Number: 27105

Client Name : Parsons Brinckerhoff

Level 27, Ernst & Young Centre 680 George
Street

Sydney NSW 2000

Contact Name : Vesna Vasiloska

Tested by : Adrian Walker

Approved Signatory :

Date : 25/07/2011



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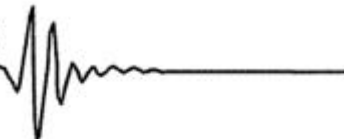
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Noise and Vibration Monitoring Instrumentation for Industry and the Environment



Sound Level Meter Test Report

Report Number : C11194

Date of Test : 04/05/2011

Report Issue Date : 04/05/2011

Equipment Tested/ Model Number: Ngara S-Pack Sound Acquisition System

Instrument Serial Number: 878043

Microphone Serial Number: 318315

Preamplifier Serial Number: 27770

Client Name : Parsons Brinckerhoff

Level 27, Ernst & Young Centre, 680 George Street

Sydney NSW 2000

Contact Name : Vesna Cokleska

Tested by : Aaron Skeates-Udy

Approved Signatory : 

Date : 4 May 2011



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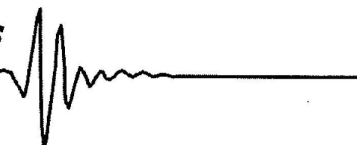
www.acousticresearch.com.au

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A.B.N. 47 050 100 804

Noise and Vibration Monitoring Instrumentation for Industry and the Environment



Sound Level Meter Test Report

Report Number : C11196

Date of Test : 03/05/2011

Report Issue Date : 04/05/2011

Equipment Tested/ Model Number: EL-316 Environmental Noise Logger

Instrument Serial Number: 16-207-009

Microphone Serial Number: 312584

Preamplifier Serial Number: 27472

Client Name : Parsons Brinckerhoff

Level 27, Ernst & Young Centre, 680 George
Street

Sydney NSW 2000

Contact Name : Vesna Cokleska

Tested by : Aaron Skeates-Udy

Approved Signatory :

Date : 4 May 2011



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