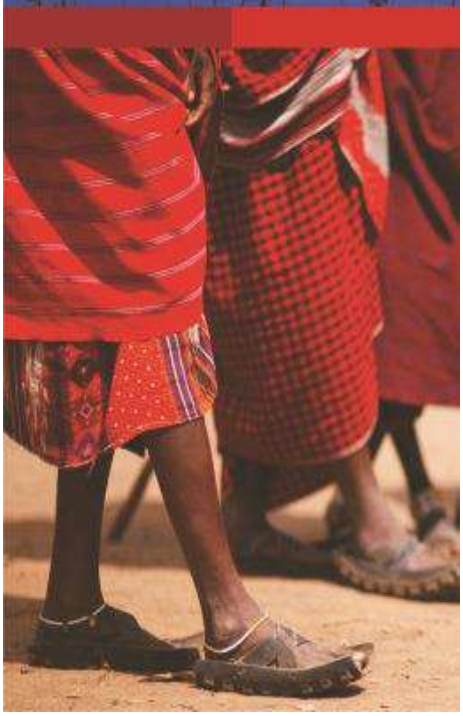

DIGBY WELLS
ENVIRONMENTAL

Environmental Impact Assessment for proposed Future Developments within the Sun City Complex

Environmental Noise Impact Assessment Report

Project Number:

SUN4642

Prepared for:

Sun International (Sun City Resort)

April 2018

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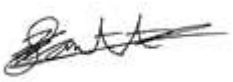
This document has been prepared by Digby Wells Environmental.

Report Type:	**Environmental Noise Impact Assessment Report**
Project Name:	**Environmental Impact Assessment for proposed Future Developments within the Sun City Complex**
Project Code:	**SUN4642**

Name	Responsibility	Signature	Date
Lukas Sadler	Report Writer		17 April 2018
Brett Coutts	Opsco Review		18 April 2018

EXECUTIVE SUMMARY

Digby Wells Environmental (hereafter Digby Wells) has been appointed by Sun City Resort to undertake an Environmental Impact Assessment (EIA) in relation to proposed future developments within the Sun City Resort Complex located near Rustenburg, North West Province.

The scope and purpose of this report is to assess what the current ambient noise levels are in and around Sun City as well as what the significance of the noise impacts from the proposed construction and operation of the resort expansion, utilities and services will be on the residents and visitors of Sun City as well as any surrounding receptors (with greater focus on the construction phase due to it being the main noise causing phase). The study includes baseline noise measurements to establish the existing soundscape of Sun City as well as assess, via predictive noise dispersion modelling, the potential impact of the noise emissions from the proposed project activities.

The baseline ambient noise levels are typical of urban residential zones with vehicle movement (cars and busses) and birdsong being the main sound sources. The central areas of Sun City (Entertainment Centre, Cascades and Soho) are also characterized by sounds from the ventilation systems.

The noise impact of the expansion as well as utilities and services projects is assessed to be negligible of nature due to the dispersion modelling results indicating that the construction noise will ultimately be limited to the construction zones.

Due to the overall negligible nature of the noise impact it is recommended that the proposed activities of the various projects should be authorised. Only minimal mitigation measures are recommended during the construction activities if the project is to go ahead.

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1 Introduction

Digby Wells Environmental (hereafter Digby Wells) has been appointed by Sun City Resort to undertake an Environmental Impact Assessment (EIA) in relation to proposed future developments within the Sun City Resort Complex located near Rustenburg, North West Province. The proposed Projects involve the following:

- Resort Expansion Projects:
  - Development of a Bush Lodge / Eco-Lodge at Bakubung - West gate;
  - Construct a Road to connect the Driving Range at Lost City Golf Course (LCGC) to the Gary Player Golf Course (GPGC) via the Palace garden road and Valley of Waves (VOW) road;
  - Construct 20 additional Rustic Chalets at Kwena Gardens;
  - Construct an additional 150 simplex units, 2- 3 bed units and associated infrastructure to expand capacity at the Vacation Club (VC Phase 3);
  - Construct of an additional 150 simplex units, 2- 3 bed units and associated infrastructure to expand capacity at the VC. The site identified for the expansion is located with the Resort undeveloped area (outside of fenced area) between the decommissioned landfill site and Bakubung Gate (VC Phase 4)
  - Expand the existing artificial beach at the Lake and construct an additional shallow swimming pool at Waterworld Beach;
  - Decommission the existing helipad, to make space for VC Phase 3, and construct a new helipad with increased bays closer to the Palace;
  - Construct an additional parking garage, Convention Centre and Hotel (250 rooms) including a bridge link from Sun Central to the new Hotel;
  - Develop 2 soccer fields at the Warehouse, on the old Motocross track.
- Utilities and Services Projects:
  - Install Stormwater pipes / culverts at both Golf Course Roads to allow water to flow under the roads and maintain the road surface for fence inspections by security (prevent floods washing away the road);
  - Construct 2 x 10Ml reservoirs or alternatively 1x 20Ml Reservoir on Telkom Hill next to existing Upper Reservoir, to supplement water storage capacity;
  - Currently there is an effluent transfer line (old asbestos line) through Sunset Drive to Hole 2. This line will be decommissioned (shut down) but remain in place. A new line will then be installed against the fence of Letsatsing;
  - Construct a main water line from the Welcome Centre to Sky Train (pipe will be attached to skytrain route)

- Currently the sewer line running through Ledig (old asbestos line) is leaking. The line will be decommissioned (shut down but remain in place). A new wastewater treatment works (WWTW) will be established to manage sewage from VC and The Palace;
- Construct an additional pipeline for water supply to South Village;
- Consolidate the generators throughout the site into one area for effective monitoring and control;

- Maintenance Projects
  - Vegetation Clearance at perimeter fences to serve as maintenance roads and Fire Breaks (25 km); and
  - Clear the Culverts under the road at Sun Park from debris and siltation. Construct maintenance road to facilitate future maintenance.

Activities that are listed in terms of the Environmental Impact Assessment (EIA) Regulations[1] require environmental authorisation prior to commencing. The proposed Projects at Sun City constitutes Listed Activities in terms of GN R 983 (Listing Notice 1); GN R 984 (Listing Notice 2) and GN R 985 (Listing Notice 3) as amended.

This specialist Environmental Noise Impact Assessment Report has been compiled in terms of Appendix 6 of the NEMA EIA Regulations, 2014, (as amended) in terms of the Scoping and EIA process which is being followed in applying for Environmental Authorisation.

The requirements of Appendix 6 are presented in Table 1-1 and cross-referenced to the relevant sections of this Report.

[1] As published in Government Notices R982; 983; 984 and 985 on 4 December 2014, as Amended 7 April 2017.

Table 1-1: Structure of this report in accordance with the EIA Regulations

Regulatory Requirement for EIA Reports	Relevant Section of this report
1. (1) A specialist report prepared in terms of these Regulations must contain -	
(a) details of— (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Please refer to Section 2 and Appendix A of this Report.
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Please refer to Section 2 of this report: Details of the Specialist.
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Please see Section 3: Scope and Purpose of this Report.
(cA) an indication of the quality and age of base data used for the specialist report;	Please see Section 4: Data used in this Report.
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Please see Section 6: Existing Environment.
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Please see Section 4: Data used in this Report.
(e) a description of the methodology adopted in preparing the report inclusive of equipment and modelling used;	Please see Section 5: Methodology.
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Please see Section 7: Sensitivity of the Site.
(g) an identification of any areas to be avoided, including buffers;	Please see Section 7: Sensitivity of the Site.
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Please see Appendix B
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Please see Section 8: Assumptions, Limitations and Gaps

	in knowledge.
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Please see Section 9: Impact Assessment.
(k) any mitigation measures for inclusion in the EMPr;	Please see Section 10: Mitigation and Management Measures.
(l) any conditions for inclusion in the environmental authorisation;	
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Please see Section 11: Monitoring Requirements.
(n) a reasoned opinion— (i) whether the proposed activity, activities or portions thereof should be authorised; (i) (A) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Please see Section 12: Reasoned Opinion of the Specialist.
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Please see Section 13: Public Consultation.
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	
(q) any other information requested by the competent authority.	No additional information was requested.

2 Details of the Specialist

This Specialist Report has been compiled by the following specialists (CVs of the Project Team are included in Appendix A):

Table 2-1: Details of the Specialist(s) who prepared this Report

Responsibility	**Field Work, Noise Dispersion Modelling and Report Compilation**
Full Name of Specialist	Lukas Sadler
Highest Qualification	B.COM Environmental Management
Years of experience in specialist field	9

2.1 Declaration of the Specialist

I ……Lukas Sadler……, as the appointed specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
  - other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
  - am not independent, but another specialist that meets the general requirements set out in Regulation 13 have been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- in terms of the remainder of the general requirements for a specialist, am fully aware of and meet all of the requirements and that failure to comply with any the requirements may result in disqualification;
- have disclosed/will disclose, to the applicant, the Department and interested and affected parties, all material information that have or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application;
- have ensured/will ensure that information containing all relevant facts in respect of the application was/will be distributed or was/will be made available to interested and affected parties and the public and that participation by interested and affected parties was/will be facilitated in such a manner that all interested and affected parties were/will be provided with a reasonable opportunity to participate and to provide comments;

- have ensured/will ensure that the comments of all interested and affected parties were/will be considered, recorded and submitted to the Department in respect of the application;
- have ensured/will ensure the inclusion of inputs and recommendations from the specialist reports in respect of the application, where relevant;
- have kept/will keep a register of all interested and affected parties that participate/d in the public participation process; and
- am aware that a false declaration is an offence in terms of regulation 48 of the 2014 NEMA EIA Regulations.

Signature of the specialist:

Lukas Sadler

Full Name and Surname of the specialist:

Digby Wells Environmental

Name of company:

17 April 2018

Date:

3 Scope and Purpose of this Report

The scope and purpose of the study is to assess what the current ambient noise levels in and around Sun City as well as what the significance of the noise impacts from the proposed construction and operation of the resort expansion, utilities and services will be on the residents and visitors of Sun City as well as any surrounding receptors. The study includes baseline noise measurements to establish the existing soundscape of Sun City as well as assess, via predictive noise dispersion modelling, the potential impact of the noise emissions from the proposed construction activities and a desktop assessment of the operational activities.

4 Data used in this Report

A baseline assessment was undertaken to determine the current ambient noise levels at various locations within the complex as well as at the nearest settlement named Ledig. The criteria that was used for the siting of the measurement locations was locations where employees as well as holiday makers were most likely to be impacted by the construction and operational activities of the proposed developments. The noise measurement locations cover ten locations (N1 – N10).

4.1 Details of the site visit

The noise measurements were taken during the month of November for a duration of an hour at each location. The noise measurements were only taken during the daytime due to the construction activities, which is the main focus of the assessment, only carried out during daylight hours.

5 Methodology

The approach used in investigating noise impacts is based on the National Noise Control Regulations as well as guidelines provided by SANS 10103:2008 “The measurement and rating of environmental noise with respect to annoyance and to speech communication”. Based on the National Noise Control Regulations it is prohibited to make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof. According to the National Noise Control Regulations "disturbing noise" means a noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7dBA or more.

According to the SANS 10103:2008, the sound pressure level is used as the measurement unit for noise levels. The acceptable rating levels according to SANS 10103:2008 for ambient noise in different districts (residential and non-residential) are presented in Table 5-1.

Table 5-1: Typical Rating Levels for Noise in Districts (SANS 10103, 2008)

Type of District	Equivalent continuous rating level ($L_{Reg.T}$) for noise (dBA)					
	Outdoors			Indoors, with open windows		
	Day-night	Day-time	Night-time	Day-night	Day-time	Night-time
	$L_{R,dn}$ [a]	$L_{Req,d}$ [b]	$L_{Req,n}$ [b]	$L_{R,dn}$ [a]	$L_{Req,d}$ [b]	$L_{Req,n}$ [b]
Residential Districts						
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
Non-Residential Districts						
d) Urban districts with some workshops, with business premises, and with main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

NOTE 1 If the measurement or calculation time interval is considerably shorter than the reference time intervals, significant deviations from the values given in the table might result.

NOTE 2 If the spectrum of the sound contains significant low frequency components, or when an unbalanced spectrum towards the low frequencies is suspected, special precautions should be taken and specialist advice should be obtained. In this case the indoor sound levels might significantly differ from the values given in columns 5 to 7

NOTE 3 In districts where outdoor LR,dn exceeds 55 dBA, residential buildings (e.g. dormitories, hotel accommodation and residences) should preferably be treated acoustically to obtain indoor LReq,T values in line with those given in table 1.

NOTE 4 For industrial districts, the LR,dn concept does not necessarily hold. For industries legitimately operating in an industrial district during the entire 24 h day/night cycle, LReq,d = LReq,n =70 dBA can be considered as typical and normal.

NOTE 5 The values given in columns 2 and 5 in this table are equivalent continuous rating levels and include corrections for tonal character, impulsiveness of the noise and the time of day.

NOTE 6 The noise from individual noise sources produced, or caused to be produced, by humans within natural quiet spaces such as national parks, wilderness areas and bird sanctuaries, should not exceed a maximum Weighted sound pressure level of 50 dBA at a distance of 15 m from each individual source.

a) The values given in columns 2 and 5 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness of the noise and the time of day.

b) The values given in columns 3, 4, 6 and 7 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness.

The probable community/group response to levels in excess of the acceptable rating levels are presented in Table 5-2, where LReq,T is the equivalent continuous A-weighted sound pressure level, in decibels (dBA), determined over a specific time period. ‘A-weighted’ is a standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.

Table 5-2: Categories of Community/Group Response (SANS 10103, 2008)

Excess ($\Delta L_{Req,T}$)[a]dBA	Estimated community/group response	
	Category	Description
0 – 10	Little	Sporadic complaints
5 – 15	Medium	Widespread complaints
10 - 20	Strong	Threats of action
>15	Very strong	Vigorous action
NOTE Overlapping ranges for the excess values are given because a spread in the community reaction might be anticipated.		
a ΔLReq,T should be calculated from the appropriate of the following:		
1) ΔLReq,T = LReq,T of ambient noise under investigation MINUS LReq,T of the residual noise (determined in the absence of the specific noise under investigation);		
2) ΔLReq,T = LReq,T of ambient noise under investigation MINUS the maximum rating level for the ambient noise given in table 1;		
3) ΔLReq,T = LReq,T of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from table 2; or		
4) ΔLReq,T = Expected increase in LReq,T of ambient noise in an area because of a proposed development under investigation.		

5.1 Determining the Baseline Environment

Noise measurement were carried out at ten locations to assess the current ambient soundscape at Sun City. A Cirrus, Optimus Green, precision integrating sound level meter was used for the measurements. The instrument was field calibrated with a Cirrus, sound level calibrator. The “ambient sound level” as defined by the National Noise Control regulations, means the reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes, after such meter had been put into operation.

The L_{Aeql} level represents the ‘average’ noise level for the measurement period including impulsive and intermittent noise sources such as traffic and animal noise. The baseline locations are presented in Table 5-3 as well as on Plan 1 (refer to Appendix B). Photographs of the measurement locations are presented in Figure 5-1 to Figure 5-10.

Table 5-3: Noise Measurement Locations

Site ID	Location	GPS Coordinates
N1	South village	25°21'24.33"S & 27°5'48.83"E
N2	Kwena gardens	25°21'23.85"S & 27°6'29.25"E
N3	Cabanas	25°20'50.01"S & 27°6'8.97"E
N4	Old village	25°20'49.33"S & 27°5'48.11"E
N5	Vacation club	25°20'29.40"S & 27°4'56.59"E

Site ID	Location	GPS Coordinates
N6	Palace	25°20'28.71"S & 27°5'32.98"E
N7	Ledig settlement	25°20'57.63"S & 27°4'52.95"E
N8	The Boma	25°20'59.37"S & 27°6'24.06"E
N9	North perimeter fence	25°20'1.07"S & 27°6'4.52"E
N10	Cascades/Gary Player Club House	25°20'44.83"S & 27°5'54.36"E

Figure 5-1: Measurement location N1

Figure 5-2: Measurement location N2

Figure 5-3: Measurement location N3

Figure 5-4: Measurement location N4

Figure 5-5: Measurement location N5

Figure 5-6: Measurement location N6

Figure 5-7: Measurement location N7

Figure 5-8: Measurement location N8

Figure 5-9: Measurement location N9

Figure 5-10: Measurement location N10

5.2 Impact Assessment Methodology

Noise Impacts and risks have been identified based on predictive modelling performed for the proposed activities through the use of the modelling software SoundPlan. The software specialises in computer simulations of noise pollution dispersion. Estimates of the cumulative noise levels for the study were derived from the noise emissions from all the major noise-generating components and activities of the project.

The following table indicates the noise power levels used in the model simulations. The sound power levels were mainly derived from the SoundPlan database.

Table 5-4: Sound Power Levels from Main Noise Causing Sources

Noise source	**Sound power levels dB**						
Octave band frequencies, Hz	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**
Haul Truck	108	118	115	114	110	106	102
Excavators	113	117	107	108	106	101	95
Front end Loader	108	116	107	108	105	99	95
Dozer	110	122	113	114	110	108	104

Noise source	Sound power levels dB						
Diesel Generator	105	120	116	108	107	108	108
Pneumatic tools	82	75	73	68	63	67	80

The noise dispersion modelling software was used to assess whether the noise from the proposed project activities will impact on the relevant noise sensitive receivers, by comparing the predicted propagating noise levels with the current ambient baseline noise levels as well as against the typical rating levels for ambient noise in districts.

Once impacts have been identified, a numerical environmental significance rating process is undertaken. Following the identification and significance ratings of potential impacts, mitigation and management measures will be incorporated into the EMP.

Details of the noise impact assessment methodology used to determine the significance of physical impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an impact occurring

And

Nature = Positive (+1) or negative (-1) impact

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts.

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 5-7. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this environmental noise impact assessment report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 5-6, which is extracted from Table 5-5. The description of the significance ratings is discussed in Table 5-7.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the

design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table 5-5: Impact Assessment Parameter Ratings

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Irreplaceable loss or damage to biological or physical resources or highly sensitive environments. Irreplaceable damage to highly sensitive cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or moderate to highly sensitive environments. Irreplaceable damage to cultural/social resources of moderate to highly sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
5	Serious loss and/or damage to physical or biological resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or moderately sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
3	Moderate loss and/or damage to biological or physical resources of low to moderately sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 5-6: Probability/Consequence Matrix

Significance

Probability 7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Consequence	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Table 5-7: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = CONSEQUENCE X PROBABILITY X NATURE

Where

Consequence = intensity + extent + duration

And

Probability = likelihood of an impact occurring

And

Nature = positive (+1) or negative (-1) impact

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 5-9. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation has been applied; post-mitigation is referred to as the residual impact. The significance of an impact is determined and categorised into one of seven categories (The descriptions of the significance ratings are presented in Table 5-10).

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

Table 5-8: Impact assessment parameter ratings

Rating	Intensity/ Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
7	Irreplaceable loss or damage to biological or physical resources or **highly** sensitive environments. Irreplaceable damage to **highly sensitive** cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or **moderate to highly** sensitive environments. Irreplaceable damage to cultural/social resources of **moderate to highly** sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur.>65 but <80% probability.

Rating	Intensity/ Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
5	Serious loss and/or damage to physical or biological resources or **highly** sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or **moderately** sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Intensity/ Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
3	Moderate loss and/or damage to biological or physical resources of **low to moderately** sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local including the site and its immediat surrounding area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	**Minor loss and/or effects** to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited extending only as far as the development site area.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity/ Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
1	**Minimal to no loss** and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 5-9: Probability/consequence matrix

Significance																																						
-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Consequence

Table 5-10: Significance rating description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

6 Existing Environment

The results from the noise meter recordings for all the monitored locations as well as the rating limits according to the SANS 10103:2008 guidelines are presented in Table 6-1, with the time history graphs presented in Figure 6-1 to Figure 6-3. The locations of the monitoring points can be viewed in Plan 1 (Appendix B).

Table 6-1: Results of Baseline Noise Measurements

Measurement location	Measurement results (L_{Aeql})
N1	53
N2	57
N3	60
N4	60
N5	57
N6	63
N7	45
N8	48
N9	49
N10	58

The results indicate that the noise levels in Sun City vary between 48dBA and 63dBA, with the lowest measurement of 45dBA measured at the Township of Ledig (N7).

N1 was taken at the South Village and recorded a level of 53dBA (refer to Figure 6-1), with the main sound sources at this location being:

- Birdsong;
- Vehicle movement; and
- Occasional aircraft.

N2 was taken at the Kwena Chalets and recorded a level of 57dBA (refer to Figure 6-2), with the main sound sources at this location being:

- Birdsong; and
- Game viewing vehicles belonging to Mankwe Game Trackers passing to and fro.

N3 was taken at the Cabanas and recorded a level of 60dBA (refer to Figure 6-3), with the main sound sources at this location being:

- The breaking down of one of the stands that was used for the Nedbank Challenge
- Birdsong; and
- People socialising at the cabanas swimming pool and near the dam.

With only isolating the common sounds such as the birdsong and people socialising, the level dropped to 55dBA.

N4 was taken at the Old Village and recorded a level of 60dBA (refer to Figure 6-4), with the main sound sources at this location being:

- High pitched sound from the ventilation system;
- Dumping of refuse at the refuse storage area; and
- Vehicle movement, especially the coach busses transporting people.

N5 was taken at Vacation Club and recorded a level of 57dBA (refer to Figure 6-5), with the main sound sources being vehicle movement on the interconnecting roads.

N6 was taken at the Palace of the Lost City and recorded the highest level of 63dBA (refer to Figure 6-6), with the sound sources at this location being:

- The water feature at the entrance being the main continuous sound source;
- Birdsong; and
- Vehicle movement.

N7 was taken at the Township of Ledig and recorded a level of 45dBA (refer to Figure 6-7), with the main sound sources at this location being:

- Birdsong; and
- Vehicle movement; and

N8 was taken at the Boma and recorded a level of 48dBA (refer to Figure 6-8), with the sound sources at this location being:

- Birdsong; and
- Vehicle movement.

N9 was taken at a location on the northern perimeter fence and recorded a level of 49dBA (refer to Figure 6-9), with the sound sources at this location being:

- Birdsong; and
- Cicadas.

N10 was taken at a location between the Cascades and the Gary Player Golf Club and recorded a level of 58dBA (refer to Figure 6-10), with the sound sources at this location being:

- Ventilation systems
- Vehicle movement, especially the coach busses transporting people; and
- Birdsong.

In conclusion the baseline ambient noise levels are typical of urban residential zones with vehicle movement (cars and busses) and birdsong being the main sound sources. The central areas of Sun City (Entertainment Centre, Cascades and Soho) are also characterized by sounds from the ventilation systems.

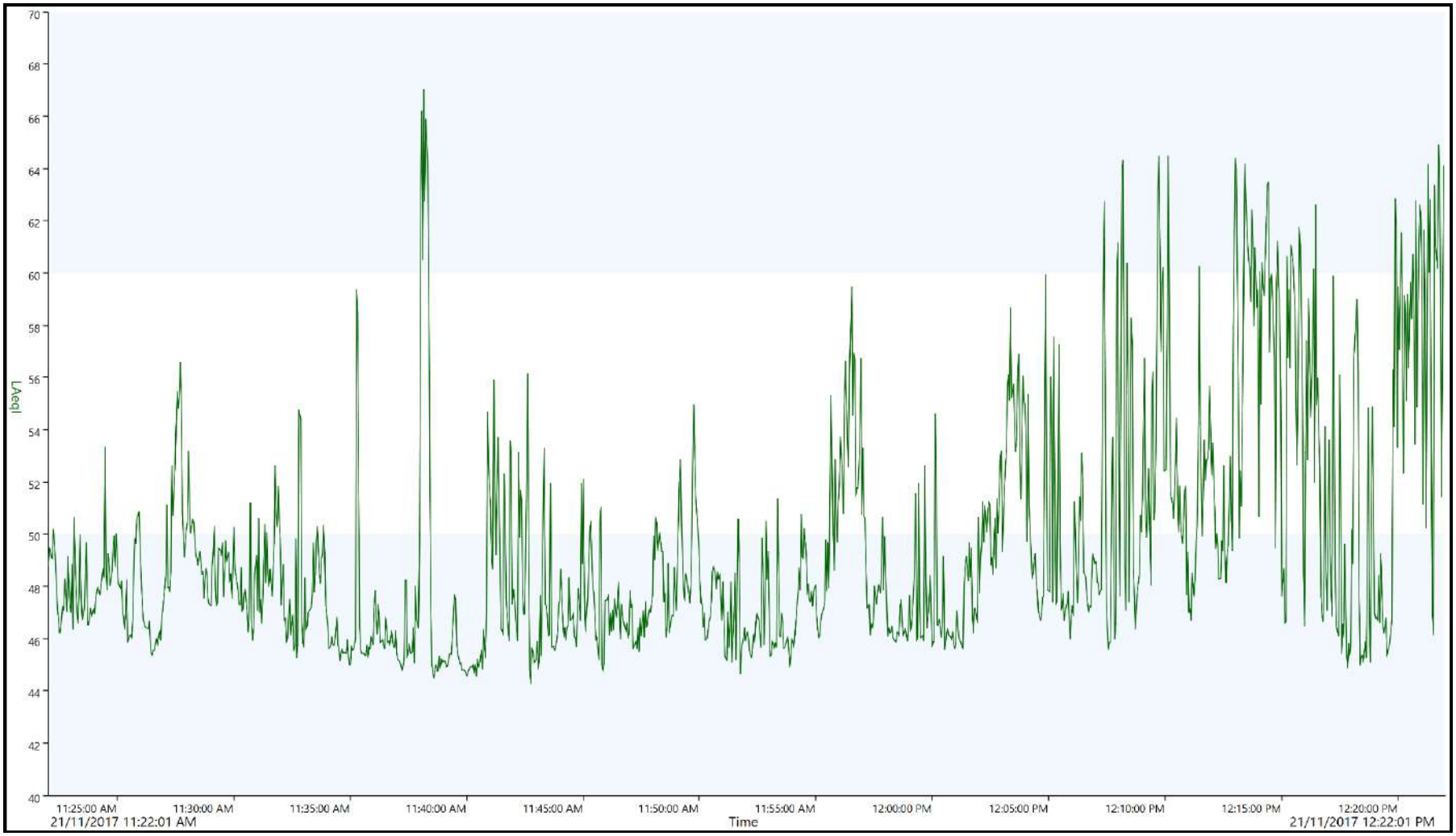


Figure 6-1: Noise time history for N1

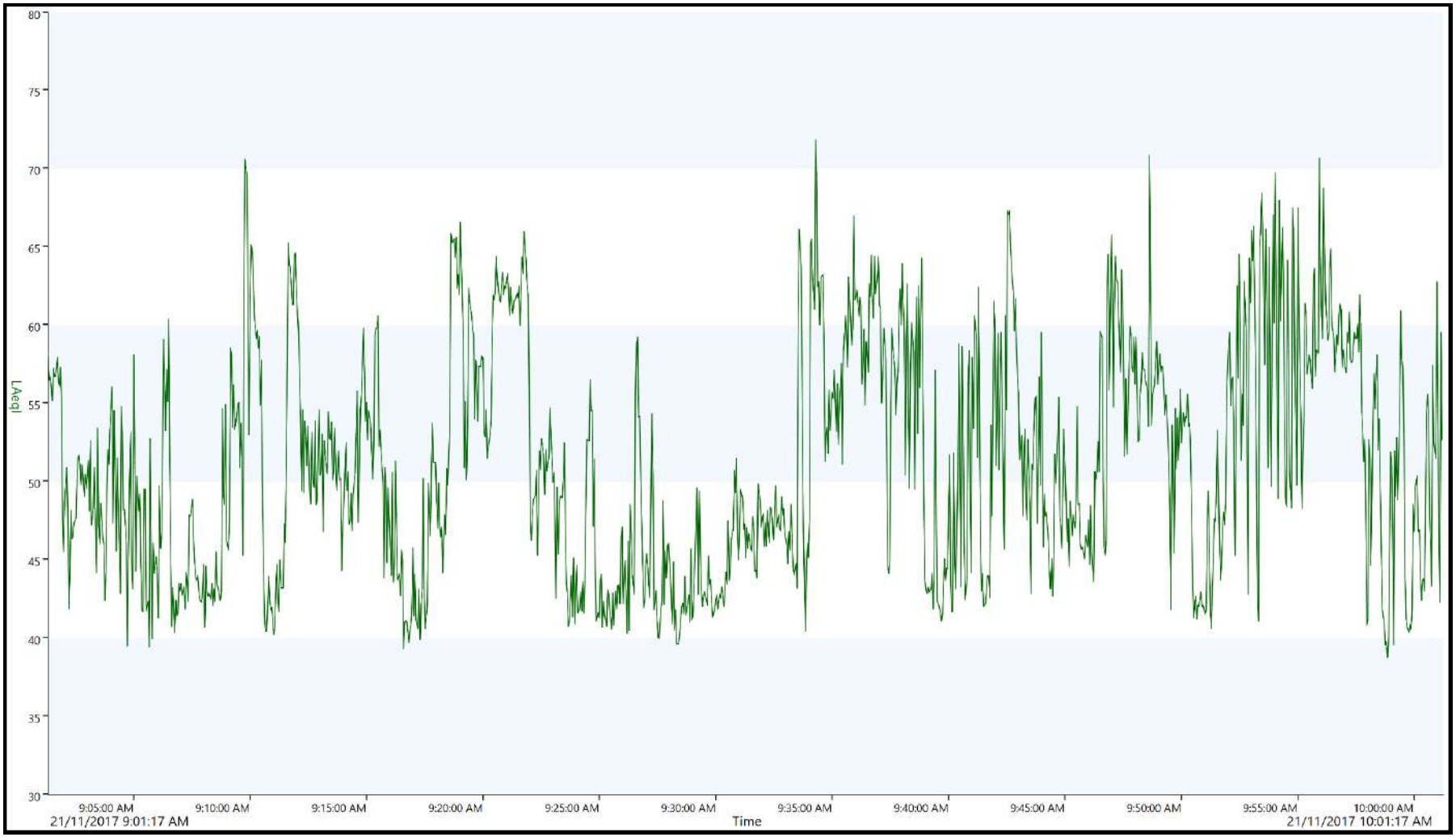


Figure 6-2: Noise time history for N2

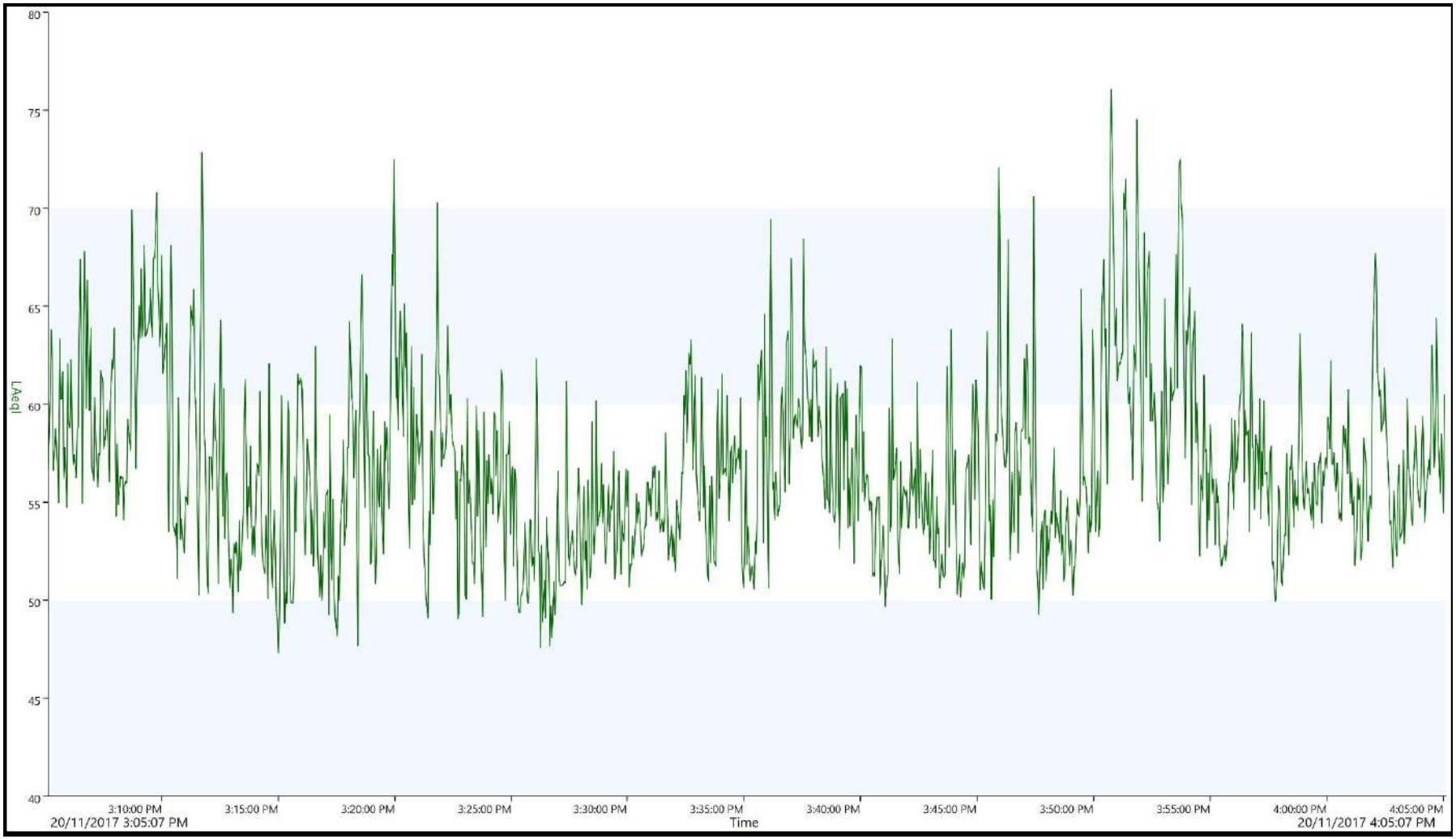


Figure 6-3: Noise time history for N3

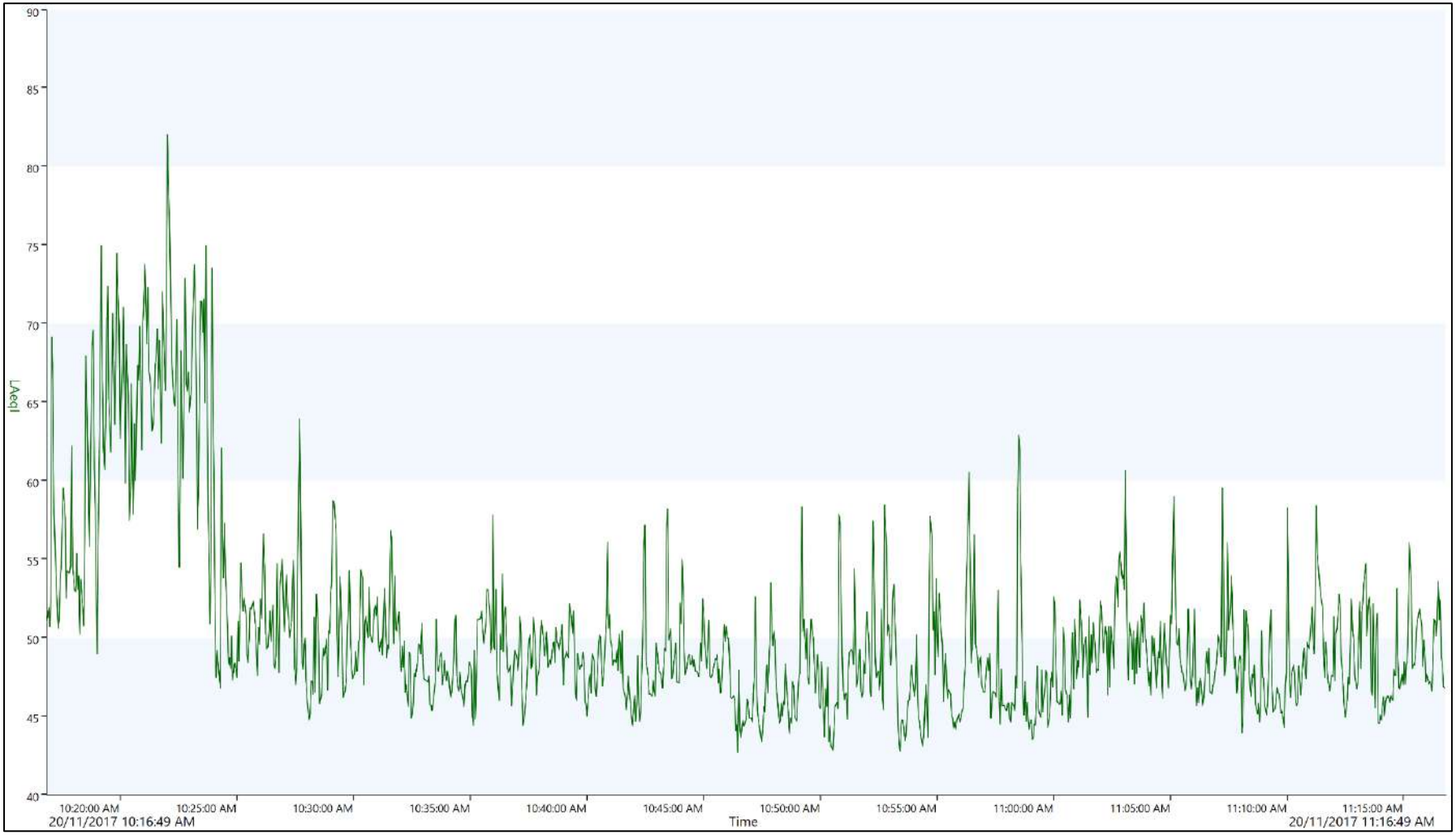


Figure 6-4: Noise time history for N4

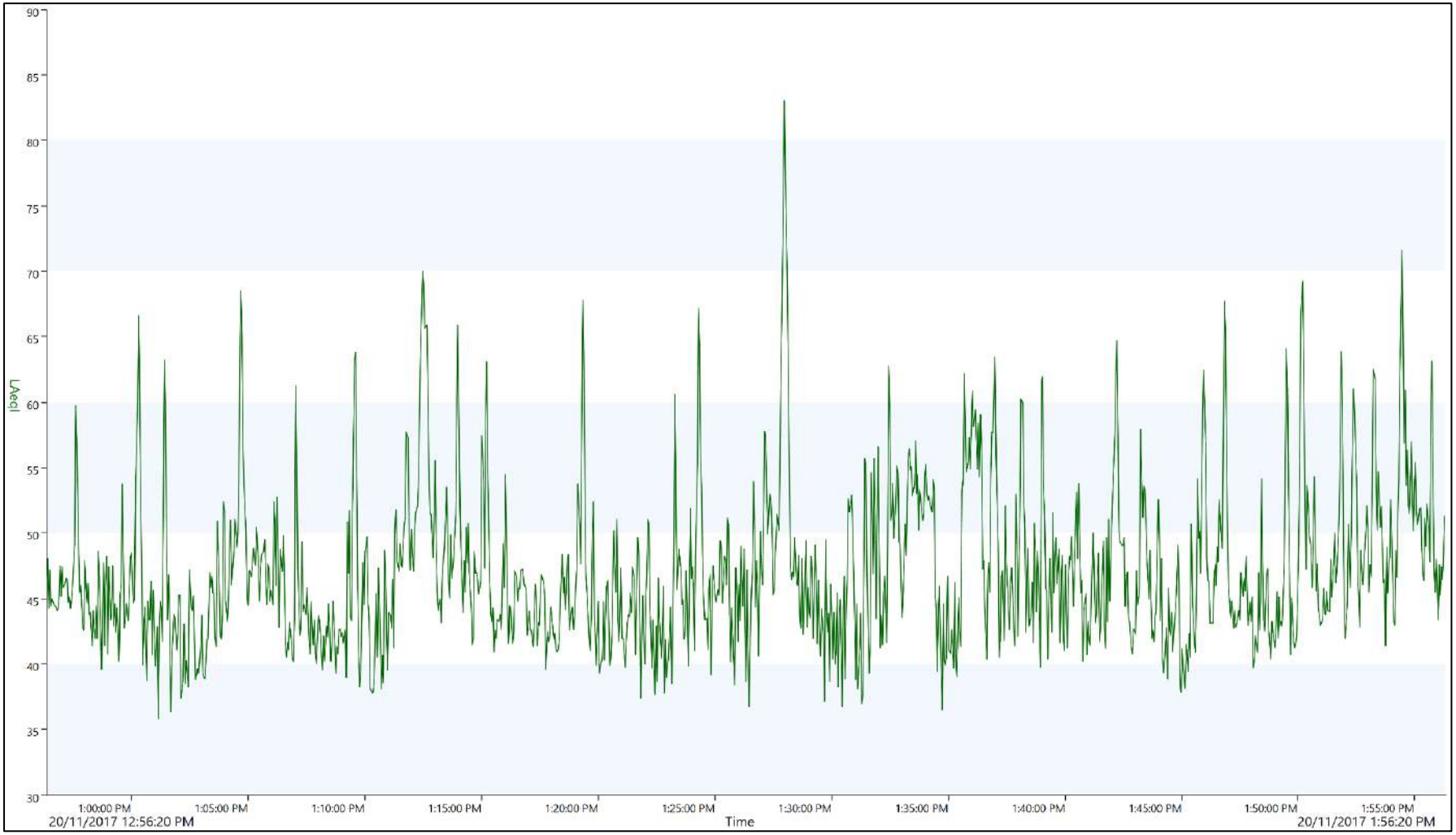


Figure 6-5: Noise time history for N5

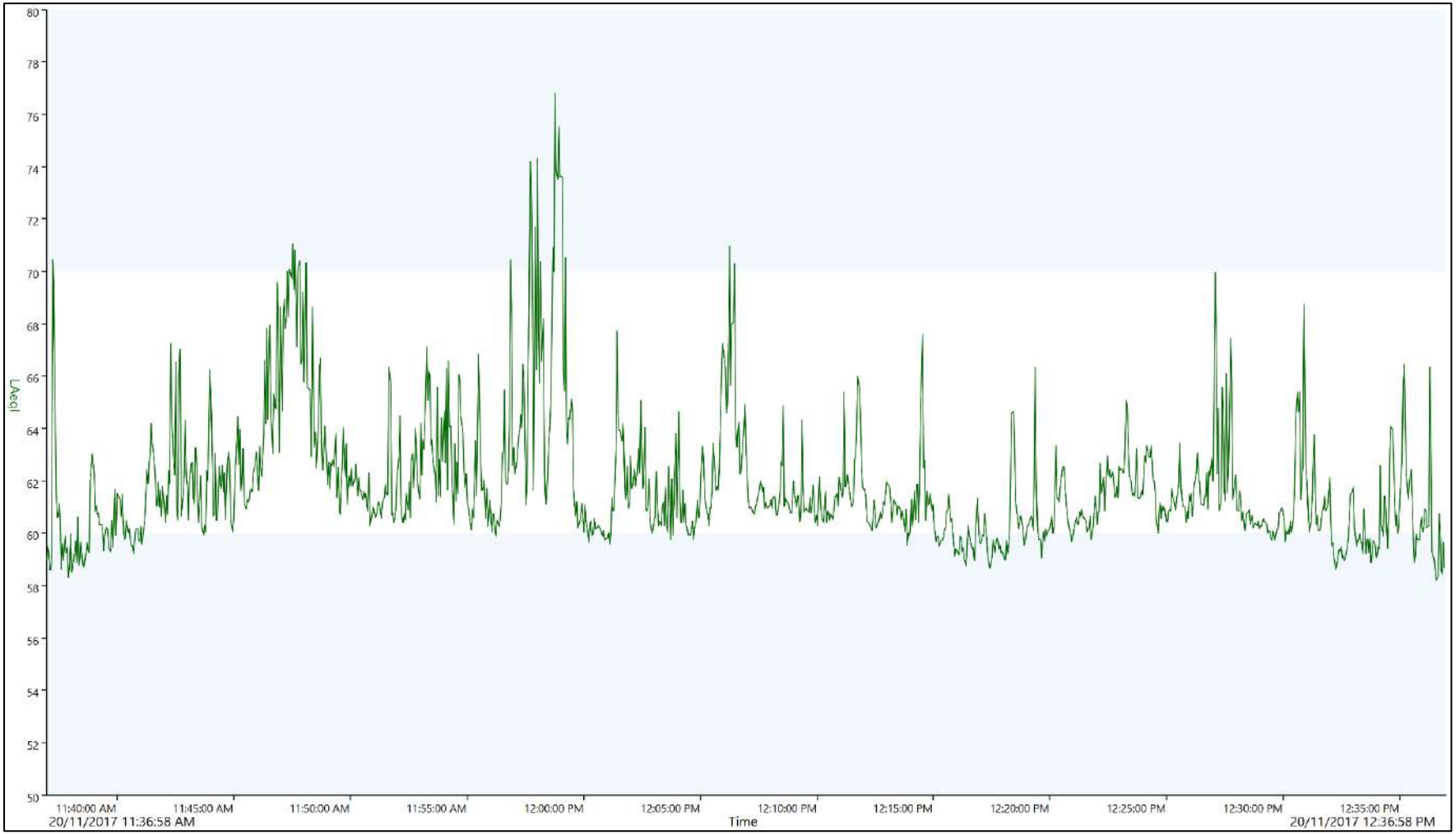


Figure 6-6: Noise time history for N6

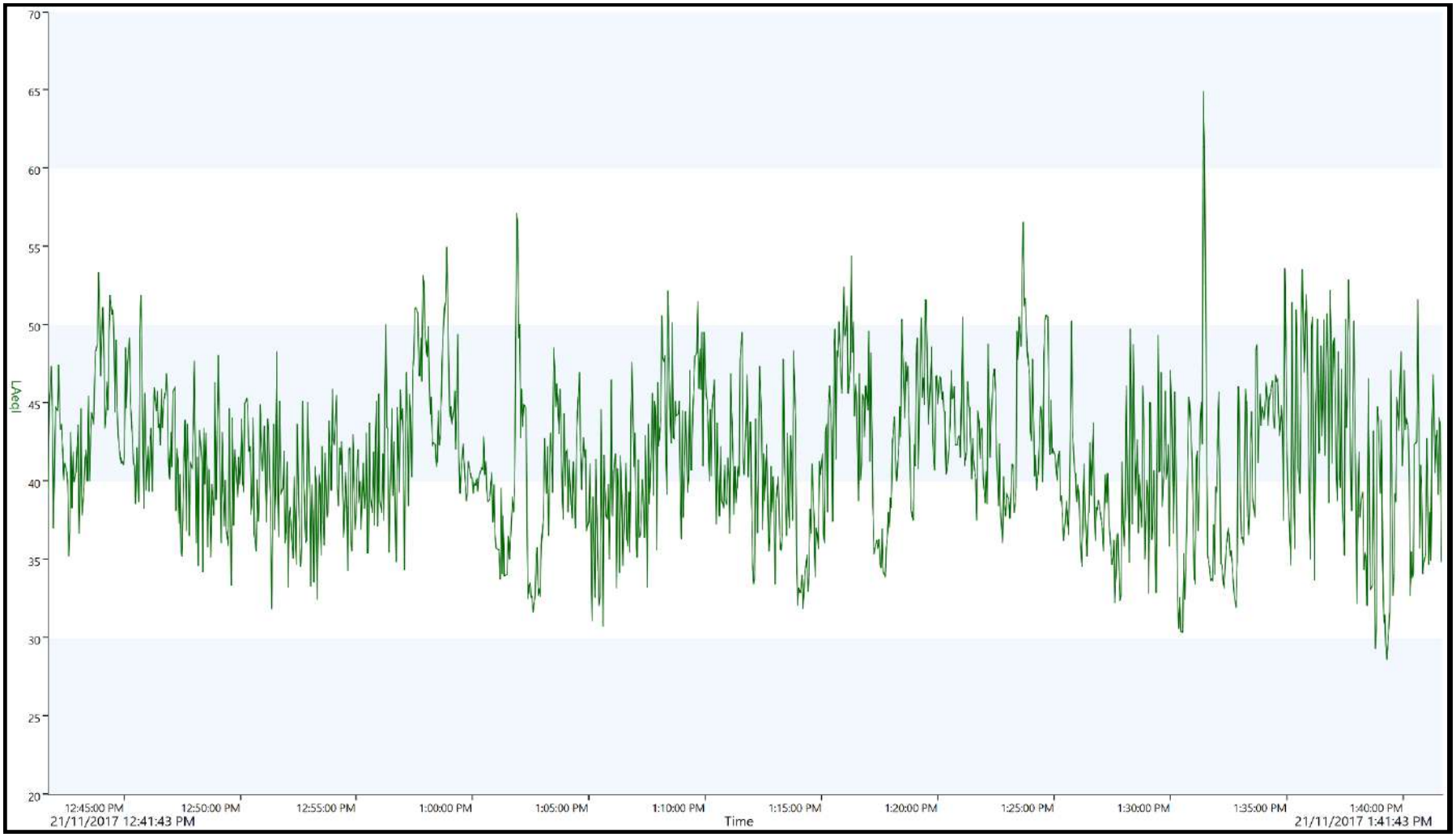


Figure 6-7: Noise time history for N7

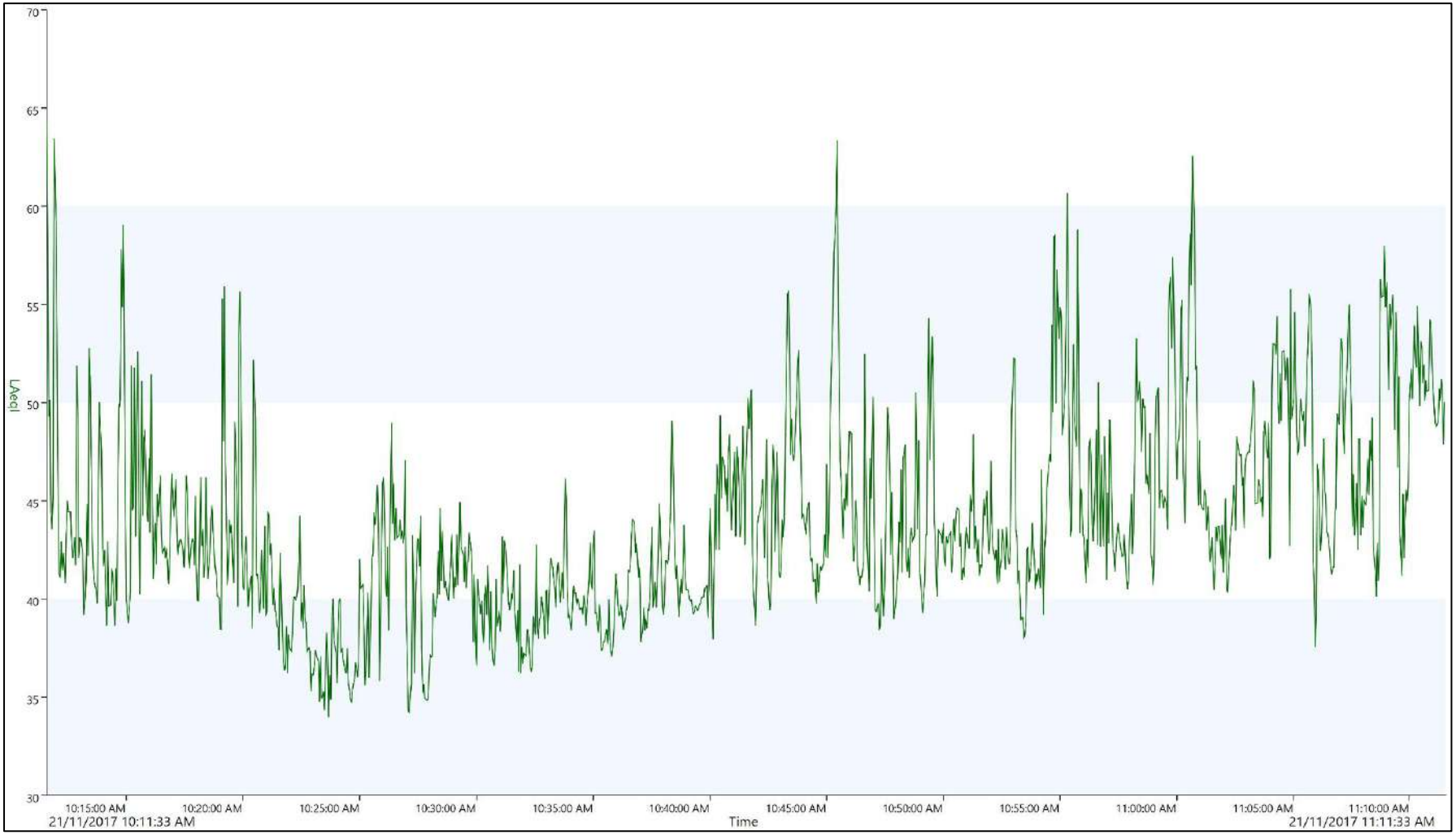


Figure 6-8: Noise time history for N8

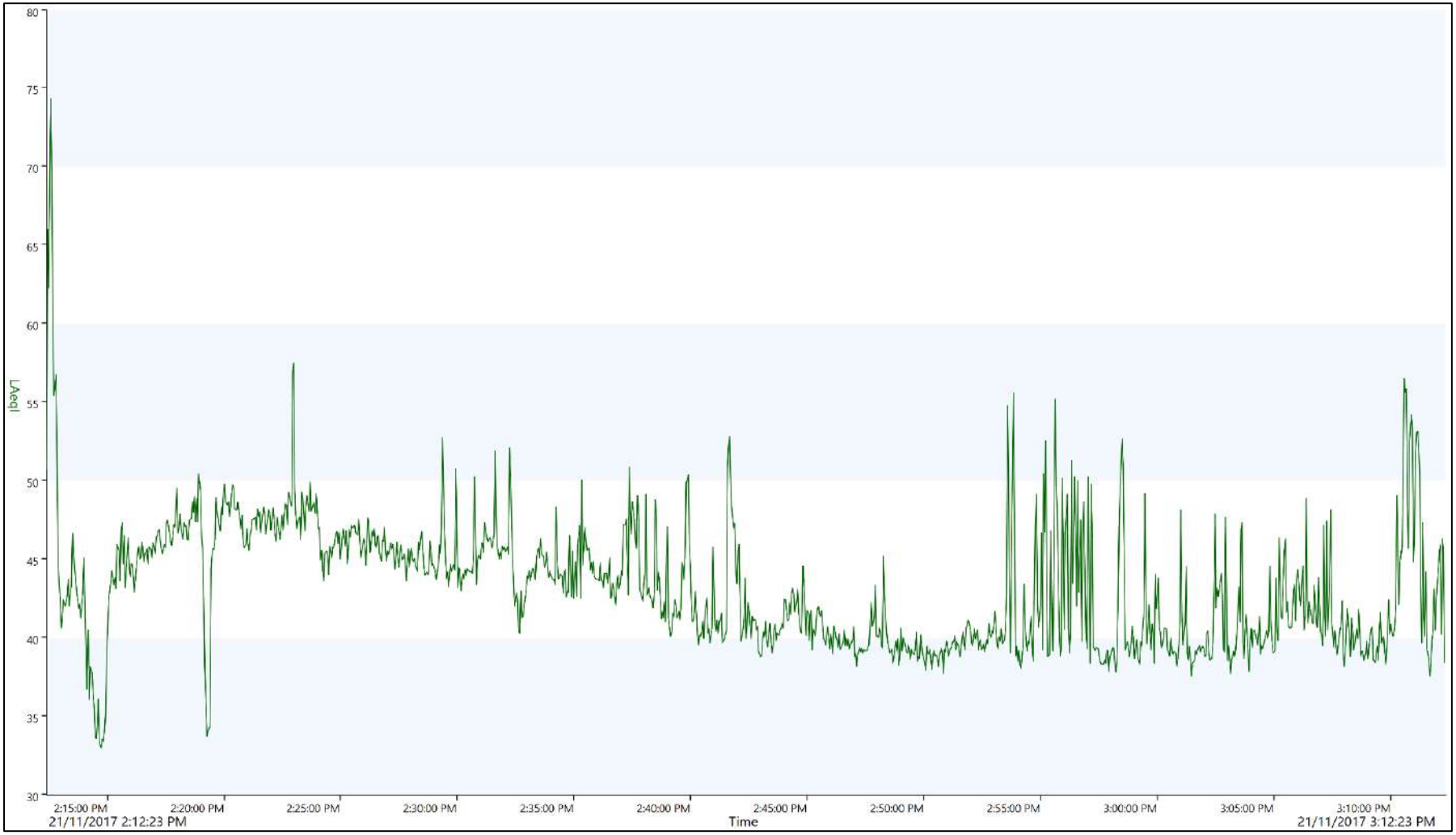


Figure 6-9: Noise time history for N9

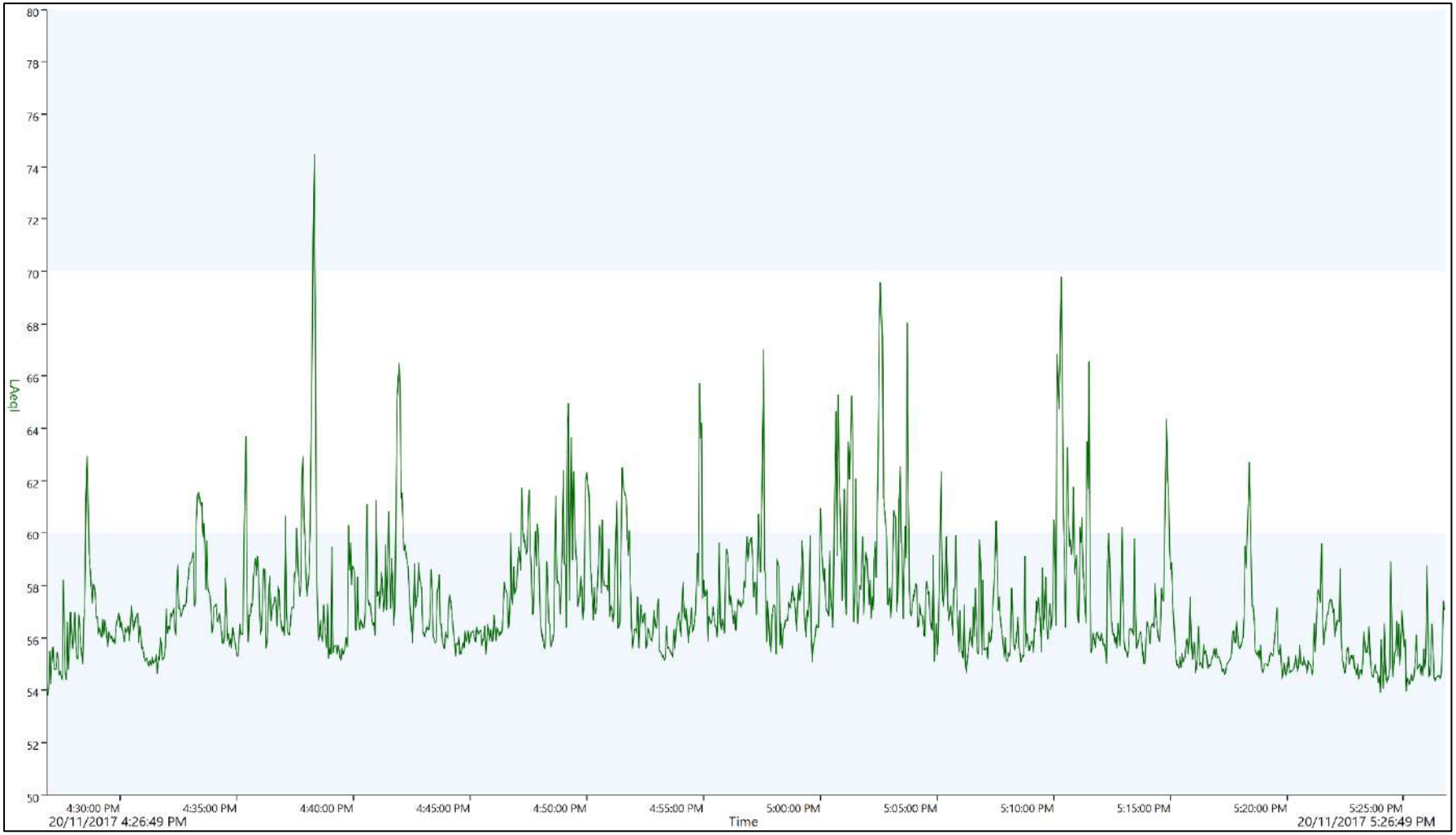


Figure 6-10: Noise time history for N10

7 Sensitivity of the Site

It is not expected that the related construction and operational activities of the various expansion as well as utilities and services projects will impact on any surrounding noise sensitive receptors (inside as well as outside of the resort) such as people and wildlife. The reason is due to the nature of especially the construction activities, the noise being limited to the location of the project's footprint as well as the existing baseline inside the resort characteristic to that of urban districts. It is therefore not necessary for comprehensive buffer zones to be implemented other than the standard demarcations for active construction zones.

8 Assumptions, Limitations and Gaps in knowledge

The following assumptions and limitations are included as part of this assessment:

- The construction phase is assumed to be carried out during daylight hours (06:00-18:00), therefore only a daytime scenario was modelled for the construction phase and the subsequent impact of the construction phase refers only to the daytime;
- The resulting noise contours represent worst case L_{Aeq} at any receiver located 360 degrees in the horizontal plane around the noise sources. The noise modelling software is limited to calculating the predominant wind direction (or downwind conditions of propagation) per single receptor only. Calm wind conditions have therefore been included in the model due to the number of surrounding receptors. Thus, the noise dispersion plots do not represent a typical seasonal scenario in the predominant wind direction but rather a yearly average of the area's meteorological conditions in all directions;
- In essence the modelling follows a conservative worst case scenario approach assuming all activities for each phase are being carried out simultaneously; and
- Only a desktop assessment of the operational phase was undertaken as the expected noise during this phase would be negligible.

9 Impact Assessment

The Environmental Noise Impact Assessment will by use of dispersion modelling software mainly focus on the construction activities of the proposed project where the below mentioned noise sources may increase the existing baseline levels by 7dBA or more and cause a noise disturbance which is prohibited by the National Noise Control Regulations. The potential impact of the construction activities are:

- The site clearing and preparation activities that may potentially impact on the existing soundscape at Sun City by causing a noise disturbance as defined by the National Noise Control Regulations, which may include the following noise sources:
  - Bulldozers;

- Front end loaders;
- Excavators;
- Graders; and
- Dump trucks.

- The construction of infrastructure that may potentially impact on the existing soundscape at Sun City by causing a noise disturbance as defined by the National Noise Control Regulations, which may include the following noise sources:
  - Generators;
  - Pneumatic tools;
  - Power tools;
  - Delivery vehicles; and
  - Cranes.

9.1 Construction Phase

9.1.1 Impact Description

The construction noise dispersion model is indicated on Plan 2 (refer to Appendix B). The results indicate that the expected noises during the construction activities will not likely cause a noise disturbance in terms of the National Noise Control Regulations at any area outside of the construction zones within the resort.

The reason for this is that the construction noise is not likely to increase the ambient noise levels by more than 7 dBA at any surrounding area of residence or where visitors may be moving to and from entertainment areas.

9.1.2 Management Objectives

To minimise/prevent the noise impact from causing a noise disturbance at the surrounding receptors as a result of the construction activities and subsequently comply with the National Noise Control Regulations.

9.1.3 Management Actions and Targets

Due to the proposed project not impacting on the surrounding receptors, the following general good housekeeping measures are recommended:

- Construction activities to be undertaken during the daytime period only; and
- Plant and Machinery should be switched off when not in use.

In addition, it is recommended that the following occupational health and safety mitigation measures are implemented on site:

- Demarcation of construction zones;
- All areas within the workspace identified as noise zones should be demarcated as such with correct signage to indicate what correct Personal Protective Equipment (PPE) should be warn;
- According to the Occupational Health and Safety Regulations, no employee should be exposed to a noise level greater than 85dBA for a duration of more than 8 hours per day without hearing protection;
- The client should supply workers with correct hearing protectors who need to work in demarcated noise zones; and
- Workers should be exposed for shorter periods or personnel should be rotated between a low noise process and the noise zones.

9.1.4 Impact Ratings

The rating table below summarises and calculates the impact significance of the construction phase in terms of the duration, extent, intensity and probability (refer to Table 9-1).

Table 9-1: Pre-mitigation and post-mitigation significance ratings for impacts on noise during the Construction Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Site clearance and construction of infrastructure)			
Impact Description: Noise will emanate from Plant and Machinery during the construction phase			
Prior to mitigation/ management			
Duration	Medium term (3)	Noise will be produced for the duration of the construction phase	Negligible (negative) – 14
Extent	Local (3)	It is expected that during construction noise will extend as far as development site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal impact	
Probability	Improbable (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		
Mitigation/ Management action			
▪ Restricting construction activities to daylight hours; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Medium term (3)	Noise will be produced for the duration of the construction phase	Negligible (negative) – 12

Dimension	Rating	Motivation	Significance
Extent	Limited (2)	It is expected that during construction noise will be limited to site with above mentioned mitigation measures further reducing the extent	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal noise impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		

9.2 Operational Phase

9.2.1 Impact Description

The operational activities of especially the expansion projects will result in an increase of visitors and subsequently an increase in vehicle activity. The noise levels associated with the operational activities are not likely to increase the existing baseline by 7dBA or more. Even though the expansion projects may result in an increase in vehicle activity inside the resort, it is difficult to quantify in terms of amount of vehicles.

Even if the amount of vehicles double to what is currently experienced throughout the year (which is likely an overestimation) it would only result in a 3dBA overall increase. Due to the nature of noise levels measured in decibels being logarithmic units, when doubling a specific noise source it would only increase by 3dBA.

It is therefore assessed that the impact of the operational activities of the various projects will be negligible.

9.2.2 Management Objectives

To minimise/prevent the noise impact from causing a noise disturbance at the surrounding receptors as a result of the operational activities of the various projects and subsequently comply with the National Noise Control Regulations.

9.2.3 Management Actions and Targets

No mitigation measures are recommended due to the operational activities not expected to impact on the existing noise levels inside as well as outside the Sun City Resort.

9.2.4 Impact Ratings

The rating table below summarises and calculates the impact significance of the construction phase in terms of the duration, extent, intensity and probability (refer to Table 9-2).

Table 9-2: Pre-mitigation and post-mitigation significance ratings for impacts on noise during the Operational Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Operational activities)			
Impact Description: Noise will emanate from the increase of vehicles during the operational phase.			
Prior to mitigation/ management			
Duration	Project Life (5)	Noise will be produced for the duration of the projects	Negligible (negative) – 16
Extent	Limited (2)	It is expected that during operation, noise will be limited to site	
Intensity x type of impact	Minimal - negative (-1)	It is expected that noise will have a minimal noise impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		
Mitigation/ Management action			
▪ No mitigation recommended			
Post- mitigation			
Duration	Project Life (5)	Noise will be produced for the duration of the projects	Negligible (negative) – 16
Extent	Limited (2)	It is expected that during operation, noise will be limited to site	
Intensity x type of impact	Minimal - negative (-1)	It is expected that noise will have a minimal noise impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		

10 Mitigation and Management Measures

Table 10-1 provides a description of the mitigation and management options for the environmental impacts anticipated during the construction, operational and closure and rehabilitations phases. Additionally it also provides a summary of the project activities, environmental aspects and impacts on the receiving environment as well as the frequency of mitigation.

Table 10-1: Mitigation and management plan

Activities	Potential Impact	Size and scale of disturbance	Aspects Affected	Phase	Mitigation Type/Measures	Compliance with standards/Standard to be achieved	Time period for Implementation
Site clearance and construction of infrastructure	Noise Impact	Limited to site	Site only and immediate surrounding area	Construction phase	Limit construction activities to daylight hours; and Switch of vehicles and machinery not in use	National Noise Control Regulations	Upon commencement of the construction phase
Operation of expansion project components	Noise Impact	Limited to site	Site only and immediate surrounding area	Operational phase	None recommended	N/A	N/A

11 Monitoring Requirements

Due to the negligible nature of the potential noise impact, it is not recommended that a noise monitoring programme be implemented. In the event of a complaint being received however, it is recommended to monitor the noise levels near the complainant. Components to be included when monitoring is required are presented in in Table 11-1 below:

Table 11-1: Monitoring plan if required

Method	Monitoring locations	Frequency	Target	Reporting
Sampled in accordance with the National Noise Control Regulations in conjunction with the SANS 10103:2008 guidelines; Noise measurement should be taken for a period not less than 10 min at each location	The noise measurements should be taken at the location of the complainant	To be conducted on an ad hoc basis if complaints of noise disturbance is received	Noise levels from the project should not measure above 6dBA of the existing baseline	A report must be compiled after the monitoring has been carried out then submitted to management to ascertain compliance with the required regulations and standards.

12 Reasoned Opinion of the Specialist

The noise impact of the expansion as well as utilities and services projects is assessed to be negligible of nature due to the dispersion modelling results indicating that the construction noise will ultimately be limited to the construction zones.

Due to the overall negligible nature of the noise impact it is recommended that the proposed activities of the various projects should be authorised. Only minimal mitigation measures are recommended during the construction and decommissioning activities if the project is to go ahead.

13 Public Consultation

The Public Participation (PP) Process will be followed. Should Interested and Affected Parties (I&APs) raise specific queries regarding noise, the comments will be addressed in the Comments and Response Report (CRR) and updated submission to authorities.

14 References

National Conservation Act, Act 73 of 1989;

National Environmental Management Act, Act no 107 of 1998;

National Environmental Management Air Quality Act, Act no 39 of 2004;

National Noise Control Regulations;

South African National Standard - Code of practice, SANS 10103:2008, Edition Six, *The measurement and rating of environmental noise with respect to annoyance and to speech communication*. Available [online] http://www.sabs.co.za.

Appendix A: CVs of the Project Team

LUKAS SADLER

Mr. Lukas Sadler

Senior Environmental Noise Consultant

Atmospheric Sciences Department

Digby Wells Environmental (Pty) Ltd

1 EDUCATION

Institution	Dates	Degree(s) or Diploma(s) obtained:
Global Prospectus	2014	Noise and Vibration Fundamentals Assessment
Mackenzie Hoy Consulting Acoustic Engineers	2013	Environmental Noise Control
University of Johannesburg	2010	Air Quality Management
Open Access Industrial Training College (OAITC)	2009	Occupational and Environmental Noise
North West University	2002	B.Com Environmental Management
Randburg High School	2001	Matric

2 EMPLOYMENT

November 2007 - Present: Digby Wells Environmental

May 2006 – July 2007: West View Rail (Pty) Ltd (London)

3 EXPERIENCE

During my two year stay in London from September 2005 – September 2007, I worked for West View Rail (Pty) Ltd on the London Underground Railway doing reconstruction of the underground railway.

I am currently working at Digby Wells Environmental in the Environmental Noise Unit, where I am responsible for the Noise Impact Assessments relating to EIA/EMP's, as well as undertaking compliance monitoring. This includes experience working with projects in accordance with the International Finance Corporation (IFC) and World Bank standards, in countries such as Namibia, Mali, Senegal, Ghana, Mozambique Liberia, DRC, Sierra Leone, Cameroon, Botswana and Zambia.

My core focus is working on Environmental Noise Impact Assessments, which includes the assessment, remediation and management of impacts related to noise disturbance for the construction, mining and petrochemical industry.

4 PROJECT EXPERIENCE

DATE		DETAILS
FROM	TO	
2009	2009	**Project**: Knights and City Deep Tailings Reclamation Noise Assessment **Country**: South Africa **Client:** Crown Gold Recoveries **Nature of Work:** To conduct an environmental noise impact assessment of the proposed reclamation of Tailings Storage Facilities in and around Johannesburg. I was responsible for assessing the significance of the noise impact from the proposed reclamation activities on the surrounding urban and suburban sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the Gauteng Noise Control Regulations. The Concawe noise quantification method was used to quantify the expected noise sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2009	2009	**Project**: Environmental Noise Impact Assessment for Gold Mining activities in the Free State **Country**: South Africa **Client:** Pamodzi Gold **Nature of Work:** To conduct an environmental noise impact assessment of the proposed gold mining activities. I was responsible for assessing the significance of the noise impact from the proposed gold mining activities on the surrounding rural and suburban sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the Free State Noise Control Regulations. The Concawe noise quantification method was used to quantify the expected noise sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2009	2009	**Project**: Environmental Noise Impact Assessment for Boikarabelo Colliery, Waterberg **Country**: South Africa **Client:** Resource Generation **Nature of Work:** To conduct an environmental noise impact assessment of the proposed colliery. I was responsible for assessing the significance of the noise impact from the proposed colliery on the surrounding rural noise sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the National Noise Control Regulations. The Concawe noise quantification method was used to quantify the expected noise sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2010	2010	**Project**: Baseline Noise Survey for proposed Coal Mine in Mpumalanga Province

		Country: South Africa **Client:** BHP Billiton Energy South Africa **Nature of Work:** To conduct baseline noise measurements in order to assess the pre-mining soundscape as well as identify the current noise sources
2010	2010	**Project**: Environmental Noise Impact Assessment for the Lesedi Power Generation Project **Country**: South Africa **Client:** Xstrata Alloys **Nature of Work:** To conduct an environmental noise impact assessment of the proposed power generating activities. I was responsible for assessing the significance of the noise impact from the proposed coal fired power station on the surrounding rural and suburban sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the National Noise Control Regulations. The Concawe noise quantification method was used to quantify the expected noise sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2011	2011	**Project**: ESIA for Gold Mine in Armenia **Country**: Armenia **Client:** GeoPro Mining Limited **Nature of Work:** To conduct an environmental noise impact assessment in support of an ESIA for a gold mining project. I was responsible for assessing the significance of the noise impact from the proposed project on the surrounding noise sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the International Finance Corporations' (IFC) Environmental Health and Safety's (EHS) Noise Management Guidelines. SoundPlan was used to quantify the expected noise sources then compared to the baseline noise measurements to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2011	2011	**Project**: Environmental Noise Impact Assessment for Extension of Koidu Diamond Mine **Country**: Sierra Leone **Client:** Koidu **Nature of Work:** To conduct an environmental noise impact assessment of the proposed extension of the diamond mine. I was responsible for assessing the significance of the noise impact from the extension of the kimberlite pipe on the surrounding villages. The environmental noise impact assessment was undertaken in accordance with the IFC EHS guidelines. The Concawe noise quantification method was used to quantify the expected noise sources then compared to background noise levels to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.

2011	2011	**Project**: Environmental Noise Impact Assessment for Roodekop Colliery **Country**: South Africa **Client:** Universal Coal **Nature of Work:** To conduct an environmental noise impact assessment of the proposed colliery. I was responsible for assessing the significance of the noise impact from the proposed colliery on the surrounding rural noise sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the National Noise Control Regulations. The Concawe noise quantification method was used to quantify the expected noise sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2012	2012	**Project**: Environmental Noise Impact Assessment for Kibali's Hydropower Plants **Country**: DRC **Client:** Randgold Resources **Nature of Work:** To conduct an environmental noise impact assessment of the proposed Hydropower Plants along the Kibali river. I was responsible for assessing the significance of the noise impact from the Hydropower Plnats on the surrounding villages. The environmental noise impact assessment was undertaken in accordance with the IFC EHS guidelines. The Concawe noise quantification method was used to quantify the expected noise sources then compared to the background noise levels to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2012	2012	**Project**: Environmental Noise Impact Assessment for Brakfontein Colliery **Country**: South Africa **Client:** Universal Coal **Nature of Work:** To conduct an environmental noise impact assessment of the proposed colliery. I was responsible for assessing the significance of the noise impact from the proposed colliery on the surrounding rural noise sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the National Noise Control Regulations. SoundPlan was used to quantify the expected noise sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2012	2016	**Project**: Environmental Noise Impact Assessment for Klipspruit South **Country**: South Africa **Client:** South 32 **Nature of Work:** To conduct an environmental noise impact assessment of the proposed colliery. I was responsible for assessing the significance of the noise impact from the proposed colliery on the surrounding rural and suburban noise sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the National Noise Control Regulations. SoundPlan was used to quantify the expected noise sources then compared to the noise control

		regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2012	2014	**Project**: Environmental Noise Impact Assessment for Platreef Platinum Mine **Country**: South Africa **Client:** Ivanplats **Nature of Work:** To conduct an environmental noise impact assessment of the proposed Platinum Mine. I was responsible for assessing the significance of the noise impact from the proposed colliery on the surrounding rural and suburban noise sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the National Noise Control Regulations. SoundPlan was used to quantify the expected noise sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2014	2016	**Project**: Compliance Monitoring for Platreef **Country**: South Africa **Client:** Ivanplats **Nature of Work:** To conduct compliance monitoring at the operational Platreef Mine to assess compliance with the relevant regulations as well as recommend noise control measures in the event of non-compliance.
2013	2013	**Project**: Environmental Noise Impact Assessment for Balama Graphite Mine **Country**: Mozambique **Client:** Syrah Resources **Nature of Work:** To conduct an environmental noise impact assessment of the proposed Graphite Mine. I was responsible for assessing the significance of the noise impact from the proposed mine on the surrounding villages. The environmental noise impact assessment was undertaken in accordance with the EHS IFS guidelines. SoundPlan was used to quantify the expected noise sources then compared to the background noise levels to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2013	2013	**Project**: Environmental Noise Impact Assessment for Ash Backfilling at Sasolburg **Country**: South Africa **Client:** Sasol **Nature of Work:** To conduct an environmental noise impact assessment of the proposed ash backfilling activities. I was responsible for assessing the significance of the noise impact from the proposed ash backfilling activities on the surrounding rural and suburban noise sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the Free State Noise Control Regulations. SoundPlan was used to quantify the expected noise

		sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2014	2014	**Project**: Environmental Noise Impact Assessment for Weltevreden Colliery, Belfast **Country**: South Africa **Client:** Northern Coal **Nature of Work:** To conduct an environmental noise impact assessment of the proposed colliery. I was responsible for assessing the significance of the noise impact from the proposed colliery on the surrounding rural noise sensitive receptors. The environmental noise impact assessment was undertaken in accordance with the National Noise Control Regulations. SoundPlan was used to quantify the expected noise sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2014	2014	**Project**: Environmental Noise Impact Assessment for Water Treatment Facility **Country**: South Africa **Client:** TCTA **Nature of Work:** To conduct an environmental noise impact assessment of the proposed water treatment and sludge disposal for the short term intervention for acid mine drainage treatment. I was responsible for assessing the significance of the noise impact from the proposed water treatment and sludge disposal on the surrounding urban noise sensitive receptors on the east rand of Johannesburg. The environmental noise impact assessment was undertaken in accordance with the Gauteng Noise Control Regulations. SoundPlan was used to quantify the expected noise sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2013	2016	**Project**: Compliance Monitoring for Kalgold **Country**: South Africa **Client:** Harmony Gold **Nature of Work:** To conduct compliance monitoring at the operational Kalgold Mine to assess compliance with the relevant regulations as well as recommend noise control measures in the event of non-compliance.
2015	2015	**Project**: Environmental Noise Impact Assessment for Thabametsi Colliery **Country**: South Africa **Client:** EXXARO **Nature of Work:** To conduct an environmental noise impact assessment of the proposed Thabametsi Colliery. I was responsible for assessing the significance of the noise impact from the proposed coal mining activities on the surrounding rural noise sensitive receptors. The

		environmental noise impact assessment was undertaken in accordance with the National Noise Control Regulations. SoundPlan was used to quantify the expected noise sources then compared to the noise control regulations to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2015	2015	**Project**: Environmental Noise Impact Assessment for a Vanadium Mine **Country**: South Africa **Client:** VMIC **Nature of Work:** To conduct an environmental noise impact assessment of the proposed Vanadium Mine. I was responsible for assessing the significance of the noise impact from the proposed mine on the surrounding communities. The environmental noise impact assessment was undertaken in accordance with the National Noise Control Regulations. SoundPlan was used to quantify the expected noise sources then compared to the background noise levels to establish the significance of the impact. Mitigation and management measures in terms of noise control were recommended in accordance with the significance of the impact.
2015	2016	**Project**: Compliance Noise Monitoring for the Kazungula Bridge Construction Project **Country**: Botswana/Zambia **Client:** Daewoo Construction **Nature of Work:** To conduct compliance monitoring at surrounding noise sensitive receptors to the bridge construction site to assess compliance with the relevant regulations as well as recommend noise control measures in the event of non-compliance.

5 PROFESSIONAL AFFILIATIONS

Affiliate Member of the Institute of Acoustics

Mr. Brett Coutts

Divisional Manager: Ecology and Atmospheric Sciences

Digby Wells Environmental

1 Education

- 2006 – 2007: BSc Honours in Ecology, Environment and Conservation - University of the Witwatersrand.
- 2003 – 2006: Undergraduate BSc - University of the Witwatersrand.

2 Language Skills

- English; and
- Afrikaans.

3 Employment

- September 2012 – Present: Digby Wells Environmental – Unit Manager: Rehabilitation.
- October 2008 – August 2012: Terra Pacis Environmental (Pty) Ltd – Environmental Consultant.
- November 2007 – September 2008: Hydromulch (Pty) Ltd – Junior Project Manager.

4 Experience

Brett Coutts is an Ecologist with a BSc Honours in Ecology, Environment and Conservation. Brett gained practical hands on experience as a project manager on environmental rehabilitation projects at Hydromulch and his roles and responsibilities include the compilation of Basic Assessment (BA) reports, Scoping & Environmental Impact Reports, compilation of Environmental Management Plans (EMP), GIS mapping and Biodiversity Action Plans linking to rehabilitation. Brett is currently the Divisional Manager for the Ecological and Atmospheric Sciences Division.

Prior to his appointment, he gained experience as a junior project manager on environmental rehabilitation projects at Hydromulch and then was appointed by Terra Pacis as an Environmental Consultant where his roles and responsibilities included the compilation of Basic Assessment (BA) reports, Scoping &Environmental Impact Reports, compilation of Environmental Management Plans (EMP), GIS mapping and Biophysical Studies.

5 Project Experience

- Integrated Environmental Authorisations for Blue Sphere Investments and Trading 103 (Pty) Ltd – Consultant.
- The compilation of the Atmospheric Emissions Licences for Samancor Manganese (Pty) Ltd, Metalloys, BHP Billiton – Consultant.
- Scoping and Environmental Impact Reporting for the Refurbishment of West Plant Sludge Dam No.3 and associated Mixing Facility at Samancor Manganese (Pty) Ltd, Metalloys, BHP Billiton – Consultant.
- Scoping and Environmental Impact Reporting for the Upgrade of the existing Pelletising Plant to an Agglomeration Plant at Samancor Manganese (Pty) Ltd, Metalloys, BHP Billiton – Consultant.
- Waste Assessment for Kopanang Mine (Phase 2) - AngloGold Ashanti –Vaal River Operations - Consultant.
- Waste Assessment for Mponeng Mine (Phase 2) - AngloGold Ashanti - West Wits - Consultant.
- Compilation of Operational Procedures for the New North and West Plant Sludge Dams - Samancor Manganese (Pty) Ltd, Metalloys, BHP Billiton - Consultant.
- Biodiversity Assessment at Samancor Manganese (Pty) Ltd, Metalloys, BHP Billiton– Specialist.
- Basic Assessment for a Proposed Residential Development on Portion 378 and Portion 379 of the Farm Driefontein 85 IR,Boksburg - Business Venture Investments No. 1172 (Pty) Ltd – Consultant.
- Vegetation, Invertebrate and Wetland Assessments for the Proposed a Residential Development on Portions 378 and 379, of the Farm Driefontein 85 IR, Boksburg - Business Venture Investments No. 1172 (Pty) Ltd - Specialist.
- Salvage Yard Layout-Review of Design and Stormwater - Samancor Manganese (Pty) Ltd, Metalloys, BHP Billiton – Consultant.
- Dams Risk Assessment - Goedgevonden Colliery, Xtrata Coal South Africa – Consultant.
- Invasive Alien Plant Control Procedure at Samancor Manganese (Pty) Ltd, Metalloys, BHP Billiton - Consultant.
- Environmental Management Plan Update - North Mara Mine Limited, Barrick Gold Corporation – Consultant.
- Waste Assessment for Kopanang Mine(Phase 1) - AngloGold Ashanti –Vaal River Operations - Consultant.

- Waste Assessment for Mponeng Mine (Phase 1) - AngloGold Ashanti - West Wits - Consultant.
- Admox Bagging Plant, Admox Bagging Plant, Admox Pelletising Plant and OBC Fume Extraction Operation Environmental Management Plan - Samancor Manganese (Pty) Ltd, Metalloys, BHP Billiton - Consultant.
- Compilation of Standard Operational Procedures for the Slag and Dust Stockpiles - Samancor Manganese (Pty) Ltd, Metalloys, BHP Billiton - Consultant.
- Internal Water Use License Audit - Goedgevonden Colliery, Xtrata Coal South Africa - Auditor.
- Biophysical Specialist Study Report for the Bravo 3 Power Line Route Alternatives-2008 – Zitholele Consulting – Specialist.
- Voorspoed Mine Closure Plan - De Beers Consolidated Mines – Consultant.
- Co-ordination and Implementation Project for Thabazimbi Iron Ore Mine associated with Aerial Seeding and Re-vegetation Reporting Plan, Anglo Group – Rehabilitation Consultant.
- Exxaro Portfolio, Rehabilitation Specialist for Grootegeluk Coal Mine, Compilation of Rehabilitation Plan, Exxaro Coal (Pty) Ltd – Rehabilitation Specialist.
- Rehabilitation plan compilation for historical mines located in Mpumalanga with associated biophysical studies and monitoring of progress of rehabilitation, Anker Coal– Rehabilitation Specialist.
- Overall management and coordination of projects associated with the mine and co-ordination with mine personnel, Key Account Management – Environmental Consultant.
- Scoping and Environmental Impact Assessment for the Proposed Schoonoord Underground Mine, Exxaro Arnot Coal Mine, Exxaro (Pty) Ltd – Project Manager.
- Scoping and Environmental Impact Assessment for the Proposed Thabametsi Coal Mine, Exxaro (Pty) Ltd – Project Manager.
- Compilation of Biodiversity Management Plans for Tongon Gold Mine, Rand Gold Resources – Technical Specialist and Project Manager.
- Wetland Offset Strategy for the Waterberg Region , Exxaro (Pty) Ltd– Project Manager.
- Rehabilitation Plan for Consbrey and Hawar Projects Msobo Coal– Rehabilitation Specialist.
- Update of Greenside Colliery Closure Plan, Anglo American (Pty) Ltd – Project Manager.
- Compilation of Putu Iron Ore Rehabilitation Plan, Liberia – Rehabilitation Specialist.

- Compilation of Rehabilitation Plan for Balama, Mozambique, Syrah Resources – Rehabilitation Specialist.
- Compilation of Rehabilitation and Closure Plan for Storm Mountain Diamond Mine – Rehabilitation Specialist.
- Overall management and coordination of projects associated with the mine and co-ordination with mine personnel, Bokoni Platinum Mine – Key Account Manager.
- Environmental and Social Impact Assessment for New Liberty Gold Mine, Liberia, Aureus – Project Manager.
- Preliminary Closure Plan for New Liberty Gold Mine, Liberia, Aureus– Rehabilitation Specialist.
- Waste Assessment for Kopanang Mine(Phase 1) - AngloGold Ashanti –Vaal River Operations - Consultant.
- Compilation of GIS Training Manual – Consultant (Internal).
- Rehabilitation Plan for IPP Station, Vedanta Resources – Rehabilitation Specialist.
- Compilation of Biodiversity Management Plans for Morila Gold Mine, Mali, Rand Gold Resources – Technical Specialist and Project Manager.

6 Short Courses

- 2009: IEMA Approved Carbon Footprint Management Course: An Introductory Programme.
- 2010: Exclusive Panel Discussion on: The Copenhagen Climate Change Conference.
- 2011: International Association for Impact Assessments conference at the Wild Coast.
- 2012: Centre for Environmental Management, North-West University: Environmental Law for Environmental Managers.

7 Professional Affiliations

Geographic Information Society of South Africa (GISSA)

8 Professional Registration

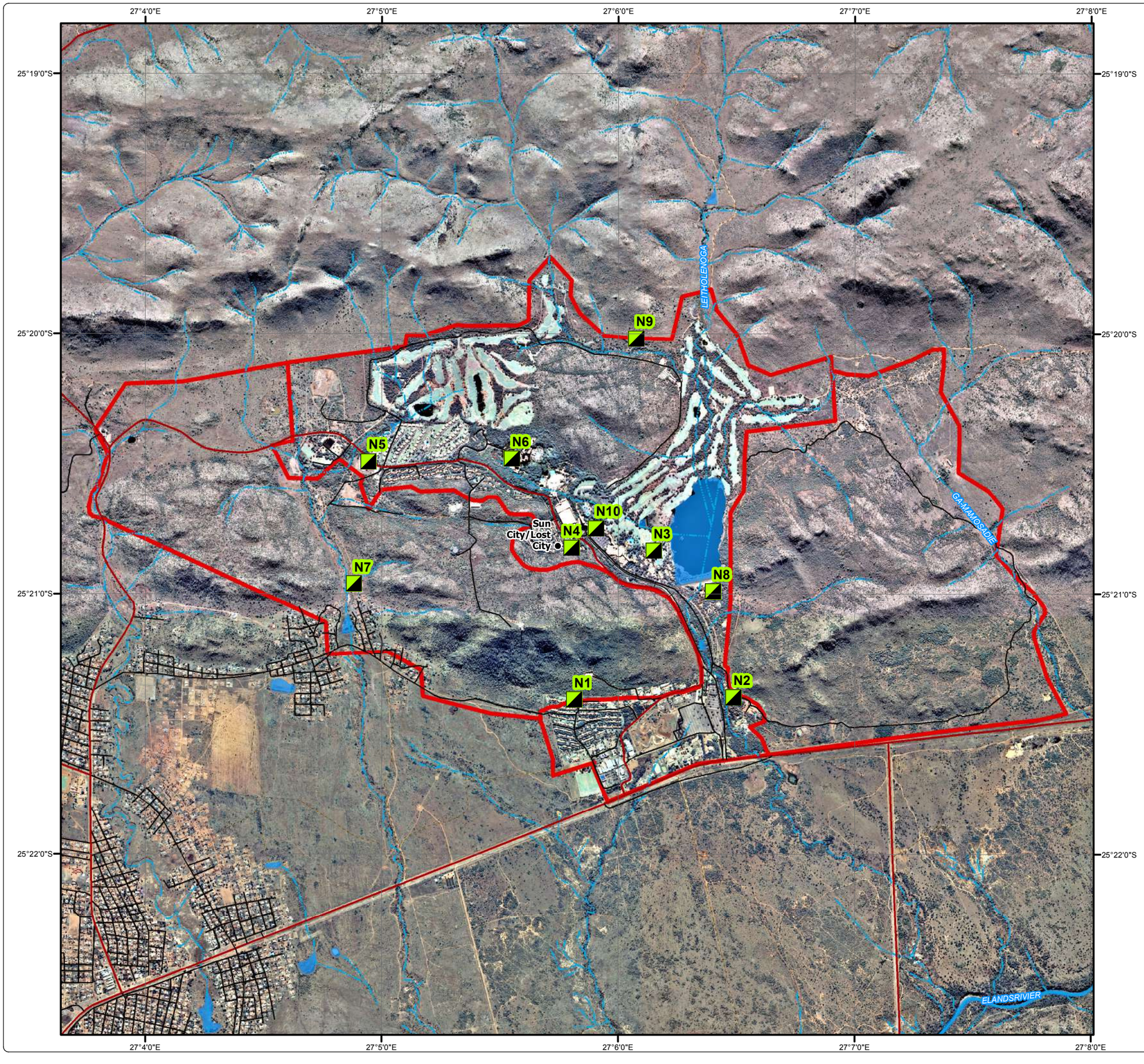
- 2009: IAIAsa - International Association for Impact Assessment (South Africa).

Appendix B: Maps and Plans

Plan 1

Sun City Complex EIA

Noise Monitoring Locations



Legend

- Development Area
- Noise Monitoring Location
- Settlement
- Main Road
- Minor Road
- Track
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake

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Projection: Transverse Mercator	Ref #: meg.SUN4642.201801.020
Datum: WGS 1984	Revision Number: 1
Central Meridian: 27°E	Date: 11/01/2018

N

0 0.25 0.5 1 1.5

Kilometres

1:27 000

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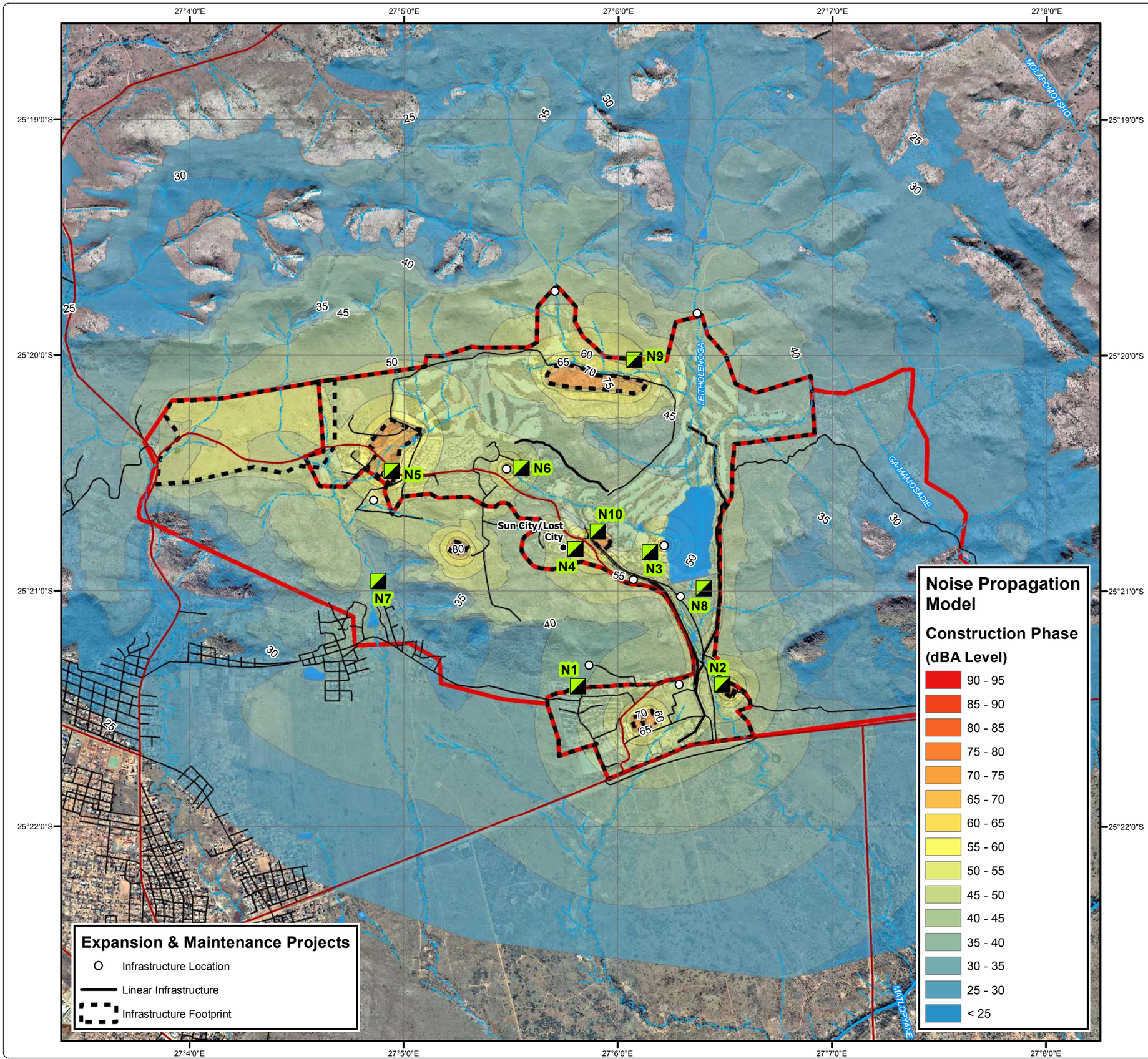
Plan 2

Sun City Complex EIA

Noise Propagation Model for the Construction Phase



Legend

- Development Area
- Settlement
- Main Road
- Minor Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake

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Datum: WGS 1984	Revision Number: 1
Central Meridian: 27°E	Date: 28/05/2018

N

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Kilometre

1:30 000

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