GREENHOUSE GAS REPORT FOR PACLIB GROUP 133-145 LENORE DRIVE, ERSKINE PARK

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1. INTRODUCTION

Benbow Environmental was engaged by the Paclib Group to prepare a Greenhouse Gas Report for the proposed use of their site at Erskine Park as a printing, warehouse and distribution facility. The new printing facility and warehouse would replace two existing facilities located at Moorebank, NSW and Clayton, VIC and storage warehouses at Chatswood and Hallam respectively.

The purpose of the report is to compare certain aspects attributable to the activities of the existing and proposed facilities in terms of greenhouse gas (GHG) emissions. Specifically, the report determines the variation in GHG emissions that would result from scope 1 and scope 2 emissions including:

- The proposed transportation requirements for raw materials, finished goods and waste as compared to those associated with the existing facilities;
- Loading and unloading practices;
- Fuel consumption; and
- Electricity consumption.

The following standards and guidelines were considered when undertaking the GHG calculations:

- AS ISO 14064.1-2006 Greenhouse gases - Part 1 Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals;
- National Greenhouse Accounts (NGA) Factors;
- National Greenhouse and Energy Reporting (Measurement) Technical Guidelines 2008 v1.1; and
- The Greenhouse Gas Protocol.

The results of this assessment are expressed in terms of GHG emissions (expressed in terms of tCO_2-equivalent) that would be saved per annum if proposed operations were to replace existing operations. The calculations were based on limited data provided by the client, data obtained from the above sources and conservative assumptions. As such, measured data from existing and proposed sites would be required to verify the results of this assessment.

A baseline inventory is needed after the first year of operation. This would establish GHG emissions based on measured data from the proposed activities and enable a GHG Action plan to be implemented in order to continually reduce GHG emissions.

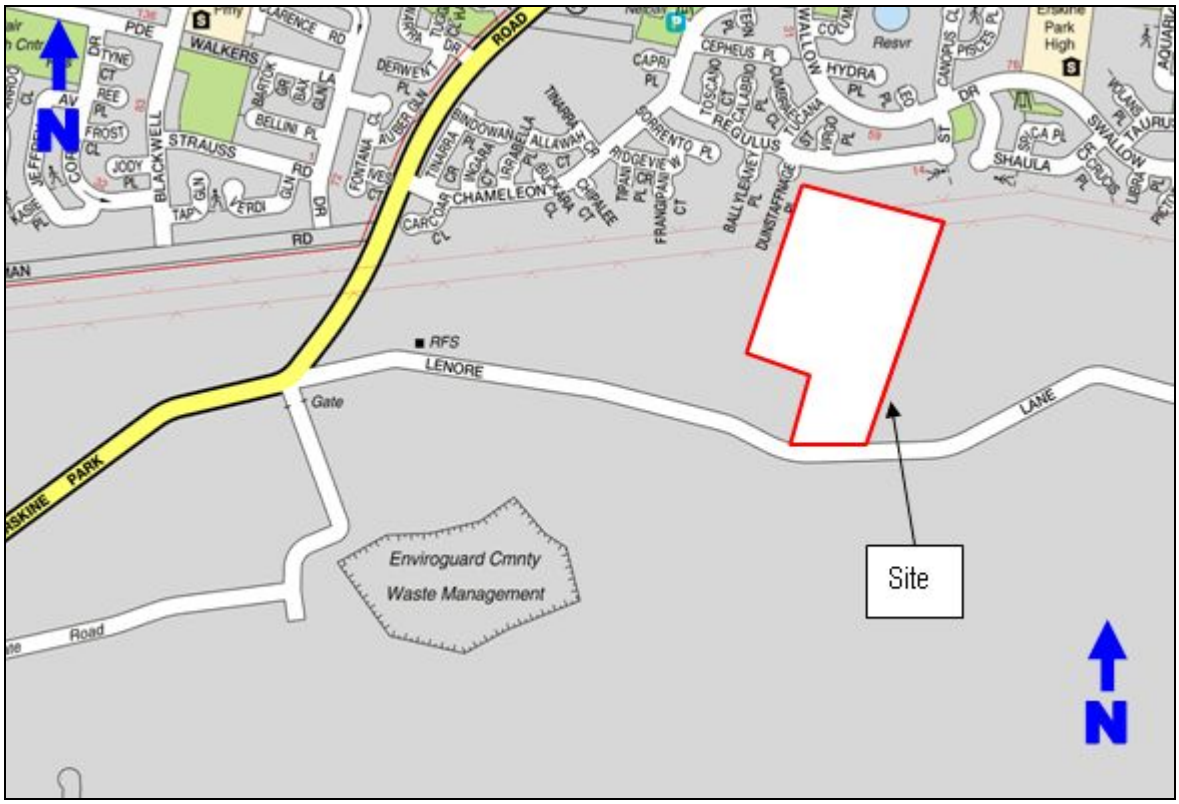
2. THE PROPOSAL

The proposed development involves the use and operation of a warehouse and distribution facility for the purposes of magazine printing. This section outlines the proposal. For further information, please refer to the Environmental Assessment Report prepared for this proposed development.

2.1 THE SITE

The site is located at No. 133-145 Lenore Drive, Erskine Park also known as Lot 62 in DP 1090695 within an industrial area of western Sydney, NSW. The site location within Erskine Park is shown in Figure 2-1.

Figure 2-1: Proposed Site Location



Source: © Universal Publishers Pty Ltd, UBD Australian Cities 2004

The site is 10.5 ha of cleared land and is relatively flat. The site has frontage onto Lenore Drive which will eventually connect to Wallgrove Road. Once the construction phase is complete, the site will consist of Warehouses 1, 2 and 3, truck loading areas, offices, carparking, hardstand areas and landscaped areas.

2.2 PROPOSED DEVELOPMENT

The proposed development involves the use and operation of a warehouse and distribution facility for the printing, storage and distribution of magazines. The main processes include web offset printing, finishing, binding and stitching. The primary raw materials are paper and ink which would be stored prior to use in the warehouse.

This new printing facility would operate in place of two existing facilities located at Moorebank in NSW and Clayton in Victoria. There would also be storage space available to store finished product within the new Erskine Park facility and this would eliminate the need to transport magazines from the existing printing facilities to a separate warehouse.

The production tonnages for the existing and proposed facilities would remain the same at 65,000 tpa. The new processes have been designed to generate less than 8% waste, much less than the existing facilities which currently generate 15% waste. The new equipment would reduce energy consumption by approximately 1 to 3%. In addition, the transportation routes would be streamlined.

A brief description of the processes is provided in Section 2.4. For more detailed information regarding the proposal, please refer to the Environmental Impact Statement for the DA.

2.3 HOURS OF OPERATION

The proposed hours of operation are on a 24 hours per day 7 day per week basis. Initially five (5) presses would be installed and would operate on a 24 hour 7 day per week basis. There would be potential for two (2) additional presses to be installed at the facility in the future.

2.4 PROCESS DESCRIPTIONS

The processes involved in the printing of the magazines include receipt and storage of raw materials, web offset printing, drying, finishing, binding, stitching, storage and distribution of finished goods. These processes are described briefly as follows.

2.4.1 Receipt of Raw Materials

Raw materials would be delivered to site on heavy vehicles and stored within the warehouse. The main raw materials include paper rolls and ink.

2.4.2 Web Offset Printing

A continuous roll of paper would be fed into the printing press. The ink would be distributed to plates through a series of rollers. The image would then be transferred onto the paper via a rubber blanket. The web offset printing method that would be used is the "heatset" process where the ink is dried rapidly in a gas fired oven at temperatures between 176 and 206°C.

2.4.3 Finishing, Binding and Stitching

After printing is complete, pages are separated and cut to size. The printed paper would be put together so that pages fall in the correct order. Pages would then be bound together to form the finished product.

2.4.4 Finished Goods Storage and Distribution

Printed and bound magazines would then be stored within a warehouse on site ready for distribution to retailers.

3. METHODOLOGY

3.1 OPERATIONAL BOUNDARIES

The scope of this report is limited to determining the variance in GHG emissions between the existing facilities and the proposed facility. The variation in scope 1 and 2 emissions is estimated.

3.1.1 Scope 1 Emissions

Scope 1 emissions are direct GHG emissions. According to *The Greenhouse Gas Protocol*,

> *"Direct GHG emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; emissions from chemical production in owned or controlled process equipment."*

The following have been included as scope 1 emissions:

- Natural gas fuel use for the dryers;
- Transportation requirements associated with the transport of raw materials and finished goods by road. Emissions of GHG's are considered to be scope 1 based on the assumption that vehicles used to transport these goods are company owned vehicles; and
- Emissions from the use of LPG forklifts for undertaking loading and unloading practices.

3.1.2 Scope 2 Emissions

Scope 2 emissions are indirect GHG emissions. *The Greenhouse Gas Protocol* states that:

> *"Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organisational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated."*

Note: The term "electricity" used in the above definition refers to electricity, steam and heating/cooling.

Scope 2 emissions included in this assessment are estimated from the use of purchased electricity.

3.2 GREENHOUSE GAS EMISSIONS

There are six (6) types of greenhouse gases listed in the Kyoto Protocol. These are presented in Table 3-1.

Table 3-1: Types of Greenhouse Gases

Type of gas	Symbol	Source	GWP	Relative contribution to global warming (%)
Carbon Dioxide	CO_2	Occurs naturally. Also a by-product of burning fossil fuels & biomass, land-use changes and various industrial processes	1	82.7
Methane	CH_4	Occurs naturally. Other sources include landfills, coal mines, paddy fields, natural gas systems and livestock.	21	10.0
Nitrous Oxide	N_2O	Generated by burning fossil fuels, manufacture of fertiliser and cultivation of soils.	310	5.6
Perflurocarbons	PFC	Human-made chemicals. By product of aluminium smelting. Also used in manufacture of semiconductors	6,500 – 9,200	1.7
Hydrofluorocarbons	HFC	Human-made chemicals. Used in refrigeration and insulating foam.	140 – 11,700	
Sulphur Hexafluoride	SF_6	Used largely in heavy industry to insulate high voltage equipment and to assist in manufacture of cooling systems.	23,900	

Source: Intergovernmental Panel on Climate Change (IPCC), 1996

The greenhouse gases that are most likely to be emitted from the activities considered in this assessment are carbon dioxide, methane and nitrous oxides from the burning of fossil fuels. These gases are expected to make up over 99% of the total GHG emissions based on the activities that have been assessed.

Perflurocarbons, hydrofluorocarbons and sulphur hexafluoride together contribute only 1.7% of the six Kyoto gases to global warming. It is also highly unlikely that these gases would be emitted from the activities that are being assessed in this report. For these reasons, emissions of perflurocarbons, hydrofluorocarbons and sulphur hexafluoride have not been calculated.

GWP is the "Global Warming Potential" and represents the ability of the greenhouse gas to trap heat from the atmosphere. The GWP of a given greenhouse gas is a factor that is relative to one unit of CO_2.

3.3 GHG EMISSION CALCULATION APPROACH

The calculation approach used in this assessment is the application of default emission factors (EF). Emission factors have been sourced from the *Department of Climate Change's National Greenhouse Accounts (NGA) Factors* and are used to calculate the total GHG emissions using the following general equation:

$$\text{GHG Emissions } (tCO_2\text{-e}) = EF \times Q$$

Where:
EF = Relevant Emission Factor;
Q = Quantity of energy consumed

Units of each parameter in the above equation depend on the energy type.

Fuel consumption quantities (Q) used in the calculations was estimated using a number of sources and techniques. These are discussed further in Sections 4 and 5.

4. SCOPE 1 GHG EMISSIONS

4.1 GHG EMISSIONS FROM USE OF NATURAL GAS

Natural gas consumption for the new dryers that would operate at the proposed printing facility was estimated using equipment specifications. Five (5) presses are initially proposed for the new facility, each with a dryer. The calculations are based on the assumption that all 5 presses would operate at any one time. It is assumed that the 5 presses would be in operation on a 24 hour, 7 day basis over the entire year.

The client estimates that with the installation of the new equipment, a 1 to 3% energy saving would be achieved. For the purposes of this assessment, it is assumed that a 2% energy saving would be achieved. Savings in GHG emissions from natural gas consumption for the proposal versus the existing scenario are presented in Table 4-1. Full calculations, data and assumptions are presented in Appendix 1.

Table 4-1: GHG Calculations for Natural Gas

Parameter	Existing Facilities	Proposed Facility
Annual Natural Gas Consumption (GJ)	337,886	331,128
Emission Factor used ($kgCO_2$-e/GJ)	51.3	51.3
Annual GHG Emissions (tCO_2-e)	17,326.6	16,986.9
Annual Savings (tCO_2-e)		339.7

Based on an assumed improvement in energy efficiency of the new equipment, the annual saving in GHG emissions would be 339.7 tonnes of CO_2-equivalent.

4.2 GHG EMISSIONS FROM ROAD TRANSPORT

The transportation routes of the primary raw materials, finished product and waste associated with the existing and proposed operations have been considered. The ramification of changes in distribution routes is complex and is dependent on customer requirements and is therefore not considered in this assessment. Employee travel is also not included.

4.2.1 Existing Transport Routes

A series of maps has been used to illustrate the existing transportation routes.

For the existing facility in NSW, paper rolls are brought by ship into Port Botany. The paper is then loaded onto trucks and transported by road to the printing facility at Moorebank as shown in Figure 4-1. Ink is sourced from a facility located in Enfield and transported to the Moorebank printing facility via road tanker.

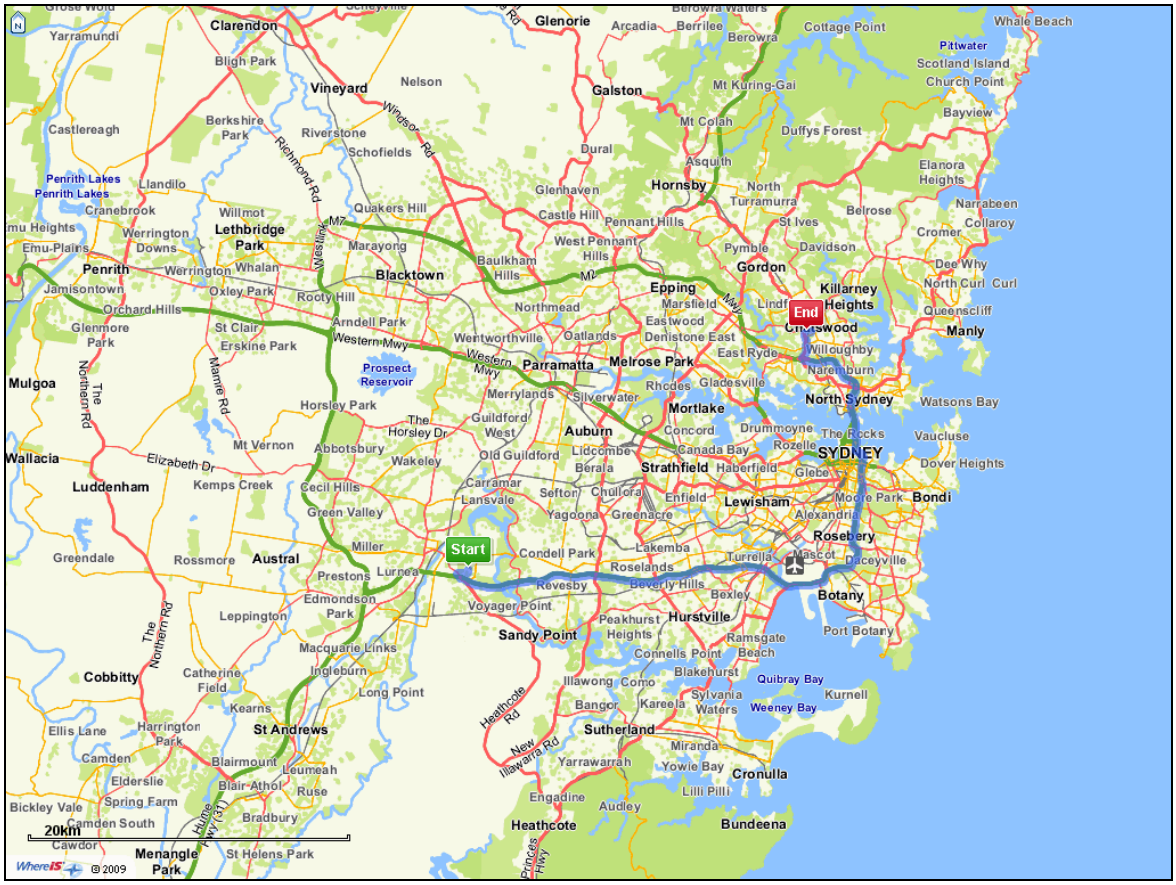
Once the magazines have been printed, these are loaded onto trucks and transported to a warehouse in Chatswood for storage awaiting distribution to retailers.

Waste is transported from the facility in Moorebank to Port Botany for shipping to Asia.

Figure 4-1: Transport route for paper rolls and waste (Port Botany to/from Moorebank)

Source: © WHEREIS Directory, www.whereis.com

Figure 4-2: Transport of magazines from the printing facility in Moorebank to the storage warehouse in Chatswood



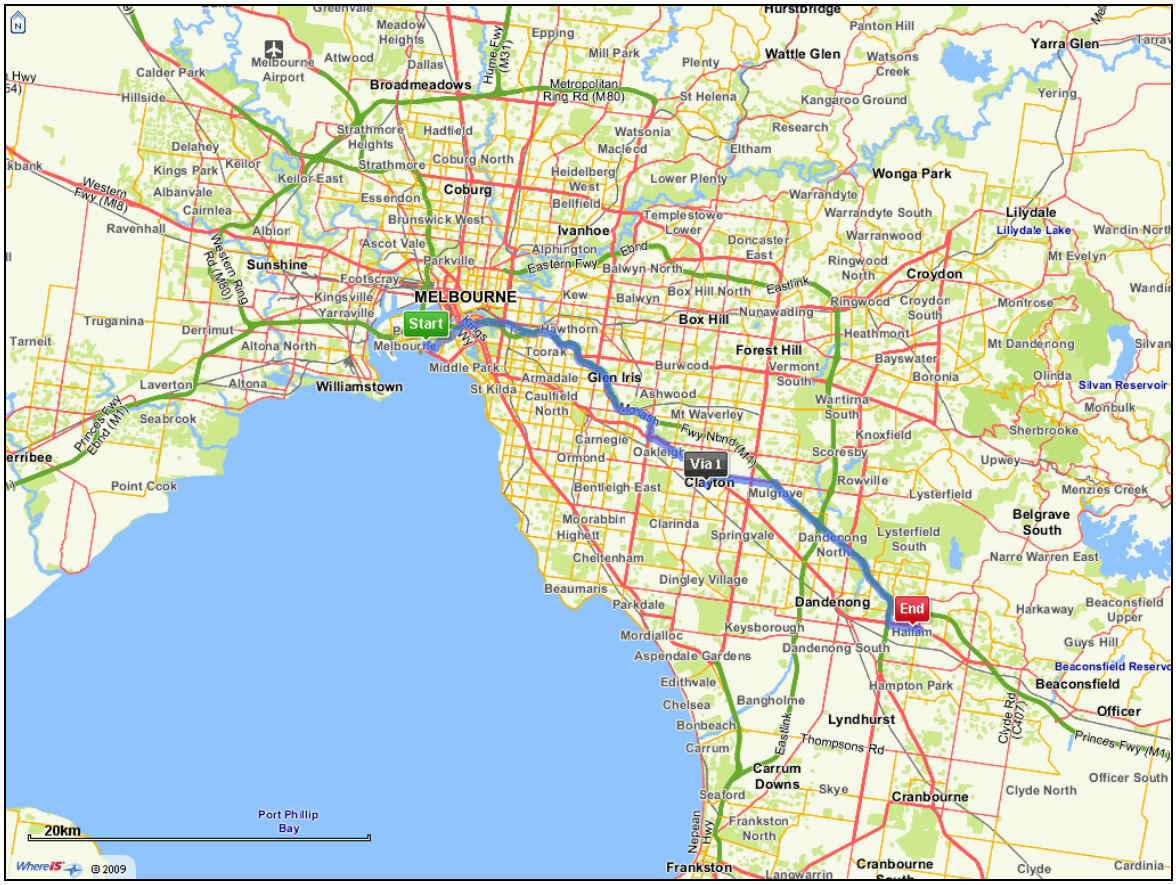
Source: © WHEREIS Directory, www.whereis.com

Similarly, transportation requirements for the existing facility based in Victoria, paper rolls are brought by ship into Port Melbourne. These raw materials are then loaded onto trucks and transported by road to the printing facility at Clayton. Once the magazines have been printed, these are loaded onto trucks and transported to a warehouse in Hallam for storage awaiting distribution to retailers. The transportation route is shown in Figure 4-3.

Waste is transported from the facility in Clayton to Port Melbourne for shipping to Asia.

Ink is sourced from a facility located in Kilsyth and transported to the Clayton printing facility via road tanker.

Figure 4-3: Route used to transport paper from Port Melbourne to Clayton and magazines from Clayton to Hallam



Source: © WHEREIS Directory, www.whereis.com

4.2.2 Proposed Transport Routes

For the proposed operation, paper rolls would also be brought by ship into Port Botany. These raw materials would then be loaded onto trucks and transported by road to the new printing facility at Erskine Park. Once the magazines have been printed, they would be stored within the warehouse at the same site awaiting distribution to retailers. The transportation route for the transport of paper rolls to the proposed facility is presented in Figure 4-4.

Waste is transported from the facility in Erskine Park to Port Botany for shipping to Asia.

Ink would be transported from the supplier at Enfield to Erskine Park via road tanker.

Figure 4-4: Proposed transportation route of paper rolls from Port Botany to Erskine Park

Source: © WHEREIS Directory, www.whereis.com

4.2.3 GHG Estimation Approach

The approach taken to estimate GHG emissions from the existing and proposed facilities involved a number of conservative assumptions. Calculations were based on one-way trips and the annual quantity of paper rolls for the proposed facility being 65,000 tonnes. Quantities of paper rolls for the two existing facilities were assumed to be divided equally between them and therefore equal 32,500 tonnes per annum. From this information, the quantity of ink was calculated based on the assumption that the ink coverage on the paper is 30%. The total kilometres travelled and number of trips required per annum for transport of this quantity of material was then determined.

The transportation of waste in terms of total kilometres travelled and number of trips required per annum from the printing facility was calculated based on 15% generation at the existing facilities and 8% generation at the proposed facility. Similarly, finished product transportation from the printing facilities to the respective storage warehouses was determined for the existing scenario. Transportation of finished product to a separate storage warehouse would not be required.

The details and assumptions used in the calculations of GHG emissions associated with road transportation include:

Type of Vehicles and Allowable Loads

- Paper rolls, Waste and Finished Product – 75% B-doubles with an allowable load of 50 tonnes, 25% Semi Trailers with an allowable load of 25 tonnes; and
- Ink – Road Tanker with an allowable load of 27,000L.

NSW Trip Distances (km) – Existing Site

- One way distance (Port Botany to Moorebank) = 31 km;
- One way distance (Moorebank to Chatswood) = 47 km; and
- One way distance (Enfield to Moorebank) = 22 km.

VIC Trip Distances (km) – Existing Site

- One way distance (Port Melbourne to Clayton) = 25 km;
- One way distance (Clayton to Hallam) = 19 km; and
- One way distance (Filsyth to Clayton) = 31 km.

Proposed Trip Distances (km)

- One way distance (Port Botany to Erskine Park) = 62 km; and
- One way distance (Enfield to Erskine Park) = 34 km.

Other Data and Assumptions

- All vehicles run on diesel fuel; and
- Average fuel consumption for diesel engine = 33.6 L per 100 km (GHG Protocol Tool).

4.2.4 Estimations of GHG Emissions from Road Transport

Table 4-2 provides a summary of the estimations determined for GHG emissions from road transportation for the existing and proposed scenarios. Full calculations and assumptions are provided in Appendix 2. The results indicate that there would be an additional 5.6 tonnes of CO2-equivalent emitted by the proposed facility. This is a direct result of the longer transport distances associated with the location of the site in relation to the suppliers of raw materials and end point of waste.

Table 4-2: GHG Calculations for Road Transportation

Parameter	Existing Facilities	Proposed Facility
Total Distance Travelled (km/annum)	132,260	138,474
Annual fuel consumption (L/annum)	44,439	46,527
Emission Factor used ($kgCO_2$-e/GJ)	69.8	69.8
Annual GHG Emissions (tCO_2-e)	119.7	125.36
Annual Savings (tCO_2-e)		- 5.6

The other component related to the road transportation of finished product is the reduced loading and unloading that would be required for the new facility. At the proposed facility, the storage of finished product would be on site and transportation to a storage warehouse would not be required. This results in less loading and unloading activities and is discussed in the following section.

4.3 GHG EMISSIONS FROM LOADING & UNLOADING

This new printing facility would replace two existing facilities located at Moorebank in NSW and Clayton in Victoria. There would also be storage space available to store finished product within the new Erskine Park facility and this would eliminate the need to transport magazines from the existing printing facilities to a separate warehouse as discussed in Section 4.2. It would also eliminate an existing loading and unloading step in the current practice - the loading of magazines at the printing facility and unloading at the storage warehouse. The saving in GHG emissions as a result of eliminating this step in the process is presented in Table 4-3.

Loading and unloading practices are currently undertaken using forklifts that run on LPG.

Table 4-3: Calculations for Savings of GHG Emissions from Loading & Unloading

Parameter	
Total number of trucks to load/unload per annum	2780
Time taken to load or unload a truck (hours)	1
Total time taken to load and unload trucks (hours per annum)	2780
Total LPG fuel consumption (L per annum)	11,222.0
Total LPG fuel consumption (GJ per annum)	294.0
LPG Emission Factor ($kgCO_2$-e/GJ)	60.2
Annual Savings (tCO_2-e)	17.7

Full calculations, data and assumptions are presented in Appendix 3.

5. SCOPE 2 GHG EMISSIONS

The electricity consumption for operation of the entire site has been predicted using available information provided by the client. The electrical power supply would be brought in at high voltage and there would be 6 sub stations transformers owned by a utility company located on site at 10 MVA. It is unlikely that the facility would require this power to operate at full capacity. The GHG calculations assume a maximum electricity usage. As such, calculations of electricity consumption are based on 10 MVA and the facility operating on a 24 hour, 7 day a week basis over the entire year.

The client estimates that with the installation of the new equipment, a 1 to 3% energy saving would be achieved. For the purposes of this assessment, it is assumed that a 2% energy saving would be achieved. Savings in GHG emissions from electricity consumption for the proposal versus the existing scenario are presented in Table 5-1. Full calculations, data and assumptions are presented in Appendix 4.

Table 5-1: GHG Calculations for Electricity Consumption

Parameter	Existing Facilities	Proposed Facility
Annual Electricity Consumption (kWh)	40,208,400 (NSW) 40,208,400 (VIC)	80,416,800
Emission Factor used ($kgCO_2$-e/kWh)	0.89 (NSW) 1.22 (VIC)	0.89
Annual GHG Emissions (tCO_2-e)	84,839.7	70,167.6
Annual Savings (tCO_2-e)		14,672.1

The results indicate that a substantial saving in GHG emissions would be possible if the proposed facility were to replace the existing facilities. This saving needs to be verified using real data obtained from the existing operations.

6. SUMMARY OF FINDINGS

A summary of the annual GHG emissions and savings in terms of tonnes of CO_2-equivalent are presented in Table 6-1.

Table 6-1: Scope 1 and 2 Annual GHG Emission Savings (tCO_2-e)

Fuel Type	Existing Facilities	Proposed Facility	Saving
Natural Gas	17,326.6	16,986.9	339.7
Road Transport	119.7	125.4	- 5.6
LPG	17.7	0.0	17.7
Electricity Consumption	84,839.7	70,167.6	14,672.1
Total Annual Savings (tCO_2-e)			15,023.9

The results of the greenhouse gas calculations indicate that operation of proposed facility would generate 15,023.9 tonnes of carbon dioxide-equivalent less than the existing operations. The majority of this saving would be achieved through the installation of more modern and energy efficient equipment that would significantly reduce the electricity consumption.

6.1 RECOMMENDED GHG ACTION PLAN

It is a strong recommendation of this report that a GHG Action Plan is implemented at the proposed facility. Based on GHG calculations presented within this report, the facility would exceed the threshold under the National Greenhouse and Energy Reporting Act (NGER Act) and would be required to report annual Scope 1 and 2 GHG emissions and energy use.

A GHG Action Plan would need to include the following:

- Base Year GHG Inventory;
- Verification of this Base Year GHG Inventory by an independent third party;
- Annual reporting of GHG emissions in accordance with NGER Legislation;
- Identification of activities to reduce GHG emissions or increase GHG removals; and
- Implementation of identified opportunities to enable reduction in GHG emissions and/or increase in GHG removals.

This concludes the report.

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8. Web Offset Printing, www.howardprinting.com/printterms.html

8. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use by Paclib Group, as per our agreement for providing environmental assessment services. Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that required by law) in relation to the information contained within this document.

Paclib Group is entitled to rely upon the findings in the report within the scope of work described in this report. No responsibility is accepted for the use of any part of the report in any other context or for any other purpose.

Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

APPENDICES

Job	109027
Client	Paclib Management Pty Ltd

NATURAL GAS CONSUMPTION (SCOPE 1)

Proposed Scenario - Data and Assumptions

		Units	Source
Natural gas is used to power the dryers on the presses			
Five (5) presses would be installed initally and would run (at any one time) on a 24/7 basis over 365 days of the year			
There would be room or Two (2) more presses at the facility for future installation - these are not considered in these calculations			
The power rating for each dryer (press) is	2100	kW	Goss Specifications Ecocool® /T 148/2060
Natural Gas Energy to Volume Factor	39.7	MJ/m^3	National Pollutant Inventory
Natural Gas Weight to Volume Factor	0.74	kg/m^3	National Pollutant Inventory
1 Watt	1	Joule/sec	NGA Factors - Table 27
Proposed facility is estimated to be 1 to 3% more energy efficient than the existing operations, use 2% improvement			

Calculations

Natural Gas - Volumetric Usage	8340755.668	m^3/year
Natural Gas - Mass Usage	6172159.194	kg/year
Annual power usage (Natural Gas)	91980000	kWh
Annual power usage (Natural Gas)	331128000	MJ
Annual power usage (Natural Gas) - Q	331128	GJ

GHG Data

		units	Source
EF - Emission Factor for consumption of natural gas- NSW & A	51.3	kgCO2-e/GJ	NGA Factors - Table 2

GHG Calculations

GHG Emissions = Q x EF / 1000

Proposed scenario GHG emissions	16986.87	tCO2-e
Existing scenario GHG emissions	17326.60	tCO2-e
Saving in GHG emissions	**339.74**	**tCO2-e**

Note: Data for the existing sites would need to be collected to verify this saving.
Assuming gas consumption in existing plant is 2% more

Job	109027
Client	Paclib Management Pty Ltd

ROAD TRANSPORT - EXISTING (SCOPE 1)

1. NSW

Assumptions

All transport vehicles for raw materials, product and waste are company owned, therefore come under "scope 1" emissions
Total production / raw materials for the existing situation is divided evenly between NSW and VIC facilities
Raw materials considered include Paper rolls and ink only.
The printing facility is located in Moorebank
The storage warehouse is located in Chatswood
Finished product is transported from Moorebank to Chatswood for storage

Paper rolls are sourced from o/s and transported from Port Botany to Moorebank

Quantity of paper rolls transported to Moorebank	32500	tonnes per annum	

Ink is sourced locally and transported from Enfield to Moorebank
Assume all solvent i.e. petroleum distillate of 30% wt is evaporated in the printing and drying process

Ink evaporated during printing process	30%		
Quantity of ink required in kg	9750000	kg per annum	
Quantity of ink required in L	8775000	Litres per annum	
Ink Coverage	30%	Assumption	
Qty of ink	9750	tonnes per annum	
Qty of ink	9750000	kg per annum	
Density of ink	0.9		MSDS
Qty of ink	8775000	L per annum	
Distance of trip from Port Botany to Moorebank	32	km	Source: Whereis
Distance of trip from Moorebank to Chatswood	47	km	Source: Whereis
Distance of trip from Enfield to Moorebank	22	km	Source: Whereis
Percentage of B-doubles used for transport of paper rolls/finished product	75%		
Percentage of semi trailers used for transport of paper rolls/finished produc	25%		
Allowable load for B-doubles	50	tonnes per load	
Allowable load for Semi trailers	25	tonnes per load	
Road tankers are used to transport ink			
Allowable load for Road Tankers	27000	Litres per load	

Waste is transported from the printing facility to Port Botany for recycling o/s

Waste generation at existing facility	15%	Printed paper waste only

All waste is transported via Semi trailer

Calculations for Transport of Raw Materials

Paper rolls

B-double Tonnes transported	24375	tonnes per annum
B-double No. of trips required (one way)	488	trips per annum
B-double Kilometres travelled	15616	km per annum
Semi trailer Tonnes transported	8125	tonnes per annum
Semi trailer No. of trips required (one way)	325	trips per annum
Semi trailer Kilometres travelled	10400	km per annum
Total No. trips	813	trips per annum
Total No. km	26016	km per annum

Ink

No. of trips required (one way)	325	trips per annum
Kilometres travelled	7150	km per annum

Calculations for Transport of Waste

Quantity of ink left on finished product	6825000	kg per annum
Quantity of ink left on finished product in tonnes	6825.0	tonnes per annum
Total raw materials used	39325.0	tonnes per annum

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ROAD TRANSPORT - EXISTING (SCOPE 1)

Waste generation at Moorebank facility	5898.8	tonnes per annum
Semi trailer No. trips required (one way)	236	trips per annum
Semi trailer Kilometres travelled	7552.0	km per annum

Calculations for Transport of Finished Product

Total finished product generated	33426.3	tonnes per annum
B-double tonnes transported	25069.7	tonnes per annum
B-double No. of trips required (one way)	502.0	trips per annum
B-double Kilometres travelled	23594	km per annum
Semi trailer Tonnes transported	8356.6	tonnes per annum
Semi trailer No. of trips required (one way)	335	trips per annum
Semi trailer Kilometres travelled	15745	km per annum
Total No. trips	837.0	trips per annum
Total No. km	39339	km per annum

2. Victoria

Assumptions

Total production / raw materials for the existing situation is divided evenly between NSW and VIC facilities
Raw materials considered include Paper rolls and ink only.
The printing facility is located in Clayton
The storage warehouse is located in Hallam
Finished product is transported from Clayton to Hallam for storage

Paper rolls are sourced from o/s and transported from Port Melbourne to Clayton

Quantity of paper rolls transported to Clayton	32500	tonnes per annum	

Ink is sourced locally and transported from Filsyth to Clayton

Ink evaporated during printing process	30%		
Quantity of ink required in kg	9750000	kg per annum	
Quantity of ink required in L	8775000	Litres per annum	
Distance of trip from Port Melbourne to Clayton	25	km	Source: Whereis
Distance of trip from Clayton to Hallam	19	km	Source: Whereis
Distance of trip from Filsyth to Clayton	31	km	Source: Whereis
Percentage of B-doubles used for transport of paper rolls/finished product	75%		
Percentage of semi trailers used for transport of paper rolls/finished produc	25%		
Allowable load for B-doubles	50	tonnes per load	
Allowable load for Semi trailers	25	tonnes per load	
Road tankers are used to transport ink			
Allowable load for Road Tankers	27000	Litres per load	
Waste generation at existing facility	15%		

Waste is transported from the printing facility to Port Botany for recycling o/s

Calculations for Transport of Raw Materials

Paper rolls

B-double Tonnes transported	24375	tonnes per annum
B-double No. of trips required (one way)	488	trips per annum
B-double Kilometres travelled	12200	km per annum
Semi trailer Tonnes transported	8125	tonnes per annum
Semi trailer No. of trips required (one way)	325	trips per annum
Semi trailer Kilometres travelled	8125	km per annum
Total No. trips	813	trips per annum

Job	109027
Client	Paclib Management Pty Ltd

ROAD TRANSPORT - EXISTING (SCOPE 1)

Total No. km	20325	km per annum

Ink

No. of trips required (one way)	325	trips per annum
Kilometres travelled	10075	km per annum

Calculations for Transport of Waste

Quantity of ink left on finished product	6825000	kg per annum
Quantity of ink left on finished product in tonnes	6825.0	tonnes per annum
Total raw materials used	39325.0	tonnes per annum
Waste generation at Moorebank facility	5898.8	tonnes per annum
Semi trailer No. trips required (one way)	236	trips per annum
Semi trailer Kilometres travelled	5900.0	km per annum

Calculations for Transport of Finished Product

Total finished product generated	33426.3	tonnes per annum
B-double tonnes transported	25069.7	tonnes per annum
B-double No. of trips required (one way)	502	trips per annum
B-double Kilometres travelled	9538	km per annum
Semi trailer Tonnes transported	8356.6	tonnes per annum
Semi trailer No. of trips required (one way)	335	trips per annum
Semi trailer Kilometres travelled	6365	km per annum
Total No. trips	837	trips per annum
Total No. km	15903	km per annum

SUMMARY - Existing km	NSW km	VIC km	Combined km
B-doubles	39210.0	21738	60948.0
Semi trailer	33697.0	20390	54087.0
Road Tanker	7150	10075	17225
TOTAL	80057.0	52203	**132260.0**

Total fuel consumption per year	44439	L	
		units	**Source**
Average fuel consumption for diesel engine	33.6	L per 100 km	GHG Protocol Tool
	0.336	L/km	(Direct emissions from transport)

GHG Data

		units	**Source**
Diesel energy content	38.6	GJ/kL	NGA Factors
Diesel Emission Factor, Scope 3 (EF)	5.3	kgCO2-e/GJ	NGA Factors
Diesel Emission Factor, Scope 1 (EF)	69.8	kgCO2-e/GJ	NGA Factors

Note: Scope 1 emission factor used (assumed all vehicles company owned)

GHG Calculations

Quantity of Diesel used	44.44	kL
Quantity of Diesel in GJ (Q)	1715.36	GJ

GHG Emissions = Q x EF / 1000	**119.73 tCO2-e**

Job	109027
Client	Paclib Management Pty Ltd

ROAD TRANSPORT - PROPOSED (SCOPE 1)

Assumptions

All transport vehicles for raw materials, product and waste are company owned, therefore come under "scope 1" emissions
Raw materials considered include Paper rolls and ink only.
The printing and storage facility is located in Erskine Park, NSW
Finished product is stored at the printing facility and transport to storage warehouse is not required

Paper rolls are sourced from o/s and transported from Port Botany to Erskine Park

Quantity of paper rolls transported to Erskine Park	65000	tonnes per annum	

Ink is sourced locally and transported from Enfield to Erskine Park

Ink evaporated during printing process	30%		
Quantity of ink required in kg	19500000	kg per annum	
Quantity of ink required in L	17550000	Litres per annum	
Distance of trip from Port Botany to Erskine Park	62	km	Source: Whereis
Distance of trip from Enfield to Erskine Park	34	km	Source: Whereis
Percentage of B-doubles used for transport of paper rolls/finished produc	75%		
Percentage of semi trailers used for transport of paper rolls/finished prod	25%		
Allowable load for B-doubles	50	tonnes per load	
Allowable load for Semi trailers	25	tonnes per load	
Road tankers are used to transport ink			
Allowable load for Road Tankers	27000	Litres per load	

Waste is transported from the printing facility to Port Botany for recycling o/s

Waste generation at existing facility	8%	
All waste is transported via Semi trailer		

Calculations for Transport of Raw Materials

Paper rolls

B-double Tonnes transported	48750	tonnes per annum
B-double No. of trips required (one way)	975	trips per annum
B-double Kilometres travelled	60450	km per annum
Semi trailer Tonnes transported	16250	tonnes per annum
Semi trailer No. of trips required (one way)	650	trips per annum
Semi trailer Kilometres travelled	40300	km per annum
Total No. trips	1625	trips per annum
Total No. km	100750	km per annum

Ink

No. of trips required (one way)	650	trips per annum
Kilometres travelled	22100	km per annum

Calculations for Transport of Waste

Quantity of ink left on finished product	13650000	kg per annum
Quantity of ink left on finished product in tonnes	13650.0	tonnes per annum
Total raw materials used	78650.0	tonnes per annum
Waste generation at Erskine Park facility	6292.0	tonnes per annum
Semi trailer No. trips required (one way)	252	trips per annum
Semi trailer Kilometres travelled	15624.0	km per annum

SUMMARY - PROPOSED	km
B-doubles	60450.0
Semi trailer	55924.0
Road Tanker	22100
TOTAL	**138474.0**

Job	109027
Client	Paclib Management Pty Ltd

ROAD TRANSPORT - PROPOSED (SCOPE 1)

Total fuel consumption per year	46527	L	
		units	**Source**
Average fuel consumption for diesel engine	33.6	L per 100 km	GHG Protocol Tool
	0.336	L/km	(Direct emissions from transport)

GHG Data

		units	**Source**
Diesel energy content	38.6	GJ/kL	NGA Factors
Diesel Emission Factor, Scope 3 (EF)	5.3	kgCO2-e/GJ	NGA Factors
Diesel Emission Factor, Scope 1 (EF)	69.8	kgCO2-e/GJ	NGA Factors

Note: Scope 1 emission factor used (assumed all vehicles company owned)

GHG Calculations

Quantity of Diesel used	46.53	kL
Quantity of Diesel in GJ (Q)	1795.95	GJ
GHG Emissions = Q x EF / 1000	**125.36**	**tCO2-e**

Job	109027
Client	Paclib Management Pty Ltd

FORKLIFT LOADING AND UNLOADING (SCOPE 1)

Assumptions

Additional forklift loading and unloading for transport of product from printing facility to storage warehouse (for existing scenario)

No. of additional trucks to load (Moorebank)	695	trucks	Source: Road Transport Calculations
No. of additional trucks to load (Clayton)	695	trucks	Source: Road Transport Calculations
No. of additional trucks to unload (Chatswood)	695	trucks	Source: Road Transport Calculations
No. of additional trucks to unload (Hallam)	695	trucks	Source: Road Transport Calculations
Total number of trucks to load/unload	2780	trucks	
Time to load/unload per truck	1	hour	
Total time to load/unload trucks	2780	hours per annum	
Forklift fuel	LPG		
Total fuel consumption per year	11222.02	L	

		units	**Source**
Density of LPG	0.545	kg/L	NPI EET conversion table
Fuel Consumption of LPG Forklift	2.2	kg/hr	
Fuel Consumption of LPG Forklift	4.0	L/hr	

GHG Data

		units	**Source**
LPG energy content	26.2	GJ/kL	National Greenhouse Accounts (NGA) Factors
LPG Emission Factor, Scope 1 (EF)	60.2	kgCO2-e/GJ	National Greenhouse Accounts (NGA) Factors

GHG Calculations

Quantity of LPG used	11.22	kL
Quantity of LPG in GJ (Q)	294.02	GJ

GHG Emissions = Q x EF / 1000	**17.70**	**tCO2-e**

Job	109027
Client	Paclib Management Pty Ltd

ELECTRICITY CONSUMPTION (SCOPE 2)

Proposed Scenario - Data and Assumptions

The electrical power supply is powered from 6 transformers with total capacity of 10MVA
Assuming maximum possible electricity usage
Facility would operate 24/7
Proposed facility is estimated to be 1 to 3% more energy efficient than the existing operations, use 2% improvement

			units	**Source**
Power required to operate entire facility		10	MVA	Client supplied
Power required to operate entire facility		9.0	MW	
Electricity consumption		78840000	kWh	
Power factor correction		0.90		Power Factor Correction Evaluation (Australian Building Boards Code)
Existing scenario GHG emission				
Exising electricity consumption		80416800	kWh	Existing plants are 2% less efficient
	NSW	40208400	kWh	
	VIC	40208400	kWh	

GHG Data

		units	**Source**
Emission Factor - NSW (Scope 2)	0.89	kgCO2-e/kWh	NGA Factors
Emission Factor - VIC (Scope 2)	1.22	kgCO2-e/kWh	NGA Factors

GHG Calculations

GHG Emissions = Q x EF / 1000

Proposed		70167.60	tCO2-e
Existing			
	NSW	35785.476	tCO2-e
	VIC	49054.248	tCO2-e
	total	84839.724	tCO2-e

Saving in GHG emissions	**14672.12**	**tCO2-e**