



**SUSTAINABLE
BUSINESS
CONSULTANTS**

Christie Walk

Carbon Inventory

2017

Prepared: 15 June 2018

Disclaimer

This report uses information provided by the Australia Government, as well as information and data supplied by CC20575 (the responsible entity for Christie walk) and emissions factors derived from generally acceptable sources. Suzanne Ridding disclaims any liability for the accuracy of any inferences to be drawn from the material, deductions, conclusions or actions in reliance on the report. To the best of the author's knowledge this report complies with the methodologies and recommendations of the reference documents detailed herein including the National Carbon Offset Standard for Precincts, the Greenhouse Accounts Factors 2017 and the Greenhouse Gas Protocol.

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Terms and Abbreviations

Word, Term or Abbreviation	Definition
<i>Carbon Account</i>	A carbon account, or carbon / greenhouse gas inventory, is a means of setting out an organisation's carbon footprint. The process of establishing a carbon account is set out in the Greenhouse Gas Protocol - Corporate Standard.
<i>Carbon Neutral</i>	The process of measuring, reducing and offsetting remaining carbon emissions.
<i>DEW</i>	Department of Environment and water, South Australia.
<i>Direct Emissions</i>	Emissions from sources owned or controlled by the entity.
<i>GHG</i>	The seven gases, collectively known as Greenhouse Gas Emissions (or carbon emissions) that are scientifically reported as contributing to global warming
<i>GHG Inventory</i>	A greenhouse gas inventory or carbon account is a means of setting out an organisation or event's carbon footprint. Also referred to a Carbon Account or Inventory.
<i>GWP</i>	Global warming potential or the capacity of an activity to produce greenhouse gases.
<i>Indirect Emissions</i>	Emissions from sources that result from an entity's activities but which occur at sources owned or controlled by another.
<i>Induced travel</i>	Travel taken by visitors
<i>Materiality</i>	Materiality under NCOS is defined as being 1% or greater of the total GHG Inventory.
<i>NCOS</i>	The National Carbon Offset Standard sets a standard for carbon neutral claims and sets rules for measuring, reducing, offsetting and reporting by organisations in Australia voluntarily seeking to be carbon neutral for their operations, products, services, events, buildings and precincts.
<i>SA</i>	South Australia
<i>Scope</i>	The categorisation of emissions into direct and indirect sources.
<i>Scope 1</i>	Includes emissions from sources owned or controlled by the company
<i>Scope 2</i>	Purchased electricity consumed by the company
<i>Scope 3</i>	Includes emissions from sources that result from the company's activities but which occur elsewhere.

Executive Summary

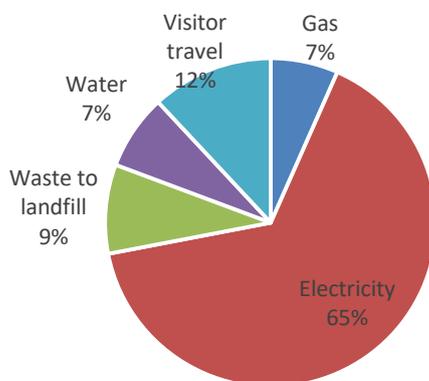
Christie Walk is an iconic eco village in the City of Adelaide, known for its sustainable building design and practices. For many years, the residents have hosted tours for the general public to showcase the village and to educate people in sustainable living.

This report has been prepared for the body corporate known as CC20575, to assist Christie Walk in the ongoing measurement, management and reporting of the greenhouse gas (GHG) emissions related to its operations.

The inventory presented has been prepared based on generally accepted carbon accounting standards and principles, as well as the National Carbon Offset Standard (NCOS) for Precincts. This is the NCOS standard that most closely reflects the nature of Christie Walk as a residential community that also attracts public interest and provides access and educational tours for visitors. The inventory includes direct and indirect emissions covering all of the emissions sources deemed to be material and relevant from a carbon accounting perspective for a precinct.

The total carbon emissions for Christie Walk for 2017 amounted to 50 tonnes of carbon dioxide equivalent (tCO₂-e). Per resident this equates to 1.22 tCO₂-e or 0.02 tCO₂-e per square meter. The breakdown of emissions sources is shown in Figure 1.

Figure 1: Emissions by source



This is the first carbon inventory for Christie Walk and therefore presents a baseline position. As such there is no comparative data unless the responsible entity has prior data available.

It is evident from Figure 1 that electricity makes up the largest portion of carbon emissions. What it does not show is that Christie Walk generates energy on-site through solar panels – some of which is self-consumed and some is exported to the grid. Similarly, waste to landfill makes up 9% of carbon emissions or 4 tCO₂-e, however this doesn't show the excellent recycling and organic waste collection that occurs. As a proportion of total waste, mixed general waste makes up only 15%.

The efforts of the Christie Walk community to maintain a sustainable village are outstanding and include a long list of initiatives, however new ideas are being pursued which could result in further reductions in the carbon inventory over time. Some further opportunities are provided in Section 6 of this report. Section 7 discuss carbon neutral certification and carbon offsetting opportunities.

It is recommended that the body corporate continues to maintain carbon emissions related data on an ongoing basis for future monitoring and reporting purposes.

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1. Introduction

The purpose of this report is to assist Christie Walk in the ongoing measurement, monitoring and reporting of its carbon emissions. The report also provides information on the processes involved in achieving carbon neutral certification including the initial and ongoing commitments.

This report was commissioned by the Department for Environment and Water (DEW) to allow Christie Walk to have a carbon inventory created for their residential precinct and to assist them to explore their goal of becoming carbon neutral. DEW has not applied any conditions to the provision of this assistance.

Situated at 105 Sturt Street, Adelaide, Christie Walk sits between Sturt Street and Gilbert Street on the west of the city. The precinct is managed by a body corporate known as CC20575 and consists of 27 dwellings (split into five groups – B, G, S, T and W) across 2,000 square meters. Currently, there are 41 residents.

2. Greenhouse Gas Reporting Standards and Principles

Australia's system for carbon accounting was developed in accordance with the internationally developed and accepted Greenhouse Gas Protocol Corporate Standard (www.ghgprotocol.org). The creation of this inventory also uses the following standards and sources of information.

- ISO 14064-1:2006 Quantification and Reporting of Greenhouse Gases
- National Greenhouse and Energy Reporting (NGER) Act 2007
- NGER (Measurement) Determination 2008
- National Greenhouse Accounts Factors 2017
- Other generally accepted sources of emissions factors.

Carbon accounting is based on the principles below, which ensure that results can be compared across organisations and across time in a consistent way.

- Relevance
- Completeness
- Consistency
- Transparency
- Accuracy

In order to ensure there is no double counting, the GHG Protocol also splits emission into three areas known as 'scopes' (see Figure 2). This report presents your carbon emission using this breakdown.

- **Scope 1** comprises emissions over which the organisation has direct control. It includes emissions from manufacturing and processing, transportation owned or controlled by the entity, fugitive emissions such as refrigerant gases, and emissions from the generation of electricity or combustion of fuels by the company.
- **Scope 2** comprises emissions associated with electricity purchased, i.e. generated off-site.
- **Scope 3** comprises indirect emissions incurred due to the purchase of goods and services. Many organisations choose to include as many Scope 3 emissions as can be measured, partly because this can provide opportunities to influence emissions reduction through engagement with suppliers. Scope 3 includes upstream emissions from the extraction, production and distribution of fuels and materials; transport emissions of employees commuting to work and

(in the case of cities, buildings and precincts) induced transport; leased assets; and emissions from the disposal of waste to landfill.

Carbon emissions are measured in tonnes of carbon dioxide equivalent or tCO₂-e and rounded to the nearest tonne. This unit is the total amount of the six greenhouse gases of varying Global Warming Potentials (GWP) compared with the GWP of carbon dioxide. The six greenhouse gases listed under the Kyoto Protocol are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), Nitrogen Trifluoride (NF₃) and sulphur hexafluoride (SF₆). This report has taken into account those that are relevant for Christie Walk.

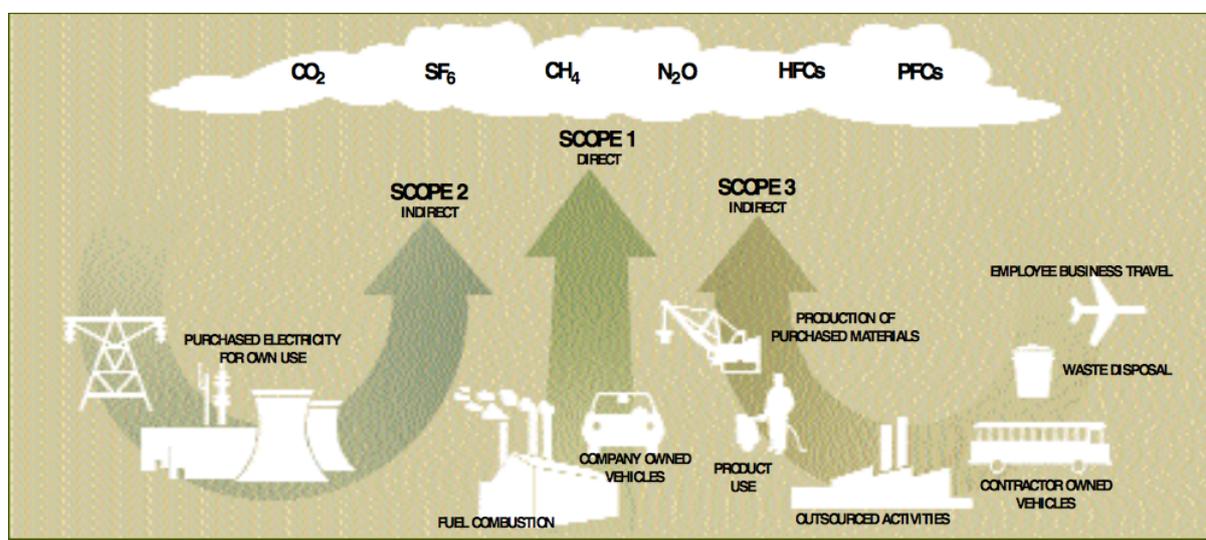


Figure 2: Emission Scopes. Source: Greenhouse Gas Protocol Corporate Standard

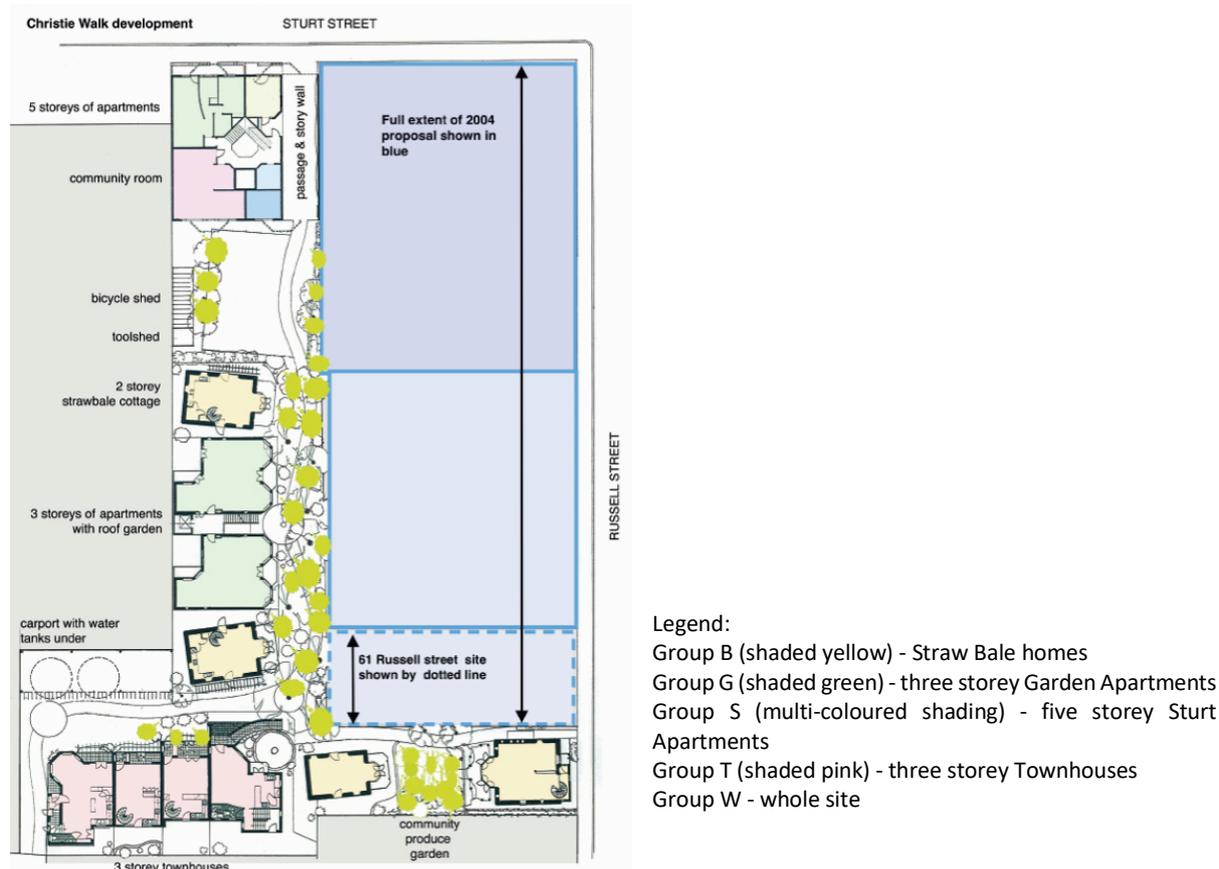
3. Emissions Boundary and Scope

The aim of the greenhouse gas (GHG) (or ‘carbon’) inventory is to set out the main elements of Christie Walk’s operational carbon footprint. This will provide a baseline for future measurement, monitoring and reporting. This information can be used to monitor progress against previous periods, for reporting and to assist in the identification of further areas in which emissions reductions and cost savings might be achieved. Some ideas are provided on page 13.

Christie Walk’s geographic boundary is clearly shown in Figure 1. The same boundary applies to the carbon inventory. The inventory has been prepared on the basis of it being a precinct, in accordance with the National Carbon Offset Standard (NCOS) for Precincts. Precinct operations are defined under NCOS as “activities related to the day to date running of the precinct ... and use of the precinct by occupants and visitors such as the provision of accommodation services and utilities”.

Inventory inclusions are based on the principles set out on page 6. The relevance test applies in that the scope must meet stakeholder expectations - internal and external to the precinct. Whilst Christie Walk does not conform to a standard type of precinct, i.e. it is not a shopping centre or commercial precinct, rather it is a residential precinct that contains an area which is available to the public and people are attracted to visit to hear the story of its development and ongoing environmental achievements and to see for themselves the precinct’s attributes. One of the key aspects for the inclusion of an emissions causing activity is whether it can be influenced in terms of its carbon reduction.

Figure 3: Christie Walk Layout



The scope of Christie Walk's inventory covers the direct and indirect emissions detailed below on the basis of that they are considered material¹ and relevant:

Emission sources included:

- Natural gas consumption
- Electricity purchased from the grid
- Waste to landfill
- Water consumed
- Visitor travel, otherwise known as 'induced travel'
- Emissions generated upstream in the production and distribution of fuel and electricity.

The following operational sources of emissions were excluded and can be added to subsequent inventories, if applicable, or where suitable data is available:

- Fuel used for business travel - not applicable, no fuel consumed for the management and maintenance of the precinct
- Refrigerant – immaterial. The common areas of Christie Walk contain just one small bar fridge for which the refrigerant gas leakage is extremely small.
- Air travel - not applicable, no company air travel
- Paper and printing – not applicable, no printing
- Residents' travel - this is an optional Scope 3 emissions activity that Christie Walk has chosen to exclude at this time.

¹ Materiality is 1% or more of the total inventory. Scope 3 excluded emissions must not together exceed 5% of the total inventory (NCOS, 2017)

4. Carbon Inventory

The total carbon emissions for 2017 were 50 tCO₂-e as shown in Table 1.

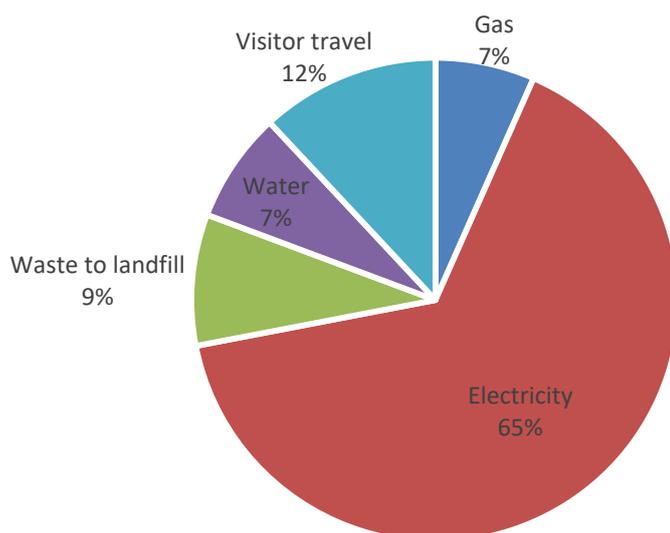
Table 1: Christie Walk carbon inventory 2017

Emission Source	Consumption Units	Consumption	GHG Emissions (t CO ₂ -e)	Proportion of total inventory (%)
Direct Emissions (Scope 1)				
Gas	Mj	53,032	2.7	5%
Total Scope 1			2.7	5%
Indirect Emissions (Scope 2)				
Electricity purchased	kWh	56,178	27.5	55%
Electricity consumed from on-site solar	kWh	5,535	0.0	0%
Total Scope 2			27.5	55%
Indirect Emissions (Scope 3)				
Gas (production & distribution)	Mj	53,032	0.6	1%
Electricity (production & distribution)	kWh	56,178	5.1	10%
Waste to landfill	tonnes	3	4.4	9%
Waste recycled	tonnes	11	0.0	0%
Waste organic	tonnes	6	0.0	0%
Induced travel - visitors	Trips	3,000	5.9	11.9%
Water purchased	kL	1,682	3.7	7.4%
Total Scope 3			19.6	39%
Total Scope 1 + 2			30.3	61%
Total Scope 1+2+3			49.8	100%

A breakdown by Scope is shown in Table 2 and by source at Figure 4.

Table 2: Christie Walk carbon inventory breakdown by scope.

Emissions category	Emissions (tCO ₂ -e)	Percent of total
Scope 1: Direct emissions	2.7	6%
Scope 2: Indirect emissions - purchased electricity	27.5	55%
Scope 3: Indirect emissions - other	19.6	39%

Figure 4: Carbon emissions broken down by source

The following sections describe the emissions sources, our assessment observations and some of the initiatives Christie Walk has already undertaken to reduce its emissions.

Natural Gas

75% of the gas consumed is in the common areas. Gas makes up 5% of the carbon inventory.

Electricity

Christie Walk incorporate a number of design elements that reduce its energy demand including passive heating and cooling. It also has LED lights, some solar panels and shared facilities such as a laundry.

Whilst Christie Walk generates its own renewable energy, electricity purchased from the grid still makes up 55% of the carbon inventory with 56,178 kWh being consumed. Fortunately, South Australia's supplied electricity has a high proportion of renewable power, currently at 50%. This means that the carbon emissions are half of what they would be if there were no renewable power.

Households and organisations can influence the amount of renewable energy in the grid by purchasing Green Power, which forces electricity suppliers to increase that portion of electricity coming from renewable sources. This is not something Christie Walk has chosen to do to date. It is an expensive option for a very tiny impact on individual emissions reduction.

At Christie Walk, Solar power is generated through panels on Groups B, G and S however only production from Groups G and S is currently measured. The total from these two groups amounts to 7,663 kWh. A total of 10,277 kWh is exported to the grid.

Due to the fact that not all solar power generation data is available it is not possible to quote what proportion of energy consumption is from self-generated power. However, the body corporate was able to report that Group S generated 84% of its power and Group G, 22%.

Group S uses the largest amount of electricity of all the groups by around four times that of the others. This is partly because it powers the common areas including the laundry, community room and some of the external lights. Group S also has a lift and heats its water by electricity. Cooling is facilitated by passive design and through water-based air coolers on the roof.

The following means of reducing electricity use are being considered:

- Evacuated-tube solar hot water with storage to minimise daytime power usage for heating
- Ridge-capping wind generators for all-day and all-night hot water boosting
- The Ridge Blade system when it becomes available in approximately 2020:
see <http://www.antsolutions.com.au/our-solutions/ridgeblade-horizontal-wind-turbines/>

Waste

As a proportion of total waste, general waste to landfill was 15% in 2017, amounting to 4 tCO₂-e. Refer to Table 3 for a breakdown of all waste types.

Residents are very diligent about recycling and organic waste collection with the following having been noted:

- Separate to the City of Adelaide recycled waste collection, residents also collect corks, soft plastics, batteries and 10c bottles. In 2017, this amounted to 7% of total recycling.
- Christie Walk has reported that the majority of its organic waste is used to make compost for use on the gardens. The remainder is collected by the council via the 'green' bins.

Table 3: Breakdown of waste disposal

Source	Total volume	Total Weight Per Annum (tonnes)	Proportion of total	GHG Emissions (t CO ₂ -e)
Mixed Waste	12.48	3	15%	4
Recycled	44.06	11	54%	0
Organic	24.96	6	31%	0
Waste Total	81.50	20	100%	4

Water

Christie Walk residents are very conscious of their water use, storing rainwater for use in 50% of toilets and for garden watering. In Group S, water is recirculated through a pipe system to avoid wastage when waiting for water to heat up for tap use.

Water consumption amounted to 1,682 kL in 2017 or 4 tCO₂-e.

Transport – Induced Travel

As previously noted, Christie Walk attracts visitors to learn about its environmental and community credentials. NCOS for Precincts requires that this type of travel is included in a precinct's carbon inventory to recognise the responsibility for that travel. The induced activity method as outlined in the Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (WRI and ICLEI, 2004) may be used which allows responsible entities to report 50% of trips, thereby recognising the responsibility shared by different geographic areas inducing these trips, and to avoid double counting of transport emissions.

The body corporate has reported some 1,500 visitors a year amounting to 3,000 trips. Data on the methods of travel is not collected however Christie Walk has made some assumptions on methods of travel based on its interactions with visitors. In summary, 75% of trips are estimated to be by school bus, with the remainder a mix of 10% public transport, taxi (1%), private cars (6%), bicycle (6%), hire car (1%) and walk (1%).

The total carbon emissions for 2017 for induced travel is 6 tCO₂-e – the second largest source of emissions for Christie Walk.

If the body corporate should deem it appropriate, it could charge visitors an amount of money to offset their travel. This could be paid as part of the tour fee, based on a per person rate. Based on the current price of local native tree planting or similar carbon offsets, of around \$20 per tonne, the price that would need to be charged would be around 10c.

Transport – Resident’s Travel

Our interpretation of NCOS for Precincts is that residents’ personal travel is an optional inclusion. The responsible entity has chosen not to include residents’ travel in the 2017 inventory. Should it wish to include this in future year’s inventories, then it is recommended that data collection commences at the start of a calendar year.

5. Emissions Intensity

For the purposes of comparison (from year to year and with other entities) and for communication purposes, it is helpful to normalise emissions data. Table 3 shows Christie Walk’s carbon emissions in terms of averages by resident, dwelling and area.

Table 3: Emissions intensity data

Carbon Intensity	Indicator	Average emissions (tCO ₂ -e)
Average emissions per resident (41)	tCO ₂ -e/resident	1.22
Average emissions per dwelling (27)	tCO ₂ -e/dwelling	1.85
Average emissions per m ² of area (2,000m ²)	tCO ₂ -e/m ²	0.02

Whilst there are no similar precincts that we are aware of to compare these figures with, comparisons for dwelling can be drawn with the average Australian household which ranges between three and thirty tonnes (EPA Victoria). This figure would however take into account household travel which, in this inventory, the Christie Walk figure does not.



6. Carbon Management

Carbon management involves taking a systematic approach to the measurement, reduction and reporting of carbon emissions. Measuring carbon emissions serves to quantify the activities that cause greenhouse gases and helps to identify areas on which to focus future emissions reduction, e.g. largest first. Good carbon management generally involves the steps shown in Table 4:

Table 4: The steps of good carbon management

Step	Description
Measure	Creating an annual carbon inventory.
Objective setting	Establishing an emissions reduction target.
Avoid	Can carbon emissions be avoided through more sustainable purchasing practices?
Reduce	Reducing emissions where possible within each of the activity areas.
Switch	Consider purchasing GreenPower.
Assess	What residual emissions remain after taking the above measures into account? Assess emissions intensity and refine reduction plans.
Offset	Consider offsetting residual emissions through the purchase of carbon offsets.
Carbon Neutral	Consider becoming certified carbon neutral.

Ongoing Data Collection and Measurement

Greenhouse gas data should continue to be collected on a regular basis, in the form of a spreadsheet and in accordance with the scope set out in this report – you can use the template provided. This will enable monitoring by the body corporate throughout the year and will make the year-end inventory calculation work easier.

Setting Objectives

Setting carbon reduction targets and incentives can lead to greater reductions than might otherwise be the case provided resident engagement occurs. Reduction targets can be absolute or relative or objectives might simply be one new initiative a year.

Reducing Emissions

Christie Walk already has an impressive list of actions it has taken to create a low carbon precinct and is continually working on a wish list of others. Whilst this report is only intended to provide a carbon inventory, some suggestions on areas of further emissions reduction and opportunities to increase Christie Walk's profile are provided in Table 5.

For offsetting and carbon neutrality refer to Section 7.

Table 5: Carbon reduction opportunities

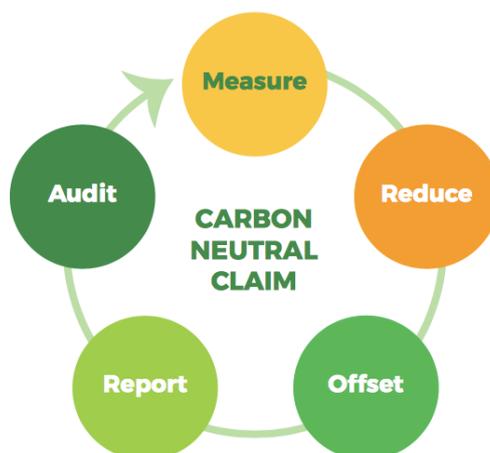
Emissions Source	Potential Opportunities
Energy	<p>If you have not already had an energy audit/review conducted this may be worthwhile to identify the latest technology opportunities and to have your energy bills verified.</p> <p>Consider solar battery storage. See link above or contact local suppliers for quotes.</p> <p>Research helpful websites such as: SA Government Energy and Environment: https://www.sa.gov.au/topics/energy-and-environment The Residential Energy Efficiency Scheme provides offers from time to time: https://www.sa.gov.au/topics/energy-and-environment/using-saving-energy/retailer-energy-efficiency-scheme</p>
Waste	Aim for 'zero waste'. Engage with all residents to identify types of waste that could be recycled or reused. Green Industries SA can provide assistance.
Water	Consider if water recycling and storage is being maximised. Is there room for more rainwater tanks?
Funding	The City of Adelaide provides funding for sustainability initiatives through the council area for building owners and tenants including businesses and residents. See https://www.cityofadelaide.com.au/your-council/funding/sustainable-city-incentives-scheme/

7. Carbon Neutral Certification

The Australian Government's National Carbon Offset Standard (NCOS) provides a step-by-step process to achieving carbon neutral certification. It also sets out the eligibility requirements for carbon offsetting in Australia. Certification can be for organisations, products, services, events, buildings and precincts. The process is set out in Figure 3.

Carbon neutrality involves, on an annual basis: creating a carbon inventory; developing an emissions reduction plan and recording emissions reduction activities; and offsetting the remainder with eligible offsets.

Figure 3: Overview of NCOS Certification (Australian Government, 2017)



Carbon Neutral is a term that has been defined in the National Carbon Offset Standard (NCOS) which also sets out how to become formally certified and eligible to use the Australian Government's NCOS logo as recognition. There is technically nothing to stop organisations saying they are carbon neutral even if they haven't followed the Standard in every respect however we would warn against 'greenwashing'². If the Standard isn't followed then an alternative term might be used clearly setting out the scope of inclusions.

The benefits of becoming certified carbon neutral include:

- Recognition of your environmental credentials and actions against climate change
- Access to a network for sharing carbon reduction ideas
- Promotional opportunities
- Ongoing cost savings due to carbon reduction
- Alignment with Carbon Neutral Adelaide, the partnership between the SA Government and the City of Adelaide to make Adelaide the world's first carbon neutral city.

NCOS for Precincts

"The Precinct Standard is a voluntary standard to manage greenhouse gas emissions and to achieve carbon neutrality. It provides best-practice guidance on how to measure, reduce, offset, report and audit emissions that occur as a result of the operations of a precinct.

"The Precinct Standard has been designed to accommodate a wide variety of precincts in Australia ... the standard can be used to achieve carbon neutrality and showcase climate leadership. The Precinct Standard can be used ... to better understand and manage carbon emissions, to credibly claim carbon neutrality and to seek carbon neutral certification".

(Australian Government NCOS for Precincts, 2017).

To make a valid and credible carbon neutral claim against NCOS for Precincts and maintain carbon neutral status, a responsible entity must:

- *Measure*: Prepare a carbon inventory/account
- *Reduce*: Reduce emissions where possible
- *Offset*: Cancel eligible offset units to compensate for remaining emissions
- *Report*: Prepare a public report
- *Audit*: Arrange for an independent audit of the carbon account and public report. Following certification an audit must be undertaken at least every three years.

The NCOS certification fee for precincts is currently \$2,500 plus GST for entities with a carbon inventory of less than 2,000 tCO₂-e. Other fees involved in the process include any consulting fees incurred in creating the carbon inventory and assisting with the preparation of documentation and liaison with the Australian Government's Carbon Neutral Program Team. Also, in the base year and first year of certification (which can be the same) an independent audit is required by a suitable accredited greenhouse gas auditor.

Suzanne Ridding has experience in taking organisations through the process to achieve NCOS certification and would be pleased to assist you down this path if you choose to aim for carbon neutrality. See Section 8.2 for more details.

² Greenwashing is the term used to describe claims of environmental responsibility that cannot be backed up by appropriate evidence and actions. The Trade Practices Act sets out the requirements for statements made by companies, products and services in terms of whether they are misleading. Fines can apply for breaches.

Carbon Offsets

Carbon offsets are projects that must have environmental benefits including carbon emissions reduction, prevention or sequestration, and which commonly also have social and economic benefits to local communities in which they are carried out.

From Christie Walk's perspective, if it decides to offset some or all of its carbon emissions, the following options apply:

1. Purchase carbon offsets but not apply for certification.
2. Purchase carbon offsets as part of a becoming a certified precinct.
3. Invest in local environmental projects that do not constitute eligible offsets under NCOS, e.g. biodiverse native plantings.

To become carbon neutral under NCOS, eligible offsets must be purchased. Carbon offsets, or carbon credits, are tradeable commodities and in Australia constitute a Financial Services Product. Carbon credits can be traded globally but are not currently fungible across international borders for the purposes of emissions trading, under emissions trading schemes. Australian Carbon Credit Units are those created through Australia's Emissions Reduction Fund. These are eligible offsets under NCOS, as are particular types of overseas credits.

As described in Section 4, page 12, Transport – Induced Travel, Christie Walk could purchase offsets on behalf of visitors, to offset their travel. This would cancel out that element of Christie Walk's carbon footprint for a very small fee which could be on-charged to visitors.
