CAMDEN GAS PROJECT

NOISE MANAGEMENT PLAN

ACOUSTICS AND AIR

REPORT NO. 06159-L

WILKINSON MURRAY

CAMDEN GAS PROJECT

NOISE MANAGEMENT PLAN

REPORT NO. 06159-L
FINAL

AUGUST 2008

PREPARED FOR

AGL GAS PRODUCTION (CAMDEN) PTY LIMITED
101 MILLER STREET
NORTH SYDNEY

Wilkinson Murray Pty Limited
ABN 41 192 548 112 • Level 2, 123 Willoughby Road, Crows Nest NSW 2065, Australia • **Asian Office: Hong Kong**
t +61 2 9437 4611 • **f** +61 2 9437 4393 • **e** acoustics@wilkinsonmurray.com.au • **w** www.wilkinsonmurray.com.au

Document Control

Camden Gas Project

Noise Management Sub Plan

Approval:

Authorising Officer	David Kelly
Title	Head of Land and Approvals, Gas and Power Development
Signature	
Date	

Revision Status:

Revision	Date	Prepared By	Checked By	Approved By	Comments

TABLE OF CONTENTS

DEFINITIONS

NMSP Noise Management Sub Plan.

DECC Department of Environment and Climate Change

DoP Department of Planning.

INP NSW Industrial Noise Policy, DEC January 2000.

ECRTN Environmental Criteria for Road Traffic Noise, DEC, May 1999.

ENCM NSW Environmental Noise Control Manual (DEC Ref. 94/31).

NGLG Environmental Noise Management, Noise Guide for Local Government (DEC Ref.2004/59).

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

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

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

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

Equivalent Continuous Sound Pressure Level (L_{Aeq}). The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

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

SWL (Sound Power Level). Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.

SPL (Sound Pressure Level). The level of noise, expressed in decibels, as measured by a standard sound level meter with a microphone.

SLM (Sound Level meter). An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.

1 INTRODUCTION

This Noise Management Sub Plan (NMSP) has been prepared to supplement the Environment Management Plan (EMP) for the Camden Gas Project ('the project' or 'CGP').

The Sub Plan has been developed to specifically address and manage potential noise emissions for all the operations of the CGP and it is based on the previously prepared and approved Noise Management Plans and Monitoring Programs, the Environment Health and Safety Management Plans and the current AGL Energy Life Guard system. More information on the structure of the Environmental Management System (EMS) for the project is available in the EMP.

It covers both the ongoing Production works at the Rosalind Park Gas Plant and existing well sites, and also establishes best practice noise management measures for the construction, operation and maintenance of new gas field developments for the Camden Gas Project.

1.1 Objectives and Targets

This NMSP addresses requirements for noise monitoring during both construction and operation.

Construction Noise

Objectives:

- To comply with the construction standards for noise control.
- To minimise noise during the construction phase.
- Limit work activities (other than drilling and gas plant operations) to daylight hours between 7:00am and 6:00pm weekdays and between 8:00am and 1:00pm on Saturday. No work on Sundays or public holidays except in emergencies.
- Best practice noise management measures for Construction works

Targets:

- Zero exceedances of noise goals
- Zero non conformances with construction hours
- Zero complaints received from sensitive receivers

Operational Noise

Objectives:

- To comply with the operations standards for noise control.
- To ensure that there are no unresolved noise related complaints from the public.
- Best practice noise management measures for Production Operation works

Targets:

- Zero exceedances of noise goals from Noise monitoring results.
- Zero complaints received from sensitive receivers

2 REQUIREMENTS

2.1 Legislative Requirements and Guidelines

Legislation and Guidelines relating to the management of noise includes:

- Protection of the Environment Operations Act 1997 (POEO Act),
- Protection of the Environment Operations (General) Regulation 1998,
- Protection of the Environment Operations (Noise Control) Regulation 2000,
- NSW Industrial Noise Policy (INP), DEC January 2000,
- Environmental Criteria for Road Traffic Noise (ECRTN), DEC, May 1999,
- NSW Environmental Noise Control Manual or ENCM (DEC Ref. 94/31),
- Environmental Noise Management, Noise Guide for Local Government (DEC Ref.2004/59).

The legislation is intended to limit transmission of "offensive noise" as defined in the POEO Act. Guidelines from the INP, ECRTN, ENCM and Noise Guide for Local Government aid in assessment of noise and design of noise control procedures.

2.2 Key Licence/ Development Consent Requirements

There are a number of Development Consent Conditions and Environmental Protection Licence Conditions that relate to noise. These range from preparing management plans, noise limits, noise monitoring and reporting requirements. A summary of the key requirements for Plans, Programs and Protocols is presented below (refer to the relevant Consent Conditions or Licences for further detail). The requirements are listed in Table 2-1.

This Noise Sub Plan and its Appendices have been prepared to fulfil the requirements for a Construction and Operational Noise Management Plan as well as requirements for Noise Monitoring Programs. Gas field and site specific Noise Overviews have be prepared, where required, to supplement this Sub Plan with site specific criteria, sensitive receivers, monitoring requirements and site specific mitigation measures.

Table 2-1 Requirements

Name/ No.	Condition	Requirement
DA 15-1-2002-i Fields – RBTP, Apap, Joe Stanley, Johndilo, Loganbrae, Lipscombe, Mahon	CoC 19 (Sch 3)	Noise Management Plan
DA 246-8-2002i Field – Kay Park	CoC 18, 19 (Sch 3)	Well Maintenance Management practices and Drilling Management practices
DA 282-6-2003-i Fields – RPGP, Rosalind Park, Wandinong, EMAI (EM01-20, 38-40), Glenlee (GL05, 07-10, 14-17)	CoC 34, 38 (Sch 4)	Construction and Well Maintenance Noise Management Protocol and an Operational Noise Management Plan
DA 75-4-2005 Field - Sugarloaf	CoC 19, 20 (Sch 2)	Construction Noise Management Protocol and a Gathering System and Trunk Line Maintenance Protocol

DA 171-7-2005 Field – El Bethel (not commenced)	CoC 4 & 5 (Sch 3)	Construction Noise Management Protocol and a Gathering System and Trunk Line Maintenance Protocol
PA 06_0138 Field – EMAI (EM23-37)	CoC 3 & 6 (Sch 3)	Construction Noise Management Plan and Noise Monitoring Program
PA 06_0137 Field - Razorback	CoC 3 & 6 (Sch 3)	Construction Noise Management Plan and Noise Monitoring Program
PA 06_0291 Fields – Spring Farm, Menangle Park	CoC 3 & 7 (Sch 3)	Construction Noise Management Plan and Noise Monitoring Program
Environment Protection Licence 12003	Condition L 6.7	Well, Gathering System and Trunk Line Maintenance Noise Management Protocol
AGL Life Guard System		Compliance Guide *Environmental Noise LG-HSE-CG-069*

3 NOISE SOURCES

Experience with the project conducting impact assessments and monitoring during different phases (construction, maintenance and production) for various activities has shown that the most significant noise impacts occur during construction. The noise generated during well and gas plant operation, maintenance and final closure are considered minor compared to construction.
A large number of Development Consents have been issued for the project since 2002 with differing noise conditions and requirements which reflect the best practice of the day. Many of the requirements of the Consents and Licences relate specifically to construction activities, or have been completed, or have expired.

AGL proposes to adopt a best practice approach to operational noise management for the whole project to ensure that the same procedures are used across the various fields. This will streamline and simplify procedures and compliance management and will not affect operational noise criteria for different areas in accordance with the INP.

3.1 Construction Noise

The results of the noise assessments completed for the project to date have established that the main noise impacts generated during the construction phase of the project include:

- Drilling of wells;
- Fracture stimulation of the coal seam (fraccing) where required; and
- Earthmoving activities associated with well site construction, trenching for the gas gathering system and upgrade of access roads.

These works are best described as civil earthworks and drilling processes. While earthmoving works are undertaken mostly using conventional construction plant such as excavators and graders, drilling processes involve specialised plant such as high-performance compressors and drilling machinery.

3.2 Operational Noise

Operational noise potentially impacting on nearby receivers includes:

- Noise emanating from free-flow wells;
- Noise emanating from pump-operated wells; and
- Noise from periodic work over operations for well maintenance.

Noise emanating from free-flow wells is dependent on the productivity of the well and the design of the surface well head equipment, with highly productive wells typically generating slightly more noise than the less productive wells.

Noise from operating wells is also dependent on factors such as:

- Well head design;
- The direction and distance of the neighbouring residences;
- Meteorological factors such as wind and temperature inversion;
- The number of wells at the surface location;
- Maintenance and workover of wells.

3.3 Gas Plant

Potential noise sources at the Rosalind Park Gas Plant are:

- Compressors;
- Cooling fans; and
- The flare.

These sources have been fitted with acoustic treatment in order to comply with noise requirements.

3.4 Gas Gathering Line Construction

Noise from the gas gathering line construction is from the trenching machine. Because the machine moves continuously during the construction, potential noise exposure is usually limited to one or two days. The duration depends on the terrain being trenched, and the distance to the receiver.

3.5 Monitoring History

The recommendations of assessments implemented to date and monitoring results have been used over the life of the project to make improvements to operations.

The approach established for future construction activities, starting with Spring Farm and Menangle Park is to move from a prescriptive approach to an individual site assessment to ensure compliance within the surrounding environment.

This is undertaken via a process of modelling the existing noise environment, designing the operations on a case by case basis to fit with the environment, commissioning the sites and then monitoring to ensure compliance.

Monitoring has been undertaken both at well sites and at residential locations throughout the project. Monitoring at well construction sites has allowed the ongoing modification to plant and processes to lower source noise levels.

Examples of the noise reduction measures undertaken to date include:

- Selection of quieter equipment;
- Mud pump attenuation, including placing pumps on the ground to increase shielding of the main noise source and placing the pumps within improved acoustic enclosures;
- Improvements to site design and layout, including identification of mud pump and drill rig noise directionality allowing orientation away from receivers
- Use of noise mufflers;
- Ongoing investigation of quieter replacement equipment for construction and maintenance;
- Appropriate acoustic content in site inductions;
- Monitoring at well heads to predict operational noise from various well heads and enclosures; and
- Design of wellhead enclosures to reduce operational noise.

Extensive noise monitoring has given AGL greater experience in minimising noise and allows increased confidence in the accuracy of the latest noise models which depend on prediction of noise propagation from well sites at various distances. This monitoring information forms the basis of ongoing mitigation measures to ensure criteria can be met if there are changes in the background noise levels, or if sensitive receivers move closer to the well surface locations.

Monitoring has been completed on the major aspects of AGL activities in Camden including:

- Gas plants;
- Various phases of well drilling;
- Producing wells;
- Well maintenance; and
- Various construction mitigation techniques as described above.

Monitoring has been both at source and at residential receivers, allowing verification of noise prediction and confidence in mitigation techniques.

4 MANAGEMENT MEASURES

4.1 Environmental Management Mitigation Measures

This section describes a number of general mitigation measures which will be implemented project wide based on the level of detail available at this time regarding the specific work sites and areas.

AGL has put in place a continuous improvement process for noise as part of the detailed Site Design process and continues to implement all reasonable and feasible noise source controls necessary to reduce noise from plant and equipment. Noise treatments have been site specific and applied as necessary.

Experience over recent years using best practice processes has allowed development of a range of noise control measures that may be applied to various situations as required. For example, continuing investigation of the principle construction noise sources has led to the extensive acoustic modifications of mud pumps with in-built noise control.

Table 4-1 summarises the management measures, responsibility and timing of the procedures.

Table 4-1 Noise Management Measures

Activity	Management Measures	Responsibility
Induction	The employee and contractor induction shall inform all site personnel about noise management measures, construction hours and nearest sensitive receivers. All employees are responsible for managing noise from their work activities and working in a manner to minimise noise.	Field Safety & Environment Officer/ All Personnel
Hours	Limit construction works other than approved 24hr activities to 7.00am -6.00pm Monday to Friday and 8.00am-1.00pm Saturday.	Project Manager
Equipment	Ensure that plant and equipment is well maintained and carry out maintenance as required.	Project Manager
Site Design and Planning process	All reasonable and feasible noise source controls to reduce noise from plant and equipment during construction shall be investigated and applied during the site design and planning process.	Site Design Committee
	Maximise offset distance between noisy plant items and nearby noise sensitive receivers and orient equipment away from sensitive areas where practical (i.e. drilling rig).	Site Design Committee and Project Manager
	Implement site specific recommendations arising from the Noise Assessment	Site Design Committee
Notification	Notice of works will be provided to relevant affected residents at least 5 days prior to commencing construction activities.	Land & Compliance Officer
Monitoring	Carry out environmental noise monitoring and keep records in accordance with Section 5 and relevant Appendices of this report.	Field Safety & Environment Officer
RPGP operations	Ensure that plant and equipment is well maintained and carry out maintenance as required.	Head of Production

4.2 Identification of Residential Receivers

The nearest receivers are identified for each location in the noise assessment in the environmental assessment process, however, these may change with time.

Over the lifetime of the project, given the nature of continuing urban development in the area, it is possible that the residential receivers identified will no longer be the most relevant by the time the wells are constructed.

4.3 Hours of Work

With the exception of well drilling and emergency situations the construction and operational hours are:

- Monday to Friday 7.00am-6.00pm
- Saturday 8.00am-1.00pm
- No construction work is to take place on Sundays or Public Holidays.

For the drilling stage of construction, working hours may be 24 hours per day depending on the consent conditions.

The Rosalind Park Gas Plant operates 24 hours per day, 7 days per week.

4.4 Training and Awareness

The site induction and ongoing health and safety and environment training programmes will reinforce to employees and contractors the need for controlling environmental performance at the site. Noise will be specifically addressed during the site induction and training will include familiarisation with site noise targets and environmental objectives. All site employees will have responsibility for managing noise from their work activities and working in a manner so as to minimise noise emissions. More information on training is available in section 5.2 of the EMP.

4.5 Notification of Construction

- Notice of works will be provided to landowners and appropriate relevant affected receivers at least 5 days prior to commencing planned construction activities.
- The notification will be letter boxed and will describe the scope and timing of the works along with AGL contact details for further information.

4.6 Well and Gas Gathering Line Maintenance Protocol

The following Protocol for Maintenance activities will be applied prior to undertaking maintenance activities at well surface locations and along gas gathering lines.

- identify noise criteria applicable to the gas field;
- identify whether mitigation measures are applicable to maintenance activities;
- implement mitigation measures (if any) demonstrating best practice;
- send out notice to relevant affected receivers for planned well maintenance activities in accordance with Section 4.5 above as appropriate;

- identify if further community consultation is needed based on the type of maintenance and its duration;
- complaints (if any) are to be handled in accordance with Section 5.3.4 of the EMP;
- hours of work are to be in accordance with Section 4.3 above;
- consider the contingency measures that can be implemented where noise complaints are received; and
- identify if noise monitoring of the activity is applicable and if so, implement in accordance with Section 5 of this Plan and relevant Appendices.

5 MONITORING AND REPORTING

5.1 Monitoring of Rosalind Park Gas Plant

Monitoring of the Rosalind Park Gas Plant is done quarterly by independent 3rd party specialist consultants. The conditions, noise targets, and monitoring locations are described in Appendix A.

5.2 Monitoring of construction

Site specific monitoring requirements during the life of the Camden Gas Project are usually required during construction as it is the phase with the highest potential for noise impact. As the construction activities in the majority of gas fields are complete, this section will cover general construction and existing operational monitoring requirements with ongoing site specific monitoring to be described in the Appendix.

The need for operational noise monitoring in existing fields could be triggered by:

- Receipt of noise complaints;
- Use of new equipment (monitoring to confirm); and
- Variations to approved noise management measures.

Detailed monitoring procedures are given in the Appendix. The following points summarise the procedures that will be common to all noise monitoring for the project.

Measuring instrument: Monitoring will consist of attended monitoring carried out in accordance with AS1055: Acoustics – Measurement and Description of Environmental Noise and the DECC INP.

Measurement conditions: Meteorological conditions must be obtained for the time of monitoring. This is to include wind speed and direction as well as data suitable for quantifying the presence or otherwise of temperature inversions.

Measurement Interval: The monitoring interval shall be a 15 minute period.

Measurement Parameters: For construction noise the measurement parameter is $L_{A10,15min}$. For operational noise the measurement parameter is $L_{Aeq,15min}$.

Background Noise: The background noise level will be reviewed and if necessary re-established.

Monitoring Records and Reporting: For each monitoring site, the following information shall be reported:

- Location, data and time;
- Instrument, calibration status and calibration level before and after measurements;
- Parameters measured and their results at each distance measured;
- Weather conditions;
- Background Noise Level; and
- Sound levels from specific identifiable sources.

5.3 Internal Reviews

Regular reviews of work practices and on site equipment to identify where practices can be improved will be performed prior to moving to new drilling sites as part of the Site Design and planning process and if noise related complaints are received. This process will involve:

- Identifying the noise sources particular to the site;
- Random audits will be used to proactively anticipate noise issues and instigate a resolution process and to ensure that previously identified control measures continue to be implemented; and
- Regularly inspect and maintain on site equipment in good working order so as to generate less noise. This includes ensuring all noise reduction devices such as mufflers and silencers are fitted correctly and operative.

5.4 Reporting

A noise compliance monitoring statement will be submitted to the DECC on an annual basis with the Annual Return. The Report will report compliance with the operational noise limits specified in the EPL (L6.1).

Details of project performance against noise objectives will be reported in the AEPR.

6 RECORDS

All records required to be kept by the EPL will be in a legible form, kept for at least 4 years and produced to any authorised officer of the DECC who asks to see them in accordance with the requirements of the Environment Protection Licence.

7 COMPLAINTS

The complaints management and incident reporting procedures are described in Section 5.3.4 and 6.5 of the EMP.

Should complaints be received regarding the effect of noise from the activities, the noise specific procedures shall include (but not be limited to):

- Inspection of the location from which the complaint originated;
- Measurement of noise levels (as relevant);
- Comparison of the measured levels with the equivalent targets;
- Identification of engineering control or management procedure (if appropriate) to be adopted to reduce the levels at the complainant location; and
- Monitoring after implementation of the control or procedure to establish the level of reduction obtained.

8 NOISE MONITORING PROCEDURES

8.1 Pre-field checks

Certain checks should be made before field measurements are obtained. These checks include:

- checking the calibration status of instruments from copies of calibration certificates or labels on instruments;
- inspecting instruments for physical damage, particularly the thread, diaphragm and protective grid of the microphone; (Caution: Do not remove the protective grid of the microphone and never touch the diaphragm.)
- checking the battery condition of the SLM;
- placing the microphone protection cap (if available)on the microphone; and
- storing the SLM with no loose equipment in its carrying case if one is available.
- The equipment is expensive and sensitive and must be treated accordingly. In-transit instructions include:
- protecting equipment from unnecessary shock and vibration;
- protecting equipment from extremes of heat (never leave equipment in a locked vehicle for any length of time during hot periods); and
- protecting equipment from moisture/condensation.

8.2 Making noise measurements

Choose measurement positions taking into account:

- the weather and other site considerations such as rain, wind noise and insect noise;
- the location and direction of any noise source/s;
- the most sensitive position at the affected premises where maximum noise levels are expected;
- the need to avoid reflecting surfaces (where possible); and
- the need to avoid atypical barriers (elevate microphone if appropriate).

Sketch measurement position(s) on the standard noise measurement form and include:

- living areas identified as likely to be particularly affected by the source noise;
- noise sensitive areas of premises;
- noise source(s) direction and approximate distances;
- relevant barriers, mounds, vegetation and ground cover in the separation zone;
- wind direction and approximate speed;
- location of measurement position(s) indicating distances from fixed reference points which are unlikely to change; and
- identification of other land uses in the vicinity of the affected premises.

8.3 Use of instruments

Set up the instrumentation at the appropriate location and allow it to stabilise to existing atmospheric conditions. Set or check the status of all function settings.

8.4 Measurement position

Normally, measuring positions should be selected outdoors where representative maximum adjusted noise levels are expected or indicated by complainants.

Outdoor noise levels should normally be measured 1.2m– 1.5m above ground level or, in the case of elevated microphones, at the centre of windows.

The position(s) should be located:

- within the apparent boundaries of land - at or near the boundary;
- within 30m during the day and evening period, and 3.5m during the night period, of buildings normally used for human habitation (not hotels, motels and similar);
- within 3.5m of the external walls of educational buildings, the wards or bedrooms of hospitals, hotels, motels and similar.
- at noise-sensitive locations on the boundaries of established commercial or industrial premises; and
- within the apparent boundaries of passive recreation areas, such as picnic grounds, public gardens and parks.

The time periods commonly used for noise measurement purposes are:

- day: 7am–6pm
- evening: 6pm–10pm
- night: 10pm–7am

Note: Microphones could need to be higher than 1.2m–1.5m above ground level in certain situations. The principle to be applied when determining if the microphone height needs to be increased is whether the sound pressure level of the noise can be accurately represented at 1.2m–1.5m above ground.

Situations where measurement at 1.2m–1.5m above ground level may not give accurate or complete determination of the sound pressure level include the following:

- low-set residences where a high boundary fence is close to the affected residence, (i.e. several metres away), and is providing a shield for a noise source(s), and is in turn generating a semi-reverberant sound field at low heights; and
- high-set residences. In these situations, measurements might need to be conducted at 1.2m–1.5m above ground level as well as at elevated microphone heights to ensure an accurate and representative determination of the adjusted average maximum sound pressure level is made.

Situations might also arise where high boundary fences act as shields in the path of the intrusive noise from the source to the residence, and where the residence is well separated from the boundary fence, such as when the fence is along the rear boundary. In these situations, measurement position(s) should be selected with a view to ensuring the principle of accurately and completely determining the sound pressure level is followed. If people affected are unlikely to be normally exposed to noise where maximum levels are expected, alternative points within the apparent boundaries of affected areas or premises can be used.

Measurement points closer to noise sources, or within or outside commercial or industrial premises and providing the worst-case noise situation, might be selected to assist assessment by:

- avoiding contributions from other sources;
- reducing atmospheric influences on noise propagation; or
- ensuring ready access to measurement points not associated with affected premises.

Noise should be measured during fine weather conditions with calm to light winds (0–10km/h). A wind direction favouring noise propagation from source(s) to receiver(s) should be chosen if this is a true representation of the normal situation. Different conditions and their effects on measurements should be noted.

8.5 Background sound pressure level

Background sound pressure level $L_{A90,T}$ is the A-weighted sound pressure level obtained using time-weighting 'F' exceeded for 90 percent of the measuring period 'T'.

The acceptable equivalent of $L_{A90,T}$ is RBL, the A-weighted sound pressure level obtained using the procedure in the INP.

The background sound pressure level is commonly denoted as background noise level and background level.

Obtaining an accurate background sound pressure level is important as it may be one of a number of criteria used to consider whether a noise from a source is reasonable. It may also form the basis of a reduction in noise emission levels to an acceptable level.

Complete and accurate determination of the background sound pressure level should be considered as an element in a successful environmental noise investigation. It can be used as the basis for the noise level limit set for noise from the source premises and therefore can be the basis for requiring a reduction of noise emissions to acceptable levels.

When possible, the same measuring points selected for source noise measurement should be used. Remote points should not be used to obtain background noise levels for determining limits.

Background noise measurements should be made at preferred locations in the absence of the noise being investigated.

If measurements cannot be made at an affected place because of other dominant noise sources, measurements are to be made instead at similar locations chosen very carefully to ensure equivalent background levels caused by traffic flow or general industrial activity.

Local knowledge of the area might be necessary to make appropriate selections.

Background noise levels should be measured during fine conditions with calm to light winds (0–5m/s). Different conditions and their effects on measurements should be noted.

Noise levels contributing to $L_{A90,T}$ should exclude noise from close traffic, birds, insects, animals and other similar noises, unless such noise is a normal or seasonal feature of the location which cannot be practically avoided. All noise levels should be written down and kept as a record.

Note: In relatively quiet areas, insect noise might tend to dominate background noise levels for large parts of the year, particularly during the warmer months. Lower ambient and background noise levels might generally be recorded during the winter months when insect activity is absent or at low levels. Careful consideration should be given to measurements of background noise levels in such instances.

8.6 Measurement of Noise from Well Site

The noise level of the alleged excessive noise will be measured at the chosen measurement point and as close as possible to the time of day when the noise is alleged to be excessive. The time interval for measurement, T, should be long enough to ensure that recorded data provide representative descriptions of measured noise.

For all measurements use time-weighting 'F' and measure the noise under investigation, unaffected by extraneous noise. Extraneous noise means all noise not emitted from the source(s) or premises of concern and includes such things as noise from passing traffic, seasonal insects and barking dogs.

For construction noise including fraccing, measure the $L_{A10,T}$.

For operational noise measure the $L_{Aeq,T}$.

8.7 Reporting

The following information should be recorded in the noise measurement form.

1. Description of source(s) and surroundings

The report should include the following:
- description of the sound source(s);
- location of source(s);
- description and sketch of physical environment, including walls, ceilings, or room contents (if appropriate). If outdoors, trees, structures, reflecting objects, topographical features, and any other relevant features;
- photographs if appropriate;
- air temperature and relative humidity where affected premises are greater than 250m from source locations;
- wind speed and direction; and
- operating conditions of sound source(s).

2. Instrumentation

For all items of equipment used for the measurements, including calibration equipment, the following information should be recorded:
- name;
- manufacturer;

- type;
- serial number(s) (also of microphones, if removable); and
- date of most recent laboratory calibration.

3. Acoustic data

The report should include the following, as appropriate:

- location(s) of the measurement position(s), and microphone orientations;
- type of noise being measured;
- noise levels measured;
- frequency weighting used for each measurement;
- time-weighting characteristic for each measurement;
- duration of each measurement period;
- background noise level with the source not in operation if possible;
- date and time when each measurement was performed (include justification of measurement period);
- tonality adjustment;
- impulsiveness adjustment; and
- any other data considered appropriate.

In addition, the following qualitative information could be included to help interpret the results:
- the possibility of locating the origin of the noise;
- the possibility of identifying the sound source;
- the character of the sound such as broad-band, impulsive, or tonal; and
- other noise source(s) apparent at the time of measurement.

8.8 References

NSW DECC Industrial Noise Policy

AS1055-1997 Acoustics — Description and measurement of environmental noise
Part 1: General procedures
Part 2: Application to specific situations
Part 3: Acquisition of data pertinent to land use

AS1259-1990 Acoustics — Sound level meters
Part 1: Non-integrating
Part 2: Integrating-averaging

AS1633-1985 Acoustics — Glossary of terms and related symbols

AS2659-1988 Acoustics — Guide to the use of sound measuring equipment
Part 1: Portable sound level meters

AS/NZS 4476:1997 Acoustics — Octave-band and fractional-octave-band-filters

Note

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

Quality Assurance

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

AAAC

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

APPENDIX A

CURRENT MONITORING REQUIREMENTS IN OPERATING FIELDS

NOISE OVERVIEW: ROSALIND PARK GAS PLANT

A.1.1 Noise Limits

Noise from the Rosalind Park Gas Plant premises must not exceed the noise limits specified in the Environmental Protection Licence (No. L12003) and Conditions of Approval (DA 282-6-2003) as summarised below:

EPL Condition L6.1 & DA 282-6-2003 CoC 29 (Sch 4): Noise Limits

Receiver Location	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{A\ eq(15\ minute)}$	Flaring (Night) $L_{A1(1minute)}$
R1 Medhurst Road, Gilead	35	35	35	45
R7 Mt. Gilead, Gilead	37	36	36	45

Noise for flaring event, must not exceed the noise limits in the table below:

EPL Condition L6.3 & DA 282-6-2003 CoC 31 (Sch 4): Flaring Events

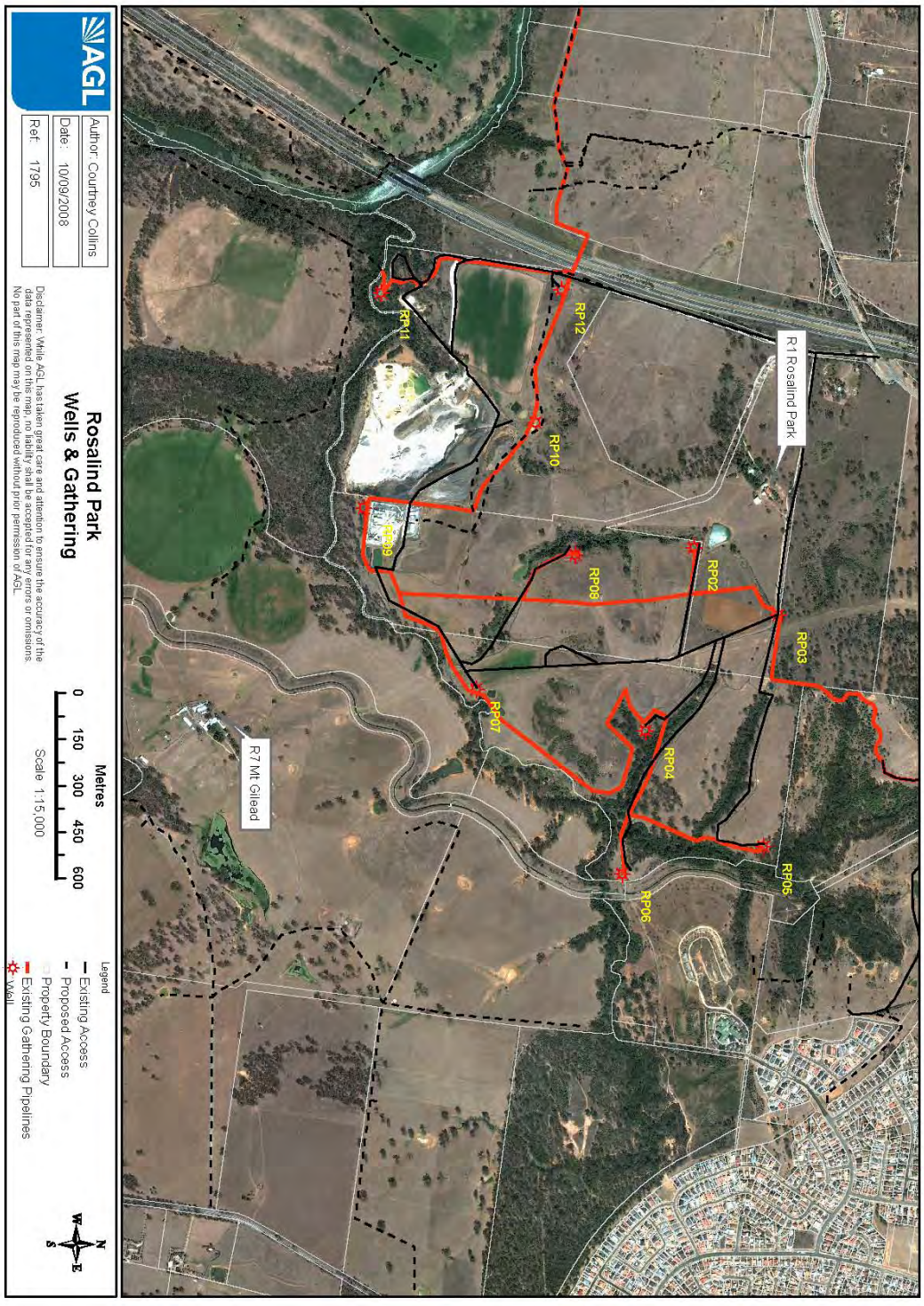
Receiver Location	Type of Flare Event	Duration of Flare Event	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{A\ eq(15\ minute)}$
R1 Medhurst Road, Gilead	Spill valve	> 2.5 hours	35	35	35
	Compressor blowdown (ESD)	15-60 minutes	40	40	35
	Compressor blowdown (shut down and unload)	6-15 minutes	42	42	37
R7 Mt. Gilead, Gilead	Spill valve	> 2.5 hours	37	36	36
	Compressor blowdown (ESD)	15-60 minutes	42	41	40
	Compressor blowdown (shut down and unload)	6-15 minutes	44	43	37

The above limits do not apply to pressure safety valve (discharge) and pressure safety valve (suction) flaring events.

A.1.2 Nearest Receivers

The receiver locations R1 and R7 are as shown in Figure A. 1.

Figure A. 1 Approximate Quarterly Compliance Noise Monitoring Locations



A.1.3 Monitoring Requirements

Noise monitoring will be undertaken at the nearest receivers outlined above in order to assess compliance with the noise limits set out in EPL Condition L6.1 and DA 282-6-2003-I COC 29 (Sch 4).

In accordance with the EPL conditions, noise from the premises is to be measured at any point on or

within the residential boundary or at any point within 30 m of the dwelling (rural situations) where the dwelling is more than 30 m from the boundary to determine compliance with the day, evening and night time criteria and at 1m from the dwelling façade to determine compliance with the flaring (night) criteria.

Attended noise monitoring will be done quarterly in accordance with the *NSW Industrial Noise Policy August 2000* and *AS 1055: "Acoustics – Description and Measurement of Environmental Noise".*

Condition 41 (Sch 4) DA 282-6-2003i: Following the first 12 months of continuous noise monitoring, during the life of the Development or as otherwise agreed by the Director-General, the Applicant shall undertake quarterly attended monitoring at the Mt Gilead Homestead to the satisfaction of the Director-General, in accordance with the NSW Industrial Noise Policy and AS 1055: "Acoustics – Description and Measurement of Environmental Noise".

A.1.4 Site Specific Mitigation Measures

The following mitigation measures have been implemented at the Rosalind Park Gas Plant:

- A noise wall was erected adjacent to the cooling fans for compressor No.1 to minimise noise from the cooling fans.
- Acoustic louvers were installed above the cooling fans for compressor No.1 to minimise noise from the cooling fans.
- Fan blades with lower noise emissions were selected at the design phase for the cooling fans of compressors 2 and 3.
- Changes made to the plumbing of the TEG pump to minimise noise emissions.

NOISE OVERVIEW: RAZORBACK

A.1.5 Noise Limits

Best endeavours will be made to undertake construction activities so as to comply with the construction noise goals specified in the Conditions of Consent (PA_0137) as summarised below.

PA_0137 Condition 2 (Schedule 3): Construction Noise Goals

Location	Day $L_{A10(15\ minutes)}$
Any residential receiver	54

Noise from the operation of the wells will not exceed the noise criteria specified in the Conditions of Consent (PA_0137) as summarised below.

PA_0137 Condition 4 (Schedule 3): Operational Noise Criteria

Location	Day $L_{A10(15\ minutes)}$	Evening $L_{A10(15\ minutes)}$	Night $L_{A10(15\ minutes)}$	Night $L_{A10(1\ minute)}$
Any residential receiver	39	39	35	45

In order to assess compliance with the above noise limits at any sensitive receiver, an assessment will be made against the sound power levels (SWL) used in the EA assessment to carry out the operational noise assessment. These SWLs are summarised below.

Well Identification No	Well Type	SWL (dBA)
EM19	Free-Flow	81_1 (or 56dBA at 7 m)
RP11	Pump-operated	81 (or 56dBA at 7 m) on the quieter side 93 (or 68dBA at 7 m) on noisier side

Note: 1. Well EM19 was highly productive during the time of measurement.

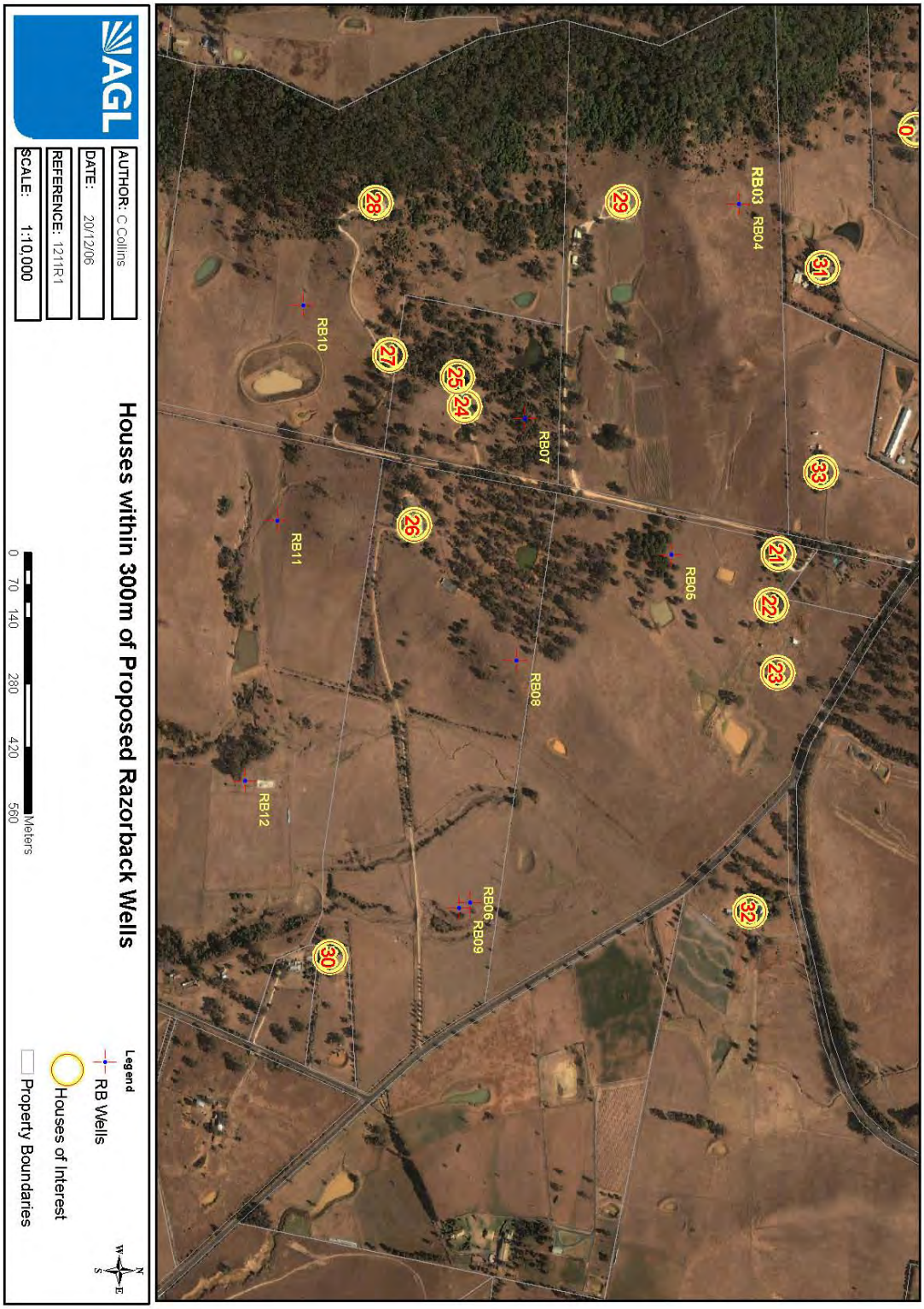
A sound power level of 81dBA was considered to be conservative due to the variation in production which results over the life of a gas well. A pump operated well was found to be 12 dBA louder around part of the enclosure based on the plant layout employed.

A.1.6 Nearest Receivers

The construction activities associated with the Razorback wells have the potential to impact on 10 residences scattered within the Razorback area. As shown in Figure A. 2, Receivers 21, 23 and 33 are located south of Finns Road and are found to be relatively close to proposed Well RB05. Similarly, Receivers 29 and 31 are close to Well RB03 and Receivers 25, 26 and 28 will be surrounded by Wells RB07, RB10 and RB11. Wells RB06 and RB09 have the potential to impact on Receivers 30 and 32.

Receivers 22, 24 and 27 shown in Figure A.2 are sheds and are therefore not included in this overview. Typical distances separating the identified receivers and the closest well sites range between 200 metres and 350 metres.

Figure A. 2 Location of RB wells and sensitive receivers



A.1.7 Monitoring Requirements

OPERATIONAL PHASE MONITORING

Noise monitoring will be carried out at each well head to ensure that noise emissions resulting from the operation of the well are consistent with the Operational Noise Levels used in the Razorback Project EA to assess noise impacts against the relevant operational noise criteria.

Monitoring will consist of attended monitoring carried out in accordance with *AS1055: Acoustics – Measurement and Description of Environmental Noise* and the NSW Department of Environmental and Conservation (DEC) *Industrial Noise Policy*.

In addition, meteorological conditions must be obtained for the time of monitoring. This is to include wind speed and direction as well as data suitable for quantifying the presence or otherwise of temperature inversions.

8.9 Monitoring Activity No.1

Frequency: Monitoring should be carried out within the first week of production and again after three months for each well or sooner of the well status changes.

Locations: At 7 metres from the gas well.

Interval: The monitoring interval shall be a 15 minute period.

Parameters: Parameters to be recorded includes $L_{Aeq,\ 15min}$.

Instruments: Instruments used for attended monitoring shall be of Type 1 – Precision grade in accordance with the requirements of *Australian Standard 1259 – Sound Level Meters*. Measurements methodology shall be in compliance with *Australian Standard 1055 – Acoustics-Description and Measurement of Environmental Noise*.

Reporting: For each site, the following shall be reported:

Location, data and time;

Instrument, calibration status and calibration level before and after measurements;

Parameters measured and their results;

Weather conditions; and

Sound levels from specific identifiable sources.

A.1.8 Site Specific Mitigation Measures

If either set of operational monitoring data (first week and three months) exceed the operational noise level, mitigation measures should be installed at the well head and further three-monthly monitoring carried out until the criteria is met.

If a pump is required at a well, careful consideration will be given to the plant layout so as to minimise any potential noise impacts on surrounding receivers.

NOISE OVERVIEW: EMAI (EM23-37)

A.1.1 Noise Limits

Best endeavours will be made to undertake construction activities so as to comply with the construction noise goals specified in Conditions of Consent (PA_0138) as summarised below.

PA_0138 Condition 2 (Schedule 3): Construction Noise Goals

Location	Day $L_{A10(15\ minutes)}$	Evening $L_{A10(15\ minutes)}$	Night $L_{A10(15\ minutes)}$
Any residential receiver	54	39	35

Noise from the operation of the wells will not exceed the noise criteria specified in Conditions of Consent (PA_0138) as summarised below.

PA_0138 Condition 4 (Schedule 3): Operational Noise Criteria

Location	Day $L_{A10(15\ minutes)}$	Evening $L_{A10(15\ minutes)}$	Night $L_{A10(15\ minutes)}$	Night $L_{A10(1\ minute)}$
Any residential receiver	39	39	35	45

In order to assess compliance with the above noise limits at any sensitive receiver, an assessment will be made against the sound power levels (SWL) used in the EA assessment to carry out the operational noise assessment. These SWLs are summarised below.

Well Identification No	Well Type	SWL (dBA)
EM19	Free-Flow	81_1 (or 56dBA at 7 m)
RP11	Pump-operated	81 (or 56dBA at 7 m) on the quieter side 93 (or 68dBA at 7 m) on noisier side

Note: 1. Well EM19 was highly productive during the time of measurement.

A sound power level of 81dBA was considered to be conservative due to the variation in production which results over the life of a gas well. A pump operated well was found to be 12 dBA louder around part of the enclosure based on the plant layout employed.

A.1.2 Nearest Receivers

The Elizabeth Macarthur wells and sensitive receivers are shown in Figure A. 3.

Figure A. 3 Location of EM wells and sensitive receivers.

A.1.3 Monitoring Requirements

OPERATIONAL PHASE MONITORING

Noise monitoring will be carried out at each well head to ensure that noise emissions resulting from the operation of the well are consistent with the Operational Noise Levels used in the Razorback Project EA to assess noise impacts against the relevant operational noise criteria.

Monitoring will consist of attended monitoring carried out in accordance with *AS1055: Acoustics – Measurement and Description of Environmental Noise* and the NSW Department of Environmental and Conservation (DEC) *Industrial Noise Policy*.

In addition, meteorological conditions must be obtained for the time of monitoring. This is to include wind speed and direction as well as data suitable for quantifying the presence or otherwise of temperature inversions.

Monitoring Activity No.1

Frequency: Monitoring should be carried out within the first week of production and again after three months for each well or sooner if the well status changes.

Locations: At 7 metres from the gas well.

Interval: The monitoring interval shall be a 15 minute period.

Parameters: Parameters to be recorded includes $L_{Aeq,\ 15min}$.

Instruments: Instruments used for attended monitoring shall be of Type 1 – Precision grade in accordance with the requirements of *Australian Standard 1259 – Sound Level Meters*. Measurements methodology shall be in compliance with *Australian Standard 1055 – Acoustics-Description and Measurement of Environmental Noise*.

Reporting: For each site, the following shall be reported:

- Location, data and time;
- Instrument, calibration status and calibration level before and after measurements;
- Parameters measured and their results;
- Weather conditions; and
- Sound levels from specific identifiable sources.

A.1.4 Site Specific Mitigation Measures

- If either set of operational monitoring data (first week and three months) exceed the operational noise level, mitigation measures should be installed at the well head and further three-monthly monitoring carried out until the criteria is met.
- If a pump is required at a well, careful consideration will be given to the plant layout so as to minimise any potential noise impacts on surrounding receivers.
- Only one mud pump will be operated at night for wells EM 32 and EM 34

NOISE OVERVIEW: SUGARLOAF

A.1.1 Noise Limits

Best endeavours will be made to undertake construction activities so as to comply with a noise goal of $L_{A10\ (15\ minutes)}$ 54 dB(A) when assessed at sensitive locations including residences and schools (particularly to avoid noise impacts during exam or other sensitive times) as specified in CoC 19 (Schedule 2) of DA 75-4-2005.

Noise from the operation of the Sugar Loaf wells will not exceed the noise criteria specified in Conditions of Consent (DA 75-4-2005) as summarised below.

DA 75-4-2005 Condition 18 (Schedule 2): Operational Noise Criteria

Location	Day	Evening	Night	
	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{A1\ (1\ minute)}$
Any residential premise	35	35	35	45

A.1.2 Nearest Receivers

- Sugarloaf Farm - 670 metres away,
- Principal's Residence at Broughton College - 420 metres away.

A.1.3 Monitoring Requirements

Noise monitoring will be undertaken at the sensitive receivers outlined above in order to assess compliance with the noise limits set out in the Conditions of Consent.
In accordance with the Conditions of Consent, noise from the premises is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary to determine compliance with the $L_{Aeq\ (15\ minute)}$ level and at 1 metre from the dwelling facade to determine compliance with the $L_{A1\ (1\ minute)}$ noise level.

Noise monitoring will undertaken in accordance with the *NSW Industrial Noise Policy August 2000*.

NOISE OVERVIEW: EL BETHEL

A.1.1 Noise Limits

Best endeavours will be made to undertake construction activities so as to comply with a noise goal of $L_{A10\ (15\ minutes)}$ 54 dB(A) when assessed at sensitive locations including residences and schools (particularly to avoid noise impacts during exam or other sensitive times) as specified in CoC 4 (Schedule 3) of DA 171-7-2005.

Noise from the operation of the El Bethel wells will not exceed the noise criteria specified in Conditions of Consent (DA 171-7-2005) as summarised below.

DA171-7-2005 Condition 3 (Schedule 3): Operational Noise Criteria

Location	Day	Evening	Night	
	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{A1\ (1\ minute)}$
Any residential or noise sensitive premise	35	35	35	45

A.1.2 Monitoring Requirements

Noise monitoring will be undertaken at the sensitive receivers in order to assess compliance with the noise limits set out in the Conditions of Consent. Within 3 months of commissioning of the wells, a Noise Compliance Assessment against the noise limits specified in CoC 3 will be submitted to the DECC. The Noise Compliance Assessment will be prepared by a suitably qualified and experienced acoustical consultant in accordance with CoC 6 (Schedule 3).

In accordance with the Conditions of Consent, noise from the premises is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary to determine compliance with the $L_{Aeq\ (15\ minute)}$ level and at 1 metre from the dwelling facade to determine compliance with the $L_{A1\ (1\ minute)}$ noise level.

Noise monitoring will undertaken in accordance with the *NSW Industrial Noise Policy August 2000*. There are no site specific mitigation measures.

APPENDIX B

SPRING FARM AND MENANGLE PARK

TABLE OF CONTENTS

B.1. CONSTRUCTION NOISE MANAGEMENT PROCEDURES

B.1.1 Introduction

This noise management sub plan gives procedures for monitoring and reporting of noise from construction and operation of the well surface locations at the Spring Farm and Menangle Park gas fields.

The Noise Management Plan for the Camden Gas Project provides the legislative framework, noise objectives and targets, and responsibilities for implementation of this sub plan.

The environmental assessment for Spring Farm and Menangle Park demonstrated that compliance with all acoustic objectives could be achieved under a worst case scenario. In practice, the worst case circumstances will not be realised, as outlined below leading to the development of the conservative management measures described in this sub plan.

B.1.2 Identification of Receivers

Potentially affected residential receivers vary with each well surface location. Receivers are identified for each well surface location.

Due to the lifetime of the project and the nature of continuing development in the area, it is possible that the residential receivers identified here will no longer be the most relevant by the time some of the well surface locations are constructed. Procedures prior to construction for each well surface location include review of residential receiver locations.

Receivers are numbered in Figures B1 and B2.

Figure B. 1 Location of receivers, Menangle Park

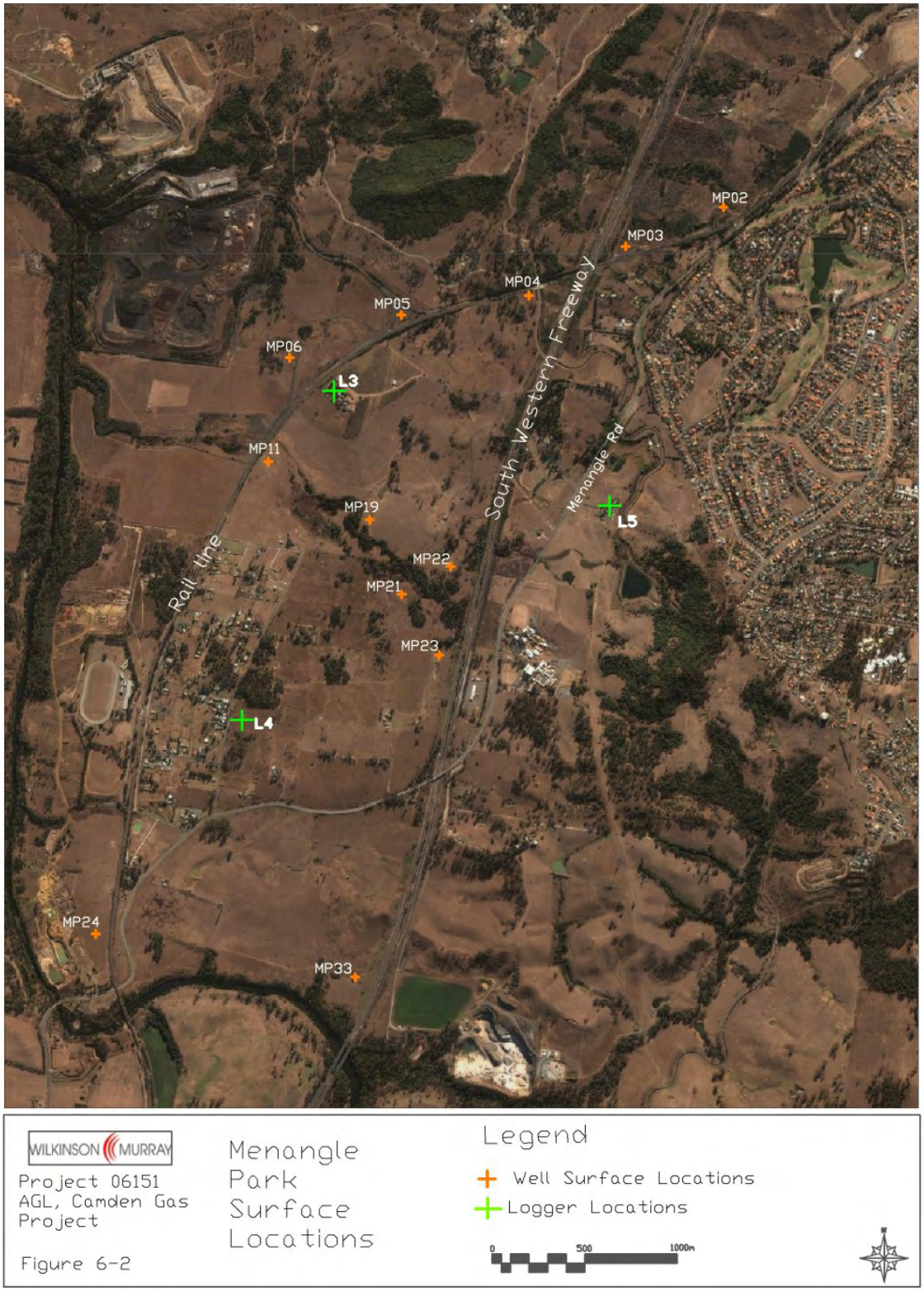


Figure B. 2 Location of receivers, Spring Farm

B.1.3 Background Information and Assumptions

The assessment of noise from each well surface location was based on a worst case scenario, based on the following assumptions:

- drilling of up to 6 wells at each well surface location,
- drilling 24 hours a day 7 days per week,
- a construction period of up to 12 months
- stringent construction criteria of background plus 5 to cover 24 hour drilling.

The well surface locations could be sited anywhere within a 100m envelope area (in Menangle Park) or a 50m envelope area (in Spring Farm). The appropriate receivers were assessed for the closest location within the envelope and so some surface locations may have moved away from the nearest receiver.

The eventual number of wells at any location may be less than six, which could dramatically reduce the duration of construction from up to 12 months to less than 6 months. AGL would still have to comply with the higher criteria, but the potential impact would be dramatically less than that outlined in the assessment.

In practice noise generating activities will not take place continuously as the construction process is staged and various activities (with lower sound power levels) are necessary for the establishment of the compound. Drilling is the loudest phase of the construction activities and as part of the worst case assessment; this is the noise level that was used to create the model to ensure that a conservative assessment had been undertaken.

Drilling would not occur for the whole 12 month period even if 6 wells were to be drilled at a surface location as part of this time would be used for initial civil construction, crew breaks, maintenance and downtime to move the rig onto the next well which would be done during normal daytime hours.

The noise assessment was based on measurements of the previously used mud pumps in the field which were elevated at least 1 metre above the ground and had no enclosures or other acoustic treatment. Continuous design and development of mud pumps and acoustic enclosures is expected to yield mud pumps with much lower noise levels in future. As the noise management tables in this appendix show, the noise goals can be met with the modelled un-treated mud pumps. However, as new acoustically treated mud pumps have entered operation as part of best practice noise management, mitigation strategies can be modified in accordance with the procedures outlined in this Plan to allow for the reduced source noise levels.

At some of the well surface locations construction will require noise mitigation to achieve the noise criteria. The level of mitigation required has been determined on a site by site basis. For the purposes of the assessment a worst case was assumed at each well surface location, i.e. drilling up to six SIS wells at each surface location over a period of up to 12 months, including 24 hour operation of drills and mud pumps/generators during drilling.

As the modelling was based on worst case assumptions, the noise will in general be less than assumed. Hence if the noise mitigation applied is based on the worst case, compliance will be achieved at each well surface location. As outlined above, there may not be six wells at each location, the mud pumps used will in general be quieter than those assumed in the model, and the background noise level may be higher due to changing land use.

Despite the conservative model and the improvements that have been made since the original assessment, it is still likely that some noise mitigation will be required. The recommended

mitigation measures will still be implemented (where relevant) along with further measures if appropriate and available, as part of the best practice approach.

The amount of noise reduction for the mitigation options depends on the circumstances at each well surface location, but generally is:

- Use of only one mud pump – 3dBA reduction;
- Placing mud pumps on the ground – 3dBA reduction;
- Orientation of mud pumps away from receivers – 3dBA reduction in the direction of the mud pump louvres;
- Temporary or permanent noise barriers – 5 to 10dBA reduction. In the noise modelling it was assumed that the barriers were approximately 10m from the drill rigs (except for SF10 and SF20, as noted);
- Acoustic treatment of mud pumps – 10dBA reduction.

In general the equipment to be used will be quieter than that assumed in the environmental assessment. Also, duration of drilling will be shorter than assumed. Hence compliance will be achieved even though some conditions or equipment selections might have changed since the environmental assessment.

B.1.4 Test for Audibility

Because the wells may not be significant noise sources, and they will be designed to meet all noise criteria, they may not be audible at nearby locations. If a noise is inaudible it cannot be monitored.

There is no standard test for “audibility”. This requires the commonsense and experience of the listener. It should be done by someone with “normal” hearing, and familiar with the noise character of the gas wells in production. “Clearly audible” means that the listener can hear that a noise is clearly emanating from a particular source.

B.1.5 Construction Noise Monitoring

Specific construction noise management procedures for each well surface location are given in this Appendix. These specific noise management procedures were based on the worst case scenario and may require changes due to:

- encroachment of receivers closer to the well surface location, either before or after construction; or
- increases in the background noise levels; or
- equipment changes.

The Spring Farm and Menangle Park extension to the project will operate over a number of years. Due to the rapid development in the surrounding areas, and improvements to procedures and construction equipment used by AGL, noise management measures for each well surface location should be reviewed at the time of construction.

The following aspects should be reviewed before commencement of construction:

- Location of nearest potentially affected residential receiver. If new houses have been built

closer to the well surface location or gas gathering line than previously assessed, the mitigation should be revised to ensure compliance at the nearest receiver.
- Background noise level at nearest receiver. Due to changing land use in the area, generally from rural to urban and industrial, it is possible that the background noise level has increased since the noise assessment. Also, if the assessing to a new residence, the background noise level will need to be established at that residence.
- If receiver or background has changed, the noise goals may have changed.
- Are the mud pumps to be used at the well surface location the same as assumed in the environmental assessment? If they are substantially quieter, then some of the listed compliance measures may be unnecessary.
- Check that there is a minimum of 1km distance between well surface locations if drilling is planned to occur simultaneously to minimise cumulative impacts well surface locations closer than 1km to each other will not be drilled simultaneously.

If after review of the above it is expected that any change would not increase noise levels then the noise management strategies outlined in this Appendix can be used.

Procedure

- Check Receiver location is still the most appropriate assessment location
- If Receiver has not changed use Compliance Measures as given in the table.
- If Receiver(s) have changed, refer to appropriate noise contours in Environmental Assessment and if Receiver(s) are outside noise contours, use Compliance Measures as given in table.
- If the new Receivers are inside the noise contours, obtain the noise level of the mud pumps proposed for this location. If mud pumps will be quieter than previously assumed, either use the Compliance Measures as given in the table or reassess noise impact of well construction.
- As the construction has been designed to comply with the noise goals, and many of the wells are remote from residences, noise monitoring will not automatically be necessary for all wells. If noise compliance measures are installed as described in this sub plan noise monitoring would not be necessary.
- If the installed noise compliance measures vary from those given in this sub plan, noise monitoring should be done once construction has commenced and compliance measures are in place.
- If a noise complaint is received, do noise monitoring at the complainant's residence. This may not necessarily be the closest residence.
- The procedure for noise monitoring is given in the body of the Noise Management Plan.

B.1.6 Operational Noise Monitoring

Operational noise criteria are listed in the Development Consent Conditions. As discussed earlier it is possible that due to the development in the surrounding area, those conditions may not be appropriate at the time the wells at a well surface location reaches steady state production. The criteria would be reassessed at the appropriate time as part of the following procedures for operational noise monitoring.

Noise emanating from free-flowing wells is dependent on the productivity of the well and the design of the surface well head equipment, with highly productive wells typically generating more noise than the less productive wells.

In assessing proposed well surface locations it was assumed that up to six highly producing

wells would be located anywhere within the envelopes of the well surface locations. Meteorological conditions that enhance noise propagation were also taken into account.

The source noise level depends on a number of factors including:

- Well head design, which is the critical issue in controlling noise from wells;
- Well productivity;
- Well maintenance;
- Free-flow or pump assisted;
- Directivity (wells can be up to 10dBA quieter on one side).

The required mitigation for any well surface location will depend on the source noise level and the nearest receivers.

A range of measures is available to mitigate noise from the wells. Most wells would be enclosed in appropriately insulated structures. Noise barriers can also be used.

There are a variety of suitable noise mitigation measures that can be applied to operation of the well surface locations. They include (but are not restricted to):

- Well head design, including enclosure (up to 30dBA reduction);
- Noise barriers for individual well heads (10-20dBA reduction);
- Noise barriers for well surface locations (a fence around it) – thus mitigating noise from all wells at a surface location (approximately 10dBA reduction);
- Enclosure of pumps/ generators and/ or separators (up to 30dBA reduction);
- Replacement of diesel pumps/ generators on pump assisted wells with electric pumps/ generators (approximately 10dBA reduction).

A case by case approach to noise mitigation at each well surface location will ensure that noise criteria can be met whatever the future land use throughout the life of the project. Recent testing of the initial design of the well enclosures has confirmed that 30dBA of noise reduction can be achieved.

Procedure

Once a well has reached steady state production, attended monitoring will be undertaken to ensure that the design criteria has been achieved. If there are changes to the surrounding environment, then the background noise level should be re-established prior to starting operational noise monitoring.

- Determine location of nearest residential receiver, and any other receiver (for example places of recreation).
- Conduct audibility test.
- If the well surface location is audible at any time of the day, under any meteorological conditions, conduct noise monitoring. This should be attended noise monitoring as in many cases it will be necessary to estimate the level of the noise in the presence of background noise of similar level.
- If a noise complaint is received, do noise monitoring at the complainant's residence. This may not necessarily be the closest residence.
- The procedure for noise monitoring is given in Section A.2 of this sub plan.
- If the monitoring results indicate non-compliance once the results have been confirmed, further mitigation may be required.

B.1.7 Fraccing

Fraccing could occur at any well for several hours during daytime construction periods. This is typically only once per well.

Given the brevity and infrequency of the operation, the target noise level ($L_{A10,15min)}$ is background plus 20 dBA. Monitoring of fraccing would not normally be considered necessary.

If noise from fraccing is not clearly audible and easily distinguished from the background noise level, then it will comply with the noise target.

Procedure

- Determine location of nearest receiver.
- If receiver is within 500m of site conduct an audibility test at commencement of fraccing.
- If fraccing is clearly audible conduct noise measurements of L_{A10} at residence.
- If receiver is not within 500m, or fraccing is not clearly audible, monitoring will not be necessary except after receipt of a noise complaint.
- The procedure for noise monitoring is given in Section A.2 of this sub plan.

B.1.8 Monitoring during the initial phase of production

Monitoring during the initial phases of production will be done to determine if there are temporary exceedances. The procedure for monitoring this phase is identical to that for the steady state operational phase, including the initial test of audibility. Temporary noise mitigation might be necessary depending on the situation. Final noise mitigation might be implemented at this stage and then verified by monitoring after steady state has been reached.

B.1.9 Monitoring of maintenance during operation

Monitoring of well maintenance during operation will not normally be necessary except on receipt of a noise complaint.

Occasionally a workover rig will come onto the site for maintenance works. Due to the infrequency and temporary nature of this work it is considered to be short term construction noise. The criterion for this is then background noise plus 20dBA. Monitoring would not normally be considered necessary during workover activities.

B.1.10 Monitoring during Gas Gathering Line Installation

Noise from the gas gathering line construction is from the trenching machine. Because the machine moves continuously during the construction, potential noise exposure is usually limited to one or two days. The duration depends on the terrain being trenched, and the distance to the receiver.

Monitoring of gas gathering line installation would not normally be considered necessary.

B.2. DEVELOPMENT CONSENT CONDITIONS

The Minister's conditions of approval are as follows.

Construction and Maintenance Hours

2. Except for the drilling (including well casing and grouting) of wells, the Proponent shall comply with the construction and maintenance hours in Table 1:

Table 1: Construction and Maintenance Hours for the Project

Activity	Day	Time
Construction	Monday – Friday	7:00am to 6:00pm
	Saturday	8:00am to 1:00pm
	Sunday and Public Holidays	Nil
Planned maintenance activities (includes well workover)	Monday – Friday	7:00am to 6:00pm
	Saturday	8:00am to 1:00pm
	Sunday and Public Holidays	Nil (unless inaudible at any residential receiver)

Notes:

- *Inaudible means that the construction activity cannot be heard by the human ear at the nearest affected residential receivers.*
- *This condition does not apply to the delivery of material if that delivery is required by the police or other authorities for safety reasons; and/or the operation or personnel or equipment is endangered. In such circumstances, prior notification is to be provided to affected residents where possible.*

Construction Noise Goals

3. The Proponent shall use its best endeavours to undertake construction activities to comply with the construction noise goals specified in Table 2.

Table 2: Construction Noise Goals dB(A) $L_{A10)}$

Location (nearest residential dwelling)		Day	Evening	Night	Saturday 1pm-6pm Sunday 7am-6pm
MP02, MP03, MP04		49	47	41	47
MP05, MP06		40	40	40	40
MP11, MP24, MP33		42	42	40	42
MP19	R3	40	40	40	40
	R25	49	47	41	47
MP21, MP22, MP23		49	47	41	47
SF04A		43	42	37	42
SF10, SF17, SF20		43	41	36	43

Note: See notes to condition 5

Construction Noise Management Plan

4. The Proponent shall prepare and implement a Construction Noise Management Plan for construction of the project to the satisfaction of the Director-General. The plan shall be submitted to the Director-General prior to construction commencing and shall include:

(a) a detailed description of the measures that would be implemented to achieve the construction noise goals in condition 3.
(b) a community notification protocol for the proposed construction activities (including any redrilling or re-fraccing of wells);
(c) a description of the measures that would be implemented where the construction noise goals in condition 3 are unlikely to be achieved or are not being achieved; and
(d) details of who would be responsible for monitoring, reviewing and implementing the plan.

Operational Noise Criteria

5. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 3.

Table 3: Noise Impact Assessment Criteria dB(A) L_{Aeq}

Location (nearest residential dwelling)	***Day***	***Evening***	***Night***
	L_{Aeq}	L_{Aeq}	L_{Aeq}
SF10	43	42	37
SF04A, SF17, SF20	43	41	36
MP05. MP06, MP11	40	40	40
MP19, MP21, MP24, MP33	42	42	40
MP02, MP03, MP04, MP22, MP23	49	45	40

Notes:

- *Noise from the site is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary, to determine compliance with the identified noise limits, except where otherwise specified below.*
- *Where it can be demonstrated that direct measurement of noise from the project is impractical, alternative means of determining compliance may be acceptable (see Chapter 11 of the NSW Industrial Noise Policy).*
- *The modification factors presented in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise level where applicable.*
- *The identified noise emission limits apply under meteorological conditions of wind speed up to 3m/s at 10 metres above ground level, and temperature inversion conditions.*
- *As the area develops the background noise may change. At that time it may be appropriate to review the intrusive noise criteria for the proposal.*

Continuous Improvement

6. The Proponent shall, to the satisfaction of the Director-General:
(a) implement all reasonable and feasible best practice noise mitigation measures;
(b) investigate ways to reduce the noise generated by the project; and
(c) report on these investigations and the implementation and effectiveness of these measures in the AEMR.

Noise Monitoring Program

7. The Proponent shall prepare and implement a Noise Monitoring Program for the construction and operation of the project to the satisfaction of the Director-General. The Program shall be submitted to the Director-General prior to construction commencing and shall include a noise monitoring protocol for evaluating compliance with the construction noise goals and the operational noise impact assessment criteria in this approval.

B.3. MANAGEMENT PROCEDURES FOR SPECIFIC WELL SURFACE LOCATIONS

MP02 WELL SURFACE LOCATION

The nearest receiver is R19 200m to the south of the site.

Noise control procedures are given in Table A. 1

Table A. 1 Construction Noise – MP02 Well Surface Location

	MP02	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		44	42	36	42
Noise Criteria, L_{A10}	dBA	49	47	41	47
Normal operation (2 pumps)	Predicted Noise Level at R19	57	57	57	57
	Compliance	☒☒☒	☒☒☒	☒☒☒	☒☒☒
Compliance Measure 1	Barriers to south	☒	☒	☒☒	☒
Compliance Measure 2	Compliance measure 1 and 1 Mud Pump only, oriented to north.	☒	☒	☒	☒
Compliance Measure 3	Compliance measure 1 and Acoustic enclosure on both mud pumps, site>200m from R19)	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP03 WELL SURFACE LOCATION

The nearest receiver is R21 200m to the southeast.

Noise control procedures are given in Table A. 2.

Table A. 2 Construction Noise –MP03 Well Surface Location

	MP03	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		44	42	36	42
Noise Criteria L_{A10} dBA		49	47	41	47
Normal operation (2 pumps)	Predicted Noise Level at R21	51	51	51	51
	Compliance	☑	☒	☒☒	☑
Compliance Measure 1	Barriers to south & east	☑	☑	☒	☑
Compliance Measure 2	1 Mud Pump only, oriented to west.	☑	☑	☑	☑
Compliance Measure 3	Compliance measure 1 and Acoustic enclosure on mud pumps (both mud pumps operate)	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP04 WELL SURFACE LOCATION

The nearest receiver is R1 390m to the east.

Noise control procedures are given in Table A. 3.

Table A. 3 Construction Noise –MP04 Well Surface Location

MP04		Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		44	42	36	42
Noise Criteria L_{A10} dBA		49	47	41	47
Normal operation (2 pumps)	Predicted Noise Level at residence R1	47	47	48	47
	Compliance	☑	☒	☒☒	☑
Compliance Measure 1	Barriers to east	☑	☑	☒	☑
Compliance Measure 2	1 Mud pump only – oriented to northwest.	☑	☑	☑	☑
Site Location Comments	Acoustic enclosures on both pumps would allow operation of two mud pumps at night.				

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP05 WELL SURFACE LOCATION

The nearest receiver is R3 520m to the east.

Noise control procedures are given in Table A. 4.

Table A. 4 Construction Noise - MP05 Well Surface Location

	MP05	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		35	38	35	35
Noise Criteria L_{A10} dBA		40	40	40	40
Normal operation (2 pumps)	Predicted Noise Level at Residence R3	57	57	58	57
	Compliance	☒☒☒	☒☒☒	☒☒☒	☒☒☒
Compliance Measure 1	Barriers to southwest	☒	☒	☒☒	☒
Compliance Measure 2	1 Mud pump only – oriented to northeast.	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP06 WELL SURFACE LOCATION

The nearest receiver is R3 350m to the southeast (Glenlee House).

Noise control procedures are given in Table A. 5.

Table A. 5 Construction Noise – MP06 Well Surface Location

	MP06	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		35	38	35	35
Noise Criteria L_{A10} dBA		40	40	40	40
Normal operation (2 pumps)	Predicted Noise Level to Residence R3	61	61	62	61
	Compliance	☒☒☒	☒☒☒	☒☒☒	☒☒☒
Compliance Measure 1	Barriers to south & east	☒☒	☒☒	☒☒	☒☒
Compliance Measure 3	Compliance Measure 1 and Acoustic enclosure on mud pumps	☑	☑	☑	☑
Site Location Comments	Should not approach R3 closer than point shown on map				

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP11 WELL SURFACE LOCATION

The nearest receiver is R5 380m to the southeast.

Noise control procedures are given in Table A. 6.

Table A. 6 Construction Noise – MP11 Well Surface Location

	MP11	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		37	37	35	37
Noise Criteria L_{A10} dBA		42	42	40	42
Normal operation (2 pumps)	Predicted Noise Level to Residence R5	54	54	55	54
	Compliance	☒☒☒	☒☒☒	☒☒☒	☒☒☒
Compliance Measure 1	Barriers to southeast, orient pumps to northwest	☑	☑	☒	☑
Compliance Measure 2	1 Mud pump only – oriented to northwest	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP19 WELL SURFACE LOCATION

The nearest receivers are R3 650m to north, and R25 500m east.

Noise control procedures are given in Table A. 7.

Table A. 7 Construction Noise – MP19 Well Surface Location

	MP19	**Weekday (7am–6pm) & Saturday (7am–1pm)**	**Evening (6-10pm)**	**Night (10pm-7am)**	**Saturday (1pm–6pm) & Sunday (7am–6pm)**
RBL	To R3	35	38	35	35
Noise Criteria L_{A10} dBA		40	40	40	40
RBL	To R25	44	42	36	42
Noise Criteria L_{A10} dBA		49	47	41	47
Normal operation (2 pumps)	Predicted Noise Level to R3	50	50	51	50
	Compliance	☒☒	☒☒	☒☒	☒☒
Compliance Measure 1	Barriers to northwest and northeast, orient southeast (to protect R3)	☑	☑	☒	☑
Compliance Measure 2	1 Mud pump only – oriented to northwest.	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP21 WELL SURFACE LOCATION

The nearest receiver is R25 590m to the northeast.

Noise control procedures are given in Table A. 8.

Table A. 8 Construction Noise - MP21 Well Surface Location

	MP21	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		44	42	36	42
Noise Criteria L_{A10} dBA		49	47	41	47
Normal operation (2 pumps)	Predicted Noise Level to R25	51	51	52	51
	Compliance	☒	☒	☒☒☒	☒
Compliance Measure 1	Barriers northeast, orient south west (to protect R25)	☑	☑	☒☒	☑
Compliance Measure 2	1 Mud pump only – oriented to northwest.	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP22 WELL SURFACE LOCATION

The nearest receiver is R25 360m to the north.

Noise control procedures are given in Table A. 9

Table A. 9 Construction Noise – MP22 Well Surface Location

	MP22	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		44	42	36	42
Noise Criteria L_{A10} dBA		49	47	41	47
Normal operation (2 pumps)	Predicted Noise Level (R25)	53	53	55	53
	Compliance	☒☒	☒☒	☒☒☒	☒☒
Compliance Measure 1	Barriers to north	☑	☑	☒☒	☑
Compliance Measure 2	1 Mud pump only – oriented to northwest.	☑	☑	☒	☑
Compliance Measure 3	Compliance measure 1 and Acoustic enclosure on both mud pumps.	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP23 WELL SURFACE LOCATION

The nearest receiver is R8 380m to the east (Principal's residence – Broughton College).

Noise control procedures are given in Table A. 10.

Table A. 10 Construction Noise – MP23 Well Surface Location

	MP23	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		44	42	36	42
Noise Criteria L_{A10} dBA		49	47	41	47
Normal operation (2 pumps)	Predicted Noise Level at R8	35	35	37	35
	Compliance	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP24 WELL SURFACE LOCATION

The nearest receiver is R14 570m to southwest. Other residences (R12 and R13) are closer but are acoustically shielded from this site.

Noise control procedures are given in Table A. 11.

Table A. 11 Construction Noise – MP24 Well Surface Location

	MP24	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		37	37	35	37
Noise Criteria L_{A10} dBA		42	42	40	42
Normal operation (2 pumps)	Predicted Noise Level at R14	44	44	45	44
	Compliance	☒	☒	☒	☒
Compliance Measure 1	Barriers to north and south, orient mud pumps west	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

MP33 WELL SURFACE LOCATION

The nearest receiver is R11, more than 900m to northeast.

Noise control procedures are given in Table A. 12.

Table A. 12 Construction Noise – MP33 Well Surface Location

	MP33	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		37	37	35	37
Noise Criteria L_{A10} dBA		42	42	40	42
Normal operation (2 pumps)	Predicted Noise Level to all residences	<30	<30	<30	<30
	Compliance	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

SF04A WELL SURFACE LOCATION

The nearest receiver is R22 650m to the north.

Noise control procedures are given in Table A. 13.

Table A. 13 Construction Noise – SF04A

SF04A		Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		38	37	32	37
Noise Criteria L_{A10} dBA		43	42	37	42
Normal operation (2 pumps)	Predicted Noise Level to R22	34	34	35	34
	Compliance	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

SF10 WELL SURFACE LOCATION

The nearest receiver is R27 340m to the northwest.

Noise control procedures are given in Table A. 14.

Table A. 14 Construction Noise – SF10 Well Surface Location

	SF10	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		38	36	31	38
Noise Criteria L_{A10} dBA		43	41	36	43
Normal operation (2 pumps)	Predicted Noise Level to R27	54	54	56	54
	Compliance	☒☒	☒☒	☒☒☒	☒☒
Compliance Measure 1	Barriers to north, orient mud pumps south	☒	☒	☒☒☒	☒
Compliance Measure 2	1 Mud pump only – oriented to northwest.	☒	☒	☒	☒
Compliance Measure 3	Acoustic enclosure on mud pumps – barrier to northwest still required, maximum 5m from rig	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

SF17 WELL SURFACE LOCATION

The nearest receiver is R24 540m to the north.

Noise control procedures are given in Table A. 15.

Table A. 15 Construction Noise - SF17 Well Surface Location

SF17		Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		38	36	31	38
Noise Criteria L_{A10} dBA		43	41	36	43
Normal operation (2 pumps)	Predicted Noise Level to R24	33	33	35	33
	Compliance	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)

SF20 WELL SURFACE LOCATION

The nearest receiver is R28 460m to the north.

Noise control procedures are given in Table A. 16.

Table A. 16 Construction Noise – SF20 Well Surface Location

	SF20	Weekday (7am–6pm) & Saturday (7am–1pm)	Evening (6-10pm)	Night (10pm-7am)	Saturday (1pm–6pm) & Sunday (7am–6pm)
RBL		38	36	31	38
Noise Criteria L_{A10} dBA		43	41	36	43
Normal operation (2 pumps)	Predicted Noise Level (R28)	57	57	57	57
	Compliance	☒☒☒	☒☒☒	☒☒☒	☒☒☒
Compliance Measure 1	Barriers to north and east, max 5m from rig	☑	☒	☒	☒
Compliance Measure 2	1 Mud pump only – oriented to south.	☑	☑	☑	☑

☑ complies
☒ non-compliance (<5dBA over criterion)
☒☒ non-compliance (5-10 dBA over criterion)
☒☒☒ non-compliance (> 10 dBA over criterion)