



# City of Creve Coeur, Missouri Phase 2 Climate Action Plan

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Sincerely,

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## Introduction:

The City of Creve Coeur has been a leader of clean energy and efficiency among local St. Louis communities. On April 14<sup>th</sup>, 2008, the City Council of the City of Creve Coeur unanimously passed a resolution endorsing the U.S. Mayors' Climate Protection Agreement. As part of this agreement the City is striving to meet or beat the greenhouse gas emission targets outlined by the Kyoto Protocol<sup>1</sup> and incorporate the following 12 strategies:

1. Inventory global warming emissions in City operations and in the community, set reduction targets, and create an action plan.
2. Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities.
3. Promote transportation options such as bicycle trails, commute trip reduction programs, and incentivize carpooling and public transit.
4. Increase the use of clean, alternative energy by, for example, investing in "green tags"<sup>2</sup>, advocating for the development of renewable energy resources, recovering landfill methane for energy production, and supporting the use of waste to energy technology.
5. Make energy efficiency a priority through building code improvements, retrofitting city facilities with energy efficient lighting, and urging employees to conserve energy and save money.
6. Purchase only Energy Star<sup>3</sup> equipment and appliances for City use, when possible.
7. Practice and promote sustainable building practices using the U.S. Green Building Council's LEED program or a similar system.
8. Make changes to the city's vehicle fleet including increasing the average fuel efficiency of municipal fleet vehicles, reduce the number of vehicles in fleet, launch an employee education program including anti-idling messages, and, if possible, convert diesel vehicles to more sustainable energy options.
9. Support and encourage Metropolitan St. Louis Sewer District (MSD) to evaluate opportunities to increase pump efficiency in water and wastewater systems, and recover wastewater treatment methane for energy production.

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<sup>1</sup> The Kyoto Protocol is an international agreement that aims at reducing carbon emissions by setting reduction targets for its parties.

<sup>2</sup> "Green tags" or as they are also commonly referred to Renewable Energy Credits (RECs) represent the ownership of the environmental benefits associated with renewable power generation

<sup>3</sup> Energy Star is a voluntary program from the EPA aimed at assisting individuals and businesses save money and protect the environment through energy efficiency

10. Increase recycling rates in City operations and in the community, including businesses and multi-family facilities.

11. Maintain healthy urban forests and promote tree planting to increase shading and to absorb carbon dioxide (CO<sub>2</sub>).

12. Help educate the public, schools, other jurisdictions, professional associations, and businesses about reducing global warming pollution.

Along with being a signatory of the U.S. Mayors' Climate Protection Agreement, in 2008 the City created the Climate Action Task Force, which led to a Phase I Greenhouse Gas (GHG) Inventory in 2008 and Climate Action Plan (CAP) in 2010. The 2010 CAP outlined several strategies aimed at curbing Creve Coeur's GHG emissions. In this initial plan much of the emphasis was placed on municipal operations. The strategies included performing an energy audit of government buildings, upgrading HVAC systems for government buildings, and organizing a staff green team. These strategies have resulted in the City of Creve Coeur seeing a marked reduction in energy usage and associated GHG emissions. Additionally, electricity and natural gas payments combined were essentially unchanged from 2005 and 2014, in spite of increasing utility rates.

The CAP envisioned a three phase program, starting with easily achieved strategies focused on government operations, then gradually expanding to include more ambitious strategies that involved the community at large. Thus, the Phase 1 plan was intended to familiarize the local government with reducing its own emissions, and to have a smaller impact on the community at large. The Phase 1 CAP set an ambitious goal of reducing GHG emissions by 20% by 2015 and by 50% by 2050. The City of Creve Coeur, Missouri Updated Greenhouse Gas Emissions Inventory for 2014 found that emissions from government operations have, indeed, been reduced by 20% from 2005 levels. In the community at large, however, construction added two million square feet of commercial space under roof between 2005 and 2014, making apples-to-apples comparisons impossible. However, adjusting for the additional construction, compared to business as usual projections for 2015, GHG emissions from the community at large have been reduced by 9%. Even though overall GHG emissions increased by 2,836 metric tons (mt) of CO<sub>2</sub>e from 2005, a per capita decrease was seen from 49.7 mt of CO<sub>2</sub>e in 2005 to 47.2 mt of CO<sub>2</sub>e in 2014.

Thus, the initial GHG emission reduction goal was met for city government operations, but not for the community at large. The best scientific information indicates that to avoid the worst effects of climate change, GHG emissions must be reduced 40-70% by mid-century.<sup>4</sup> Because technological progress is likely to make further reductions easier for Creve Coeur, the largest reductions should be loaded toward the end of the time period. Thus, this report recommends that Creve Coeur adopt new goals of reducing GHG emissions 10% by 2025, 20% by 2035, and 50% by 2050, all compared to 2015 GHG emissions. This amounts to an annual reduction of 8,544 mt of CO<sub>2</sub>e per year by 2025, and 13,670 mt of CO<sub>2</sub>e between 2025 and 2050.

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<sup>4</sup> *Fifth Assessment Report*, Intergovernmental Panel on Climate Change, published in 2014.

## Climate Change:

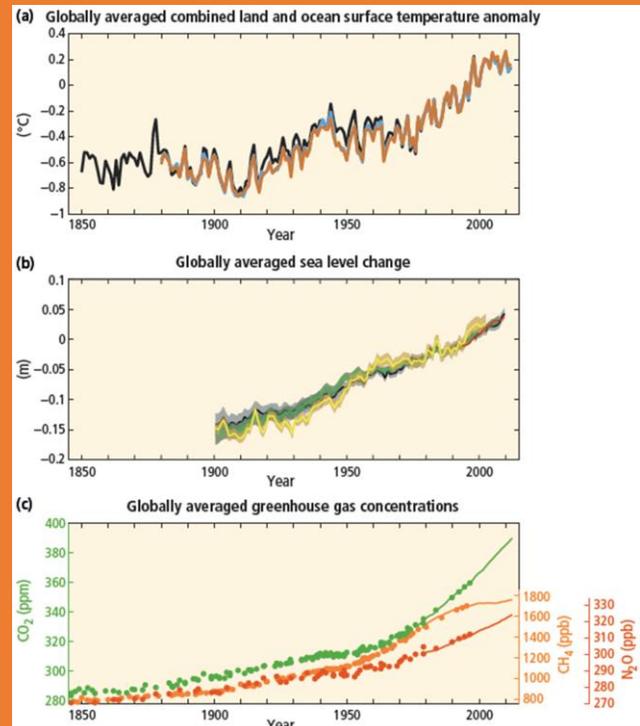
Human activities are causing vast and lasting changes to the Earth's atmosphere. Though scientific consensus is overwhelming many citizens are still skeptical of the immediate need for strategies to reduce greenhouse gas emissions that could help stem the alterations to the atmosphere and consequent climate change. However, if communities wait to take action until the worst effects of climate change are visible, it will be too late.

A report by the Risky Business Project identified the St. Louis Area as the Midwestern metropolitan area facing the highest climate risk due to its high summer temperatures and humidity levels. Some of the economic effects that could be experienced include increased energy costs and declines in labor productivity (Kate Gordon, 2015).

Increased demand for electricity will further tax an already aging and over-taxed electrical grid. Without improvements to the grid or alteration to the distribution of electrical energy, power outages may become more frequent and prolonged (Neumann and Price, 2009).

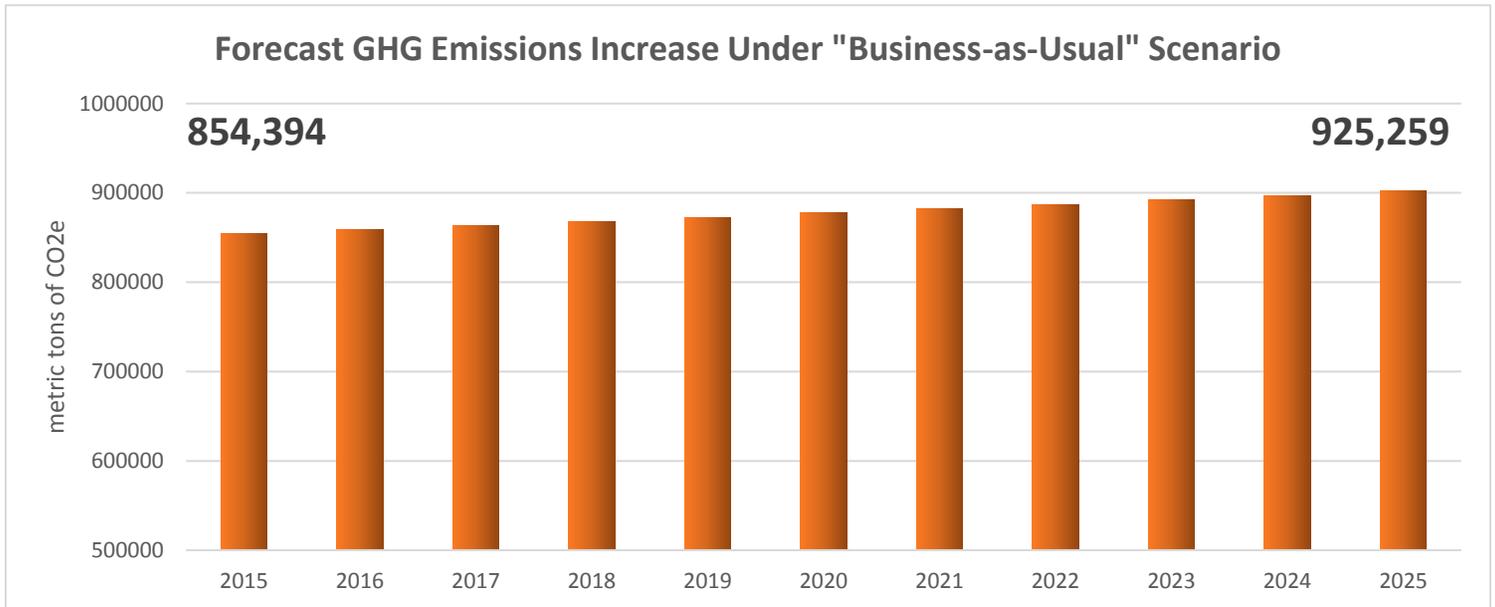
The human contribution to climate change is caused primarily by the emission of greenhouse gases from burning fossil fuel to create energy. Many strategies to reduce GHG emissions do so by reducing energy consumption or by substituting renewable energy for energy from fossil fuel. They are investments in our future. Sometimes the investment is expected to reduce or avoid future energy costs. Other times they are anticipated to generate returns related to the City's leadership position and ability to attract "the best and the brightest" to live and work here. And at times they are anticipated to generate returns related to health, welfare, social values, and quality of life. The City of Creve Coeur, Missouri, Updated Greenhouse Gas Emissions Inventory for 2014 estimated that the City's efforts to reduce GHG emissions were already saving \$2.8 million annually in avoided damages that would have been caused by the carbon emissions<sup>5</sup>.

Figure 1: Correlation of atmospheric gases and Earth's temperature



<sup>5</sup> Based on the per ton social cost of carbon as determined by the U.S. Government, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (May 2013)

## Forecast:



**Figure 2: Forecast GHG emissions for Creve Coeur by 2025**

Greenhouse gas emissions are expected to increase at the same rate as does population. Creve Coeur's annual rate of population increase is expected to be 0.08%. Thus, emissions are forecasted to increase by 70,865 metric tons of CO<sub>2</sub>e in the next 10 years (Figure 2). This is equivalent to adding 1,500 cars to road each year. Looking further out this “business-as-usual” scenario would result in 1,002,059 mt of CO<sub>2</sub>e emissions by 2035 and 1,126,815 mt of CO<sub>2</sub>e emissions by 2050. This is equivalent to burning approximately 1,500 railroad cars full of coal.

## GOALS:

The following recommended goals are an update and expansion of the goals set forth in the original Climate Action Plan.

1. Increase energy efficiency in the community as a whole and in government operations;
2. Increase the use of renewable energy in the community as a whole and in government operations;
3. Increase the use of alternative transportation in the community as a whole and in government operations;
4. Provide and encourage education on climate change, and on strategies to reduce energy consumption and GHG emissions.
5. Reduce waste in the community at large and in government operations;
6. Encourage the development of plans and strategies to create a resilient community to cope with and adapt to the changes that will occur as a result of climate change.

## Energy Efficiency:

### *Community Strategies:*

Commercial buildings are the single largest emitters of greenhouse gases in Creve Coeur (60% of all GHG). If emissions are to be reduced by any meaningful amount, then reducing their consumption of energy from fossil fuel must be priority.

### **Strategies:**

#### **Encourage participation in the national building benchmarking challenge:**

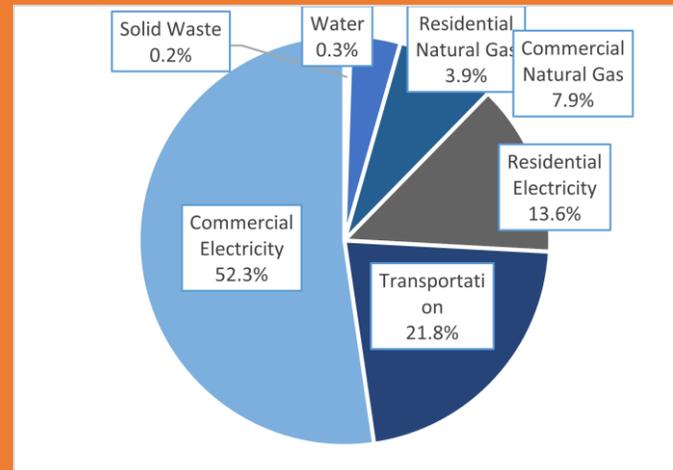
The past few years have seen a surge of governments, particularly of large cities, requiring large private buildings in their community to benchmark energy consumption. This benchmarking is typically done with a tool such as the ENERGY STAR Portfolio Manager, which

allows building energy consumption to be tracked over time and compared to the energy consumption of other similar buildings around the country. Benchmarking allows for better management of building operations and maintenance and allows building managers to more effectively consider energy efficiency when making their capital improvement plans. The Environmental Protection Agency (EPA) estimates that buildings that participate in energy benchmarking save 2.4% in annual energy through improved energy use.

**Commercial building upgrades & retrofits:** This report recommends that the City of Creve Coeur encourage commercial buildings to make energy efficiency retrofits and upgrades using two basic approaches. One is educational, and will be discussed below. The other involves incentives. Development of a program of incentives is beyond the scope of this plan, but could include zoning and building code trade-offs, permitting fee reductions or rebates, and expedited permit processing.

**Develop a program to encourage energy audits in small commercial and residential buildings.** Energy audits identify building systems that involve the greatest energy waste as well as building systems that can be upgraded or retrofitted economically. They are the essential first step of any retrofit or upgrade project. Three levels of energy audits have been identified. In increasing comprehensiveness they are walkthrough, general, and investment grade. Investment grade audits tend to identify the largest energy saving opportunities. In a large commercial building, an investment grade energy audit is a significant project. Most commercial building retrofits should begin with an investment grade energy audit, which should be incentivized by the City of Creve Coeur as part of the upgrade and retrofit incentive program discussed above.

Figure 3: GHG emissions percentage by sector



The largest single emitter of green-house gases in Creve Coeur is commercial electricity use.

Economically justifying comprehensive energy audits in small commercial and residential buildings may be more difficult. For this reason, this plan recommends development of a program of incentives to encourage them. The specifics of such a program are beyond the scope of this report. They could include, however, developing a referral list of state certified energy auditors, aggregating audits for buildings in Creve Coeur and contracting with approved energy auditors to provide the audits at a discounted price, zoning or building code trade-offs for buildings that obtain an audit and carry out the recommendations, or even development of an Energy Conservation Audit and Disclosure ordinance mandating that building sellers must conduct an energy audit and disclose it to the buyer.

**Developing financial incentives for energy efficiency and clean energy:** Properly conceived and executed energy efficiency and clean energy projects have a moderate return on investment. While it is larger than the return on most bond investments, the immediate cost of the project coupled with its moderate return over time may not be sufficient to capture the interest of building owners. To help businesses and residents invest in energy efficiency, the City of Creve Coeur could adopt any of a series of financial programs to encourage energy efficiency:

- **Clean energy financing programs.** The returns on energy efficiency and clean energy programs are moderate, but reliable. They are ideal candidates for financing programs in which the cost of the financing is paid out of the energy savings they achieve. Because returns are moderate, the payoff period of such loans can be five years or more, making it advantageous for the financing program to attach to the property rather than the individual if the property is sold. A variety of clean energy financing schemes exist, including financing by energy service companies, bank loans, and Property Assessed Clean Energy (PACE) programs. A PACE program is a program in which energy efficiency and clean energy projects are bundled together by a PACE authority. The authority sells a bond in the aggregated amount. The proceeds from the sale of the bond are distributed to the property owners in the form of loans to do the energy efficiency and clean energy projects. The property owners pay off the loans from their energy savings, keeping any additional savings for themselves. However, unlike a traditional loan, which attaches to the individual, the PACE loan attaches to the property and is paid as a form of property tax. This means it runs with the property should the property be sold before it is paid off. Properly designed PACE projects provide sufficient savings to pay the debt service on the loan and provide a return to the property owner. After the loan is paid off, all savings accrue to the property owner.

In order to be economic, energy financing programs must aggregate a sufficient number of projects to make the process efficient. Creve Coeur is not a large enough city to aggregate sufficient projects. Thus, it would need to participate in financing programs operated by others. Each program has its own specific advantages. Exploring which is the best fit for Creve Coeur is beyond the scope of this plan. However, participating in one or the other would be one way the City could help make energy efficiency and clean energy projects affordable.

Alternatively, there are various forms of private funding for energy efficiency projects through private third party financing companies that are available for building owners. These companies often work through contractors that arrange financing for the customer and the contractor or financing company is paid over time through the energy savings.

- **Fee reductions:** The City of Creve Coeur collects a variety of permitting fees related to properties. Though not a large fraction of building or project costs, on some projects the fees can aggregate to a significant sum. The City could develop a program of permitting fee reductions for projects that include energy efficiency and clean energy projects. The City could include expedited processing as part of the program.
- **Zoning incentives.** It is common for cities to negotiate zoning incentives with property developers in order to secure goals related to public welfare that may not be directly covered by zoning or building codes. The City of Creve Coeur could use zoning incentives to secure energy efficiency or clean energy features in new construction and significant renovations. The City of Creve Coeur is currently looking at incorporating zoning incentives into its updated Comprehensive Plan.

<b>Table 1: Ordinances for Energy Efficiency Financing:</b>	
<ul style="list-style-type: none"> <li>• PACE</li> <li>• Building benchmarking</li> <li>• Tax break/penalty to comply</li> <li>• Fee reduction</li> <li>• Expedited processing</li> <li>• Zoning incentives</li> </ul>	15-25% reduction in energy use resulting in a reduction of <b>10,000 to 17,000 mt of CO<sub>2</sub>e</b> <sup>67</sup>

**Updating the IECC code:** The lifespan of a typical building is 50-60 years. Inefficient building construction leads to higher energy bills over the life of the building resulting in decades of increased costs that far exceed the cost of energy efficient construction. Because the building stock transforms slowly, the IECC building codes will not result in an immediate large reduction in building-related GHG emissions or energy consumption. However, if kept up to date, they will ensure that future construction will produce energy efficient buildings, and large energy and GHG reductions will be achieved over time. The City of Creve Coeur should review and adopt updated versions of the IECC as part of its regular code updating process.

*Leaders in the Community:*

Much “buy in” will be required from the commercial sector to realize these emission reductions. Strategies to educate the community and encourage participation will be discussed under "Education" below. However, many commercial entities within Creve Coeur are already taking a closer look at their energy expenditures and realizing the savings available from energy efficient practices. Though by no means comprehensive, examples might include:

The Danforth Plant Sciences Center- HVAC and boiler upgrade

<sup>6</sup> Estimated reductions based on average energy efficiency projects from a variety of energy efficiency resource site (ex: EPA, ACEEE, MEEA), as well as data from local energy efficiency contractors

<sup>7</sup> Reductions based on 10% participation by Creve Coeur community

- The Danforth Plant Sciences Center has implemented energy efficiency measures including conversion of water boiler system and recalibrating HVAC airflow system
- These changes have resulted in approximately 50% decrease in energy usage

Missouri Baptist University- Lighting conversion to LED

- The university converted 1,542 fluorescent fixtures to high efficiency LEDs
- The return on investment of this lighting retrofit is expected to be less than one year

### *Government Strategies:*

The City of Creve Coeur has been a leader in implementing energy efficient practices in their buildings.

For several years the City implemented energy efficiency strategies on an ad hoc basis. In 2013 the City procured an energy audit and has used its recommendations to guide its energy efficiency efforts since then.

These practices have reduced emissions by 14% and saved the city \$40,000 in utility costs for 2014. These changes not only resulted in annual savings, they also created a more sustainable environment for current and future citizens of Creve Coeur.

At this point, the City has initiated numerous energy efficiency strategies. The next steps for the City should focus on periodically monitoring city operations and promoting energy efficiency strategies within the community.

**Require "Green" certification of new buildings:** Buildings that are energy efficient result in greater energy savings over the life of the building. Energy efficient buildings also help utilities better handle demand during peak hours. In addition to energy efficiency, "green" buildings provide a healthier, more comfortable working environment. At the time of this writing, the City is considering a new Police Department building and either a new Government Center or a renovation of the existing Government Center. Two types of green certification are available. The first involves the overall environmental impact of the building. A variety of green building certification schemes exist, however the U.S. Green Building Council's (USGBC) Leadership in Energy & Environmental Design (LEED) program is the best-known green building certification system, with more than 13.8 billion square feet of building space certified. The second kind of certification involves energy efficiency. The U.S. Department of Energy's Energy Star certification is available to buildings that achieve a certain level of energy efficiency, with more than 25,000 properties certified. The City of Creve Coeur could adopt a policy requiring both certifications for new government buildings and for significant renovations of existing buildings.

**Building Benchmarking coupled with periodic reports to City Council:** Benchmarking would allow the city to better manage building energy use and better target energy inefficiencies. The past few years have seen a surge of governments, both state and local, requiring regular benchmarking of energy performance in their own buildings. The most commonly used tool is the U.S. Department of Energy's ENERGY STAR Portfolio Manager which allow for tracking of energy consumption over time and for comparisons of performance to other similar buildings around the country. Tracking with Portfolio Manager is required to achieve ENERGY STAR certification, discussed above.

<b>Table 2: Government Building benchmarking (Assumes a 2.4% reduction in improved annual energy use)</b>			
Estimated total potential annual emissions reductions (mt of CO2e)			<b>53</b>
Buildings	Government Center	Dielmann Rec Complex	Public Works Garage
Emissions Reductions (mt of CO2e)	<b>20</b>	<b>29</b>	<b>4</b>

## Renewable Energy:

### *Community Strategies:*

The access to renewable energy sources is key to creating a sustainable and carbon neutral society. Energy efficiency is the most cost effective strategy for reducing GHG emissions. However, in today's world, humans require energy to support our lives and our economy. Thus, it will not be possible for Creve Coeur to achieve the deep reductions in GHG emissions that are needed without access to renewable energy.

The City of Creve Coeur has been an EPA Green Power Partner since 2012. As part of this commitment the Creve Coeur community at large committed to purchasing at least 3% of its electrical energy from renewable sources. This amounted to approximately 15 million kWh from renewable energy for 2014. Most of this energy was acquired by purchasing Green-e certified renewable energy credits through Ameren Missouri. The city has also granted building permits for rooftop solar array installation amounting to 872 kW of solar energy production in Creve Coeur.

Because commercial buildings are the largest consumers of electrical energy, encouraging them to source energy from renewable sources should be a primary focus.

### **Strategies:**

**Purchase additional renewable energy credits:** Currently the Creve Coeur community is sourcing 3.2% of its electrical energy from renewable energy sources. Increasing the purchase of credits would result in an immediate offsetting of carbon emissions. Purchasing renewable energy credits is among the easiest strategies for increasing consumption of renewable energy. Creve Coeur should continue its participation in the Green Energy Challenge, and should periodically engage in public events and educational campaigns that promote the use of renewable energy.

<b>Table 3: Increase in renewable energy credits (RECs) purchased by community</b>			
Percent increase in RECs purchase	50%	100%	150%
Percent of total energy purchased	4.8%	6.4%	8.0%
Annual kWh	23,085,192	30,780,256	38,475,320
Estimated annual emissions reductions (mt of CO2e)	<b>7,000</b>	<b>9,333</b>	<b>11,667</b>

**Solarize Campaign:** Purchasing renewable energy credits may be the easiest renewable energy strategy, but it adds cost to the energy bill without providing a payback, except by avoiding future damage from GHG emissions. In addition, it does not provide a physical asset that can be seen by the public to serve

as a symbol of the city's commitment to renewable energy. For those reasons, Creve Coeur may want to develop renewable energy assets that provide a payback and have a physical presence inside the city.

Solar energy is a renewable energy well-suited to the St. Louis area. The city of Creve Coeur should review its codes and ordinances to ensure that building owners who want to install solar energy systems, whether residential or commercial, are not constrained from doing so by zoning restrictions, outdated building codes, or neighborhood covenants. The city should encourage commercial buildings to consider rooftop solar as they provide a greater area with minimal shading.

However, a national study found that only 22-27% of residential roofs are suitable for PV arrays. One option would be to establish a larger community installation, often called a "solar garden," which would sell some or all of its power to Creve Coeur residents. As Missouri is a regulated market for utilities a third party cannot at this time install and sell energy from a solar garden that supplies solar power to its customers. For this reason the most likely scenario would be for the local utility (i.e. Ameren Missouri) to install and operate the array. Ameren Missouri has made just such an installation at the O'Fallon Renewable Energy Center in O'Fallon, MO. To develop a solar garden, the city would need to locate a suitable tract of land and work with community partners to build the solar garden and sell its power to Creve Coeur residents. The table below estimates the emission reductions of a 1MW array.

<b>Table 4: Solarize Campaign</b>	
Estimated total potential annual emissions reductions (mt of CO <sub>2</sub> e)	<b>900<sup>8</sup></b>

### *Leaders in the Community:*

Several members of the Creve Coeur community have made significant commitments to renewable energy:

DeSmet Jesuit Academy- 100kW PV array

- In July of 2014 four 25kW arrays were installed on the roof of the DeSmet Jesuit Academy
- This is the largest single solar array in Creve Coeur

Monsanto- RECs in community

- Monsanto contributes the largest percentage of renewable energy credits (RECs) within Creve Coeur

### *Government Strategies:*

As part of the Green Power Challenge, the City itself purchased 396,000 kWh of renewable energy in 2014. This amounts to 14% of the total electrical energy used for city operations.

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<sup>8</sup> Electricity generation and subsequent emissions were calculated using the PVWatts<sup>®</sup> calculator from the National Renewable Energy Laboratory

In addition, the city also placed a 25kW array on the roof of the Dielmann Recreation Complex. Since coming online in August of 2014 the solar array has generated approximately 35,000 kWh of electricity for the city.

**Strategies:**

**Installation of additional solar power on city facilities:** The City of Creve Coeur has installed a trial 25kWh array on the Dielmann Recreation Center. The city should establish a goal of procuring 30% of its electricity from renewable energy by 2035. This does not have to come completely from on-site installations but could also be purchased from the larger community solar discussed in the Community Strategies section. The city is considering constructing a new police building and renovating the city government center. Incorporating solar arrays into the designs for those buildings would be a natural step in implementing this strategy.

<b>Table 5: Emissions avoided from additional renewable energy procurement</b>	
Two 25 kWh solar arrays on new/renovated government buildings	48 mt of CO2e
30% of electricity for municipal operations coming from renewable sources	690 mt of CO2e

**10% RECs increase:** Currently the City of Creve Coeur purchases 15% of its electrical energy in the form of renewable energy credits. Increasing the purchase of RECs from 15% to 25% would result in immediate offsetting of carbon emissions (Table5).

<b>Table 6: Increase purchase of RECs offsetting Government electricity</b>	
Current RECs (kWh)	396,000
Current RECs % of Government electricity	15%
Potential increase in RECs purchase	25%
Estimated annual emissions reductions (mt of CO2e)	<b>455</b>

## Alternative Transportation:

### *Community Strategies:*

Emissions from vehicles account for 22% of Creve Coeur's greenhouse gas emissions. Strategies that encourage alternative modes of transportation (walking, bicycling, mass transit) would not only reduce GHG emissions, they would bring other benefits to the citizens of Creve Coeur, such as safer roads, increased air quality and better health.

**Strategies:**

**Pedestrian connectivity:** The 2002 Comprehensive Plan calls for the city to design and create a comprehensive community wide network of off-street and on-street connections for pedestrians. The plan also calls for the city to require new development to include public amenities, including pedestrian connections and bicycle facilities. These efforts should be continued and given a high priority.

**Bikeway plan:** The 2002 Comprehensive Plan calls for the city to develop a Bikeway Plan as part of the Pedestrian Plan. The city should work with a local partner (for instance, Trailnet) to develop such a plan and implement it.

**Multi-modal streets:** The 2002 Comprehensive Plan calls for the city to promote the design of multi-modal streets that provide safe and efficient mobility for automobiles, bicycles, and pedestrians. In some locations, street modifications have been accomplished, for instance along Olive Boulevard west of I-270. The city should continue its efforts to create multi-modal streets. Since 2002, however, several street design ethics have gained national attention that not only promote safety for multiple transportation modes, but also address other concerns such as stormwater runoff. The most well-known of them is called "Complete Streets." The city should explore the adoption of Complete Streets or a similar design ethic as part of its comprehensive plan update (Table 7).

<b>Table 7: Multi-modal streets program (based on 5% participation)</b>			
Avg. vehicle fuel efficiency (mpg)	23.8		
Est. population of Creve Coeur	17,000		
No. of weekly VMTs avoided	1	3	5
Total weekly gallons of gasoline avoided	36	108	180
Estimated annual emissions reductions (mt of CO <sub>2</sub> e)	<b>16</b>	<b>48</b>	<b>80</b>

**Carpooling program:** Work with a local transportation or carpooling partner to develop a carpooling program for businesses in Creve Coeur (Table 8).

<b>Table 8: Carpooling program (based on 5% participation)</b>			
Avg. vehicle fuel efficiency	23.8		
Est. commuting population of Creve Coeur	28,000		
No. of daily commute VMTs avoided	4	10	20
Total daily gallons of gasoline avoided	235	588	1,176
Estimated annual emissions reductions (mt of CO <sub>2</sub> e)	<b>460</b>	<b>1,150</b>	<b>2,300</b>

### *Leaders in the Community:*

The Parkway School District has been a leader and staunch advocate for sustainability in the community for many years. The district could be included in all six of the goals set forth in this report. The district serves as an example of how large organizations can effectively implement sustainable practices.

Parkway School District has integrated CNG fuel into its bus fleet

- Currently Parkway Schools operate 30 CNG buses out of its 150 bus fleet
- The school district will continue to convert to CNG as older buses are replaced

### Government Strategies:

Transportation-related emissions from government operations come from two main sources: emissions by vehicles in the city fleet (primarily police and public works) and emissions for vehicles used by employees in their daily commute. In both cases, reductions in energy consumption and GHG emissions are accompanied by reductions in energy costs. Further reductions can be accomplished by substituting alternative fuels for gasoline and diesel, by reducing vehicle miles traveled, and by continuing the transition from gas guzzling vehicles to fuel efficient vehicles.

### Strategies:

**Alternative fuel sources:** CNG vehicles have several advantages over gasoline and diesel vehicles: CNG costs less per mile travelled, it emits 20-45% less smog producing pollutants, and 5-9% fewer GHG emissions. The city government has researched the feasibility of establishing compressed natural gas fuel stations within Creve Coeur. In addition the capital cost associated with building a CNG plant cannot be justified with the current usage of CNG in the community. However, future demand might become more favorable towards CNG, especially if local businesses express interest. In addition, if a fueling station could be established in cooperation with a consortium of nearby local governments, all of which contract to purchase fuel from the station, then affordability might improve.

The following table represents the savings that would be possible by converting the Public Works gasoline vehicles to compressed natural gas (Table 9). The difference in fuel consumption reflects the greater efficiency of CNG fuels<sup>9</sup>. At the time of this writing the price for CNG was \$1.99/gasoline gallon equivalent (GGE)<sup>10</sup>.

<b>Table 9: Explore Alternative fuel sources for Public Works fleet vehicles</b>			
	Annual Fuel Consumption	GHG emissions (mt of CO2e)	Cost (\$)
Gasoline consumption	8,325 gallons	44	\$24,847
CNG equivalent	6,926 GGE	36	\$13,784

**Employee Carpooling Campaign:** The city government could develop an employee carpooling program. Such programs typically involve a central registry that connects potential users with each other. The city could follow up with a program of incentives or contests to reward and encourage participation. Table 10 illustrates the emissions reductions of half the city staff participating in a ride sharing programming.

<b>Table 10: Promote employee carpooling/ride sharing</b>	
Emissions reduction (mt of CO2e)	<b>218</b>
Annual gallons of gasoline	24,530
Annual savings to employees	\$51,513

**Anti-idling campaign:** Engine idling consumes fuel and emits greenhouse gases. In addition, it emits other pollutants and increases engine wear and tear. Between 5-10% of vehicle fuel use occurs during idling, and hence, a similar proportion of GHG emissions. Most idling episodes are brief. However, some

<sup>9</sup> Based on fuel conversion table by the California Energy Commission; <http://energyalmanac.ca.gov/transportation/gge.html>

<sup>10</sup> <http://www.cngprices.com/stations/CNG/Missouri/St-Louis/>

vehicles (trucks, construction equipment, etc.) may be allowed to idle for longer periods of time, increasing the fraction of fuel use and GHG emissions attributable to idling. The City of Creve Coeur should develop and conduct an anti-idling campaign for operators of its vehicle fleet. In addition to directly reducing GHG emissions, an anti-idling campaign would have the effect of demonstrating to its employees the city's commitment to reducing GHG emissions.

## Reducing Waste:

While greenhouse gas emissions from waste and associated activities contributed little to overall emissions in Creve Coeur, promoting waste reduction is an essential element of sustainable communities.

### *Community Strategies:*

#### **Strategies:**

**Trash service:** Under the current contract residents will pay for the valet component of the trash service. The city has already seen a significant drop in valet service from 40% to 18%. This results in fewer GHG emissions from idling trash trucks. Currently, the residents may choose from three sizes of trash totes. The city, in the future, might consider other programs aimed at reducing the amount of trash produced by residents such as composting (discussed below) programs.

**Increase composting of local waste:** Much of the refuse taken to the landfill is compostable waste. This should be encouraged not only for the local residents but also some of the businesses where food is a major waste product (ex: grocery stores and restaurants). As mentioned below the Parkway School District has successfully partnered with local composting organizations to collect and remove the waste. The city might want to explore options into large scale community composting. Many major cities have implemented curbside composting for residents, this might be easily incorporated into Creve Coeur's successful yard waste program. The city yard waste sites might be ideal locations to consolidate organic waste from the community and partner with a composting organization to remove the compostable food waste.

### *Leaders in the Community:*

Parkway School District

- 500 tons of waste is composted annually in partnership with Total Organics Recycling/St. Louis Composting
- Much of the tableware used in the schools is compostable

### *Government Operations:*

#### **Strategies:**

**Monitor current waste reduction:** In July 2015, the City of Creve Coeur changed its waste service. This was done to decrease waste going to the landfill and increase recycling. The effectiveness of this effort should be evaluated as data becomes available. Included in this should be the effect of conversion from any of the trash pickup vehicles from diesel to CNG.

#### **Implementation:**

- Monitor effectiveness of new waste program (Green Team, EEC)
- Promote composting among residents and businesses that produce the largest quantity of compostable waste.

## Education:

As Creve Coeur implements the various initiatives that will put this plan into effect, it will be necessary to inform the public about them. Thus, Creve Coeur will need an ongoing climate action public education campaign. The current government website offers information on a variety of environmentally friendly practices. This however, needs to be expanded upon with community outreach campaigns.

## *Community Strategies*

### **Strategies:**

**Creve Coeur Sustainability Campaign:** Beginning in 2016 the City of Creve Coeur's Energy and Environment Committee began to offer informative meetings aimed at curbing energy inefficiency for residents and businesses. Information regarding cost effective strategies that range from simple to complex to reduce energy use and GHG emissions is widely needed to counter any misinformation.

**Website update:** Creve Coeur's website offers environmental tips and information on reducing GHG emissions on its website. The information on those pages is several years old and is no longer accurate. As part of the sustainability campaign discussed above, the city should update this information regularly.

## *Leaders in the Community:*

Dr. Joseph Martinich- 2016 Sustainability Campaign

- In early 2016 Creve Coeur resident Dr. Joseph Martinich, Founders Professor of Logistics and Operations Management at the University of Missouri- St. Louis, conducted information sessions on a wide range of energy and waste reduction methods

## *Government Strategies:*

Though often overlooked, strategies to organize city staff, educate them, motivate them, and reward them are among the most important strategies of all. The reason is that there are hundreds, if not thousands, of sustainability practices, and no planning process can identify or evaluate them all. Creve Coeur will have to rely on its staff to identify and implement strategies to reduce GHG emissions. Unless staff is organized around sustainability, educated, motivated, and rewarded, Creve Coeur is unlikely to achieve its GHG reduction goals.

### **Strategies:**

**Regular municipal green team meetings:** A green team is team of city employees who meet to create, evaluate, coordinate, and implement sustainability strategies. The requirements of a successful green team are that it be chaired by somebody who is held responsible for its success, that it have a clear mission, that its members be committed to improving the sustainability of government operations, and that members be in positions to actually influence city operations.

Many sustainability experts consider the establishment of a functioning green team to be the single most important sustainability strategy any organization can pursue. Creve Coeur established a green team a few years ago; it does not meet regularly, however. Creve Coeur should reinvigorate its green team, give it a clearly defined mission, and hold it responsible for meeting regularly and continuing to accomplish its mission.

**Incentivize "green" practices:** City employees are the city's greatest resource for developing green ideas. To tap this resource, Creve Coeur would need to develop a program through which green ideas can be submitted to the green team, and through which successful ideas can be acknowledged and incentivized.

**"Green" recognition:** Creve Coeur should develop a program to recognize employees that are practicing or promoting "green" policies during monthly administration meetings.

**Review the green purchasing plan:** In 2009, Creve Coeur became one of the first municipalities in the region to implement a green purchasing policy. At the time, the policy intentionally gave considerable leeway to purchasers in deciding whether to pursue a green purchase or a more standard purchase. Creve Coeur has now been implementing this green purchasing policy for six years, and it is an appropriate time to review it, determine its strengths and weaknesses, and determine where and how it needs to be amended.

## Adaptation:

While it is of utmost importance to reduce the amount of greenhouse gases emitted into the atmosphere there is overwhelming consensus that we are beginning to see, and will for the foreseeable future continue to see, the effects of global climate change. For this reason, it is important for communities to implement strategies aimed at mitigating climate change's effects. It is only in recent years, however, that scientific information has begun to emerge in sufficient detail to allow for such planning in our region. For the Midwest, and the St. Louis area in particular, the direct effects include hotter summer days, warmer winters, more severe and acute rain events that could lead to flooding, and longer dry periods between the rains. Combined, these direct effects are likely to have some or all of the following secondary effects:

- a greater number of extremely hot days during summer, with an accompanying increase in heat-related illness and death, and a decrease in work productivity;
- a decrease in air quality, with an accompanying increase in respiratory illness;
- a decrease in water quality during hot periods due to low oxygenation and the growth of algae and other microorganisms;
- an increase in water demand during hot summer months;
- an increase in insect pests, including those that vector diseases;
- an increase in electricity demand during hot summer months, with an accompanying increase in electricity outages and interruptions;
- an increase in heat-related maintenance costs, such as equipment overheating and road buckling;
- a decrease in heating demand during the winter months;
- a decrease in cold-related maintenance costs such as pipe freezing and snow removal;
- possible changes in food availability.

Until these threats become clearer, and specifically how they will affect Creve Coeur, it is not possible for the city to take extensive action. However, a few general strategies can be pursued. Having a diverse plant community could help mitigate some of the effects of climate change. Plants also actively reduce the concentration of atmospheric carbon dioxide, a greenhouse gas. Plants also provide additional benefits to the community, these include: increasing property values, lower utility costs and increasing quality of life.

### *Community Strategies:*

#### **Strategies:**

**Strengthen the electrical grid:** Modern life is heavily dependent on the energy grid. Weather events over the past few decades have taught us that when the grid goes down, our ability to function normally is seriously disrupted. Creve Coeur does not have control over the grid, and it is regulated at the state and national level. However, the city is in a position to speak for its residents and advocate for a strong, resilient grid. In addition, local renewable energy systems, such as rooftop solar and solar gardens, have the potential to provide some power should a catastrophic failure occur on the grid. Creve Coeur should advocate at the state level for a strong, resilient grid. It should encourage local renewable energy systems, and see that they are designed to function as partial backups in the event of a grid failure. This would include the advocacy for micro-grids that have the potential to operate independent of the grid.

**Harden city infrastructure:** Creve Coeur should convene a task force to study how climate change is likely to impact infrastructure owned by the city, and how it should be hardened.

**Heat emergency plan:** Creve Coeur should develop and keep updated an emergency plan to cope with heat emergencies. The plan should have such factors as establishing emergency cooling shelters, identifying those in need of emergency services, determining whether they need medical or cooling attention, and transporting them to medical facilities and/or cooling shelters.

### *Government Strategies:*

One of the City of Creve Coeur's points of pride is the amount of green space. The City has been certified a Tree City USA by the Arbor Day foundation since 1997 and recently completed a tree inventory which will help maintain a diverse tree population. While Creve Coeur has made many strides in creating a verdant community many improvements are possible.

#### **Strategies:**

**Urban ecosystems modelled after SITES:** SITES is a rating system that assesses the design, construction and maintenance of landscapes. The goal with these landscapes is to create ecologically resilient communities. Among some of the benefits are a suite of ecosystem services including: flood mitigation, water quality improvement and erosion control.

The city is currently developing a residential storm water ordinance aimed at mitigating storm water. This involves a buffer zone along creeks where no disturbance is allowed. These locations would be ideal for diverse urban ecosystems. In addition, city parks have implemented different plantings such as rain garden and swales that provide varied ecosystem services. While these practices are individually beneficial the city could move towards a more extensive and wide-reaching plan aimed at encouraging the implementation of SITES based ecosystems where applicable.

**Provide native planting habitats for pollinators including the Monarch butterfly:** This strategy works in conjunction with the previous one. High functioning urban ecosystems have the added benefit of providing habitat for fauna including native pollinators. Currently, native pollinators are facing marked declines in population and these declines are having, previously unforeseen, effects on plant communities. City committees and departments, including the Horticulture, Ecology, and Beautification Committee, the Stormwater Committee, and the Planning and Zoning Commission, the Public Works Department, the Community Development Department, and the Recreation Department should be charged with developing plans to adapt city infrastructure and property to the effects of climate change.

## Conclusion:

Since 2008, when it completed the first greenhouse gas inventory in the St. Louis Region, Creve Coeur has been a sustainability leader. The completion of the Updated Greenhouse Gas Emissions Inventory for 2014 and the adoption of this climate action plan, Creve Coeur reaffirms that it remains a sustainability leader in the St. Louis Region. History shows that when the people of Creve Coeur unite and put their hearts and minds behind a task, they can accomplish great things. Climate change will require the city's best efforts, for its own welfare, and for the welfare of the world.

Energy Efficiency			Estimated Reductions
Community			
Building Benchmarking	Short (next year)	Initiate communications with major commercial partners, establish contact person within city staff	N/A
	Medium (1-5 yrs)	Establish infrastructure for collecting and monitoring building performance	
	Long (5 yrs +)	Explore feasibility of requiring benchmarking for all commercial buildings	

<b>Energy Auditors List</b>	<b>Short (next year)</b>	Task EEC member and staff to create a list of energy auditors	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Promote energy auditors list to community	
	<b>Long (5 yrs +)</b>	Explore opportunities to incentivize residential energy efficiency	
<b>Adopt new IECC standards</b>	<b>Short (next year)</b>	City Council pass new IECC standards	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Continue to monitor and upgrade as necessary	
	<b>Long (5 yrs +)</b>	Continue to monitor and upgrade as necessary	
<b>Commercial Energy Efficiency Incentive Programs</b>	<b>Short (next year)</b>	Explore energy efficiency ordinances centered on incentivizing energy efficiency upgrades for commercial buildings	<b>10,000 – 17,000</b>
	<b>Medium (1-5 yrs)</b>	Pass affordable financing ordinances for building energy efficiency programs	
	<b>Long (5 yrs +)</b>		
<b>Government</b>			
<b>Require "Green" Certification</b>	<b>Short (next year)</b>	Team EEC, city staff and USGBC to explore LEED certification for new city construction	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Based on results of committee findings implement necessary steps	
	<b>Long (5 yrs +)</b>		
<b>Building benchmarking with reports to City Council</b>	<b>Short (next year)</b>	Assign city staff responsible for updating benchmarking info. and reports	<b>53</b>
	<b>Medium (1-5 yrs)</b>	Set goals for municipal buildings to reach energy star certification	
	<b>Long (5 yrs +)</b>	Adjust goals as needed to continually improve building performance	

<b>Renewable Energy</b>			<b>Estimated Reductions</b>
<b>Community</b>			
<b>RECs increase</b>	<b>Short (next year)</b>	Promote Green Power Community commitment to community	<b>7,000</b>
	<b>Medium (1-5 yrs)</b>	Explore collaboration and participation with large community organizations (business, hospitals, schools, etc.)	

	<b>Long (5 yrs +)</b>	Continue promotion of renewable energy	
<b>Community Solar</b>	<b>Short (next year)</b>	Explore public interest and feasibility of community solar campaign	<b>900</b>
	<b>Medium (1-5 yrs)</b>	Based on findings, task residents with building interest or support	
	<b>Long (5 yrs +)</b>	Create campaign aimed at utility (Ameren) owned community solar array	
<b>Government</b>			
<b>RECs increase</b>	<b>Short (next year)</b>	Increase RECs purchases of RECs from 15% to 25%	<b>455</b>
	<b>Medium (1-5 yrs)</b>	Move out into community to increase RECs purchases throughout community	
	<b>Long (5 yrs +)</b>	Use RECs purchasing as clear sign of Creve Coeur's commitment and interest in local renewable energy	
<b>Additional solar on city buildings</b>	<b>Short (next year)</b>	Complete thorough analysis of cost/benefit of solar installation on DRC	<b>740</b>
	<b>Medium (1-5 yrs)</b>	Consider solar and geothermal installations on new/renovated buildings	
	<b>Long (5 yrs +)</b>	Explore options to increase renewable energy either within or outside of Creve Coeur	

<b>Alternative Transportation</b>			<b>Estimated Reductions</b>
<b>Community</b>			
<b>Multi-modal Streets</b>	<b>Short (next year)</b>	Comprehensive plan currently underway	<b>80</b>
	<b>Medium (1-5 yrs)</b>	With guidance from Comprehensive plan partner with community organizations (ex: Trailnet) to identify potential expansion of alternative transport	

	<b>Long (5 yrs +)</b>	Incorporate dense community building planning in key areas around Creve Coeur	
<b>Carpool Campaign</b>	<b>Short (next year)</b>	Communicate with major businesses within Creve Coeur	<b>2,300</b>
	<b>Medium (1-5 yrs)</b>	Work with business to develop plan to encourage carpooling by employees	
	<b>Long (5 yrs +)</b>	Evaluate effectiveness of plan and adjust as necessary	
<b>Government</b>			
<b>Alternative Fuel Source</b>	<b>Short (next year)</b>	Explore interest in community for fleet vehicle upgrade to CNG or other fuel source	<b>8</b>
	<b>Medium (1-5 yrs)</b>	Continue upgrading vehicle fleet to diesel and other fuel alternatives to gasoline	
	<b>Long (5 yrs +)</b>		
<b>Employee Carpool</b>	<b>Short (next year)</b>	Develop plan to encourage/incentivize employee carpooling	<b>218</b>
	<b>Medium (1-5 yrs)</b>	Evaluate effectiveness of plan and adjust as necessary	
	<b>Long (5 yrs +)</b>	Continue evaluation	
<b>Anti-idling Campaign</b>	<b>Short (next year)</b>	Develop campaign setting limits on idling time for city vehicles	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Initiate campaign	
	<b>Long (5 yrs +)</b>	Evaluate fuel consumption savings	

<b>Reducing Waste</b>			<b>Estimated Reductions</b>
<b>Community</b>			
<b>Increase Composting</b>	<b>Short (next year)</b>	Communicate with major organic waste producers (restaurants, grocery stores, etc.) within city	<b>TBD</b>

	<b>Medium (1-5 yrs)</b>	Explore feasibility of partnering trash producers with composting companies in the region	
	<b>Long (5 yrs +)</b>	Consider expanding composting to other areas of the community	
<b>Government</b>			
<b>Monitor Current waste reduction</b>	<b>Short (next year)</b>	Continue monitoring trash conversion to curbside and size of trash totes used by residents	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Explore options aimed at reducing trash and increasing recycling and composting	
	<b>Long (5 yrs +)</b>	Explore options aimed at reducing trash and increasing recycling and composting	

<b>Education</b>			<b>Estimated Reductions</b>
<b>Community</b>			
<b>Sustainability Campaign</b>	<b>Short (next year)</b>	First phase of the Creve Coeur Sustainable Living series	<b>N/A</b>

	<b>Medium (1-5 yrs)</b>	Monitor success/participation of campaign, adapt topics/presentation as needed	
	<b>Long (5 yrs +)</b>	Continue monitoring/adapting	
<b>Website Update</b>	<b>Short (next year)</b>	Task EEC with compiling current sustainability topics and information	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Update sustainability section of website with new information	
	<b>Long (5 yrs +)</b>	Continue updating as needed	
<b>Government</b>			
<b>Regular Green Team Meetings</b>	<b>Short (next year)</b>	Set a team "leader" and team member from all departments, initial planning meeting to set goals and schedule (possible ideas follow)	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Continue meetings adjusting goals as needed	
	<b>Long (5 yrs +)</b>	Evaluate success of goals	
<b>Incentivize "green" practices</b>	<b>Short (next year)</b>	Green Team develop "green" campaign	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Launch "green" campaign	
	<b>Long (5 yrs +)</b>	Evaluate success and adapt as needed	
<b>"Green" recognition</b>	<b>Short (next year)</b>	Green Team explore recognition for staff that practice "green" habits	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Implement recognition program	
	<b>Long (5 yrs +)</b>	Evaluate success and adapt as needed	
<b>Review the green purchasing plan</b>	<b>Short (next year)</b>	Green Team evaluate green practices in city operations	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Report to city council success/improvement	
	<b>Long (5 yrs +)</b>	Continue evaluating purchase practices	

<b>Adaptation</b>		<b>Estimated Reductions</b>	
<b>Community</b>			
	<b>Short (next year)</b>	Explore along with community solar campaign	<b>N/A</b>

<b>Strengthen the electrical grid</b>	<b>Medium (1-5 yrs)</b>	Develop strategies to campaign for electrical grid renovation to state government	
	<b>Long (5 yrs +)</b>	Continue conveying importance to state officials	
<b>Heat emergency plan</b>	<b>Short (next year)</b>	Identify target areas and population susceptible to high temperature	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Determine whether Heat Emergency Plan is necessary for Creve Coeur	
	<b>Long (5 yrs +)</b>	Develop and implement plan	
<b>Government</b>			
<b>Urban ecosystem based on SITES</b>	<b>Short (next year)</b>	Explore integration with current city stormwater and comprehensive plans	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Encourage SITES model to businesses and residents where applicable	
	<b>Long (5 yrs +)</b>	Evaluate effectiveness of SITES model and adapt as necessary	
<b>Provide native planting for pollinators</b>	<b>Short (next year)</b>	Provide education on benefits of diverse plantings	<b>N/A</b>
	<b>Medium (1-5 yrs)</b>	Expand native plantings on government grounds	
	<b>Long (5 yrs +)</b>	Collaborate with local agencies to help expand efforts	