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Gunns Ltd
Northern Tasmania Pulp Mill - Transport Greenhouse Gas Emissions

Construction of Pulp Mill	
Construction workers	4477.36
Deliveries	251.01
Total CO2 Emissions (t CO2-e) during 3-year construction phase	**4728.36**

Operation of Pulp Mill	**Startup (2008/09)**		**Snapshot 1(2013-2015)**		**Snapshot 2 (2019-2021)**	
	Anticipated Strategy	**Plantation Strategy**	**Anticipated Strategy**	**Plantation Strategy**	**Anticipated Strategy**	**Plantation Strategy**
RAIL SCENARIO						
Light vehicles - 60% Launceston	1128	1128	1128	1128	1128	1128
Light vehicles - 40% George Town	215	215	215	215	215	215
Chemical Delivery	129	129	129	129	129	129
Boiler Fuel Delivery	3453	3453	3453	3453	3453	3453
Timber Resources - By road	23455	23455	23041	26199	27137	30089
Timber Resources - By rail	39	37	97	117	100	99
Waste Disposal	17	17	17	17	17	17
Final product delivery	251478	251478	307362	307362	307362	307362
Total CO2 Emissions (t CO2-e)	**279913**	**279912**	**335441**	**338619**	**339540**	**342491**
NO RAIL SCENARIO						
Light vehicles - 60% Launceston	1128	1128	1128	1128	1128	1128
Light vehicles - 40% George Town	215	215	215	215	215	215
Chemical Delivery	129	129	129	129	129	129
Boiler Fuel Delivery	3453	3453	3453	3453	3453	3453
Timber Resources - By road	26811	26679	31416	36282	35751	38662
Waste Disposal	17	17	17	17	17	17
Final product delivery	251478	251478	307362	307362	307362	307362
Total CO2 Emissions (t CO2-e)	**283230**	**283098**	**343719**	**348585**	**348054**	**350965**

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Notes and Assumptions:
Ref: AGO Factors and Methods Workbook, December 2005; AGO Aust Methodology for the Estimation of GHG Emissions & Sinks, 2003; GHD Pulp Mill TIA
Construction:

Operation:
Light vehicles travel Launceston to Bell Bay return; 35 km each way; 60% of 275 veh/day; assume 365 days/yr and use of petrol
Light vehicles travel George Town to Bell Bay return; 10 km each way; 40% of 275 veh/day; assume 365 days/yr and use of petrol
Refer to Chem Del worksheet for chemical celivery calculations
Refer to Boiler Fuel worksheet for boiler fuel delivery calculations
Refer to Resource Del Road worksheet for resource delivery by road calculations
Refer to Resource Del Rail worksheet for resource delivery by rail calculations
Refer to Waste Disposal worksheet for waste disposal calculations
Refer to Product Del worksheet for product delivery calculations

Resource Delivery by Rail

Rail Scenario - Million Tonne Kilometres Travelled Per Annum

	Startup (2008/09)		Snapshot 1 (2013-2015)		Snapshot 2 (2019-2021)	
	Anticipated	Plantation	Anticipated	Plantation	Anticipated	Plantation
Total Rail pa (M tkm)	2.293	2.203	5.723	6.89	5.886	5.858
Energy Consumption (MJ)	556553	534709	1389078	1672330	1428641	1421845
CO2 Emissions (t CO2-e)	38.79	37.27	96.82	116.56	99.58	99.10

Assumptions

Ref: AGO Aust Methodology for the Estimation of GHG Emissions & Sinks, 2003; GHD Pulp Mill TIA, Section 6.13

Trains use diesel

Freight rail energy efficiency varies depending on the source of data, from 3 tkm/MJ to 5.24 tkm/MJ, therefore an avg will be used to calculate energy consumption 4.12 tkm/MJ

Fuel combustion factor of diesel (Table A.2) 69.7 g/MJ

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Waste Disposal

Distance from Proposed Pulp Mill (km)	No of kms Travelled per return trip	Estimated Trucks per day	Total No of Kms Travelled per year	Fuel Consumption Conversion	CO2 Emissions (t CO2-e)
1.5	3	20	21900	6197.7	16.73379

Assumptions

Ref: AGO Factors and Methods Workbook, December 2005; GHD Pulp Mill TIA, Section 4.4.4

All chemicals are delivered by medium truck (ie rigid trucks)

All trucks use diesel

Km travelled converted to fuel consumption using diesel rate for medium trucks (Table 4)	0.283
Fuel combustion factor of diesel (Table 3) in t CO2-e/kL	2.7

Waste disposal rate of approx 200 tonnes to landfill per day is consistent across the life of the pulp mill

No of trucks per day is based on the use of 10 tonne trucks

Distance from pulp mill to landfill is based on distance to the landfill from the existing chip mill (approx 1.4 km)

Waste disposal occurs 365 days per year

Final Product Delivery

	Startup (2008/09)		Snapshot 1 (2013-2015)		Snapshot 2 (2019-2021)	
	Anticipated	Plantation	Anticipated	Plantation	Anticipated	Plantation
Total Shipping pa (M tkm)	15009.3	15009.3	18344.7	18344.7	18344.7	18344.7
Energy Consumption (MJ)	3608004808	3608004808	4409783654	4409783654	4409783654	4409783654
CO2 Emissions (t CO2-e)	251478	251478	307362	307362	307362	307362

Assumptions

Ref: AGO Aust Methodology for the Estimation of GHG Emissions & Sinks, 2003;

Estimated No of Pulp Ships per year (avg 45,000 t): Startup - 18; Snapshot 1 - 22; Snapshot 2 - 22
Ships use diesel

Distance based on 5000 Nmiles converted to kms using factor of 1.853	18530	km return
Freight shipping energy efficiency to calculate energy consumption	4.16	tkm/MJ
Fuel combustion factor of diesel (Table A.2)	69.7	g/MJ

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Resource Delivery by Road

Rail Scenario - Million Log Truck Vehicle Kilometres Travelled Per Annum

	Startup (2008/09)			Snapshot 1 (2013-2015)			Snapshot 2 (2019-2021)		
	Control	Anticipated	Plantation	Control	Anticipated	Plantation	Control	Anticipated	Plantation
NE	6.252	5.328	5.325	5.508	4.174	5.49	6.46	5.214	6.258
NW	2.152	2.152	2.152	3.786	2.684	3.526	3.484	3.096	4.069
South	8.549	8.549	8.549	8.887	8.887	8.887	10.234	10.234	10.234
Total Road pa (M tkm)	**16.953**	**16.028**	**16.028**	**18.181**	**15.745**	**17.903**	**20.177**	**18.544**	**20.561**
Fuel Consumption Conversion	9188526	8687176	8687176	9854102	8533790	9703426	10935934	10050848	11144062
CO2 Emissions (t CO2-e)	24809.0202	23455.3752	23455.3752	26606.0754	23041.233	26199.2502	29527.0218	27137.2896	30088.9674

No Rail Scenario - Million Log Truck Vehicle Kilometres Travelled Per Annum

	Startup (2008/09)			Snapshot 1 (2013-2015)			Snapshot 2 (2019-2021)		
	Control	Anticipated	Plantation	Control	Anticipated	Plantation	Control	Anticipated	Plantation
NE	6.252	7.621	7.621	5.508	7.387	6.235	6.46	8.2	8.816
NW	2.152	2.152	2.152	3.786	5.193	9.671	3.484	5.996	7.369
South	8.549	8.549	8.549	8.887	8.887	8.887	10.234	10.234	10.234
Total Road pa (M tkm)	**16.953**	**18.321**	**18.231**	**18.181**	**21.468**	**24.793**	**20.177**	**24.43**	**26.419**
Fuel Consumption Conversion	9188526	9929982	9881202	9854102	11635656	13437806	10935934	13241060	14319098
CO2 Emissions (t CO2-e)	24809.0202	26810.9514	26679.2454	26606.0754	31416.2712	36282.0762	29527.0218	35750.862	38661.5646

Assumptions

Ref: AGO Factors and Methods Workbook, December 2005; GHD Pulp Mill TIA

All resource is delivered by heavy truck (ie articulated trucks)

All trucks use diesel

Km travelled converted to fuel consumption using diesel rate for heavy trucks (Table 4)	0.542
Fuel combustion factor of diesel (Table 3) in t CO2-e/kL	2.7

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Chemical Delivery

Chemical	Trucks per annum	Entering approach to Proposed Pulp Mill	No of kms Travelled per return trip	Total No of Kms Travelled per year	Fuel Consumption Conversion	CO2 Emissions (t CO2-e)
Sulphuric acid	1,245	North	4	4980	1409.34	3.805
Sulphate	165	North	4	660	186.78	0.504
Sand	150	South	142	21300	6027.9	16.275
Limestone	600	South	234	140400	39733.2	107.280
Burnt lime	183	South	4	732	207.156	0.559
Aluminium sulphate	154	South	4	616	174.328	0.471
Urea	97	North	4	388	109.804	0.296
Defoamer	28	North	4	112	31.696	0.086
Talc	28	North	4	112	31.696	0.086
Phosphoric acid	12	North	4	48	13.584	0.037
Sodium carbonate	6	North	4	24	6.792	0.018
Flocculation aids	6	North	4	24	6.792	0.018
Filtering aids	12	North	4	48	13.584	0.037
Boiler water & stream chemicals	1	North	4	4	1.132	0.003
Miscellaneous	1	North	4	4	1.132	0.003
TOTAL						**129.478**

Assumptions
Ref: AGO Factors and Methods Workbook, December 2005; GHD Pulp Mill TIA
All chemicals are delivered by medium truck (ie rigid trucks)
All trucks use diesel

Km travelled converted to fuel consumption using diesel rate for medium trucks (Table 4)	0.283
Fuel combustion factor of diesel (Table 3) in t CO2-e/kL	2.7

For deliveries from the Bell Bay port and from other businesses within Bell Bay to site assume 4 km return trip

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Boiler Fuel Delivery

Wood Residue Origin	Forest Catchment Origin	Quantity per annum (Tonnes)	Distance from Proposed Pulp Mill (km)	Tonnes per day	Estimated Trucks per day	Approaching Mill from direction	No of Trucks per year	No of kms Travelled per return trip	Total No of Kms Travelled per year	Fuel Consumption Conversion	CO2 Emissions (t CO2-e)
N/A	WK	1,500	8	6	0.22	South	54	16	857.14	464.57	1.25
N/A	DM	3,600	10	15	0.54	North	129	20	2571.43	1393.71	3.76
N/A	DM	13,500	10	56	2.01	North	482	20	9642.86	5226.43	14.11
N/A	DM	19,000	10	79	2.83	North	679	20	13571.43	7355.71	19.86
N/A	WK	15,600	30	65	2.32	South	557	60	33428.57	18118.29	48.92
N/A	DM	10,000	10	42	1.49	North	357	20	7142.86	3871.43	10.45
N/A	BL	14,400	40	60	2.14	South	514	80	41142.86	22299.43	60.21
N/A	LL	4,300	40	18	0.64	South	154	80	12285.71	6658.86	17.98
N/A	BL	10,002	38	42	1.49	South	357	76	27148.29	14714.37	39.73
N/A	BL	7,353	43	31	1.09	South	263	86	22584.21	12240.64	33.05
N/A	BL	2,500	38	10	0.37	South	89	76	6785.71	3677.86	9.93
N/A	BL	15,000	38	63	2.23	South	536	76	40714.29	22067.14	59.58
N/A	BL	7,952	51	33	1.18	South	284	102	28968.00	15700.66	42.39
N/A	BL	432	43	2	0.06	South	15	86	1326.86	719.16	1.94
N/A	BL	3,600	54	15	0.54	South	129	108	13885.71	7526.06	20.32
N/A	BL	480	54	2	0.07	South	17	108	1851.43	1003.47	2.71
N/A	LZ	1,920	110	8	0.29	South	69	220	15085.71	8176.46	22.08
N/A	M7	7,353	86	31	1.09	South	263	172	45168.43	24481.29	66.10
N/A	NG	4,590	220	19	0.68	South	164	440	72128.57	39093.69	105.55
N/A	NG	4,194	220	17	0.62	South	150	440	65905.71	35720.90	96.45
MILL RESIDUE TOTAL		***219,216***		***913***	***33***						**676.38**

Additional Wood Waste from Northeast Resource Catchment Zones							No of Trucks per year	No of kms Travelled per return trip	Total No of Kms Travelled per year	Fuel Consumption Conversion	CO2 Emissions (t CO2-e)
Blessington	BL	17,647	80	74	2.63	South	630.25	160	100840	54655.28	147.57

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Campbell Town	CB	17,647	105	74	2.63	South	630.25	210	132352.5	71735.055	193.68	
Dismal	DM	17,647	10	74	2.63	North	630.25	20	12605	6831.91	18.45	
Devonport	DT	17,647	80	74	2.63	South	630.25	160	100840	54655.28	147.57	
Fingal	FG	17,647	160	74	2.63	South	630.25	320	201680	109310.56	295.14	
Highlands	HI	17,647	175	74	2.63	South	630.25	350	220587.5	119558.425	322.81	
Lilydale	LL	17,647	55	74	2.63	South	630.25	110	69327.5	37575.505	101.45	
Liffey	LZ	17,647	80	74	2.63	South	630.25	160	100840	54655.28	147.57	
Merged Block 7	M7	17,647	65	74	2.63	South	630.25	130	81932.5	44407.415	119.90	
Merged Block 8	M8	17,647	135	74	2.63	North	630.25	270	170167.5	92230.785	249.02	
Meander	MQ	17,647	110	74	2.63	South	630.25	220	138655	75151.01	202.91	
Rosevale	RV	17,647	50	74	2.63	South	630.25	100	63025	34159.55	92.23	
Snake Bank	SN	17,647	115	74	2.63	North	630.25	230	144957.5	78566.965	212.13	
Sheffield	SQ	17,647	95	74	2.63	South	630.25	190	119747.5	64903.145	175.24	
Scottsdale	SZ	17,647	85	74	2.63	South	630.25	170	107142.5	58071.235	156.79	
Targa	TR	17,647	70	74	2.63		630.25	140	88235	47823.37	129.12	
Winkleigh	WK	17,647	35	74	2.63		630.25	70	44117.5	23911.685	64.56	
RESOURCE ZONE TOTAL		***300,000***		***1,250***	***45***							**2776.15**
GRAND TOTAL		**519,296**		**2,164**	**78**							**3452.52**

Assumptions

Ref: AGO Factors and Methods Workbook, December 2005; GHD Pulp Mill TIA

All boiler fuel is delivered by heavy truck (ie articulated trucks)
All trucks use diesel

Km travelled converted to fuel consumption using diesel rate for heavy trucks (Table 4)	0.542
Fuel combustion factor of diesel (Table 3) in t CO2-e/kL	2.7
Return trip factor	2
Wood residue transport truck load size (tonne)	28

Assume all trucks return to origin

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Construction Phase

	Vehicles per day	Vehicles during 3-year construction phase	No of kms Travelled per return trip	Total No of Kms Travelled during Construction	Fuel Consumption Conversion	CO2 Emissions (t CO2-e)
Construction workers						
Light vehicles - 60% Launceston	180	197100	70	13797000	1476279	3690.70
Light vehicles - 40% George Town	120	131400	20	2628000	281196	702.99
Buses - 100% George Town	5	5475	20	109500	30988.5	83.67
Total						**4477.36**
Deliveries						
Medium trucks - 80% Launceston	4	4380	70	306600	86767.8	234.27
Medium trucks - 20% George Town	1	1095	20	21900	6197.7	16.73
Total						**251.01**

The construction phase is likely to take place over a 3 year period
Traffic assoc with construction will be highly variable over the 3 year period hence it is difficult to accurately estimate vehicle numbers and distance travelled
Peak traffic for construction workers is estimated to be 900 veh/day plus 40 buses during the peak period of construction phase
On average it is assumed there will be 500 employees on site per day during the 3-year construction phase
On average it is assumed there will be 300 veh/day and 5 buses/day (carrying on avg 40 people/bus) during the 3-year construction phase
As there is no data relating to deliveries to site during construction, it is assumed that there will be on avg 5 medium trucks per day for 3 years;
Delivery trucks - 80% from Lton & 20% from George Town; assume medium trucks on avg rather than an unknown proportion of sm/med/lge trucks

External site construction activities such as effluent pipeline, landfill, water reservior and quarry construction have not been included due to lack of data on transport movements

Furthermore, as these external activities

Light vehicles use petrol and trucks/buses use diesel

Km travelled converted to fuel consumption using diesel rate for medium trucks (Table 4)	0.283
Km travelled converted to fuel consumption using petrol rate for light vehicles (Table 4)	0.107
Fuel combustion factor of diesel (Table 3) in t CO2-e/kL	2.7
Fuel combustion factor of petrol (Table 3) in t CO2-e/kL	2.5