HANCOCK PROSPECTING PTY LTD

Alpha Coal Project Environmental Impact Statement

C Climate and Climate Change and Greenhouse Gas

Greenhouse Gas Calculations

Greenhouse Gas Emissions Calculator - Alpha Rail

CONSTRUCTION

Raw Materials	Value	Units	Total Value (Q)	Units	Scope 1 Emission Factor (EF)	Scope 2 Emission Factor (EF)	Scope 3 Emission Factor (EF)	Total Emission Factor (EF)	Units	Source	Method	Scope 1 Emissions (t CO2-e)	Scope 2 Emissions (t CO2-e)	Scope 3 Emissions (t CO2-e)	Total Emissions (t CO2-e)	Proportion of Total Inventory %	Proportion of Total Inventory %
Sand (Common)	2,209,100	m^3	3,538,978	t	0.000	0.000	0.0169	0.0169	t CO_2-e/t	Simapro Australian Database	Q x EF	0	0	59,809	59,809	2.76%	0.71%
Gravel (Common)	2,209,100	m^3	3,362,250	t	0.000	0.000	0.0170	0.0170	t CO_2-e/t	Simapro Australian Database	Q x EF	0	0	57,158	57,158	2.63%	0.68%
Crushed Aggregate (Common)	2,209,100	m^3	4,550,746	t	0.000	0.000	0.0041	0.0041	t CO_2-e/t	EcoInvent Unit Process	Q x EF	0	0	18,613	18,613	0.86%	0.22%
Crushed rock (Rock)	5,627,300	m^3	9,014,935	t	0.000	0.000	0.0169	0.0169	t CO_2-e/t	Simapro Australian Database	Q x EF	0	0	152,352	152,352	7.02%	1.80%
Sand (Borrow material for general fill)	2,437,167	m^3	3,904,341	t	0.000	0.000	0.0169	0.0169	t CO2-e/t	Simapro Australian Database	Q x EF	0	0	65,983	65,983	3.04%	0.78%
Gravel (Borrow material for general fill)	2,437,167	m^3	3,709,368	t	0.000	0.000	0.0170	0.0170	t CO2-e/t	Simapro Australian Database	Q x EF	0	0	63,059	63,059	2.91%	0.74%
Crushed Aggregate (Borrow material for general fill)	2,437,167	m^3	5,020,563	t	0.000	0.000	0.0041	0.0041	t CO2-e/t	EcoInvent Unit Process	Q x EF	0	0	20,534	20,534	0.95%	0.24%
Sand (General fill)	6,233,333	m^3	9,985,800	t	0.000	0.000	0.0169	0.0169	t CO2-e/t	Simapro Australian Database	Q x EF	0	0	168,760	168,760	7.78%	1.99%
Gravel (General fill)	6,233,333	m^3	9,487,133	t	0.000	0.000	0.0170	0.0170	t CO2-e/t	Simapro Australian Database	Q x EF	0	0	161,281	161,281	7.43%	1.91%
Crushed Aggregate (General fill)	6,233,333	m^3	12,840,667	t	0.000	0.000	0.0041	0.0041	t CO2-e/t	EcoInvent Unit Process	Q x EF	0	0	52,518	52,518	2.42%	0.62%
Crushed Aggregate (Top capping layer)	815,500	m^3	1,679,930	t	0.000	0.000	0.0041	0.0041	t CO2-e/t	EcoInvent Unit Process	Q x EF	0	0	6,871	6,871	0.32%	0.08%
Gravel (Ballast)	751,800	m^3	1,144,240	t	0.000	0.000	0.0170	0.0170	t CO2-e/t	Simapro Australian Database	Q x EF	0	0	19,452	19,452	0.90%	0.23%
Concrete (Sleepers)			247,500	t	0.000	0.000	0.1410	0.1410	t CO_2-e/t	Simapro Australian Database	Q x EF	0	0	34,898	34,898	1.61%	0.41%
Steel (Sleepers)			5,400	t	0.000	0.000	1.8574	1.8574	t CO_2-e/t	RMIT	Q x EF	0	0	10,030	10,030	0.46%	0.12%
Gravel (Maintenance Track)	1,113,750	m^3	1,695,128	t	0.000	0.000	0.0170	0.0170	t CO2-e/t	Simapro Australian Database	Q x EF	0	0	28,817	28,817	1.33%	0.34%
Total Raw Materials Embodied Emissions												**0**	**0**	**920,136**	**920,136**	**42.41%**	**10.87%**
Transportation of Materials to Site																	
Sand (Common)	3,538,978	t					14.700	14.7000	kg CO_2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	52,023	52,023	2.40%	0.61%
Gravel (Common)	3,362,250	t					14.700	14.7000	kg CO_2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	49,425	49,425	2.28%	0.58%
Crushed Aggregate (Common)	4,550,746	t					14.700	14.7000	kg CO_2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	66,896	66,896	3.08%	0.79%
Crushed rock (Rock)	9,014,935	t					14.700	14.7000	kg CO_2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	132,520	132,520	6.11%	1.57%
Sand (Borrow material for general fill)	3,904,341	t					2.450	2.4500	kg CO_2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	9,566	9,566	0.44%	0.11%
Gravel (Borrow material for general fill)	3,709,368	t					2.450	2.4500	kg CO_2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	9,088	9,088	0.42%	0.11%
Crushed Aggregate (Borrow material for general fill)	5,020,563	t					2.450	2.4500	kg CO_2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	12,300	12,300	0.57%	0.15%
Sand (General fill)	9,985,800	t					2.450	2.4500	kg CO_2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	24,465	24,465	1.13%	0.29%
Gravel (General fill)	9,487,133	t					2.450	2.4500	kg CO_2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	23,243	23,243	1.07%	0.27%
Crushed Aggregate (General fill)	12,840,667	t					2.450	2.4500	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	31,460	31,460	1.45%	0.37%
Crushed Aggregate (Top capping layer)	1,679,930	t					14.700	14.7000	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	24,695	24,695	1.14%	0.29%
Gravel (Ballast) - Merinda	286,060	t					16.195	16.1945	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	4,633	4,633	0.21%	0.05%
Gravel (Ballast) - Collinsville	286,060	t					35.280	35.2800	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	10,092	10,092	0.47%	0.12%
Gravel (Ballast) - Eaglefield	286,060	t					79.625	79.6250	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	22,778	22,778	1.05%	0.27%
Gravel (Ballast) - Gregory Hwy	286,060	t					121.030	121.0300	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	34,622	34,622	1.60%	0.41%
Cement (Sleepers)		t					47.775	47.7750	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	0	0	0.00%	0.00%
Steel (Sleepers)	5,400	t					280.280	280.2800	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	1,514	1,514	0.07%	0.02%
Gravel (Maintenance Track)	1,695,128	t					14.700	14.7000	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	24,918	24,918	1.15%	0.29%
Sleepers - Merinda to Collinsville	63,225	t					20.507	20.5065	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	1,297	1,297	0.06%	0.02%
Sleepers - Collinsville to Eaglefield	63,225	t					64.925	64.9250	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	4,105	4,105	0.19%	0.05%
Sleepers - Eaglefield to Gregory Hwy	63,225	t					106.330	106.3300	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	6,723	6,723	0.31%	0.08%
Sleepers - Gregory Hwy to Alpha Mine	63,225	t					172.235	172.2350	kg CO2-e/t	Materials Delivery worksheet	Q x EF/1000	0	0	10,890	10,890	0.50%	0.13%
Total Materials Transportation												**0**	**0**	**557,251**	**557,251**	**25.68%**	**6.58%**
Fuel - Operation																	
Diesel used - construction	163,590	kL	6,314,574	GJ	69.90		5.30	75.20	kg CO2-e/G	NGA Factors June 2009	Q x EF / 1000	441,389	0	33,467	474,856	**21.89%**	**5.61%**
Vegetation removal																	
Vegetation removal	1,600	ha						0.00	t CO2-e/ha	Full Carbon Accounting Model	Q x EF	217,451	0	0	217,451	10.02%	
Total Vegetation Removal												**217,451**	**0**	**0**	**217,451**	**10.02%**	**2.57%**
Total emissions for construction period												**217,451**	**0**	**1,477,386**	**2,169,694**	**100.00%**	**25.63%**

OPERATION

Fuel - Transport																	
Diesel used - transport operation (over 30 year period)	2,168,901	kL	83,719,571	GJ	69.90		5.30	75.20	kg CO2-e/G	NGA Factors June 2009	Q x EF / 1000	5,851,998	0	443,714	6,295,712	100.00%	74.37%
Total emissions for operation period												**5,851,998**	**0**	**443,714**	**6,295,712**	**100.00%**	74.37%

TOTAL PROJECT EMISSIONS	**6,069,449**	**0**	**1,921,100**	**8,465,405**	100.00%

Transportation of Materials

Transportation Emission Factors	EF	Units	Source
Rigid Truck	0.245	kg CO2-e/t.km	Simapro
International freight shipping	0.00537	kg CO2-e/t.km	SimaPro
Rail	0.0123	kg CO2-e/t.km	Simapro

Material	Origin	Rigid Truck Distance (km)	Ship Distance (km)	Rail Distance (km)	EF (kg CO2-e/t)
Materials - Construction					
Sand (Common)		60			14.7
Gravel (Common)		60			14.7
Crushed Aggregate (Common)		60			14.7
Crushed rock (Rock)		60			14.7
Sand (Borrow material for general fill)		10			2.5
Gravel (Borrow material for general fill)		10			2.5
Crushed Aggregate (Borrow material for general fill)		10			2.5
Sand (General fill)		10			2.5
Gravel (General fill)		10			2.5
Crushed Aggregate (General fill)		10			2.5
Crushed Aggregate (Top capping layer)		60			14.7
Ballast - Merinda	Proserpine	66.1			16.2
Ballast - Collinsville	Proserpine	144			35.3
Ballast - Eaglefield	Proserpine	325			79.6
Ballast - Gregory Hwy	Proserpine	494			121.0
Steel - reinforced concrete (Sleepers)	Brisbane	1144			280.3
Cement (Concrete - Sleepers)	Mackay	195			47.8
Gravel (Maintenance Track)		60			14.7
Sleepers - Merinda to Collinsville	Merinda camp	83.7			20.5
Sleepers - Collinsville to Eaglefield	Merinda camp	265			64.9
Sleepers - Eaglefield to Gregory Hwy	Merinda camp	434			106.3
Sleepers - Gregory Hwy to Alpha Mine	Merinda camp	703			172.2

Total Materials - Construction

References		
Reference 1		DEFRA, 2005 "Guidelines for Company Reporting on Greenhouse Gas Emissions"
Reference 2		http://www.portworld.com/map/
Reference 3	Distances calculated on	http://maps.google.com.au/
Reference 4	Ballast quarries in QLD	http://www.dme.qld.gov.au/mines/quarry_materials.cfm
Reference 5	Cement plant	http://www.cemaust.com.au/driver.asp?page=%2Foperations%2Flocations

Alpha Rail

Vegetation community	Area (ha)	Onsite (tC/ha)	Onsite (tC)	Onsite (t CO2-e)
Local Vegetation (FullCAM)				
Total area to be cleared	1600			217,451
		136		

Calculations by Matthew Searson:

Rainfall band	**1**	**2**	**3**	**4**	**5**
mm	**450-500**	**500-600**	**600-700**	**700-800**	**800-900**
	ha	ha	ha	ha	ha
Endangered	131.21	30.01	1.88	0	0
Of Concern	91.65	88.53	22.53	66.03	12.16
Least Concern	460.1	452.31	131.8	26.04	23.79
Regrowth	51.81	5.76	1.76	2.26	0.09
Total area	734.77	577	158	94	36
	tC/ha	tC/ha	tC/ha	tC/ha	tC/ha
Endangered	3,030	1,458	102	-	-
Of Concern	2,116	4,300	1,222	2,454	744
Least Concern	10,624	21,969	7,149	968	1,456
Regrowth	1,196	280	95	84	6
Total tC	16,965.84	28,006	8,568	3,505	2,206
	tCO2-e/ha	tCO2-e/ha	tCO2-e/ha	tCO2-e/ha	tCO2-e/ha
Endangered	11,119	5,349	374	-	-
Of Concern	7,766	15,781	4,485	9,005	2,731
Least Concern	38,989	80,625	26,236	3,551	5,343
Regrowth	4,390	1,027	350	308	20
Total tCO2	62,265	102,782	31,446	12,864	8,095

Fuel Use Operation

			Notes
Lifespan	*30*	years	
Fuel Consumption per trip (L/tonne)	**1.36**	L / tonne	1.36l/t (using 3 locos.) for the return trip.

Tonnes per annum

Year (calendar)	Tonnes	Fuel Usage		
2014	6000	8,160.00		
2015	18156	24,692.16		
2016	29168	39,668.48		
2017	42959	58,424.24		
2018	46066	62,649.76		
2019	52025	70,754.00		
2020-2043	58600	1,912,704.00		7,969,600
		2,177,052.64	L	
		2,177.05	kL	

Tonnes per annum					
Year (calendar)	6000	8,160.00		8,160,000.00	8,160,000.00
2014	18156000	24,692,160.00		24,692,160.00	24,692,160.00
2015	29168000	39,668,480.00		39,668,480.00	39,668,480.00
2016	42959000	58,424,240.00		58,424,240.00	58,424,240.00
2017	46066000	62,649,760.00		62,649,760.00	62,649,760.00
2018	52025000	70,754,000.00		70,754,000.00	70,754,000.00
2019	58600000	1,912,704,000.00		79,696,000.00	1,912,704,000.00
2020-2043		2,168,900,800.00	L		2,177,052,640.00
		2,168,900.80	kL		2,177,053

2,177,052,640.00	L	
2,177,052.64	kL	

Fuel Use Construction

Estimated Fuel Usage:

Bulk Earthworks (bench marked from past projects): 6 l/m3 - 18,700,000 m3 moved & treated: Approx 112,200,000 L		112,200,000	L
Road Maintenance: 6 plant; 50% of time spent per day for each 6 Separable portions; 700 days: Approx 2,000,000 L		2,000,000	L
Track Construction: Approx 500,000 liters		500,000	L
Camps:			
Camp 1 (800 man) Assume power is available before construction; Fuel needed for LV's /buses: 39,000 l/wk; 2 years: Approx 3,900,000 L		3,900,000	L
Camp 2 (600 man) inc LV's /buses: 98,000 l/wk; 2 years: Approx 10,200,000 L		10,200,000	L
Camp3 (600 man) inc LV's /buses: 98,000 l/wk; 2 years: Approx 10,200,000 L		10,200,000	L
Camp4 (600 man) inc LV's /buses: 98,000 l/wk; 2 years: Approx 10,200,000 L		10,200,000	L
Camp5 (600 man Assume power is available before construction; Fuel needed for LV's /buses: 30,000 l/wk; 2 years: Approx 3,000,000 L		3,000,000	L
Track Construction Depot: Assume power is available before construction: 0 L		-	L
Ballast Transport: Average haul dist 20km (round trip: 40km); 30m3 of ballast for a double; 900,000m3 of ballast; fuel consumption3 l/km; 3,600,000 L		3,600,000	L
Rail Transport: Fuel provided off site: 0 L		-	L
Miscellaneous & Other: 5 % of all above items: Approx 8,000,000 L	155,800,000	7,790,000	L
		163,590,000	L
		163,590	KL