ENVIRONMENTAL NOISE ASSESSMENT FOR THE SASOL SIGMA COLLIERY ASH BACKFILLING PROJECT

SASOL MINING (PTY) LTD

OCTOBER 2013

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This document has been prepared by **Digby Wells Environmental**.

Report Title:	**Environmental Noise Assessment For The Sasol Sigma Colliery's Ash Backfilling Project**
Project Number:	**SAS1691**

Name	Responsibility	Signature	Date
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EXECUTIVE SUMMARY

The Sasol Mining (Pty) Ltd (Sasol) project proposes to backfill old mine voids with ash in order to stabilise old underground mine workings and reduce the risk of subsidence. The ash backfilling process will utilise several pipelines located above ground to transport the ash slurry (comprising 20% fine ash and 80% water) from the Sasol Ash pump station to the underground voids. The return water pipelines will be used to abstract water from the mine voids for treatment, prior to backfilling.

Digby Wells Environmental (Digby Wells) was commissioned by Sasol to conduct an environmental noise assessment in support of the Environmental Impact Assessment.

This environmental noise assessment report entails the following tasks:

- Identification of noise sources and potential noise sensitive receivers;
- Establishment of the existing noise climate at various locations in the project area and directly adjacent areas through the undertaking of baseline noise measurements; and
- Assessment of the anticipated noise impacts associated with the project activities during the construction, operational, decommissioning and post-closure phases.

In terms of the baseline conditions, it is gathered that the existing ambient noise levels on the western boundary of Sasolburg are characteristic of urban surroundings. The noise levels measure between 52dBA and 53dBA during the daytime and between 42dBA and 44dBA during the night time.

It is concluded that the proposed construction activities will cause a noise disturbance at certain farmsteads, but only for a very short duration. The recommended mitigation measures during the periods of noise disturbance should lessen the significance of the impact. The recommended mitigation measures along with the short duration equate to the overall significance of the impact being low. The operational phase will also have a low significant impact on the surrounding areas.

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACCOUSTIC TERMS

A-weighted sound level	**A measure of sound pressure level designed to reflect the acuity of the human ear.**
Decibel (dB)	**A unit in which sound pressure is measured.**

dBA	**Unit of sound level. The weighted sound pressure level by the use of the A metering characteristic, which allows the sound pressure level to be measured at the approximate sensitivity as the human ear**
$L_{Aeq,T}$	**Is the value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval T_m, has the same mean-square sound pressure as a sound under consideration whose level varies with time.**

1 INTRODUCTION

The Sasol Mining (Pty) Ltd (Sasol) project proposes to backfill old mine voids with ash in order to stabilise old underground mine workings and reduce the risk of subsidence. The ash backfilling process will utilise several pipelines located above ground to transport the ash slurry (comprising 20% fine ash and 80% water) from the Sasol Ash pump station to the underground voids. The return water pipelines will be used to abstract water from the mine voids for treatment, prior to backfilling.

2 TERMS OF REFERENCE

Digby Wells was commissioned by Sasol to conduct a noise assessment for the Sasol Sigma Colliery Ash Backfilling Project in the Metsimaholo Local Municipality (MLM), situated in the Fezile Dabi District Municipality (FDDM) in Free State. The purpose of the study was to assess the potential impact of the proposed construction and operations of the pipelines on the ambient noise climate of the area, which is primarily agricultural on the western side and urban on the eastern side. The approach used in investigating noise impacts is based on guidelines provided by the South African National Standards (SANS 10103:2008). The following legislation was considered for this survey:

- The National Environmental Management Act (Act 107 of 1998), NEMA;
- The National Environmental Management Air Quality Act (Act 39 of 2004), NEMAQA; and
- The Environment Conservation Act, 1989 (Act 73 of 1989).

The Environmental Noise Impact Assessment report will include a baseline study, predicted noise impacts on the identified noise sensitive receivers, during the various project phases as well as recommendations and mitigation measures for potential impacts.

3 STUDY AREA

The ash backfilling project falls under the jurisdiction of the Metsimaholo Local Municipality (MLM) is situated in the Fezile Dabi District Municipality (FDDM) in Free State and its towns are Sasolburg, Deneysville, Oranjeville and Viljoensdrift. The project is situated near the western boundary of Sasolburg.

4 EXPERTISE OF THE SPECIALIST

A curriculum vitae (CV) and declaration of independence is attached in Appendix A.

5 AIMS AND OBJECTIVES

The objective of the study is to assess what the current ambient noise levels are in the area as well as what the significance of the noise impact from the proposed project will be on the surrounding area. The study will comprise of baseline noise measurements to establish the soundscape of the area surrounding the proposed project as well as assess, via predictive noise dispersion modelling, the potential impact of the noise emissions from the proposed construction and operation if the pipeline on the surrounding environment.

6 METHODOLOGY

The approach used in investigating noise impacts is based on the noise control regulations as published under PN24 of 1998 (PG 35 of 24 April 1998) in terms of section 25 of the Environmental Conservation Act, 1989 (Act 73 of 1989) as well as guidelines provided by SANS 10103:2008. According to the SANS 10103:2008 “The measurement and rating of environmental noise with respect to annoyance and to speech communication”, 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 6-1.

Table 6-1: Acceptable 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]
RESIDENTAIL 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 $L_{R,dn}$ exceeds 55 dBA, residential buildings (e.g. dormitories, hotel accommodation and residences) should preferably be treated acoustically to obtain indoor $L_{Req,T}$ values in line with those given in table 1.						
NOTE 4 For industrial districts, the $L_{R,dn}$ 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 6-2, 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 6-2: 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 $\Delta L_{Req,T}$ should be calculated from the appropriate of the following:		
1) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS LReq,T of the residual noise (determined in the absence of the specific noise under investigation);		
2) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level for the ambient noise given in table 1;		
3) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from table 2; or		
4) $\Delta L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in an area because of a proposed development under investigation.		

A baseline assessment was undertaken at two locations on the western boundary of Sasolburg to determine the current ambient noise levels at the surrounding areas of the

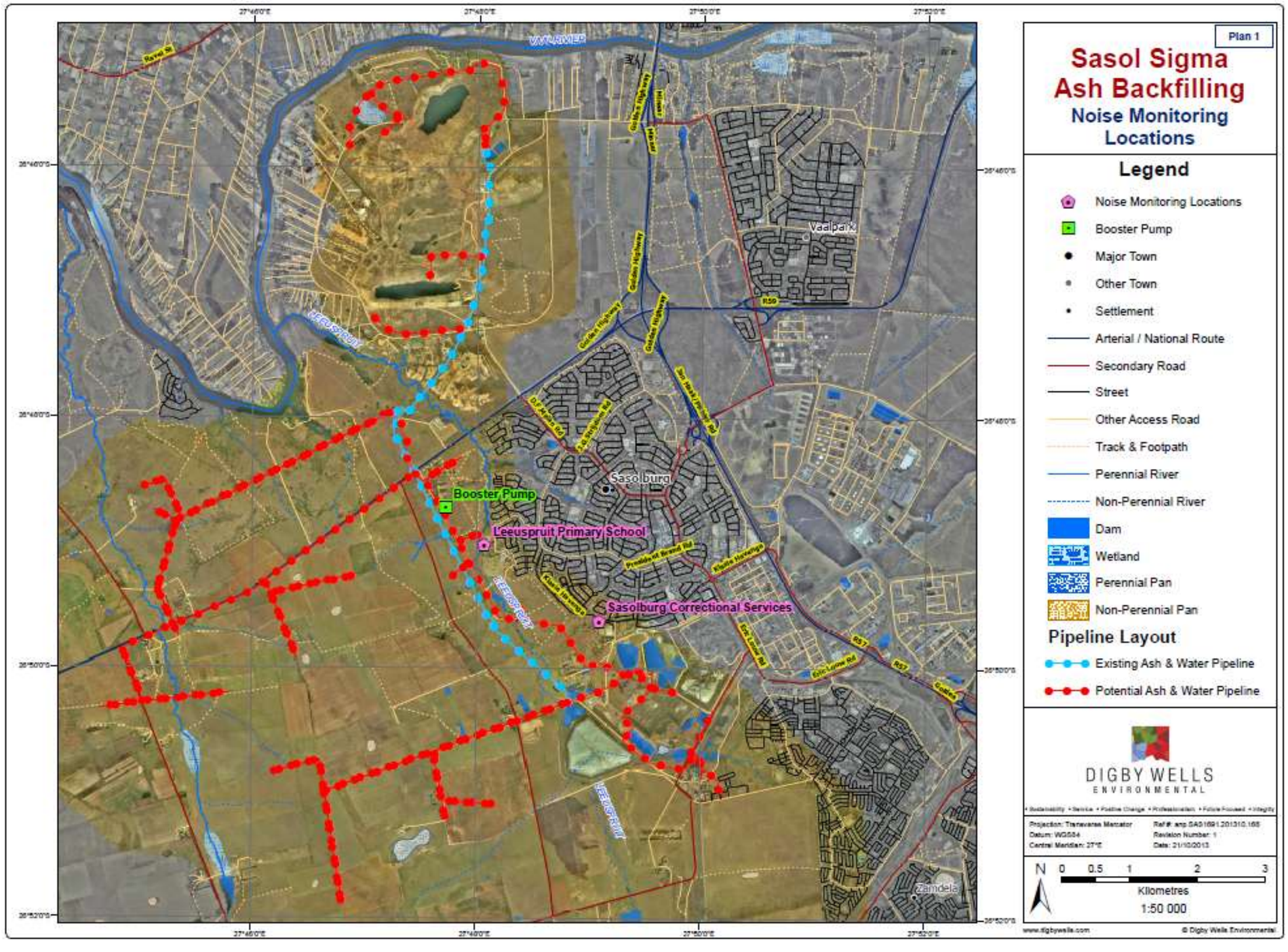
proposed project. The criteria that were used for the siting of the measurement locations were:

- The locations were the nearest noise sensitive receptors to the main continuous noise source throughout the operational phase; and
- That they served as suitable reference points for the measurement of ambient sound levels surrounding the proposed project area. The noise measurement locations cover residential areas that represent a comprehensive soundscape of the urban district of Sasolburg. The measurement location at Leeuspruit Primary School was chosen because it was important to know what the sound level at the school was to determine whether the booster pump station would cause a noise disturbance during school.

The list of noise measurement locations can be seen in Table 6-3. 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 baseline locations are presented in Table 6-3 as well as on Plan 1 below. Photos of the measurement locations are presented in Figure 6-1 and Figure 6-2.

Table 6-3: Noise measurement locations

Site ID	Location	Category of receiver	GPS coordinates
N1	Sasolburg correctional services	Urban	-26.817047° & 27.801124°
N2	Leeuspruit primary	Urban	-26.827020° & 27.818174°



Plan 1: Noise measurement locations

Figure 6-1: Measurement location N1

Figure 6-2: Measurement location N2

Predictive modelling was performed for the proposed construction and operational activities through the use of the modelling software SoundPlan. The software specializes in computer simulations of noise pollution dispersion. Estimates of the cumulative noise levels from the study were derived from the noise emissions from all the major noise-generating components and activities of the proposed project.

The following table indicates the noise power levels used in the model simulations. The sound power levels were derived from a number of previous studies.

Table 6-4: 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
Construction phase							
Haul Truck	108	118	115	114	110	106	102
Back actor	113	117	107	108	106	101	95
Compressor	103	108	107	105	108	113	110
Operational phase							
Booster pump station	107	102	106	106	108	103	97

The noise dispersion modelling software was used to assess whether the noise from the proposed construction and operational activities will impact on the relevant noise sensitive receivers, by comparing the predicted propagating noise levels with the current ambient baseline noise levels.

If the predicted noise levels measure above the existing baseline levels then the difference in dBA levels will be compared to the SANS guideline (Table 6-2) to establish the categories of community/group response to the . According to *Brüel & Kjær.2001,* an increase of about 8 -10 dBA is required before the sound subjectively appears to be significantly louder.

7 BASELINE RESULTS AND DISCUSSIONS

The results from the noise meter recordings for all the sampled points as well as the rating limits according to the SANS 10103:2008 guidelines are presented in Table 7-1. The noise level time history graph per noise measurement location can be seen in Figure 7-1 to **Error! Reference source not found.**.

Table 7-1: Results of the baseline noise measurements

Sample ID	SANS 10103:2008 rating limit					
	Type of district	**Period**	**Acceptable rating level dBA**	**$L_{Areq,T}$ dBA**	**Maximum/Minimum dBA**	**Date**
N1	Urban	Daytime	55	52	83 / 29	01/10/2013
		Night time	45	44	78 / 28	01/10/2013
N2	Urban	Daytime	55	53	85 / 25	02/10/2013
		Night time	45	42	73 / 25	02/10/2013
	Indicates current $L_{Aeq,T}$ levels above either the daytime rating limit or the night time rating limit					

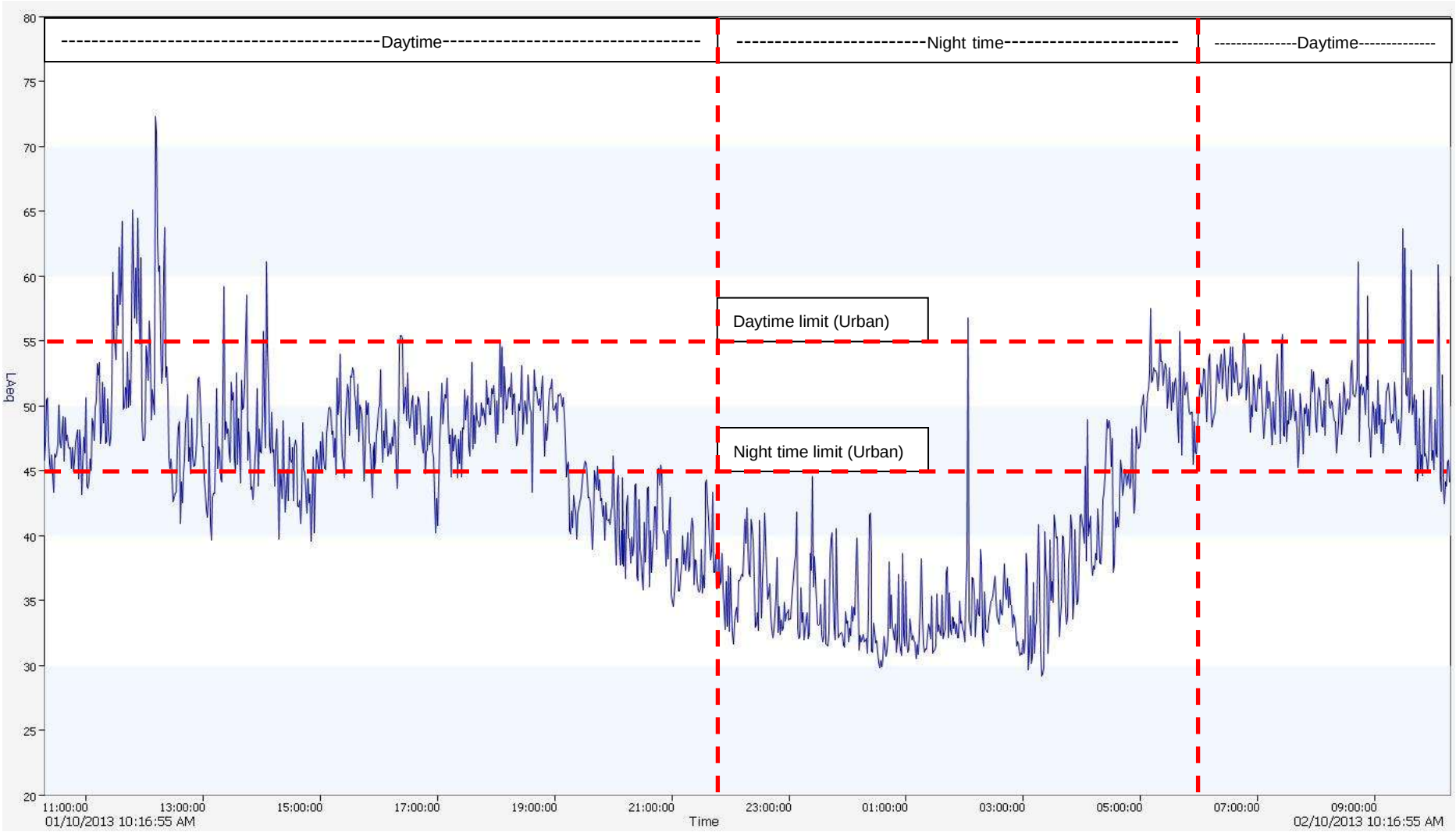


Figure 7-1: Noise time history graph for N1

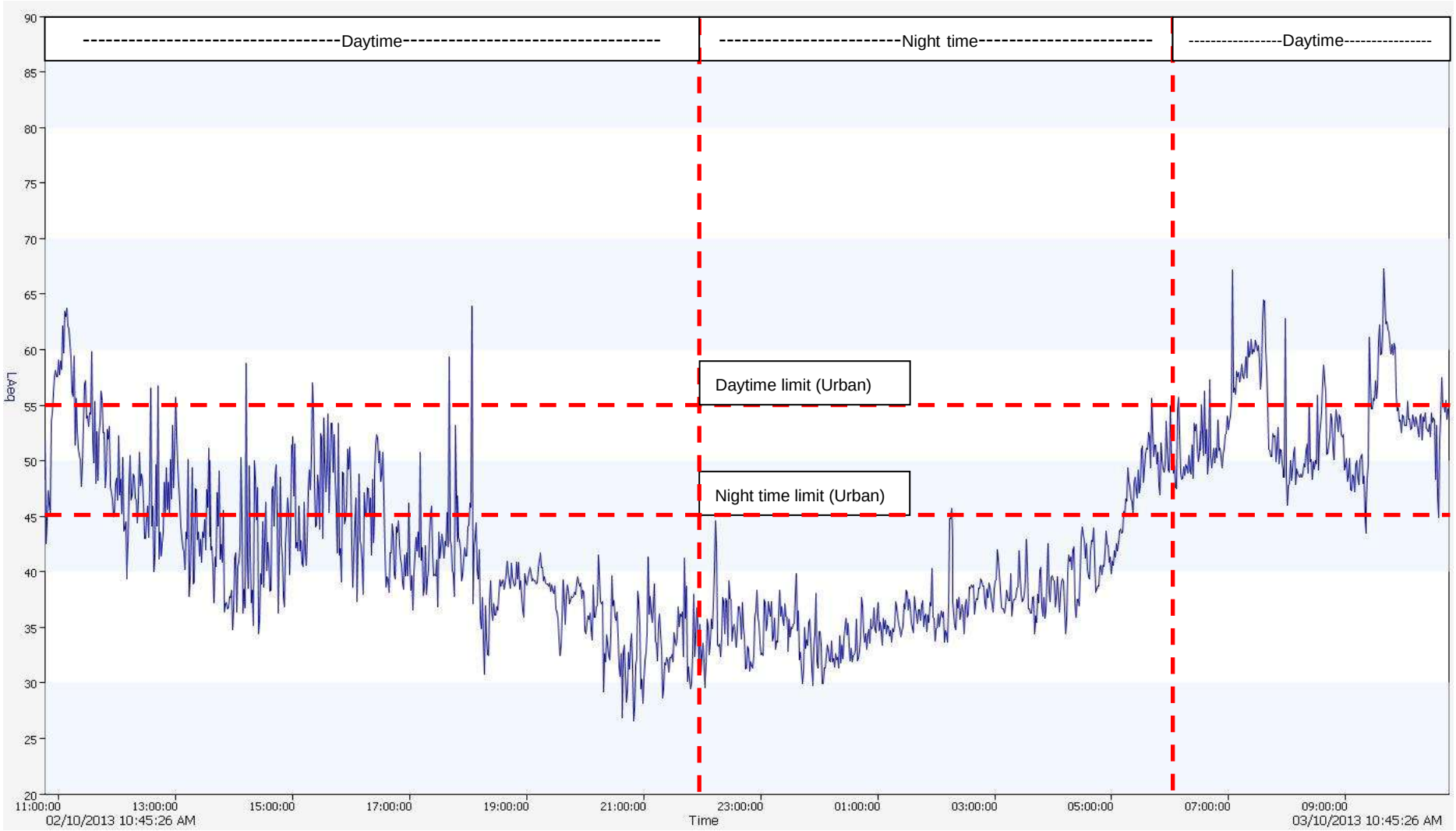


Figure 7-2: Noise time history graph for N2

7.1 Daytime results

Based on the daytime results measured at the receptors (N1 and N2), the existing ambient noise levels are mostly below the SANS rating levels for the maximum allowable outdoor daytime limit for ambient noise in urban districts.

The overall trend of the daytime sound levels indicate the levels peak between 06:00 and 08:00 in the morning and then again between 15:00 and 17:00 in the evening.

7.2 Night time results

Based on the night time results measured at the receptors, the existing ambient noise levels are below the SANS guidelines for the maximum allowable outdoor night time limit for ambient noise in urban districts.

The overall trend of the night time sound levels indicate a steady decline in noise levels from 00:00 until 03:00 and then a sharp rise between 05:00 and 06:00.

The noise sources that influenced the noise levels to rise above the day and night time guidelines at certain times are summarised in Table 7-2.

Table 7-2: Noise sources during baseline measurements

Measurement	Noise source description			
	Day	Duration	Night	Duration
N1	Birdsong and vehicular activity	Continuous	N/A	N/A
N2	Children playing during brake periods as well as birdsong		N/A	N/A

No night time noise sources influenced the night time measurements to measure above the night time guideline of 45dBA.

8 FINDINGS

8.1 The findings for the various phases

The findings present the results of the predictive modelling, which subsequently indicates the noise attenuation from the proposed construction and operational activities in relation to all the surrounding noise sensitive receivers.

8.1.1 Construction phase

It is assumed that the construction activities will only take place during daylight hours; therefore the noise contribution from the proposed activities will only be compared to the existing ambient daytime noise levels as well as compared to the daytime SANS guideline limits.

The following proposed activities during the construction phase are identified as possible noise sources and may impact on the ambient noise level of the area:

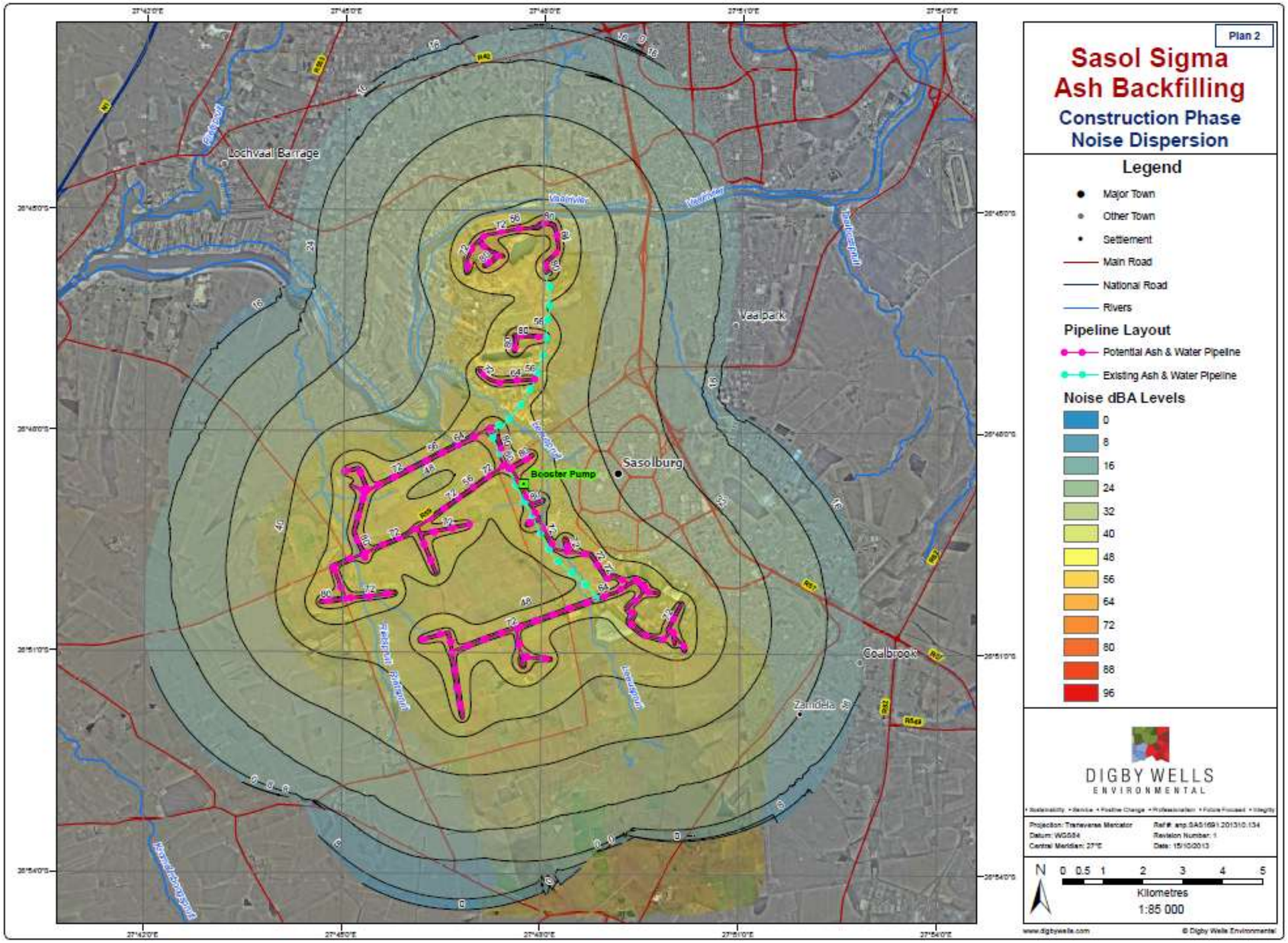
- Construction of pipeline for the ash backfilling.

Potential impact: The construction machinery involved with the construction of the pipeline such as the haul truck, machine for offloading and alignment of pipeline as well as a compressor for air tools will be the continuous noise sources throughout the construction phase.

The grid noise map, shown on Plan 2 , presents the noise contour lines and visually indicates the noise propagation during the construction phase. The model suggests that the construction noise could impact on the farmhouses on the following properties:

- Farmstead of Mr Lucas Erasmus on portion R of Beginsel 310;
- Farmstead of Mr Dirk Strydom on portion R of Brakkuil 408;
- Farmstead of Mr Dirk Strydom on portion R of Zaaiplaats 203; and
- Farmstead of Lewies Trust on portion R of Donkerhoek 323.

The impact which the above mentioned receptors will be exposed to will be short lived due to the relatively quick timeframe the pipeline is laid in. It is estimated that when the pipeline reaches a position where it might be a noise disturbance near any of the above mentioned locations, it will take another 4 days for the disturbance to dissipate



Plan 2: Noise dispersion from the construction phase.

8.1.2 Operational phase

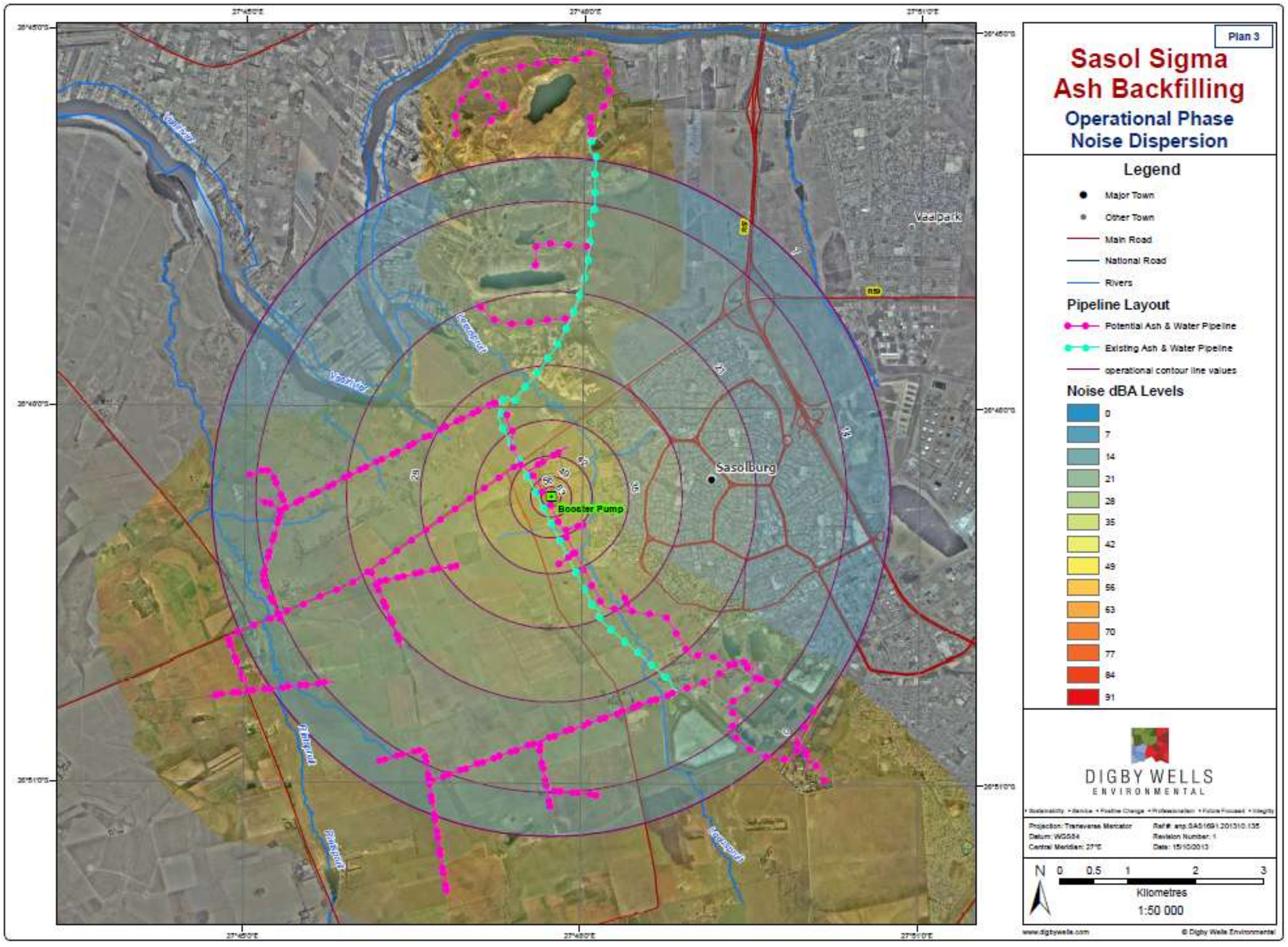
The following proposed activities during the operational phase are identified as possible noise sources and may impact on the ambient noise level at the relevant noise sensitive receivers:

- Operation of booster pump station.

Potential impact: the anticipated noise sources associated with the proposed project include:

- Interior to exterior noise from the water pumps;
- Interior to exterior noise from the pressure reduction valve;
- Exterior noise from the air handler unit;
- Exterior noise from the packed air conditioning (PAC) unit; and
- Exterior noise from the site power transformer.

The grid noise map, shown on Plan 3, presents the noise contour lines and visually indicates the noise propagation during the operational phase for the day and night time. According to the noise dispersion model for the operational phase, the noise from the proposed booster pump station will be lower than that of the current ambient day and night time noise levels at the surrounding noise sensitive receivers.



Plan 3: Noise dispersion during the operational phase

8.1.3 Decommissioning phase

It is assumed that the decommissioning activities will only take place during daylight hours. The following activities during the decommissioning phase are identified as possible noise sources and may impact on the ambient noise level at the relevant noise sensitive receivers:

- Demolishing and removal of infrastructure such as the booster pump station; and
- Removal of the pipeline.

Potential impact: The machinery involved with the above mentioned activities will be a source of continuous noise throughout the decommissioning phase.

The impact during the decommissioning phase is expected to be lower than both that of the construction and operational phases due to the limited activities.

9 IMPACT ASSESSMENT

The impact rating process is designed to provide a numerical rating of the various environmental impacts identified by use of the Input-Output model.

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

Significance = Consequence (21) x Probability (7)

Where: Consequence = Severity (7) + Spatial Scale (7) + Duration (7)

And: Probability = Likelihood of an impact occurring (7)

The matrix calculates the significance rating out of 147, whereby Severity, Spatial Scale, duration and probability are each given a rating out of seven as indicated in Table 9-1. The weight assigned to the various parameters for positive and negative impacts in the formula.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in the EMP. The significance of an impact is then determined and categorised into one of four categories, as indicated in Table 9-3, which is extracted from Table 9-2.

Table 9-1: Impact assessment parameter ratings

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	***Social, cultural and heritage***			
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitat or eco system. Persistent severe damage.	Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.	International The effect will occur across international borders	Permanent: No Mitigation No mitigation measures/ natural process will reduce the impact after implementation.	Certain/ Definite. The impact will occur regardless of the implementation of any preventative or corrective actions.
6	Significant impact on highly valued species, habitat or ecosystem.	Irreparable damage to highly valued items of cultural significance or breakdown of social order.	National Will affect the entire country	Permanent: Mitigation Mitigation measures of natural process will reduce the impact.	Almost certain/Highly probable It is most likely that the impact will occur.
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate	Very serious widespread social impacts. Irreparable damage to highly valued items	Province/ Region Will affect the entire province or region	Project Life The impact will cease after the operational life span of the project.	Likely The impact may occur.
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year	On-going serious social issues. Significant damage to structures / items of cultural significance	Municipal Area Will affect the whole municipal area	Long term 6-15 years	Probable Has occurred here or elsewhere and could therefore occur.

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	***Social, cultural and heritage***			
3	Moderate, short-term effects but not affecting ecosystem function. Rehabilitation requires intervention of external specialists and can be done in less than a month.	On-going social issues. Damage to items of cultural significance.	Local Local extending only as far as the development site area	Medium term 1-5 years	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.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants.	Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Limited Limited to the site and its immediate surroundings	Short term Less than 1 year	Rare/ improbable Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures
1	Limited damage to minimal area of low significance that will have no impact on the environment.	Low-level repairable damage to commonplace structures.	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month	Highly unlikely/None Expected never to happen.

Table 9-2: Probability X Consequence Matrix

Significance										
		Consequence (severity + scale + duration)								
		1	3	5	7	9	11	15	18	21
Probability / Likelihood	1	1	3	5	7	9	11	15	18	21
	2	2	6	10	14	18	22	30	36	42
	3	3	9	15	21	27	33	45	54	63
	4	4	12	20	28	36	44	60	72	84
	5	5	15	25	35	45	55	75	90	105
	6	6	18	30	42	54	66	90	108	126
	7	7	21	35	49	63	77	105	126	147

Table 9-3: Significance threshold limits

Significance		
High	108- 147	
Medium-High	73 - 107	
Medium-Low	36 - 72	
Low	0 - 35	

9.1 Construction phase

Impact assessment

CRITERIA	DETAILS/DISCUSSION
Activities	• Construction of the pipelines.
Description of impact	The equipment and machinery involved such as compressors, back actors and haul trucks may impact on the surrounding ambient noise levels at the noise sensitive receivers near the project area
Mitigation	• As far as possible keep constructions activities to daylight hours;

CRITERIA	DETAILS/DISCUSSION				
Activities	• Construction of the pipelines.				
required	• Construction related machines and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; • Installing mobile noise barriers at the construction site when construction reaches 200metes from the properties mentioned in section 8.1.1. for the duration until construction reaches a point 200m away from the mentioned properties; • Switching off equipment when not in use; and • Fixed noise producing sources such as compressors to be either housed in enclosures or barriers put up around the noise source.				
Parameters	*Severity*	*Spatial scale*	*Duration*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	1	4	28
Post-Mitigation	2	2	1	3	15

9.2 Operational phase

Impact assessment

CRITERIA	DETAILS/DISCUSSION				
Activities	• Operation of booster pump station.				
Description of impact	The booster pump station will be a source of continuous noise during the operational phase.				
Mitigation required	• Booster pump station to be housed in a noise absorbent enclosure.				
Parameters	*Severity*	*Spatial scale*	*Duration*	*Probability*	*Significant rating*
Pre-Mitigation	1	1	5	1	7
Post-Mitigation	1	1	5	1	7

9.3 Decommissioning phase

Impact assessment

CRITERIA	DETAILS/DISCUSSION
Activities	• Construction of the pipelines.
Description of impact	The equipment and machinery involved such as compressors, back actors and haul trucks may impact on the surrounding ambient noise levels at the noise sensitive receivers near the project area

CRITERIA	DETAILS/DISCUSSION				
Activities	• Construction of the pipelines.				
Mitigation required	• As far as possible keep constructions activities to daylight hours; • Construction related machines and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and • Fixed noise producing sources such as compressors to be either housed in enclosures or barriers put up around the noise source.				
Parameters	*Severity*	*Spatial scale*	*Duration*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	1	2	5
Post-Mitigation	1	1	1	1	3

10 CUMULATIVE IMPLACTS

Cumulative impacts should be considered for the overall improvement of ambient noise levels. The proposed project is considered a causative source of noise pollution of low significance during the construction and operational phase. Because of the lack of other major sources of noise in the immediate area of the proposed project as well as the low significance of the impact, the proposed project in isolation is not considered a significant contributor to the cumulative noise impacts to the area.

11 RECOMMENDATIONS

As mentioned in the table in section 9.1, mobile noise barriers should be erected as soon as construction reaches 200m from the properties listed in section 8.1.1 for the duration until construction reaches 200m away from the properties. The noise barriers should be made up of panels, 4m wide and 3m high. Three or four panels that can be interlinked should be *in situ* when construction occurs within the impact zone (200m buffer) near the mentioned properties.

A noise monitoring programme should then be put in place during the time construction takes place in the impact zone. The monitoring programme will determine potential sources of noise, increases and decreases in noise levels, and determine whether the recommended mitigation measures are effective.

12 MITIGATION MEASURES AND MANAGEMENT PLAN

The objectives described for the recommended mitigation and/or management measures for each identified impact associated with each activity are presented below in Table 16. Table 16 lists the relevant activities for each phase of the project and provides information pertaining to the legal requirements, recommended actions plans, timing, responsible person and significance after mitigation.

Table 12-1: Information pertaining to the recommended mitigation measures for the construction phase

Activity	Objectives	Mitigation/Management measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person
Construction phase							
Pipeline construction	To prevent the noise emanating from the construction machinery from impacting on the sensitive receivers	• Construction activities to only take place during daylight hours; • Construction-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; • Switching off equipment when not in use; and • Fixed noise producing sources such as compressor to be either housed in enclosures or barriers put up around the noise source. The barriers should be installed between the noise source and sensitive noise receptor, as close to the noise source as possible.	Vehicles to be service according to service plan. Machinery to be switched off when not in use.	National Environmental Management Air Quality Act (Act 39 of 2004) Environmental Conservation Act (Act 73 of 1989)	Noise monitoring programme to be implemented when construction takes place in impact zone at mentioned properties. Regular vehicle inspections.	Construction	Environmental Manager
Operational phase							
Operation of booster pump station	To prevent the noise emanating from the booster pump station from impacting on the sensitive receivers	• Booster pump station to be housed in enclosures or barriers put up around it. The barriers should be installed between the noise source and sensitive noise receptor, as close to the noise source as possible. A basic rule of thumb for barrier height is: Any noise barrier should be at least as tall as the line-of-sight between the noise source and the receptor, plus 30%. So if the line-of-sight is 10m high, then the barrier should be at least 13m tall for best performance (Sound Fighter Systems, 2007).	Throughout operational phase	National Environmental Management Air Quality Act (Act 39 of 2004) Environmental Conservation Act (Act 73 of 1989)	Noise monitoring programme to be followed. Regular vehicle inspections.	Operational phase	Environmental Manager
Decommissioning phase							
Decommissioning activities	To prevent the noise emanating from the machinery from impacting on the sensitive receivers	• Decommissioning-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; • Switching off equipment when not in use; and • Limiting decommissioning activities to daylight hours where possible.	Vehicles to be service according to service plan. Machinery to be switched off when not in use.	National Environmental Management Air Quality Act (Act 39 of 2004) Environmental Conservation Act (Act 73 of 1989)	Noise monitoring programme to be followed. Regular vehicle inspections.	Decommissioning phase	Environmental Manager

13 MONITORING PLAN

It is recommended that the monitoring plan be implemented to determine potential sources of noise, increases and decreases in noise levels, and determine level of mitigation required. Components to be included in the proposed monitoring plan are discussed in Table 13-1 below:

Table 13-1: Monitoring plan

Method	Monitoring locations	Frequency	Target	Reporting
Sampled in accordance with the Free State Noise Control Regulations PN 24 of 1998 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 properties listed in section 8.1.1 when construction activities reach the impact zone at the specific property	To be conducted only when construction activities have reached the impact zones of each listed property; Once it is established that the mitigation measures have decreased the specific noise levels from the construction activities, the noise monitoring should cease.	Noise levels from the proposed construction activities should not measure above the SANS 10103:2008 rating limit.	A report must be compiled after the monitoring has been carried out then submitted to management to ascertain compliance with the required standards

14 STUDY SUMMARY

In terms of the baseline conditions, it is gathered that the existing ambient noise levels on the western boundary of Sasolburg are characteristic of urban surroundings.

The findings have indicated by means of dispersion modelling that the noise produced by the proposed construction activities will measure above the SANS guidelines for rural districts at the relevant noise sensitive receivers listed in section 8.1.1. The impact will only occur when the construction activities are with the impact zones (200m buffer) of each listed property. During the operational phase however, the noise levels are not expected to impact on any surrounding noise receptors. The reason for this is due to the main continuous noise producing source being the booster pump station, which the calculated noise levels of will not measure above the existing ambient at any surrounding receptor.

15 CONCLUSION

It is concluded that the proposed construction activities will cause a noise disturbance at certain farmsteads, but only for a very short duration. The recommended mitigation measures during the periods of noise disturbance should lessen the significance of the impact. The recommended mitigation measures along with the short duration equate to the overall significance of the impact being low. The operational phase will also have a low significant impact on the surrounding areas.

16 REFERENCES

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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

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Appendix A: Curriculum Vitae and Declaration of Independence

Lukas Sadler

Lukas Sadler
Environmental Consultant
Digby Wells and Associates

EDUCATION
2002 – 2004: BCom Environmental Management (North West University)
2009: Short course in Occupational and Environmental Noise
2010: Short course in Air Quality Management

PROFESSIONAL AFFILIATIONS
The National Association for Clean Air (NACA)

EMPLOYMENT

May 2006 – July 2007:	West View Rail (pty) ltd (London)
November 2007 - Present:	Digby Wells Environmental

PAST 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.

I am currently working at Digby Wells Environmental in the GIS and Air Quality Department, where I am responsible for the Air Quality and Noise Impact Assessments relating to EIA/EMP's, as well as assisting with the compilation of reports such as environmental impact assessments. 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 and Sierra Leone.

My core focus is working on Environmental Noise impact assessments as well as Air Quality impact assessments, which includes the assessment, remediation and management of impacts related to noise and air quality.

Further responsibilities and experience gained at Digby Wells Environmental currently include but are not limited to:

- Assist with the compilation of EIA's and EMP's;
- Dust fallout monitoring (installation and maintenance for baseline as well as continuous compliance monitoring) ; and
- Noise monitoring (baseline as well as continuous compliance monitoring).

SPECIALIST DECLARATION OF INDEPENDENCE

I, Lukas Sadler, declare that I –

- Act as the independent specialist for the undertaking of a specialist section for the proposed The Sasol Sigma Colliery's Ash Backfilling Project;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2006;
- Do not have nor will have a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2006;

Lukas Sadler

Name of the Specialist

Signature of the Specialist

Digby Wells and Associates (PTY)Ltd

Name of company

22/10/2013

Date