# Appendix 6

## Supporting Documentation

A Correspondence from DPI-MR Regarding Licencing of the Gas Flow Line

B Technical Description of Genset

C Noise Measurements of a Gas Compressor

(No. of pages excluding this page = 19)

# Appendix 6A

## Correspondence from DPI-MR Regarding Licencing of the Gas Flow Line

(No. of pages excluding this page = 1)

DAC TJF RS—FILE

NSW DEPARTMENT OF
**PRIMARY INDUSTRIES**

RECEIVED
05 OCT

OUT07/8013

Mr Dennis Morton
Managing Director
Eastern Star Gas Limited
GPO Box 4526
SYDNEY NSW 2001

Dear Mr Morton

Thank you for your letter of 24 July 2007 to Mr Barry Buffier, Director-General, Department of Primary Industries, concerning the Narrabri Coal Seam Gas Gathering Infrastructure. The Director-General has asked me to respond to you on his behalf.

The gas gathering pipeline proposed within your Petroleum Assessment Lease Application No 3 (PALA 3) is not a 'distribution pipeline' under the *Gas Supply Act 1996*. As the pipeline is to be constructed for conveying petroleum for the purposes of recovery of petroleum it is not subject to the *Pipelines Act 1967*. As such, the proposed gas gathering pipeline may be constructed under the *Petroleum (Onshore) Act 1991* on the basis that it is a low pressure pipeline which is not a prescribed pipeline under the *Pipelines Act 1967*.

Any title granted in satisfaction of PALA 3 will include conditions pertaining to the design, installation, operation and removal of the gas gathering pipeline.

Yours sincerely

**Alan Coutts**
**Deputy Director-General**

02 OCT 2007

MINERAL RESOURCES
PO Box K220 Haymarket NSW 1240
T - 02 8289 3999 • F - 02 9286 3208 • W - www.dpi.nsw.gov.au

ABN 51 734 124 190

# Appendix 6B

## Technical Description of Genset

(No. of pages excluding this page = 10)

**Technical Description**

**Genset**

# JGS 620 GS-S.L

## Eastern Star Wilga Park

**Electrical output** **3039 kW el.**

**Emission values**
NOx < 400 mg/Nm³ (5% O2)

**0.01 Technical Data (at genset)** 4
Main dimensions and weights (at genset) 5
Connections 5
Output / fuel consumption 5
**0.02 Technical data of engine** 6
Thermal energy balance 6
Exhaust gas data 6
Combustion air data 6
Sound pressure level 7
Sound power level 7
**0.03 Technical data of generator** 8
Reactance and time constants 8
**connection variant 1K** 9
**0.05 Cooling water circuit** 10
Oil - heat (Engine jacket water cooling circuit) 10
Engine jacket water - heat (Engine jacket water cooling circuit) 10
Mixture Intercooler (1st stage) (Engine jacket water cooling circuit) 10
Mixture Intercooler (2nd stage) (Low temperature circuit) 10
**0.10 Technical parameters** 11
**1.00 Scope of supply - Genset** 12
**1.01 Spark ignited gas engine** 12
**1.01.01 Engine design** 12
**1.01.02 Engine accessories** 13
**1.01.02 Engine accessories – Commissioning spare parts** 14
**1.01.03 Standard tools (1/plant)** 14
**1.02 Generator-medium voltage** 15
**1.03 Module accessories** 15
**1.03.01 Engine jacket water system** 17
**1.03.02 Automatic lube oil replenishing system** 17
**1.05 Gas train** 18
**1.07 Painting** 18
**1.11 Engine generator control panel – DIA.NE XT** 19
**1.11.03 Remote Data-Transfer with DIA.NE XT - HERMES** 23
**1.20.01 Starting system** 26
**1.20.03 Electric jacket water preheating** 26
**1.20.04 Flexible connections** 27
**2.00 Electrical equipment** 27

**2.03.02 Power control** ____ **27**

**4.00 Delivery, installation and commissioning** ____ **28**
**4.01 Carriage** **28**
**4.02 Unloading** **28**
**4.03 Assembly and installation** **28**
**4.04 Storage** **28**
**4.05 Start-up and commissioning** **28**

**5.02 Factory tests and inspections** ____ **28**
**5.02.01 Engine tests** **28**
**5.02.02 Generator tests** **28**
**5.02.03 Module tests** **28**

**5.03 Documentation** ____ **29**



## 0.01 Technical Data (at genset)

| **Data at:** | | | | **Full load** | **Part Load** | |
|---|---|---|---|---|---|---|
| Fuel gas LHV | | kWh/Nm³ | | 9,5 | | |
| | | | | 100% | 75% | 50% |
| | | | | | | |
| Energy input | | kW | [2] | 7.195 | 5.560 | 3.925 |
| Gas volume | | Nm³/h | *) | 757 | 585 | 413 |
| Mechanical output | | kW | [1] | 3.119 | 2.339 | 1.559 |
| Electrical output | | kW el. | [4] | 3.039 | 2.275 | 1.504 |
| | | | | | | |
| Heat to be dissipated | | | [5] | | | |
| ~ Intercooler 1st stage (Engine jacket water cooling circuit) | | kW | | 597 | | |
| ~ Intercooler 2nd stage (Low temperature circuit) | | kW | | 273 | | |
| ~ Lube oil (Engine jacket water cooling circuit) | | kW | | 337 | | |
| ~ Jacket water | | kW | | 547 | | |
| ~ Surface heat | ca. | kW | [7] | 274 | | |
| ~ Balance heat | | kW | | 72 | | |
| | | | | | | |
| | | | | | | |
| Spec. fuel consumption of engine | | kWh/kWh | [2] | 2,31 | 2,38 | 2,52 |
| Lube oil consumption | ca. | kg/h | [3] | 0,94 | ~ | ~ |
| Electrical efficiency | | % | | 42,2% | 40,9% | 38,3% |

*) approximate value for pipework dimensioning
[_] Explanations: see 0.10 - Technical parameters

All heat data is based on standard conditions according to attachment 0.10. Deviations from the standard conditions can result in a change of values within the heat balance, and must be taken into consideration in the layout of the cooling circuit/equipment (intercooler; emergency cooling; ...). In the specifications in addition to the general tolerance of +/- 8% on the thermal output a further reserve of 10% is recommended for the dimensioning of the cooling requirements.

## Main dimensions and weights (at genset)

| | | |
|---|---|---|
| Length | mm | ~ 8.900 |
| Width | mm | ~ 2.200 |
| Height | mm | ~ 2.800 |
| Weight empty | kg | ~ 29.700 |
| Weight filled | kg | ~ 30.700 |

## Connections

| | | |
|---|---|---|
| Jacket water inlet and outlet | DN/PN | 100/10 |
| Exhaust gas outlet | DN/PN | 600/10 |
| Fuel gas (at gas train) | DN/PN | 100/16 |
| Fuel Gas (at genset) | DN/PN | 100/10 |
| Water drain ISO 228 | G | ½" |
| Condensate drain | mm | 18 |
| Safety valve - jacket water ISO 228 | DN/PN | 2x1½"/2,5 |
| Lube oil replenishing (pipe) | mm | 28 |
| Lube oil drain (pipe) | mm | 28 |
| Jacket water - filling (flex pipe) | mm | 13 |
| Intercooler water-Inlet/Outlet 1st stage | DN/PN | 100/10 |
| Intercooler water-Inlet/Outlet 2nd stage | DN/PN | 65/10 |

## Output / fuel consumption

| | | |
|---|---|---|
| ISO standard fuel stop power ICFN | kW | 3.119 |
| Mean effe. press. at stand. power and nom. speed | bar | 20,00 |
| Fuel gas type | | Coal Bed Methane |
| Based on methane number\|Min. methane number | MZ d) | 94\|80 |
| Compression ratio | Epsilon | 11,00 |
| Min. fuel gas pressure for the pre chamber | bar | 3,3-4,0 |
| Min./Max. fuel gas pressure at inlet to gas train | mbar | 80 - 200 c) |
| Allowed Fluctuation of fuel gas pressure | % | ± 10 |
| Max. rate of gas pressure fluctuation | mbar/sec | 10 |
| Maximum Intercooler 2nd stage inlet water temperature | °C | 40 |
| Spec. fuel consumption of engine | kWh/kWh | 2,31 |
| Specific lube oil consumption | g/kWh | 0,30 |
| Max. Oil temperature | °C | 80 |
| Jacket-water temperature max. | °C | 95 |
| Filling capacity lube oil (refill) | lit | ~ 765 |

c) Lower gas pressures upon inquiry
d) based on methane number calculation software AVL 3.1

## 0.02 Technical data of engine

| | | |
|---|---|---|
| Manufacturer | | GE Jenbacher |
| Engine type | | J 620 GS-E02 |
| Working principle | | 4-Stroke |
| Configuration | | V 60° |
| No. of cylinders | | 20 |
| Bore | mm | 190 |
| Stroke | mm | 220 |
| Piston displacement | lit | 124,75 |
| Nominal speed | rpm | 1.500 |
| Mean piston speed | m/s | 11,00 |
| Length | mm | 5.542 |
| Width | mm | 1.900 |
| Height | mm | 2.540 |
| Weight dry | kg | 12.000 |
| Weight filled | kg | 13.000 |
| Moment of inertia | kgm² | 69,21 |
| Direction of rotation (from flywheel view) | | left |
| Flywheel connection | | SAE 24" |
| Radio interference level to VDE 0875 | | N |
| Starter motor output | kW | 30 |
| Starter motor voltage | V | 24 |
| **Thermal energy balance** | | |
| Energy input | kW | 7.195 |
| Intercooler | kW | 870 |
| Lube oil | kW | 337 |
| Jacket water | kW | 547 |
| Exhaust gas total | kW | 2.055 |
| Exhaust gas cooled to 180 °C | kW | 1.202 |
| Exhaust gas cooled to 100 °C | kW | 1.645 |
| Surface heat | kW | 194 |
| Balance heat | kW | 72 |
| **Exhaust gas data** | | |
| Exhaust gas temperature at full load | °C [8] | 390 |
| Exhaust gas mass flow rate, wet | kg/h | 18.531 |
| Exhaust gas mass flow rate, dry | kg/h | 17.368 |
| Exhaust gas volume, wet | Nm³/h | 14.603 |
| Exhaust gas volume, dry | Nm³/h | 13.208 |
| Max.admissible exhaust back pressure after engine | mbar | 60 |
| **Combustion air data** | | |
| Combustion air mass flow rate | kg/h | 18.013 |
| Combustion air volume | Nm³/h | 13.934 |
| Max. admissible pressure drop in front of intake-air filter | mbar | 10 |

**basis for exhaust gas data: natural gas: 100% CH4; biogas 65% CH4, 35% CO2**

## Sound pressure level

| | | | |
|---|---|---|---|
| Aggregate b) | | dB(A) re 20µPa | 101 |
| 31,5 | Hz | dB | 88 |
| 63 | Hz | dB | 95 |
| 125 | Hz | dB | 101 |
| 250 | Hz | dB | 99 |
| 500 | Hz | dB | 94 |
| 1000 | Hz | dB | 93 |
| 2000 | Hz | dB | 92 |
| 4000 | Hz | dB | 94 |
| 8000 | Hz | dB | 95 |
| Exhaust gas a) | | dB(A) re 20µPa | 123 |
| 31,5 | Hz | dB | 112 |
| 63 | Hz | dB | 121 |
| 125 | Hz | dB | 131 |
| 250 | Hz | dB | 119 |
| 500 | Hz | dB | 117 |
| 1000 | Hz | dB | 118 |
| 2000 | Hz | dB | 117 |
| 4000 | Hz | dB | 112 |
| 8000 | Hz | dB | 98 |

## Sound power level

| | | |
|---|---|---|
| Aggregate | dB(A) re 1pW | 122 |
| Measurement surface | m² | 144 |
| Exhaust gas | dB(A) re 1pW | 131 |
| Measurement surface | m² | 6,28 |

a) average sound pressure level on measurement surface in a distance of 1m according to DIN 45635, precision class 2.
b) average sound pressure level on measurement surface in a distance of 1m (converted to free field) according to DIN 45635, precision class 3.
Operation with 1200 rpm see upper values, operation with 1800 rpm add 3 dB to upper values.
Engine tolerance ± 3 dB

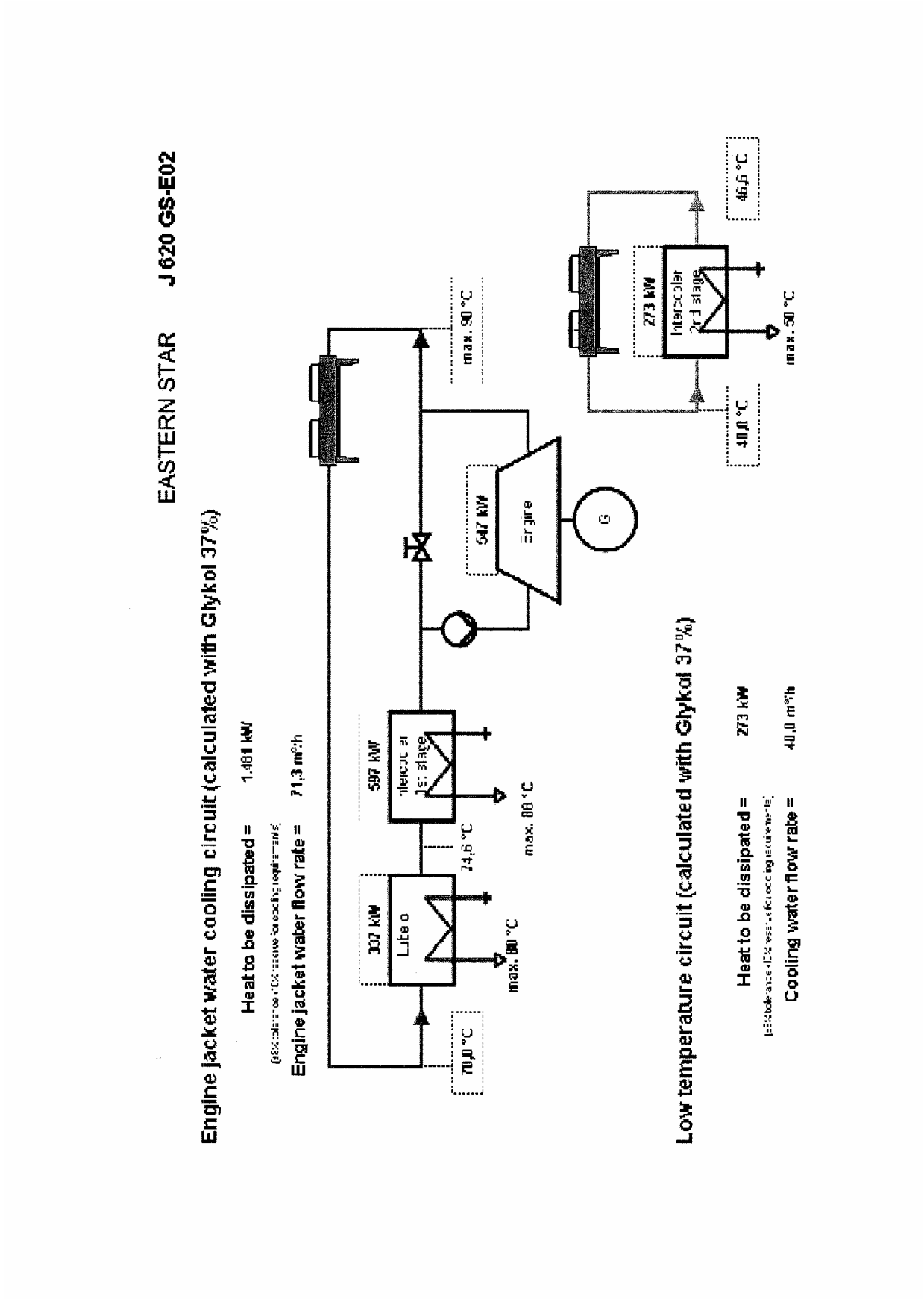
## 0.03 Technical data of generator

| | | |
|---|---|---|
| Manufacturer | | AVK e) |
| Type | | DIG 140 k/4 e) |
| Type rating | kVA | 4.000 |
| Driving power | kW | 3.119 |
| Ratings at p.f. = 1,0 | kW | 3.039 |
| Ratings at p.f. = 0,8 | kW | 3.013 |
| Rated output at p.f. = 0,8 | kVA | 3.766 |
| Rated current at p.f. = 0,8 | A | 198 |
| Frequency | Hz | 50 |
| Voltage | kV | 11 |
| Speed | rpm | 1.500 |
| Permissible overspeed | rpm | 2.250 |
| Power factor lagging | | 0,8 - 1,0 |
| Efficiency at p.f. = 1,0 | % | 97,4% |
| Efficiency at p.f. = 0,8 | % | 96,6% |
| Moment of inertia | kgm² | 190,00 |
| Mass | kg | 10.300 |
| Radio interference level to VDE 0875 | | N |
| Construction | | IMB 24 |
| Protection Class | | IP 23 |
| Insulation class | | F |
| Temperature (rise at driving power) | | F |
| Maximum ambient temperature | °C | 40 |
| Total harmonic distortion | % | 5,0 |

### Reactance and time constants

| | | |
|---|---|---|
| xd direct axis synchronous reactance | p.u. | 1,88 |
| xd' direct axis transient reactance | p.u. | 0,26 |
| xd" direct axis sub transient reactance | p.u. | 0,16 |
| Td" sub transient reactance time constant | ms | 40 |
| Ta Time constant direct-current | ms | 80 |
| Tdo' open circuit field time constant | s | 3,80 |

e) GE Jenbacher reserves the right to change the generator supplier and the generator type. The contractual data of the generator may thereby change slightly. The contractual produced electrical power will not change.


EASTERN STAR J 620 GS-E02
Engine jacket water cooling circuit (calculated with Glykol 37%)
Heat to be dissipated = 1.484 kW
Engine jacket waber flow rate = 71,3 m³/h
70,0 °C
337 kW
Liteo
597 kW
Intercooler 1st stage
74,6 °C
max. 88 °C
max. 90 °C
547 kW
Engine
G
273 kW
Intercooler 2nd stage
40,0 °C
46,6 °C
max. 50 °C
Low temperature circuit (calculated with Glykol 37%)
Heat to be dissipated = 273 kW
Cooling water flow rate = 40,0 m³/h

## 0.05 Cooling water circuit

### Oil - heat (Engine jacket water cooling circuit)

| | | |
|---|---|---|
| Nominal output | kW | 337 |
| Max. Oil temperature | °C | 80 |
| Nominal pressure of engine jacket water | bar | 10 |
| Loss of nominal pressure of engine jacket water | bar | 0,40 |
| Safety valve - max press. set point | bar | 2,50 |

### Engine jacket water - heat (Engine jacket water cooling circuit)

| | | |
|---|---|---|
| Nominal output | kW | 547 |
| Max. engine jacket water temperature (outlet engine) | °C | 90 |
| Engine jacket water flow rate | m³/h | 71,3 |
| Safety valve - max press. set point | bar | 2,50 |

### Mixture Intercooler (1st stage) (Engine jacket water cooling circuit)

| | | |
|---|---|---|
| Nominal output | kW | 597 |
| Max. inlet cooling water temp. (intercooler) | °C | 74,6 |
| Nominal pressure of cooling water | bar | 10 |
| Loss of nominal pressure of engine jacket water | bar | 0,50 |
| Safety valve - max press. set point | bar | 2,50 |

### Mixture Intercooler (2nd stage) (Low temperature circuit)

| | | |
|---|---|---|
| Nominal output | kW | 273 |
| Max. inlet cooling water temp. (intercooler) | °C | 40 |
| Aftercooler water flow rate | m³/h | 40,0 |
| Nominal pressure of cooling water | bar | 10 |
| Intercooler water pressure drop | bar | 0,60 |
| Safety valve - max press. set point | bar | 2,50 |

# Appendix 6C

## Noise Measurements of a Gas Compressor

(No. of pages excluding this page = 4)

Faszer Farquharson & Associates Ltd.

Consultants in Acoustics & Noise Control

May 8, 2001

Mr. Greg Holden
JIRO Manufacturing Ltd.
Box 1450
Stettler, Alberta
T0C 2L0

Dear Mr. Holden:

**Re: JIRO Model 8400 Caterpillar 3306NA Engine Driven Compressor**
**Noise Impact Assessment**
**FFA File 101-382-02**

JIRO Manufacturing Ltd. (JIRO) wished to determine the environmental noise impact of their Model 8400 engine driven portable compressor unit, and retained Faszer Farquharson & Associates Ltd. Consultants in Acoustics & Noise Control to conduct this assessment. Clients using the JIRO Model 8400 engine driven portable compressor unit can use this information as a general guide for determining compliance with the Alberta Energy and Utilities Board (EUB) Noise Control Directive ID 99-8 (Directive).

On March 14, 2001, Mr. Peter Davis of Faszer Farquharson & Associates conducted sound pressure level measurements of the significant noise sources associated with the JIRO Model 8400 engine driven portable compressor unit at JIRO's manufacturing facility in Stettler, Alberta. The unit tested was fitted with a Noise Solutions Inc. engine exhaust silencer. A Caterpillar Model 3306NA engine drove the compressor unit. The engine was noted as opertaing at 1800 rpm during the test. The sound pressure level measurements were conducted with a Brüel & Kjær Model 2260 Real Time Analyzer. The sound measurement system was field calibrated with a Brüel & Kjær Model 4231 calibrator at the commencement of the measurements and then checked upon the completion. The Brüel & Kjær Model 2260 measures the 1/3 octave band sound level and the overall sound level. Octave band sound pressure levels were calculated from the 1/3 octave band spectra and are presented in Table 1.

304, 605 – 1st Street S.W., Calgary, Alberta T2P 3S9
Telephone: (403) 508-4996, Fax: (403) 508-4998

Faszer Farquharson & Associates Ltd.

Consultants in Acoustics & Noise Control



**Table 1**
**JIRO Model 8400 Compressor Unit**
**Sound Pressure Levels**

| Measurement Description | Sound Pressure Level (dBA) Octave Band Centre Frequency (Hz) | | | | | | | | | Sum (dBA) |
|---|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| Building Air Inlet (Right) | 88.5 | 97.0 | 101.8 | 103.0 | 102.7 | 103.4 | 97.5 | 93.0 | 50.0 | 106.4 |
| Building Air Inlet (Left) | 83.7 | 88.5 | 93.6 | 101.0 | 99.2 | 100.9 | 96.7 | 92.3 | 50.0 | 104.2 |
| Open Doors | 83.4 | 91.5 | 98.1 | 100.1 | 99.0 | 98.4 | 94.9 | 92.7 | 50.0 | 102.7 |
| Cooler Outlet | 91.8 | 90.5 | 96.3 | 102.9 | 96.7 | 97.8 | 95.0 | 88.2 | 78.9 | 102.1 |
| Engine Exhaust Silencer Shell | 80.9 | 110.2 | 116.0 | 82.3 | 76.2 | 72.9 | 77.5 | 77.7 | 66.9 | 100.1 |
| Building | 79.1 | 96.5 | 102.7 | 95.2 | 83.4 | 78.4 | 74.5 | 68.6 | 52.9 | 90.6 |
| Engine Exhaust | 81.3 | 97.8 | 103.5 | 86.6 | 74.1 | 70.2 | 70.8 | 72.3 | 65.5 | 88.4 |

FFA File 101-382-02

To evaluate the environmental noise impact of the portable compressor unit, the sound power level of each significant noise source was determined from the sound pressure level measurements. Faszer Farquharson & Associates used accepted acoustical engineering evaluation methods for the determination of sound power levels from sound pressure levels for large machinery. The calculated sound power levels for the JIRO Model 8400 engine driven portable compressor are presented in Table 2.

**Table 2**
**JIRO Model 8400 Compressor Unit**
**Sound Power Levels**

| Source Description | Sound Power Level (dB *re:* $10^{-12}$ W) Octave Band Centre Frequency (Hz) | | | | | | | | | Sum (dBA) |
|---|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| Open Doors | 86.7 | 94.8 | 101.4 | 103.3 | 102.3 | 101.7 | 98.2 | 96.0 | 53.3 | 106.0 |
| Building | 93.8 | 111.2 | 117.4 | 109.9 | 98.1 | 93.1 | 89.2 | 83.3 | 67.6 | 105.3 |
| Engine Exhaust Silencer Shell | 85.6 | 114.8 | 120.6 | 86.9 | 80.9 | 77.5 | 82.1 | 82.3 | 71.5 | 104.7 |
| Cooler Outlet | 93.1 | 91.8 | 97.6 | 104.2 | 98.0 | 99.1 | 96.3 | 89.5 | 80.2 | 103.4 |
| Open Windows | 83.0 | 91.1 | 97.7 | 99.6 | 98.5 | 97.9 | 94.5 | 92.2 | 49.5 | 102.3 |
| Building Air Inlet (Right) | 84.0 | 92.6 | 97.3 | 98.5 | 98.3 | 99.0 | 93.1 | 88.6 | 45.6 | 102.0 |
| Building Air Inlet (Left) | 79.3 | 84.1 | 89.2 | 96.5 | 94.8 | 96.5 | 92.3 | 87.9 | 45.6 | 99.8 |
| Engine Exhaust | 86.3 | 102.7 | 108.5 | 91.6 | 79.1 | 75.1 | 75.8 | 77.3 | 70.5 | 93.4 |

FFA File 101-382-02

The sound power level values, along with information regarding a typical layout for the unit and the meteorological conditions of interest, were incorporated into ENM, a leading environmental noise assessment software package from RTA Technology Pty. Ltd. The modelling was undertaken using calm conditions and a 5.0 kph wind from the portable compressor unit to the point of reception, a temperature of +25° C and a relative humidity level of 50%. The JIRO Model 8400 portable compressor unit was situated on a short grass covered plain for the purposes of this assessment.

Faszer Farquharson & Associates LTD.

Consultants in Acoustics & Noise Control



The results of the modelling for a calm wind condition along with a 5.0 kph wind from the JIRO Model 8400 portable compressor unit to the points of reception are presented in Table 3.

**Table 3**
**JIRO Model 8400 Compressor**
**Predicted Facility Sound Levels**

| Distance from Unit (metres) | Predicted Sound Pressure Level | |
|---|---|---|
| | Calm Wind Condition (dBA) | 5.0 kph Downwind Condition (dBA) |
| 50 | 69.4 | 69.6 |
| 100 | 63.1 | 63.6 |
| 200 | 55.3 | 55.8 |
| 300 | 49.9 | 50.5 |
| 400 | 45.9 | 46.6 |
| 500 | 42.7 | 43.6 |
| 600 | 40.2 | 41.2 |
| 700 | 38.0 | 39.1 |
| 1500 | 27.1 | 28.2 |

FFA File 101-382-02

The modelling results for the calm condition are presented as noise contour values in the attached Figure 1.

Faszer Farquharson & Associates Ltd. recommends that the modelled sound level results should only be used as a guide for determining the noise impact of this portable compressor unit to the community. Environmental factors such as wind velocity and direction, terrain type and changes in facility operating conditions will effect the propagation of sound.

Should you have any questions regarding this matter or require additional information please contact the undersigned at your convenience.

Sincerely,

Faszer Farquharson & Associates Ltd.

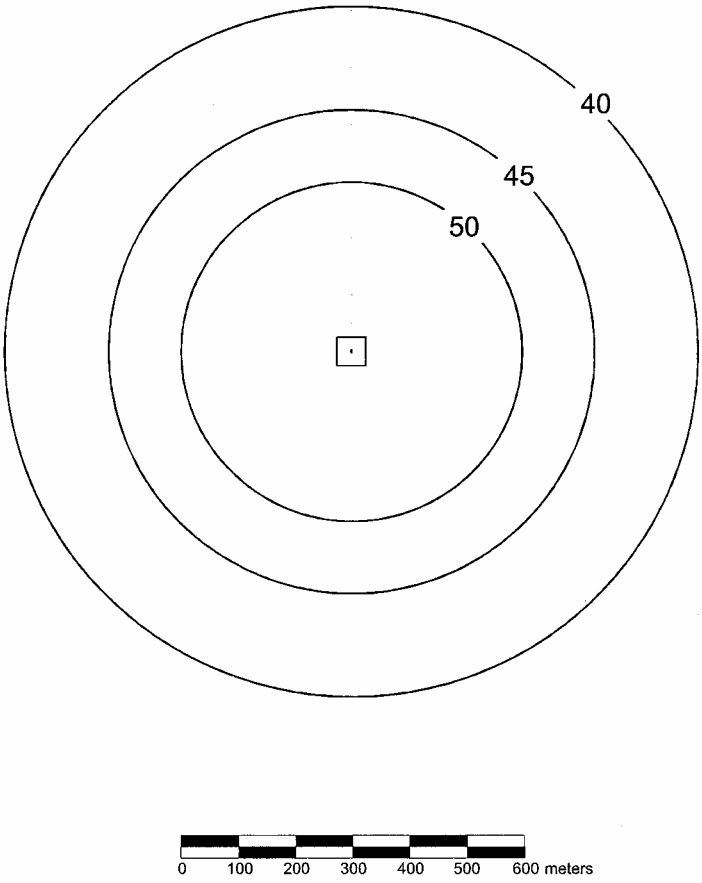
James Farquharson, CET

Attachment

Faszer Farquharson & Associates Ltd.

Consultants in Acoustics & Noise Control

**Figure 1**
**Noise Contours (dBA)**
**Enhanced Recovery Systems**
**Model 8400**



This page has intentionally been left blank