

A Carbon Inventory for Catalyst[®] Ltd

19 September 2012

Period: April 1, 2011 – March 31, 2012



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1. Executive Summary

Catalyst® Ltd (Catalyst®) is a consultancy company with 4 offices nationwide with 3 full time and 1 part-time consultants. In the 2011/2012 financial year GHG emissions from Scope 1, Scope 2 and significant¹ Scope 3 business activity amounted to 10.98 tonnes (t) CO₂e.

This is 11% less than the same period in 2010/2011 when emissions were determined to be 12.32 t CO₂e.

The majority emissions arose from travel with air travel at, 7.12 t CO₂e, accounting for 66% of overall company emissions. Road travel accounted for a further 3.49 t CO₂e. Compared with the previous year air travel emissions have dropped 17%.

Where GHG emissions cannot be reduced they will be offset where feasible. Catalyst® has been enrolled in a programme (Greenfleet) to offset emissions from vehicle use for the past five years. However, as the calculations in this report illustrates, this enrolment will not begin to be effective for some years due to the delayed nature of the offset. In addition Catalyst® invests in energy efficiency projects within its staffs' homes.

2. Background

Catalyst® is committed to the sustainable operation of its business activities. We aim to be efficient in our use of resources, give our consultants a healthy and rewarding work-life balance and minimize the impact our activities have on the environment.

To achieve this Catalyst® has quantified its business emissions for each of the past four financial years using an in-house developed Annual Carbon Emissions calculator (ACE)². The total emissions determined for each of these years is presented below.

April 2006 – March 2007	10.87 t CO ₂ e
April 2007 – March 2008	14.51 t CO ₂ e
April 2008 – March 2009	14.28 t CO ₂ e
April 2009 – March 2010	13.12 t CO ₂ e
April 2010 – March 2011	12.32 t CO ₂ e

The 2006/2007 year, as the first full year emissions were quantified, is the Catalyst® base year.

For the 2011/2012 financial year Catalyst® has again measured its organisation emissions using ACE. This report presents the measurement and the methodology and calculations behind it. In addition, the report examines the GHG removals associated Catalyst® emission mitigation strategies. A comparative analysis with previous periods at the end of the report highlights trends and identifies areas where emissions may be reduced or mitigated, and identifies strategies for consideration for following years.

¹ From air travel and use of taxis and airport shuttles

² Visit www.Catalystnz.co.nz to learn about ACE

3. Report Details

3.1. Report period

The reporting period for this inventory is 31 March 2011 - 1 April 2012.

3.2. Responsible person/party

This report has been compiled by Catalyst® based on logged and filed in-house data and information. Catalyst® has taken every care in the compiling and analysis of the data, and in the preparation of this report. Catalyst® is responsible for all GHG calculations within the report as well as the completeness and accuracy of the data provided.

3.3. ISO 14064-1

This report has been produced in conformance with the principles set out by the International Standards Organisation (ISO) for the quantification and reporting of greenhouse gas emissions and removals (Standard 14064-1:2006).

4. Organisational Boundaries

Catalyst® Ltd is a consultancy business employing five consultants with offices in Christchurch, Wellington, Rotorua and Tauranga. Business activity takes place in each of these offices as well as offsite at the premises of clients, partners and associates.

Christchurch office	Home office (address not available)
Wellington office	32 Salamanca Road, Wellington
Rotorua office	Home office (address not available)
Tauranga office	27 Church Street, Katikati

5. GHG inventory

5.1. Operational boundaries and scope

This inventory accounts for all Scope³ 1 (direct) and Scope 2 (electricity indirect) emissions arising from activities within the Christchurch, Wellington, Rotorua and Tauranga offices, as well as business travel in private vehicles (see Table 1). Scope 3 emissions included (indirect emissions other than electricity) arise from airline travel, hire car travel, and travel by taxi cab.

Table 1. Emissions included in Catalyst® operational boundary

Operation	Source	GHG	Description
Offices	Electricity	CO ₂ e	Indirect emission
Travel	Private vehicle usage	CO ₂ e	Direct emission
	Airline travel	CO ₂ e	Indirect emission
	Hire car usage	CO ₂ e	Indirect emission
	Taxi	CO ₂ e	Indirect emission

³ For an explanation of the technical definitions relating to Scope see Section 8

The following are excluded from the inventory

- Activity that takes place in the premises of clients and associates. This activity is considered the responsibility of the hosting partner
- Biodegradable waste to landfill; this is negligible due to recycling and composting practices and has therefore been discounted
- Emissions arising from the use of public transport, due to a lack of robust methodology for New Zealand.

Combined these omitted emission sources have been estimated to contribute less than 5% total company emissions.

To mitigate a proportion of its annual emissions, Catalyst® is a member of GreenFleet, a Sustainable Business Network of New Zealand initiative to offset business vehicle emissions. This operation is summarised in Table 2 and discussed further in Section 5.2.2.

Table 2. Removals according to Catalyst® operational boundary

Operation	Component	GHG	Description
GreenFleet membership	Native forest plantations	CO ₂	Direct removal

5.2. Methodology

5.2.1. Calculating emissions

All GHG emission data presented in this report is calculation based, determined by multiplying activity data by emission or removal factors.

Emissions (tonnes GHG) = quantity of energy (unit) X emission factor (tonnes GHG/unit)

Emission factors are provided in terms of CO₂ equivalent (CO₂e) emissions. The emissions of different GHGs are calculated separately and converted to CO₂ equivalents on the basis of their global warming potential. For example:

- 1 unit of methane (CH₄) is equivalent to 25 units of CO₂,
- 1 unit of nitrous oxide (N₂O) is equivalent to 298 units of CO₂.

Emission factors have been sourced principally from the New Zealand Ministry for the Environment (MfE). Their values and original sources are listed below.

Transport Fuel

	CO ₂ e emission factor (kg CO ₂ e/L)	CO ₂ emission factor (kg CO ₂ /L)	CH ₄ emission factor (kg CO ₂ e/L)	N ₂ O emission factor (kg CO ₂ e/L)
Petrol - default	2.34	2.32	0.0137	0.0155

Consultants keep travel logs of all work related travel, recording distance travel, and each month fuel conversion values specific to each consultant's vehicle are applied to determine quantity of fuel used. The emission factors above are then applied to this data.

Stationary fuel

	CO ₂ e emission factor	CO ₂ emission factor	CH ₄ emission factor	N ₂ O emission factor
	(kg CO ₂ e/kWh)	(kg CO ₂ e/kWh)	(kg CO ₂ e/kWh)	(kg CO ₂ e/kWh)
Natural gas	0.193	0.191	0.0001	0.0023

The emission factors above for transport and stationary fuel were derived by MfE using calorific values sourced from the *New Zealand Energy Data File 2011* and incorporate relevant oxidation factors which are sourced from *The IPCC Revised Guidelines for National Greenhouse Gas Inventories (1996)*.

Electricity

	CO ₂ e emission factor	CO ₂ emission factor	CH ₄ emission factor	N ₂ O emission factor
	(kg CO ₂ e/kWh)	(kg CO ₂ e/kWh)	(kg CO ₂ e/kWh)	(kg CO ₂ e/kWh)
Electricity	0.137	n/a	n/a	n/a

This emission factor is derived from the net electricity generation data in the *New Zealand Energy Data File 2011* and reflects the CO₂-e emissions associated with the generation of a unit of electricity, purchased from the national grid, in New Zealand in 2010.

Electricity transmission & distribution line losses

	CO ₂ e emission factor	CO ₂ emission factor	CH ₄ emission factor	N ₂ O emission factor
	(kg CO ₂ e/kWh)	(kg CO ₂ e/kWh)	(kg CO ₂ e/kWh)	(kg CO ₂ e/kWh)
Electricity	0.0123	n/a	n/a	n/a

The transmission and distribution line losses emission factor accounts for emissions (from the generation) of the electricity lost in the transmission and distribution network due to inefficiencies in the grid and is the difference between the generation and consumption emission factors reported by the Ministry of Economic Development.

Air travel

	CO ₂ e emission factor	CO ₂ emission factor	CH ₄ emission factor	N ₂ O emission factor
	(kg CO ₂ e/km)	(kg CO ₂ e/km)	(kg CO ₂ e/km)	(kg CO ₂ e/km)
Domestic	0.1650	n/a	n/a	n/a
Inter. short haul	0.0968	n/a	n/a	n/a
Inter. Long haul	0.1110	n/a	n/a	n/a

These emission factors provided were sourced by MfE from the UK Department for Environment Food and Rural Affairs (DEFRA) in their *August 2011 Guidelines to DEFRA / DECC's GHG Conversion Factors For Company Reporting*. These are deemed to be the most suitable emission factors currently available.

Travel by taxi and rental cars

	unit	CO ₂ e emission factor (kg CO ₂ /unit)
Rental car – small (<1600 cc)	km	0.180
Rental car – medium (1600 – 2499 cc)	km	0.238
Rental car – large (>2499 cc)	km	0.312
Taxi – distance traveled	km	0.312
Taxi – fare based	\$	0.125

The rental car emission factors are derived by multiplying the default petrol emission factor by ‘real world’ fuel consumption rates for the petrol light vehicle fleet, based on information from the Ministry of Transport’s New Zealand vehicle fleet statistics for 2010.

The emission factor for taxis, based on distance traveled, is the same as that for large vehicles. Data from the Motor Industry Association New Vehicles Sales database shows that for the period January 2002 – July 2008, 84.2% of taxis purchased were in the large vehicle class size.

The fare based emission factor for taxis is based on a national average fare figure of \$2.50 per km traveled, sourced from Taxicharge New Zealand.

5.2.2. Calculating sinks

In 2006 Catalyst® joined GreenFleet, the Sustainable Business Network programme for offsetting business emissions relating to vehicle use.

For each vehicle enrolled in the programme 23 native seedlings are planted in a local reforestation project. The basis for this number is

- The average business vehicle travels 15,000km per annum
- The average business vehicle has a fuel efficiency of 10L/100km
- Native forest sequesters 400 t CO₂ (109 t C) per Ha over 100 years
- An assumed 10% mortality rate following planting

Catalyst® has 2 vehicles enrolled in the programme.

The GreenFleet programme is a “future forests” offset programme designed such that the emissions relating to the year of planting will be offset over a period of 100 years. As such these cannot be considered instant offsets. The trees will need to grow for 100 years before they can accumulate the amount of carbon emitted by Catalyst® vehicles in the year of their planting.

For this reason, and for the purposes of this inventory, it has been deemed necessary to assess actual removals of these plantings on a year by year basis. This can be achieved by calculating change in biomass for each year’s plantings based on their age at the start and the end of each reporting period using MAF carbon sequestration look up tables.

For Catalyst® at this point in time, removals by forest sinks will be minimal given the young age of the planted trees. Details of the plantations are presented in Table 3.

5.3. Quantification

5.3.1. Activity data

Table 3 summarises Catalyst®'s total GHG activity data for the 2010/2011 year and explains how the data was determined or where it was sourced.

Table 3. Activity data for Catalyst® 2011/2012

	Data	Determined by/Source
Removals by Sinks		
Native reforestation	46 x 6yo plants (planted 2006) 46 x 5yo plants (planted 2007) 46 x 4yo plants (planted 2008) 46 x 3yo plants (planted 2009) 46 x 2yo plants (planted 2010) 46 x 1yo plants (planted 2011)	Assigned plantings as per GreenFleet programme
Emissions by Sources		
Electricity	1,268 kWh	Individual consultant determinations – see explanation below
Natural gas	29.4 kWh	
Private vehicle fuel	1,293 L	Individual consultant travel logs – see explanation below
Hire car travel	1,047 km (small) 746 km (medium)	
Travel by taxi	260 km, and \$278	
Airline travel (domestic)	28,028 pkm (domestic) 4,921 pkm (short haul int.) 18,170 pkm (long haul int.)	Airline electronic itinerary details

Activity data is logged monthly by each consultant and tallied at the end of the period. How this data is determined is outlined below. Records are filed and processed in the Tauranga office.

Electricity

Catalyst® operates out of individual, independent offices. Electricity and natural gas usage at each office is determined as follows:

Tauranga	Leased office Electricity meter readings for appliances; ceiling lights estimated
Rotorua	Home office Electricity meter readings for appliances; ceiling lights omitted Natural gas usage estimated as percentage of total appliance usage (heater)
Wellington	Leased office Electricity estimated based on other consultants' usage
Christchurch	Home office Electricity meter readings for appliances, including free standing lights

Private vehicle travel

Travel logs are kept by each consultant to record distances traveled relating to business activity. This includes travel to and from meetings as well as daily travel to and from offices. Where car pooling takes

place with person(s) from another business organisation a determination is made as to which business is accountable and data is logged accordingly.

Fuel use by private vehicle is then calculated based on distance traveled and the fuel consumption rates determined by each consultant for their vehicle:

Fuel consumed (L) = km traveled x vehicle fuel consumption rate⁴ /100

Hire vehicle travel

Each time a hire vehicle is used its engine size is noted and distance traveled recorded.

Taxi use

Where possible, travel distances are recorded. In situations where this is not feasible the fare is recorded and used to determine the related emissions (see Section 5.2.1 above).

Public transport

Public transport activity (use of buses, trains, cable cars) is recorded. As there is currently no robust methodology for determining emissions from these forms of transport in a New Zealand setting, this category has been excluded from the analysis.

5.3.2. Calculations

a. Emissions

Emissions have been calculated for each source based on the emission factors listed in Section 5.2.1 and the activity data in Table 3. Table 4 presents the values for each category of emission (Scope 1, 2, 3), and in accordance with ISO guidelines Scope 1 emissions have been presented according to GHG type.

Table 4. GHG emissions for the Catalyst® office operations and associated travel for 2011/2012

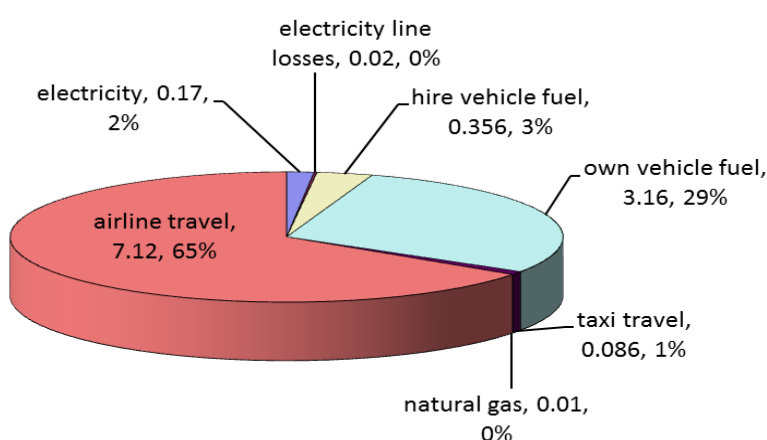
	GHG type	Source	Units	tonnes CO ₂ e
Scope 1	CO ₂	Fuel – petrol	1,336 L	3.126
		Fuel – natural gas	29 kWh	0.006
		Total (direct CO₂)		3.132
	CH ₄	Fuel – petrol	1,336 L	0.018
		Fuel – natural gas	29 kWh	<0.001
		Total (direct CH₄)		0.018
N ₂ O	Fuel – petrol	1,336 L	0.020	
	Fuel – natural gas	29 kWh	<0.001	
	Total (direct N₂O)		0.020	
Total (direct, all GHGs)				3.168
Scope 2	n/a	Electricity	1,268 kWh	0.174
		Total (Scope 2)		0.174

⁴ L/100km

	GHG type	Source	Units	tonnes CO ₂ e
Scope 3	n/a	Airline travel - domestic	28,028 km	4.624
		Airline travel – short int.	4,921 km	0.476
		Airline travel – long int.	18,170 km	2.017
		Electricity line losses	1,268 kWh	0.016
		Vehicle hire	1,793 km	0.356
		Taxi travel	260 km	0.086
)	\$278	0.019
		Total (Scope 3)		7.594
		GRAND TOTAL		10.98

This data is summarized and presented in Figure 1.

Figure 1. Catalyst® emissions for 2011/2012 (t CO₂e)



b. Removals

As discussed in Section 5.2.2, based on the age and number of trees in the GreenFleet programme, biomass change through the 2011/2012 year is small. Table 5 shows the year's removals by each plantation. These have been determined using data in the MAF Forest sequestration look up tables for native forests and an assumed planting density of 2,500 stems per hectare.⁵

Table 5. Catalyst® GHG removals for 2011/2012

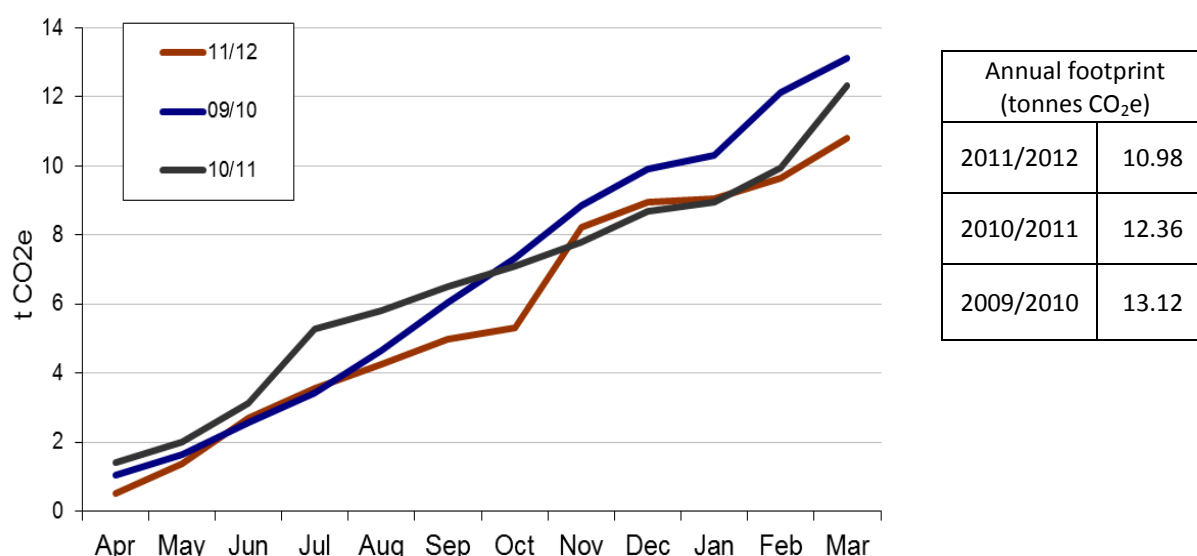
Year of planting	No. of trees	Age	Removals (kg CO ₂)
2006	46	6	79.1
2007	46	5	58.8
2008	46	4	38.6
2009	46	3	23.9
2010	46	2	11.0
2011	46	1	11.0
Total			0.22 tonnes

⁵ GreenFleet value

5.4. Interpretation

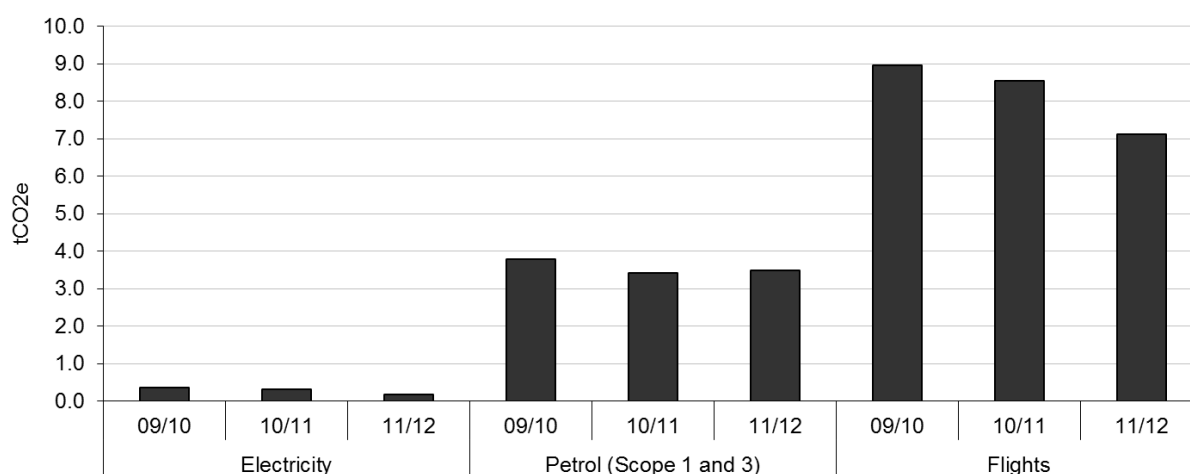
In 2011/2012, Catalyst® business activities emitted 10.98 t CO₂e. For the same period in 2010/2011, the value was 12.36 t CO₂e, as shown in Figure 3. In 2009/2010 Catalyst® emissions were 13.12 t CO₂e. An annual drop in emissions between November and February reflects a reduction in business activity over the Christmas/New Year holiday period.

Figure 2. Cumulative emissions for 09/10, 10/11 and 11/12



In terms of source, the majority of emissions in the 11/12 year came about from Scope 3 activities, namely airline travel (65%). The greatest source of Scope 1 emissions was own vehicle travel, which was the second greatest source of emissions overall. Emissions from electricity use are minimal. Similar observations were made in 10/11 and 09/10.

Figure 3. Total emissions by source for 09/10, 10/11 and 11/12



When making these annual comparisons it is important to note any differences in calculation methodologies and/or assumptions. For 11/12, as described in this report, emission factors for the 2010 calendar year were used in lieu of more recent factors being available. Emission factors for the 2009 calendar year were used in the 10/11 inventory, and emission factors for the 2008 calendar year were used in the 09/10 inventory, as these were the most recent factors available at the time of the analyses.

5.5. Uncertainty

This inventory has been prepared with care and accuracy. There are however two areas in the inventory where uncertainty exists. They are

1. Determination of indirect emissions from electricity. The uncertainty exist for two reasons
 - a. units (kWh) used in the calculation are to some degree estimate based (see Section 5.3.1)
 - b. emission factors used may not accurately represent emissions associated with the generation of the electricity consumed by Catalyst®.

The emission factors used for electricity in this report are derived from the net electricity generation data in the *New Zealand Energy Data File 2010* and reflects the CO₂e emissions associated with the generation of a unit of electricity, purchased from the national grid, in New Zealand in 2010. Such a national average may not accurately represent the Catalyst® emission profile for electricity if the provider(s) generates electricity from sources atypical to those represented by the national grid average.

2. The second area of uncertainty exists in relation to minibus travel (e.g. airport shuttle). With no robust methodology available for this form of public transport, minibus travel has been analysed using emission factors for taxi use. In this regard shuttle-use emissions are in most instances over-calculated as taxi emission factors allocate emissions on the assumption of a single passenger. In most cases a shuttle transports a number of passengers.

6. Next steps

6.1. Mitigation

Where practical, Catalyst® looks to reduce its GHG emitting activities and aims to achieve at least 4% reductions per annum in the medium term. This is based on the target (3.9%) required globally according to IPCC⁶ to reduce emissions by 80% by 2050. Between 10/11 and 11/12 Catalyst® emissions reduced 11.1%.

The main area for address is airline travel, which for this inventory accounts for 65% of total emissions. The bulk of this travel is specified by clients and cannot be readily reduced. Where alternatives are available e.g. conference calls, these are used. Figure 3 illustrates a small reduction in absolute air travel emissions but the percentage contribution remains relatively unchanged.

Petrol use is the other major source of emissions and Catalyst® actively seeks to reduce the number of vehicle trips made. Where more than one vehicle is available taking the most fuel efficient option

⁶ Intergovernmental Panel on Climate Change

Catalyst® does not formerly offset the emissions it cannot reduce other than enrolment in GreenFleet. As explained in Section 5.2.2, the GreenFleet programme is designed to offset vehicle only emissions, over a 100 year period. In addition Catalyst has invested in staff projects including light bulb replacements, and heating duct and fireplace installments, to reduce personal electricity use.

6.2. Verification

This inventory has not been verified.

7. Glossary of Terms

The following terms have been used in this report.

Scope (taken from MfE's Guidance for Voluntary, Corporate Greenhouse Gas Reporting):

The GHG Protocol categorises emission sources into **Scope 1**, **Scope 2** and **Scope 3** activities as follows:

1. **Scope 1:** Direct GHG emissions occur from sources that are owned or controlled by the company (ie, sources within the organisational boundary), for example emissions from combustion of fuel in owned or controlled vehicles. The GHG Protocol and ISO 14064-1 require Scope 1 emissions to be reported
2. **Scope 2:** Electricity indirect GHG emissions occur from the generation of purchased electricity⁸ consumed by the company. The GHG Protocol and ISO 14064-1 require Scope 2 emissions to be reported
3. **Scope 3:** Other indirect GHG emissions occur as a consequence of the activities of the company, but occur from sources not owned or controlled by the company, for example emissions from air travel. Under the reporting framework of The GHG Protocol and ISO 14064-1, Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions.

The definitions presented below have been taken from the ISO 14064-1 "Greenhouse gasses – Part 1. Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals".

Carbon dioxide equivalent (CO₂e)

unit for comparing the radiative forcing of a GHG to carbon dioxide

NOTE The carbon dioxide equivalent is calculated using the mass of a given GHG multiplied by its global warming potential .

Base year

historical period specified for the purpose of comparing GHG emissions or removals or other GHG-related information over time

NOTE Base-year emissions or removals may be quantified based on a specific period (e.g. a year) or averaged from several periods (e.g. several years).

Facility

single installation, set of installations or production processes (stationary or mobile), which can be defined within a single geographical boundary, organizational unit or production process

Greenhouse gas (GHG)

gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds

NOTE GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆).

Greenhouse gas source

physical unit or process that releases a GHG into the atmosphere

Greenhouse gas sink

physical unit or process that removes a GHG from the atmosphere

Greenhouse gas reservoir

physical unit or component of the biosphere, geosphere or hydrosphere with the capability to store or accumulate a GHG removed from the atmosphere by a greenhouse gas sink or a GHG captured from a greenhouse gas source

NOTE 1 The total mass of carbon contained in a GHG reservoir at a specified point in time could be referred to as the carbon stock of the reservoir.

NOTE 2 A GHG reservoir can transfer greenhouse gases to another GHG reservoir.

NOTE 3 The collection of a GHG from a GHG source before it enters the atmosphere and storage of the collected GHG in a GHG reservoir could be referred to as GHG capture and storage.

Greenhouse gas emission or removal factor

factor relating activity data to GHG emissions or removals

Greenhouse gas activity data

quantitative measure of activity that results in a GHG emission or removal

NOTE Examples of GHG activity data include the amount of energy, fuels or electricity consumed, material produced, service provided or area of land affected.

Responsible party

person or persons responsible for the provision of the greenhouse gas assertion and the supporting GHG information

NOTE The responsible party can be either individuals or representatives of an organization or project and can be the party who engages the validator or verifier. The validator or verifier may be engaged by the client or by other parties, such as the GHG programme administrator.

Verification

systematic, independent and documented process for the evaluation of a greenhouse gas assertion (2.11) against agreed verification criteria verification criteria

NOTE In some cases, such as in first-party verifications, independence can be demonstrated by the freedom from responsibility for the development of GHG data and information.

Uncertainty

parameter associated with the result of quantification which characterizes the dispersion of the values that could be reasonably attributed to the quantified amount

NOTE Uncertainty information typically specifies quantitative estimates of the likely dispersion of values and a qualitative description of the likely causes of the dispersion.

Annex 1. Amendments to previous inventories

Scope 3 travel data omitted from 09/10 Carbon Inventory effecting emissions

The following travel data was not included in the 2009/2010 Carbon Inventory. It is scope 3 travel data originally deemed not necessary to include. Upon reflection, and in line with the inventory for 2010/2011, it has since been added.

	# flights	Return	shuttle	
Chch - Akl	4 (Aug Oct, Nov, Dec)	Y	4 x 40 KM	All of these are shuttle van to airport from home.
Chch - Wgtn	1 (Feb)	Y	40 KM	
Chch - Hton	1 (Mar)	Y	40 KM	

As a result, the total GHG emissions for 09/10 have been recalculated and amended from 11.67 to 13.12 tonnes CO₂e.

The GHG emissions total for 09/10 in the 2009/2010 Carbon Inventory report does not include this data. The GHG emissions total for 09/10 referred to in this report does.

Correction to GreenFleet registration details effecting removals

In previous reporting (08/09, 09/10 financial years) it was reported that CATALYST® had three motor vehicle subscribed to the GreenFleet programme. It has since come to light that the number is in fact two. Although removals have not been calculated in previous inventories it is important this correction is documented.