Greenhouse Gas Assessment

Appendix L

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global environmental solutions

Greenhouse Gas Assessment

Proposed Bourke Small Stock Abattoir

SSD 7268

Report Number 640.11172-R2

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CAPRA Developments Pty Ltd

C/- Saran (NSW) Pty Ltd

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Orange

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Greenhouse Gas Assessment

Proposed Bourke Small Stock Abattoir

SSD 7268

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Executive Summary

This Greenhouse Gas (GHG) assessment has been prepared by SLR Consulting Australia on behalf of CAPRA Developments Pty Ltd, as part of the Environmental Impact Statement (EIS) that will accompany an application for State Significant Development (SSD 7268) to the Department of Planning & Environment seeking Project Approval under Part 4 of the EP&A Act.

This assessment has determined Scope 1, 2 and key Scope 3 GHG emission estimates for the operation of the Project, and found the emissions to be minimal, particularly when compared to the emissions from the State of NSW as a whole. Annual emissions were predicted to be **19,314 tCO_2-e** from the proposed abattoir. Importantly, this represents just 0.01% of the GHG emissions from NSW in 2012/2013.

Key elements in the design of the abattoir have ensured that GHG emissions will be minimised where possible, in particular the incorporation of the energy efficient glycol refrigeration system. In addition, this report provides a suite of mitigation and management measures that, if implemented, could reduce GHG emissions further.

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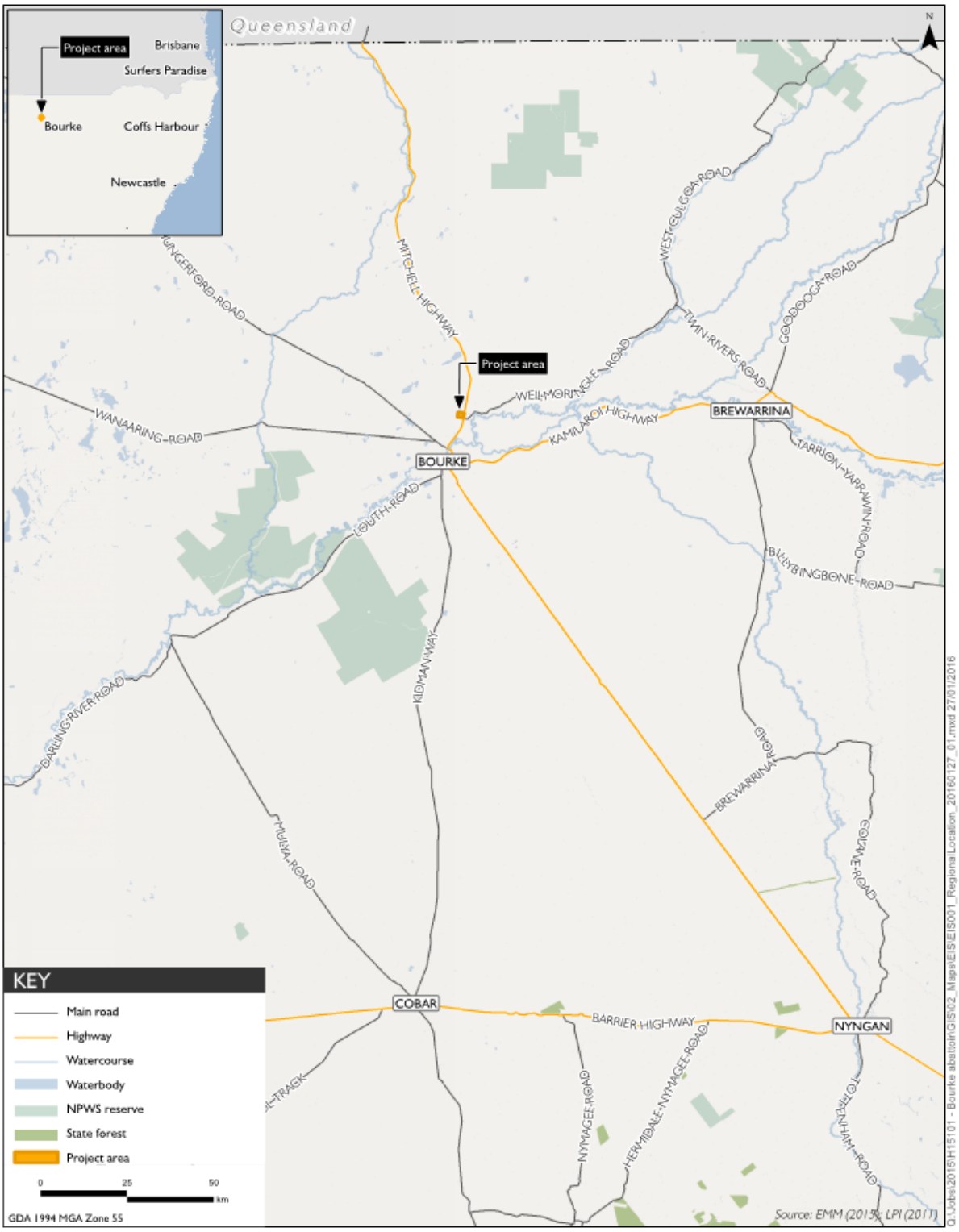
1 INTRODUCTION

1.1 Overview

This Greenhouse Gas (GHG) assessment has been prepared by SLR Consulting Australia (SLR) on behalf of CAPRA Developments Pty Ltd (CAPRA), as part of the Environmental Impact Statement (EIS) that will accompany an application for State Significant Development (SSD 7268) to the NSW Department of Planning and Environment (DP&E) seeking Project Approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The application relates to the proposed Bourke Small Stock Abattoir (the Project), to be located approximately 14 kilometres (km) north of Bourke in north-western NSW as shown on **Figure 1**.

CAPRA is seeking approval for the development of a small stock abattoir within the site (Lot 17 in DP 753546) (the Project Site). The abattoir will have the capacity to process up to 6,000 head per day, comprising rangeland goats, sheep, and lambs.

Figure 1 Regional Context



1.2 The Project

The primary components of the Project include:

- construction of an abattoir with the capacity to process up to 6,000 small stock per day, comprising sheep, lamb and goats;
- construction and provision of ancillary infrastructure to support the abattoir, including reticulation of power, and telecommunication services, vehicular access off the Mitchell Highway, heavy vehicle manoeuvring and turning areas, car parking, administration office, staff amenities and a wastewater treatment system;
- livestock will be principally sourced from the surrounding region and trucked to the Project Site;
- meat products from the abattoir will be chilled to less than 7 degrees Celsius (◦C) or frozen for transport to market;
- four water treatment ponds will be constructed where wastewater will be treated via an anaerobic ponding process, and then utilised for irrigation;
- no rendering will take place on site with all waste products to be transported off site for disposal at licensed facilities;
- employment of up to 200 full time equivalent personnel when operational; and
- the abattoir will operate 24 hours per day, 7 days per week.

The complex will produce three types of meat products as demanded by the serviced export markets – (i) whole bone-in carcass with skin on; (ii) whole bone-in carcass with skin off; and (iii) six way cut of carcass in cartons.

Further detail on specific aspects of the Project relevant to the GHG assessment is provided in the sub-sections below.

1.2.1 Stock Holding Area

Livestock will be transported to the abattoir in semi-trailers, B-doubles or road trains and off-loaded into watered receival yards adjoining the abattoir building. When ready for slaughter, the livestock will be moved to the holding pens and then to the kill floor.

1.2.2 Refrigeration

After slaughter, stock will either go to the scald tanks for hair removal if being sold as skin on, or to the processing area for skin removal. If being sold as a whole carcass, stock will be sent to chillers and refrigerated ready for transport. Stock to be processed as a six-way cut will be processed, packed, palletised and chilled ready for transport to market.

Refrigeration in the freezer rooms would take the room temperature to -30 degrees Celsius while the loading docks and food packaging room would operate at +10 degrees Celsius. Refrigeration will be achieved through a closed ammonia system.

The operational area of the abattoir will be temperature controlled by an enclosed glycol refrigeration system.

1.2.3 Wastewater Management

All operational wastewater generated by the proposal will be treated on-site in a specifically designed wastewater treatment system which will include settlement and anaerobic treatment ponds.

Treated effluent from the ponds totalling 175 ML per annum will be utilised for onsite irrigation of paddocks on the Project Site.

1.2.4 Hours of Operation

Approval is sought to operate the abattoir 24 hours per day, 7 days per week. However, activities during the hours of 11 pm - 6 am, and during the day on weekends, will generally involve stock delivery and product dispatch, regular maintenance and cleaning and operation of the wastewater treatment plant.

1.2.5 Vehicular Access and Parking

Access to the Project Site will be via the Mitchell Highway. This new access road will serve all vehicles including heavy vehicles and staff vehicles.

A new car parking area will be also constructed as part of the abattoir complex for use by abattoir employees and visitors, as well as manoeuvring areas for heavy vehicles.

1.2.6 Traffic Generation

The primary operational activities that will generate traffic to and from the Project Site will be:

- Delivery of livestock in semi-trailers, B-doubles, or road trains;
- Delivery of livestock feed (as needed) and other consumables in semi-trailers;
- Removal of meat products from the abattoir in refrigerated trucks or containers on semi-trailers for distribution;
- Removal of meat waste products in enclosed semi-trailers for off-site processing at a licenced facility;
- Removal of skins in rigid trucks for off-site treatment;
- Removal of general garbage in rigid trucks;
- Servicing/tradesman visits in utes/vans; and
- Staff visits by cars.

1.3 GHG Assessment Objectives

The purpose of this report is to undertake a GHG gas assessment that addresses Scope 1, 2 and key Scope 3 emissions relating to the operation of the Project.

The Secretary's Environmental Assessment Requirements (SEARs), issued by the Department of Planning and Environment (DP&E) for the Project (SSD 7268), include a requirement to specifically address GHG, as follows:

- *an assessment of the potential greenhouse gas emissions of the development, including an assessment of the potential impacts of those emissions on the environment;*
- *a detailed description of the measures that would be implemented on site to ensure that the development is energy efficient.*

2 GREENHOUSE GAS EMISSIONS

2.1 Emission Types

The Commonwealth Department of the Environment (DoE) document, "National Greenhouse Accounts Factors" Workbook (NGA Factors) (DoE, 2015) defines two types of GHG emissions (see **Table 1**), *direct* and *indirect*. This assessment considers both direct emissions and indirect emissions.

Table 1 Greenhouse Gas Emission Types

Emissions	Definition
Direct	Produced from sources within the boundary of an organisation and as a result of that organisation's activities (e.g. consumption of petrol in on-site vehicles).
Indirect	Generated in the wider economy as a consequence of an organisation's activities (particularly from its demand for goods and services), but which are physically produced by the activities of another organisation (e.g. consumption of purchased electricity).

Note:. adapted from NGA Factors 2015

2.2 Emission Scopes

The NGA Factors identifies two 'scopes' of emissions for GHG accounting and reporting purposes as shown in **Table 2**.

Table 2 Greenhouse Gas Scopes

Scope	Definition
Scope 1	Direct (or point-source) emission factors give the kilograms of carbon dioxide equivalent (CO_2-e) emitted per unit of activity at the point of emission release (i.e. fuel use, energy use, manufacturing process activity, mining activity, on-site waste disposal, etc.). These factors are used to calculate scope 1 emissions.
Scope 2	Indirect emission factors are used to calculate scope 2 emissions from the generation of the electricity purchased and consumed by an organisation as kilograms of CO_2-e per unit of electricity consumed. Scope 2 emissions are physically produced by the burning of fuels (coal, natural gas, etc.) at the power station.

A third scope of emissions – *Scope 3 Emissions* are also recognised in some GHG assessments. The *Greenhouse Gas Protocol (GHG Protocol)* (World Business Council for Sustainable Development 2004) defines Scope 3 emissions as "*other indirect GHG emissions":*

> *Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Some examples of Scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.*

Scope 3 emissions related to the transport of goods and materials to and from the Project Site are considered in this assessment. Whilst the emissions associated with these activities are from sources not owned or controlled by CAPRA (e.g. generated by transport contractors), it is noted that these emissions occur as a result of the Project operations and should therefore be considered when conducting an assessment of this nature.

2.3 The Potential Impact of Greenhouse Gas Emissions on the Environment

Increased emissions of GHG are widely accepted to exert a warming influence on climate. Increasing concentrations of the long-lived GHG's (LLGHGs) (CO_2, CH_4, N_2O, halocarbons and SF_6) have led to a combined radiative forcing (RF) in 2011 relative to 1750 of +3.00 [±0.78] Watts per square metre ($W\,m^{-2}$) with emissions of CO_2 alone causing an RF of 1.68 (±0.35) Wm^{-2} and CH_4 of 0.97 (±0.23) Wm^{-2} (IPCC 2013).

The IPCC state that it is *highly likely* that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic (man-made) increase in GHG concentrations and other anthropogenic forcings together (IPCC, 2013). Surface temperature increases between 1951 and 2010 have been observed in the range 0.6°C to 0.7°C and are a combined result of surface warming due to GHG concentrations and surface cooling due to aerosols.

IPCC (2013) reports with high confidence that key climate risks in Australasia relate to structure of coral reef systems, the increased frequency and intensity of flood damage to infrastructure and settlements and increasing risks to coastal infrastructure and low-lying ecosystems with widespread damage likely should projections of sea level rise reach the upper bounds of estimated increases.

3 ASSESSMENT METHODOLOGY

This assessment considers Scope 1 and 2 emissions as well as key Scope 3 emissions from the operation of the abattoir.

Emissions from *construction* of the abattoir were not considered within the scope of the assessment. Estimates were not undertaken, however the emissions are *expected to be immaterial* (less than 5%[1]) in the context of the broader Project operating emissions, given the short construction timeframe, minimal use of construction plant and equipment, and relatively simple design of the abattoir building.

3.1 Source Identification and Boundary Definition

The boundary for the Project was determined to be the geographical boundary of the Project Site for Scope 1 and Scope 2 emissions. Scope 3 emissions associated with the transport of products and materials to and from the site as part of general operations were also considered within the broader reporting boundary.

3.1.1 Emissions Sources

The emissions sources identified for the assessment are shown in **Table 3**.

Table 3 Scope 1 and 2 Emission Sources for Operation of Abattoir

Scope	Activity	Source
Scope 1	Abattoir operations	Consumption of purchased natural gas
	Wastewater treatment	Wastewater treatment plant
Scope 2	Abattoir operations	Consumption of purchased electricity

Table 4 Scope 3 Emission Sources for Operation of Abattoir

Activity	Source
Heavy vehicles	
Delivery of livestock	Diesel fuel for transport
Delivery of consumables	Diesel fuel for transport
Removal of meat products from the abattoir	Diesel fuel for transport
Removal of meat waste products	Diesel fuel for transport
Removal of skins	Diesel fuel for transport
Removal of general garbage	Diesel fuel for transport
Maintenance	Diesel fuel for transport
Passenger vehicles	
Employee travel	Unleaded fuel for transport
Waste	
Animal waste products	Abattoir wastes

[1] 5% is a nominal, though commonly used, threshold for materiality in greenhouse gas accounting. The *National Greenhouse and Energy Reporting Act 2007* includes a threshold for reporting of energy consumption at 5%.

3.2 Quantitative Assessment

The quantitative assessment used the source data and emissions factors as outlined in **Section 4** to determine the overall emissions for each source.

3.3 GHG Management

This phase of the methodology involved identification of possible measures to minimise, mitigate or offset the Project emissions and is discussed in **Section 6**.

4 SOURCE DATA AND EMISSIONS FACTORS

4.1 Source Data

The source data was determined by estimating potential fuel usage from a number of key activities as outlined in **Section 3.1.1**.

4.1.1 Transport of Materials and Products to and from Site (diesel)

Calculations for material and product transport were based on the source data shown in **Table 5** which was provided by CAPRA.

Table 5 Material and Product Transport Source Data

Activity	Origin / Destination	Round Trip Distance (km)	Vehicle Type	Annual Vehicles (1-way)
Delivery of consumables	Local / regional area.	30	Semi-trailer	250
Delivery of livestock	Bourke and surrounding area	200	Road train	1,250
Removal of meat products from the abattoir	Sydney[1]	1,525	Semi-trailer and/or B-double	750
Removal of meat waste products	Registered landfill	30	Rigid truck	500
Removal of skins	Blayney	1,100	Rigid truck	250
Removal of general garbage	Registered landfill	30	Rigid truck	250
Maintenance	Local / regional area.	30	Rigid truck	250

Note 1: Majority of product anticipated to be dispatched via Port Botany in Sydney, however may be sent via ports in Melbourne and Brisbane depending on market demand.

It was assumed that the fuel efficiency of a rigid truck was 28.7 L/100km (ABS 2013) and the semi-trailer and B-doubles or road trains were 57.7 L/100km (ABS 2013).

4.1.2 Employee Travel to and from Work

Calculations for employee travel were based on the source data shown in **Table 6** which was provided by CAPRA. It was assumed that all employees will be based in Bourke.

Table 6 Employee Travel Source Data

Destination	Round trip distance	Number of employees
Bourke	30 km	200

It was assumed that employees each travelled by unleaded fuelled passenger vehicle with a fuel efficiency of 11.1 L/100km (ABS 2013) and assumed to work 250 days per year, with activities on the weekends generally involving stock delivery, maintenance and wastewater treatment. It was also conservatively assumed that no car pooling will take place between employees.

4.1.3 Gas (LNG)

LNG will be stored in an 80 kL tank on site. The anticipated LNG use at the abattoir is shown in **Table 7** which was provided by CAPRA.

Table 7 Liquefied Natural Gas Source Data

Source	Annual Consumption (TJ)
Natural Gas	41.7

41.7 TJ LNG = 750 tonnes = 1808 kL (@2,410 L/t)

4.1.4 Electricity Consumption

The source data for anticipated annual electricity consumption during operations is shown in **Table 8** which was provided by CAPRA.

Table 8 Electricity Consumption Source Data

Source	Annual Consumption (kWh)
Electricity	4,410,000

4.1.5 Waste Disposal

The source data for waste disposal to an appropriately licensed landfill is shown in **Table 9** which was provided by CAPRA.

Table 9 Waste Source Data for Abattoir

Source	Annual Quantity (tonnes)
Non edible waste (general)	3,300
Paunch	750
Waste from skins	188
Hair	500
Dead Animals	150
Waste water solids	750

All other waste products are beneficially reused either on site or at another facility.

Emissions have been conservatively estimated assuming that all waste outlined in **Table 9** would be sent to landfill at the Bourke Shire Council waste facility.

4.1.6 Wastewater Treatment

The source data for wastewater treatment is shown in **Table 10** which was provided by CAPRA.

Table 10 Wastewater Treatment Plant Source Data

Facility	Source	Annual Quantity
Wastewater Treatment Plant	Wastewater	175 ML

4.1.7 Aggregated Source Data

The aggregated estimations for source data are shown in **Table 11**.

Table 11 Aggregate Source Data

Source	Abattoir	
	Quantity	**Unit**
Diesel	896	kL
Gasoline (unleaded fuel)	167	kL
Liquefied Natural Gas	41,667	GJ
Electricity	4,410,000	kWh
Waste	5,637.5	t
Wastewater	175	ML

4.2 Emission Factors

Emissions factors used for operation of the Project were taken from the NGA Factors (DoE, 2015) (see **Table 12**).

Table 12 Emissions Factors

Scope	Source	Emissions factor	Energy Content Factor[4]
Scope 1	Liquefied Natural Gas	51.53 kg CO_2-e /GJ	25.3 GJ/kL
	Wastewater	Multiple input equation[3]	NA
Scope 2	Electricity (NSW)	0.84 kg CO_2-e/kWh	NA
Scope 3	Diesel fuel for transport purposes[1]	70.5 kg CO_2-e /GJ	38.6 GJ/kL
	Gasoline (unleaded fuel)	69.7 kg CO_2-e /GJ	34.2 GJ/kL
	Landfilling of waste[2]	1.3 t CO_2-e / t	NA

1. Transport purposes include machinery and vehicles which by law can drive on the road
2. Taken from the NGA Factors emissions factor for Commercial and Industrial waste
3. Refer to equation in Section 4.4 of the NGA factors and Department of the Environment's wastewater treatment calculator
4. Not all emission sources have an energy content factor, as per the NGA Factors this has been represented by an NA (Not Applicable).

5 GREENHOUSE GAS ASSESSMENT

5.1 Operational Emissions Quantitative Assessment

This estimated annual GHG emissions for the Project are presented in **Table 13**.

Table 13 Abattoir GHG Annual Emissions

	Quantity	unit	Emissions (t CO_2-e)
Scope1			
LNG	41.7	TJ	2,147
Wastewater	175	ML	3,298
Scope 2			
Electricity	4,410,000	kwh	3,704
Scope 3			
Diesel	896	kL	2,438
Gasoline (unleaded fuel)	167	kL	397
Waste	5,637.5	t	7,329
Total			**19,314 t CO_2-e per year**

The total estimated annual operational GHG emissions for the Project are **19,314 t CO_2-e per year**.

5.2 Emissions context

The NSW Office of Environment and Heritage (OEH) has published the NSW state emissions profile for 2012/2013 as 148.8 million t CO_2-e. Therefore in the NSW state context **the Project represents approximately 0.01% of the total state emissions**.

6 GHG MITIGATION AND MANAGEMENT MEASURES

GHG mitigation has been considered in the design of the Project, particularly in relation to energy efficiency and refrigeration. The GHG emission mitigation and management measures included in the design, as well as other measures recommended for consideration, are listed below.

6.1 Refrigerant Usage

GHG mitigation has been considered in the design of the Project, particularly in relation to energy efficiency and refrigeration. Refrigerants which do not emit greenhouse gases (ammonia and glycol) will be used in the abattoir.

In addition, regular checks of seals on all refrigerated areas will be undertaken to ensure energy efficiency and subsequently minimise GHG emissions.

6.2 Electricity Usage

The following points could be considered to reduce the emissions caused from on-site electricity usage:

- A percentage of the total electricity for the site could be offset through purchasing *green power* from an electricity supplier.
- Sensor lighting could be used in some areas to minimise the number of lights on during all hours of operation.
- Where possible, high efficiency lighting should be used.
- Investigate the option of installing solar panels at the abattoir within 3 years of commencement of operations.

6.3 Vehicles and Stationary Plant and Equipment

The following points could be considered to reduce overall fuel use from onsite and transport vehicles:

- All vehicles/plant and machinery should be turned off when not in use and regularly serviced to ensure efficient operation.
- Truck routes and loading capacity should be designed to reduce the distance and effort required by the vehicles.
- Encourage car-pooling by employees.
- Ensure correct vehicle mass limits not exceeded by use of the heavy vehicle weighbridge.
- Where possible, B5 and E10 fuel should be used in plant and equipment.

6.4 Wastewater Treatment

The following points could be considered to reduce the overall emissions from wastewater treatment:

- Consider flaring methane emissions.
- Incorporate air blowers / aeration to improve bacteria functioning (reduces nitrous oxide).
- Consider capture of methane for onsite energy generation.

7 CONCLUSIONS

This GHG assessment has been prepared by SLR on behalf of CAPRA, as part of the EIS that will accompany an application for State Significant Development (SSD 7268) to the DP&E seeking Project Approval for the Bourke Small Stock Abattoir under Part 4 of the EP&A Act.

This assessment has determined Scope 1, 2 and key Scope 3 GHG emission estimates for the operation of the Project, and found the emissions to be minimal, particularly when compared to the emissions from the State of NSW as a whole. Annual emissions were predicted to be **19,314 tCO_2-e** from the proposed abattoir. Importantly, this represents just 0.01% of the GHG emissions from NSW in 2012/2013.

Key elements in the design of the abattoir have ensured that GHG emissions will be minimised where possible, in particular the incorporation of the energy efficient glycol refrigeration system. In addition, this report provides a suite of mitigation and management measures that, if implemented, could reduce GHG emissions further.