MARSHALL DAY Acoustics

PAKENHAM EAST PRECINCT STRUCTURE PLAN
CITY GATE NOISE ASSESSMENT

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Project: **PAKENHAM EAST PRECINCT STRUCTURE PLAN**

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1.0 INTRODUCTION

The Cardinia Shire Council (CSC) and Victorian Planning Authority (VPA) are preparing a Precinct Structure Plan (PSP) for the Pakenham East area.

The PSP area includes approximately 650 hectares of land located approximately 3 km east of the Pakenham CBD.

Marshall Day Acoustics Pty Ltd (MDA) has been commissioned to undertake a noise assessment of existing uses on the land and consider the potential noise impacts associated with the Dore Road City Gate gas facility at future proposed sensitive land uses.

This report includes the following:

- Relevant noise assessment criteria
- Assessment of noise from the City Gate gas facility
- Conceptual advice on noise mitigation options to demonstrate practicality of achieving compliance with the relevant noise criteria at the nearest future noise sensitive receivers.

A glossary of acoustic terminology is provided in Appendix A.

2.0 SITE DESCRIPTION

2.1 Location

The existing land uses within the PSP area are primarily agriculture (cattle and dairy) with rural residential dwellings and ancillary uses.

The PSP area is intersected by the Princes Highway, with proposed sensitive land uses to the north and south.

The overall site is generally bounded by the following:

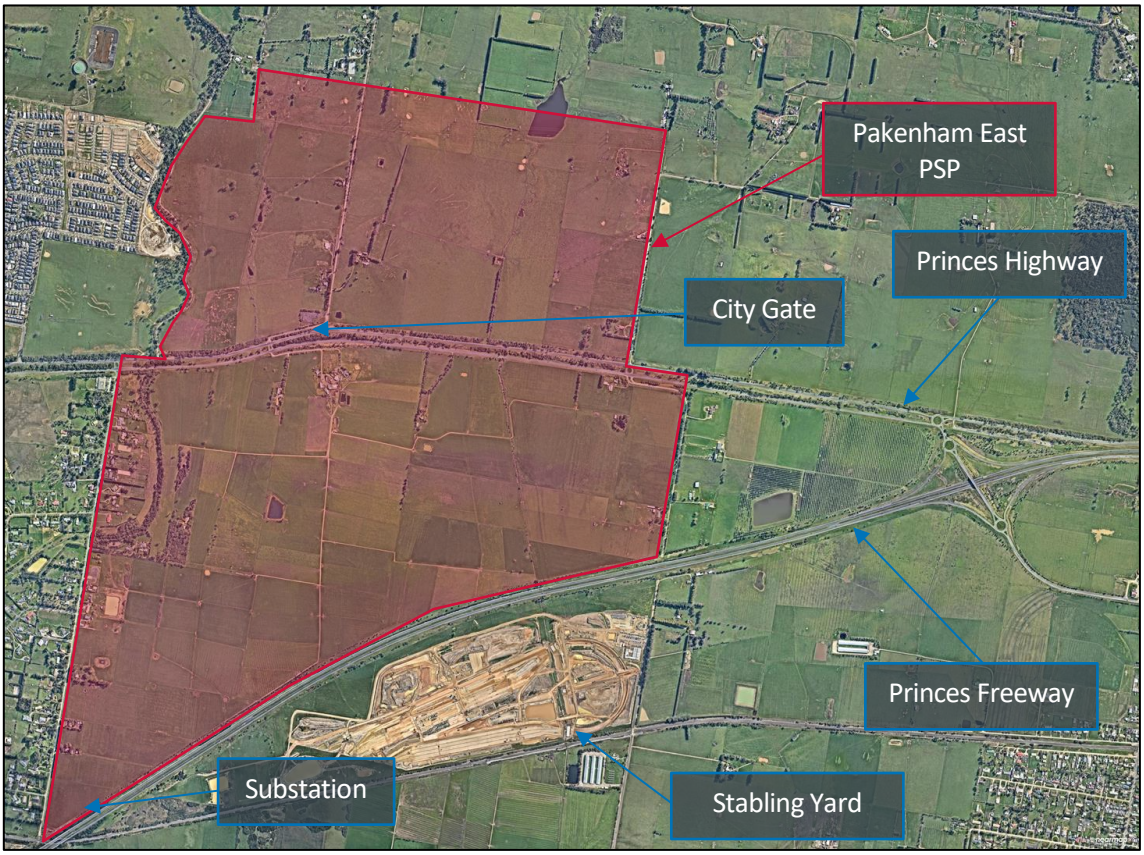
- An electricity transmission easement to the north
- Mount Ararat Road to the east
- The Pakenham Bypass (Princes Freeway) to the south, with the Pakenham Railway Line beyond
- Ryan Road and existing low-density residential development to the west, with Pakenham golf club and the Pakenham CBD beyond

There are a number of industrial facilities surrounding and within the PSP area extent. These include:

- An existing City Gate gas infrastructure located centrally to the PSP at 27 Dore Road
- A stabling yard currently under construction to the south of the site between the Princes Freeway and the Pakenham Railway Line
- A transformer substation located in the southwest corner of the PSP

An aerial photograph of the PSP extent and the surrounding environment is provided in Figure 1.

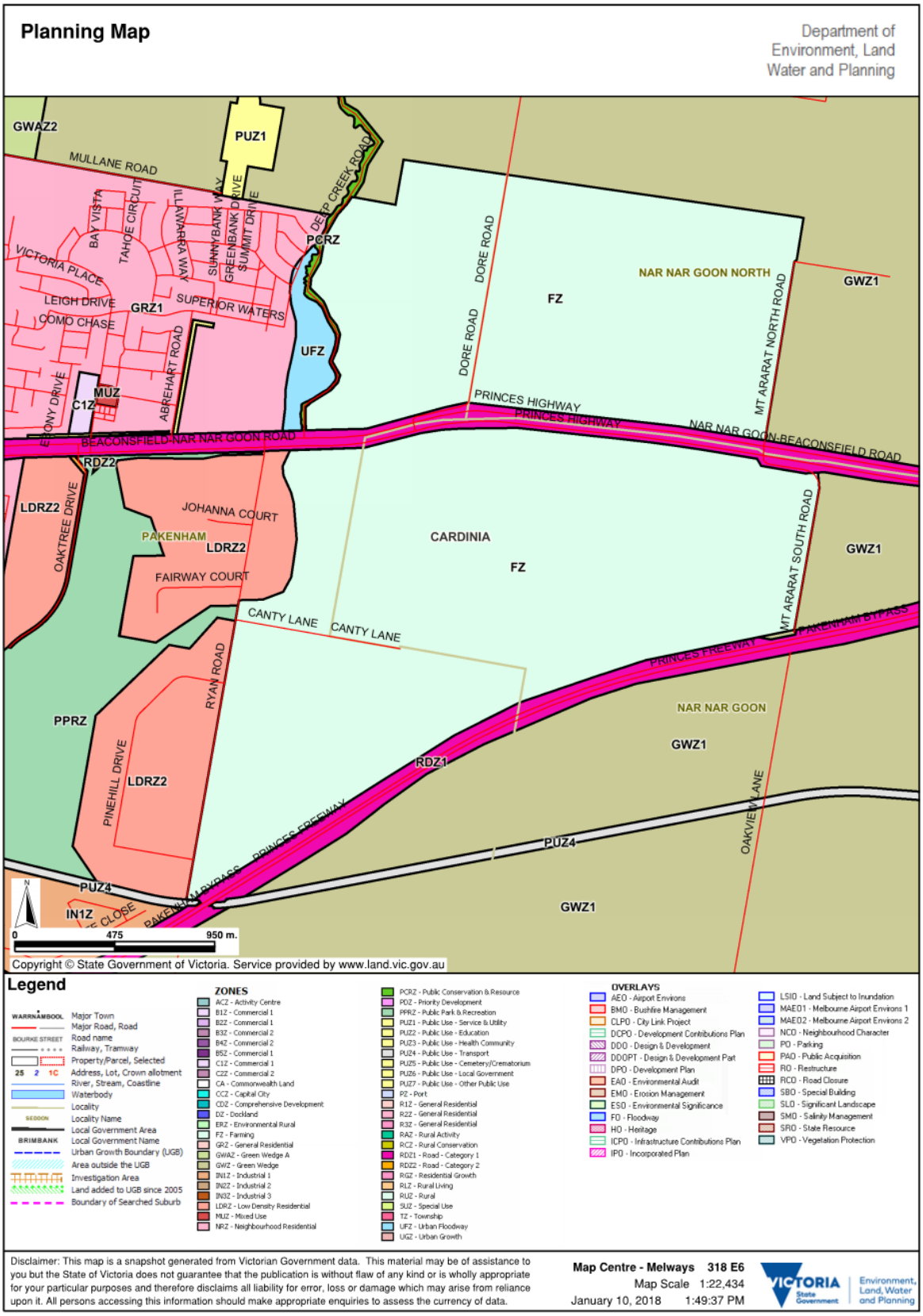
Figure 1: Aerial view of subject site (Source: NearMap)



2.2 Land use zoning

The land within the PSP is zoned Farming (FZ) with Road (RDZ1), Green Wedge (GWZ1), Low Density Residential (LDRZ2), Public Park and Recreation (PPRZ) and Urban Floodway (UFZ) in the immediate environs. The relevant planning map is provided in Figure 2.

Figure 2: Planning map



2.3 Impacts on the development from the surrounding environment

The proposed future sensitive land use (residential) within the PSP will potentially be impacted by the following noise sources:

- Road traffic noise from the Princes Freeway to the south of the site and the Princes Highway that intersects the site.
- Local industrial sites including the City Gate Gas site and the transformer substation at the south end of Ryan Road
- Existing local commercial or industrial sites and associated operations (e.g. commercial deliveries or waste collection)
- Train noise from the Pakenham line adjacent to the south-west corner of the PSP.

This report considers an assessment of noise associated with City Gate gas facility only. A road traffic noise assessment for the PSP are covered in *Rp 001 R01 20171138 - Pakenham East Precinct Structure Plan -Traffic Noise Assessment*.

3.0 LEGISLATION AND GUIDELINES

A range of guidelines and legislation is used in Victoria to assess environmental noise. This section provides an overview of the key documents and guidelines that are applicable to noise generated from the City Gate gas facility within the PSP for the Pakenham East area.

3.1 Victorian Legislation and Guidelines

A summary of the relevant Victorian legislation and guidelines is provided in Table 1. Refer to Appendix B for further details.

Table 1: Relevant Victorian noise legislation and guidelines

Document	Overview
Environment Protection Act 1970 (the Act)	The Act provides the overarching legislative framework for the protection of the environment in Victoria. It establishes obligations for the control of environmental noise and applies to all types of noise sources except rail operations. The legislation does not specify noise limit values, but sets out legal requirements to comply with State environment protection policies and prescribed standards.
EPA Publications 1411-1413 *Noise from Industry in Regional Victoria* (NIRV)	Prescribes recommended maximum noise levels (RMNLs) for commercial, industrial or trade premises in regional Victoria. The NIRV document is a non-statutory guideline. Accordingly, the recommended levels are only legally binding when applied through statutory instruments, such as a planning permit or notice.
State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1 (SEPP N-1)	SEPP N-1 defines mandatory noise limits for commercial, industrial or trade premises in the Metropolitan Region of Melbourne. The limits apply to the level of noise occurring at neighbouring sensitive receivers. SEPP N-1 is relevant to this project as the site is located within the Urban Growth Boundary of Melbourne, refer Section 3.2. The limits apply to the total level of noise occurring at sensitive receivers as a result of the cumulative effect of all sources of industrial or commercial noise. The noise limits are determined on the basis of land zoning and background noise levels, and are separately defined for day, evening and night periods. Refer to Appendix B for further detail and noise limit derivation.

3.2 Noise from Industry in Regional Victoria (NIRV)

The relevant guidelines for noise from commercial operations in regional Victoria are the EPA Publications 1411-1413 Noise from Industry in Regional Victoria (NIRV).

NIRV applies outside the Melbourne Metropolitan areas and the method NIRV uses to set Recommended Noise limits depends on whether the subject site and noise sensitive receiver are located within a major urban area (inside an urban growth boundary) or a rural area.

In a major urban area, NIRV adopts the methodology of SEPP N-1 for setting Recommended Maximum Noise Levels (RMNLs) from industry. The PSP site is located within the planning urban growth boundary and therefore the SEPP N-1 methodology (as described in Appendix B) is applied to this area.

4.0 SITE NOISE SURVEYS

The following sections detail measurements of existing City Gate noise taken within the proposed PSP area along with the background noise survey used to determine the SEPP N-1 Recommended Maximum Noise Levels.

4.1 Background noise survey

The determination of applicable NIRV RMNLs using the SEPP N-1 methodology is based on existing background noise levels and it is therefore necessary to establish existing noise levels at a location representative of the nearest future noise sensitive receiver.

Unattended 24-hour noise measurements were taken at the subject site between 1 November and 13 November 2017 using an ARL 316 Type 1 Environmental Noise Logger fitted with a weather proof windshield. The microphone was mounted at a height of approximately 1.5 m above local ground level under free field conditions. Measurements were obtained using the 'F' response time and A-weighting frequency network. The equipment was checked before and after the survey and no significant calibration drift was observed.

The measured background noise levels for each day during the survey period are provided in Appendix C. The lowest of the averaged background noise levels for each day, evening and night-time period are summarised in Table 2.

Table 2: Measured background noise levels, dB L_{A90}

Description	Day	Evening	Night
Lowest average background noise level	**35**	**34**	**28**

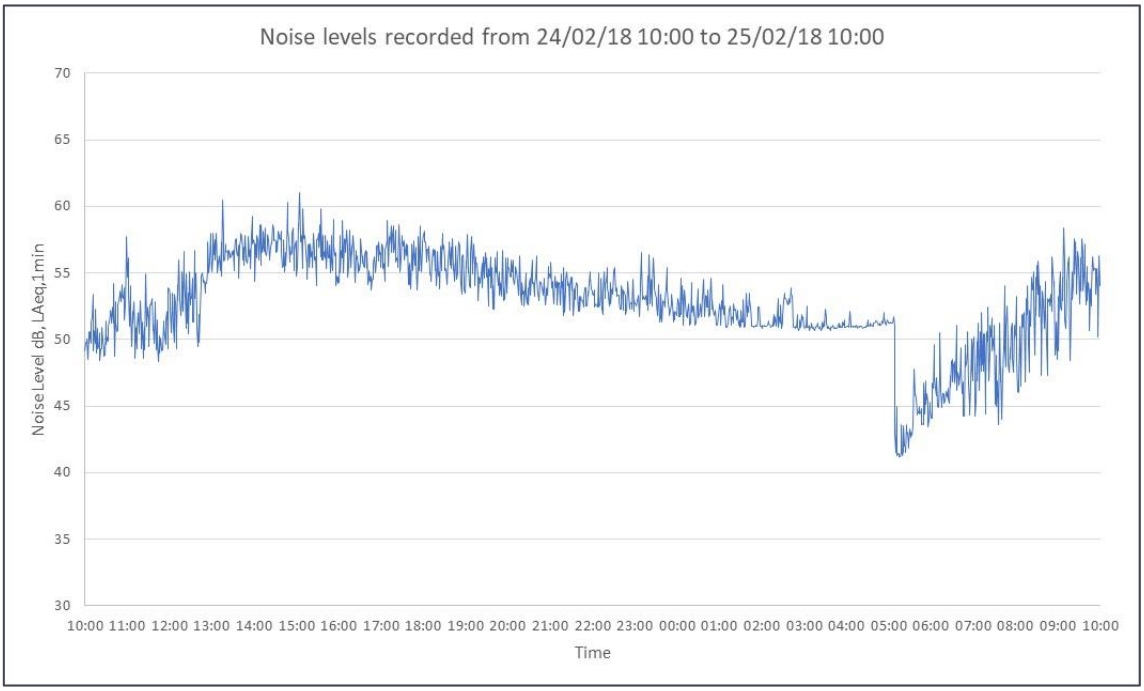
4.2 City Gate noise survey

Attended measurements of the City Gate facility have been carried out as part of this assessment along with unattended noise monitoring between the two periphery fences.

The two gas regulators located in the north west corner of the City Gate were identified to be the primary noise sources in the facility.

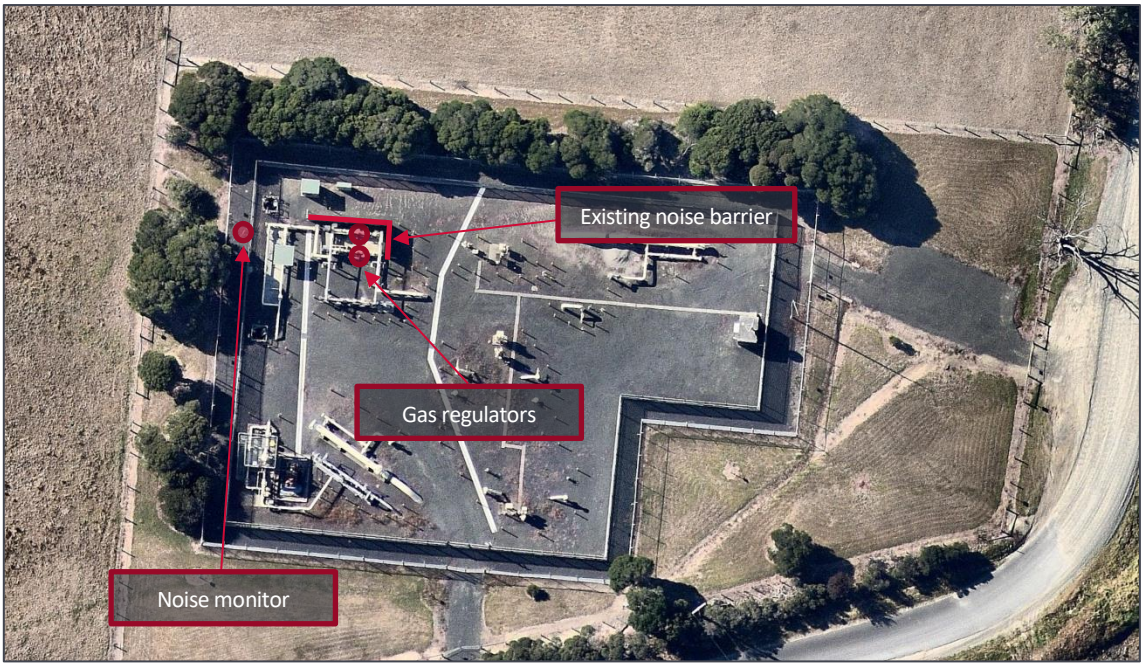
An unattended noise monitor was left on site to continuously measure noise from the two regulators between 22 February and 7 March 2018. Periods of elevated noise from the City Gate during the early morning were identified in the data collected. A graph showing the noise levels recorded over an example period is displayed in Figure 3.

Figure 3: Graph showing the measured noise levels over 24 & 25 February 2018



These noise levels recorded by the unattended noise monitor were higher than those measured by the consultant on site and therefore potentially relate to an operating scenario not observed during the attended noise measurement survey. The noise levels measured between 3am and 5am are a good example of noise produced by the city gate with minimal interference from extraneous noise sources. Noise levels during this period were recorded as approximately 51 dB L_{Aeq} 14 meters away from the regulators. The operation of the city gate can be observed to cease after 5am. Figure 4 shows the locations of the two regulators and the unattended noise monitor.

Figure 4: Aerial view of City Gate facility



5.0 CITY GATE NOISE ASSESSMENT

5.1 Applicable noise limits

Based on the background noise levels, Table 3 details the NIRV Recommended Maximum Noise Levels (RMNLs) applicable to noise from the City Gate facility. These limits have been determined in accordance with the SEPP N-1 methodology. A full derivation is provided in Appendix B.

Table 3: Applicable time periods and NIRV RMNLs, L_{eff} dB

Period	Noise limit
Day	48
Evening	43
Night	38

5.2 Noise model

To calculate noise levels in the vicinity of the City Gate, a 3-dimensional digital model of the site and surrounding environment was created using SoundPLAN proprietary modelling software (version 7.4).

Geometry data for the model has been sourced from public aerial photography, visual inspections of the area, and building heights defined on the basis of standard assumed heights per floor level. The geometries in the model are simplified representations of the built environment that have been configured to a level of detail that is appropriate for noise calculation purposes.

The SoundPLAN digital model has been used to calculate noise levels using the International Standard *ISO 9613-2: 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO 9613-2). ISO 9613-2 is a general environmental noise calculation standard that has been used extensively throughout Australia, New Zealand, and Europe since its publication in 1996.

The implementation of ISO 9613-2 within proprietary noise modelling software enables multiple sound transmission paths, including reflected and screened paths, to be accounted for in the calculated noise levels. While atmospheric effects are expected to have a negligible effect on the transmission of sound from the proposal to neighbouring sensitive receiver locations, it is noted that the ISO 9613 predicts noise levels for meteorological conditions which favour the propagation of noise.

5.3 Noise level information

Noise from the gas regulators within the City Gate was recorded using an unattended noise monitor. The loudest period of noise from the regulators have been used to calculate an upper level sound power for the regulators. A sound power data of 79 dB L_{WA} from each regulator, has been used to predict noise levels at future noise sensitive receivers within the Pakenham East PSP.

5.4 Predicted City Gate noise levels and noise mitigation recommendations

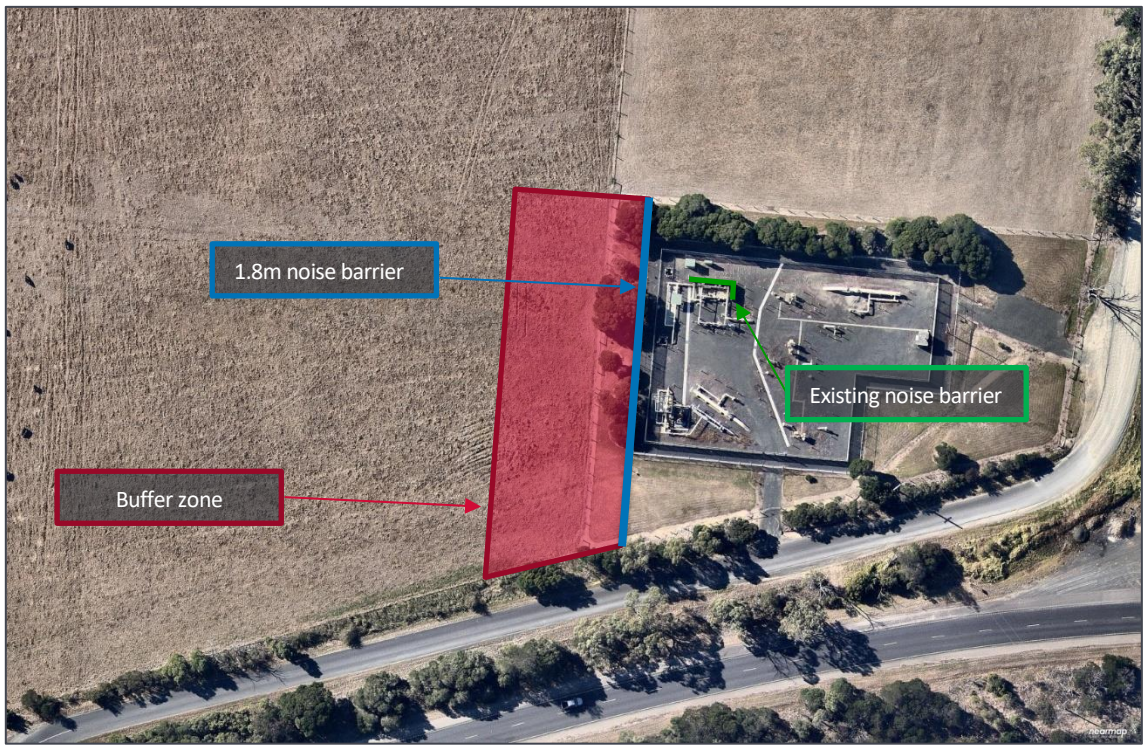
With no noise mitigation the noise level was predicted to be 44 dB 1.5 m above ground level at the point closest to the gas regulators along the western boundary of the city gate. To meet the night time RMNL 38 dB L_{Aeq}, it is recommended future noise sensitive allotments are setback 35 m from the western boundary of the City Gate facility, based on the current facility layout.

No setback from the eastern boundary of the City Gate site is required due to the existing noise barrier to the north and east of the gas regulators and the greater separation distance of the regulators to the eastern boundary. The existing noise barrier within the City Gate facility and the

setback due to the proposed road to the north is expected to provide sufficient attenuation to enable compliance with the recommended noise levels.

If residential or noise sensitive allotments are to be built up to and adjacent the western boundary of the City Gate facility, then a 1.8 m high noise barrier along the western boundary is recommended to enable compliance for single storey dwellings with the night time RMNL. If multistorey dwellings are proposed adjacent to the western boundary, then the upper levels may require acoustic treatment to their facade. Indicative construction details for a suitable noise barrier are included in Appendix D. An aerial image showing the approximate area of the buffer zone and the extent of the noise barrier can be seen in Figure 5.

Figure 5: Buffer distance and/or recommended barrier location



6.0 SUMMARY

Marshall Day Acoustics (MDA) has been commissioned to undertake an assessment of noise from the Dore Road City Gate gas facility to the closest future noise sensitive receivers in the proposed Pakenham East PSP.

The assessment concludes that the land near the City Gate gas facility is acceptable for noise sensitive use such as residential development subject to appropriate noise attenuation measures. To enable compliance with the maximum recommended noise levels, allotments to the western boundary of the site are required to be setback by a minimum of 35 m or feature a 1.8 m high noise barrier along the western boundary. Multi-storey dwellings immediately to the west of the City Gate may require a higher barrier or acoustic treatment to the upper level facade.

No treatment is required for noise sensitive uses to the north and east of the existing City Gate site. There is sufficient noise attenuation provided by the existing noise barrier along with the larger buffer distances provided by the separation between the regulators and the eastern site boundary and the proposed road to the north.

APPENDIX A GLOSSARY OF TERMINOLOGY

A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
dB	Decibel The unit of sound level.
L_{A90}	The noise level exceeded for 90% of the measurement period, measured in dB. This is commonly referred to as the background noise level.
$L_{A10\,(t)}$	The A-weighted noise level equalled or exceeded for 10% of the measurement period. This is commonly referred to as the average maximum noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Aeq}	The equivalent continuous sound level. This is commonly referred to as the average noise level and is measured in dB.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to ability of a material to stop sound travelling through it.
R_w	Weighted Sound Reduction Index A single number rating of the sound insulation performance of a specific building element. Rw is measured in a laboratory. Rw is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete.
Hertz (Hz)	Vibration can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. The frequency of vibration and sound is measured in hertz (Hz). Once hertz is one cycle per second. Structural Vibration is generally measured over the frequency range from 1Hz to 500Hz (0.5kHz).

APPENDIX B LEGISLATION AND GUIDELINES

B1 SEPP N-1

B1.1 Application

State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1 (SEPP N-1) sets noise limits that apply to commercial, industrial and trade premises within the Melbourne metropolitan region. Compliance with SEPP N-1 is mandatory under section 46 of the Environment Protection Act 1970. However, for the purpose of this site, the procedure for determining recommended noise limits is the relevant application of SEPP N-1, i.e. it is not mandatory compliance with the limits.

SEPP N-1 defines a 'commercial, industrial and trade premises' as:

> *any premises except:*
>
> *(a) residential premises as defined in section 48A of the [Environment Protection] Act;*
>
> *(b) a street or road, including every carriageway, footpath, reservation and traffic island on any street or road;*
>
> *(c) a tram, light rail or railway line not being a siding, marshalling yard or maintenance depot of any tram, light rail or railway line; and*
>
> *(d) [land situated at Luna Park, St Kilda].*
>
> *Section 48A of the Act defines residential premises as:*
>
> *any building or part of a building used as or for the purposes of a private residence or residential flat.*

B1.2 Assessment methodology

SEPP N-1 is a policy and technical document. The Policy prescribes the methodology and measurement procedure used to determine applicable noise limits and assessment of compliance.

The Policy requires that proposed commercial premises be designed to comply with SEPP N-1 noise limits. Clause 16 of the Policy states:

> *Where it is planned to develop new commercial, industrial or trade premises, the premises shall be designed so that the noise emissions do not exceed the noise limits*

Further, the occupier of commercial, industrial or trade premises has an ongoing obligation to meet the SEPP N-1 noise limits. Clause 15 of the Policy states:

> *where noise emissions from existing commercial, industrial or trade premises exceed the requirements set out in the Policy, steps shall be taken by the occupier to reduce the level of these noise emissions to, or below, the relevant Policy noise limits.*

SEPP N-1 defines a 'noise sensitive area' as an area of land within 10m outside the external walls of:

> *a dwelling or residential building*
>
> *a dormitory, ward or bedroom of a caretaker's house, hospital, hotel, institutional home, motel, reformative institution, tourist establishment or work release hostel.*

The assessment of noise from the subject site under SEPP N-1 is based on the calculation of a noise limit at a receiver position, taking into account a zoning noise level derived from the land zoning types in the surrounding area and the background noise level.

Once a noise limit is established, the noise level (L_{Aeq}) due to the commercial premises is measured or predicted. If necessary, the L_{Aeq} noise level is adjusted for noise character and duration to give the effective noise level (L_{eff}). If the L_{eff} level exceeds the noise limit, then remedial action is required.

B1.3 Calculation of noise limits

SEPP N-1 noise limits are calculated taking into account land 'zoning types' within a 70 m and 200 m radius of a noise sensitive building. Zoning types are categorised as type 1, 2 or 3.[1] A prescribed formula is used to calculate a corresponding Zoning Level. In general, zone type designations are as follows.

- areas such as residential, rural and open space are type 1;
- areas such as commercial, business and light industry are type 2; and
- areas such as general industry and major roads are type 3.

Greater areas of type 2 and 3 land within a 200 m radius of a noise sensitive site result in higher Zoning Levels than a site with respectively larger areas of type 1 land.

The SEPP N-1 Noise Limit is equal to the 'zoning level' unless the background level at the noise sensitive site is categorised as low or high according to Clause B3 of the Policy. If the background level is low or high, the Noise Limit is calculated from a formula taking into account the Zoning Level and the Background Level.

The limits are separately defined for the day, evening and night periods. The time periods are shown in Table 4.

Table 4: SEPP N-1 time periods

Period	Day of week	Start time	End time
Day	Monday-Friday	0700 hrs	1800 hrs
	Saturday	0700 hrs	1300 hrs
Evening	Monday-Friday	1800 hrs	2200 hrs
	Saturday	1300 hrs	2200 hrs
	Sunday, Public holidays	0700 hrs	2200 hrs
Night	Monday-Sunday	2200 hrs	0700 hrs

The noise limits derived from the SEPP N-1 methodology are shown in Table 5.

Table 5: Noise limits, dB L_{eff}

Period	Zoning level	Background noise level, dB L_{A90}	Noise limit
Day	52	35	48
Evening	46	34	43
Night	41	28	38

[1] EPA Publication no.: 316a, 17 February 2000, *Designation of Types of Zones and Reservations in the Metropolitan Region Planning Schemes for the Purposes of State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1* <http://www.epa.vic.gov.au/our-work/publications/publication/2000/february/316a>

APPENDIX C UNATTENDED NOISE MEASUREMENT SURVEY

Figure 6: Noise monitoring locations

Table 6 provides a summary of the measured background noise levels.

Table 6: Background noise levels, dB L_{A90}

Date	Average background noise level		
	Day	**Evening**	**Night**
Wednesday 1 November 2017	40	39	31
Thursday 2 November 2017	38	37	29
Friday 3 November 2017	41	42	33
Saturday 4 November 2017	38	38	29
Sunday 5 November 2017		38	31
Monday 6 November 2017	40	40	31
Tuesday 7 November 2017	41	40	30
Wednesday 8 November 2017	37	36	34
Thursday 9 November 2017	35	36	31
Friday 10 November 2017	35	36	31
Saturday 11 November 2017	37	34	28
Sunday 12 November 2017		34	29
Monday 13 November 2017	37		
Lowest measured average backgrounds	**35**	**34**	**28**

APPENDIX D NOISE BARRIER CONSTRUCTION

There are a number of options available for use as noise barriers. In short, for a barrier of this type any material with a surface density of at least 12 kg/m^2 will provide sufficient noise reduction to perform adequately as a noise barrier. Above this surface density threshold, the barrier performance is limited by sound flanking over and around the barrier, rather than sound passing through it.

It is critical that the barrier is well sealed and free from any holes or gaps. In particular, there must be no gap at the base of the barrier. It is recommended that the base of the barrier is buried to a depth of 10-20 cm.

Suitable materials for noise barriers include:

- 30 mm thick timber
- 15 mm thick Perspex or polycarbonate
- 75 mm brick or concrete
- Earth mounding

Combinations of the above can also be used to construct effective noise barriers, thus providing some variation in barrier appearance. For example, a timber barrier on top of earth mounds can be used.