



# CITY OF NORMAN, OK CITY COUNCIL CONFERENCE MEETING

Municipal Building, Executive Conference Room, 201 West Gray, Norman,  
OK 73069

Tuesday, January 23, 2024 at 5:30 PM

---

## AGENDA

*It is the policy of the City of Norman that no person or groups of persons shall on the grounds of race, color, religion, ancestry, national origin, age, place of birth, sex, sexual orientation, gender identity or expression, familial status, marital status, including marriage to a person of the same sex, disability, relation, or genetic information, be excluded from participation in, be denied the benefits of, or otherwise subjected to discrimination in employment activities or in all programs, services, or activities administered by the City, its recipients, sub-recipients, and contractors. In the event of any comments, complaints, modifications, accommodations, alternative formats, and auxiliary aids and services regarding accessibility or inclusion, please contact the ADA Technician at 405-366-5446, Relay Service: 711. To better serve you, five (5) business days' advance notice is preferred.*

### CALL TO ORDER

### AGENDA ITEMS

1. FIVE YEAR UPDATE ON THE MAYOR'S CLIMATE PROTECTION AGREEMENT.

### ADJOURNMENT

# MAYOR'S CLIMATE PROTECTION AGREEMENT RECOMMENDATIONS

2023 REVIEW AND UPDATE

# BACKGROUND

Time Period	Billion-Dollar Disasters	Events/Year	Cost	Percent of Total Cost	Cost/Year	Deaths	Deaths/Year
1980s (1980-1989)	33	3.3	\$213.6B	8.0%	\$21.4B	2,994	299
1990s (1990-1999)	57	5.7	\$326.8B	12.3%	\$32.7B	3,075	308
2000s (2000-2009)	67	6.7	\$604.2B	22.7%	\$60.4B	3,102	310
2010s (2010-2019)	131	13.1	\$967.5B	36.4%	\$96.8B	5,227	523
Last 5 Years (2019-2023)	102	20.4	\$603.0B	22.7%	\$120.6B	1,996	399
Last 3 Years (2021-2023)	66	22.0	\$431.4B	16.2%	\$143.8B	1,690	563
Last Year (2023)	28	28.0	\$92.9B	3.5%	\$92.9B	492	492
<b>All Years (1980-2023)</b>	<b>376</b>	<b>8.5</b>	<b>\$2,661.0B</b>	<b>100.0%</b>	<b>\$60.5B</b>	<b>16,350</b>	<b>372</b>

<https://www.ncei.noaa.gov/access/billions/summary-stats>

Screenshot of a table of summary statistics of billion-dollar disasters by decade and by latest 1, 3-, and 5-year periods. NCEI Billion-dollar disaster

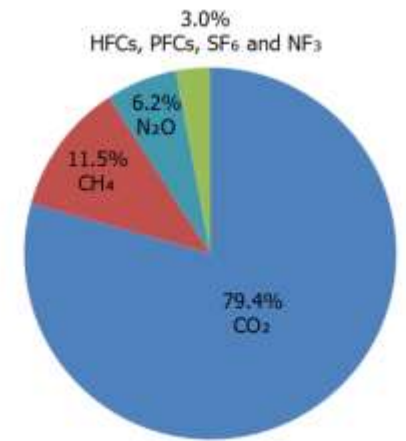
# BACKGROUND

- Signed by Mayor Haralson in 2005
  - Endorsed by the US conference of Mayors in 2005
  - Aligned with Kyoto protocol of 2005
  - 12 Elements designed to reduce emissions and increase conservation
  - ECAB tasked with creation of plan and updates
- Initial recommendations provided March 2007
  - Formal adoption February 2009
  - Intended as reference tool for future climate protection plan
- First review and update in 2018
  - Listed accomplishments and made additional recommendations

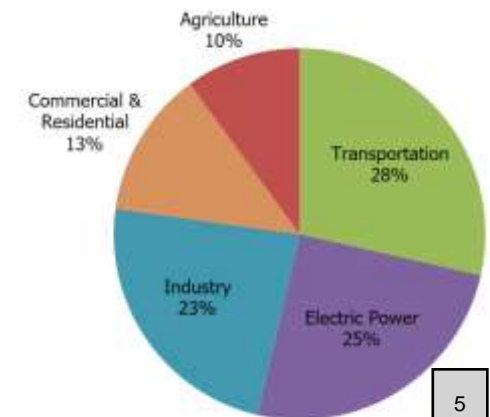


# ACTION ITEM 1: INVENTORY GREENHOUSE GAS EMISSIONS

- Identify and quantify pollution from heat-trapping pollutants like methane, carbon dioxide and nitrous oxide to set goals and measure progress
- Baseline – 2000; Comparison – 2021; Forecast - 2026
- Accomplishments include
  - Per capita emissions decreased 17.6%
  - Streetlights and traffic lights emissions very low in comparison with other cities (traffic lights to LED 2011, streetlights 2022)
  - The Water Reclamation Facility decreased emissions from energy use by 88%
- Top three recommendations
  - Complete inventory update every 5 years with Koch methodology; work to include Scope 3 emissions
  - Reduce GHG emissions by 25% by the year 2028
  - Continue creation of renewable-friendly-dedicated parking spaces throughout Norman



U.S. Environmental Protection Agency (2023). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021



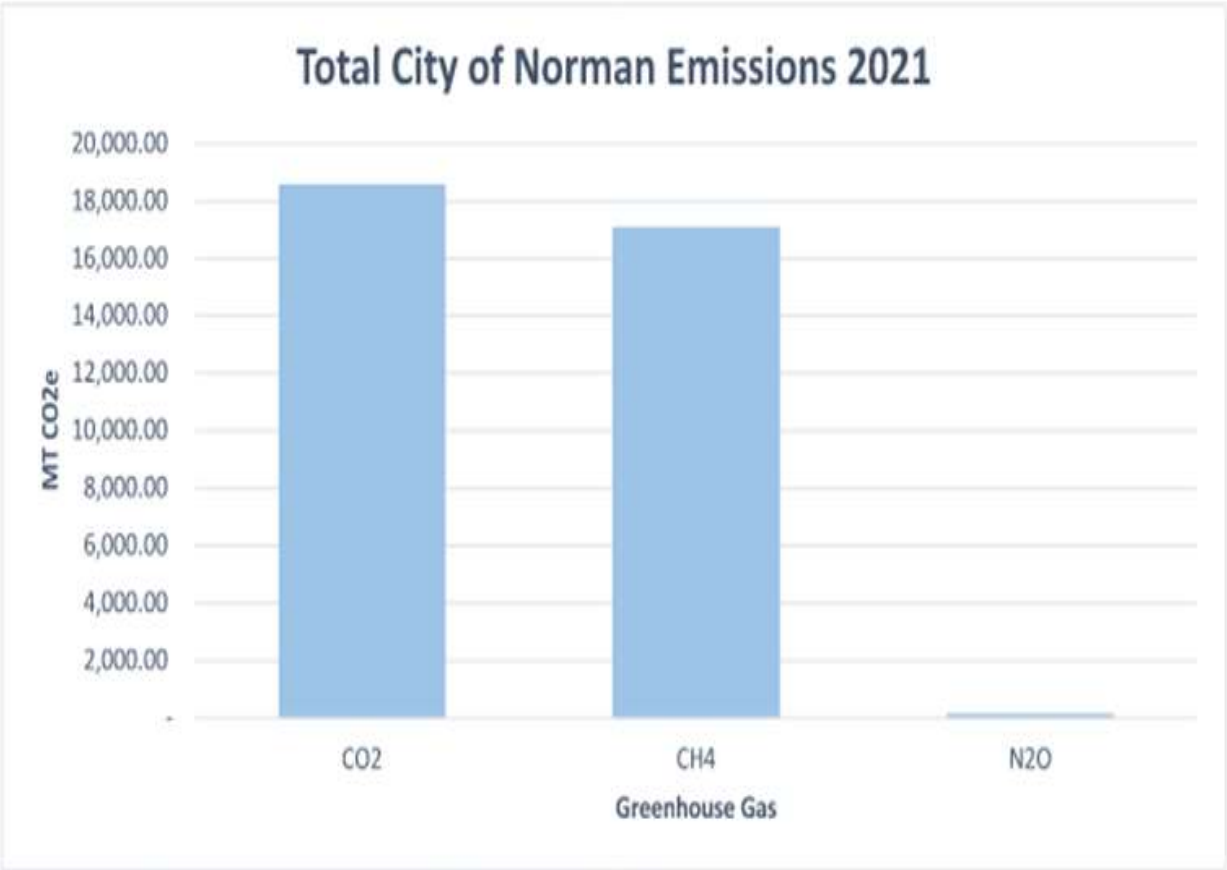


Figure 4. Total City of Norman Emissions in 2021 by Greenhouse Gas.

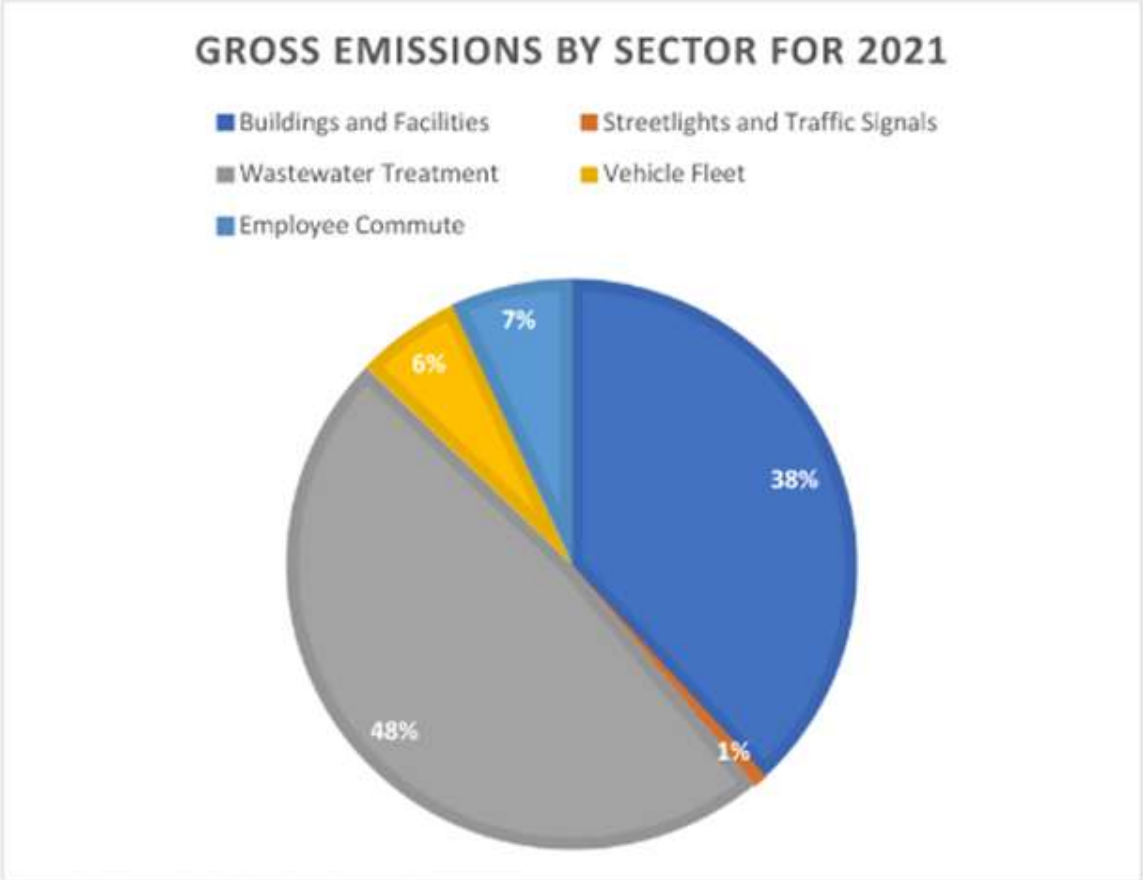
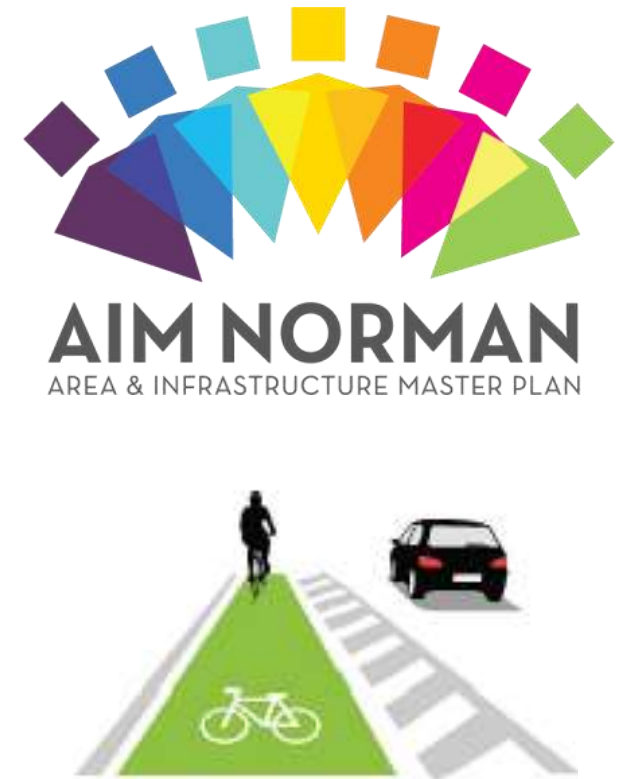


Figure 6. Gross Emissions by Sector for 2021 Percentage.

## ACTION ITEM 2: ADOPT AND ENFORCE LAND USE POLICIES

- Accomplishments include
  - Current work on the AIM Norman project
  - Revision of the CCFBC to promote wider variety of housing types and eliminating unit maximums
  - Retention of rural nature of east Norman through lot-size requirements
- Top three recommendations
  - Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities
  - Refine CCFBC to enhance walkable, bikeable areas of core Norman, and continue connection efforts for downtown and Campus Corner
  - Expand and refine development rules to prioritize Nature-based Solutions/LID over traditional



# ACTION ITEM 3: PROMOTE ALTERNATIVE TRANSPORTATION

- Accomplishments include
  - Extension of bicycle and multi-modal trails throughout much of Norman
  - Sidewalk improvements and installations in areas expanding from core Norman
  - Commitment to alternative transportation infrastructure through route optimization and many investments, including the City Transit Center
- Top three recommendations
  - Continue Embark support with goal of bringing service to southeast Norman as soon as possible
  - Continue bicycle route expansion with an eye to bicycle safety and practicality
  - Extend bicycle path along 24<sup>th</sup> Ave NW to the north for access to University North Park businesses





# ACTION ITEM 4: RENEWABLE ENERGY AND ENERGY EFFICIENCY

- Accomplishments include
  - Completion of solar-farm projects at WTP and WRF
  - EV charging station implementation throughout Norman
  - Shout out to NPS on update of their energy guidelines in 2020
- Top three recommendations
  - Explore the creation of a renewable energy employment initiative
  - Encourage installation of solar panels on private homes, private businesses, municipal buildings; work with HOAs to revise bylaw prohibition
  - Request electric utility companies to purchase back the power generated by those solar panels at the same price



# ACTION ITEM 5: SUSTAINABLE BUILDING PRACTICES

- Accomplishments include
  - 23 LEED certified buildings in Norman, 4 are City-owned
  - Many building codes were updated to 2018 or later standards in June 2023
  - The Engineering Design Criteria was updated in February 2023 and Chapter 7000 added
- Top three recommendations
  - Encourage review and use of principles and standards from programs like LEED, Living Building Challenge, Energy Star, etc.,
  - Encourage and recommend the use of higher quality energy and water conservation practices w.r.t. to building envelope, HVAC, lighting and fixtures, as well as the addition of additional exterior rigid installation
  - Adopt the most current version of the International Energy Conservation Code (IECC)



## ACTION ITEM 6: MUNICIPAL FLEET VEHICLES

- Accomplishments include
  - Addition of 15 hybrid police cars to existing 133 CNG powered vehicles and 2 EV buses
  - Continual and dedicated monitoring of the renewable-friendly vehicle industry
  - Installation of EV chargers for Fleet and public use
- Top three recommendations
  - Continue to monitor and explore alternative fuel technologies
  - Continue investment in alternative fuel infrastructure
  - Implement internal education campaign to reduce fuel usage



# ACTION ITEM 7: EFFICIENCIES AT WATER AND WASTEWATER PLANTS

- Accomplishments include
  - Purchases of higher efficiency motors
  - Solar projects completed at both facilities
  - Phase 2 plant upgrades completed at both facilities that included energy efficiency pieces
- Top three recommendations
  - Installation of covered area for storage of dewatered sludge
  - Devise new method of using recovered methane as the primary fuel source for the boilers
  - Explore more efficient biogas generation at WRF and alternative funding sources for implementation



## ACTION ITEM 8: RECYCLING IN CITY OPERATIONS AND COMMUNITY

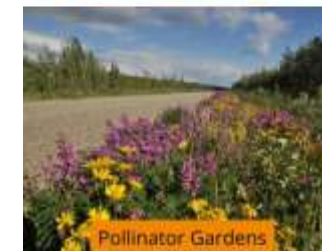
- Accomplishments include
  - Establishment of the permanent Household Hazardous Waste Facility
  - 88% curbside recycling participation rate in 2022
  - Diversion of 27.5% of the total waste stream from landfill in 2022
- Top three recommendations
  - Work to reduce contamination rate
  - Explore and implement opportunities for apartment and business recycling
  - Work to improve recycling rates





# ACTION ITEM 9: MAINTAIN HEALTHY URBAN ECOSYSTEMS

- Accomplishments include
  - Hired full-time Forester in March 2022
  - Several capstone projects designs were sponsored by the City including an LID-retrofit to the detention pond at City Hall, and treatment wetlands to support indirect potable reuse
  - Collaboration on multiple graduate research efforts including the Trailwoods paired watershed assessment and the current treatment wetland mesocosm project at the VRF
- Top three recommendations
  - Update the Forestry Master Plan and Community Forest Management Plan
  - Refine the EDC to comprehensively and explicitly include nature-based solutions
  - Increased and improved interdepartmental coordination and communication to ensure projects are implemented as approved



# ACTION ITEM 10: PUBLIC EDUCATION OF ENVIRONMENTAL DISCIPLINES

- Accomplishments include
  - Collaboration with outside experts to provide workshop opportunities to enhance City and volunteer board efforts
  - Improved environmental content on recently updated website
  - Increase in social media support for various environmental education campaigns
- Top three recommendations
  - Employ or contract with a public education professional to expand and enhance current efforts
  - Expand environmental content on website
  - Develop and implement a strategy to utilize social media to promote environmental content



# QUESTIONS



# **2023: Review and Update of MAYORS' CLIMATE AGREEMENT RECOMMENDATIONS**

**Prepared by the City of Norman**



## Executive Summary

On August 9, 2005, Mayor Haralson signed the United States Mayors' Climate Protection Agreement. The Mayors' Climate Protection Agreement consisted of 12 elements or recommended action items designed to reduce global warming emissions and increase energy conservation. Mayor Haralson charged the City of Norman Environmental Control Advisory Board (ECAB) with studying the agreement and proposing a general plan of action to be implemented by the City of Norman. Initial recommendations were provided in March 2007 and formally adopted by the City Council of Norman, Oklahoma on February 10, 2009, under Mayor Rosenthal. The document was intended to serve as a reference tool for the City of Norman to implement a climate protection plan.

The initial ECAB document addressed the elements and recommended action items found within the Mayors' Climate Protection Agreement including:

- Inventorying emissions to establish a baseline and an emissions reduction target including an action plan to achieve the reduction target;
- Adopting policies to reduce sprawl and preserve open space within the community while maintaining a healthy urban forest;
- Developing infrastructure and promoting alternative transportation methods such as carpooling and public transit;
- Increasing the use of alternate energy sources;
- Improving energy efficiency through renovations of existing facilities, building code modification, promoting the use of the U.S. Green Building Council's LEED Program or a similar system, and a commitment to purchase Energy Star equipment when appropriate;
- Increasing fuel efficiency of the City of Norman's fleet by reducing the total number of vehicles, establishing anti-idling policies, and purchasing alternative fuel vehicles;
- Evaluating pump efficiencies at the City's water and wastewater treatment plants;
- Increasing recycling within the community;
- Developing educational programs for the community to promote good environmental stewardship.

In 2018, ECAB reviewed and updated the original recommendation document, with the goal of reviewing, updating, and adopting a new document every 5 years. In April 2022, ECAB began the second review of the recommendation document. While the City of Norman has accomplished many recommendations outlined in the original document, ECAB believes additional improvements are possible. Future environmental recommendations include, but are not limited to:

- Conducting an inventory of greenhouse gas emissions to measure potential reductions from the 2000 baseline;
- Expanding alternative vehicle infrastructure including construction of additional bike routes;
- Increasing renewable energy throughout the City with a goal of reaching 100% renewable energy consumption by the year 2050;
- Investing in infrastructure to increase renewable-friendly vehicle use within the City of Norman;

- Exploring apartment and business recycling;
- Continuing to work with outside groups, like the University of Oklahoma, specializing in skills necessary for nature-based solutions within the City;
- Increasing environmental educational opportunities for the community.

The remainder of this document addresses and describes the 12 “Recommended Actions” outlined in the original ECAB document. These recommended actions have been consolidated since the original document into 10 action items. Each action item includes general information about the subject, the benefits and needs for adopting it, accomplishments since the last ECAB document, and specific recommendations for action the City should strive to achieve over the next five years. The 2009 and 2018 reports can be found on the City of Norman’s [Green Norman](http://greennorman.org) website ([greennorman.org](http://greennorman.org)). ECAB has invested a significant amount of time researching and gathering information and hopes this document exceeds expectations and serves as a tool for directing future environmental efforts within the City of Norman. ECAB would also like to remain active in the program and willingly offers its assistance in any form. Further, ECAB would like to collaborate as an active participant and serve as a monitor or in some program review capacity. Finally, ECAB suggests a review of the action items occur every 5 years to promote the City of Norman’s progress and potentially modify action items in response to changes in law, environmental regulations, and technology.

The City of Norman remains a leader in environmental stewardship. From being the first municipality in the State of Oklahoma to formally adopt the Mayors’ Climate Protection Agreement, to being the first in the United States to have a “Water’s Worth It” proclamation, the importance of protecting the environment is evident. Striving to achieve the recommended action items found in the following document can help Norman maintain its leadership in Oklahoma as a forward-thinking and progressive community.

## **Environmental Control Advisory Board 2023**

### Board Members:

Dane Heins – Chair – Ward 4

Nathalie Rocher – Vice Chair – Ward 4

Sara Bondy – Ward 4

Deborah Cretsinger – Ward 2

Inger Giuffrida – Ward 6

Bob Nairn – Ward 6

Lainey Phillips – Ward 8

Debbie Smith – Ward 4

Valerie Green – Ward 5

### City of Norman Staff Representatives:

Michele Loudenback – Environmental Services and Sustainability Manager

Jerry Gates – Environmental Services Assistant Manager

Deborah Tindell – Environmental Services Admin Tech II

Rachel Croft – Water Treatment Plant Manager

## Table of Contents

<b>ACTION ITEM #1: INVENTORY GREENHOUSE GAS EMISSIONS .....</b>	<b>6</b>
<b>ACTION ITEM #2: ADOPT AND ENFORCE LAND USE POLICIES .....</b>	<b>8</b>
<b>ACTION ITEM #3: PROMOTE ALTERNATIVE TRANSPORTATION.....</b>	<b>10</b>
<b>ACTION ITEM #4: RENEWABLE ENERGY AND ENERGY EFFICIENCY .....</b>	<b>12</b>
<b>ACTION ITEM #5: SUSTAINABLE BUILDING PRACTICES .....</b>	<b>14</b>
<b>ACTION ITEM #6: MUNICIPAL FLEET VEHICLES .....</b>	<b>16</b>
<b>ACTION ITEM #7: EFFICIENCIES AT WATER AND WASTEWATER PLANTS .....</b>	<b>18</b>
<b>ACTION ITEM #8: RECYCLING IN CITY OPERATIONS AND COMMUNITY .....</b>	<b>20</b>
<b>ACTION ITEM #9: MAINTAIN HEALTHY URBAN ECOSYSTEMS .....</b>	<b>22</b>
<b>ACTION ITEM #10: PUBLIC EDUCATION OF ENVIRONMENTAL DISCIPLINES ..</b>	<b>25</b>

## LIST OF APPENDICES

<b>Appendix A: Norman Greenhouse Gas Emissions Inventory Final Report (2021 update).....</b>	<b>277</b>
<b>Appendix B: 2011 City of Norman Bike Paths Map .....</b>	<b>54</b>
<b>Appendix C: 2021 Norman Forward Legacy Trail Master Plan .....</b>	<b>55</b>
<b>Appendix D: Existing CART and Embark Norman Routes .....</b>	<b>56</b>
<b>Appendix E: Recommended Embark Norman Route Network Changes.....</b>	<b>57</b>
<b>Appendix F: 2005 Resolution Endorsing the US Conference of Mayor’s Climate Protection Agreement.....</b>	<b>58</b>
<b>Appendix G: 2009 Resolution Adopting ECAB’s Mayor’s Climate Protection Agreement .....</b>	<b>59</b>
<b>Appendix H: 2018 Resolution Adopting ECAB’s Updated Mayor’s Climate Protection Agreement.....</b>	<b>60</b>
<b>Appendix I: 2024 Resolution Adopting ECAB’s Updated Mayor’s Climate Protection Agreement.....</b>	<b>62</b>

## **ACTION ITEM #1: INVENTORY GREENHOUSE GAS EMISSIONS**

### **INTRODUCTION**

An inventory identifies and quantifies the global warming pollution produced by both government operations and the community at large in a particular year. The inventory and forecast provide a benchmark against which Norman can measure the progress in terms of its operations and that of its citizens. The emissions analysis identifies the activities that contribute to emissions and the quantity of pollution generated by each of the activities. Establishment of an inventory occurs by collecting data about energy management, recycling and waste reduction, transportation, and land use. A local government can calculate global warming pollution for both a base year (e.g., 2000) and a forecast year (e.g., 2025). Expertise in climate science is not necessary; City staff members (e.g., public works, environment or facilities departments) could conduct an inventory.

The inventory and quantification of existing climate protection measures will help guide the City of Norman to understand where they can get the most significant emissions reductions. The majority of measures in the City of Norman's Mayor's Climate Protection Agreement, which is a customized roadmap to reduce global warming pollution, fall into energy management, transportation, waste reduction, and land use. Standard measures include energy efficiency improvements to municipal buildings and water treatment facilities, streetlight retrofits, public transit improvements, installation of renewable power applications, and methane recovery from waste management.

The City of Norman established a greenhouse gas emissions baseline for the year 2000 for City buildings, fleet, employee commute, water/wastewater facility, compost, and recyclables, which can be found in the 2018 report.

### **BENEFITS AND NEED**

Conducting a greenhouse gas emission inventory is the first and fundamental step in developing a plan to meet Mayors' Climate Protection Agreement goals. The inventory provides the baseline information needed to set emission reduction targets and the preparation of a plan to achieve the target. Without an inventory, it will be exceedingly difficult, if not impossible, to meet reduction targets. Much of the information needed to conduct an inventory already exists. These include electricity usage; the purchase and consumption of natural gas, diesel, and gasoline, recycling rates, etc.

A community inventory of greenhouse gas emissions will require additional efforts but could be a more macro level analysis. This inventory would require the cooperation of utility companies (OG&E, OEC, ONG, petroleum companies, others) to provide information on the usage of electricity, fuel, natural gas, and other greenhouse gas emission sources. A reasonably accurate inventory based on energy consumption could provide adequate information to allow establishing emission reduction targets and an action plan.

### **NORMAN ACCOMPLISHMENTS 2023 UPDATE**

- *The City of Norman worked with The University of Oklahoma undergraduate student, Rachel Koch, to determine the 2021 greenhouse gas emissions for the City of Norman.*

*This senior capstone project also included a comparison of the new 2021 inventory to the baseline greenhouse gas emissions found in 2000. Detailed findings from this project are provided in Appendix A.*

- *Compared to the 2000 baseline emissions data*
  - *Per capita emissions have decreased 17.6%;*
  - *Streetlights and traffic signal emissions were very low compared to cities of similar size (potentially due to the switch to LED traffic lights in 2011 and ongoing switch to LED luminaire streetlights that was completed in 2022);*
  - *The Water Reclamation Facility decreased emissions from energy use by 88%. This reduction is likely due to the Phase 2 capital improvements completed in 2021 to update existing infrastructure.*

## **RECOMMENDATIONS**

1. Update greenhouse gas emissions every five (5) years using Rachel Koch's methodology and improving upon it to include Scope 3 emissions, those emissions not directly owned or controlled by the City, such as emissions from delivery trucks, business travel, employee commuting, and suppliers, not previously included;
2. Reduce greenhouse gas emissions by 25% by 2028;
3. Continue to create preferred parking spaces throughout the City for renewable-friendly vehicles;
4. Implement a Public Education Outreach Program to reduce fuel usage.

## ACTION ITEM #2: ADOPT AND ENFORCE LAND USE POLICIES

### INTRODUCTION

Traditional development practices in Norman have continued to be reviewed for appropriateness and consistency with the plans for the City's residential and commercial growth. Norman is not unique in this approach. Many cities have adopted growth plans that are intended to limit the effects of urban sprawl. Sprawl tends to reduce population densities and create dependence on private vehicle transportation, among other impacts. The effects of sprawl are also manifested in terms of increased consumption of farmland and wildlife habitat, local infrastructure strain, flooding due to increased impervious surfaces, and per capita costs of infrastructure.

Planned growth that manages the sprawl in the community has been identified in studies nationwide to be an important factor for human health<sup>1</sup>. Growth today in Norman, Oklahoma should continue to consider thoughtful planning and consideration of the future as well as the health and safety of our citizens. The suggested term used most frequently is to employ "smart growth" when planning the future growth policies for a community. Norman has implemented such plans and has an active citizenry to ensure public involvement in these areas.

### BENEFITS AND NEED

A significant advantage to managing growth and avoiding sprawl is reducing the impacts associated with the increased transportation need and the environmental impacts of emissions from burning fossil fuels. This, together with the safety and health issues noted, causes and identifies the direct and indirect benefits of employing smarter growth efforts such as Center City Form Based Code (CCFBC) for core Norman. By creating compact, mixed-use neighborhoods (i.e., residential and commercial) Norman can profit by reducing fuel consumption and by cutting utility infrastructure and service delivery costs. Studies show that it is more efficient to operate, maintain, and replace infrastructure in more compact and densely populated communities.<sup>2</sup>

### NORMAN ACCOMPLISHMENTS 2023 UPDATE

- *PlanNorman was never adopted, but the City recently issued a Request for Proposals (RFP) in September 2022 for professional services to prepare a Comprehensive Plan, Housing Market Analysis and Affordability Strategy, Comprehensive Transportation Plan Update, Stormwater Master Plan Update, Water Hydraulic Modeling Update, Wastewater Master Plan, and Sanitation Master Plan for the City of Norman. This work is ongoing.*
- *Two of the goals of CCFBC are to expand housing options and to create a pedestrian orientated district. The CCFB Code was revised to aid these goals by:*
  - *Promoting a wider variety of housing types (more dwelling units with fewer bedrooms per unit);*
  - *Eliminating unit maximums in large swaths of the CCFBC area, which will increase density and create a market for future walkable commercial investment;*

<sup>1</sup> Pollard, Trip (2003) Policy Prescriptions for Healthier Communities. *The Science of Health Promotion*. September/December 2003 Vol. 18, No. 1, pp.109-113

<sup>2</sup> Haddaoui, Catlyen (2018) Cities Can Save \$17 Trillion by Preventing Urban Sprawl. *World Resources Institute*. Available: <https://www.wri.org/insights/cities-can-save-17-trillion-preventing-urban-sprawl>



- *Creating an easier to use and understandable document, which will reduce review time for staff, help new developers enter the area, and allow for housing density to increase more quickly.*
- *Retain rural nature of east Norman by restricting development acreage east of 48<sup>th</sup> Avenue East.*

## RECOMMENDATIONS

1. Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
2. Refine CCFBC to enhance walkable, bikeable areas of core Norman, and continue efforts to connect downtown with Campus Corner to reduce demand for vehicle traffic, and apply these same principles throughout the community (see Action Item 3);
3. Expand and refine development rules to encourage Low Impact Development (LID);
4. Continue to involve non-government organizations, such as the Norman Area Land Conservancy (NALC), to provide assistance with protecting open space through conservation easements and other mechanisms;
5. Initiatives/City recognition to encourage all property owners to adopt better land use practices;
  - a. Businesses – incentives such as stickers for their window that indicates their degree of sustainable practices
  - b. Homes including HOAs/POAs and rental units.
  - c. Golf courses – natural/safe lawn care and/or participating in Audubon International Cooperative Sanctuary Program for Golf<sup>3</sup>
6. Ensure environmentally friendly land use practices are included in Strong Towns/Norman Economic Development Coalition/land use plans – 3 current initiatives for CON;
7. Encourage green planning policies to create incentives for developers (such as moving plans to the top of review list/concierge service for those that include these better land use practices).

---

<sup>3</sup> Audubon International – ACSP for Golf <https://auduboninternational.org/acsp-for-golf/>

## ACTION ITEM #3: PROMOTE ALTERNATIVE TRANSPORTATION

### INTRODUCTION

A typical passenger vehicle emits about 4.6 metric tons of carbon dioxide per year<sup>4</sup>. Although new technologies can lower vehicle emissions, reducing the use of passenger vehicles is a straightforward means of containing greenhouse gasses and air pollution. Over the last few decades, the City of Norman has made reasonable investments in alternative transportation infrastructure, given the extent to which Normanites are likely to use trails, sidewalks, and busses. Unfortunately, the traffic volume in Norman has increased 7% between 2010 and 2023<sup>5</sup>, and the City public transportation system is underused, but has the potential to expand and be a useful tool for alternative transportation. Additionally, bike use is increasing but is still dangerous on many roads, and electronic scooter use has increased around the University and downtown areas, but bring their own safety issues. While getting residents out of their cars will require a cultural change and continuing education, investments in alternative transportation infrastructure is necessary in order for people to make these changes.

### BENEFITS AND NEED

The benefits of using forms of transportation other than the personal automobile are many and extend into the areas of public health, street maintenance, roadway congestion, public safety, and air quality. A substantial increase in the use of alternative forms of transportation will require both sufficient infrastructure to allow for effective mobility without a car and willingness among the population to forgo the convenience of the personal vehicle. Norman has focused its efforts on infrastructure but has not addressed the need to change attitudes and behaviors. We suggest the City of Norman couple improvements to infrastructure associated with alternative transportation with campaigns and incentives to get people to leave their cars in the driveway regularly.

### NORMAN ACCOMPLISHMENTS 2023 UPDATE

- *Extensions of bicycle and multi-modal trails throughout much of the City (Appendix B);*
- *Sidewalk improvements and installation (Appendix C);*
  - *Legacy Trail sidewalk improvements are continually being made to connect Campus Corner to downtown Norman, as well as other parts of Norman. New bike trails currently being constructed are:*
    - *Jenkins Avenue to Classen Avenue along Constitution Street*
    - *Robinson Street to Tecumseh Road along Flood Avenue*
- *Commitments to alternative transportation infrastructure by funding Embark Norman buses and increasing routes and bus stops by:*
  - *Adopting the Go Norman Transit Plan in 2021 – a roadmap for optimizing and expanding transit service within the City, providing detailed and prioritized*

<sup>4</sup> Environmental Protection Agency “Tailpipe Greenhouse Gas Emissions from a Typical Passenger Vehicle.” Accessed 2023. Available: <https://www.epa.gov/greenvehicles/tailpipe-greenhouse-gas-emissions-typical-passenger-vehicle#:~:text=Green%20Vehicle%20Guide-.Tailpipe%20Greenhouse%20Gas%20Emissions%20from%20a%20Typical%20Passenger%20Vehicle,of%20carbon%20dioxide%20per%20year.>

<sup>5</sup> Association of Central Oklahoma Governments, Transportation Data Management system. Accessed 2023. Available: <http://www.acogok.org/transportation-planning/congestion-management/traffic-counts/>

*recommendations for service improvements and expansion<sup>6</sup> (Existing CART and Embark Norman routes can be found in Appendix D);*

- *Making almost all bus routes bidirectional and eliminating the larger loop system;*
- *Remodeling 318 E. Comanche Street into a new City Transit Center and installing 80 new bus stops;*
- *Changes to the route network became effective on October 16, 2023 (New Routes shown in Appendix E).*

## RECOMMENDATIONS

1. Continue support for Embark Norman with their goal of expansion of service to Southeast Norman, a densely populated area without bus service, as soon as possible;
2. Continue efforts to expand bicycle routes and connection of preexisting routes to make bicycling a safe and practical means of transportation. More bike trails within the downtown area as well as on the main streets going both north/south and east/west are necessary for bicycling safety. Dedicated pathways or marked paths that are protected from traffic with some sort of barrier would also be helpful;
3. A bicycle path on NW 24<sup>th</sup> would be extremely useful to people wanting to access University North Park and the many medical facilities on that road;
4. Improve sidewalk infrastructure and add sidewalks to busy roads that currently don't have any (Boyd Street between Berry and Merrywood Lane is an example), so pedestrians don't have to detour to side streets to get from one place to another. Any plans or improvements should prioritize LID or environmentally friendly practices;
5. Pair efforts to expand infrastructure with campaigns and incentives to get people to use sidewalks, trails, and buses;
6. Add alternative shading options around bus stops;
7. Add light shielding to limit light pollution and advocate for changes in types of lighting and fixtures, such as warm-colored LEDs instead of blue-rich bulbs, and switch to fixtures that minimize glare and light trespass, by proposing a lighting ordinance;
8. Continue to create preferred parking spaces throughout the City for renewable-friendly vehicles;

<sup>6</sup> Go Norman Transit Plan. 2021. Accessed 2023. Available: <https://www.normanok.gov/sites/default/files/documents/2021-06/Go%20Norman%20Transit%20Plan%20-%20Final%20Report%20with%20Appendices%20%28reduced%29.pdf>

## **ACTION ITEM #4: RENEWABLE ENERGY AND ENERGY EFFICIENCY**

### **INTRODUCTION**

Energy efficiency programs offer one of the best ways to reduce global warming emissions. One example is the EPA's Energy Star Program, which includes equipment and building efficiency. Energy Star equipment is competitively priced and readily available. A significant share of fossil fuel use occurs during the electricity generation process with the majority of energy produced consumed in cities.<sup>7</sup> Decreasing the dependence on fossil fuels occurs through using renewable energy sources incorporating energy conservation practices. Solar and wind power are two primary renewable energy sources that decrease the dependency on fossil fuel usage for electricity generation. Designing construction projects with energy efficiency in mind may reduce energy demands having a direct effect on emissions while also saving on energy costs. There are no current policies in Norman to encourage the use of distributed or renewable energy generation.

### **BENEFITS AND NEEDS**

The City of Norman can provide leadership to the community by making energy efficiency and the use of renewable energy sources a priority. Energy efficient equipment and systems incorporated into buildings and City infrastructure (lighting, heating, and air conditioning) saves money and helps to reduce greenhouse gas emissions. Solar and wind power systems could further reduce air pollution.

### **NORMAN ACCOMPLISHMENTS 2023 UPDATE**

- *The Utilities Department recently completed a solar implementation project at both the Water Treatment Plant (WTP) and the Water Reclamation Facility (WRF), which will offset roughly 30% of the City's electric consumption at these facilities with solar power (Action Item #7).*
- *The Environmental Services Division is in the process of implementing electric charging stations for EV vehicles at municipal locations.*
- *Also noteworthy, but not City of Norman-developed, Norman Public Schools (NPS) updated their Energy Guidelines in 2020 that addresses most concerns in this Action Item.*

### **RECOMMENDATIONS**

1. Explore the creation of a renewable energy employment initiative to help bring jobs to Norman within the renewable energy sector;
2. Encourage the installation of solar panels on private homes, private businesses, as well as municipal buildings throughout Norman, and work with local HOAs to revise bylaws that prohibit solar panels on homes.
3. Request electric utility companies to purchase back the power generated by those solar panels at the same price that it is being sold. In addition, explore using time-of-day pricing methods in order to determine the price that power is sold back to the grid by private individuals.

<sup>7</sup> United Nations (un.org). "Climate Action – Generating Power." Available: <https://www.un.org/en/climatechange/climate-solutions/cities-pollution>

- a. Encourage the City or request electric companies to switch back to buying back power or re-evaluate contracts in some other way.
4. Decrease energy consumption and light pollution. Encourage residential and commercial users to minimize/efficiently use lighting by using shielding, direction, and/or motion sensed lighting as well as video footage for security purposes.
5. Encourage gas stations to implement electric charging stations. City staff should investigate funding mechanisms for such and provide technical assistance to entities on funding resources and other items.

## ACTION ITEM #5: SUSTAINABLE BUILDING PRACTICES

### INTRODUCTION

Cities across the country are passing ordinances to mandate municipal buildings meet green building standards. Some of the most frequently cited standards are those set by the Leadership in Energy and Environmental Design (LEED) program of the U.S. Green Building Council (USGBC) and the U.S. EPA's Energy Star Program. These programs provide a framework for implementing energy efficiency and sustainable design techniques for public and private buildings, homes, and neighborhoods that could save money, reduce water and energy consumption and greenhouse gas emissions.

### BENEFITS AND NEEDS

The City of Norman has an opportunity to lead by example through the implementation of sustainable design principles. The City also has some influence with private and public sector entities that build the majority of the homes and buildings in Norman.

### NORMAN ACCOMPLISHMENTS 2023 UPDATE

- *To date, Norman has a total of 23 LEED certified buildings, 4 of which are City-owned properties.<sup>8</sup>*
- *The City of Norman adopted the following codes in June 2023: 2018 International Building Code, 2018 International Existing Building Code, 2018 International Plumbing Code, 2018 International Fuel Gas Code, 2020 National Electric Code, 2018 International Residential Code, 2018 International Property Maintenance Code. The City still operated under the 2006 IECC - International Energy Conservation Code.*
- *The City of Norman updated the Engineering Design Criteria in February 2023. Chapter 7000, Sustainable Stormwater Development, was added creating standard specifications for Low Impact Development features.*

### RECOMMENDATIONS

1. The City should recommend that all commercial and residential project teams, both public and private, review goals, design principles, and standards from certification programs, such as Leadership in Energy and Environmental Design (LEED – administered through the United States Green Building Council, USGBC), Living Building Challenge (LBC – administered through the International Living Future Institute), WELL (administered through the International WELL Building Institute), and the Energy Star program (administered through the Environmental Protection Agency and the Department of Energy), and encourage incorporation into projects to the fullest extent possible. These recommendations and resources should be included on the City's Planning and Development website;
2. The City should specifically recommend and encourage:
  - a. Higher quality building envelopes (air sealing and insulation), HVAC systems, efficient lighting and water-efficient fixtures for all projects;

<sup>8</sup> United States Green Building Council. Available:  
<https://www.usgbc.org/projects?Country=%5B%22United+States%22%5D&State=%5B%22Oklahoma%22%5D>

- b. Single-family, wood-framed homes exceed minimum IECC requirements for insulation through the addition of 1” to 2” of continuous exterior rigid insulation, which would increase the effective R-value by 35% to 65% according to [greenbuilding.com](http://greenbuilding.com);
- 3. Adopt the latest version of the International Energy Conservation Code (IECC)
- 4. Incentivize apartment building owners to bring their structure to existing building codes with regards to insulation of the walls and roofs, as well as installation of efficient heat and air systems.

## ACTION ITEM #6: MUNICIPAL FLEET VEHICLES

### INTRODUCTION

Automobiles are a leading cause of global warming. Nationally, the transportation sector is one of the most significant sources of U.S. emissions, representing nearly one-third of total emissions.<sup>9</sup> Every gallon of gasoline burned emits 20 pounds of carbon dioxide—the principal global warming pollutant. Hybrid vehicles offer one solution to reduce greenhouse gas emissions, however, their use within the City of Norman is limited. This is primarily due to the significant infrastructure investments made by the City to support CNG vehicles, the low fuel cost for CNG vehicles, and the possibility for hybrid vehicles to meet the capability standards required by most City departments.

### BENEFITS AND NEED

Actions that reduce global warming also reduce fuel use, minimize costs for local governments, help cities comply with federal air quality regulations, and improve community livability.

### NORMAN ACCOMPLISHMENTS 2023 UPDATE

- *Fleet has added 15 hybrid police units this year to the existing 133 CNG powered vehicles and 2 EV transit buses.*
  - *On average, the hybrid police cars use 5 gallons less fuel per fill up versus a gasoline unit. So, to say if a PD SUV gets 10 mpg, on average, a hybrid will get approximately 15 mpg. This does not include idle reduction, which is a major benefit of using hybrid technology in a PD application. The City hopes to have more data on this within the next year.*
  - *The two EV buses were averaging 4 mpg and are now electric, so are now consuming 0 diesel versus their predecessors.*
- *Fleet continues to monitor the renewable-friendly vehicle industry. This is an ongoing practice that Fleet takes very seriously. Fleet's goal is to reduce the City of Norman's carbon output by replacing gasoline and diesel units with CNG, gasoline hybrids, and electric vehicles. Additionally, Fleet will keep up with the latest technology and upcoming trends in emission reduction.*
- *The Fleet Division follows its alternative fuels purchasing policy and has installed EV chargers, one of which is a publicly accessible unit in an effort to increase EV charging accessibility for the public.*
- *Electric charging stations have been installed at municipal buildings, such as those recently installed at North Base. The City is working on expansion to City Hall and other buildings/facilities.*
- *Created preferred parking spaces throughout the City for renewable-friendly vehicles. Low-emission parking spaces can currently be found in the City's municipal parking lot and at some public libraries.*

### RECOMMENDATIONS

1. Continue to create preferred parking spaces throughout the City for renewable-friendly vehicles;

<sup>9</sup> United States Environmental Protection Agency. Sources of Greenhouse Gas Emissions. Accessed 2023. Available: <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>



2. Continue to invest in infrastructure to support renewable-friendly vehicles;
  - a. Install electric charging stations at City Hall and other municipal buildings/facilities;
3. Implement a Public Education Outreach Program to reduce fuel usage.

## ACTION ITEM #7: EFFICIENCIES AT WATER AND WASTEWATER PLANTS

### INTRODUCTION

Nationwide, drinking water and wastewater systems cost more than \$4 billion a year in energy costs to pump, treat, deliver, collect, and clean water—with the majority of this cost borne by municipalities. The energy cost to run drinking water and wastewater systems can represent as much as one-third of a municipality's energy bill, and this is often the single most significant utility expenditure for a city.<sup>10</sup> Water conservation plays a big part in reducing energy costs for the drinking water treatment plant (WTP) and wastewater treatment facilities/water reclamation facilities (WRF). If less water is used, not as much water will need to be treated by either the WTP or the WRF, therefore reducing electricity needs.

### BENEFITS AND NEEDS

By increasing pumping efficiencies and reducing the energy usage at water and wastewater treatment facilities, less electricity will be required resulting in a decrease in carbon dioxide emissions from the indirect use of fossil fuels. Methane, which is a more potent greenhouse gas than carbon dioxide by a factor of 25, is emitted along several stages of the wastewater treatment process.<sup>11</sup> Methane captured at the WRF can reduce greenhouse gas emissions, provide a local renewable source of energy, and even generate income by turning a waste product into a revenue source.<sup>12</sup>

### NORMAN ACCOMPLISHMENTS 2023 UPDATE

- *The WTP and WRF continue to purchase energy reducing motors as they see fit.*
- *Solar projects recently completed at both facilities to offset 30% of energy consumption with solar power (Action Item #4).*
- ***Phase 2 plant upgrades at the WTP:***
  - *Consisted of mainly revisions to treatment processes;*
  - *Designed to use as little energy as possible by utilizing gravity rather than pumps throughout treatment process. Only one set of pumps was needed for the new additions.*
- *The Utilities Department added 9 new water wells to their system in 2021, all of which use up-to-date pumping motors that are continually monitored for pumping performance on a pump curve.*
- ***Phase 2 plant upgrades at the WRF:***
  - *In addition to aeration basin blowers, diffusers, and Variable Frequency Drive (VFD) replacement, this project also updated the headworks to allow for more efficient solids removal by lowering the pumping height and removing clogging issues.*
- *A project to replace two outdated and inefficient centrifuges at the WRF is ongoing. A grant was obtained for \$5 million and the funding will be available after Congress passes the FYE 2024 budget. In the interim, because the project is so important, the City will move forward with the work, expecting reimbursement later.*

<sup>10</sup> EPA. 2008. Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities. Accessed 2023. Available: <https://nepis.epa.gov/Exe/ZyPDF.cgi/P1003Y1G.PDF?Dockey=P1003Y1G.PDF>

<sup>11</sup> Daelman, M. et al. 2012. Methane Emission During Municipal Wastewater Treatment. *Water Research*. 46:11, p. 3657-3670. Available: <https://doi.org/10.1016/j.watres.2012.04.024>

<sup>12</sup> Global Methane Initiative (GMI). Accessed 2023. Available: <https://www.globalmethane.org/>

- *WRF occasionally uses recovered methane from the treatment process to heat boilers. However, due to the quality of the methane it can only be used by the boilers and is still not as efficient as natural gas, especially during the winter, so staff continues to switch between using recovered methane and natural gas.*
- *The WRF obtained equipment to start dewatering some of the sludge produced. This decreases the sludge weight, allowing for less fuel and trips needed for land application.*

## RECOMMENDATIONS

1. While the WRF has the ability to dewater some of its sludge, it's proposed that they obtain a covered storage area to store the dried sludge to aid in efficiencies when time is a constraint;
2. The WRF currently does not have a way to run recovered methane and natural gas to the boilers at the same time. This usually means that staff uses natural gas most of the time to obtain the heat necessary for the boilers. It is recommended that WRF staff add additional piping for the recovered methane so that it can be run at all times while natural gas runs to make up the difference needed;
3. Explore efficient biogas generation at the WRF and alternative funding sources for implementation;
4. WTP staff to meet with OGE and OEC to determine if there are any special rates or new buy-back plans that can be implemented for saving costs on electricity at the plant, and especially at the wells.
  - Staff should review well run times to determine if there is a way to implement smart hours to save in electrical usage and cost.
5. The WTP is running out of space for storing lagoon sludge at the old Hall Park site and staff should start determining alternative pathways for disposal that don't involve costly disposal at landfills;
6. While the water produced at the WTP is monitored to determine water loss within the system, staff should meter and keep a record of water used for filter backwash, recycling, and process water to obtain a more accurate water loss number when completing the annual water loss audit;

## ACTION ITEM #8: RECYCLING IN CITY OPERATIONS AND COMMUNITY

### INTRODUCTION

Recycling plays an important role in reducing global warming emissions. Because recycling saves energy, conserves resources, lowers emissions from incinerators, reduces landfill methane releases, and increases carbon storage in trees, it is effective in reducing greenhouse gases. Also, the steps in supplying recycled materials to industry (including collection, processing, and transportation) typically use less energy than supplying virgin materials (including extraction, refining, transportation, and processing).

### BENEFITS AND NEED

In general, manufacturing using recycled materials requires markedly less energy than when virgin materials are used. For instance, it takes 95% less energy to recycle aluminum than it does to make it from raw materials. Other materials requiring less energy to recycle include steel (60%), paper (50%), newsprint (40%), plastics (70%), and glass (40%). In addition to energy savings, there can be a direct benefit realized in terms of reduced carbon dioxide emissions from fossil fuel combustion and reduced methane generation from decomposing organic matter in landfills.

### NORMAN ACCOMPLISHMENTS 2023 UPDATE

- *Established a permanent site to recycle household hazardous waste at the HHW facility.*
- *Established city-hosted events for the collection of Styrofoam and Styrofoam densification, along with electronic waste collection events.*
- *2022 had an average curbside recycling participation rate of 88%.*
- *27.5% of the total waste stream (including compost and recycling), by tonnage, was diverted in 2022.*
- *The City's current rate of contamination for recycling is 27.9%.*

### RECOMMENDATIONS

1. Set goals to reduce contamination rate of recyclables. City of Norman rate is well above the national average of 17%<sup>13</sup>, so there is more room to grow for our residential recycling operations;
2. Explore and implement opportunities for apartment and business recycling;
3. Set goals to reduce waste and improve recycling rates;
  - a. Encourage the City of Norman to model after other global communities (South Korea, Japan, Germany, and Sweden) to imitate their progression towards a more environmentally friendly community;<sup>14</sup>
4. Explore ways to reduce consumption of non-recyclable materials, or those that must be collected separately, within the City (e.g., plastic bags);
5. Partner with local environmental groups and the Chamber of Commerce to promote recycling at special events (e.g., football games, music festivals, etc.);
6. Adopt EPA procurement guidelines for recycled content in new products;
  - a. Launch an interior recycling bin incentive (ex. the first 200 people to sign up will

<sup>13</sup> The Recycling Partnership. 2020 State of Curbside Recycling Report. [https://recyclingpartnership.org/wp-content/uploads/dlm\\_uploads/2020/02/2020-State-of-Curbside-Recycling.pdf](https://recyclingpartnership.org/wp-content/uploads/dlm_uploads/2020/02/2020-State-of-Curbside-Recycling.pdf)

<sup>14</sup> WasteAdvantage. The Top 15 Greenest Cities in the World for Recycling. <https://wasteadvantagemag.com/the-top-15-greenest-cities-in-the-world-for-recycling/>

- receive a recycling bin for use inside the home for free);
- b. Implement recycling education to the public and schools;
- 7. Reduce behavioral waste by 50% by the year 2035 through public education initiatives;
- 8. Install recycling bins at public parks and regularly occurring venues (e.g., soccer/baseball games, tournaments, etc.), in addition to adding a recycle bin next to all public trash cans;
- 9. Encourage or incentivize food service companies to utilize biodegradable or eco-friendly containers;
- 10. Implement a glass bottle bill in Oklahoma;
- 11. Save more money and keep increasing net revenues by moving to in-house recycling services;
- 12. Explore opportunities for implementing a compost food waste program;
- 13. Expand and bolster Keep Norman Neat efforts;

## **ACTION ITEM #9: MAINTAIN HEALTHY URBAN ECOSYSTEMS**

### **INTRODUCTION**

Ideally, carbon dioxide (CO<sub>2</sub>) production by humans and animals is balanced by plant uptake. As the population grows worldwide, industry and agriculture also expand. Consequently, forests and vegetation are removed and this balance is lost, causing an increase in CO<sub>2</sub>. An average of 40% of a residential lot is covered by structures and paving, with commercial coverage even higher, which contributes to increases in stormwater runoff that negatively impact our watershed. It's imperative that nature-based solutions be recognized and policies be provided for their implementation as common design practices for their environmental, economic, and social benefits.

### **BENEFITS AND NEEDS**

Natural ecosystems are capital assets to a community and must be considered an investment on par with critical infrastructure such as roads, buildings, utilities, and emergency services. Diverse ecosystems are essential to every human being, and with rapid urbanization leading to deforestation, habitat loss, and soil, water, and air pollution, every bit of space must be accounted for. Urban ecosystems include all types of habitats such as tree-lined streets, parking lots, greenbelts, creeks, parks, retention ponds, wetlands, bioswales, and anywhere soil exists. Natural ecosystems sustain us and provide benefits that are truly beyond any measurable scale. In addition to the ability to produce oxygen, clean water, mitigate floods, provide pollination and pest control, store carbon, and provide health benefits, etc., the increased economic return makes it a win-win investment for our community.

Norman is historically well poised to meet this challenge with a long list of community- and Council- mandated volunteer groups that care deeply about these issues. However, while Norman has made progress, significant needs still exist. In addition, a number of trees have been lost to storms and extreme temperatures over the past 4 years.

### **NORMAN ACCOMPLISHMENTS 2023 UPDATE**

- *Hired a full-time Forester in March 2022 to assist the City and citizens in development and planning.*
- *Adopted a tree ordinance<sup>15</sup> (Municipal Code 36-551, Original Ordinance O-9091-28 Adopted by Ordinance O-2223-23) for New Residential construction that requires one, and at times two, trees to be planted in the front yard with its location intended to provide a canopy over the street. This ordinance also requires homeowners to replace healthy street trees they remove. This ordinance is currently under revision under direction of the City Attorney's office.*
  - *The City sent out an RFQ to hire a company to conduct a street tree inventory, develop an Urban Forestry Master Plan, and revise our Tree Ordinance in March 2023. The winning contractor, Davey Resources, is currently updating the Tree Ordinance. The scope of the tree inventory has since been reduced to only City-*

<sup>15</sup> Norman Municipal Code 36-551 – Landscaping Requirements for Off-Street Parking Facilities.  
[https://norman.municipalcodeonline.com/book?type=ordinances#name=36-551\\_Landscaping\\_Requirements\\_For\\_Off-Street\\_Parking\\_Facilities](https://norman.municipalcodeonline.com/book?type=ordinances#name=36-551_Landscaping_Requirements_For_Off-Street_Parking_Facilities)

*owned properties, and the Urban Forest Master Plan process will begin after the inventory has been completed.*

- *The City's recently updated website lists multiple links that give guidance to private homeowners on maintenance and tree-trimming practices for existing trees on their property. <https://www.normanok.gov/residents-visitors/parks-recreation/forestry>. This website includes information on proper tree planting (planting the right tree in the right place).*
- *The City works with The University of Oklahoma's School of Civil Engineering and Environmental Science (CEES) Senior Capstone students on various projects. Since 2018, these capstone projects include:*
  - *2018 – Design of low impact development/ green infrastructure best management practice retrofits for existing stormwater detention pond at the City of Norman Municipal Complex;*
  - *2019 – Evaluation of hydrologic effects of indirect potable reuse of WRF effluent on Dave Blue Creek, a critical tributary of Lake Thunderbird;*
  - *2021 – Assessment of reservoir water quality and design of best management practice recommendations for in-lake and watershed-scale nature based solutions;*
  - *2023 – Design of pilot-scale tertiary wastewater treatment wetlands on City's property to support indirect potable reuse.*
- *The City and The University of Oklahoma's Center for Restoration of Ecosystems and Watersheds (CREW) are mutually pursuing multiple collaborative efforts, supporting graduate student research important to the City. Recent and current projects include:*
  - *Development and assessment of water quality changes in treatment wetland mesocosms at the WRF, with an emphasis on constituents of emerging concern;*
  - *Paired watershed assessment of urban stormwater low impact development best management practices;*
  - *Preliminary survey of constituents of emerging concern in Lake Thunderbird.*

## RECOMMENDATIONS

1. Update the Forestry Master Plan and Community Forest Management Plan
  - a. Engage in collaborations with the US Army Corps of Engineers' Engineering With Nature program<sup>16</sup> and commit to involvement with the collaborative Network for Engineering with Nature;<sup>17</sup>
2. Refine the City's Engineering and Design Criteria to comprehensively and explicitly include nature-based solutions;
3. Planning Department and Public Works Department coordination and communication for upcoming capital improvement projects to ensure projects are implemented as approved under planning commission.
4. Adopt new ordinances for parking lots, so that existing parking lots will need to be brought up to new parking lot codes within a certain timeframe regardless of whether there is a change of use for the parking lot or adjacent building;
  - a. Revised landscaping/number of parking spots

<sup>16</sup> <https://ewn.ercd.dren.mil/about/>

<sup>17</sup> <https://n-ewn.org/>

Inclusion of pervious pavements, bioswales, and underground detention

5. Expand city codes regarding outdoor play areas – school grounds, day care playgrounds, church playgrounds – by requiring a minimum number of trees to provide shade and other natural areas for children at play;
6. Expand city codes regarding outdoor areas surrounding apartment complexes with regards to tree coverage and natural areas;
7. Expand the no-mowing zones around parks and creeks in Norman with the goal to regenerate biodiversity<sup>18</sup>;
8. Develop chemical spraying guidelines and restrictions for the use of toxic chemicals and switch to the use of safe and more biodegradable products;
9. Finalize tree inventory on City property;
10. Pursue public and private partnerships for created and restored wetland development on city properties.
11. Complete installation of nature-based designs at City-owned park (Alameda and Carter)

---

<sup>18</sup> Homegrown National Park <https://www.homegrownnationalpark.org/>



## **ACTION ITEM #10: PUBLIC EDUCATION OF ENVIRONMENTAL DISCIPLINES**

### **INTRODUCTION**

Today, one cannot read a newspaper or news feed, science or political blog, or listen to or view news programs without hearing about climate change. Some people are interested, and some are worried. They want to know how their local, state, and federal governments are responding. More importantly, many need to be informed, to know more about what they can do to help. The City of Norman has been a leader in environmental stewardship in Oklahoma. In 2005, the Mayor of Norman was the only mayor in Oklahoma to sign the U.S. Mayors' Climate Protection Agreement. The creation of numerous environmentally focused citizen boards and committees demonstrates the continued emphasis placed on environmental issues by the City. The City can continue to lead by example, inform the community of what it has done to reduce carbon emissions, what it plans to do in the future, and how citizens can participate.

### **BENEFITS AND NEEDS**

A reduction in electricity consumption saves money and enhances our environment. Reductions in both electricity and fuel consumption yield subsequent declines in greenhouse gases. Many people do not know how they can easily reduce their personal contribution to greenhouse gases. The City can demonstrate its leadership by setting the example, filling in the blanks, and providing guidance for average citizens to leverage opportunities for success.

### **NORMAN ACCOMPLISHMENTS 2023 UPDATE**

- *In FYE22, the City hired Michele Loudonback, Environmental & Sustainability Manager.*
- *In regards to public education/public relations, the City contracted a professional with specific expertise on wetlands to provide workshop opportunities in an effort to expand and enhance the extensive efforts of volunteer boards and City employees.*
- *The City and ECAB have both contributed to overcoming a previous shortfall of missing environmental information on the City websites by producing and making available on the City's website a wealth of new environmentally focused educational content. This includes pages for ECAB, the FOG Program, GreenNorman.org, the Household Hazardous Waste Facility, and the Industrial Pretreatment Program, among others.*
- *Various campaigns created by both the City and ECAB on environmental disciplines have been promoted via the City's social channels. Topics include: Composting, Recycling, Waste Reduction, Plant Diversity, and many more.*

### **RECOMMENDATIONS**

Although ECAB members, staff, and many citizens have actively advocated for greenhouse gas and plastic pollution reductions, many other citizens are unaware or only vaguely aware of the issues. City of Norman management and leadership can greatly expand the impact and benefit of public education by addressing the primary shortfall of citizen efforts to date: expertise and resources.

1. Engage or employ contract professionals with specific expertise in public education and/or public relations to expand and enhance the extensive efforts of many volunteer boards and City employees;
2. Expand the environmental education sections of the City's website;

3. Develop and implement a strategy to utilize social media to promote environmental disciplines, including water conservation, waste reduction, recycling, etc.;
4. Challenge and engage local businesses, organizations, and other communities to become partners in environmental public education;
5. Education on anti-idling practices and other sustainable policies for both the public and City staff (i.e., implement easy access training for City Staff so they are aware when new policies and procedures take place).

**Appendix A:** City of Norman Greenhouse Gas Emissions Inventory (2021 update)

**City of Norman  
2021 Greenhouse Gas Emissions  
Inventory Report**

May 2023



City of Norman, 201 West Gray Street, Norman, OK 73069  
p (405) 217-7700 | [www.NormanOK.gov](http://www.NormanOK.gov)

## ACKNOWLEDGEMENTS

Rachel Koch, an Environmental Sustainability student at the University of Oklahoma, conducted the City of Norman's 2021 Greenhouse Gas Emissions Inventory and prepared this report in conjunction with the City of Norman's Environmental and Sustainability Manager, Michele Loudenback, and Department of Geography and Environmental Sustainability professor, Dr. Travis Gliedt.

We are grateful to the many people within the City of Norman who assisted in our calculating efforts and made this report possible.

## TABLE OF CONTENTS

<b>Executive Summary .....</b>	<b>5</b>
<b>Background .....</b>	<b>7</b>
<b>Part I: 2000 Emissions Inventory Review .....</b>	<b>10</b>
<b>Part II: 2021 Emissions Inventory .....</b>	<b>12</b>
<b>Part III: Comparison of 2000 to 2021 .....</b>	<b>18</b>
<b>Part IV: 2021 Government Sector Analysis .....</b>	<b>23</b>
<b>Part V: Future Projections .....</b>	<b>25</b>
<b>Conclusion .....</b>	<b>27</b>

## TABLE OF TABLES

Table 1. 2000 Emissions Inventory Overview.....	10
Table 2. 2000 Building Breakdown by Utility Provider.....	11
Table 3. Gross Emissions by Sector for 2021.....	14
Table 4. Gross Emissions by Source for 2021.....	15
Table 5. kWh of Energy Use by Sector for 2021.....	17
Table 6. Energy Emissions by Sector for 2021.....	17
Table 7. Gross MT CO <sub>2</sub> e Emissions for Norman in 2000 and 2021.....	18
Table 8. Total and Average Year Percent Change for Norman Gross 2000 and 2021 Emissions.....	18
Table 9. Per Capita MT CO <sub>2</sub> e Emissions for 2000 and 2021.....	19
Table 10. Per Capita Total and Average Year Percent Change for Norman 2000 to 2021.....	19
Table 11. 2000 to 2021 Gross and Per Capita Emissions Breakdown.....	21
Table 12. Percent Change for Gross and Per Capita Emissions for 2000-2026.....	25

## TABLE OF FIGURES

Figure 1. 2000-2026 Norman Gross Emissions with Actual, Estimated, and Projected Data.....	5
Figure 2. 2000-2026 Norman Per Capita Emissions with Actual, Estimated, and Projected Data.....	6
Figure 3. 2000 Emissions by Sector.....	10
Figure 4. Total City of Norman Emissions in 2021 by Greenhouse Gas.....	12
Figure 5. Gross Emissions by Sector for 2021.....	13
Figure 6. Gross Emissions by Sector for 2021 Percentage.....	13
Figure 7. Gross Emissions by Source for 2021.....	14
Figure 8. Gross Emissions by Source for 2021.....	15
Figure 9. Energy Emissions by Sector for 2021.....	16
Figure 10. Energy Emissions by Sector for 2021.....	16
Figure 11. Actual and Estimated Gross Emissions for Norman 2000-2021.....	19
Figure 12. Actual and Estimated Per Capita Emissions for Norman 2000-2021.....	20
Figure 13. Sector Comparisons for Gross Emissions in Norman 2000-2021.....	21
Figure 14. Sector Comparisons for Per Capita Emissions in Norman 2000-2021.....	22
Figure 15. 2000-2026 Norman Gross Emissions with Actual, Estimated, and Projected Data.....	25
Figure 16. 2000-2026 Norman Per Capita Emissions with Actual, Estimated, and Projected Data.....	26

## Executive Summary

This greenhouse gas emissions inventory aligns with the City's goal of reducing emissions. The data and information in this report can be used to assess progress on reducing emissions, identify emissions hotspots, and assist in setting science-based targets.

The 2021 inventory analyzes emissions produced by the City of Norman in its municipal operations. Scope 1 and 2 emissions are primarily analyzed in this inventory. Conducting an inventory every five years is in line with national standards. The next year an inventory should be completed is 2026.

**In 2021, the City of Norman was responsible for gross emissions of 35,867 metric tons of carbon dioxide equivalent (MT CO<sub>2</sub>e). This is a 5% reduction (-2,034 MT CO<sub>2</sub>e) compared to the 2000 emissions inventory.**

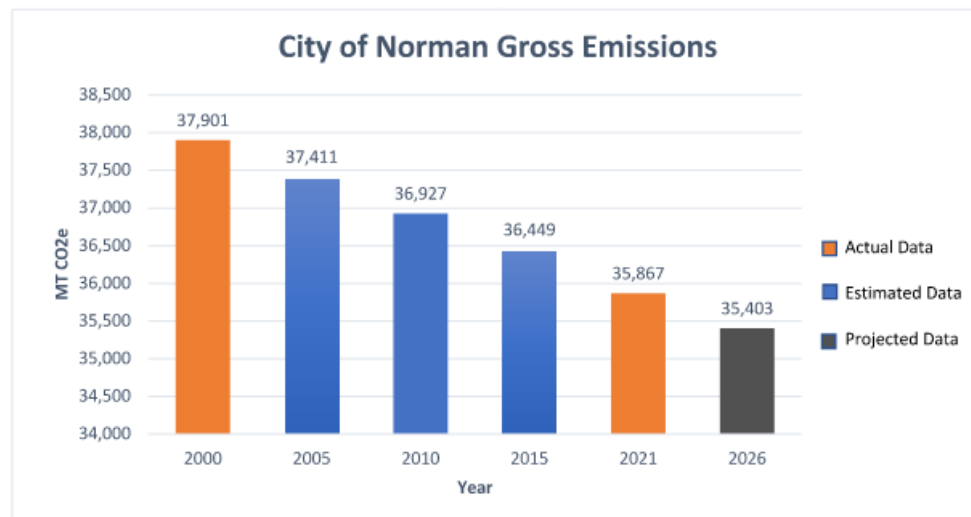


Figure 1. 2000-2026 Norman Gross Emissions with Actual, Estimated, and Projected Data.

Wastewater treatment comprised the largest portion of emissions (48%) with 17,229 MT CO<sub>2</sub>e. Streetlights and traffic signals comprised less than 1% of total emissions, with only 295 MT CO<sub>2</sub>e emitted – far fewer emissions than cities of comparable size.

**In 2021, the City of Norman was responsible for per capita emissions of 0.28 MT CO<sub>2</sub>e. This is a 27% reduction (-0.10 MT CO<sub>2</sub>e) compared to the 2000 emissions inventory.**

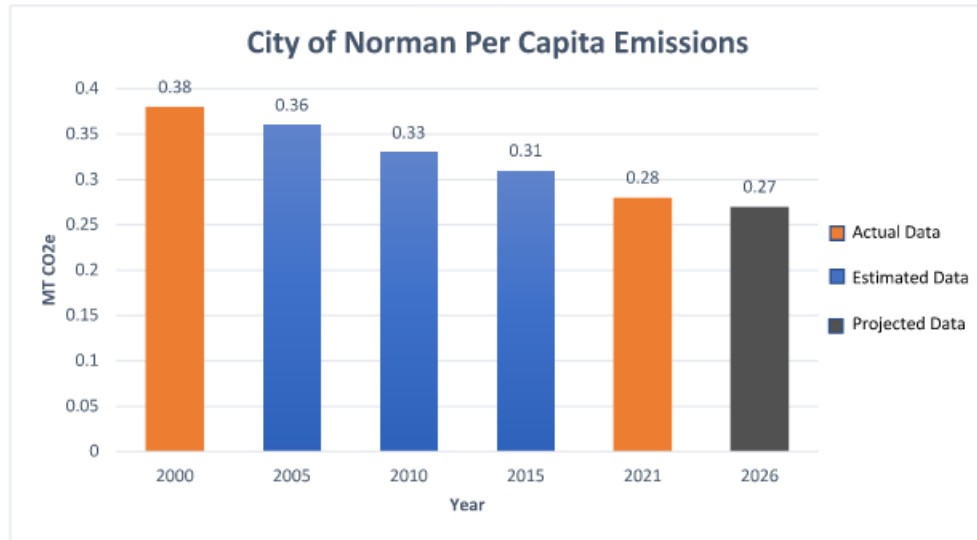


Figure 2. 2000-2026 Norman Per Capita Emissions with Actual, Estimated, and Projected Data.

**Emissions for the City of Norman are decreasing for both gross and per capita emissions.** While we cannot establish causality, there are indications that the sustainability programs implemented by the City are potentially reducing emissions. However, further inventories will need to be conducted to confirm the findings of this report.



## Background

### THE CITY OF NORMAN

This emissions inventory report summarizes the greenhouse gas (GHG) emissions for 2021. The City of Norman has previously conducted an inventory for 2000. The 2021 GHG emissions inventory is part of the City's efforts to reduce emissions and promote sustainability. In 2005, Mayor Harold Haralson signed the Mayors' Climate Protection Agreement. In 2007, initial climate protection plan recommendations were delivered to the City and formally adopted in February 2009. In February 2017, the Environmental Control Advisory Board reviewed the climate protection plan recommendations and found many of the recommendations implemented. However, the City had yet to complete one of the recommendations: conducting an inventory of GHG emissions to measure potential reductions from the 2000 baseline. The report also recommends conducting an emissions inventory every five years.<sup>1</sup>

This inventory has two major aims: identify 2021 GHG emissions and compare 2021 emissions to the 2000 baseline. This inventory will solely analyze municipal government operations and not look at community activity emissions. The information in this report can be used to make informed climate and sustainability decisions for the City of Norman's operations.

Norman, Oklahoma, is located within Cleveland County and has a population of 120,866 people and an area of 189.5 square miles. Norman has a temperate climate with an annual mean temperature of 61.4°F and an annual mean precipitation of 35.4 inches.<sup>2</sup> The City of Norman employs 861 full-time, 26 part-time, and 150 to 200 seasonal employees.<sup>3</sup>

### GREENHOUSE GASES

GHGs are gases that trap heat in the atmosphere. The six GHGs identified by the EPA are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), sulfur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). The warming potential and atmospheric concentrations of these gases vary. The GHG effect helps keep the Earth warm and habitable for life to thrive, with natural sinks (such as trees, vegetation, and the ocean) sucking excess GHGs out of the atmosphere. However, when too many GHGs enter the atmosphere – faster than natural sinks can absorb them – the planet heats up too quickly. Human activities, such as burning fossil fuels, have released significant amounts of GHGs into the atmosphere, warming the planet and causing climate change.<sup>4</sup> Climate change is affecting the entire planet and poses a threat to local regions and municipalities. Understanding how much GHGs institutions emit is vital to identifying effective emissions reduction strategies.

<sup>1</sup> City of Norman. Council of the City of Norman. *Resolution R-1718-119*.

<https://www.normanok.gov/sites/default/files/documents/2020-10/R-1718-119%20ECAB%20MCP%20updates.pdf>.

<sup>2</sup> "Demographics and Characteristics," City of Norman, Accessed April 20, 2023, <https://www.normanok.gov/about-norman/demographics-and-characteristics>.

<sup>3</sup> "Job Opportunities," City of Norman, Accessed April 20, 2023, <https://www.normanok.gov/your-government/departments/human-resources/job-opportunities>.

<sup>4</sup> IPCC, "Summary for Policymakers." Report, Cambridge University Press, Cambridge, United Kingdom and New York, USA.

Reducing GHGs (and associated strategies) can improve a city's air quality, improve residents' health and well-being, and generate economic benefits for a city.<sup>5</sup> By conducting a GHG inventory, the City of Norman will better understand its emissions and identify strategies for GHG reduction, ultimately improving the health and safety of all residents.

## METHODOLOGY AND NOTES

This emissions inventory is strictly looking at municipal operations. Other GHG inventories have looked at community emissions and municipal operations; however, solely focusing on municipal operations aligns with the City's current sustainability goals.

Two key elements of conducting a GHG inventory are scope and boundary. The scope of the inventory identifies how broad or narrow the inventory is regarding the type of emissions. There are 3 scopes associated with a GHG inventory:

- Scope 1: direct GHG emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles).
- Scope 2: indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Although scope 2 emissions physically occur at the facility where they are generated, they are accounted for in an organization's GHG inventory because they are a result of the organization's energy use.
- Scope 3: the result of activities from assets not owned or controlled by the reporting organization but that the organization indirectly affects in its value chain. Scope 3 emissions include all sources not within an organization's scope 1 and 2 boundary.<sup>6</sup>

Additionally, a GHG inventory needs to identify the boundary. The typical boundaries of an inventory are:

- Equity share: an organization accounts for GHG emissions from operations and assets according to its share of equity in the operation. The equity share reflects economic interest, which is the extent of rights an organization has to the risks and rewards flowing from an operation.
- Financial control: an organization accounts for 100 percent of the GHG emissions over which it has financial control. It does not account for GHG emissions from operations it owns equity in but does not have financial control over.

<sup>5</sup> Bianco, N. et al. 2014. "Summary for Policymakers, Seeing is Believing: Creating a New Climate Economy in the United States." Working Paper. Washington, DC: World Resources Institute.

<sup>6</sup> "GHG Inventory Development Process and Guidance." EPA, Accessed April 20, 2023, <https://www.epa.gov/climateleadership/ghg-inventory-development-process-and-guidance>

- Operational control: An organization accounts for 100 percent of the GHG emissions over which it has operational control. It does not account for GHG emissions from operations it owns equity in but does not have operational control over.<sup>7</sup>

The primary scopes analyzed in the 2021 GHG inventory were scope 1 and scope 2. This decision was largely based on the City's current needs and a desire to identify areas where the City has the most control over operations and, thus, a greater ability to implement emission reduction strategies. While some scope 3 emissions were calculated (employee commute), there was not a direct emphasis on calculating scope 3 emissions. The boundary for this inventory was operational control over municipal operations. Community activities were not analyzed in this inventory for reasons identical to the decision to focus on scope 1 and 2 emissions.

We utilized the EPA's Local Greenhouse Gas Inventory Tool: Government Operations Module for this inventory. The version utilized was updated on January 14th, 2022. Additionally, we implemented guidance for conducting the inventory and writing this report from the International Council for Local Environmental Initiatives (ICLEI) Local Government Operations Protocol and the Greenhouse Gas Emissions Protocol: Employee Commuting.

For the analysis portion of the inventory, we looked at both source and sector emissions. Source emissions are the emissions associated with the fuel source: electricity, diesel, gasoline, and natural gas. Sector emissions are associated with the specific sector, including buildings and facilities, employee commute, water delivery services, vehicle fleet, wastewater treatment, and streetlights and traffic signals.

Given this inventory was conducted for 2021, the Covid-19 pandemic likely impacted the data and, thus, the results. Future inventories should keep this in mind when using this report as a baseline for comparison.

---

<sup>7</sup> *Ibid.*

## Part I: 2000 Emissions Inventory Review

### OVERVIEW OF 2000 EMISSIONS REPORT

In 2005 the City conducted a GHG emissions inventory for 2000. The 2000 emissions inventory analyzed municipal operations in the following sectors: buildings, vehicle fleet, employee commute, wastewater, water, and waste. The 2000 inventory did not analyze community activities. The 2000 emissions inventory analyzed utility data to calculate emissions and, thus, is likely missing some crucial data from the wastewater treatment process. The report lacks detail about the scope and boundary of the inventory; however, we can glean some key insights.

Table 1. 2000 Emissions Inventory Overview.

Sector	MT CO <sub>2</sub> e
Buildings	19,275
Vehicle Fleet	6,040
Employee Commute	380
Wastewater	3,286
Water	8,920
Waste	49,353
<b>Total</b>	<b>87,254</b>

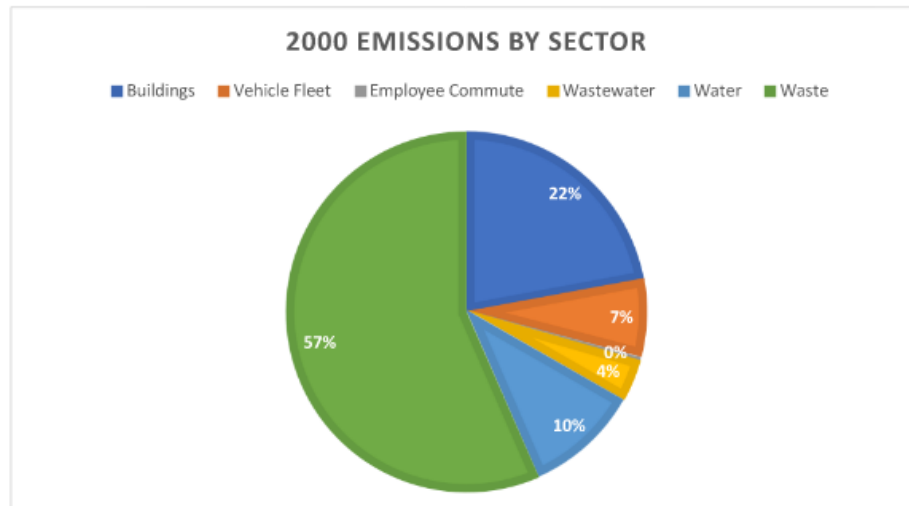


Figure 3. 2000 Emissions by Sector.

The total 2000 emissions for municipal operations were 87,254 MT CO<sub>2</sub>e. The sector with the largest emissions was waste. In the 2000 report, most of the waste emissions come from paper products (36,635 MT CO<sub>2</sub>e) and food waste (17,508 MT CO<sub>2</sub>e).

*Table 2. 2000 Building Breakdown by Utility Provider.*

<b>Buildings</b>	<b>MT CO<sub>2</sub>e</b>
OEC Consumption	29
OGE Consumption	14,120
ONG Consumption	5,126
Subtotal Buildings	19,275

Buildings make up the second largest sector for emissions with 19,275 MT CO<sub>2</sub>e. While the report does not provide specifics on the type of fuel consumed for energy emissions, we can assume that ONG (Oklahoma Natural Gas) utilizes natural gas, OGE (Oklahoma Gas and Electric) utilizes a grid mix, and OEC (Oklahoma Electric Cooperative) utilizes electricity. In 2000, Oklahoma's grid mix was 90% natural gas, 10% coal, and >1% petroleum. Given this information, and the utility provider breakdown in Table 2, we can assume that most of the fuel consumed by buildings and facilities was natural gas.

## Part II: 2021 Emissions Inventory

### MUNICIPAL OPERATIONS EMISSIONS OVERVIEW

In 2021, the total emissions produced by the City of Norman's municipal operations was **35,867 MT CO<sub>2</sub>e**. This number represents primarily scope 1 and 2 emissions, with employee commute as the only source for scope 3 emissions based on our inventory boundary.

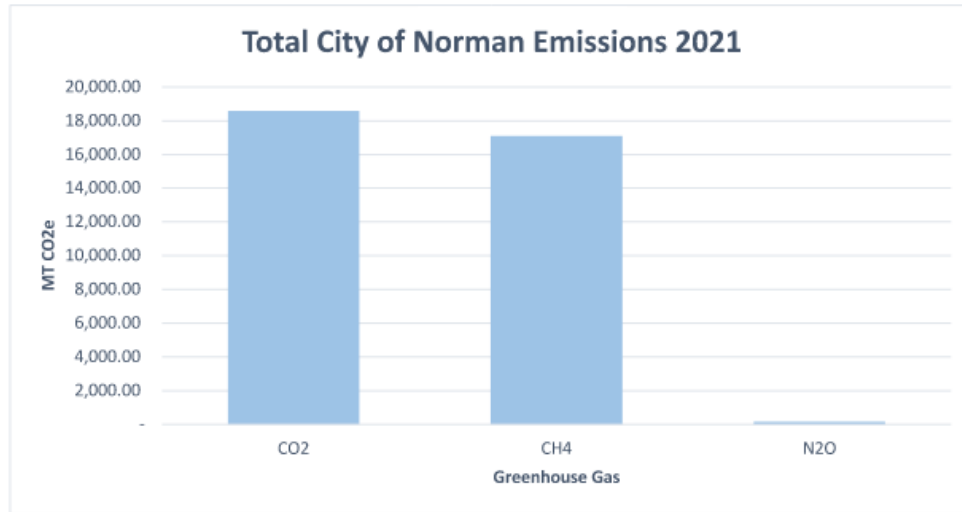


Figure 4. Total City of Norman Emissions in 2021 by Greenhouse Gas.

Within our scope and boundary, carbon dioxide (CO<sub>2</sub>) comprised the largest percentage of GHGs emitted at 52% and methane (CH<sub>4</sub>) was the second largest percentage at 48%. Nitrous oxide (N<sub>2</sub>O) comprised <1% of total GHGs emitted. Given the scope and boundary of this inventory and data availability, the other 3 common GHGs (HFCs, PFCs, and SF<sub>6</sub>) were not included.

### MUNICIPAL OPERATIONS EMISSIONS BY SECTOR

The following sectors were analyzed: buildings and facilities, streetlights and traffic signals, wastewater treatment, vehicle fleet, and employee commute.\* Within these sectors, **wastewater treatment comprised the greatest portion of emissions (48%) with 17,229 MT CO<sub>2</sub>e**. Buildings and facilities were the second highest (38%) at **13,662 MT CO<sub>2</sub>e**.

\* Energy use by all buildings and facilities (including water delivery and wastewater treatment facilities) was included in buildings and facilities for analysis by sector. Within the Energy Use Emissions Breakdown section is more detail about each department's emissions. Additionally, municipal solid waste is not included here because the City contracts Republic Services for transfer station management, making this scope 3.

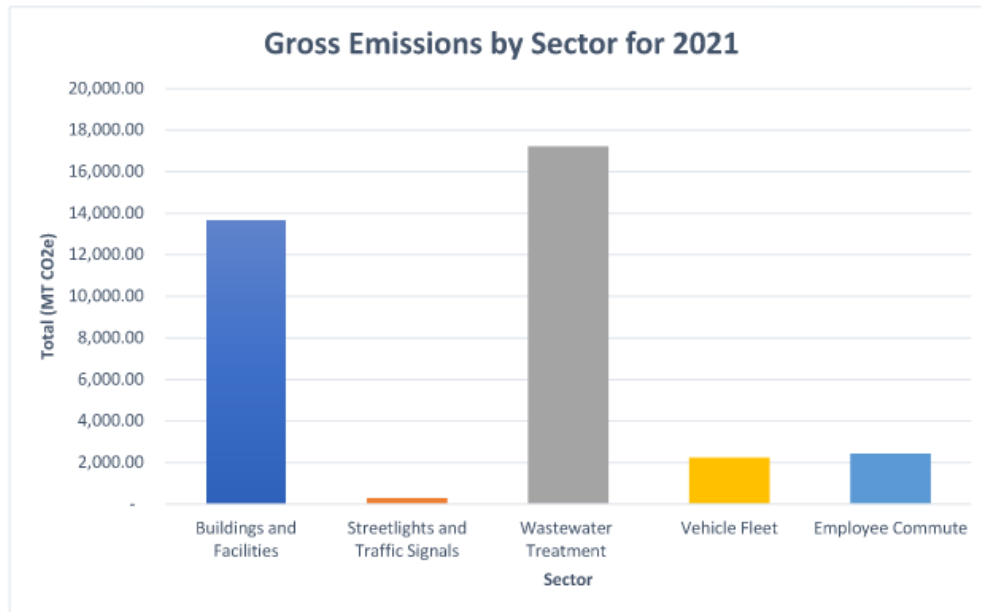


Figure 5. Gross Emissions by Sector for 2021.

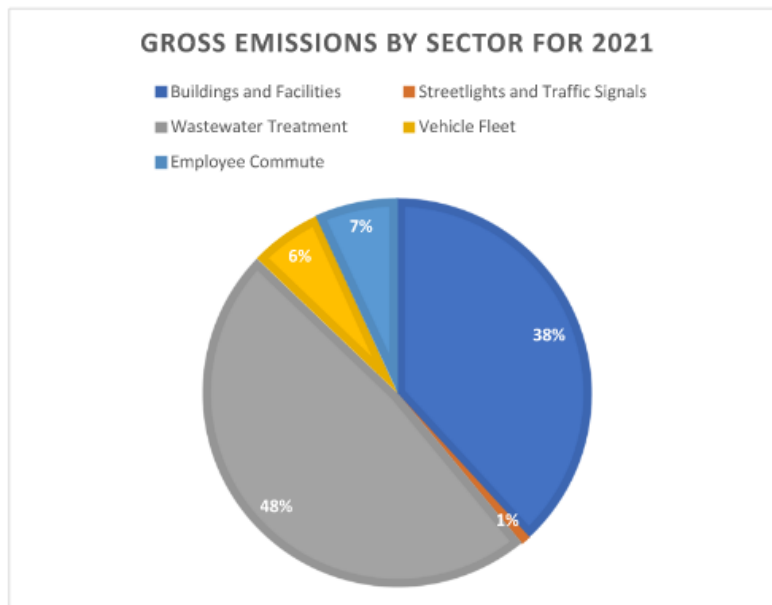


Figure 6. Gross Emissions by Sector for 2021 Percentage.

Table 3. Gross Emissions by Sector for 2021.

Gross Emissions by Sector for 2021		
Sector	Total (MT CO <sub>2</sub> e)	Percent of Total
Buildings and Facilities	13,662	38%
Streetlights and Traffic Signals	295	1%
Wastewater Treatment	17,229	48%
Vehicle Fleet	2,245	6%
Employee Commute	2,436	7%
<b>Total</b>	<b>35,867</b>	<b>100%</b>

### MUNICIPAL OPERATIONS EMISSIONS BY SOURCE

Source analysis for this inventory focuses on the following: electricity, gasoline, diesel, and compressed natural gas (CNG).<sup>\*</sup> **Electricity comprised the largest emissions by source (58%) with 10,872 MT CO<sub>2</sub>e.** Gasoline and CNG were relatively even (both 19%), with emissions at 3,615 MT CO<sub>2</sub>e and 3,562 MT CO<sub>2</sub>e, respectively. Diesel comprised the lowest emissions (3%) with 589 MT CO<sub>2</sub>e.

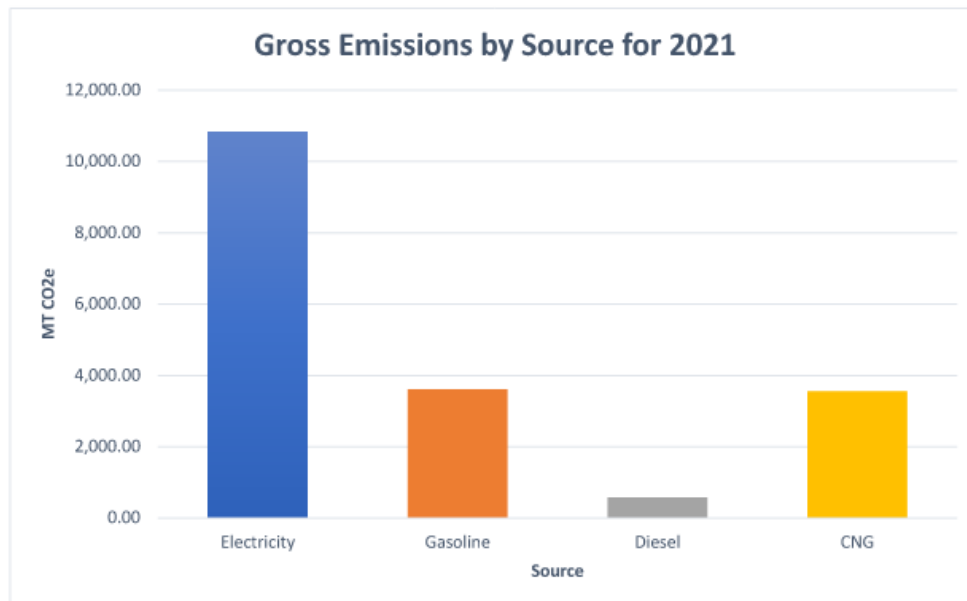


Figure 7. Gross Emissions by Source for 2021.

<sup>\*</sup> Emissions from the wastewater treatment process are not included in this section, given it does not produce source emissions.



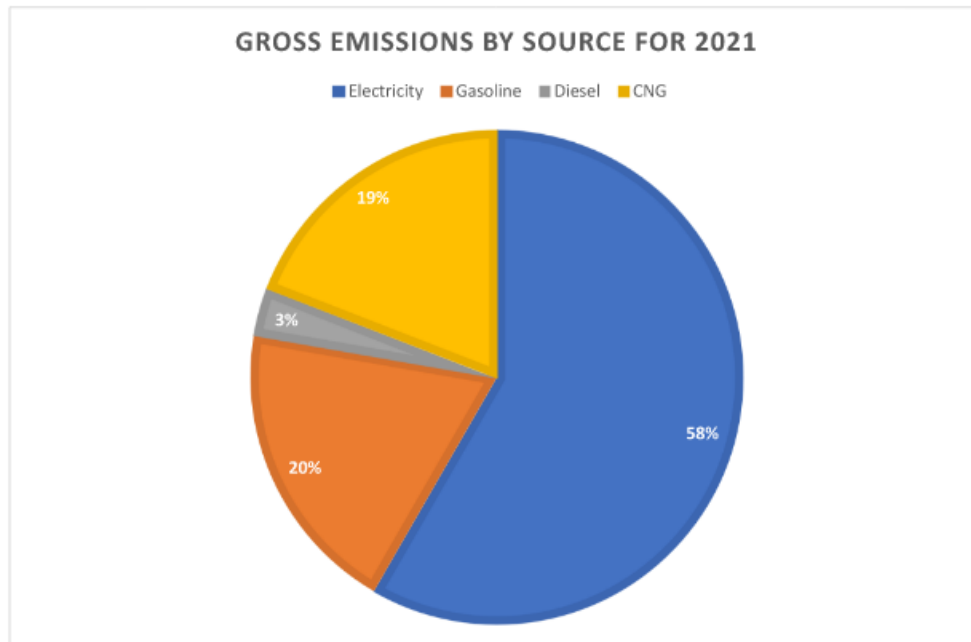


Figure 8. Gross Emissions by Source for 2021.

Table 4. Gross Emissions by Source for 2021.

Gross Emissions by Source					
Source	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Total (MT CO <sub>2</sub> e)	Percent of Total
Electricity	10,821	19	32	10,872	58%
Gasoline	3,615	-	-	3,615	19%
Diesel	589	-	-	589	3%
CNG	3,553	7	2	3,562	19%
<b>Total</b>	<b>18,578</b>	<b>26</b>	<b>34</b>	<b>18,638</b>	<b>100%</b>

### ENERGY USE EMISSIONS BREAKDOWN

Energy use for all sectors was compiled under buildings and facilities. This was done to ease analysis and identify which sectors consume the most energy and produce the most emissions. The categories of analysis are buildings and facilities, streetlights and traffic signals, water delivery services, and wastewater treatment facilities. Buildings and facilities refer to stationary locations that fall outside the other three categories. These sectors were the only ones that required stationary combustion or electricity use.

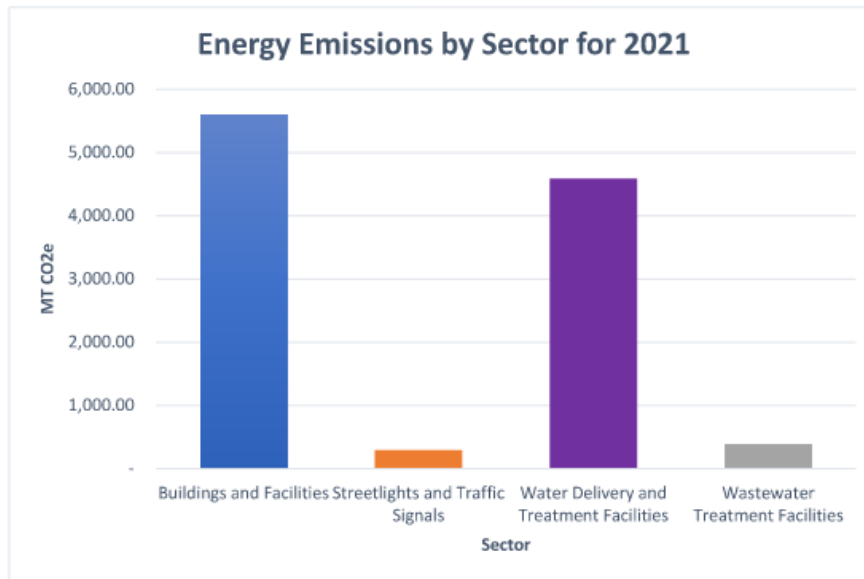


Figure 9. Energy Emissions by Sector for 2021.

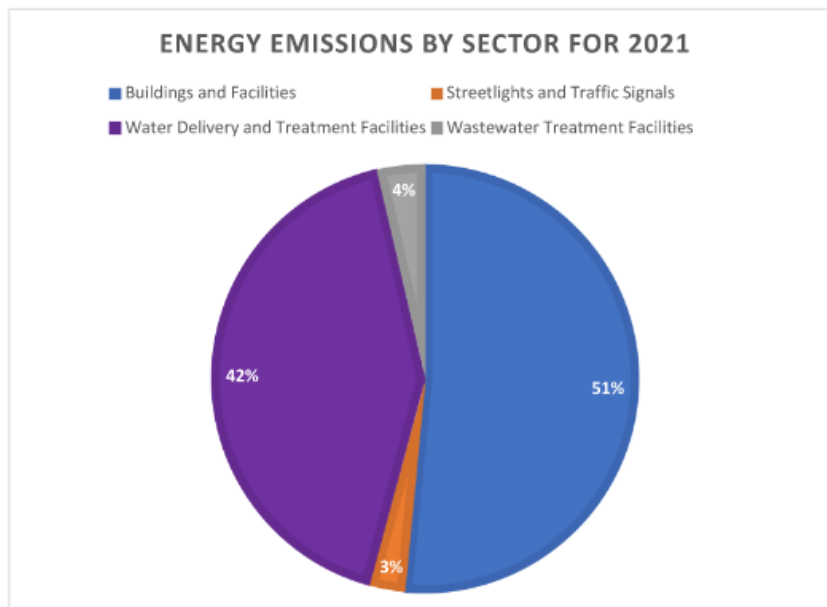


Figure 10. Energy Emissions by Sector for 2021.

Table 5. kWh of Energy Use by Sector for 2021.

kWh of Energy Use by Sector for 2021	
Department	kWh
Buildings and Facilities	12,259,565
Streetlights and Traffic Signals	646,052
Water Delivery Services	10,051,978
Wastewater Treatment Facilities	852,091
<b>Total Use</b>	<b>23,809,686</b>

Table 6. Energy Emissions by Sector for 2021.

Energy Emissions by Sector for 2021				
Sector	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Total (MT CO <sub>2e</sub> )
Buildings and Facilities	5,572	10	17	5,598
Streetlights and Traffic Signals	294	0.51	0.87	295
Water Delivery Services	4,569	8	14	4,590
Wastewater Treatment Facilities	387	0.68	1	389
<b>Total Emissions from Energy Use</b>	<b>10,821</b>	<b>19</b>	<b>32.18</b>	<b>10,872</b>

The total emissions from energy use were **10,872 MT CO<sub>2e</sub>**. **Buildings and facilities made up the largest portion of energy use emissions (51%) at 5,598 MT CO<sub>2e</sub>**. Water delivery services comprised the second largest portion of energy use (42%) with 4,590 MT CO<sub>2e</sub>. Wastewater treatment facilities (4%) emitted 389 MT CO<sub>2e</sub>, and streetlights and traffic signals (3%) emitted 295 MT CO<sub>2e</sub>.

## Part III: Comparison of 2000 to 2021

### IMPORTANT NOTES AND CONTEXT

While the information in this section can be useful for understanding large-scale changes in emissions, more information is needed for sector-based decision making. The 2000 report lacks information on both boundary and scope; thus, we cannot accurately say that the data from the 2000 report is suitable for detailed comparison in 2021. Additionally, there were only two data points, so only a percentage change calculation could be performed. We will provide information on sector comparisons and note where we can confidently identify data discrepancies or comparability.

Waste from the 2000 report was not included in this comparison, given a waste emissions calculation was not completed for 2021.

Gross and per capita calculations were done to control for population. From 2000 to 2021, Norman's population increased by 29,215 people.

### GROSS EMISSIONS BREAKDOWN

In 2000, the total emissions for the City of Norman (excluding waste) were 37,901 MT CO<sub>2</sub>e. In 2021, the total emissions were 35,867 MT CO<sub>2</sub>e. This represents a **5% decrease in gross emissions, with an average yearly decrease of 0.26%.**

Table 7. Gross MT CO<sub>2</sub>e Emissions for Norman in 2000 and 2021.

Sector	MT CO <sub>2</sub> e 2000	MT CO <sub>2</sub> e 2021
Buildings and Facilities	19,275	9,072
Streetlights and Traffic Signals	-	295
Vehicle Fleet	6,040	2,245
Wastewater Treatment	3,286	17,229
Water Delivery Services (energy use)	8,920	4,590
Employee Commute	380	2,436
<b>Total</b>	<b>37,901</b>	<b>35,867</b>

Table 8. Total and Average Year Percent Change for Norman Gross 2000 and 2021 Emissions.

Gross Emissions Total Percent Change	Gross Emissions Average Year Percent Change
-5.37%	-0.26%

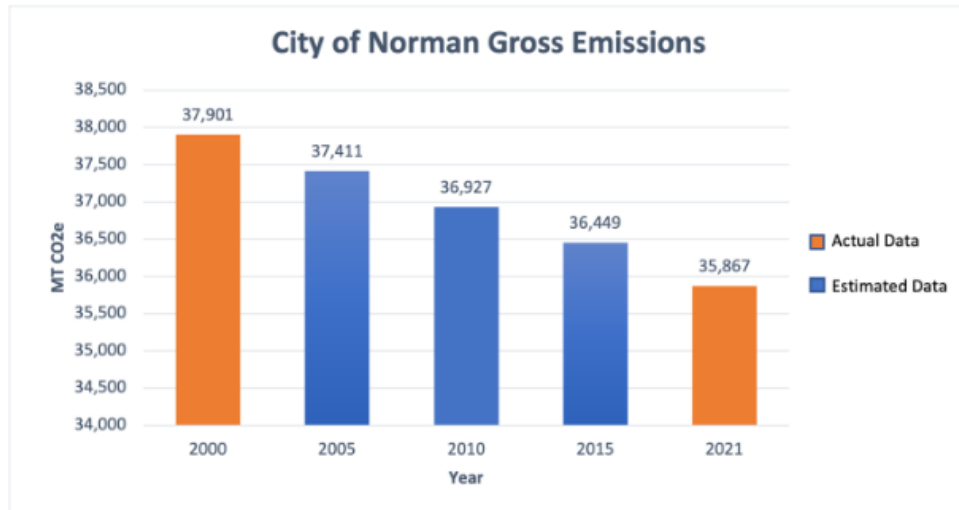


Figure 11. Actual and Estimated Gross Emissions for Norman 2000-2021.

#### PER CAPITA EMISSIONS BREAKDOWN

When controlling for population, Norman's **per capita emissions decreased by 27% with a 1% average yearly decrease**. In 2000, the per capita emissions were 0.38 MT CO<sub>2</sub>e. In 2021, the per capita emissions were 0.28 MT CO<sub>2</sub>e.

Table 9. Per Capita MT CO<sub>2</sub>e Emissions for 2000 and 2021.

Sector	Per Capita MT CO <sub>2</sub> e (2000)	Per Capita MT CO <sub>2</sub> e (2021)
Buildings and Facilities	0.19	0.07
Streetlights and Traffic Signals	-	0.00
Vehicle Fleet	0.06	0.02
Wastewater Treatment	0.03	0.13
Water Delivery Services (energy use)	0.09	0.04
Employee Commute	0.00	0.02
<b>Total</b>	<b>0.38</b>	<b>0.28</b>

Table 10. Per Capita Total and Average Year Percent Change for Norman 2000 to 2021.

Per Capita Emissions Percent Change	Average Year Per Capita Percent Change
-26.95%	-1.28%

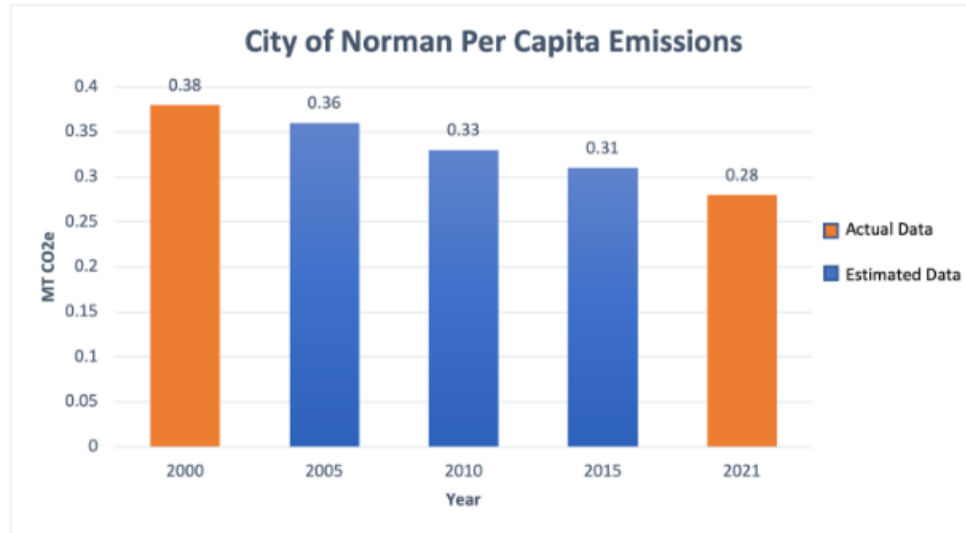


Figure 12. Actual and Estimated Per Capita Emissions for Norman 2000-2021.

### EMISSIONS BREAKDOWN BY SECTOR

For 2000 and 2021, the following sectors were analyzed in reporting: buildings and facilities, vehicle fleet, wastewater treatment, water delivery services, and employee commute. Streetlights and traffic signals were not individually analyzed in the 2000 report, so a comparison cannot be made.

For buildings and facilities, there was a decrease in both gross and per capita emissions, with a 29% decrease in gross emissions and a 45% decrease in per capita emissions. We are confident in the data comparability in this sector.

For vehicle fleet, there was a 63% decrease in gross emissions and a 70% decrease in per capita emissions. We are confident in the data comparability in this sector.

For wastewater treatment, it is not appropriate to conduct an emissions comparison based on the data shown in Tables 7 and 9 because the data for 2000 and 2021 analyze different aspects of the wastewater treatment process. The 2000 report only analyzes energy use from the wastewater treatment facilities. In 2021, the chemical processes of wastewater treatment are included in the analysis. However, when we pull data on wastewater treatment facility energy use (Table 6) from 2021, we find an 88% decrease in wastewater treatment energy use from 2000 to 2021.

For water delivery services, only energy use is analyzed for both 2000 and 2021 here (because energy use is the only available measurement from the 2000 report). Between 2000 and 2021, there was a 49% decrease in gross emissions and a 60% decrease in per capita emissions. We are confident in the data comparability in this sector.

For employee commute, there was a 540% increase in gross emissions and a 400% increase in per capita emissions. We are confident in the data comparability in this sector.

Table 11. 2000 to 2021 Gross and Per Capita Emissions Breakdown.

Sector	2000			2021		
	MT CO <sub>2</sub> e	MT CO <sub>2</sub> e (%)	Per Capita MT CO <sub>2</sub> e	MT CO <sub>2</sub> e	MT CO <sub>2</sub> e (%)	Per Capita MT CO <sub>2</sub> e
Buildings and Facilities	19,275	22%	0.19492931	13,662	38%	0.106654098
Streetlights and Traffic Signals	-	-	-	295	1%	0.00230302
Vehicle Fleet	6,040	7%	0.061082907	2,245	48%	0.017528279
Wastewater Treatment	3,286	4%	0.033231528	17,229	6%	0.134501745
Water Delivery Services (energy use)	8,920	10%	0.090208531	4,590	-	0.035833158
Employee Commute	380	0.4%	0.003842964	2,434	7%	0.019014263
<b>Total</b>	<b>37,901</b>		<b>0.383295241</b>	<b>40,457</b>		<b>0.315834563</b>

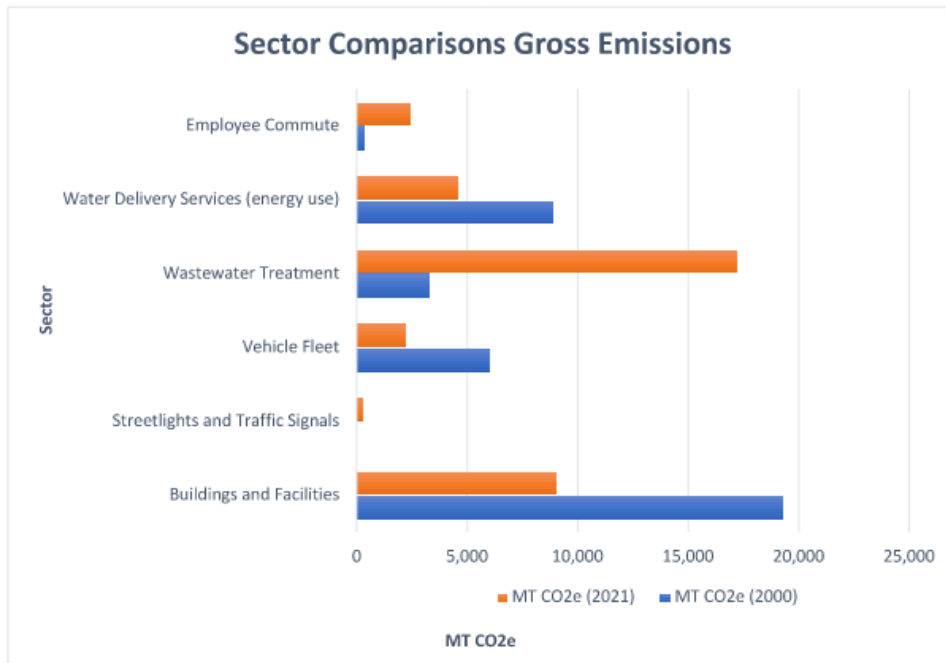


Figure 13. Sector Comparisons for Gross Emissions in Norman 2000-2021.

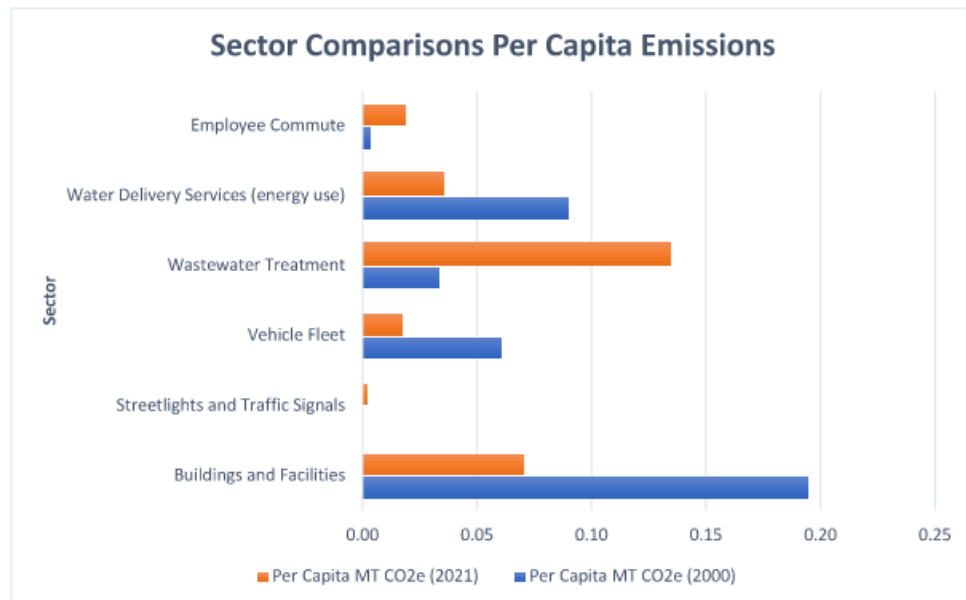


Figure 14. Sector Comparisons for Per Capita Emissions in Norman 2000-2021.



## Part IV: 2021 Government Sector Analysis

### IMPORTANT NOTES

Since 2000 is serving as the baseline year of the 2021 inventory and lacks detail about scope and boundary, it is difficult to confidently analyze emissions reductions for 2021. Thus, this section will analyze individual sectors based on available public data and comparable emissions comparisons from the 2000 report.

### BUILDINGS AND FACILITIES

The buildings and facilities sector includes energy use and fuel consumption from electricity, natural gas, and other fuels in all City-owned operated buildings and facilities. Data for this sector was collected from OGE, OEC, and ONG energy bills. In the U.S., buildings account for 30-40% of all GHG emissions through heating, cooling, lighting, and other equipment.<sup>8</sup> Reducing emissions from building and facility operations will significantly impact an organization's emissions reductions.

Buildings and facilities comprised 38% of gross emissions by sector, representing the second-highest portion of overall emissions and a total of 13,662 MT CO<sub>2</sub>e. Most of those emissions (79%) came from grid energy. The grid mix for Oklahoma energy in 2021 was 42% natural gas, 40% wind, and 14% coal.<sup>9</sup>

### STREETLIGHTS AND TRAFFIC SIGNALS

The City of Norman operates streetlights and traffic signals. Data was collected from energy bills from OGE, OEC, and ONG.

Streetlights and traffic signals comprised 1% of total emissions in 2021, with a total of 295 MT CO<sub>2</sub>e. While comparable data from the 2000 report is unavailable, this is a significant decrease in streetlight and traffic signal emissions compared to other municipalities, such as St. Louis, Missouri. St. Louis has per capita emissions from streetlights and traffic signals at 0.11 MT CO<sub>2</sub>e compared to Norman's per capita emissions at 0.002 MT CO<sub>2</sub>e.<sup>10</sup> Norman's much lower emissions rate from this sector is likely due to the implementation of LED bulbs in 2011.

### VEHICLE FLEET

In 2021, the City of Norman owned and operated 518 vehicles. The vehicle fleet includes dump trucks, police vehicles, utility vehicles, and tow trucks. Data was collected from internal documents provided by the City.

Vehicle fuel sources included compressed natural gas, gasoline, and diesel. Emissions from the vehicle fleet comprised 6% of total emissions at 2,245 MT CO<sub>2</sub>e. As noted in Part III, there was a 63% decrease in overall emissions and a 70% decrease in per capita emissions for the vehicle fleet between 2000 and 2021.

<sup>8</sup> "Building Performance Standards: Overview for State and Local Decision Makers," EPA, 2021.

<sup>9</sup> "Electricity Data Browser," Energy Information Agency, Accessed April 20, 2023.

<sup>10</sup> Dulle, R. "City of St. Louis 2018 Greenhouse Gas Emissions Inventory Report," 2019.

## WASTEWATER TREATMENT

This inventory analyzed wastewater treatment primarily from the emissions associated with wastewater treatment processing. This process involves removing contaminants from wastewater. The City of Norman operates one wastewater treatment facility.

Emissions from the wastewater treatment process were 17,229 MT CO<sub>2</sub>e, with 99% of those emissions stemming from the release of methane. The emissions associated with energy consumption from the wastewater treatment facilities were very low, with 389 MT CO<sub>2</sub>e comprising 4% of total energy use emissions. The low energy use of the wastewater treatment facilities is likely due to efficient energy usage. Solar panels were installed on wastewater treatment facilities in 2022, so these emissions will likely be lower in 2026.

## EMPLOYEE COMMUTE

Employee commute refers to the commute employees take to and from work. While individual commute decisions are in the hands of employees, the City can implement strategies and programs to incentivize more sustainable commute practices.

Emissions from employee commute made up 7% of total 2021 emissions with a total of 2,436 MT CO<sub>2</sub>e. This is a 400% per capita increase compared to 2000. The increase in emissions is likely due to an increase in the number of employees.

## Part V: Future Projections

A projection for emissions was conducted for 2026. This year was chosen given it will be the next year the City will conduct a GHG inventory. Given there are only two data points (2000 and 2021) on which to base a projection, a percent change calculation was conducted. This calculation cannot definitively establish an emissions reduction trend, given there are only two data points. It is not a guarantee these will be the emission rates. Individual sector projections will not be completed for this section.

In 2026, it is estimated that gross emissions will be 35,403 MT CO<sub>2</sub>e (a decrease of 1%) and per capita emissions will be 0.27 MT CO<sub>2</sub>e (a decrease of 4%).

Table 12. Percent Change for Gross and Per Capita Emissions for 2000-2026.

Percent Change Gross and Per Capita Emissions		
Year	MT CO <sub>2</sub> e	Per Capita MT CO <sub>2</sub> e
2000	37,901	0.38
2005	37,411	0.36
2010	36,927	0.33
2015	36,449	0.31
2021	35,867	0.28
2026	35,403	0.27

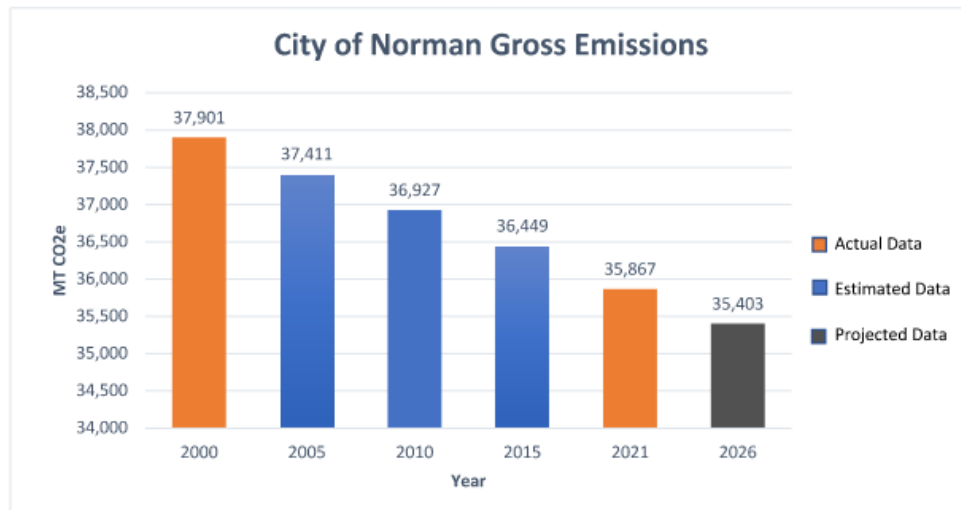


Figure 15. 2000-2026 Norman Gross Emissions with Actual, Estimated, and Projected Data.

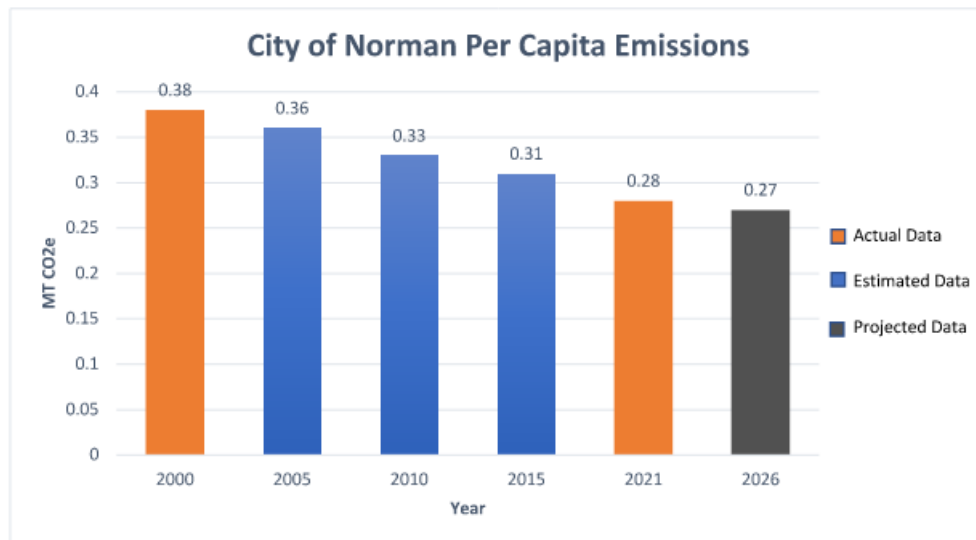


Figure 16. 2000-2026 Norman Per Capita Emissions with Actual, Estimated, and Projected Data.

## Conclusion

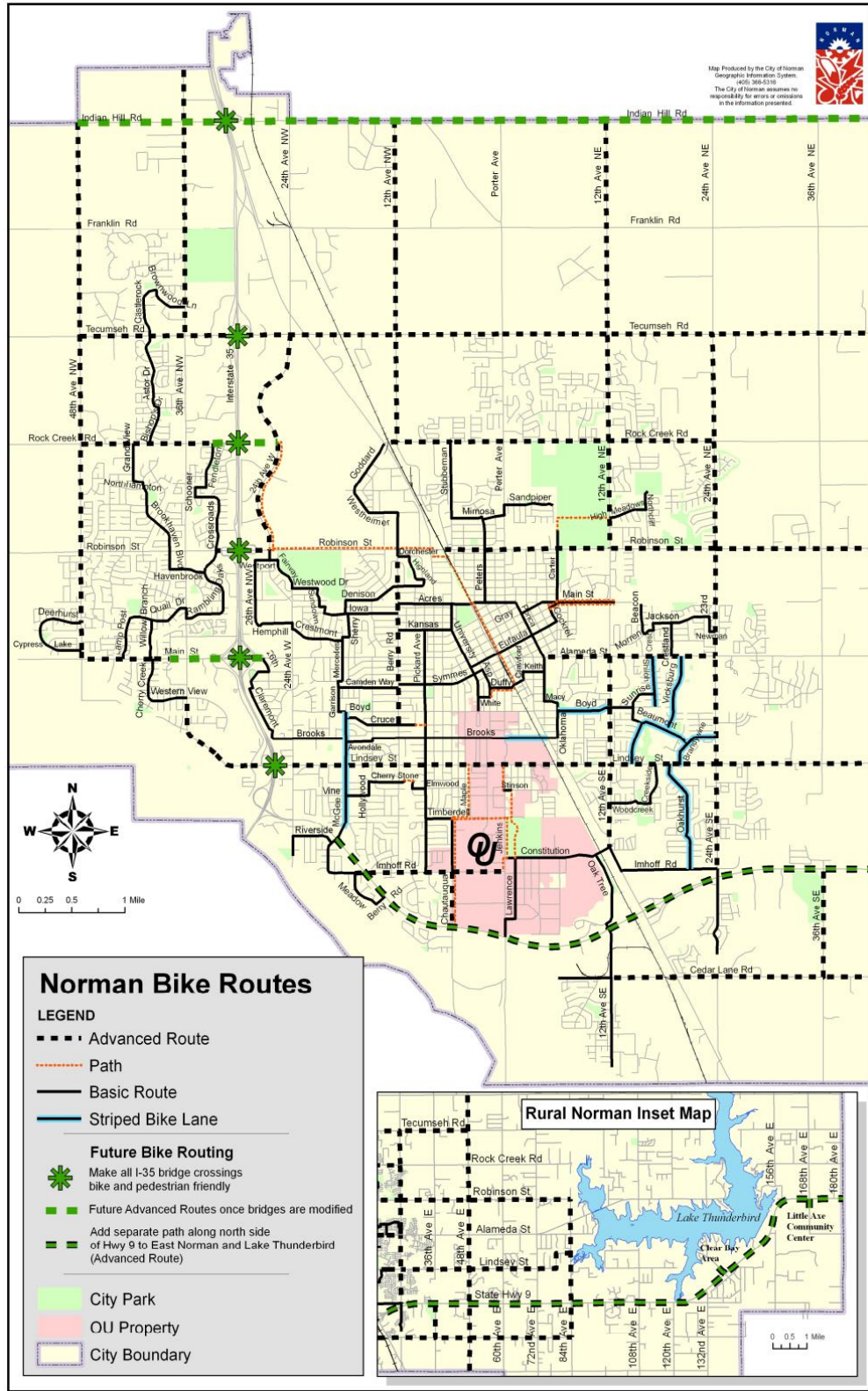
Based on available data, the City of Norman has made good progress on gross and per capita GHG emissions reductions and is projected to reduce emissions even further in 2026. With more emission reduction programs and initiatives, those emissions will likely be even lower.

A key highlight in this report is the very low emissions associated with streetlights and traffic signals. As noted above, this is likely due to the switch to LED bulbs. Additionally, the City cut emissions associated with energy use at wastewater treatment facilities by 88% by implementing more efficient energy use. These are examples of the power and ability of the City to implement green programs and see tangible results.

This report focused primarily on scope 1 and 2 emissions and analyzed municipal operations. Future inventories should consider analyzing scope 3 emissions and expanding the inventory to consider community activities. This expansion will allow for a greater understanding of the emissions associated with the City of Norman and provide more avenues for emissions reductions. In the future, this 2021 inventory should be used as a baseline for reporting, given the data discrepancies in the 2000 report. This will allow for more appropriate data comparisons and more data that can be used for decision making.

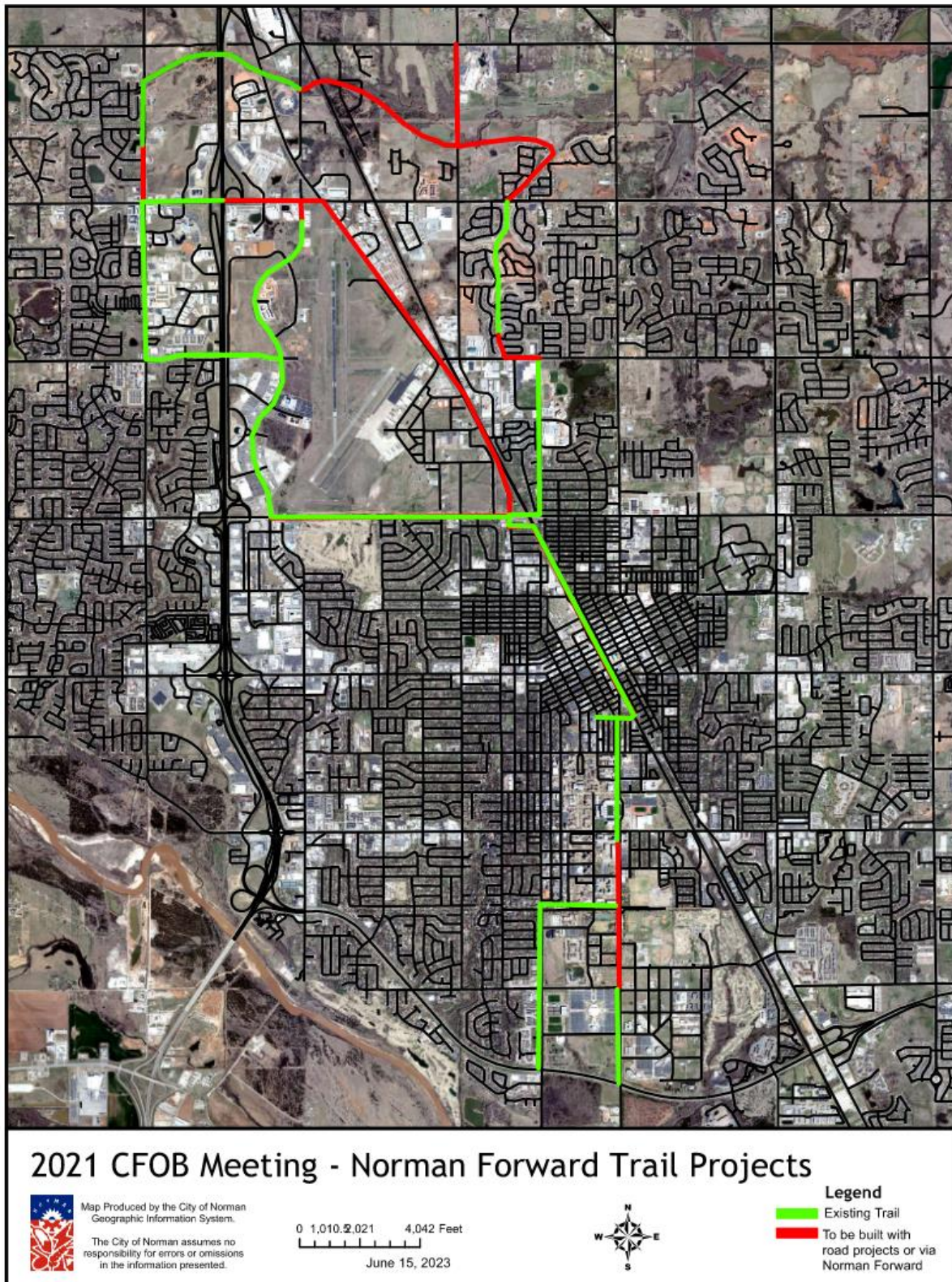
The City of Norman has tremendous potential to set and meet ambitious climate goals. Norman has already implemented many green and sustainability programs. Future endeavors to reduce Norman's GHG emissions will make Norman a cleaner, healthier, and greener place to live.

## Appendix B: 2011 City of Norman Bike Paths Map





## Appendix C: 2021 Norman Forward Legacy Trail Master Plan





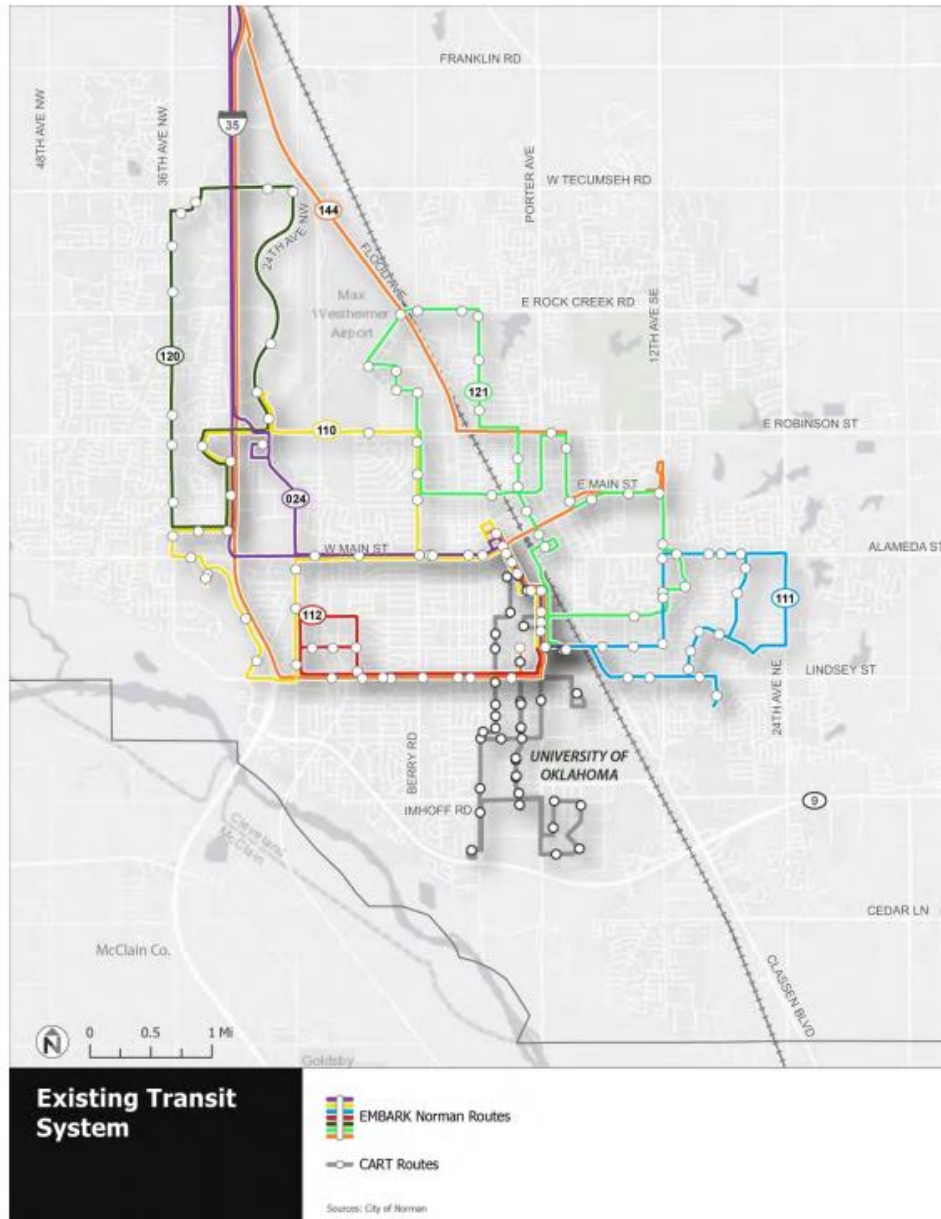
## Appendix D: Existing CART and Embark Norman Routes



Final Report

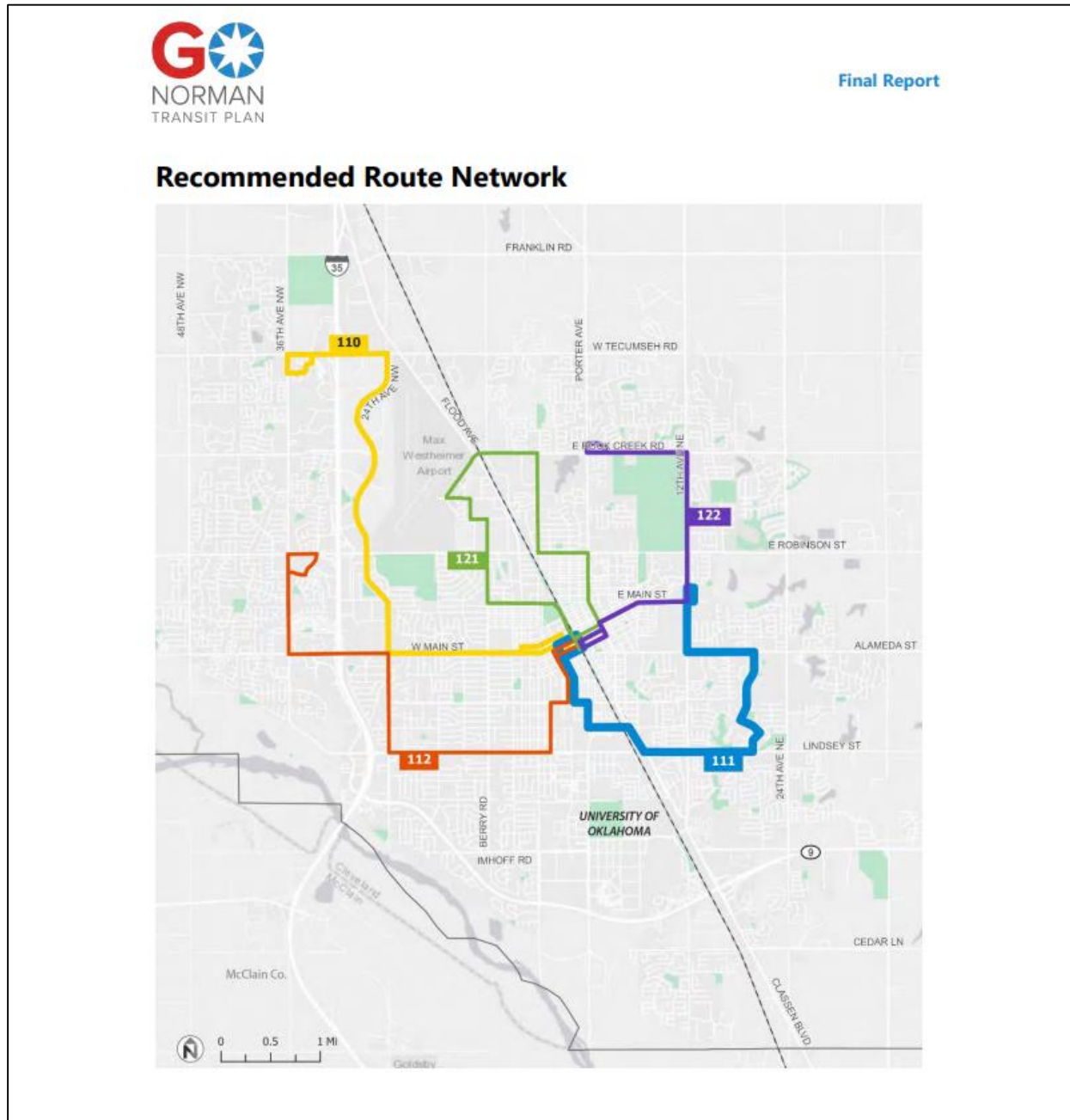
### System Design

While the EMBARK Norman route network provides extensive coverage, most routes operate in loop, resulting in indirect travel for riders. Routes have a timed connection at the Brooks Street Transfer Station on the OU campus. Route 120 intersects with Route 110 at University Town Center and Sooner Mall, however, the connection between these routes is not timed.






## Appendix E: Recommended Embark Norman Route Network Changes



## Appendix F: 2005 Resolution Endorsing the US Conference of Mayor's Climate Protection Agreement

		<b>Resolution</b>
		R-0506-36
<p>A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, ENDORSING THE U.S. CONFERENCE OF MAYORS' CLIMATE PROTECTION AGREEMENT.</p>		
§ 1.	WHEREAS, the U.S. Conference of Mayors has previously adopted strong policy resolutions calling for cities, communities, and the federal government to take actions to reduce global warming pollution; and	
§ 2.	WHEREAS, recent, well-documented impacts of climate disruption include average global sea level increases of four to eight inches during the 20th century, a 40% decline in Arctic sea-ice thickness, and nine of the ten hottest years on record occurring in the past decade; and	
§ 3.	WHEREAS, the central Oklahoma region experienced a record number of ozone alerts in June 2005 and the Association of Central Oklahoma Governments (ACOG) in which Norman participates is working on strategies to deal with traffic congestion and further erosion of the quality of our air quality and climate; and	
§ 4.	WHEREAS, climate disruption of the magnitude now predicted by the scientific community will cause costly disruption of human and natural systems throughout the world including: increased risk of floods or droughts; sea-level rises that interact with coastal storms to erode beaches, inundate land, and damage structures; more frequent and extreme heat waves; and more frequent and greater concentrations of smog; and	
§ 5.	WHEREAS, many leading U.S. companies have adopted greenhouse gas reduction programs to demonstrate corporate social responsibility and have publicly called for the U.S. to adopt precise and mandatory emissions targets and timetables in order to remain competitive in the international marketplace, to mitigate financial risk, and to promote sound investment decisions; and	
§ 6.	WHEREAS, the City of Norman has also committed itself to goals in its 2025 Plan that promote climate protection and environmental sensitivity and through practices in various city programs such as green space preservation, improved transportation alternatives, tree preservation and planting, encouragement of recycling, water conservation efforts, and increased energy efficiency and conservation; and	
§ 7.	WHEREAS, mayors from around the nation including those from more than 140 diverse communities such as Austin, Texas; Burlington, Vermont; Topeka, Kansas; and Seattle, Washington, have signed the U.S. Conference of Mayors' Climate Protection Agreement.	
NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:		
§ 8.	That the City Council of Norman, Oklahoma, endorses the U.S. Conference of Mayors' Climate Protection Agreement and commits itself to strive to take appropriate local actions in our own operations and community such as those identified in the Agreement.	
PASSED AND ADOPTED this 9th day of August, 2005.		
	<p>ATTEST:</p> <p><i>Mary Hatley</i> City Clerk</p>	<p><i>Harold Hardaway</i> Mayor</p> <p>25-1</p>

## Appendix G: 2009 Resolution Adopting ECAB's Mayor's Climate Protection Agreement

### Resolution

R-0809-109

A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, ADOPTING THE ENVIRONMENTAL CONTROL ADVISORY BOARD'S TWELVE GOALS FOR REDUCING EMISSIONS OF CITY OF NORMAN OPERATIONS AND THE COMMUNITY AS A WHOLE.

- § 1. WHEREAS, the Environmental Control Advisory Board, at the request of the Norman City Council, was asked to study the United States Mayors' Climate Protection Agreement and make recommendations for improvement of emissions; and
- § 2. WHEREAS, the Environmental Control Advisory Board finalized those recommendations in March 2007, and brought them forward to the Norman City Council; and
- § 3. WHEREAS, the City Council of Norman, Oklahoma, heard and received those recommendations; and
- § 4. WHEREAS, in December 2008, the Environmental Control Advisory Board reviewed the recommendations made in March 2007, in light of the many actions the City of Norman has taken towards improvement of energy conservation and lowered emissions; and
- § 5. WHEREAS, the Environmental Control Advisory Board has affirmed the recommendations made in March 2007, and encourages the City of Norman to continue to make energy conservations and emissions reductions a priority.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 6. To recognize the following recommendations suggested by the Environmental Control Advisory Board as goals to guide the City of Norman in its ongoing process of reducing emissions and conserving energy:
  - To inventory global warming emissions in the City of Norman, target an amount for reduction, and create an action plan;
  - To adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
  - To promote and support transportation options such as bicycle trails, commute trip reduction programs, incentives for carpooling, and public transit;
  - To increase the use of clean alternate energy;
  - To make energy efficiency a priority through building code improvements, retrofitting City facilities with energy efficient lighting, and urging employees to conserve energy and save money;
  - To purchase only Energy Star equipment and appliances for City of Norman use;
  - To practice and promote sustainable building practices using the U.S. Green Building Council's LEED Program or a similar system;

14-2



## Appendix H: 2018 Resolution Adopting ECAB's Updated Mayor's Climate Protection Agreement

### Resolution

R-1718-119

A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, ADOPTING THE ENVIRONMENTAL CONTROL ADVISORY BOARD'S UPDATED RECOMMENDATIONS TO IMPLEMENT THE MAYORS' CLIMATE AGREEMENT; REQUIRING THE PREPARATION OF AN ACTION PLAN TO IMPLEMENT SAID RECOMMENDATIONS; AND PROVIDING FOR A PROGRESS UPDATE TO CITY COUNCIL ON A SEMI-ANNUAL BASIS.

- § 1. WHEREAS, Mayor Harold Haralson, in 2005, signed the Mayors' Climate Protection Agreement, the only mayor in Oklahoma to do so; and
- § 2. WHEREAS, Mayor Cindy Rosenthal and the City Council in 2009, recognized and received recommendations of the then serving Environmental Control Advisory Board; and
- § 3. WHEREAS, after encouragement from and in consultation with Mayor Lynne Miller, the current Environmental Control Advisory Board studied the Recommended Actions adopted by Council in February 2009 to implement said Agreement by reducing emissions of the City and the community as a whole; and
- § 4. WHEREAS, the Environmental Control Advisory Board by assignment to the individual members and staff liaisons, evaluated progress made by the City to date, changes in the scientific information available, and updates of codes and standards for construction, planning and management; and
- § 5. WHEREAS, the Environmental Control Advisory Board then updated and consolidated recommended action items for the City to further reduce its carbon dioxide footprint and limit discharge of greenhouse gases; and
- § 6. WHEREAS, the Environmental Control Advisory Board finalized those recommendations in April 2018, and brought them forward to the Norman City Council; and
- § 7. WHEREAS, the Environmental Control Advisory Board further affirms and endorses said recommendations, and encourages the City of Norman, its leadership and all of its citizens to continue to make emissions reductions and energy conservation a priority.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 8. To accept and promote the following recommendations of the Environmental Control Advisory Board found in the document titled 2018: Review and Update of Mayors' Climate Agreement Recommendations as objectives for the City of Norman to reduce emissions and conserve energy:



Resolution No. R-1718-119  
Page 2

- To inventory global warming emissions in the City of Norman, target an amount for reduction, and create an action plan;
  - To adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
  - To promote alternative transportation options such as bicycle trails, commute trip reduction programs, incentives for carpooling, and public transit;
  - To increase the access and use of renewable energy, while making energy efficiency a priority throughout purchasing and construction processes while working with community and industry partners to move our community towards a 100% renewable future;
  - To practice and promote sustainable building practices using the U.S. Green Building Council's LEED Program or a similar system;
  - To increase the average fuel efficiency of municipal fleet vehicles, and increase use of renewable friendly vehicles;
  - To evaluate opportunities to increase pump efficiency in water and wastewater systems and recover wastewater treatment methane for energy production;
  - To increase recycling rates in city operations and in the community;
  - To maintain a healthy urban forest, and promote tree planting to increase shading and absorb carbon dioxide; and
  - To help educate the public; schools; other jurisdictions; professional associations; businesses; and industry about reducing global warming pollution.
- § 9. To instruct the City Manager, in partnership with the Environmental Control Advisory Board, to prepare and implement an action plan for advancing these objectives;
- § 10. To instruct the City Manager to make semi-annual progress reports to the Norman City Council regarding the implementation of the action plan.

PASSED AND ADOPTED this \_\_\_\_ day of \_\_\_\_, 2018.

\_\_\_\_\_  
Mayor

ATTEST:

\_\_\_\_\_  
City Clerk

**Appendix I: 2024 Resolution Adopting ECAB's Updated Mayor's Climate Protection Agreement**