PKCT EXISTING OPERATIONS & INCREASED ROAD RECEIVAL HOURS ENVIRONMENTAL ASSESSMENT APPENDIX L

GREEN HOUSE GAS EMISSIONS FROM PORT KEMBLA COAL TERMINAL SITE

1 METHODOLOGY

The GHG calculations in this EA have been prepared using methodology outlined in the *National Greenhouse Accounts (NGA) Factors* (2008) and using emissions factors tabulated in the document and best industry practice. This document, produced by DECC, replaces the AGO Factors & Methods Workbook (2006). All methodologies are underpinned by frameworks outlined in documents produced by the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC) with due regard to the Kyoto Protocol. Policies devised by these bodies are accepted as the internationally spanning frameworks designed for intergovernmental efforts to tackle the challenges posed by climate change.

All methodology used in this assessment for the estimation of GHG emissions has been in accord with the NGA Factors document in the first instance and/or in accord with sound scientific and engineering principles where NGA Factors has proved inadequate for the required calculations. The specific methodologies used in each calculation are given in the following sections.

There are several recognised greenhouse gases and the contribution of greenhouse gas emissions to global warming varies for each different greenhouse gas. The more common ones are carbon dioxide, methane, sulphur hexafluoride, and halogenated refrigerants. The Intergovernmental Panel on Climate Change (IPCC) has defined the Global Warming Potential (GWP) for a number of greenhouse gases, and all are referenced to carbon dioxide which is assumed to have a GWP of 1. For example, the IPCC GWP for methane (CH_4) is 21. To allow a quantitative comparison between the emissions of different types of greenhouse gases it is necessary to convert all emissions to a universally comparable unit. The methodology adapted by the NGA Factors document and used in this assessment converts all emissions for non-carbon dioxide gases to a carbon dioxide equivalent (CO_2-e). Emissions from non-carbon dioxide gases are converted to t CO_2-e by multiplying the emission of each non-carbon dioxide gas by its GWP.

2 CALCULATIONS

2.1 SCOPE 1 EMISSIONS

2.1.1 Diesel Consumption by Loaders and Trucks Onsite

The formula for calculating GHG emissions from diesel fuel combustion onsite and during transportation of materials is given as

GHG emission (t CO_2-e) = Q x EF **(Equation 1)**

Where: Q is the quantity of fuel consumed expressed in tonnes or by volume (kL)

EF is the relevant emission factor, obtained from the *National Greenhouse Accounts (NGA) Factors* document, or the GHG Protocol online database

The FY2007 diesel usage from PKCT records were used in the calculations for existing operations. The 2007 diesel usage was increased by 20% to accommodate additional use associated with the proposed increase in throughput of coal & bulk product by the PKCT.

Associated with this Scope 1 emission is also the Scope 3 emissions due to diesel consumption discussed below in Section 2.3.1. The EF for diesel combustion (Scope 1) is 2.7 t CO_2-e / kL of diesel consumed while the Scope 3 EF value is 0.2 t CO_2-e / kL of diesel consumed.

2.2 SCOPE 2 EMISSIONS

2.2.1 Emissions Associated with Electricity Consumption

Emissions from the consumption of purchased electricity were calculated using the following equation (*NGA Factors*, 2008):

GHG Emission (t CO_2-e) = (Q x EF) / 1000 (Equation 2)

Where: Q is the amount of electricity consumed in kWh

EF is the relevant emission factor, obtained from *NGA Factors* document

PKCT records relating to electricity usage in FY2007 was used in the calculations for the current 24/7 operations.

In the proposed scenario the current 24/7 onsite operations will continue but since the amount of coal & bulk product throughput will increase the amount of electricity consumption will also increase. We have allowed a 20% increase in the electricity usage to account for increased coal & bulk product throughput. It should be noted that as the PKCT already operates 24/7 much of the plant is using electricity during the hours that public road deliveries are currently prohibited. Due to this, additional electricity used is not proportional to additional throughput.

2.3 SCOPE 3 EMISSIONS

2.3.1 Emissions Associated with Shipping of Coal & Bulk Products to Customers

A preliminary estimate of GHG emissions from sea transport of product coal and bulk products was undertaken using similar methodology to that used in the Anvil Hill Coal Project GHG Assessment Addendum Report to the Director-General Department of Planning (Independent Hearing and Assessment Panel for the Anvil Hill Coal Project, 2007). The assessment makes the following assumptions:

1. The percentage of clean coal and bulk products that will be transported by sea to customers for the proposed scenario will be the same as the average over the 2007 operations. These percentages are as follows:

    - 21% – India
    - 15% – Europe/UK/Africa/Other
    - 57% – China/Japan/Korea/Taiwan
    - 7% – Domestic (assumed Whyalla, South Australia)

2. Cargo ship carrying capacity 75,000 tonnes.

3. Freight shipping energy efficiency is equal to 4.16 tkm / MJ.

4. Shipping distances are as follows:

    - 12,000 km to India/Japan/China
    - 20,000 km to Europe/UK/Africa
    - 1,000 km to Whyalla (South Australia)

5. Ships are assumed to burn heavy fuel oil.

6. All trips are assumed one way as it is likely that ships would carry other goods elsewhere upon unloading trip.

The calculations for the preliminary estimation of GHG emissions associated with shipping of clean coal and bulk products are provided in **Table 1** (current operations) and **Table 3** (proposed operations) of this appendix.

2.3.2 Emissions Associated with End-Use Coal Combustion

We have classed this indirect source of emissions under scope 3 as emissions will be generated by the end-user, with 93% (see **Section 2.3.1**) being generated overseas. The formula for calculating emissions from end-use coal combustion is given by:

GHG Emission (t CO_2-e) = (Q x EF) / 1000 **(Equation 3)**

Where: Q is the amount of electricity consumed in kWh

EF is the relevant emission factor, obtained from *NGA Factors* document

EF is the full fuel cycle emission factor for NSW coal (98.1 t CO_2-e per kg of coal combusted) and is the sum of both the Scope 1 and Scope 3 coal combustion EF values.

2.3.3 Emissions Associated with the Transport of Coal & Bulk Products to PKCT

Transport fuels consumed for the transport of coal and bulk products from mines both by rail and road are Scope 3 as this is consumed by vehicles owned and run by companies other than PKCT. The emissions are calculated using the formula:

GHG Emission (t CO_2-e) = (Q x EF) / 1000 **(Equation 4)**

Where: Q is the amount of electricity consumed in kWh

EF is the relevant emission factor, obtained from *NGA Factors* document

The EF factor used is the full fuel cycle value of 2.9 t CO_2-e / kL diesel consumed.

Road

These calculations are based on:

1. The actual amount (FY2007) and predicted amount (FY2014) (as provided to DoP by PKCT) of coal & bulk products, in tonnes, delivered to PKCT by public and private road from: West Cliff Colliery; No. 1 Mine; Dendrobium CPP/BSL Steelworks; and Coalcliff Coke Works (refer to **Figure 1** & **Table 1**)
2. The number of trucks required to carry this amount of coal/bulk products (assuming an average truck capacity of 30 t)
3. The distance (km) from the delivery points of origin to PKCT
4. The amount of diesel used per km in a standard truck engine (0.25 L per km).

This provides the amount of Kl of diesel used to transport the actual FY2007 and predicted FY2014 road deliveries to PKCT and is shown under heading 5 (Emissions from Transport of Coal & Bulk Products to PKCT by Road) in the GHG calculation spreadsheets below. GHG emissions from this Kl amount of diesel are calculated using equation 4 (above).

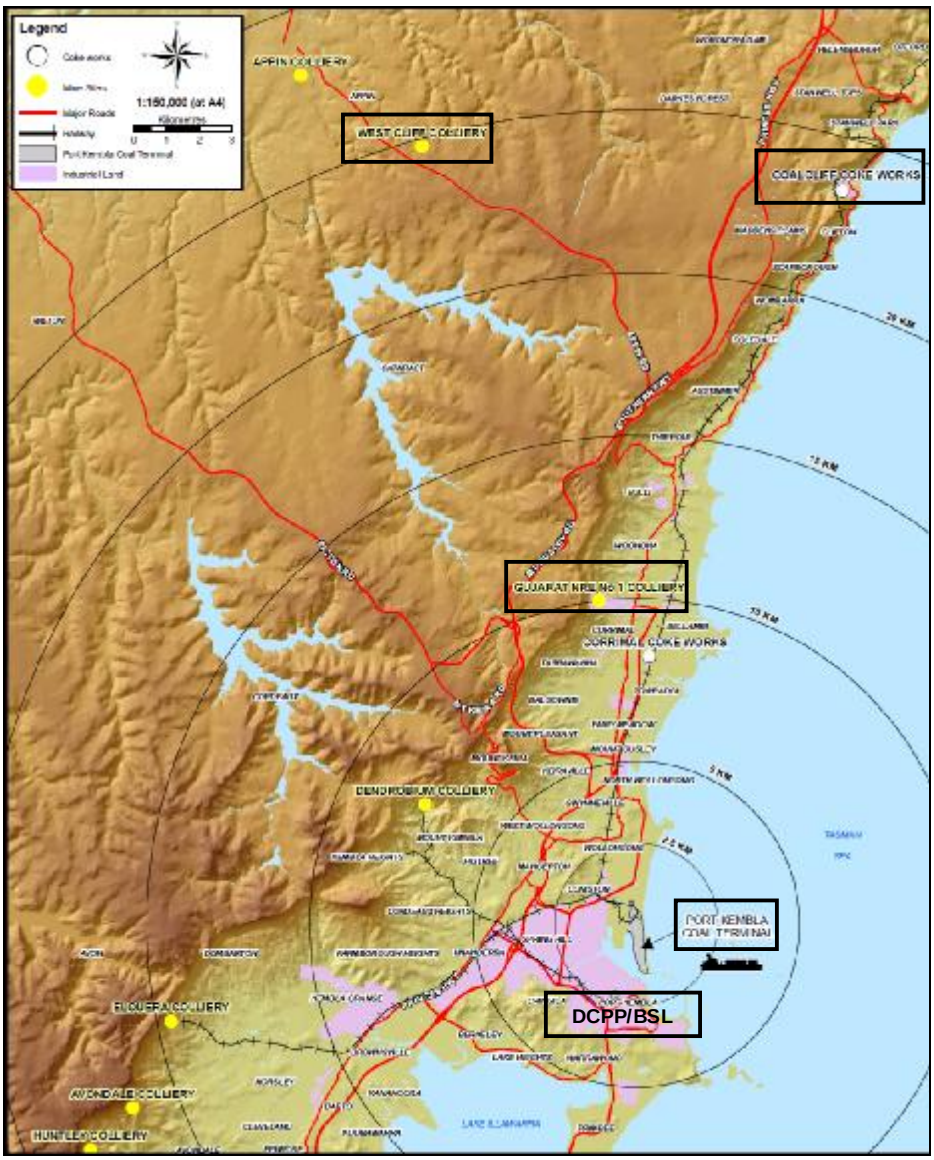

FIGURE 1 – ROAD DELIVERY POINTS OF ORIGIN

TABLE 1 – ROAD DISTANCES

Point of Origin	Distance to PKCT (return trip)
BHPBIC West Cliff Colliery	80 km
GNRE No.1 Mine	30 km
Dendrobium CPP/BSL Steelworks	13 km
Coalcliff Coke Works (via Southern Freeway)	82 km

Rail

These calculations are based on:

1. The actual amount (FY2007) and predicted amount (FY2014) (as provided to DoP by PKCT) of coal and Bulk Products, in tonnes, delivered to PKCT by rail from the NSW Western Coalfields and Southern Coalfields (refer to **Figure 2** & **Table 2**)
2. The number of rail journeys (each train has three locomotives) required to carry this amount of coal and bulk products (assuming an average train capacity of 3,300 t)
3. The distance (km) from the delivery points of origin to PKCT
4. The amount of diesel used per km in a standard locomotive engine (4.3 L per km (data from Pacific National)).

This provides the amount of kL of diesel used to transport the actual FY2007 and predicted FY2014 rail deliveries to PKCT and is shown under heading 6 (Emissions from Transport of Coal and Bulk Products to PKCT by Rail) in the GHG calculation spreadsheets below. GHG emissions from this kL amount of diesel are calculated using equation 4 (above).

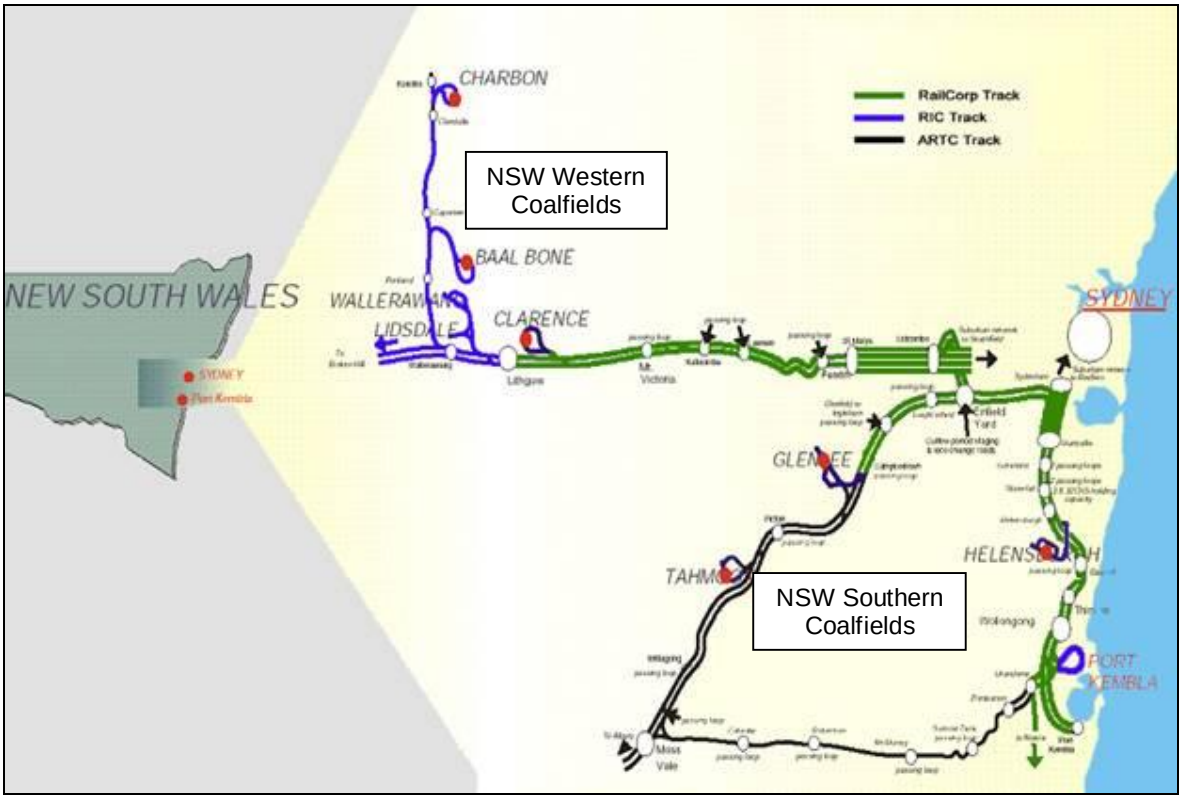

FIGURE 2 – LOCATION OF NSW COALFIELDS

TABLE 2 – RAIL DISTANCES

Point of Origin	Distance to PKCT (return trip)
Lithgow	652 km
Helensburgh	74 km
Tahmoor	224 km
Wongawilli	17 km

2.3.4 Emissions from Waste Generation and Disposal

Municipal solid waste that is ultimately disposed of in a well-managed landfill is estimated to produce methane in accordance with the formula:

GHG Emission (t CO_2-e) = [(Q x DOC) / 3 – R)] x 18.9 **(Equation 5)**

Where: Q is the quantity of municipal waste in tonnes

DOC is the degradable organic carbon expressed as a proportion of the particular waste type and listed in the NGA Factors document

R is the recovered methane (in tonnes) from wastewater in an inventory year

However, since the actual composition of the waste is not known we use the weighted average emission factors for municipal, commercial and industrial and construction and demolition waste, given as 1.11 t CO_2-e / t waste, to calculate GHG emissions from the PKCT site.

2.3.5 Emissions from Staff Travel

PKCT employees commute to and from the Terminal each day to attend work. Emissions from employee's vehicular engines are related to PKCT through the employee but are not under the control of the company and as such are deemed Scope 3 emissions. The extent of the GHG emissions are calculated using Equation 6 below.

GHG Emission (t CO_2-e) = (Q x EF) / 1000 **(Equation 6)**

Where: Q is the amount of kL consumed by staff travel

EF is the relevant emission factor, obtained from Table 3 of *NGA Factors* document

This calculation is based on PKCT, on average, employing 30 staff per day at weekends and 80 staff per day during weekdays. These staff numbers are multiplied to give the total number of staff working days per year. It is impossible to determine the mode of transport used to commute or the commute distance for each employee. Due to this, an average travel distance of 30km (60km return trip) and use of an average size car is used in these calculations.

The 60km return trip is multiplied by the number of employees to provide an estimation of the total km commuted per year. The distance is multiplied by the petrol consumption of an average size car (7L / 100 km) to provide an estimation of the annual amount of fuel consumed by PKCT employees in relation to travelling to work. This figure is used in equation 6 to calculate the GHG emissions.

2.4 EMISSIONS NOT INCLUDED IN ASSESSMENT

The following Scope 3 emission sources were not considered in this assessment:

- Disposal (end of life) of product sold
- Fugitive emissions due to coal production
- Extraction, production, and transport of other purchased materials and goods (eg. packaging materials)
- Out sourced activities.

There are practical difficulties and anomalies associated with determining these Scope 3 upstream emissions in any assessment and are thus generally not required to be included in GHG emission calculations, according to the international emission accounting and reporting frameworks. This is especially true of building materials production where no stringent records have been kept or are easily accessible from the open literature, or online.

In any case, these minor point sources are expected to make negligible contributions in comparison with the Scope 1 and Scope 2 emissions included in the assessment.

Table 1: Greenhouse Gas Assessment Calculations for Port Kembla Coal Terminal – Current

Greenhouse Gas Assessment Calculations - Port Kembla Coal Terminal - Current Operations

Prepared By: PFP

Updated On: 29 April 2009

Checked By:

NOTE: XXX = Emission rate in t CO_{2-e} / annum

Parameter	Value	Unit
1. Emissions from PKCT Diesel Consumption Onsite (Scope 1)		
Data for Consumption Calculations		
(refer email with PKCT data from Debra Murphy 24-Aug-2007)		
FY2007 PKCT Diesel Consumption	126	kL / yr
Diesel Emission Factors (EF)		
(refer NGA Factors January 2008, p13, Table 1.2)		
EF (CO_{2-e}) Scope 1 (Diesel combustion)	2.7	t / kL Diesel Consumed
EF (CO_{2-e}) Scope 3 (Diesel combustion)	0.2	t / kL Diesel Consumed
EF (CO_{2-e}) Scopes 1 & 3 (Diesel consumption)	2.9	t / kL Diesel Consumed
Onsite Fuel Combustion GHG emission (Scope 1)	340.2	t CO_{2-e} / yr
Onsite Fuel Combustion GHG emission (Scope 3)	25.2	t CO_{2-e} / yr
Overall Onsite Fuel Combustion GHG Emission (Scope 1 + Scope 3)	**365**	**t CO_{2-e} / yr**

2. Emissions from PKCT Electricity Consumption (Scope 2 & Scope 3)			
Consumption Calculations			
FY2007 PKCT Electricity Consumption	21,000		MWh / yr
FY2007 PKCT Electricity Consumption	21,000,000		kWh / yr
Emission Calculation:			
(refer NGA Factors January 2008, p16, Table 5)			
EF (CO_{2-e}) Scope 2 (Electricity consumed in NSW & ACT)		0.89	kg/kWh
EF (CO_{2-e}) Scope 3 (Electricity consumed in NSW & ACT)		0.17	kg/kWh
EF (CO_{2-e}) Scope 2 & 3 (Electricity consumed in NSW & ACT)		1.06	kg/kWh
Onsite Electricity Consumption GHG Emission (Scope 2)	**18,690**		**t CO_{2-e} / yr**
Onsite Electricity Consumption GHG Emission (Scope 3)	**3,570**		**t CO_{2-e} / yr**
Overall Onsite Electricity Consumption GHG Emission (Scope 2 & 3)	**22,260**		**t CO_{2-e} / yr**
3. Emissions from Shipping to Customers (Scope 3)			
(Refer "Customer Shipping" Spreadsheet)			
Total Emission from Shipping to Customers (Scope 3)	**920,124**		**t CO_{2-e} / yr**
Total Emission from Shipping to Customers (Scope 3) Overall Emission Rate	**920,124**		**t CO_{2-e}/yr**

4. End Use Combustion of Coal (Scope 3)		
EF Full Fuel Cycle for NSW Coal Combustion	**98.1**	**kg CO_{2-e} / GJ**
Energy content of Black coal for electricity in NSW	**22.5**	**GJ/t**
Total energy content of 12.2 Mt of coal throughput	**274,500,000.0**	**GJ**
Emissions from exported coal and domestic coal use (12.2 Mt)	**26,928,450**	**t CO_{2-e} / yr**
Total Emission from Customer Coal Combustion (Scope 3)	**26,928,450**	**t CO_{2-e} / yr**
5. Emissions from Transport of Coal & Bulk Products from Mines to PKCT by Road (Scope 3)		
Diesel Consumption for total distance travelled by all trucks (based on number of trucks to deliver FY07 coal & bulk products amounts (as provided to DoP by PKCT), distance from mine to PKCT and standard truck engine consumption)	2591.67	kL
Diesel Emission Factors (EF)		
(refer NGA Factors January 2008, p13, Table 1.2)		
EF (CO_{2-e}) Full Fuel Cycle (Diesel consumption)	2.9	t / kL Diesel Consumed
Transport Diesel Combustion GHG emission (Scope 3)	**7516**	**t CO_{2-e} / yr**
Total GHG Emissions from Coal & Bulk Products Transport from Mines to PKCT by Road (Scope 3)	**7516**	**t CO_{2-e} / yr**

6. Emission from Transport of Coal from Mines to PKCT by Rail (Scope 3)		
Coal transported by rail	6.7	Mt / yr
Diesel consumption for transport of 6.7 Mt of coal (based on number of train journeys to deliver FY14 coal amounts (as provided to DoP by PKCT), distance from mine to PKCT and standard train engine consumption)	4113.9	kL
EF (CO_{2-e}) Full Fuel Cycle (Diesel combustion)	2.9	t / kL
Emissions from transport of 6.7 Mt coal from mines to PKCT by rail	**11930**	**t CO_{2-e} / yr**
Total GHG Emissions from Coal Transport from Mines to PKCT by Rail (Scope 3)	**11930**	**t CO_{2-e} / yr**
7. Emissions from Waste Generated Onsite during Operations (Scope 3)		
Waste (dry) generated per year onsite	291	t
Waste (liquid) generated per year onsite (assume liquid density = 1.3 g/mL)	53	t
Weighting factor for unknown composition	1.1	t CO_{2-e} / yr
Emissions from disposal of waste generated onsite	379	t CO_{2-e} / yr
Total GHG Emissions from Waste Generated onsite during PKCt operations	**379**	t CO_{2-e} / yr
8. Emissions from Staff Travel (Scope 3)		
Full fuel cycle emission factor (Table 3, NGO Factors)	2.5	t CO_{2-e} / kL
Total staff equivalent at weekends per year with 30 staff per day	3120	/ yr
Total staff equivalent during weekdays per year at 80 staff per day	20800	/yr
Total distance travelled by each staff assuming they live within 30 km from PKCT site	1435200	km
Petrol consumption for total distance travelled assuming 7L / 100 km consumption for an average -sized car	100	kL
Emissions for total staff per year (commute to and from work, business travel)	**251**	t CO_{2-e} / yr

Total GHG Emissions from PKCT Staff & Truck Drivers (Scope 3)	**251**	**t CO_{2-e} / yr**
Total Scope 1 GHG Emissions	**340**	**t CO_{2-e} / yr**
Total Scope 2 GHG Emissions	**18690**	**t CO2-e / yr**
Total Scope 3 GHG Emissions	**27.872**	**Mt CO2-e / yr**
Total GHG Emissions (Scope 1 + Scope 2)	**19.030**	**Mt CO_{2-e} / yr**
Total GHG Emissions (Scope 1, Scope 2, Scope 3)	**27.891**	**Mt CO_{2-e} / yr**
Total GHG Emissions (Scope 1, Scope 2, Scope 3) per tonne of coal/bulk product	**2.38**	**t CO_{2-e} / yr**
GHG Emissions (Scope 1, Scope 2) per tonne of coal/bulk product	**0.00163**	**t CO2-e / yr**

Table 2: PKCT Shipping Information - Current

PKCT Shipping Emission Calculations -Current

Prepared By: PFP

Updated On: 28 April 2009

Checked By:

End User Location	India	Europe/UK/Africa/Other	China/Japan/Korea/ Taiwan	Domestic	TOTAL
2007 Tonnage	2,562,000	1,830,000	6,954,000	854,000	**12,200,000**
% of Total Coal & Bulk Product Throughput	21	15	57	7	**100**
Avg. Shipping Distance (km)	12,000	20,000	12,000	1,000	**45,000**
Carrying Capacity of Ship (tonnes)	75,000	75,000	75,000	75,000	**300,000**
No of Ship movements required	34	24	93	34	**185**
Rate as per (DEFRA 2008) (kg CO2/tkm)	0.006	0.006	0.006	0.006	
Total Shipping (Mtkm)	30,744	36,600	83,448	2,562	**153,354**
Total Emission (t CO_{2-e})	184,464	219,600	500,688	15,372	**920,124**

NOTES:

1. Assumed average shipping distance from Australia to China/Japan/India is 12,000km

2. Assumed average shipping distance from Australia to Europe/UK/Africa is 20,000km

3. Assumed average shipping distance to domestic customers in Australia is 1,000km (approx. distance to SA)

4. Percentages to different destinations approved by Debra Murphy of PKCT by e-mail dated 28 April 2009.

Table 3: Greenhouse Gas Assessment Calculations for Port Kembla Coal Terminal – Proposed

Greenhouse Gas Assessment Calculations - Port Kembla Coal Terminal - Proposed Operations

Prepared By: PFP

Updated On: 29 April 2009

Checked By:

NOTE: XXX = Emission rate in t CO_{2-e} / annum

Parameter	Value	Unit
1. Emissions from PKCT Diesel Consumption Onsite		
Data for Consumption Calculations		
(refer email with PKCT data from Debra Murphy 24-Aug-2007)		
FY2007 PKCT Diesel Consumption	126	kL / yr
FY2014 PKCT Diesel Consumption plus 20% increase	151	kL / yr
Diesel Emission Factors (EF)		
(refer NGA Factors January 2008, p13, Table 1.2)		
EF (CO_{2-e}) Scope 1 (Diesel combustion)	2.7	t / kL Diesel Consumed
EF (CO_{2-e}) Scope 3 (Diesel combustion)	0.2	t / kL Diesel Consumed
EF (CO_{2-e}) Scopes 1 & 3 (Diesel consumption)	2.9	t / kL Diesel Consumed
Onsite Fuel Combustion GHG emission (Scope 1)	408.2	t CO_{2-e} / yr
Onsite Fuel Combustion GHG emission (Scope 3)	30.2	t CO_{2-e} / yr
Overall Onsite Fuel Combustion GHG Emission (Scope 1 + Scope 3)	**438**	**t CO_{2-e} / yr**

2. Emissions from PKCT Electricity Consumption (Scope 2 & Scope 3)			
Consumption Calculations			
FY2007 PKCT Electricity Consumption	21,000		MWh / yr
FY2014 PKCT Electricity Consumption plus 20% increase	25,200,000		kWh / yr
Emission Calculation:			
(refer NGA Factors January 2008, p16, Table 5)			
EF (CO_{2-e}) Scope 2 (Electricity consumed in NSW & ACT)		0.89	kg/kWh
EF (CO_{2-e}) Scope 3 (Electricity consumed in NSW & ACT)		0.17	kg/kWh
EF (CO_{2-e}) Scope 2 & 3 (Electricity consumed in NSW & ACT)		1.06	kg/kWh
Onsite Electricity Consumption GHG Emission (Scope 2)	**22,428**		**t CO_{2-e} / yr**
Onsite Electricity Consumption GHG Emission (Scope 3)	**4,284**		**t CO_{2-e} / yr**
Overall Onsite Electricity Consumption GHG Emission (Scope 2 & 3)	**26,712**		**t CO_{2-e} / yr**
3. Emissions from Shipping to Customers (Scope 3)			
(Refer "Customer Shipping" Spreadsheet)			
Total Emission from Shipping to Customers (Scope 3)	**1,764,828**		**t CO_{2-e} / yr**
Total Emission from Shipping to Customers (Scope 3) Overall Emission Rate	**1,764,828**		**t CO_{2-e}/yr**

4. End Use Combustion of Coal (Scope 3)		
EF Full Fuel Cycle for NSW Coal Combustion	98.1	kg CO_{2-e} /GJ
Energy content of black coal in NSW	22.5	GJ/t
Total energy content of proposed 23.4 Mt of coal throughput in one year	526,500,000	GJ
Emissions from exported coal and domestic coal use (23.4 Mt)	**51,649,650**	**t CO_{2-e} / yr**
Total Emission from Customer Coal Combustion (Scope 3)	**51,649,650**	**t CO_{2-e} / yr**
5. Emissions from Transport of Coal & Bulk Product from Mines to PKCT by Road (Scope 3)		
Diesel Consumption for total distance travelled by all trucks in FY2014 (based on number of trucks to deliver FY14 coal & bulk products amounts (as provided to DoP by PKCT), distance from mine to PKCT and standard truck engine consumption)	3591	kL
Diesel Emission Factors (EF)		
(refer NGA Factors January 2008, p13, Table 1.2)		
EF (CO_{2-e}) Full Fuel Cycle (Diesel consumption)	2.9	t / kL Diesel Consumed
Transport Diesel Combustion GHG emission (Scope 3)	**10413**	**t CO_{2-e} / yr**
Total GHG Emissions from Coal & Bulk Product Transport from Mines to PKCT by Road (Scope 3)	**10413**	**t CO_{2-e} / yr**
6. Emission from Transport of Coal from Mines to PKCT by Rail (Scope 3)		
Coal transported by rail (FY2014)	13.4	Mt / yr
Diesel consumption for transport of 13.4 Mt of coal (based on number of train journeys to deliver FY14 coal & bulk products amounts (as provided to DoP by PKCT), distance from mine to PKCT and standard train engine consumption)	5919.4	kL
EF (CO_{2-e}) Full Fuel Cycle (Diesel combustion)	2.9	t / kL
Emissions from transport of 13.4 Mt coal & bulk products from mines to PKCT by rail	**17166**	**t CO_{2-e} / yr**
Total GHG Emissions from Coal & Bulk Products Transport from Mines to PKCT by Rail (Scope 3)	**17166**	**t CO_{2-e} / yr**

7. Emissions from Waste Generated Onsite during Operations (Scope 3)		
Waste (dry) generated per year onsite plus 20% increase	349	t
Waste (liquid) generated per year onsite (volume*density) plus 20% increase	64	t
Weighting factor for unknown composition	1.1	t $CO_{2\text{-}e}$ / yr
Emissions from disposal of waste generated onsite plus 20% increase	**454**	**t $CO_{2\text{-}e}$ / yr**
Total GHG Emissions from Waste Generated onsite during PKCT operations	**454**	**t $CO_{2\text{-}e}$ / yr**

8. Emissions from Staff Travel (Scope 3)		
Full fuel cycle emission factor (Table 3, NGO Factors)	2.5	t CO2-e / kL
Total staff equivalent at weekends per year with 30 staff per day for 2 days per week for 52 weeks	3120.0	/ yr
Total staff equivalent during weekdays per year at 80 staff per day	20800	/yr
Total distance travelled by each staff assuming they live within 30 km from PKCT site	1435200	km
Petrol consumption for total distance travelled assuming 7L / 100 km consumption for an average - sized car	100	kL
Emissions for total staff per year (commute to and from work, business travel)	251	t CO2-e / yr
Total GHG Emissions from PKCT Staff & Truck Drivers (Scope 3)	**251**	**t $CO_{2\text{-}e}$ / yr**
Total Scope 1 GHG Emissions	**408**	**t $CO_{2\text{-}e}$ / yr**
Total Scope 2 GHG Emissions	**22428**	**t CO2-e / yr**
Total Scope 3 GHG Emissions	**53.45**	**Mt CO2-e / yr**

Total GHG Emissions (Scope 1 + Scope 2)	**22.84**	**Mt $CO_{2\text{-}e}$ / yr**
Total GHG Emissions (Scope 1, Scope 2, Scope 3)	**53.47**	**Mt $CO_{2\text{-}e}$ / yr**
Total GHG Emissions (Scope 1, Scope 2, Scope 3) per tonne of coal/bulk product	**3.24**	**t $CO_{2\text{-}e}$ / yr**
GHG Emissions (Scope 1+ Scope 2) per tonne of coal/bulk product	**0.001384**	**t $CO_{2\text{-}e}$ / yr**

Table 4: PKCT Shipping Information – Proposed

PKCT Shipping Emission Calculations - Proposed

Prepared By: PFP

Updated On: 28 April 2009

Checked By:

End User Location	India	Europe/UK/Africa/Other	China/Japan/Korea/Taiwan	Domestic	TOTAL
2014 Tonnage	4,914,000	3,510,000	13,338,000	1,638,000	**23,400,000**
% of Total Coal & Bulk Product Throughput	21	15	57	7	**100**
Avg. Shipping Distance (km)	12,000	20,000	12,000	1,000	**45,000**
Carrying Capacity of Ship (tonnes)	75,000	75,000	75,000	75,000	**300,000**
No of Ship movements required	66	47	178	66	**356**
Total Shipping (Mtkm)	58,968	70,200	160,056	4,914	**294,138**
Rate as per (DEFRA 2008) (kg CO2/tkm)	0.006	0.006	0.006	0.006	
Total Emission (t CO_{2-e})	353,808	421,200.000	960,336.000	29,484.000	**1,764,828**

NOTES:

1. Assumed average shipping distance from Australia to China/Japan/India is 12,000km
2. Assumed average shipping distance from Australia to Europe/UK/Africa is 20,000km
3. Assumed average shipping distance to domestic customers in Australia is 1,000km (approx. distance to SA)
4. Percentages to different destinations approved by Debra Murphy of PKCT by e-mail dated 28 April 2009.