

# Mecklenburg County Government Greenhouse Gas Emissions 2012 Inventory

Mecklenburg County Air Quality (MCAQ) conducts a Greenhouse Gas (GHG) Emissions Inventory to determine the amount of GHGs released into the air as a result of county government operations. The different GHG emissions are calculated and converted into one common unit of measure called carbon dioxide equivalents (CO<sub>2</sub>e). For 2012, MCAQ estimates 75,140 tons of CO<sub>2</sub>e were released into the air as a result of Mecklenburg County Government (County) operations.

MCAQ began quantifying the County's greenhouse gas emissions with the first GHG inventory for year 2006, followed by a second GHG inventory for 2009. The 2009 inventory was a significant improvement in both scope and data quality compared to the initial 2006 inventory. The additions of the County operated landfill, jails, recycling facilities and more complete utility usage data overall, lead to a more comprehensive inventory in 2009. Enhanced data completeness and quality have been carried over to the 2012 GHG inventory.

The 2012 GHG inventory includes emissions from County operated buildings, facilities, parks, landfill, fleet vehicles, non-road equipment, and outdoor lighting. Facilities operated by Charlotte Mecklenburg School (CMS) System, Alcohol Beverage Control (ABC) Board, City of Charlotte or facilities where the County does not have operational control are not included in this emissions inventory. By quantifying GHG emissions, the County can focus on areas where there is potential to reduce emissions, and possibly reduce costs associated with government operations.

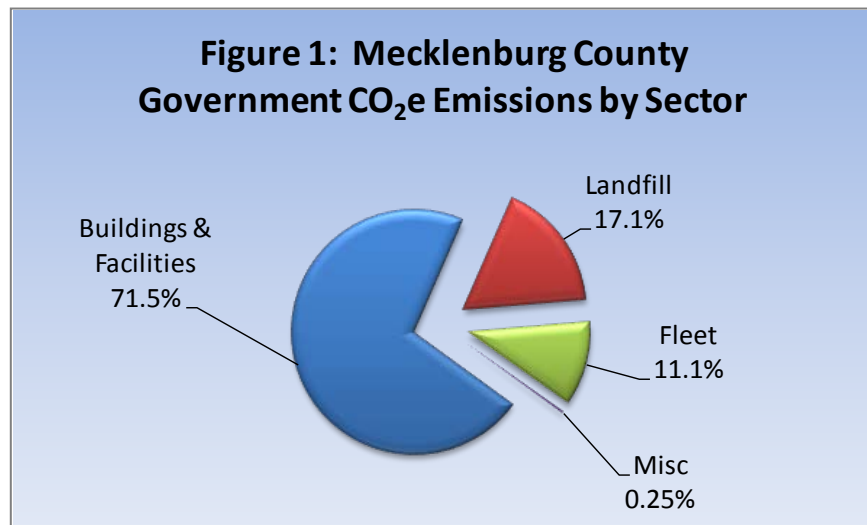
## **Key Findings and Recommendations**

- ♦ Mecklenburg County Government Operations generated 75,140 tons of CO<sub>2</sub>e emissions in 2012, down 7.8% from 2009.
- ♦ Government buildings and facilities continue to be the largest GHG emitting sector, accounting for 71.5% of all emissions. The County should continue to identify and implement ways to reduce energy consumption at its current facilities and integrate energy efficiency into design processes when planning for new facilities.
- ♦ County Fleet generated 11% of County emissions. This includes emissions from gasoline combustion, diesel combustion, and refrigerant leaks. Diesel vehicles make up 18% of fleet but account for a third of total fleet GHGs. A focus on replacing older diesel vehicles may have a significant impact on the amount of emissions from government fleet.
- ♦ County landfill waste emissions have increased by 3% from 2009. This increase is due to the cumulative nature of waste deposited in the landfill. Diverting waste from the landfill, through reuse or recycling efforts, is the easiest way to keep decomposition emissions from growing.

## Discussion of Results

The GHG emissions from Mecklenburg County Government operations in 2012 amounted to 75,140 tons of CO<sub>2</sub>e. In 2009 it was reported that the total amount of emissions generated were 80,222 tons of CO<sub>2</sub>e. Overall, 2012 GHG emissions decrease by 7.8% when compared to 2009. The entities which generate GHG emissions through their operations can be divided into four main sectors.

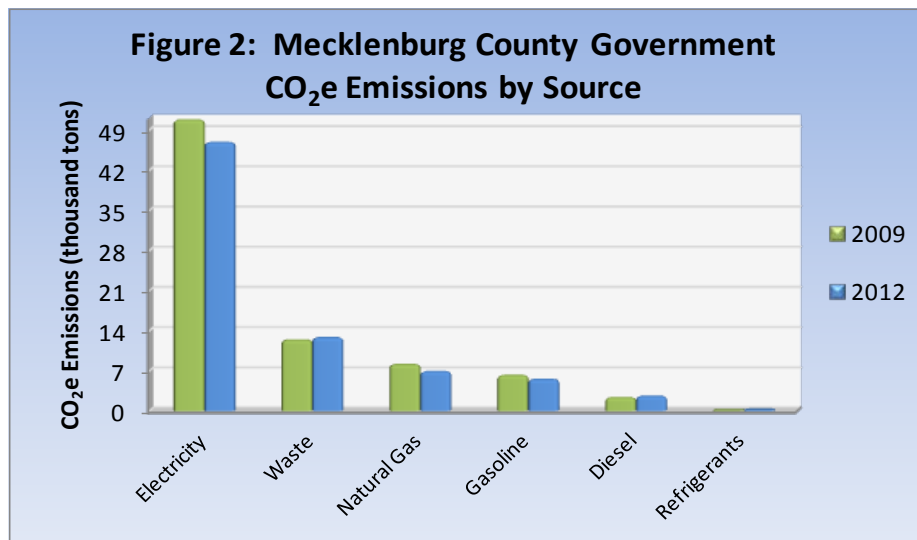
- County-operated **buildings and facilities**, including office buildings, jails, libraries, warehouses, and park facilities make up the largest sector and accounted for 71.5% of the GHG emissions in 2012. This includes emissions from electricity, natural gas and refrigerants at those facilities.
- **Foxhole Landfill** is the second largest sector with 17.1% of County emissions coming from waste decomposition.
- **County fleet** includes the combustion of gasoline and diesel fuel in on-road vehicles and non-road equipment, as well as refrigerant leak emissions from vehicle air conditioning systems. The County Fleet sector accounted for 11% of the reported GHG emissions.
- A combination of **miscellaneous** lighting, air quality monitoring sites, water quality monitoring sites, and historic landmarks commission sites, together totaled less than half of 1% of the GHG emissions from County government.



A breakdown of the emissions by the four sectors is shown in Figure 1. The general distribution of emissions by sector is the same for 2012 as it was for 2009. Total GHG emissions can be broken-down further into specific sources, or origin of emissions. For example, waste decomposition is the *source* of GHG emissions within the landfill *sector*. Below are the six emission sources included in this inventory along with the sector where the source can be found.

Table 1: Greenhouse Gas Emission Sources		
Source of GHG Emissions	% of Total GHG	Sector Where Source is Found
Electricity Usage	62.3%	Buildings and Facilities, Miscellaneous
Waste Decomposition	17.1%	Foxhole Landfill
Natural Gas Combustion	9.2%	Buildings and Facilities, Miscellaneous
Gasoline Combustion	7.5%	County Fleet
Diesel Combustion	3.5%	County Fleet
Hydroflouorocarbon Refrigerants	0.3%	Buildings and Facilities, County Fleet

Though the total amount of GHG emissions from County government has decreased for 2012, the distribution of emissions across all County sources is relatively the same as it was in 2009. Figure 2 shows total GHG emissions broken-down by County source.



**Electricity usage continues to be the largest source of County GHG emissions.**

County government emitted 46,834 tons of CO<sub>2</sub>e from the use of electricity in 2012 and the use of electricity at County-operated facilities accounted for 62% of total emissions in 2012.

The 2009 and 2012 GHG inventories use a more complete set of electricity data than the 2006 GHG inventory, due primarily to the addition of Mecklenburg County jail facilities, recycling facilities and the general increase of electricity data available. Based on the additional facility electricity data MCAQ recommends comparing the 2012 GHG Inventory to the 2009 Inventory for a more accurate representation of the County’s GHG emissions. Compared to the 50,777 tons of CO<sub>2</sub>e in 2009, County electricity consumption generated 3,943 fewer tons of CO<sub>2</sub>e in 2012. A focus on energy efficiency within government buildings contributed to a decrease in the amount of GHGs the County emits. Electricity emission factors have also decreased since 2009, due to a drop in emissions from electricity generation by utilities. The decreased emission factors play a part in the reduction of emissions the County generated from its electricity consumption.

**Landfill waste emissions increased due to cumulative effects.**

The decomposition of landfill waste was responsible for 17% of total County GHG emissions. For 2012, waste decomposition generated 12,868 tons of CO<sub>2</sub>e emissions compared to 12,444 tons of CO<sub>2</sub>e emissions in 2009. The increase in emissions can be attributed to the accumulation of demolition and construction debris entering the landfill over the years. Unlike energy sources that stop producing emissions when the source is not in use, like electricity, emissions at landfills are cumulative because the emission source (waste) is always present.

Data for the waste decomposition from the Foxhole Landfill was added to the GHG inventory in 2009 based on guidance provided by the Local Government Operations Protocol (LGOP). Not all waste sent to the landfill is generated by County government, but because the County is responsible for operating the landfill all associated GHG emissions are attributed to County operations. Some waste from the County is sent to Cabarrus County Landfill. Currently there is no technically sound or accepted method for accurately determining the amount of GHGs emitted by only County government waste at this landfill.

By encouraging recycling and reuse initiatives the County has and can continue to divert waste from the landfill. These efforts will result in the avoidance of emissions from material that would have otherwise ended up in the landfill. The County can also investigate possible ways to capture the landfill methane emissions to use as a potential energy source, and thus divert those emissions from entering the atmosphere.

**Natural gas combustion emissions for 2012 are down by 1,200 tons compared to 2009.**

In 2012, the amount of facilities reporting natural gas use was roughly the same as those reporting in 2009. However, GHG emissions from the combustion of natural gas decreased from 8,191 tons in 2009 to 6,948 tons in 2012. More data availability led to a large increase in natural gas CO<sub>2</sub>e emissions reported for 2009 compared to 2006, therefore the 2009 Inventory can be more easily compared to the 2012 Inventory because of the similarities in data quality and quantity. Efforts to improve energy efficiency and building insulation can lead to decreases in the amount of GHG emissions associated with natural gas combustion. For 2012, natural gas combustion emissions account for 9% of the overall GHG emissions generated by the County.

**Diesel combustion makes up a disproportionate amount of fleet emissions.**

Combined, gasoline and diesel combustion from both on-road and non-road vehicles accounted for 8,260 tons of CO<sub>2</sub>e, 11% of the total County GHGs in 2012. On-road and non-road fleet emissions have been included in all three inventories. The 2006 inventory used estimates of fuel usage and vehicle miles traveled to calculate GHG emissions. In 2009 and 2012 the actual fuel usages tracked by County Business Support Services Agency and emission factors provided by the LGPO were used to calculate the amount of emissions from gasoline and diesel combustion in County operated vehicles.

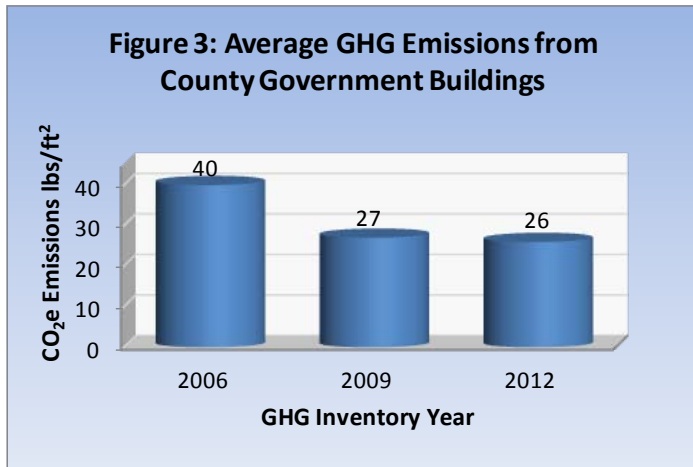
Further analysis of diesel vehicles, both on-road and non-road, is one area to focus on for reducing fleet emissions could be a. Only about 18% of fleet vehicles are diesel, yet they are responsible for a third of the overall County fleet emissions. MCAQ's 2012 County Fleet Assessment also reported that focusing on cleaner diesel vehicles is a way for the County to reduce emissions. By replacing older less fuel efficient vehicles with hybrids or vehicles with better fuel economy the County can reduce the amount of CO<sub>2</sub>e emissions from its fleet. Exploring ways to improve routes and reduce the number of vehicle miles traveled by employees when doing daily tasks, such as routine inspections or site visits, can also reduce fleet emissions.

**Refrigerant leaks continue to contribute the least amount of GHG emissions.**

In 2012, Refrigerant leaks made up only 0.3% of the total GHG emissions generated by the County. HFC refrigerant emissions were first reported in the GHG inventory in 2009. These emissions are the result of

leaks in vehicle and stationary air conditioning systems. Two refrigerants, R-134a and R-140a, listed in the LGOP were included in this inventory.

### Comparing Inventories



In general it is difficult to compare the abbreviated 2006 inventory to the 2009 and 2012 inventories, which include more comprehensive GHG data. The 2006 inventory does not include landfill waste, recycling facilities, County jails, or refrigerant emissions. These facilities and sources were incorporated into the GHG Inventory in 2009 and have been included in the 2012 GHG Inventory. Facility and operational changes, such as the addition of new facilities or converting storage space to office space, can make it difficult to directly

compare inventories. However, one measurement that does translate well across all three inventories is comparing the GHG emissions generated per square foot of building space. Figure 3 shows the comparison of CO<sub>2</sub>e per square foot of building space across the three inventory years. In 2006, the amount of CO<sub>2</sub>e per square foot of building space was reported to be 40 lbs CO<sub>2</sub>e/ft<sup>2</sup>. This decreased to 27 lbs CO<sub>2</sub>e/ft<sup>2</sup> in 2009, and for 2012 it has decreased further to 26 lbs CO<sub>2</sub>e/ft<sup>2</sup>. Table 2 shows a breakdown of 2012 GHG emissions per square foot of building space by County departments. Compared to the 2009 inventory the GHG emissions per square foot for Real Estate Services, Park and Recreation, and Solid Waste have remained the same. The Sheriff Department has decreased by one pound per square foot and Libraries have decreased by six pounds per square foot. The reduction of emissions per square foot can be attributed to improved energy efficiency at County facilities, such as:

- replacing older machinery, equipment, heating or cooling units and lighting fixtures with newer more energy efficient models
- more efficient use of facility resources such as placing thermostats and lighting on timers or sensors, and powering down equipment when not in use
- more resourceful balance of building space and use so that square footage within a facility does not go over or under utilized
- replacing older windows and insulation to reduce energy needed for heating and cooling

Department	CO <sub>2</sub> e lbs/ft <sup>2</sup>
Sheriff & Jails	27
Parks & Recreation	26
Real Estates Services	26
Libraries	23
Solid Waste	18

## ***Background***

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The Earth's surface is warmed by absorbing some of the heat radiated by the Sun. The heat that is not absorbed is reflected out of the atmosphere. Greenhouse gases are harmful because of their ability to trap heat in the Earth's atmosphere causing an anomalous rise in the Earth's temperature; a phenomenon known as the "greenhouse gas effect." Some GHGs, such as carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) are emitted in relatively small amounts through natural processes, but human activity has led to these GHGs being emitted at much higher rates than would naturally occur. Nitrous oxide (N<sub>2</sub>O), and fluorinated gases are also emitted into the atmosphere due primarily to human activity. Each GHG has a global warming potential (GWP) that signifies its ability to trap heat in the atmosphere compared to CO<sub>2</sub>. As an example, the GWP of CH<sub>4</sub> is 21. This means that CH<sub>4</sub> is 21 times more capable of trapping heat in the atmosphere than CO<sub>2</sub>. GWPs and emission factors provided by LGOP and eGRID2012 were used to calculate emissions for each GHG and combine them into one common unit of measure known as a carbon dioxide equivalent (CO<sub>2</sub>e). The use of CO<sub>2</sub>e allows for an easier comparison of multi-pollutant emissions among sources and organizations. Table 3 lists the GHGs reported in the 2012 inventory along with their GWP.

Greenhouse Gas	GWP
Carbon Dioxide (CO <sub>2</sub> )	1
Methane (CH <sub>4</sub> )	21
Nitrous Oxide (N <sub>2</sub> O)	310
Refrigerant R-134a	1,300
Refrigerant R-410a	1,725

## ***Methodology***

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The Local Government Operations Protocol (LGOP), Version 1.1 was used as a guide for the creation of the 2012 GHG Inventory. This version of the LGOP was developed in May of 2010 by the International Council for Local Environmental Initiatives (ICLEI), the California Air Resources Board (CARB), the California Climate Action Registry (CCAR) and the Climate Registry. The LGOP was created for local governments to use as a reference on what to include in their GHG Inventories, technical guidance on calculations, as well as providing common emission factors. By doing so, the LGOP insures that GHG Inventories created by different entities will include relatable information across the board.

Mecklenburg County has begun to implement Utility Manager Pro software that allows for government utilities to be more easily tracked. This software, managed by the County's Business Support Services Agency, stores electricity and natural gas usage data for all County owned and operated buildings and facilities. This is the first GHG Inventory the County has conducted that was able to utilize Utility Manager Pro. It made the comprehensive collection of energy use data easier to obtain. Checking for missing data and continuing to update the program with the most recent utility usage will allow it to be a quality asset for gathering energy data for future GHG inventories. It will also be a useful tool for facility managers to locate areas where efforts can be made to become more energy efficient.

## ***Conclusions and Recommendations***

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Overall, the amount of GHGs emitted by Mecklenburg County Government Operations in 2012 decreased by 7.8% compared to 2009. This decrease is attributed to improved energy efficiencies at County operated facilities, as well as improvements in electricity generation by utilities. County operated buildings continue to be the largest contributing sector of GHG emissions, mainly through electricity

usage. However, when comparing the three County GHG inventories, there is a downward trend in the amount of CO<sub>2</sub>e emitted per square foot of building space (See Figure 3). This indicates that efforts to make government buildings more energy efficient have been successful.

Table 4 lists the seven County buildings with the highest CO<sub>2</sub>e lb/ft<sup>2</sup>. It is recommended that Mecklenburg County determine if there are ways to further reduce energy consumption at these seven facilities. Improvements at these buildings and other County facilities can reduce the amount of electricity and natural gas used, which in turn will help to avoid GHG emissions and reduce energy costs. All departments of Mecklenburg County Government should continue to pursue energy efficient standards when renovating older buildings and constructing new facilities.

<b>Dept</b>	<b>Building</b>	<b>CO<sub>2</sub>e lb/ft<sup>2</sup></b>
PRK	Ray's Splash Planet	103.09
RES	Old Intake Center	88.44
RES	Samuel Billings Center	84.95
PRK	Aquatic Center	78.63
PRK	Jetton Park Indoor Shelter	59.14
PRK	William R. Davie Center	57.06
LIB	Sugar Creek Library	53.23

County fleet emissions have seen a small decrease since 2009. By replacing older fleet vehicles and non-road equipment with newer more fuel efficient models the County can continue to reduce its GHG emissions and bring down the operating cost of its fleet. Diesel combustion makes up a disproportionate amount of fleet emissions and should be seen as an area of focus when deciding which vehicles to replace.

There has been a 3% increase in the amount of emissions from waste decomposition at Foxhole Landfill since 2009. Landfill emissions are cumulative over time unlike emissions from other sources which can account for some of this increase. Efforts to divert waste from the landfill are the easiest way to control the growth of waste emissions. Landfill gas recovery systems are also an option for the County to explore.

Mecklenburg County Government has made an effort towards reducing the amount of GHGs it emits. The implementation of Utility Manager Pro has aided in the collection of utility data. Tracking department and facility level energy use allows the County to better understand areas where efforts have succeeded and areas for improvement. By continuing to track energy consumption and focusing on advances in energy and fuel efficiency, while also exploring new technologies such as electric fleet vehicles and landfill gas recovery, Mecklenburg County can contribute to the global effort to reduce GHGs.





Appendix A	Total CO2e Emissions		CO2e from Electricity	CO2e from Natural Gas	CO2e from HFC	CO2e from Gasoline	CO2e from Diesel	CO2e from Landfill Waste	Total Energy Cost
	(tons)	% Total CO2e	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	(\$)
Eastover Park	15.50	0.02%	15.50	0.00	0.00				\$ 6,885.27
Eastway Park	5.10	0.01%	5.10	0.00	0.00				\$ 1,327.26
Eastway Specialty Park	21.99	0.03%	21.99	0.00	0.00				\$ 15,722.62
EB Moore Park	2.51	0.00%	2.51	0.00	0.00				\$ 822.11
Edgehill Park	1.74	0.00%	1.74	0.00	0.00				\$ 387.00
Elon Park	65.29	0.09%	65.29	0.00	0.00				\$ 24,382.47
Elsie Coleman Park	3.64	0.00%	3.64	0.00	0.00				\$ 1,086.34
Enderly Park	10.78	0.01%	10.78	0.00	0.00				\$ 4,627.85
Epr - Evergreen Cemetery	0.95	0.00%	0.95	0.00	0.00				\$ 184.70
Evergreen Nature Preserve	5.14	0.01%	5.14	0.00	0.00				\$ 1,058.33
Ezell Farm	0.00	0.00%	0.00	0.00	0.00				\$ 106.01
Five Points Park	6.88	0.01%	6.88	0.00	0.00				\$ 1,605.58
Flat Branch Park	36.45	0.05%	36.45	0.00	0.00				\$ 12,169.16
Four Mile Creek Greenway	4.30	0.01%	4.30	0.00	0.00				\$ 1,245.40
Fourth Ward Park	20.18	0.03%	20.18	0.00	0.00				\$ 14,357.13
Frazier Park	8.32	0.01%	8.32	0.00	0.00				\$ 3,700.35
Fred Alexander Park	5.80	0.01%	5.80	0.00	0.00				\$ 1,160.47
Freedom Park	209.78	0.28%	209.78	0.00	0.00				\$ 82,593.10
Grady Cole Ctr	462.40	0.62%	379.35	83.06	0.00				\$ 83,689.69
Grier Heights Park	9.77	0.01%	9.77	0.00	0.00				\$ 2,152.69
Gum Branch Greenway	0.47	0.00%	0.47	0.00	0.00				\$ 96.39
Harrisburg Park	43.90	0.06%	43.90	0.00	0.00				\$ 17,821.01
Hawthorne Rec Ctr.	42.20	0.06%	37.11	5.09	0.00				\$ 8,030.45
Hornets Nest Park	159.08	0.21%	159.08	0.00	0.00				\$ 45,789.12
Horticulture Compound	25.04	0.03%	25.04	0.00	0.00				\$ 6,987.52
Howie Acres Park	7.08	0.01%	7.08	0.00	0.00				\$ 1,755.19
Idlewild Road Park	21.88	0.03%	21.88	0.00	0.00				\$ 9,276.39
Independence Park	46.88	0.06%	46.88	0.00	0.00				\$ 17,230.08
Irwin Creek Greenway	2.73	0.00%	2.73	0.00	0.00				\$ 888.73
Ivory Baker Rec Ctr.	166.58	0.22%	134.63	31.95	0.00				\$ 27,443.00
James Boyce Park	6.23	0.01%	6.23	0.00	0.00				\$ 1,681.14
Jetton Indoor Shelter	67.66	0.09%	67.66	0.00	0.00				\$ 17,183.49
Jetton Park (On Lake Norman)	14.10	0.02%	14.10	0.00	0.00				\$ 3,761.30
Kilborne Park	14.75	0.02%	14.75	0.00	0.00				\$ 5,186.61
Latta Park	9.01	0.01%	9.01	0.00	0.00				\$ 2,873.10
Latta Plantation Nature	0.53	0.00%	0.53	0.00	0.00				\$ 379.59
Latta Rec Center	5.51	0.01%	5.51	0.00	0.00				\$ 8,499.86
LC Coleman Park	7.05	0.01%	7.05	0.00	0.00				\$ 1,363.48
Little Peoples Park	0.44	0.00%	0.44	0.00	0.00				\$ 217.68
Little Sugar Creek Greenway	28.54	0.04%	28.54	0.00	0.00				\$ 9,389.72
Mahlon Adams Indoor Shelter	29.52	0.04%	24.44	5.07	0.00				\$ 7,060.43
Mallard Creek Park	96.44	0.13%	96.43	0.01	0.00				\$ 34,400.22
Mallard Creek Rec Ctr	186.68	0.25%	160.68	25.99	0.00				\$ 29,758.44
Marion Diehl Rec Ctr	440.04	0.59%	234.60	205.45	0.00				\$ 62,327.84
Marshall Park	111.24	0.15%	111.24	0.00	0.00				\$ 13,990.09
Martin Luther King Park	1.09	0.00%	1.09	0.00	0.00				\$ 506.94
Mason Wallace Park	13.10	0.02%	13.10	0.00	0.00				\$ 4,235.46
McAlpine Creek Park	25.82	0.03%	24.34	1.49	0.00				\$ 5,439.88
McDowell Nature Ctr	92.61	0.12%	92.61	0.00	0.00				\$ 23,002.42
Mcdowell Nature Preserve	6.41	0.01%	6.41	0.00	0.00				\$ 1,814.84
Mcdowell Park	6.51	0.01%	6.51	0.00	0.00				\$ 2,384.06
McKee Road Park	9.80	0.01%	9.80	0.00	0.00				\$ 2,957.39
Meck Co Park & Rec	2.17	0.00%	2.17	0.00	0.00				\$ 835.60
Memorial Stadium	30.01	0.04%	30.01	0.00	0.00				\$ 6,536.50
Methodist Home Rec Ctr	159.53	0.21%	159.53	0.00	0.00				\$ 29,778.72
Midtown Park	15.67	0.02%	15.67	0.00	0.00				\$ 3,859.14
Midwood Park	4.75	0.01%	4.75	0.00	0.00				\$ 1,826.38
Naomi Drenan Rec Ctr	162.22	0.22%	162.22	0.00	0.00				\$ 29,634.12
Nevin Park	132.85	0.18%	132.85	0.00	0.00				\$ 48,758.25
Nevin Park Playground	13.98	0.02%	13.98	0.00	0.00				\$ 3,697.80
Newell Park	6.66	0.01%	6.66	0.00	0.00				\$ 2,494.23
Ninth Street Park	10.92	0.01%	10.92	0.00	0.00				\$ 2,982.63
North Charlotte Park	3.53	0.00%	3.53	0.00	0.00				\$ 858.27
NPR - Parcel	7.36	0.01%	7.36	0.00	0.00				\$ 2,898.10

Appendix A	Total CO2e Emissions		CO2e from Electricity	CO2e from Natural Gas	CO2e from HFC	CO2e from Gasoline	CO2e from Diesel	CO2e from Landfill Waste	Total Energy Cost
	(tons)	% Total CO2e	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	(\$)
NPR - Clarks Creek Greenway	2.84	0.00%	2.84	0.00	0.00				\$ 912.58
NPR - Vacant Lot	50.13	0.07%	50.13	0.00	0.00				\$ 10,447.89
Olde Providence Park	46.63	0.06%	46.63	0.00	0.00				\$ 11,350.14
Pal Office	1.41	0.00%	1.41	0.00	0.00				\$ 272.58
Park And Recreation	2.29	0.00%	2.29	0.00	0.00				\$ 1,382.35
Park Road Park	221.06	0.29%	221.06	0.00	0.00				\$ 72,859.68
Parks and Rec - PARCEL	0.01	0.00%	0.01	0.00	0.00				\$ 242.79
Parks and Rec - Parking Lot(1)	4.59	0.01%	4.59	0.00	0.00				\$ 1,253.79
Parks and Rec - Parking Lot(2)	10.09	0.01%	10.09	0.00	0.00				\$ 2,761.14
Parks and Rec - Vacant Lot(1)	1.91	0.00%	1.91	0.00	0.00				\$ 298.76
Parks and Rec Vacant Lot(2)	0.66	0.00%	0.66	0.00	0.00				\$ 153.16
Parks and Recreation	2.28	0.00%	2.28	0.00	0.00				\$ 531.55
Pearl Street Park	15.13	0.02%	15.13	0.00	0.00				\$ 5,079.52
Pressley Road Park	1.93	0.00%	1.93	0.00	0.00				\$ 484.93
Ramblewood Park	7.02	0.01%	7.02	0.00	0.00				\$ 2,033.23
Ramsey Creek Park	35.88	0.05%	35.88	0.00	0.00				\$ 9,631.79
Randolph Road Park	67.08	0.09%	66.19	0.90	0.00				\$ 22,285.14
Ray's Splash Planet	1,105.36	1.47%	851.19	254.17	0.00				\$ 151,123.79
Reedy Creek Nat Ctr & Shelter	96.24	0.13%	96.24	0.00	0.00				\$ 21,681.81
Reedy Creek Park	0.39	0.00%	0.39	0.00	0.00				\$ 344.19
Renaissance Park	285.81	0.38%	285.81	0.00	0.00				\$ 91,659.96
Revolution Park	76.94	0.10%	76.94	0.00	0.00				\$ 22,370.67
Revolution Park Sports Academy	287.84	0.38%	266.66	8.25	12.94				\$ 56,442.80
Robert L Smith Park	16.97	0.02%	16.97	0.00	0.00				\$ 9,999.31
Sedgefield Park	0.94	0.00%	0.94	0.00	0.00				\$ 438.76
Seversville Park	7.33	0.01%	7.33	0.00	0.00				\$ 4,483.31
Shamrock Park	1.87	0.00%	1.87	0.00	0.00				\$ 594.93
Shuffletown Park	27.90	0.04%	27.90	0.00	0.00				\$ 12,440.73
Southside Park	3.07	0.00%	3.07	0.00	0.00				\$ 1,182.28
Southview Rec Ctr	181.50	0.24%	151.56	29.95	0.00				\$ 33,690.39
SPR	1.88	0.00%	1.88	0.00	0.00				\$ 363.66
St. Mary's Chapel	28.04	0.04%	23.85	4.19	0.00				\$ 7,966.41
Sugaw Creek Park	11.14	0.01%	11.14	0.00	0.00				\$ 5,969.88
Sugaw Creek Rec Ctr.	140.28	0.19%	140.28	0.00	0.00				\$ 25,223.80
Theresa Clark Elder Park	2.25	0.00%	2.25	0.00	0.00				\$ 955.58
Third Ward Park	0.85	0.00%	0.85	0.00	0.00				\$ 551.28
Thomas Mcallister Winget Park	35.60	0.05%	35.60	0.00	0.00				\$ 17,367.37
Thompson Park	1.13	0.00%	1.13	0.00	0.00				\$ 518.10
Tuckaseegee Park	0.12	0.00%	0.12	0.00	0.00				\$ 537.89
Tuckaseegee Rec Ctr	147.41	0.20%	147.41	0.00	0.00				\$ 26,728.84
TWP # 220 Main Building A- PRK	33.89	0.05%	33.89	0.00	0.00				\$ 5,938.86
TWP # 221 Vehicle Maintenance Bld B- PRK	12.42	0.02%	12.42	0.00	0.00				\$ 2,952.53
Veterans Park (w/shelter)	70.08	0.09%	65.74	4.34	0.00				\$ 19,342.13
Viewmont Park	4.15	0.01%	4.15	0.00	0.00				\$ 1,040.50
West Charlotte Rec Ctr	83.08	0.11%	66.43	16.64	0.00				\$ 14,993.68
William R Davie Park	22.01	0.03%	21.52	0.49	0.00				\$ 11,343.50
William R. Davie Ctr	85.59	0.11%	79.68	5.91	0.00				\$ 24,463.20
Wingate Park	2.13	0.00%	2.13	0.00	0.00				\$ 681.29
WPR - Parcel	2.52	0.00%	2.52	0.00	0.00				\$ 689.77
<b>RES</b>	<b>21,467.06</b>	<b>28.57%</b>	<b>19,883.50</b>	<b>1,506.09</b>	<b>77.47</b>				<b>\$ 2,900,975.99</b>
4th Street Parking Deck	462.66	0.62%	462.66	0.00	0.00				\$ 56,896.63
Bank Building/New Trades Shop	14.13	0.02%	14.13	0.00	0.00				\$ 3,526.75
Brevard Street Bldg	34.10	0.05%	31.43	2.67	0.00				\$ 6,812.01
Carlton Watkins Center (CHD)	406.29	0.54%	393.44	12.84	0.00				\$ 59,570.78
Civil Courts	1,727.87	2.30%	1,727.87	0.00	0.00				\$ 202,444.58
Community Service Center A	284.06	0.38%	254.10	29.96	0.00				\$ 43,180.55
Community Servie Center B	372.47	0.50%	341.12	31.36	0.00				\$ 50,581.43
Cottage A	106.19	0.14%	105.96	0.23	0.00				\$ 14,629.99
Cottage B	85.71	0.11%	78.40	7.30	0.00				\$ 16,023.02
Cottage C	110.07	0.15%	107.58	2.49	0.00				\$ 17,136.29
Cottage D	74.05	0.10%	66.02	8.03	0.00				\$ 11,687.50
Cottage E	41.81	0.06%	40.14	1.67	0.00				\$ 6,946.64
County Courts Office Bldg (CCOB)	955.45	1.27%	955.45	0.00	0.00				\$ 133,802.38
Courthouse	7,952.63	10.58%	6,947.73	1,004.90	0.00				\$ 1,055,955.95

Appendix A	Total CO2e		CO2e from	CO2e from	CO2e	CO2e from	CO2e from	CO2e from	Total Energy Cost (\$)
	Emissions (tons)	% Total CO2e	Electricity (tons)	Natural Gas (tons)	from HFC (tons)	Gasoline (tons)	Diesel (tons)	Landfill Waste (tons)	
Criminal Courts	1,068.11	1.42%	1,027.25	27.07	13.80				\$ 137,757.58
Election Board	68.67	0.09%	68.67	0.00	0.00				\$ 12,959.89
Fighting Back	4.40	0.01%	4.40	0.00	0.00				\$ 1,129.86
Fleet - General Services/Garage	210.26	0.28%	169.98	40.28	0.00				\$ 31,783.91
Freedom Mall	1,217.88	1.62%	1,212.71	0.00	5.17				\$ 164,487.11
Hal Marshall Center	1,459.74	1.94%	1,201.53	199.71	58.50				\$ 189,196.17
Hal Marshall Center Annex	421.56	0.56%	363.35	58.21	0.00				\$ 55,327.28
LUESA South	38.56	0.05%	38.56	0.00	0.00				\$ 7,704.20
McDowell Street Parking Deck	93.85	0.12%	93.85	0.00	0.00				\$ 11,474.08
Mecklenburg Cty 461	3.09	0.00%	3.09	0.00	0.00				\$ 972.15
Medic #3 (only when called)	20.45	0.03%	15.59	4.85	0.00				\$ 4,716.95
Medic #4 (only when called)	12.72	0.02%	9.86	2.87	0.00				\$ 3,100.01
Medical Examiners Office	331.05	0.44%	312.03	19.02	0.00				\$ 51,467.14
Nations Ford Storage	1.70	0.00%	1.22	0.48	0.00				\$ 851.68
Old Intake Center	698.70	0.93%	698.70	0.00	0.00				\$ 92,341.93
Samuel Billings Center (Detox)	1,847.59	2.46%	1,805.51	42.08	0.00				\$ 270,067.42
Tom Ray Center	116.47	0.15%	106.40	10.07	0.00				\$ 17,802.47
Vector - Health/Environment	10.51	0.01%	10.51	0.00	0.00				\$ 2,590.96
Wallace Kuralt Center (DSS)	9.29	0.01%	9.29	0.00	0.00				\$ 2,395.13
Walton Plaza	1,181.05	1.57%	1,181.05	0.00	0.00				\$ 155,618.29
Women's Commission	23.92	0.03%	23.92	0.00	0.00				\$ 8,037.28
<b>SHF</b>	<b>16,028.25</b>	<b>21.33%</b>	<b>12,122.96</b>	<b>3,905.29</b>	<b>0.00</b>				<b>\$ 1,636,271.54</b>
Jail Central/Expansion	9,643.44	12.83%	6,695.65	2,947.79	0.00				\$ 934,611.30
Jail North Annex	699.61	0.93%	670.25	29.36	0.00				\$ 61,826.04
Jail North/Firing Range	4,327.05	5.76%	3,439.28	887.77	0.00				\$ 469,774.09
Work Release	1,358.15	1.81%	1,317.79	40.37	0.00				\$ 170,060.11
<b>SLW</b>	<b>13,045.82</b>	<b>17.36%</b>	<b>176.02</b>	<b>1.44</b>	<b>0.00</b>			<b>12,868.37</b>	<b>\$ 38,562.58</b>
Compost Central	19.07	0.03%	19.07	0.00	0.00				\$ 6,907.78
Foxhole Landfill	12,914.58	17.19%	46.21	0.00	0.00		12,868.37		\$ 7,516.21
Hickory Grove Recycling Center	43.09	0.06%	43.09	0.00	0.00				\$ 6,669.81
North Mecklenburg Recycling Center	5.49	0.01%	5.49	0.00	0.00				\$ 1,563.64
Recycling Center	30.60	0.04%	30.60	0.00	0.00				\$ 7,642.57
Tire & Metal Recycling	22.91	0.03%	21.47	1.44	0.00				\$ 5,457.23
Uptown Recycling Center	2.46	0.00%	2.46	0.00	0.00				\$ 824.97
West Mecklenburg Recycling Center	7.63	0.01%	7.63	0.00	0.00				\$ 1,980.37
<b>Grand Total</b>	<b>75,140.47</b>	<b>100.00%</b>	<b>46,834.24</b>	<b>6,948.09</b>	<b>230.29</b>	<b>5,598.23</b>	<b>2,661.26</b>	<b>12,868.37</b>	<b>\$ 10,582,991.53</b>

## APPENDIX B: Method Review

The table below presents a summary of the methods used in calculating the 2012 greenhouse gas emissions. In general, the methods suggested in the Local Government Operations Protocol Version 1.1 (May 2010) were followed but any variations to the recommended procedures or emission factors are noted in the table.

<b>Method Review for 2012 Mecklenburg County Greenhouse Gas Inventory</b>			
<i>Data Type</i>	<i>Value</i>	<i>Source</i>	<i>LGOP Compliant?</i>
<b>Emissions from the Generation of Electricity (Indirect Emissions from Consumption)</b>			
Electricity Usage Data	Actual usage in kWh	Utility Manager Pro, Mecklenburg County BSSA	Yes
CO <sub>2</sub> Emission Factor	1035.87 lb/MWh	eGRID 2012 v1.0 <i>Year 2009 GHG Annual Output Emission Rates</i> Subregion SRVC VA/Carolina	No. MCAQ used most recent eGRID2012 emission factors, LGOP used eGRID2007 factors
CH <sub>4</sub> Emission Factor	21.51 lb/GWh	eGRID 2012 v1.0 <i>Year 2009 GHG Annual Output Emission Rates</i> Subregion SRVC VA/Carolina	No. MCAQ used most recent eGRID2012 emission factors, LGOP used eGRID2007 factors
N <sub>2</sub> O Emission Factor	17.45 lb/GWh	eGRID 2012 v1.0 <i>Year 2009 GHG Annual Output Emission Rates</i> Subregion SRVC VA/Carolina	No. MCAQ used most recent eGRID2012 emission factors, LGOP used eGRID2007 factors
<b>Emissions from the Combustion of Natural Gas</b>			
Natural Gas Consumption Data	Actual therms delivered	Utility Manager Pro, Mecklenburg County BSSA	Yes
CO <sub>2</sub> Emission Factor	53.06 kg / MMBTU	LGOP Table G.1 for NG with heat content 1,025 – 1,050 BTU/scf	Yes
CH <sub>4</sub> Emission Factor	0.005 kg / MMBTU	LGOP Table G.3 for Commercial sector	Yes
N <sub>2</sub> O Emission Factor	0.0001 kg / MMBTU	LGOP Table G.3 for Commercial sector	Yes
<b>Emissions from Refrigeration Systems</b>			
Vehicular Air Conditioner HFC leak amount	Mass of replacement refrigerant added to A/C systems	Fleet services technical support	Yes, although mass balance was simplified
HFC Emission Factor	1,300 GWP	LGOP Table E.1 <i>GWP Factors for Greenhouse Gases</i>	Yes

Building air conditioner and chiller HFC leak amount	Mass of replacement refrigerant added to systems	Mecklenburg County BSSA, TKC Management Services	Yes, although mass balance was simplified
<b>Data Type</b>	<b>Value</b>	<b>Source</b>	<b>LGOP Compliant?</b>
<b>Emissions from Foxhole Landfill</b>			
Amount of waste deposited	Actual tons waste deposited in landfill	Solid Waste Division	Yes
Reaction rate constant for IPCC First order decay model	k value = 0.057	CARB IPCC Model spreadsheet recommended in LGOP	Yes
Percent Anaerobically Decomposable Organic Carbon	ANDOC of 2% based on 100% of waste being construction and demolition waste	CARB IPCC Model spreadsheet recommended in LGOP	Yes
<b>On-Road County Fleet Emissions from the Combustion of Fuels</b>			
CO <sub>2</sub> Emissions: Gallons of fuel combusted	Actual fuel consumption data by fuel type	County Fleet services	Yes
CO <sub>2</sub> emission factors for fuels	8.78 kg/gal gasoline 10.21 kg/gal diesel	LGOP Table G.11. <i>Default CO<sub>2</sub> Emission Factors for Transport Fuels</i>	Yes
CH <sub>4</sub> and N <sub>2</sub> O Emissions: Mileage of fleet vehicles	Actual mileage driven by vehicle	Mecklenburg County Fleet Services	Yes
CH <sub>4</sub> and N <sub>2</sub> O emission factors	Factors vary by model year, vehicle type and fuel type	LGOP Table G.12 <i>Default CH<sub>4</sub> and N<sub>2</sub>O Emission Factors for Highway Vehicles by Model Year</i>	Yes
<b>Non-Road County Equipment Emissions from the Combustion of Fuels</b>			
CO <sub>2</sub> Emissions: Gallons of fuel combusted	Estimates of fuel consumption by fuel type	County Fleet Services	Yes
CO <sub>2</sub> Emission factors for fuels	8.78 kg/gal gasoline 10.21 kg/gal diesel	LGOP Table G.11. <i>Default CO<sub>2</sub> Emission Factors for Transport Fuels</i>	Yes
CH <sub>4</sub> emission factors for fuels	0.50 g/gal gasoline 0.58 g/gal diesel	LGOP Table G.14 <i>Default CH<sub>4</sub> and N<sub>2</sub>O Emission Factors for Non-Highway Vehicles</i> construction designation	Yes
N <sub>2</sub> O Emission factors for fuels	0.22 g/gal gasoline 0.26 g/gal diesel	LGOP Table G.14 <i>Default CH<sub>4</sub> and N<sub>2</sub>O Emission Factors for Non-Highway Vehicles</i> construction designation	Yes