

Appendix A: Industrial emissions survey form

Industrial Questionnaire

Rangiora Emissions Inventory 2005

Please complete and return by 30 April 2005

Company or organisation name.....

Resource consent number(s) if applicable.....

Street address.....

Postal address.....

Name of person completing questionnaire.....

Position.....

Contact telephone number.....

Fax number.....

PLEASE RING (03) 371 7196 IF YOU NEED ASSISTANCE WITH THIS QUESTIONNAIRE.

1. What type of industrial activity is undertaken?
2. Is the industrial activity mobile and if so, how often is it undertaken in the Rangiora area?
3. Please indicate whether the following equipment or activities are used or undertaken by the business:

<input type="checkbox"/> Coal – fired boiler	<input type="checkbox"/> Diesel – fired boiler/heater	<input type="checkbox"/> LPG –fired boiler/heater	<input type="checkbox"/> Foundry
<input type="checkbox"/> Powder coating	<input type="checkbox"/> LFO – fired boiler/heater	<input type="checkbox"/> Wood fired boiler	<input type="checkbox"/> Electric arc welding
<input type="checkbox"/> Quarrying	<input type="checkbox"/> Seed cleaning/handling	<input type="checkbox"/> Incinerator	<input type="checkbox"/> Concrete production
<input type="checkbox"/> Meat smoking	<input type="checkbox"/> Waste oil burner	<input type="checkbox"/> Abrasive blasting	<input type="checkbox"/> Flour milling
<input type="checkbox"/> Diesel – driven generator	<input type="checkbox"/> Other (please specify)		

4. If you use a solid fuel, liquid fuel or gas fired heating appliance or generator (other than small, portable, non-flued appliances), please fill out the following details (the first, shaded row is provided as an example):

Type of appliance ¹	Rating (kW)	Fuel Type	Type of emission control equipment	Operating Schedule and Fuel Use													
				June		July		August		Sep-Nov		Dec-Feb		Mar-Apr			
				Hours and days of operation	Average monthly fuel use ²	Hours and days of operation	Average monthly fuel use ²	Hours and days of operation	Average monthly fuel use ²	Hours and days of operation	Total fuel used in period ²	Hours and days of operation	Total fuel used in period ²	Hours and days of operation	Total fuel used in period ²		
FOR EXAMPLE: Vekos coal boiler	450 kW	coal	baghouse filter	Mon-Fri 08.00-12.00 Sat-08.00-10.00	30 tonnes	Mon-Fri 08.00-12.00	25 tonnes	Mon-Fri 08.00-12.00	25 tonnes	Mon-Fri 08.00-12.00	25 tonnes	Mon-Fri 08.00-12.00	80 tonnes	Mon-Fri 08.00-12.00	80 tonnes	Mon-Fri 08.00-12.00	80 tonnes
Please state any variation to the rate of operation of the appliance here: (for example: Boiler is run at 75% (08.00 - 10.00) and at 20% (10.00 - 12.00))																	
Any other comments:																	

¹ In column 1, please indicate brand/type of boiler e.g. - for coal boilers - chain grate, vekos, underfeed stoker, low ram etc
² Use either kg, tonnes or litres as units and indicate which one is used.

5. For other discharge sources please fill out the following details (the first, shaded row is provided as an example):

PLEASE REFER TO ATTACHMENT 1 IF UNSURE OF DATA REQUIRED:

Discharge type	Rate of operation ¹	Material used	Type of control equipment	Wintertime operating schedule and material used								Sep-Nov		Dec-Feb		Feb-Apr	
				June		July		August		Hours and days of operation	Material Used ²	Hours and days of operation	Material Used ²	Hours and days of operation	Material Used ²		
				Hours and days of operation	Average monthly material use ¹	Hours and days of operation	Average monthly material use ¹	Hours and days of operation	Average monthly material use ¹								
FOR EXAMPLE: Abrasive Blasting	120 kg/hr	Garnet	Filtration system	Mon - Fri 08.00 - 12.00 Sat 08.00 - 10.00	30 tonnes	Mon - Fri 08.00 - 12.00	25 tonnes	Mon - Fri 08.00 - 12.00	25 tonnes	Mon - Fri 08.00 - 12.00	80 tonnes	Mon - Fri 08.00 - 12.00	80 tonnes	Mon - Fri 08.00 - 12.00	80 tonnes		
Please make any relevant comments here:																	

¹ Use either kg/hour, tonnes/hour or litres/hour as units and indicate which one is used

²Total amount of material used over the entire time period

6. If the emissions from any processes or equipment have been measured please outline these below and attach emission test data if available.

Discharge Type	Compounds Measured	Discharge Rate	Tested By

For Office Use Only

Name

File number

Resource consent number(s)

Data entered

Attachment 1: Types of activity data required for different industries

Discharge type	Type of activity data required	Other data required
Abrasive blasting	Quantity of abrasive material used	Type of material eg, sand, garnet or metal
Aggregate handling and storage piles	Tonnes of material transferred	Type of material, mean wind speed
Asphalt plants	Tonnes of product produced	Process type eg, batch mix or drum mix, type of control equipment eg, venturi scrubber
Coal – fired boiler	Tonnes of coal burnt	Type of boiler eg, chain grate, vekos, underfeed stoker etc
Concrete Batching	Amount of concrete produced	Type of control equipment (eg baghouse filters)
Diesel – fired boiler	Litres or tonnes of diesel burnt	
Diesel – driven generator	Heat output of the generator (kW or kVa)	
Electric Arc Welding	Kilograms of rod used	Type of rod used, type of control equipment
Flour Milling	Amount of flour produced	Type of control equipment (eg baghouse filter)
Foundry	Tonnes of metal melted	Type of metal, type of furnace, type of control equipment (eg, baghouse filter)
Incinerators	Quantity of material burnt	Type of material, control equipment
Light fuel oil (LFO) – fired boilers	Litres or tonnes of LFO burnt	
LPG – fired boilers	Tonnes of LPG burnt	
Meat smoking	Tonnes of wood used to prepare smoke	Batch or continuous process, control equipment eg, wet scrubber and de-mister
Pneumatic conveying of wood waste	Hours conveying occurs and quantity (m ³) of material conveyed	Type and number of machines, type of wood or wood product
Powder coating and other metal coating methods	Area coated	Object being coated ie, large appliance, metal furniture or miscellaneous, control technology
Quarrying	Quantity of material processed	Type of material eg, coal, lime etc, control equipment,
Seed cleaning and handling	Tonnes of seed cleaned/ handled	Type of control equipment
Waste oil – fired burners	Litres or tonnes of waste oil burnt	Ash content (note ash content for no. 5 & 6 oils is 15%, waste oil is higher)
Wood - fired burners	Tonnes of wood burnt	Type of control equipment, moisture content, fuel type (wood or bark)

Appendix B: Industrial emission factors used in this study, and their sources

Table B.1: Emission factors (continued on next page)

Discharge types	PM ₁₀	Unit	Rating ¹	PM _{2.5}	Unit	Rating	NOx	Unit	Rating SOx	Unit	Rating
Abrasive blasting sand uncontrolled	13	g/kg blast medium	E	1.3	g/kg blast medium	E					
Aluminium crucible furnace uncontrolled	0.95	kg TSP/tn product	N/A								
Asphalt plant oil-fired batch mix venturi scrubber	0.07	g/kg product	C				0.06	g/kg product	E	0.044	E
Asphalt plant oil-fired drum mix venturi scrubber	0.023	g/kg product	A				0.028	g/kg product	E	0.0055	C
Coal-fired boiler Spreader stoker with cyclones	6.2	g/kg fuel	E	0.7	g/kg fuel	E	4.4	g/kg fuel	B	17.5	B
Coal-fired boiler Underfeed stoker controlled and uncontrolled	3.1	g/kg fuel	E	1.9	g/kg fuel	C	4.75	g/kg fuel	A	15.5	A
Concrete batching total	0.081	g/kg product	N/A								
Diesel-fired boiler/heater	0.13	g/l fuel	D	0.1	g/l fuel	D	2.4	g/l fuel	A	1.37	A
Dry wood boiler/heater with cyclones	0.27	lb/MMbtu	D	0.16	lb/MMbtu	D	0.49	lb/MMbtu	C	0.49	A
Electric arc welding GMAW/mig	9.2	g/kg rod	N/A								
Electric arc welding SMAW/covered electrode	20.17	g/kg rod	N/A								
Flour (wheat) milling cyclones and fabric filters	0.8	kg/tn product	N/A								
Iron electric arc furnace uncontrolled	12.63	kg/tn product	N/A								
Liquefied petroleum gas-fired boiler/heater	0.11	g/kg fuel	E	0.11 ²	g/kg fuel	E	3.345	g/kg fuel	E		
Quarrying total	0.05	kg/tn product	N/A	0.0002	kg/tn product	N/A					
Seed cleaning/handling uncontrolled	0.013	kg/tn product	N/A	0.0037	kg/tn product	N/A					
Waste oil-fired boiler/heater Space heater atomizing	7.7A	g/kg fuel	E				1.728	g/kg fuel	D	25.68	D

1: AP-42 emission factors are rated in reliability from E to A, with A being the most reliable. The factors found in Economopoulos (1993) are not rated. In some cases, a single process emission factor has been calculated from a number of sub-process factors with different ratings. In these cases no single rating is assigned.

2: LPG PM_{2.5}, 100% of PM₁₀ assumed

Table B.1: Emission factors (continued from previous page)

Discharge types	CO	Unit	Rating ¹	Carbon content (by weight)	CO ₂ "emission factor" calculated using mass balance equation	Unit	Rating
Abrasive blasting sand uncontrolled							
Aluminium crucible furnace uncontrolled							
Asphalt plant oil-fired batch mix venturi scrubber	0.065	g/kg product	B	86% (diesel)	NA, AP-42 used at all times	g/kg product	E
Asphalt plant oil-fired drum mix venturi scrubber	0.044	g/kg product	B	86% (diesel)	NA, AP-42 used at all times	g/kg product	E and B
Coal-fired boiler Spreader stoker with cyclones	2.5	g/kg fuel	A	56% (sub-bituminous)	2051 g/kg	g/kg fuel	B
Coal-fired boiler Underfeed stoker controlled and uncontrolled	5.5	g/kg fuel	B	56% (sub-bituminous)	2051 g/kg	g/kg fuel	B
Concrete batching total							
Diesel-fired boiler/heater	0.6	g/l fuel	A	86%	2615 g/l	g/l fuel	B
Dry wood boiler/heater with cyclones	0.6	lb/MMbtu	A	65%	2382 g/kg	g/kg fuel	A
Electric arc welding GMAW/mig							
Electric arc welding SMAW/covered electrode							
Flour (wheat) milling cyclones and fabric filters							
Iron electric arc furnace uncontrolled							
Liquefied petroleum gas-fired boiler/heater	0.8	g/kg fuel	E	82%	3004 g/kg	g/kg fuel	E
Quarrying total							
Seed cleaning/handling uncontrolled							
Waste oil-fired boiler/heater Space heater atomizing	0.225	g/kg fuel	D	88% (light fuel oil)	3224 g/kg	g/kg fuel	D

1: AP-42 emission factors are rated in reliability from E to A, with A being the most reliable. The factors found in Economopoulos (1993) are not rated. In some cases, a single process emission factor has been calculated from a number of sub-process factors with different ratings. In these cases no single rating is assigned.

Table B.2: Emission factor source documents

Abrasive blasting sand uncontrolled	AP-42 Chapter 13.2.6
Aluminium crucible furnace uncontrolled	Economopoulos Section 372
Asphalt plant oil-fired batch mix venturi scrubber	AP-42 Chapter 11.1
Asphalt plant oil-fired drum mix venturi scrubber	Economopoulos Section 354
Coal-fired boiler Spreader no control	AP-42 Chapter 1.1
Coal-fired boiler Underfeed no control	AP-42 Chapter 1.1
Coal-fired boiler Underfeed with cyclones	AP-42 Chapter 1.1
Concrete batching total	AP-42 Chapter 11.12 (a sum of sub-process emission factors)
Diesel-fired boiler/heater	AP-42 Chapter 1.3
Dry wood boiler/heater with cyclones	AP-42 Chapter 1.6
Electric arc welding GMAW/mig	AP-42 Chapter 12.19
Electric arc welding SMAW/covered electrode	AP-42 Chapter 12.19
Flour (wheat) milling cyclones and fabric filters	Economopoulos Section 3116
Iron electric arc furnace uncontrolled	Economopoulos Section 371
Liquefied petroleum gas-fired boiler/heater	AP-42 Chapter 1.5
Pneumatic conveying of wood waste	Source unknown - figure used is from previous inventories
Quarrying total	AP-42 Chapter 11.19.2 (a sum of sub-process emission factors)
Seed cleaning/handling uncontrolled	Source unknown - figure used is from previous inventories
Waste oil-fired boiler/heater Space heater atomising	AP-42 Chapter 1.11

Appendix C: Vehicle emission factors used in this study

Table C.1: NZ-TER single vehicle emission factors for CO, NO_x and PM₁₀ (g/VKT)

	Central urban, LOS A,B			Suburban, LOS A,B			Central urban, LOS C,D			Suburban, LOS C,D		
	CO	NOx	PM	CO	NOx	PM	CO	NOx	PM	CO	NOx	PM
Diesel bus medium	1.8	9.06	0.6265	1.54	9.06	0.6269	2.1	11.41	0.8359	1.8	10.07	0.7314
Diesel bus large	3.57	20.96	1.2414	2.82	19.3	1.1431	4.12	26.09	1.6363	3.04	19.81	1.232
LPG bus medium	1.8	6.8	0.0313	1.08	4.53	0.0125	2.1	8.56	0.0418	1.8	7.55	0.0366
LPG bus large	3.57	15.72	0.0621	2.82	14.47	0.0572	4.12	19.57	0.0818	3.04	14.86	0.0616
Petrol LCV	11.43	1.39	0.0165	9.89	1.32	0.0153	19.47	1.74	0.0235	15.31	1.34	0.0172
Diesel LCV	1.17	0.63	0.3534	1.17	0.55	0.2827	1.41	0.98	0.4873	1.33	0.59	0.3677
CNG LCV	3.77	0.93	0.0111	3.26	0.88	0.0102	6.43	1.16	0.0157	5.05	0.9	0.0115
LPG LCV	8.57	1.39	0.0124	7.41	1.32	0.0115	14.6	1.74	0.0176	11.48	1.34	0.0129
Diesel HCV small	1.9	8.36	0.6173	1.39	7.17	0.5294	2.25	10.69	0.836	1.82	8.94	0.6935
Diesel HCV medium	1.8	9.06	0.6269	1.54	9.06	0.6269	2.1	11.41	0.8359	1.8	10.07	0.7314
Diesel HCV large	3.57	20.96	1.2414	2.82	19.3	1.1431	4.12	26.09	1.6363	3.04	19.81	1.232
LPG HCV small	1.9	6.27	0.0309	1.39	5.38	0.0265	2.25	8.02	0.0418	1.82	6.71	0.0343
LPG HCV medium	1.8	6.8	0.0313	1.54	6.8	0.0313	2.1	8.56	0.0418	1.8	7.55	0.0366
LPG HCV large	3.57	15.72	0.0621	2.82	14.47	0.0572	4.12	19.57	0.0818	3.04	14.86	0.0616
Motorcycle/moped	13.09	0.11	0.035	11.28	0.11	0.0322	21.92	0.15	0.0488	17.49	0.13	0.0362
Petrol car	8.44	0.98	0.0137	7.27	1.01	0.0126	14.13	1.32	0.0191	11.28	1.11	0.0142
Diesel car	1.08	0.49	0.308	1.08	0.54	0.231	1.29	0.76	0.4213	1.24	0.58	0.3022
CNG car	2.79	0.66	0.0092	2.4	0.68	0.0085	4.66	0.89	0.0128	3.72	0.75	0.0095
LPG car	6.33	0.98	0.0103	5.46	1.01	0.0095	10.6	1.32	0.0143	8.46	1.11	0.0107

Table C.1 (continued): NZ-TER single vehicle emission factors for CO, NO_x and PM₁₀ (g/VKT)

	Central urban, Cold start			Suburban, Cold start		
	CO	NO _x	PM	CO	NO _x	PM
Diesel bus medium	2.55	13.51	1.0981	2.19	11.75	0.9143
Diesel bus large	4.93	30.69	2.2004	3.64	23.11	1.54
LPG bus medium	2.55	10.13	0.0549	2.19	8.81	0.0457
LPG bus large	4.93	23.02	0.11	3.64	17.33	0.077
Petrol LCV	68.43	1.44	0.0598	53.46	1.5	0.064
Diesel LCV	2.91	1.44	0.8528	2.74	0.94	0.6435
CNG LCV	22.58	0.96	0.0401	17.64	1.01	0.0429
LPG LCV	51.32	1.44	0.0448	40.1	1.5	0.048
Diesel HCV small	2.75	12.57	1.0821	2.24	10.43	0.8669
Diesel HCV medium	2.55	13.51	1.0981	2.19	11.75	0.9143
Diesel HCV large	4.93	30.69	2.2004	3.64	23.11	1.54
LPG HCV small	2.75	9.43	0.0541	2.24	7.82	0.0433
LPG HCV medium	2.55	10.13	0.0549	2.19	8.81	0.0457
LPG HCV large	4.93	23.02	0.11	3.64	17.33	0.077
Motorcycle/moped	78.56	0.13	0.1351	59.86	0.13	0.1448
Petrol car	50.66	1.11	0.53	38.6	1.19	0.0568
Diesel car	2.67	1.11	0.7373	2.56	0.94	0.5288
CNG car	16.72	0.74	0.0355	12.74	0.8	0.0381
LPG car	37.99	1.11	0.039	28.95	1.19	0.0426

Table C.2: Aggregated (“corridor”) Emission factors for SO_x and CO₂ (g/VKT)

Road type	LOS	SO _x (g/VKT)	CO ₂ (g/VKT)
Central urban	A,B	0.26	412.93
	C,D	0.32	561.6
Suburban	A,B	0.22	368.22
	C,D	0.24	409.28

Appendix D: Home heating survey form

Home Heating Questionnaire

Good afternoon/evening my name is _____ and I am calling on behalf of Environment Canterbury. Could I please speak to an adult in your household who knows about your home heating. We wish to know what you use **to heat your main living area, on a typically cold Winter's day, and night.**

1. Area (*Tick*) Waimate [] Ashburton [] Kaiapoi [] Rangiora []

2. (a) Do you use an open fire (**includes a visor fireplace**) in your MAIN living area on a TYPICALLY COLD Winter's day or night? YES (1) [] NO (0) [] *If NO GO TO Question 3.*

- (b) Do you use it
 - i. In the morning (between 6am and 10 am) YES (1) [] NO (0) []
 - ii. Day time (between 10am and 4pm) YES (1) [] NO (0) []
 - iii. Evening (between 4pm and 10pm) YES (1) [] NO (0) []
 - iv. Overnight (between 10pm and 6am) YES (1) [] NO (0) []

- (c) Do you use wood on your open fire? YES (1) [] NO (0) [] *If NO GO TO Part (e).*

- (d) How much wood do you use per day? (*ask them how many pieces of wood (logs) they use on an average cold Winter's day*) _____

- (e) Do you use coal on your open fire? YES (1) [] NO (0) [] *If NO GO TO Question 3.*

- (f) How much coal do you use per day? (*ask them how many buckets of coal they use on an average cold Winters day*) _____

3. (a) Do you use **any type** of electrical heating in your MAIN living area on a TYPICALLY COLD Winter's day or night? YES (1) [] NO (0) [] *If NO GO TO Question 4.*

- (b) Approximately how many hours a day on a typical cold winters day would you use your heater _____

4. (a) Do you use **any type** of gas heating in your MAIN living area on a TYPICALLY COLD Winter's day or night? YES (1) [] NO (0) [] *If NO GO TO Question 5.*

- (b) Is it **flued or unflued** gas heating? FLUED (1) [] UNFLUED (2) [] BOTH (3) []

- (c) Do you use it
 - i. In the morning (between 6am and 10 am) YES (1) [] NO (0) []
 - ii. Day time (between 10am and 4pm) YES (1) [] NO (0) []
 - iii. Evening (between 4pm and 10pm) YES (1) [] NO (0) []
 - iv. Overnight (between 10pm and 6am) YES (1) [] NO (0) []

- (d) How much gas do you use ? (*ask them for the size of the gas bottles(s) and how often they would refill them* - (sizes are 2kg, 2.5kg, 3kg, 4.5kg, 9kg, 18kg, 20kg, 45kg, 90kg)
 Size#1 _____ Freq#1 _____
 Size#2 _____ Freq#2 _____

5. (a) Do you use a log burner or pellet burner ? (*This is not a multi fuel burner ie does not burn coal*) in your MAIN living area on a TYPICALLY COLD Winter's day or night.
 YES Log burner (1) [] YES Pellet fire (2) [] NO (0) [] *If NO GO TO Question 6.*

- (b) How old is your log burner/pellet fire ? 12 yrs+ (1) [] 4-12 yrs old(2) [] Less than 4 yrs (3) []

- (c) Do you use it
 - i. In the morning (between 6am and 10 am) YES [] NO []
 - ii. Day time (between 10am and 4pm) YES [] NO []
 - iii. Evening (between 4pm and 10pm) YES [] NO []
 - iv. Overnight (between 10pm and 6am) YES [] NO []

- (d) How much wood or buckets of pellets do you use per day? (*ask them how many pieces of wood (logs) they use on an average cold Winters day*) _____ Buckets of pellets _____

6. (a) Do you use a burner which burns coal as well as wood - ie a multi fuel burner (*This includes incinerators, pot belly stoves, McKay space heaters etc.*) in your MAIN living area on a TYPICALLY COLD Winter's day or night? YES (1) [] NO (0) [] *If NO GO TO Question 7*
- (b) How old is your multi fuel burner? 12 yrs+ (1) [] 4-12 yrs old(2) [] Less than 4 yrs (3)
- (c) Do you use it
- i. In the morning (between 6am and 10 am) YES (1) [] NO (0) []
 - ii. Day time (between 10am and 4pm) YES (1) [] NO (0) []
 - iii. Evening (between 4pm and 10pm) YES (1) [] NO (0) []
 - iv. Overnight (between 10pm and 6am) YES (1) [] NO (0) []
- (d) How much wood do you use per day? (*ask them how many pieces of wood (logs) they use on an average cold Winters day*) _____
- (e) Do you use coal on your multi fuel burner? YES (1) [] NO (0) [] *If NO GO TO Question 7.*
- (f) How much coal do you use per day? (*ask them how many buckets of coal they use on an average cold Winters day*) _____
7. (a) Do you use an oil fired heating system in your MAIN living area on a TYPICALLY COLD Winter's day or night? YES (1) [] NO(0) [] *If NO GO TO Q8.*
- (b) Do you use it
- i. In the morning (between 6am and 10 am) YES (1) [] NO (0) []
 - ii. Day time (between 10am and 4pm) YES (1) [] NO (0) []
 - iii. Evening (between 4pm and 10pm) YES (1) [] NO (0) []
 - iv. Overnight (between 10pm and 6am) YES (1) [] NO (0) []
- (c) How much oil do you use? _____
8. (a) Since July last year, ie 2003, do you or have you burnt household rubbish or garden waste, outdoors? YES (1) [] NO (0) [] *If NO GO TO Question END*

IF YES

Do you burn this material between May and September? YES (1) [] NO (0) []
If NO GO TO Question END

IF YES

- (a) How many times would you have burnt garden waste _____ (*total number of times*)
 for approximately how long each time _____ (*hours*)
- (b) How many times would you have burnt food waste _____ (*total number of times*)
 for approximately how long each time _____ (*hours*)
- (c) How many times would you have burnt packaging _____ (*total number of times*)
 for approximately how long each time _____ (*hours*)
- (d) How many times would you have burnt anything else (STIPULATE WHAT IT WAS) _____
 how many times _____
 for approximately how long each time _____ (*hours*)

END

THANK YOU VERY MUCH FOR YOUR HELP WITH THIS SURVEY.

Appendix E: Rail activity data

		Monday	Tuesday to Friday	Saturday	Sunday
Trains through Ashburton	0600-1000	1	2	3	0
	1000-1600	2	2	1	0
	1600-2200	1	1	1	1
	2200-0600	4	6	4	2
Trains through Kaiapoi and Rangiora	0600-1000	2	3	3	2
	1000-1600	1	4	3	2
	1600-2200	1	2	2	2
	2200-0600	2	5	5	4
Locomotive kilometres travelled Ashburton	0600-1000	5.9	11.8	17.7	0
	1000-1600	11.8	11.8	5.9	0
	1600-2200	5.9	5.9	5.9	5.9
	2200-0600	23.6	35.4	23.6	11.8
Locomotive kilometres travelled Kaiapoi	0600-1000	7.4	11.1	11.1	7.4
	1000-1600	3.7	14.8	11.1	7.4
	1600-2200	3.7	7.4	7.4	7.4
	2200-0600	7.4	18.5	18.5	14.8
Locomotive kilometres travelled Rangiora	0600-1000	14.4	21.6	21.6	14.4
	1000-1600	7.2	28.8	21.6	14.4
	1600-2200	7.2	14.4	14.4	14.4
	2200-0600	14.4	36	36	28.8
Fuel use (litres) Ashburton	0600-1000	99.2	198.4	595.1	0.0
	1000-1600	198.4	198.4	198.4	0.0
	1600-2200	99.2	99.2	198.4	198.4
	2200-0600	396.8	595.1	793.5	396.8
Fuel use (litres) Kaiapoi	0600-1000	99.5	161.7	286.1	161.7
	1000-1600	62.2	248.8	373.2	248.8
	1600-2200	37.3	99.5	161.7	161.7
	2200-0600	124.4	311.0	622.0	497.6
Fuel use (litres) Rangiora	0600-1000	193.7	314.7	556.8	314.7
	1000-1600	121.0	484.2	726.2	484.2
	1600-2200	72.6	193.7	314.7	314.7
	2200-0600	242.1	605.2	1210.4	968.3
Key assumptions:					
<ul style="list-style-type: none"> • Rail link lengths are 5.9 km (Ashburton); 3.7 km (Kaiapoi) and 7.2 km (Rangiora); • Locomotive types are DCP or DC (passenger); DX or DFT (freight); • All movements are freight except one northbound and one southbound passenger train through Kaiapoi and Rangiora; • All weekday freight trains use one locomotive, and all weekend freight trains use two. All passenger trains use 1 locomotive. 					