GOLDER

Report

Noise and Air Quality Assessment Desktop Study

Western Outer Ring Main (WORM) Project

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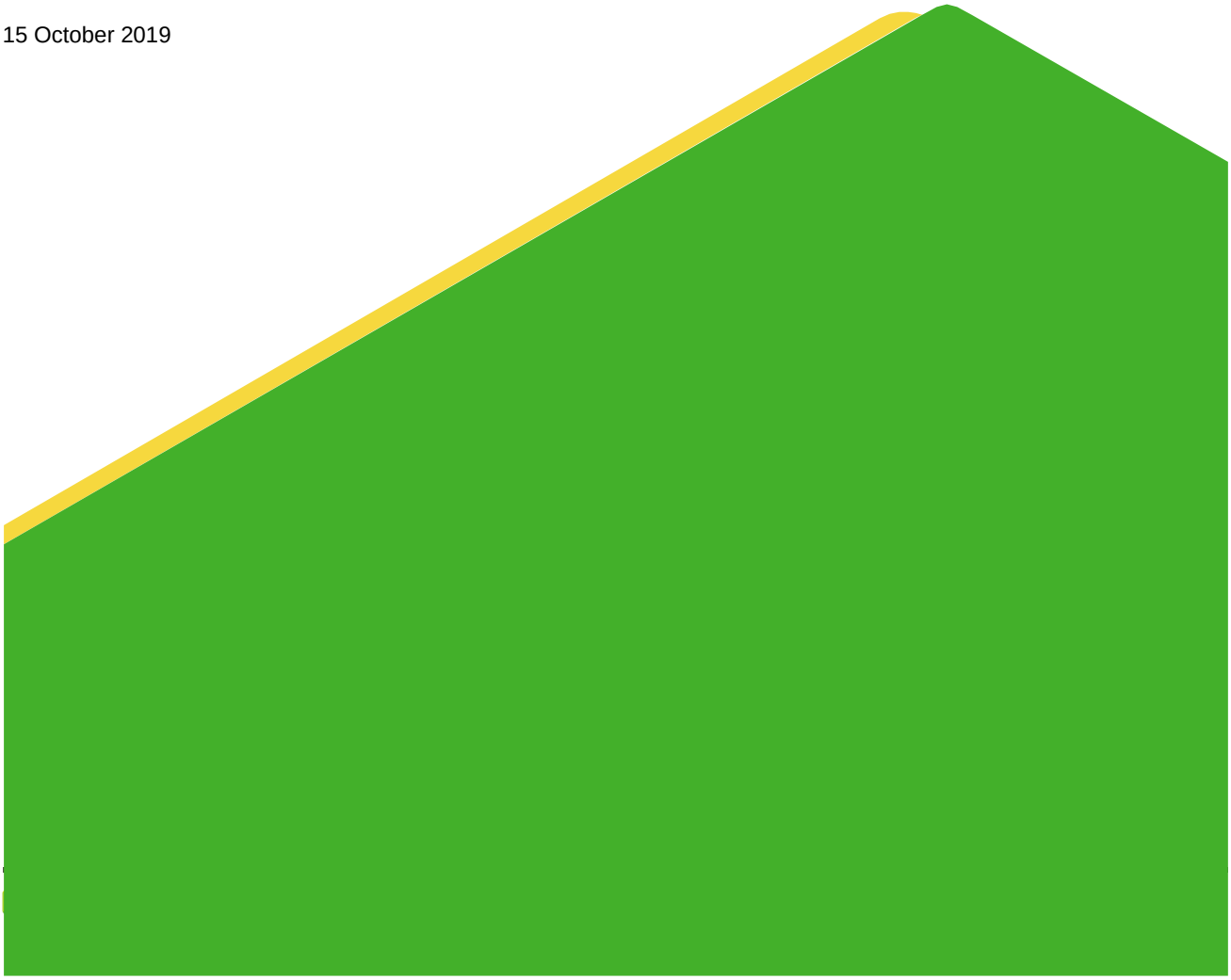

Executive Summary

Golder Associates Pty Ltd (Golder) has prepared this Noise and Air Quality Impact Assessment Report on behalf of APA to support a desktop review of a proposed high pressure gas pipeline between Plumpton and Wollert known as the Western Outer Ring Main (WORM) Project. This information will inform the Environmental Effects Statement (EES) referral. APA is proposing to construct a 500 mm diameter, buried steel, high pressure gas pipeline approximately 50 kilometres in length. The Project also includes an upgrade to the existing compressor station at Wollert.

As part of the desktop review noise and air quality impact assessments were conducted with objectives for the Study Area determined in accordance with national and state legislation and other relevant guidelines.

Sources of noise and dust emission from the Project were identified and the potential impacts of these on the nearest sensitive receptors along the 100 m wide Study Area was qualitatively assessed.

The noise and air assessments indicate that there is a low risk of impacts from the site activities at the nearest sensitive receptors and it is expected that the Project would comply with the relevant criteria.

Nevertheless, best management practices to mitigate noise and air quality impacts have been recommended and it is intended that these be included in a Construction Environmental Management Plan (CEMP).

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1.0 PROJECT CONTEXT

1.1 Project description

The project description is presented in the "*Western Outer Ring Main (WORM) Project Description*" document.

1.2 Legislative Framework

The *Environment Protection Act 2017* (EP Act) is the primary legislative instrument that governs protection of the environment in Victoria. It sets environmental objectives for air, water and land and regulates the discharge of emissions of these elements to the environment. Pursuant to the EP Act, beneficial uses of the air quality environment are principally protected by the following subordinate regulations and policies:

- *Environment Protection (Scheduled Premises and Exemptions) Regulations 2017*;
- *State Environment Protection Policy (Ambient Air Quality)* [SEPP(AAQ)] as amended in July 2016 to incorporate changes to the National Environment Protection (Ambient Air Quality) Measure (Air NEPM) particle standards (February 2016);
- *State Environment Protection Policy (Air Quality Management)* December 2001 [SEPP(AQM);
- *State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade)* (as amended October 2001).

On 1 July 2020, the Environment Protection Amendment Act 2018 (the Act) comes into force. An important part of the Act is the general environmental duty (GED). The GED says that any person engaging in an activity that can cause harm to human health or the environment, from pollution or waste, must minimise those risks. The Act introduces a more flexible approach to issues of compliance. This means a business must reduce the level of risk to human health and the environment, from any of its activities, so far as is reasonably practicable.

1.2.1 Environment Protection (Scheduled Premises) Regulations

Facilities with the potential to significantly impact on the environment are subject to listing as a scheduled premise, which may include conditions relating to discharge limits, monitoring and reporting requirements.

Schedule 1 of the *Environment Protection (Scheduled Premises) Regulations 2017* prescribe the premises that are subject to these requirements. Schedule 1 and L01 (General emissions to air) provides that the Wollert Compressor Station may be required to be listed as a scheduled premise if emitting:

- at least 100 kg per day of Volatile Organic Compounds (VOCs), particles, sulphur oxides (SO_x), nitrogen oxides (NO_x), other acid gases.
- at least 500 kg per day of carbon monoxide (CO).

A Works Approval for the upgrade of the Wollert Compression Station may be required if the new compressor has a cumulative effect on emissions such that the premise emits the following:

- 100 kg per day of NO_x or CO.
- 10 kg per day of SO_x or particles.
- 5 kg per day of VOCs.
- 0.1 g/min of Class 2 or Class 3 indicators.

1.2.2 State Environment Protection Policy (Ambient Air Quality)

In general, the SEPP(AAQ) adopts the requirements of the Air NEPM, with environmental quality objectives (EQOs) for CO, Nitrogen Dioxide (NO_2), photochemical oxidants (as ozone), sulphur dioxide (SO_2), lead, particulate matter with an equivalent aerodynamic diameter of less than 10 microns (PM_{10}) and particulate matter with an equivalent aerodynamic diameter of less than 2.5 microns($PM_{2.5}$), together with an additional objective for visibility reducing particles. The SEPP(AAQ) EQOs apply to air quality within a region or sub-region considered to be representative of exposure of the general population in Victoria.

1.2.3 State Environment Protection Policy (Air Quality Management)

The SEPP(AQM) sets out legislative requirements for managing and assessing air emissions in Victoria. The aim of the SEPP(AQM) is to:

- Ensure that prescribed air quality objectives are met.
- Drive continual improvement in air quality, whist having regard to the social and economic development of Victoria.
- Support the Victorian Government's other environmental goals.

The SEPP(AQM) identifies the following beneficial uses of the air environment:

- Life, health and well-being of humans.
- Life, health and well-being of other forms of life, including the protection of ecosystems and biodiversity.
- Local amenity and aesthetic enjoyment.
- Visibility.
- The useful life and aesthetic appearance of buildings, structures, property and materials.
- Climate systems that are consistent with human development, the life, health and well-being of humans and the protection of ecosystems and biodiversity.

Part II of the SEPP(AQM) classifies air pollutants as Class 1, 2 or 3 air quality indicators according to their potential to adversely affect the beneficial uses of the air environment:

- Class 1 air quality indicators are common or widely distributed air pollutants that may threaten the beneficial uses of local and regional air environments.
- Class 2 air quality indicators are hazardous substance that may threaten the beneficial uses of the air environment by virtue of their toxicity, bio-accumulation or odorous characteristics.
- Class 3 air quality indicators are extremely hazardous substances that are carcinogenic, mutagenic, teratogenic, highly toxic or highly persistent, which may threaten the beneficial uses of the air environment.
- Unclassified air quality indicators have the potential to affect the beneficial uses of local amenity and aesthetic enjoyment, namely odour and total suspended particulates (nuisance dust).

SEPP(AQM) Clause 19(1) states that a generator of a new source of air emissions '*must apply best practice to the management of those emissions*'.

Best practice is defined as '*the best combination of eco-efficient techniques, methods, processes or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector or activity*'. Eco-efficient is defined as '*producing more goods with less energy and fewer natural resources, resulting in less waste and pollution*'.

Additionally, SEPP(AQM) Policy Principles under 7(1)(c) states that '*the measures adopted should be cost-effective and in proportion to the significance of the environmental problems being addressed*'.

Pollutant impacts from the upgraded Wollert Compressor Station will be assessed against SEPP(AQM) Schedule A design criteria, as presented in Table 1.

Table 1: SEPP(AQM) design criteria

Pollutant	Criterion (mg/m^3)[1, 2]	Averaging period
NO_2	0.19	1 hour
CO	29	1 hour
Total VOCs (as Benzene)	0.053	3 minute

Notes:
1 Design criteria are to be used in assessing the design of new or expanded sources of emissions such as industrial premises
2 Assessment criteria based on 99.9th percentile as determined by modelling in accordance with Schedule C of SEPP (AQM)

1.2.4 State Environmental Planning Policy N1

Noise emissions from commercial industrial or trade noise sources within the Melbourne Metropolitan region are regulated under State Environmental Planning Policy N1 (SEPP-N1). This will apply to the Wollert Compression Station.

1.2.5 Pipeline construction

There are currently no Victorian regulations or policies that specifically govern air quality or noise during pipeline construction. The general provisions of the EP Act, including the offence provisions regarding air pollution (Section 41), are applicable to construction activities. The nuisance provisions of the *Public Health and Wellbeing Act 2008* also apply. The *Public Health and Wellbeing Act* applies to nuisances arising from a number of sources, including any state, condition or activity, which is, or is liable to be, dangerous to health or offensive.

The EPA Victoria Environmental Guidelines for Major Construction Sites (The Construction Guidelines) (EPA Victoria 1996) will apply to the Project during construction.

It should be noted that under Section 133 of the *Pipeline Act 2005* an Operational Environmental Management Plan (OEMP) is required.

2.0 EXISTING BASELINE DATA

The Study Area is located north of Melbourne between Plumpton in the west and Wollert in the north east. The Bureau of Meteorology (BOM) weather station at the Melbourne Airport (IDV60801) is located approximately 3 – 20 km from pipeline construction and 17 km from the Wollert compressor station. The Melbourne Airport station is considered a suitable representation of the local meteorology at the site for the purposes of this assessment.

A summary of the meteorological conditions (wind speed, wind direction) and existing acoustic and air environment is provided below.

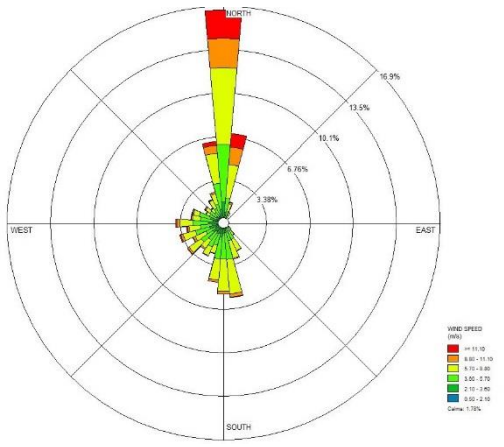
2.1 Wind Speed and Direction

The seasonal wind patterns are displayed as wind rose plots (WRP) for each season over a combined five-year period (2013 – 2017). Each WRP details the wind speed and direction that occurred in that particular period (Figure 1).

A summary of the meteorological data measured is presented below:

- The prevailing wind direction for all seasons is northerly.
- The average wind speed is 5.4 m/s.
- Strong winds (above 8.8 m/s) are infrequent and more likely to occur in spring.
- Calm winds occur at a frequency of 1.8%.

Annual



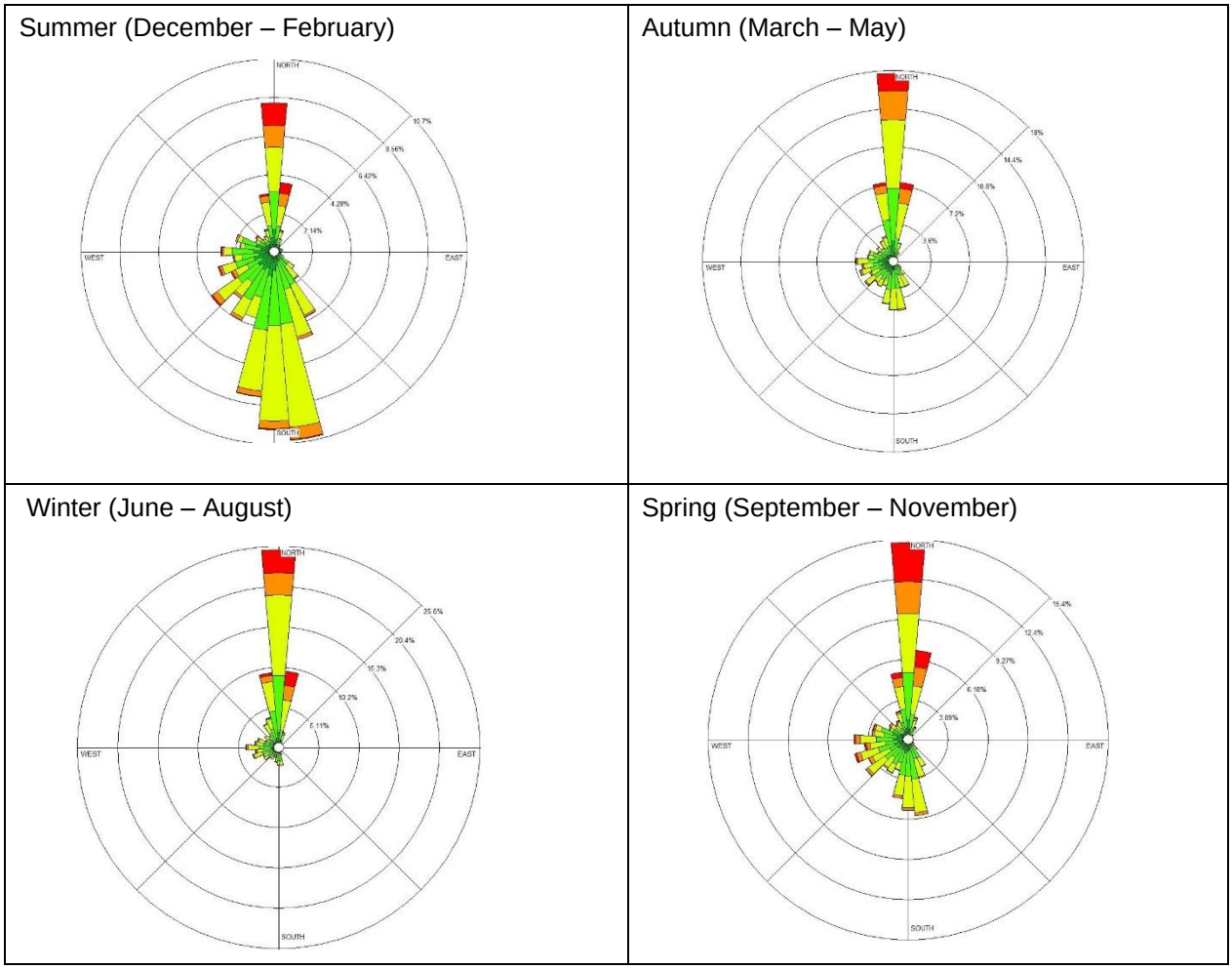


Figure 1: Wind rose plots - BOM Melbourne Airport Station (2013 – 2017)

2.2 Acoustic Environment

The Study Area is primarily located in rural areas, however urban growth zones are planned and/or currently being developed adjacent to the alignment and the Wollert Compressor Station (see APPENDIX A, Figure 2). The SEPP- sets noise limits for the Melbourne metropolitan area. These apply to noise sensitive areas (residences, hospitals etc).

In relation to the Wollert Compression Station a noise assessment study was undertaken by Wood (2019) (see Appendix B) This reports states that the sound power levels of equipment operating at the compression station were measured on the 2nd April 2019. At the same time noise levels were also measured at the boundary of the buffer zone surrounding the compression station. The background noise limit at night was 39dB(A).

2.3 Air Environment

Existing air quality is considered typical of a Victorian rural area based on the current population density (see below). Sources of atmospheric contaminants in these areas include exhaust emissions from road vehicles and farm machinery, the burning of fossil fuels due to household activity (cooking/heating) and windblown dust generated from exposed surfaces.

Industrial sources of air emissions in the area include the Melbourne Airport, sand and rock quarries, landfills, existing compressor stations associated with the Victorian transmission system and other light industry.

Air pollutants of relevance operation of the Wollert Compressor Station include:

- NO_2
- CO
- VOCs

Air pollutants of relevance to pipeline construction include:

- Particulate matter
- NO_2
- CO
- VOCs

Local air quality has been characterised from ambient air quality monitoring conducted by EPA Victoria and published in their Air Monitoring report *National Environment Protection (Ambient Air Quality) Measure* 2017. 75th percentile background concentrations in Table 2 have been selected from Ambient Air Quality Monitoring Stations (AAQMS) with a low population density (10 – 100 people/km^2).

Particulate matter is represented by measurement of coarse and fine particles (i.e. PM_{10} and $PM_{2.5}$).

Table 2: Representative background air quality concentrations in the Study Area

Pollutant	Units	Averaging period	Background concentration (75th percentile)	Period
CO	mg/m^3	8 hour	0.34	2017
NO_2	µg/m^3	1 hour	0.020	
PM_{10}	µg/m^3	daily	18	
$PM_{2.5}$	µg/m^3	1 hour, 24 hour and annual	8.5	

The ambient background concentration of VOCs is considered very low in rural areas and is considered zero for the purpose of this assessment.

2.4 Sensitive receptors

EPA Victoria Publication No. 1518, *Recommended Separation Distances for Industrial Residual Air Emissions*' (March 2013) defines a sensitive land use as 'any land uses which require a particular focus on protecting the beneficial uses of the air environment relating to human health and wellbeing, local amenity and aesthetic enjoyment, for example residential premises, childcare centres, pre-schools, primary schools, education centres or informal outdoor recreation sites.

The Wollert compressor station is located in an agricultural zone, with minimal sensitive receptor locations in the surrounding area. For pipeline construction, existing sensitive receptor locations (residences) have been identified based on aerial imagery. Areas identified as potential residential areas have been provided by APA. For the purpose of this assessment, any sensitive receptor (including existing residences and potential future residences) within 1 km of the study area has been considered to have the potential to be impacted by noise and air emissions.

Table 3 identifies sections of the alignment that have the potential to impact nearby sensitive receptors.

Table 3: Existing sensitive receptor locations (pipeline construction)

KP	Precinct Structure Plan (PSP) or Zone	Adjacent Land use	Sensitive receptors located within 1 km of Study area
0	Plumpton PSP	Residential	Yes
1	Plumpton PSP	Residential	Yes
2	Plumpton PSP	Residential	Yes, potential residences within study area.
3	Plumpton PSP	Residential	Yes, potential residences within study area.
4	Plumpton PSP	Residential	Yes
5	GWZ	Ag	Yes
6	GWZ	Ag	No
7	GWZ	Ag	No
8	GWZ	Ag	No
9	GWZ	Ag	Yes
10	GWZ/PUZ4/RDZ1/GWAZ	Ag entering Rural Res (GWZA)	Yes
11	GWAZ	Rural Res	Yes
12	GWAZ	Rural Res	Yes
13	GWAZ/GWZ	Rural Res	Yes
14	GWZ	Rural Res	Yes
15	GWZ	Rural Res into Ag	Yes
16	GWZ	Ag/cropping	Yes
17	GWZ	Ag	Yes
18	GWZ	Ag	Yes
19	GWZ	Ag	Yes, PPA at 19.5 one dwelling within study area.
20	GWZ	Ag/Rural Res	Yes

KP	Precinct Structure Plan (PSP) or Zone	Adjacent Land use	Sensitive receptors located within 1 km of Study area
21	GWZ	Ag/Rural Res	Yes
22	GWZ	Ag	No
23	GWZ	Rural Res/Ag	Yes
24	GWZ	Rural Res/Ag	No
25	GWZ	Rural Res/Ag	No
26	GWZ	Rural Res/Ag	Yes-PPA at 26.5 and 26.6 two dwellings within study area
27	GWZ	Rural Res/Ag	Yes- PPA at 27.0 one dwelling within study area
28	GWZ	Rural Res	Yes, potential residences within study area.
29	GWZ/RDZ1/Lindum Vale PSP	Rural Res	Yes, potential residences within study area.
30	Merrifield West PSP	Residential	Yes, potential residences within study area.
31	Merrifield West PSP	Residential	Yes, potential residences within study area (as of May 2019, some residences already built within study area).
32	Merrifield West PSP	Residential	Yes
33	Merrifield West PSP	Residential	Yes
34	Merrifield West PSP/UGZ/Merrifield North Employment PSP	Residential	Yes
35	UGZ/Merrifield North Employment PSP	Future employment/res	Yes
36	Merrifield North Employment PSP	Future employment/res	Yes
37	Merrifield North Employment PSP	Future employment/res	Yes- PPA at 37.9 a dwelling within study area

KP	Precinct Structure Plan (PSP) or Zone	Adjacent Land use	Sensitive receptors located within 1 km of Study area
38	Merrifield North Employment PSP / Lockerbie PSP	Future employment/res	Ye
39	Lockerbie PSP	Residential	Yes
40	Lockerbie PSP	Residential	Yes
41	Lockerbie PSP	Residential	Yes
42	Lockerbie PSP/Donnybrook PSP	Residential	Yes
43	Donnybrook PSP	Residential	Yes
44	Donnybrook PSP	Residential/Conservation	Yes
45	Donnybrook PSP	Residential	Yes
46	Donnybrook PSP/Woodstock PSP	Residential	Yes, potential residences within study area.
47	Woodstock PSP	Residential	Yes
48	Woodstock PSP/Shenstone Park PSP	Residential/TBC	No
49	Shenstone Park PSP	TBC	No
50	Shenstone Park PSP/Northern Quarries PSP	RCZ/TBC	Yes
51	Northern Quarries PSP	SUZ/FZ/RCZ/TBC	No

3.0 IMPACTS (POTENTIAL EFFECTS) OF THE PROJECT

3.1 Wollert Compressor Station

3.1.1 Overview

The Project includes an upgrade to the existing compressor station at Wollert. The air quality impacts of this station were assessed by Golder based on information provided by APA including emissions as listed in the National Pollution Inventory (NPI). APA propose the installation of an additional compressor identical to the existing compressors 4 and 5. Various operating scenarios have been considered with the worst-case emissions scenario being the simultaneous operation of existing compressor units 4 and 5 and new compressor 6. This scenario is expected to occur no more than 10% of the time.

3.1.2 Source identification

Based on the emissions from the Wollert Compression Station as listed in the National Pollution Inventory[1] Air emissions from compressor stations include PM_{10}, $PM_{2.5}$, NO_2 and CO and minor trace elements of Total Volatile Organic Compounds (TVOC), Polychlorinated Dioxins and Furans (PDF), Polycyclic Aromatic Hydrocarbons (PAH) and SO_2.

3.1.3 Emission Inventory

An emission inventory for the compressor station has been compiled using emission testing reports provided by APA and publicly available data accessed from the Australian Government Department of the Environment and Energy's National Pollutant Inventory.

3.1.4 Project specific impacts

The nearest sensitive receptor (farmhouse) is located approximately 850 m from the Wollert Compressor Station.

Where there are activities that have the potential for significant environmental impact a Works Approval is required. These are issued by EPA Victoria under the *Environment Protection Act 1970* ('the Act'). However, the EPA can grant works approval exemptions for some activities that are eligible for an exemption under *the Environment Protection (Scheduled Premises) Regulations 2017*. Of relevance is the exemptions listed for air emissions in Part 3, Section 10 of the Regulations. These are summarised in Table 4 below together with the current emissions from the Wollert Compressor Station.

Table 4: Works Approval Triggers and Existing Emissions from the Wollert Compressor Station

Emissions from the WSC including Gas Turbines	NPI Report 2017/2018 Existing Wollert Compressor Station Daily Air Emissions (kg)	Threshold Exemptions per day
NOx	173 kg	100 kg
SOx	0.27 kg	100 kg
CO	44 kg	500 kg
VOCs	7.4 kg	100 kg

[1] See http://www.npi.gov.au/npidata/action/load/emission-by-individual-facility-result/criteria/state/null/year/2018/jurisdiction-facility/00006832

NOx are above the exemption threshold for a Works Approval. Therefore, the Wollert Compressor Station is a Scheduled Premise under Schedule 1 of the Regulations. As part of the Works Approval process detailed modelling will be required.

A Works Approval under section19A(1)(d) of the EP Act is not required with respect to emissions of noise from a source emitting less than 80dB(A) sound power level. The modelling for the compressor station assumed that the proposed unit 6 will have an overall package sound power level of 111dB(A), inclusive of the gas and lube oil coolers, the same as that of the existing Units 4 and 5 (Wood, 2019).

The modelling and analysis undertaken for the expanded facility operating at the maximum operational scenario determined that:

- Noise levels would increase by 1.5 to 2dB at most receivers; and
- Modelled noise levels fall below the SEPP-N1 limits.

Therefore, noise levels should not trigger the need for Works Approval on this specific scenario alone.

3.2 Pipeline construction

Construction emissions for pipeline construction are complex due to the range, type and number of activities, the geographical extent over which these activities occur and the intensity and duration. Air quality impacts associated with construction activities have therefore been addressed qualitatively. Where information was available, the nature of the proposed works and potential emission sources were described.

Risks associated with construction of the project were identified, and management and mitigation measures proposed to reduce the potential for adverse impacts on local air quality and the receiving environment.

3.2.1 Project specific impacts

The PPA traverses both rural land (~22km) and urban growth zones (~25km); and is adjacent to an existing urban area (~3km). A desktop assessment of potential air quality and noise impacts from the construction of the pipeline was made based on information provided by APA. There is the potential for air and noise emissions to occur along the corridor Right-of-Way (ROW) during construction period, however impacts are expected to be localised, of short duration and intermittent in nature. Proposed management measures presented in Section 4.0 would ensure impacts on the receiving environment are minimised.

3.2.1.1 Air Quality

The main air quality impacts resulting from pipeline construction are associated with airborne particulate matter of various size fractions [deposited dust, Total Suspended Particulates (TSP), PM_{10} and $PM_{2.5}$].

Dust emissions are caused by surface materials being pulverised and abraded by application of mechanical force through the use of implements (wheels and blades), followed by entrainment of particles by the action of turbulent air currents.

Impacts would depend on the quantity and drift potential of the particles in the atmosphere, with larger particles (deposited dust and the larger particle fraction of TSP) settling out close to the source due to their larger mass. The deposition of dust can cause nuisance and aesthetic impacts on the receiving environment. Finer particles (PM_{10} and $PM_{2.5}$) remain entrained much longer and are therefore dispersed at greater distances from the source. The fine nature of these particles also has the potential for human health impacts if not adequately controlled.

Key construction activities with the potential to generate dust include clearing and grading, trench excavation, stockpiling of topsoil, backfilling, transport of materials, construction of surface facilities and reinstatement.

Dust on site may be generated from the following sources:

- vehicle movements on paved and unpaved roads (wheel generated dust)
- erosion of stockpiles and freshly exposed areas
- handling, transfer and storage of materials
- handling, transfer and stockpiling of spoil material
- mulching
- operation of heavy earthworks machinery
- movement of on-site machinery
- fuel combustion in heavy vehicles and mobile plant
- blasting

Construction equipment is likely to include, but not be limited to, trucks, dozers, graders, excavators, compactors, rollers, scrapers and rock saws. The actual number and type of equipment used during construction would depend on availability and the contractor's preferred working method.

Off-site impacts could occur due to the movement of trucks filled with spoil or fill moving along roads in the local area.

The combustion of diesel fuel and petrol in heavy vehicles and mobile plant would result in emissions of CO, NO_x, SO_2, particulate matter fractions (PM_{10} and $PM_{2.5}$), VOCs, semi-volatile organic compounds (SVOCs), (including PAH) and trace levels of heavy metals. Emission rates and impacts would depend on the number and power outputs of the combustion engines, the quality of the fuel and engine maintenance. Notwithstanding, these sources are considered to be minor given their intermittent nature, duration and the geographical extent over which emissions would occur.

3.2.1.2 Noise/Vibration

There is the potential for noise and vibration impacts during all construction activities. The main sources of noise are associated with mobile plant engines (primarily during acceleration), extraction and clearing activities and blasting.

Noise on site may be generated from the following sources:

- vehicle movements, trucks driving to and from site
- operation of heavy earthworks machinery including:
  - excavation
  - rock breaking
  - clearing and grading
  - stringing
  - bending
  - backfilling
  - fencing and tree clearing

  - lowering in and padding
- operation of generators and other stationary plant using engines
- sandblasting
- welding
- mulching
- trench blasting

Road traffic off-site will also be increased during the Project during the construction phase, as truck movements are required for material supply and delivery. These impacts are expected to be relatively minor.

Where significant hard rock conditions are encountered, blasting is likely to be required along the alignment to provide an adequate trench for the pipeline. Without appropriate mitigation measures, blasting activities could potentially cause dust, noise, vibration and fly rock impacts at nearby sensitive receptors.

3.2.2 Cumulative impacts

Pipeline construction is expected to have negligible ongoing air or noise environmental impacts and, as such, an assessment of cumulative impacts is not considered appropriate.

4.0 MITIGATION

4.1 Wollert Compressor Station

The Wollert Compressor Station will require detailed assessment of noise and air quality impacts during the Works Approval process. In this context to mitigate the impacts from the Wollert Compressor Station the following actions are recommended:

- Undertake detailed modelling as required under the Works Approval process in line with EPA requirements.
- Implement an Air Quality Management Plan.
- Develop and implement an inspection and maintenance program to ensure all equipment operates efficiently and as per design.
- Routine monitoring and maintenance to be undertaken and recorded to track equipment operating parameters.
- Stack emissions testing to be undertaken as required by the applicable regulations.

4.2 Pipeline construction

A Construction Environmental Management Plan (CEMP) would be required to outline the mitigation measures used to minimise air quality, noise and vibration impacts from the Project. The CEMP would be consistent with the EPA Victoria Environmental Guidelines for Major Construction Sites (1996) (“Construction Guidelines”) and prepared in consultation with relevant councils, EPA Victoria and other authorities as required for approval. Mitigation measures to be included in the CEMP are described below.

Construction activities will occur during normal working hours to minimize impacts on nearby sensitive receptors. Where it is necessary to work out of hours, procedures for notifying affected residents and documentation justifying this work will be included in the CEMP. Daily inspections of the works within the ROW will be undertaken to inspect for adequate dust and noise control.

4.2.1 Dust and air quality

A Dust and Air Quality Management Plan would be prepared by APA and included in the CEMP to minimise air quality impacts during construction. The plan will set out how the Project will control the emission of smoke, dust, fumes, odour and other pollution into the atmosphere during construction in accordance with the SEPP (AQM), with reference to the Construction Guidelines.

The Dust and Air Quality Management Plan would outline the main sources of dust and airborne pollutants, and the location of sensitive land uses, describe the proposed air quality and dust management and monitoring system and describe the mitigation measures that will be implemented to ensure compliance with air quality criteria.

Mitigation measures proposed for the Project have been provided by APA and include:

- Vehicle speeds on the construction ROW will be restricted to a maximum of 40 kph reduced to 10 kph when passing work crews.
- Vehicle speeds at the construction depot and pipe storage area will be restricted to a maximum of 10 kph.
- Plant and equipment will be regularly maintained and monitored.

- Road surfaces will be monitored for erosion and rutting particularly if frequently trafficked and adjacent to residences.
- Water will be applied to exposed soils to prevent dust generation.
- Dust generated from soil stockpiles will be minimised by ensuring exposure time is minimised, applying water, covering stockpiles with protective materials (e.g. hessian, tarpaulins), applying polymers or applying sterile grass as a medium-term stabiliser on stockpiles or exposed slope batters.
- If all available methods of dust stabilisation fail to suppress dust and it continues to result in unacceptable impacts, construction activities may need to be temporarily halted until dust generating conditions subside.
- Early reinstatement of the construction corridor to assist in soil stabilisation.
- Minimising the time that surfaces such as stockpiles and cleared areas are exposed.

4.2.2 Noise/Vibration

A Noise and Vibration Management Plan would be prepared by APA and included in the CEMP to minimise air quality impacts during construction. The plan will set out how the project will control the emission of noise during construction with reference to the Construction Guidelines.

Mitigation measures proposed for the project have been provided by APA and include:

- All field personnel will be made aware of potential noise sources from their operations and noise mitigation measures available.
- Where construction is adjacent to residences, construction activities will be undertaken within standard construction hours throughout a 7-day working week and will be in line with the Construction guidelines, except where unavoidable for practical reasons or agreement is obtained from affected residents.
- Where practicable, excessively noisy construction activities will be scheduled for periods which are less likely to result in a noise nuisance.
- A nuisance complaint and dispute resolution process will be established.
- Construction equipment will be maintained in good working order.
- All equipment will be equipped with noise abatement devices and these will be maintained in good working order.
- Exhaust breaks on heavy vehicles will not be used within 100 m of any resident except in an emergency.
- Noisy machinery will not be left running when not required.
- Wherever possible, materials will be lifted and placed, slid or rolled down inclines rather than dropped.
- Noisy generating equipment (e.g. generators) will be located at appropriate distances form residences and/or within noise enclosures if necessary.
- Noisy construction activities restricted to agreed working hours based upon a 6-day working week or 12 day working fortnight.
- Residents or landowners of neighbouring areas likely to be affected by works will be kept informed regarding work progress and operational issues that may impact them.

- Affected residents to be advised by APA when there is unavoidable out-of-hours work that may result in noise nuisance.
- Noise attenuation screens will be provided where appropriate.

Should specific operations that may result in noise nuisance, such as HDD drilling, require works to be conducted outside the standard working hour, this shall only be undertaken with notification of affected landholders/occupiers and subject to consultation to minimise impacts.

A Blasting Management Plan will be prepared by APA and included in the CEMP, based on the outcomes of a detailed assessment of blasting impacts from the project. This must meet the requirements as set out in *AS 2187.2: Explosives-Storage and use. Part 2: Use of explosives*. WorkSafe Victoria *Guidance note: Blast Management Plans*[2] (April 2011) together with Australian Explosives Code (AEC) provide further advice. This plan will include blasting methodology and procedures, mitigation and management measures to be used and the minimum distance required between residences and blasting.

Mitigation measures proposed for the project have been provided by APA and include:

- Where blasting is deemed necessary, application for blasting will be submitted to relevant authorities.
- Specific blast design/plan by an approved contractor to be provided for each blasting activity.
- Vibration limits set according to the AEC and with reference to legislation in Victoria.
- Blasting works performed to guarantee zero fly rock escaping beyond the work site boundaries.
- Airblast overpressure will not exceed project specific limits as informed by the detailed assessment.
- Peak particle velocity will not exceed project specific limits as informed by the detailed assessment.

[2] See: https://www.worksafe.vic.gov.au/resources/blast-management-plans-guidance-note

5.0 GREENHOUSE GAS ASSESSMENT

5.1 Wollert Compressor Station

A greenhouse gas (GHG) assessment was conducted for the proposed gas turbine to be installed at the existing Wollert gas compressor station. The GHG assessment is based on the energy consumption of the proposed gas turbine and assumes the compressor operating 12 hours per day, 365 days per year (i.e. 50% operational time). The gas turbine specifications supplied by APA are presented in Table 5 and the GHG emission factors for natural gas are presented in Table 6.

Table 5: Gas turbine specifications gas emissions

Gas Turbine - Centaur 50		
Output power	4,570	kW
Fuel	Natural gas	
Fuel consumption	1,090	kg/h
Gas consumption	1,449	m^3/h
Energy consumption	57	GJ/h
Operation	12 hours per day, 365 days per year	
Annual operating hours	4,380	hours
Annual gas consumption	6,300,000	m^3/year
Annual energy consumption	250,000	GJ/year

GHG emissions from the gas compressor station are comprised of energy related GHG from the combustion of natural gas by the compressor engine and fugitive emissions of methane from equipment leaks such as valves, seals and flanges.

Operational GHG emission have been determined from the *National Greenhouse Account Factors – July 2018*. Fugitive GHG emissions have been determined in accordance with the *NGERS (Measurement) Determination 2008*, Section 3.77 using Method 2. This method requires adoption of the American Petroleum Institute's (API) *Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry 2009*. Table 6 and Table 7 present the relevant emission factors used in the assessment of the Wollert compressor station.

Table 6: Operational Greenhouse Gas Emission Factors[3]

Description	Energy content (GJ/m^3)	Emission factor kg CO_2-e/ GJ		
		CO_2	CH_4	N_2O
Natural gas distributed by pipeline	39.3×10^{-3}	51.4	0.1	0.03

[3] National Greenhouse Account Factors – July 2018

Table 7: Fugitive Greenhouse Gas Emission Factors

Description	Operational hours per year	Emission factor t CO_2-e/ station hour
Compressor station centrifugal	4 380	0.00247

Annual GHG emissions from the proposed gas turbine operating under an operational scenario of 12 hours per day, 365 days per year is 12,900 tCO_2-e per year as presented in Table 8.

Table 8: Wollert Compressor Station Greenhouse Gas Emissions

Description	Emissions tCO_2-e/ station- year
Compressor station centrifugal	12 900
Fugitive emissions	11
Total GHG emissions	12 900

5.1.1 Worst case GHG emissions

The annual combined worst case GHG emissions from all three gas turbines operating continuously 365 days per year is estimated to be 77, 000 tCO_2-e/year, compared with the EES referral trigger level of 200, 000 t CO_2-e/year, indicating the EES referral criteria will not be triggered by GHG emissions due to the proposed works. Note this scenario is extremely conservative as it is expected to occur no more than 10% of the time.

5.2 Pipeline Operation

Fugitive emissions related to the transmission of natural gas in the WORM pipeline have been determined in accordance with the *NGERS (Measurement) Determination 2008*, Section 3.76 using Method 1. This accounts for fugitive emissions of methane from the pipeline from valves and other infrastructure.

Other activities associated with the operations of the pipeline by infrequent transport movements required for the pipeline surveillance and operational maintenance activities have minor impacts (< 1 tCO_2-e/year) and therefore have not been considered further in this assessment.

Annual GHG emissions from the proposed WORM pipeline per year is presented in Table 9.

Table 9: WORM Pipeline Greenhouse Gas Emissions

Description	Emission factor tCO_2-e/ km of pipe	Pipeline length (km)	CO2 emissions tCO_2-e/ year
Natural gas transmission in a pipeline	10.42	50.6	527

6.0 RESIDUAL IMPACTS

6.1 Wollert Compressor Station

The operation of the Wollert Compressor Station will inherently result in emissions and impacts to air quality. However, implementation of the mitigation measures as outlined in Section 4.1 will reduce this to As Low As Reasonably Practical (ALARP).

6.2 Pipeline Construction

A risk assessment was undertaken to assess the residual impacts of pipeline construction following implementation of mitigation measures.

The following matrix, adopted from the EPA '*Licence Assessment Guidelines*' (EPA Publication 1321.2), was used to assess the likelihood of occurrence and potential consequences of the operation.

Risk ratings were assessed by considering the consequence and likelihood of an event occurring.
In assessing the consequence, the extent, severity and duration of the risks were considered. These are discussed below.

Assigning the consequences of risks

'Consequence' refers to the maximum credible outcome of an event affecting the objectives in relation to an asset, value or use. Consequence criteria have been developed to consider the following characteristics:

- Extent of impact
- Severity of impact
- Duration of threat

Severity has been assigned a greater weighting than extent and duration as this is considered the most important characteristic.

Each risk pathway was assigned a value for each of the three characteristics, which were added together to provide an overall consequence rating.

Table 10: Risk assessment matrix

Consequence	Likelihood				
	Almost Certain	Likely	Probable	Unlikely	Rare
Severe	Very High	Very High	Very High	High	High
Significant	Very High	High	High	High	Moderate
Moderate	Very High	High	Moderate	Moderate	Low
Minor	High	High	Moderate	Moderate	Low
Negligible	High	Moderate	Low	Low	Low

In applying the above matrix to the consideration of potential risks associated with the Project, the following descriptors were applied:

Likelihood of hazard:

'Likelihood' refers to the chance of an event happening and the maximum credible consequence occurring from that event.

- Almost Certain: Is expected to occur almost all of the time.
- Likely: Is expected to occur most of the time.
- Probable: Might occur.
- Unlikely: Might occur but not expected.
- Rare: Only expected to occur under exceptional circumstances.

Consequence of hazard:

'Consequence' refers to the maximum credible outcome of an event affecting the objectives in relation to an asset, value or use.

- Severe: Death, substantial off-site impacts to broader environment, long-term environmental damage, extensive clean-up required, complete failure of environmental protection controls.
- Significant: Hospitalisation required, off-site impacts to a segment of the environment, medium-term environmental damage, off-site clean-up required, breach of environmental legislation.
- Moderate: Medical attention required, some off-site, temporary impacts, moderate onsite impacts.
- Minor: First aid required, minimal onsite impacts immediately contained, no discernible off-site impacts, no external complaints received.
- Negligible: No health impacts, negligible onsite impacts, no off-site impacts.

The residual risk for pipeline construction activities is summarised in Table 11.

Table 11: Pipeline construction risk assessment

Identified Aspects	Description	Initial risk			Control Measures	Residual risk		
		Consequence	Likelihood	Overall		Consequence	Likelihood	Overall
Dust impacts at nearby sensitive receptors	Vehicle movements on paved and unpaved roads (wheel generated dust)	Moderate	Probable	Moderate	Dust and air quality monitoring plan Vehicle speeds on the construction ROW will be restricted to a maximum of 40 kph reduced to 10 kph when passing work crews Vehicle speeds at the construction depot and pipe storage area will be restricted to a maximum of 10 kph Road surfaces will be monitored for erosion and rutting particularly if frequently trafficked and adjacent to residences	Negligible	Rare	Low

Identified Aspects	Description	Initial risk			Control Measures	Residual risk		
		Consequence	Likelihood	Overall		Consequence	Likelihood	Overall
	Erosion of stockpiles and freshly exposed areas	Moderate	Probable	Moderate	Water will be applied to exposed soils to prevent dust generation Dust generated from soil stockpiles will be minimised by ensuring exposure time is minimised, applying water, covering stockpiles, with protective materials (e.g. hessian, tarpaulins), applying polymers or applying sterile grass as a longer term stabiliser on stockpiles or exposed slope batters Early reinstatement of the construction corridor to assist in soil stabilisation Minimising the time that surfaces such as stockpiles and cleared areas are exposed			Low

Identified Aspects	Description	Initial risk			Control Measures	Residual risk		
		Consequence	Likelihood	Overall		Consequence	Likelihood	Overall
	Handling, transfer and storage of materials	Moderate	Probable	Moderate	Water will be applied to exposed soils to prevent dust generation Minimising the time that surfaces such as stockpiles and cleared areas are exposed If all available methods of dust stabilisation fail to suppress dust and it continues to result in unacceptable impacts, construction activities may need to be temporarily halted until dust generating conditions subside	Minor	Rare	Low
	Handling, transfer and stockpiling of spoil material	Moderate	Probable	Moderate		Minor	Rare	Low
	Mulching	Moderate	Probable	Moderate	Plant and equipment will be regularly maintained and monitored	Minor	Rare	Low

Identified Aspects	Description	Initial risk			Control Measures	Residual risk		
		Consequence	Likelihood	Overall		Consequence	Likelihood	Overall
					If all available methods of dust stabilisation fail to suppress dust and it continues to result in unacceptable impacts, construction activities may need to be temporarily halted until dust generating conditions subside			
	Operation of heavy earthworks machinery	Moderate	Probable	Moderate	Plant and equipment will be regularly maintained and monitored If all available methods of dust stabilisation fail to suppress dust and it continues to result in unacceptable impacts, construction activities may need to be temporarily halted until dust generating conditions subside			Low

Identified Aspects	Description	Initial risk			Control Measures	Residual risk		
		Consequence	Likelihood	Overall		Consequence	Likelihood	Overall
	Fuel combustion in HCVs and mobile plant	Moderate	Probable	Moderate	Plant and equipment will be regularly maintained and monitored	Minor	Rare	Low
	Blasting (including flyrock)	Significant	Probable	High	Blasting works performed to guarantee zero fly rock escaping beyond the work site boundaries	Significant	Rare	Moderate
Air quality impacts at nearby sensitive receptors	Fuel combustion in HCVs and mobile plant	Moderate	Probable	Moderate	Plant and equipment will be regularly maintained and monitored	Negligible	Probable	Low
Noise/Vibration impacts at nearby sensitive receptors	Vehicle movements (in particular trucks driving to and from site)	Moderate	Unlikely	Moderate	Where construction is adjacent to residences, construction activities will be undertaken within standard construction hours throughout a 7 day working week and will be in line with the Construction guidelines, except where unavoidable for practical reasons or	Minor	Rare	Low

Identified Aspects	Description	Initial risk			Control Measures	Residual risk		
		Consequence	Likelihood	Overall		Consequence	Likelihood	Overall
					agreement is obtained from affected residents. Exhaust breaks on heavy vehicles will not be used within 100 m of any resident except in an emergency			
	Operation of heavy earthworks machinery	Moderate	Unlikely	Moderate	Where construction is adjacent to residences, construction activities will be undertaken within standard construction hours throughout a 7 day working week and will be in line with the Construction guidelines, except where unavoidable for practical reasons or agreement is obtained from affected residents. Wherever possible, materials will be lifted and placed, slid			Low

Identified Aspects	Description	Initial risk			Control Measures	Residual risk		
		Consequence	Likelihood	Overall		Consequence	Likelihood	Overall
					or rolled down inclines rather than dropped Noise machinery will not be left running when not required All equipment will be equipped with noise abatement devices and these will be maintained in good working order			
	Operation of generators and other stationary plant	Moderate	Unlikely	Moderate	Noisy generating equipment (e.g. generators) will be located at appropriate distances form residences and/or within noise enclosures if necessary All equipment will be equipped with noise abatement devices and these			Low

Identified Aspects	Description	Initial risk			Control Measures	Residual risk		
		Consequence	Likelihood	Overall		Consequence	Likelihood	Overall
					will be maintained in good working order			
	Sandblasting, welding	Moderate	Unlikely	Moderate	Noise attenuation screens will be provided where appropriate All equipment will be equipped with noise abatement devices and these will be maintained in good working order			Low
	Mulching	Moderate	Unlikely	Moderate	Noise attenuation screens will be provided where appropriate All equipment will be equipped with noise abatement devices and these will be maintained in good working order			Low

Identified Aspects	Description	Initial risk			Control Measures	Residual risk		
		Consequence	Likelihood	Overall		Consequence	Likelihood	Overall
	Blasting	Significant	Probable	High	Where blasting is deemed necessary, application for blasting will be submitted to relevant authorities Specific blast design/plan by an approved contractor to be provided for each blasting activity Vibration limits set according to the Australian Explosives Code (AEC) and with reference to legislation in Victoria. Blasting works performed to guarantee zero fly rock escaping beyond the work site boundaries Airblast overpressure will not exceed project specific limits	Significant	Unlikely	Moderate

Identified Aspects	Description	Initial risk			Control Measures	Residual risk		
		Consequence	Likelihood	Overall		Consequence	Likelihood	Overall
					as informed by the detailed assessment Peak particle velocity will not exceed project specific limits as informed by the detailed assessment Where practicable, excessively noisy construction activities will be scheduled for periods which are less likely to result in a noise nuisance.			

7.0 CONCLUSION AND RECOMMENDATIONS

Implementing the following recommendations should not result in the need for the PPA to be realigned due to air or noise concerns.

Based on the outcomes of this preliminary air and noise assessment, Golder has made following recommendations for the project:

- Proposed Wollert Compressor Station to utilize industry best practice measures and make application for a Works Approval.
- Delivery of pipeline construction in accordance with a Construction Environmental Management Plan (CEMP).
- Within the EMP include a dust and air quality management plan to minimise air quality impacts during pipeline construction.
- In accordance with the Construction Guidelines, conduct a study on the impact of ground vibration from construction activities, where these operations occur within 50 metres of a building.
- Within the EMP include a noise and vibration management plan to minimise noise impacts during pipeline construction.
- Implement a blasting management plan to minimise the impacts of noise, dust, flyrock and vibration during pipeline construction.
- Implementation of a Stakeholder Engagement Plan.

The above recommendations will result in the project being at ALARP.

8.0 GLOSSARY

Best practice	The best combination of eco-efficient techniques, methods, processes or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector or activity (as described in the SEPP (AQM)).
Preliminary Pipeline Alignment	Has been used as ‘reference project’ for the purpose of this desktop assessment of the Project within the Study Area.
Sensitive receptor	any land uses which require a particular focus on protecting the beneficial uses of the air environment relating to human health and wellbeing, local amenity and aesthetic enjoyment, for example residential premises, childcare centres, pre-schools, primary schools, education centres or informal outdoor recreation sites.
Study area	The study area is an approximately 100 m wide corridor, which is indicative of where the Project could conceivably occur (50 m either side of the preliminary pipeline alignment).

9.0 ABBREVIATIONS

AAQMS	Ambient Air Quality Monitoring Stations
AEC	Australian Explosives Code
Air NEPM	National Environment Protection (Ambient Air Quality) Measure
ALARP	As Low As Reasonably Practical
BOM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CO	Carbon Monoxide
EES	Environmental Effects Statement
EMP	Environmental Management Plan
EP Act	Environment Protection Act 2017
EQO	Environmental Quality Objectives
GED	General Environmental Duty
GHG	Greenhouse Gas
NO2	Nitrogen Dioxide
NOx	Nitrous Oxides
NPI	National Pollution Inventory
OEMP	Operational Environmental Management Plan
PAH	Polycyclic Aromatic Hydrocarbons
PDF	Polychlorinated Dioxins and Furans
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometers in diameter
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometers in diameter
PPA	Preliminary Pipeline Alignment
PPA	Preliminary Pipeline Alignment
ROW	Right Of Way

SEPP(AAQ)	State Environment Protection Policy (Ambient Air Quality)
SEPP(AQM)	State Environment Protection Policy (Air Quality Management)
SEPP-N1	State Environmental Planning Policy N1 (Control of Noise from industry, commerce and Trade)
SO2	Sulphur Dioxide
SOx	Sulphur Oxides
SVOCs	Semi-Volatile Organic Compounds
TSP	Total Suspended Particulates
TVOC	Total Volatile Organic Compounds
VOCs	Volatile Organic Compounds
WORM	Western Outer Ring Main
WRP	Wind Rose Plots

10.0 REFERENCES

(Australian Government 2017). *National Greenhouse Energy Reporting Scheme Measurement: Technical Guidelines for the estimation of emissions by facilities in Australia.* Australian Government - Department of the Environment and Energy, October 2017.

(EPA VIC 2013). *Recommended separation distance for industrial residual air emissions.* Victorian Environment Protection Authority, 2013.

Wood, APA Wollert Compression Station Noise Assessment, Rpt01-1403780-Rev0-27 May 19, 2019

11.0 IMPORTANT INFORMATION

Your attention is drawn to the document, Important Information Relating to this Report, which is attached to this report (Appendix C). The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing. We would be pleased to answer any questions the reader may have regarding this document

Signature Page

Golder Associates Pty Ltd

Mark Tulau
Air and Noise Specialist

MJP/JAS/MT-GCH/JMB/mjp

A.B.N. 64 006 107 857

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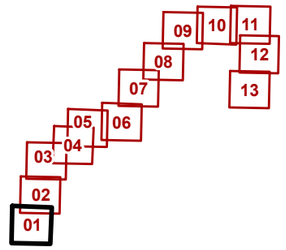
APPENDIX A

Figures

KEY MAP



LEGEND

- Kilometre Point
- Preliminary Pipeline Agreement (PPA)
- Study Area
- 1km Buffer area from the Priliminary Alignment
- Farming Zone
- General Residential Zone
- Green Wedge
- Neighbourhood Residential Zone
- Road Zone
- Rural Conservation Zone
- Special Use Zone
- Urban Floodway Zone
- Urban Growth Zone

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NOTE(S)
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REFERENCE(S)
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2. AERIAL IMAGERY SOURCED FROM ESRI ONLINE BASEMAPS
3. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
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CLIENT
APA

PROJECT
APA WORM PROJECT

TITLE
PLAN ZONES WITHIN 1KM OF THE SECTION

CONSULTANT
[redacted]

YYYY-MM-DD	7/08/2019
DESIGNED	-
PREPARED	CJS
REVIEWED	GCH
APPROVED	GCH

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KP 5

KP 4

KP 3

CALDER FREEWAY

MELTON HIGHWAY

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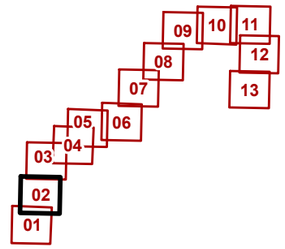
KEY MAP



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- Green Wedge
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- Public Use Zone - Service and Utility
- Public Use Zone - Transport
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- Special Use Zone
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- Urban Growth Zone

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CALDER FREEWAY

KP 11

KP 10

KP 9

KP 8

KP 7

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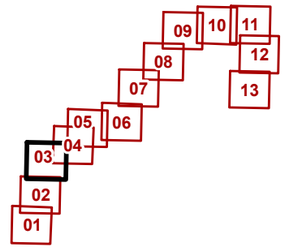

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- Road Zone
- Rural Conservation Zone

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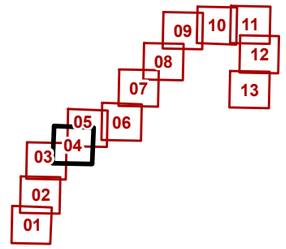

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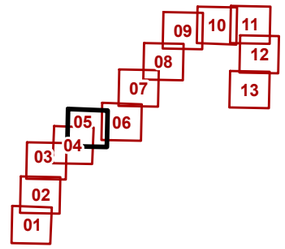

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- Public Conservation and Resource Zone
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PROJECT
APA WORM PROJECT

TITLE
PLAN ZONES WITHIN 1KM OF THE SECTION

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APPROVED	GCH

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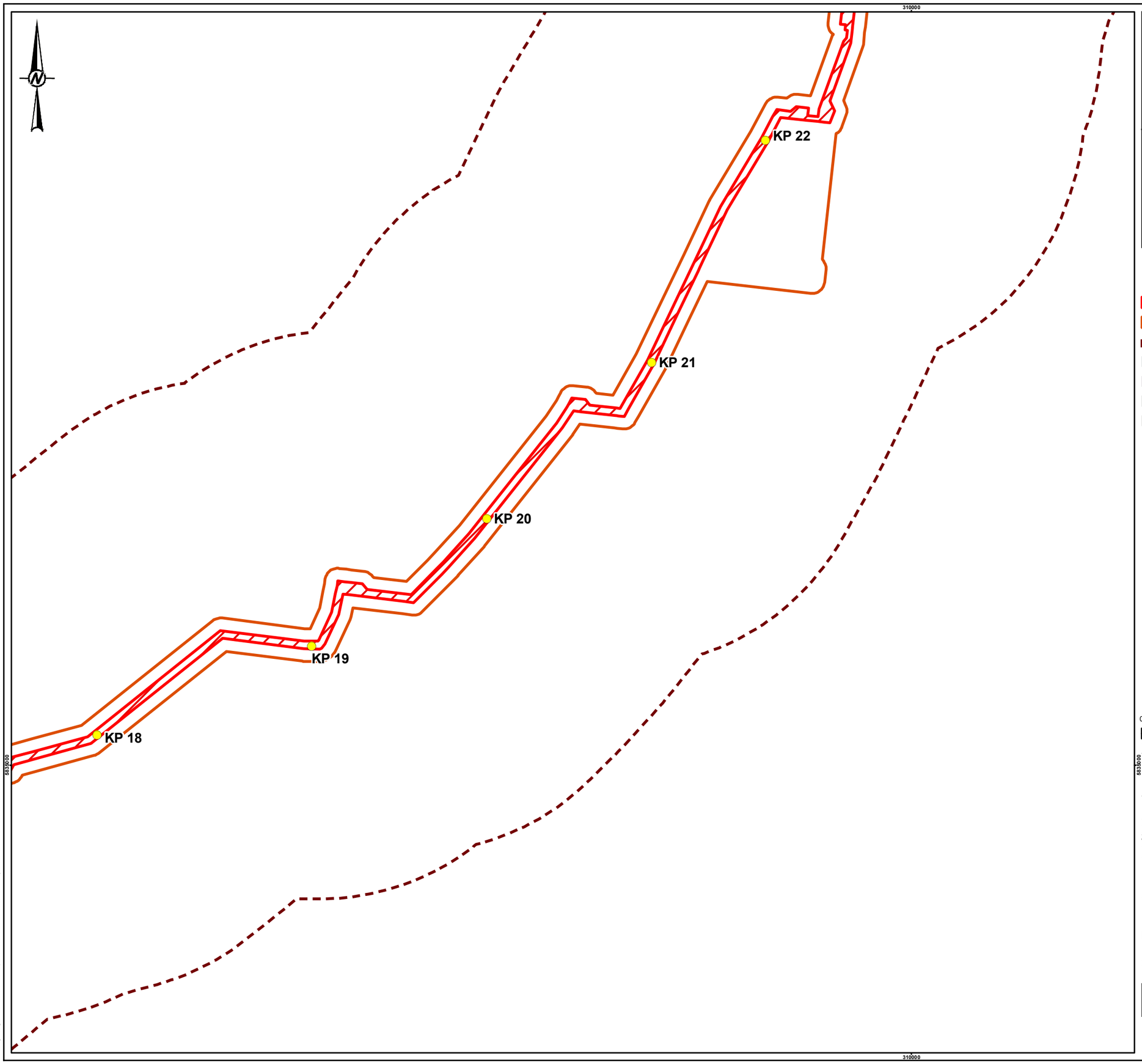

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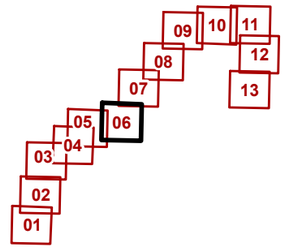

LEGEND

- Kilometre Point
- Preliminary Pipeline Agreement (PPA)
- Study Area
- 1km Buffer area from the Priliminary Alignment
- Green Wedge
- Public Conservation and Resource Zone
- Road Zone
- Special Use Zone

0 260 520 780 1,040 1,300

1:15,000 METRES

NOTE(S)
COORDINATE SYSTEM: GDA 1994 MGA ZONE 55

REFERENCE(S)
1. ROAD, WATER, PROPERTY AND RAIL INFORMATION, SOURCED FROM VICMAP 14/05/2016.
2. AERIAL IMAGERY SOURCED FROM ESRI ONLINE BASEMAPS
3. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
4. PLANNING ZONE INFORMATION SOURCED FROM VICMAP, PUBLISHED: 17/01/2019.

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PROJECT
APA WORM PROJECT

TITLE
PLAN ZONES WITHIN 1KM OF THE SECTION

CONSULTANT
[redacted]

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REVIEWED	GCH
APPROVED	GCH

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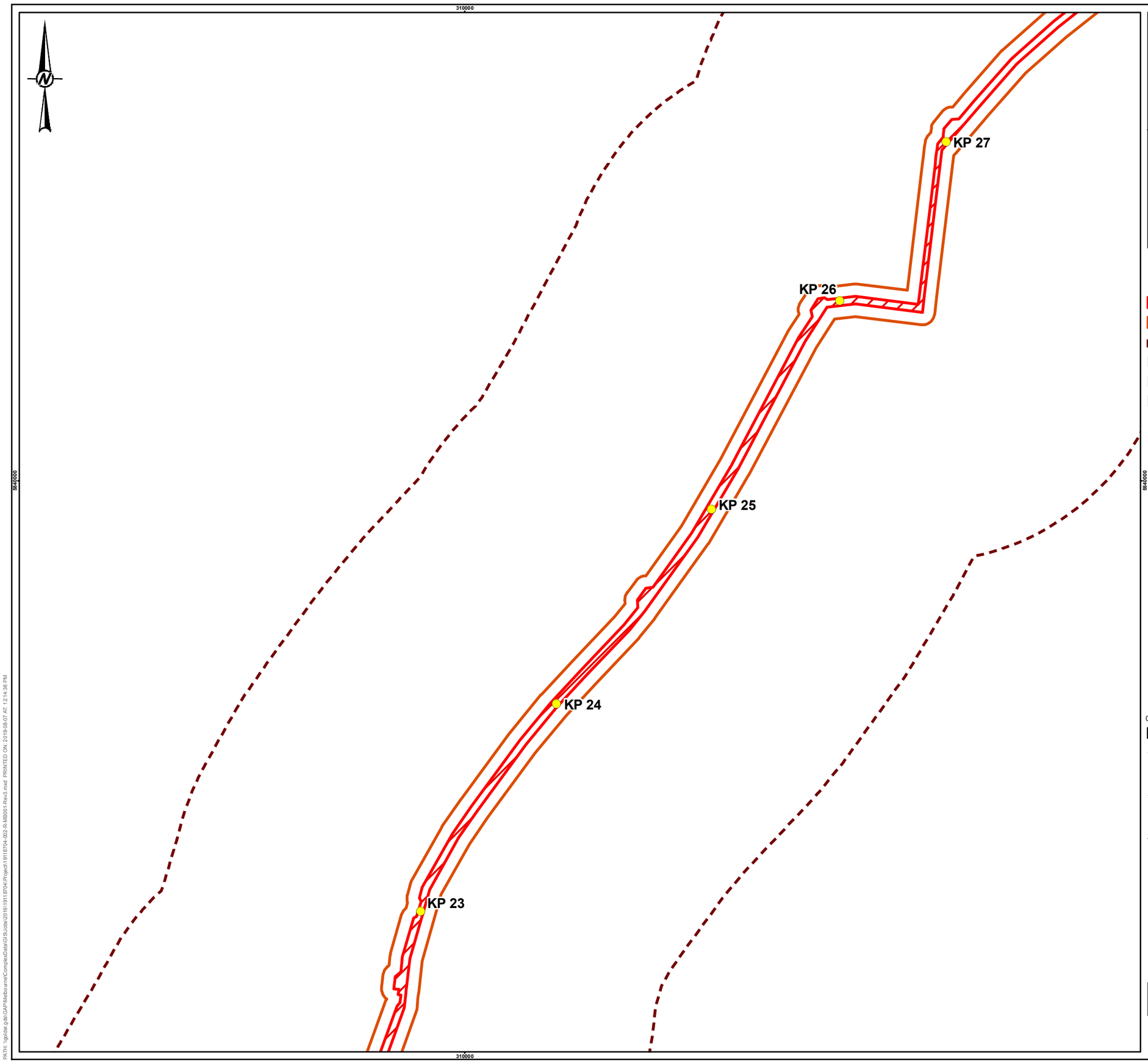

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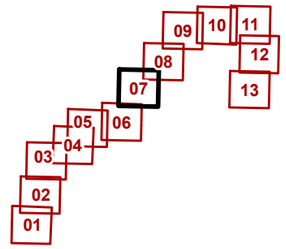

LEGEND

- Kilometre Point
- Preliminary Pipeline Agreement (PPA)
- Study Area
- 1km Buffer area from the Priliminary Alignment
- Farming Zone
- Green Wedge
- Road Zone

0 260 520 780 1,040 1,300

1:15,000 METRES

NOTE(S)
COORDINATE SYSTEM: GDA 1994 MGA ZONE 55

REFERENCE(S)
1. ROAD, WATER, PROPERTY AND RAIL INFORMATION, SOURCED FROM VICMAP 14/05/2016.
2. AERIAL IMAGERY SOURCED FROM ESRI ONLINE BASEMAPS
3. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
4. PLANNING ZONE INFORMATION SOURCED FROM VICMAP, PUBLISHED: 17/01/2019.

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PROJECT
APA WORM PROJECT

TITLE
PLAN ZONES WITHIN 1KM OF THE SECTION

CONSULTANT
[redacted]

YYYY-MM-DD	7/08/2019
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APPROVED	GCH

PROJECT NO.	CONTROL	REV.	FIGURE
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KP 30

KP 29

KP 28

KP 27

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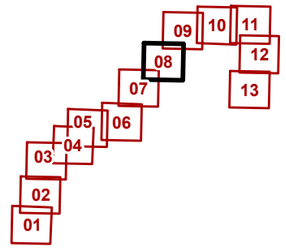

LEGEND

- Kilometre Point
- Preliminary Pipeline Agreement (PPA)
- Study Area
- 1km Buffer area from the Priliminary Alignment
- Farming Zone
- Green Wedge
- Public Use Zone - Service and Utility
- Road Zone
- Rural Conservation Zone
- Rural Living Zone
- Urban Growth Zone

0 260 520 780 1,040 1,300

1:15,000 METRES

NOTE(S)
COORDINATE SYSTEM: GDA 1994 MGA ZONE 55

REFERENCE(S)
1. ROAD, WATER, PROPERTY AND RAIL INFORMATION, SOURCED FROM VICMAP 14/05/2016.
2. AERIAL IMAGERY SOURCED FROM ESRI ONLINE BASEMAPS
3. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
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TITLE
PLAN ZONES WITHIN 1KM OF THE SECTION

CONSULTANT
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YYYY-MM-DD	7/08/2019
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PROJECT NO.	CONTROL	REV.	FIGURE
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KP 35

KP 33

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KP 31

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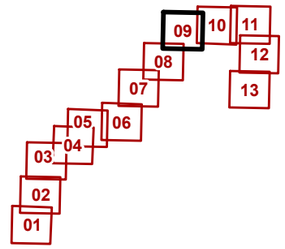

LEGEND

- Kilometre Point
- Preliminary Pipeline Agreement (PPA)
- Study Area
- 1km Buffer area from the Priliminary Alignment
- Farming Zone
- Green Wedge
- Public Use Zone - Service and Utility
- Road Zone
- Rural Conservation Zone
- Urban Floodway Zone
- Urban Growth Zone

0 260 520 780 1,040 1,300

1:15,000 METRES

NOTE(S)
COORDINATE SYSTEM: GDA 1994 MGA ZONE 55

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2. AERIAL IMAGERY SOURCED FROM ESRI ONLINE BASEMAPS
3. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
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PROJECT
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TITLE
PLAN ZONES WITHIN 1KM OF THE SECTION

CONSULTANT
[redacted]

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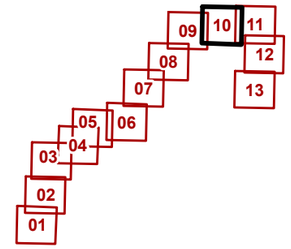

LEGEND

- Kilometre Point
- Preliminary Pipeline Agreement (PPA)
- Study Area
- 1km Buffer area from the Priliminary Alignment
- Farming Zone
- Public Use Zone - Service and Utility
- Road Zone
- Rural Conservation Zone
- Urban Floodway Zone
- Urban Growth Zone

HUME FREEWAY

KP 35
KP 36
KP 37
KP 38
KP 39
KP 40

0 260 520 780 1,040 1,300

1:15,000 METRES

NOTE(S)
COORDINATE SYSTEM: GDA 1994 MGA ZONE 55

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2. AERIAL IMAGERY SOURCED FROM ESRI ONLINE BASEMAPS
3. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
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PROJECT
APA WORM PROJECT

TITLE
PLAN ZONES WITHIN 1KM OF THE SECTION

CONSULTANT
[redacted]

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APPROVED	GCH

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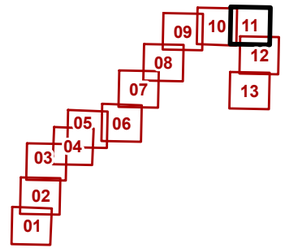

LEGEND

- Kilometre Point
- Preliminary Pipeline Agreement (PPA)
- Study Area
- 1km Buffer area from the Priliminary Alignment
- Farming Zone
- Green Wedge
- Public Use Zone - Transport
- Road Zone
- Rural Conservation Zone
- Urban Growth Zone

0 260 520 780 1,040 1,300

1:15,000 METRES

NOTE(S)
COORDINATE SYSTEM: GDA 1994 MGA ZONE 55

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2. AERIAL IMAGERY SOURCED FROM ESRI ONLINE BASEMAPS
3. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
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PROJECT
APA WORM PROJECT

TITLE
PLAN ZONES WITHIN 1KM OF THE SECTION

CONSULTANT

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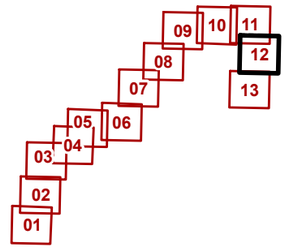

LEGEND

- Kilometre Point
- Preliminary Pipeline Agreement (PPA)
- Study Area
- 1km Buffer area from the Priliminary Alignment
- Green Wedge
- Road Zone
- Rural Conservation Zone
- Urban Growth Zone

0 260 520 780 1,040 1,300

1:15,000 METRES

NOTE(S)
COORDINATE SYSTEM: GDA 1994 MGA ZONE 55

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2. AERIAL IMAGERY SOURCED FROM ESRI ONLINE BASEMAPS
3. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
4. PLANNING ZONE INFORMATION SOURCED FROM VICMAP, PUBLISHED: 17/01/2019.

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PROJECT
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TITLE
PLAN ZONES WITHIN 1KM OF THE SECTION

CONSULTANT
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KP 50.745

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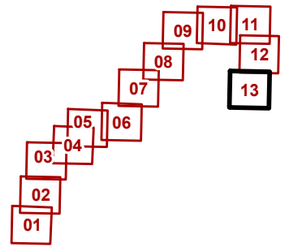

LEGEND

- Kilometre Point
- Preliminary Pipeline Agreement (PPA)
- Study Area
- 1km Buffer area from the Priliminary Alignment
- Farming Zone
- Green Wedge
- Road Zone
- Rural Conservation Zone
- Special Use Zone
- Urban Growth Zone

0 260 520 780 1,040 1,300

1:15,000 METRES

NOTE(S)
COORDINATE SYSTEM: GDA 1994 MGA ZONE 55

REFERENCE(S)
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2. AERIAL IMAGERY SOURCED FROM ESRI ONLINE BASEMAPS
3. KEY MAP SOURCED FROM ESRI ONLINE BASEMAPS.
4. PLANNING ZONE INFORMATION SOURCED FROM VICMAP, PUBLISHED: 17/01/2019.

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PROJECT
APA WORM PROJECT

TITLE
PLAN ZONES WITHIN 1KM OF THE SECTION

CONSULTANT
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APPENDIX B

Noise Assessment Study

Wood 2019

APA WOLLERT COMPRESSION STATION NOISE ASSESSMENT

APA GROUP

Rpt01-1403780-Rev0-27 MAY 19

www.woodplc.com
Specialist Technical Services
Vibration, dynamics and noise

DOCUMENT CONTROL & REVIEW INFORMATION

Customer: **APA Group**

Customer Contact: Jim Fjeldsoe

Wood Contact: Tom Wiltshire

Wood Office: Perth

Wood Job No: 1403780

Wood Document No: **Rpt01-1403780-Rev1-27 MAY 19**

Rev	Date	Description	Prepared	Reviewed	Approved	
					Proj Manager	Customer
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B	15 MAY 19	Issued for Review	M Pettersson	J McLoughlin	P Glorie	
C	24 MAY 19	Issued for Review	M Pettersson	J McLoughlin	P Glorie	
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Item	Page	Section	Comments

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EXECUTIVE SUMMARY

APA Group owns and operates a gas compression station located at 365 Summerhill Rd, Wollert, VIC 3750. The APA Wollert site comprises:

- Wollert City Gate: Four regulator runs that reduce the gas pressure from the 7000 kPa country pipeline system to the 2800 kPa metropolitan system, with a 3MW gas fired water bath heater.

- Compressor Station: Two Solar Centaur 50 and three Solar Saturn 10 gas turbine driven compressor units with one fin fan gas cooler and one lube oil cooler per unit, a standby diesel generator, an instrument air compressor, a station vent and two pressure regulation valves.

APA are currently progressing the Western Outer Ring Main Project, which includes addition of a Solar Centaur 50 compressor to the site.

There are around 30 noise sensitive receivers close to the compressor station and the current planning scheme allows for additional residential development near the site.

APA has commissioned Wood to assess the noise impact of the proposed facility expansion in accordance with State Environmental Planning Policy N1 (SEPP-N1).

The modelling and analysis undertaken for the assessment show that noise levels for the expanded facility would fall below the SEPP-N1 limits. Modelled receiver noise levels for the facility operating at the maximum operational scenario and under adverse meteorological conditions were up to 36.8dB(A), which is below the most stringent noise limit (39dB(A)).

The modelling assumed that the proposed Unit 6 will have an overall package sound power level of 111dB(A), the same as that of the existing Units 4 and 5. The modelled noise levels for the expanded facility would not meet the requirements of SEPP-N1 if the Unit 6 package sound power level exceeded 116dB(A).

It is recommended that APA procure the proposed Unit 6 compressor with a maximum overall package sound power level of 111dB(A). This would require an acoustic enclosure for the compressor and turbine; and turbine exhaust and combustion air attenuators.

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Facility Description

APA Group owns and operates a gas compression station located at 365 Summerhill Rd, Wollert, VIC 3750. APA are currently progressing the Western Outer Ring Main Project, which includes addition of an additional Solar Centaur 50 compressor to the site.

APA has commissioned Wood to assess the noise impact of the proposed facility expansion in accordance with State Environmental Planning Policy N1 (SEPP-N1).

The APA Wollert site comprises:

- Wollert City Gate: Four regulator runs that reduce the gas pressure from the country pipeline system to the metropolitan system. A gas fired water bath heater preheats the gas entering the valves.
- Compressor Station: Two Solar Centaur 50 (Units 4 and 5) and three Solar Saturn 10 (Units 1, 2 and 3) gas turbine driven compressor units with one gas after cooler and one lube oil cooler per unit, a standby diesel generator, an instrument air compressor, flow control valves and two pressure regulation stations.

1.2 Surrounding Land Uses and Sensitive Receivers

The current zoning map of the area surrounding the Wollert Compressor Station is shown in Figure 1-1 overleaf; and the land uses for the area to the east of the facility are shown in Figure 1-2 overleaf. The land uses surrounding the site are primarily Type 1 (noise sensitive), as scheduled in SEPP-N1[1].

[1] 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

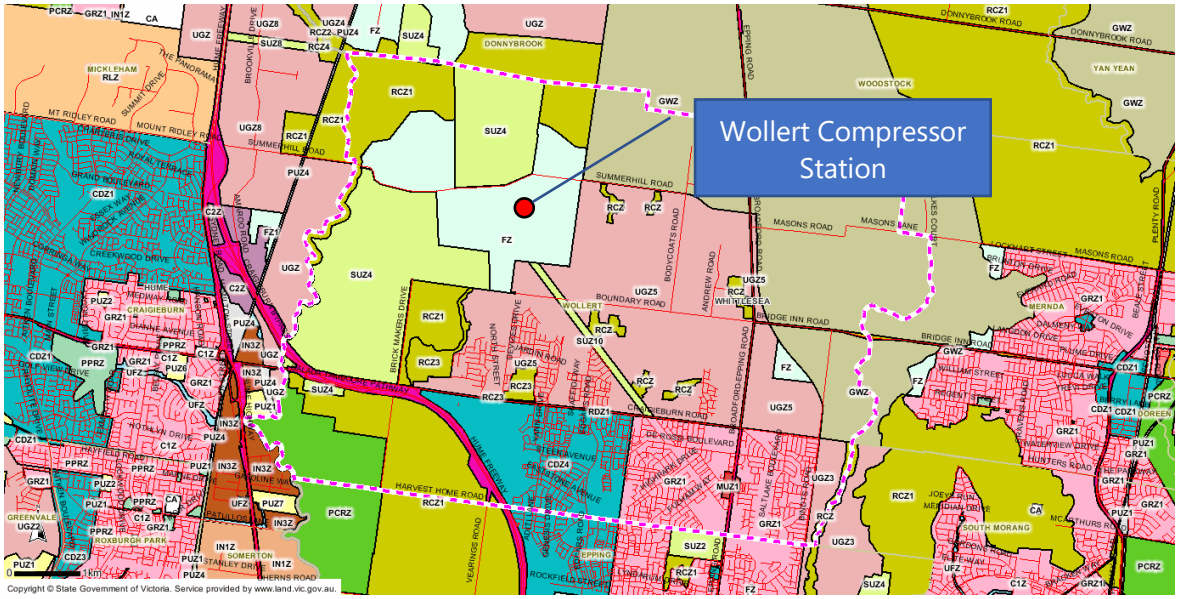


Figure 1-1: Current zoning of surrounding land[2]

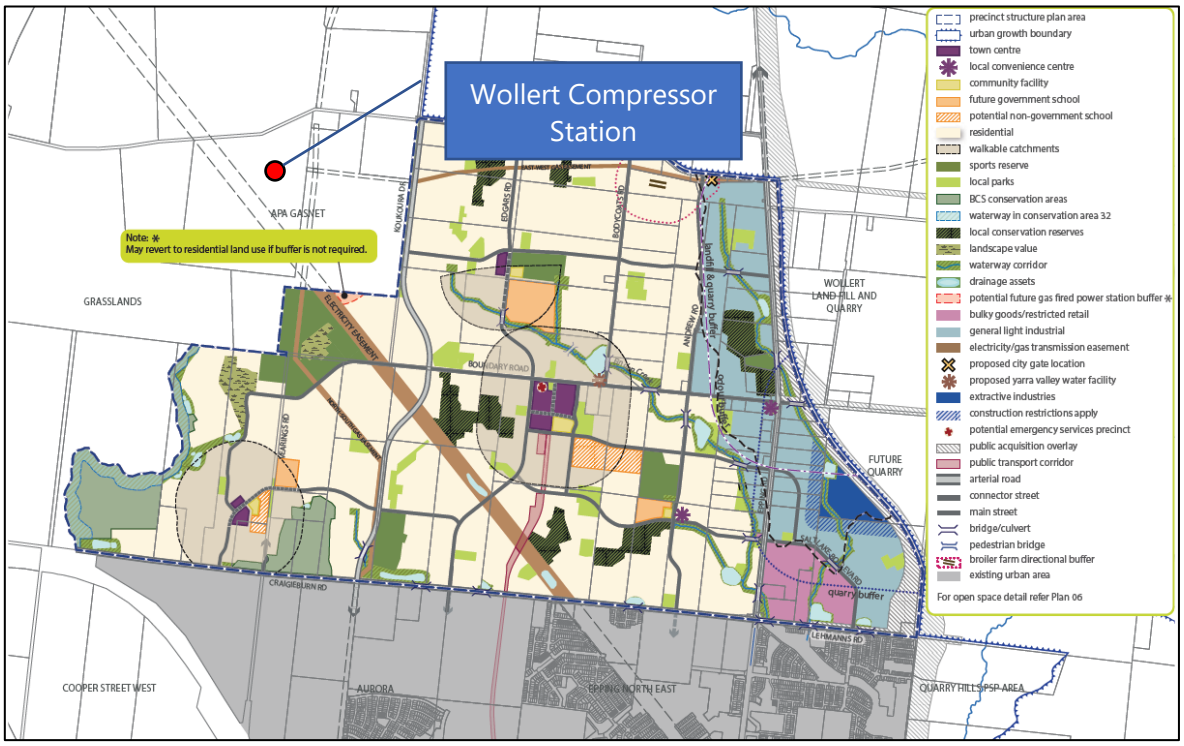


Figure 1-2: Uses of surrounding land in Whittlesea planning scheme[3]

[2] "Planning Maps Online – Wollert, City of Whittlesea Council", Department of Planning & Community Development, Victoria, available at: http://services.land.vic.gov.au/maps/pmo.jsp , accessed 24 March 2019.

[3] "Wollert Precinct Structure Plan – April 2015", Metropolitan Planning Authority and City of Whittlesea Council.

There are around 30 noise sensitive receivers close to the compressor station (refer Figure 1-3 below).

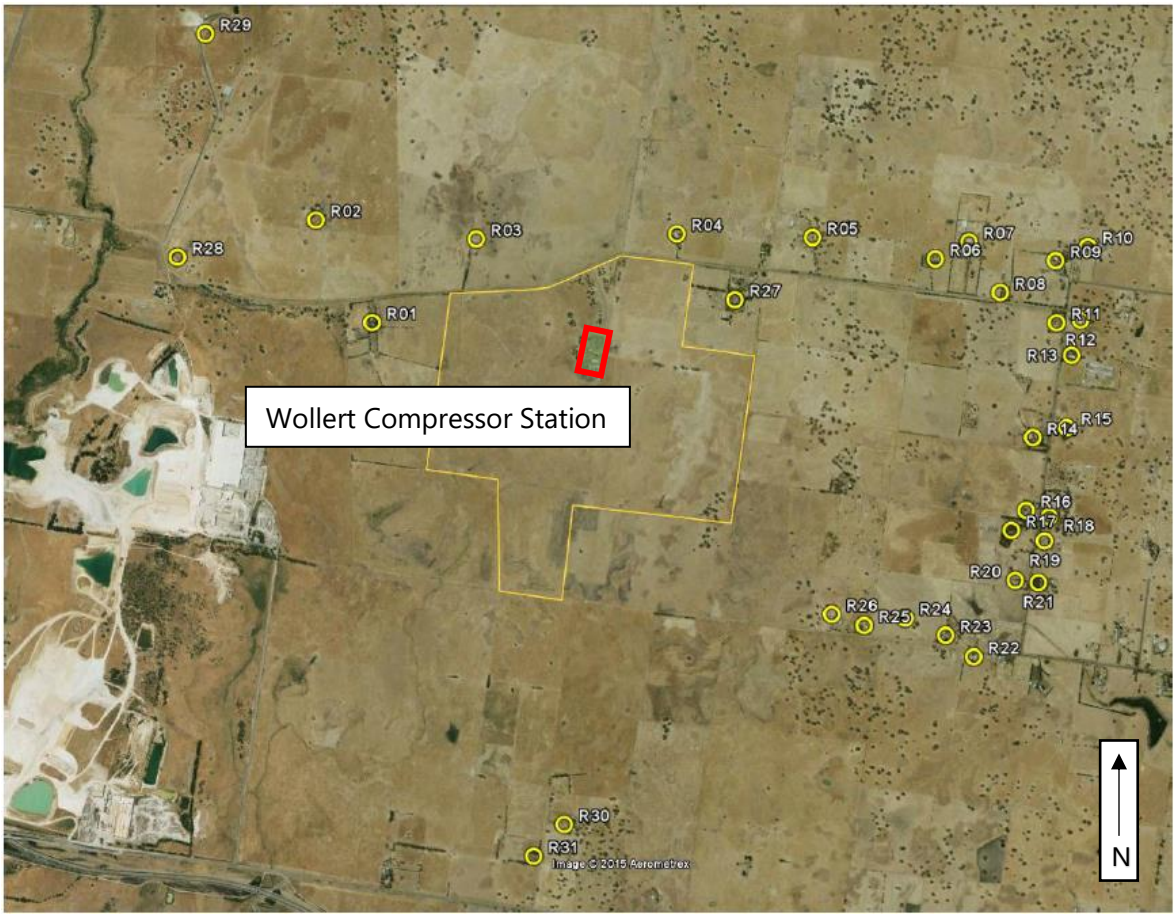


Figure 1-3: Receiver locations

2 NOISE MODELLING

2.1 Modelling Standard

A noise model of the Wollert Compressor station was built using SoundPlan version 8.0 noise modelling software. SoundPlan calculates predicted sound pressure levels at nominated receiver locations or produces noise contours over a designed area of interest around noise sources. SoundPlan can be used to model different sources of environmental noise such as industrial noise, road traffic and rail noise and aircraft noise.

SoundPlan provides a range of published noise propagation prediction algorithms that can be selected by the user. The CONCAWE[4] algorithm, which is accepted by EPA Victoria, was selected for use in this study.

The inputs to the CONCAWE algorithm are noise source sound power data, locations and heights of barriers and screens, ground topographical and absorption type data, meteorological conditions and receiver point locations.

2.2 Terrain and Ground Properties

Ground elevation data (topography) at 1m intervals, was supplied by APA Group.

The acoustic properties of the ground surface influence noise propagation. The land surrounding the Wollert Compressor Station is noted to be absorptive due to thick ground foliage and soil cover. A ground absorption factor of 1 has been used.

2.3 Meteorological conditions

Atmospheric conditions are important factors in noise modelling because temperature and wind shear profiles in the atmosphere can influence the propagation of noise from source to receiver, resulting in deviations in modelled noise level of up to 6dB.

The CONCAWE model defines six meteorological categories (1 to 6). Categories 1 to 3 result in a reduction of received noise, category 4 results in no change and categories 5 and 6 increase received noise. Categories 5 and 6 are defined by the following conditions:

- Category 5: ν >3 m/s and A or B; ν = 0.5 to 3 m/s and C, D or E; ν = -3 m/s to 0.5 m/s and F or G;
- Category 6: ν >3 m/s and C, D or E; ν = 0.5 to 3 m/s and F or G.

[4] CONCAWE (Conservation of Clean Air and Water in Europe) was established in 1963 by a group of oil companies to carry out research on environmental issues relevant to the oil industry.

Where v is the averaged wind velocity blowing source to receiver and A to G are Pascal-Gifford stability classes.

The noise guidance published by EPA Victoria does not specify meteorological conditions for noise modelling. However, SEPP-N1 specifies that noise due to sites where the propagation of noise is affected by atmospheric conditions should be measured on three separate occasions over 30 days (i.e. on 10% of the days in the period) and the average of the measurements be used to assess compliance[5]. This approach reduces the significance of infrequent atmospheric conditions on compliance assessment, which implies that conditions occurring much less frequently than 10% of the time can be considered insignificant.

The frequency of noise enhancing conditions at the site has been assessed[6], based on 18 years of data from the BOM weather station at Melbourne airport. The assessment indicates that:

- Calm conditions are rare and averaged wind speed typically exceeds 3m/s.
- The prevailing conditions during winter night time, when maximum facility operation is most likely to occur and when noise limits are most stringent, are winds exceeding 3m/s in a northerly direction (53% of the time) and Pascal-Gifford stability class D or E (85% of the time). This results in the category 6 meteorological condition for receivers directly to the north of the facility.
- Other noise enhancing conditions, as defined in the CONCAWE model, occur for much less than 10% of the time over any 30-day period. While F or G stability class conditions occur for around 10% of the night time, this would almost always be in combination with wind speed exceeding 3m/s, resulting in category 4 or falling outside the CONCAWE meteorological categories. As a result, no other noise enhancing conditions occur frequently enough to justify assessment under SEPP-N1.

Thus, the following 'neutral' (non-enhancing) and 'adverse' (enhancing) meteorological conditions were assumed:

- Neutral Condition (Category 4): Model forced to compute nil enhancement by setting meteorological conditions to Category 4.
- Adverse Condition (Category 6): Pasqual Stability Class D, 3.1m/s northerly wind.

2.4 Equipment Sound Power Levels

The sound power levels of equipment operating at the Wollert Compressor Station were measured on the 2nd of April 2019. Sound power levels were determined in accordance with AS 1217.7-1985 Acoustics – Determination of Sound Power Levels of Noise Sources, Part 7 – Survey

[5] SEPP-N1 Schedule A, Part A2, Clause 6

[6] Worley Parsons '401010-01412 – AA-REP-0001 Noise Impact Study - 2017 365 Summerhill Rd, Wollert VIC 3750' November 2017

Method. The sound power levels for the proposed equipment were assumed to be the same as the levels measured for similar existing equipment.

Sound intensity measurements were utilized for situations where multiple noise sources contributed to the noise level at the measurement location. Sound intensity measurement is a technique that uses a device with two opposed microphones to isolate the acoustic energy emanating from a specific point or area.

The sound power levels are presented in APPENDIX B.

2.5 Noise Model Validation

Noise levels were measured at the boundary of the buffer zone surrounding the Wollert Compressor station for validating the noise model predictions on the 2nd April 2019. The measurement locations are shown in Figure 2-1 below. The sound measurement equipment was compliant with IEC 61672, and was check calibrated before and after use with no significant drift identified.

Figure 2-1: Validation Measurement Locations

The noise levels generated by the facility at the validation locations were determined using the 90th percentile (L_{A90}) noise level. The L_{A90} level should exclude the influence of variable extraneous noise present in the measurement (e.g. bird vocalizations, wind gusts) while retaining the contribution of the steady noise that would be generated by the Wollert Compressor station.

The noise model was used to predict noise levels during the facility process conditions at the time of measurement, between 1200 hours and 1330 hours on the 2nd April 2019. The process conditions are shown in Figure 2-2. The weather was generally calm with intermittent wind gusts during the validation measurements. Therefore, neutral (non-enhancing) meteorological conditions were assumed in the model.

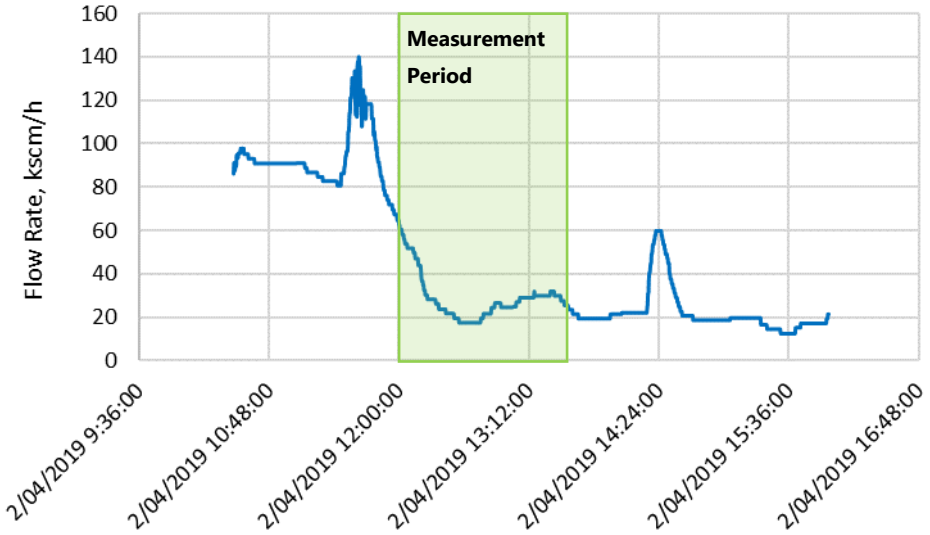


Figure 2-2: Wollert CG Regulator Outlet Flow Rate

During the validation measurements the following equipment was operating:

- Unit 4 Centaur running in recycle; and
- 1 x City Gate value open.

The modelled and measured noise levels are presented in Table 2-1 below.

Table 2-1: Validation Noise Modelling

Receiver	Predicted Levels, dBA	Measured Levels, dBA	Variance, dB
Env 1	40.1	39.1	+1.0
Env 2	37.3	34.3	+3.0
Env 3	44.0	43.5	+0.5

3 NOISE CRITERIA

3.1 State Environmental Planning Policy N1

Noise emissions from commercial, industrial or trade noise sources within the Melbourne Metropolitan region are regulated under State Environmental Planning Policy N1 (SEPP-N1). SEPP-N1 specifies noise level limits at noise sensitive land uses near the activity, within a defined region that encircles the Melbourne metropolitan area. The Wollert Compressor Station falls within the SEPP-N1 area, as shown in Figure 3-1 below.

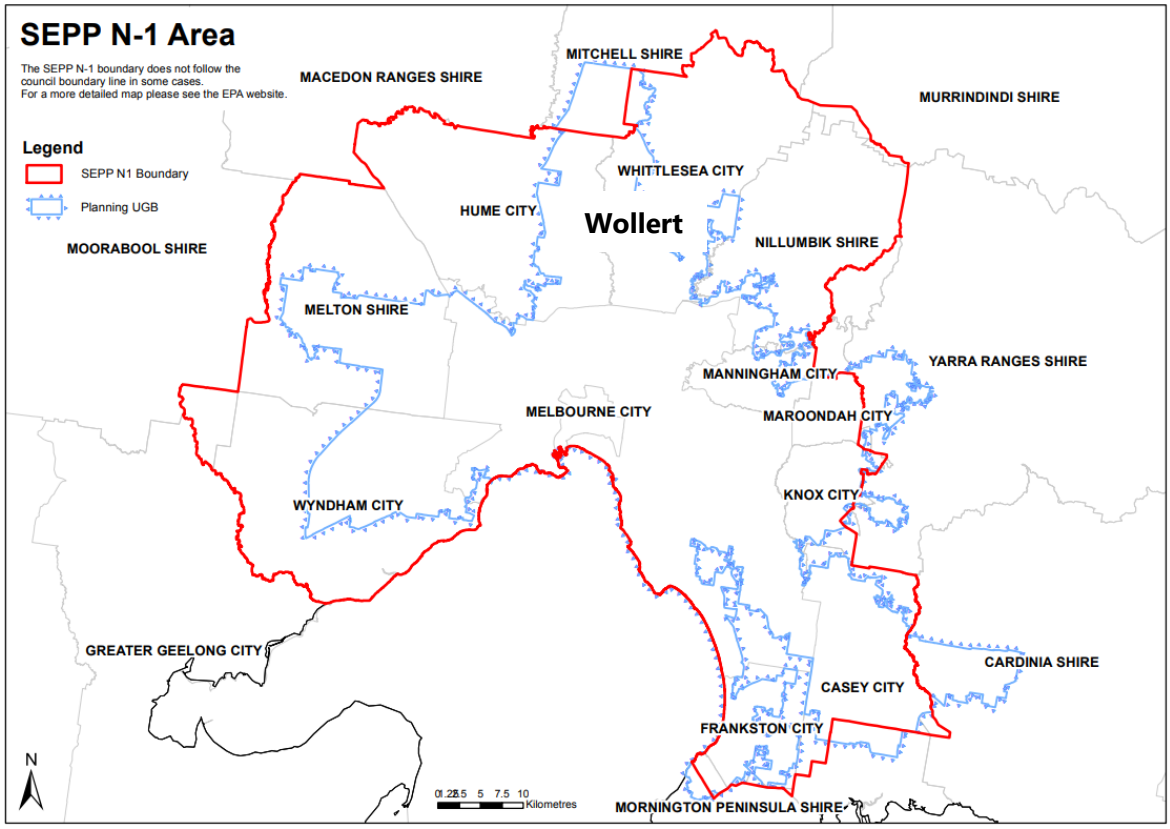


Figure 3-1: Location of Wollert within the SEPP N-1 boundary

The noise limits set by SEPP-N1 are influenced by the zoning of land uses surrounding a noise-sensitive receiver and the existing background noise level. Different limits apply for the day (0700 and 1800 hours), evening (1800 and 2200) and night (2200 to 0700) periods. The noise limit is adjusted (reduced) where non-project industrial noise sources also contribute to industrial noise at a receiver.

The noise limits can be no less than the following values:

- Day Period: 45dB(A)
- Evening Period: 40dB(A)
- Night Period: 35dB(A)

3.2 Noise Limits

The noise limits that apply to the Wollert Compressor Station have been established[7] and these limits were adopted for the study reported here. The night time noise limits, which are the most stringent, range from 39dB(A) to 56dB(A) (refer Table 3-1 below).

Table 3-1: Receiver noise limits

Receiver	Zoning	Influencing Factor	Background Noise Level	Night time zoning Level	Night time noise limit (dB(A))
R01	FZ	0.125	36	41	41
R04, R27	FZ	0	36	39	39
R02	IN2Z	1	36	56	49
R03	SUZ4	1	36	56	49
R05, R06, R07, R08, R09, R10	GWZ	0	36	39	39
R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26	R1Z	0	36	39	39
R28	IN2Z	1	36	56	49
R31	R1Z	0	36	39	39
R29, R30	RCZ	0	36	39	39

An intent of SEPP-N1 is to limit the total industrial noise level at a sensitive receiver. Thus, the SEPP-N1 noise limit is adjusted (reduced) where non-project industrial noise sources also contribute to industrial noise at a receiver. However, the Wollert Compressor Station is the only existing industrial noise source that could contribute to noise levels at the noise sensitive receivers. As a result, this adjustment was not applied.

[7] Worley Parsons '401010-01412 – AA-REP-0001 Noise Impact Study - 2017 365 Summerhill Rd, Wollert VIC 3750' November 2017

4 RESULTS

4.1 Maximum Operating Scenario

Noise levels were modelled for the maximum operating scenarios for the current and expanded facility. APA have advised that the maximum operating scenario involves operation of the following equipment:

Current Facility

Rotating Equipment

- Compressor Units 4 and 5
- Diesel engine generator
- Instrument air compressor

Valves & Piping

- 4x City gate valves and associated piping, water bath preheater
- T74 PRS (Pressure Reduction Station)
- T119 PRS

Expanded Facility

Rotating Equipment

- Compressor Unit 6
- All rotating equipment sources in the 'current facility' scenario

Valves & Piping

- WORM PRS
- WORM flow control valves
- New T119 Flow control valves
- All valves and piping in the 'current facility' scenario

4.2 Modelled Noise Levels

The receiver noise levels predicted for the current and expanded facility under the maximum operating scenarios and adverse meteorological conditions are presented in Table 4-1 overleaf.

Noise level contours for the current and expanded facility maximum operating scenarios under neutral and adverse conditions are presented in APPENDIX A.

Table 4-1: Predicted noise levels for the maximum operating scenario and adverse conditions

Receiver	Limit, dBA	Predicted Noise Level, dBA	
		Current Facility	Expanded Facility
R01	41	30.6	32.5
R02	49	26.1	27.9
R03	49	34.1	36.0
R04	39	30.2	34.1
R05	39	28.6	30.2
R06	39	24.0	25.7
R07	39	22.6	24.2
R08	39	21.9	23.6
R09	39	19.8	21.5
R10	39	18.7	20.4
R11	39	20.1	21.8
R12	39	19.3	21.0
R13	39	19.7	21.3
R14	39	20.8	22.5
R15	39	19.8	21.4
R16	39	20.4	22.0
R17	39	20.6	22.3
R18	39	19.6	21.2
R19	39	19.5	21.2
R20	39	19.9	21.5
R21	39	19.1	20.8
R22	39	19.7	21.4
R23	39	20.9	22.6
R24	39	22.4	24.1
R25	39	23.5	25.2
R26	39	24.8	26.5
R27	39	35.3	36.8
R28	49	21.4	23.2
R29	39	18.8	20.6
R30	39	20.8	22.5
R31	39	19.7	21.3

5 DISCUSSION

The noise levels at nearby noise sensitive receivers due to operation of the current and expanded Wollert Compressor Station at the maximum operating conditions have been modelled. The model was validated against noise levels measured at three locations near the site and found to be accurate within to +3.0 to +0.5dB. Therefore, the modelled noise levels are slightly conservative.

The modelling and analysis undertaken show that for the expanded facility operating at the maximum operational scenario and under adverse meteorological conditions:

- Noise levels would increase by 1.5 to 2dB at most receivers; and
- Modelled noise levels fall below the SEPP-N1 limits. The modelled noise levels were up to 36.8dB(A), which is below the most stringent noise limit (39dB(A)).

The modelling assumed that the proposed Unit 6 will have an overall package sound power level of 111dB(A), inclusive of the gas and lube oil air coolers, the same as that of the existing Units 4 and 5. The modelled noise levels for the expanded facility would not meet the requirements of SEPP-N1 if the Unit 6 package sound power level exceeded 116dB(A).

6 CONCLUSIONS

The noise levels generated at nearby noise sensitive receivers due to the maximum operating conditions for the current and expanded Wollert Compressor Station have been modelled. The model was validated against noise levels measured at three locations near the site and found to be slightly conservative.

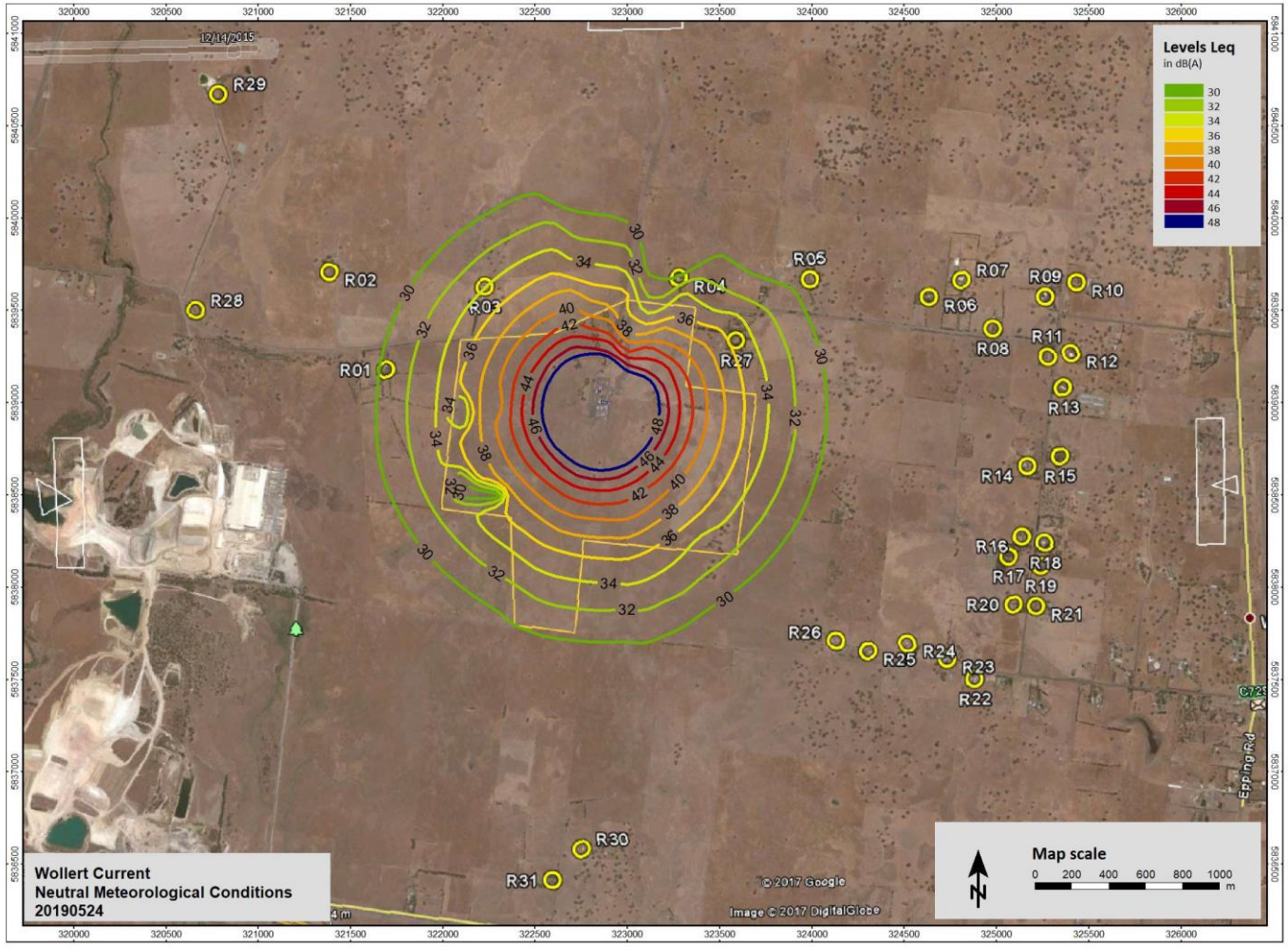
The modelling and analysis undertaken for this assessment show that for the expanded facility operating at the maximum operational scenario:

- Noise levels would increase by 1.5 to 2dB at most receivers; and
- Modelled noise levels fall below the SEPP-N1 limits.

7 RECOMMENDATIONS

It is recommended that APA procure the proposed Unit 6 compressor with a maximum overall package sound power level of 111dB(A), inclusive of the gas and lube oil coolers. This would require an acoustic enclosure for the compressor and turbine; and turbine exhaust and combustion air attenuators.

APPENDIX A NOISE CONTOURS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Neutral Meteorological Conditions
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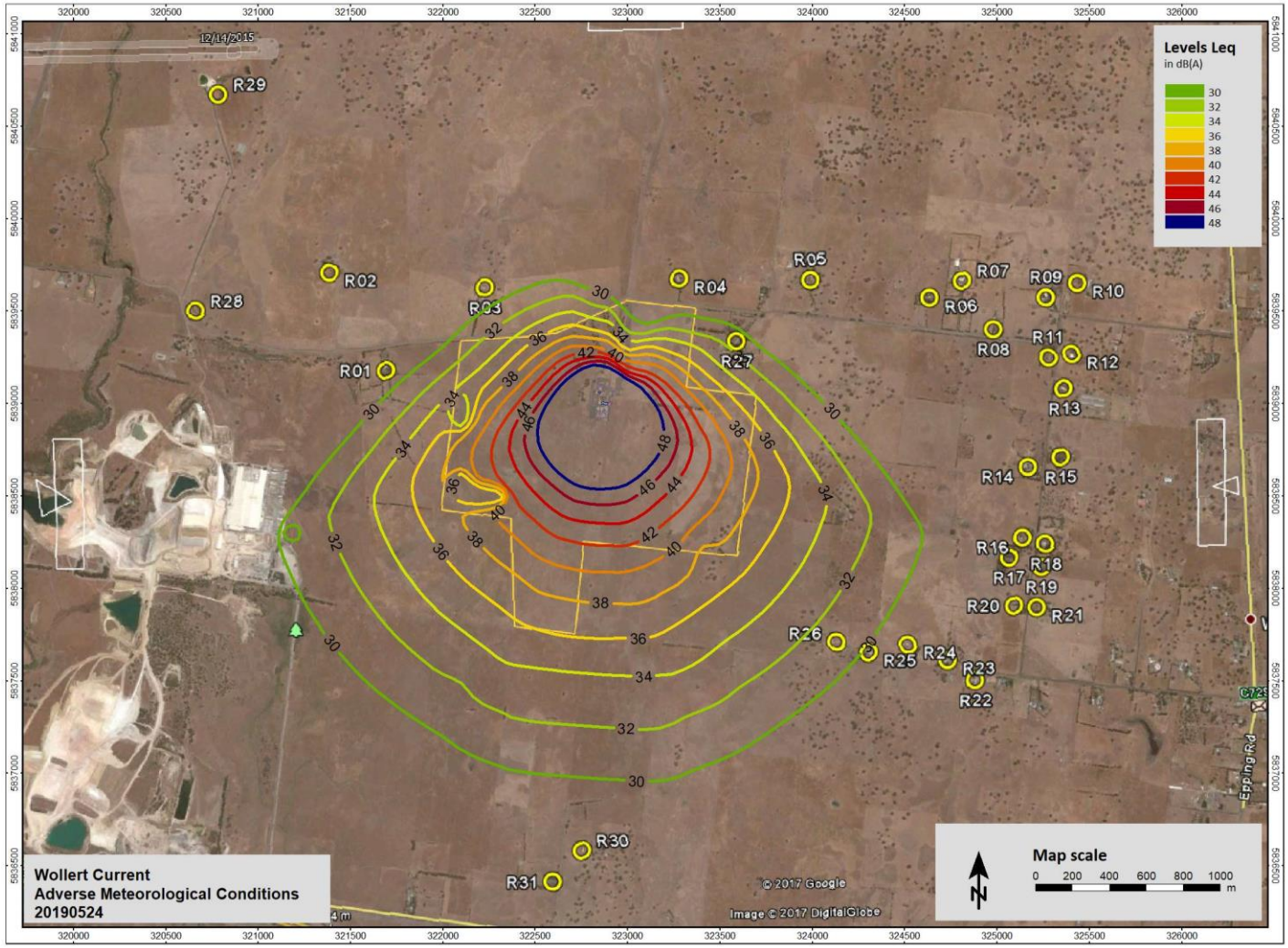
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Wollert Current
Adverse Meteorological Conditions
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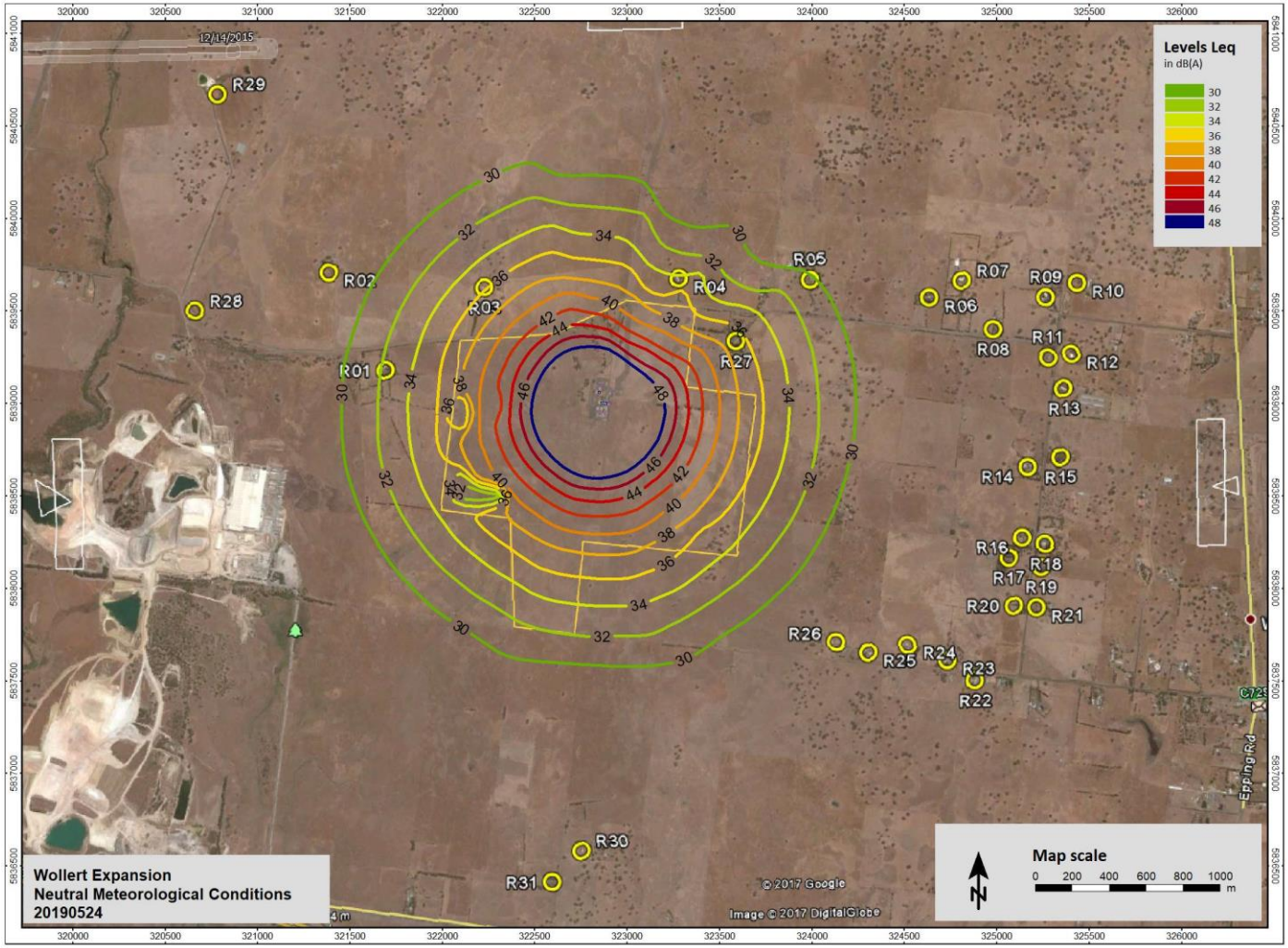
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Wollert Expansion
Neutral Meteorological Conditions
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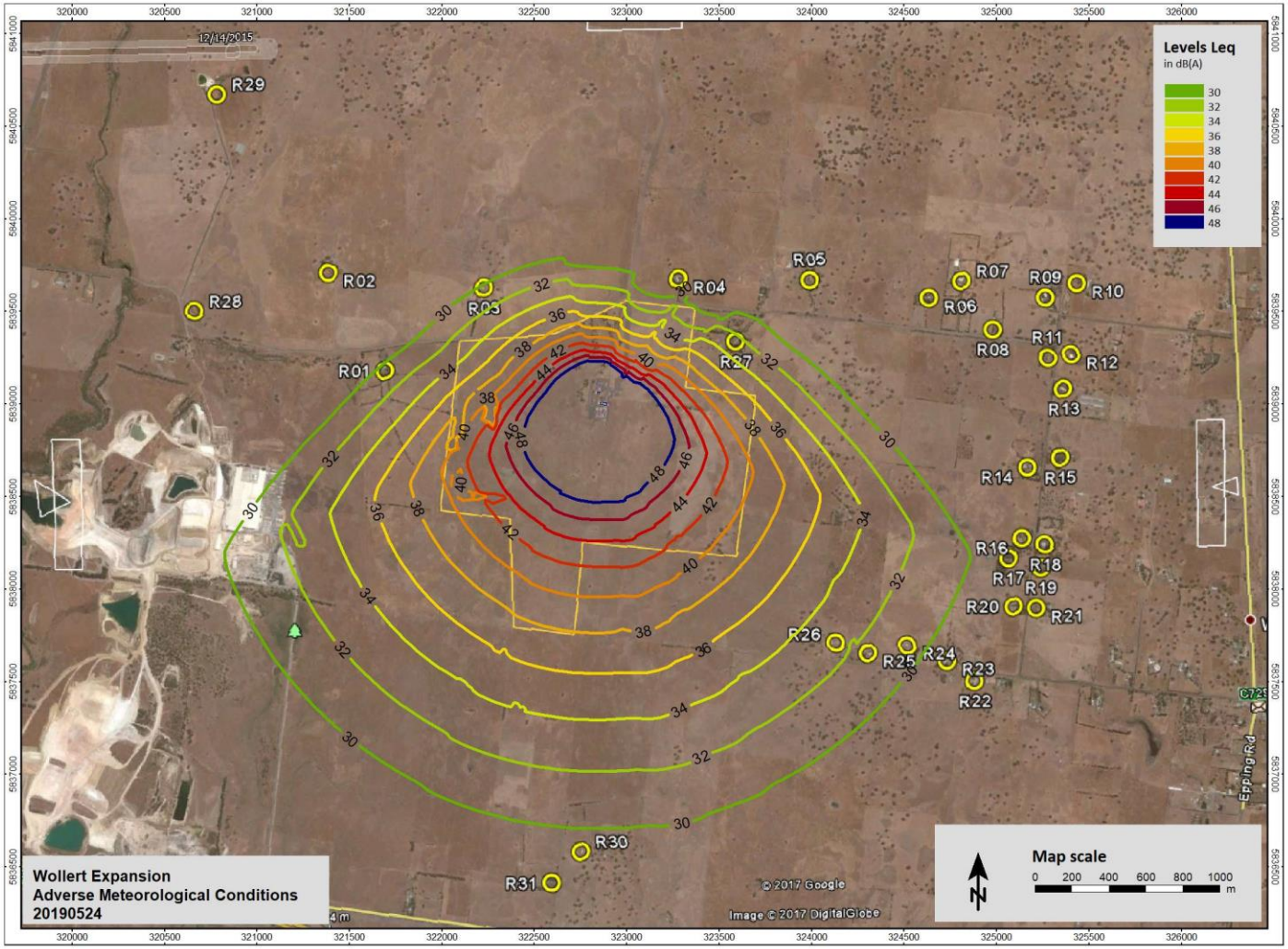
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Wollert Expansion
Adverse Meteorological Conditions
20190524
Map scale
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APPENDIX B MEASURED SOUND POWER LEVELS

Source	Sound Power Level in 1/3 Octave Band, dB																					Overall dB(A)
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	
Compressor Unit 4	104	106	109	107	103	99	103	99	100	106	109	99	98	100	97	95	99	96	96	94	100	111
Unit 4 Compressor - West	90	91	94	93	90	88	93	93	86	89	90	86	87	87	87	89	91	87	87	88	94	101
Unit 4 Compressor - North	92	92	97	97	92	90	89	86	83	85	84	78	81	80	79	81	82	79	80	79	90	94
Unit 4 Compressor - East	101	103	104	103	101	96	95	91	89	91	92	87	88	88	87	88	89	85	87	85	94	100
Unit 4 Compressor Stack	95	98	100	97	93	89	92	91	89	91	93	87	89	88	86	87	88	86	86	86	98	102
Unit 4 Compressor Top - Stack Platform	104	103	105	101	98	95	99	96	94	97	99	92	94	93	91	92	93	90	91	91	102	106
Unit 4 Compressor Top - Compressor Platform	101	102	104	102	100	97	97	95	92	94	96	91	92	92	92	92	93	90	89	91	107	109
Compressor Unit 4 Aftercooler	100	97	102	98	94	99	103	98	101	109	112	102	100	100	98	98	100	97	99	98	97	113
Recycle Vale	87	86	89	88	83	84	88	82	83	88	89	83	81	80	80	80	80	77	77	77	75	92

Source	Sound Power Level in 1/3 Octave Band, dB																					Overall dB(A)
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	
Unit 4 Aftercooler	101	97	99	98	95	100	105	99	105	110	112	103	103	101	100	99	98	95	98	98	97	114
Regulator Valve (T119-PRD)	79	78	79	76	71	69	69	64	67	68	70	69	71	72	70	70	70	70	70	70	69	82
Regulator Valve (T74)	78	75	73	71	67	65	63	63	60	59	60	58	58	63	61	62	61	63	61	63	63	73
City Gate - Run 1	76	74	73	84	72	68	68	68	67	71	73	67	71	75	78	87	87	89	90	95	95	102
City Gate - Run 4	79	75	73	85	74	71	70	70	69	70	73	74	71	81	82	91	89	89	91	94	96	104
Compressor Unit 2	105	105	102	95	88	90	84	81	82	83	85	84	86	83	78	77	76	74	70	67	66	92
Lube Oil Fan	90	93	94	96	98	103	99	101	107	103	101	99	98	96	98	98	96	94	88	89	87	108
Compressors Units 1,2,3 Air Intake - North	91	91	86	80	79	76	71	70	83	70	73	71	74	80	83	84	87	90	87	85	88	98
Compressors Units 1,2,3 Air Intake - East	84	82	79	79	78	77	69	71	84	70	73	73	74	82	81	85	84	85	82	79	78	93
Compressors Units 1,2,3 Air Intake - West	83	80	76	73	73	77	68	67	72	64	66	65	66	72	73	78	79	79	76	74	76	87

Source	Sound Power Level in 1/3 Octave Band, dB																					Overall dB(A)
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	
Compressors Units 1,2,3 Air Intake - Above	94	94	89	85	84	84	76	76	89	75	78	78	79	87	88	90	91	94	90	88	91	101
Generator Building	94	92	93	101	101	92	94	95	91	89	88	90	90	89	87	86	86	87	83	81	80	99
Compressor Units 1,2 & 3 Aftercoolers	103	103	101	98	95	94	94	93	93	92	95	90	93	92	89	94	94	93	90	85	86	103

APPENDIX C

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