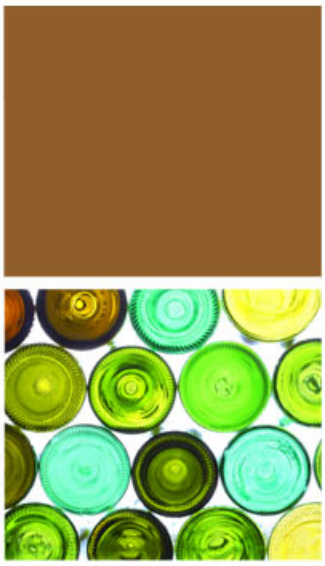
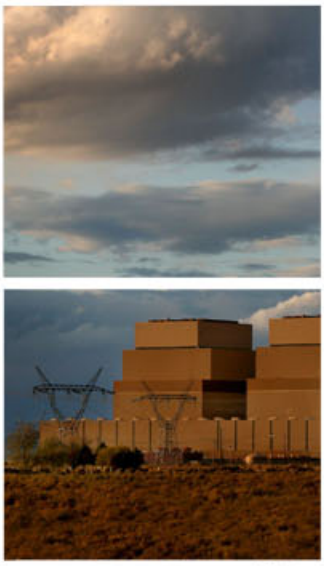
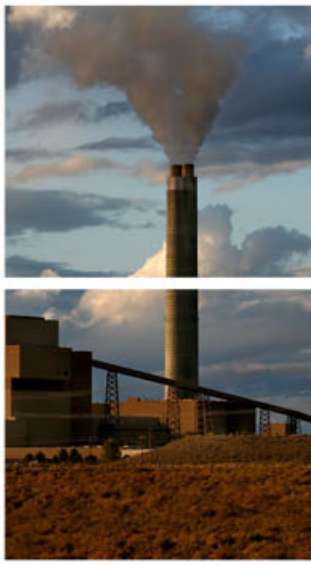
City of Henderson

2005 Baseline Emissions Inventory

Community Wide and City Government

OurHenderson
Our home. My responsibility.









April 2011

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Executive Summary

One of the strategic goals of the City of Henderson is to support sustainable practices and development in the community. In 2008, the City Council adopted the Sustainability Action Plan which included the goal to reduce greenhouse gas emissions in City operations and throughout our community. In 2009, the City of Henderson joined ICLEI-Local Governments for Sustainability (ICLEI) and in 2010 initiated an effort to prepare a greenhouse emissions (GHG) inventory. The GHG emissions inventory was initiated with three goals in mind:

- Establish a baseline against which to measure future emission levels.
- Calculate emissions trends and identify sources for the highest percentages of emissions.
- Use the completed GHG emissions inventory as the basis to fulfill a separate sustainability action item to identify and implement measures to reduce GHG emissions in City operations and throughout the community.

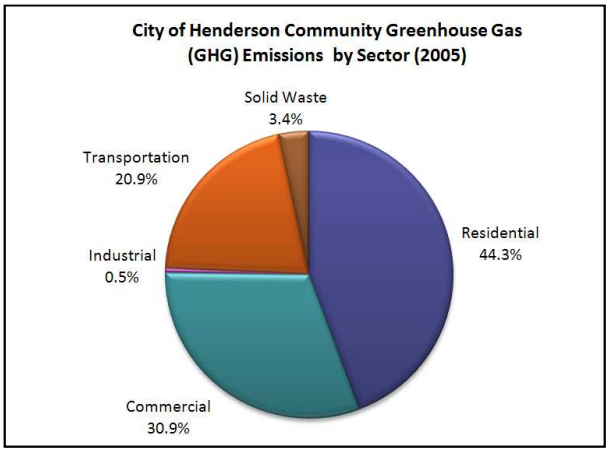
By establishing a baseline, this GHG emissions inventory will enable the City of Henderson to coordinate efforts to reduce GHG emissions, thereby improving air quality, reducing waste, cutting energy use, saving money and supporting the City's economic vitality.

Community Emissions Inventory Results

The Inventory identifies that the Henderson community emitted approximately 2,637,960 metric tons of CO_2e in the baseline year 2005. As shown in Figure I, the residential sector was the largest contributor to emissions (44.3%), producing approximately 1,167,447 metric tons of CO_2e in 2005. Emissions from the commercial sector (30.9%) and transportation sector (20.9%) accounted for the other major sources. The solid waste (3.4%) and industrial sector (0.5%) combined for less than 5% of all emissions.

The majority of emissions from the residential sector were the result electricity consumption in homes.

Figure I: Community GHG Emissions by Sector



Municipal Operations Emissions Inventory Results

Municipal operations and facilities produced approximately 78,989 metric tons of greenhouse gas emissions in 2005. As displayed in Figure II, this is approximately 2.9% of total community emissions in the city. Municipal emissions are comprised of wastewater, water delivery, streetlights, buildings, employee commute, and vehicle fleet (Figure III). Wastewater was the largest contributor of municipal emissions (28%) producing 22,119 metric tons of CO_2e. The second largest contributor (24.2%) was from energy consumption in City-owned and operated buildings.

Municipal emissions are a subset of the total community emissions as outlined below. However, similar to how businesses and factories perform their own facility-scale GHG Inventories; this Inventory analyzes Municipal emissions separately in order to be able to identify cost-effective emission reduction strategies in the future. The methodology for estimating emissions from local government operations is guided specifically by the Local Government Greenhouse Gas Emissions Inventory Protocol developed by the California Air Resources Board, ICLEI, and the California Climate Registry.

Figure II: Municipal Portion of Community GHG Emissions

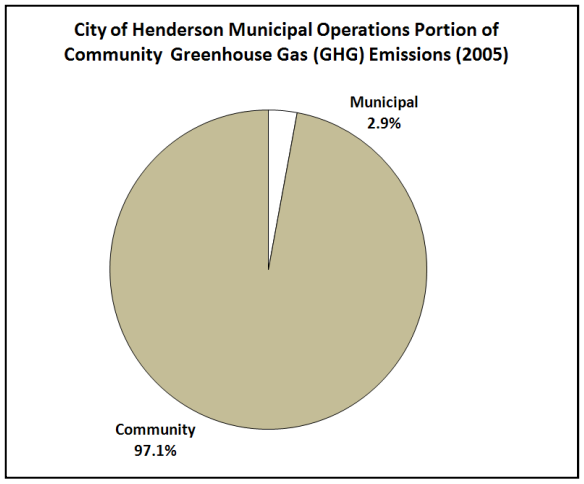
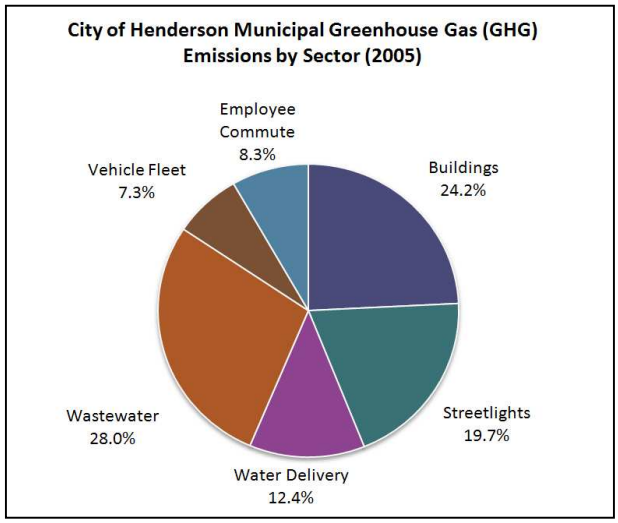


Figure III: Municipal GHG Emissions by Sector



Comparison of Emissions

Per capita emissions can be a useful metric for measuring progress in reducing greenhouse gas emissions. These comparisons can also be useful for evaluating one community's emissions with neighboring cities and against regional and national averages. Due to differences in emission inventory methods, it can be difficult to calculate a directly comparable per capita emissions number, and this margin of error must be considered when comparing figures.

Figure IV: Municipal Portion of Community GHG Emissions

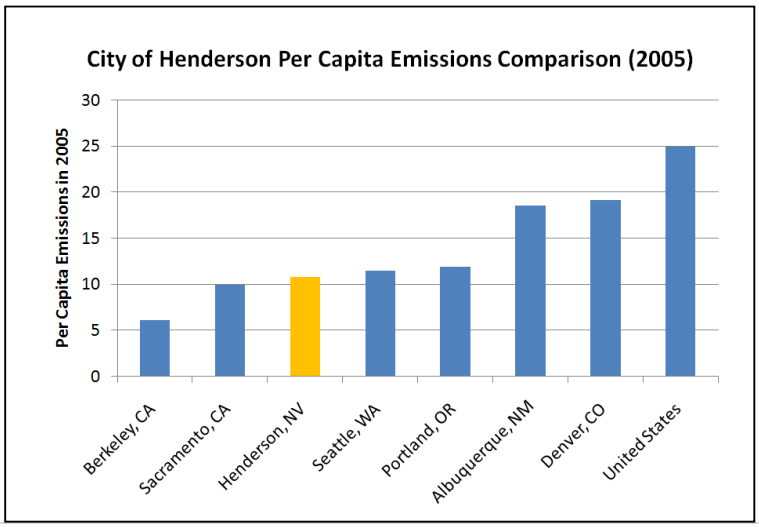


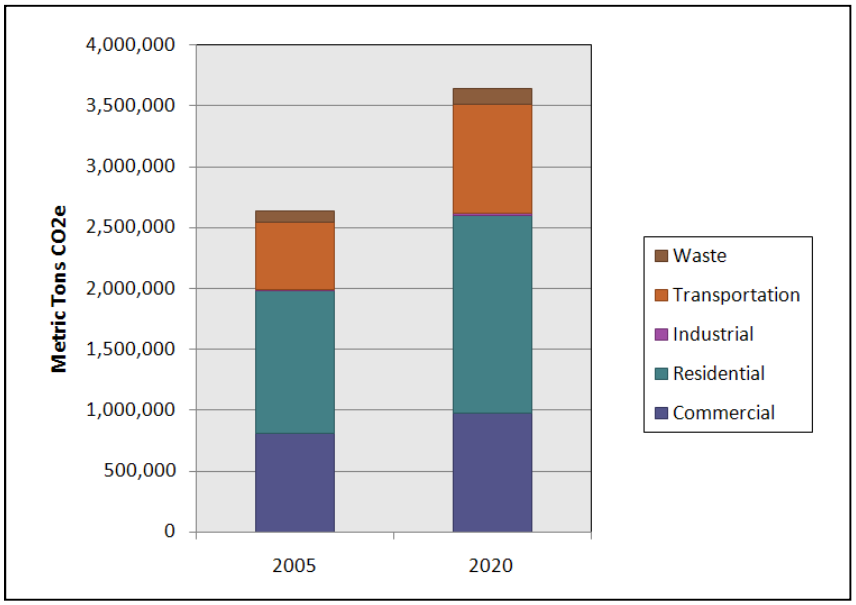
Figure IV compares the results on this inventory with other communities that have completed emissions inventories. Henderson compares favorably with most of the communities or jurisdictions on this list. However, differences between data sets and the time of data collection make comparisons difficult. Comparisons with cities in other regions may not be appropriate due to variations in climate and its corresponding impact on building energy use.

Forecast and Next Steps

If consumption trends continue the pattern observed in 2010, emissions will reach 3,643,898 metric tons CO_2e by the year 2020, or a 39% increase over 2005 baseline levels. This growth, shown in Figure V, is due to projected increases in households, population, and jobs within the City.

With this information, the City can make an informed determination of a reduction target, along with corresponding future sustainability initiatives.

Figure V: Community Emissions Forecast to 2020



1. Introduction

As the City of Henderson seeks to promote a more sustainable future through its Sustainability Action Plan, it has identified emissions reductions as one of its primary goals. In 2009, the City of Henderson joined ICLEI-Local Governments for Sustainability (ICLEI) and in 2010 initiated an effort to prepare a greenhouse emissions (GHG) inventory. The GHG emissions inventory was initiated with three goals in mind:

- Establish a baseline against which to measure future emission levels.
- Calculate emissions trends and identify sources for the highest percentages of emissions.
- Use the completed GHG emissions inventory as the basis to fulfill a separate sustainability action item to identify and implement measures to reduce GHG emissions in City operations and throughout the community.

By establishing a baseline, this GHG emissions inventory will enable the City of Henderson to coordinate efforts to reduce GHG emissions, thereby improving air quality, reducing waste, cutting energy use, saving money and supporting the City's economic vitality.

1.1 Greenhouse Gas Reduction Efforts in Nevada

In 2008, Governor Jim Gibbons signed an executive order to create the Nevada Climate Change Advisory Committee. The Committee identified a number of potential impacts to the state in the areas of public health, water, wildfire, agriculture, and air quality. The Committee also prepared a report with recommendations on how to reduce Nevada's GHG emissions with emphasis placed on developing renewable resources within the state. The Committee made a number of recommendations, including the following recommendations for local governments:

- Enact new or support existing energy efficient building standards to reduce energy consumption as necessary;
- Establish local Recycling Market Development Programs that reduce landfill waste, reduce transportation impacts, and save natural resources by strengthening recycling at the local level;

While the State of Nevada does not currently require local governments to inventory and report their emissions, an emissions inventory is a critical first step for the City to develop internal emissions reduction strategies and track future progress.

1.2 Sustainability and Greenhouse Gas Reduction Efforts in Henderson

The City of Henderson is committed to maintaining a high quality of life for its residents while pursuing a progressive approach to environmental issues. Recently, the City has taken major steps to increase sustainability awareness in the community and to address GHG emissions through a variety of sustainability programs and initiatives. For example, in 2002, the City of Henderson adopted an Energy Management Plan and began to implement simple, low-cost and energy-efficiency changes. In 2006, the City began an energy services performance contract with AMERESCO, a national energy services company. The initial $2.7 million investment included interior lighting upgrades, boiler replacements, a power management system for computer workstations, and traffic signal LED and control upgrades at 64 intersections. These changes resulted in a guaranteed annual savings of $264,277. A second $18 million project that includes retrofitting 26,000 streetlights and completing building energy efficiency upgrades to most city buildings will save more than $900,000 annually.

In 2009, the City adopted its first Sustainability Action Plan to address the issues of energy and water conservation, recycling and waste reduction, alternative transportation, urban design, urban nature and

environmental health. The City also launched its 'OurHenderson' campaign to promote sustainability in the community and emphasize personal responsibility as a key factor in achieving a more sustainable future. Later that year, the City joined ICLEI to assist with the preparation of a GHG emissions inventory. Most recently, the City has completed or initiated the following efforts to reduce its GHG emissions:

- Allocated a portion of the City's $2.2 million in federal Energy Efficiency and Conservation Block Grant (EECBG) funds and related utility rebates to double the capacity of an existing solar photovoltaic system on the North Community Police Station to 60kw.
- Upgraded the City's technology infrastructure so that 76% of the City's servers are EnergyStar compliant, 41% of all PCs are more energy efficient models, and 90% of monitors are LCD.
- Partnered with other local jurisdictions to create HomeFree Nevada, a non-profit organization to provide job training and certification for energy auditors and promote energy efficiency in homes.
- Removed roughly 69,000 square feet of turf along Henderson streets for an annual water savings of 3,795,660 gallons. The City's turf conversion loan program for homes and businesses has funded fifty projects and resulted in total annual water savings of more than three million gallons.
- Partnered with Republic Services to roll-out a single-stream residential recycling pilot program to 20,000 homes in Henderson in September 2010.
- Received Leadership in Energy and Environmental Design (LEED) Gold certification for the new North Community Police Station.
- Applied for LEED Gold certification for the new Heritage Park Senior Center and LEED Platinum certification for the new Heritage Park Aquatics Facility.
- Adopted innovative new standards to promote sustainable development as part of an updated Development Code (Title 19).
- Established the 'TreesHenderson' program to raise awareness about the significance of urban forestry resources in our community and sponsor tree planting events throughout the year.
- Adopted the Boulder Highway Investment Strategy as a long-range planning tool to promote public transit and transit-oriented development (TOD) along a key corridor in the community.
  Participated in the Clark County Lawnmower Exchange Program, which helped more than 300 Henderson residents replace their old gas-powered mowers with clean electric models.

As the City of Henderson continues to expand its sustainability efforts, quantifying the corresponding reductions in GHG emissions will be an important next step in measuring and reporting community progress toward a more sustainable future. This Baseline Inventory of GHG Emissions represents the City's first effort toward creating an established format and procedure for taking such strides.

2. Methodology

2.1. Greenhouse Gas Emissions Inventory Protocols

The first step towards achieving tangible greenhouse gas emissions reductions requires identifying baseline levels and sources of emissions. As local governments continue to join the sustainability movement, the need for a standardized approach to quantify these emissions is essential. Given this, Henderson staff used the International Local Government GHG Emissions Analysis Protocol (IEAP) to inventory the City's community emissions and the Local Government Operations Protocol (LGOP) to inventory GHG emissions from municipal buildings and operations (which is evaluated as a subsector of the community inventory).

2.1.1. Community Emissions Protocol

Henderson used the IEAP, developed by ICLEI, to create an inventory of community emissions. The IEAP provides an easily implementable set of guidelines to assist local governments in quantifying greenhouse gas emissions from both their internal operations and from the whole community within their boundaries. ICLEI began development of the IEAP in 1993, and recently formalized an official version to establish a common GHG emissions inventory protocol for all local governments worldwide.

2.1.2. Municipal Emissions Protocol

Henderson used the LGOP, also developed by ICLEI and others, to conduct the municipal emissions inventory specifically. The LGOP serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. The purpose of the LGOP is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory.

2.2. Quantifying Greenhouse Gases Emissions

2.2.1. Establishing a Base Year

A primary requirement of the emissions inventory process is to select a base year with which to compare current emissions. Most local governments, including other local governments in Southern Nevada, have opted to use 2005 as the base year for their emissions inventories due to the availability of accurate and complete data. Similar to these jurisdictions, Henderson's inventory also utilizes 2005 as its base year.

2.2.2. Establishing Boundaries

Community: Geopolitical Boundary

Henderson's community inventory assesses emissions resulting from activities taking place within the City's geopolitical boundaries. The IEAP defines geopolitical boundary as that "consisting of the physical area or region over which the local government has jurisdictional authority." Activities that occur within this boundary can be, for the most part, controlled or influenced by Henderson's policies and educational programs. Although the City may have limited influence over the level of emissions from some activities, it is important that every effort be made to compile a complete analysis of all activities that result in GHG emissions.

Government: Organizational Boundaries

According to the LGOP, a government can use two approaches to define its organizational boundary for reporting GHG emissions: activities and operations that the jurisdiction controls operationally and activities and operations that the jurisdiction controls financially. This report estimates Henderson's municipal GHG emissions based on activities and facilities over which the City maintains operational control.

2.2.3. Emission Types

The IEAP and LGOP recommend assessing emissions from the six internationally recognized greenhouse gases regulated under the Kyoto Protocol as listed in Table 1. However, quantifying emissions beyond the three primary GHGs – carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_20) – can be difficult. Therefore, ICLEI has developed a means for local governments to produce a simplified inventory that includes the three primary GHGs yet is still in accordance with the IEAP and LGOP methodology. This methodology includes creating equivalents based on using the most common GHG: carbon dioxide, as a base unit. Other GHG's are expressed as multiples of CO_2, or carbon dioxide equivalents (CO_2e).

Table 1: Greenhouse Gases

Greenhouse Gas	Chemical Formula	Carbon Dioxide Equivalent (CO_2e)
Carbon Dioxide	CO_2	1
Methane	CH_4	21
Nitrous Oxide	N_2O	310
Hydrofluorocarbons	Various	43-11,700
Perfluorocarbons	Various	6,500-9,000
Sulfur Hexafluoride	SF_6	23,900

2.2.4. Quantification Methods

GHG emissions can be quantified in two ways, and this report uses both methods.

Measurement-based methodologies refer to the direct measurement of GHG emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, or landfill.

Calculation-based methodologies refer to the calculation of GHG emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used:

Activity Data x Emission Factor = Emissions

Activity data refer to the relevant measurement of energy use such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see Section 6: Appendices for a detailed listing of the activity data used in composing this inventory.

Known emission factors are used to convert energy usage or other activity data into associated emissions quantities. They are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO_2 /kWh of electricity). Table 2 demonstrates an example of common emission calculations that use this formula. Please see Section 6: Appendices for details on the emissions factors used in this inventory.

Table 2: Basic Emission Calculations

Activity Data	Emissions Factor	Emissions
Electricity Consumption (kWh)	CO_2 emitted/kWh	CO_2 emitted
Natural Gas Consumption (therms)	CO_2 emitted/therm	CO_2 emitted
Gasoline/Diesel Consumption (gallons)	CO_2 emitted/gallon	CO_2 emitted
Vehicle Miles Traveled	CH_4, N_20 emitted/mile	CH_4, N_2O emitted

2.2.5. Clean Air and Climate Protection (CACP) Software

To facilitate community efforts to reduce greenhouse gas emissions, ICLEI developed the Clean Air and Climate Protection (CACP) software package in partnership with the State and Territorial Air Pollution Program Administrators (STAPPA), the National Association of Clean Air Agencies and Torrie Smith Associates. The CACP software translates data on energy use, transportation patterns, solid waste disposal, and other inputs into GHG emissions. In addition, the software quantifies the benefit of actions that have the effect of avoiding or reducing CO_2e emissions.

In this report, GHG emissions are aggregated and reported in terms of equivalent carbon dioxide units, or CO_2e. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide on a per weight basis in its capacity to trap heat, so the CACP software converts one metric ton of methane emissions to 21 metric tons of carbon dioxide equivalents. Table 1 lists the CO_2e of the most commonly occurring greenhouse gases.

The CACP software has been and continues to be used by over 500 U.S. cities and towns to reduce their greenhouse gas emissions. However, it is worth noting that, although the software provides governments with a sophisticated and useful tool, calculating emissions from energy use with precision is difficult. The model depends upon numerous assumptions, and it is limited by the quantity and quality of available data. With this in mind, it is useful to think of any specific number generated by the model as an approximation of reality, rather than an exact value.

2.3. Evaluating Emissions

2.3.1. Emissions by Scope

For both community and government operations, emissions sources are categorized according to where they fall relative to the geopolitical boundaries of the community or the operational boundaries of the government. Emissions sources are categorized as direct or indirect emissions – Scope 1, Scope 2, or Scope 3. Using the "Scopes" framework for reporting GHG emissions at the local level helps prevent double counting for major categories such as electricity use and waste disposal.

<u>Scope Definitions for Community-wide Emissions</u>

Three emissions scopes are identified for community emissions:

- **Scope 1:** All direct emissions from sources located within the geopolitical boundaries of the local government.
- **Scope 2:** Indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, and cooling. Scope 2 emissions occur as a result of activities that take place within the geopolitical boundaries of the local government, but that occur at sources located outside of the government's jurisdiction.
- **Scope 3:** All other indirect or embodied emissions not covered in Scope 2 that occur as a result of activity within the geopolitical boundaries. Scope 1 and Scope 2 sources are the most essential components of a community greenhouse gas analysis as these sources are typically the most significant in scale, and are most easily influenced by local policymaking.

<u>Scope Definitions for Municipal Operations</u>

Similar to the community framework, three main categories of scopes are identified for municipal operations:

- **Scope 1:** Direct emissions from sources within a local government's organizational

boundaries that the local government owns or controls.

- **Scope 2:** Indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, and cooling. Scope 2 emissions occur as a result of activities that take place within the organizational boundaries of the reporting entity, but that occur at sources owned or controlled by another entity.
- **Scope 3:** All other indirect emissions not covered in Scope 2, such as emissions from up-stream and downstream activities that occur as a result of activities within the operational boundaries of the local government, emissions resulting from the extraction of and production of purchased materials and fuels, contracted services, and waste disposal.

As with the community inventory, Scope 1 and Scope 2 sources are the most essential components of a local GHG emissions analysis because these sources are usually significant in scale and are directly under the control of local governments. Local governments typically have indirect control over Scope 3 emissions. For example, solid waste generated from municipal operations is included as Scope 3 because of the unique circumstances in which emissions are generated – emissions from waste are generated over time as the waste decomposes and not directly in the base year.

2.3.2. Emissions by Sector

In addition to categorizing emissions by scope, this inventory examines emissions by sector. Many local governments find a sector-based analysis more relevant to policy making and project management, as it assists in formulating sector-specific reduction measures. This inventory evaluates community and municipal emissions by their respective sectors as listed in Table 3.

Table 3: Community and Municipal Sectors

Community	Municipal
Residential	Buildings
Commercial	Streetlights
Industrial	Vehicle Fleet
Transportation	Employee Commute
Waste	Water/Sewage

3. Community Emissions Inventory Results

3.1. Emissions by Scope

As outlined in the previous section, numerous items can be included in a community scale emissions inventory. This inventory includes Scope 1, Scope 2, and Scope 3 sources from the sectors shown in Table 4 below:

Table 4: Scopes and Sectors Included in City of Henderson 2005 Community Inventory

Sector	Scope 1	Scope 2	Scope 3
Residential	Natural Gas	Electricity	
Commercial	Natural Gas	Electricity	
Industrial	Natural Gas	Electricity	
Transportation	Gasoline & Diesel		
Waste			Future Emissions from 2005 Waste

Including all scopes, the community of Henderson emitted approximately 2,637,960 metric tons of CO_2e in the year 2005. As shown in Table 5 and illustrated in Figure 1, Scope 2 emissions are the largest (62.8%) with Scope 1 (33.8%) and Scope 3 (3.4%) constituting the remainder.

Figure 1: Community GHG Emissions by Scope

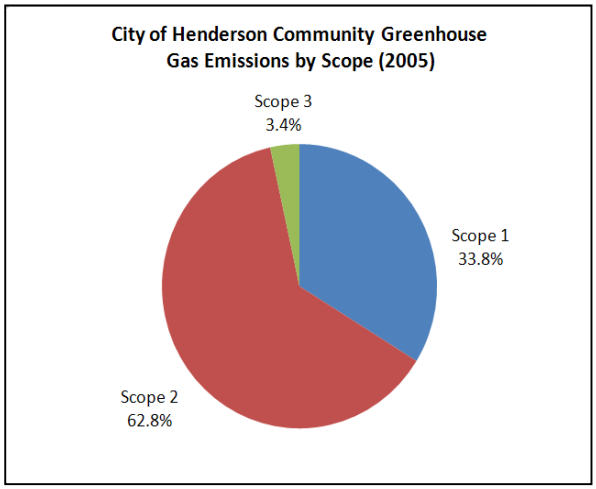


Table 5: Community GHG Emissions per Sector per Scope (metric tons of CO_2e)

Sector	Scope 1	Scope 2	Scope 3	TOTAL
Residential	286,964	880,483	-	1,167,447
Commercial	54,785	761,297	-	816,082
Industrial	309	13,704	-	14,013
Transportation	550,316	-	-	550,316
Waste	-	-	90,102	90,102
TOTAL	892,374	1,655,484	90,102	**2,637,960**
Percentage of Total CO_2e	33.8%	62.8%	3.4%	**100%**

As shown in Table 6 and Figure 2 on the following page, the largest percentage of Scope 1 emissions came from the Transportation Sector (61.7%). The Transportation Sector emissions are the result of diesel and gasoline consumed on local roads and state highways located within Henderson city limits. The remainder of Scope 1 emissions resulted from natural gas combustion in Henderson homes (Residential Sector - 32.2%) and businesses (Commercial Sector – 6.1%).

Table 6: Scope 1 GHG Emissions (metric tons of CO_2e)

Scope 1 Emissions by Sector	Residential	Commercial	Industrial	Transportation	TOTAL
CO_2e (metric tons)	286,964	54,785	309	550,316	892,374
% of Total CO2e	32.2%	6.1%	0.0%	61.7%	100%
MMBtu	4,893,780	934,289	5,269	6,867,532	12,700,870

Table 7: Scope 2 GHG Emissions (metric tons of CO_2e)

Scope 2 Emissions by Sector	Residential	Commercial	Industrial	TOTAL
CO_2e (metric tons)	880,483	761,297	13,704	1,655,484
% of Total CO2e	53.2%	46.0%	0.8%	100%
MMBtu	4,563,571	3,945,829	71,029	8,580,429

Figure 2: Community Scope 1 GHG

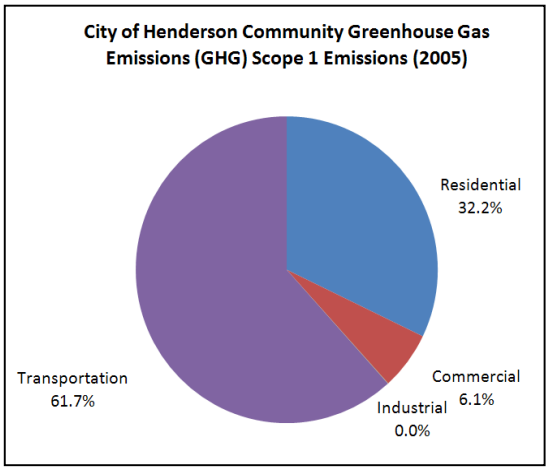
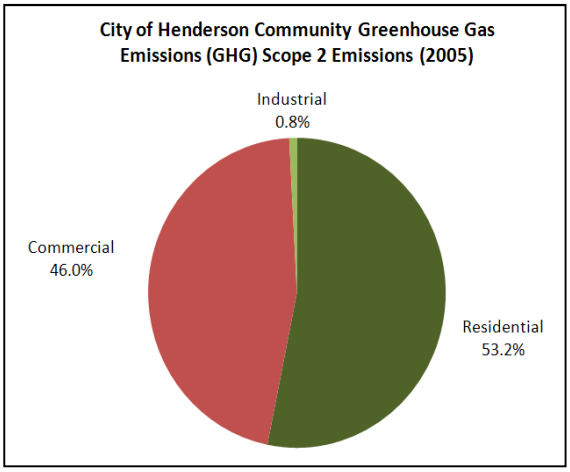


Figure 3: Community Scope 2 GHG

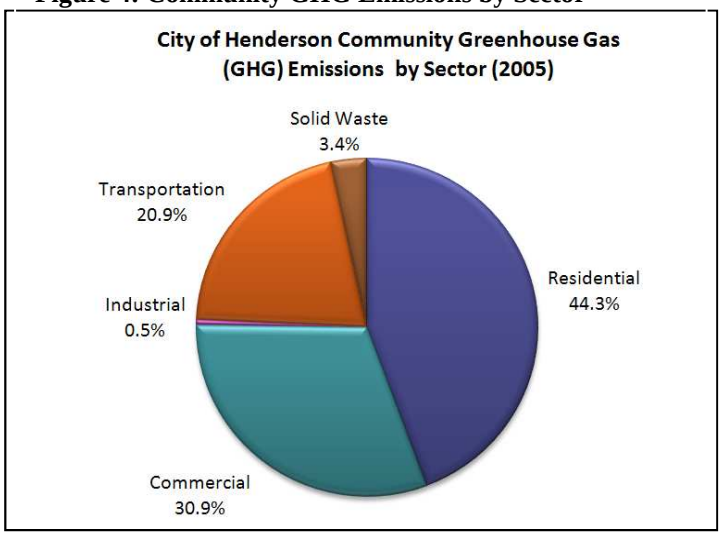


As shown in Table 7 and Figure 3, the largest percentage of Scope 2 emissions in 2005 was generated by the Residential Sector. One hundred percent (100%) of Scope 2 emissions came from electricity consumption in the Residential Sector (53.2%), Commercial Sector (46.0%) and Industrial Sector (0.8%) within city boundaries. As noted above in the general description of Scope 2 parameters, the actual emissions from these activities were generated outside of Henderson city boundaries – in this case, at the source of electricity generation.

The remaining portion of emissions included in the community inventory for 2005 fall under the category of Scope 3. All emissions in this category are an estimate over the lifecycle decomposition of waste sent to landfill in the base year (2005).

3.2 Emissions by Sector

Figure 4: Community GHG Emissions by Sector



As noted in the previous section, the community of Henderson emitted approximately 2,637,960 metric tons of CO_2e in 2005. In addition to viewing these data through the lens of the various scopes, we can also focus specifically on each sector, with scopes aggregated by sector. As shown in Figure 4 and Table 8 below, electricity and natural gas consumption within the Residential Sector was the largest sources of community emissions (44.3 %). Electricity and natural gas emissions from the Commercial Sector accounted for 30.9% of total community emissions and emissions from the Transportation Sector (gasoline and diesel sources) accounted for 20.9% of the community emissions. The remaining 3.9% came from a combination of waste generated by Henderson's residents and businesses and electricity and natural gas emissions from the Industrial Sector. The following subsections 3.2.1 – 3.2.5 provide further detail for each sector.

Table 8: Community GHG Emissions by Sector (metric tons CO2e)

2005 Community Emissions by Sector	Residential	Commercial	Industrial	Transportation	Waste	TOTAL
CO_2e (metric tons)	1,167,447	816,083	14,013	550,316	90,102	2,622,368
% of Total CO2e	44.3%	30.9%	0.5%	20.9%	3.4%	100%
MMBtu	9,457,351	4,880,118	76,299	6,867,532	-	21,281,299

3.2.1 Residential

As shown in Table 8, Henderson's Residential Sector generated an estimated 1,167,447 metric tons of CO_2e in 2005. This estimate was calculated using 2005 electricity and natural gas consumption data provided by NV Energy and Southwest Gas, and includes only consumption in residential buildings. Data on residential equipment usage, such as lawnmowers or on-site electricity generation, is not included in this inventory. GHG emissions associated with residential transportation and residential waste generation are included separately in the Transportation and Waste Sector emissions totals.

Table 9 provides information on residential emissions on a per household basis. Henderson households generated 12.4 metric tons of GHG emissions (CO_2e in 2005.

Table 9: Henderson 2005 GHG Emissions per Household

Number of Occupied Housing Units	94,537
Total Residential GHG Emissions (metric tons CO_2e)	1,167,447
Residential GHG Emissions / Household (metric tons CO_2e)	12.4

Figure 5 illustrates the breakdown of residential GHG emissions by fuel type. Over 75 percent of residential GHG emissions were generated from the use of electricity. Electricity is typically used in residences for air conditioning, lighting and home appliances. Approximately 25 percent of residential GHG emissions were generated through natural gas provided by Southwest Gas.

Figure 5: Residential Emissions by Source

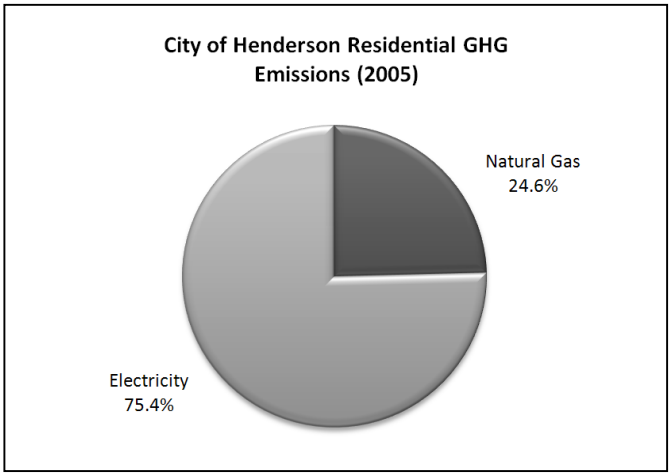


Table 10: Residential Emissions by Source

Residential Emission Sources 2005	Electricity	Natural Gas	TOTAL
$MTCO_2e$	880,483	286,964	1,167,447
% of Total CO_2e	75.4%	24.6%	100%
MMBtu	4,563,571	4,893,780	9,457,351

3.2.2 Commercial

Overall, Henderson's businesses generated approximately 800,490 metric tons of CO_2e (30%) of community-wide GHG emissions in 2005. As illustrated in Table 11, 761,297 metric tons of CO_2e (93.3%) of the Commercial GHG emissions identified in this study were generated from the combustion of electricity. In addition, Commercial natural gas consumption accounts for 54,754 metric tons $C0_2e$ (6.8%) of the Commercial GHG emissions.

Table 11: Commercial Emissions by Source

Commercial Emission Sources 2005	Electricity	Natural Gas	TOTAL
CO_2e (metric tons)	761,297	54,745	816,083
% of Total CO_2e	93.3%	6.7%	100%
MMBtu	3,945,829	934,289	4,880,118

3.2.3 Industrial

Overall, Henderson's industries generated approximately 14,013 metric tons of CO_2e (0.5%) of community-wide GHG emissions in 2005.

As illustrated in Table 12, 13,704 metric tons of CO_2e (97.8%) of the Industrial GHG emissions identified in this study were generated from the combustion of electricity. In addition, Industrial natural gas consumption accounts for about 309 metric tons CO2e (2.2%) of the Industrial GHG emissions.

Table 12: Industrial Emissions by Source

Commercial Emission Sources 2005	Electricity	Natural Gas	TOTAL
CO_2e (metric tons)	13,704	309	14,013
% of Total CO_2e	97.8%	2.2%	100%
MMBtu	71,029	5,269	76,299

3.2.4 Transportation

Table 13 details Henderson's emissions for the Transportation Sector by fuel type. Gasoline consumption in 2005 generated 87,352 metric tons of CO2e (15.9%) of total transportation-related GHG emissions while diesel consumption generated 462,964 metric tons CO2e (84.1%)..

Table 13: Transportation Emissions by Source

Transportation Fuel Emissions Sources 2005	Gasoline	Diesel	TOTAL
CO_2e (metric tons)	87,352	462,964	550,316
% of Total CO_2e	15.9%	84.1%	100%
MMBtu	1,082,253	5,785,278	6,867,532

Overall, Henderson's Transportation Sector accounted for 550,316 metric tons of CO_2e (20.9%) of the City's GHG emissions in 2005. The Transportation Sector analysis includes emissions from all vehicle used within Henderson's city boundaries (whether on local roads or State highways passing through Henderson's jurisdiction).

Data provided did not allow for a breakdown by road type (local streets vs. State highways). In addition, emissions from the air travel of Henderson residents were not included in the Transportation Sector analysis. With more time and the availability of additional data the GHG emissions from air travel could be estimated. Please see Section 6: Appendices for more detail on methods and emissions factors used in calculating emissions from the Transportation Sector.

3.2.5 Waste

As noted in Table 8, the Waste Sector constituted 3.4% of total 2005 emissions for the community of Henderson. Emissions from the Waste Sector are an estimate of methane generation from the anaerobic decomposition of organic wastes (such as paper, food scraps, plant debris, wood, etc.) that are deposited in the local landfill.

The waste generation emissions included in the report are the estimated future emissions of waste that was sent to any landfill by Henderson households and businesses in the base year 2005. These emissions are considered Scope 3 because they are not generated in the base year, but will result from the decomposition of the 2005 waste over the full 100+ year cycle of its decomposition.

Waste generation emissions figures are the product of a modeling exercise that estimates the future emissions that will result over the full decomposition of the organic waste sent to any landfill in the base year 2005. The model used to run this estimation is based on the U.S. EPA Waste Reduction Model (WARM). In order to estimate the relative quantities of various types of waste included in the general disposal figures obtained from Clark County, waste characterization figures were utilized from the 2005 EPA report, *Municipal Solid Waste in the United States: Facts and Figures.*[1]

[1] http://www.epa.gov/osw/nonhaz/municipal/pubs/mswchar05.pdf

Waste generation sources are included because they enable policy development addressing both landfill gas management and waste diversion. Transportation emissions generated from the collection, transfer and disposal of solid waste are included in the Transportation Sector GHG emissions.

3.3 Per Capita Emissions

Per capita emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one community's emissions with neighboring cities and against regional and national averages. Due to differences in emission inventory methods, it can be difficult to calculate a directly comparable per capita emissions number, and this margin of error must be considered when comparing figures.

As detailed in Table 14, dividing total community GHG emissions by population yields a result of 10.8 metric tons CO_2e per capita for the City of Henderson. It is important to note that this number is not the same as carbon footprint of the average individual living in Henderson (which would include lifecycle emissions, emissions from air travel, etc.)

Table 14: Henderson 2005 GHG Emissions per Capita

Estimated 2005 population	243,897
Community GHG Emissions (metric tons CO_2e)	2,622,368
GHG Emissions / Resident (metric tons CO_2e/resident)	10.8

Table 15 compares the results on this inventory with other communities that have completed emissions inventories. Henderson compares favorably with most of the communities or jurisdictions on this list. However, differences between data sets and the time of data collection make comparisons difficult. Comparisons with cities in other regions may not be appropriate due to variations in climate and its corresponding impact on building energy use.

Table 15: Comparing Per Capita Emissions

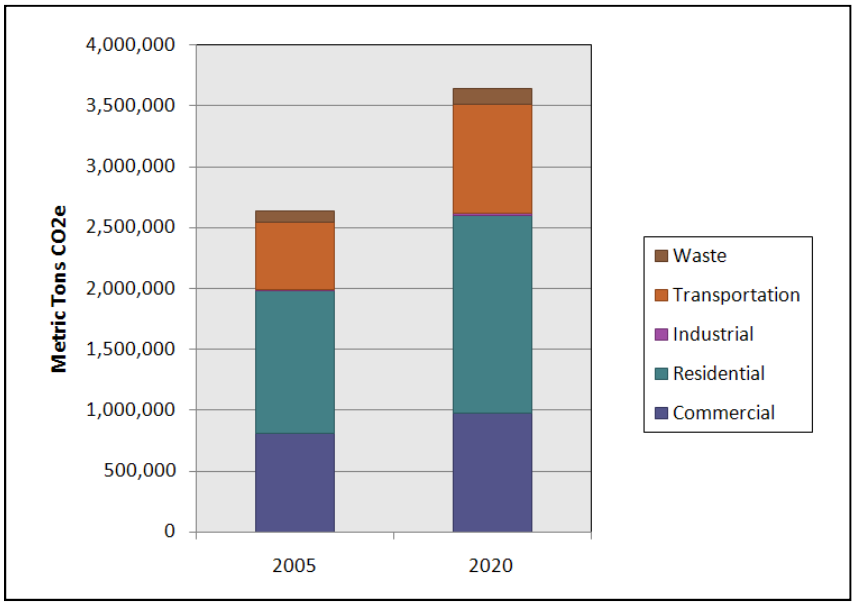
	Per Capita Emissions (tons/person/year)
Vancouver[2]	4.6
Berkeley	6.1
New York[3]	6.4
Henderson	10.8
Seattle[4]	11.5
Portland[5]	11.9
Albuquerque[6]	18.5
Denver[7]	19.1
United States[8]	24.9

[2] Vancouver 2008 GHG Emissions Report.
[3] 2008 Inventory of New York City GHG Emissions.
[4] Seattle's Community Carbon Footprint 2005.
[5] City of Portland and Multnomah County Climate Action Plan 2009.
[6] City of Albuquerque Climate Action Plan 2009.
[7] City of Denver Climate Action Plan.
[8] EIA Emissions of Greenhouse Gases Report.

3.4. Community Emissions Forecast

To illustrate the potential emissions growth based on projected trends in energy use, driving habits, job growth and population growth from the baseline year going forward, Henderson staff has conducted an emissions forecast for the year 2020. Under a business-as-usual scenario, the City of Henderson's emissions will grow from 2,622,368 in 2005 to approximately 3,643,898 metric tons CO_2e by the year 2020, or about 39%. See Figure 6 and Table 15.

Figure 6: Community Emissions Forecast to 2020



3.4.1 Residential

For the Residential Sector, a population projection for the City of Henderson conducted by the Community Development Department estimated that Henderson's population was 243,897 in 2005 and will be 340,657 in 2020. Based on these population projections, staff estimated average annual compound growth in energy demand to be 0.58%.

3.4.2 Commercial/Industrial

Analysis contained within *Nevada Statewide Greenhouse Gas Emissions Inventory and Projections, 1990-2020*[9], a 2008 report by the Nevada Division of Environmental Protection (NDEP), shows that projected electricity consumption growth rates are 1.2 percent for the Commercial Sector and 1.1 percent for the Industrial Sector. These estimates come from the Public Utilities Commission of Nevada (PUCN) 2008 Nevada Energy Forecast and are based on the results of the econometric modeling of consumer electricity demand forecast by the University of Nevada Las Vegas Center for Business & Economic Research (CBER).

3.4.2 Transportation

For the Transportation Sector, projected growth in energy demand was obtained from the NDEP 2008 statewide GHG emissions inventory referenced above.[10] In their report, the NDEP projects that on-road vehicle miles traveled (VMT) will increase 3.3% per year through 2020. This number was used to estimate emissions growth in the Transportation Sector for the Henderson forecast.

[9] http://ndep.nv.gov/baqp/technical/NV_Statewide_GHG_Inventory2008.pdf
[10] http://ndep.nv.gov/baqp/technical/NV_Statewide_GHG_Inventory2008.pdf

3.4.2 Waste Generation

As with the Residential Sector, population is the primary determinate for growth in emissions pertaining to waste generation (Scope 3). Therefore, the average annual population growth rate for 2005 to 2020 (2.25%, as calculated by Community Development population projections) was used to estimate future emissions from waste disposal.

Table 16: Community Emissions Growth Projections by Sector

2005 Community Emissions Growth Forecast by Sector	2005 CO_2e (metric tons)	2020 CO_2e (metric tons)	Annual Growth Rate	Percent Change from 2005 to 2020
Residential	1,167,447	1,629,997	2.25%	39.6%
Commercial	816,083	975,982	1.20%	19.6%
Industrial	14,013	15,512	1.10%	17.8%
Transportation	550,316	895,606	3.30%	62.7%
Waste Generation	90,102	125,801	2.25%	39.6%
TOTAL	**2,622,368**	**3,643,898**	**-**	**39.0%**

4. Municipal Emissions Inventory Results

City operations and facilities produced approximately 78,989 metric tons of CO_2e in 2005. Municipal GHG emissions for Henderson were embedded in the community emissions inventory in the following sectors detailed in Table 16.

Table 17: Municipal Emissions by Source

Municipal Sector	Community Sector
Buildings	Commercial/Industrial
Streetlights	Commercial/Industrial
Vehicle Fleet	Transportation
Employee Commute	Transportation
Water	Commercial/Industrial
Wastewater	Commercial/Industrial
	Waste Generation

Municipal GHG emissions constituted three percent (3%) of total community emissions. While reductions in municipal greenhouse gas emissions will have limited impact on the community's overall emission levels, municipal leadership in reducing GHG emissions has symbolic value that extends beyond the magnitude of emissions reduced.

4.1 Emissions by Scope

Including all scopes, the City of Henderson's municipal operations emitted approximately 78,989 metric tons of CO_2e in the year 2005. Table 17 lists the breakdown of emissions sources by scope and sector.

Table 18: Municipal Emissions by Sector

Sector	Scope 1	Scope 2	Scope 3
Buildings	Natural Gas	Electricity	
Streetlights		Electricity	
Vehicle Fleet	Gasoline & Diesel		
Employee Commute			Gasoline & Diesel
Water	Natural Gas	Electricity	
Wastewater	Natural Gas, Methane, Nitrous Oxide	Electricity	

Table 18 details, Henderson's municipal emissions by Sector and Scope 1(13.2 percent), Scope 2 (78.5 percent) and Scope 3 (8.3 percent).

Table 19: Scope and Sectors Included in Henderson's 2005 Municipal Inventory

Sector	Scope 1	Scope 2	Scope 3	TOTAL
Buildings	3,004	16,148	-	19,152
Streetlights	-	15,593	-	15,593
Vehicle Fleet	5,739	-	-	5,739
Employee Commute	-	-	6,573	6,573
Water	7	9,805	-	9,812
Wastewater	1,647	20,472	-	22,119
TOTAL	10,397	62,018	6,573	**78,988**
Percentage of Total CO_2e	13.2%	78.5%	8.3%	**100%**

As shown in Table 19 and Figure 7 below, the largest percentage of Scope 1 emissions came from the City's Vehicle Fleet (55.2%). Scope 1 Vehicle Fleet emissions are the result of gasoline, diesel and natural gas consumption by fleet vehicles. The remainder of Scope 1 emissions resulted from natural gas consumption in City Buildings (28.9%), Wastewater Facilities (15.8%) and Water Delivery (0.1%).

As detailed in Table 20 and Figure 8, the largest percentage of Scope 2 emissions in 2005 was generated by Wastewater Facilities (33%), followed by Buildings (26%), Streetlights (25.2%) and Water Delivery Facilities (15.8%). One hundred percent (100%) of Henderson's municipal Scope 2 emissions came from electricity consumption from municipally operated sources. As noted in the general description of Scope 2 parameters, the actual emissions from these activities were generated outside of Henderson city boundaries – in this case, at the source of electricity generation.

Table 20: Municipal Scope 1 GHG Emissions (metric tons CO_2e)

Scope 1 Emissions by Sector	Buildings	Vehicle Fleet	Water	Wastewater	TOTAL
CO_2e (metric tons)	3004	5,739	7	1,647	10,397
Percentage of Total CO_2e	28.9%	55.2%	0.1%	15.8%	100%
MMBtu	51,228	71,327	126	106,109	228,790

Table 21: Municipal Scope 2 GHG Emissions (metric tons CO_2e)

Scope 2 Emissions by Sector	Buildings	Streetlights	Water	Wastewater	TOTAL
CO_2e (metric tons)	16,148	15,593	9,805	20,472	62,018
Percentage of Total CO_2e	26.0%	25.2%	15.8%	33.0%	100%
MMBtu	83,703	80,817	50,819	1,522	216,861

Figure 7: Municipal Scope 1 Emissions

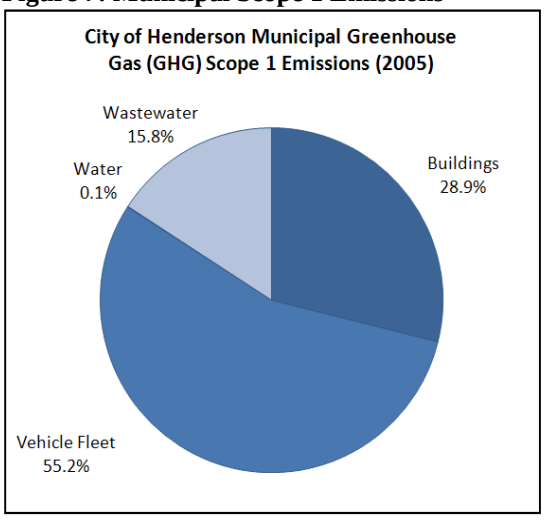
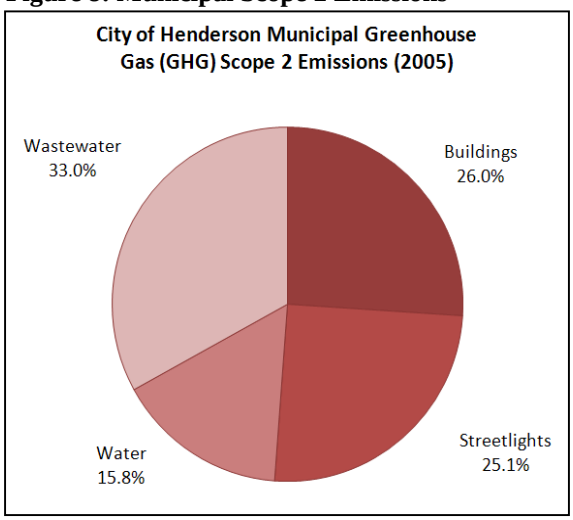


Figure 8: Municipal Scope 2 Emissions



Remaining emissions included in the City of Henderson 2005 municipal inventory fall under Scope 3. GHG emissions from these sources are related to municipal operations; however they fall outside of Scopes 1 and 2 because they are not financially or operationally controlled by the City of Henderson. As shown in Table 14, the Employee Commute Sector comprises 100% of GHG emissions from this category which includes estimates of employee gasoline and diesel use in travel to and from work. Scope 3 presents a more complete picture of a local government's energy use patterns and impact on the

environment. The City of Henderson can influence these emissions through various programs despite not having direct control over them.

4.2 Emissions by Sector

As noted previously, municipal operations in Henderson emitted approximately 78,989 metric tons of CO_2e in 2005. In addition to viewing these data by scopes, we can also look at each sector, with scopes aggregated by sector. As shown in Figure 9, electricity and natural gas consumption by Wastewater was the largest source of municipal emissions (28.0%). Total municipal emissions include Buildings (24.2%) of total municipal emissions, followed by Streetlights (19.7%), Water Delivery (12.4%), Employee Commute (8.3%) and Vehicle Fleet (7.3%). See Table 21 below for details on each sector.

Figure 9: Municipal GHG Emissions by Sector

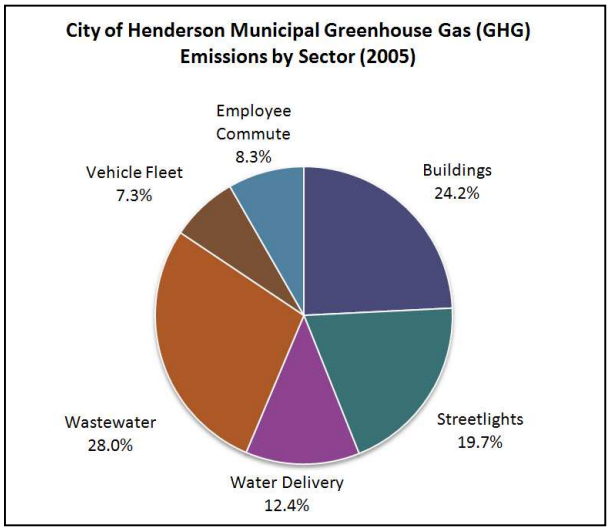


Table 22: Municipal Emissions by Sector

2005 Municipal Emissions by Sector	Buildings	Streetlights	Vehicle Fleet	Employee Commute	Water Delivery	Wastewater	TOTAL
CO_2e (metric tons)	19,153	15,593	5,739	6,573	9,812	22,119	78,989
% of Total CO2e	24.2%	19.7%	7.3%	8.3%	12.4%	28.0%	100%
MMBtu	134,928	80,817	71,327	82,177	50,945	107,632	527,825

4.2.1. Buildings

The City of Henderson owns, operates and occupies a large variety of buildings and facilities. For municipal operations, the Buildings Sector generated 19,153 metric tons CO2e (24.7%) of municipal emissions in 2005. This estimate was calculated using 2005 electricity and natural gas consumption data provided by NV Energy, and includes consumption from municipal buildings and facilities.

Table 23: Building Emissions by Source

Building Emissions Sources 2005	Electricity	Natural Gas	TOTAL
CO_2e (metric tons)	16,148	3,005	19,153
% of Total CO2e	84.3%	15.7%	100%
MMBtu	83,708	51,225	134,928

Figure 10: Building Emissions by Source

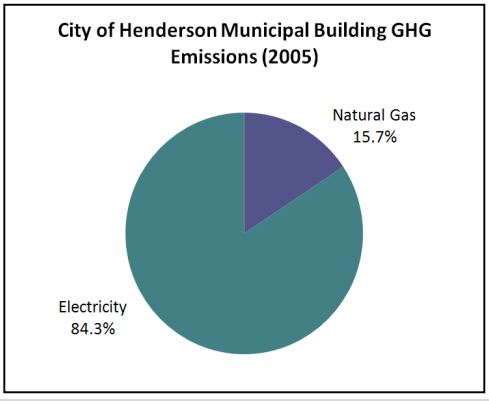


Table 22 details Building Sector GHG emissions by source (electricity and natural gas consumption). . Electricity consumption resulted in 16,148 metric tons CO_2e (84.3%) and the remaining 3,005 metric tons CO_2e (15.7%) resulted from natural gas consumption. These data do not include emissions resulting from fuel combustion by stationary equipment located at City facilities. Emissions from fuel-powered equipment is in part reflected in the Vehicle Fleet Sector. Additionally, the Buildings Sector does not include fugitive HFC emissions that may result from the use of refrigerants and fire suppression equipment in City facilities. City staff will continue to investigate emissions from these sources.

Table 25 lists the top ten greenhouse gas emitting municipal buildings and facilities in 2005. It is important to note that the City's Waste Water Treatment Plan is accounted for in the Wastewater Sector. The top ten buildings account for 15,968 metric tons CO_2e (83.4%) of the municipal Building Sector GHG emissions reductions, while the top five alone account for12, 821 metric tons CO_2e (66.9%) percent of this Sector's emissions. Reduction measures for GHG emissions in these top emitting buildings would be a worthwhile strategy to achieve notable emissions reductions.

Table 24: Top 10 GHG Emitting Buildings

Building	Location	CO_2e (metric tons)	GHG Emissions (%CO_2e)	Energy (MMBtu)	Utility Costs
City Hall	240 Water St	6,309	32.9%	42,160	$809,670
Justice Facility	243 Water St	2,292	12.0%	17,260	$297,503
Multigen Rec Center	250 S Green Valley Pkwy	1,954	10.2%	15,626	$263,227
Emergency Services Facility	223 Lead St	1,172	6.1%	6,994	$153,192
Whitney Ranch Activity & Indoor Pools	1575 Galleria Dr – B, C	1,094	5.7%	11,191	$158,491
Black Mountain Rec Center	599 Greenway Rd	907	4.7%	6,103	$126,798
Whitney Ranch Rec Center	1575 Galleria Dr – A	632	3.3%	3,540	$86,848
Valley View Rec Center	500 Harris St	585	3.1%	3,767	$84,071
Silver Springs Rec Center	1951 Silver Springs Pkwy	557	2.9%	3,648	$78,531
Fire Station 82/Training Center	401 Parkson Rd	466	2.4%	2,913	$66,195
TOTAL		**15,968**	**83.4%**	**113,202**	**$2,124,526**

4.2.2. Streetlights

Henderson's Streetlights Sector generated 15,593 metric tons CO_2e (20.1%) of municipal GHG emissions in 2005. This estimate was calculated using 2005 electricity consumption data for streetlights. Streetlights include street lamps and traffic lights. NV Energy provides electricity consumption for streetlights grouped info service categories. Unfortunately, these service categories currently do not have clear geographic delineations, making the prospect of targeting streetlights at specific locations to achieve greenhouse gas emissions reductions currently infeasible with this data.

4.2.3. Vehicle Fleet

Henderson's municipal Vehicle Fleet Sector generated 5,739 metric tons CO2e (7.4%) of municipal GHG emissions in 2005, This estimate was calculated using 2005 fleet and fuel consumption data provided by the City's Public Works Department. Table 26 and Figure 11 portray Fleet emissions from gasoline and diesel consumption. Gasoline use constituted 50%, diesel use generated 49.1% and natural gas contributed 0.9% of emissions from the Vehicle Fleet Sector. The City owned a combined total of 884 fleet vehicles in 2005.

Figure 11: Vehicle Fleet Emissions by Fuel Type

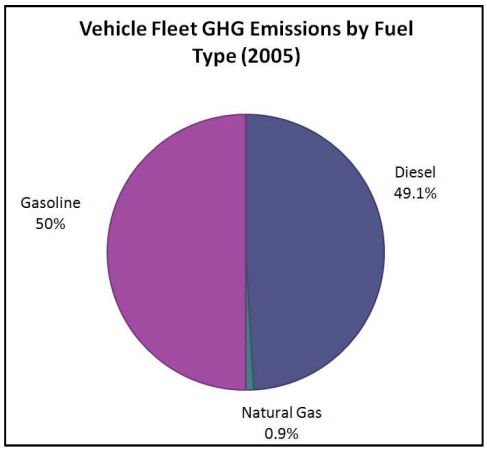


Table 25: Vehicle Fleet Emissions by Fuel Type

Vehicle Fleet Fuel Emissions Sources	Gasoline	Diesel	Natural Gas	TOTAL
CO_2e (metric tons)	2,871	2,819	49	5,739
% of Total CO2e	50.0%	49.1%	0.9%	100%
MMBtu	35,864	34,924	539	71,327

4.2.4. Employee Commute

The Employee Commute Sector emissions estimated in this report include GHG emissions from all personal vehicle use in travel to and from work by employees in 2005. City of Henderson employees generated an estimated 6,573 metric tons of CO_2e (8.5%) of municipal emissions in travel to and from work in 2005. One hundred percent (100%) of emissions from gasoline use constituted the emissions in the Employee Commute Sector. Although the City does not have direct control over these emissions, it may influence emissions through various programs designed to influence employee travel choices.

Emissions from the Employee Commute Sector were estimated using figures from the City's Employee Commute Trip Reduction Program and applying it to the number of employees in 2005 (2,767).

4.2.5. Water Delivery

The Water Delivery Sector emissions are generated from operations that include one water plant and over 20 pump stations throughout the City of Henderson. Operations in this sector generated an estimated 9,812 metric tons of CO_2e (12.4%) of municipal emissions in 2005. This estimate was calculated using 2005 electricity and natural gas consumption data from the City of Henderson Department of Utility Services Task4-GHG Emissions Inventory (Appendix I). As detailed in Table 27, electricity consumption accounted for virtually all (99.9%) of Water Delivery GHG emissions. Natural gas accounted for less than one percent (1%) of emissions.

Table 26: GHG Emissions from Water Delivery

Water Delivery Emissions Sources	Electricity	Natural Gas	TOTAL
CO_2e (metric tons)	9,805	7	9,812
% of Total CO2e	99.9%	0.01%	100%
MMBtu	50,819	126	50,945

4.2.6. Wastewater

The Wastewater Sector generated an estimated 22,119 metric tons of CO_2e (28%) of municipal emissions in 2005.This estimate was calculated using electricity and natural gas consumption, as well as methane and nitrous oxide production data from the City of Henderson Department of Utility Services Task4-GHG Emissions Inventory (Appendix I). This data includes consumption and production data from one wastewater treatment plant, pump stations, lift stations, aerated lagoons and water reclamation facilities located throughout the City of Henderson. As detailed in Table 28, the bulk of Wastewater GHG emissions (92.6%) were generated from electricity consumption, with nitrous oxide (4.6%), methane (2.4%) and natural gas (0.4%) accounting for the remaining emissions.

Table 27: GHG Emissions from Wastewater

Wastewater Emissions Sources	Electricity	Natural Gas	Methane	Nitrous Oxide	TOTAL
CO_2e (metric tons)	20,472	89	533	1,025	22,119
% of Total CO2e	92.6%	0.4%	2.4%	4.6%	100%
MMBtu	106,109	1,522	0	0	107,632

4.2.7. Missing Municipal Data Sources

Data were not available to calculate emissions from all sources suggested by LGOP and ICLEI for this inventory. The municipal Waste Sector emissions is typically an estimate of future emissions of organic waste that was generated and sent to the APEX Landfill by municipal facilities and operations in the base year 2005. These emissions are considered Scope 3 because they are not generated in the base year, but will result from the decomposition of the 2005 waste over the full 100+ year cycle of its decomposition. Unfortunately, disposal estimates for 2005 were not available.

4.3 Per Employee Emissions

Table 29 provides information on municipal emissions on a per employee basis. Estimated using GHG emissions totals from the Buildings, Vehicle Fleet and Employee Commute Sectors, Henderson employees generated 31,465 metric tons of GHG emissions in 2005. This may be an overestimate for employees, as the Buildings and Vehicle Fleet Sectors include emissions from public buildings and operations that are used by both Henderson residents and employees. The Streetlights, Water Delivery and Wastewater sectors are not included in the estimate for GHG Emissions per Employee because these operations primarily serve the community as a whole. Per employee emissions can be a useful metric for comparing one's emissions with those of neighboring cities and against regional and national averages and for measuring progress in reducing greenhouse gas emissions from municipal sources.

Table 28: Municipal GHG Emissions per Employee

Number of Employees	2,767
Total Employee GHG Emissions (metric tons CO_2e)	31,465
GHG Emissions / Employee (metric tons CO_2e/employee)	**11.4**

5. Conclusion

The City of Henderson has made a formal commitment to reduce its greenhouse gas emissions by signing on to the 2005 U.S. Conference of Mayors Climate Protection Agreement and by adopting a Sustainability Action Plan in 2009.

This study provides a foundation for future activity by the City of Henderson to manage its GHG emission. The community as a whole was responsible for emitting 2,622,368 metric tons of CO_2e in the base year 2005, with emissions from the Residential Sector contributing the most to this total. Municipal operations were responsible for emitting 78,988 metric tons of CO_2e in the base year 2005 (approximately 3% of total community emissions), with Wastewater Facilities contributing 28% of this total.

The results from the 2020 emissions forecast demonstrate that under a business-as-usual scenario, emissions will grow significantly in the Commercial, Residential and Transportation sectors. These results suggest that energy usage in vehicular travel and residential buildings presents both the greatest challenge and requires the most urgent action in order for Henderson to reduce its emissions in the future.

The inventory for municipal operations suggests that there may be significant opportunity to reduce GHG emissions in the Wastewater, City Buildings and Streetlights sectors. Specifically, efforts to reduce energy consumption and increase energy efficiency in the top emitting buildings and facilities are likely to have significant effects in reducing municipal greenhouse gas emissions.

Based on the ICLEI methodology and recommendations, the City of Henderson should begin to document emission reduction measures that have been implemented since 2005 and should quantify the emissions benefits of these measures to demonstrate progress made to date.

As Henderson moves forward with considering emission reduction strategies, the City should identify and quantify the emission reduction benefits of sustainability strategies that could be implemented in the future, including energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, waste reduction and other strategies. Through these efforts and others the City of Henderson can achieve additional benefits beyond reducing emissions, including saving money and improving Henderson's economic vitality and its quality of life.

City Staff will continue to update this inventory as additional data becomes available.

6. Appendices

A. Residential Sector Notes

Data Inputs:

Residential	Electricity Consumption	kWh	1,337,126,347
	Natural Gas Consumption	Therms	48,937,800

Data Sources:

1. NV Energy: Darrell Soyars, dsoyars@nvenergy.com, 775-834-4744.
   File name: 2005_KWh_report.doc

2. Southwest Gas
   File name: Gas_Useage_and_Customer_Counts_Clark_County.pdf

Notes:

City of Henderson Population Projections:

Year	Population Total	# of New Residents	Percent change
2005	243,897	10,391	4.4%
2006	256,128	12,231	5.0%
2007	265,790	9,662	3.8%
2008	272,063	6,273	2.4%
2009	275,134	3,071	1.1%
2010	277,885	2,751	1.0%
2015	303,293	25,408	9.1%
2020	340,657	37,364	12.3%
2025	386,624	45,967	13.5%
2030	434,358	47,734	12.3%
2035	462,958	28,600	6.6%

Source: City of Henderson Community Development Department, July 2009

B. Commercial/Industrial Sector Notes

Data Inputs:

Commercial	Electricity Consumption	kWh	1,132,448,538
	Natural Gas Consumption	Therms	9,342,889
Industrial	Electricity Consumption	kWh	20,811,542
	Natural Gas Consumption	Therms	52,694

Data Sources:

1. NV Energy: Darrell Soyars, dsoyars@nvenergy.com, 775-834-4744.
   File name: 2005_KWh_report.doc

2. Southwest Gas
   File name: Gas_Useage_and_Customer_Counts_Clark_County.pdf

C. Transportation Sector Notes

Data Inputs:

Transportation	Local Roads & State Highways (VMT)	Annual VMT (93% Gasoline 7% Diesel)	828,903,203

Data Sources:

1. Nevada Department of Transportation: Jodi Swirczek, jswirczek@dot.state.nv.us, 775-888-7448
   File name: NDOT 2005_AVMT.pdf

Notes:

1. Fleet mix data (on road total fleet breakdown by vehicle type, fuel efficiency, and fuel type) was used to extrapolate VMT into actual gallons of gasoline and diesel consumed on Henderson's roads and state highways. Fleet mix data was provided by ICLEI.

D. Waste Sector Notes

Data Inputs:

Waste	Total Landfill Waste	Short Tons	433,271

Data Sources:

1. NDEP: Kathryn Fergus,kfergus@ndep.nv.gov, 702-486-2850.
   File name: 2004-2005 Waste Report.doc

Notes:

1. Total Municipal Solid Waste (MSW) generated in Clark County was 3,332,853 tons. In 2005, Henderson (pop. 241,134) represented 13% of the total population in Clark County (pop. 1,796,379). Thus, 13% of the total MSW was estimated to have come from Henderson.

2. Waste Characterization: 2005 Municipal Solid Waste in the United States: Facts and Figures
   http://www.epa.gov/wastes/nonhaz/municipal/pubs/mswchar05.pdf

E. Municipal Building Sector Notes

Data Inputs:

See Table on following page.

Data Sources:

1. City of Henderson: Steve Wilcox, Construction Project Coordinator
   File name: COH Major Buildings 2005 Utility Use.xls

Detailed Municipal GHG Emissions from Building Sector in 2005

Building	Address	Electricity kWh	Natural Gas Therms
City Facilities - General			
City Hall	240 Water St	8,370,720	135,909
City Hall Parking Garage	231 Lead St	298,800	N/A
Justice Facility	243 Water St	2,791,463	77,330
City Shop	486 Gibson Rd	366,900	9,923
Henderson Pavilion	200 S Green Valley Pkwy	577,750	4,308
Facilities Maint Shop	134 W Atlantic Av	38,410	439
	TOTALS	**12,444,043**	**227,909**
Police Dept. Facilities			
Emergency Services Facility	223 Lead St	1,661,961	13,217
West Substation	300 S Green Valley Pkwy	517,960	2,191
Animal Shelter	300 E Galleria Dr	240,360	24,006
	TOTALS	**2,420,281**	**39,414**
Fire Dept Facilities			
Fire Station 81	601 College Ave	73,366	1,625
Fire Station 82/Fire Training Center	401 Parkson Rd	643,200	7,179
Fire Station 83	500 E Lake Mead Dr	65,520	2,179
Fire Station 94	400 N Valle Verde Dr	66,937	2,215
Fire Station 95	2300 E Pebble Rd	111,216	1,501
Fire Station 86	96 Via Antincendio	156,400	3,570
Fire Station 97	1550 Amador Ln	98,240	3,207
Fire Station 98	891 Coronado Center Dr	114,806	2,936
Fire Station 99	2401 Atchley Dr	97,360	3,123
	TOTALS	**1,427,045**	**27,535**
Parks & Recreation Facilities			
Senior Center	27 E Texas Av	358,880	2,488
Downtown Rec Center	105 W Basic Rd	671,400	2,086
Multigenerational Rec Center	250 S Green Valley Pkwy	2,263,820	78,996
Valley View Rec Center	500 Harris St	795,240	10,532
Black Mountain Rec Center	599 Greenway Rd	1,198,210	20,135
Silver Springs Rec Center	1951 Silver Springs Pkwy	747,900	10,950
Whitney Ranch Rec Center	1575 Galleria Dr - A	925,200	3,826
Whitney Ranch Activity & Indoor Pools	1575 Galleria Dr - B,C	955,200	79,309
Parks Maintenance Shop	405 Van Vagenen St	49,921	3,571
Wells Park Pool	1629 Moser Dr	137,200	5,246
Wells Boy's & Girls Club	1608 Moser Dr	131,200	537
	TOTALS	**8,234,171**	**217,676**

F. Municipal Streetlights Sector Notes

Data Inputs:

Streetlights	Outdoor Lighting (kWh)	23,679,373

Data Sources:

1. NV Energy: Darrell Soyars, dsoyars@nvenergy.com, 775-834-4744.
   File name: 2005_KWh_report.doc

G. Municipal Vehicle Fleet Sector Notes

Data Inputs:

See Table below.

Data Sources:

1. City of Henderson: Steven Hoese, Fleet Services Manager
   File name: 2005 FUEL USE(2).xls

Notes:

Detailed Fleet Information (All City Departments) for 2005

Fuel and Vehicle Type	Number of Vehicles	Fuel Use (gallons)	Miles	Cost
Gasoline	492	288,703	3,471,913	$682,604
Light Truck	322	231,541	2,585,479	$544,416
Heavy Truck	27	5,845	132,826	$14,711
Auto-Full Size	61	31,708	349,470	$76,283
Auto-Mid Size	50	13,343	307,775	$31,986
Auto-Subcompact/Compact	32	6,266	96,363	$15,208
Diesel	378	251,837	1,704,330	$600,245
Light Truck	277	164,231	1,626,263	$391,836
Heavy Truck	101	87,606	78,067	$208,409
Natural Gas	14	9,157	172,442	$14,549
Light Truck	14	9,157	172,442	$14,549
TOTAL	**884**	**549,697**	**5,348,685**	**$1,297,398**

H. Municipal Employee Commute Sector Notes

Data Inputs:

See notes

Data Sources:

1. City of Henderson: Caryn Gyarmati, Administrative Analyst III

2. City of Henderson: Di Lan Borders, Clubride Coordinator

Notes:

1. Information for this section comes from Human Resources Department, which provided the employee totals for 2005 (Full-Time: 1,583, Part Time: 1,184). The Community Development Department coordinates the City's Commute Trip Reduction Program and provided the number of carpool trips in 2005 and the average roundtrip commute distance figure (22 miles).

2. It was also assumed that all employees commuted via gasoline –powered full-size automobile. In addition, it was assumed that all traveled the same distance (22 miles) and did so 240 days a year.

I. Municipal Water Delivery/Wastewater Notes

Data Inputs:

Water Delivery Facilities	Electricity Consumption	kWh	14,890,000
	Natural Gas Consumption	Therms	1,257
Wastewater Facilities	Electricity Consumption	kWh	31,090,000
	Natural Gas Consumption	Therms	15,223

Data Sources:

1. City of Henderson: Polly Walker, Senior Technical Analyst
   File name: City of Henderson Department of Utility Services Task4-GHG Emissions Inventory

J. Acknowledgements

Initiation of this project came from approval of the City Of Henderson Executive Team.

Significant work was needed to complete this report which required a large team effort. Efforts from staff from numerous City departments made this report possible by supplying all necessary data. Vital to this process was cooperation from personnel from Information Technology, Human Resources, Public Works and Utility Services, all of whom were very helpful in supplying data and information concerning the data.

The emissions inventory was led by staff within the City of Henderson Community Development Department (CD) and Department of Utility Services (DUS). The project was managed and the report was written by Richard Rojas, Planner (CD) in collaboration with Kyle Okamura, Manager of Utility Management Services (DUS) and Polly Walker, Senior Technical Analyst (DUS).

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Outside agencies that provided data and assistance were NV Energy, Southwest Gas, Nevada Division of Environmental Protection and the Nevada Department of Transportation, all of who provided the majority of the data for the community analysis.

Without the combined work of many individuals, this project would not have been possible.