

CITY OF MEDFORD



CLIMATE ACTION PLAN

RETROSPECTIVE

MARCH 2021



CLIMATE ACTION PLAN

OCTOBER 2001



MEDFORD, MASSACHUSETTS
MAYOR BREANNA LUNGO-KOEHN

Dear Members of the Medford Community,

With great pleasure, I present the City of Medford's "**Climate Action Plan 2001 - Retrospective**". Over the last 20 years, Medford has been proactive in fighting climate change; in 2001, Medford was the first community in Massachusetts to publish a Climate Action Plan (CAP). The primary objective of our 2001 plan was to reduce greenhouse gas emissions through progressive programs and policies, incorporating results from Medford's first greenhouse gas emissions inventory and recommendations to reduce emissions in transportation, buildings and energy, waste and recycling sectors among others.

In the 20 years since the initial release of our Climate Action Plan, Medford has seen growth in environmental initiatives and has made steady progress toward creating a climate-resilient community. Our Plan made Medford a leader in the fight against climate change, but through this Retrospective, we are taking a hard look to better understand our progress and re-evaluate our community's goals.

Since 2001 we have participated actively in regional efforts to adapt to and mitigate climate change. From the formation of the Office of Energy and Environment in 2003 to receiving various awards for municipal leadership and policy innovation, to publishing various reports in the climate change domain, we remain committed to a sustainable future. Medford has advocated for climate-friendly policies and is a partner in numerous local and regional climate collaboratives like Global Covenant of Mayors for Climate and Energy, Climate Mayors, Resilient Mystic Collaborative, etc. Recently published reports have included but are not limited to Medford's Local Energy Action Plan 2013 and Medford's Climate Change Vulnerability Assessment in 2019. Most recently, we inaugurated the new low-energy, all-electric, police headquarters and have started construction of the new public library which will be the first net-zero public library in Massachusetts, both working toward our goal of becoming carbon neutral by 2050.

This report marks 20 years since the release of the original Plan and provides a review and analysis of past and current actions Medford has taken to address concerns and recommendations outlined in the 2001 version. Later this year, the city will publish a more comprehensive report, Medford's Climate Action and Adaptation Plan 2021, which will outline in more detail the city's proposed actions and strategies to tackle climate change and shape an equitable society. Medford remains committed to carbon neutrality by 2050 and to provide a healthy, sustainable, and climate-resilient future for all.

Sincerely,

A handwritten signature in blue ink, appearing to read "Breanna Lungo-Koehn".

Breanna Lungo-Koehn
Mayor
City of Medford, MA

CITY OF MEDFORD CLIMATE ACTION PLAN

TABLE OF CONTENTS

| | |
|--|-----------|
| Executive Summary..... | 5 |
| Objective | 10 |
| Section I – Introduction..... | 10 |
| A. General Information on Climate Change | 10 |
| B. Effects of Global Climate Change | 13 |
| C. Responses to Global Climate Change | 13 |
| Section II - Cities for Climate Protection Campaign..... | 15 |
| Section III - Medford’s Greenhouse Gas Emissions Inventory-Details..... | 16 |
| A. Municipal Emissions | 17 |
| i. Buildings | 18 |
| ii. Lighting | 19 |
| iii. Fleet | 20 |
| B. Community Emissions | 21 |
| i. Residential..... | 22 |
| ii. Commercial..... | 22 |
| iii. Transportation..... | 23 |
| iv. Waste | 23 |
| Section IV - Existing/ Proposed Reduction Measures – Municipal..... | 24 |
| A. Buildings..... | 24 |
| i. Local Energy Efficiency Code-Municipal Buildings..... | 28 |
| ii. Annual Energy Audits..... | 30 |
| iii. Renewable Energy Sources..... | 30 |
| iv. Hormel Stadium Retrofit..... | 31 |
| B. Lighting..... | 32 |
| i. Streetlight Conversion..... | 32 |
| ii. Streetlight Inventory..... | 33 |
| iii. Traffic Light Conversion..... | 34 |
| iv. Photovoltaic Recreational Lighting | 34 |
| C. Fleet..... | 35 |
| i. Increase Fuel Efficiency and Downsize Vehicles..... | 35 |
| ii. Alternative Fuel Vehicles..... | 36 |
| iii. Support Cleaner Fuel School Buses..... | 37 |
| iv. Idling Policy | 38 |
| v. Trip Reduction Program-City Hall Employees | 39 |

| | |
|---|-----------|
| vi. Bicycle Patrol Program..... | 41 |
| Section V - Additional Municipal Reduction Measures..... | 41 |
| A. Procurement..... | 41 |
| i. Only Energy Star or Equivalent Purchases..... | 42 |
| ii. Require Life Cycle Cost Analysis..... | 43 |
| iii. Block Purchasing of Green Energy..... | 44 |
| B. Waste/Recycling..... | 44 |
| i. Increase Recycling Areas and Awareness..... | 44 |
| Section VI - Existing/ Proposed Reduction Measures- Community..... | 46 |
| A. Buildings..... | 46 |
| i. Local Energy Efficiency Code-Residential | 46 |
| ii. Local Energy Efficiency Code-Commercial & Industrial | 47 |
| iii. Incentives for Energy Efficiency and Renewable Energy Sources..... | 48 |
| B. Transportation..... | 48 |
| i. Biker/Pedestrian Friendly Roads..... | 50 |
| ii. Alternative Fuel Buses/Alternative Fuel Taxis | 50 |
| iii. Encourage Transit Use by Local Business..... | 50 |
| iv. City-Wide Trip Reduction Program..... | 51 |
| C. Community Outreach..... | 52 |
| i. Public Education Campaign for the Environment..... | 52 |
| ii. School Curriculum..... | 53 |
| iii. Partnering with Community Groups..... | 54 |
| iv. Encourage Neighboring Cities to Join CCP Campaign..... | 55 |
| Section VII - Other Measures..... | 56 |
| A. Hire an Energy Efficiency Coordinator..... | 56 |
| B. Tree Planting..... | 57 |
| Conclusion..... | 60 |

Charts

| | | |
|----------|---|----|
| Chart 1 | The Greenhouse Effect..... | 11 |
| Chart 2 | Percentage of eCO ₂ per Source-Municipal..... | 18 |
| Chart 3 | Percentage of eCO ₂ per Source-Community..... | 18 |
| Chart 4 | Percent of Buildings Total eCO ₂ Emissions..... | 19 |
| Chart 5 | Percentage of 1998 eCO ₂ Emissions from Lighting..... | 20 |
| Chart 6 | Percent eCO ₂ Emissions for Municipal Fleet by Department..... | 21 |
| Chart 7 | Breakdown of Community Emissions-Residential..... | 22 |
| Chart 8 | Breakdown of Community Emissions-Commercial..... | 22 |
| Chart 9 | Percentage of eCO ₂ Emissions by Transportation Source..... | 23 |
| Chart 10 | Equivalent CO ₂ 1998-Schools Closing 2001..... | 24 |
| Chart 11 | Equivalent CO ₂ 1998-Schools Closing 2003..... | 25 |
| Chart 12 | Medford Housing Authority Percentage of Energy Use by Source.. | 26 |
| Chart 13 | City Hall Comparisons Before and After Energy Retrofit..... | 26 |
| Chart 14 | Annual Costs of Energy Use..... | 28 |

Tables

| | | |
|---------|--|----|
| Table 1 | Inventory Results: Municipal Emissions..... | 17 |
| Table 2 | Inventory Results: Community Emissions..... | 17 |
| Table 3 | Existing and Proposed Reduction Measures for Buildings | 27 |

Appendices

| | |
|------------|--|
| Appendix A | Summary of Proposed Emissions Reduction Measures |
| Appendix B | Cities for Climate Protection Council Resolution |
| Appendix C | Letter of Approval to Join Cities for Climate Protection |
| Appendix D | Municipal and Community Reduction Targets |

EXECUTIVE SUMMARY

In 2001, the City of Medford released its first Climate Action Plan. Now, 20 years later, Medford is preparing to release a new and updated Climate Action and Adaptation Plan that will be a standalone living document outlining actions and strategies to tackle climate change equitably and create a climate resilient community. As we prepare to publish our latest Climate Plan, we are taking this opportunity to look back and examine Medford's progress on the goals and recommendations motivated by our first, historic guiding document.

As an early member of the Cities for Climate Protection Campaign, Medford's 2001 Climate Action Plan (CAP) aimed to reduce city-wide greenhouse gas (GHG) emissions through progressive programs and policies. Drawing on the results from the City's first GHG inventory in 1999, the CAP proposed ways to reduce emissions in key sectors such as transportation, buildings and energy, waste, and recycling. This document, *"Climate Action Plan 2001 - Retrospective,"* is a progress report that tracks the achievements of the CAP's proposed strategies in order to assess and re-evaluate Medford's goals toward building a climate resilient community.

According to the 1999 GHG Emissions Inventory, community emissions could be divided into six categories: Residential, Commercial, Industrial, Transportation, Waste, and Other. Among these categories, residential and commercial use of heating oil and electricity, along with the widespread use of personal vehicles, were found to be major contributors to GHG emissions in Medford. Municipal buildings, in particular Medford Public Schools and the Medford Housing Authority units, were found to be the greatest sources of GHG emissions. Emissions from lighting, calculated through electricity use, showed that public lighting was the second largest contributor of eCO₂ (equivalent carbon dioxide) for the City. Due to their widespread use and abundance across Medford, streetlights were found to be the largest emitter within this category. Emissions from the municipal fleet indicated that school buses generated the most GHG emissions, closely followed by emissions from the highway department and the fire and parks department. The 2001 Climate Action Plan consisted of recommendations to reduce the city's carbon footprint in each of the six emission categories for municipal and community-wide operations.

Why this report?

The *"Climate Action Plan 2001 - Retrospective"* provides an update about the progress made over the last twenty years, tracks the journey of climate action in Medford, and responds directly to the recommendations proposed by the 2001 CAP. This

Retrospective tracks the progress of city-wide GHG emissions reduction projects across Medford, including municipal buildings, public lighting, city transport, and municipal fleet. Additionally, this document identifies policies and initiatives undertaken by the Energy and Environment Office in response to the CAP 2001, such as community outreach programs, citywide education and recycling initiatives, as well as active membership in national and local organizations.

What's in here?

Since the release of the 2001 CAP, the City of Medford has been an engaged partner in local and regional environmental efforts aimed at mitigating and adapting to the threats posed by climate change. Based on the recommendations proposed, the City of Medford has established a multitude of programs, initiatives and guidelines to attain the CAP's goal of reducing GHG emissions and stimulating sustainable behavioral changes within the community that respects the environment and supports the future health of the community. This report highlights the city's work in response to those recommendations.

How to read this report?

What follows after this Executive Summary is the contents of the original plan, with responses and updates in grey text boxes. The authors of this response were very careful to not make any edits to the original plan, leaving the text exactly as originally written. After this Executive Summary, all new material is carefully delineated with grey boxes. The document ends with a conclusion on what we hoped to accomplish from this report and what are the next steps in Climate Action planning.

We invite you on Medford's 20 year climate action journey and hope you will enjoy reading this report. Meanwhile below is a snapshot of some of the city's notable achievements, projects, and initiatives conducted in the last 20 years.

Highlights of the City's most noteworthy achievements:

- **Creation of the Office of Energy & Environment:** Established in 2003, the E&E oversees and implements environmentally sound programs in the City. In cooperation with other departments and organizations, E&E works to improve energy efficiency, air quality, climate change protection, wetlands protection, open space conservation, and stormwater management. To date, E&E has published various reports in the climate change domain, including Medford's Local Energy Action Plan (2013), Climate Change Vulnerability Assessment (2019), and Climate Action and Adaptation Plan (2021).

- **Municipal Energy Efficiency Policy:** In 2005, the City issued an Energy & Resource Efficiency Policy to promote guidelines on energy use in lighting, office equipment purchasing and use, building heating and cooling, water usage, the motor vehicle fleet and commuting options and alternatives.
- **Making Buildings More Energy Efficient:** Since 2009, Medford has conducted annual energy audits in all municipal and school buildings. In 2010, Medford adopted the Green Communities Stretch Code to enact stricter building codes. Over the past 20 years, various municipal buildings in Medford have undergone lighting upgrades and retrofits. Additionally, the City conducts periodic lighting/HVAC audits and has partnered with Mass Save to promote home energy assessments. In 2019 the City committed to making new municipal buildings as low energy as possible and all electric when feasible, resulting in a low energy Police Station and the state's first net-zero public library is under construction in Medford.
- **Expanding Renewable Energy Sources:** The City has promoted the use of solar across several municipal buildings. In 2009, the City installed a wind turbine at the McGlynn Elementary & Middle School, which powers 10% of the school. Additionally, new buildings, such as the Police Station and Public Library are designed to utilize solar and be as low energy as possible. In 2019, Medford launched its first municipal electricity aggregation program which has a default rate of 5% more renewable energy than the state mandate.
- **Retrofitting Public Lighting:** In 2002, street lighting was retrofitted to convert streetlights from mercury vapor to more efficient high-pressure sodium vapor lights and all traffic lights were converted to LEDs. In 2019, 4,840 streetlights were converted to LEDs with the help of the Metropolitan Area Planning Council. Additionally, the City installed wireless streetlight controls to monitor and control most streetlights.
- **Greening the Municipal Fleet:** Medford has committed to buying vehicles according to Green Communities fuel efficiency standards. As of 2020, these standards apply to light utility trucks and passenger vehicles. Medford became the first recipient of the US EPA Clean School Bus Project, successfully managing the program across Medford and 12 other Metro Boston communities. The Energy and Resource Efficiency Policy (2005) includes municipal no-idling policies and advises the City to reduce its municipal fleet size and miles driven. The City continues to evaluate alternative fuel vehicle options (e.g. battery electric vehicles).
- **Enhancing Waste & Recycling Programs:** In 2010, the City transitioned to a containerized curbside recycling program, which limited residents to 64 gallons of trash per week. In 2013-2014, Medford schools and the City of Medford each launched textile recycling programs. In 2019, Tufts University students conducted a composting study to determine the efficacy of diverting organic waste in Medford

and the city is working to implement a municipal option in 2021. Many community groups organize electronic recycling events each year as fundraisers and service to the community and the city includes it each year as part of the *Harvest Your Energy Festival*.

- **Transportation Improvements:** Medford’s Bike Advisory Commission, formed in May 2013, developed a Bicycle Infrastructure Master Plan (2016) in partnership with the E&E office. In 2016, Medford adopted a Complete Streets policy that aims to accommodate street amenities such as crosswalks and bike lanes. The City has also collaborated with Mass DCR and MassDOT on creating shared-use paths. 2020 saw great improvements in the City’s partnership and advocacy with MBTA to expand public transit options, and the Green Line Rapid Transit Extension is scheduled to open in Medford in 2021.
- **Expanding the Tree Canopy:** Medford has been a designated “Tree City USA” since 1998. Through our climate work the City has developed maps of the tree canopy and heat maps which has greatly inspired both residential advocacy for trees and the City’s efforts to identify additional funding for planting trees. Between 2010-2018, Medford planted 800 new trees. In 2021 the City is exploring the use of city-wide tree mapping and management software.
- **Community and Education Campaigns:** Since 2001, Medford has launched numerous city-wide outreach and educational campaigns including Solarize Medford Program, Community Resiliency Building Workshop, Community Conversations about Climate Change, and the annual Harvest Your Energy Festival. The E&E office prioritizes community engagement across its projects, in particular Medford’s Climate Change Vulnerability Assessment (2019) and the upcoming Climate Action and Adaptation Plan. In 2013, the City launched its *Go Green Medford* website and expanded its social media presence to provide information to residents about ongoing initiatives and community projects.
- **National, Regional & Local Partnerships:** Established in 2010, the Medford Energy and Environment Committee (MEEC) works to “promote policies and actions that make Medford more sustainable by encouraging resource conservation, improving climate resiliency, and increasing the use of renewables to meet present and future needs of the Medford community”. The Office of Energy and Environment works in conjunction with various local groups and organizations such as Walk Medford, the Medford Family Network, the Medford Senior Center, and numerous others to promote various city programs and initiatives. Over the last decade, Medford saw a rise in the number of community organizations dedicated to improving the environment such as, Trees Medford, Friends of the Mystic River, Mystic Valley 350, and Friends of the Medford Community Gardens. Medford has partnered with numerous national and regional climate organizations such as, Global Covenant of

Mayors for Climate and Energy, Climate Mayors, and Resilient Mystic Collaborative. The City also partners with organizations, such as National Grid, Mystic River Watershed Association (MyRWA), the Metropolitan Area Planning Council (MAPC) and the Massachusetts Bay Transportation Authority (MBTA) that operate within Medford to provide more resilient infrastructure and to reduce local emissions.

This work would not have been possible without the forward-thinking and dedication of the City's current and previous Directors of Energy & Environment: Kim Lundgren (the City's first E&E Director, and original author of the 2001 Climate Action Plan), Patty Barry, Carey Duques, and Alicia Hunt. Thank you all, and to the staff of the Office of Energy & Environment, for all of your tireless work.

CLIMATE ACTION PLAN

CITY OF MEDFORD, MA

OBJECTIVE

The ultimate goal of this Climate Action Plan is to initiate programs and policies within the City of Medford that aim to reduce greenhouse gas emissions. Nearly every facet of the municipal government contributes to the increased levels of greenhouse gases in the atmosphere. Additionally, the community as a whole has an even greater impact on those levels. Ideally, the programs and policies proposed in this plan will stimulate behavioral changes within the community, creating a sustainable Medford which respects the environment and the people within it, thus ensuring the health of future generations.

As one of the first Massachusetts communities to join the Cities for Climate Protection Campaign, Medford eagerly assumes a leadership role for the campaign and hopes to demonstrate its commitment towards the cause by following through all of its commitments in a timely fashion. Currently, no City in Massachusetts has an approved Climate Action Plan. Medford is eager to lead the way for all communities in this area.

Objective of 2021 Review

The ultimate goal of the 2001 Climate Action Plan was to initiate programs and policies within the City of Medford, to reduce greenhouse gas emissions (GHG) and stimulate sustainable behavioral changes within the community that respect the environment and supports the future health of the community. The 2001 Climate Action Plan established GHG emission targets and implemented a system for monitoring emissions over time. This “Climate Action Plan 2001 - Retrospective” document being released in 2021, addresses the impacts and achievements of the 2001 strategies over the past 20 years. This review will be used to inform the 2021 Medford Climate Action and Adaptation Plan, which is currently under development. Recommendations of the 2001 Climate Action Plan and the 20-year review begin from SECTION IV, page 24.

SECTION I: INTRODUCTION

The earth’s climate is predicted to change because human activities are altering the chemical composition of the atmosphere through the buildup of greenhouse gases-primarily carbon

dioxide (CO₂), methane (CH₄), nitrogen oxides (NO_x), and fluorocarbons. The heat trapping property of these gases create a natural greenhouse effect.¹

The greenhouse effect refers to the phenomenon by which the Earth's atmosphere traps solar radiation, or heat (refer to Chart 1). Gases in the atmosphere make the greenhouse effect work, with the gases operating like a greenhouse's glass panels that let electromagnetic radiation (light) through, but trap thermal radiation (heat). This natural greenhouse effect helps keep the Earth's average temperature at around 59° Fahrenheit (F). Without the greenhouse effect, the Earth's temperature would be about 0°F and the planet would be largely uninhabitable. Natural sources of greenhouse gases include respiration and fire (CO₂), along with decaying organic matter and animal waste (CH₄). Of a far greater magnitude than these natural sources, billions of tons of heat-trapping gases are released every year into the atmosphere from human activities, including:

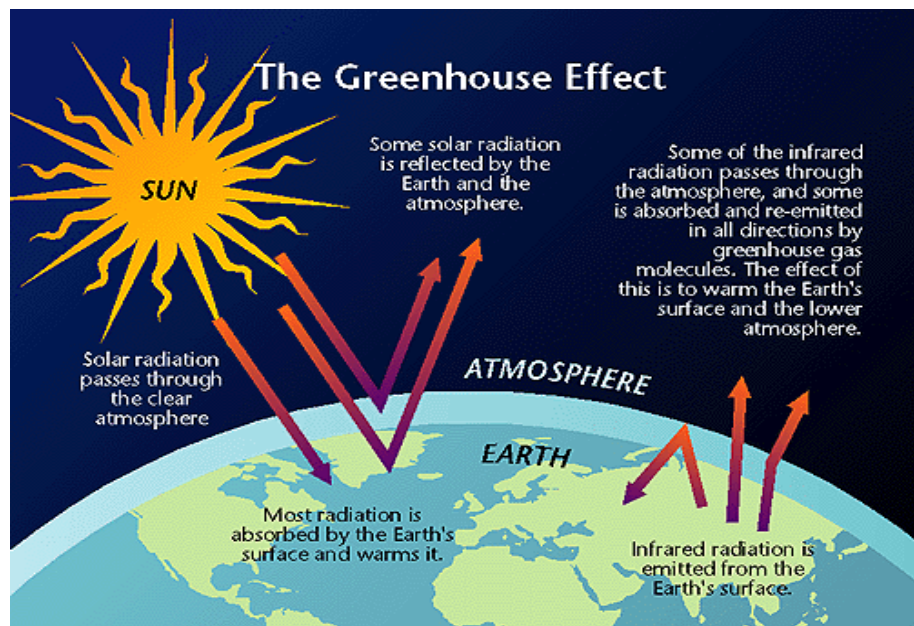
CO₂ from the burning of fossil fuels for transportation and industrial operations, and from the destruction of carbon-sequestering forests;

CH₄ from landfills, fuel production, livestock production, and farming;

NO_x from fertilizers; and

Fluorocarbons from refrigerants and other industrial products. (Fluorocarbons are 10,000 times more effective than CO₂ at trapping heat and accelerating the greenhouse effect).²

CHART 1



1 United States Environmental Protection Agency. 1997. Climate Change and Massachusetts. September.

2 Excerpt from City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

Evidence from recent studies indicates that the Earth's climate is warming at an unprecedented rate and that the future impact from this warming may be more severe and sudden than predicted. In 1998, a team of researchers directed by the National Center for Scientific Research in Grenoble, France, extracted the longest ice core record of the Earth's weather history from an Antarctic ice sheet. This record shows that the four previous ice ages all have been followed by temperature increases and corresponding increases in CO₂ and methane. What is significant about the record is that current greenhouse gas levels are unprecedented compared to the previous 420,000 years CO₂ levels are 25 percent higher and methane 220 percent higher. According to the National Geophysical Data Center in Boulder, Colorado, this is well beyond the range of natural variation and offers convincing evidence that humans are making large changes to the Earth's climate system.³

An international team of researchers using computer simulations of normal changes in the area of the Arctic ice cap have found that there is only a 2-percent chance that the rate of melting over the last 19 years is a result of natural climate changes, and only a 0.1-percent chance that the melting over the last 46 years is natural. Study participants included the University of Maryland, Rutgers University, the National Oceanic and Atmospheric Administration (NOAA), the University of Illinois, the National Aeronautics and Space Administration (NASA), the Hadley Center in Great Britain, and the Arctic and Antarctic Research Institute in Russia.⁴

NOAA recently completed an analysis indicating that the Earth's climate is warming at an unprecedented rate. Records indicate that, on average, warming throughout the 1900s occurred at a rate of less than 1°F per century. Since 1976, the warming has occurred at a rate of nearly 4°F per century. According to government scientists, this increase could prove evidence of a "change point"- a period when the Earth's climate begins warming at a faster rate. Pointing to the all-time global high temperature records in 1997 and 1998, NOAA scientists contend that the temperatures are far higher than could be explained by natural events, including El Niño.⁵

³ Stauffer, Bernhard. 1999. Cornucopia of ice core results. *Nature*, Vol. 399, 3 June 1999, from City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

⁴ Vinnikov, Konstantin Y.; Robock, Alan; Stouffer, Ronald J.; et al. 1999. Global warming

and northern hemisphere sea ice extent. *Science*, Vol. 286, 3 December 1999, from City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

⁵ Karl, Thomas R.; Knight, Richard W.; Baker, Bruce. 2000. The record breaking global temperatures of 1997 and 1998: evidence for an increase in the rate of global warming? *Geophysical Research Letters*, Vol. 27, No. 5, 1 March 2000, from City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

EFFECTS OF GLOBAL CLIMATE CHANGE

If the rate of emission of greenhouse gases is not reduced, it is predicted that average global temperatures could rise substantially in the next 100 years. While the effects of such changes are difficult to predict, rising global temperatures are expected to raise the sea level and change precipitation and other local climate conditions.⁶ In Massachusetts, specifically, the average annual temperature has increased by 2°F and precipitation has increased by nearly 20% over the last century. The United States Environmental Protection Agency has stated that these climactic changes could alter forests, crop yields, and water supplies. Rising sea levels will have a significant impact on coastal areas, such as the Massachusetts coastline, which has over 1,500 miles of shoreline. These changes could also threaten human health, harm fish, and wildlife, and affect many types of ecosystems.⁷

RESPONSES TO GLOBAL CLIMATE CHANGE

Scientific evidence indicates that the accelerated emission of greenhouse gases is altering the global climate. In response, organizations at international, national, and local levels have initiated actions to reduce these emissions.⁸

International efforts have been coordinated primarily by the United Nations and have included:

- The Intergovernmental Panel on Climate Change (IPCC)

In 1988, the United Nations Environment Programme and the World Meteorological Organization created the IPCC to conduct studies on global warming. Efforts undertaken include identifying emission sources, assessing possible consequences, and developing mitigation strategies.⁹

- United Nations Conference on Environment and Development (UNCED)

The United States and 153 other nations signed the United Nations Framework Convention on Climate Change (UNFCCC) on June 12, 1992, at UNCED (the Earth Summit) in Rio de Janeiro. This Convention contains a legal framework that commits the world's governments to voluntary reductions of greenhouse gases or other actions (such as enhancements of greenhouse gas sinks) aimed at stabilizing atmospheric concentrations of greenhouse gases at 1990 levels. To facilitate this, the Convention requires that all parties to the UNFCCC develop, periodically update, and make available to the Conference of the Parties (COP)

6 Excerpt from City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

7 United States Environmental Protection Agency. 1997. Climate Change and Massachusetts.

8 Excerpt from City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

9 Excerpt from City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

national inventories of all anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol (addressing chlorofluorocarbons [CFCs]). In October 1992, the United States became the first industrialized nation to ratify the Climate Change Treaty, which took effect on March 21, 1994.¹⁰

□ 1997 Third Conference of the Parties

After COP-1 and COP-2 developed draft proposals for new, legally binding reduction targets and strategies for both industrialized and developing countries, COP-3 met in December 1997 in Kyoto, Japan, where the parties agreed to an historic protocol to reduce global greenhouse gas emissions and set binding targets for developed nations (For example, the binding emission target for the United States is 7 percent below 1990 emission levels). The Kyoto Protocol, which remains to be ratified, seeks to achieve targets on all four major greenhouse gases by 2008-2012, with international emissions trading included as a compliance option. The United States backed out of these negotiations in 2001.¹¹

National efforts initiated by the United States to address climate change, include scientific and economic research, policy analysis, and program development. These actions culminated in the release of the Climate Change Action Plan (CCAP) by the Clinton Administration in October 1993. The CCAP presented the U.S. strategy for reducing greenhouse gas emissions to 1990 levels by the year 2000. Although this goal was not achieved, the measures initiated in 1993 and subsequent years should result in a reduction of 76 million metric tons of carbon equivalent, or 70 percent of the reduction goal.¹²

In 1994, the U.S. Department of Energy (DOE) adopted the Climate Challenge Program, a joint voluntary effort of the DOE and the electric utility industry to report industry reductions of greenhouse gas emissions and fixation of carbon (carbon sequestering) achieved through any measure.¹³

The DOE also sponsors a number of other programs. Rebuild America is a program that emphasizes energy-efficient retrofits of existing buildings, energy-efficient design of new buildings, renewable energy, and energy education. The Energy Star® program- a voluntary partnership between the DOE, the U.S. Environmental Protection Agency (EPA), manufacturers, utilities and retailers- promotes efficient products by labeling them with the Energy Star® logo and educating consumers about the unique benefits of energy-efficient

¹⁰ Ibid.

¹¹ Ibid.

¹² Ibid.

¹³ Ibid.

items. In addition, the Energy Star Buildings and Greenlights Program encourages investment by U.S. businesses and government agencies in energy-efficient lighting, heating and ventilation, and cooling technologies for buildings.¹⁴

SECTION II: CITIES FOR CLIMATE PROTECTION CAMPAIGN

On August 10, 1999, the Medford City Council adopted a resolution in support of the International Council on Local Environmental Initiatives' (ICLEI) Cities for Climate Protection (CCP) Campaign (*Council File No. 99-615*). "ICLEI is the international environmental agency for local governments. Its mission is to build and serve a worldwide movement of local governments to achieve tangible improvements in global environmental and sustainable development conditions through cumulative local actions."¹⁵

ICLEI's CCP Campaign began in 1993 and is a global campaign to reduce the emissions that cause global warming and air pollution. By 1999, the campaign had engaged more than 350 local governments in this effort, which jointly accounted for approximately 7 percent of global greenhouse gas emissions. The Campaign now boasts over 470 local governments worldwide.

The CCP Campaign consists of five milestones which each City commits to completing. The five milestones are:

- ❑ Milestone One: Conduct a Baseline Emissions Inventory for all municipal operations and the entire community
- ❑ Milestone Two: Set an Emissions Reduction Target
- ❑ Milestone Three: Develop an Action Plan which describes initiatives the City intends to take in order to reach its emissions reductions target
- ❑ Milestone Four: Implement the initiatives in the Action Plan
- ❑ Milestone Five: Monitor Emission Reductions

The City of Medford has completed Milestones One and Two. Medford conducted a greenhouse gas emissions inventory for the baseline year 1995, with an interim year of 1998 and a forecast of 2010. The emissions inventory focuses on two categories: Municipal Emissions and Community Emissions. Municipal Emissions measure those emissions that are a product of municipal operations only. For example, emissions from municipally owned

¹⁴ Excerpt from City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

¹⁵ International Council for Local Environmental Initiatives, from <http://www.iclei.org/about.htm>

buildings such as City hall and schools or from the municipal fleet such as the police and fire vehicles. Community Emissions refer to the community of Medford as a whole. All heating oil, natural gas, and electricity used by the residents and commercial and industrial businesses are estimated for this section of the inventory. The Community Emissions section also includes municipal emissions. Refer to Section III of this report for further details regarding the Emissions Inventory.

After the completion of the Emissions Inventory, the City of Medford set an Emissions Reduction Target. The City selected a reduction target for Municipal Emissions of 20% below 1998 levels by the year 2010. The Community Emissions Reduction target has been set at 10% below 1998 levels by 2010.

This report is the Climate Action Plan for Medford and signifies the completion of Milestone Three. The proposed initiatives listed in this report are programs that the City believes to be the most effective way to reduce emissions and to meet reduction targets. The approval of this report by the Medford City Council demonstrates the commitment of the City to reduce its greenhouse gases through implementation of various programs described in Sections IV-VII of this report.

SECTION III: GREENHOUSE GAS EMISSIONS INVENTORY - DETAILS

The Emissions Inventory uses electric, gas, and oil utility bills to determine the level of energy usage for each building. This information is inputted into the CCP software and converted from its unit of measure, such as kilowatt hour of electricity, therms of gas, or gallons of oil, into million British Thermal Units (MMBTU) and tons of equivalent carbon dioxide (eCO₂).

The City of Medford completed a Greenhouse Gas Emissions Inventory in 1999. Data was collected for a base year of 1995, with an interim year of 1998 and a forecast year of 2010. The Greenhouse Gas Emissions Inventory provides a baseline of emissions for the City to analyze and create a reduction target from. Based on the results of the Emissions Inventory, the City of Medford established the following reduction targets:

Municipal Emissions Reduction Target = 20% below 1998 emission levels

This reduction target equates to a goal of reducing total municipal emissions by 3,911.6 tons of eCO₂ by 2010.

Community Emissions Reduction Target = 10% below 1998 emission levels

This reduction target equates to a goal of reducing total community emissions by 72,579.5 tons of eCO₂ by 2010.

The results of the Emissions Inventory indicated the top three sources of emissions from municipal operations as buildings at 80.8%, lighting at 10.5%, and fleet at 8.5%. The following tables summarize the results of the emissions inventory for both municipal and community emissions each year calculated. Please note that it is not possible to calculate the cost for community emissions as that would entail reviewing utility bills for all residents and businesses within Medford.

Table 1
Inventory Results-Municipal Emissions

| Year | Total eCO₂ (Tons) | Energy Use (MMBTU) | Cost |
|-----------------|-------------------------------------|---------------------------|-------------|
| 1995 | 19,154 | 168,716 | \$1,658,332 |
| 1998 | 19,558 | 170,509 | \$2,070,733 |
| 2010 (forecast) | 19,883 | 165,405 | \$2,317,983 |

Table 2
Inventory Results-Community Emissions

| Year | Total eCO₂ (Tons) | Energy Use (MMBTU) |
|-----------------|-------------------------------------|---------------------------|
| 1995 | 696,112 | 7,139,666 |
| 1998 | 725,795 | 7,384,567 |
| 2010 (forecast) | 805,729 | 8,039,635 |

The main sources of greenhouse gas emissions calculated for this inventory are electricity, natural gas, heating oil, gasoline, and diesel. The following charts summarize the percent contribution of each source to municipal and community emissions in the City of Medford, respectively.

Chart 2

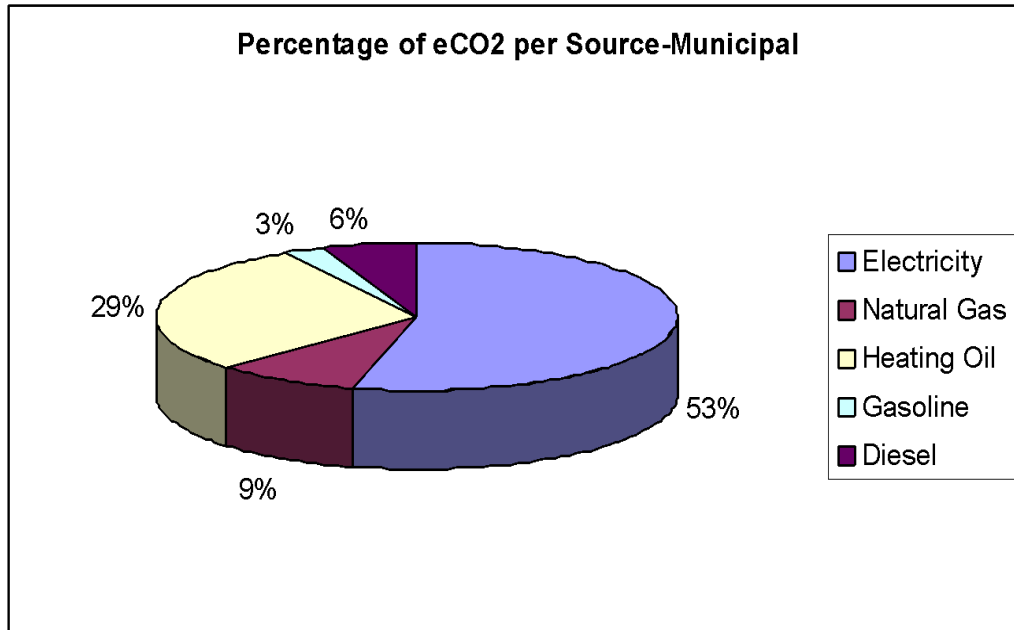
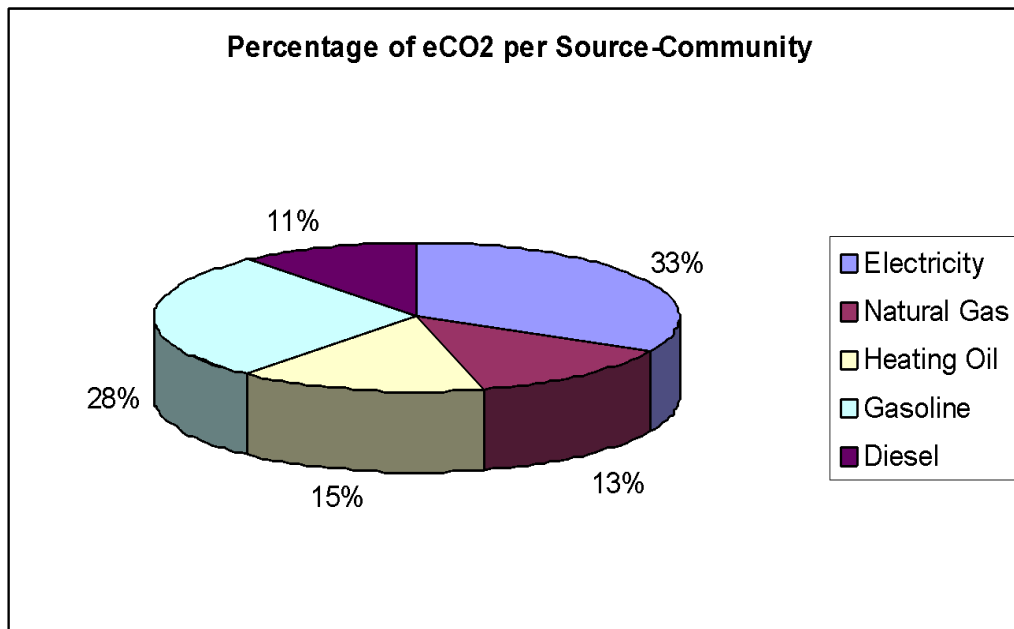


Chart 3



Municipal Emissions

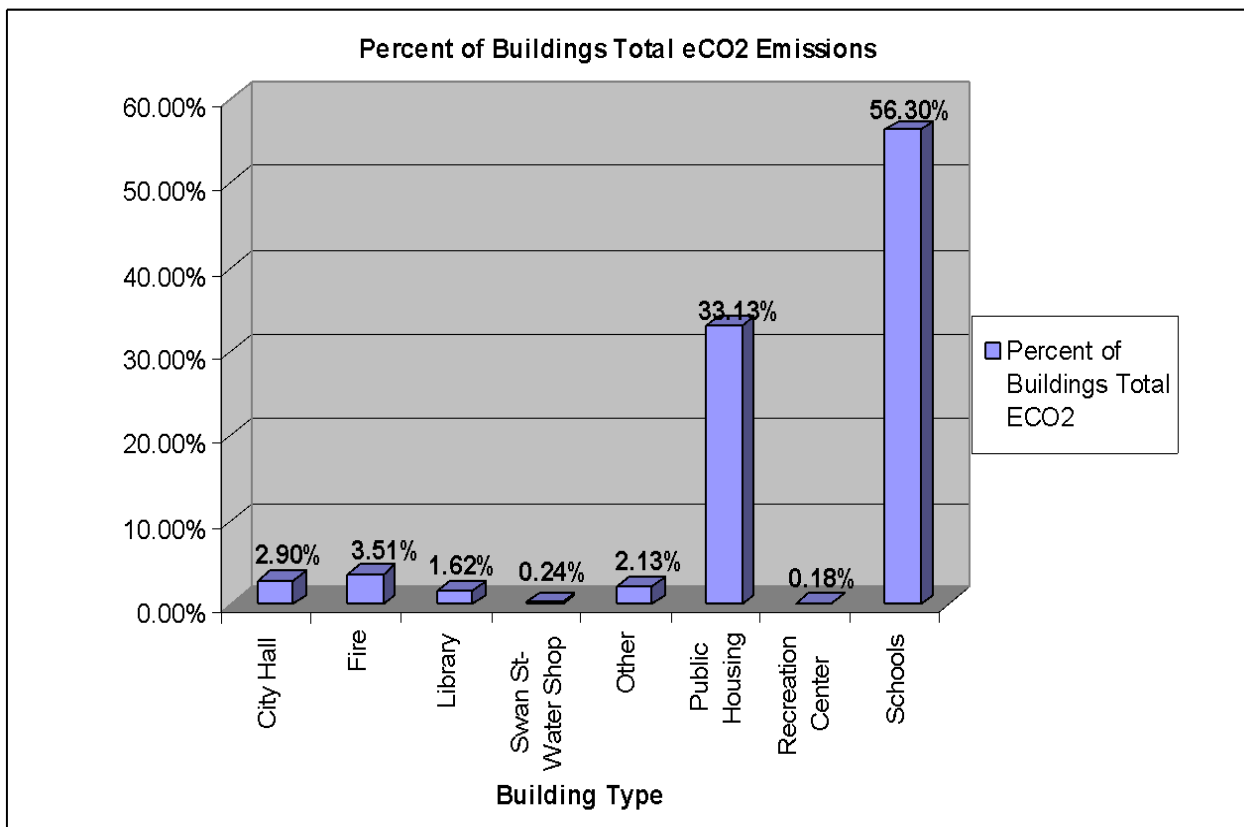
Please note that this report utilizes data for the interim year 1998, instead of the base year 1995, due to technical problems retrieving all of the data from 1995.

Buildings

The Emissions Inventory breaks down emissions from all buildings into electricity, natural gas, and heating oil use. Each energy source creates a different amount of eCO₂, which the CCP software calculates based on the annual usage levels.

According to the Emissions Inventory, municipal buildings are the greatest source of municipal emissions. For the interim year 1998, buildings accounted for nearly 81% of all carbon dioxide emissions. Schools were by far the largest emitters of greenhouse gases within the Buildings category, accounting for over 56% of total municipal emissions. Additionally, Medford public schools used the most energy and cost the City the most money in 1998. The Medford Housing Authority units accounted for the second largest emitters within the Buildings category, accounting for over 33% of total eCO₂ emissions. Chart 4 summarizes the percent of total eCO₂ emissions for all buildings included in the Emissions Inventory.

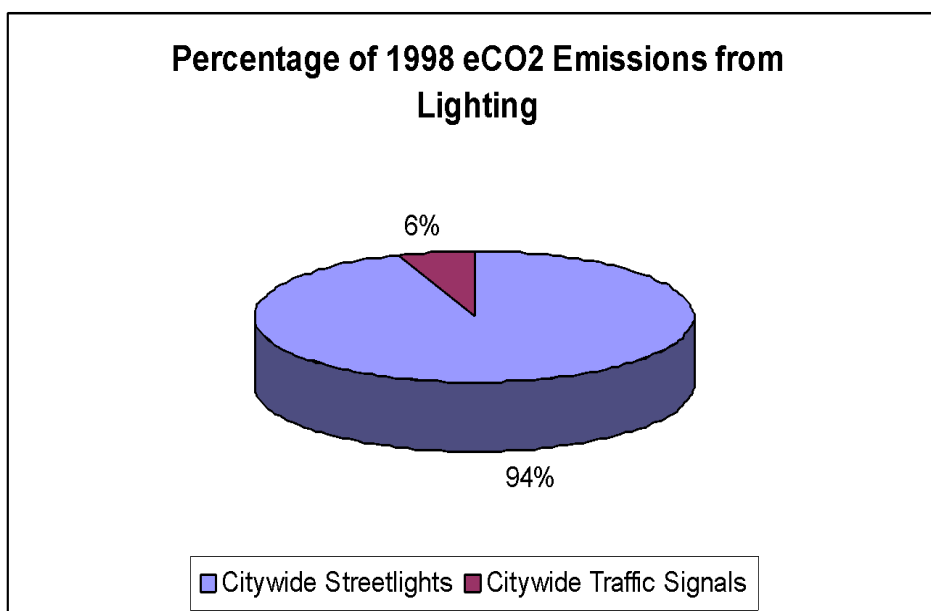
Chart 4



Lighting

The Emissions Inventory calculated emissions data for the streetlights, traffic lights, and recreational lights within Medford. According to the Emissions Inventory, public lighting accounted for 10.5% of Medford's total eCO₂ emissions in 1998, making it the second largest contributor of eCO₂ for the City. This usage cost the City \$483,014 for that year. Emissions from lighting are calculated through the electricity use. Streetlights are clearly the largest emitter within this category, mostly because there are simply more of them than any other type of lighting in the City. The following chart summarizes the percentage breakdown of eCO₂ emissions for all public lights in the City.

Chart 5



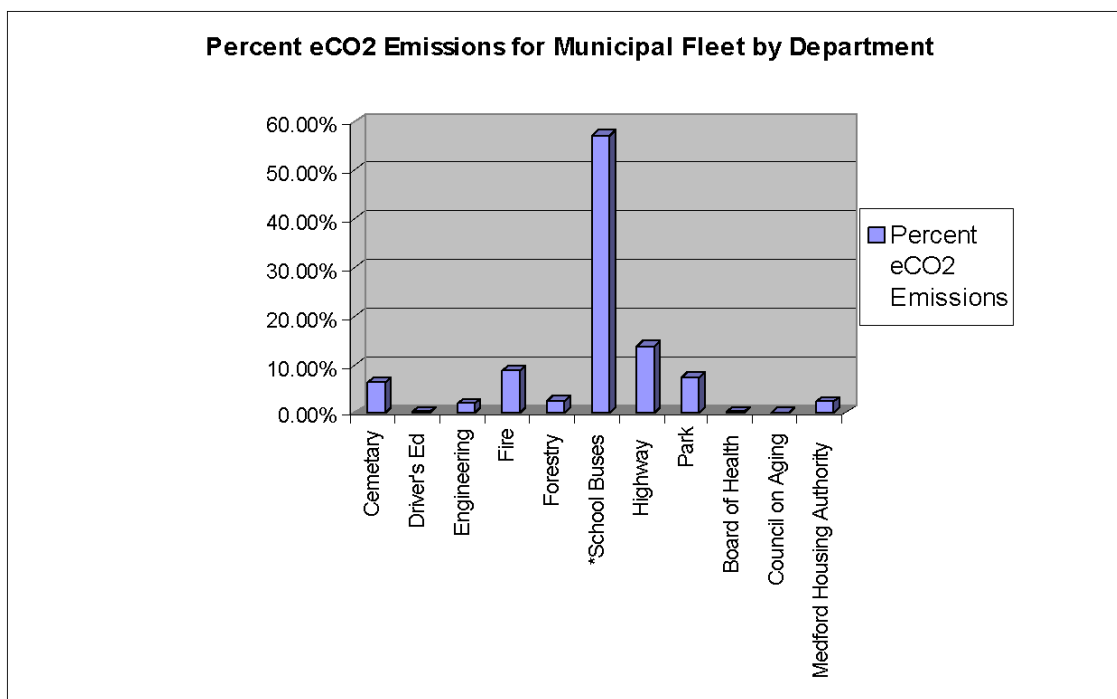
Fleet

The 1998 data from the Emissions Inventory determined the municipal fleet as the third largest contributor of greenhouse gas emissions in the City of Medford. Please note that at the time of the Inventory, data for the police department was not calculated. Based on data from 2000 and 2001, it is believed that the inclusion of the police department would generate an increase in fleet emissions significant enough to place Municipal Fleet as the second highest emission source for the City of Medford and placing lighting as third. As of 2001, the City of Medford maintained 120 vehicles for municipal operations, excluding police vehicles.

For the Fleet section, the Inventory was broken down into diesel and gasoline use. According to the Inventory, the school buses generated the most greenhouse gas emissions from a diesel source as well as overall. The school buses accounted for 81.93% of emissions from diesel and 57.14% of total eCO₂ emissions in the Fleet category. The highway department was the highest emitter from gasoline at 37.15%, while the fire and parks department followed closely behind at 18.01% and 14.82% respectively.

The following chart depicts the breakdown by percentage of 1998 eCO₂ emissions from both diesel and gasoline sources by municipal department.

Chart 6



* The School Buses are owned and operated by Joseph's Transportation

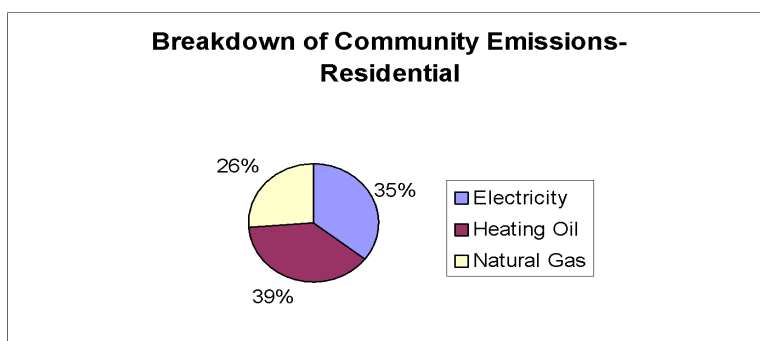
Community Emissions

For the purposes of the Inventory, community emissions were divided into six categories: Residential, Commercial, Industrial, Transportation, Waste, and Other. The Residential and Commercial areas were further broken down into the usage of electricity, heating oil, and natural gas. The electricity and natural gas usage for the Industrial sector was included in the data for the Commercial sector; therefore, heating oil is the only subdivision within the Industrial category. The Transportation section was divided into gasoline, diesel, and electricity (train). The Other section consisted of buildings at Tufts University. Only energy use and eCO₂ are calculated for community emissions; costs cannot be determined.

Residential

The Emissions Inventory determined that in the Residential sector heating oil was the largest contributor to greenhouse gas emissions in Medford, with electricity usage following very closely behind. Utilizing the results of the Inventory enables the City to focus policies and programs that will create the greatest reductions in emissions, as well as save the residents of Medford substantial amounts of money. Refer to section VI of this report for further details on proposed community reduction measures. The following pie chart summarizes the emissions from each source within the Residential sector for 1998.

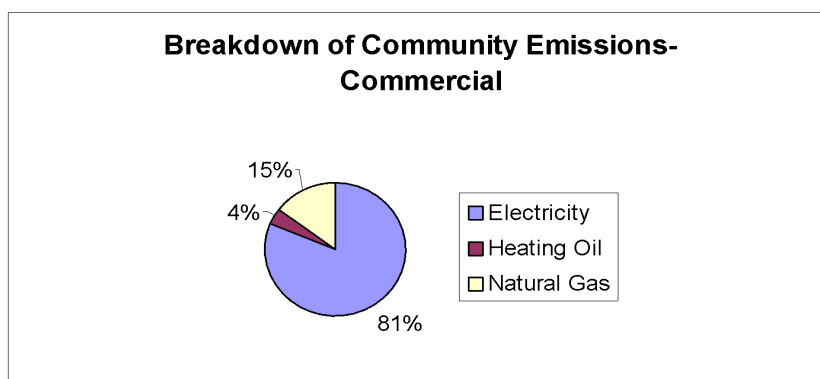
Chart 7



Commercial

For the Commercial sector, electricity was by far the largest contributor to greenhouse gas emissions in Medford. Programs aimed at energy efficiency in lighting and office equipment may be the most beneficial for reducing emissions in this sector. Refer to section VI of this report for further details on proposed community reduction measures. Chart 8 summarizes the emissions from each source within the Commercial sector for 1998.

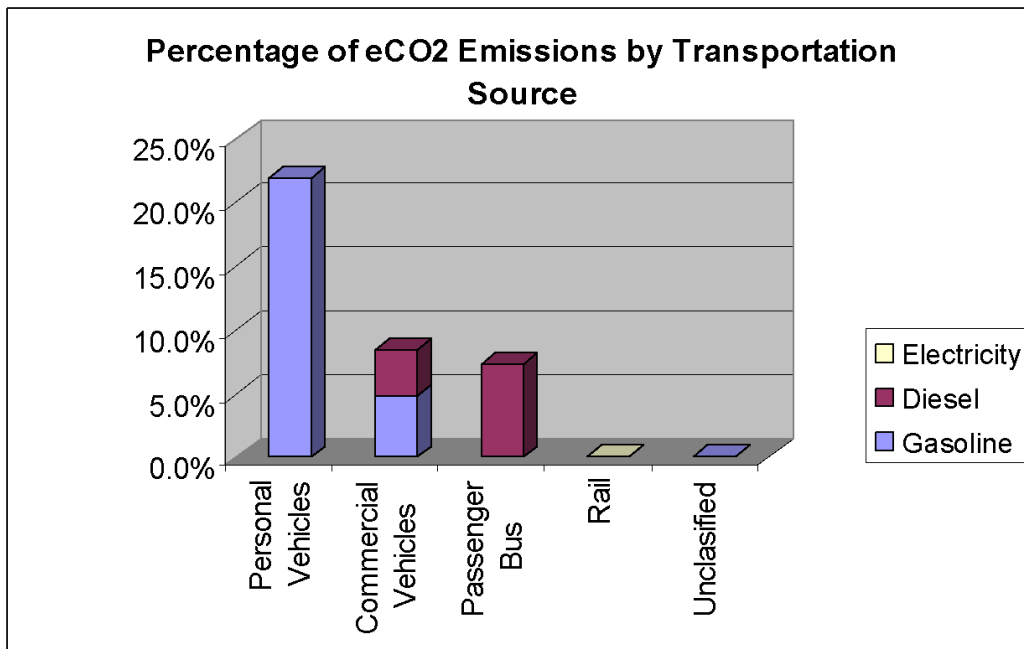
Chart 8



Transportation

The Transportation sector of the inventory consisted of personal vehicles, commercial vehicles, passenger buses, rail, and unclassified. The Inventory indicated personal vehicles as the single highest source of greenhouse gas emissions in the City. The 1998 data for tons of eCO₂ among modes of transportation are summarized in the following chart.

Chart 9



Emissions reductions can come about in the Transportation section through the implementation programs and policies aimed at getting people out of their vehicles through seeking alternative modes of transportation, such as biking or walking. Additionally, the City can encourage residents to take advantage of public modes of transportation, carpools, or alternative fuel vehicles. Refer to section VI of this report for further details on proposed community reduction measures.

Waste

The Emissions Inventory did not quantify emissions for waste. The majority of waste produced in Medford is incinerated, however a small amount, approximately 3,000 tons per year, is landfilled. Any solid waste that is sent to a landfill can contribute to CH₄ gas emissions from decomposition. Quantifying the emissions from solid waste is difficult without knowing

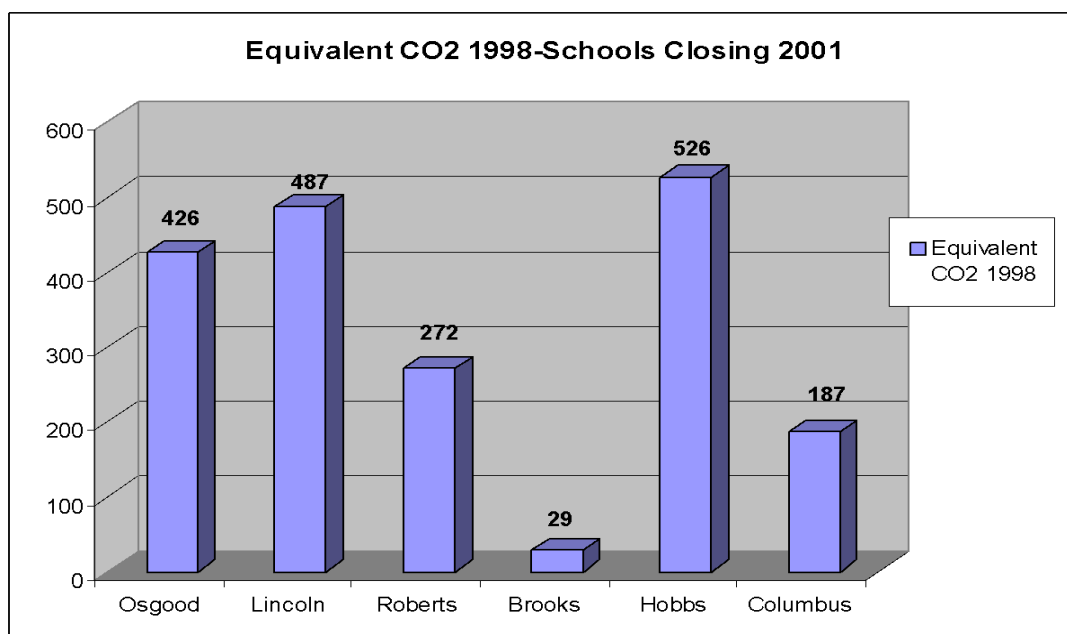
the actual content, therefore these emissions have not been calculated here, but the Energy Task Force believed it was important to recognize that there are emissions from this source.

SECTION IV: PROPOSED EMISSIONS REDUCTION MEASURES - MUNICIPAL

BUILDINGS:

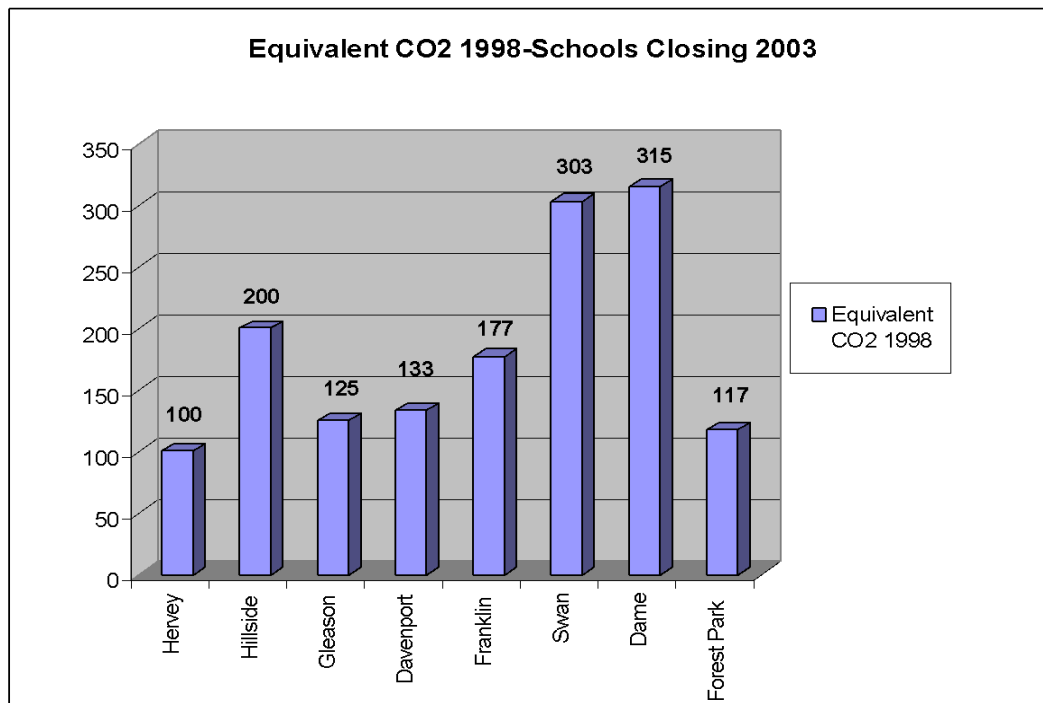
According to the Emissions Inventory, over 56% of Medford's 1998 municipal emissions were from the schools. The 1998 eCO₂ emissions from the schools were 8,898 tons. The City of Medford currently has 11 elementary schools, 3 middle schools, 1 high school/vocational school, and 2 alternative schools. The average age of the elementary and middle school buildings is nearly 80 years. The City has already undertaken a major construction project which consists of replacing all the current elementary and middle schools with 5 new school buildings by 2003. The Brooks, Columbus, and Osgood elementary schools and the three current middle schools (Hobbs, Lincoln, and Roberts) will close after the 2000-2001 school year. Two new elementary and one new middle school will replace these schools. All remaining old elementary schools will close after the 2002-2003 school year. The above mentioned six schools accounted for 1,927 tons of that total. These buildings are going to be replaced with new buildings and reopened for students in 2003. Therefore, these emissions will not be completely eliminated, but are expected to decrease depending on the degree of efficiency the new buildings are created with.

Chart 10



Of the remaining schools, the schools listed in the chart below will be sold or destroyed. In 1998, these buildings collectively accounted for 1,470 tons of eCO₂ from municipal emissions. The actual eCO₂ reduction, however, will be dependent on the decisions made regarding the fate of each of these buildings.

Chart 11

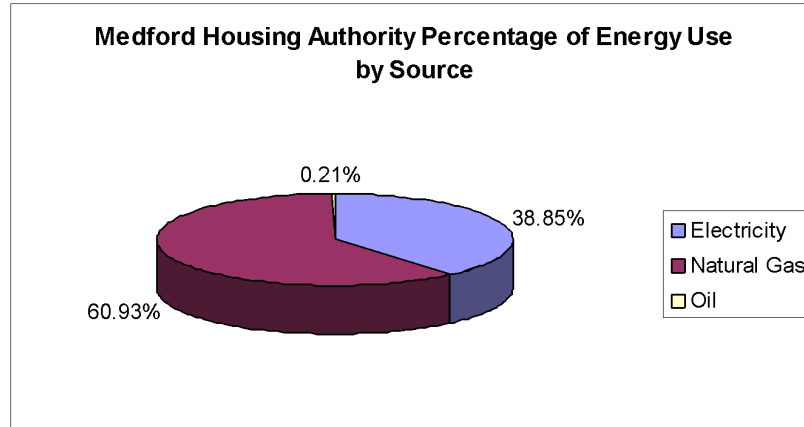


In 1998, the high school was the largest emitter of eCO₂. This building is not scheduled for a replacement, however the City is converting the high school heating system from oil to natural gas. This measure will take place summer 2001. Based on the same level of usage, this will result in a reduction of 665 tons of eCO₂ per year. Although natural gas is a greenhouse gas, it produces about 30% fewer eCO₂ emissions as heating oil. Additionally, the City is considering various efficiency upgrades within the high school, which will increase the eCO₂ reduction value.

Although the Medford Housing Authority (MHA) is not technically a part of the municipal government, it was included in the Emissions Inventory that was conducted in 1999. Therefore, it will be included in this plan and strongly encouraged to take appropriate measures to create its own emission reductions. MHA manages seven properties and approximately 854 units within Medford. The MHA has already taken several energy efficiency measures throughout these properties. These measures include water saver toilets, low-flow shower heads, and conversion of all lighting, except appliances, to

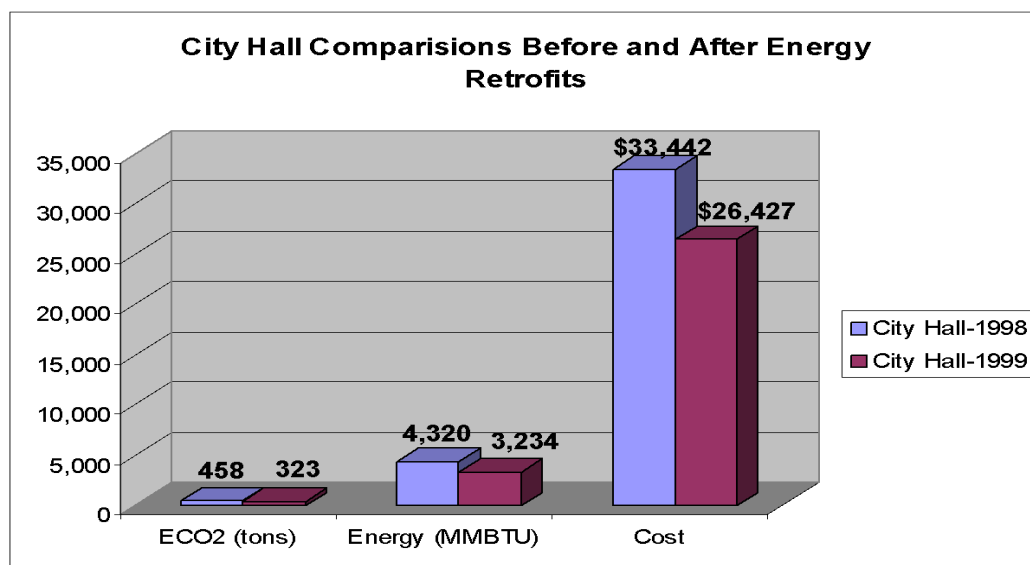
fluorescent bulbs and electronic ballasts. Additionally, two properties have converted to high-efficiency gas burners and several more are examining the possibility. MHA is currently working with Keyspan Energy Delivery Service to convert their 121 Riverside building from electric heat to natural gas. Based on the same level of usage as 1998, this measure will result in an estimated reduction of 541 tons of eCO₂ per year, once completed.

Chart 12



In 1999, City Hall underwent a conversion from heating oil to natural gas. Additionally, most indoor lighting was upgraded from magnetic to electronic ballasts and efficient lighting replaced previous lights. This conversion and the lighting upgrades created an estimated reduction of 133 tons of eCO₂ per year, reduced energy costs by more than \$7,000, and created a significant reduction in maintenance costs from 1998 to 1999. The following chart depicts the changes from 1998 to 1999.

Chart 13



All reduction measures are estimated assuming the current level of energy is equal to the level calculated at the time of the Emissions Inventory.

Table 3
EXISTING AND PROPOSED REDUCTION MEASURES FOR BUILDINGS

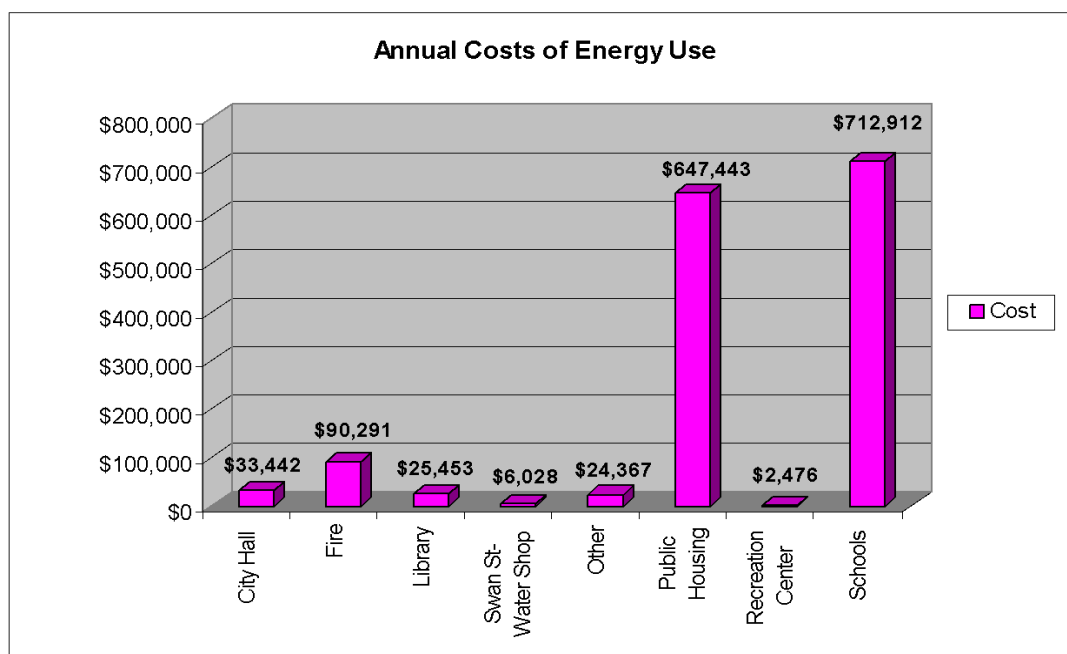
| Measures | Estimated Reductions in Tons of eCO₂ |
|-----------------------------------|--|
| School Replacement-2001 | 1,927 |
| School Replacement-2003 | 1,470 |
| High School Conversion Oil to Gas | 665 |
| MHA Conversion Electric to Gas | 541 |
| City Hall Retrofits | 133 |
| TOTAL | 4,736 |

Although the estimated emissions reduction numbers add up to 4,736 tons, this number does not take into account the emissions from the new schools, which cannot be calculated until the schools are operating for nearly one year. Also, the emissions from school buildings that are being sold and not destroyed does not eliminate these emissions from the atmosphere, but just eliminates the ownership from the City. These emissions will still be included in the community emissions analysis, and therefore, are still part of the City's emissions. The City of Medford prefers to calculate emission reductions from complete elimination of CO₂ emissions, not just transfers from one owner to another. Therefore, our target is not considered attained until it can be confirmed through a follow-up inventory.

Various Fire and Public Safety buildings within Medford have also incorporated energy efficient measures into their budgets, such as insulating doors and replacing windows. Additionally, the Fire Department is investigating converting two of the Public Safety Buildings from oil to natural gas heat. This conversion alone should provide a 30% reduction in eCO₂ emissions from these buildings.

It is important to note that the emissions reductions, which this Plan is aimed at achieving, will also create cost savings to the City. This was demonstrated with the City Hall model above. Energy efficient retrofits of other municipal buildings could create a significant cost reduction for the City. The following chart summarizes the costs of energy use within municipal buildings for the year 1998.

Chart 14



Since the inventory, the City has also acquired another building, Hormel Stadium, which is emitting an estimated 129 tons of eCO₂ and is incurring energy costs of more than \$16,000 annually. Please refer to Section IV of this report for further details on Hormel Stadium.

In addition to the reduction measures already taken, the City of Medford has proposed additional programs to create emission reductions. These programs are summarized below.

Local Energy Efficiency Code-Municipal Buildings

There have been some recent changes regarding new energy conservation requirements made to the Massachusetts State Building Code. Prior to these changes, the State energy requirement for all buildings was 10% above the minimum threshold needed. Now, the recently passed proposals require that it be at the minimum threshold.¹⁶

The conservation requirements for new low-rise buildings (under four stories in height) took effect on March 1, 1998. These requirements are based on the 1995 Model Energy Code, with Massachusetts specific amendments. On July 13, 1999, the Board of Building Regulations and Standards (BBRS) voted to adopt a complete revision to the energy conservation requirements for new commercial buildings in the Massachusetts State

¹⁶ Town of Brookline. 2001. Action Plan (Model Two), May 21.

Building Code (780 CMR, Chapter 13). The new requirements took full effect as an option on January 1, 2001 and became mandatory on July 1, 2001.¹⁷

The code for the City of Medford is the same as the State and applies to the residential and commercial sectors. The State's new building code regulations will apply to the City as well. However, the City could also consider developing its own regulatory or voluntary green building code that would require enhanced energy efficiency design in all new structures or substantial additions.

The City can develop a local energy efficient building code-detailing the use of insulation, double paned windows, compact fluorescent light bulbs, and other efficiency measures, as well as the use of renewable energy sources. This code could be a supplement for the Energy Efficiency Code of Massachusetts, detailing more specific information for residents in Medford. If adopted, this program would require all new municipal buildings to meet or exceed both the State and local efficiency codes.

2021 Review

In Massachusetts, local communities did not have the authority to enact stricter building code than the state building code. However, in 2008 the Green Communities Act was passed in MA, allowing communities to adopt the "Stretch Code" which included specific energy efficiency requirements for construction on pre-existing and new buildings for communities that chose to adopt them.

In May 2010, Medford adopted the GC Stretch Code, in accordance with this recommendation. Note that Medford did not have the authority to develop its own building code, only to adopt or not, the MA Stretch Code.

Further details on changes to building code are continued below in the discussion of annual energy audits and building retrofits.

¹⁷ Town of Brookline. 2001. Action Plan (Model Two), May 21.

Annual Energy Audits

The City of Medford should conduct annual energy audits in each of the municipal buildings. The City should rate each of the buildings based on the level of efficiency and assign a priority to each in order to update all buildings with the most efficient technology feasible. Additionally, the efficiency retrofits should be coordinated into a time schedule to ensure the completion of all retrofits within a specified time frame.

2021 Review

From 1999 to 2001, building retrofits were installed in various municipal buildings to maximize the potential for savings and reduce energy usage. Additionally, between 1999 and 2001, City Hall, the Fire Station, and Medford High School were converted from oil to natural gas. Between 2012-2017 various municipal and school buildings underwent lighting upgrades and retrofits with projected savings of over \$100,000.

Since 2009, Medford has been conducting annual energy audits, i.e. reviewing the energy usage, in all municipal and school buildings. The City adopted the Mass energy insight tracking tool created by Massachusetts Department of Energy Resources (DOER) to track energy, oil, and gas consumption.

Complete energy audits for the school were done in 2009 as part of the National Grid While Building Assessment Program. The City does periodic lighting and HVAC audits to develop energy savings projects throughout municipal buildings.

Renewable Energy Sources

The City of Medford should require all municipal buildings have annual energy audits. As part of these energy audits the City should examine potential renewable energy sources. This should include an evaluation of the economic feasibility of converting existing buildings to realistically available renewable energy sources. Any new municipal buildings should be required to utilize a renewable energy source for at least one energy use: heating, electricity, or hot water, or for 35% of total energy use per building.

2021 Review

The Office of Energy and Environment conducts regular assessments on municipal buildings and has determined that the use of renewable energy for all municipal buildings was not possible due to various constraints. However, despite these limitations, the City of Medford strives to grow renewable energy sources throughout the city. For example, in 2008, a solar lighting system was installed for the Playstead Cemetery Monument. In 2009, Medford received grants to install a wind turbine at the McGlynn Elementary School, which powers 10% of the school. Furthermore, new buildings are designed to be as low energy as possible. The City added solar to the DPW building built in 2016, through a PPA. In 2019, the Department of Public Utilities approved Medford's Municipal Aggregation Program, which provides residents 5% more renewable energy than required by state law and the option of 100% renewable energy at an affordable rate. The Police Station, inaugurated in 2020, has solar and a very low energy use intensity. The Public Library, opening in 2021, will be net-zero on-site with the whole roof covered in solar.

Hormel Stadium-Retrofit

The City of Medford acquired Hormel Stadium from the Metropolitan District Commission in the year 2000. This building is in dire need of energy efficiency upgrades. Energy use in 1999 cost \$16,534 and emitted approximately 129 tons of eCO₂.

The City proposes several energy efficiency measures at Hormel Stadium, including insulation and possible conversion to renewable energy sources. The Energy Task Force has taken the initiative to evaluate the potential measures necessary at Hormel to create energy savings and a cost reduction for the City.

2021 Review

The city does not have records of energy efficiency work carried out in this building before 2007. Since 2007 the energy use and CO₂ emissions have been significantly lower than what is highlighted in the 2001 plan. In 2015, a new turf field and new stadium lighting were installed at Hormel Stadium. The city has had several energy audits for this building, but these projects have not yielded a high enough cost-benefit ratio to warrant moving forward.

Since Hormel Stadium's electricity and natural gas usage since 2010 has been quite low compared to most other municipal buildings, it has not taken priority over other building retrofits.

LIGHTING:

The Emissions Inventory indicated lighting as the second largest emitter of greenhouse gas emissions in Medford in 1998. The following are a list of initiatives the City can undertake to curb these emissions.

Streetlight Conversion

Lighting of public places and streets is a major energy drain for municipalities. The City of Medford does not own the vast majority of the streetlights in the City. They are owned by either the electric utility, Massachusetts Electric, or the State through the Metropolitan District Commission. Although the utility owns the streetlights, the City pays the electricity bills. Therefore, having the most efficient lighting possible will not only reduce emissions, but will also generate cost savings for the City.

The lighting industry is constantly developing new technologies that produce the same amount of light while using less energy and therefore creating a substantial cost savings in energy expenses. For streetlights, one of the most efficient lamps at this time is the high-pressure sodium vapor. The majority of the streetlights within Medford have been converted from the less efficient incandescent and mercury vapor lamps to the more efficient high-pressure sodium vapor. The high-pressure sodium lighting is 57 percent more efficient than incandescent, using 825 fewer kilowatt-hours (kWh), and 32 percent more efficient than mercury vapor, using 292 fewer kWh.¹⁸

As of summer 2001, 541 of the approximate 4,600 streetlights in Medford are still mercury vapor. The City is working with Massachusetts Electric to convert these remaining lamps. Upon the completion of this conversion the City will save an estimated *\$19,647.80 annually on its electricity bill and further reduce eCO₂ emissions by 148 tons.

* = This number is based on a 196,478 kilowatt hour (kwh) savings at \$0.10 per kwh.

Additionally, Medford should require any new streetlights added to its system be high-pressure sodium or the most energy efficient lamp at the time of purchase.

¹⁸ City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

2021 Review

In 2001 and 2002, street lighting was retrofitted to convert streetlights from mercury vapor to more efficient high-pressure sodium vapor lights. The most significant reduction in electricity costs for streetlights was observed from 2002 to 2008, which showed a 14.2% decrease in costs. In 2019, 4,840 streetlights were converted to LEDs with the help of the Metropolitan Area Planning Council and its contractors. Prior to the conversion, Medford was consuming 2,739,648 kWh at a cost of \$396,555 annually. The annual projections for post-conversion are 721,849 kWh at a cost of \$137,844. The greater reliability of LEDs compared to high-pressure sodium lights will also save the city on future maintenance expenses. Additionally, the City uses a wireless streetlight controls software, LightingGale, developed by CIMCON Lighting, that allows us to monitor and control all streetlights, except the 187 decorative lamps.

Streetlight Inventory

In a further effort to reduce emissions from streetlight usage, the City of Medford can conduct an inventory of all streetlights in the City to evaluate the necessity of each streetlight for public safety concerns. The Medford Energy Task Force will oversee this program, if initiated. To be effective, the program must detail specific criteria, as approved by the Chief of Police, for determining the necessity of each streetlight for the purposes of public safety. Once a light has been determined by the Energy Task Force and the Police Chief to be unnecessary for public safety the lamp will be removed from the streetlight and stored in a facility for re-use in another streetlight, if feasible, or should be recycled by a licensed contractor.

2021 Review

In 2017, the City of Medford conducted a streetlight inventory during the conversion to LEDs. While the idea of removing streetlights to save energy is innovative, it would have been difficult to implement in a manner that would satisfy Medford's public safety requirements. Instead, each new LED streetlight has been equipped with a wireless streetlight control software, which allows certain streetlights to be dimmed, if deemed necessary.

Traffic Light Conversion

In 1998, City traffic lights accounted for 114 tons of eCO₂ and cost the City nearly \$37,000. New technologies have been developed to replace energy-intensive incandescent bulbs in traffic signal lights with highly efficient light emitting diodes (LEDs). The technology is expected to reduce energy use by 90 percent, lower maintenance due to increased life, and incorporate innovations such as battery backup using photovoltaics.¹⁹ Since 1998, there have been three intersections in Medford where traffic lights have been converted to LEDs. Two additional intersections are currently scheduled for replacement.

In regards to the costs, the electric utility offers a rebate for the conversion to LEDs, providing a \$75 rebate for every red light converted and a \$90 rebate for each green light conversion. Yellow lights are typically not converted due to the lesser amount of time which they are on.

Additionally, any new traffic lights that are added onto the Medford system should be required to be LEDs.

2021 Review

In April 2002, all traffic lights in Medford were converted to LEDs to reduce energy use. These LEDs offer significant energy savings, approximately 80-90% in additional savings from reduced maintenance, and the potential to improve visibility and safety. In 2002, the cost of electricity usage for the traffic lights was \$20,776.00; that number dropped to \$12,732.00 in 2008.

Photovoltaic Recreational Lighting

The City of Medford manages over 20 parks. These parks are used primarily in the spring and summer. Due to the seasonal usage, this is a significant opportunity for installing photovoltaic cells to fuel the arc lights in the recreational fields. These lights will nearly eliminate emissions, but will also serve as a demonstration of the City's commitment to reduce its impact on the environment and to create a cleaner, healthier Medford.

¹⁹ Suozzo, Margaret. American Council for an Energy-Efficient Economy. 2001. LED Traffic Signal Market Transformation: An Update with Boston-Area Case Studies. February.

The City should establish a replacement schedule to phase in the photovoltaic lamps over a five-year period. Medford aims to have all lights in all municipally owned recreational parks converted to photovoltaic lamps by 2010.

2021 Review

After cost-benefit analyses, the City of Medford found photovoltaic lamps to be not cost-effective lighting alternatives for parks. Instead, recreational lighting (except for stadium lights) were converted to LEDs and added to the LightingGale control system during the 2017 streetlight project. The City has gotten estimates on several occasions to upgrade the stadium lighting to LED and install a control system but has found it to be prohibitively expensive.

FLEET:

The City of Medford strives to maintain as efficient a fleet as is economically feasible. The City will consider undertaking several measures, including those listed below in order to reduce greenhouse gas emissions from its municipal fleet

Increase Fuel Efficiency and Downsize Vehicles

Whereas the City of Medford is committed to reducing its emissions of greenhouse gases and reducing air pollution, the City should require that all new vehicles purchased by the City for municipal use, be the most fuel-efficient vehicle in the class required for the job.

Additionally, current vehicles in every department shall be evaluated to determine if the size and the fuel type of the vehicles are appropriate based on the frequency and the type of usage. Where feasible, the City of Medford should purchase smaller vehicles for each department.

2021 Review

The City of Medford has committed to the 2001 recommendation that all new vehicles purchased by the city for municipal use, be the most fuel-efficient vehicle in the class required for the job. Older, diesel-fuel vehicles, such as trucks used by DPW and the Fire department, were determined to be priority vehicles.

In 2010, Medford became a Green Community and committed to buying vehicles according to Green Communities fuel efficiency standards. Massachusetts periodically updates the Green Community standards, therefore the city always checks for the most recent state standards before making any purchases. As of 2020, the standards only apply to light utility trucks and passenger vehicles. Off-road vehicles, motorcycles, heavy-duty trucks, fire engines, emergency vehicles, and police cruisers are exempt under the Green Communities criteria.

Alternative Fuel Vehicles

There are currently several alternative fuels available for use by vehicles. Many of these fuels are considered "Clean Fuels" because they create less pollution than traditional gasolines.

U.S. Department of Energy classifies the following fuels as "alternative" to gasoline: biodiesel, electric, ethanol, hydrogen, methanol, natural gas, propane, P-series, and solar. The Commonwealth of Massachusetts mandates that 75% of new light-duty vehicles purchased for the State are alternative fuel vehicles (AFVs).

The City of Medford could commit to purchasing AFVs to replace gasoline and diesel vehicles currently in the City's fleet. The City of Medford may consider a goal of having 50% of all new light duty vehicles purchased for the City be AFVs, by 2003. In addition to the above fuel options, the City can also consider gasoline-electric hybrids for local work in the interim. Although hybrid vehicles are not nationally considered AFVs due to the fact that they utilize gasoline, the City of Medford believes they have could be useful in certain positions within the City. Hybrid vehicles are ideal for most of the inspectors within the City that utilize a vehicle if they are traveling locally at slower speeds and do not need to carry a significant amount of materials.

Medford understands that the best opportunity to reduce emissions within its fleet is through the purchase and use of alternative fuel vehicles. One fuel the City has researched is CNG. Natural gas is a significantly cleaner fuel than petroleum. The City should commit to gradually turning its municipal fleet over to alternative fuels such as CNG. Additionally, the City should make a commitment to support the construction of any alternative fueling station within Medford, provided that the fuel will be available to municipal vehicles and will aid in the conversion of the City fleet to AFVs.

2021 Review

Since 2004, the Cemetery Division has been using a B-20 biodiesel blend for the Cemetery vehicles. A B-20 biodiesel blend is 20% biodiesel and 80% diesel. However, during the winter, the division uses a B-10 blend, which has more diesel in the blend.

By 2010, the city no longer utilized fleet vehicles for inspectors and had reduced the fleet to being only light and heavy-duty trucks.

The city has monitored and reviewed alternative fuel vehicle options for the municipal fleet for over the past 20 years, but they have not been proved feasible. On occasion, the City has been loaned natural gas and all-electric fueled vehicles on a trial basis. While city staff, including inspectors, thought very highly of these vehicles, the city has declined to purchase any passenger vehicles for city staff, and these options have not been available in heavy-duty vehicles. Due to these constraints, making changes to the whole fleet has not been possible. However, the City continues to evaluate alternative fuel vehicle options for the City's fleet and as of 2020 is reviewing the options around battery electric vehicles.

Support Cleaner Fuel School Buses

Due to the fact that the public school buses are contracted the only way in which the City can make changes is by adjusting its contract to specify the use of alternative and cleaner fuel buses. There has already been some discussion between the City and Joseph's Transportation, the current contract holder, regarding pursuing an investment in cleaner fuel buses. The City of Medford is willing to assist Joseph's and any other bus company with whatever information they may require to make decisions on purchasing cleaner fuels buses. By 2003, the City should also require that 25% of the public school buses are AFVs.

2021 Review

As a part of the Vehicle Emissions Reduction program in 2003, the city received a Clean School Bus USA grant from the US Environmental Protection Agency (EPA). In 2005, the entire Vocell Bus Company's (the school bus contractor at the time) fleet was retrofitted with diesel particulate filters (DPFs) or diesel oxidation catalysts (DOCs). Additionally, these buses were converted to ultra-low sulfur diesel from regular diesel fuel. Medford became the first US EPA Clean School Bus Project recipient in the country to not only manage this Program for our City but for the other 12 Metro Boston communities served by our school bus contractor.

By 2010 the regulations and technology evolved such that the new emissions reductions equipment started getting autofitted in vehicles during manufacturing itself. Just by requiring newer models of buses from the contractor, the City was able to reduce school bus emissions. The city as of 2021, is working with regional efforts to determine the best way to convert to electric school buses. However, they are very expensive, and most programs are focused on municipalities that own their school buses.

Idling Policy

The City recognizes idling as an unnecessary waste of money and fuel and a senseless contributor to air pollutants and greenhouse gases in the atmosphere. A gasoline vehicle idling for two hours burns two gallons of gas and emits approximately 44 pounds of eCO₂ into the atmosphere. A diesel vehicle idling for two hours burns approximately one to two gallons of fuel²⁰ and emits 22-44 pounds of eCO₂ into the atmosphere.²¹ In addition to emissions, an idling vehicle effect engine life. A diesel vehicle that idles for one hour a day is equivalent in engine wear to driving 64,000 miles and using over 500 gallons of fuel annually. This creates significant maintenance and fuel costs for the City.²²

The Commonwealth of Massachusetts has mandated a 5-minute maximum idling time for vehicles.²³ The City of Medford will consider establishing an Idling Enforcement Program for municipal operations, which will enforce the 5-minute idling time prescribed by the State regulations. The primary method of enforcement will be through an educational program as well as through incentives. The City can provide incentives in the form of public

20 International Council for Local Environmental Initiatives, Green Fleets, from www.greenfleets.org

21 Environmental News Network, "Truck and Bus Operators to Study Idle Emissions Controls," July 19, 2001, from www.enn.com

22 American Trucking Association. 1989. Document #1419 "Diesel Idling," February 2, from www.greentruck.com/air_emissions/1419.html.

23 Massachusetts General Law, Chapter 90, Section 16A, from www.state.ma.us/legis/laws/mgl/90-16A.htm

recognition for City employees who obey the idling policies of the State and City government.

2021 Review

In 2004 the City adopted a No idling Policy with regards to school buses and created a comprehensive program to reduce school bus idling, which aimed to reduce diesel emissions and the related health effects of pollution. The policy applied to every diesel-powered school bus and designated school areas as idle-free zones. No idling signs were installed by the schools but in 2020 the signs had been knocked down and were no longer in place. The city is looking into replacing them.

In 2005 the City included municipal no-idling policies in the Energy Efficiency and Resource Policy. The policy contains various measures and directives to prevent and reduce idling in Medford. For example, this policy requires that municipal employees apply the policies to municipal fleets. This policy also set allowances for municipal fleet idling in colder temperatures, given Medford's extreme weather in winter.

Additionally, the Massachusetts Department of Environmental Protection has had a long-standing idling policy since the 1970s. The current iteration of the Massachusetts Anti-Idling Law limits unnecessary engine idling to five minutes. However, it has been difficult to enforce the Massachusetts Anti-Idling Law for private vehicles.

Trip Reduction Program-City Hall Employees

Motor vehicle usage accounted for 38% of community emissions in Medford in 1998. Out of this, personal vehicles were more than 21%. In an effort to reduce these amounts and to encourage the use of alternative modes of transportation among municipal employees, Medford is establishing several Trip Reduction Programs.

The City aims to develop and manage a variety of commuter Trip Reduction Programs designed to encourage vanpooling, carpooling, use of transit services, bicycling, and walking by City employees commuting to and from work. These commuter programs will be available to all City employees not requiring the use of their own vehicle for work related business. The goals of these types of programs is to alleviate traffic congestion, reduce energy consumption, and curtail vehicle emissions and air pollution to create a healthier workforce and downtown environment. Some trip reduction initiatives are listed below.

- ❑ The City of Medford can organize carpools and vanpools for City employees who live in the same areas of Medford. Ideally, the employees will rotate drivers each day. The City can also provide preferential parking for the carpools. This will not only reduce greenhouse gas emissions, it will also cut gasoline costs for each member of the carpool.
- ❑ Various incentives can be offered to those employees that take advantage of the Program. The City will consider seeking discounts and coupons from local businesses for such things as lunch, clothing, and specialized items.
- ❑ A City contact should be established to arrange for alternative transportation-shuttle buses, carpools, vanpools, etc. for City Employees.
- ❑ The City should also provide incentives and discounts to those employees that walk or bike to work. These employees will be completely eliminating emissions from their commute. Therefore, the City should do its best to provide bike racks and places for storing equipment.
- ❑ The City can research the opportunity of getting involved in the Zipcar program. The most common comment regarding taking alternative modes of transportation to work is that the employees like to run errands on their breaks. The solution to this could be establishing a corporate account for the City of Medford employees with Zipcar. The Zipcar program is a Boston-based program which provides vehicles for people to use on an hourly basis. This type of situation is ideal for running errands. The City of Medford can set up a corporate account which will allow its employees to use the vehicle for various purposes throughout the day.

2021 Review

In 2005, Medford passed an Energy and Resource Efficiency policy, which instructed city staff to efficiently manage vehicles operated by the city for municipal use by reducing miles driven and diminishing fleet size, wherever possible. However, the Trip Reduction Program proposed above, does not transfer well in practice for city employees and the use of personal vehicles. Some barriers to carpooling include the location of residence, and work assignments as the city does not have a fleet for inspectors and other staff to use. The city has explored various state programs for trip optimization and the use of zip cars for official visits, however, they have not garnered much support and popularity among the city staff.

Bicycle Patrol Program

Although the police department vehicles were not included in the Emissions Inventory for the years 1995 and 1998, the City does have data for 2000-2001. From June 2000 to April of 2001, the police department used 47,677.7 gallons of fuel. In addition to cost savings, alternative modes of transportation will create significant reductions in greenhouse gas and general air pollutant emissions within this area of municipal government.

Bicycle patrols provide a low-cost and highly visible vehicle alternative that improves community relations and officer morale while reducing emissions. Over the years, the City has demonstrated the viability of using bicycles in place of patrol vehicles throughout the City.²⁴ Currently, Medford owns eight bicycles and has 15 officers that are certified to use them. Medford should continue to increase these numbers over the next nine years.

Please refer to Section V of this report for additional transportation policies that relate to the community as a whole.

2021 Review

The bicycle patrol program has been phased in and out depending on staff capacity. However, as of 2020, the Police Department was actively looking to hire more personnel to boost staff capacity and provide bicycle patrols.

SECTION V: ADDITIONAL MUNICIPAL EMISSION REDUCTION MEASURES

PROCUREMENT:

Procurement policies specify how and what goods and materials the City purchases. Municipalities are often required to submit proposals for services and goods. The purchase is made from the entity that supplies the services and/or goods for the least amount. This low-bidder requirement can often leave the City with a lower quality product. Therefore, it is imperative that the City specifies certain requirements in its proposal. By inserting energy efficiency requirements into the procurement policies, Medford can guarantee that its efforts to reduce its emissions will not be compromised by having to choose the low-bidder.

24 City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

To ensure energy and cost savings for the future, the City of Medford should institute two important procurement policies: an Energy Star® or Equivalent Purchases Only Policy and Life Cycle Cost Analysis Policy. In addition, Medford should create a Green Energy Procurement Policy, which could be utilized, as renewable energy sources become more readily available.

Only Energy Star® or Equivalent Purchases

The Energy Star® office equipment program was created in 1992 by the DOE and EPA to increase the energy efficiency of common office equipment. Energy Star® manufacturing partners voluntarily join this effort by agreeing to label products that meet stringent efficiency criteria. Many computers, monitors, copiers, fax machines and other devices on the market are Energy Star®-compliant, and as the program expands new products are being added to the list of labeled products, including televisions, VCRs and lighting fixtures.²⁵

Energy Star®-labeled equipment (which is designed to use energy more efficiently while in operation) contains automatic power management features that will reduce its power, or even turn itself off, after a period of inactivity. Priced comparably with conventional office equipment, Energy Star®-labeled equipment can save as much as 50-75 percent of total electricity use, depending on the type of device and usage patterns. This creates an opportunity for substantial operating cost savings and pollution prevention.²⁶

Because of these substantial projected savings in electricity costs, the City of Medford should require all new office appliances purchased for the City be Energy Star® or equivalent and should establish an Environmentally Preferable Product Program based on the program established by the Commonwealth of Massachusetts.

It is important to note that in order to be effective, Energy Star® products must have the specific energy efficient features active. The City of Medford should assign a member of the Data Processing Team to ensure that all computers and other office equipment with the Energy Star® logo are in the active mode. Additionally, the City could provide educational resources for its employees to train them on how to maintain the equipment in active mode and the benefits of doing so.

²⁵ City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

²⁶ Ibid.

2021 Review

In 2005, Medford passed an Energy and Resource Efficiency policy, which informed City employees of the need to use energy and other resources efficiently in order to minimize the cost of City operations for City taxpayers and to protect and preserve the natural environment and quality of life in Medford. This policy appointed all department heads as responsible for energy efficiency programs in their departments in accordance with the policy guidelines pertaining to lighting, office equipment, heating and air conditioning, and municipal vehicles.

Require Life Cycle Cost Analysis

Currently, many of the most efficient products on the market tend to have a slightly higher up front cost than the competition, but by looking at the overall costs of owning the appliance, typically the more efficient product will be cheaper. Life Cycle Cost Analysis will examine the overall costs of an item including the maintenance and energy costs along with the initial costs of the item. Utilizing Life Cycle Cost Analysis will ensure that the most energy efficient product for the job will be purchased and avoid the downfalls of going with the cheapest product that costs much more to maintain and operate.

The City of Medford should institute a procurement regulation requiring that Life Cycle Cost Analysis is evaluated before a major product purchase, such as computers, printers, copiers, etc., is made by any municipal department, including schools.

2021 Review

All purchases made by the City of Medford follow state procurement law. While there are no formal regulations requiring Life Cycle Cost Analysis, all Medford equipment is sourced according to the 2005 Energy and Resource Efficiency Policy. The city leases copiers that are then returned after three years. Other technical goods, such as computers, printers, etc. are bought by the city's IT Department.

The city frequently utilizes state contracts for procurement. The state incorporates a number of environmentally favorable terms and conditions for each item being procured.

Block Purchasing of Green Energy

With the deregulation of electricity in Massachusetts, consumers are free to choose their electricity provider. An option communities have is to pool together their electricity needs and engage in block purchases in order to save money. Additionally, electricity providers will be better able to provide green energy options, which draw electricity from renewable energy resources.

Local governments now have the opportunity to build a block purchasing group either within the City or with other cities to buy green power from electric utilities. Medford could consider working with the City of Somerville and/or Tufts University to create a block purchasing group for green energy. Additionally, the City could pass a resolution requiring the utilities to provide a certain percentage of renewable energy sources to Medford customers.

2021 Review

In 2003, the State of Massachusetts established the Massachusetts Renewable Energy Portfolio Standard (RPS), requiring retail electricity suppliers to purchase 1% renewable energy of the total electricity they serve in Massachusetts, which would increase by one-half percent each year until 2008 and 1% annually thereafter. For example, in 2020, the suppliers were required to purchase 15% renewable energy of the total electricity they serve in Massachusetts.

At the end of 2019, Medford launched its first municipal electricity aggregation program. Medford's aggregation program has a default rate of 5% more renewable energy than the state mandate. As with all municipal aggregation programs in MA the residents are enrolled by default and may choose to opt-out if they do not want to participate. There is also an option for residents to "opt-up" to 100% renewable energy. As of June 2020, the City has 82 accounts enrolled in the 100% local green energy, 16781 accounts enrolled for 5% extra local green energy. While 5% seems like a low number, this accounts for an additional 430,000 kWh of local green energy purchased by Medford residents during June 2020.

Increase Recycling Areas and Awareness

Although Medford has a strong recycling program, there are a few ways in which the City could further reduce waste. The only recommendation for the residential recycling is to increase individual recycling amounts through educational awareness programs. It may be

beneficial to involve school children so they can apply what they learn in school to what they do at their own homes.

Currently, municipal curbside recycling is not offered to commercial or industrial operations within Medford. Providing these sectors the opportunity to participate in local recycling with the City could ensure recycling within these areas. Another option to ensure recycling in these sectors is to create a by-law requiring all private haulers who service commercial and industrial sectors in Medford provide recycling services for their customers.

2021 Review

Citywide recycling programs:

In 2009, the City hosted its first-annual Harvest Your Energy Festival. Medford organizes electronic recycling programs as a part of the festival each year. Several community groups have started offering these programs multiple times a year.

In 2010 the city switched from curbside recycling to a containerized curbside recycling program where residents were limited to 64 gallons of trash each week and were given 96-gallon recycling totes. There is a charge if residents want to dispose of any additional trash. This program significantly increased the recycling rate of the City from 10% to 26% based on weight.

The city introduced a clothing recycling program with the help of Simple Recycling in 2018. With no charge to residents, they can put textiles and shoes in a bag provided by the company at the curbside on their recycling day.

The Department of Public Works (DPW) plays an active role in recycling awareness and education. Additionally, the DPW yard accepts recycled waste from community members.

School Initiatives:

In 2014, Medford schools launched a textile recycling program in partnership with Bay State Textile. The company contributes \$100 for every ton of textiles collected to schools for supporting student activities and programs.²⁷ During the 2019-2020 school year, the City also conducted a Zero Waste Assessment in Medford Public Schools to study the schools' waste streams and to recommend improvements for waste reduction and recycling.

²⁷ Ruppenthal, A. Wicked Local, (Oct, 2014). *Medford Schools Launch Textile Recycling Program*. from <https://medford.wickedlocal.com/article/20141030/News/141039956>. Nov, 2020

In 2019, Tufts University students conducted a composting study for the City of Medford. Since greenhouse gas emissions from waste are ~2% for Medford, diverting organic waste would not make a measurable impact on our greenhouse gas emissions. In addition, city-wide composting was found not to be cost effective.²⁸

Education and outreach:

Over the last two decades, the City of Medford has launched numerous city-wide outreach and educational campaigns. The Harvest your Energy Festival has played an integral role in Medford's outreach and education efforts. The festival educates and engages business owners and community members on renewable and energy efficiency programs, as well as on waste disposal through various informational tables.

SECTION VI: PROPOSED EMISSIONS REDUCTION MEASURES - COMMUNITY WIDE

The above proposed policies are the measures that the City places on itself to reduce municipal emissions. By initiating such programs, the municipal government can be a role model for the entire community. The City can encourage the local community to reduce the amount of electricity used by promoting numerous efficiency solutions. An array of products and services are available, including energy-efficient refrigerators, washing machines, and light bulbs; home energy audits; and heating, ventilation and air conditioning system tune-ups and new equipment purchase incentives. The following proposed policies are measures the City can take to encourage residents and the private sector to be more energy efficient within their homes and businesses and to reduce their own greenhouse gas emissions.

BUILDINGS:

Local Energy Efficiency Code-Residential

In an attempt to make residential buildings more efficient, the City should evaluate and pilot a few incentive programs which are aimed at encouraging residents to utilize energy efficient products, particularly Energy Star® products in the home. These incentives should apply to those residents who are building or remodeling energy efficient houses. These incentives may consist of reduced costs or priority consideration for permits for energy efficient homes. The City can develop a local energy efficient building guidebook-detailing the use of

²⁸ Tufts University, Dept. of Urban and Environmental Policy and Planning. (Spring 2019). *Organics Diversion in the City of Medford, Massachusetts*. Jan, 2020

insulation, double paned windows, compact fluorescent light bulbs, and other efficiency measures, as well as the use of renewable energy sources. Additionally, the guidebook should include where and how to obtain grant money for undertaking such efficiency upgrades.

2021 Review

The Mass Save Utility Program, in partnership with National Grid, conducts free home energy assessments and provides simple educational tools and information to the public. Mass Save also provides rebates and incentives to homeowners, renters, and landlords who qualify through their home energy assessment. Despite the number of energy accounts increasing by 69% between 2010 and 2018, there was only about a 37% increase in electricity usage in that time.²⁹

In 2013, the city partnered with Mass Save to promote their program and home energy assessments. In addition, the city launched Go Green Medford website to provide information to homeowners on various topics including but not limited to energy efficiency and promote the Mass Save program. The city has also developed social media accounts and promotes standard good practices rather than creating separate guidelines.

Local Energy Efficiency Code-Commercial & Industrial

To encourage energy efficiency and emissions reductions within the commercial and industrial sectors, the City could require all new commercial and industrial buildings meet strict energy efficiency standards. These standards should be detailed in the new City Building Code created through the acceptance of this Climate Action Plan (refer to Section IV of this report). To aid in the compliance of the new energy code, the City should develop a local energy efficient building guidebook-detailing the use of insulation, double paned windows, compact fluorescent light bulbs, utilizing renewable energy sources, and other efficiency measures. This guidebook should also contain information on grant money available to anyone who pursues such measures.

One possible requirement for new commercial and industrial buildings in Medford is the installation of a light-colored roof in order to lower energy costs in the summer from air conditioning. Additionally, each commercial and industrial building could be required to utilize a renewable energy source for at least one energy use: heating, electricity, or hot water, or for 35% of total energy use.

²⁹ Data Provided by National Grid

2021 Review

While this is a creative idea, having a building code that is different than the statewide code is not allowed in MA. In 2008 the state passed the “green communities act” which created the “stretch code” which was a stricter building code that individual municipalities could adopt. In 2010 Medford was one of the first communities in MA to adopt this new code. Over time the statewide building code has increased its energy efficiency measures such that in 2020 the stretch code is no longer more energy efficient than the base building code in MA.

The Mass Save Utility Program, in partnership with National Grid, conducts free energy assessments for commercial properties. Mass Save also provides technical assistance and energy services to business owners who are interested in reducing their energy usage. Energy services by Mass Save include rebates to upgrade electrical systems and lighting controls. The City saw a reduction of approximately 6% in commercial electricity usage from 2010 to 2018 even though the number of commercial accounts through that period increased by 38%.³⁰

Incentives for Energy Efficiency and Renewable Energy Sources

In order to encourage efficiency upgrades, the City could reduce the cost of a permit for remodeling or building which include measures that increase efficiency and consider renewable energy sources for buildings.

2021 Review

It is not clear if this idea was pursued by the previous staff. However, the current Building Department is considering this option. They are reviewing the financial impact and analyzing methods to make the process simpler for contractors and whether the city has the capacity to implement this action.

TRANSPORTATION:

Biker/Pedestrian Friendly Roads

The four greatest impediments for commuters choosing to bike to work are weather, distance, safety, and inadequate facilities for storage and changing at their destination.

³⁰ Data provided by national grid

Although the City does not have control over the weather or the distance a person commutes to work, it can work to ensure the safety of its bicycling community. One way to do this is provide more biker and pedestrian friendly roads. By adding more bike lanes in conjunction with road improvements the City can demonstrate its commitment to its bicycling community and to its goal of reducing its per capita vehicle miles traveled, thereby reducing overall vehicle emissions. Additionally, the City can make an effort to provide more bike racks throughout the downtown area and outside City Hall and other public buildings.

To encourage walking or biking among children, a “Walking Bus” program could be established through cooperation with the elementary schools. Such a program would allow parents to walk their kids to school. Those families that live closest to the schools their children attend would utilize this program. Similar programs have been initiated in other Massachusetts cities and have fostered strong parent-child relationships as well as created a greater sense of community when families walked together.

2021 Review

The city has been actively working to implement these recommendations in recent years.

Medford’s Bike Advisory Commission was formed in May 2013, with the goal of providing safety and utility to bikers in the city and encouraging greater use of bicycles. In 2016, the Bike Advisory Commission, with the assistance of the Office of Energy & Environment, released a Bicycle Infrastructure Master Plan.

In 2016, Medford adopted a Complete Streets policy which asserts that to the maximum extent practical, the design, construction, maintenance, and operation of all streets over which the city has control, will incorporate comprehensive and integrated networks of travel for people of all ages and abilities. The current policy is that when a Medford road is repaved or restriped, street amenities like crosswalks, bike lanes, and parking shoulders are added in accordance with our Complete Streets policy wherever practical.

Walk Medford, a local walking advocacy group supported by the Medford Board of Health also partners with Safe Routes to School to encourage pedestrian-friendly roads.

Walk Medford and the Safe Routes to School program periodically sponsor and support the Walking School Bus program.

The City periodically installs new bike racks at various locations in the City. To further promote biking and walking around the city, the city has been collaborating with Mass DCR and MassDOT on various shared use paths such as the Clippership Connector, which will connect Clippership Drive to Riverbend Park, passing under Interstate 93.

Alternative Fuel Buses/ Alternative Fuel Taxis

As the City is committed to creating a cleaner, healthier Medford, and as this Plan calls for the increased use of public transportation rather than personal vehicles, Medford will do all it can to encourage local transit and taxi operators to convert their fleet to cleaner fuel vehicles. The City is willing to provide educational tools as well as act as a liaison between transit and taxi operators and alternative fuel vehicle experts.

2021 Review

The city does not have a record of previous work done in this space. However, the city advocates for and supports electrification of public transit. For example, in 2018 the Mayor published an op-ed on electrification of public buses.³¹

The taxi industry has been disrupted by rideshare companies, such as Uber and Lyft. Taxi businesses that are still in operation are in strong competition with these rideshare companies and have less of an incentive to switch their cars to more expensive electric vehicles. Vehicles operated under Uber and Lyft are mostly personal vehicles and are thus difficult to survey.

Encourage Transit Use by Local Business

In addition to municipal efforts, the City could work with the commercial and industrial sectors to encourage them to provide incentives for employees to utilize public transportation. This will create a cleaner Medford, while educating local workers and increasing business for transit operators.

³¹ Burke. S. Narkewicz. D. Commonwealth Magazine (April, 2018). Mass. *Needs to move much faster on electric buses*. From <https://commonwealthmagazine.org/opinion/mass-needs-to-move-much-faster-on-electric-buses/>. July, 2020

2021 Review

Municipalities in MA have found that the best time to encourage businesses to provide incentives to their employees to utilize public transportation is when they are looking to expand their buildings or increase parking. Therefore, this is frequently incorporated into the Site Plan Review process. The Medford Community Development Board always requires a Traffic Study and when appropriate, will request a Transportation Demand Management (TDM) plan from the developer. TDMs frequently require incentivization of alternate modes of transportation.

The City of Medford houses many small businesses that have few employees. Unfortunately, providing incentives to employees for businesses of this size is often not financially feasible due to economies of scale. The City's largest employers, Tufts University and Lawrence Memorial Hospital, already have shuttle services for their staff.

The City has found that education alone is not enough of an incentive for businesses to provide incentives to employees to utilize public transportation.

City-Wide Trip Reduction Program

Motor vehicle usage in Medford accounted for 38% of community emissions in 1998. Out of this, personal vehicles were more than 21%. In an effort to reduce these amounts and to encourage the use of alternative modes of transportation among all residents of Medford, the City can foster and provide information to businesses to establish their own Trip Reduction Programs. These Trip Reduction Programs can follow the template established by the Municipal Employee Trip Reduction Program. The programs can consist of many alternatives to commuting as a solo driver, such as organizing and providing funding for carpools, vanpools, the use of transit services, bicycling, and walking. The goals of these types of programs is to alleviate traffic congestion, reduce energy consumption, and curtail vehicle emissions and air pollution to create a healthier workforce and downtown environment.

Additionally, businesses can participate in the proposed Zipcar program that the City may establish for the downtown area. Refer to Section IV of this report for further information on the proposed Trip Reduction measures to be taken for municipal employees.

2021 Review

The measures mentioned above rely heavily on where the workers reside. Oftentimes, workers' schedules and locations do not align well for workers to carpool. However, the City partners with other organizations to promote walking, biking, and other modes of transport. For example, the City created the Medford Bicycle Commission in 2013³² and collaborates with Walk Medford, a community group that focuses on improving walking conditions in Medford.

Even though the rise of rideshare programs, such as Uber and Lyft, has reduced the number of trips by personal vehicle, the number of cars overall has increased. It is difficult to measure the impact of rideshare and personal driving trends, as Uber and Lyft also provide interstate services.

As of 2020, the City has approximately 8 Zipcar locations in Medford. We have found that the demand isn't high enough in suburban neighborhoods to support significant penetration, even though the City has spoken with Zipcar on several occasions. The current Zipcar locations in Medford are concentrated on the Tufts Campus. In 2020, the bicycle version, shared bikes, is quite popular. There is a significant cost associated with installing new bike-share locations and the City is working on grants to bring Blue Bike locations, a bike-sharing company in the Boston region, to Medford.

COMMUNITY OUTREACH:

A community reduction target can only be reached through a commitment by the City to not only foster new programs and policies, but also provide thorough community outreach and education. There are three priority avenues which, after research and evaluation, the Energy Task Force believes would be ideal for the City to pursue in order to educate the community as a whole.

Public Education Campaign for the Environment

The City of Medford should conduct a public education campaign that educates the community on climate change and the impacts individual activities can have. A successful

³² O'Donnell, J. Patch. (Apr, 2013). *New Medford Bicycle Commission Members Selected.* from <https://patch.com/massachusetts/medford/new-medford-bicycle-commission-members-selected>. Nov, 2020

campaign will consist of mass mailings to residences and businesses, City events, and educational programming on local cable access television.

2021 Review

Over the twenty years since this report was released, there have been a number of education campaigns by the Medford Office of Energy and Environment on a variety of climate change topics. For example - Solarize Medford Program, Community Resiliency Building Workshop, Community Conversations about Climate Change, among others. Additionally, the city has partnered with the US EPA, MA MWRA, and MA DEP to circulate educational materials produced by those organizations.

The City of Medford's Department of Energy and Environment started a newsletter updating community members on upcoming events and the latest environmental initiatives in 2018. Between 2001 and 2009 the City hosted several educational fairs on environmental topics and in 2010, the City launched an annual event titled "Harvest Your Energy Festival" which brings together businesses, non-profits, schools, and community groups to educate the community on environmental and green topics in a fun setting, usually with live music, raffles, and food.

The Department of Energy and Environment prioritizes community engagement in its projects. Various community input and public meetings were employed during the development of Medford's 2019 Climate Change Vulnerability Assessment (CCVA). In July 2019, the City also held a public meeting for Medford's Climate Action and Adaptation Plan, which was also telecast on the local TV channel. As part of the Climate Action and Adaptation Plan, the City formed working groups of residents, staff, and local experts to learn about and provide insight into areas of the plan.

In 2020, due to the global pandemic, the committee has focused on contributing to the repository of environmental videos available through Medford's cable tv, also available online at <http://medfordtv.com/>.

School Curriculum

The Energy Task Force has researched several school curriculums on climate change and other environmental issues. The City should seek to establish a climate change program within the science curriculum for the elementary, middle, and high schools. The City is currently in possession of programs created by other agencies which can be used in this capacity. Additionally, Medford should foster the reformation of an Environmental Club

within the school system to provide a forum for environmental education and extracurricular activities.

2021 Review

The Massachusetts Department of Education sets the curriculum for science and technology for all Massachusetts public schools, which includes courses on environmental sciences and climate change. The Medford Director of Energy and Environment has been a strong advocate for climate education in Massachusetts public schools.

The Medford Public School environmental clubs have seen an increase in active participation and interest over the years and have organized various events, such as Play and Learn activities, to engage students in environmental education and awareness. Over the years the clubs have included the MHS Community Garden Club/Roots and Shoots at Medford and Curtis-Tufts High Schools, Outing and Environmental Club at Andrews Middle School. In 2013, the Center for Citizenship and Social Responsibility (CCSR) was established at Medford High School to allow students to collaborate on community development and environment-related projects. Since 2018, the CCSR has expanded to all Medford public schools. The 2019 Medford Plastic Bag Ordinance, which eliminates plastic bags from retail establishments throughout the city, originated from Medford High Schools' CCSR as did many other environmental projects and initiatives.

Partnering with Community Groups

The City of Medford and the Medford Energy Task Force should consider partnering with local community groups to conduct local events which provide information to residents and businesses on how to be more energy efficient and how to reduce personal greenhouse gas emissions. These partnerships will assist Medford in reaching its reduction targets as well as create a greater sense of community and responsibility among those involved.

2021 Review

The Office of Energy and Environment works in conjunction with various local groups and organizations such as Walk Medford, the Medford Family Network, the Medford Senior Center, and numerous others to promote various city programs and initiatives. Over the past 10 years, the City has organized the Harvest Your Energy Festival in partnership with these local community groups and organizations to raise awareness on the importance of energy efficiency and reducing GHG emissions. The City also hosts Green Awards at the Festival to reward the efforts of community members and organizations in energy efficiency and conservation.

The Medford Energy and Environment Committee, established in 2010, has taken on the work of the Medford Clean Energy Committee and the Medford Energy Task Force. It is comprised of residents and staff who work on energy and environment projects in Medford and assist with resident outreach.

Between 2010 and 2020, a large number of community organizations related to the environment have been started in the city of Medford (e.g. Trees Medford, Friends of the Mystic River, Mystic Valley 350, Friends of the Medford Community Gardens.)

The City of Medford also partners with organizations, such as National Grid, Mystic River Watershed Association (MyRWA), and the Massachusetts Bay Transportation Authority (MBTA), that operate within Medford to provide more resilient infrastructure and to reduce local emissions.

Encourage Neighboring Cities to Join CCP Campaign

As emissions of greenhouse gases understand no political borders, the City of Medford recognizes its commitment to reduce emissions can only go so far on its own. In addition to educating Medford residents and businesses, it will be important to encourage neighboring cities, such as Malden and Everett to join the CCP campaign. Medford is willing to take a leadership role in encouraging other cities in the metropolitan Boston area to recognize the climate change problem and to commit to reducing their own emissions. Neighboring Arlington and Somerville have already made the commitment to reduce greenhouse gas emissions by signing on to the CCP campaign in 2000 and 2001, respectively.

A considerable amount of land in Medford is owned by the Metropolitan District Commission (MDC). The City of Medford should also consider working with this entity to reduce their emissions, particularly in the areas of fleet and streetlighting. A number of streetlights in Medford are owned by the MDC and many of these are still mercury vapor lights. Conversion of streetlights to high-pressure sodium lights, conversion of fleet, and general education on climate change will be essential topics to introduce to the MDC for consideration on their property in Medford.

2021 Review

The City of Medford partners with other municipalities to advance climate change initiatives. For example, Medford takes part in multiple mayoral coalitions, including the Metro Mayors Coalition, the Global Covenant of Mayors for Climate and Energy, and the Climate Mayors. Medford is a founding member of the Resilient Mystic Collaborative, which is a voluntary partnership among 18 Mystic River watershed communities organized by the Mystic River Watershed Association. Medford is also a founding member of the New England Municipal Sustainability Network, which is a consortium of New England cities and towns that collaborate to build more sustainable communities consistent with the goals of the Global Covenant of Mayors. In conjunction with the Boston Metro Mayors, Medford has pledged to be carbon neutral by 2050.

The City of Medford also works collaboratively with the Commonwealth of Massachusetts on many environmental initiatives. The Massachusetts Department of Conservation and Recreation (DCR), formerly known as the Metropolitan District Commission (MDC), converted their streetlights to LED between 2015 and 2018.

SECTION VII: OTHER MEASURES

Hire an Energy Efficiency Coordinator

The City of Medford should strive to incorporate energy efficient measures throughout every department and facet of municipal operations. The City should consider hiring a full-time Energy Efficiency Coordinator (EEC) who will be charged with the following:

❑ **Maintain the emissions inventory**

The EEC must maintain the CCP software and conduct an emissions inventory update once a year. The EEC should receive copies of all heating and electricity bills for each municipal department in order to successfully quantify reduction measures.

❑ **Director of the Public Education Campaign for the Environment**

The EEC will be charged with organizing programs for the community in order to educate them on energy efficiency, the potential for renewable energy sources, and other issues

related to climate change. This will include integrating a climate change curriculum into the public school system.

□ **Head the Energy Task Force**

The EEC will be charged with heading the Medford Energy Task Force. The Task Force has already begun and should continue to conduct regular projects on energy efficiency within the City and host events throughout the City.

2021 Review

In 2009, the city was awarded a grant to hire a part-time Energy Efficiency Coordinator. After two years, in 2011, the position was made a permanent staff position. In 2013, the coordinator was promoted to the Director of the Department and hired a full-time Associate Environmental Agent to manage the environmental aspects of the department. The Director kept the responsibilities of the Energy Efficiency Coordinator in her scope of work.

The Office of E&E works in conjunction with the Medford Energy and Environment Committee (previously known as the Medford Energy Task Force) to reduce the city's GHG gases and on various other environmental programs. The Office of E&E also conducts various outreach campaigns aimed at educating the community on energy efficiency, renewables, and various city initiatives. The current Director is responsible for managing the execution of multiple environmental initiatives throughout the city, drafting municipal reports, maintaining Medford's GHG emissions inventory, conducting environmental studies, and maintaining relationships with relevant stakeholders. As the city's commitment to sustainability evolves, in 2020, the city merged the Office of Energy and Environment with the Office of Community Development and is in the process of creating an Office of Planning and Sustainability. The current administration plans to hire a facilities manager and is considering an energy planner as well.

Tree Planting

Urban forestry can serve as an effective measure to achieve substantial CO₂ reductions in addition to providing other social, economic and ecological benefits. Trees contribute to reducing CO₂ by sequestering carbon and mitigating the effects of urban heat islands. Strategic planting of trees can shade buildings and air conditioning units from the direct rays of the sun, thereby reducing electricity needed for air conditioning. Trees also provide shade for streets and parking lots (many of which are dark-surfaced and absorb heat), and the evapotranspiration from trees cools ambient air temperatures. Lowering temperatures

lessens the energy demand for cooling, which in turn reduces the burning of fossil fuels and the emission of CO₂ and other air pollutants. The City continues to demonstrate a proven commitment to urban forestry and tree planting.³³

In 1998, the City of Medford became a member of “Tree City USA”. This designation brings Medford official recognition from the Massachusetts Department of Environmental Management and the National Arbor Day Foundation as a City that places the management of trees as a high priority. In order to earn this title, a City must meet four standards: have a Tree Warden, a Tree Care Ordinance, a minimum budget of \$2 per capita, and the City must observe Arbor Day. The City of Medford maintains a forestry department of two people and the Tree Warden has been a City employee for over 30 years. The fiscal year 2001 budget for the Forestry department was \$337,155 dollars amounting to a per capita cost of \$6.05.

The California Energy Commission has estimated that on average, mature urban trees reduce the amount of CO₂ in the air by approximately 115 pounds per year. From 1990 to 2000, the City of Medford planted 2,625 new trees, leading to the sequestration of over 150 tons of equivalent CO₂ annually.

2021 Review

As of 2016, the City of Medford has expanded the Forestry Division of the Department of Public Works to include 3 full-time staff members, including a full-time Tree Warden, showcasing the strong commitment Medford has to public trees. In 2015, Medford’s Tree Warden was named “Tree Warden of the Year” by the Massachusetts Tree Warden and Forestry Association. For 23 years, since 1998, the City of Medford has been a member of and has continuously maintained its status as a “Tree City USA,” highlighting Medford’s commitment to the urban forest. In addition, Medford has also been awarded the “Tree City USA Growth Award” for past 10 years.

From 2010 to 2018, the City of Medford planted 800 new trees. To address climate change, the city has focused on increasing the diversity of tree species. In 2001, the city planted just 3 species: Norway maple, Bradford pear, and Purpleleaf plum. Now, the Medford plants approximately two dozen species of trees, including Red maple, Elm, Honeylocust, London planetree, Pink oak, and Tulip trees.

33 City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan. March.

In 2019, the city was awarded a grant for a Medford Canopy Improvement initiative, which will be used to plant new trees in areas of low tree coverage. The fiscal year 2020 budget for the Forestry department increased by 57% from 2001, further emphasizing Medford's commitment to urban forestry and climate change adaptation and mitigation.

In 2018, Trees Medford, was formed which comprises of residents that care about trees. Trees Medford has worked with the Medford's Tree Warden in obtaining grants to plant more trees and help educate the residents on the importance of trees in the city. The group has more than 100 members and advocates for City's trees.

The Tree Advisory Committee, a subcommittee under the Medford Energy and Environment Committee (MEEC), researched and produced a report that examined existing Massachusetts Tree Ordinances and provided recommendations including program ideas and a sample ordinance to help maintain and grow the existing tree canopy. The report was published on the city go green website under a new "Trees" category in 2020 for all to access. In addition, the MEEC also continues to educate the public and the Administration on the importance of trees in our environment and the benefits they provide.

2021 CONCLUSION

This document marks the 20th anniversary of the original Climate Action Plan 2001 and is intended to provide information on the city's progress regarding the proposed measures listed in the original 2001 plan. While the city has made significant progress in implementing some recommendations, others have either been outdated by new technologies, are no longer relevant, or are not economically/financially feasible.

The City is currently in the process of developing its Climate Action and Adaptation Plan which will consist of detailed Medford specific strategies and recommendations. It will be a standalone living document aimed to illuminate future climate action of the city and help Medford progress towards its goal and commitment of carbon neutrality, while creating an equitable and climate resilient community.