

SITA ADVANCED WASTE TREATMENT
FACILITY AT ELIZABETH DRIVE
NOISE ASSESSMENT

ACOUSTICS AND AIR

REPORT NO. 04092
VERSION J

WILKINSON  MURRAY

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PREPARED FOR

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ABBREVIATIONS & GLOSSARY

ABL	The Assessment Background Level is the single figure background level representing each assessment period (day, evening and night) for each day. It is determined by calculating the 10 th percentile (lowest 10 th percent) background level (L_{A90}) for each period.
CoRTN	Calculation of Road Traffic Noise, a methodology for predicting traffic noise by UK Department of Transport
dBA	A-weighted Decibels, also written as dB(A)
DEC-EPA	NSW Department of Environment & Conservation – Environmental Protection Authority
ECRTN	Environmental Criteria for Road Traffic Noise (DEC-EPA document)
ENM	Modelling software to predict operational noise. It is a point-to-point model that takes into account attenuation factors by using a number of assumptions.
ENCM	Environmental Noise Control Manual (DEC-EPA document)
INP	Industrial Noise Policy (DEC-EPA document)
L_{A1}	The noise level, which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.
L_{A10}	The noise level, which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time.
L_{Aeq}	The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise, which contains the same energy as the varying noise environment.
L_{A90}	The noise level, which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. Commonly referred to as the background noise level.
MSW	Municipal Solid Waste
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period, day, evening and night.
SAWT	SITA Advanced Waste Treatment
SPL	Sound Pressure Level, root mean square air pressure expressed as decibels relative to 10^{-6} Pa
SWL	Sound Power Level, intrinsic (independent of distance) parameter for noise sources

1 INTRODUCTION

SITA proposes to build a new development to be known as the SITA Advanced Waste Treatment (SAWT) facility, at its existing Landfill Site at Elizabeth Drive. This report has been prepared in accordance with the NSW Department of Environment & Conservation (DEC) documents, the *Industrial Noise Policy (INP)*, the *Environmental Criteria for Road Traffic Noise (ECRTN)*, and the *Environmental Noise Control Manual (ENCM)*.

This noise study forms part of the Environmental Impact Statement and supporting documents prepared for the development and in particular, for the following three purposes:

- Development Application;
- DEC-EPA Licence Application; and
- Rezoning Application

The assessment in this report is intended to cover all environmental noise aspects related to construction, operation and traffic of the proposed new facility. The approach also considers the cumulative noise from the existing (already approved) landfill operations.

To simplify the process as much as practicable, criteria have been set against which noise from the proposed SAWT can be assessed to determine any potential noise impacts.

Figure 1-1 Site Plan showing Residential Receivers



2 PROJECT DESCRIPTION

The SITA Advanced Waste Treatment (SAWT) facility is designed to have a two-shift operation design capacity of treating up to 120,000 tonnes per annum (tpa) of Mixed Solid Waste (which includes: municipal solid waste (MSW); commercial and industrial waste; and green waste) plus an additional 14,400 tpa of Biosolids.

It is envisaged that the SAWT facility may be developed in stages with the first stage operating at a minimum of half of the total two-shift capacity, and the later stages operating at up to the two-shift capacity. This staged approach will allow noise from the installed plant (while in actual operation) to be measured at the most affected residences during the initial stage. Refinements to the facility design can then be made (if necessary) prior to operation at the two-shift capacity.

For the purposes of noise modelling the following two situations have been considered which reflect the two stages of the SAWT facility development:

- Scenario 1 – processing approximately 60,000 tpa of mixed solid waste plus 7,200 tpa of Biosolids
- Scenario 2 – processing approximately 120,000 tpa of mixed solid waste plus 14,400 tpa of Biosolids

The proposed layout of the facility is shown in Figure 2-1 which is almost all contained in a large building including receipt, resource recovery and composting. Mixed solid waste will be received in the Receipt Area where it will be delivered onto a tipping floor and shifted by a front-end loader onto a slow moving conveyor belt that connects to the Resource Recovery Area. Here, waste will be processed in a series of mechanical steps to recover the organic fraction for composting and also recyclables. The inorganic residual fraction will be sent to the Landfill during the Landfill's normal operating hours.

The organic fraction of the waste will be converted into compost using a series of composting tunnels and biocells. Air will be drawn through each tunnel and biocell. After composting, the material will be transported by conveyor to maturation in stockpiles. The material undergoes further refining prior to be transported for use off site.

Although the proponent does not initially intend to accept clean green waste, it is envisaged that the SAWT facility may receive and process green waste in future operations. If clean green waste is accepted, source-separated green waste received at the facility will pass through different processing stages. This material will be shredded by an outdoor shredder as it is received.

The SAWT facility will be available for waste to be accepted and product collected 6.00am-6.00pm Monday to Friday, 8.00am-5.00pm on Saturdays, and 8.00am-4.00pm on Sundays and Public Holidays. This is in line with the current licence for the neighbouring landfill operation.

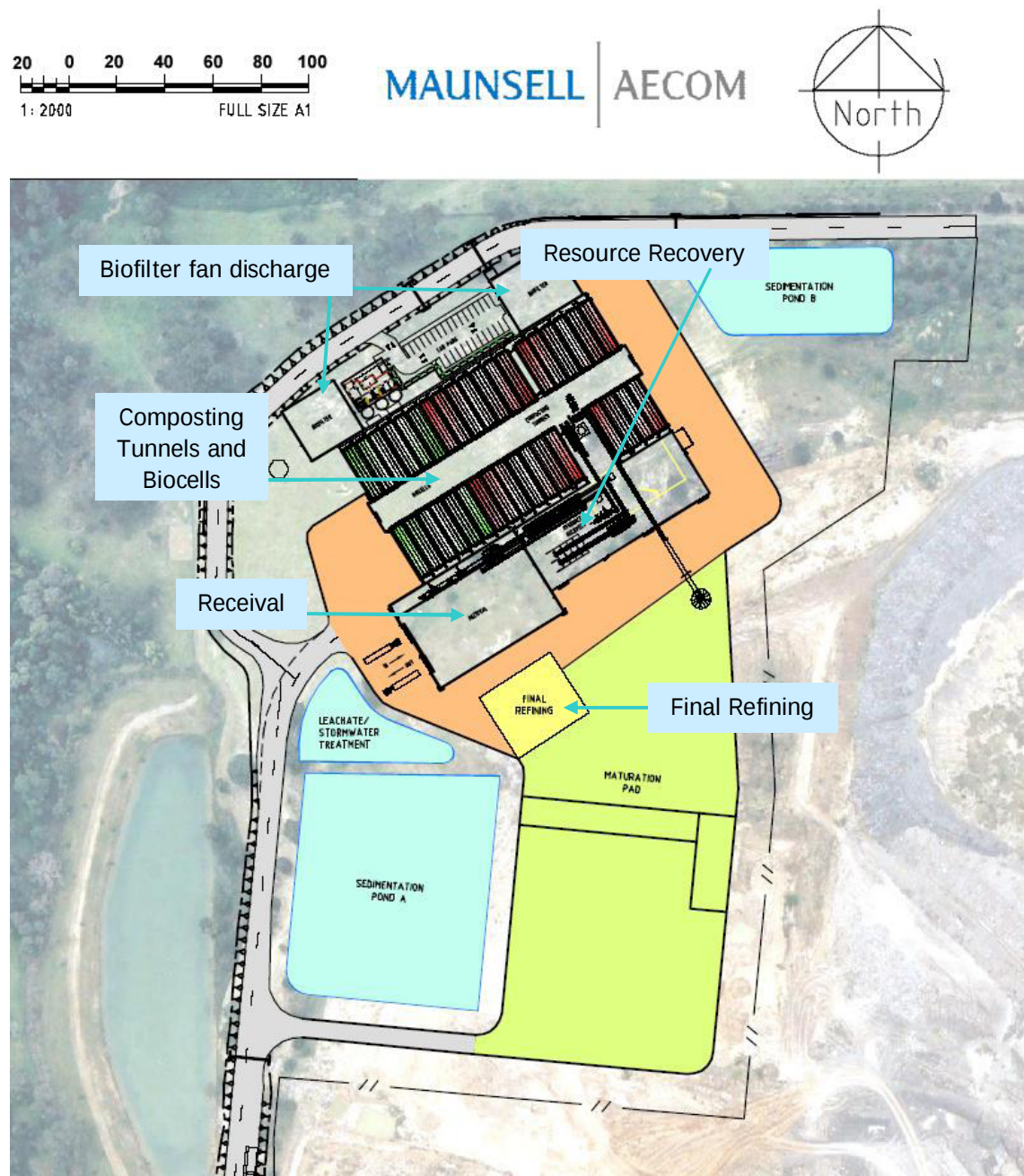
The resource recovery and sorting operation will have the flexibility to operate continuously from 7.00am Monday to 11.00pm Friday, 8.00am-5.00pm Saturdays and 8.00am-4.00pm on Sundays and Public Holidays during periods of high demand, after downtime, or in order to manage or assist with other extraordinary circumstances. Ordinarily, operating times will be 7.00am-11.00pm Monday to Friday.

The process by which material is deposited into, and removed from, the composting tunnels and the biocells will be during resource recovery and sorting operation hours. Work on the maturation area will take place during waste acceptance hours.

Vehicles will enter and leave the SITA site via the existing access road from Elizabeth Drive. Within the site the vehicles will use a new sealed access road that follows the southern and western boundaries, linking the entrance gate (located at the southeast corner) to the SAWT facility, which will be located in the northwest corner. The proponent may change the location of the site road to go over completed landfill cells in the south-west corner of the landfill site. As the final location of the site road is not finalised at this stage, the initial alignment following the southern and western boundaries will be assumed for modelling as it represents the worst case scenario for noise. It should be noted that the southern access road already has an existing 4m bund wall along its southern edge, which will mitigate vehicle noise to the residences to the south.

SITA has conducted a transport analysis and expects an average of 85 waste delivery vehicles per day will arrive at the SAWT facility. In addition, another eight empty vehicles per day will arrive at the site to transport compost product and recovered recyclables. Therefore, the total number of average daily arrivals at the SAWT facility is predicted to be 93 vehicles. Actual vehicle numbers will depend upon collection vehicle routing and traffic conditions and therefore could vary from day to day.

Besides delivery vehicles operating during waste acceptance hours, SITA will also park garbage trucks overnight on site near the maintenance workshop in the southeast corner for Penrith Council. Those trucks will depart at approximately 4.30am and 5.30am Monday to Friday. Trucks would leave from 3.30am on public holidays.

Figure 2-1 Proposed SAWT Layout

3 AMBIENT NOISE LEVELS

Ambient background noise levels were measured by noise loggers that were set up at a number of noise receivers around the SITA Site. Table 3-1 shows details of these measurements.

Table 3-1 Ambient Noise Monitoring Locations

Receiver	Monitoring Location	Dates	Comments
McGarvie Smith Farm	Garden 10m to east of house	8-16 April 04	Closest of 3 clustered residences to west of site, land owned by University of Sydney
1745 Elizabeth Drive	Yard 8m east of office	1-16 April 04	South of SITA site
Caretakers for 1669A Elizabeth Drive	Yard east of house	1-16 April 04	East of SITA site 50m from gate entrance
1669A Elizabeth Drive	10m west of cottage	1-16 April 04	East of SITA site
2140 Elizabeth Drive	Front yard, 13m from Elizabeth Drive kerb ⁽¹⁾	8-16 April 04	Traffic noise measurement, southern side of Elizabeth Drive, 800m west of SITA site

Note: 1) A facade measurement was not possible so a 2.5dBA adjustment was made to the results for assessment of traffic noise.

3.1 Noise Logger Description

The noise monitoring equipment used for this measurement consisted of Acoustic Research Laboratories and RTA Technology Environmental Noise Loggers set to A-Weighted, fast response continuously monitoring over 15 minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift occurred.

The loggers determine L_{A1} , L_{A10} , L_{A90} and L_{Aeq} levels of the ambient noise. The L_{A1} , L_{A10} and L_{A90} levels are the levels exceeded for 1%, 10% and 90% of the sample time respectively. The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional passby of a heavy vehicle. This is used for the noise assessment of potential sleep disturbance. The L_{A90} level is normally taken as the background noise level during the relevant period. The L_{Aeq} level is the Equivalent Continuous Sound Level and has the same sound energy over the sampling period as the actual noise environment with its fluctuating sound levels. The L_{Aeq} is used for the assessment of operational noise and traffic noise. The noise descriptors are further explained in the Abbreviations & Glossary section. The monitored noise levels are shown in graphical format in Appendix B.

3.2 Measured Background Noise Levels

Table 3-2 summarises the background noise levels that were measured, expressed as Rating Background Levels (RBL) as prescribed by the DEC. The results of the ambient measurements at 2140 Elizabeth Drive pertain to traffic noise and are therefore reported in Section 4.3.

Table 3-2 Measured Rating Background Levels (RBL)

Location	RBL (dBA)			
	Day (7am–6pm)	Evening (6–10pm)	Night Time (10pm–7am)	Morning Shoulder (6–7am)
McGarvie Smith Farm	35	44	38	43
1745 Elizabeth Drive	36	37	33	40
Caretakers for 1669A Elizabeth Drive	33	34	31	38
1669A Elizabeth Drive	33	36	33	41

The background levels (expressed as RBL) are affected by both traffic and the natural environment. It is interesting to note the evening and morning shoulder period RBL values are all higher than daytime levels at the corresponding locations, probably as a result of surrounding traffic noise in the morning and also possibly insect noise. This data indicates that there are sufficient periods of the day when existing SITA Landfill activities do not affect the background noise, and hence the RBL is not affected.

4 NOISE LEVEL CRITERIA

This report sets operational noise level criteria for the SAWT facility in accordance with the *Industrial Noise Policy (INP)* promulgated by the NSW Department of Environment and Conservation (DEC-EPA). Operational noise will also be assessed against 'sleep disturbance' criteria outlined in the EPA *Environmental Noise Control Manual (ENCM)*. In addition, traffic noise is assessed in accordance with the *Environmental Criteria for Road Traffic Noise (ECRTN)* and construction noise criteria in accordance with the *Environmental Noise Control Manual (ENCM)*.

4.1 Operational Noise Criteria

The *INP* recommends two criteria, "Intrusiveness" and "Amenity", both of which are relevant for the assessment of noise. In most situations, one of these is more stringent than the other and dominates the noise assessment. The criteria are based on the L_{Aeq} descriptor, which is explained in the Abbreviations & Glossary section.

4.1.1 Intrusiveness Criterion

An intrusiveness criterion applies for residential receivers only.

The intrusiveness criterion requires that the L_{Aeq} noise level from the source being assessed, when measured over 15 minutes, should not to exceed the Rating Background Noise Level (RBL) by more than 5dBA. The RBL represents the "background" noise in the area, and is determined from measurement of L_{A90} noise levels, in the absence of noise from the source. The definition of L_{A90} and the procedure for calculating RBL is given in the abbreviations and glossary section above.

Where the noise level from the source varies over time due to changes in operating conditions, meteorological conditions or other factors, the upper 10th percentile of 15-minute L_{Aeq} noise levels can be used for comparison with the criterion.

4.1.2 Amenity Criterion

The amenity criterion sets a limit on the total noise level from *all industrial noise sources* affecting a receiver. Different criteria apply for different types of receiver (e.g. residence, school classroom); different areas (e.g. rural, suburban); and different time periods, namely daytime (7.00am-6.00pm), evening (6.00pm-10.00pm) and night time (10.00pm-7.00am).

The noise level to be compared with this criterion is the L_{Aeq} noise level, measured over the time period in question, due to all industrial noise sources, but excluding non-industrial sources such as transportation.

Where a new noise source is proposed in an area with negligible existing industrial noise, the amenity criterion for that source may be taken as being equal to the overall amenity criterion. However, if there is significant existing industrial noise, the criterion for any new source must be set at a lower value. If existing industrial noise already exceeds the relevant amenity criterion, noise from any new source must be set well below the overall criterion to ensure that any increase in noise levels is negligible. Methods for determining a source-specific amenity criterion where there is existing industrial noise are set out in the *INP*.

4.1.3 Sleep Disturbance Criterion

There is a requirement to meet sleep disturbance criteria for the intermittent / impulsive noise at night time (10.00pm-7.00am). The criterion for this type of noise, which applies to L_{A1} levels, requires that the noise level from the source being assessed, when measured over a one minute period, should not exceed the L_{A90} by more than 15dBA. For the purpose of assessing sleep disturbance from council truck passbys, the assessment will consider maximum levels (L_{Amax}) as representative of L_{A1} levels and Rating Background Noise Level (RBL) as representative of L_{A90} levels. The definitions of maximum level (L_{Amax}) and L_{A1} are given in the abbreviations and glossary section above.

4.2 Determination of Report Specific Operational Noise Criteria

Since the operation of the SAWT facility will be independent of the existing approved landfill operation, the intrusiveness criteria are set independently of the landfill operations. However, as requested in the Director-General's Requirements for the EIS, the amenity criteria take into account the cumulative effect of the proposed development in the context of the existing Elizabeth Drive Landfill operation.

It is considered necessary to establish separate criteria as it is possible the SAWT could be independently operated from the landfill and is subject to a separate application.

4.2.1 Intrusiveness Criteria

The *INP* specifies intrusiveness criteria as the RBL + 5dBA. Table 4-1 summarises the noise criteria that are set for the SAWT facility.

Table 4-1 Intrusiveness Criteria

Location	$L_{Aeq,15min}$ Intrusiveness Criterion (dBA)			
	Day (7am–6pm)	Evening (6–10pm)	Night Time (10pm–7am)	Morning Shoulder (6–7am)
McGarvie Smith Farm	40	49	43	48
1745 Elizabeth Drive	41	42	38	45
Caretakers for 1669A Elizabeth Drive	38	39	36	43
1669A Elizabeth Drive	38	41	38	46

4.2.2 Amenity Noise Levels

The area surrounding the SITA Site is currently rural. Therefore the amenity noise levels are 50dBA, 45dBA and 40dBA for daytime, evening and night time periods respectively.

In order to assess the potential for cumulative impacts, the landfill operations were considered as an existing industrial noise source (which currently operates at daytime only). It is also possible that the landfill or other industrial operations could happen during the evening or night time. The new SAWT development should therefore “share” its contribution to the overall amenity noise levels in all time periods, thus reducing the amenity criteria by 3dBA. The project specific amenity criteria become 47dBA, 42dBA and 37dBA for the daytime, evening and night time periods respectively.

4.2.3 Cumulative Impacts from Existing Landfill & SAWT

The current landfill has approval to operate with the following noise limits in the Licence Conditions:

- Daytime $L_{A10} \leq 50\text{dBA}$
- Night time $L_{A10} \leq 45\text{dBA}$

There are no proposed changes to the landfill operation as part of the proposed SAWT development. It has been suggested that the combined noise from the landfill operations and SAWT activities should be assessed on the basis noise from the two operations could not be separated when assessing compliance. If this is the case, then the current noise limits should be adopted for the combined noise from both operations. We consider there are measurement techniques which could separate noise from the operations.

The landfill operations will dominate at all receivers at daytime (landfill does not occur during night time). Introducing the future predicted noise from an already approved and quite variable operation such as the current landfill, where all plant is external, to the more consistent noise from the proposed SAWT operations which mostly occur internally, potentially confuses the assessment of the proposed SAWT facility.

In summary, if it can be demonstrated that the proposed SAWT facility can satisfy intrusive or amenity criteria set independently of the current landfill (which are significantly lower than the current noise limits), then the combined noise from both the proposed SAWT and landfill operations would almost always comply with the current noise limits. If there are times that compliance would not occur, it would be due to the already approved landfill rather than the proposed SAWT.

We therefore consider the intrusive and amenity criteria nominated above are appropriate to address the potential noise impact from the proposed SAWT.

4.2.4 Sleep Disturbance Criteria

The *ENCM* specifies sleep disturbance criteria as the RBL + 15dBA. Table 4-1 summarises the noise criteria that are set for the SAWT facility.

Table 4-2 Sleep Disturbance Criteria

Location	Night Time Period (dBA)
	(10pm–7am)
McGarvie Smith Farm	53
1745 Elizabeth Drive	48
Caretakers for 1669A Elizabeth Drive	46
1669A Elizabeth Drive	48

4.3 Road Traffic Noise Criteria

Trucks and other vehicles servicing the proposed SAWT facility will increase the traffic flows on Elizabeth Drive. The *Environmental Criteria for Road Traffic Noise (ECRTN)* sets noise criteria for assessing such impacts. The SAWT development is classified under the *ECRTN* category of “Land use developments with potential to create additional traffic on arterial roads”. This category of developments is assessed to $L_{Aeq,15hr}$ 60dBA during the daytime and $L_{Aeq,9hr}$ 55dBA during the night time period.

Vehicles moving along the SAWT access road from Elizabeth Drive (used almost entirely by SITA) are considered as industrial noise sources and assessed according to the *INP*. Therefore, the intrusiveness criteria in Table 4-1 apply, and these sources are included in the ENM noise model of on-site activities addressed in Section 5.

4.4 Construction Noise Criteria

SITA intends to construct the SAWT facility in stages. During the first five to six months the main noise producing activities will be earthworks, roadways and building construction. Following this, an approximately three month period will be required for fitout of the waste processing facility inside the buildings. Construction work will take place mostly during the daytime period.

Given that the noise levels during the second stage of construction will be significantly less than the first stage (and the operational noise levels), and that the main stage has a total duration of less than 26 weeks, it is reasonable to apply the background + 10dBA criteria to such works as specified in the *ENCM*. These criteria are expressed using the $L_{A10,15min}$ noise descriptor. Table 4-3 shows the noise criteria for the construction works.

Table 4-3 Criteria for Construction Noise

Location	$L_{A10,15min}$ Construction Noise Criterion (dBA)
	Daytime (7am–6pm)
McGarvie Smith Farm	45
1745 Elizabeth Drive	46
Caretakers for 1669A Elizabeth Drive	43
1669A Elizabeth Drive	43

5 OPERATIONAL NOISE ASSESSMENT

5.1 Methodology

Intervening topography attenuates noise before it reaches receivers. Additionally, noise propagation over distances approximately 1km or greater is significantly influenced by meteorological factors such as wind speed, wind direction and the presence of temperature inversions. Receivers downwind of noise sources experience increased noise levels due to refraction and focusing of the sound energy. In a similar manner, temperature inversions also refract sound waves towards the ground. In addition to increasing noise levels, these meteorological conditions significantly reduce the attenuating effect of intervening topography (and bunds) since the sound waves follow a curved path that can go over barriers.

For this assessment, operational noise predictions were made with the ENM modelling software, which is a point-to-point model that takes into account the above attenuation factors. In order to assess the potential noise impact of the initial and final phases of the SAWT development, both Scenario 1 (60,000 tpa) and 2 (120,000 tpa) were considered.

5.2 Modelling Assumptions

The ENM noise model required a number of assumptions. The following sections describe the significant assumptions that were made.

5.2.1 Meteorological Conditions

During the night time period, the worst case noise levels are likely to be experienced during temperature inversions. The *INP* specifies 3°C/100m in altitude as the worst case temperature inversion for noise assessments. Drainage flows are not applicable in this project since there is no straight descending slope between any of the receivers and the treatment plant.

Temperature inversions are rarely present during daylight hours. Therefore, the most significant meteorological effect during the daytime, evening and morning shoulder periods is wind. The effect of wind was assessed by considering 3m/s wind (at 10m altitude) at eight points of the compass evenly spaced at 45 degrees. The resulting noise levels were synthesised into a worst case set of results shown in Table 5-4 and Table 5-5.

5.2.2 Topography

Prior to site closure, SITA will shape the landfill and SAWT premises in the topographic state set by the 'Final Approved Landform'. However, during the period in which the SAWT facility will operate, the SITA Landfill Site will undergo significant changes in its topography due to ongoing landfill operations.

Since the intervening topography can attenuate noise propagation, a worst case (minimal shielding) landform was assumed for the noise modelling used in this study. The landform was formed by manually synthesising the contour maps of the current day and final approved landforms to a worst case for noise (i.e. lowest) topography. The height of the central bund assumed by this landform is RL 66m AHD, which is 2m below both the current level and also the 'Final Approved Landform'.

5.3 Preliminary Assessment of Operational Noise

A preliminary model was constructed with typical noise source sound power levels (SWL) to determine if the baseline operational concept meets the noise criteria. For the model it was assumed that no noise mitigation measures (such as shielding or noise bunds) were in place. Some minor exceedances of the criteria were found. An iterative process involving interaction with the proponent (SITA) was undertaken to determine the necessary noise mitigation measures in order for the calculated noise levels to meet the criteria. It was determined that the following controls reduce the operational noise to acceptable levels:

- Attenuation of biofilter discharge fans to an effective SWL of 91dBA per fan. The induct SWL is 106dBA for each fan therefore an induct attenuator or lining will be sufficient;
- Purchasing of modern front end loaders with SWL (110dBA);
- If green waste is accepted, selection of an outdoor shredder and noise mitigation to give effective SWL of 112dBA; and
- Shielding by the configuration of the layout and buildings.

5.4 Operational Scenarios

Three operational scenarios were assessed for noise impacts of the SAWT development, daytime, night time and the evening / morning shoulder periods. The daytime operational scenario included operation of plant such as trommels and conveyors within the buildings and external plant such as biofilter discharge fans (operating at typical utilization rate), trucks and loaders. The evening shoulder period includes activities in the Resource Recovery Area and the noise created by the outdoor biofilter fans. The night time and morning shoulder periods also include council garbage truck departures and truck deliveries respectively. Detailed descriptions of the operational scenarios are given in the following sections. These scenarios assume the mitigation measures discussed in Section 5.3.

5.4.1 Internal Plant

Sound levels were obtained from typical equipment specifications for the majority of the plant items planned for operation within the SAWT buildings. From this, the SWL were derived using the $L_{Aeq,15min}$ descriptor taking into account the expected utilisation rates of the plant items. Table 5-1 shows the significant internal noise sources that are proposed for the building. The noise levels are common to Scenario 1 and 2 since the same plant will operate in both scenarios.

Table 5-1 Noise Sources within Processing Buildings

Building	Plant Item	Effective $L_{Aeq,15min}$ SWL (dBA)
Receival	Loader	108
	Drag chain conveyor	78
Resource Recovery	Cardboard shredder	103
	Loader	100
	Trommel 1	92
	Trommel 2	92
	Trommel 3	89
	Electromagnets (x2)	91
	Conveyors (x10)	85
	Separating screens (x2)	96
	Cyclone fans (x2)	94
Refining Building	Fluidising air fans (x2)	94
	Trommel 1	93
	Electromagnets (x2)	91
	Conveyors (x7)	87
	Vibrating feeders (x2)	86
	Belt feeder conveyor	83

It should be noted that all biocell and composting tunnel fans are located inside the Resource Recovery Building. They are not listed in Table 5-1 as their noise impact is considered negligible when compared with that of the rest of the internal plant.

The SWL of sources within each building were added and typical worst case internal $L_{Aeq,15min}$ SPL was calculated (assuming typical reverberation times of two seconds). Noise breaking out through the walls, roof and openings of the buildings were calculated based on conceptual design plans supplied by SITA's consultant designer, Maunsell. Table 5-2 summarises the results of these calculations.

Table 5-2 Effective Radiated SWL (dBA) from Processing Buildings

Building Area	Total Internal $L_{Aeq,15min}$ Sound Pressure Level	Percentage of Facade Open	Effective Radiated Sound Power Level
Receival	87	100% to southwest	100% to southwest
Resource Recovery	73	0%	89
Refining	77	10%	93

5.4.2 External Plant

For Scenario 2, the truck arrivals rate is predicted to be 93 vehicles per day, which would be eight trucks per hour to service the fully operational SAWT facility. Only half that amount is predicted for Scenario 1. However, during a typical busy period the hourly number of deliveries is expected to increase by 50%. For this reason, the noise model assumed the same amount of truck deliveries for Scenario 1 as for the second stage in order to account for the typical busy periods during Scenario 1.

Truck noise was modelled as line sources along the route of the access roads. It was assumed that the trucks move at up to 30km/h along the roads. The SWL for a truck at this speed was assumed to be 102dBA, which is typical of the trucks likely to access the SAWT facility.

The night time council garbage truck departures were also modelled as a line source extending from Elizabeth Drive to just inside the landfill. For Scenario 1 and 2, it was assumed as a worst case scenario for the night time period two trucks would depart site within the same 15-minute period. Measurements established instantaneous sound power levels of typical truck departures between 104dBA and 108dBA. However, the sound power level over a 15-minute period was reduced to reflect the limited amount of truck passbys.

The biofilter discharge fans were conservatively modelled outside the Resource Recovery Building even though it will be possible to locate them inside the building. The fans were modelled as point sources located between the biofilters and the north facade of the Resource Recovery Building. Six discharge fans are expected to operate for Scenario 1 and double that amount for Scenario 2.

If green waste is accepted, the outdoor shredder will operate as required when green waste is brought onto the site. On average, it would be required for six days per month when the SAWT facility operates at Scenario 2 and half that time for Scenario 1.

It was assumed that two loaders will operate outside the buildings for the full daytime operational period for Scenario 2. For Scenario 1, only one loader operating outside the buildings for the full daytime operational period was considered. It was assumed these would operate on the green waste and maturation pads.

Note that only major outdoor plant contributing to the overall operational noise level was modelled. Table 5-3 summarises the SWL assumed for the external plant.

Table 5-3 Summary of External Plant SWL

Plant Item/s	SWL (dBA)	Height Above Ground (m)	Number or Usage		Effective $L_{Aeq,15min}$ Sound Power Level (dBA)	
			Scenario	Scenario	Scenario	Scenario
			1	2	1	2
Biofilter Discharge Fans	91/fan	1.5	6	12	99	102
Shredder (if green waste is accepted)	112	1.5	3 days /month	6 days /month	112	112
Front-end loader(s)	110	1.5	1	2	107	110

5.5 Calculated Noise Levels

Noise levels were calculated at each of the nominated receivers (residences) assuming receiver heights of 1.5m above local ground level.

5.5.1 Daytime Noise Levels

During daytime it was assumed that all noise sources in Table 5-3 are operational. The predictions were made for Normal Operation (without the shredder) and Normal Operation with the shredder operating since this may potentially occur for a few days per month in the event 'clean' green waste is accepted. As expected, noise levels are higher when the shredder is included in the predictions. Table 5-4 and Table 5-5 summarise the daytime noise levels calculated for Scenario 1 and 2. Both the neutral and worst case wind predictions are also shown.

Table 5-4 Daytime Noise Levels (dBA) at Receivers (Scenario 1)

Location	Predicted L _{Aeq,15min} Noise Level				Daytime Intrusiveness Criterion	Daytime Amenity Criterion
	Neutral		Worst Wind			
	Normal	Normal + Shredder	Normal	Normal + Shredder		
McGarvie Smith Farm	32	35	40	43	40	47
1745 Elizabeth Drive	35	35	40	43	41	47
Caretakers for 1669A Elizabeth Drive	37	37	42	42	38	47
1669A Elizabeth Drive	30	33	38	38	38	47

For Scenario 1 in neutral wind conditions, daytime noise levels will satisfy DEC-EPA intrusiveness criteria at all receivers both with and without the shredder operating. Noise at the Caretakers and 1745 Elizabeth Drive is dominated by trucks on the service road which is much closer to these residences hence there is little difference with and without the shredder operating.

For the reason of distance, there is also a smaller increase in noise levels under “unfavourable” wind conditions at these two residences than calculated at McGarvie Smith Farm or 1669A Elizabeth Drive and this is especially true when the shredder is not operating.

Under unfavourable wind conditions, the predicted daytime noise levels for normal operation marginally exceed the intrusiveness criteria at only one receiver by up to 4dBA. This exceedance is considered minor given it is only predicted to occur during unfavourable wind conditions.

Under unfavourable wind conditions, the predicted daytime noise levels exceed the intrusiveness criteria at three of the receivers by up to 4dBA if the shredder is operating. Since the shredder would operate periodically, whilst this exceedance of up to 4dBA is considered minor, management procedures would be put into place to ensure that shredding does not occur during these unfavourable wind conditions.

Under both neutral and unfavourable wind conditions the predicted noise levels satisfy the 47dBA daytime amenity criterion and also the current noise limits at all receivers. Table 5-5 shows the predicted noise levels for the SAWT facility for Scenario 2.

Table 5-5 Daytime Noise Levels (dBA) at Receivers (Scenario 2)

Location	Predicted L _{Aeq,15min} Noise Level				Daytime Intrusiveness Criterion	Daytime Amenity Criterion
	Neutral		Worst Wind			
	Normal	Normal + Shredder	Normal	Normal + Shredder		
McGarvie Smith Farm	33	35	41	44	40	47
1745 Elizabeth Drive	35	35	40	43	41	47
Caretakers for 1669A Elizabeth Drive	37	37	42	42	38	47
1669A Elizabeth Drive	30	33	38	38	38	47

For Scenario 2 in neutral wind conditions, daytime noise levels will satisfy intrusiveness criteria at all receivers both with and without the shredder operating.

During unfavourable wind conditions the predicted daytime noise levels exceed the intrusiveness criteria at two of the receivers by 2-4dBA without the shredder. The highest exceedance occurs at the Caretaker's Cottage. These exceedances are considered minor given they are only predicted to occur during unfavourable wind conditions.

If 'clean' green waste is accepted by the proponent, the use of the shredder will generate 2-4dBA exceedances of the intrusiveness criteria at three of the receivers. Since the shredder would operate periodically, whilst this exceedance of up to 4dBA is considered minor, management procedures would be put into place to ensure that shredding will not occur during these unfavourable wind conditions.

For neutral and unfavourable wind conditions the predicted noise levels satisfy the 47dBA daytime amenity criterion and also the current noise limits at all of the receivers. Scenario 2 is not much higher than Scenario 1 as the noise is dominated by the shredder and trucks. As discussed earlier, the truck numbers were assumed to be the same when assessing a worst case 15-minute period.

5.5.2 Morning Shoulder & Evening Period Operations

During the morning shoulder (6.00-7.00am) and evening (6.00-10.00pm) periods the operational noise sources are the Resource Recovery Building as well as the biofilter discharge fans. During the morning shoulder period (but not the evening), trucks will also deliver to the Receiving Area. Table 5-6 summarises the noise levels calculated for Scenario 2.

Table 5-6 Evening & Early Morning Noise Levels (dBA) at Receivers (Scenario 2)

Location	Predicted $L_{Aeq, 15min}$ Noise Level				Morning	Evening	Evening
	Neutral		Worst Wind		Shoulder	Intrusiveness	Amenity
	Plant	With	Plant	With	Intrusiveness	Criterion	Criterion
	Only	Trucks	Only	Trucks	Criterion	Plant only	Plant only
McGarvie Smith Farm	25	31	33	39	48	49	42
1745 Elizabeth Drive	11	35	18	40	45	42	42
Caretakers for 1669A Elizabeth Drive	12	37	17	42	43	39	42
1669A Elizabeth Drive	15	30	20	38	46	41	42

The calculated evening and early morning noise levels are within the intrusiveness criteria at all receivers for all wind conditions, including during truck delivery in the morning. The 42dBA evening amenity criterion is also satisfied for the operation of plant for all wind conditions. Since Scenario 2 case meets the criteria, it is concluded that Scenario 1 with half the number of fans and trucks, also meets the noise criteria.

5.5.3 Night Time Operations

As explained in Section 2 of this report, the resource recovery and sorting operation will have the flexibility to operate continuously from 7.00am Monday to 11.00pm Friday even if operating times are ordinarily 7.00am-11.00pm Monday to Friday. In addition, the biofilter discharge fans as well as the aeration fans for the biocells/tunnels will operate 24 hour a day, 7 days a week. This scenario will be used for predicting night time noise levels.

As mentioned above, two council garbage trucks will typically depart from the current landfill site entrance as early as 4.30am. Table 5-7 shows the predicted noise levels at the receivers with and without temperature inversion conditions.

Table 5-7 Night Time Noise Levels at Receivers (Scenario 2)

Location	Predicted $L_{Aeq,15min}$ Noise Level (dBA)				Night time Intrusiveness Criterion (dBA)	Night time Amenity Criterion (dBA)
	Neutral		Temp. Inversion (3°C/100m)			
	Resource Recovery Building Operations	Resource Recovery Building Operations + Council Truck Departures	Resource Recovery Building Operations	Resource Recovery Building Operations + Council Truck Departures		
McGarvie Smith Farm	26	27	31	31	43	37
1745 Elizabeth Drive	11	33	14	37	38	37
Caretakers for 1669A Elizabeth Drive	12	37	14	38	36	37
1669A Elizabeth Drive	15	30	17	34	38	37

The night time noise levels satisfy the intrusiveness criteria at all receivers with the exception of the Caretakers Cottage with and without temperature inversion conditions. The 37dBA night time amenity criterion and existing noise limit is also satisfied at all receivers with the exception of the Caretakers Cottage with and without temperature inversion conditions.

At the Caretakers Cottage, the night time noise levels with council truck departures exceed the intrusiveness criterion by 1dBA without temperature inversions and by 2dBA with temperature inversion conditions.

Council truck departures represent the main contributor to the predicted noise levels at 1745 Elizabeth Drive, 1669A Elizabeth Drive and the Caretakers Cottage where the only exceedances are.

It should be noted that when no resource recovery and sorting operations are operating, only the composting tunnel and biocell fans are assumed to operate. Since the night time predictions with the resource recovery and sorting operation meet the criteria with no truck departures, it is concluded that predictions without the resource recovery and sorting operation also meet the noise limits assuming no garbage truck departures occur.

Since council garbage truck departures occur during the night time period, sleep disturbance should be assessed at the receivers where truck movements may potentially interfere with the residents' sleep (i.e. Caretakers Cottage and 1745 Elizabeth Drive). Because of the relatively small distances between the truck passbys and the receivers, it is assumed that meteorological conditions would not affect maximum noise levels and were therefore not considered. Table 5-8 shows the predicted maximum noise level from a garbage truck passby at both receivers.

Table 5-8 Maximum Noise Levels due to Truck Passby

Location	Predicted $L_{Aeq,15min}$ Noise Level (dBA)	Sleep Disturbance Criterion (dBA)
Caretakers for 1669A Elizabeth Drive	53	46
1745 Elizabeth Drive	47	48

The predicted maximum noise level from a council garbage truck passby at the Caretakers Cottage exceeds the relevant sleep disturbance criterion by 7dBA. On the other hand, the sleep disturbance criterion is satisfied at 1745 Elizabeth Drive.

5.5.4 Statistical Analysis of Potential Noise Impacts Due to Meteorological Effects

Similarly to maximum noise levels, L_{Aeq} night time exceedances are due to council garbage truck departures and only occur at the Caretakers Cottage due to the relatively small distance separating the access road used by the trucks and the receiver. For this reason, it is assumed that meteorological conditions would not affect predicted noise levels and were therefore not considered. Please note that the difference between neutral and adverse meteorological conditions is less than 1dBA.

Therefore, noise levels under adverse meteorological conditions are predicted to exceed only daytime intrusiveness criteria. For this reason, it is important to quantify the proportion of time that this may occur to better understand the potential noise impacts. Generally, the likelihood of concurrent wind speed and wind direction leading to noise levels significantly above the criteria is low. However, this higher degree of affectation can result if prevalent wind conditions dominate in certain directions.

Records of wind speed and direction were obtained from the meteorological station at Badgerys Creek for the period January 2001 to December 2001.

The *INP* requires that in predicting operational noise levels, wind speed and direction should be taken into account if wind speeds of up to 3m/s in the source-to-receiver direction occur more than 30% of the time in any season. It was found that this is the case for most receivers and seasons. Taking into account prevalent wind conditions, statistical modelling was undertaken to determine the proportion of time that exceedances of the relevant criteria could occur.

A total of 41 separate meteorological conditions were considered – wind speeds of 1-3m/s in each of eight directions, and zero wind speed (representing both zero wind and wind speeds above 3m/s). Noise levels were calculated under each of these conditions, and the probability of occurrence of each wind condition was taken into account to determine the percent of time that noise levels could exceed the relevant criterion.

The results are separated into seasons and tabulated below. Results are provided in percentile bands. Since noise production will vary over time, there will frequently be periods of lower noise production on-site. Therefore, the results below indicate only the percentage of the worst case noise production time when exceedances are expected.

Table 5-9 shows the proportions of time that meteorological conditions are predicted to give rise to noise levels in excess of the daytime criteria for Scenario 1.

Table 5-9 Proportion of Operating Hours Resulting in Noise Level Exceedance (Scenario 1 - Normal Operations)

Receiver	Daytime $L_{Aeq,15min}$ Intrusiveness Criterion (dBA)	Proportion of Time (%)			
		Summer	Autumn	Winter	Spring
McGarvie Smith Farm	40	0	0	0	0
1745 Elizabeth Drive	41	0	0	0	0
Caretakers for 1669A Elizabeth Drive	38	<10	<15	<5	<5
1669A Elizabeth Drive	38	0	0	0	0

In Scenario 1, the proportion of time that noise exceedances are predicted to occur is less than 15% of the time at the Caretaker's Cottage (the level exceeding the criterion for 10% of the time is predicted at 39dBA). However, at the Caretaker's Cottage, given that the major contributor to noise is vehicles entering the SAWT and Landfill facility, and hence the high number of trucks assumed in a typical busy 15-minute period, the exceedance is more likely to be approximately less than 10% of the time in autumn, less than 5% in summer, and less than 3% of the time in winter and spring.

Given exceedances occur less than 10% of the time in any season, the impacts are considered to be small and generally acceptable to the DEC-EPA. Overall impacts at the residences are likely to be minimal. The predictions for Scenario 2 are shown in Table 5-10.

Table 5-10 Proportion of Operating Hours Resulting in Noise Level Exceedance (Scenario 2 – Normal Operations)

Receiver	Daytime $L_{Aeq,15min}$ Intrusiveness Criterion (dBA)	Proportion of Time (%)			
		Summer	Autumn	Winter	Spring
McGarvie Smith Farm	40	<5	<5	0	<5
1745 Elizabeth Drive	41	0	0	0	0
Caretakers for 1669A Elizabeth Drive	38	<10	<15	<5	<5
1669A Elizabeth Drive	38	0	0	0	0

Scenario 2 predicts exceedances below 5% of the typical worst case noise production time for McGarvie Smith Farm. At the Caretaker's Cottage, the proportion of time that noise exceedances are predicted to occur is less than 15% in autumn (the level exceeding the criterion for 10% of the time is predicted at 39dBA), less than 10% in summer, and less than 5% in winter and spring.

When considering wind conditions up to a speed of 3m/s, the noise impact on McGarvie Smith Farm is considered to be small and acceptable. The same can be said about the Caretaker's Cottage for most of the weather seasons. However, the statistical analysis considering meteorological effects shows that operational noise levels associated with the proposed facility do not comply with the intrusiveness criterion at the Caretaker's Cottage in autumn. This is dominated by truck noise near to the entrance gate.

5.6 Noise Contour Maps – Scenario

For both daytime and night time during Scenario 2, contours of the noise levels in the areas surrounding the SAWT site were predicted. The contour maps are presented in Appendix A of this report as overlays on an aerial photograph of the locality. The contours presented are under neutral meteorological conditions and represent typical noise levels that can be expected at times of full SAWT facility operation.

6 OPERATIONAL NOISE MITIGATION OPTIONS & REVIEW

The preliminary assessment of operational noise indicated a number of noise control measures would be incorporated in the design of the facility. These were discussed in Section 5.3.

With these noise controls incorporated, the assessment indicated marginal daytime exceedances would occur at three locations, McGarvie Smith Farm, the Caretaker's cottage for 1669-A Elizabeth Drive, and 1745 Elizabeth Drive. The Exceedance at 1745 Elizabeth Drive only occurs when the shredder is operating. With regards to the other two receivers, although some of the highest exceedances occur when the shredder is operating, the shredder is not necessarily the dominant noise source at each residence.

The assessment also established noise exceedances related to night time L_{Aeq} maximum noise levels at the Caretaker's cottage which are due to council garbage truck departures.

SITA propose to undertake noise monitoring once the facility is operational to ensure compliance with the relevant criteria are met at all times and review options for further noise control. In particular this will include (if necessary), the feasibility of locating the shredder in such a position that shielding from the proposed buildings or an additional U or L shaped enclosure is provided to control noise in the directions of receivers potentially most affected. This can only be effectively designed once the facility has been operational and actual noise levels measured.

6.1 McGarvie Smith Farm

The exceedance at McGarvie Smith Farm only occurs under certain meteorological conditions with wind blowing towards the residence. This is shown to occur less than 5% of the time in the worst case season.

Currently the southern and eastern boundaries of the SITA Landfill Site have 4m noise bund walls, whereas the western boundary has no bund. Therefore, the western haul road and most of the SAWT facility buildings will be in acoustic line of sight to McGarvie Smith Farm.

An investigation was conducted to determine the effectiveness of a 4m noise bund along the northern part of the western boundary to provide shielding from the SAWT facility and part of the haul route to this receiver. For both the Scenarios 1 and 2, the model indicates that a 1-2dBA reduction in noise level would be achieved under neutral weather conditions. Under the unfavourable wind condition, the noise reduction was less than 0.1dBA.

Since the predicted noise levels at McGarvie Smith Farm under the neutral meteorological condition already meets the criteria and the bund has virtually no effect under adverse meteorological conditions, the construction of a noise bund along part of the western boundary is considered ineffective when it is required to perform. The bund is therefore not considered as a reasonable mitigation measure for a relatively small noise level reduction to one receiver.

6.2 1669-A Caretaker's Cottage

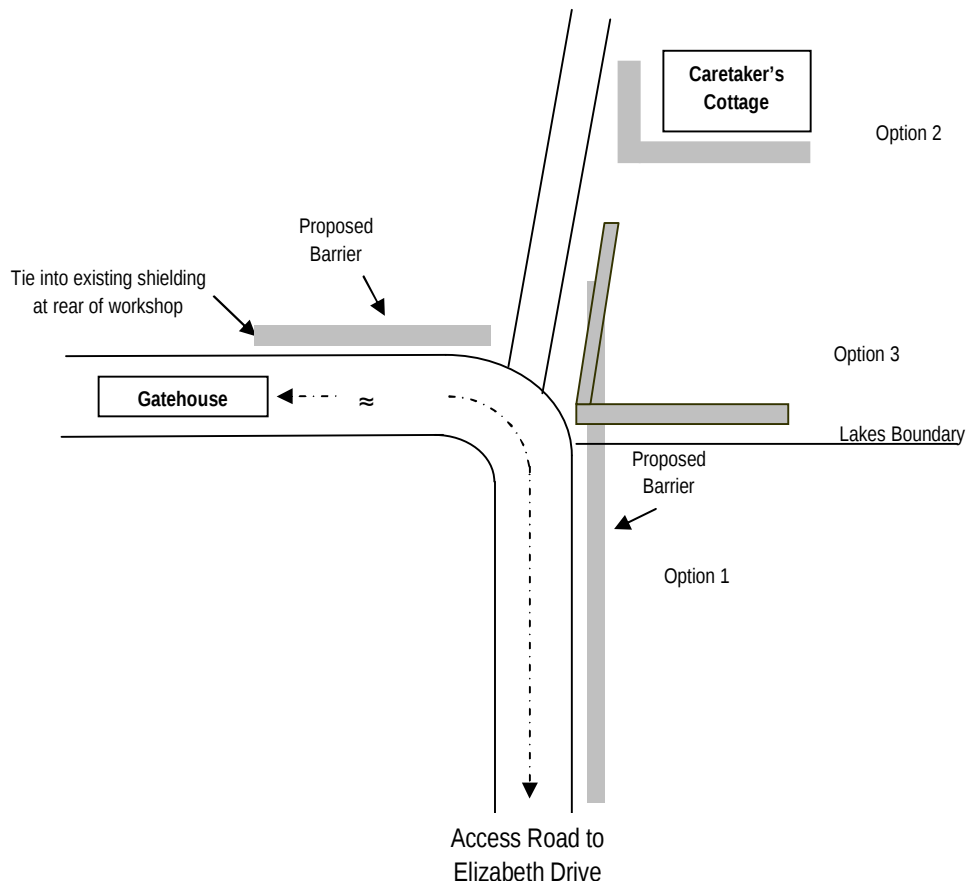
The predicted exceedances at this residence are dominated by delivery trucks during daytime and morning shoulder periods and also council garbage trucks during night time all using the access road, which pass within 135m of the residence when rounding the bend just before the Gatehouse. The greatest exceedance relates to the sleep disturbance criteria at night time.

It should be noted that the total number of delivery trucks which are proposed to use the access road for both the existing Landfill and proposed SAWT facility are lower than the number of trucks approved in the existing Landfill Development Consent. However, departure times are now earlier.

The most favourable option to mitigate both intrusiveness and sleep disturbance noise would be to provide a 4m high barrier adjacent to the access road for a length of approximately 150m and along the residence's driveway for a length of approximately 40m (see Figure 6-1 Option 1). The barrier would need a gap to allow access into the property so the existing shielding to the south of the workshop would also require extension in an easterly direction towards the Caretakers driveway for approximately 30m.

Although the access road is used almost exclusively by SITA and by 1669-A (and maintained by SITA), it is a Council road. It is therefore not possible at this stage for SITA to confirm that a noise barrier would be constructed, as this would require both Council approval and also consultation with the neighbours regarding and visual or other potential impacts. SITA are available to discuss these issues. The barrier section proposed on private property belonging to the potentially affected landowners would also be subject to discussions with this landowner.

If a barrier was not possible, an alternative would be to provide mitigation at the Caretakers Cottage. This could include a courtyard style wall closer to the residence (shown as Option 2) , a barrier along the Lakes property boundary (shown as Option 3), or double glazing of windows of affected rooms facing the noise source and/or the provision of air conditioning, which would allow existing windows to remain closed. These options would need to be discussed with the potentially affected residents.

Figure 6-1 Sketch Showing Proposed Noise Barrier Options

6.3 1745 Elizabeth Drive

Exceedances at 1745 Elizabeth Drive only occur when the shredder is operating. As explained earlier, the most appropriate and effective noise mitigation for controlling the noise generated by the shredder would be to provide shielding with the use of the facility's building and additional enclosure if necessary. Again, as stated earlier, this can only be effectively designed once the facility has been operational and actual noise levels measured.

7 TRAFFIC NOISE ASSESSMENT

This section assesses the impact of increased traffic noise along Elizabeth Drive in accordance with the *ECRTN*. The current traffic volume along Elizabeth Drive is approximately 9,000 vehicles per day. The proposed SAWT development is additional to the existing Landfill operation on the same property and related investigations indicate that there will be a marginal increase in vehicular traffic on Elizabeth Drive of approximately 1%.

7.1 Existing Traffic Noise

A noise logger was installed at 2140 Elizabeth Drive for the dates indicated in Table 3-1 (April 2004) to measure the existing traffic noise along Elizabeth Drive near to the Site. The logger was located 13m from the road, which is representative of the closest residences. A facade measurement was not possible at this location so a facade correction is necessary for the assessment of traffic noise. Taking into account a 2.5dBA facade correction, the existing daytime traffic noise level $L_{Aeq,15hr}$ was 69dBA.

7.2 Predicted Increase in Traffic Noise

A spreadsheet based on the Calculation of Road Traffic Noise (CoRTN) method was used to predict the increase in traffic noise due to the proposed SAWT facility operations. The proponent believes that it is reasonable to assume that trucks entering and leaving the Site will be split into approximately 40% arriving from the east and 60% arriving from the west along Elizabeth Drive.

For Scenario 2, and assuming an extra eight trucks per hour on average for the daytime period, the $L_{Aeq,15hr}$ traffic noise level on Elizabeth Drive is predicted to increase by 0.5dBA. This is less than the 2dBA that the *ECRTN* prescribes as a maximum allowable increase when existing noise levels cannot be reduced to meet the criterion. Accordingly, the traffic noise generated by the proposed (additional) activity meets the DEC-EPA criteria for traffic noise.

7.3 Mitigation of Existing Traffic Noise

Since the existing traffic noise level exceeds the *ECRTN* daytime based criterion, the *ECRTN* states that where reasonable (feasible and practicable), noise levels should be mitigated to reduce noise levels to achieve the base criterion. Furthermore, the *ECRTN* states that in all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2dBA.

Although the "Allowance Criterion" of 2dBA has been shown to be met, it is still necessary to consider possible mitigation. To mitigate existing noise levels, the DEC-EPA normally recommends the following controls:

- Regulating the times of use;
- Using clustering;
- Using 'quiet' vehicles; and
- Using barriers or acoustic treatments.

With the exception of barriers or other treatment to residences, these mitigation measures do not relate to reducing existing noise levels because they only deal with the proposed additional noise source due to a marginal increase in traffic accessing the Elizabeth Drive Site.

Since the SAWT facility will generate a very small proportion of the total traffic noise on Elizabeth Drive, the provision of noise barriers on land which is not owned by the proponent is unlikely to be practicable or necessary.

8 CONSTRUCTION NOISE ASSESSMENT

This section of the report assesses the potential impact of noise during the construction of the SAWT facility.

8.1 Construction Activities

Earthworks and construction of the foundations, drainage and buildings is expected to take approximately six months with the installation and commissioning of equipment to follow. Operations would occur in the following three phases:

- Earthworks and drainage
- Foundation and paving works
- Superstructure erection

8.2 Construction Noise Sources

The following construction plant items and associated maximum SWL are summarised as follows:

- | | |
|----------------------|--------|
| • Front-end Loader | 110dBA |
| • Dozer | 113dBA |
| • Excavator | 107dBA |
| • Grader | 107dBA |
| • Concrete/Tip Truck | 109dBA |
| • Concrete Vibrator | 103dBA |
| • Roller | 110dBA |
| • Mobile Crane | 110dBA |
| • Hand Tools (up to) | 113dBA |
| • Air Compressor | 100dBA |

Based on a typical worst case operating scenario involving use of the dozer, excavator and truck, the combined SWL for the construction activities is calculated at 116dBA.

8.3 Predicted Construction Noise Levels

Taking into account attenuation due to distance and intervening topography, the following range of L_{A10} noise levels are predicted at the nearest residences for the construction phase. These are shown in Table 8-1.

Table 8-1 Construction Noise Levels (dBA) at Receivers

Location	Predicted Construction Noise Level $L_{A10,15min}$ (dBA)	L_{A10} Construction Noise Criterion for Period		
		Day (7am–6pm)	Evening (6pm–10pm)	Morning Shoulder (6am–7am)
McGarvie Smith Farm	47	45	54	53
1745 Elizabeth Drive	40	46	47	50
Caretakers for 1669A Elizabeth Drive	39	43	44	48
1669A Elizabeth Drive	37	43	46	51

The construction noise level at McGarvie Smith Farm is predicted to marginally exceed the daytime criterion by 2dBA. The noise levels at the other receivers, and for all other periods, are within the relevant DEC-EPA criteria.

8.4 Mitigation of Construction Noise

It is quite common that construction noise exceeds the DEC-EPA criteria. Mitigation measures for these marginal exceedances required by the DEC-EPA would rely on the management of noise using a combination of the following;

- Construction Hours
- Review of proposed construction Methodologies to minimise noise and vibration
- Use of modern well maintained equipment with appropriate mufflers
- Noise and Vibration Monitoring
 - Plant Items on Site
 - At Sensitive Receiver
- Training and Awareness
- Communication and Complaint Handling

These can be reviewed in more detail in a Construction Noise Impact Statement when more details of construction methodology and plant numbers etc are known.

9 CONCLUSION

The construction, operational and traffic noise impacts due to the proposed SAWT development has been assessed in accordance with the NSW Department of Environment & Conservation *Industrial Noise Policy (INP)*, the *Environmental Criteria for Road Traffic Noise (ECRTN)*, and the *Environmental Noise Control Manual (ENCM)*.

The following specific noise mitigation measures have been determined as necessary to reduce impacts from operational noise. These are detailed in Section 6:

- Attenuation of biofilter discharge fans to achieve an effective SWL of 91dBA per fan;
- Shielding of biofilter discharge fans by biofilter units;
- Purchasing of recent model front-end loaders with a low SWL;
- If 'clean' green waste is accepted, selection of a shredder with an effective SWL (including shielding) of 112dBA;
- If 'clean' green waste is accepted, controlling shredding operations so as they will not occur under unfavourable wind conditions;
- The proposed use of noise barriers and acoustic treatments to plant as required; and
- Management of times of operation of various plant / activities.

With this mitigation in place the daytime operational noise levels for Scenario 1 will satisfy relevant intrusiveness criteria, except under adverse wind conditions where exceedances of up to 4dBA are predicted at three of the four nearest residences when the shredder is operating. The proportion of time that exceedances are likely to occur over any one climatic season is shown to be less than 15%. This degree of exceedance for such a small proportion of time is considered to result in negligible impact at the nearest residences.

Predicted daytime noise levels for Scenario 2 case are higher but also meet the relevant criteria under the neutral wind condition used in this analysis. However, under adverse winds, the noise levels exceed the intrusiveness criteria by up to 4dBA when the shredder is operating. For the remaining times, the proportion of time an exceedance is likely to occur is typically less than 5% at the McGarvie Smith Farm and less than 15% at the Caretaker's Cottage.

Noise impacts can be considered minimal at the McGarvie Smith Farm. The same can be concluded for the Caretaker's Cottage considering the proportion of time that exceedances are likely to occur is shown to only exceed 10% during one climatic season. In the event the DEC-EPA considers the exceedance at the Caretaker's Cottage unacceptable, operational noise may be controlled by mitigating noise from truck deliveries as the receiver is located near to the Site entrance and is mainly affected by the trucks entering the site.

For all scenarios the project specific daytime amenity criterion of 47dBA would be achieved. In addition, there are no other "on site" reasonable or feasible noise control measures which could be implemented.

As discussed in Section 6, other mitigation measures have been reviewed, however their adoption would mean further consultation with Council and/or the property owners as to their suitability.

Intrusiveness and amenity criteria would also be achieved for operations occurring during the morning shoulder and evening periods.

Night time noise predictions will comply with the relevant criteria at all the receivers but the Caretaker's cottage where council garbage truck departures would marginally exceed the intrusiveness criterion by up to 2dBA. Maximum levels from garbage truck departures exceed the sleep disturbance criteria by up to 7dBA at the same receiver.

SITA propose to undertake operational noise monitoring once the facility is operational to ensure compliance with the relevant criteria are met at all times and review options for further noise control which can only be effectively designed once the facility has been operational and actual noise levels measured.

Noise impacts due to the minimal amount of extra traffic on Elizabeth Drive at the capacity of the proposed development were found to be negligible and within the *ECRTN* criterion.

Noise levels due to construction of the proposed facility are predicted to be within the criteria except for a marginal exceedance at McGarvie Smith Farm. Proposed mitigation measures are discussed in Section 8.4.

Note

All materials specified by Wilkinson Murray Pty Limited have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose.

Quality Assurance

We are committed to and have implemented AS/NZS ISO 9001:2000 "Quality Management Systems – Requirements". This management system has been externally certified and Licence No. QEC 13457 has been issued.

AAAC

This firm is a member firm of the Association of Australian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

Version	Status	Date	Prepared by	Checked by
A	Draft	14 May 2004	Andrew Barton	Neil Gross
B	Draft	27 May 2004	Andrew Barton	Neil Gross
C	Draft	26 July 2004	Andrew Barton	Neil Gross
D	Draft	4 March 2005	Neil Gross	-
E	Draft	31 March 2005	Neil Gross	-
F	Draft	7 August 2006	Roman Haverkamp	Neil Gross
G	Draft	24 August 2006	Roman Haverkamp	Neil Gross
H	Final	10 April 2007	Roman Haverkamp	Neil Gross
I	Final	24 April 2007	Roman Haverkamp	-
J	Final	30 April 2007	Roman Haverkamp	-

APPENDIX A

NOISE CONTOUR MAPS

Daytime Operational Noise Contours for Stage 2 in Neutral Conditions (dBA) (no shredder)

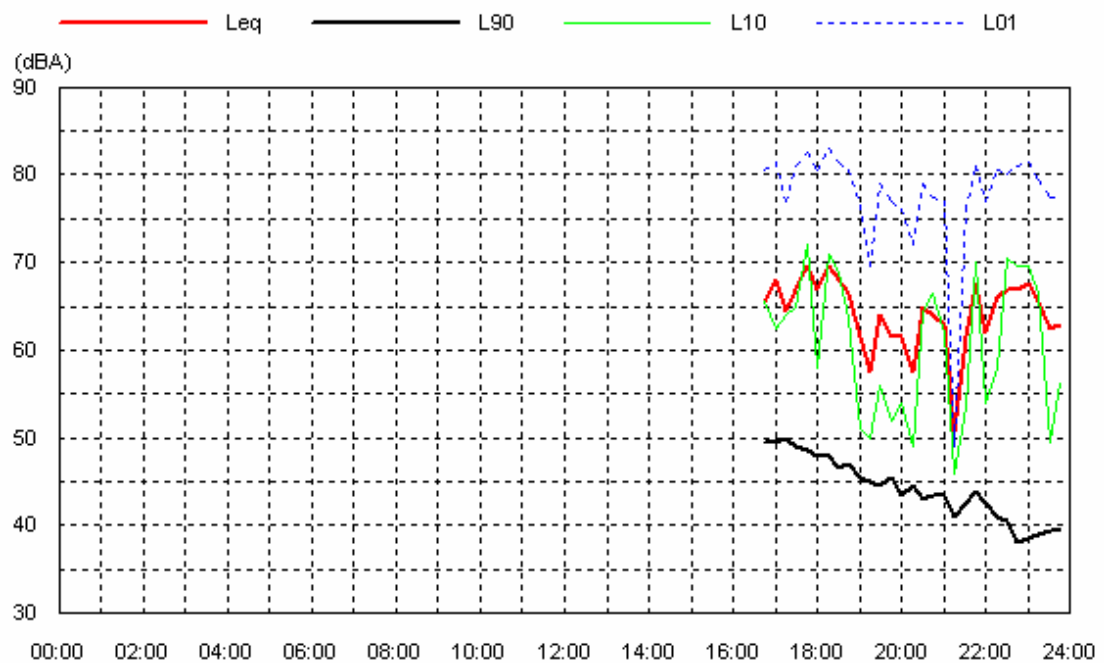
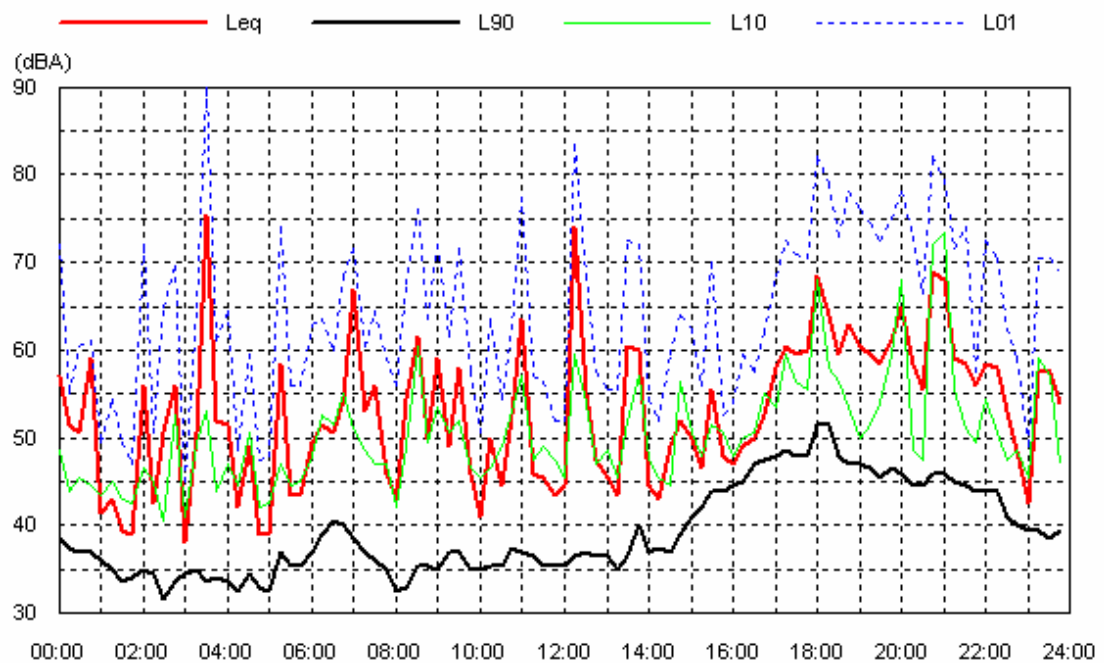


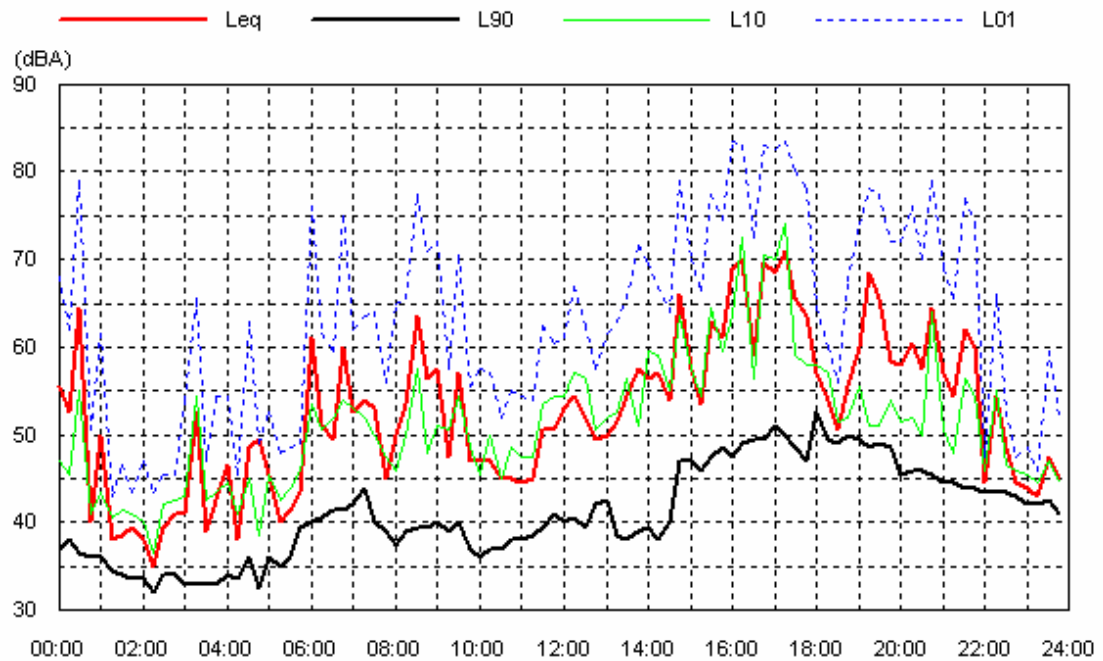
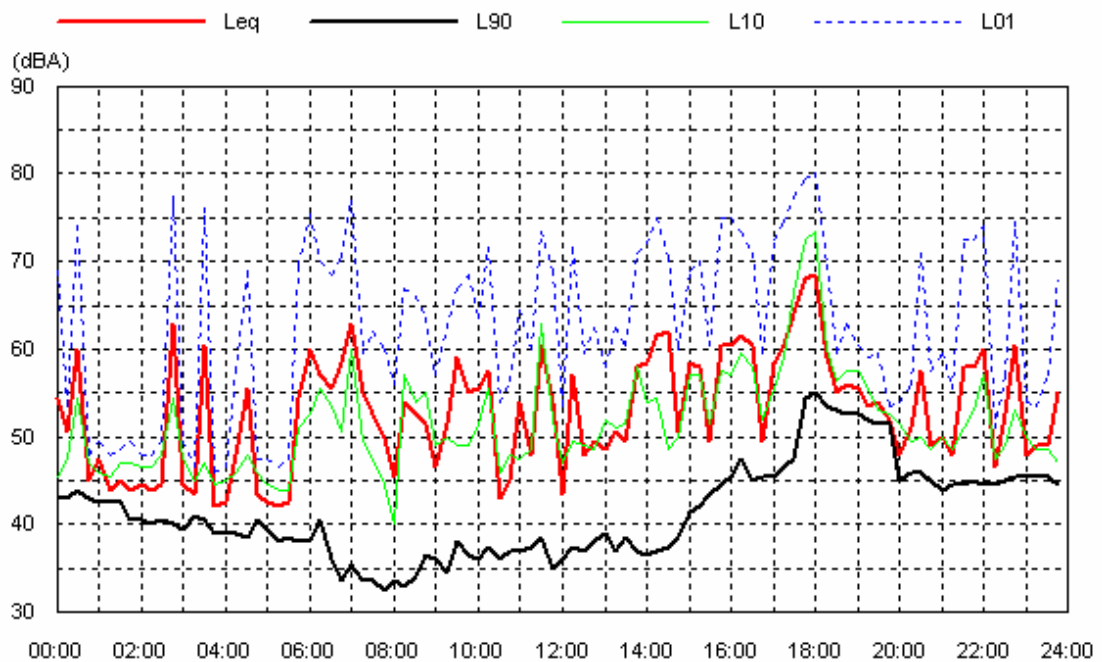
Night Time Operational Noise Contours for Stage 2 with Council Garbage Truck Departures in Neutral Conditions (dBA)

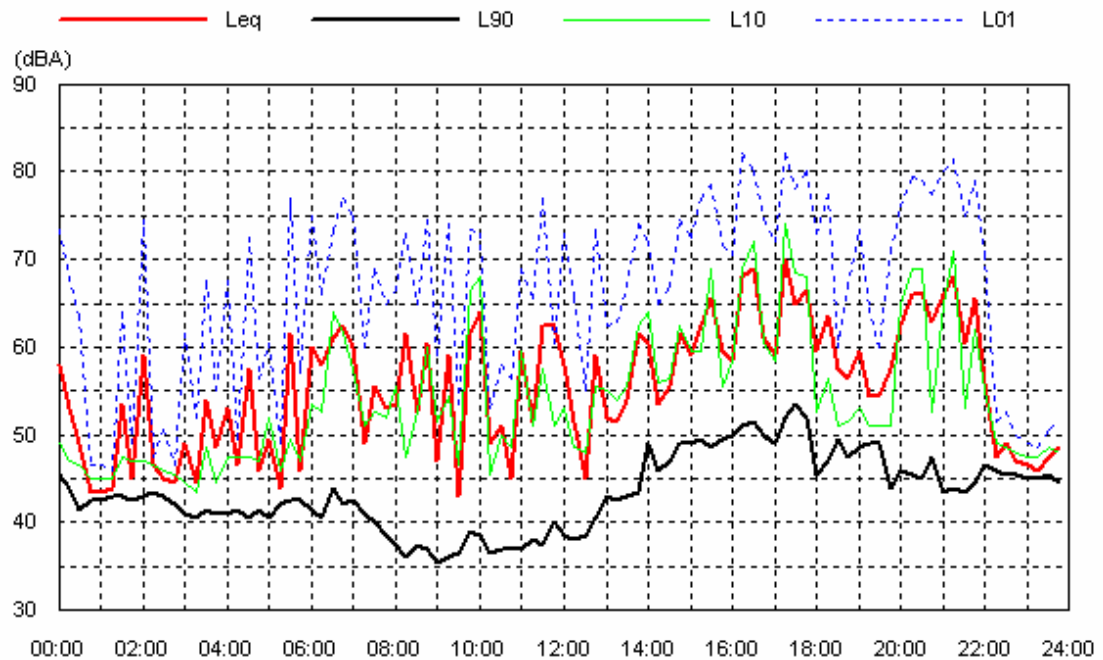
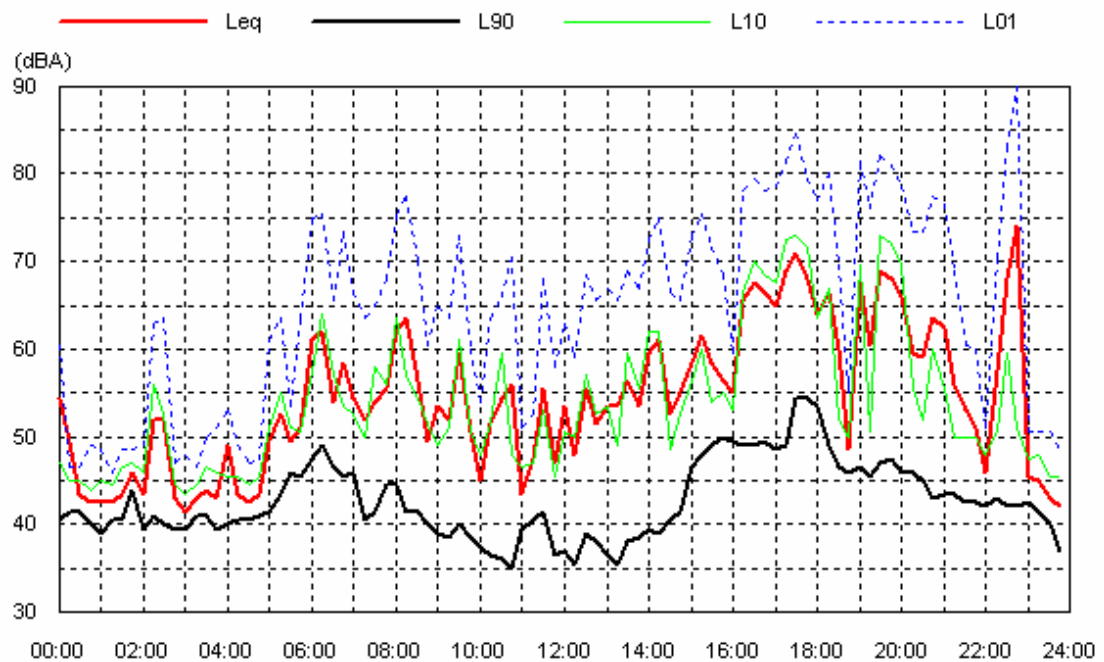


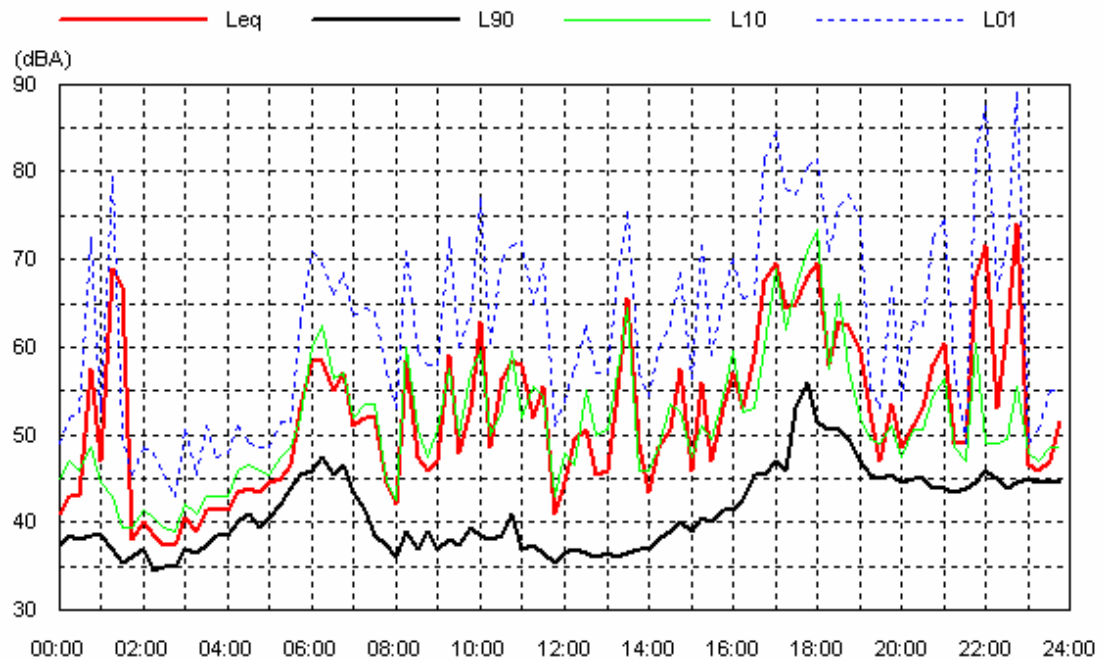
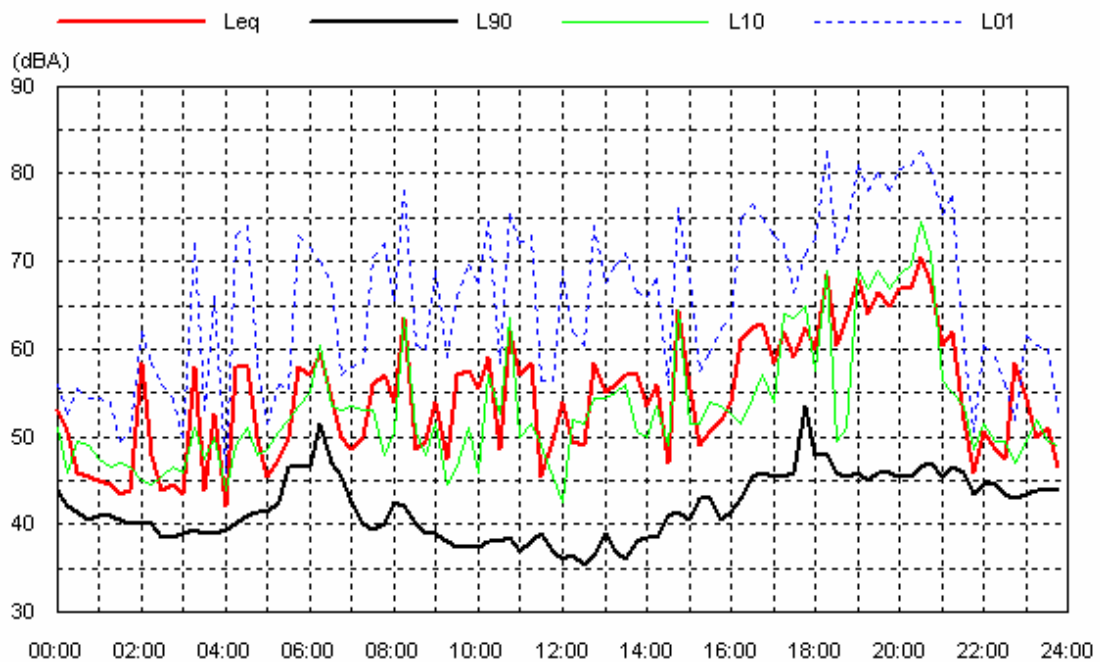
APPENDIX B

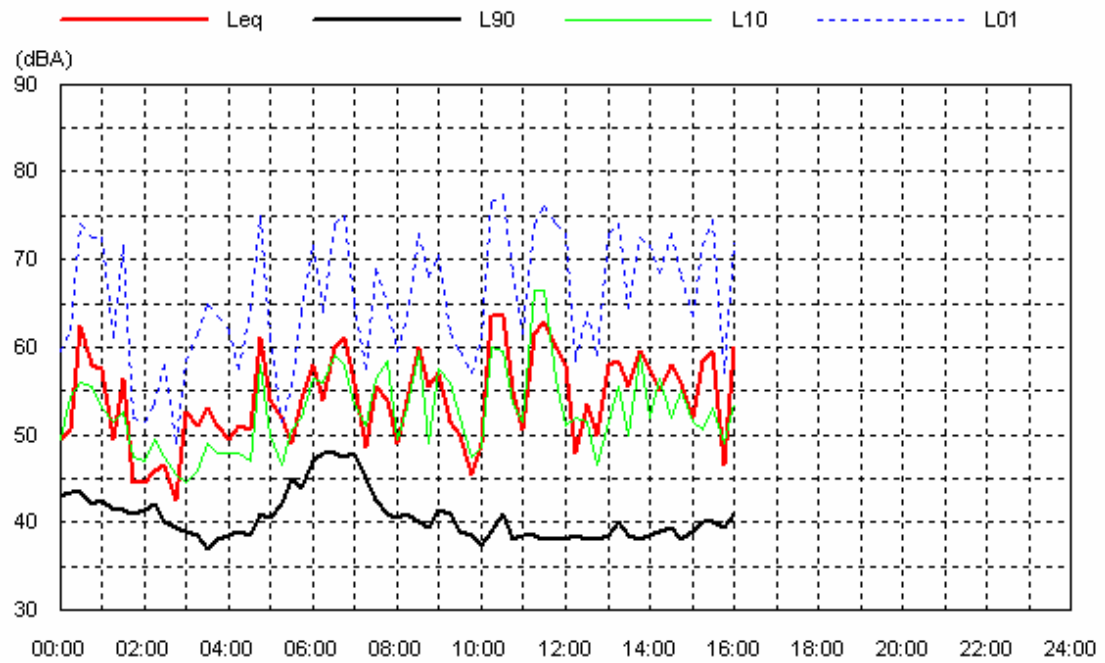
MEASURED BACKGROUND NOISE LEVELS

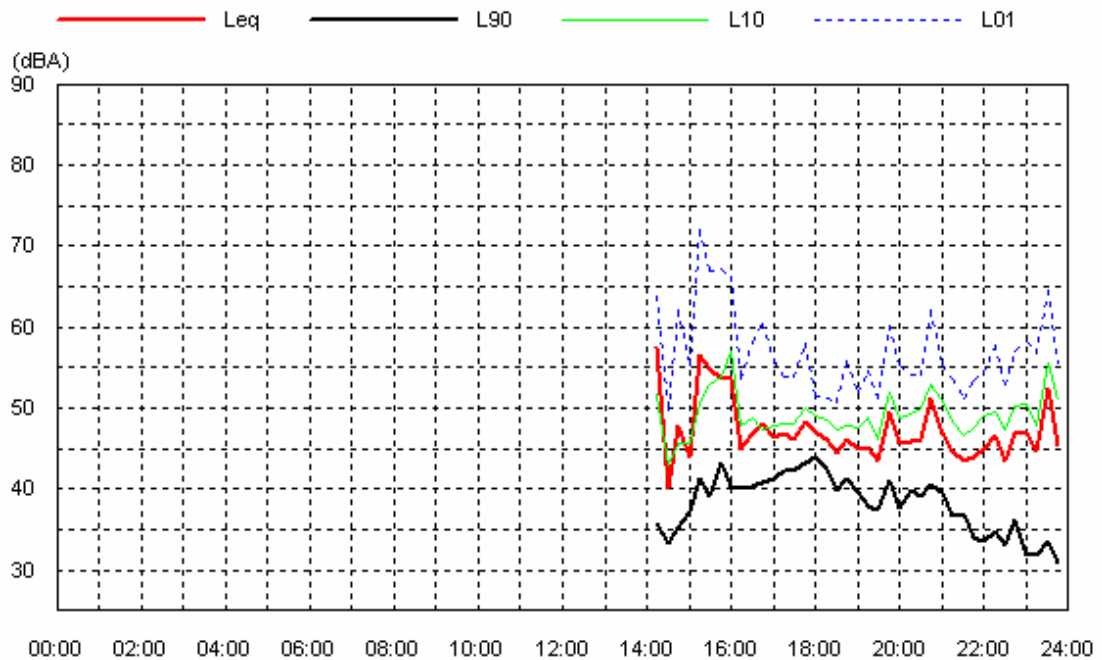
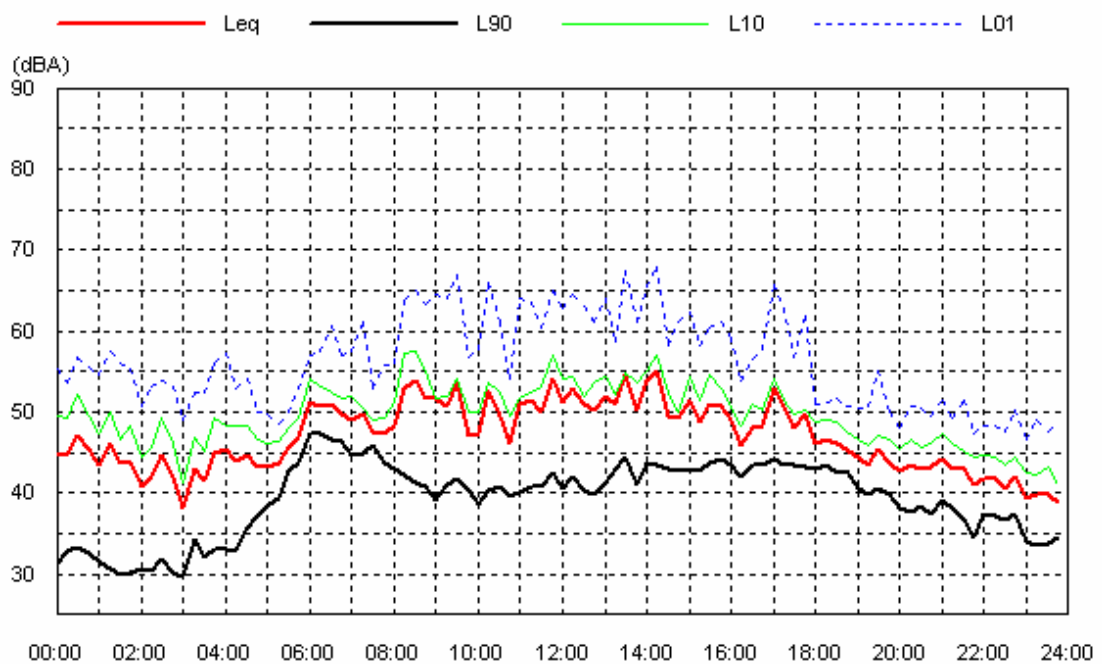
Location: McGarvie Smith Farm**Thu 08 Apr 04****Fri 09 Apr 04**

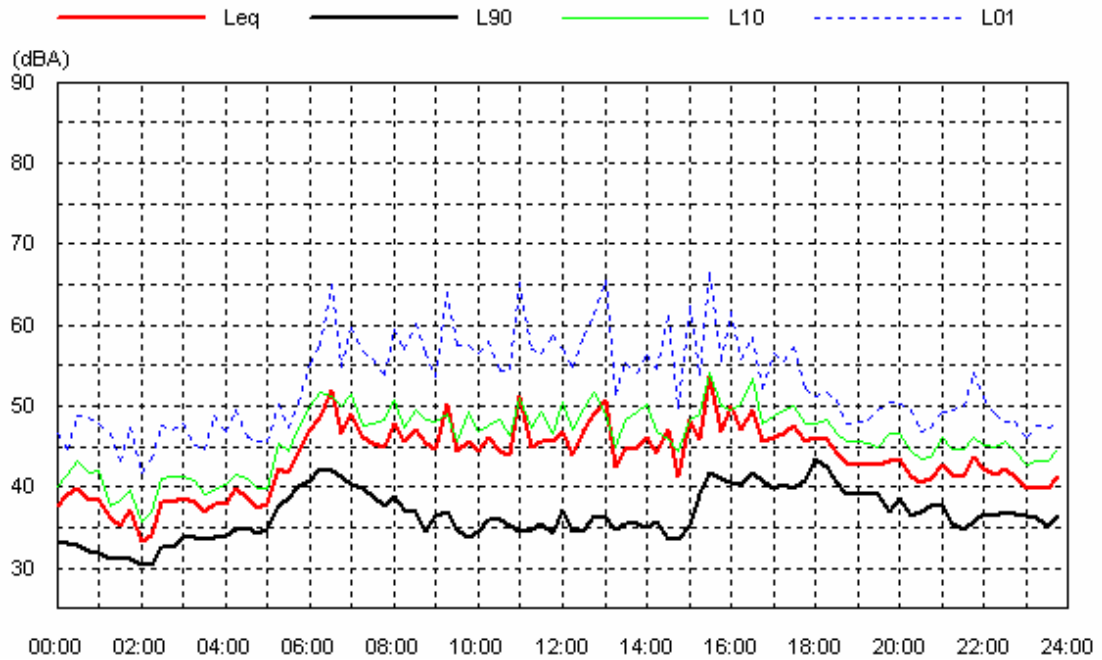
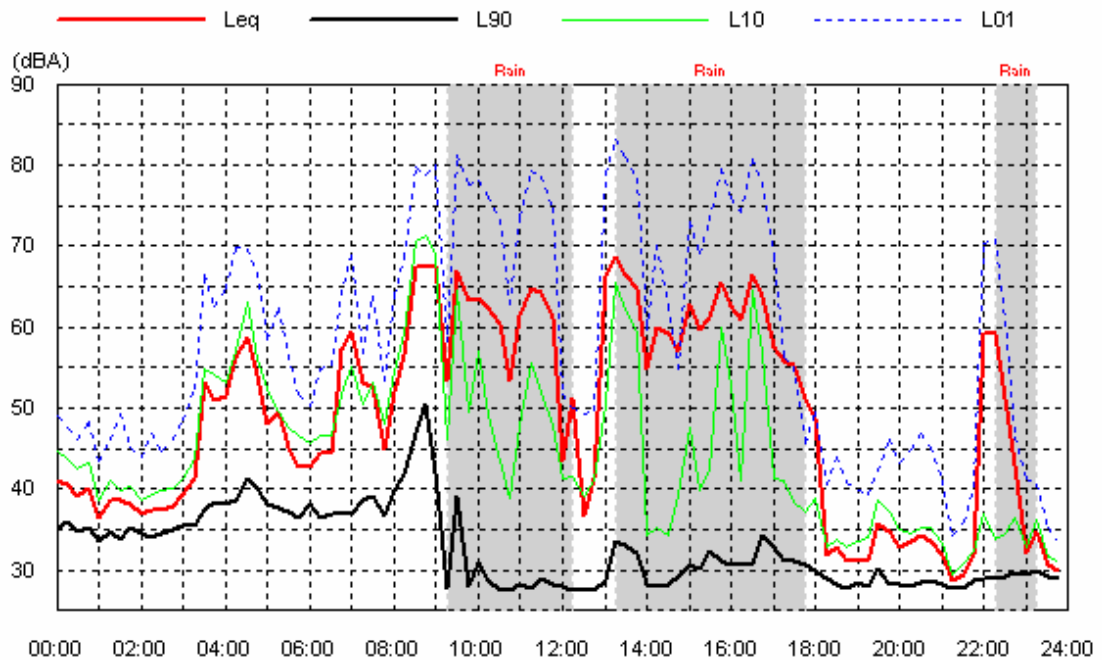
Location: McGarvie Smith Farm**Sat 10 Apr 04****Sun 11 Apr 04**

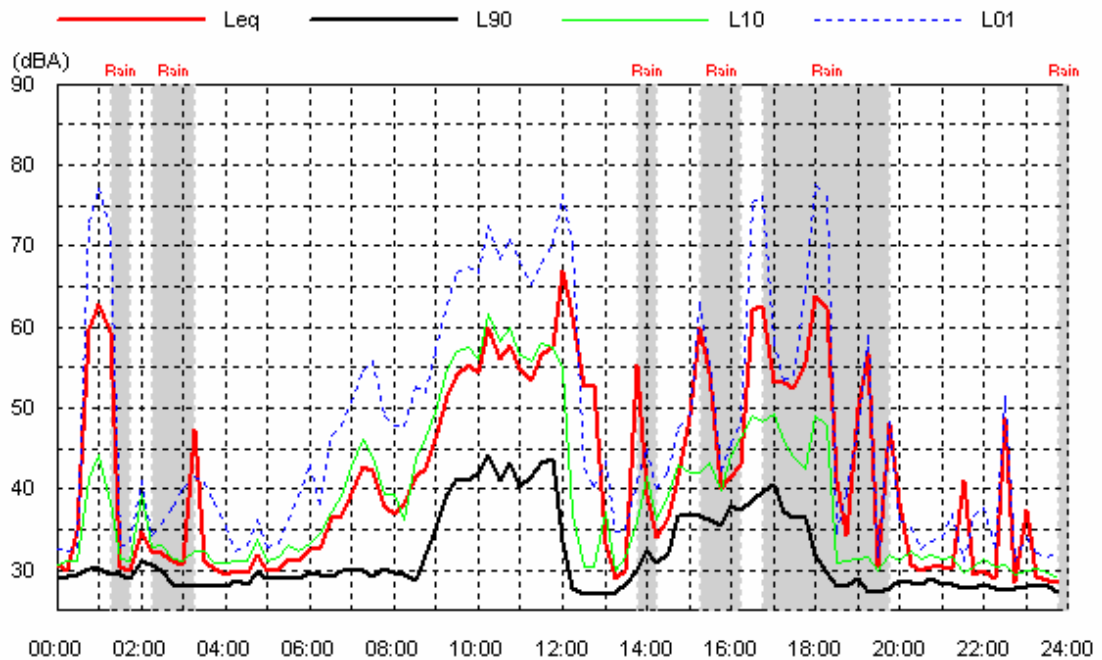
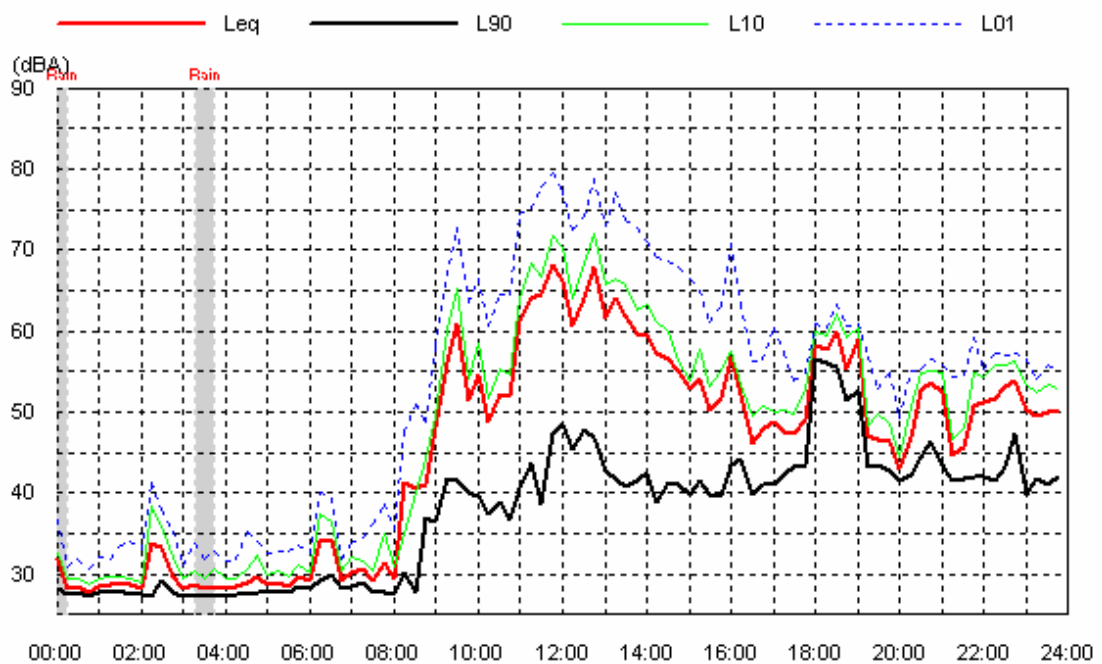
Location: McGarvie Smith Farm**Mon 12 Apr 04****Tue 13 Apr 04**

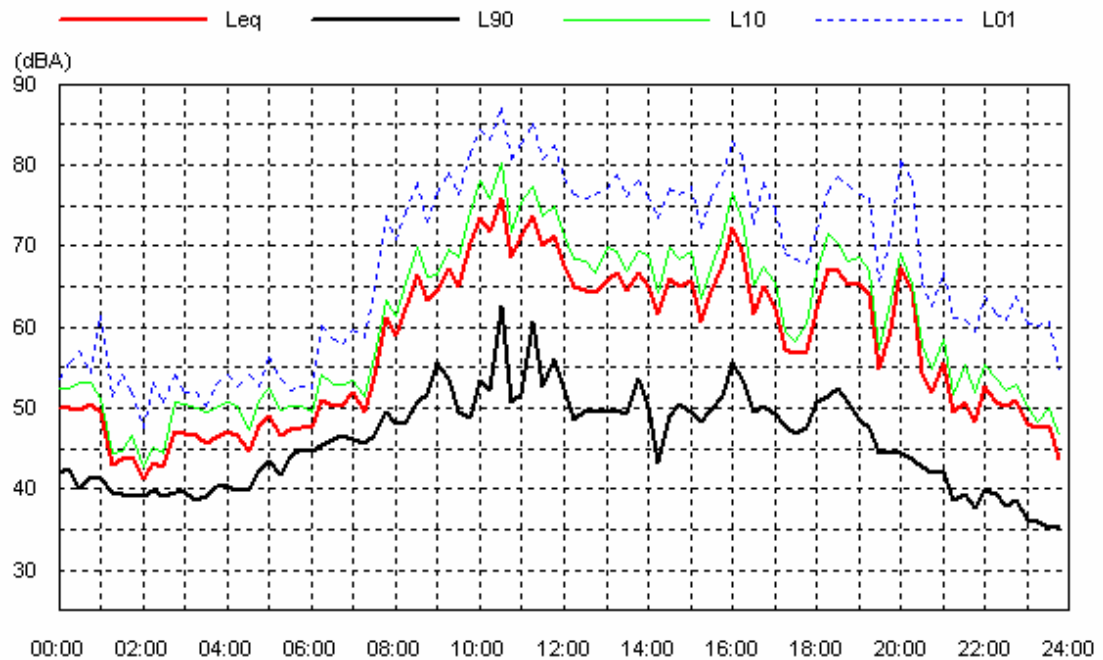
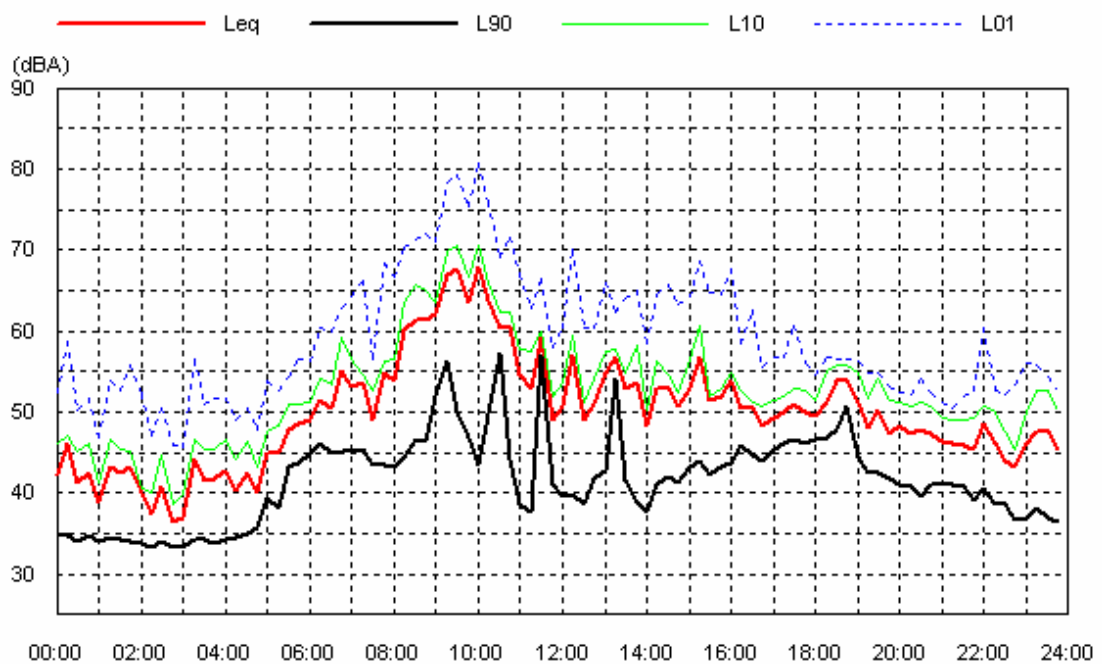
Location: McGarvie Smith Farm**Wed 14 Apr 04****Thu 15 Apr 04**

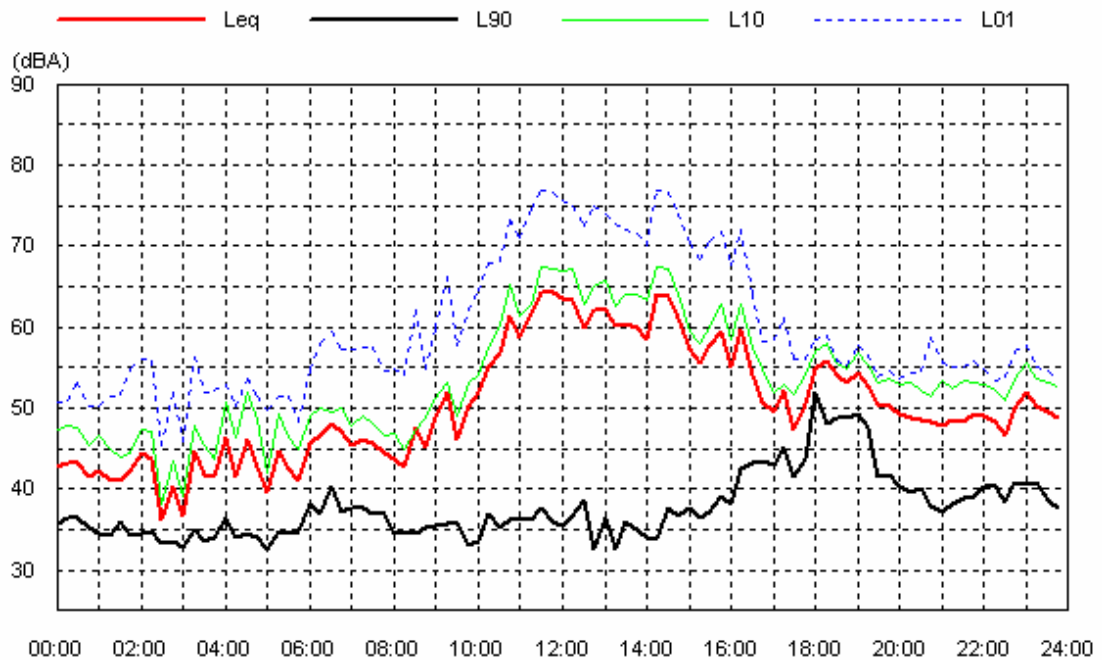
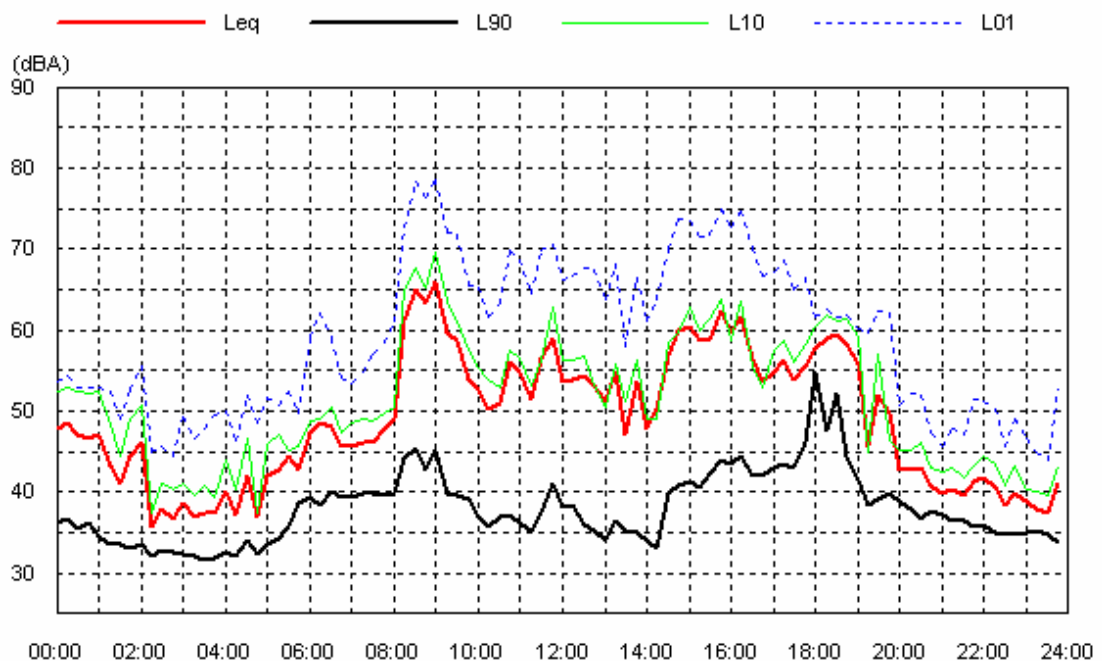
Location: McGarvie Smith Farm**Fri 16 Apr 04**

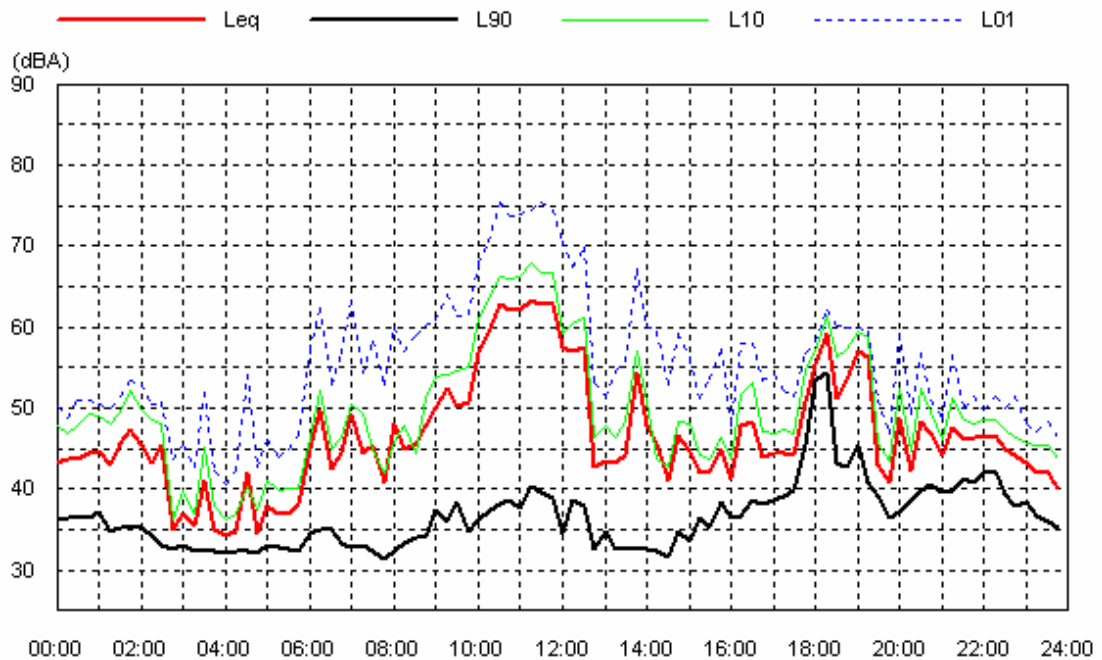
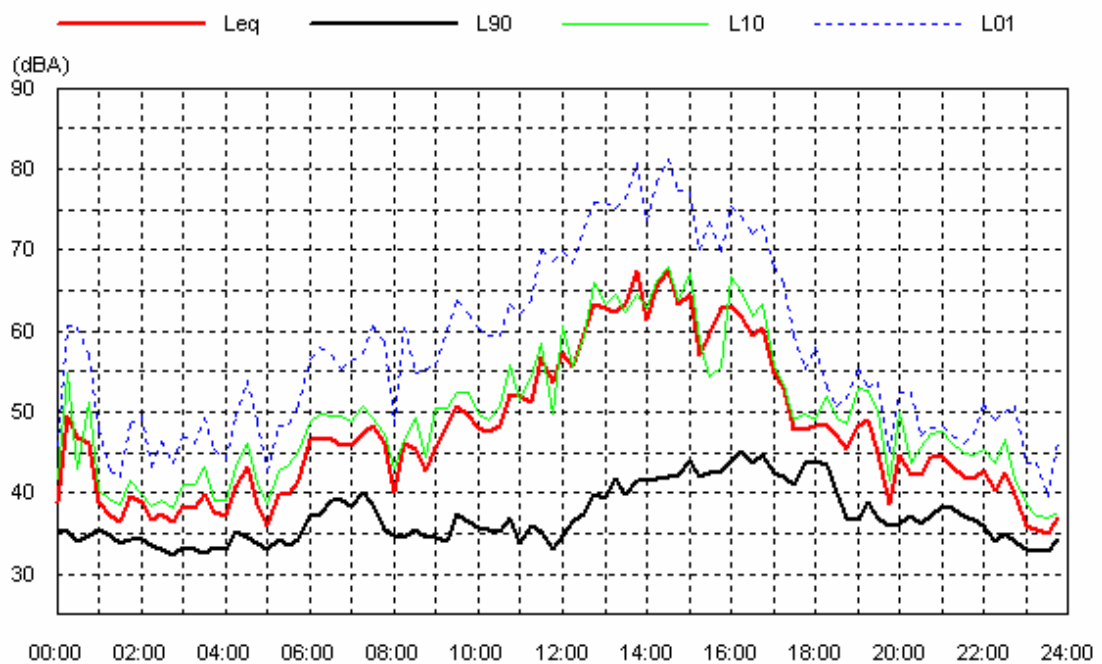
Location: 1745 Elizabeth Drive**Data shaded: Rain****Thu 01 Apr 04****Fri 02 Apr 04**

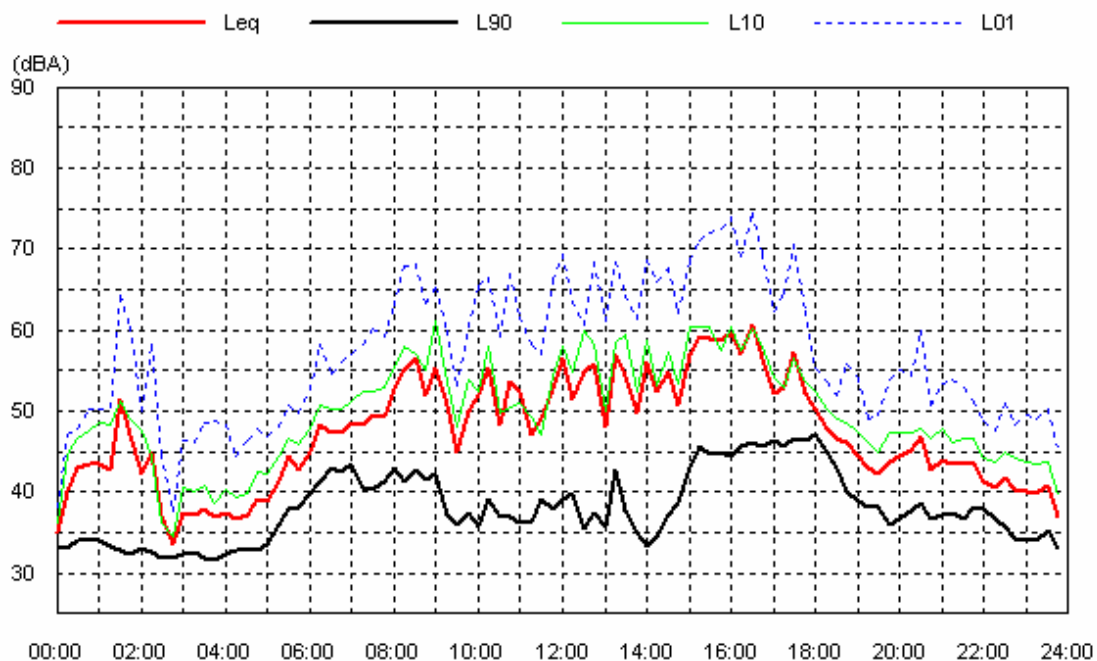
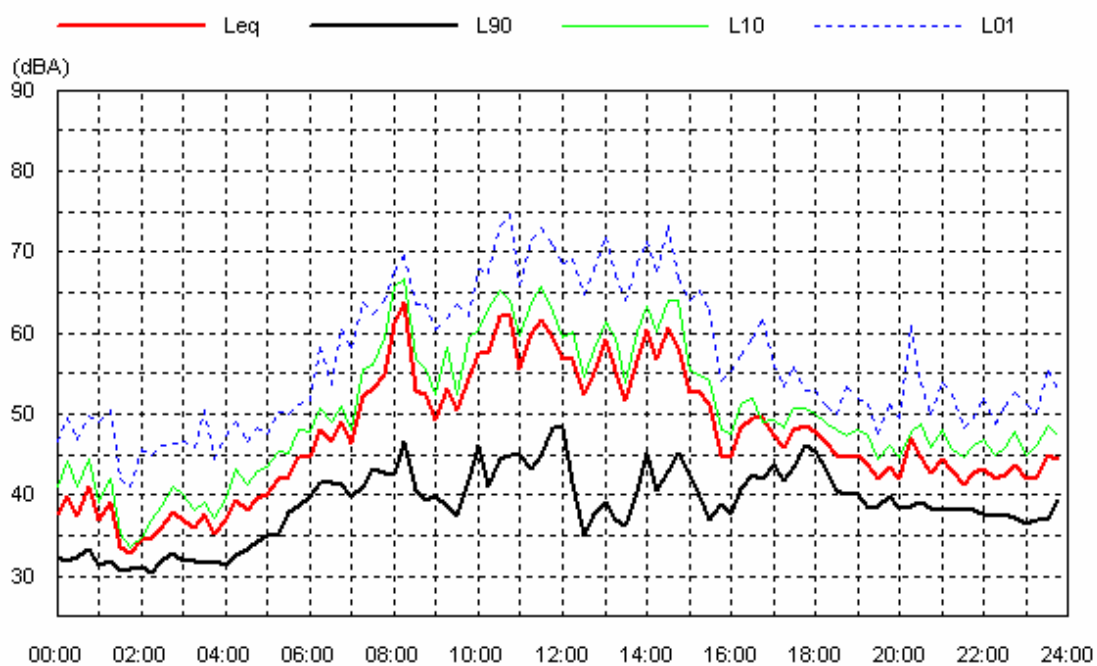
Location: 1745 Elizabeth Drive**Data shaded: Rain****Sat 03 Apr 04****Sun 04 Apr 04**

Location: 1745 Elizabeth Drive**Data shaded: Rain****Mon 05 Apr 04****Tue 06 Apr 04**

Location: 1745 Elizabeth Drive**Data shaded: Rain****Wed 07 Apr 04****Thu 08 Apr 04**

Location: 1745 Elizabeth Drive**Data shaded: Rain****Fri 09 Apr 04****Sat 10 Apr 04**

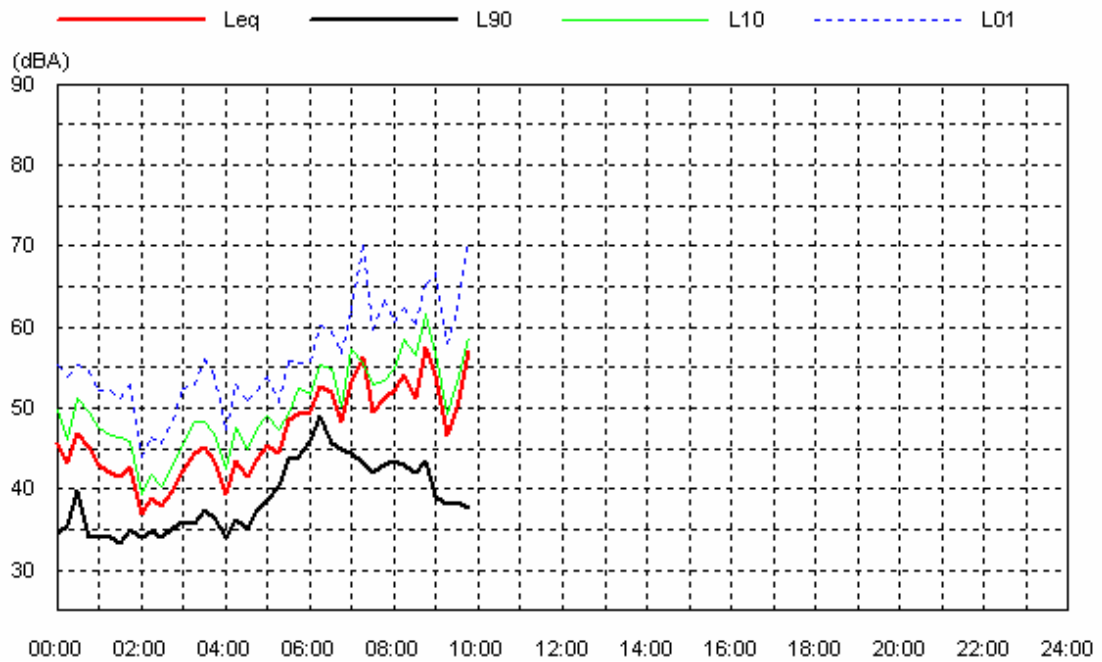
Location: 1745 Elizabeth Drive**Data shaded: Rain****Sun 11 Apr 04****Mon 12 Apr 04**

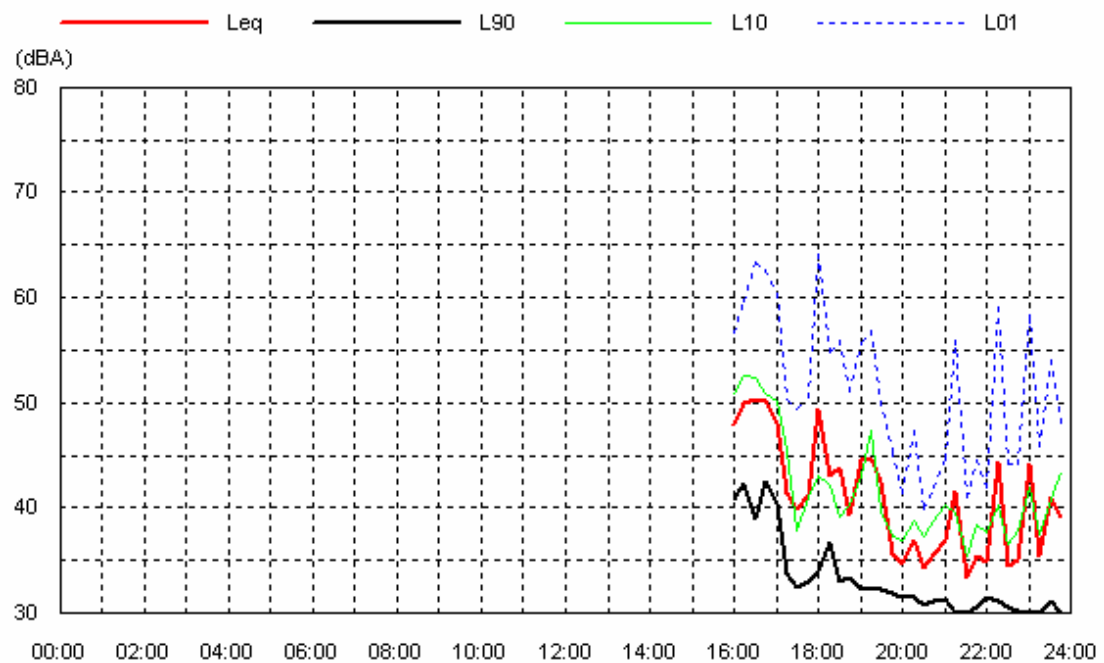
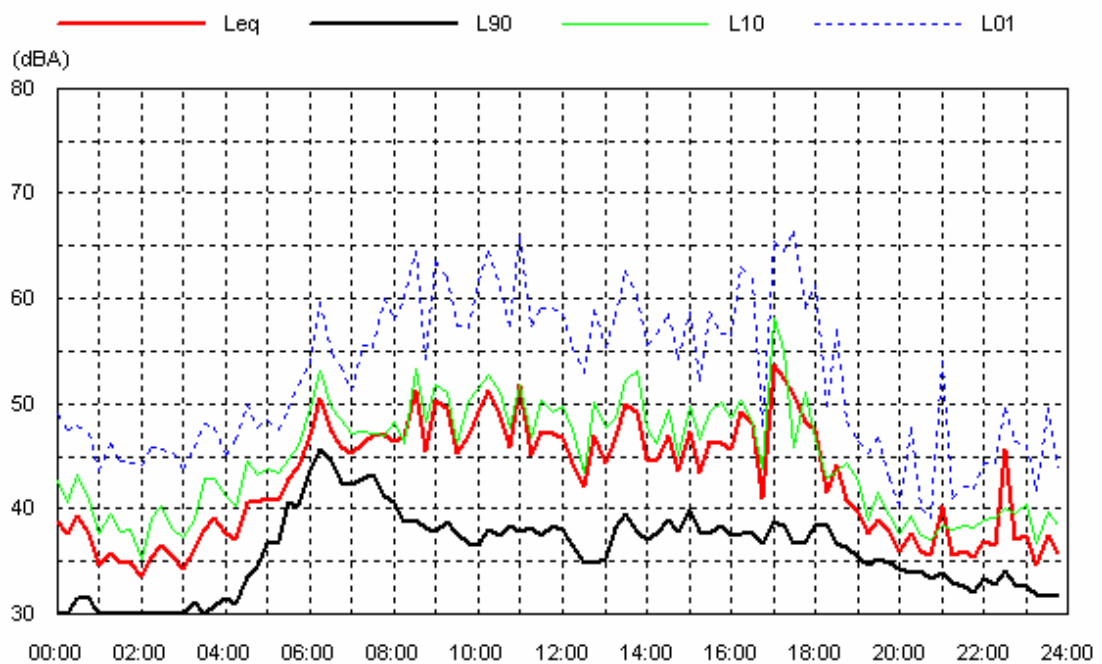
Location: 1745 Elizabeth Drive**Data shaded: Rain****Tue 13 Apr 04****Wed 14 Apr 04**

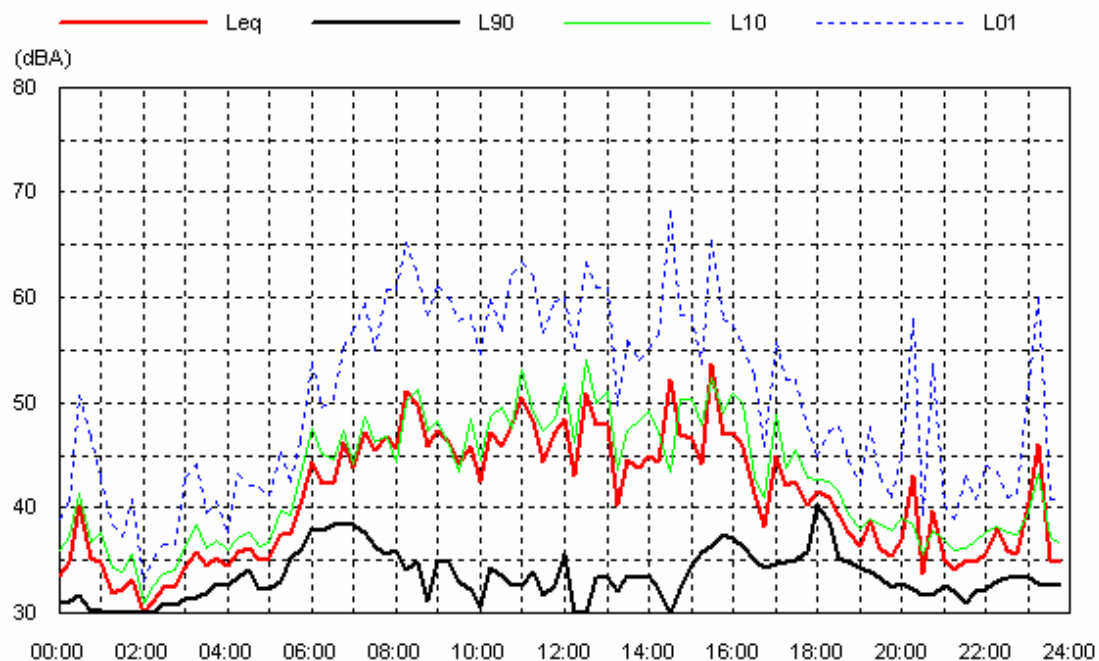
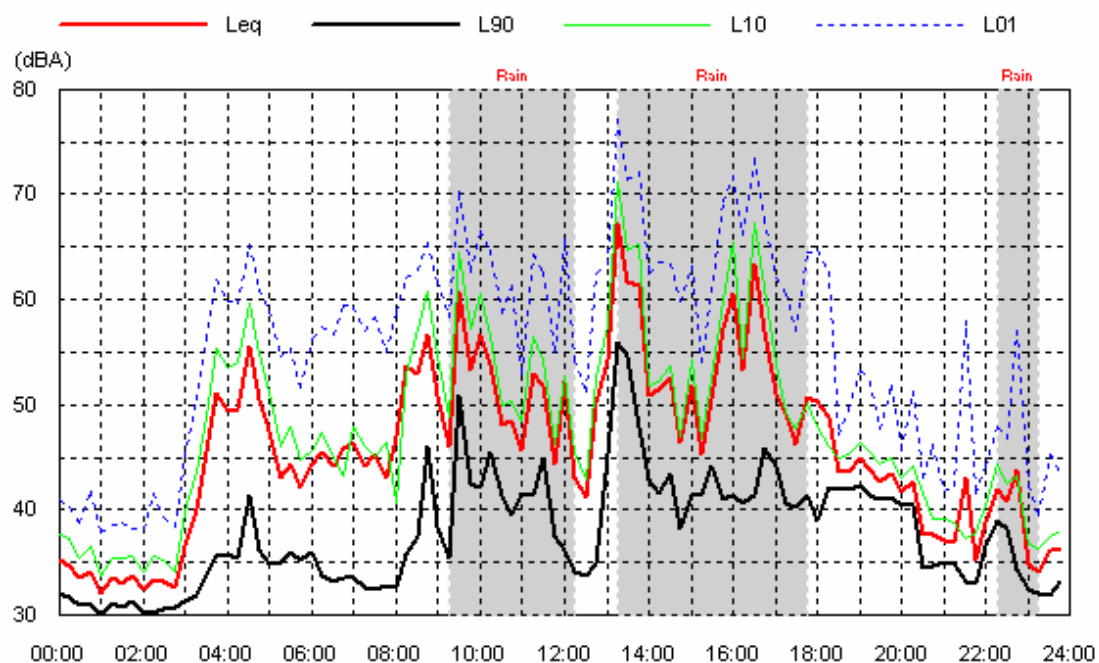
Location: 1745 Elizabeth Drive

Data shaded: Rain

Thu 15 Apr 04



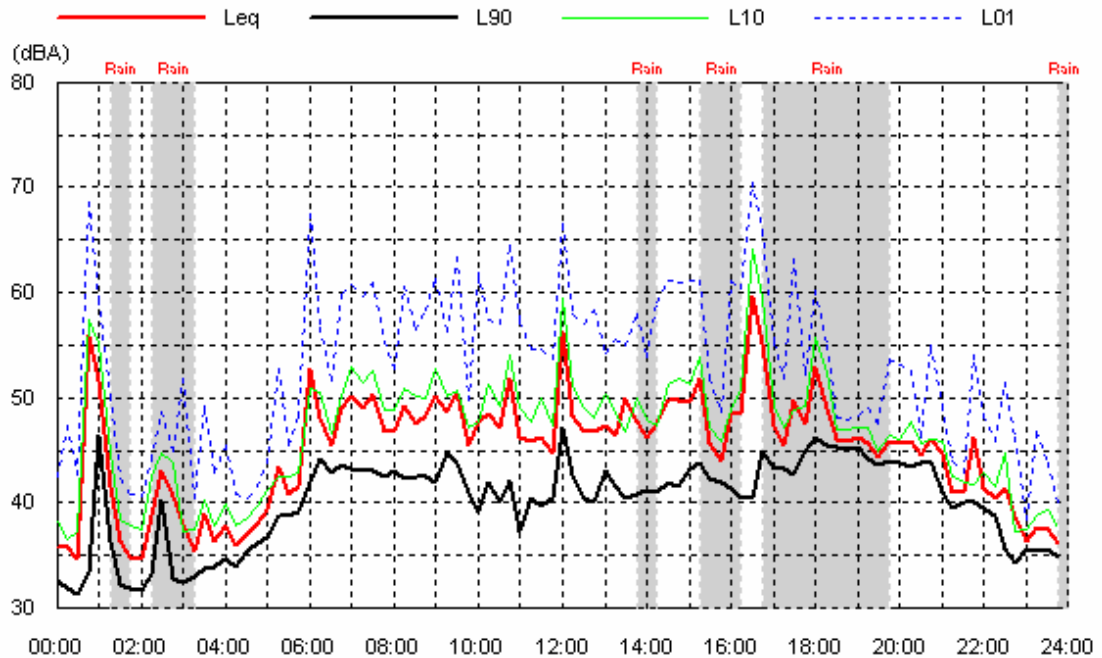
Location: Caretaker 1669A Elizabeth Drive**Data shaded: Rain****Thu 01 Apr 04****Fri 02 Apr 04**

Location: Caretaker 1669A Elizabeth Drive**Data shaded: Rain****Sat 03 Apr 04****Sun 04 Apr 04**

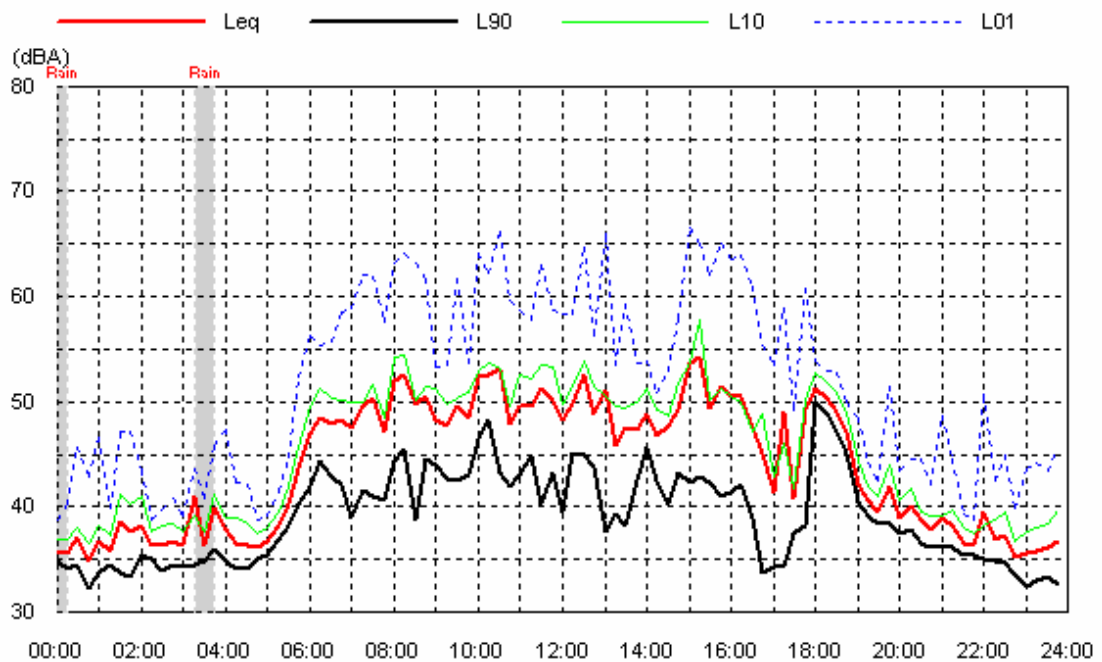
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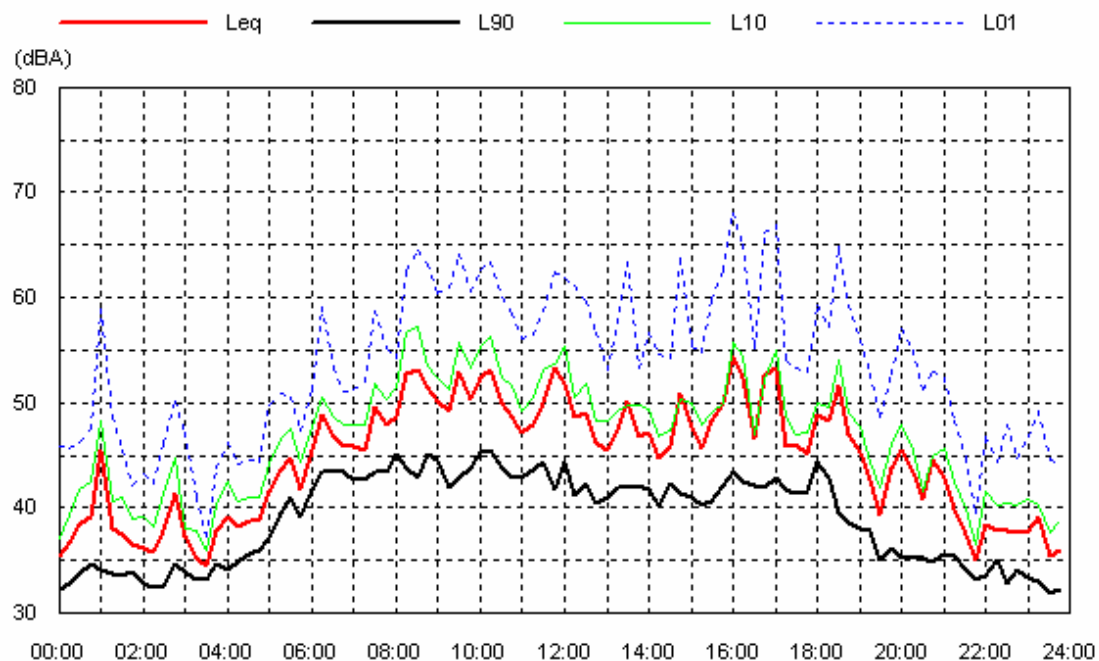
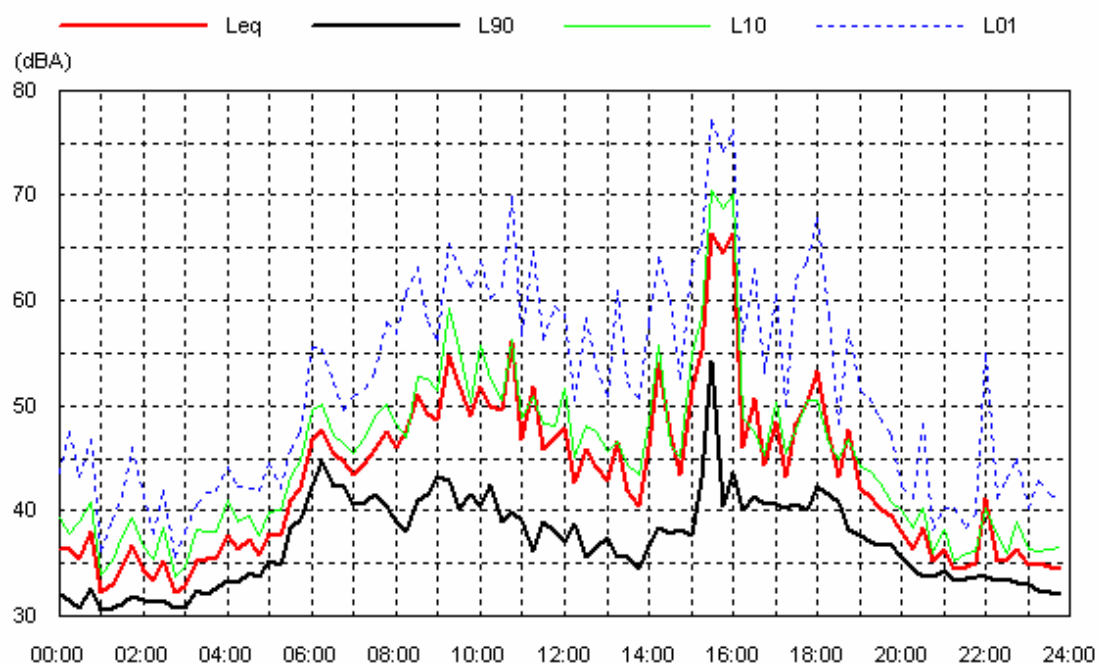
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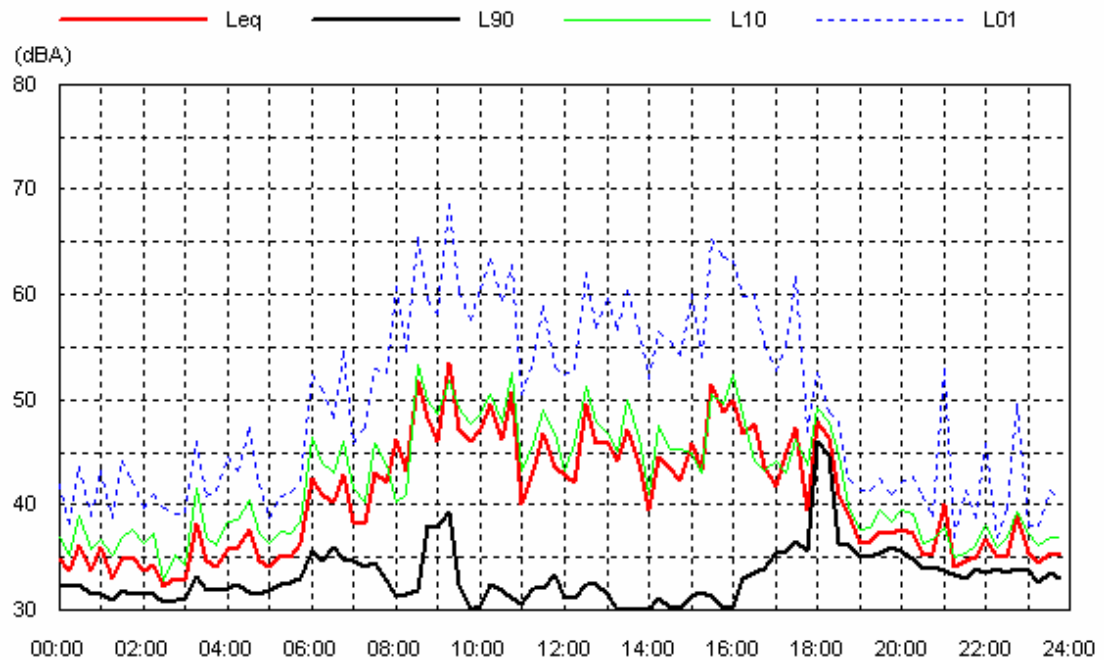
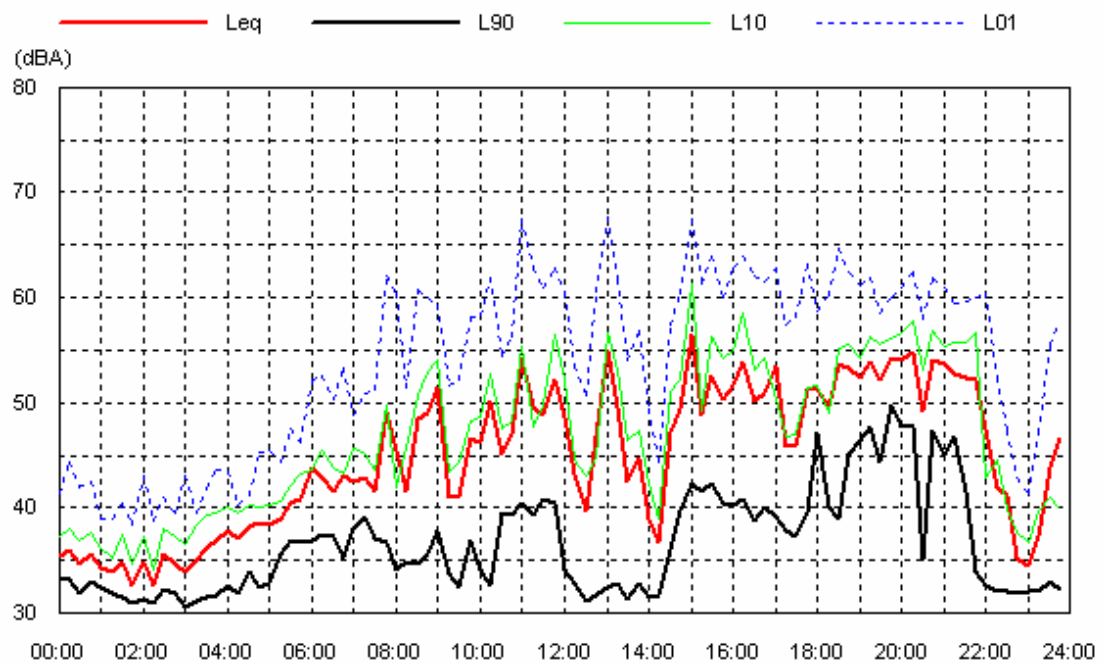
Mon 05 Apr 04



Tue 06 Apr 04



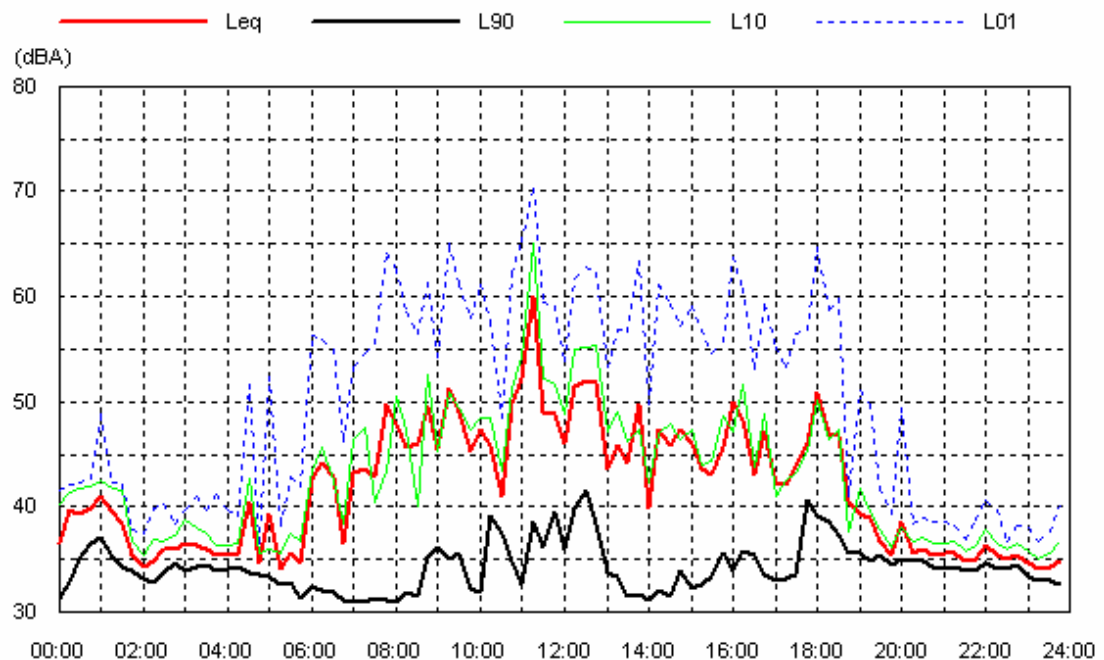
Location: Caretaker 1669A Elizabeth Drive**Data shaded: Rain****Wed 07 Apr 04****Thu 08 Apr 04**

Location: Caretaker 1669A Elizabeth Drive**Data shaded: Rain****Fri 09 Apr 04****Sat 10 Apr 04**

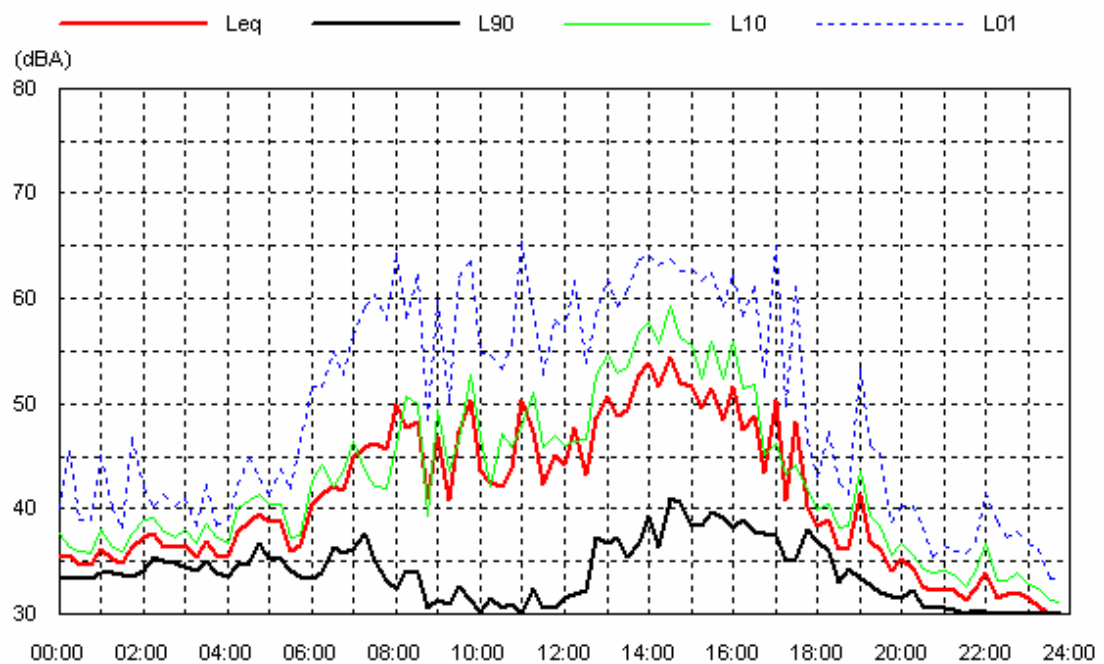
Location: Caretaker 1669A Elizabeth Drive

Data shaded: Rain

Sun 11 Apr 04



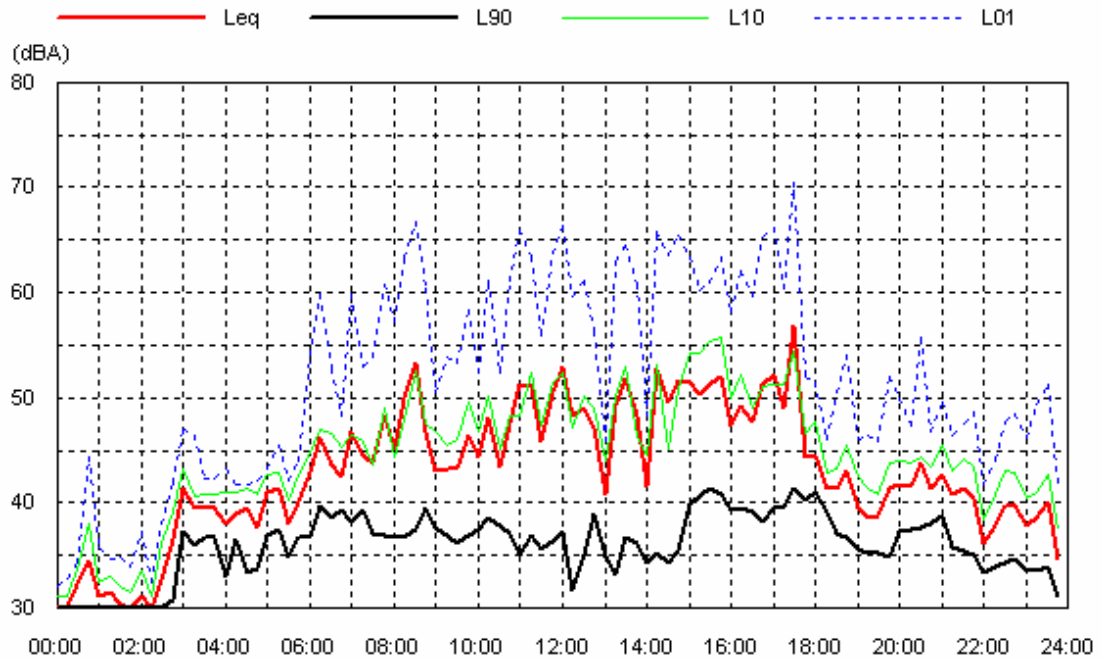
Mon 12 Apr 04



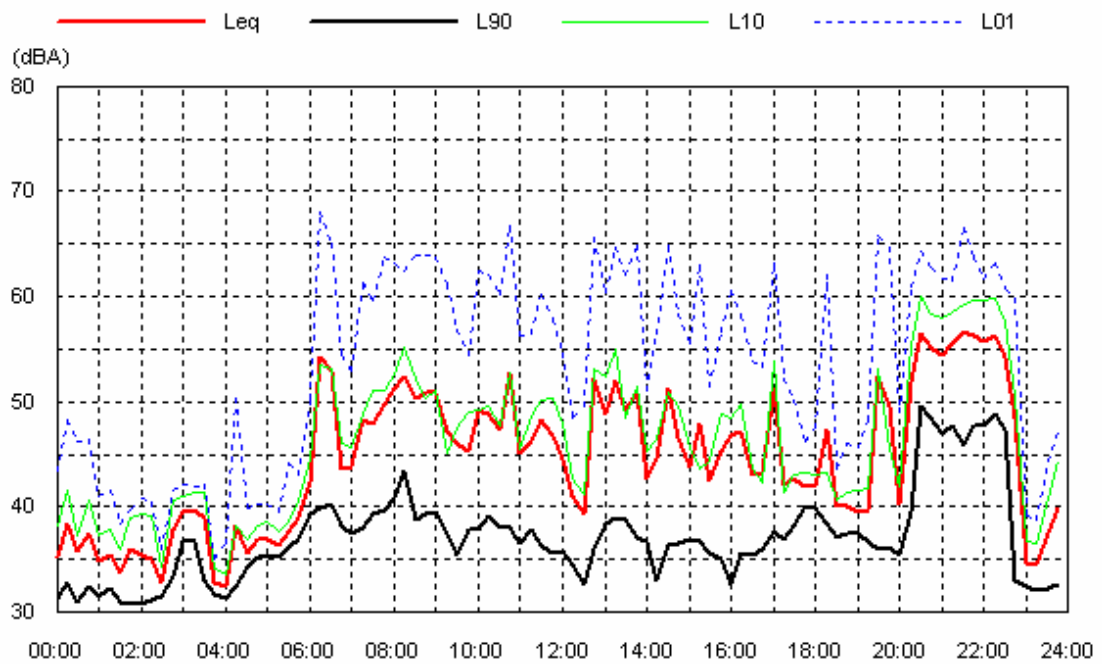
Location: Caretaker 1669A Elizabeth Drive

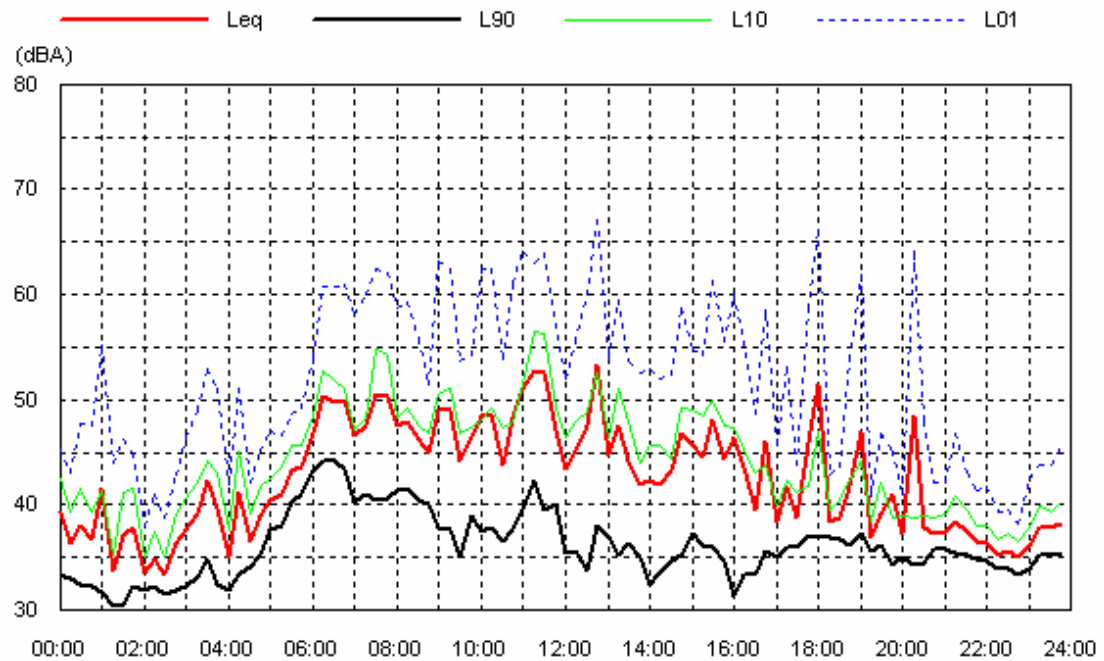
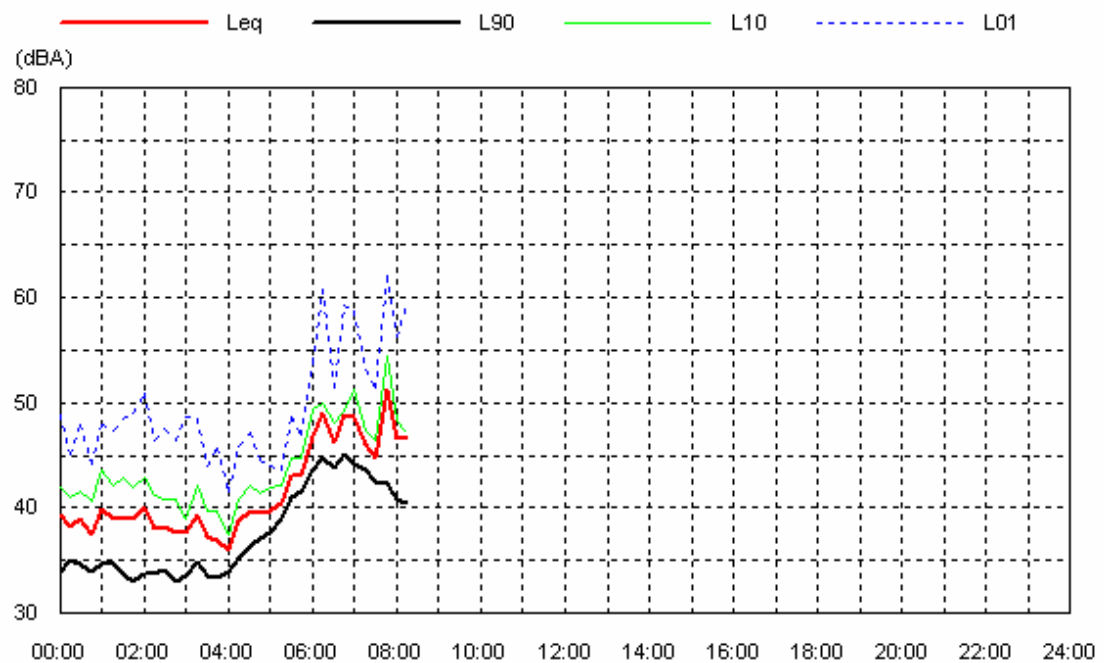
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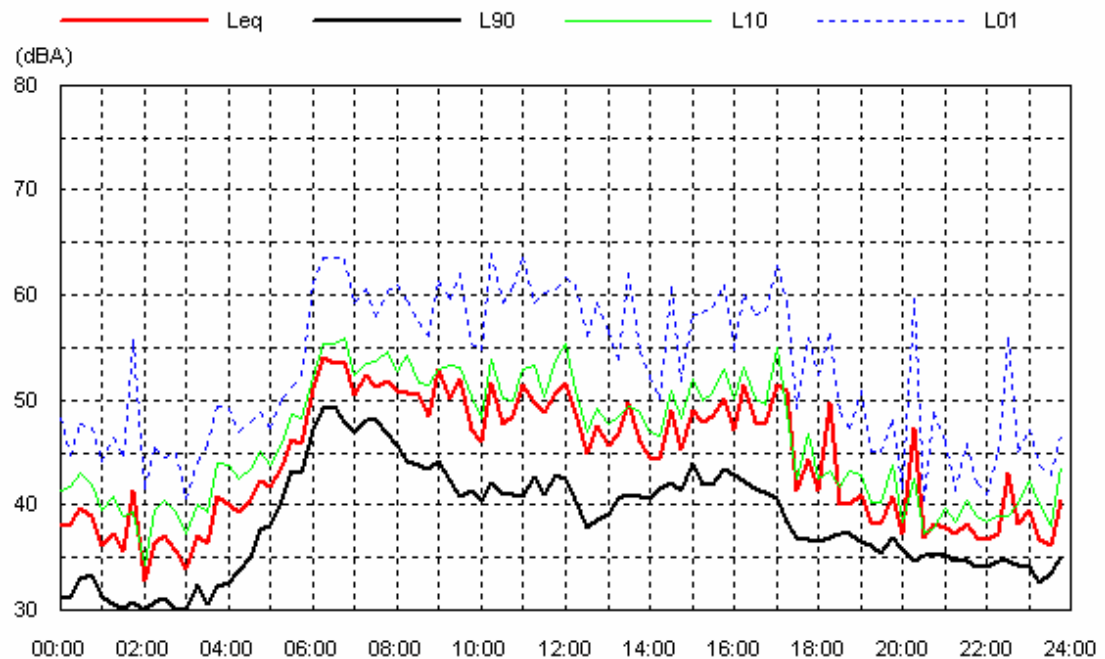
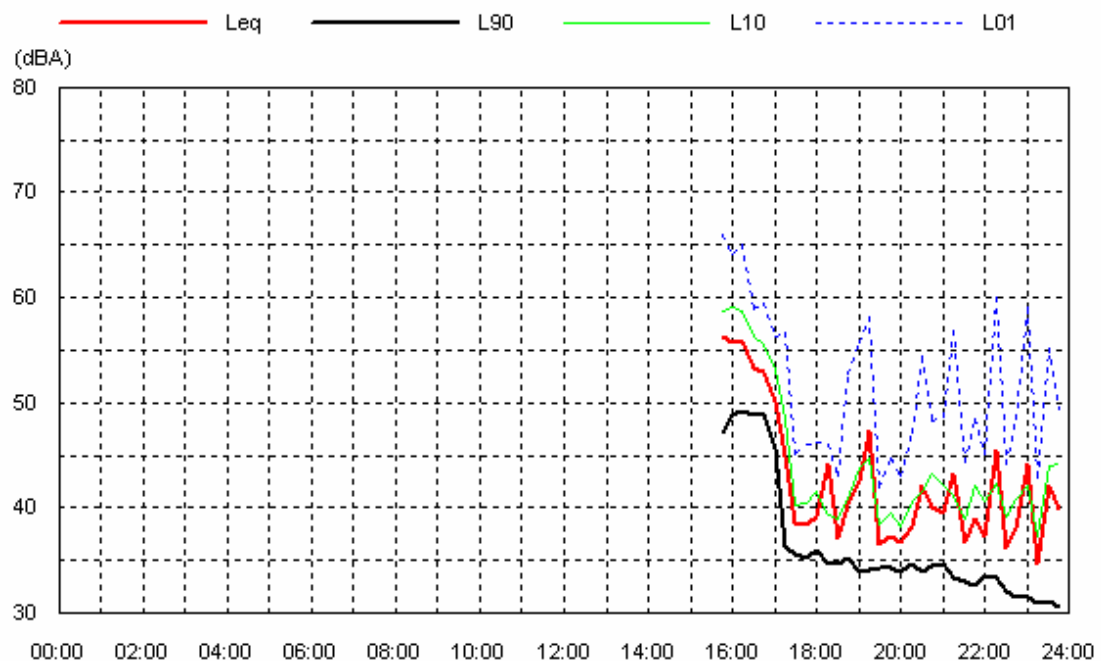
Tue 13 Apr 04

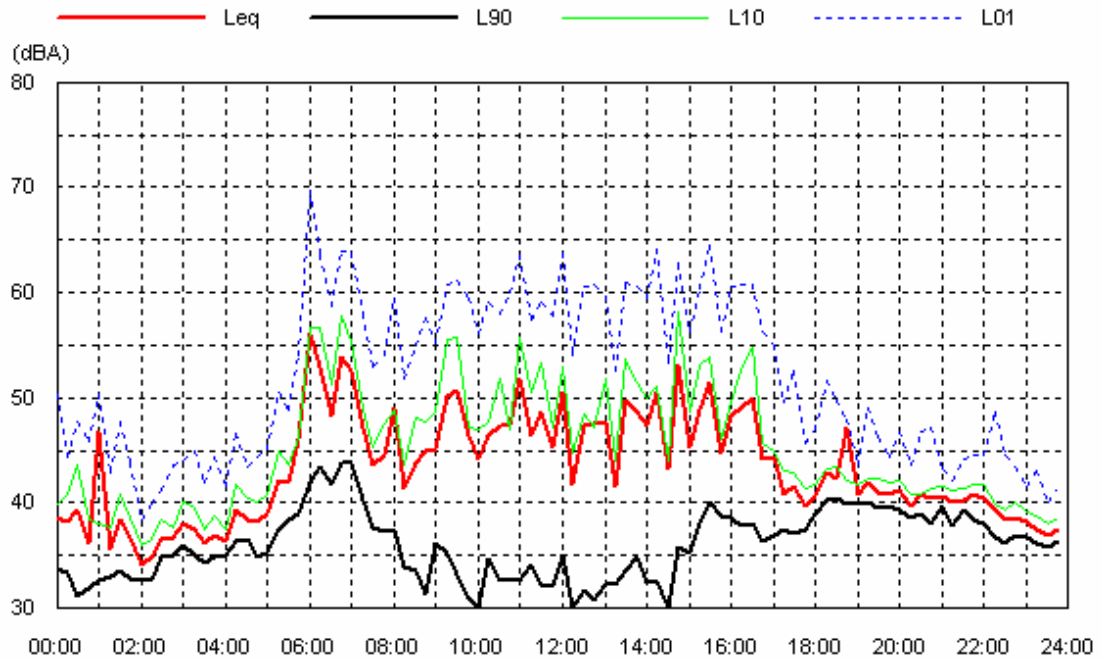
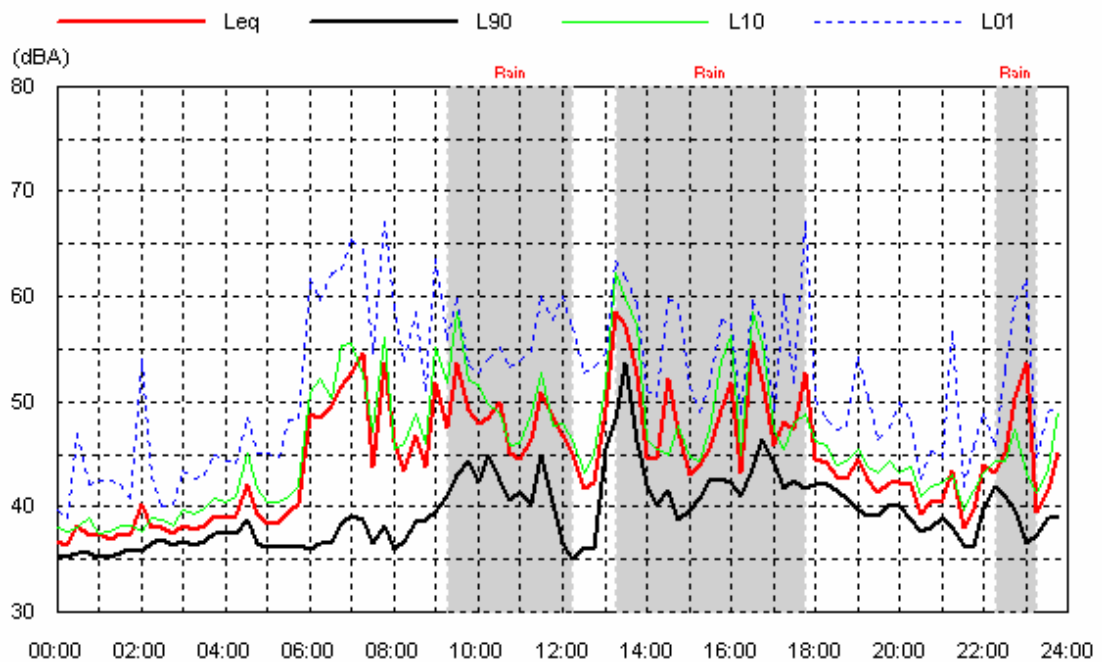


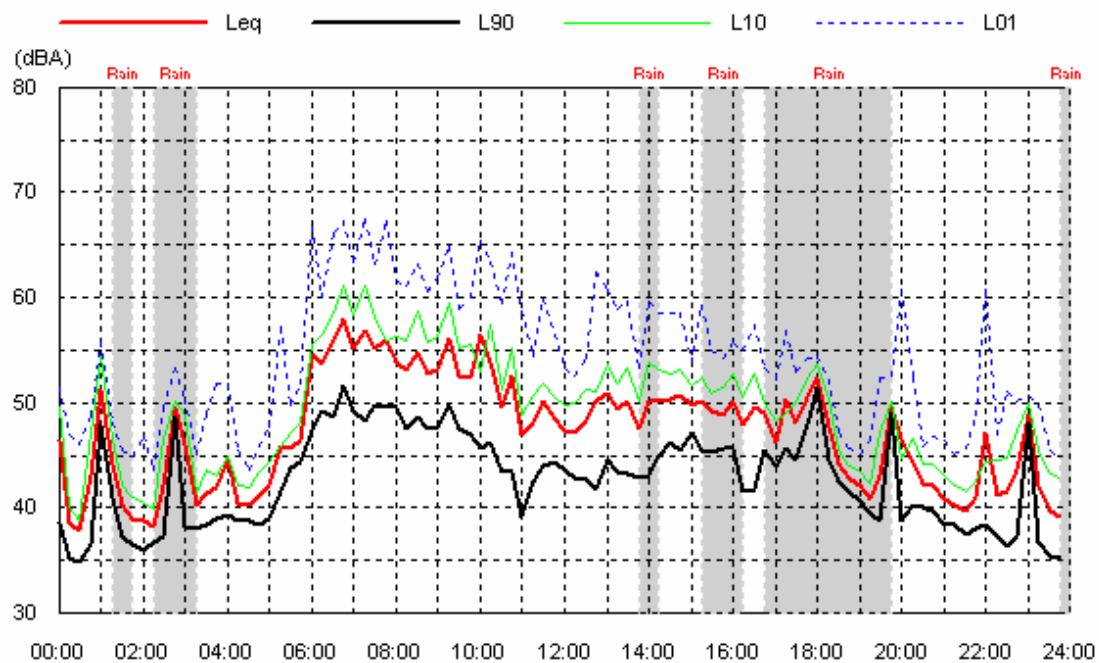
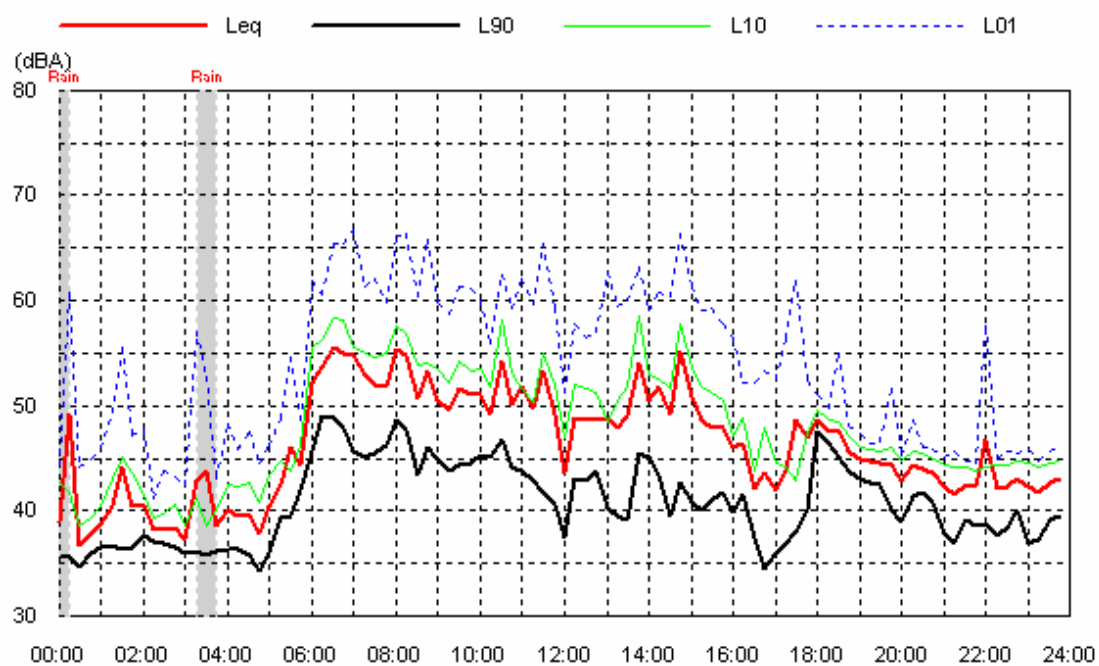
Wed 14 Apr 04

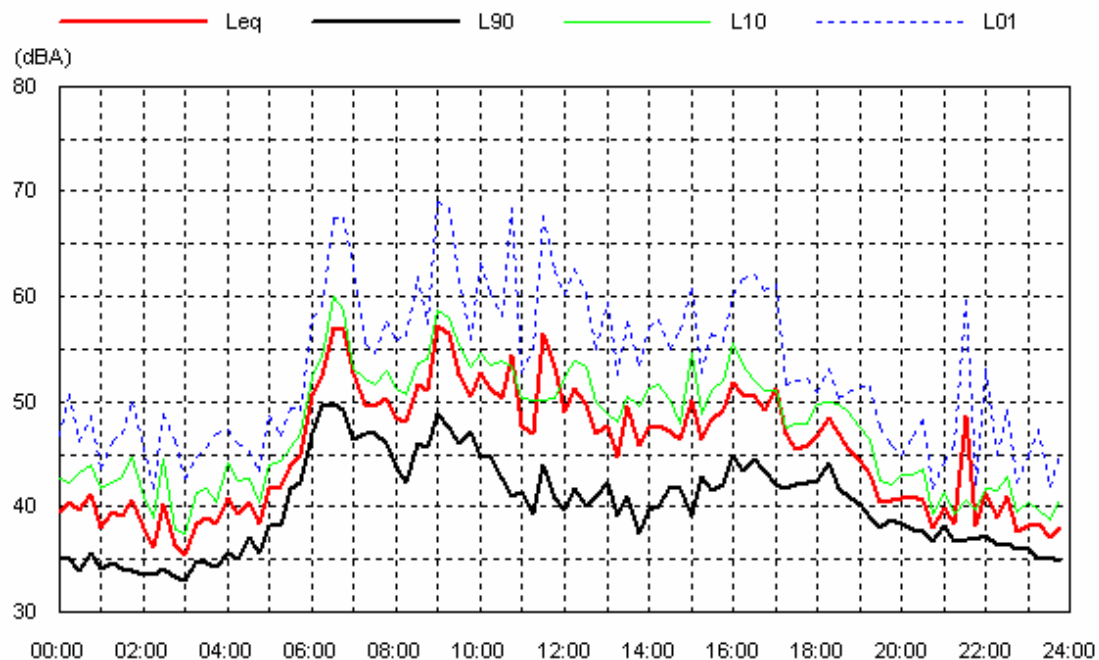
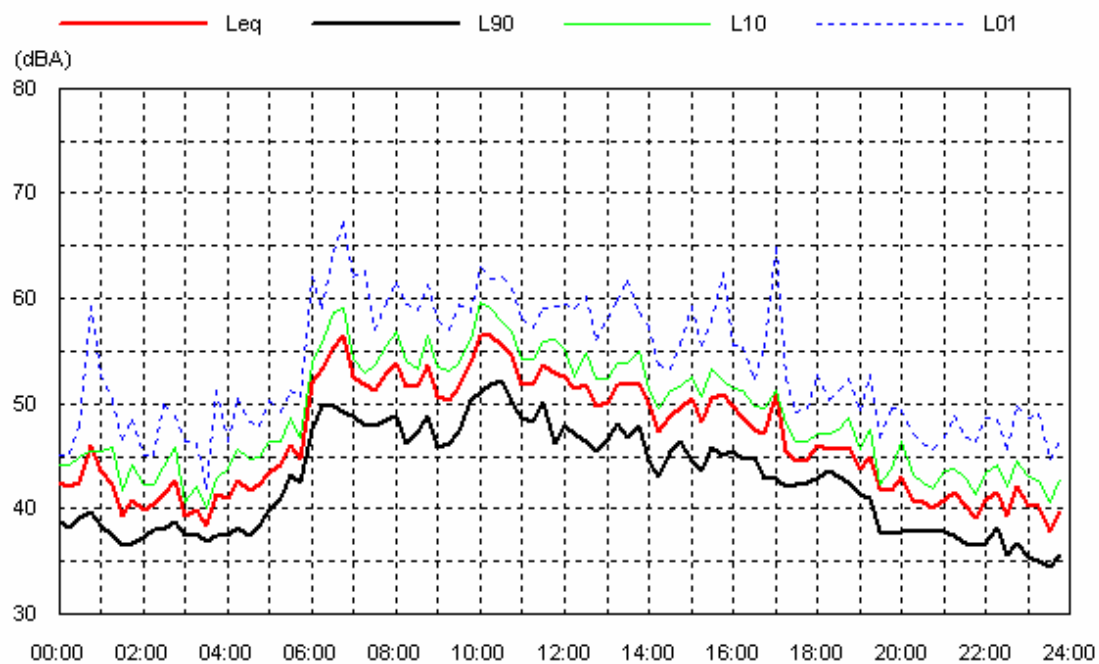


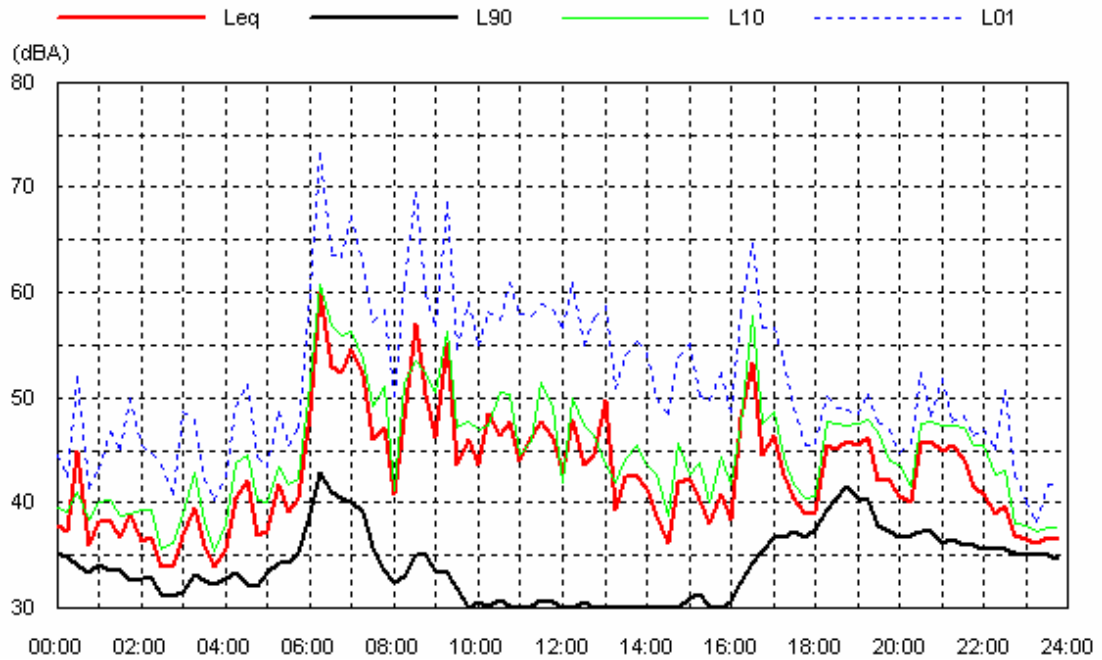
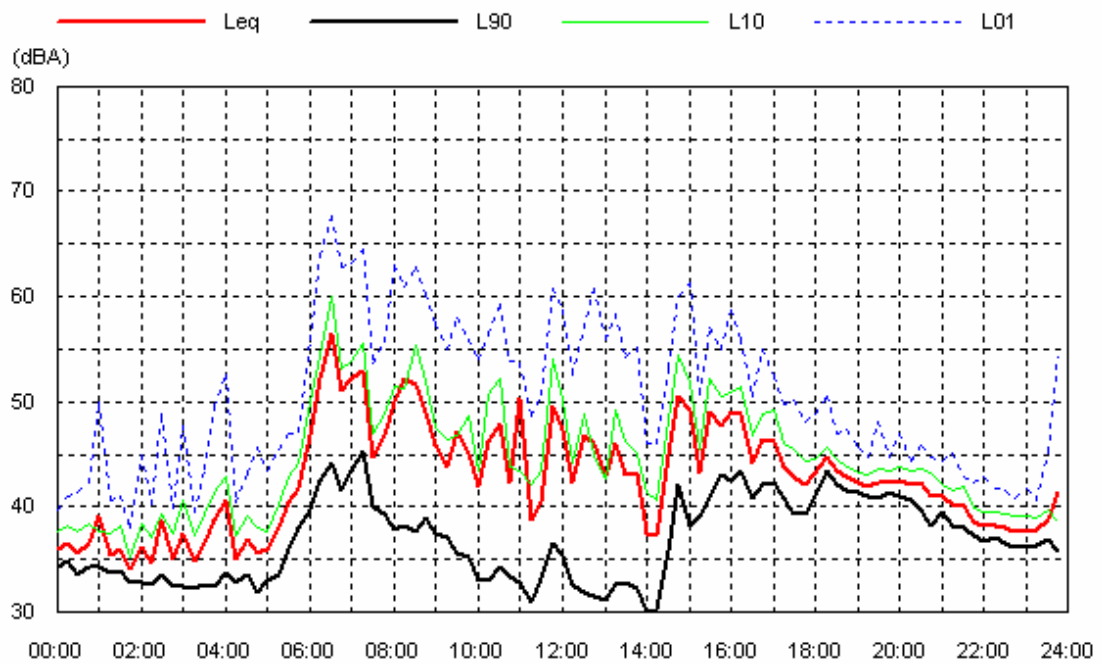
Location: Caretaker 1669A Elizabeth Drive**Data shaded: Rain****Thu 15 Apr 04****Fri 16 Apr 04**

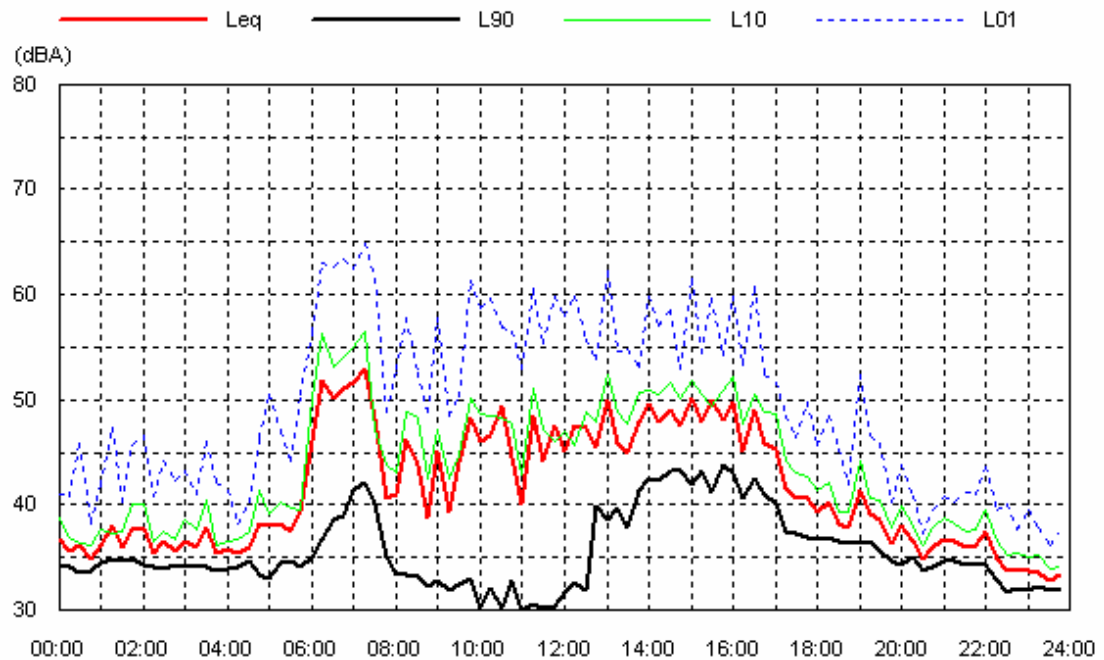
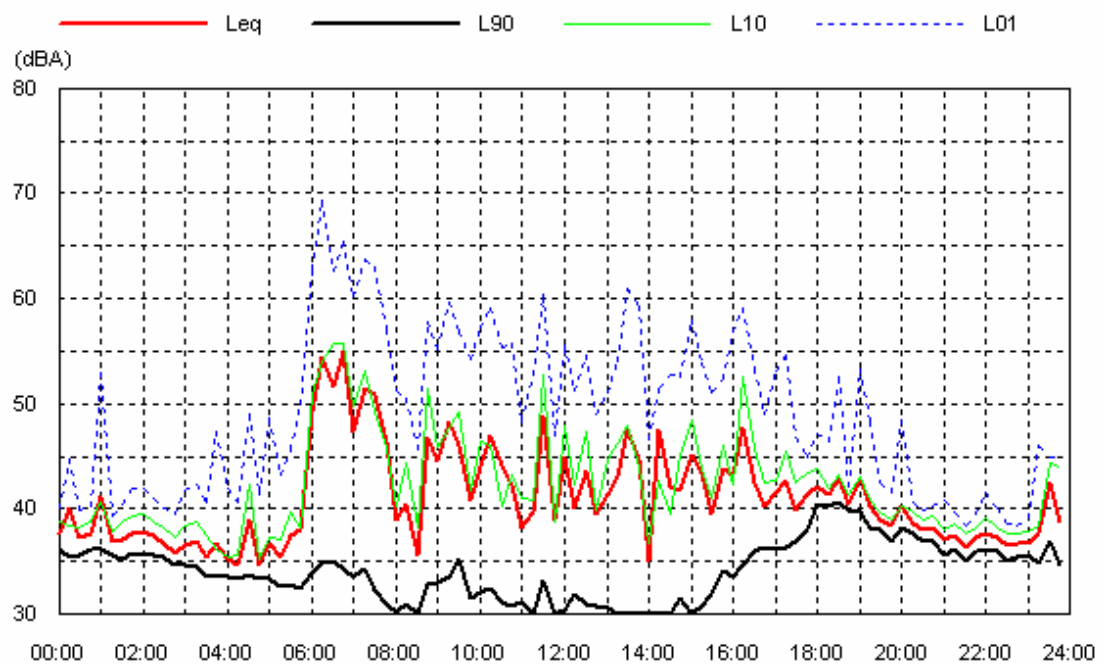
Location: 1669A Elizabeth Drive**Data shaded: Rain****Thu 01 Apr 04****Fri 02 Apr 04**

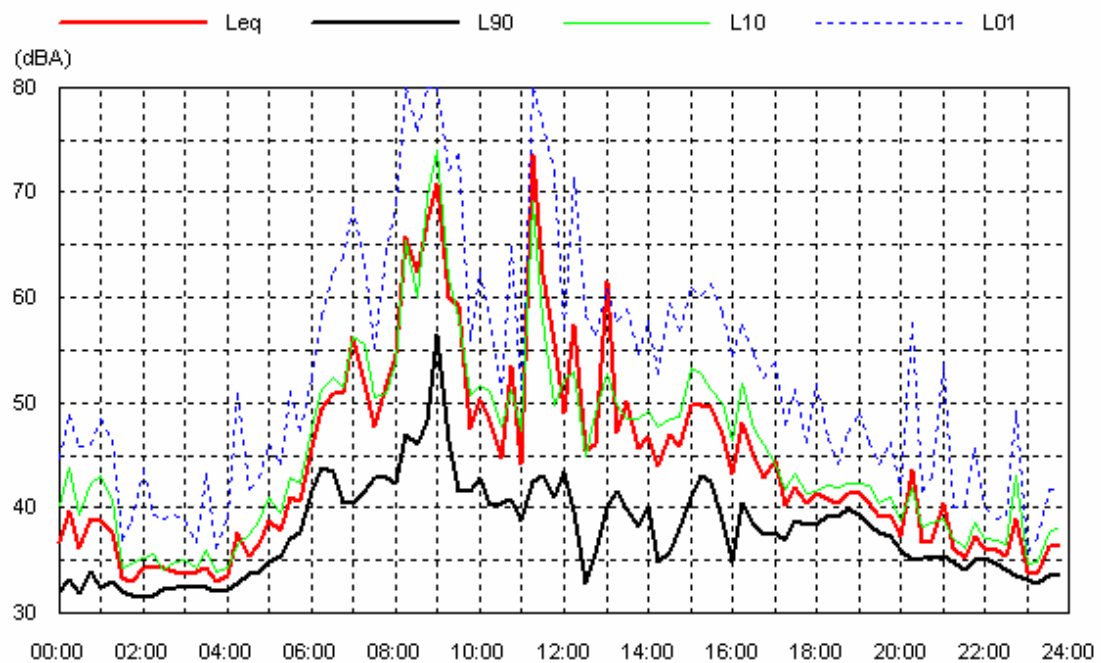
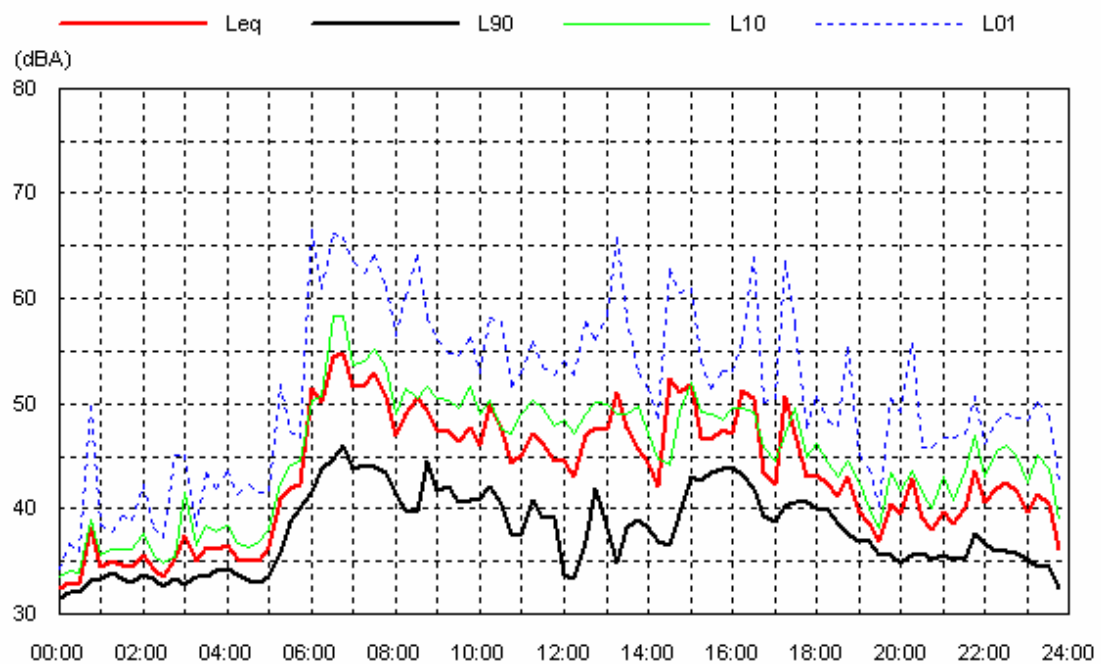
Location: 1669A Elizabeth Drive**Data shaded: Rain****Sat 03 Apr 04****Sun 04 Apr 04**

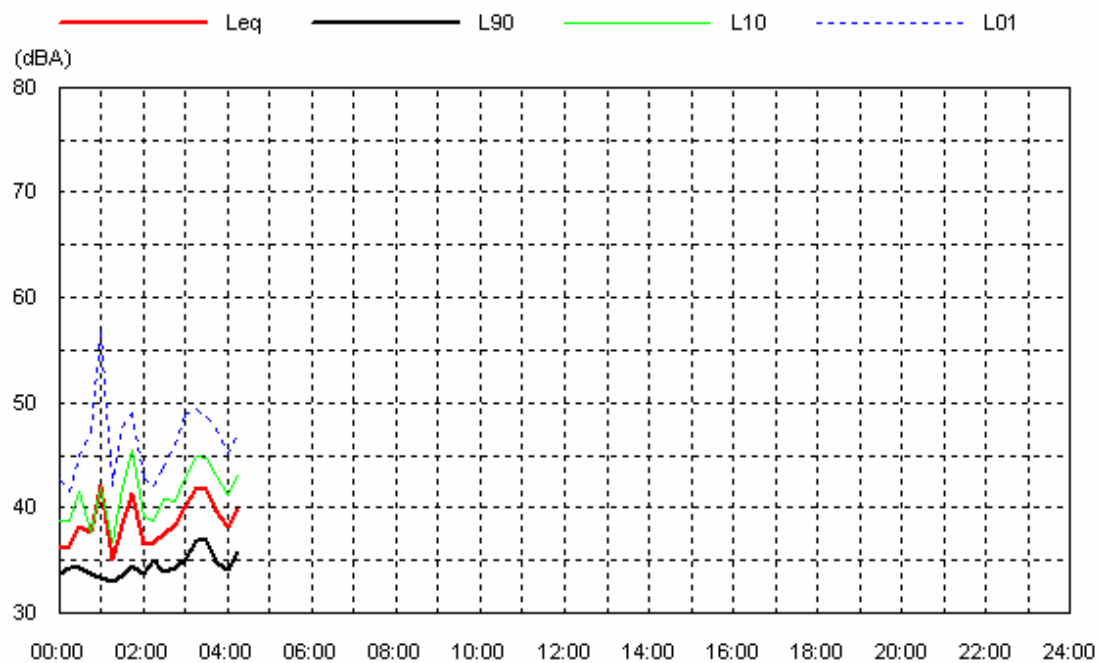
Location: 1669A Elizabeth Drive**Data shaded: Rain****Mon 05 Apr 04****Tue 06 Apr 04**

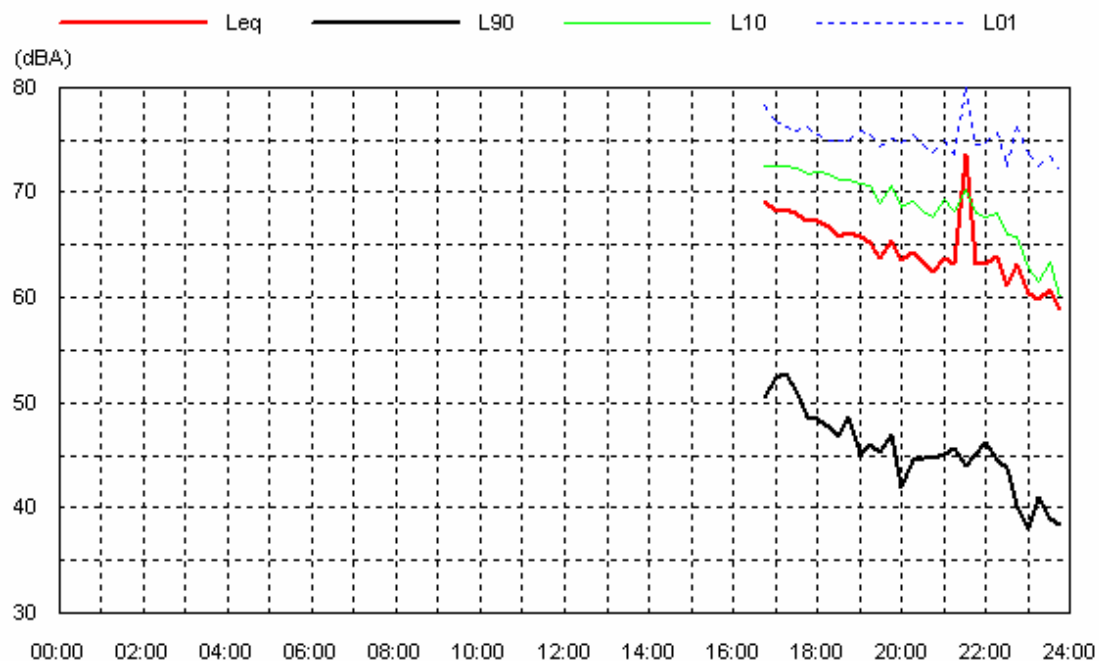
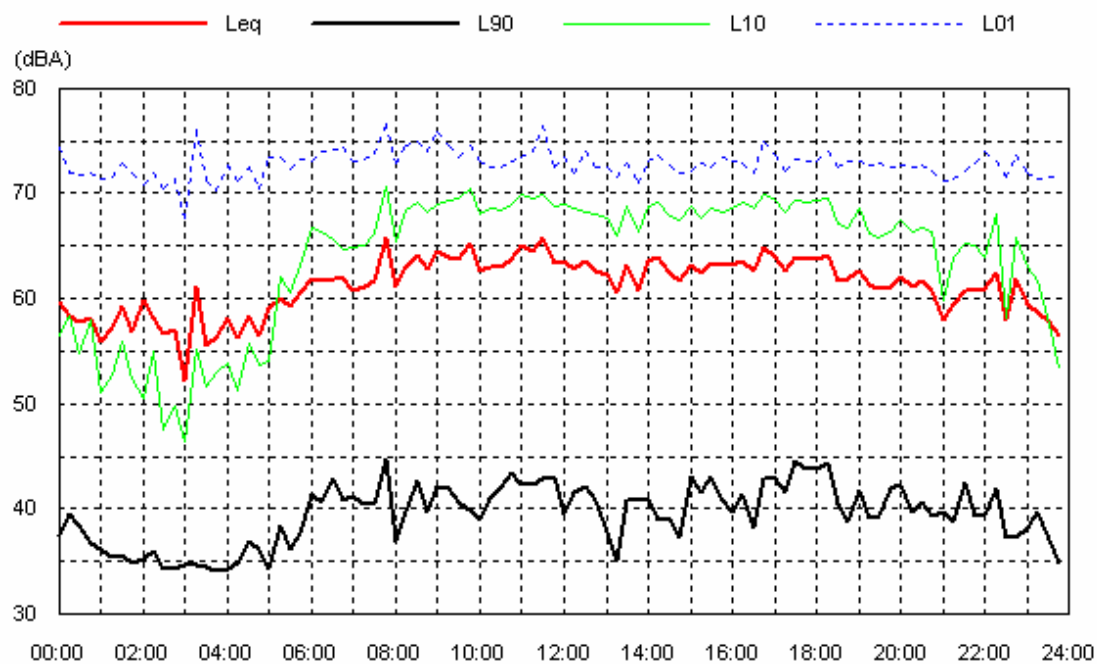
Location: 1669A Elizabeth Drive**Data shaded: Rain****Wed 07 Apr 04****Thu 08 Apr 04**

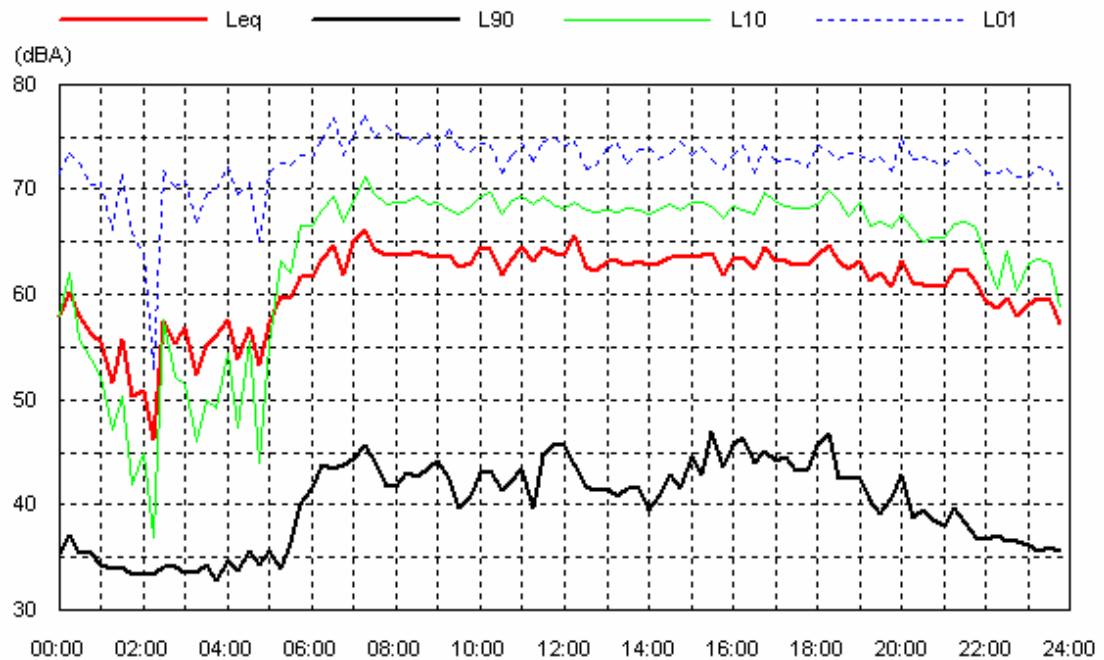
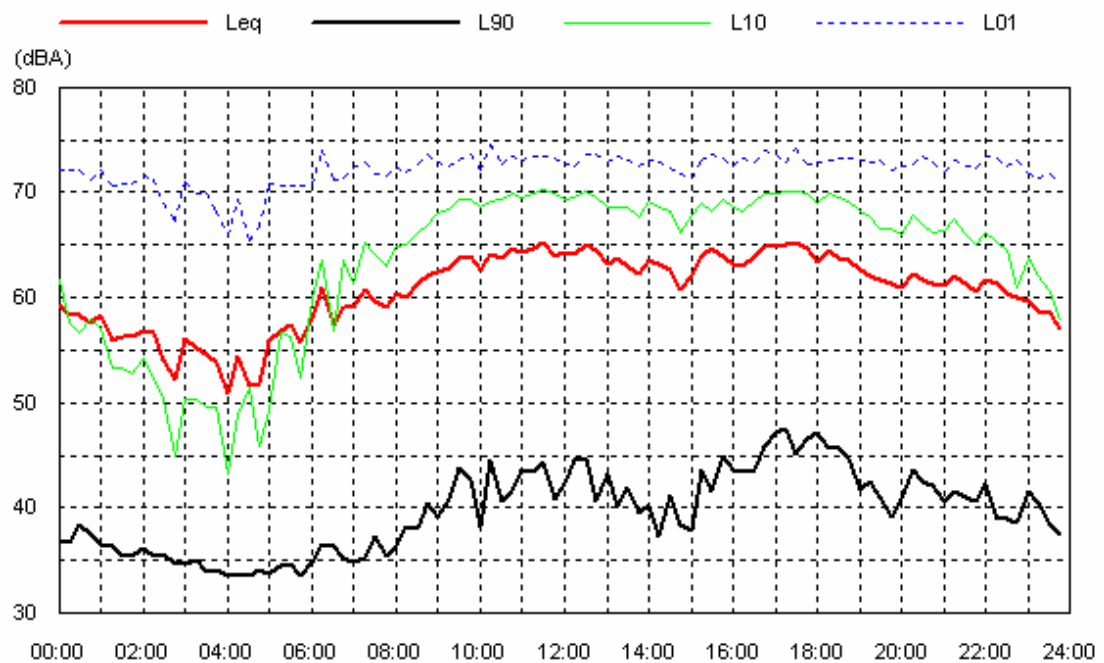
Location: 1669A Elizabeth Drive**Data shaded: Rain****Fri 09 Apr 04****Sat 10 Apr 04**

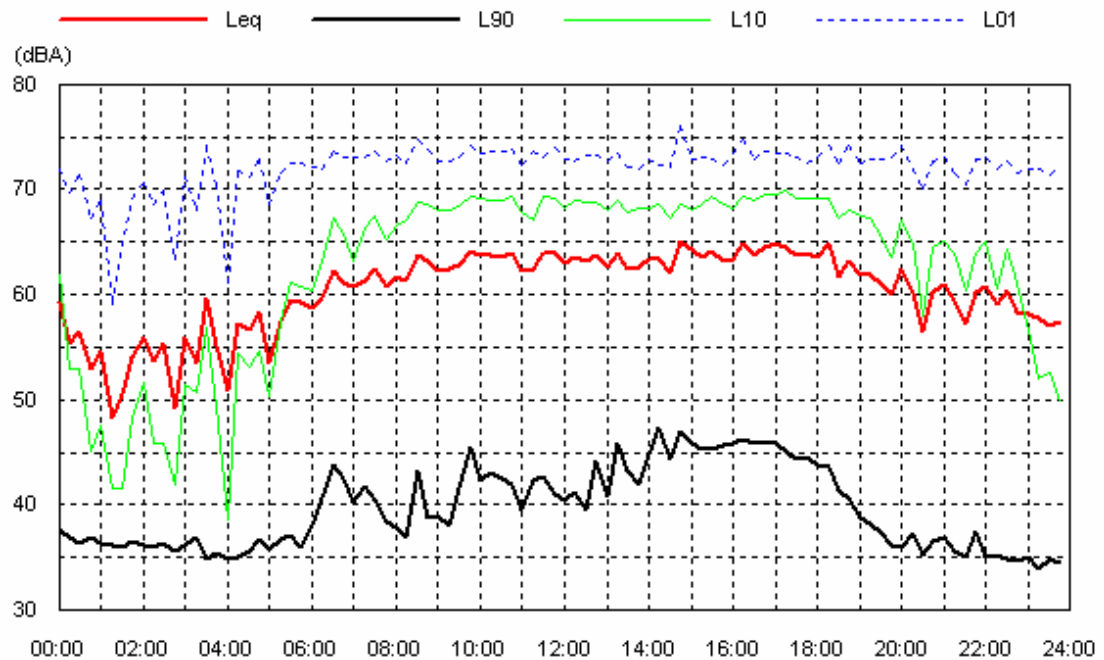
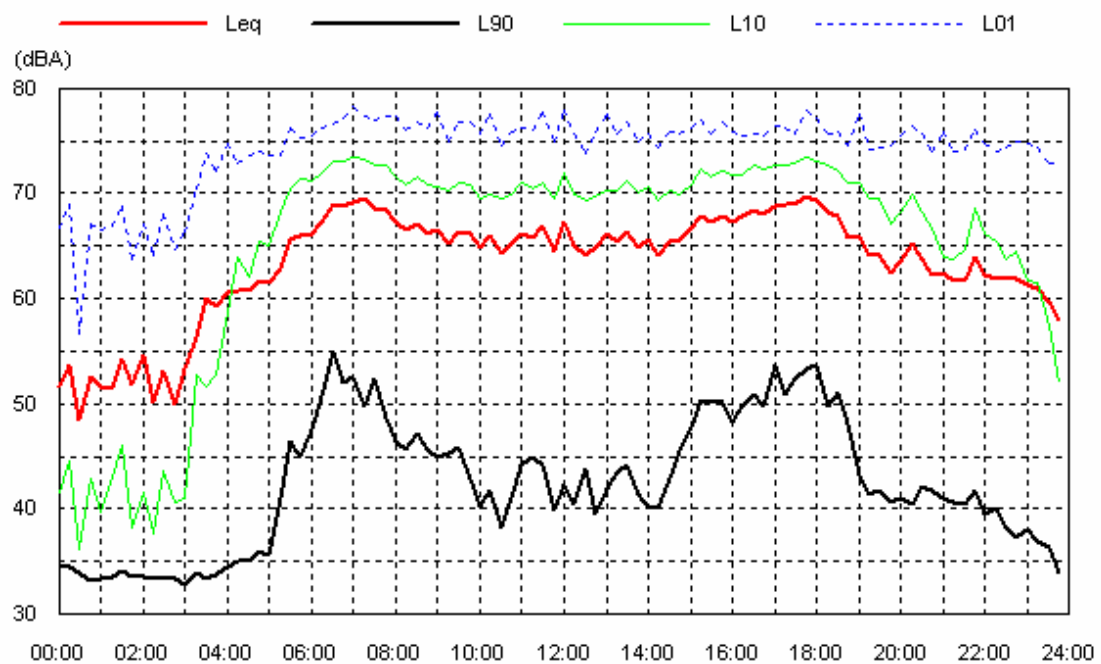
Location: 1669A Elizabeth Drive**Data shaded: Rain****Sun 11 Apr 04****Mon 12 Apr 04**

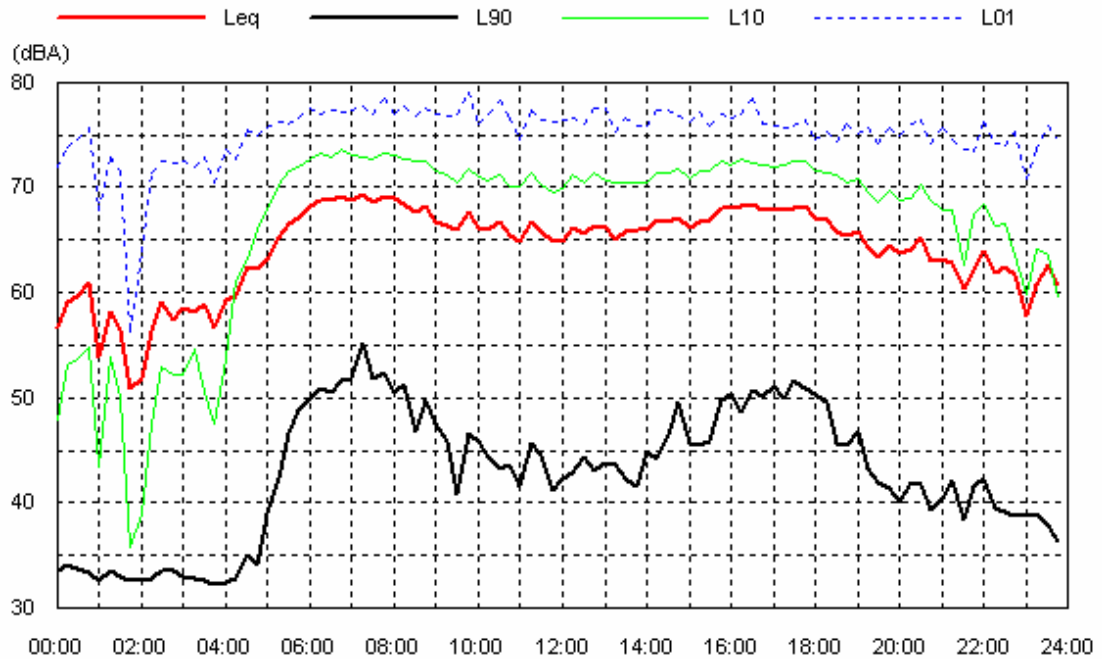
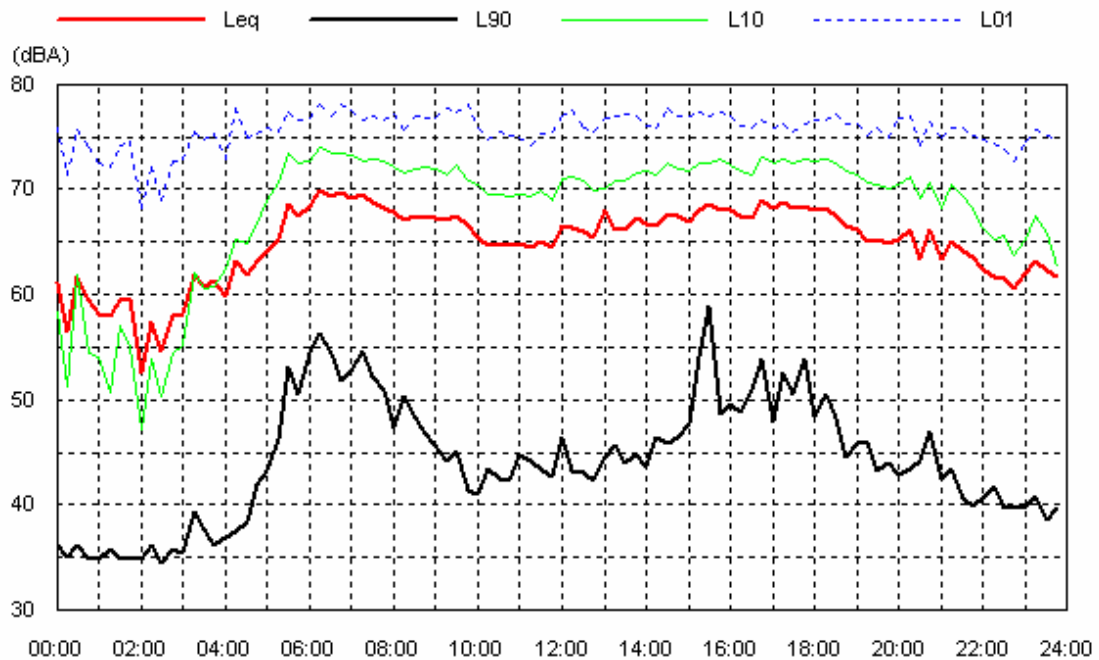
Location: 1669A Elizabeth Drive**Data shaded: Rain****Tue 13 Apr 04****Wed 14 Apr 04**

Location: 1669A Elizabeth Drive**Data shaded: Rain****Thu 15 Apr 04**

Location: 2140 Elizabeth Drive**Thu 08 Apr 04****Fri 09 Apr 04**

Location: 2140 Elizabeth Drive**Sat 10 Apr 04****Sun 11 Apr 04**

Location: 2140 Elizabeth Drive**Mon 12 Apr 04****Tue 13 Apr 04**

Location: 2140 Elizabeth Drive**Wed 14 Apr 04****Thu 15 Apr 04**

Location: 2140 Elizabeth Drive**Fri 16 Apr 04**