

EXPANSION OF THE ADVANCED WASTE
TREATMENT FACILITY
KEMPS CREEK RESOURCE RECOVERY
PRECINCT

NOISE ASSESSMENT

**REPORT NO. 04092-R
VERSION A**

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PREPARED FOR

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for one percent of the sample period. During the sample period, the noise level is below the L_{A1} level for 99 percent of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10 percent of the sample period. During the sample period, the noise level is below the L_{A10} level for 90 percent of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

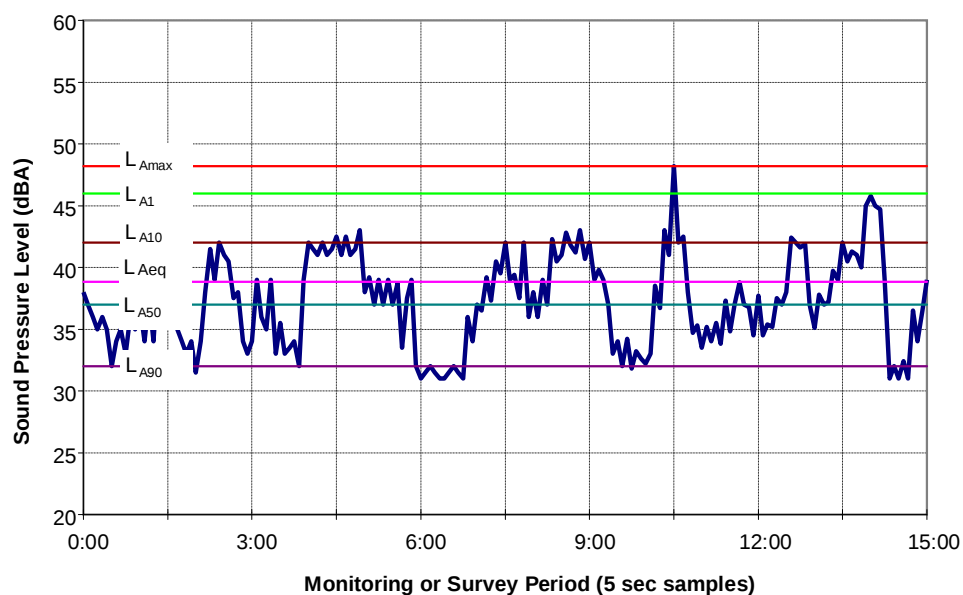
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90 percent of the sample period. During the sample period, the noise level is below the L_{A90} level for 10 percent of the time. This measure is commonly referred to as the background noise level.

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. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

SITA proposes to expand the SITA Advanced Waste Treatment (SAWT) facility located at its Kemps Creek Resource Recovery Precinct (the Precinct) (See Figures 1-1 and 1-2 for regional context and site location within the Precinct, respectively).

The Precinct includes the following facilities:

- SAWT;
- Landfill; and
- Depot for Garbage trucks for Penrith Council.

Wilkinson Murray Pty Ltd (WMPL) was engaged to undertake an environmental noise and vibration assessment associated with the expansion of the existing SAWT facility located at its Kemps Creek Resource Recovery Precinct (the 'Development').

The existing SAWT facility Project Application 06_0185 was approved on 15 April 2008, and limits the facility to processing approximately 134,400 tonnes per annum (tpa) of input waste, 120,000 tpa of mixed solid waste and 14,400 tpa of biosolids. SITA proposes to increase the SAWT receival capacity to 220,000 tpa of input waste.

1.1 Objectives of this Study

The primary objective of this study is to assess the potential noise impacts associated with the Development by addressing the Director-General's Environmental Assessment Requirements issued by the NSW Department of Planning and Infrastructure (DP&I) on 16 May 2012 and outlined as follows:

Noise – including a quantitative assessment of the potential:

- construction, operational and transport noise impacts;
- offsite road noise impacts; and
- details of the proposed management and monitoring.

Specific noise requirements from the NSW Environment Protection Authority (EPA) were not provided initially. Additional consultation was conducted by AECOM where EPA requested that in addition to the typical requirement of assessing noise from SAWT facility to its existing Approval and EPL noise limits, a noise assessment of the combined SAWT and Landfill be conducted considering the Landfill EPL limits and Industrial Noise Policy (INP) noise criteria. The reason for this being the close proximity between the Landfill and the SAWT facility which may potentially impact on the same receptors and the fact that both operations are managed by the same operator. A cumulative noise assessment considering the EPL limits and INP criteria has been conducted to provide an understanding of the impacts consistent with contemporary guidelines. Despite the decision to assess the SAWT and Landfill operations cumulatively it is important to note that both sites work independently of each other as different commercial entities.

Table 1-1 shows DP&I's assessment requirements and the sections they are addressed in.

Table 1-1 Agency Comments

Comment	Agency	Section
Construction, operational and transport noise impacts	DP&I	Section 8
Offsite road noise impacts	DP&I	Section 12
Details of the proposed management and monitoring	DP&I	Section 7 Section 13
Cumulative assessment of the Kemps Creek Resource Recovery Precinct	EPA	Section 9
Assess against the Industrial Noise Policy (INP) noise criteria	EPA	Section 10

Figure 1-1 Location of Kemps Creek Resource Recovery Precinct

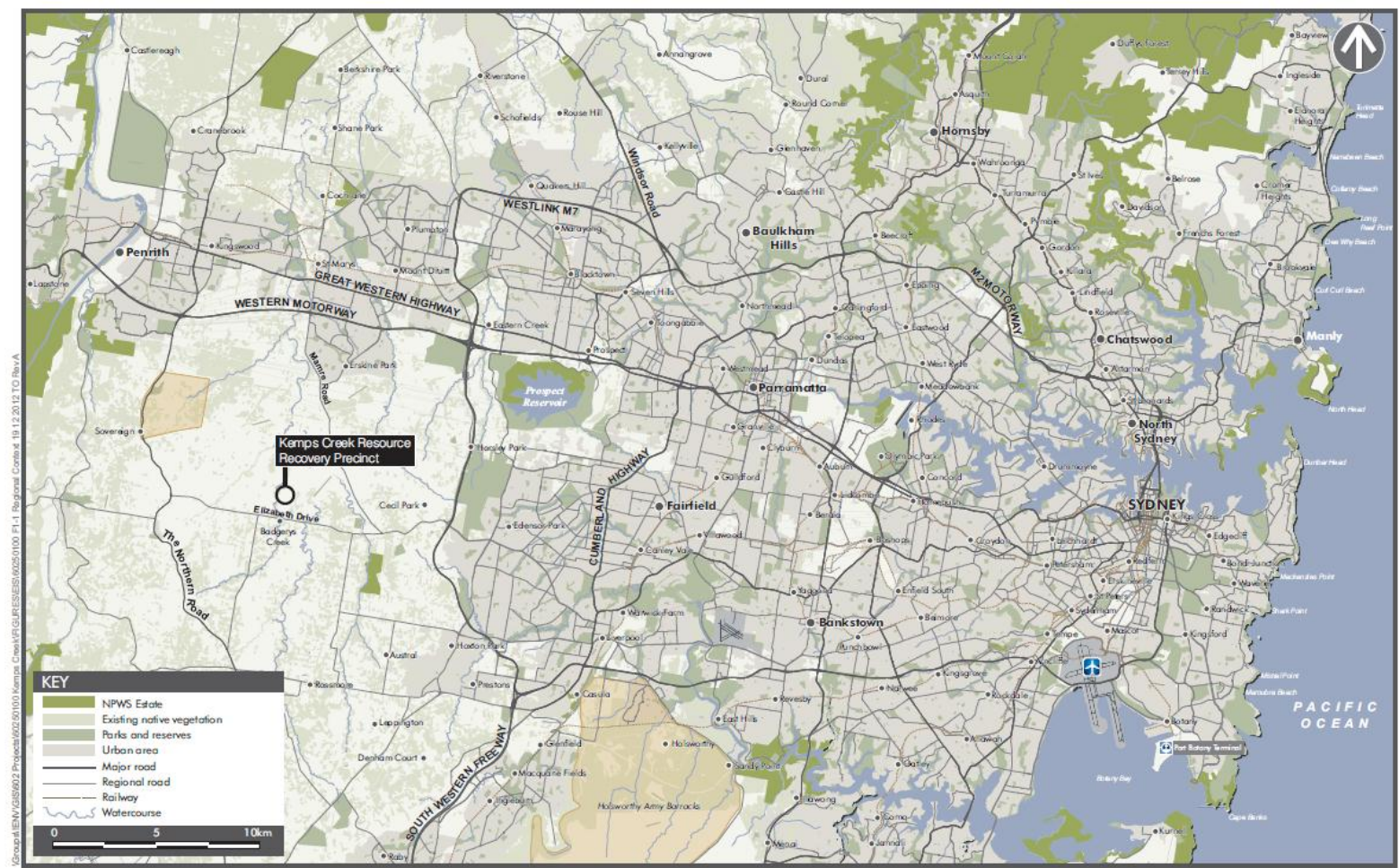


Figure 1-2 Site Location



2 SITE DESCRIPTION

The proposed layout for the Development is shown in Figure 2-1.

2.1 Existing SAWT Operations

The existing SAWT facility has a two-shift operation design with the capacity of processing approximately 134,400 tpa of input waste.

2.1.1 Site

The existing SAWT facility is almost all contained in a large building including receipt, resource recovery, refining and initial composting.

Mixed solid waste is received in the receipt area where it is delivered onto a tipping floor and shifted by a wheel loader into the pre treatment system. Waste is processed in a series of mechanical steps to recover the organic fraction for composting and also recyclables. The inorganic residual fraction is sent to the adjacent landfill.

The organic fraction of the waste is converted into compost using a series of composting tunnels. After composting, the material is transported by conveyor to maturation in stockpiles. The material undergoes further refining prior to being transported for use offsite. Exhaust air is treated through biofilters prior to release into the atmosphere.

2.1.2 Operating Hours

The current Conditions of Approval (CoA) permits indoor activities 7.00am to 11.00pm Monday to Saturday. Waste receipt and product dispatch are permissible between 6.00am and 6.00pm Monday to Friday, 8.00am-5.00pm on Saturdays, and 8.00am-4.00pm on Sundays. Outdoor operations are allowed between 6.00am and 10.00pm Monday to Friday (subject to conditions relating to number of mobile plant movements) and 7.00am-4.00pm on Public Holidays.

Fans associated with the biofilters and tunnels are operate 24-hours.

2.1.3 Traffic

Vehicles enter and leave the Precinct via the existing access road from Elizabeth Drive. Within the Site the vehicles use a new sealed access road that follows the southern and western boundaries, linking the entrance gate (located at the southeast corner of the Precinct) to the SAWT facility, which is located in the northwest corner of the site. It should be noted that the southern access road already has an existing four metre bund along its southern edge, which mitigates vehicle noise to the residences to the south.

Approximately 80 percent of SAWT traffic currently leaves the Site in an easterly direction, with the remaining travelling west.

Figure 2-1 Proposed Layout for the Development



The existing SAWT facility currently accepts an average of 51 truck deliveries per day. As a daily average, four trucks transport material from the SAWT facility out of the Precinct, three trucks transport material from the SAWT facility to the food and garden organics (Source Separated Organics (SSO)) maturation pad, nine trucks transport material from the SAWT facility to the compost stockpiling area and 35 vehicles transport material from the SAWT facility to the landfill. Actual vehicle numbers depend upon collection vehicle routing and traffic conditions and therefore vary from day to day.

2.2 The Development

The Development would be capable of processing up to 220,000 tpa of input waste, which could include source separated organics as well as biosolids from time to time. It should be noted that this capacity will be ramped up over a period of time.

The Development would include adjustments to the existing SAWT facility, an extension of the hours of operation for indoor activities and an increase in truck movements delivering and dispatching material.

2.2.1 Site

The proposed modifications to the SAWT site involve:

- an upgrade to the Resource Recovery Building plant;
- a new enclosed composting hall adjacent to the existing SAWT facility building (this addition would result in most mobile plant operations being moved indoors therefore reducing noise impacts to surrounding receptors);
- a reconfiguration of the existing biofilters, and the addition of four 15 metre high stacks (above ground level);
- the installation of new biofilters with three 15 metre high stacks;
- the extension of the existing compost pad for additional storage space; and
- an upgrade to the access road, car parking, water storage and reuse infrastructure.

2.2.2 Operating Hours

Indoor operations are proposed 24 hours a day, seven days per week (including Public Holidays). Outdoor operations are proposed between 6.00am and 10.00pm Monday to Friday (with no restriction on vehicle movements).

The proposed operating hours for truck movements are summarised in Table 2-1.

Table 2-1 Proposed Operating Hours for Truck Movements

Route/Purpose of Truck Movements	Proposed Hours of Operation
Waste receipt to SAWT	6.00am – 5.00pm
Compost sales going off-site	7.00am – 4.00pm
Dispatch of residual material from SAWT to landfill	6.00am – 6.00pm
Dispatch of compost material from SAWT to proposed compost storage pad	7.00am – 10.00pm

2.2.3 Traffic

SITA proposes to increase the number of truck movements to and from the Development as summarised in Table 2-2.

Table 2-2 Proposed Increase in Number of Truck Movements

Route/Purpose of Truck Movements	Proposed Increase in Number of Movements
Waste receipt to SAWT	62
Compost sales going off-site	12
Dispatch of residual material from SAWT to landfill	42
Dispatch of compost material from SAWT to proposed compost storage pad	16

It is anticipated that approximately 80 percent of traffic from the Development would leave the Site in an easterly direction, with the remaining travelling west.

2.3 Landfill Operations

2.3.1 Site

The Landfill site operations are not proposed to change. The landfill operations consist of three different elements potentially occurring simultaneously:

- Delivery of waste into landfill cells (ongoing).
- Excavation of new cells to create room for future waste (approximately six months a year).
- Removal of excavated shale sold to other sites for further use (occurs on a campaign basis – can be up to four months a year).

The noise assessment conservatively assumes all three elements happen simultaneously.

It should be noted that capping of final landform (once cells are filled) has not been considered in this assessment. The justification for this decision is that capping happens on a campaign basis for as little as two months of every two years, and consequently is not considered

representative of the typical worst case landfill operations.

Each of the areas of operation involves a fleet of one or more mobile plant items, as listed in Table 2-3.

Table 2-3 Landfill Operations – Mobile plant

Activity	Plant items
General waste filling	• D6 or D7 Dozer • 2x 30t Excavators • 45t Compactor • 35t Dump truck
Industrial waste filling	• 30t Excavator
Excavation of new cell for general waste	• D10 Dozer • 45t Excavator • 3x CAT637 Scrapers
Removal of shale stockpile	• 45t Excavator
Others	• 2X Water carts

2.3.2 Operating Hours

All landfill operations are restricted between 6.00am and 6.00pm Monday to Friday.

2.3.3 Traffic

Table 2-4 summarises traffic movements associated with landfill operations.

Table 2-4 Number of Truck Movements Associated with Landfill Operations

Route/Purpose of Truck Movements	Number of Daily Movements	
	Shoulder Period (6am – 7am)	Day (7am – 6pm)
Delivery of General Waste	38	165.6
Delivery of Industrial Waste	0	46.8
Shifting of shale and clay material from excavation area to stockpile area	15	74.5
Removal of shale and clay material off-site	0	65.2

* Notes: The traffic volumes are the result of weighbridge logs averaged over a whole week. As such, some have been expressed with one decimal place.

It should be noted that truck movements associated with the shifting of shale and clay material within the site and off-site does not always occur.

Based on a recent traffic survey conducted by AECOM, approximately 80 percent of Landfill traffic arrives and leaves the Site in an easterly direction, with the remaining travelling west.

2.4 Construction

2.4.1 Site

Construction works of the development are divided into stages to allow for the continued operation of the SAWT facility.

It is anticipated that construction of the development would occur in two stages over approximately two years, commencing in May 2013 with practical completion expected in May 2015.

Table 2-5 provides indicative phases and timeframes for each stage of construction.

Table 2-5 Construction Phases and Timeframes

Construction Stage	Phase	Indicative Timing
Stage One	Provision of dedicated left and right turning lanes on the access road	June 2013 to July 2013
	Capping of landfill area and construction of the Compost Storage Pad and stormwater leachate pond	June 2013 to August 2013
	Decommissioning of the existing Maturation Pad for MSW compost and leachate ponds	September 2013 to October 2013
Stage Two	Site establishment and establishment of temporary facilities	November 2013 to December 2013
	Earthworks and civil infrastructure	January 2014 to February 2014
	Construction of building foundations and buildings	February 2014 to May 2014
	Plant and services installation	June 2014 to January 2015
	Internal fit-out and miscellaneous works	December 2014 to January 2015
	Commissioning	February 2015 to May 2015
	Upgrade of the existing intersection on Elizabeth Drive	Prior to commencement of operations

2.4.2 Traffic

It is estimated that at the peak of construction up to 260 light vehicle movements would be generated in a typical day with the need for up to 130 on-site parking spaces. 95 percent of construction personnel would utilise the existing truck depot area in the south east corner of the Precinct while five percent would utilise parking adjacent to the construction zone. The workforce using the depot parking would be transported to the construction site via shuttles. It is anticipated 28 shuttle movements would be expected daily (14 at the beginning of each shift and the same amount at the end of each shift).

It is anticipated that approximately 80 percent of construction staff would leave the Site in an easterly direction, with the remaining travelling west.

It is anticipated that in a typical day at the peak of construction, there would be up to 60 heavy vehicle movements (from 30 heavy vehicles). Around 80 percent of these heavy vehicles are expected to originate from the Liverpool area, with the remaining accessing the Site from the west.

All heavy vehicle movements associated with the construction works are anticipated to use the eastern route running alongside the eastern and northern boundaries of the landfill precinct. All staff movements including shuttles would use the existing route running alongside the southern and western boundaries.

2.4.3 Operating Hours

Consistent with the operation of the site construction of the development would be carried out over a single 10-hour shift per day. Construction hours would be between:

- 6.00am-6.00pm Monday to Friday (extended to 10.00pm in extraneous circumstances for testing and commissioning);
- 7.00am-4.00pm on Saturday; and
- No construction work would be carried out on Sundays or public holidays.

It is anticipated that most construction personnel would generally arrive at the Site between 5.30am-6.00am and exit the Site between 4.00pm-5.00pm on weekdays. On Saturdays, construction personnel entry and exit times would be between 6.30am-7.00am and 3.00pm-4.00pm, respectively.

Heavy construction traffic movements would commence only after 7.00am.

2.5 Depot

SITA currently parks waste collection trucks overnight on site near the maintenance workshop in the southeast corner of the Precinct for Penrith Council. Those trucks depart from the depot between 5.00am-5.30am and return between 1.00pm-4.00pm Monday to Friday.

The depot is moving off-site in 2013.

3 NOISE SENSITIVE RECEPTORS

There are a number of residential receptors surrounding the site. The receptors considered in this assessment are shown on Figure 3-1 and listed in Table 3-1. Eastings and Northings are in MGA 84 coordinates, Zone 56. Those receptors were selected to be consistent with the air quality assessment for this EIS.

Figure 3-1 Receptors Considered in the Noise Assessment

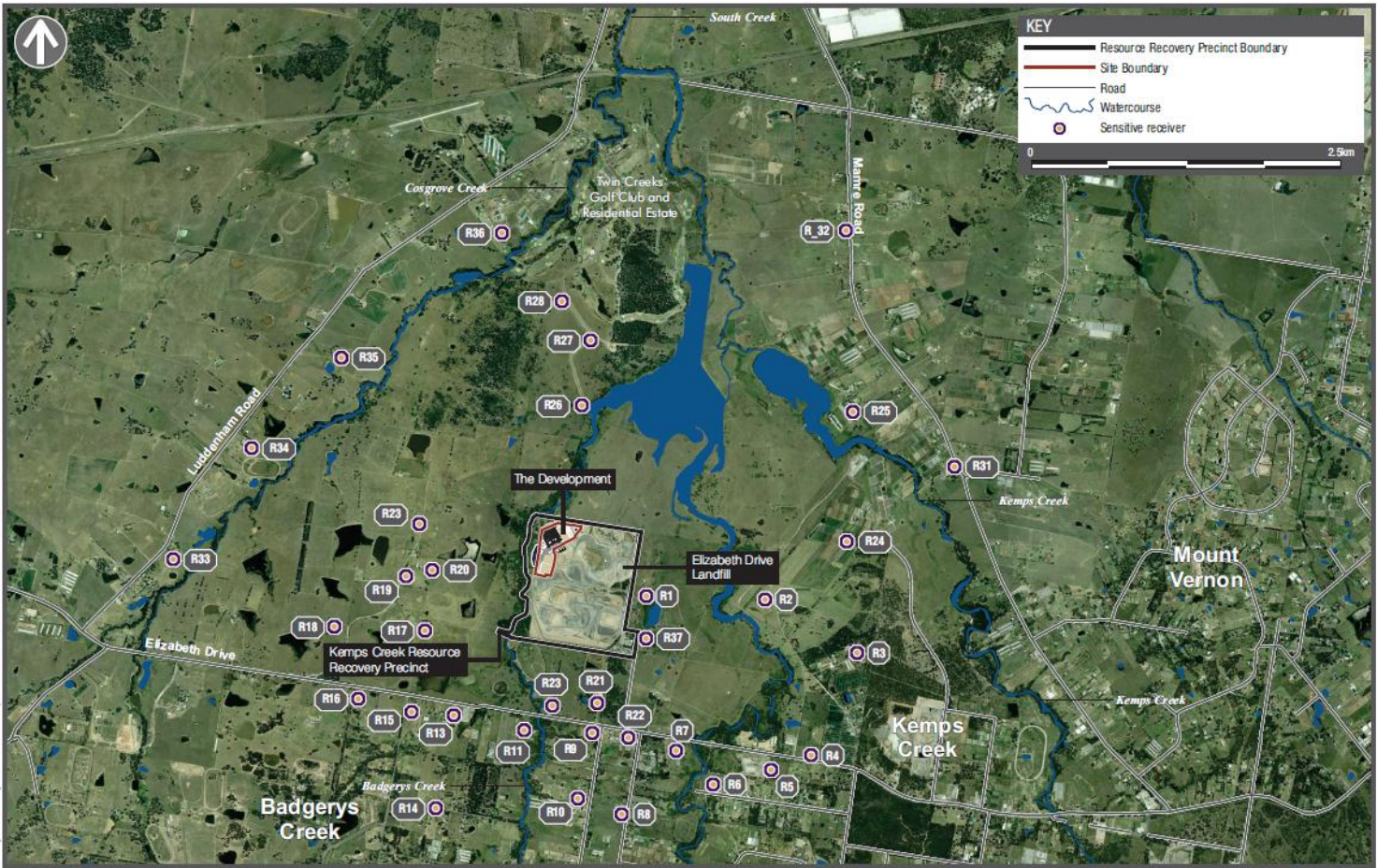


Table 3-1 Receptors Considered in this Assessment

Rec ID	Description	Easting	Northing
R1	Kemps Creek Resource Recovery Precinct Access Road; Lakes Residence	293145	6250516
R2	Weston Road	294065	6250508
R3	Weston Road	294788	6250113
R4	Elizabeth Drive	294450	6249316
R5	Elizabeth Drive	294142	6249197
R6	Overett Avenue	293696	6249073
R7	Elizabeth Drive	293401	6249322
R8	Martin Road	292990.6	6248829
R9	Elizabeth Drive	292745	6249446
R10	Lawson Road	292648.5	6248937
R11	Elizabeth Drive	292220	6249460
R12	Elizabeth Drive	292437	6249648
R13	Elizabeth Drive	291666	6249565
R14	Gardiner Road	291536.1	6248839
R15	Elizabeth Drive	291348	6249588
R16	Elizabeth Drive	290931	6249672
R17	Private Road off Elizabeth Drive	291438	6250216
R18	Private Road off Elizabeth Drive	290722	6250226
R19	Private Road off Elizabeth Drive	291275	6250627
R20	Private Road off Elizabeth Drive	291464	6250680
R21	Private Road off Elizabeth Drive	292772	6249676
R22	Elizabeth Drive	293007	6249420
R23	Private Road off Elizabeth Drive	291377	6251026
R24	Cliffton Avenue	294689	6250969
R25	Mamre Road	294710	6251968
R26	Humewood Place; Twin Creeks Golf Estate	292610	6251976
R27	Twin Creeks Drive; Twin Creeks Golf Estate	292669	6252477
R28	Twin Creeks Drive; Twin Creeks Golf Estate	292448	6252775
R31	Mamre Road	295513	6251565
R32	Mamre Road	294654	6253357
R33	Luddenham Road	289476	6250718
R34	Luddenham Road	290050	6251586
R35	Luddenham Road	290740	6252294
R36	Portus Crescent; Twin Creeks Golf Estate	291964	6253285
R37	Kemps Creek RRP Access Road; Caretakers Cottage	293150	6250188

4 NOISE LIMITS & CRITERIA

The existing SAWT facility operations are currently subject to noise limits as presented in the DP&I Project Approval (Application no. 06_0185, 2008) and EPA's Environment Protection Licence (#12889).

The Landfill is subject to noise limits from EPA's Environment Protection Licence (#4068). The Depot has consent from Penrith City Council and does not have any noise limits.

4.1 SAWT Project Approval and EPL Noise Limits

The noise limits set in the Project Approval and EPL are summarised in table 4-1. For ease of reference, Table 4-1 also provides the corresponding receiver ID numbers relevant to this assessment.

Table 4-1 Noise Limits in current Project Approval (dBA)

Rec ID	Location	Day (7am–6pm)	Evening (6pm–10pm)	Night Time (10pm–7am)		Morning Shoulder (6am–7am)
		$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{Aeq,15min}$	L_{max}	$L_{Aeq,15min}$
R20	McGarvie Smith Farm	42	39	35	n/a	39
R21	1745 Elizabeth Drive	41	40	37	47	40
R1	1669A Elizabeth Drive	38	38	35	n/a	38
R37	Caretakers Residence 1669A Elizabeth Drive	42	42	38	53	42

4.2 Landfill EPL Noise Limits

The Landfill EPL states the following noise limits:

"Noise from the premises must not exceed:

- a) an $L_{A10(15\text{ minute})}$ noise emission criterion of 50 dB(A) during the day (7am to 10pm);*
- b) an $L_{A10(15\text{ minute})}$ noise emission criterion of 45 dB(A) during the night (10pm to 7am);*

except as expressly provided by this licence."

For the purpose of this assessment, it is assumed that industrial $L_{Aeq,15min}$ noise levels are directly comparable to $L_{A10,15min}$ criteria presented above.

4.3 Construction Noise Criteria

The proposed expansion of the SAWT facility would involve the construction of additional processing areas and for this reason construction noise needs to be addressed.

As mentioned above, the combined noise generated by both SAWT operations and construction activities is assessed against the noise limits set in the Project Approval. However, for completeness and to provide a better understanding of the noise impact, the *Interim Construction Noise Guideline* (ICNG) is also used for comparison purposes.

The ICNG presents the process to assess construction in NSW. The ICNG was developed by the EPA taking into consideration that construction is temporary, noisy and difficult to ameliorate. As such, the ICNG was developed to focus on applying a range of work practices most suited to minimising construction noise impacts, rather than focusing only on achieving a numeric noise level.

The ICNG recommends that standard construction work hours should typically be as follows:

- Monday to Friday 7.00am to 6.00pm;
- Saturday 8.00am to 1.00pm; and
- No work on Sundays or public holiday.

Additionally, it recommends quantitative management noise criteria at residences as presented in Table 4-2.

Table 4-2 Construction Noise at Residences using Quantitative Assessment

Time of Day	Management Level	How to Apply
	$L_{Aeq} (15 \text{ min})$	
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq} (15 \text{ min})$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.

Time of Day	Management Level	How to Apply
	L _{Aeq} (15 min)	
Outside recommended standard hours	Noise affected RBL + 5dBA	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dBA above the noise affected level, the proponent should negotiate with the community.

Table 4-3 presents the Project-specific construction noise criteria.

Table 4-3 Project-Specific Criteria for Construction Noise

Location	L _{Aeq,15min} Noise Affected Level (dBA)				L _{Aeq,15min} Highly Noise Affected Level (dBA)
	During Recommended Standard Hours	Outside Recommended Standard Hours			
		Day	Evening	Night	
		(Weekend) (7am–6pm)	(6pm–10pm)	(10pm–7am)	
R1	47	42	41	38	75
R2	47	42	41	38	75
R3	47	42	41	38	75
R4	52	47	44	38	75
R5	52	47	44	38	75
R6	52	47	44	38	75
R7	52	47	44	38	75
R8	47	42	41	38	75
R9	52	47	44	38	75
R10	47	42	41	38	75
R11	52	47	44	38	75
R12	52	47	44	38	75
R13	52	47	44	38	75
R14	47	42	41	38	75
R15	52	47	44	38	75
R16	52	47	44	38	75
R17	47	42	41	38	75
R18	47	42	41	38	75
R19	47	42	41	38	75
R20	47	42	41	38	75

Location	L _{Aeq,15min} Noise Affected Level (dBA)				L _{Aeq,15min} Highly Noise Affected Level (dBA)
	During Recommended Standard Hours	Outside Recommended Standard Hours			
		Day (Weekend) (7am–6pm)	Evening (6pm–10pm)	Night (10pm–7am)	
R21	52	47	44	38	75
R22	52	47	44	38	75
R23	47	42	41	38	75
R24	43	38	38	35	75
R25	43	38	38	35	75
R26	43	38	38	35	75
R27	43	38	38	35	75
R28	43	38	38	35	75
R31	43	38	38	35	75
R32	43	38	38	35	75
R33	47	42	41	38	75
R34	43	38	38	35	75
R35	43	38	38	35	75
R36	43	38	38	35	75
R37	47	42	41	38	75

4.4 Assessment Methodology

The approved noise limits are used to assess the existing SAWT operations (2012), the existing SAWT operations and construction activities combined (2014), and the proposed SAWT expansion Development at full capacity (2016).

The rationale behind using the Project Approval's noise limits during the construction period is that construction is anticipated to last a considerable amount of time (approximately two years) and potentially impacted receptors might not be able to distinguish noise generated by operations and construction. For completeness and to provide a better understanding of the noise impact, the Interim Construction Noise Guideline (ICNG) has also been provided for comparison purposes.

As stated above, a consultation process with EPA highlighted the close proximity between both operations which may potentially be impacting on the same receptors and the fact that both operations are managed by the same operator, namely SITA. As such, it has been decided to also include an assessment addressing the combined noise levels from both Landfill and the Development.

As mentioned in the introduction the cumulative noise levels generated by the SAWT and the Landfill have been assessed against the Landfill EPL noise limits (#4068) as the Landfill represents the industrial noise source with potentially the most noise impact on the identified receptors.

5 OPERATIONAL NOISE MODELLING

5.1 Noise Modelling Methodology

Operational noise levels at nearby receptors have been calculated using the Environmental Noise Model (ENM). The ENM modelling software is accepted by the EPA for use in environmental noise assessments. The assessment models the total noise at each receiver from the operation of the Development. Total predicted operational noise levels are then compared with the relevant noise limits.

5.1.1 Noise Assessment Years

Noise modelling was undertaken for the day, evening and night operating scenarios for 2012, 2014 and 2016. Table 5-1 summarises the pertinent information relevant to each assessment year.

Table 5-1 Description of Assessment Years

Assessment	Assessment Year	Operations Assessed	Assessment Methodology
SAWT	Current SAWT Operations (2012)	Current SAWT operations (excl. landfill and depot activities)	Worst typical 15 minute period assessed against SAWT EPL noise limits
	Construction Phase (2014)	Current SAWT operations and construction activities combined (excl. landfill activities)	Worst typical 15 minute period assessed against SAWT EPL noise limits
	Proposed SAWT Operations (2016)	Expanded SAWT operations (excl. landfill activities)	Worst typical 15 minute period assessed against SAWT EPL noise limits
Cumulative	Proposed SAWT Operations (2016)	Expanded SAWT operations and landfill operations combined	Worst typical 15 minute period assessed against Landfill EPL noise limits

It should be noted that the 2012 assessment year also enables the calibration of the noise model.

5.1.2 Noise Assessment Scenarios

Based on traffic numbers and mobile plant activities, the worst typical 15 minute periods associated with SAWT operations within each assessment period, namely daytime (7.00am-6.00pm), evening (6.00pm-10.00pm) and night time (10.00pm-7.00am), were established and are summarised in Table 5-2. Note that the intrusive assessment also addresses the morning shoulder period (6.00am-7.00am) since distinct CoA noise limits are applicable for that period.

Table 5-2 Busiest 15 Minute Periods Identified for SAWT Assessment

Assessment Year	Assessment Period	Identified 15-Min Period	Rationale
2012	Day	1.15pm-1.30pm	Largest number of trucks travelling to and from the SAWT facility and SAWT staff arriving for PM shift.
	Evening	Any 15-min period between 6.00pm and 10.00pm	n/a
	Night	5.15am-5.30am	SAWT staff arriving for day shift.
	Shoulder	6.45am-7.00am	Trucks travelling to SAWT facility and SAWT staff arriving for day shift.
2014	Day	1.15pm-1.30pm	Largest number of trucks travelling to and from the SAWT facility and SAWT staff arriving for PM shift.
	Evening	Any 15-min period between 6.00pm and 10.00pm	n/a
	Night	5.45am-6.00am	Construction workforce arriving to site
	Shoulder	6.45am-7.00am	Trucks travelling to SAWT facility and SAWT staff arriving for day shift.
2016	Day	1.15pm-1.30pm	Largest number of trucks travelling to and from the SAWT facility and SAWT staff arriving for PM shift.
	Evening	9.15pm-9.30pm	Arrival of night shift SAWT staff.
	Night	5.15am-5.30am	SAWT staff arriving for day shift.
	Shoulder	6.45am-7.00am	Trucks travelling to SAWT facility and SAWT staff arriving for day shift.

With regards to the cumulative assessment, the worst typical 15 minute periods associated with the combined Landfill and expanded SAWT operations were established and are summarised in Table 5-3.

Table 5-3 Busiest 15 Minute Periods Identified for Cumulative Assessment

Assessment Year	Assessment Period	Identified 15-Min Period	Rationale
2016	Day	10.00am-10.15am	Largest number of trucks travelling to the Site.
	Evening	9.15pm-9.30pm	Arrival of night shift SAWT staff.
	Night	6.45am-7.00am	Largest number of Landfill/SAWT trucks travelling to the Site and Landfill/SAWT staff arriving for day shift.

5.1.3 Meteorological Environment for Noise Assessment Purposes

The INP generally directs the use of a single set of adverse meteorological data in the assessment of noise impacts (EPA, 2000). However, for noise modelling in this and other projects, WMPL has adopted the more rigorous approach of predicting noise levels at nearby receptors for a range of meteorological conditions based on meteorological data obtained from the site. The noise modelling presented in this assessment is based on data provided by AECOM (2012) from their CALMET model at a location indicative of the Development area for the period from 1 January 2011 to 31 December 2011. CALMET data developed for the Development includes a contiguous dataset of wind speed, direction and Pasquil-Gifford stability classes from which temperature inversions can be deducted. Statistical occurrences of meteorological conditions are used to calculate a 10th percentile exceedance noise level (i.e. the level that is exceeded 10 percent of the time), which is then compared with relevant intrusiveness criteria.

This alternative assessment procedure involves significantly greater computational complexity than the use of a single set of meteorological conditions. However, WMPL believes it provides a more rigorous method of assessing noise exposure, and one that is more easily understood by the community. The approach of using the 10th percentile calculated noise level as a measure of noise impacts has been considered acceptable by the DP&I and the EPA for other project assessments.

The data for wind direction and wind speed are classified into eight directional intervals and five speed intervals (between 0.5 m/s and 3 m/s – with all other instances of wind speed described as “calm”) in accordance with the INP.

It is important to note that the conditions which determine the 10th percentile noise level are expected to differ between receptors.

In accordance with the INP Application Notes, noise levels at the identified receptors were also predicted for calm isothermal meteorological conditions (referred to as ‘calm’ in this report).

5.1.4 Topography

Prior to site closure, SITA will shape the landfill topography per the ‘Final Approved Landform’.

The existing landform which is based on a ground survey was provided by SITA and used for 2012. The 2014 and 2016 landforms were manually formed by synthesising projected contour maps based on the site’s filling plan.

Topographical information for the areas surrounding the site was provided by SITA.

5.2 On-Site Industrial Noise Sources

This section only describes the on-site noise sources considered in the assessment and does not include transportation noise sources on public roads which are addressed in Section 11.

5.2.1 SAWT On-Site Industrial Noise Sources

A description of the SAWT noise sources included for the 2012/2014 and 2016 noise model is provided in Tables 5-4 and 5-5, respectively. Note that only the sources with a relatively significant contribution to the overall noise levels have been considered. Mobile plant locations for years 2012, 2014 and 2016 are shown in Figures 5-1, 5-2 and 5-3, respectively.

Figure 5-1 Mobile Plant Locations for 2012



Figure 5-2 Mobile Plant Locations for 2014



Figure 5-3 Mobile Plant Locations for 2016



Table 5-4 SAWT On-Site Industrial Noise Sources for 2012 and 2014

Plant Item	Time of Operation	Percentage of Time when in Operation	Percentage of Time when Operating Outside
Outdoor Mobile Plant			
Forklift	6.00am-10.00pm	80%	5%
Wheel loader (maturation pad)	6.00am-10.00pm	80%	100%
Wheel loader (shared between SSO maturation pad and storage pad)	6.00am-10.00pm	80%	100%
Excavator (shared between maturation pad and storage pad)	6.00am-6.00pm	50%	100%
Windrow turner (maturation pad)	9.00am-5.00pm	50%	100%
Mobile refining line (SSO maturation pad)	6.00am-10.00pm	80%	100%
Hooklift truck	6.00am-10.00pm	80%	100%
Processing Building			
Biofilter room	24hr	100%	n/a
Pre-refine outdoor trommel	6.00am-10.00pm	70%	n/a
Receival area	6.00am-6.00pm	100%	n/a
Refining area	7.00am-10.00pm	100%	n/a
Pre-refining area	7.00am-10.00pm	100%	n/a

Table 5-5 SAWT On-Site Industrial Noise Sources for 2016

Plant Item	Time of Operation	Percentage of Time when in Operation	Percentage of Time when Operating Outside
Outdoor Mobile Plant			
Forklifts (two)	6.00am-10.00pm	100%	10%
Wheel loader (new refining area)	6.00am-10.00pm	80%	100%
Wheel loader (new storage pad)	6.00am-10.00pm	80%	100%
Truck and dog (replacing existing hooklift truck)	6.00am-10.00pm	80%	100%
Processing Building			
Existing biofilter room	24hr	n/a	n/a
Proposed biofilter room	24hr	n/a	n/a
Existing receival area	6.00am-6.00pm	n/a	n/a
Proposed refining area	6.00am-12.00am	n/a	n/a
Existing refining area	6.00am-12.00am	n/a	n/a

5.2.2 Landfill On-Site Noise Sources

A description of the landfill noise sources included in the cumulative noise model is provided in Table 5-6.

Table 5-6 Landfill On-Site Noise Sources for 2016

Activity	Plant items	Time of Operation	Percentage of Time when in Operation
Mobile Plant			
General waste Filling	- D6 or D7 dozer 2 X 30t excavators 45t compactor 35t dump truck	7.00am-6.00pm	100% (7.00am-3.00pm) and 50% (3.00pm-6.00pm)
Industrial waste Filling	30t excavator	7.00am-6.00pm	60% (7.00am-4.00pm)
General waste Excavation	- D10 dozer 3x CAT637 scrapers 45t excavator	7.00am-6.00pm	100% (7.00am-3.00pm)
Shale Removal	45t excavator	7.00am-6.00pm	100% (7.00am-4.00pm)
General (Watercarts)	2x Watercarts	7.00am-6.00pm	75% (7.00am-4.00pm)
Gas Engines			
Gas engines	3x Gas engines 3x Hase blowers	24hr	100%

5.2.3 Construction On-Site Noise Sources

Bulk earthworks were conservatively assumed when modelling year 2014. Bulk earthworks are anticipated to represent the construction phase generating the most noise impact on the surrounding receptors as it potentially involves the largest number of plant items operating simultaneously. These are likely to include:

- two 30t excavators;
- four trucks (truck and dog or 30 tonne dump truck);
- water cart;
- 10 tonne roller; and
- D6 dozer.

It should be noted that a -5dB correction was applied to noise levels generated by the construction works to account for the fact that not all plant items present on site are likely to be at their loudest during the same 15-minute period.

5.3 Transportation Noise Sources

This section summarises the traffic numbers used in the intrusiveness and amenity noise assessments. As such, numbers have been provided to enable calculation of L_{Aeq} noise levels over whole assessment periods, i.e. day (7.00am-6.00pm), evening (6.00pm-10.00pm) and night time (10.00pm-7.00am), and over the identified busiest 15 minutes in each assessment period. It is important to note that all traffic numbers are expressed as movements (i.e. not vehicles).

5.3.1 SAWT Transportation Noise Sources

Traffic numbers associated with deliveries to the SAWT facility and dispatch of material from the facility to various areas within the Precinct and off-site are summarised in Table 5-7.

Table 5-7 SAWT Heavy Vehicles – SAWT & Cumulative Assessment

Purpose of Movements	Hourly Number of Movements Representative of Identified Busiest 15 Minutes in each Assessment Period											
	2012				2014				2016			
	Day	Eve	Night	Shoulder	Day	Eve	Night	Shoulder	Day	Eve	Night	Shoulder
Deliveries going to SAWT ¹	10.4	0	0	4	10.4	0	0	4	15.6	0	0	8
Material leaving SAWT ¹	1.2	0	0	0	1.2	0	0	0	2.4	0	0	0
Dispatch of Residual Material from SAWT to Landfill ¹	9.6	0	0	0	9.6	0	0	0	12	0	0	6
Dispatch of Material from SAWT to SSO Maturation ¹	2.4	0	0	0	2.4	0	0	0	n/a	n/a	n/a	n/a
Dispatch of Material from SAWT to Stockpiling Area ¹	0.8	0	0	0	0.8	0	0	0	n/a	n/a	n/a	n/a
Dispatch of Material from SAWT to Compost Storage Pad ¹	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4.4	1.2	0	0

Note: 1) Hourly traffic volumes were derived from estimated numbers over various time periods. As such, they have been expressed with one decimal place. This is considered appropriate for the purpose of the noise assessment.

Light vehicle numbers associated with SAWT staff commuting to and from the facility are summarised in Tables 5-8 and 5-9.

Table 5-8 SAWT Light Vehicles – SAWT Assessment

Purpose of Mvts	Total Number of Movements during Identified Busiest 15 Minutes in each Assessment Period											
	2012				2014				2016			
	Day	Eve	Night	Shoulder	Day	Eve	Night	Shoulder	Day	Eve	Night	Shoulder
SAWT Staff Commuting to and from the Facility	12	0	10	14	12	0	0	14	23	5	24	6

Table 5-9 SAWT Light Vehicles – Cumulative Assessment

Purpose of Movements	Total Number of Movements during Identified Busiest 15 Minutes in each Assessment Period		
	2016		
	Day	Eve	Night
SAWT Staff Commuting to and from the Facility	0	5	6

5.3.2 Landfill Transportation Noise Sources

Traffic numbers associated with deliveries to the Landfill and dispatch of material off-site and within the Landfill are summarised in Table 5-10.

Table 5-10 Landfill Heavy Vehicles

Purpose of Movements	Hourly Number of Movements Representative of Identified Busiest 15 Minutes in each Assessment Period		
	2016		
	Day	Eve	Night
Deliveries of General Waste ¹	11.6	0	19.2
Deliveries of Industrial Waste ¹	3.6	0	0
Shale Removal going Off-Site ¹	7.6	0	7.6
Shale Transportation to Stockpile (Internal) ¹	0	0	0

Note: 1) Traffic volumes are the result of weighbridge logs averaged over a whole week. As such, they have been expressed with one decimal place. This is considered appropriate for the purpose of the noise assessment.

Light vehicle numbers associated with Landfill staff commuting to and from the Precinct are summarised in Table 5-11.

Table 5-11 Landfill Light Vehicles

Purpose of Movements	Total Number of Movements during Identified Busiest 15 Minutes in each Assessment Period		
	2016		
	Day	Eve	Night
Landfill Staff Commuting to and from the Precinct	0	0	14

5.3.3 Construction Transportation Noise Sources

Heavy traffic numbers associated with the delivery of material to the construction site are summarised in Table 5-12.

Table 5-12 Construction Heavy Vehicles

Purpose of Movements	Hourly Number of Movements Representative of Identified Busiest 15 Minutes in each Assessment Period			
	2014			
	Day	Eve	Night	Shoulder
Trucks Delivering Material to Construction Site	6.8	0	0	0

* Note: Hourly traffic volumes were derived from estimated numbers over various time periods. As such, they have been expressed with one decimal place. This is considered appropriate for the purpose of the noise assessment.

Light vehicle numbers associated with construction staff commuting to and from the construction site are summarised in Table 5-13.

Table 5-13 Construction Light Vehicles

Purpose of Movements	Total Number of Movements during Identified Busiest 15 Minutes in each Assessment Period			
	2014			
	Day	Eve	Night	Shoulder
Construction Staff Commuting to and from the Parking in SE Corner of Precinct	0	0	61.8	0

Purpose of Movements	Total Number of Movements during Identified Busiest 15 Minutes in each Assessment Period			
	2014			
	Day	Eve	Night	Shoulder
Construction Staff Commuting to and from the Construction Site	0	0	3.2	0
Shuttles Transporting Construction Staff from Parking to Construction Site	0	0	7	0

5.4 Sound Power Levels

The sound power levels used in the ENM noise model were obtained from SITA and site measurements.

5.4.1 SAWT Sound Power Levels

Sound power levels (SWL) for the more industry-specific external plant items were obtained from SITA. The SWLs are provided in Table 5-14.

Table 5-14 Sound Power Levels – SAWT

Plant Item	$L_{Aeq,15min}$ SWL (dBA)
Apron feeder	86
Conveyor	75
Trommel	93
Separating screen	93
Densimetric table	88
Baghouse & fans	94
Compost windrow turner	95
Biofilter extraction fan	105
Forklift	85

A typical cycle of a wheel loader shifting compost into the refiner was measured with a sound power level of 110dBA. This SWL was assigned to all wheel loaders associated with the current and proposed operations.

WMPL has conducted onsite measurements as part of a compliance monitoring survey carried out on Thursday, 2 July 2009 shortly after SAWT started its operations. The measurement results were used to model the noise sources representing the existing SAWT operations.

Typical internal reverberant noise levels were measured inside each of the processing areas and the results are summarised in Table 5-15.

Table 5-15 Measured Internal Reverberant Noise Levels (SAWT)

Building Area	Typical Internal $L_{Aeq,15min}$
	Sound Pressure Level (dBA)
Receival	81
Resource Recovery / Pre-Refining	86
Tunnels	82

External measurements of the existing biofilters discharge fan room were also carried out at various distances ranging from 25-120 metres from the building and the resulting effective radiated sound power levels for the fan room was calculated at 100dBA.

Based on those measurement results and the provided sound power levels, noise breaking out through the walls, roof and openings of the buildings were calculated. The resulting effective radiated sound power levels were used in the ENM model to represent operations from the existing and expanded processing building.

5.4.2 Landfill Sound Power Levels

Sound power levels associated with the Landfill operations are summarised in Table 5-16. Those sound power levels were obtained from past measurements conducted on the SITA Landfill site and other sites.

Table 5-16 Sound Power Levels - Landfill

Plant Item	$L_{Aeq,15min}$ SWL/item (dBA)
35t Dump Truck	113
D6 or D7 Dozer	111
D10 Dozer	116
30t Excavator	107
45t Excavator	110
45t Compactor	112
CAT637 Scraper	112
Watercart	108

5.4.3 Transportation Sound Power Levels

Truck deliveries on the adjacent landfill have been established with an average sound power level of 104dBA. This level was assumed typical of all trucks going to the landfill, SAWT facility, or the depot in the south-east corner of the Precinct.

A SWL of 90dBA was assumed for all light vehicles.

5.4.4 Construction Sound Power Levels

Sound power levels associated with bulk earthworks are summarised in Table 5-17. Those sound power levels were obtained from past measurements conducted across a wide variety of construction sites.

Table 5-17 Sound Power Levels - Construction

Plant Item	L_{Aeq,15min} SWL/item (dBA)
30t Excavator	107
Dump Truck	104
Watercart	108
10t Roller	108
D6	111

Shuttles transporting construction staff from the parking area to the construction site have been modelled with a sound power level of 100dBA.

6 MODEL VALIDATION

On-site measurements were conducted around the SAWT facility on Thursday, 2 July 2009. The measurements were focused on noise radiated from the SAWT facility and noise generated by wheel loaders. Those measurement results were then extrapolated to predict noise levels and assess compliance at the potentially most affected western residential receiver i.e. the McGarvie Smith Farm (R20).

Considering ground absorption, air absorption and distance attenuation daytime noise levels from the SAWT facility were predicted between 30-41dBA at R20.

A comparison of the predicted daytime noise levels based on the site measurements and those predicted using ENM is summarised in Table 6-1.

Table 6-1 Comparison of Levels based on Measurements and Levels Generated using ENM

Rec ID	Location	Daytime $L_{Aeq,15min}$	Daytime $L_{Aeq,15min}$
		based on Measurements (dBA)	based on Noise Model (dBA)
R20	McGarvie Smith Farm	30-41	42

The daytime noise level predicted using ENM is consistent with the higher end of the range of levels established based on site measurements.

It is important to note that site measurements only accounted for on-site wheel loaders and noise radiated from the facility and as such did not consider noise generated by trucks using the facility and on-site excavators which were not operating during the measurements. Furthermore, the predicted level using ENM represents a 10th percentile predicted $L_{Aeq,15min}$ noise level. Those factors explain why the measurement-based levels are at times lower than the ENM-based predicted level.

WMPL therefore considers that the ENM site model calibrates well with the measurements, possibly marginally over predicting the noise levels.

7 PRELIMINARY ASSESSMENT OF OPERATIONAL NOISE

A preliminary model was constructed with typical noise source SWLs to determine if the baseline operational concept meets the noise criteria. For the model it was assumed that no noise mitigation measures were in place. Some exceedances of the criteria were found. An iterative process involving interaction with SITA was undertaken to determine the necessary noise mitigation measures so as to meet the criteria. It was determined that the following controls would reduce the operational noise to meet the criteria relevant to the Development:

- Introduction of noise mitigation to the wheel loaders to ensure maximum SWL of 108dBA or introducing new loaders with a SWL less than 108dBA.
- Attenuation of all seven biofilter extraction fan ducting systems such that noise emanated from top of each stack is reduced by 10dBA. The most appropriate and effective noise mitigation for controlling the noise generated by the fans would be to introduce a silencer between the biofilter extraction fans and the stack outlets.
- The cessation of wheel loader outdoor operations after 10.00pm.
- The erection of an 8.5 metre high and 30 metre long wall of sufficient density along the northern side of the external refining bunkers to reduce noise generated by mobile plant at the northern receptors. The bunkers area would also be roofed at the same height as the refining building.

It should also be noted that SITA has committed to using quackers (broadband reversing alarms) instead of tonal reversing alarms on all mobile plant.

8 NOISE ASSESSMENT OF SAWT OPERATIONS

Noise levels generated by the existing SAWT facility operations (2012), during the construction phase (2014) and once the Development is operational (2016) were predicted and compared with the SAWT CoA and EPL noise limits. It is important to note that those noise limits are applicable to operational noise generated by the SAWT, i.e. without Landfill operations.

Noise levels were calculated and the results are summarised in Sections 9.1-9.3. All levels are provided as dBA levels.

8.1 Current Noise Levels (2012)

Table 8-1 summarises the 10th percentile predicted $L_{Aeq,15min}$ noise levels from the SAWT operations and compares them against the relevant CoA and EPL noise limits.

Table 8-1 2012 Noise Predictions (10th Percentile) - SAWT Operations

Rec	Day		Evening		Night		Shoulder	
	Predicted Level	$L_{Aeq,15min}$ Noise Limit	Predicted Level	$L_{Aeq,15min}$ Noise Limit	Predicted Level	$L_{Aeq,15min}$ Noise Limit	Predicted Level	$L_{Aeq,15min}$ Noise Limit
R1	36	38	34	38	26	35	37	38
R20	42	42	40	39	34	35	41	39
R21	39	41	37	40	29	37	39	40
R37	40	42	30	42	31	38	37	42

Note: Predicted operational noise levels in excess of the relevant noise criteria are shown in grey

Under adverse weather conditions, the predicted noise levels are generally within the relevant CoA and EPL $L_{Aeq,15min}$ noise limits at all four receptors. There is however a 1dB and 2dB exceedance at R20 during the evening and the morning shoulder period, respectively. It should be noted that the noise validation appeared to suggest that the noise predictions may be over estimating the noise levels by approximately 1 dB, therefore the exceedance might be 1dB less than presented.

Generally all receptors that experience noise levels that exceed the noise criteria can be separated into three noise exceedance categories, namely:

- 0-2dB(A): minor exceedances;
- 3-5dB(A): marginal exceedances; and
- >5dB(A): significant exceedances.

As such, R20 has minor exceedances of the CoA and EPL $L_{Aeq,15min}$ noise limits which are typically considered negligible.

Table 8-2 summarises the $L_{Aeq,15min}$ noise levels under calm weather conditions from the SAWT operations and compares them against the relevant CoA and EPL noise limits.

Table 8-2 2012 Noise Predictions (Calm) - SAWT Operations

Rec	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)		Shoulder (6am – 7am)	
	Predicted Level	$L_{Aeq,15min}$ Noise Limit	Predicted Level	$L_{Aeq,15min}$ Noise Limit	Predicted Level	$L_{Aeq,15min}$ Noise Limit	Predicted Level	$L_{Aeq,15min}$ Noise Limit
R1	34	38	28	38	21	35	31	38
R20	38	42	37	39	31	35	38	39
R21	37	41	29	40	27	37	35	40
R37	39	42	26	42	29	38	35	42

The predicted noise levels are expected to be within the relevant CoA $L_{Aeq,15min}$ noise limits at all four receptors under calm weather conditions.

According to the project approval, L_{Amax} levels also need to be assessed during the night time period at R21 and R37 to assess potential sleep arousal. Waste deliveries to the SAWT during the morning shoulder period represent the noise sources generating the loudest L_{Amax} noise levels at R21 and R37.

Table 8-3 summarises the calculated maximum noise level from a truck passby at both receptors.

Table 8-3 Maximum Noise Levels due to Truck Passby

Rec	Predicted L_{Amax} Noise Level (dBA)	L_{Amax} Noise Limit
R21	47	47
R37	53	53

Table 8-3 indicates that early morning waste deliveries to the SAWT comply with the relevant L_{Amax} noise limits.

8.2 Noise Levels during Construction (2014)

Table 8-4 summarises the 10th percentile predicted $L_{Aeq,15min}$ noise levels from the combined SAWT operations and construction activities and compares them against the relevant CoA and EPL noise limits.

Table 8-4 2014 Noise Predictions (10th Percentile) – SAWT Operations with Construction

Rec	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)		Shoulder (6am – 7am)	
	Predicted Level	$L_{Aeq,15min}$ Noise Limit	Predicted Level	$L_{Aeq,15min}$ Noise Limit	Predicted Level	$L_{Aeq,15min}$ Noise Limit	Predicted Level	$L_{Aeq,15min}$ Noise Limit
R1	39	38	34	38	33	35	36	38
R20	43	42	40	39	35	35	42	39
R21	40	41	37	40	37	37	40	40
R37	41	42	30	42	39	38	37	42

Note: Predicted operational noise levels in excess of the relevant noise criteria are shown in grey

During the day, the addition of construction activities is expected to increase noise levels on the surrounding receptors with a 1dB exceedance anticipated at R1 and R20. Such a small exceedance is considered negligible.

In the evening, no changes are noted when compared with the 2012 predictions and therefore R20 is still expected to exceed by 1dB. Again, this is generally considered negligible.

With regards to construction staff arrivals at night, one 1dB exceedance is expected at R37. Such small exceedance is generally considered negligible.

During the morning shoulder period, a 3dB exceedance is expected at R20.

Table 8-5 summarises the predicted $L_{Aeq,15min}$ noise levels under calm weather conditions from the combined SAWT operations and construction activities and compares them against the relevant CoA and EPL noise limits.

Table 8-5 2014 Noise Predictions (Calm) - SAWT Operations with Construction

Rec	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)		Shoulder (6am – 7am)	
	Predicted Level	L _{Aeq,15min} Noise Limit	Predicted Level	L _{Aeq,15min} Noise Limit	Predicted Level	L _{Aeq,15min} Noise Limit	Predicted Level	L _{Aeq,15min} Noise Limit
R1	38	38	28	38	28	35	32	38
R20	41	42	37	39	32	35	41	39
R21	39	41	29	40	35	37	36	40
R37	40	42	26	42	37	38	35	42

Note: Predicted operational noise levels in excess of the relevant noise criteria are shown in grey

Under calm weather conditions, the addition of construction activities is expected to impact on the surrounding receptors with a 2dB exceedance expected at R20 in the morning shoulder period. The 2dB exceedance is generally considered negligible.

L_{Amax} levels at R21 and R37 are not anticipated to change between 2012 and 2014 and therefore compliance with the relevant L_{Amax} noise limits can be assumed in 2014.

8.3 Noise Levels after SAWT Expansion Development (2016)

Table 8-6 summarises the 10th percentile predicted L_{Aeq,15min} noise levels from the expanded SAWT operations and compares them against the relevant CoA and EPL noise limits.

Table 8-6 2016 Noise Predictions (10th Percentile) – SAWT Operations

Rec	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)		Shoulder (6am – 7am)	
	Predicted Level	L _{Aeq,15min} Noise Limit	Predicted Level	L _{Aeq,15min} Noise Limit	Predicted Level	L _{Aeq,15min} Noise Limit	Predicted Level	L _{Aeq,15min} Noise Limit
R1	37	38	30	38	25	35	36	38
R20	37	42	35	39	27	35	35	39
R21	38	41	28	40	28	37	36	40
R37	41	42	29	42	31	38	39	42

The predicted noise levels are expected to be within the relevant CoA and EPL L_{Aeq,15min} noise limits at all four receptors under adverse weather conditions.

Table 8-7 summarises the predicted L_{Aeq,15min} noise levels under calm weather conditions from the expanded SAWT operations and compares them against the relevant CoA and EPL noise limits.

Table 8-7 2016 Noise Predictions (Calm) - SAWT Operations

Rec	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)		Shoulder (6am – 7am)	
	Predicted Level	L _{Aeq,15min} Noise Limit	Predicted Level	L _{Aeq,15min} Noise Limit	Predicted Level	L _{Aeq,15min} Noise Limit	Predicted Level	L _{Aeq,15min} Noise Limit
R1	34	38	25	38	31	35	20	38
R20	34	42	32	39	33	35	25	39
R21	38	41	25	40	35	37	27	40
R37	40	42	27	42	37	38	29	42

The predicted noise levels are expected to be within the relevant CoA L_{Aeq,15min} noise limits at all four receptors under calm weather conditions.

L_{Amax} levels at R21 and R37 are not anticipated to change between 2012, 2014 and 2016 and therefore compliance with the relevant L_{Amax} noise limits can be assumed in 2016.

9 NOISE ASSESSMENT OF CUMULATIVE OPERATIONS

Table 9-1 summarises the 10th percentile predicted $L_{Aeq,15min}$ noise levels for the combined expanded SAWT operations (2016) and Landfill operations and compares them against the landfill EPL noise limits. Table 9-2 summarises the predicted $L_{Aeq,15min}$ noise levels under calm weather conditions.

Table 9-1 Cumulative Noise Predictions (10th Percentile)

Rec	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)	
	SAWT & Landfill	EPL Noise Limit	SAWT & Landfill	EPL Noise Limit	SAWT & Landfill	EPL Noise Limit
R1	50	50	30	50	41	45
R2	40	50	33	50	35	45
R3	40	50	30	50	31	45
R4	32	50	27	50	30	45
R5	32	50	27	50	31	45
R6	33	50	24	50	31	45
R7	38	50	27	50	38	45
R8	27	50	15	50	25	45
R9	39	50	30	50	39	45
R10	28	50	19	50	28	45
R11	36	50	33	50	35	45
R12	38	50	34	50	38	45
R13	36	50	33	50	35	45
R14	26	50	20	50	25	45
R15	35	50	32	50	33	45
R16	33	50	27	50	29	45
R17	39	50	34	50	35	45
R18	34	50	26	50	28	45
R19	42	50	34	50	34	45
R20	43	50	35	50	35	45
R21	42	50	28	50	41	45
R22	45	50	30	50	45	45
R23	44	50	38	50	38	45
R24	39	50	30	50	32	45
R25	38	50	29	50	30	45
R26	40	50	37	50	37	45

Rec	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)	
	SAWT & Landfill	EPL Noise Limit	SAWT & Landfill	EPL Noise Limit	SAWT & Landfill	EPL Noise Limit
R27	36	50	33	50	34	45
R28	34	50	29	50	30	45
R31	35	50	26	50	28	45
R32	29	50	24	50	25	45
R33	30	50	22	50	22	45
R34	32	50	27	50	27	45
R35	34	50	29	50	29	45
R36	30	50	22	50	23	45
R37	45	50	29	50	45	45

The predicted noise levels are expected to be within the relevant landfill EPL $L_{Aeq,15min}$ noise limits at all the identified receptors under adverse weather conditions.

Table 9-2 Cumulative Noise Predictions (Calm)

Rec	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)	
	SAWT & Landfill	EPL Noise Limit	SAWT & Landfill	EPL Noise Limit	SAWT & Landfill	EPL Noise Limit
R1	48	50	25	50	37	45
R2	33	50	21	50	27	45
R3	29	50	16	50	21	45
R4	26	50	11	50	21	45
R5	27	50	12	50	23	45
R6	27	50	13	50	24	45
R7	33	50	17	50	31	45
R8	25	50	11	50	22	45
R9	38	50	23	50	37	45
R10	27	50	15	50	24	45
R11	32	50	24	50	29	45
R12	35	50	24	50	32	45
R13	33	50	27	50	30	45
R14	23	50	14	50	19	45
R15	32	50	25	50	27	45
R16	30	50	23	50	25	45

Rec	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)	
	SAWT & Landfill	EPL Noise Limit	SAWT & Landfill	EPL Noise Limit	SAWT & Landfill	EPL Noise Limit
R17	37	50	31	50	33	45
R18	30	50	21	50	23	45
R19	36	50	30	50	31	45
R20	38	50	32	50	33	45
R21	42	50	25	50	41	45
R22	45	50	28	50	45	45
R23	38	50	33	50	33	45
R24	30	50	20	50	22	45
R25	29	50	18	50	20	45
R26	34	50	29	50	29	45
R27	31	50	23	50	24	45
R28	28	50	20	50	21	45
R31	26	50	14	50	16	45
R32	23	50	13	50	15	45
R33	23	50	10	50	13	45
R34	24	50	13	50	15	45
R35	25	50	15	50	16	45
R36	24	50	13	50	15	45
R37	44	50	27	50	43	45

The predicted noise levels are expected to be within the relevant landfill EPL $L_{Aeq,15min}$ noise limits at all the identified receptors under calm weather conditions.

10 NOISE ASSESSMENT ACCORDING TO INP

As mentioned in the introduction a cumulative noise assessment considering INP criteria has been conducted to provide an understanding of the impacts consistent with contemporary guidelines. As such background noise levels have been measured without noise from either the SAWT or the Landfill to establish INP noise criteria.

10.1 Noise Survey

Since traffic volumes on the surrounding road network continue to grow, background noise levels continue to increase. As such, a new noise survey is considered necessary to provide an adequate up-to-date baseline for this assessment. The noise survey was conducted in accordance with the INP.

10.1.1 Monitoring Locations

Background noise levels were measured between Friday, 20 July and Monday, 30 July 2012 using environmental noise loggers set up at three residential receptors around the Site. Each logger location was selected to represent receptors at various distances to Elizabeth Drive.

It is important to note that care was taken to ensure industrial noise associated with the Site (including both SAWT and landfill operations) did not affect the acoustic environment at the logger locations during the day and at night. This was done by means of daytime and night time attended noise measurements along Elizabeth Drive, Badgerys Creek Road, Mamre Road, Luddenham Road, Twin Creeks Drive and Humewood Place. Night time measurements were conducted in the early hours of Tuesday, 17 July 2012 to establish the areas in which SAWT operations are contributing to the overall background noise levels. Similarly, daytime attended measurements were conducted on Friday, 20 July to establish the areas in which SAWT operations and/or Landfill operations are contributing to the overall background noise levels. Those areas already impacted by noise from the site were strictly avoided when installing the noise loggers to ensure industrial noise associated with the site did not affect the acoustic environment at the various logger locations.

One should also consider that no other industrial noise sources were noted during the attended noise measurements.

The three logger locations are described in Table 10-1 and shown in Figure 10-1.

Table 10-1 Logger Locations

Logger Location ID	Residential Address
L1	55 Taylors Road, Badgerys Creek
L2	35 Overett Avenue, Kemps Creek
L3	28 Twins Creek Drive, Badgerys Creek

Figure 10-1 Logger Locations



10.1.2 Equipment

The noise monitoring equipment used for this measurement consisted of Acoustic Research Laboratories 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 to ensure the equipment stayed calibrated throughout the survey.

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 one percent, 10 percent and 90 percent 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 Glossary of Acoustic Terms.

10.1.3 Measured Background Noise Levels

The monitored noise levels are shown in graphical format in Appendix A.

Periods of adverse meteorological conditions were excluded from the results before calculating RBLs. Those periods of adverse meteorological conditions were minimal during the noise survey and are shown as greyed out in the graphs. Meteorological data was obtained from the weather station located on the landfill site. As a precaution, this data was also compared with data obtained from the Badgerys Creek Bureau of Meteorological (BoM) station and no inconsistencies were found.

Table 10-2 summarises the background noise levels that were measured, expressed as Rating Background Levels (RBL). 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 method for calculating RBL values from measured L_{A90} levels is presented in the INP.

Table 10-2 Measured Rating Background Levels

Location	Measured RBL (dBA)		
	Day (7am–6pm)	Evening (6pm–10pm)	Night Time (10pm–7am)
L1	37	36	33
L2	42	39	33
L3	33	33	30

Background noise levels measured at L1, L2 and L3 were assigned to the identified receptors addressed in this assessment based on their location relative to Elizabeth Drive. This is shown in Table 10-3.

Table 10-3 Representative Logger Location and RBLs for Identified Receptors

Rec ID	Representative Logger Location	Measured RBL (dBA)		
		Day (7am–6pm)	Evening (6pm–10pm)	Night Time (10pm–7am)
R1	L1	37	36	33
R2	L1	37	36	33
R3	L1	37	36	33
R4	L2	42	39	33
R5	L2	42	39	33
R6	L2	42	39	33
R7	L2	42	39	33
R8	L1	37	36	33
R9	L2	42	39	33
R10	L1	37	36	33
R11	L2	42	39	33
R12	L2	42	39	33
R13	L2	42	39	33
R14	L1	37	36	33
R15	L2	42	39	33
R16	L2	42	39	33
R17	L1	37	36	33
R18	L1	37	36	33
R19	L1	37	36	33
R20	L1	37	36	33
R21	L2	42	39	33
R22	L2	42	39	33
R23	L1	37	36	33
R24	L3	33	33	30
R25	L3	33	33	30
R26	L3	33	33	30
R27	L3	33	33	30
R28	L3	33	33	30
R31	L3	33	33	30
R32	L3	33	33	30
R33	L1	37	36	33
R34	L3	33	33	30
R35	L3	33	33	30
R36	L3	33	33	30
R37	L1	37	36	33

10.2 Industrial Noise Criteria

10.2.1 Description of 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 Glossary of Terms section above.

Intrusiveness Criterion

Where noise levels are currently low, noise levels from the proposed operation are limited by the intrusiveness criterion. In general, the L_{Aeq} noise level from such sources should not exceed the Rating Background Level (RBL) by more than 5dBA. This is assessed over a typical worst case period of 15 minutes.

Amenity Criterion

The amenity criterion sets an upper limit to control the total L_{Aeq} noise level from all industrial sources.

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, where noise levels from industrial sources are close to or above the acceptable levels then the amenity criterion, which incorporates a sliding scale to set limits, would apply. The sliding scale prevents the overall noise level exceeding the acceptable level due to the addition of a new noise source. Amenity criterion also needs to consider the possibility of other developments which may affect noise levels.

10.2.2 Determination of Project-Specific Industrial Noise Criteria

Intrusiveness Criteria

Based on Table 10-3, Table 10-4 summarises the noise criteria that are set for the Site.

Table 10-4 Intrusiveness Criteria

Location	L _{Aeq,15min} Intrusiveness Criterion (dBA)		
	Day (7am–6pm)	Evening (6pm–10pm)	Night Time (10pm–7am)
R1	42	41	38
R2	42	41	38
R3	42	41	38
R4	47	44	38
R5	47	44	38
R6	47	44	38
R7	47	44	38
R8	42	41	38
R9	47	44	38
R10	42	41	38
R11	47	44	38
R12	47	44	38
R13	47	44	38
R14	42	41	38
R15	47	44	38
R16	47	44	38
R17	42	41	38
R18	42	41	38
R19	42	41	38
R20	42	41	38
R21	47	44	38
R22	47	44	38
R23	42	41	38
R24	38	38	35
R25	38	38	35
R26	38	38	35
R27	38	38	35
R28	38	38	35
R31	38	38	35

Location	L _{Aeq,15min} Intrusiveness Criterion (dBA)		
	Day (7am–6pm)	Evening (6pm–10pm)	Night Time (10pm–7am)
R32	38	38	35
R33	42	41	38
R34	38	38	35
R35	38	38	35
R36	38	38	35
R37	42	41	38

Amenity Noise Levels

The area surrounding the SITA Site is currently rural. Furthermore, no other industrial noise sources potentially impacting on the identified receptors have been noted during the attended measurements. Therefore under the INP the amenity criteria are 50dBA, 45dBA and 40dBA L_{Aeq,period} for daytime, evening and night time periods, respectively.

Sleep Disturbance Criteria

The INP Application Notes specify sleep disturbance criteria as the RBL plus 15dBA. Table 10-5 summarises the noise criteria that are set for the Site.

Table 10-5 Sleep Disturbance Criteria

Location	Night Time (10pm–7am)	
	RBL (dBA)	Sleep Disturbance Criteria (dBA)
R1	33	48
R2	33	48
R3	33	48
R4	33	48
R5	33	48
R6	33	48
R7	33	48
R8	33	48
R9	33	48
R10	33	48
R11	33	48
R12	33	48
R13	33	48
R14	33	48

Location	Night Time (10pm–7am)	
	RBL (dBA)	Sleep Disturbance Criteria (dBA)
R15	33	48
R16	33	48
R17	33	48
R18	33	48
R19	33	48
R20	33	48
R21	33	48
R22	33	48
R23	33	48
R24	30	45
R25	30	45
R26	30	45
R27	30	45
R28	30	45
R31	30	45
R32	30	45
R33	33	48
R34	30	45
R35	30	45
R36	30	45
R37	33	48

10.3 Assessment of Predicted Noise Levels

10.3.1 Intrusiveness Noise Assessment

Table 10-6 summarises the 10th percentile predicted $L_{Aeq,15min}$ noise levels for the expanded SAWT operations alone and when combined with landfill operations and assesses them against the newly developed intrusiveness noise criteria. Table 10-7 summarises the predicted $L_{Aeq,15min}$ noise levels under calm weather conditions.

Table 10-6 2016 Noise Predictions (10th Percentile) – Intrusiveness

Rec	Day (7am – 6pm)			Evening (6pm – 10pm)			Night (10pm – 7am)		
	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion
R1	37	50	42	30	30	41	36	41	38
R2	31	40	42	33	33	41	33	35	38
R3	28	40	42	30	30	41	30	31	38
R4	25	32	47	27	27	44	28	30	38
R5	27	32	47	27	27	44	28	31	38
R6	27	33	47	24	24	44	27	31	38
R7	33	38	47	26	27	44	32	38	38
R8	23	27	42	14	15	41	21	25	38
R9	36	39	47	29	30	44	35	39	38
R10	25	28	42	19	19	41	24	28	38
R11	35	36	47	33	33	44	35	35	38
R12	36	38	47	34	34	44	37	38	38
R13	33	36	47	33	33	44	34	35	38
R14	23	26	42	20	20	41	23	25	38
R15	32	35	47	31	32	44	33	33	38
R16	29	33	47	26	27	44	28	29	38
R17	36	39	42	34	34	41	35	35	38
R18	29	34	42	26	26	41	28	28	38
R19	35	42	42	33	34	41	34	34	38
R20	37	43	42	35	35	41	35	35	38
R21	38	42	47	28	28	44	36	41	38
R22	42	45	47	30	30	44	39	45	38
R23	39	44	42	38	38	41	38	38	38
R24	29	39	38	30	30	38	31	32	35
R25	28	38	38	29	29	38	30	30	35
R26	34	40	38	37	37	38	37	37	35
R27	32	36	38	33	33	38	33	34	35
R28	28	34	38	29	29	38	29	30	35
R31	24	35	38	26	26	38	27	28	35
R32	23	29	38	24	24	38	25	25	35
R33	23	30	42	22	22	41	22	22	38
R34	27	32	38	27	27	38	26	27	35

Rec	Day (7am – 6pm)			Evening (6pm – 10pm)			Night (10pm – 7am)		
	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion
R35	29	34	38	29	29	38	29	29	35
R36	23	30	38	22	22	38	23	23	35
R37	41	45	42	29	29	41	39	45	38

Note: Predicted operational noise levels in excess of the relevant noise criteria are shown in grey.

Table 10-7 2016 Noise Predictions (Calm) – Intrusiveness

Rec	Day (7am – 6pm)			Evening (6pm – 10pm)			Night (10pm – 7am)		
	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion
R1	34	48	42	25	25	41	31	37	38
R2	25	33	42	21	21	41	24	27	38
R3	20	29	42	16	16	41	18	21	38
R4	19	26	47	11	11	44	16	21	38
R5	20	27	47	12	12	44	18	23	38
R6	22	27	47	12	13	44	19	24	38
R7	29	33	47	17	17	44	26	31	38
R8	21	25	42	11	11	41	18	22	38
R9	35	38	47	23	23	44	32	37	38
R10	23	27	42	15	15	41	21	24	38
R11	29	32	47	24	24	44	27	29	38
R12	32	35	47	24	24	44	30	32	38
R13	30	33	47	27	27	44	29	30	38
R14	19	23	42	14	14	41	17	19	38
R15	28	32	47	25	25	44	27	27	38
R16	25	30	47	23	23	44	24	25	38
R17	34	37	42	30	31	41	33	33	38
R18	23	30	42	20	21	41	22	23	38
R19	31	36	42	30	30	41	31	31	38
R20	34	38	42	32	32	41	33	33	38
R21	38	42	47	25	25	44	35	41	38
R22	42	45	47	28	28	44	39	45	38
R23	33	38	42	32	33	41	33	33	38
R24	21	30	38	20	20	38	21	22	35
R25	19	29	38	18	18	38	19	20	35

Rec	Day (7am – 6pm)			Evening (6pm – 10pm)			Night (10pm – 7am)		
	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion	SAWT	SAWT & Landfill	L _{Aeq,15min} Criterion
R26	29	34	38	28	29	38	29	29	35
R27	24	31	38	23	23	38	23	24	35
R28	21	28	38	20	20	38	21	21	35
R31	16	26	38	14	14	38	15	16	35
R32	14	23	38	13	13	38	14	15	35
R33	13	23	42	9	10	41	12	13	38
R34	16	24	38	13	13	38	14	15	35
R35	16	25	38	14	15	38	15	16	35
R36	15	24	38	13	13	38	14	15	35
R37	40	44	42	27	27	41	37	43	38

Note: Predicted operational noise levels in excess of the relevant noise criteria are shown in grey.

Based on results summarised in Tables 10-6 and 10-7, the following observations can be made:

- Under calm and adverse weather conditions, predicted noise levels associated with the SAWT operations (i.e. excluding Landfill operations) are expected to comply with the INP intrusiveness L_{Aeq,15min} criterion at all the identified receptors during the day and evening periods.
- Under adverse weather conditions, predicted noise levels associated with the SAWT operations (i.e. excluding Landfill operations) are expected to comply with the INP intrusiveness L_{Aeq,15min} criterion at all the identified receptors during the night time period except R22, R26 and R37 where 1-2dB exceedances are anticipated.
- During calm weather conditions, predicted noise levels associated with the SAWT operations (i.e. excluding Landfill operations) are expected to comply with the INP intrusiveness L_{Aeq,15min} criterion at all the identified receptors during the night time period except R22 where a 1dB exceedance is anticipated.
- Under adverse weather conditions, predicted noise levels generated by the SAWT and Landfill operations combined are expected to exceed the INP intrusiveness L_{Aeq,15min} criterion at up to six receptors (R1, R20, R23, R24, R26 and R37) during daytime. Exceedances are found to range 1-8dB above the INP intrusiveness L_{Aeq,15min} criteria.
- Under calm weather conditions, predicted noise levels generated by the SAWT and Landfill operations combined are expected to exceed the INP intrusiveness L_{Aeq,15min} criterion at only two receptors (R1 and R37) during daytime. Exceedances are found to range 2-6dB above the relevant intrusiveness L_{Aeq,15min} criteria.
- Under calm and adverse weather conditions, predicted noise levels generated by the SAWT and Landfill operations combined are expected to comply with the INP intrusiveness L_{Aeq,15min} criterion at all the identified receptors during the evening period.

- Under adverse weather conditions, predicted noise levels generated by the SAWT and Landfill operations combined are expected to exceed the INP intrusiveness $L_{Aeq,15min}$ criterion at up to six receptors (R1, R9, R21, R22, R26 and R37) during night time. Exceedances are found to range 1-7dB above the relevant intrusiveness $L_{Aeq,15min}$ criteria.
- Under calm weather conditions, predicted noise levels generated by the SAWT and Landfill operations combined are expected to exceed the INP intrusiveness $L_{Aeq,15min}$ criterion at up to three receptors (R21, R22 and R37) during night time. Exceedances are found to range 3-7dB above the relevant intrusiveness $L_{Aeq,15min}$ criteria.

10.3.2 Amenity Noise Assessment

Table 10-8 summarises the predicted $L_{Aeq,period}$ noise levels for the expanded SAWT operations alone and when combined with Landfill operations and assesses them against the newly developed amenity noise criteria.

Table 10-8 2016 Noise Predictions – Amenity

Rec	Day (7am – 6pm)			Evening (6pm – 10pm)			Night (10pm – 7am)		
	SAWT	SAWT & Landfill	$L_{Aeq,period}$ Criterion	SAWT	SAWT & Landfill	$L_{Aeq,period}$ Criterion	SAWT	SAWT & Landfill	$L_{Aeq,period}$ Criterion
R1	35	48	50	27	27	45	26	33	40
R2	28	36	50	30	30	45	24	27	40
R3	24	35	50	27	27	45	20	22	40
R4	22	29	50	23	23	45	17	22	40
R5	23	29	50	22	22	45	17	23	40
R6	23	29	50	19	19	45	17	23	40
R7	30	34	50	21	21	45	22	29	40
R8	20	25	50	12	12	45	12	17	40
R9	34	39	50	27	27	45	25	31	40
R10	23	27	50	16	17	45	15	19	40
R11	31	33	50	29	29	45	24	26	40
R12	33	36	50	30	30	45	25	29	40
R13	30	33	50	29	29	45	24	26	40
R14	20	24	50	17	17	45	15	17	40
R15	29	33	50	26	26	45	22	24	40
R16	26	31	50	22	23	45	19	22	40
R17	34	37	50	32	32	45	26	28	40
R18	25	31	50	23	24	45	19	20	40
R19	32	38	50	32	32	45	25	26	40
R20	34	39	50	33	33	45	27	28	40

Rec	Day (7am – 6pm)			Evening (6pm – 10pm)			Night (10pm – 7am)		
	SAWT	SAWT & Landfill	L _{Aeq,period} Criterion	SAWT	SAWT & Landfill	L _{Aeq,period} Criterion	SAWT	SAWT & Landfill	L _{Aeq,period} Criterion
R21	37	42	50	24	24	45	27	34	40
R22	41	45	50	22	22	45	31	38	40
R23	35	40	50	36	36	45	28	29	40
R24	25	35	50	27	27	45	22	23	40
R25	24	33	50	27	27	45	20	21	40
R26	31	37	50	34	34	45	29	30	40
R27	28	33	50	31	31	45	25	26	40
R28	25	31	50	27	27	45	22	24	40
R31	20	30	50	23	23	45	17	18	40
R32	19	26	50	21	22	45	15	16	40
R33	19	26	50	20	20	45	12	13	40
R34	22	28	50	23	23	45	16	16	40
R35	25	30	50	27	27	45	19	20	40
R36	19	27	50	20	20	45	18	19	40
R37	40	45	50	22	22	45	30	38	40

Predicted noise levels generated by the SAWT and Landfill operations combined are expected to comply with the relevant amenity L_{Aeq,period} criteria at all the identified receptors.

10.4 Discussion & Recommendations

Noise levels associated with the expanded SAWT operations are generally expected to comply at all the identified receptors and at all times with the INP intrusive noise criterion. Only two exceedances are expected during adverse weather conditions ranging between 1-2dB. This has been achieved via all reasonable and feasible 'at the source' noise mitigation measures that are presented in Section 7.

When considering the combined noise generated by both the SAWT and landfill operations, noise levels are expected to exceed the INP intrusive noise criteria at nine receptors, namely R1, R9, R20, R21, R22, R23, R24, R26 and R37.

Although noise levels at those receptors are generally a combination of SAWT generated noise and Landfill generated noise, the biggest contributor is generally found to be the Landfill. This is especially true for the receptors with the highest exceedances.

It is recommended that a noise pollution reduction program be prepared and implemented to address noise generated by the Landfill operations and ensure all reasonable and feasible noise mitigation is implemented when considering the INP criteria.

11 SLEEP AROUSAL ASSESSMENT

11.1 Sleep Disturbance Criterion

According to EPA Application Notes (EPA, 2012), there is a requirement to assess the potential for sleep disturbance due to intermittent or impulsive noise at night time (10.00pm-7.00am). A screening criterion for this assessment, which applies to $L_{A1,1min}$ 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 truck passbys, the assessment will consider maximum levels (L_{Amax}) as representative of $L_{A1,1min}$ levels and RBLs as representative of L_{A90} levels. The definitions of maximum level (L_{Amax}) and L_{A1} are given in the Glossary of Acoustic Terms.

As a result of a recent review of the latest research into sleep disturbance, the EPA recognises that the current criterion is not ideal. Nevertheless, as there is insufficient evidence to conclude what should replace it, the EPA recommends that this approach be used as a guide. Where the criterion is likely to be exceeded, more detailed analysis is required. This analysis generally involves determining the extent to which the criterion is exceeded and how many noise events are likely to occur during each night.

11.2 Predictions

L_{Amax} levels also need to be assessed during the night time period at all the receptors potentially awoken by waste deliveries to the SAWT and Landfill during the morning shoulder period. Receptors where potential sleep arousal may occur are R7, R9, R21, R22 and R37. All other receptors are considered to far to be potentially awoken by waste deliveries.

Table 11-1 summarises the calculated maximum noise level from a truck passby at the five receptors.

Table 11-1 Maximum Noise Levels due to Truck Passby

Rec	Predicted	
	L_{Amax} Noise Level (dBA)	L_{Amax} Noise Limit
R7	47	48
R9	47	48
R21	47	48
R22	60	48
R37	53	48

Note: Predicted noise levels in excess of the relevant noise criteria are shown in grey.

11.3 Discussion

Table 10-9 indicates that early morning waste deliveries comply with the relevant L_{Amax} noise limits at R7, R9 and R21. However, exceedances ranging 12dB and 5dB are expected at R22 and R37, respectively.

EPA recognises that current sleep disturbance criterion of an $L_{A1,1min}$ not exceeding the $L_{A90,15min}$ by more than 15dBA is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, EPA will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.

According to the RNP, research on sleep disturbance to date has shown that maximum internal noise levels below 50-55dBA are unlikely to awaken people from sleep. Based on this, noise impacts from waste deliveries from the access road are unlikely to awake people from sleep as internal noise levels with windows open are expected to be approximately 50dBA at R22 and 43dBA at R37. One should consider that R22 is exposed to non-Project related traffic on Elizabeth Drive and that no noise complaints have been lodged in the past from R22 or R37.

12 TRAFFIC NOISE ASSESSMENT

This section assesses the impact of increased traffic noise along Elizabeth Drive in accordance with the RNP.

12.1 Road Traffic Noise Criteria

Trucks and other vehicles servicing the Site will increase the traffic flows on Elizabeth Drive. The Road Noise Policy (RNP) sets noise criteria for assessing such impacts. The SAWT development is classified under the RNP type of project/land use "Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use development". Base noise criteria for this type of project/land use are $L_{Aeq,15hr}$ 60dBA during the daytime (7.00am-10.00pm) and $L_{Aeq,9hr}$ 55dBA during the night time period (10.00pm-7.00am).

The RNP also recommends relative increase criteria addressing any increase in the total traffic noise level due to land use developments. The total traffic noise level with the additional traffic should not exceed the existing traffic $L_{Aeq,15hr} + 12dB$ during the daytime and the existing traffic $L_{Aeq,9hr} + 12dB$ during the night time period. Where the above criteria are already exceeded, the RNP states that in all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2dBA.

Vehicles moving along the Precinct 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 and amenity criteria apply, and these sources are included in the ENM noise model of on site activities.

12.2 Existing Traffic Noise Levels

A noise logger was installed at 2140 Elizabeth Drive (2-14 June 2011) to measure the existing traffic noise along Elizabeth Drive near to the Site. The logger was located 15 metres from the road. 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 and a distance correction to represent the closest residences (20 metres from the road), the existing daytime traffic $L_{Aeq,15hr}$ noise level (7.00am-10.00pm) at these residences was measured at 64dBA and the existing night time traffic $L_{Aeq,9hr}$ noise level (10.00pm-7.00am) was 60dBA. These are significantly above the relevant base criteria of 60dBA and 55dBA.

12.3 Predicted Increase in Traffic Noise Levels

A spreadsheet based on the Calculation of Road Traffic Noise (CoRTN) method was used to predict traffic noise levels for the following two scenarios:

- During the peak of construction associated with the expanded SAWT facility. This scenario would account for all traffic associated with the Landfill operations, the existing SAWT operations and construction activities.
- With the expanded SAWT facility operating at full capacity. This scenario would account for all traffic associated with the Landfill operations and the expanded SAWT operations.

All pertinent information associated with both scenarios are summarised in Tables 12-1 and 12-2.

Table 12-1 Traffic Information – During Peak of Construction Activities

Route/Purpose of Truck Movements	Vehicle Type (Light Vehicle/ Heavy Vehicle)	Traffic Direction (%Westbound/ %Eastbound)	Number of Daily Movements	
			Day (7am – 10pm)	Night (10pm – 7am)
EXISTING SAWT OPERATIONS				
Deliveries going to SAWT	HV	20% / 80%	98	4
Deliveries of output product leaving SAWT	HV	20% / 80%	8	0
Staff	LV	20% / 80%	40	36
PEAK CONSTRUCTION ACTIVITIES				
Deliveries	HV	20% / 80%	60	0
Staff	LV	20% / 80%	130	130
LANDFILL OPERATIONS				
Delivery of General Waste	HV	20% / 80%	165.6	38
Delivery of Industrial Waste	HV	20% / 80%	46.8	0
Shifting of shale and clay material from excavation area to stockpile area	HV	20% / 80%	74.5	15
Removal of shale and clay material off-site	HV	20% / 80%	65.2	0
Staff	LV	20% / 80%	47	7

Table 12-2 Traffic Information – With Expanded SAWT Facility Operating at Full Capacity

Route/Purpose of Truck Movements	Vehicle Type (Light Vehicle/ Heavy Vehicle)	Traffic Direction (%Westbound/ %Eastbound)	Number of Daily Movements	
			Day (7am – 10pm)	Night (10pm – 7am)
EXPANDED SAWT OPERATIONS				
Deliveries going to SAWT	HV	20% / 80%	156	8
Deliveries of output product leaving SAWT	HV	20% / 80%	20	0
Staff	LV	20% / 80%	62	58
LANDFILL OPERATIONS				
Delivery of General Waste	HV	20% / 80%	165.6	38
Delivery of Industrial Waste	HV	20% / 80%	46.8	0
Shifting of shale and clay material from excavation area to stockpile area	HV	20% / 80%	74.5	15
Removal of shale and clay material off-site	HV	20% / 80%	65.2	0
Staff	LV	20% / 80%	47	7

During the peak of construction activities, the $L_{Aeq,15hr}$ traffic noise level at the closest residences on Elizabeth Drive is predicted at 59dBA which would increase the existing $L_{Aeq,15hr}$ traffic noise level of 64dBA by 1dBA. The $L_{Aeq,9hr}$ traffic noise level is predicted at 53dBA which is expected to increase the existing $L_{Aeq,9hr}$ traffic noise level of 60dBA by 1dBA.

With the expanded SAWT facility operating at full capacity, the $L_{Aeq,15hr}$ traffic noise level at the closest residences on Elizabeth Drive is predicted at 62dBA which would increase the existing $L_{Aeq,15hr}$ traffic noise level of 64dBA by 2dBA. The $L_{Aeq,9hr}$ traffic noise level is predicted at 55dBA which is expected to increase the existing $L_{Aeq,9hr}$ traffic noise level of 60dBA by 1dBA.

The RNP states that in all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2dBA. This criterion has been shown to be met in both cases.

The predicted increase in total traffic noise level is also expected to meet the RNP relative increase criteria.

12.4 Mitigation of Existing Traffic Noise

Since the existing traffic noise level exceeds the RNP daytime and night time base criteria, the RNP indicates that where reasonable (feasible and practicable), noise levels should be mitigated to reduce noise levels to achieve the base criteria. The mitigation measures should be implemented in the following order of priority:

- (i) Road design and traffic management.
- (ii) Quieter pavement surfaces
- (iii) In-corridor noise barriers/mounds.
- (iv) At-property treatments or localised barriers/mounds.

Road design and traffic management measures are not considered reasonable for this Development as they do not relate to reducing existing noise levels and only deal with the proposed additional noise source.

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

13 CONCLUSION

SITA proposes to expand the SITA Advanced Waste Treatment (SAWT) facility located at its Kemps Creek Resource Recovery Precinct.

The current existing SAWT facility Project Application 06_0185, approved on 15 April 2008, limits the facility to processing approximately 134,400 tonnes per annum (tpa) of input waste; 120,000 tpa of mixed solid waste and 14,400 tpa of biosolids. SITA proposes to increase the SAWT receival capacity to 220,000 tpa.

Wilkinson Murray has prepared a noise assessment intended to cover all environmental noise aspects related to construction, operation and traffic of the proposed new facility and maturation areas.

13.1 Noise Assessment of SAWT Operations

The SAWT generated noise levels for 2016 meet the existing CoA for the existing SAWT facility and EPL noise limits. For 2014 where the SAWT and construction occur simultaneously negligible exceedances of the CoA and EPL noise limits were found which would only occur for approximately a year.

13.2 Noise Assessment of Cumulative Operations

The predicted noise levels are expected to be within the relevant landfill EPL $L_{Aeq,15min}$ noise limits at all the identified receptors.

13.3 Noise Assessment According to INP

As mentioned in the introduction a cumulative noise assessment considering INP criteria has been conducted to provide an understanding of the impacts consistent with contemporary guidelines. The INP noise assessment stemmed from the consultation process between AECOM and EPA and supplements the requirements of meeting the SAWT current CoA and EPL noise limits.

Noise levels associated with the expanded SAWT operations are generally expected to comply at all the identified receptors and at all times with the INP intrusive noise criterion. Only two exceedances are expected during adverse weather conditions ranging between 1-2dB. This has been achieved via all reasonable and feasible 'at the source' noise mitigation measures that are presented in Section 7.

When considering the combined noise generated by both the SAWT and Landfill operations, noise levels are expected to exceed the INP intrusive noise criteria at nine receptors, namely R1, R9, R20, R21, R22, R23, R24, R26 and R37.

Although noise levels at those receptors are generally a combination of SAWT generated noise and Landfill generated noise, the biggest contributor is generally found to be the Landfill. This is especially true for the receptors with the highest exceedances.

When considering the INP criteria, it is recommended that a noise pollution reduction program be prepared and implemented to address noise generated by the Landfill operations and ensure

all reasonable and feasible noise mitigation is implemented.

13.4 Traffic Noise Assessment

Traffic arising from the development complies with the relevant RNP noise criteria.

13.5 Noise Mitigation

The following noise mitigation is proposed for the SAWT. It is important to note that those noise mitigation measures have been included in the noise predictions presented in this noise assessment.

- Introduction of noise mitigation to the wheel loaders to ensure maximum SWL of 108dBA or introducing new loaders with a SWL less than 108dBA.
- Attenuation of all seven biofilter extraction fan ducting systems such that noise emanated from top of each stack is reduced by 10dBA. The most appropriate and effective noise mitigation for controlling the noise generated by the fans would be to introduce a silencer between the biofilter extraction fans and the stack outlets.
- The cessation of wheel loader outdoor operations after 10.00pm.
- The erection of an 8.5 metre high and 30 metre long wall of sufficient density along the northern side of the external refining bunkers to reduce noise generated by mobile plant at the northern receptors. The bunkers area will also be roofed at the same height as the refining building.
- The use of quackers (broadband reversing alarms) instead of tonal reversing alarms on all mobile plant.

13.6 Recommended Noise Monitoring

It is proposed to implement a quarterly attended noise monitoring regime for both the SAWT and the Landfill. On site operational observations would also need to be carried out by SITA personnel in order to support the noise monitoring program and enable the distinction between noise levels generated by the SAWT and those generated by the Landfill. Noise monitoring would be conducted at 12 locations, namely:

- R1;
- R2;
- R9;
- R12;
- R17;
- R20;
- R21;
- R22;
- R23;
- R24;
- R26; and
- R37.

To assess compliance with the proposed noise limits presented, attended noise monitoring would be undertaken during a day, evening and night period as defined in the NSW Industrial Noise Policy for a period two consecutive operating days.

14 REFERENCES

Environment Protection Authority (2000) *NSW Industrial Noise Policy (INP)*

Environment Protection Authority (2011) *NSW Road Traffic Noise Policy (RNP)*

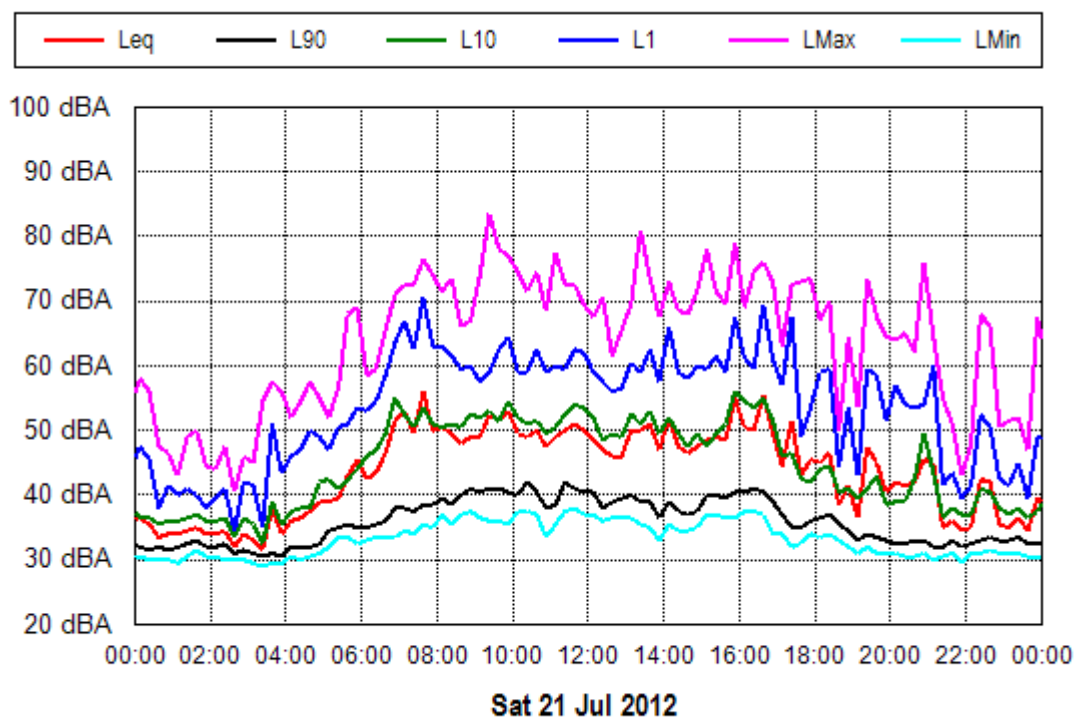
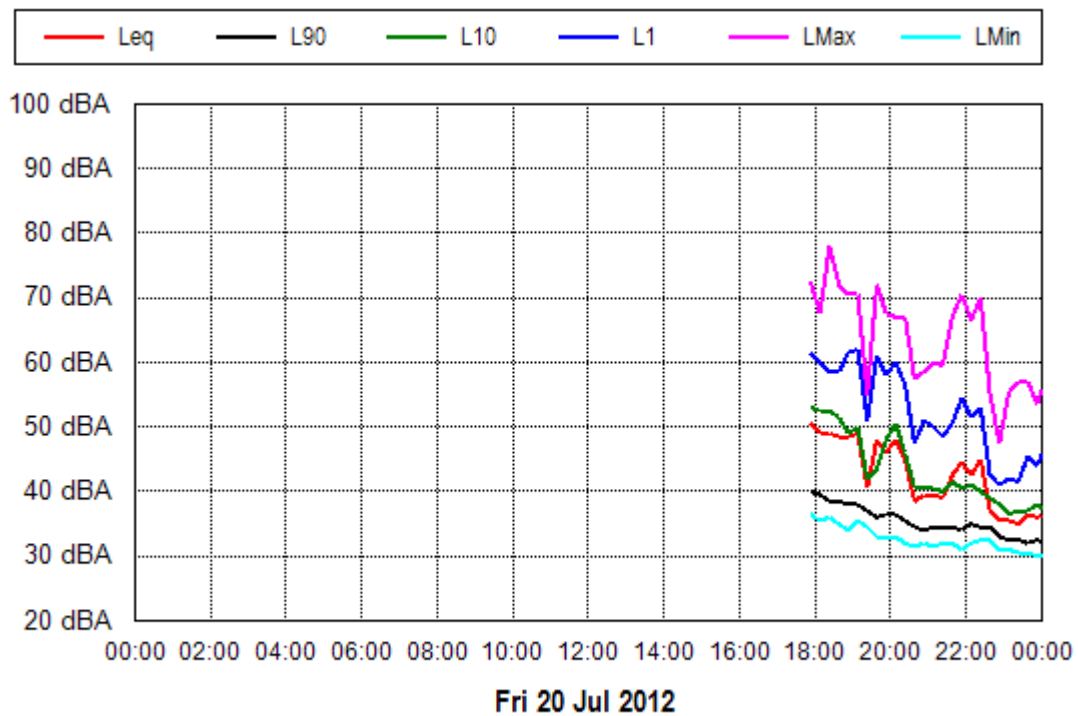
Environment Protection Authority (2012) Application Notes – *NSW Industrial Noise Policy*
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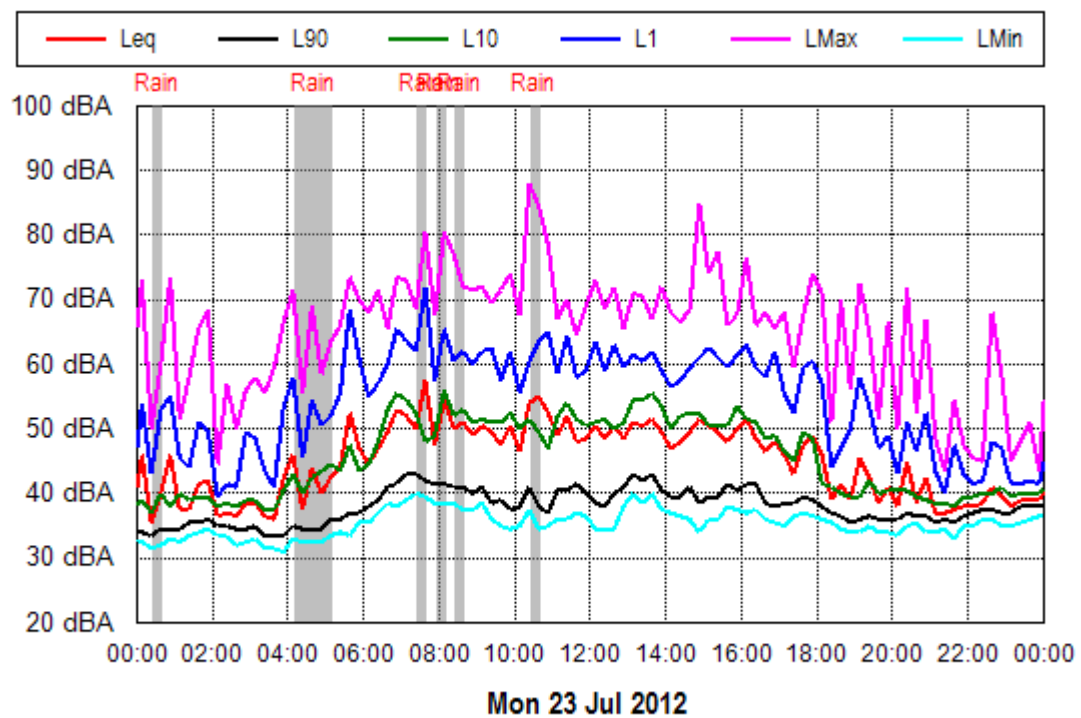
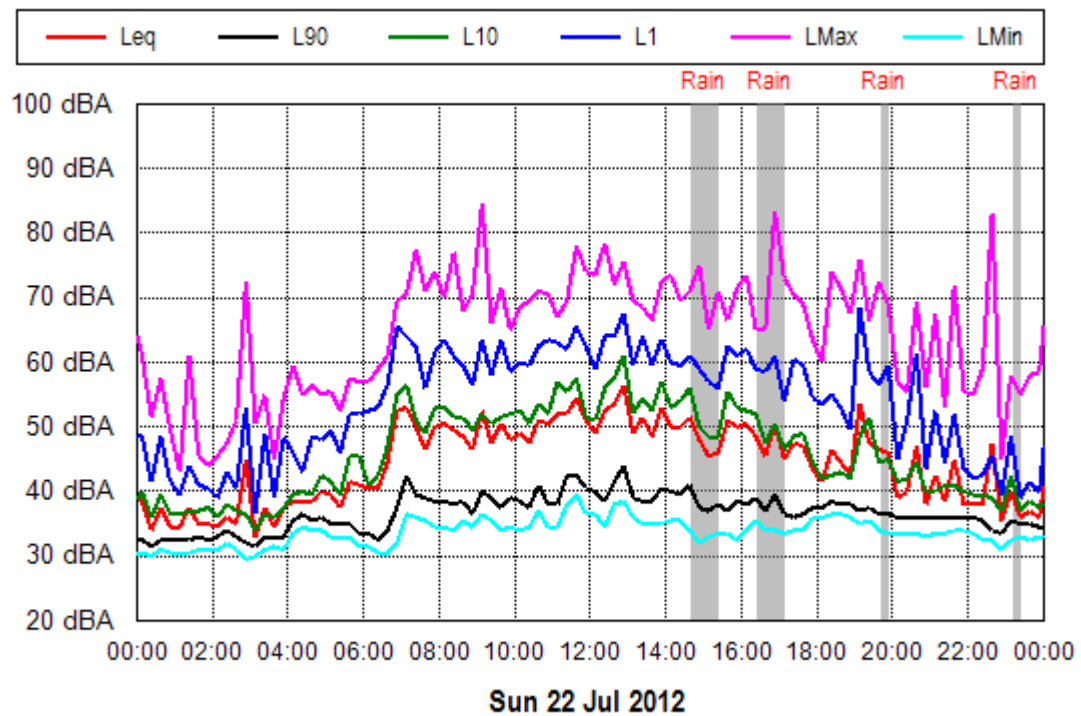
APPENDIX A

NOISE MEASUREMENT RESULTS

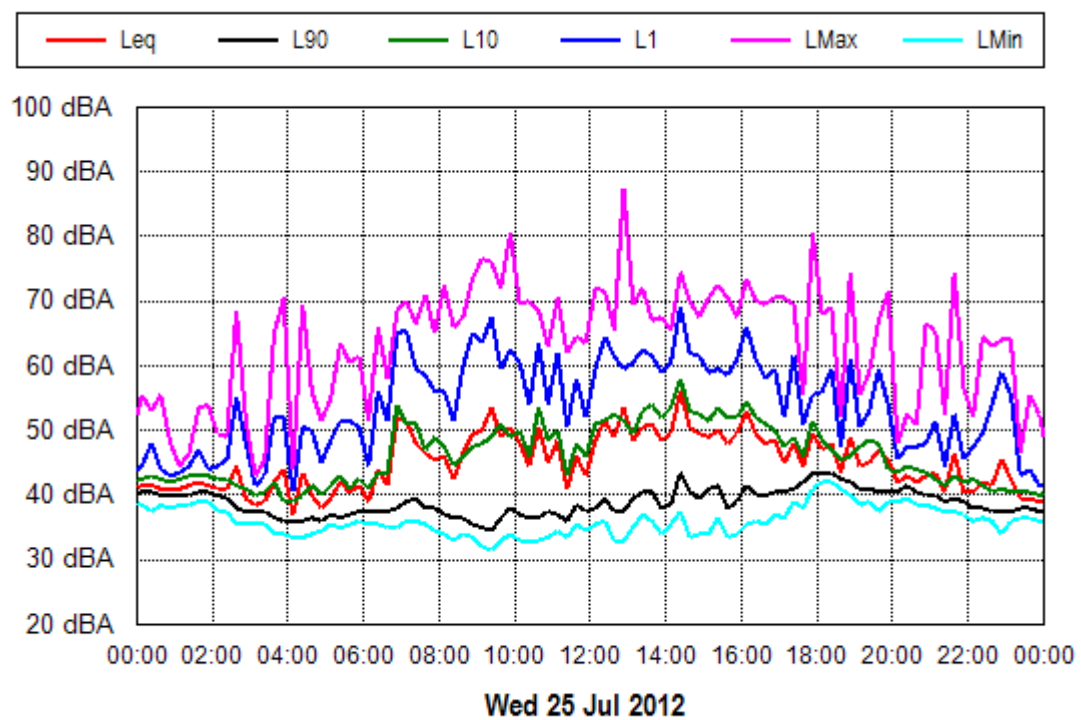
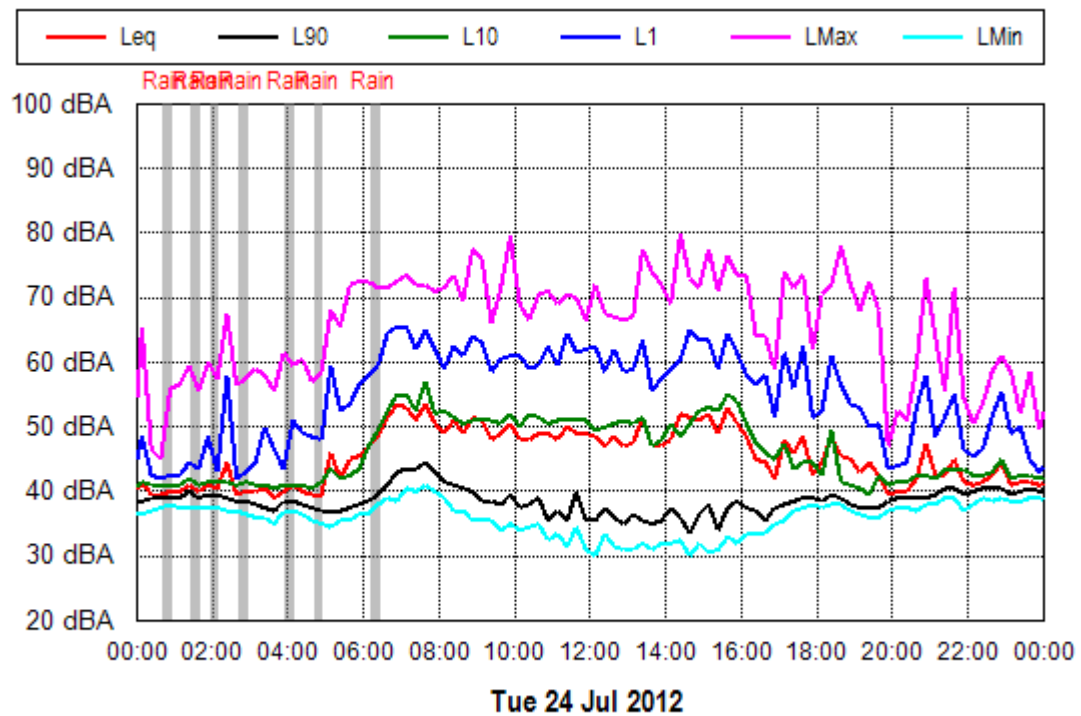
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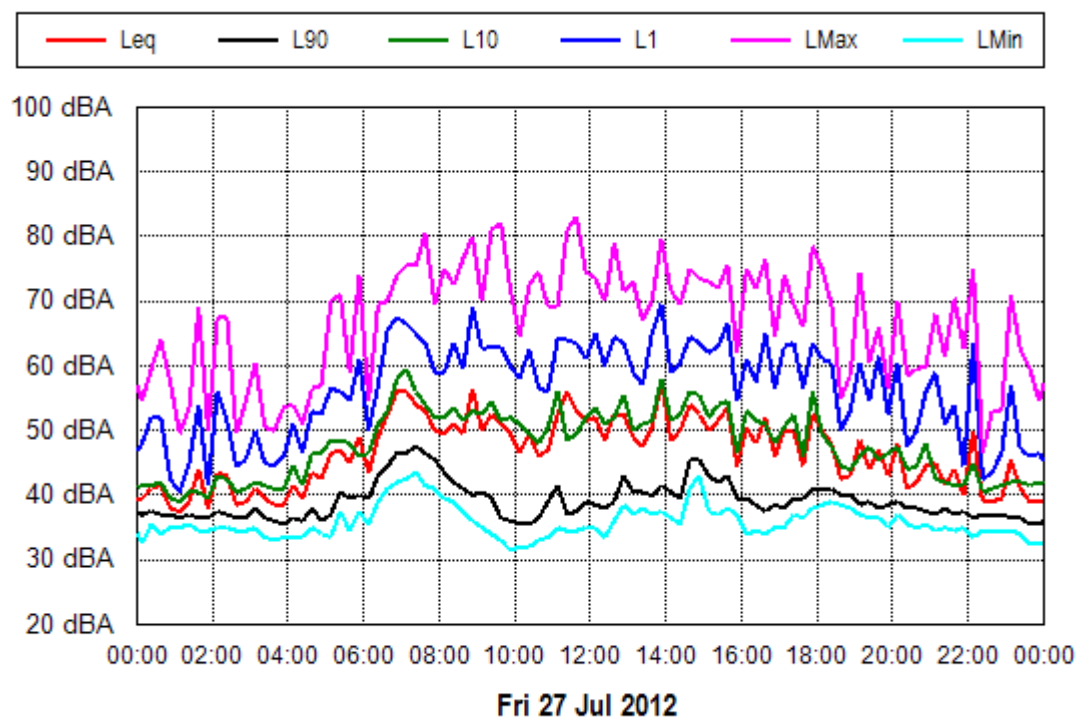
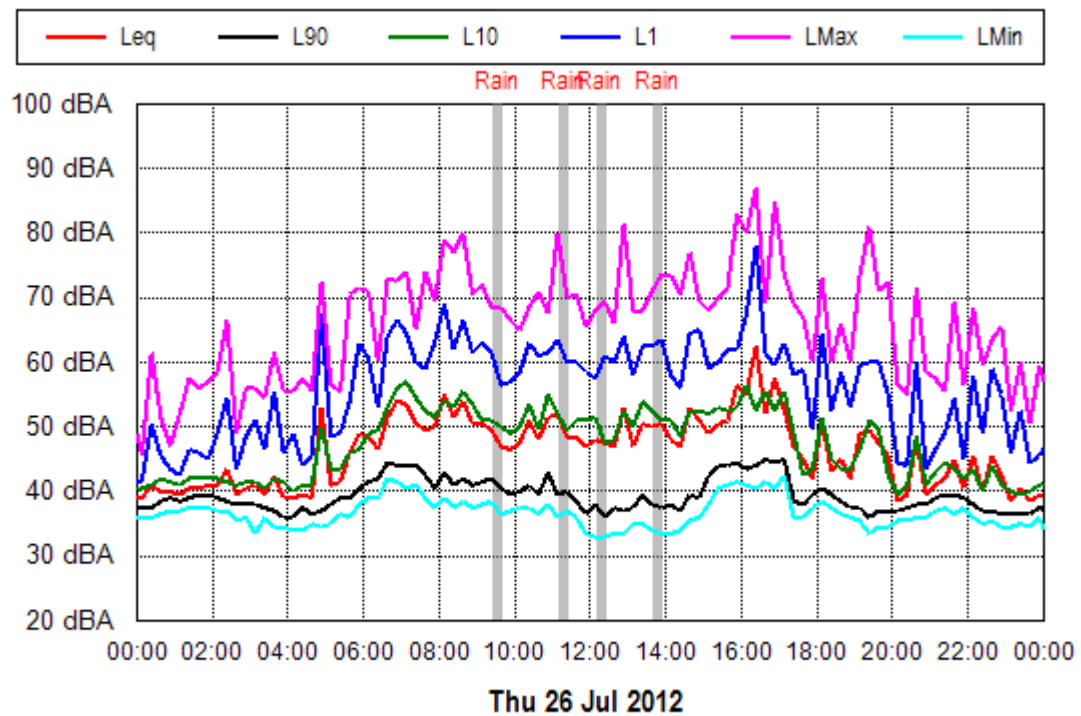
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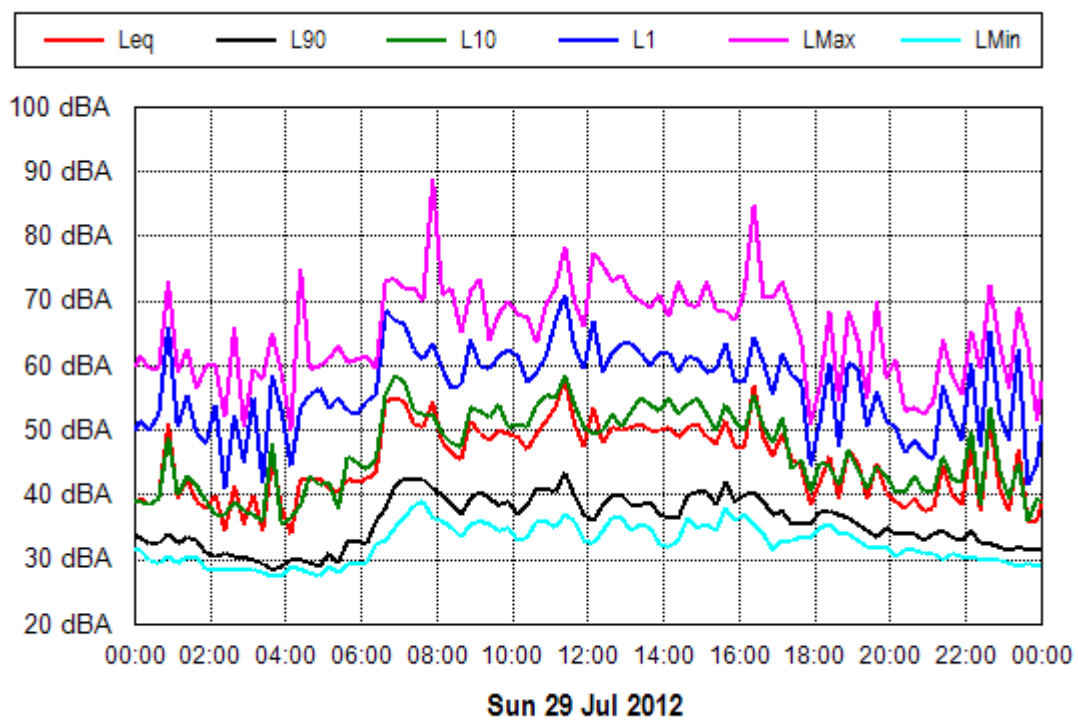
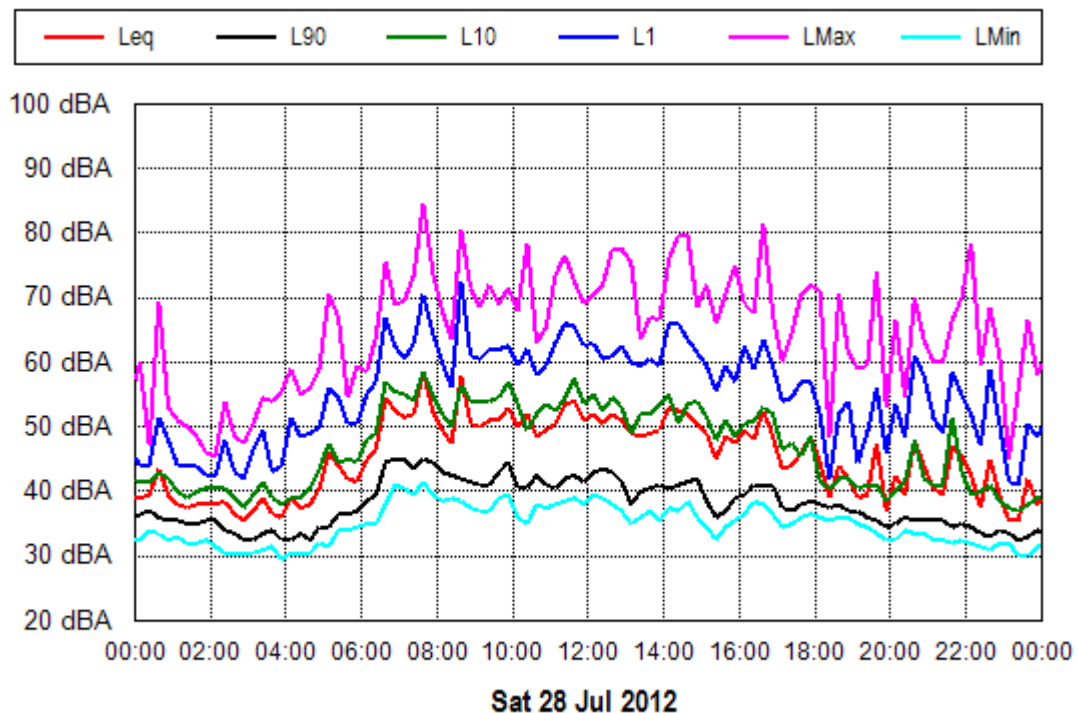
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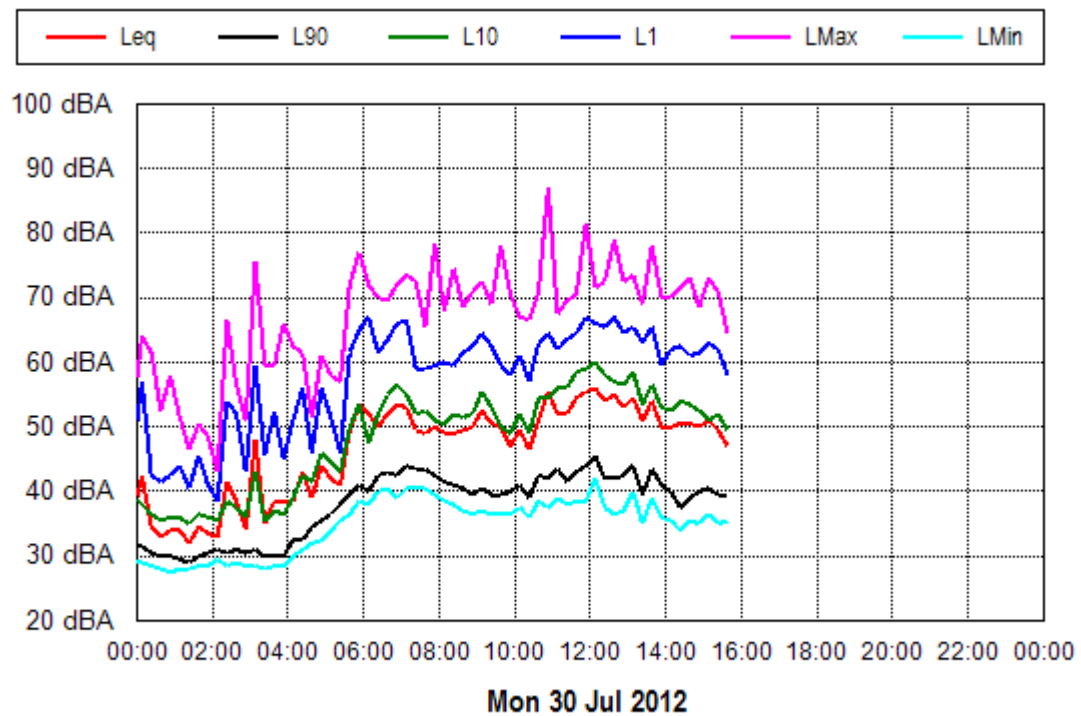
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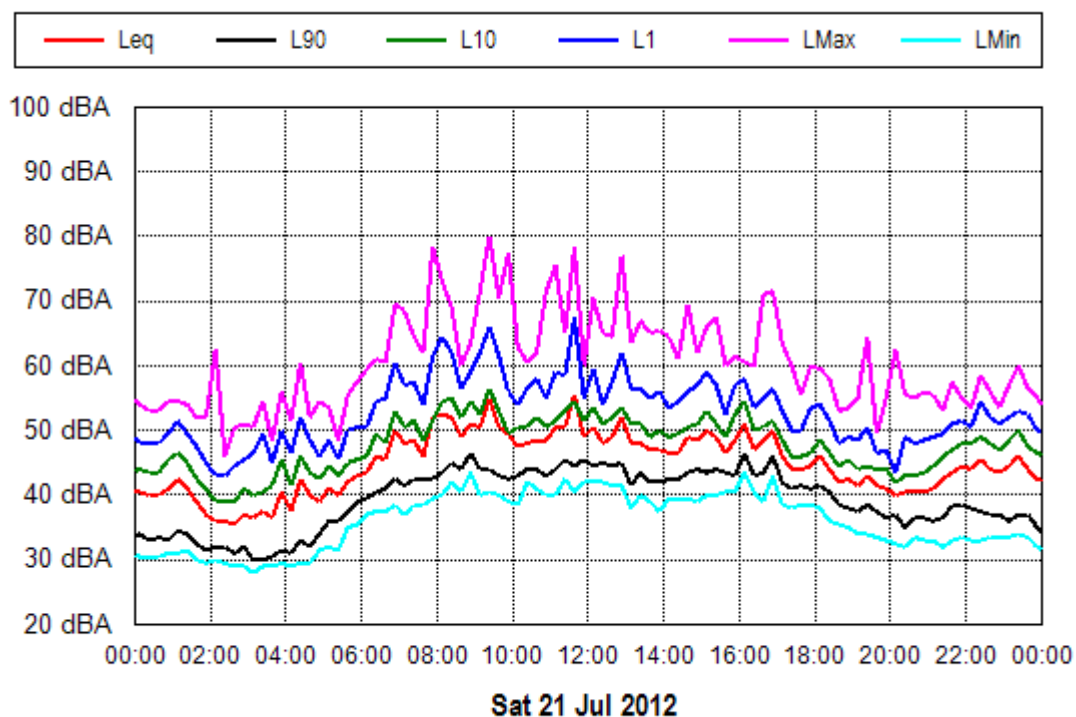
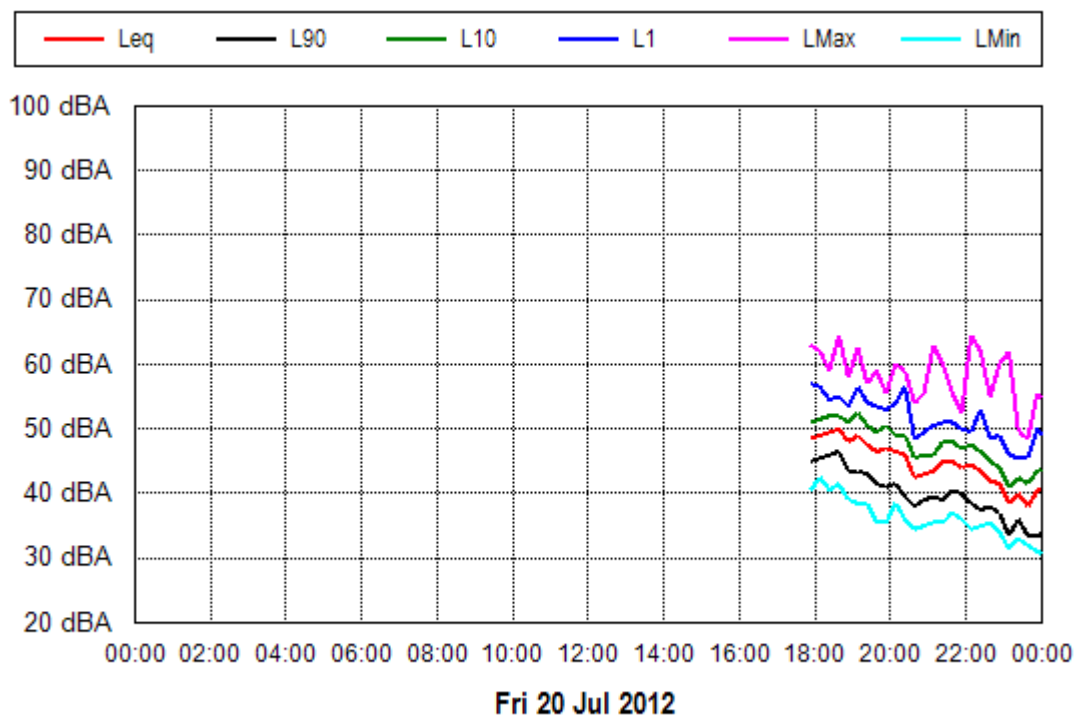
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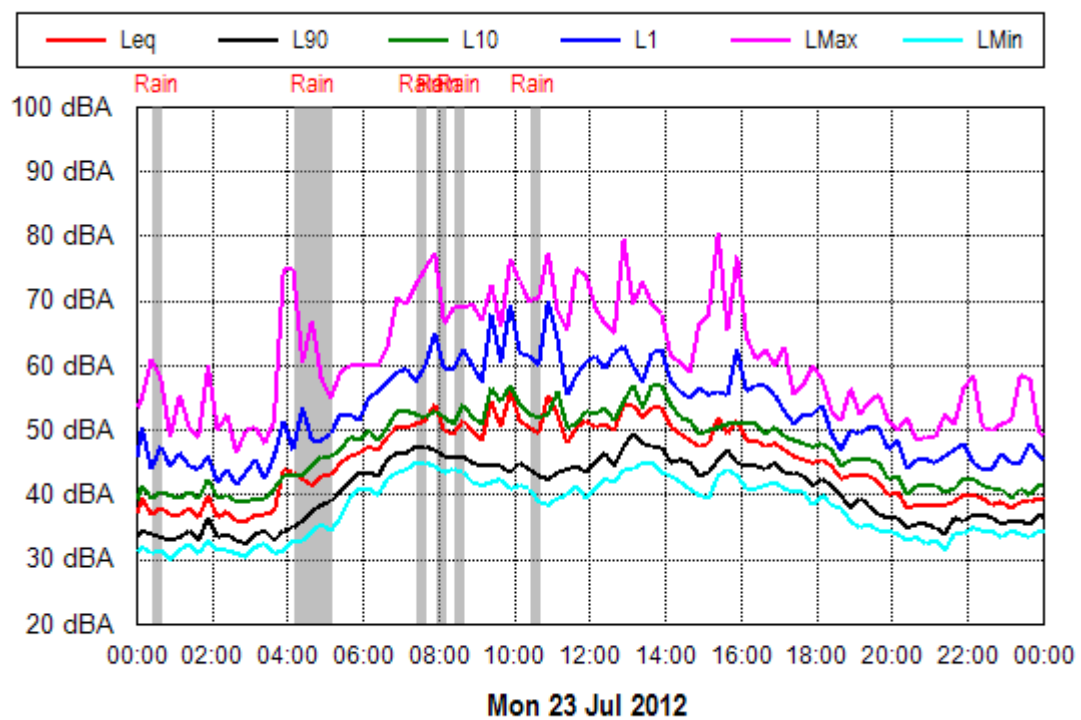
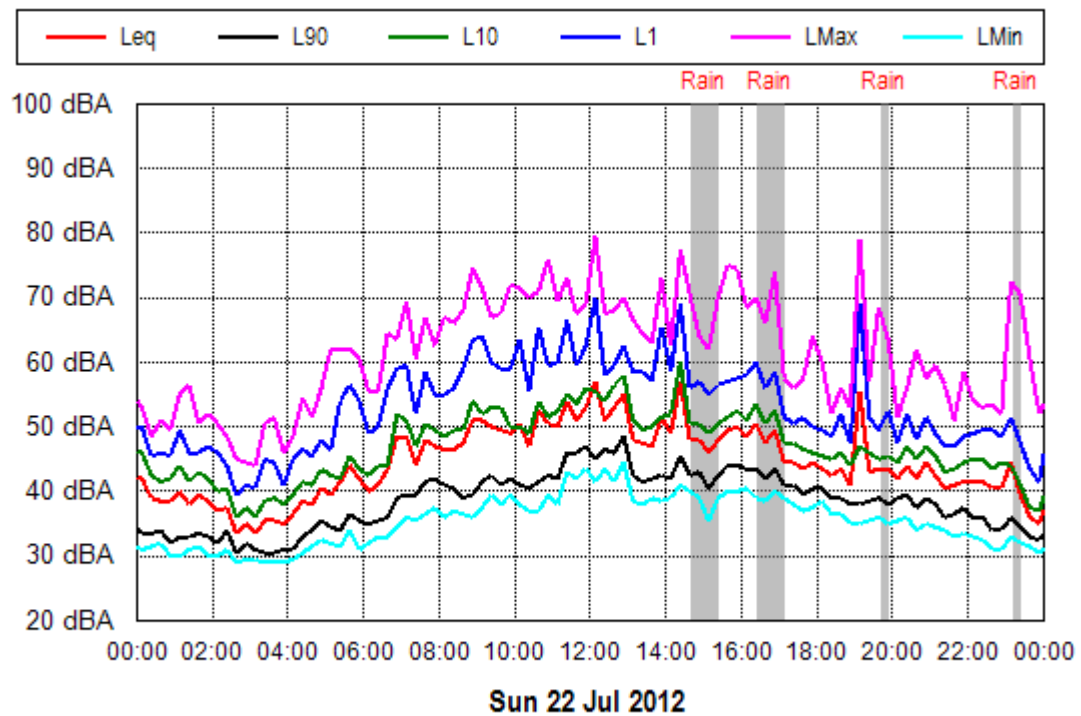
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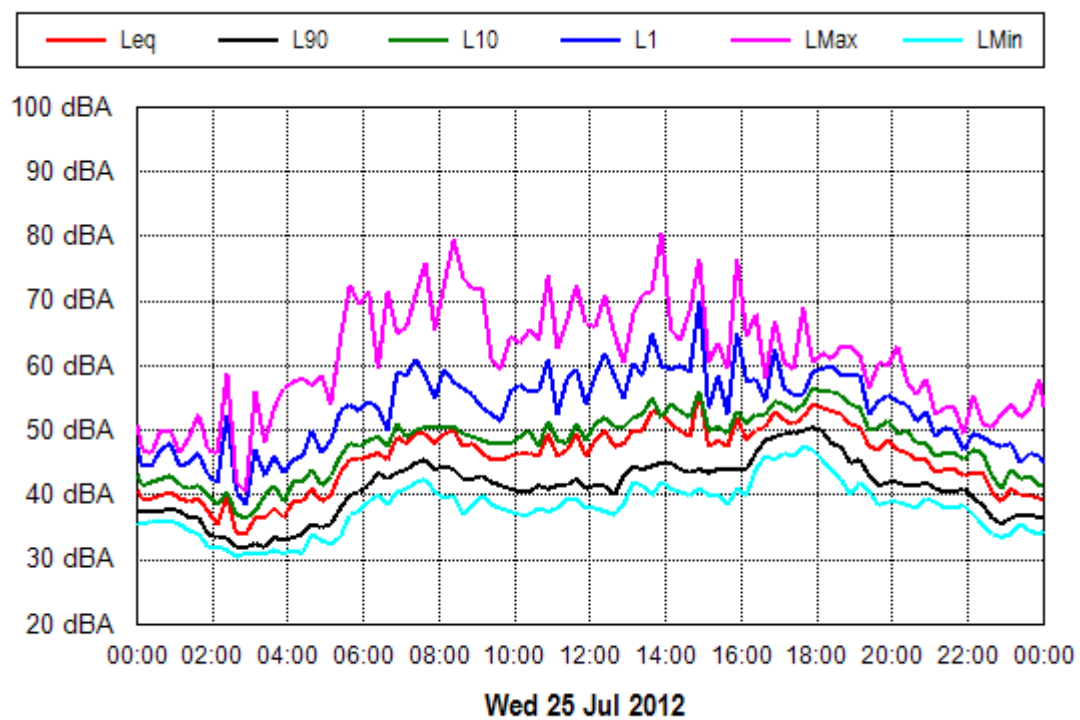
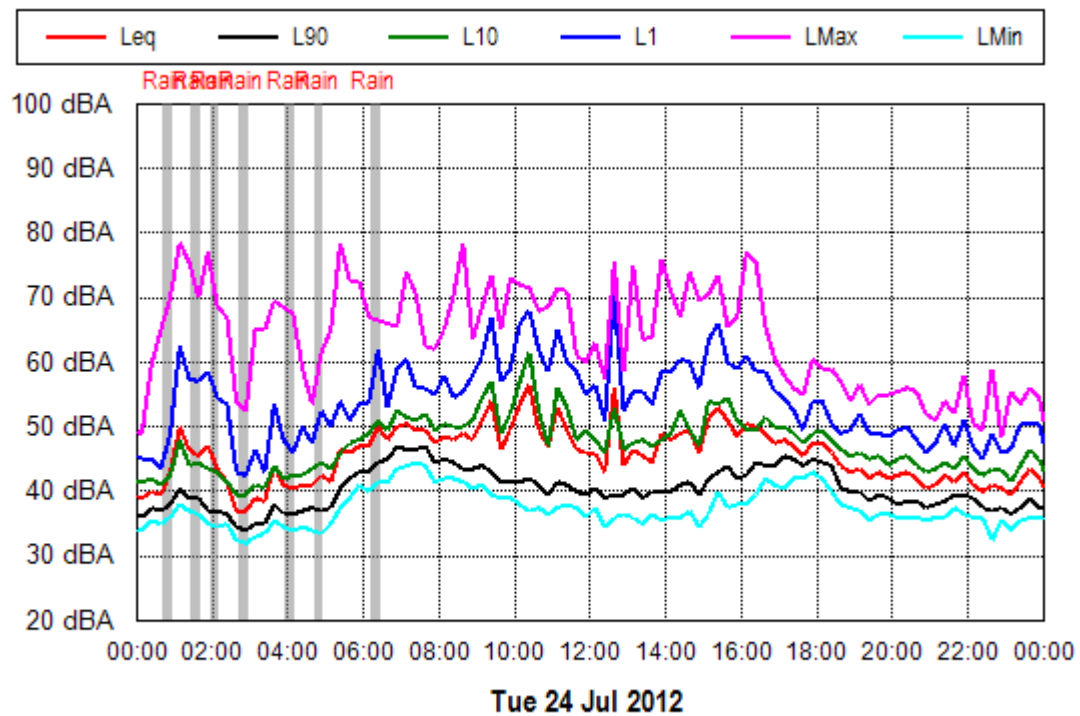
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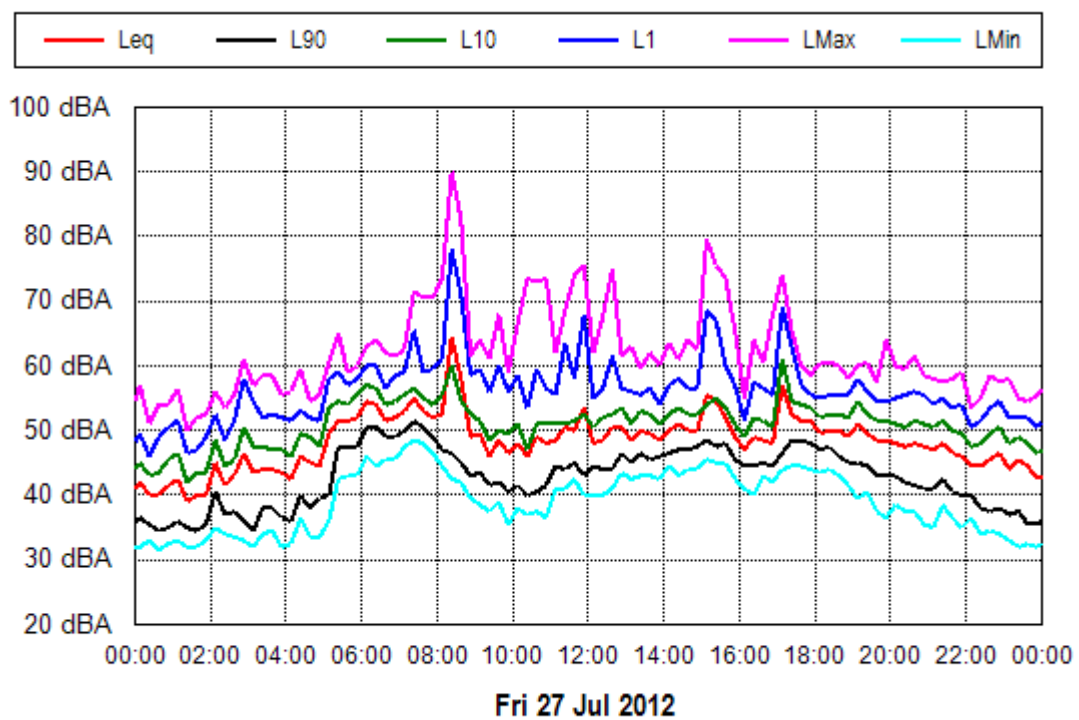
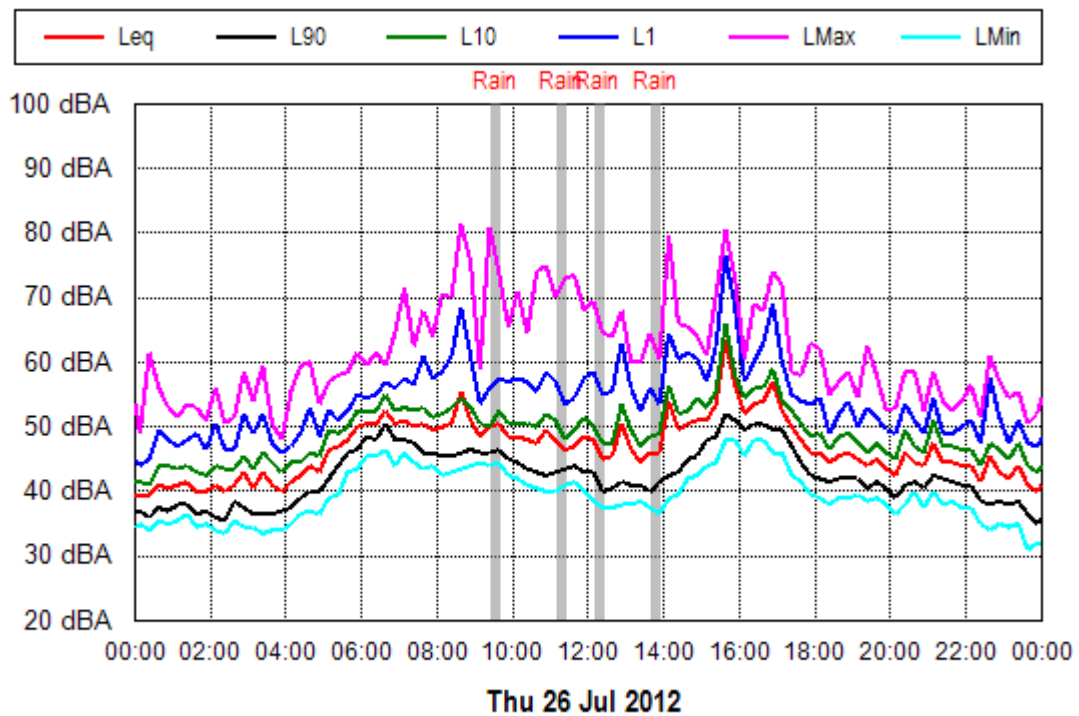
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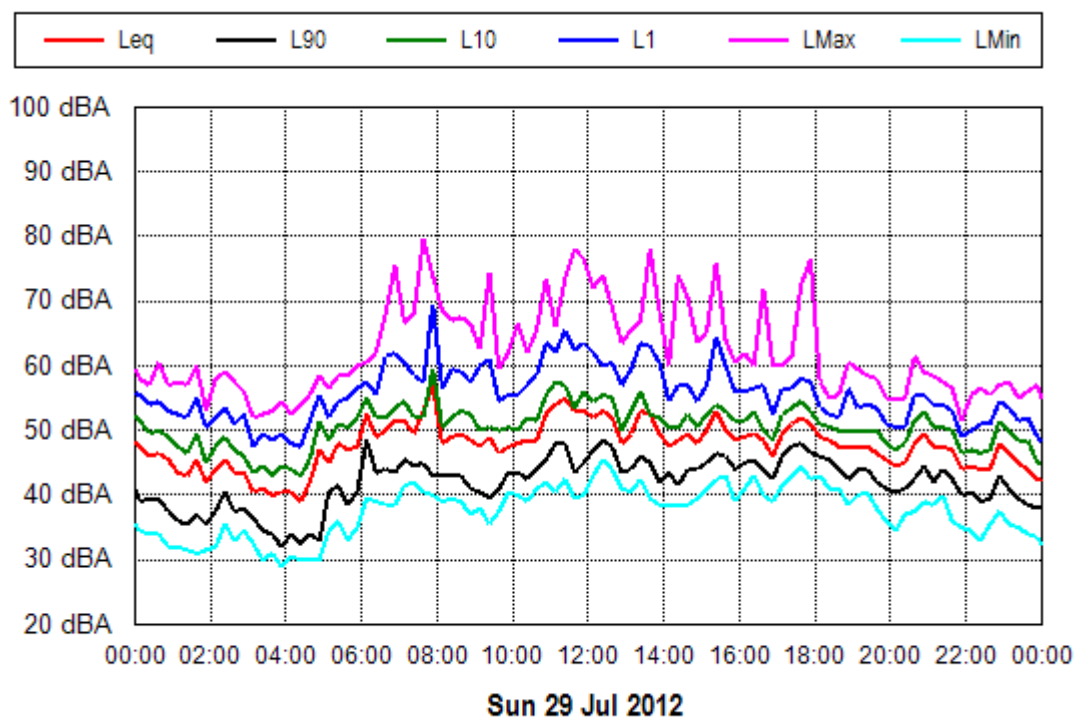
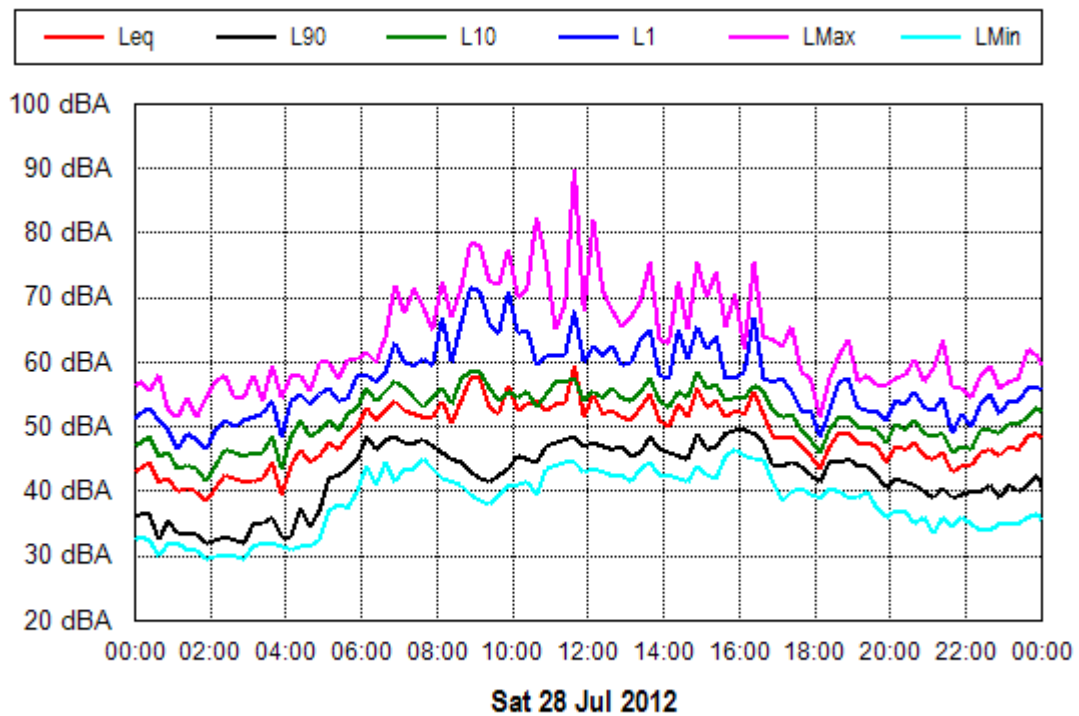
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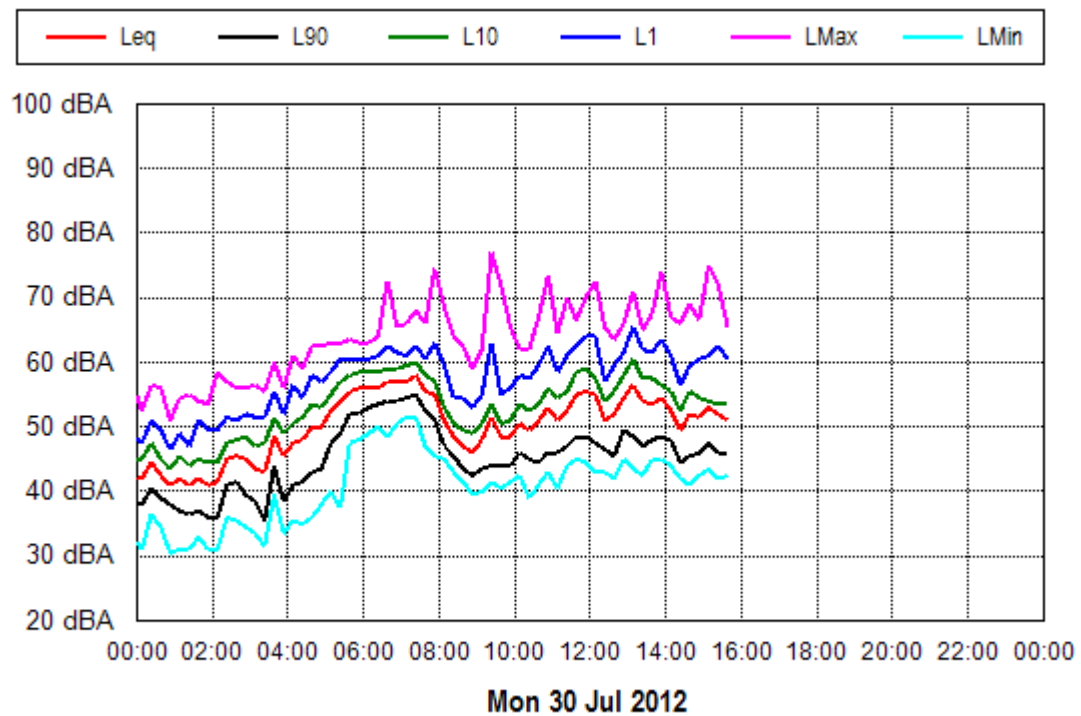
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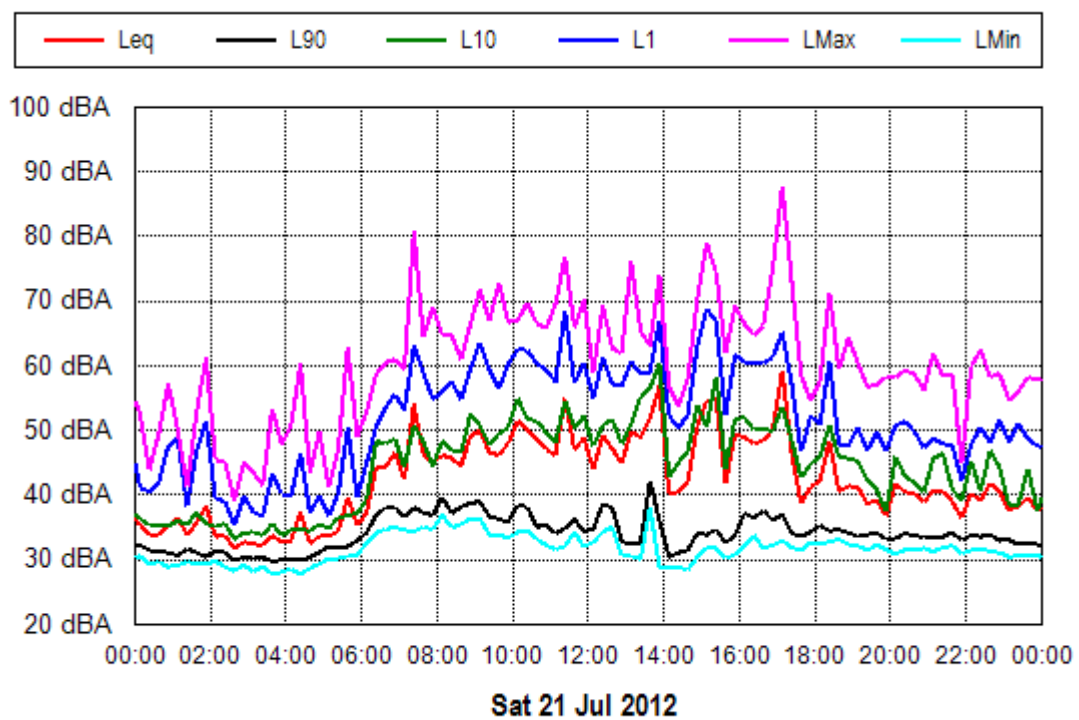
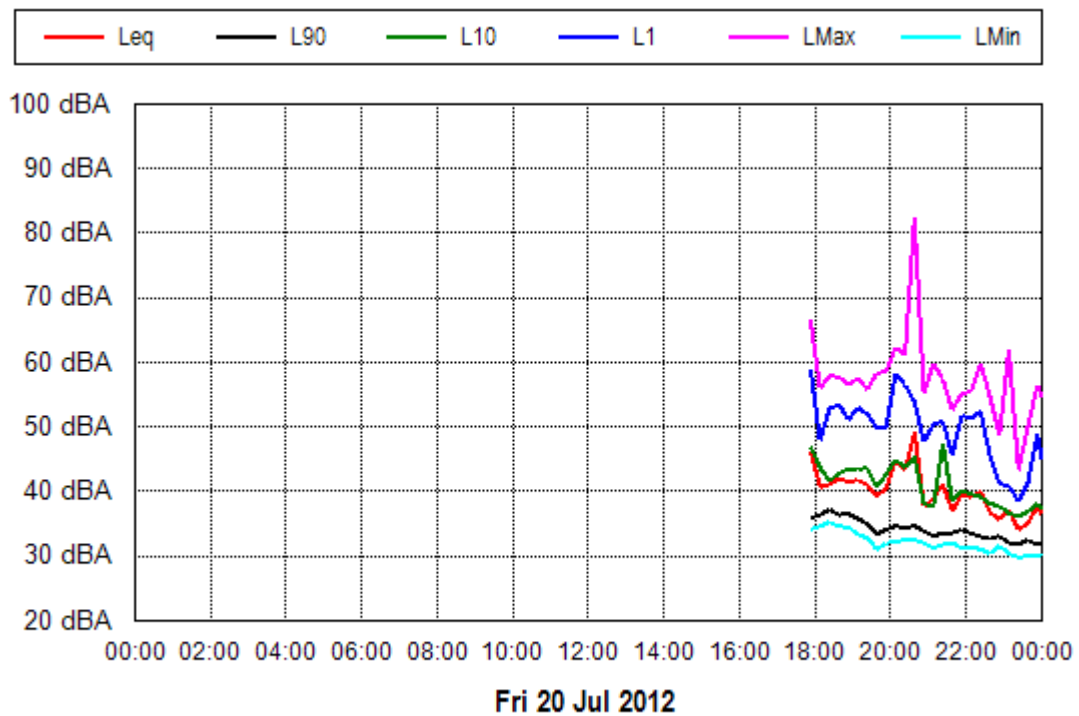
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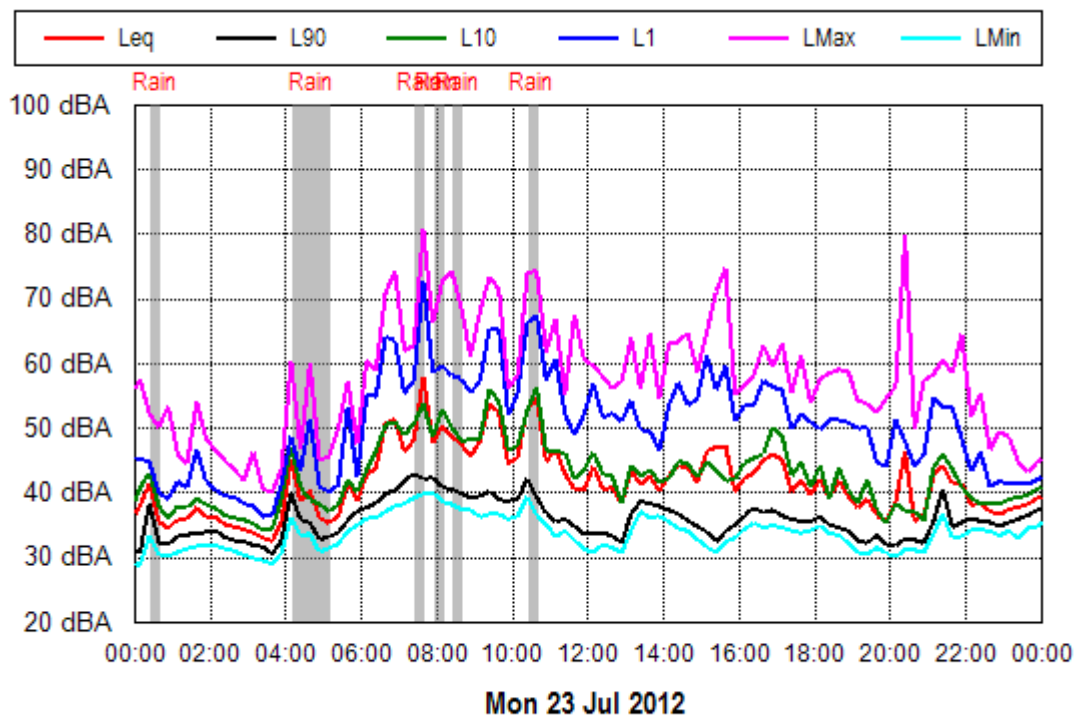
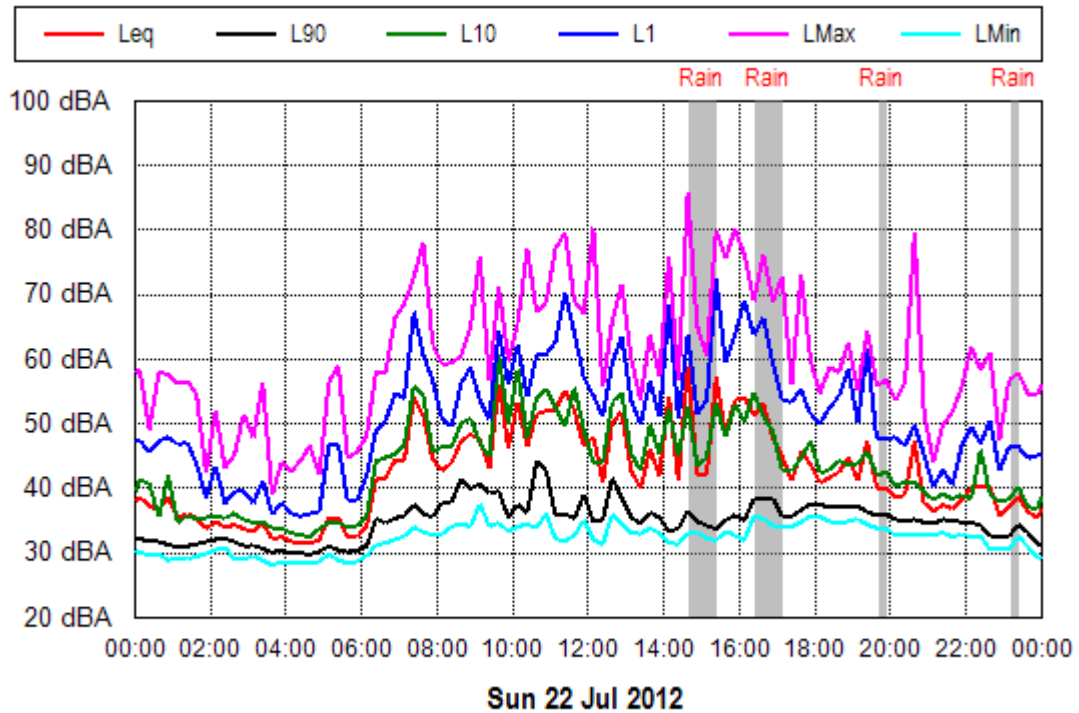
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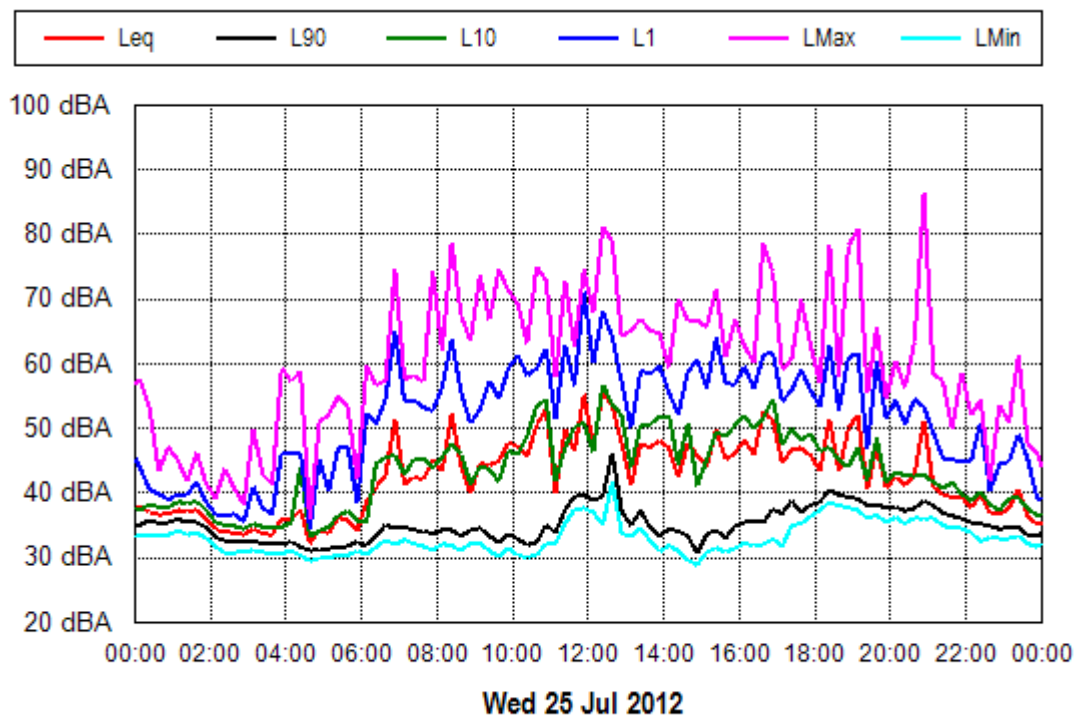
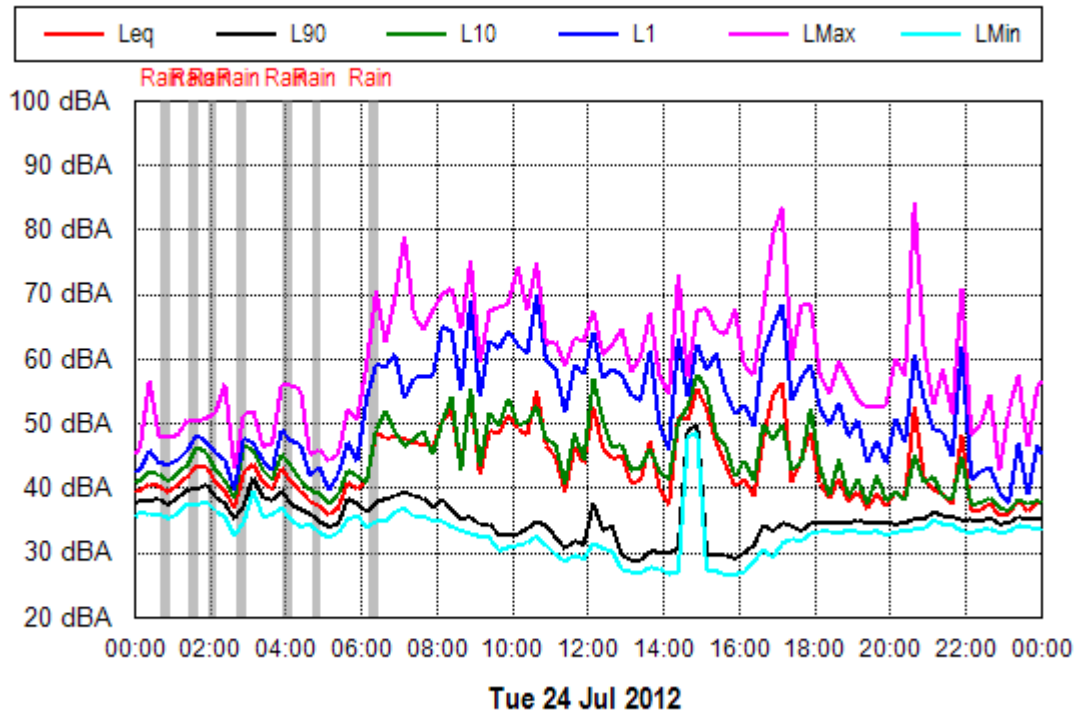
Project: SAWT EIS
Location: 28 Twins Creek Drive



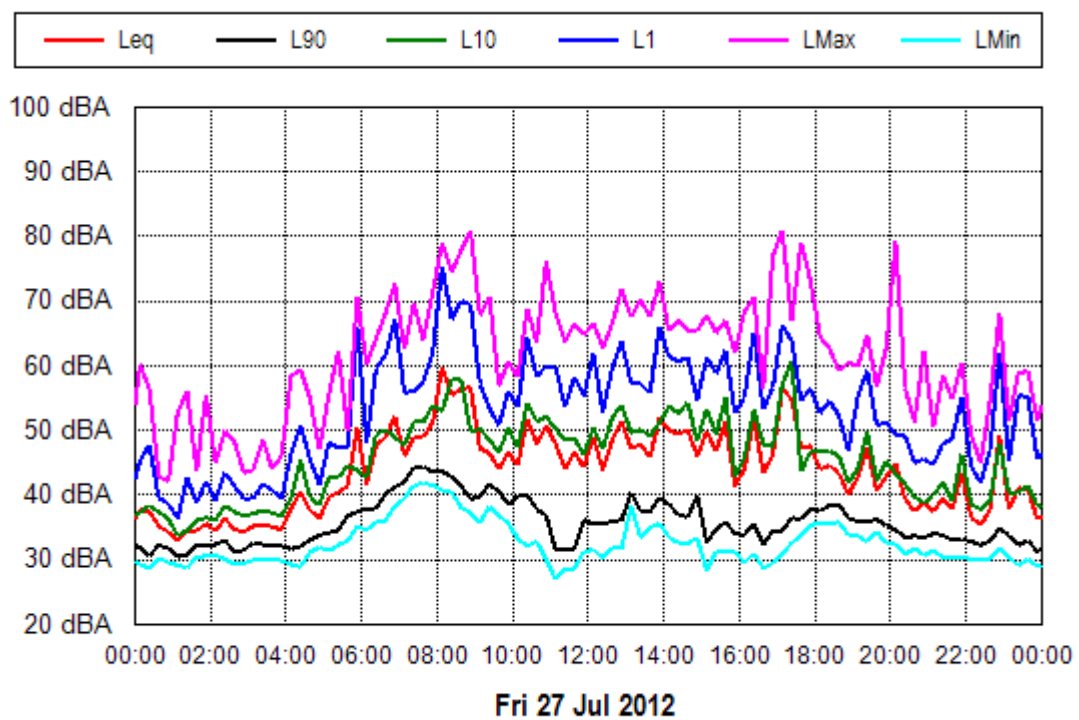
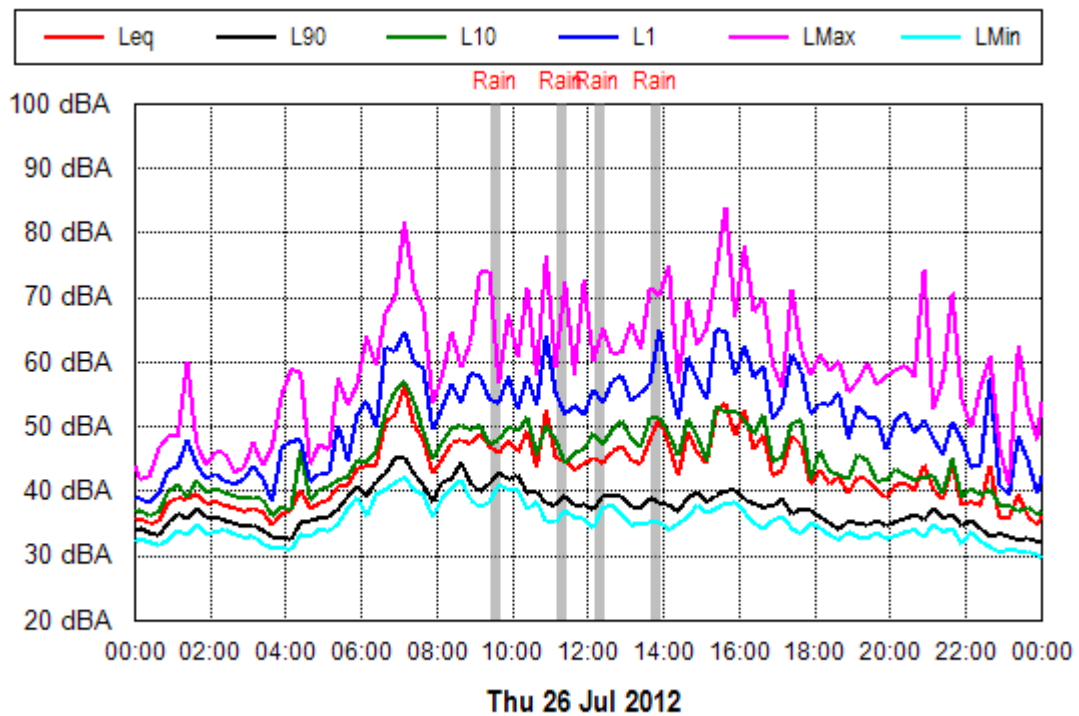
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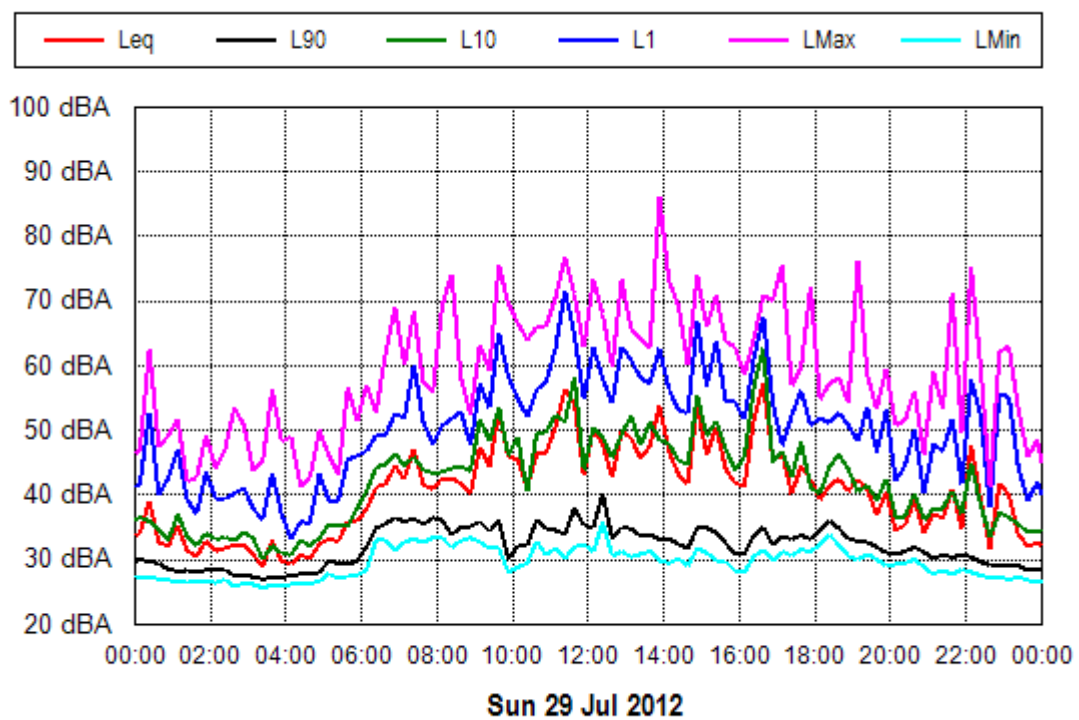
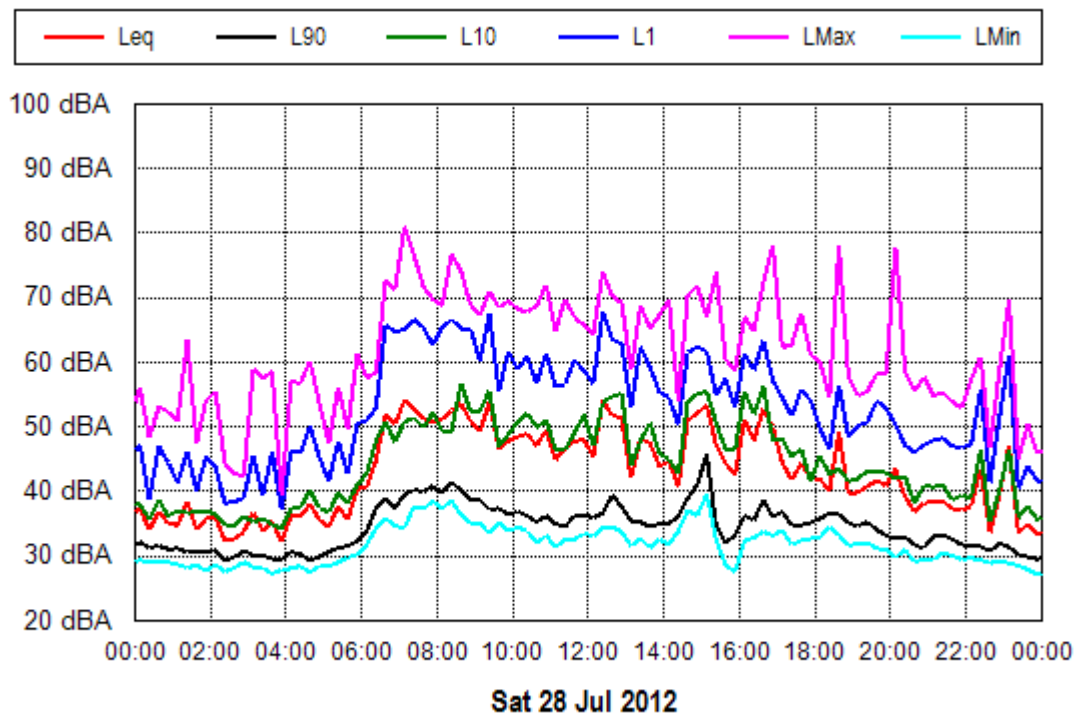
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