ISPT Pty Ltd

Air Quality Assessment of Proposed Backup Generators

Warehouse 1 Elevation at Greystanes
Clunies Ross Street, Greystanes, NSW

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JBS&G

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Executive Summary

JBS&G Australia Pty Ltd (JBS&G) was engaged by ISPT Pty Ltd (ISPT, the client) care of Aliro Management Pty Ltd (Aliro) to undertake an Air Quality Assessment (AQA) for the use of two backup generators in Warehouse 1 at the proposed Elevation at Greystanes redevelopment, located at Clunies Ross Street in Greystanes New South Wales.

The AQA was requested to assess potential air quality impacts to receptors in proximity of the site, by the Department of Planning, Infrastructure & Environment (DPIE) which is the consent authority for Elevation at Greystanes, as part of the following conditions to assess the impact of plant and equipment associated with the use of Warehouse 1.

The scope of this assessment has been to limited to potential emissions generated by the proposed generators to be installed at Warehouse 1 i.e. emissions to air associated with other aspects of the site have not been considered and are otherwise considered to be insignificant in comparison. Limited data was available to characterise the nature and extent of emissions associated with a standby diesel generator. However ISPT have requested that a worst case scenario for emissions be assessed, using emission rates determined using technical specifications available for the intended machinery and published data. The AQA has been undertaken using Gaussian dispersion modelling using a range of parameters to characterise odour emissions from the site. The modelling has further incorporated worst case meteorological data. Modelling results have been assessed to NSW EPA endorsed criteria.

Based on the findings of this assessment and subject to Limitations in **Section 8,** predicted maximum estimated air emissions from use of the generators (operated for 24 hours a day over a 12 month period) are at least half the applicable criteria value. As such it is considered that the dispersion modelling results for chemical and dust emissions to air from operation of two generators at the site will not result in unacceptable air emissions to human health in the surrounding area.

For a number of reasons discussed in the report, the assessment has not specifically assessed air quality impacts to the workers and visitors at the Elevation at Greystanes Precinct, as these receptors would be expected to avail themselves of appropriate personal protective equipment (PPE) should emissions from the generators be considered a cause of concern.

Notwithstanding this conclusion it is recommended that this AQA be reviewed, and revised if required, should the performance of the units to be installed differ significantly from that modelled herein. Furthermore any unit installed on the site should be maintained as per the suppliers requirements, and any relevant legislative obligations for maintenance of backup generators. This is likely to require as a minimum:

- A weekly check of the area surrounding the generator to ensure it is clean and no parts of either generators are obstructed;
- A once monthly startup to confirm the generator is operating correctly and/or after either generator has been run for 25 consecutive days;
- A monthly visual inspection of wire connections and clamps to ensure all fittings remain intact;
- A monthly visual inspection of piping to ensure no leaks are occurring or any damage is evident;
- A monthly check of oil and coolant levels; and
- A monthly check of available diesel levels.

1. Introduction and Background

1.1 Introduction

JBS&G Australia Pty Ltd (JBS&G) was engaged by ISPT Pty Ltd (ISPT, the client) care of Aliro Management Pty Ltd (Aliro) to undertake an Air Quality Assessment (AQA) for the use of two backup generators at the proposed Elevation at Greystanes, located at Clunies Ross Street in Greystanes New South Wales. The proposed Elevation at Greystanes occupies an area of approximately 20.2 hectares (ha), and will be developed into a warehouse logistic estate. The extent of the site for this air quality assessment is the however restricted to the area of Warehouse 1 only, which is located at the northern end of Lot 10 in Deposited Plan 1022044. The location of the site within the proposed Elevation at Greystanes is shown on **Figure 1**. The AQA is required to assess the potential impacts to receptors in proximity of the site from use of backup generators as part of the proposed warehouse operations. The AQA was requested by the Department of Planning, Infrastructure & Environment (DPIE) which is then consent authority for Elevation at Greystanes, as part of the following conditions to assess the impact of plant and equipment associated with the use of Warehouse 1:

'***Impacts from additional plant and equipment***
Provide the following:

- *number and location of refrigeration units and generators*
- *hours of operation of refrigeration units and generators*
- *an assessment of acoustic impacts of additional plant and equipment including cumulative acoustic impacts*
- *air quality impact assessment of generators including maintenance and testing'*

1.2 Purpose of the AQA

The purpose of this AQA is to present a screening assessment of the potential impacts to air from use of the proposed Warehouse 1 generators, as required by point 4 in the DPI&E request. As agreed with Aliro the source data used in this AQA has been based on the specifications provided for the generators anticipated to be installed and readily available published literature on the potential emissions from diesel generators.

Given that the refrigeration units on the site will be supplied with electricity from the local grid, and the generators under consideration are being installed for backup electricity generation only in the event the grid supply is interrupted, this approach is considered to be an appropriate screen for this low risk source. Nonetheless an appropriate level of conservativism has been incorporated in this approach to ensure the screening provides characterisation of the likely worst case air quality impacts.

2. Site and Existing Environment

2.1 Site Identification

The location of the proposed Elevation at Greystanes is approximately 25 kilometres (km) west of the Sydney central business district (CBD), within the local government area of Cumberland Council. The location has historically been used for agricultural/pastoral purposes (owned by dairy farmers) and small-scale quarrying (blue metal) prior to regional quarrying activities which saw the stockpiling of quarried materials on site and masonry manufacturing. Following cessation of large-scale quarrying activities, the northern portion has until recently been utilised for masonry/manufacturing activities (Austral Masonry) with the southern portion utilised for commercial (Boral Concrete and Brick Head Offices) and vacant land (Council depot/stockpiling yard) land uses.

The location of the site as part of the Elevation at Greystanes is shown in **Figure 1**. The current and proposed site layout is shown in **Figure 2**. Site details are summarised in **Table 2.1** and discussed in detail in the following section.

Table 2.1: Summary of Site Details

Site Legal Identifier (as shown on Figure 2)	Northern end of Lot 10 in DP 1022044
Site Address	44 Clunies Ross Street, Pemulwuy, NSW, 2145
Site Area	Approximately 18,105m^2 (proposed warehouse footprint)
Approximate Relative Level (RL) m Australian Height Datum (AHD)	57.8 m AHD – post construction of Warehouse 1
Local Government Authority	Cumberland City Council
Site Geographic Coordinates (MGA 56)	Refer to Figure 2
Current Zoning	Zone IN1 General Industrial
Current Land Uses	Agricultural Purposes (owned by dairy farmers) and subject to Minor Quarrying Activities
Proposed Land Uses	Commercial/Industrial

2.2 Current Site Condition

The site to have been subject to recent demolition and cut/fill activities to accommodate the proposed redevelopment. As shown on **Figure 2** the site is wholly unsealed and currently occupied by material stockpiles and used for vehicle parking. However as recently as two years ago the site was occupied by large warehouses and associated works/storage areas, which was reported to have housed a boiler, a number of hydraulic operated machines, curing chambers and hoppers on a concrete hardstand pavement for masonry production. The extent of the site also includes a riparian zone, housing a recycling water treatment wetland.

2.3 Surrounding Land Uses

The current land use of adjacent properties or properties across adjacent roads are summarised following.

- North – The site is bound to the north by a vacant vegetated parcel of land which is dissected by Girraween Creek;
- South – The site is bound to the south by an area of construction works, understood to be part of the larger Elevation at Greystanes development;
- East –The site is bound by Clunies Ross Street to the east and north east, across which there are low density residential allotments and commercial/industrial warehouses; and

- West – The site is bound to the west by an area of construction works, understood to be part of the larger Elevation at Greystanes development, with other commercial/industrial allotments (large open plan warehouses) and Girraween Creek present further west.

The closest environmental receptor is Girraween Creek located approximately 15 m north west of the site to the south of The Great Western Highway. A dam is present within the north western site extent.

2.4 Topography

The area of the site sits at a level between 55 and 60 m AHD, falling to 52m AHD along the northern site boundary, in close proximity to Girraween Creek. As noted in **Section 2.2**, the site, as part of the larger Elevation at Greystanes area appears to have been subject to cut and fill activities as to accommodate the current built forms resulting in a tiered landscape.

2.5 Meteorology

A review of average climatic data for the nearest Bureau of Meteorology monitoring location (Prospect Reservoir AMO) indicates the site is located within the following meteorological setting:

- Average minimum temperatures vary from 6.1 ^{o}C in July to 17.8 ^{o}C in February;
- Average maximum temperatures vary from 16.9 ^{o}C in July to 28.6 ^{o}C in January;
- Average annual rainfall of approximately 873.7 mm with rainfall greater than 1 mm occurring on an average of 83.9 days per year;
- Monthly rainfall varies from 46.5 mm in September to 98.8 mm in February.

Wind roses for the historical monitoring record at the Prospect Reservoir AMO are presented on **Figure 3** and indicate that on an annual basis, the prevalent wind direction across the area is from the south west which accounts for approximately 20% of all observations. Observations of wind conditions originating from both the west and south-west accounts for approximately 30% of all combined morning and afternoon observations.

2.6 Proposed Site Redevelopment

Review of architectural plans (**Appendix A**) indicates that the majority of the site is to be developed into a large warehouse building (**Figure 2**) constructed with a floor level of 57.7m above Australia Height Datum (m AHD) with an external housing for 'generators' on the northern side. ISPT have advised that the roof height of the new warehouse building is 16.7m above ground level.

Information provided by ISPT to JBS&G for the proposed generators indicate that it is likely the facility intends to use two Kohler brand generators, placed at ground level and each fitted with a exhaust valve. Technical specifications as available for the Kohler machines selected (**Appendix B**) indicates the machines have a proprietary system that minimises exhaust emissions and allows for the generators to be operated safely in a standard commercial workspace.

The proposed location of the two generators is within the 'generators' area as shown on **Figure 2**.

3. Description of Air Impact Sources

Noting the particular focus of this assessment, i.e. to determine the magnitude of air emissions that may be caused by use of the Warehouse 1 backup generators, the following sections present a review of information available relating to the generators, the potential for the generation of air impacts and the likely magnitude of those impacts.

Detailed assessment of the nature and location of emissions likely to result from intermittent use of the backup generators on the site are then discussed in **Section 4**.

3.1 Background to the Electricity Generators

The National Pollution Inventory Measure National Environment Protection (National Pollutant Inventory) Measure 1998 was adopted by the Australian Government with the intention of maintaining and improving ambient air quality, among other goals. The National Pollutant Inventory (NPI) includes measures for estimating the emissions from 94 industries including coffee roasting. The process of electricity generation via chemical and mechanical actions and potential for emissions, as described in '*Emission Estimation Techniques Manual for Fossil Fuel Electric Power Generation Version 3.0*' National Pollutant Inventory, dated January 2012 (NPI 2012) is summarised below.

Internal combustion engines convert the chemical energy stored within fossil fuels to electricity, by using either petrol, diesel, natural gas, distillate, or liquified petroleum gas, coupled to electricity generators. Engines are commonly used to provide electricity in remote sites and stand-by(emergency) facilities.

Emissions to air resulting from internal combustion engines include carbon dioxide (CO_2), water vapour, carbon monoxide (CO), oxides of nitrogen (NOx), hydrocarbons, and minor emissions of metals and metal compounds. Bulk organic liquid storage may also be a source of emissions.

3.2 Emissions from Generators/Engines

NPI (2012) provides emission rates for the quantities of PM_{10}, carbon monoxide and oxides of nitrogen as summarised in **Table 3.1**. These factors are reported to have been based on the emission factors are derived from the '*Compilation of Air Emission Factors, AP-42, Fifth Edition, Volume 1: Stationary Point and Area Sources*' (Reference: USEPA 1995[1]), for the version that was current in 2011. The emission factors presented in NPI (2012) are based on the rate of fuel consumption by the generator, and NPI (2012) states that the preference for application of these emission factors is to use facility-specific information (e.g. monitoring data) for the final emissions estimate.

Review of Chapter 3.4 of the current version of USEPA (1995[2]) available online indicates that most of the pollutants from IC engines are emitted through the exhaust. The primary pollutants from internal combustion engines are reported to be oxides of nitrogen (NOx), hydrocarbons and other organic compounds, carbon monoxide (CO), and particulates, which include both visible (smoke) and nonvisible emissions. Nitrogen oxide formation is directly related to high pressures and temperatures during the combustion process and to the nitrogen content, if any, of the fuel. Similarly sulfur oxide emissions were reported to be a function of only the sulfur content in the fuel rather than any combustion variables. The other pollutants i.e. the hydrocarbons, CO and particulates were considered to be primarily the result of incomplete combustion, which are discharged into the atmosphere when some of the fuel remains unburned or is only partially

[1] USEPA, *Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources,* January 1995

[2] now issued as USEPA, *Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume 1: Stationary Point and Area Sources,* http://www.epa.gov/ttnchie1/ap42.html, 1998a

burned during the combustion process. The emission rates for these pollutants are provided in AP-42 as a function of the fuel used by the combustion system, and also separately as a function of the energy output by the system. Both rates are also included in **Table 3.1.**

Table 3.1 Summary of Emission Rates from Stationary Combustion Systems

Pollutant	NPI (2012) Controlled Conditions [A]	AP-42 Controlled Conditions [B]	
	Emission Rate (kg/kL Fuel Used)	**Emission Rate (pounds/MMBtu)**	**Emission Rate (pounds / horsepower-hour)**
Carbon monoxide	5.6×10^{-2}	0.85	5.5×10^{-3}
Oxides of Nitrogen[B]	1.5×10^{1}	3.2	0.024
Particulate (as $PM_{2.5}$)	0.19	-[F]	-[F]
Particulate (as PM_{10} [C])	0.2	0.1	0.0007
Sulfur dioxide[D]	1.7×10^{1}	1.01	8.08×10^{-3}
Total VOCs[E]	0.7×10^{-3}	0.09	7.05×10^{-4}

Notes:
A = Using Distillate Fuels (as extracted from Table 15 NPI 2012)
B = For large Stationary Diesel Systems, all values converted to kg/kL from pounds/MMBtu and kg/KVA from pounds/horsepower-hour)
C= Emission factors for trace and their compounds from natural gas combustion sourced from Reference: USEPA 1998a section 1.4 Natural Gas Combustion (steam cycle), emission rate shown is sum of particulate matter emissions – assumed by JBS&G to be 100% PM_{10} emissions for this assessment.
D = All sulfur in fuel assumed to be converted to SO2. S = percent sulfur in fuel. Example, if sulfur content is 2.5%, then S= 2.5. If S is not available use defaults (equations are more accurate)
E = Total VOCs emissions are assumed to equal the sum of organic emissions.
F= $PM_{2.5}$ emission rate not provided in US EPA 1995, however Table 3.4-2indicates that PM2.5 can account for up to 70% of the sum of the total filterable particulate and condensable particulate emissions.

3.3 Proposed Site Generators

As noted in **Section 2.6** the generators to be installed and used on site will be 2 x 1500 kVA systems, and JBS&G has been advised the preference will be the Kohler B1500 and/or the Kohler KM2200 units fuelled by a 15,000 litre bulk diesel tank. Product specifications for the two preferred units indicate the following:

- both units have a total height of 2.25m (or 2.8m if used within the supplier provided soundproofing structure);
- the power output of the units operating in a standby capacity is 1513 kvA;
- the exhaust outlet is reported to be 100mm in diameter, exhaust temperature is reported to be 550°C with an exit velocity in the range of 4197 to 4622 L/s;
- both machines have a power factor of 0.8;
- both machines are provided with a warranty for a standard two-year period or 1000-hours when operated in a standby, not continuous, capacity. This is consistent with running each unit for 24 hours a day for a total of 41 days over a two year period; and
- maintenance checks are likely to be required after every 25 hours of operational time as a minimum.

4. Identification of Near-Field Receptors

The range of potential receptors to the emissions from the generators have been set as eleven points located near the site. Details for each receptor point is summarised in **Table 4.1**. The location of the receptors are shown on **Figure 4**.

Table 4.1: Summary of Possible Receptors

Receptor ID	Distance from source (approx.)	Comments	Easting	Northing
1	300m north-west	Commercial/industrial properties near Great Western Highway and Turlington Rad intersection, north of Western Motorway	307845	6257420
2	300m north-east	Commercial/industrial properties near Great Western Highway and Turlington Rad intersection, north of Western Motorway	308130	6257430
3	200m east	Residential properties eastern side of Clunies Ross Street	308207	6257153
4	200m south-east	Residential properties eastern side of Clunies Ross Street	308199	6257112
5	250m south-east	Residential properties eastern side of Clunies Ross Street	308164	6256873
6	350m south-east	Open space land at the southern end of Clunies Ross Street	308137	6256780
7	500m south	Foundation Place commercial/industrial properties (within future Elevation at Greystanes development)	307945	6256706
8	400m south-west	Foundation Place commercial/industrial properties east of Girraween Creek	307862	6256790
9	300m south-west	Foundation Place commercial/industrial properties east of Girraween Creek	307823	6256889
10	300m south-west	Reservoir Road commercial/industrial properties west of Girraween Creek	307648	6257011
11	350m west	Reservoir Road commercial/industrial properties west of Girraween Creek	307596	6257131

The majority of receptor locations in **Table 4.1** relate to commercial workforces, however it is considered that the most sensitive receptors to emissions from the site are the users of residential and open space land represented by receptor points 3 to 6 in **Table 4.1**. As such the AQA has considered emissions that may occur at a distance of 200m from the site, which is consistent with the closest sensitive receptors. The values determined for a distance of 200m will be greater than the levels experienced by the receptors on nearby commercial premises. It is also noted the receptors on commercial sites are not considered as sensitive to potential air emissions, if any, for the following reasons:

- The majority of these workers undertake duties within close buildings with ventilation systems that will not be affected by outdoor air quality, if detrimental; and
- Insufficient information is available on the location and performance of these ventilation systems to estimate whether impacts from the generators will reach indoor workers.

5. Assessment Criteria

Air quality criteria are provided and endorsed by the NSW EPA and are provided in NSW EPA (2016) 'Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW'. This document specifies a range of impact assessment criteria for toxic and malodorous air pollutants. The impact assessment criteria for the pollutants associated with the proposed generator use (**Section 3.2**) are summarised in **Tables 5.1 and 5.2**.

Table 5.1: Ground Level Concentration Criteria for Substances of Interest at the Site (1hr and 8hr Averaging Period)

Constitutents	1 hr averaging time Ground Concentration		8hr averaging time Ground Concentration	
	Design Level (µg/m³)	Design Level (ppm)	Design Level (µg/m³)	Design Level (ppm)
Nitrogen dioxide	246	12	-	-
Sulfur dioxide	570	20	-	-
Carbon monoxide	30,000	25	10,000	9
$PM_{2.5}$	-	-	-	-
PM_{10}	-	-	-	-
Benzene	29	0.009	-	-

Table 5.2: Ground Level Concentration Criteria for Substances of Interest at the Site (24hr and Annual Averaging Period)

Constitutents	24hr averaging time Ground Concentration		Annual average Ground Concentration	
	Design Level (µg/m³)	Design Level (ppm)	Design Level (µg/m³)	Design Level (ppm)
Nitrogen dioxide	-	-	63	3
Sulfur dioxide	228	8	60	2
Carbon monoxide	-	-	-	-
$PM_{2.5}$	25	-	8	-
PM_{10}	50	-	25	-
Benzene	-	-	-	-

The air quality impact assessment comprises comparison of the above ground concentration levels to the worst case levels determined for receptor location summarised in **Table 4.1**.

6. Methods for Air Quality Impact Assessment

ISPT has requested that JBS&G undertake an AQA for the site to address the information request made by DPI&E as listed in **Section 1.1**. As the warehouse has not yet been constructed the AQA reported in the following sections has therefore been based on technical specifications available for the generators likely to be installed on the site and publicly available odour measurements. The assessment has used methods compatible with relevant regulatory guidance, and also by adopting software as currently endorsed by the NSW EPA and similar Australian regulators in other jurisdictions.

In order to address the requested work brief, and based on the presence of sensitive residential receptors at locations 3, 4 and 6 in **Table 4.1**, JBS&G undertook dispersion modelling using the using the AERMOD dispersion program to estimate the concentrations in air at 200m east of the from the proposed generator location in Warehouse 1. Use of AERMOD was considered appropriate for the purposes of the screening level assessment noting that AERMOD is nominated by the Environment Protection Authority of Victoria (VIC EPA) the approved regulatory air model for impact assessments in Victoria. In VIC EPA (2013[3]) it is stated that approval from VIC EPA is required if a model other than AERMOD is to be used.

In completing the AERMOD dispersion modelling a number of conservative assumptions were made to simulate conditions at the site during generator operation. These are listed below.

6.1 Sources of Air Emissions

Advice from Aliro confirms that both generator units will be placed side-by-side in the same space on the northern end of the building, labelled 'generators' on **Figure 2**. To replicate this configuration the modelling has assumed that both generators will essentially act as one emission source in the event that they are turned on. Noting that the orientation and final venting point on each generator is likely to be finalised at the time of installation, this is considered an acceptable approach for these point sources in such close proximity of each other.

As per the agreed scope, the assessment was limited to potential emissions occurring from the generators, and does not include any other air emissions that may occur from the warehouse operation. In the absence of the generators being present in their final form on site, ISPT has requested JBS&G address the requirements for an AQA provided by DPI&E (see **Section 1.1**) through dispersion modelling of the following scenario:

- Operation of two generators (as one point source) continuously for 12 months (i.e. the full duration of the meteorological data as discussed in **Section 6.3)**.

Based on the available warehouse design plans (**Appendix A**) the characteristics of generator emissions used in the dispersion modelling are shown in **Table 6.1.** The likely position of the generator exhaust point has been estimated from Nearmap images of the site.

Table 6.1 Source Characteristics

Point Source Parameters	Generators 1 & 2 Exhaust Point
Easting	333175.38
Northing	6248061.65
Ground Level (m AHD)	57.7
Stack Release Height (m AHD)[1]	60.5
Source Type	Point
Machine Type	Kohler B1500 and Kohler KM220
Stack Internal Diameter (m)	0.1
Stack Temperature (continuous in °C)	550

[3] VIC EPA '*Guidance Note on the Use of the Regulatory Air Pollution Model AERMOD in Victoria*' October 2013 (VIC EPA 2013a), http://www.epa.vic.gov.au/~/media/Publications/1551.pdf

Stack Flow Rate (L/min)	4612
Orientation of Stack Release Point	Vertical (assumed)

Notes:

1. Assumes generator exhaust will be vented from a point placed on the top of the suppliers soundproofing chamber described in **Section 3.3.**

6.2 Terrain Data

It was assumed that the site and surrounding area was essentially flat consistent with the development plans provided for the site (**Appendix A**). As such The dispersion model has been run under the 'flat' terrain option, omitting the need for site specific terrain data, and consistent with VIC EPA (2013a) recommendations.

Modelling was undertaken across a 1km by 1km grid area, centred around the generators' space at the northern end of Warehouse 1, with 50m spacings;

6.3 Meteorological Data

Modelling has been undertaken using a generic file of worst case meteorological data as suppled with the AERMOD program. The generic worst case file provides 12 months of hourly meteorological data setting wind conditions in one dominant direction. The worst case file used has adopted winds to the east as the dominant direction. Noting that the most sensitive receptors to air emissions from the generators are residents on the eastern side of Clunies Ross Street (**Section 4**) this worst case met file is considered appropriate for this screening assessment. Use of the worst case meteorological file is also likely to over estimate potential impacts at these residential properties given that wind conditions measured at the Prospect Reservoir monitoring station are not dominated by winds to the east. The preparation and analysis of the meteorological data has been undertaken in accordance with the requirements of NSW EPA (2016), in addition to specific guidance provided in VIC EPA (2013b[4]).

Noting that this is a screening level assessment and maximum potential levels only have been considered, the use of worst case meteorological file is considered appropriate, however the reliability of the results and estimates should be considered in respect of potential limitations associated with this approach.

6.4 Receptors Points Under Assessment

As per **Section 4** the range of potential receptors to the emissions from the generators has been streamlined to the most sensitive receptor only for the purposes of this screening AQA. The most sensitive receptor point is considered to be potential residents located 200m east of the generators (receptor point 3 on **Figure 4**). Emissions predicted at this location will be sufficiently conservative to characterise the impact of air emissions, if any, at the remaining receptor points located at greater distance from the source.

[4] VIC EPA '*Construction of input meteorological data files for EPA Victoria's regulatory air pollution model (AERMOD)*' October 2013 (VIC EPA 2013b), http://www.epa.vic.gov.au/~/media/Publications/1550.pdf

7. Results of Air Quality Modelling

7.1 Modelled Scenarios

Based on the information available and the range of averaging times /criteria applicable to the pollutants potentially emitted by the generators a number of were modelled for the site, which are summarised in **Table 7.1.**

Table 7.1: Summary of Dispersion Modelling Simulations Completed

Scenario	Objective	Height of Exhaust	Pollutant	Averaging Time
1. Likely Normal Use of Backup Generators	To determine conservative worst case GLCs to be experienced in the surrounding areas due to operation of the generators for one month continuously. Month of operation set to 1st month of meteorological data file.	2.8 m above ground level	NO_2	1hr, annual
			SO_2	1 hr 24 hr and annual
			$PM_{2.5}$	24 hr and annual
			PM_{10}	24 hr and annual
			CO	1 hr and 8 hr
			VOCs[1]	1hr

Notes:

1. Total VOC results assessed against criteria for benzene.

Table 6.1 summarised the key details relevant to the point at which generator emissions are vented on the site. **Table 7.2** summarises the emission rates and other input parameters used for the generator point source for the modelled scenario. While ISPT has advised that generators will only be used in the event that the electricity supply from the grid is temporarily unavailable or suspended, the model has conservatively assumed the generators are constantly run i.e. emitting odours, for 24 hours a day, 12 months a year. This is considered to be a highly conservative assumption given that the maximum allowable operation under the product warranty is no more than 20 day per year. The hourly emission rate adopted was based on the available literature value for combustion engines as summarised in **Section 3.2**. Of the emission rates presented in **Table 3.1**, the values obtained from AP-42 in the units of emissions per unit of engine output were adopted over the NPI (2012) rates, which were based on emissions per unit of fuel used. This was considered appropriate given insufficient data is available to predict the frequency and duration of backup generator use at Warehouse 1, however it is reasonable to assume when running the backup generators will be operated at full power. The emission rates presented in **Table 3.1** were converted to the metric units of g/s based on the generator power supply of 1513 kilo-volt amps (kVa) as nominated in the technical specifications (**Appendix B**).

In the absence of being able to measure actual emissions from the generators at the site these emission rates are considered to be overly conservative given that the suspension of power from the electricity grid in Sydney for a whole year is highly unlikely.

Table 7.2 Model Input - Generator Emission Details

Parameter	Source
Easting	333175.38
Northing	6248061.65
Ground Level (m AHD)	57.7
Stack Release Height (m AHD)	60.5
Source Type	Point
Assumed Exhaust Internal Diameter (m)	0.1
Exhaust Cross-Sectional Area (m^2)	7.86×10^{-3}
Exhaust Flow Rate (m3/min)[1]	4.197
Exhaust Exit velocity (m/s)	9
Stack Emissions Temperature (continuous in °C) [1]	550
Pollutant Emission rate (g/s) – NO2	2.65[2]
Pollutant Emission rate (g/s) – SO2	1.65[2]
Pollutant Emission rate (g/s) – $PM_{2.5}$	0.1[2,3]
Pollutant Emission rate (g/s) – PM_{10}	0.143[2]
Pollutant Emission rate (g/s) – CO	1.12[2]
Pollutant Emission rate (g/s) – total VOC	0.144[2]
Emission release direction	horizontal
Proximity of release point to nearest building	Not considered in the screening level assessment

Note:

1. Based on Kohler technical specifications (**Appendix B**)
2. Emission rate based on uncontrolled emission rate (in Lbs/hp-Hr) reported in **Table 3.1** converted to g/s by adopting the conversion rates based on 1 kilowatt equal to 1.341 units of horsepower-hour, and a power factor of 0.8 for each generator of 1513 kVA as per Kohler technical specifications (**Appendix B**).
3. Emission rate for PM2.5 assumed to be 70% of total particulate emissions based on US EPA (1995) guidance review presented in **Table 3.1**.

7.2 Results of Air Quality Modelling

Modelling results for each of the pollutants of interest are summarised in **Table 7.2**. AERMOD modelling input files have provided as **Appendix C**.

Table 7.2 Maximum Predicted Ground Level Concentrations (GLCs) in µg/m^3 at Receptor Point 3

Parameter	Averaging Time	Guideline Concentration (ug/m^3)	Predicted GLC (ug/m^3)	
			Unadjusted Model Results	Adjustment for Wind Direction [2]
Predicted NO_2	**1 hour**	**246**	**573**	171.9
	Annual	**63**	16	4.8
Predicted SO_2	**1 hour**	**570**	377	113.1
	24 hour	**228**	55	16.5
	Annual	**60**	10	3
Predicted $PM_{2.5}$	**24 hour**	**25**	3.4[3]	1.0
	Annual	**8**	0.61[3]	0.2
Predicted PM_{10}	**24 hour**	**50**	4.8	1.44
	Annual	**25**	0.86	0.258
Predicted CO	**1 hour**	**30,000**	256	76.8
	8 hour	**10,000**	66	19.8
Predicted Total VOCs	**1 hour**	**29[1]**	**31.1**	9.33

Notes:

1. Assessment criteria for benzene only. Comparison assumes 100% of the predicted Total VOC GLC occurs as benzene.
2. A correction factor of 30% has been applied to the unadjusted predicted GLCs to account for actual frequency of wind conditions originating from the west or south-west direction.
3. While the reference documents used to determined particulate emission rates did not include an emission rate for PM2.5, as a worst case assessment the PM2.5 emission rate was set to 70% of the total particulate matter emission rate presented in USEPA (1995).

7.3 Comparison to Guideline Criteria

The unadjusted results presented in **Table 7.2** are the 100th percentile (or maximum) results consistent with the requirements of NSW EPA (2016), and the majority of results are less than the adopted criteria. However the maximum predicted results for NO_2 (1 hour averaging time) and Total VOCs (assessed against benzene only criterion) are slightly higher than the adopted criteria, i.e. less than a factor of 2.

In viewing these minor exceedances it should also be noted that the 100th percentile values reported have incorporated substantial levels of conservativism such as use of the generators for 24 hours a day/365 days a year, use of a worst case meteorological file etc. Noting that in reality the observed weather conditions at the nearest weather monitoring station (i.e. Prospect Reservoir, **Section 2.5**) vary substantially from the eastwards pushing winds used for modelling, a correction factor has been applied to the unadjusted model results presented in **Table 7.2** to account for no more than 30% of wind conditions in proximity of the site likely to be directed to the east, as per the wind conditions observed at the nearby Prospect Reservoir monitoring station. These corrected results presented in **Table 7.2** are considered to more closely represent the maximum pollutant GLCs likely to be experienced at the closest residential receptors to the generators even if the generators are operated for 24 hours a day over a 12 month period.

Review of the adjusted results in **Table 7.2** indicates that the maximum estimated air emissions from use of the generators (operated for 24 hours a day over a 12 month period) are at least half the applicable criteria value.

As such it is considered that the dispersion modelling results for chemical and dust emissions to air from operation of two generators at the site will not result in unacceptable air emissions to human health in the surrounding area.

Notwithstanding this conclusion it is recommended that this AQA be reviewed, and revised if required, should the performance of the units to be installed differ significantly from that modelled herein. Furthermore any unit installed on the site should be maintained as per the suppliers requirements, and any relevant legislative obligations for maintenance of backup generators. This is likely to require as a minimum:

- A weekly check of the area surrounding the generator to ensure it is clean and no parts of either generators are obstructed;
- A once monthly startup to confirm the generator is operating correctly and/or after either generator has been run for 25 consecutive days;
- A monthly visual inspection of wire connections and clamps to ensure all fittings remain intact;
- A monthly visual inspection of piping to ensure no leaks are occurring or any damage is evident;
- A monthly check of oil and coolant levels; and
- A monthly check of available diesel levels.

8. Conclusions

JBS&G Australia Pty Ltd (JBS&G) was engaged by ISPT Pty Ltd (ISPT, the client) care of Aliro Management Pty Ltd (Aliro) to undertake an Air Quality Assessment (AQA) for the use of two backup generators in Warehouse 1 at the proposed Elevation at Greystanes, located at Clunies Ross Street in Greystanes New South Wales.

The AQA was requested to assess potential air quality impacts to receptors in proximity of the site, by the Department of Planning, Infrastructure & Environment (DPIE) which is the consent authority for Elevation at Greystanes, as part of the following conditions to assess the impact of plant and equipment associated with the use of Warehouse 1.

The scope of this assessment has been to limited to potential emissions generated by the proposed generators to be installed at Warehouse 1 i.e. emissions to air associated with other aspects of the site have not been considered and are otherwise considered to be insignificant in comparison. Limited data was available to characterise the nature and extent of emissions associated with a standby diesel generator. However ISPT have requested that a worst case scenario for emissions be assessed, using emission rates determined using technical specifications available for the intended machinery and published data. The AQA has been undertaken using Gaussian dispersion modelling using a range of parameters to characterise odour emissions from the site. The modelling has further incorporated worst case meteorological data. Modelling results have been assessed to NSW EPA endorsed criteria.

Based on the findings of this assessment and subject to Limitations in **Section 8,** predicted maximum estimated air emissions from use of the generators (operated for 24 hours a day over a 12 month period) are at least half the applicable criteria value. As such it is considered that the dispersion modelling results for chemical and dust emissions to air from operation of two generators at the site will not result in unacceptable air emissions to human health in the surrounding area.

For a number of reasons discussed in the report, the assessment has not specifically assessed air quality impacts to the workers and visitors at the Elevation at Greystanes Precinct, as these receptors would be expected to avail themselves of appropriate personal protective equipment (PPE) should emissions from the generators be considered a cause of concern.

9. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

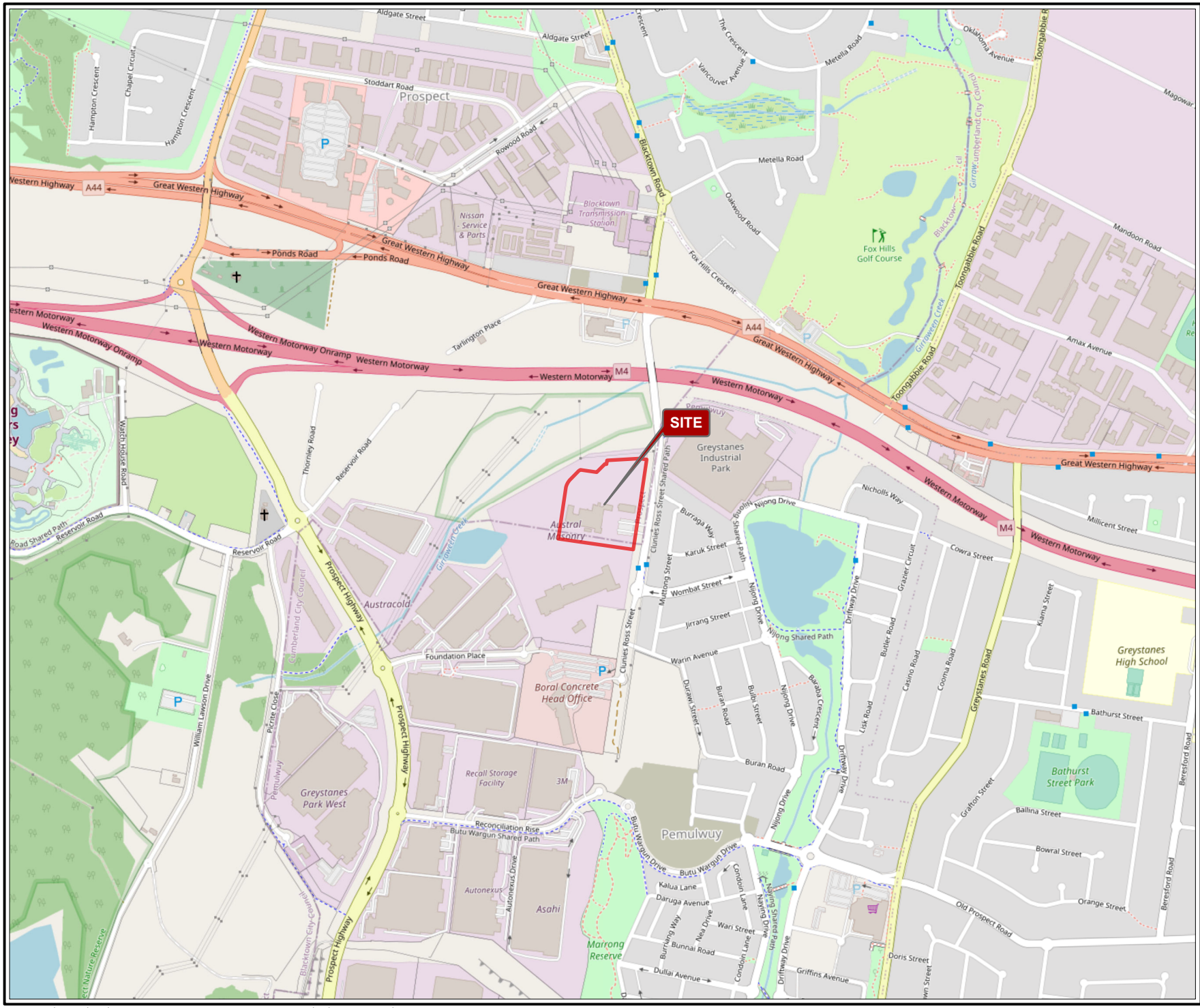
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Figures



Job No: 63526

Client: Aliro

Version: R01 Rev 0 | Date 26/07/2022

Drawn By: AB | Checked By: SD

Scale 1:12,500

0 110 220

metres

Coord. Sys. GDA 1994 MGA Zone 56

44 Clunies Ross Street
Prospect, NSW

SITE LOCATION

FIGURE 1

File Name: N:\Projects\Aliro\63526 Pemulwuy Warehouse 1 Air Quality Assessment\GIS\02_MapProjects\63526_Pemulwuy_R01_Rev0.aprx

Legend

- Approximate Site Boundary
- Cadastre (DFSI, 2021)
- Generator

JBS&G

Job No: 63526

Client: Aliro

Version: R01 Rev 0	Date 28/07/2022
Drawn By: AB	Checked By: SD

Scale 1:2,500

0 20 40

metres

Coord. Sys. GDA 1994 MGA Zone 56

44 Clunies Ross Street
Prospect, NSW

SITE LOCATION

FIGURE 2

File Name: N:\Projects\Aliro\63526 Pemulwuy Warehouse 1 Air Quality Assessment\GIS\02_MapProjects\63526_Pemulwuy_R01_Rev0.aprx
Reference: Nearmap - www.nearmap.com (Capture Date: 19/05/2022)

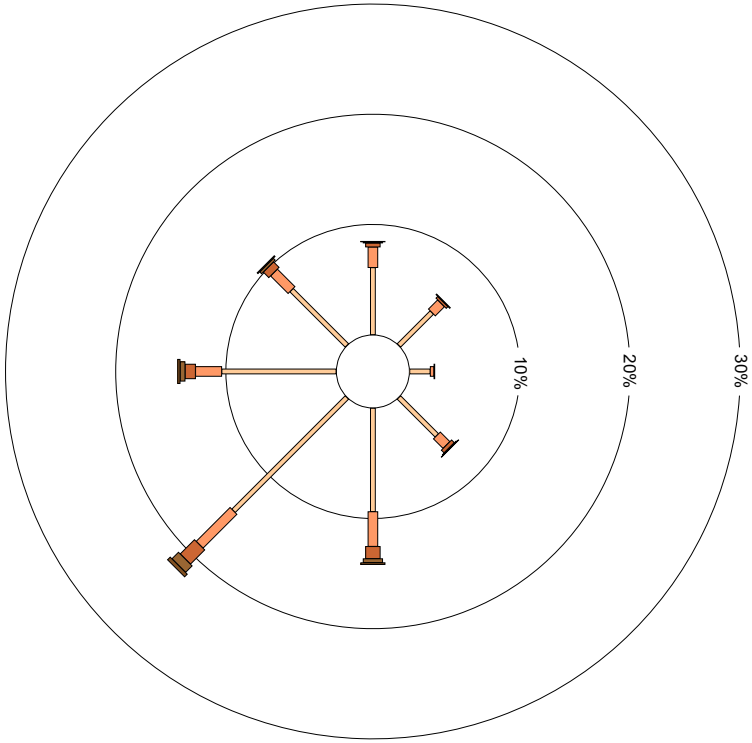
Rose of Wind direction versus Wind speed in km/h (01 Jan 1965 to 27 May 2018)

Custom times selected, refer to attached note for details

PROSPECT RESERVOIR

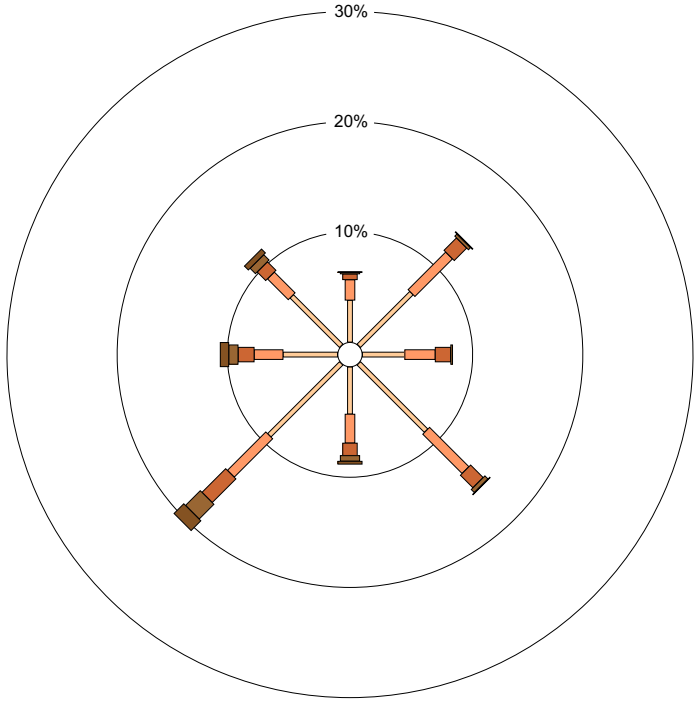
Site No: 067019 • Opened Jan 1887 • Still Open • Latitude: -33.8193° • Longitude: 150.9127° • Elevation 61m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



9 am
19100 Total Observations

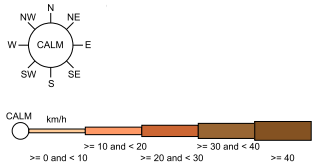
Calm 17%



3 pm
11187 Total Observations

Calm 6%

Legend



JBS&G

Job No: 63526

Client: Aliro

Version: R01 Rev 0 | Date 28/07/2022

Drawn By: AB | Checked By: SD

Scale 1:12,500

0 110 220
metres

Coord. Sys. GDA 1994 MGA Zone 56

44 Clunies Ross Street
Prospect, NSW

WIND ROSES
PROSPECT RESERVOIR
BOM WEATHER STATION

FIGURE 3

File Name: N:\Projects\Aliro\63526 Pemulwuy Warehouse 1 Air Quality Assessment\GIS\02_MapProjects\63526_Pemulwuy_R01_Rev0.aprx

Legend
- Approximate Site Boundary
- Generator
- Receptor Point

JBS&G

Job No: 63526

Client: Aliro

Version: R01 Rev 0	Date 28/07/2022
Drawn By: AB	Checked By: SD

Scale 1:4,224

0 40 80
metres

Coord. Sys. GDA 1994 MGA Zone 56

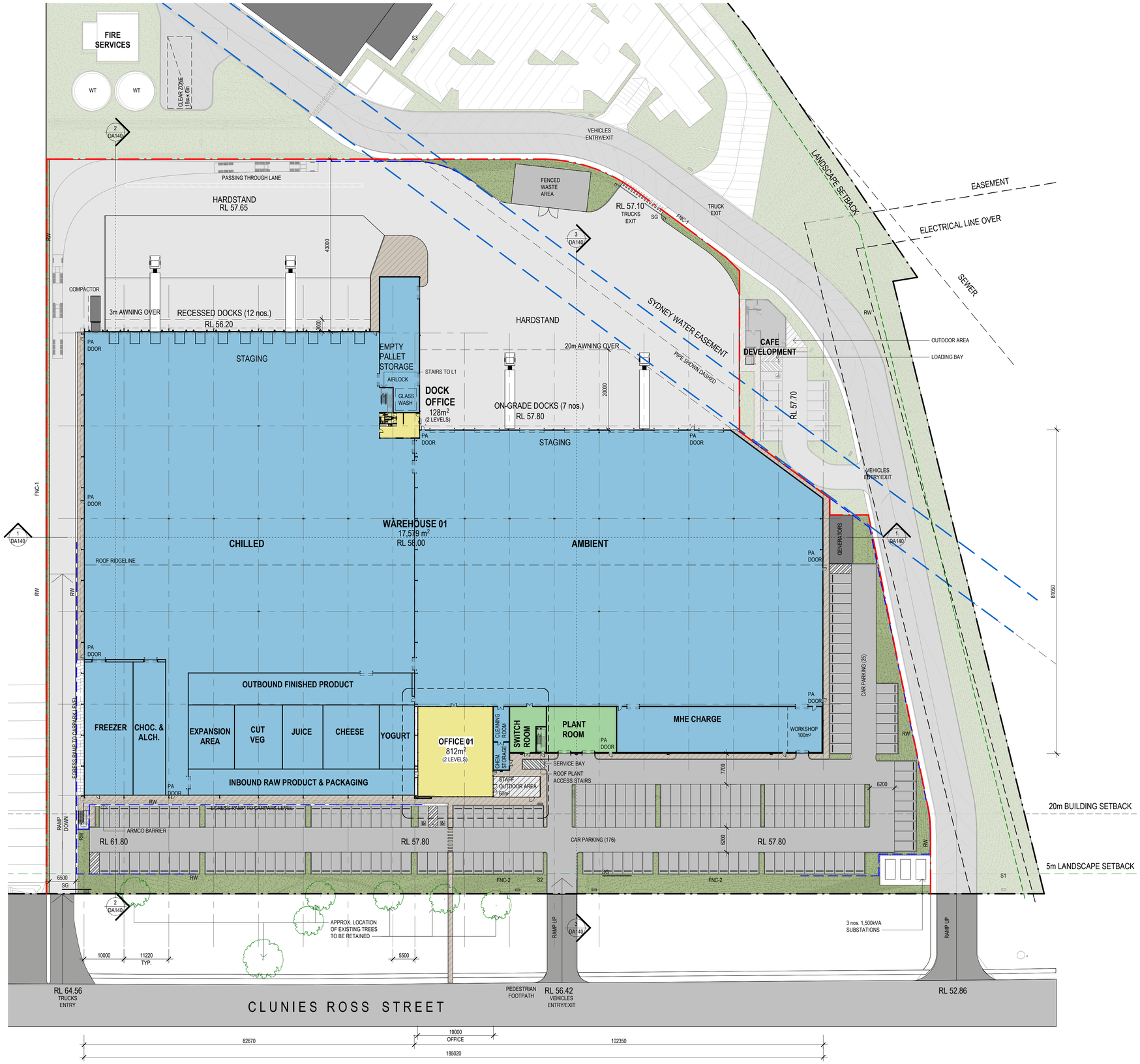
44 Clunies Ross Street
Prospect, NSW

SITE AND
POTENTIAL SENSITIVE RECEPTORS
FOR EMISSIONS TO AIR

FIGURE 4

File Name: N:\Projects\Aliro\63526 Pemulwuy Warehouse 1 Air Quality Assessment\GIS\02_MapProjects\63526_Pemulwuy_R01_Rev0.aprx
Reference: www.nearmap.com (Capture Date: 19/05/2022)

Appendix A: Site Development Plans



NOTES

ALL NEW CROSSOVERS IN ACCORANDCE WITH COUNCIL REQUIREMENTS.

ALL DISABLED PARKING SPACES IN ACOORDANCE WITH AUSTRALIAN STANDARD AS2890 (5.4m x 2.4m).

SITE STORMWATER DRAINAGE IN ACCORANCE TO LOCAL AUTHORITY & COUNCIL REQUIREMENTS.

OUTDOOR LIGHTING WILL BE PROVIDED TO ILLUMINATE THE OUTDOOR AREAS OF THE SITE OUTSIDE OF DAYLIGHT HOURS IN ACCORDANCE WITH AS-4282.

THE OUTDOOR LIGHTING WILL BE DESIGNED TO AVOID SAFETY/GLARE ISSUES FOR THE USERS OF THE ROAD RESERVE IN ACCORDANCE WITH AS-4282.

19m SEMI TO REVERSE INTO LOADING DOCKS AND B-DOUBLE TO BE SIDE LOADED.

ALL RELATIVE LEVELS ARE SHOWN TO A.H.D. (Australian Height Datum)
RELATIVE LEVELS SHOWN INDICATIVELY ONLY.
REFER TO CIVIL DRAWINGS.

GFA CALCULATION IS AS PER CUMBERLAND LEP 2021.

LEGEND

- INDICATES EXTENT OF HEAVY DUTY HARDSTAND TO CIVIL ENGINEERS DETAILS
- INDICATES EXTENT OF LIGHT DUTY PAVEMENT TO CIVIL ENGINEERS DETAILS
- CONCRETE PAVING WITH EXPOSED AGGREGATE FINISH OR SIMILAR
- CRUSHED ROCK TO FIRE TRUCK ACCESS TRACK
- AREA OF GRASS / LANDSCAPING, REFER TO LANDSCAPE ARCHITECTS DRAWINGS FOR LANDSCAPE LAYOUT AND DETAILS
- INDICATES EXTENT OF WAREHOUSE
- INDICATES EXTENT OF OFFICES & ANCILLARY BUILDINGS
- RETAINING WALL
- SYDNEY WATER EASEMENT

DEVELOPMENT ANALYSIS

BUILDING	GLA	GFA
WAREHOUSE TOTAL	17,279 m²	17,160 m²
WAREHOUSE - AMBIENT	6,883 m²	
WAREHOUSE - CHILLER	6,960 m²	
PRODUCTION AREA	1,741 m²	
CHOCOLATE & ALCOHOL	280 m²	
FREEZER	419 m²	
MHE CHARGE & WORKSHOP	608 m²	
CHEM. STORAGE, & CLEANING	66 m²	
EMPTY PALLET STORAGE & GLASS WASH	322 m²	
DOCK OFFICE - GROUND	64 m²	61 m²
DOCK OFFICE - LEVEL 1	64 m²	61 m²
OFFICE - GROUND	422 m²	406 m²
OFFICE - LEVEL 1	390 m²	384 m²
PLANT & SWITCH ROOM	316 m²	
TOTAL	18,535 m²	18,072 m²

EXTERNAL AREAS (APPROX)	
CANOPIES	1,496 m²
HARDSTAND	9,014 m²
LIGHT DUTY	5,369 m²
CONCRETE PAVING	880 m²

CAR PARKING	
CAR SPACES (NORTH)	25 No.
CAR SPACES (EAST)	175 No.
TOTAL CAR SPACES	200 No.

SITE COVERAGE EXCLUDES CAFE	
TOTAL SITE AREA	35,640 m²
TOTAL BUILDING FOOTPRINT	18,105 m²
SITE COVERAGE	50.80 %

NO:	DATE:	REVISION:	BY:	CHK:
P11	23.06.2022	PRELIMINARY	IO	JF
P12	24.06.2022	PRELIMINARY	IO	JF
P13	28.06.2022	PRELIMINARY	IO	JF
D	04.06.2020	PREVIOUS SSDA APPROVAL		
E	19.07.2022	ISSUED FOR APPROVAL	IO	JF

Watson Young Architects P/L Melbourne | Perth | Sydney 03 9516 8555 ACN: 111398700
8 Grattan Street Prahran VIC 3181 info@watsonyoung.com.au watsonyoung.com.au

GREYSTANES INDUSTRIAL PARK - WH 1
CLUNIES ROSS STREET, GREYSTANES NSW

SITE PLAN

DATE: JULY, 2022
DRAWN BY: IO
SCALE: 1:500 @ A1
SCALE:

JOB NO: 22103
DRAWING NO: DA110
REVISION: E

watson young

Appendix B: Generator Technical Specifications

Industrial Diesel Generator Set – B1500
50 Hz

RATINGS 400 V - 50 Hz		
Standby	kVA	1513
	kWe	1210
Prime	kVA	1375
	kWe	1100

Benefits & features

KOHLER premium quality

- KOHLER provides **one source responsibility** for the generating set and accessories
- The generator set, its components and a wide range of options have been **fully developed, prototype tested, factory built**, and production tested
- The generator sets are designed in accordance to ISO8528
- Approved for use with HVO (Hydrotreated Vegetable Oil) according to EN15940

KOHLER premium performances

Engines

- High reliability enhanced through a simple design for optimal functional performances
- High performances turbochargers providing high engine performances under all loads
- Easy operation and maintenance: accessories requiring daily maintenance are conveniently located on the same side of the engine

Alternator

- Provide industry leading motor starting capability
- Excitation system to permit sustained overcurrent > 300% In, during 10 sec
- Built with a class H insulation and IP23

Cooling

- A compact and complete solution using a mechanical driven fan radiator
- High temperature and altitude product capacity available

Control Panel

- The KOHLER wide controller range provides the reliability and performances you expect from your equipment. You can program, manage and diagnose it easily and in an efficient way

KOHLER worldwide support

- A standard two-year or 1000-hours limited warranty for standby applications.
- A standard one-year or 2500 hours limited warranty for prime power applications.
- A worldwide product support

GENERAL SPECIFICATIONS	
Engine brand	BAUDOUIN
Alternator commercial brand	KOHLER
Voltage (V)	400/230
Standard Control Panel	APM403
Consumption @ 100% load ESP (L/h)	326
Consumption @ 100% load PRP (L/h)	293
Emission level	Fuel consumption optimization
Type of Cooling	Mechanical driven fan
Performance class	G2

GENERATOR SETS RATINGS

				Standby Rating			Prime Rating	
	Voltage	PH	Hz	kWe	kVA	Amps	kWe	kVA
B1500	415/240	3	50	1210	1513	2105	1100	1375
	400/230	3	50	1210	1513	2184	1100	1375
	380/220	3	50	1210	1513	2299	1100	1375

DIMENSIONS COMPACT VERSION	
Length (mm)	4765
Width (mm)	2250
Height (mm)	2465
Tank capacity (L)	500
Dry weight (kg)	9440

DIMENSIONS SOUNDPROOFED VERSION	
Type soundproofing	NOT AVAILABLE
Length (mm)	6060
Width (mm)	2440
Height (mm)	2896
Tank capacity (L)	500
Dry weight (kg)	15230
Acoustic pressure level @1m in dB(A) 50Hz (75% PRP)	93
Acoustic pressure level @7m in dB(A) 50Hz (75% PRP)	84

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit.
Data was taken from a single engine test according to the test methods, fuel specification and reference conditions stated above and is subjected to instrumentation and engine-to-engine variability. Test conducted with alternate test methods, instrumentation, fuel or reference conditions can yield different results. Data and specifications subject to change without notice.

Industrial Diesel Generator Set – B1500
50 Hz

Engine

General	
Engine brand	BAUDOUIN
Engine ref.	12M33G1500_V2_5 *
Air inlet system	Turbo
Fuel	Diesel Fuel/HVO
Emission level	Fuel consumption optimization
Cylinder configuration	V
Number of cylinders	12
Displacement (l)	39,23
Bore (mm) * Stroke (mm)	150 * 185
Compression ratio	15 : 1
Speed 50Hz (RPM)	1500
Maximum stand-by power at rated RPM (kW)	1320
Charge Air coolant	Air/Air
Frequency regulation, steady state (%)	+/- 0.5%
Injection Type	Direct
Governor type	Electronic
Air cleaner type, models	Dry

Fuel system	
Maximum fuel pump flow (l/h)	1070
Fuel Inlet Minimum recommended size (mm)	14
Fuel Outlet Minimum recommended size (mm)	14
Max head on fuel return line (m)	5,90
Maximum allowed inlet fuel temperature (°C)	70

Consumption with cooling system

Specific consumption @ ESP Max Power (g/kW.h)	210,30
Specific consumption @ PRP Max Power (g/kW.h)	207,80
Specific consumption @ 75% of PRP Power (g/kW.h)	200,10
Specific consumption @ 50% of PRP Power (g/kW.h)	204,70

Lubrication System	
Oil system capacity including filters (l)	160
Min. oil pressure (bar)	2
Max. oil pressure (bar)	7
Oil sump capacity (l)	155
Oil consumption 100% ESP 50Hz (l/h)	0,98

Air Intake system	
Max. intake restriction (mm H2O)	663
Combustion air flow (l/s)	1650

Exhaust system	PRP	ESP
Exhaust gas temperature (°C)	550	550
Exhaust gas flow (L/s)	4197	4617
Max. exhaust back pressure (mm H2O)	765	

Cooling system	
Radiator & Engine capacity (l)	303
Fan power 50Hz (kW)	55
Fan air flow w/o restriction (m3/s)	27,50
Available restriction on air flow (mm H2O)	20
Type of coolant	Gencool
Coolant capacity HT, engine only (l)	83
Max coolant temperature, Shutdown (°C)	103
Thermostat begin of opening HT (°C)	77
Thermostat end of opening HT (°C)	87

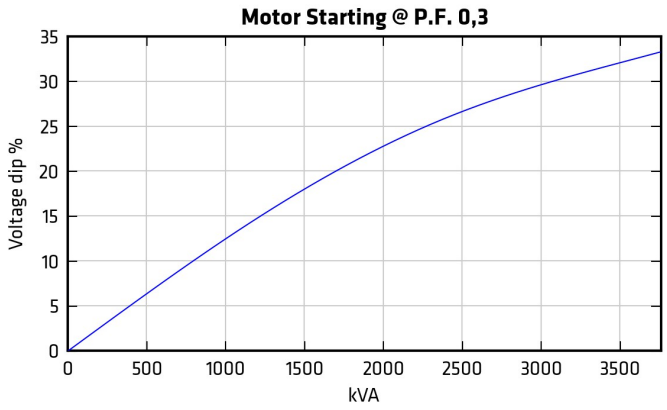
* Engine reference may be partially modified depending on genset application, options selected by the customer and lead time required.
** Fuel consumption is up to 4% higher when using HVO than Diesel Fuel

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit.
Data was taken from a single engine test according to the test methods, fuel specification and reference conditions stated above and is subjected to instrumentation and engine-to-engine variability. Test conducted with alternate test methods, instrumentation, fuel or reference conditions can yield different results. Data and specifications subject to change without notice.

Industrial Diesel Generator Set – B1500
50 Hz

Alternator Specifications	
Alternator commercial brand	KOHLER
Kohler Alternator description	KH05520T
Number of pole	4
Number of bearing	Single Bearing
Technology	Brushless
Indication of protection	IP23
Insulation class	H
Number of wires	12
AVR Regulation	Yes
Coupling	Direct
Capacity for maintaining short circuit at 3 In for 10 s	Yes
Application data	
Overspeed (rpm)	2250
Power factor (Cos Phi)	0,80
Voltage regulation at established rating (+/- %)	0,50
Wave form : NEMA=TIF	<40
Wave form : CEI=FHT	<2
Total Harmonic Distortion in no-load DHT (%)	2,6
Total Harmonic Distortion, on linear load DHT (%)	1,7
Recovery time (Delta U = 20% transcient) (ms)	200
Performance datas	
Continuous Nominal Rating 40°C (kVA)	1400
Unbalanced load acceptance ratio (%)	8

Peak motor starting (kVA) based on x% voltage dip power factor at 0.3



Alternator Standard Features

- All models are brushless, rotating-field alternators
- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting
- The AVR voltage regulator provides superior short circuit capability
- Self-ventilated and dip proof construction
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds
- Superior voltage waveform

Note: See Alternator Data Sheets for alternator application data and ratings, efficiency curves, voltage dip with motor starting curves, and short circuit decrement curves.

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit.
Data was taken from a single engine test according to the test methods, fuel specification and reference conditions stated above and is subjected to instrumentation and engine-to-engine variability. Test conducted with alternate test methods, instrumentation, fuel or reference conditions can yield different results. Data and specifications subject to change without notice.

Industrial Diesel Generator Set – B1500
50 Hz

Dimensions compact version with baseframe fuel tank

Length (mm) * Width (mm) * Height (mm)	4765 * 2250 * 2465
Dry weight (kg)	9440
Tank capacity (L)	500

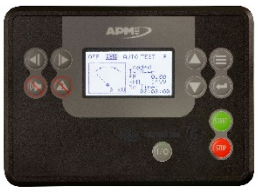
Container dimensions ISO20 soundproofed version

Length (mm) * Width (mm) * Height (mm)	6060 * 2440 * 2896
Dry weight (kg)	15230
Tank capacity (L)	500
Acoustic pressure level @1m in dB(A) 50Hz (75% PRP)	93
Sound power level guaranteed (Lwa) 50Hz (75% PRP)	114
Acoustic pressure level @7m in dB(A) 50Hz (75% PRP)	84

* dimensions and weight without options

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit.
Data was taken from a single engine test according to the test methods, fuel specification and reference conditions stated above and is subjected to instrumentation and engine-to-engine variability. Test conducted with alternate test methods, instrumentation, fuel or reference conditions can yield different results. Data and specifications subject to change without notice.

APM403



BASIC GENERATING SET AND POWER PLANT CONTROL

The APM403 is a versatile control unit which allows operation in manual or automatic mode

- Measurements : voltage and current
- kW/kWh/kVA power meters
- Standard specifications: Voltmeter, Frequency meter.
- Optional : Battery ammeter.
- J1939 CAN ECU engine control
- Alarms and faults: Oil pressure, Coolant temperature, Overspeed, Start-up failure, alternator min/max, Emergency stop button.
- Engine parameters: Fuel level, hour counter, battery voltage.
- Optional (standard at 24V): Oil pressure, water temperature.
- Event log/ Management of the last 300 genset events.
- Mains and genset protection
- Clock management
- USB connections, USB Host and PC,
- Communications : RS485 INTERFACE
- ModBUS protocol /SNMP
- Optional : Ethernet, GPRS, remote control, 3G, 4G,
- Websupervisor, SMS, E-mails

Industrial Diesel Generator Set – B1500
50 Hz

STANDARD DELIVERY

All our gensets are fitted with:

- Industrial water-cooled DIESEL engine
- Electric starter & charge alternator
- Standard air filter
- Electric circuit breaker, adapted to the short-circuit current of the generating set
- Single bearing alternator IP 23 T° rise/ insulation to class H/H
- Welded steel base frame with 85% vibration attenuation mounts
- frame height optimized to allow it to be moved safely by forklift
- enclosure made of new high-quality European steel with enhanced corrosion resistance
- enclosures and base frames tested and analyzed by the French Corrosion Institut
- 100% of tanks tested for permeability
- Personal protection ensured by protective grilles on hot and rotating parts
- Separate 9 dB(A) silencer
- Fuel tank welded inside the genset frame
- Retention bund included for gensets up to 250 kVA ESP
- Charged DC starting battery with electrolyte
- Emergency stop button on the outside
- Flexible fuel lines & lub oil drain cock
- Exhaust outlet with flexible and flanges
- User's manual (1 copy)
- Packing under plastic film
- Delivered with oil and antifreeze liquid

CODES AND STANDARDS

Engine-generators set is designed and manufactured in facilities certified to standards ISO9001:2015 & ISO14001:2015. The generator sets and its components are prototype-tested, factory built and production tested and are in compliance with the relevant standards:

- Machinery Directive 2006/42/EC of May 17th 2006
- EMC Directive2014/30/UE
- Safety objectives set out in the Low Voltage Directive 2014/35/UE
- EN ISO 8528-13, EN 60034-1, EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 55011, EN 1679-1 et EN 60204-1

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit.
Data was taken from a single engine test according to the test methods, fuel specification and reference conditions stated above and is subjected to instrumentation and engine-to-engine variability. Test conducted with alternate test methods, instrumentation, fuel or reference conditions can yield different results. Data and specifications subject to change without notice.

TERMS OF USE

According to the standard, the nominal power assigned by the genset is given for 25°C Air Intlet Temperature, of a barometric pressure of 100 kPA (100 m A.S.L), and 30% relative humidity. For particular conditions in your installation, refer to the derating table.

WARRANTY INFORMATIONS

Standard Warranty Period:

- for Products in "back-up" service
    - 30 months from the date the Product leaves the plant
    - 24 months from the Product's commissioning date
    - 1,000 running hours

  The warranty expires when one of the above conditions is met.

- for Products in "prime" or "continuous" service (continuous supply of electricity, either in the absence of any normal electricity grid or to complement the grid),
    - 18 months from the date the Product leaves the plant
    - 12 months from the Product's commissioning date
    - 2,500 running hours

  The warranty expires when one of the above conditions is met.

For more details regarding conditions of application and scope of the warranty please refer to our General "terms & conditions of sales".

Appendix C: Summary of AERMOD Inputs

```
** AERMOD Input Produced by AUSMOD v6.0
** Licensed to SumiD_JBS
** AERMOD Control Pathway
CO STARTING
   TITLEONE Generator Test Case CO exhaust at 3m high Constant emission
   MODELOPT CONC FLAT NOCHKD
   AVERTIME 1 8
   POLLUTID CO
   RUNORNOT RUN
   ERRORFIL "CO 3m High Exhaust Release Constant.err"
CO FINISHED

** AERMOD Source Pathway
SO STARTING
   LOCATION PS01 POINT 308034.170 6257159.170 57.700
   SRCPARAM PS01 1.12000 3.000 823.150 40.000 0.100
   CONCUNIT 1000000 g/s ug/m3
   SRCGROUP GP01 PS01
   SRCGROUP ALL
SO FINISHED

** AERMOD Receptor Pathway
RE STARTING
   GRIDCART RGCART STA
                   XYINC 307450.000 50 50.000 6256500.000 50 50.000
   GRIDCART RGCART END
** Discrete receptors
   DISCCART       307844.778 6257420.472
   DISCCART       308130.267 6257430.181
   DISCCART       308207.499 6257152.622
   DISCCART       308198.875 6257112.095
   DISCCART       308163.554 6256872.630
   DISCCART       308136.807 6256779.816
   DISCCART       307945.326 6256706.430
   DISCCART       307861.862 6256790.197
   DISCCART       307822.612 6256888.803
   DISCCART       307648.139 6257011.383
   DISCCART       307595.843 6257130.991
   DISCCART       0.000 0.000
RE FINISHED

** AERMOD Meteorology Pathway
ME STARTING
   SURFFILE "ScreenMet.sfc"
   PROFFILE "ScreenMet.pfl"
   SURFDATA 00011111 2010
   UAIRDATA 00022222 0
   PROFBASE 0 METERS
ME FINISHED
```

```
** AERMOD Output Pathway
OU STARTING
   RECTABLE ALLAVE 1ST
   RECTABLE 1 9TH
   RECTABLE 8 1ST
   MAXTABLE ALLAVE 999
   RANKFILE 1 100 ALL_01_100T.RNK
   PLOTFILE 01 ALL 9TH ALL_01_9H.PLT
OU FINISHED
```

```
** AERMOD Input Produced by AUSMOD v6.0
** Licensed to SumiD_JBS
** AERMOD Control Pathway
CO STARTING
   TITLEONE Generator Test Case NO2 exhaust at 3m high COnstant emission
   MODELOPT CONC FLAT NOCHKD
   AVERTIME 1 PERIOD
   POLLUTID NO2
   RUNORNOT RUN
   ERRORFIL "NOx 3m High Exhaust Release Constant.err"
CO FINISHED

** AERMOD Source Pathway
SO STARTING
   LOCATION PS01 POINT 308034.170 6257159.170 0.000
   SRCPARAM PS01 2.65000 3.000 823.150 40.000 0.100
   CONCUNIT 1000000 g/s ug/m3
   SRCGROUP GP01 PS01
   SRCGROUP ALL
SO FINISHED

** AERMOD Receptor Pathway
RE STARTING
   GRIDCART RGCART STA
                   XYINC 307450.000 50 50.000 6256500.000 50 50.000
   GRIDCART RGCART END
** Discrete receptors
   DISCCART       307844.778 6257420.472
   DISCCART       308130.267 6257430.181
   DISCCART       308207.499 6257152.622
   DISCCART       308198.875 6257112.095
   DISCCART       308163.554 6256872.630
   DISCCART       308136.807 6256779.816
   DISCCART       307945.326 6256706.430
   DISCCART       307861.862 6256790.197
   DISCCART       307822.612 6256888.803
   DISCCART       307648.139 6257011.383
   DISCCART       307595.843 6257130.991
   DISCCART       0.000 0.000
RE FINISHED

** AERMOD Meteorology Pathway
ME STARTING
   SURFFILE "ScreenMet.sfc"
   PROFFILE "ScreenMet.pfl"
   SURFDATA 00011111 2010
   UAIRDATA 00022222 0
   PROFBASE 0 METERS
ME FINISHED
```

```
** AERMOD Output Pathway
OU STARTING
   RECTABLE ALLAVE 1ST
   RECTABLE 1 9TH
   MAXTABLE ALLAVE 999
   RANKFILE 1 100 ALL_PERIOD_100T.RNK
   PLOTFILE 01 ALL 9TH ALL_01_9H.PLT
   PLOTFILE 01 ALL 1ST ALL_01_1H.PLT
OU FINISHED
```

```
** AERMOD Input Produced by AUSMOD v6.0
** Licensed to SumiD_JBS
** AERMOD Control Pathway
CO STARTING
   TITLEONE Generator Test Case PM2.5 exhaust at 3m high Constant emission
   MODELOPT CONC FLAT NOCHKD
   AVERTIME 1 24 PERIOD
   POLLUTID PM2.5
   RUNORNOT RUN
   ERRORFIL "PM25 3m High Exhaust Release Constant.err"
CO FINISHED

** AERMOD Source Pathway
SO STARTING
   LOCATION PS01 POINT 308034.170 6257159.170 0.000
   SRCPARAM PS01 0.14300 3.000 823.150 40.000 0.100
   CONCUNIT 1000000 g/s ug/m3
   SRCGROUP GP01 PS01
   SRCGROUP ALL
SO FINISHED

** AERMOD Receptor Pathway
RE STARTING
   GRIDCART RGCART STA
                   XYINC 307450.000 50 50.000 6256500.000 50 50.000
   GRIDCART RGCART END
** Discrete receptors
   DISCCART       307844.778 6257420.472
   DISCCART       308130.267 6257430.181
   DISCCART       308207.499 6257152.622
   DISCCART       308198.875 6257112.095
   DISCCART       308163.554 6256872.630
   DISCCART       308136.807 6256779.816
   DISCCART       307945.326 6256706.430
   DISCCART       307861.862 6256790.197
   DISCCART       307822.612 6256888.803
   DISCCART       307648.139 6257011.383
   DISCCART       307595.843 6257130.991
   DISCCART       0.000 0.000
RE FINISHED

** AERMOD Meteorology Pathway
ME STARTING
   SURFFILE "ScreenMet.sfc"
   PROFFILE "ScreenMet.pfl"
   SURFDATA 00011111 2010
   UAIRDATA 00022222 0
   PROFBASE 0 METERS
ME FINISHED
```

```
** AERMOD Output Pathway
OU STARTING
   RECTABLE ALLAVE 1ST
   RECTABLE 1 9TH
   RECTABLE 24 1ST
   MAXTABLE ALLAVE 999
   RANKFILE 1 100 ALL_PERIOD_100T.RNK
   PLOTFILE 24 ALL 1ST ALL_24_1H.PLT
OU FINISHED
```

```
** AERMOD Input Produced by AUSMOD v6.0
** Licensed to SumiD_JBS
** AERMOD Control Pathway
CO STARTING
   TITLEONE Generator Test Case PM10 exhaust at 3m high Constant emission
   MODELOPT CONC FLAT NOCHKD
   AVERTIME 1 24 PERIOD
   POLLUTID PM10
   RUNORNOT RUN
   ERRORFIL "PM10 3m High Exhaust Release Constant.err"
CO FINISHED

** AERMOD Source Pathway
SO STARTING
   LOCATION PS01 POINT 308034.170 6257159.170 57.500
   SRCPARAM PS01 0.14300 3.000 823.150 40.000 0.100
   CONCUNIT 1000000 g/s ug/m3
   SRCGROUP GP01 PS01
   SRCGROUP ALL
SO FINISHED

** AERMOD Receptor Pathway
RE STARTING
   GRIDCART RGCART STA
                   XYINC 307450.000 50 50.000 6256500.000 50 50.000
   GRIDCART RGCART END
** Discrete receptors
   DISCCART       307844.778 6257420.472
   DISCCART       308130.267 6257430.181
   DISCCART       308207.499 6257152.622
   DISCCART       308198.875 6257112.095
   DISCCART       308163.554 6256872.630
   DISCCART       308136.807 6256779.816
   DISCCART       307945.326 6256706.430
   DISCCART       307861.862 6256790.197
   DISCCART       307822.612 6256888.803
   DISCCART       307648.139 6257011.383
   DISCCART       307595.843 6257130.991
   DISCCART       0.000 0.000
RE FINISHED

** AERMOD Meteorology Pathway
ME STARTING
   SURFFILE "ScreenMet.sfc"
   PROFFILE "ScreenMet.pfl"
   SURFDATA 00011111 2010
   UAIRDATA 00022222 0
   PROFBASE 0 METERS
ME FINISHED
```

```
** AERMOD Output Pathway
OU STARTING
   RECTABLE ALLAVE 1ST
   RECTABLE 1 9TH
   RECTABLE 24 1ST
   MAXTABLE ALLAVE 999
   RANKFILE 1 100 ALL_PERIOD_100T.RNK
   PLOTFILE 24 ALL 1ST ALL_24_1H.PLT
OU FINISHED
```

```
** AERMOD Input Produced by AUSMOD v6.0
** Licensed to SumiD_JBS
** AERMOD Control Pathway
CO STARTING
   TITLEONE Generator Test Case SO2 exhaust at 3m high COnstant emission
   MODELOPT CONC FLAT NOCHKD
   AVERTIME 1 24 PERIOD
   POLLUTID SO2
   RUNORNOT RUN
   ERRORFIL "SO2 3m High Exhaust Release Constant.err"
CO FINISHED

** AERMOD Source Pathway
SO STARTING
   LOCATION PS01 POINT 308034.170 6257159.170 57.700
   SRCPARAM PS01 1.65000 3.000 823.150 40.000 0.100
   CONCUNIT 1000000 g/s ug/m3
   SRCGROUP GP01 PS01
   SRCGROUP ALL
SO FINISHED

** AERMOD Receptor Pathway
RE STARTING
   GRIDCART RGCART STA
                   XYINC 307450.000 50 50.000 6256500.000 50 50.000
   GRIDCART RGCART END
** Discrete receptors
   DISCCART       307844.778 6257420.472
   DISCCART       308130.267 6257430.181
   DISCCART       308207.499 6257152.622
   DISCCART       308198.875 6257112.095
   DISCCART       308163.554 6256872.630
   DISCCART       308136.807 6256779.816
   DISCCART       307945.326 6256706.430
   DISCCART       307861.862 6256790.197
   DISCCART       307822.612 6256888.803
   DISCCART       307648.139 6257011.383
   DISCCART       307595.843 6257130.991
   DISCCART       0.000 0.000
RE FINISHED

** AERMOD Meteorology Pathway
ME STARTING
   SURFFILE "ScreenMet.sfc"
   PROFFILE "ScreenMet.pfl"
   SURFDATA 00011111 2010
   UAIRDATA 00022222 0
   PROFBASE 0 METERS
ME FINISHED
```

```
** AERMOD Output Pathway
OU STARTING
   RECTABLE ALLAVE 1ST
   RECTABLE 1 9TH
   RECTABLE 24 1ST
   MAXTABLE ALLAVE 999
   RANKFILE 1 100 ALL_PERIOD_100T.RNK
   PLOTFILE 01 ALL 9TH ALL_01_9H.PLT
   PLOTFILE 01 ALL 1ST ALL_01_1H.PLT
OU FINISHED
```

```
** AERMOD Input Produced by AUSMOD v6.0
** Licensed to SumiD_JBS
** AERMOD Control Pathway
CO STARTING
   TITLEONE Generator Test Case VOC exhaust at 3m high Constant emission
   MODELOPT CONC FLAT NOCHKD
   AVERTIME 1
   POLLUTID OTHER
   RUNORNOT RUN
   ERRORFIL "VOC 3m High Exhaust Release Constant.err"
CO FINISHED

** AERMOD Source Pathway
SO STARTING
   LOCATION PS01 POINT 308034.170 6257159.170 57.700
   SRCPARAM PS01 0.14400 3.000 823.150 40.000 0.100
   CONCUNIT 1000000 g/s ug/m3
   SRCGROUP GP01 PS01
   SRCGROUP ALL
SO FINISHED

** AERMOD Receptor Pathway
RE STARTING
   GRIDCART RGCART STA
                   XYINC 307450.000 50 50.000 6256500.000 50 50.000
   GRIDCART RGCART END
** Discrete receptors
   DISCCART       307844.778 6257420.472
   DISCCART       308130.267 6257430.181
   DISCCART       308207.499 6257152.622
   DISCCART       308198.875 6257112.095
   DISCCART       308163.554 6256872.630
   DISCCART       308136.807 6256779.816
   DISCCART       307945.326 6256706.430
   DISCCART       307861.862 6256790.197
   DISCCART       307822.612 6256888.803
   DISCCART       307648.139 6257011.383
   DISCCART       307595.843 6257130.991
   DISCCART       0.000 0.000
RE FINISHED

** AERMOD Meteorology Pathway
ME STARTING
   SURFFILE "ScreenMet.sfc"
   PROFFILE "ScreenMet.pfl"
   SURFDATA 00011111 2010
   UAIRDATA 00022222 0
   PROFBASE 0 METERS
ME FINISHED
```

```
** AERMOD Output Pathway
OU STARTING
   RECTABLE ALLAVE 1ST
   RECTABLE 1 9TH
   MAXTABLE ALLAVE 999
   RANKFILE 1 100 ALL_01_100T.RNK
   PLOTFILE 01 ALL 9TH ALL_01_9H.PLT
OU FINISHED
```

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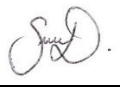
0	Sumi Dorairaj, CEnvP-SC	Matthew Parkinson, CEnvP-SC	Sumi Dorairaj, CEnvP-SC		20/10/2022