Report

Rushes Creek Mod 3 – Greenhouse Gas Assessment

Job: 22-143

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1 INTRODUCTION

Astute Environmental Consulting ("Astute) was engaged by ProTen to conduct a greenhouse gas (GHG) assessment relating to Modification 3 which refers to Farm 2 at the Rushes Creek Poultry Complex in the Tamworth Regional local government area.

ProTen was granted Development Consent SSD 7704 in April 2020 to construct and operate four poultry farm units (Farms 1 to 4) (up to 54 tunnel ventilated sheds) on a rural property on Rushes Creek Road approximately 43 kilometres (km) northwest of Tamworth and 33 km northeast of Gunnedah ("the site").

1.1 Background

ProTen is seeking approval to undertake an additional modification to Development Consent SSD 7704 (Modification 3).

Modification 3 relates to Stage 1 only (Farm 2) and comprises the following components:

- Minor amendments to the positioning of ancillaries at Farm 2 (including diesel generators) as shown in Figure 1-1;
- Additional emergency standby diesel generator capacity at Farm 2;
- Addition of an emergency standby diesel generator and diesel storage at the Namoi River water supply pump; and
- Concurrent construction and operation of diesel generators at Farm 2 for up to 12 months[1].

The Department of Planning and Environment issued a Request for Information on the 31 May 2022, where in Attachment A, they requested additional information as follows:

The Department notes that the amended modification application has not incorporated the off-grid solar and battery solution, as requested in the Department's comments on the modification dated 4 February 2022. It is acknowledged this will be progressed as a separate subsequent modification application. The Department, therefore, requests that an assessment of greenhouse gas emissions be carried out for the current modification.

The GHG assessment should quantify the CO_2 emissions generated by the modification in comparison to the approved operational energy supply scenario (grid electricity + 0.25 hectares of solar).

[1] EME Advisory report, Mod 3 v2.

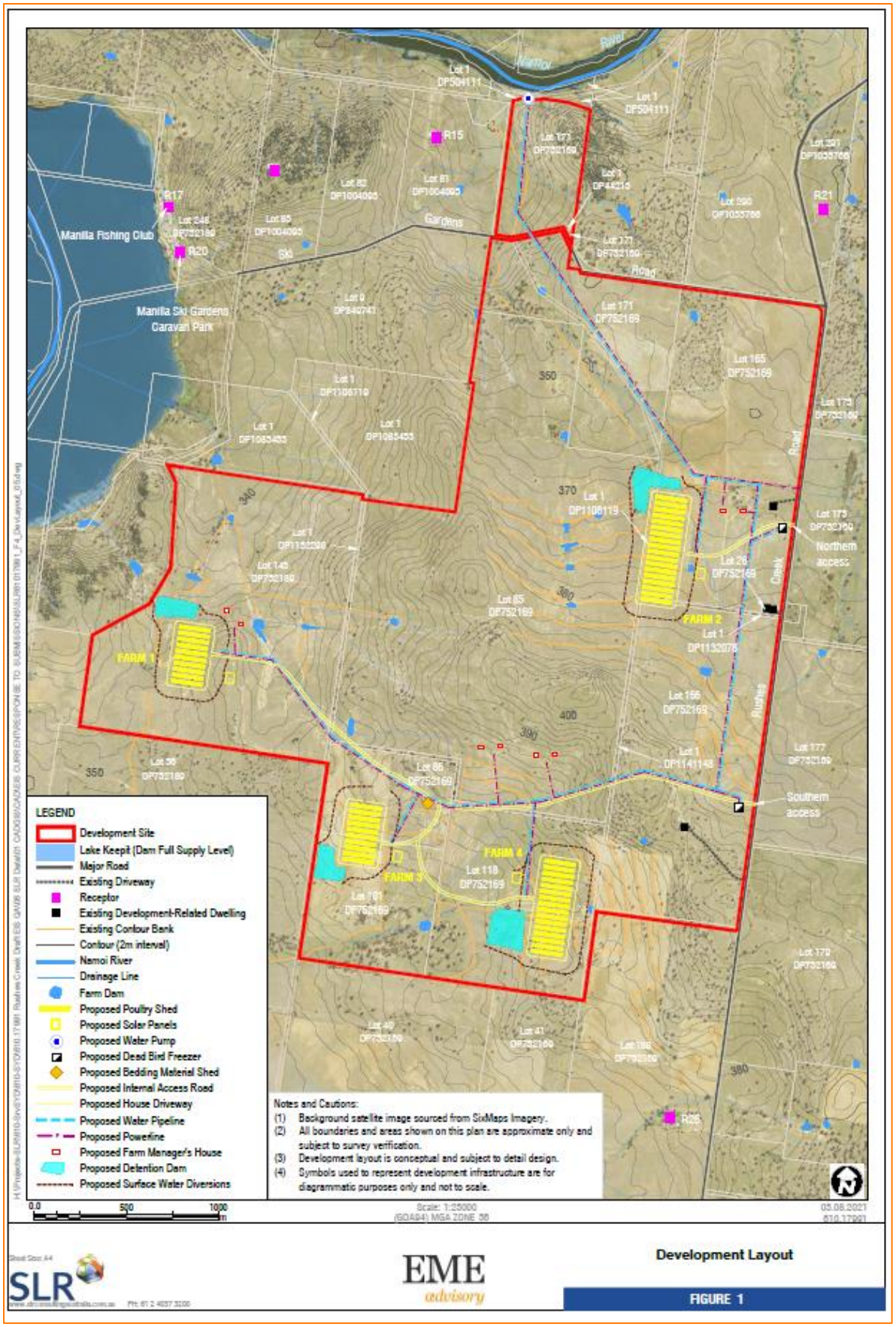

Figure 1-1: Development Layout (Source: EME Advisory)

1.2 Scope of Work

The scope of work for this assessment is to calculate the GHG for the current modification and compare them to the approved operational energy supply scenario. The GHG emissions from the proposed Modification 4 have also been included. For simplicity, the three energy supply configurations have been named Scenario A, B and C. A summary is as follows;

Scenario A (Development Consent):

The original Development Consent SSD 7704 in April 2020 was based on all operational power requirements being met by the main electricity grid with supplementary power supplied by solar panels (0.25 ha per farm).

Scenario B (Modification 3 v2):

Due to the current demand for broiler birds in Australia ProTen need to commence operations at Farm 2, with power requirements changing from Scenario A to completely off-grid with a solar and battery solution. The off-grid solar option is still being designed and ProTen anticipates that Farm 2 and associated ancillaries will need to be powered using diesel generators for up to 12 months[2].

Mod 3 v2, therefore, is 12 months of operation of Farm 2 on generator only.

Scenario C (Proposed Modification 4)

The proposed long-term solution is for an off-grid solar and battery solution (with backup diesel generators).

This would see the solar and battery system being the primary source of electricity except for the use of diesel generators for supplementary power requirements.

[2] Mod 3 v2

2 GREENHOUSE GAS INVENTORY

The National Greenhouse Accounts (NGA) Factors (DISER, 2020) defines three scopes (Scope 1, 2 and 3) for different emission categories. The categories are presented in Table 2-1 below.

Table 2-1: Emission Categories

Scope	Definition	Included?
1	Direct (or point-source) emission factors give the kilograms of carbon dioxide equivalent (CO2-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.).	Yes
2	Indirect emissions from the generation of the electricity purchased and consumed by an organisation as kilograms of CO2-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.	Yes
3	Indirect emissions which are not included in scope 2, occurring within an organisation's value chain.	No

Emissions generated in all three scopes defined above provide a suitable approximation of the total GHG emissions generated from the site. Scope 3 emissions can be a significant component of the total emissions inventory; however, these emissions are typically not controlled by the operation.

Various indirect sources associated with the poultry farm such as emissions generated by employees travelling to and from the site are relatively minor and have not been considered further in this assessment as the primary focus is on the change in emissions with the various power options.

2.1 Sources of GHG

For this assessment and comparing the three scenarios described in Section 1.2, the Scope 1 emissions sources are from the combustion of diesel fuel for both Modification 3 for 12 months and also using these generators as a backup power source.

Scope 2 emissions have been identified as the consumption of electricity to power the farm. The inclusion of solar and battery power has been subtracted from the GHG from the diesel and electricity consumption as no emission factors are published in the NGA for electricity generated by solar and will offset the emissions.

The energy (MWh) demand of Farm 2 has been provided by SLR in discussion with ProTen and its suppliers and consultants. It has been estimated that the total energy use for the farm (based on Mod 4) will be 933 MWh/annum, with the generators used to provide supplementary power at 158,345 kWh/annum (158.3 MWh/annum)[3].

Datasheets were also provided for the diesel generators and assumptions were made to calculate the fuel consumption. The input data are summarised in Table 2-2.

[3] H Jones, personal communication, 3 June 2022

Table 2-2: Summary of data inputs

Scenario	Comments	Solar Power?	Energy demand for Farm (MWh)	Network Electricity consumed (MWh)	Solar Electricity Supplied (MWh)	Diesel Generated Electricity (MWh)
A	Development Consent SSD 7704	Yes	933	547	365	21
B	Modification 3 v2	No		0	0	933
C	Modification 4	Yes		0	775	158

Note:

1. Scenario A
    a. Solar generation from 0.25 ha of solar assumes 365 MWH/year generation capacity averaged across 12 months (based on 1 MW generated ~1,500 MWh/year).
    b. Generator use has been assumed to be 200 hours per year due to emergency power requirements based on average energy requirements of 0.1 MW/hour[4].
2. Scenario B - Mod 3 v2 includes 100% generator with no solar.
3. Scenario C - Mod 4 assumes 83% solar and 17% generator supplied power based on data supplied.

2.2 Emission Factors

The emission factors relevant to the site are presented in Table 2-3.

Table 2-3: Summary of Emission Factors (DISER, 2020)

Type	Scope	Energy Content Factor (Gj/kL)	Emission Factor			Units
			CO_2	CH_4	N_2O	
Diesel	1	38.6	69.9	0.1	0.2	kg CO_2-e/GJ
Electricity	2	-	0.81	--	-	kg CO_2-e/kWh

2.3 Generator Emissions

GHG emissions from the diesel generators were estimated based on the Technical Guidelines for the estimation of emissions by facilities in Australia (Department of the Environment and Energy, 2017) using anticipated fuel consumption using the equation below:

$$E = \frac{Q \times EC \times EF}{1{,}000}$$

Where:

[4] ProTen have informed us that the expected emergency use will typyically be under 200 hours per year.

- *E* is the total emissions released measured in tonnes $CO_{2\text{-}e}$
- *Q* is the quantity of fuel combusted in *kL*
- *EC* is the energy content factor of the fuel in *GJ/kL*; and
- *EF* is the emission factor for the fuel in *kg* $CO_{2\text{-}e}$*/GJ*

The assumptions for the amount of diesel consumed is as follows;

Scenario A:

- The emergency generator will run for 200 hours a year as a backup only;
- The run time equates to approximately 2.28% of the year which is an energy requirement of 21.3 MWh (933 MWh/year x 2.28% divided by 200 hours = 106 kW/h);
- The fuel consumption rate is the equivalent of 29 l/hour as shown in Figure 2-1 for an output of 106 kW/h[5].

Scenario B:

- The diesel generators are expected to run for the entire year for year 1 only;
- In the second year and every year onwards the off grid and solar solution (i.e. Scenario C – Mod 4) will provide the electrical demand;
- The generators are expected to run for 17% of the year; and
- The fuel consumption rate is the equivalent of 29 l/hour as shown in Figure 2-1 for an output of 106 kW/h.

Scenario C:

- The off grid and solar solution will provide the electrical demand;
- The generators are expected to run for 17% of the year; and
- The fuel consumption rate is the equivalent of 29 l/hour as shown in Figure 2-1

[5] 322 kW generator at 33% = 106 kW per hour.

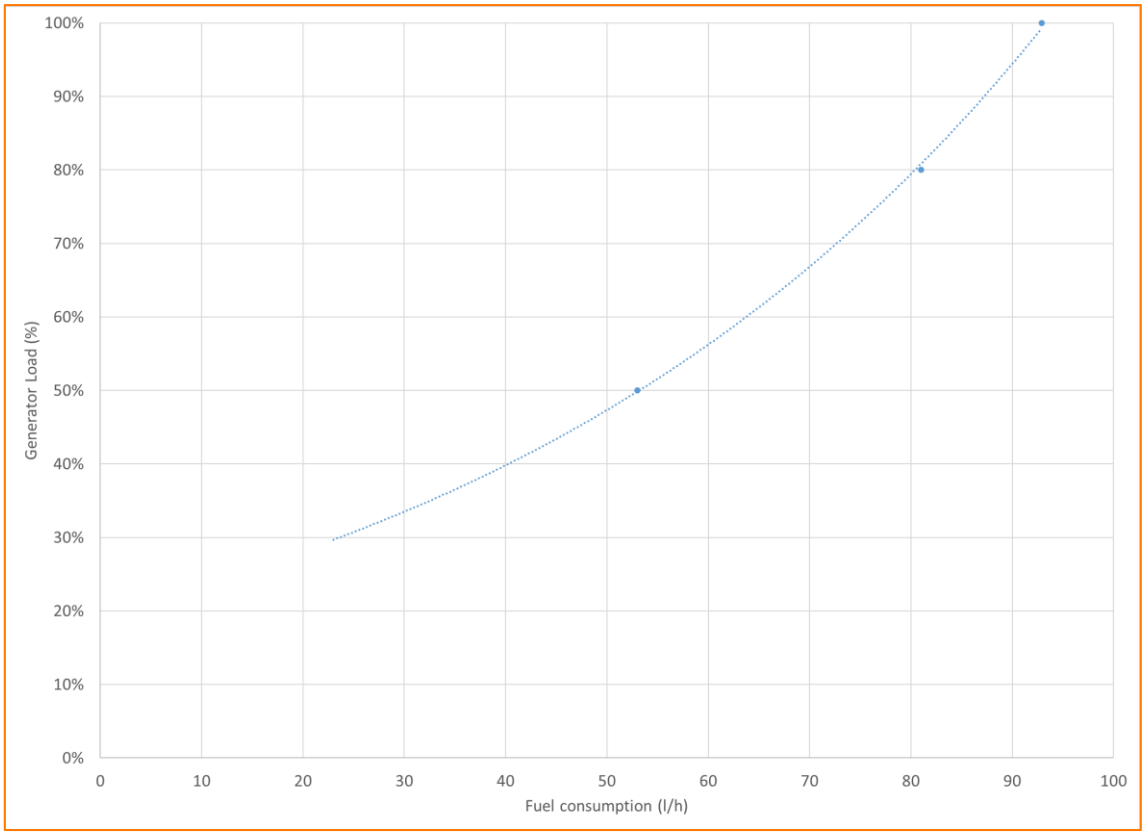

Figure 2-1: Generator fuel consumption loads – 322 kw @ 100% PRP (Himonsa , 2021)

2.4 Summary of GHG emissions

A summary of the GHG emissions for the three scenarios for five years is presented in Table 2-4 and cumulative emissions are presented from year 1 to year 5 in Figure 2-2.

Figure 2-2 shows that while Scenario B (Mod 3 v2 -12 months of diesel generated electricity) is higher than the approved scenario (Scenario A), by year 2, overall emissions would be lower than the currently approved grid solution.

Table 2-4: Summary of Yearly GHG emissions (tons CO_2-e)

Year	GHG from Diesel			GHG from Electricity			TOTAL		
	Scenario A	Scenario B	Scenario C	Scenario A	Scenario B	Scenario C	Scenario A	Scenario B	Scenario C
1	16	692	117	443	0	0	459	692	117
2	16	117	117	443	0	0	459	117	117
3	16	117	117	443	0	0	459	117	117
4	16	117	117	443	0	0	459	117	117
5	16	117	117	443	0	0	459	117	117

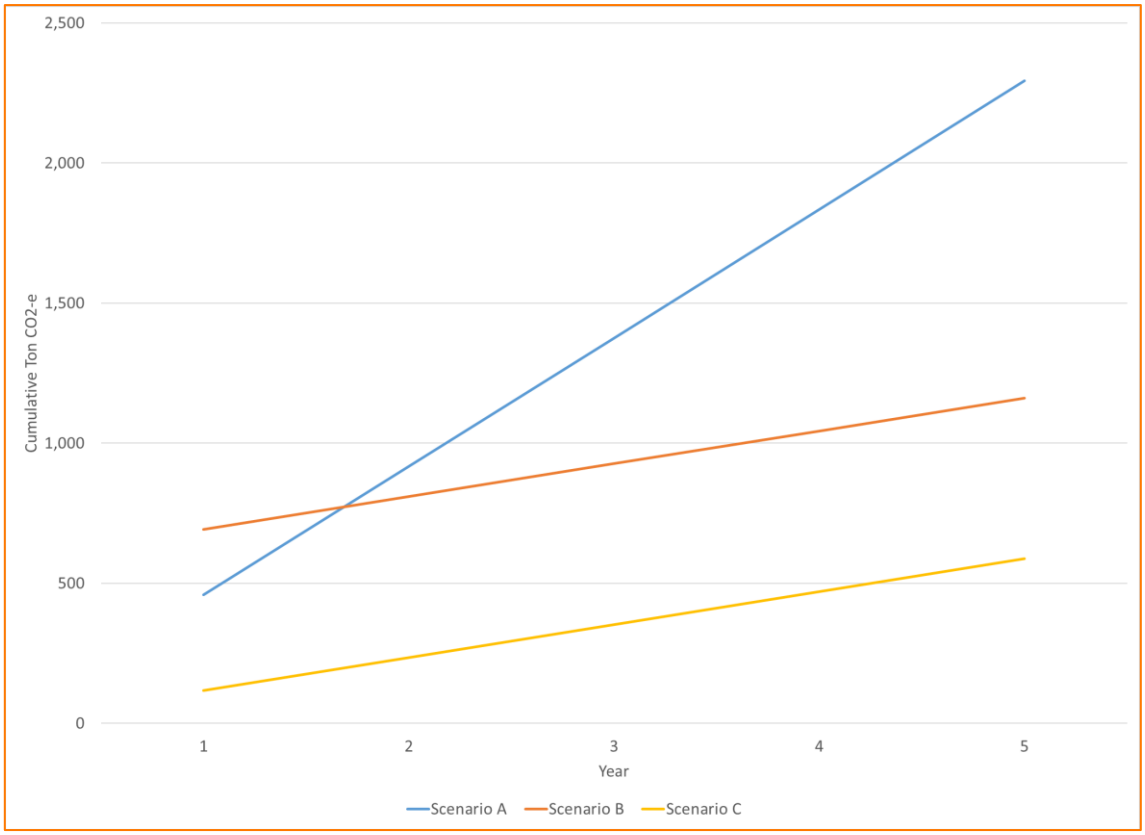

Figure 2-2: Cumulative GHG emissions over 5 years

2.5 GHG Management

As part of their ongoing operations, ProTen will apply various mitigation measures to minimise the overall generation of GHG emissions at the site. Some examples of mitigation and management practices include:

- Regular maintenance checks and cleaning of the solar panels;
- Monitoring and recording the consumption of diesel in the generators;
- Combustion tuning of the diesel generators as required;
- Ensuring the ventilation fans are cleaned and serviced regularly; and
- Investigating ways to reduce energy consumption and monitoring the total site electricity consumption

3 CONCLUSION

This report has assessed the potential GHG emissions associated with the operation of Farm 2 using the emission factors in the document National Greenhouse Accounts Factors (DISER, 2020) and has been based on the scenarios identified above.

The results show that while the 12 month generator operation (Scenario B) will have higher emissions in the first year than the approved grid solution (Scenario A) once the off grid solar and battery solution is brought online (Scenario C), the cumulative GHG emissions will be below the approved Scenario A emissions by year 2.

4 REFERENCES

Department of the Environment and Energy. (2017). *National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the estimation of emissions by facilities in Australia.* Canberra: Commonwealth of Australia.

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Himonsa . (2021). *HFW-400 Tf Industiral Range Generator .* 30730 San Javier / Murcia SPAIN: Himonsa .