



Sustainable Temple

Striving for Energy Efficiency Excellence

2011 Sustainability Management Plan



Foreword

The 2011 Sustainability Management Plan is a working product that identifies areas of efficiency and inefficiency within City operations and enables the City of Temple to improve operations, benefitting both the employees and the entire community. The purpose of this plan is to provide the current assessment of the City's sustainable efforts and to provide recommendations to improve the City's sustainable efforts.

Employees of the City Manager's office, as well as the Sustainability Committee, prepared this document over the course of a year, after continued analysis and observation. This report utilizes data from various sources and departments, including employee participation.

Listed below are the committee members who assisted in developing the plan during 2010 to 2011.

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Lacy Borgeson	Amy Casey	Judy Chrisman
Alan Deloera	William Hickman	Sam Hoefert
Sharon Rostovich	Jeremy Schroeder	Lisa Sebek
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The City Manager's Office and the Sustainability Committee would like to express their gratitude to everyone who participated in the process of developing this Sustainable Management Plan. We appreciate the time and effort of those who took part in this process.



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Section 1:
Introduction



This 2011 Sustainability Management Plan is the City of Temple's strategic plan to move towards more sustainable and efficient operations. These actions are in response to the continued increase in energy consumption and costs, and the current economic conditions. The intention of the plan is to demonstrate that sustainability is both practical and beneficial to the City of Temple.

In April 2010 the City hired a Sustainability Manager to develop and manage the Plan. In October 2010 a Sustainability Committee was formed, with representatives from various departments. The Committee has taken a proactive approach of crafting a community vision and mission statement, as follows:

Vision:

“Our vision is to strive for a sustainable future.”

Mission Statement:

“The City of Temple is committed to creating a more vibrant, harmonious and sustainable city by building on existing strengths, exploring new opportunities, fostering regional partnerships and responding to change, in support of environmental stewardship, community responsibility and economic vitality.”

The Sustainable Management Plan acts as an integrated effort, from all City departments, to work towards achieving the above vision. The Plan will serve as a guide in City efforts and actions to become more sustainable by identifying the following goals:

- Reduce energy costs and consumption
- Improve environmental monitoring
- Prevent pollution
- Increase energy efficiency
- Conserve water
- Reduce consumption and waste
- Reuse, recycle and purchase recycled content products
- Reduce reliance on non-renewable resources
- Engage and educate employees and the community
- Promote inter-departmental collaboration
- Measuring, monitoring and communicating the City's progress toward a defined goal set

What is sustainability?

Many view sustainability as a relatively new term, a “buzz-word” to some; however the term was established as a National goal in the 1970 National Environmental Protection Act. During that time the notion of sustainability was generally synonymous with a variety of green and environmental movements that focused solely on improving the environment in which society lives. Today, sustainability is still misconstrued as only pertaining to environmental issues. However, throughout the evolution of the sustainable movement, the term has expanded to encompass three main aspects – environmental stewardship, economic vitality and community responsibility (Figure 1-



Figure 1-1



1). These aspects, once viewed as separate entities, have been found to be greatly interrelated as independent and mutually reinforcing pillars.

Throughout the development of the concept of sustainability, the term has been defined in a variety of different ways. The overall accepted definition is “development that meets the needs of the present, without compromising the ability of future generations to meet their own needs.” This definition was established in 1983 when the Bruntland Commission, also known as the World Commission on Environment and Development, was gathered by the United Nations to discuss a growing concern about the “accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development.” A report, entitled “Our Community,” was released in 1987 by the Bruntland Commission, defining sustainability as the above definition.

The definition and findings recognized by the Bruntland Commission serve as the basis of the Sustainability Management Plan. The report recognizes that the problems that we face are global problems that, depending on our actions, will have rippling effects throughout the global environmental, social and economic systems. Therefore, the City of Temple realizes that actions being completed at a local level, respond to the challenge identified by the Bruntland Commission on a global level.

Recently, businesses have realized that their perception and response to sustainability measures greatly impact the bottom line. This idea is known as the “Triple Bottom Line,” and describes the concept of sustainable management. The “Triple Bottom Line” states that success is measured not only by financial performance (the traditional bottom line), but by balanced achievements in environmental stewardship, economic growth and social responsibility. In order to achieve the “Triple Bottom Line” an organization must achieve a balance of excellence in all three components. The City of Temple, through the implementation of the Sustainability Management Plan, will use this concept as an approach to manage and measure the success of achieving sustainability.

Why Communities are Key Assets towards a Sustainable Future

Communities serve as a guiding foundation for the residents and businesses that make-up the community. Therefore, as sustainability considerations become a larger part of our nation’s business landscape, communities, like the City of Temple, are key assets towards a sustainable future. Due to current financial pressures, rising utility costs, need for resource conservation, aging infrastructure needs, and increasing lifecycle costs the City has the opportunity to take a pro-active approach supporting sustainability. The City of Temple has the ability to plan for and ensure a better future for its community through a Sustainable Management Plan. Through the Plan the City will:

- have a greater utilization of assets;
- reduce its environmental footprint;
- improve work environments;
- reduce environmental, health and safety risk factors;
- reduce operating and life-cycle costs;
- provide diverse development options;
- increase revenues and divert savings to other projects;
- provide economic benefits and stability; and
- improve reputation by leading by example.

These actions are essential to the future of the community. Applying sustainable actions at City facilities is the first step in educating and illustrating sustainable actions to the community.

SUSTAINABILITY

...is development that meets the needs of the present, without **COMPROMISING** the ability of future generations to meet their own needs.

...envisions the enduring **PROSPERITY** of all things.

...is a characteristic of natural and human systems that embodies the possibility of **FLOURISHING** forever.

...means **SATISFYING** our lives, both now and in the future, by not using more natural resources than nature can regenerate.

...**CHALLENGES** us to live our lives and make decisions as individuals, organizations and societies, so that we make sure that future generations have access to the same opportunities and quality of life we do.

...is living within earth’s **LIMITS**.



The State of Texas has realized the importance of City's implementing sustainability efforts at a local level. In 2001, Texas Senate Bill 5 was enacted to assist in complying with the federal Clean Air Act standards. This act amended the state's Health and Safety Code to require political subdivisions in 41 Texas counties to:

- Implement energy efficiency measures and reduce electricity consumption, as stated in Section 302.004(b) of the Local Government Code;
 - Establish a goal to reduce electricity consumption by 5% each year for five years; and
 - Publish efforts and progress annually on the City website.
- Bell County and the City of Temple have not been required to take part in the above requirements. However, the City can use these tactics in pursuing its own Management Plan.

How to Apply the Sustainable Management Plan

Background

The creation of this document is due to the need to identify more efficient measures of operation for the very different departments that make up the City. The plan brings together current initiatives developed by individual departments and identifies needed initiatives across the City. These initiatives are discussed throughout the Plan, but include current recycling practices, anti-idling policies and measures to meet environmental standards at different departments, among others.

Developing the Plan

As the importance of sustainability is realized in different businesses and governmental entities, many are approaching improvements and actions without a developed plan to implement, measure and report. In most cases these quick actions to undertake sustainability is due to the increased urgency and awareness. However, a well developed plan that includes input from all departments and appropriate assessment of current conditions, allows for a more comprehensive and consensus-based approach. With greater input from employees, there is a higher chance for success once the plan is implemented. The City of Temple has established the following steps to properly establish a successful plan (Figure 1-2):

The first step taken by the City of Temple, after recognizing the need for sustainable efforts, was to involve all departments. This action allowed the City to realize the current needs and practices of all departments, in order to appropriately assess the steps needed to successfully implement a Sustainable Management Plan. The representatives of the Sustainability Committee quickly came to the conclusion that support for these efforts start with the decision-making process. Through the above steps this approach provides a decision-making structure and allows continual performance improvement by implementing processes that are synchronized with existing management systems and practices throughout all departments. The following defines each of the above steps, as to how the City of Temple will proceed:

Develop Benchmarks

An evaluation of the current utility use conditions was conducted to establish a baseline upon which further action can be taken.

Identify Strengths, Weaknesses, Opportunities, and Threats

Identify current programs and important contextual factors that will help establish known strengths, weaknesses, opportunities and threats.

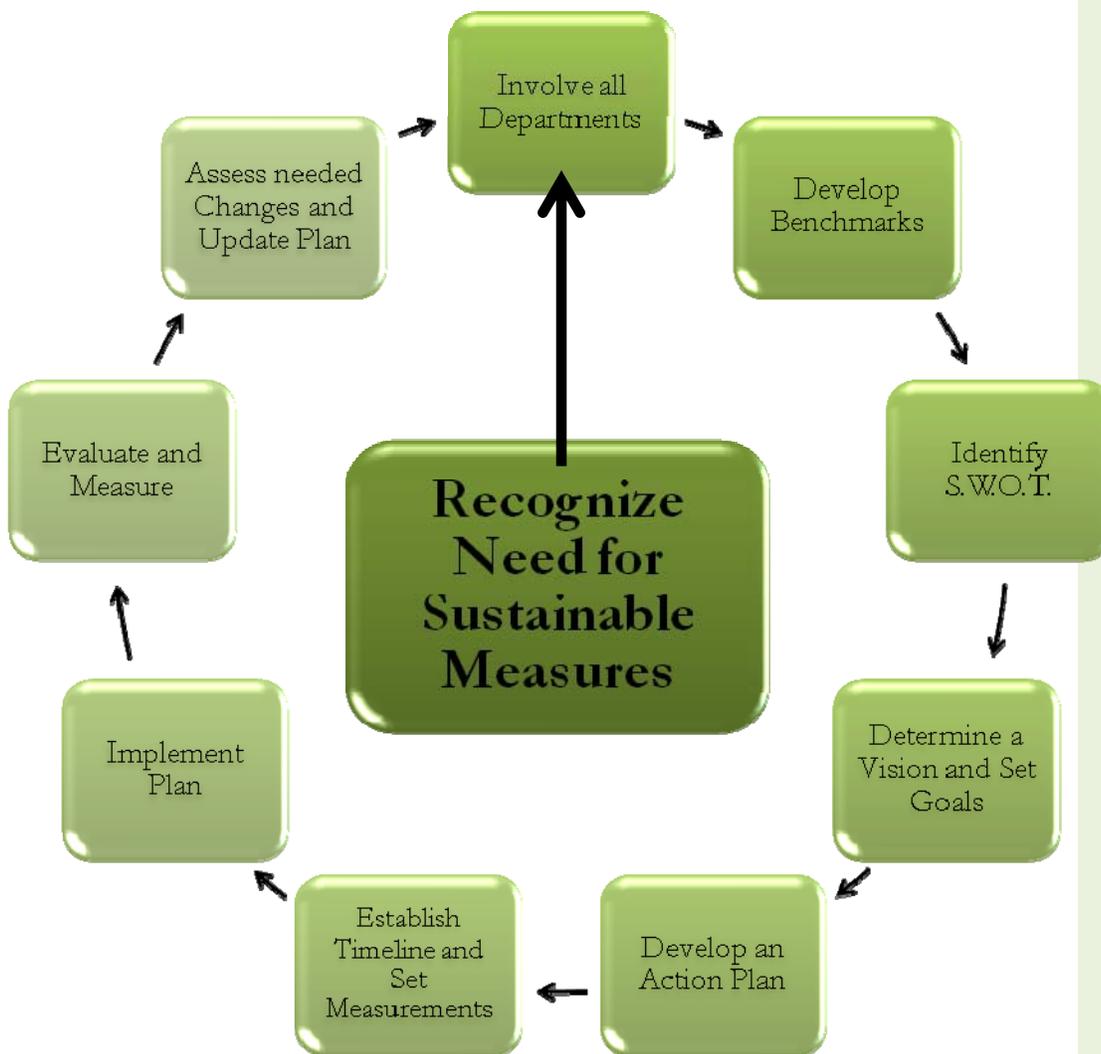


Figure 1-2

Determine a Vision and Set Goals

A vision was developed by the Sustainability Committee based on City-wide feedback, serving as the foundation for the Plan, which will guide future actions.

Develop an Action Plan

An Action Plan is developed to streamline the process of plan implementation, which will determine actions, roles and responsibilities in achieving overall success.

Establish Timeline and Set Measurements

Develop quantitative and qualitative metrics and targets to measure performance towards achieving established goals, according to an established timeline.

Implement Plan

Upon approval of the entire Sustainability Management Plan the developed Action Plan will be implemented.



Evaluate and Measure

Using identified metrics and targets set through the defined Monitoring Plan, Temple will measure its performance towards achieving the established goals.

Assess Needed Changes and Update Plan

An established and well executed management system enhances the traditional planning process by including a continual reassessment of goals, as well as a monitoring of performance and communication results. Overall, this system of steps provides an overarching framework for operation; in order to best suit the Cities needs to achieve superior excellence in sustainability.

Use of the Plan

The Sustainability Management Plan has the ability to guide the City in becoming more sustainable, ensuring high levels of economic vitality, social responsibility and environmental stewardship. However, the Plan must be implemented appropriately to be successful. The Plan established overall policy, programs, standards and direction for various aspects of sustainability. The Plan will serve as a guidance document for all City departments, City Council and staff that will be making daily decisions that affect the City's level of sustainability and assist in achieving the overall goals established within this Plan.

The plan is laid out as follows:

Current Assessment

This section offers an overview of current utility use, roles of sustainability in City departments, existing conditions and current initiatives and plans, if any.

Action Plan

This section presents opportunities for innovation, tools and best practices, case studies, policy recommendations and suggested metrics for measuring methods for future progress for each department.

Summary

This section will discuss an overview of the entire plan, ranking opportunities discussed in the Action Plan within a work plan matrix and providing guidance for continued program development.

Focus Areas and Sustainability Goals

As introduced, the sustainability vision requires participation from all departments and employees, to successfully implement the Plan through their actions. However, the City is composed of many different departments from those that provide public safety, community recreation to public infrastructure. With this said, each department has different requirements and tasks that need to be accomplished in order to successfully operate. Therefore, it is difficult to place all departments under an umbrella of sustainability goals. Therefore, each department has established focus areas and specific goals to improve sustainability, as appropriate for their operations. Department specific goals are as follows in Table 1-1.



GENERAL	Reduce energy costs and consumption	WATER SYSTEMS	Continue to provide clean drinking water
	Improve environmental monitoring (model responsible energy management)		Reduce water consumption in City facilities
	Prevent pollution		Reduce energy use associated with treatment and distribution of water
CITY FACILITIES	Maintain a clean and healthy work environment to secure economic well being	STREETS	Improve energy use in streetlighting
	Be proactive		Provide and expand on multiple modes of mobilization on City streets
	Increase energy efficiency	SOLID WASTE	Reduce the amount of solid waste going into landfill from City facilities
	Reduce reliance on non-renewable resources		Reuse, recycle and purchase recycled content products
ADMINISTRATIVE OPERATIONS	Promote inter-departmental collaboration		Increase recycling opportunities at City facilities
	Incorporate sustainability into the City's decision-making process	OPEN SPACE	Naturalize City landscaping
SUSTAINABLE PROCUREMENT	Increase the City's use of sustainable procurement		Provide equitable access for all residents to City open spaces
TRANSPORTATION / FLEET	Reduce vehicle miles traveled	EDUCATION and COMMUNICATION	Engage and educate employees and the community
	Reduce total fuel consumption for fleet vehicles		Measure, monitor and communicate the City's progress toward a defined goal set

Table 1-1



Section 2:
Employee
Survey



Introduction

A vital element of any planning process is employee participation. Employee involvement allows the City to plan accurately. For the purposes of this Sustainable Management Plan an employee questionnaire was used to collect employee opinions on the concept of sustainability. This information is being used as a guide to realistic opportunities that the City would like to employ. The questionnaire ensures input from those participating on a larger scale, more than the Sustainability Committee. One-hundred sixty-five surveys (165) were returned, a 25% response rate.

The questionnaires were distributed between March and May of 2011 to employees, via supervisors. The questionnaire can be found in the Appendix. Also in the Appendix are the results from each respondent.

Demographics

To determine if the City employee base is accurately represented by the survey results, demographic factors such as age, sex, department and years employed was compiled.

It is important for the questionnaire to obtain a representative number of responses from both males and females. Of the 165 responses 109 (66%) are male, 53 (32%) are female and 3 (2%) employees did not respond. This generally represents the overall trend in male to female ratio in the City; therefore, the survey respondents appropriately reflect the employee population. This is graphically represented in Figure 2-1.

There is not an equal representation of respondents by age. 115 (69%) of the respondents were over the age of 40. There were no respondents below the age of 18 years. However, this response rate is reflective of the current employee demographics of the City. Figure 2-2 illustrates the age of the respondents.

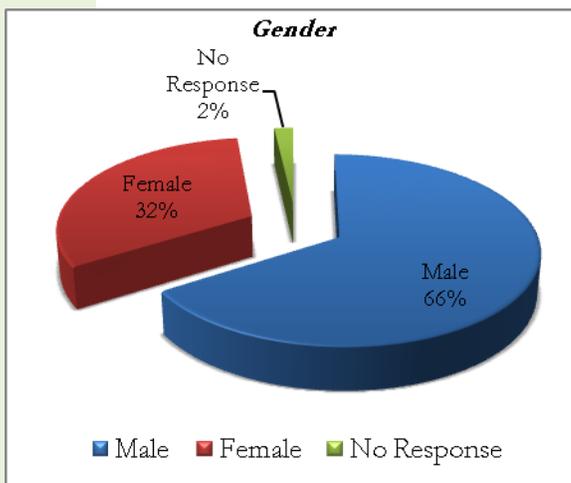


Figure 2-1

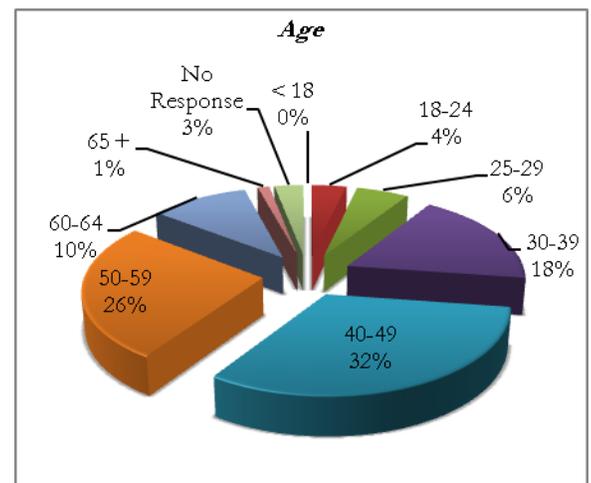


Figure 2-2

All departments were asked to participate in the survey, Figure 2-3 depicts the departments that participated in the survey. If the department is not included in the graph, a completed survey was not submitted from that department. The main departments to participate were Public Works and Park and Leisure Services. This response mimics the general department breakdown of the City.

The survey respondents have generally worked for the City less than ten years, with 43% employed less than five years and 19% employed between six and ten years. Figure 2-4 displays a graph of the years employed for employees who participated in the survey.

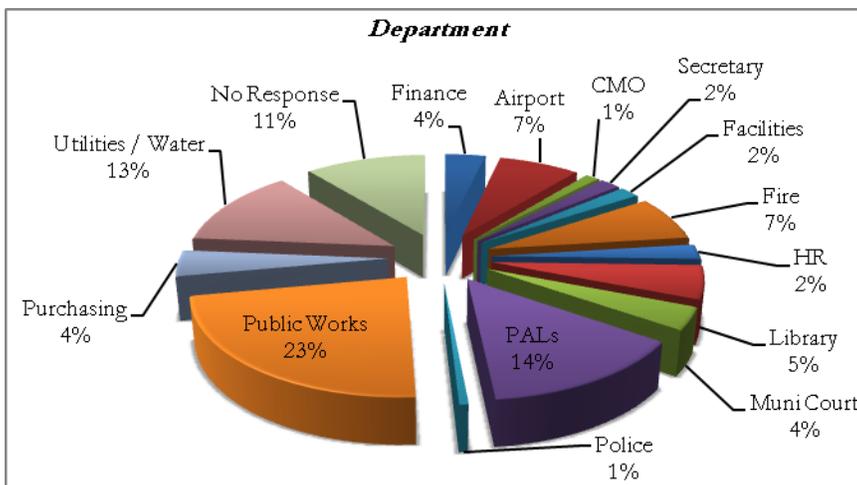


Figure 2-3

Personal Behavior

Personal behavior questions were asked in order to assess the personal views and actions taken in the employee's lifestyle, as related to sustainability. It was determined that more than half believe they know an average amount of information concerning living sustainably and general sustainable efforts, as shown in Figure 2-5.

The survey also questioned how the employee partakes in a sustainable lifestyle. It was found that 98% of those surveyed feel that they consciously partake in one of the actions listed. Of those individuals, many of them would expand on what they currently practice, to include more sustainable efforts in their daily life. Figure 2-6 depicts the breakdown of what employees currently practice and Figure 2-7 depicts what employees would be willing to practice.

When responding to the question of what the employee would be willing to do some employees did not include the actions they already practice, whereas some included the actions they already practice. Assuming that most people would continue to practice their current actions, they were added to the answers that did not include current and future practices. This was done so that an accurate increase in future actions could be shown, as to what employees would be willing to partake in.

General Questions

General questions were asked in order to assess the employees view towards the City of Temple's involve-

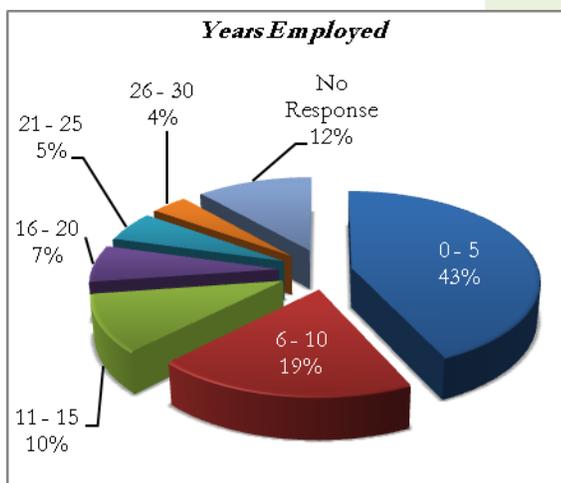


Figure 2-4

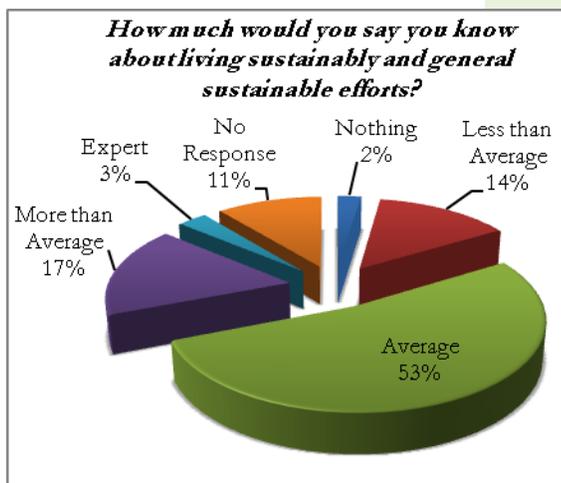


Figure 2-5



ment in sustainable efforts. Questions mainly focused on whether or not the employee felt the City or their department practiced sustainable efforts. As depicted in Figure 2-8 and Figure 2-9 just over 40% of the employees feel that sustainable practices somewhat take place at the City and in their department. What should be noted from this question is that roughly 20% of the em-

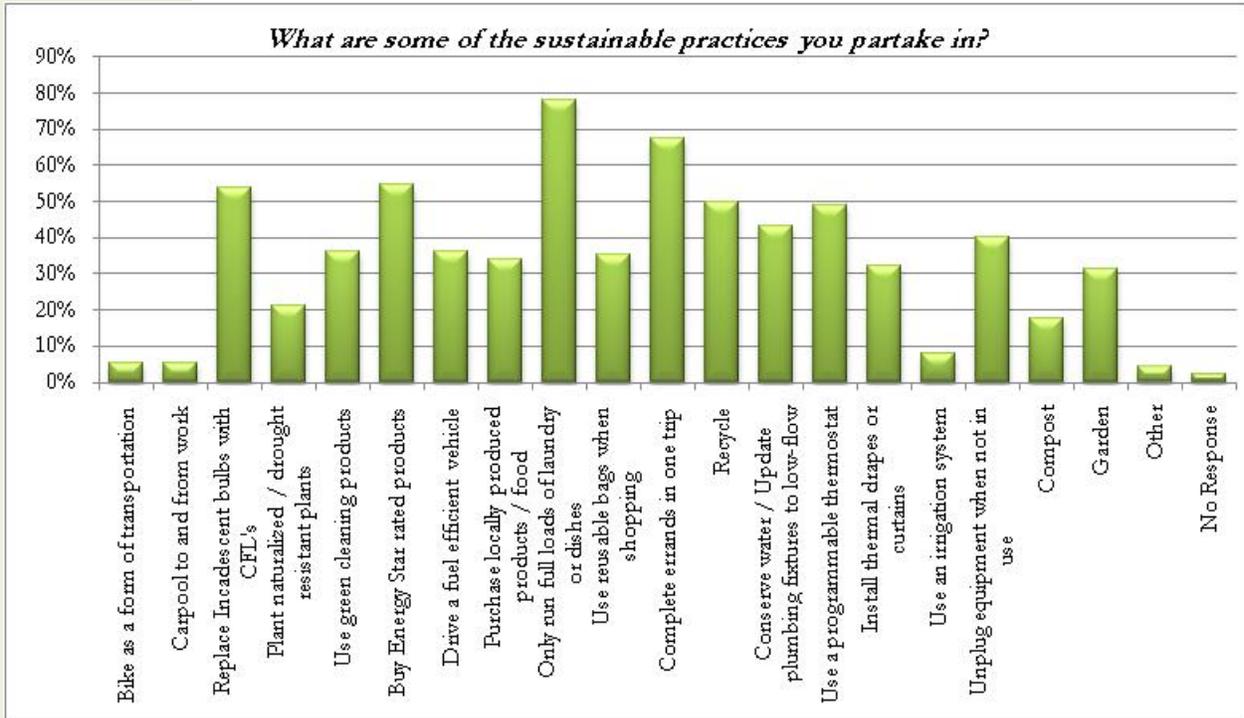


Figure 2-6

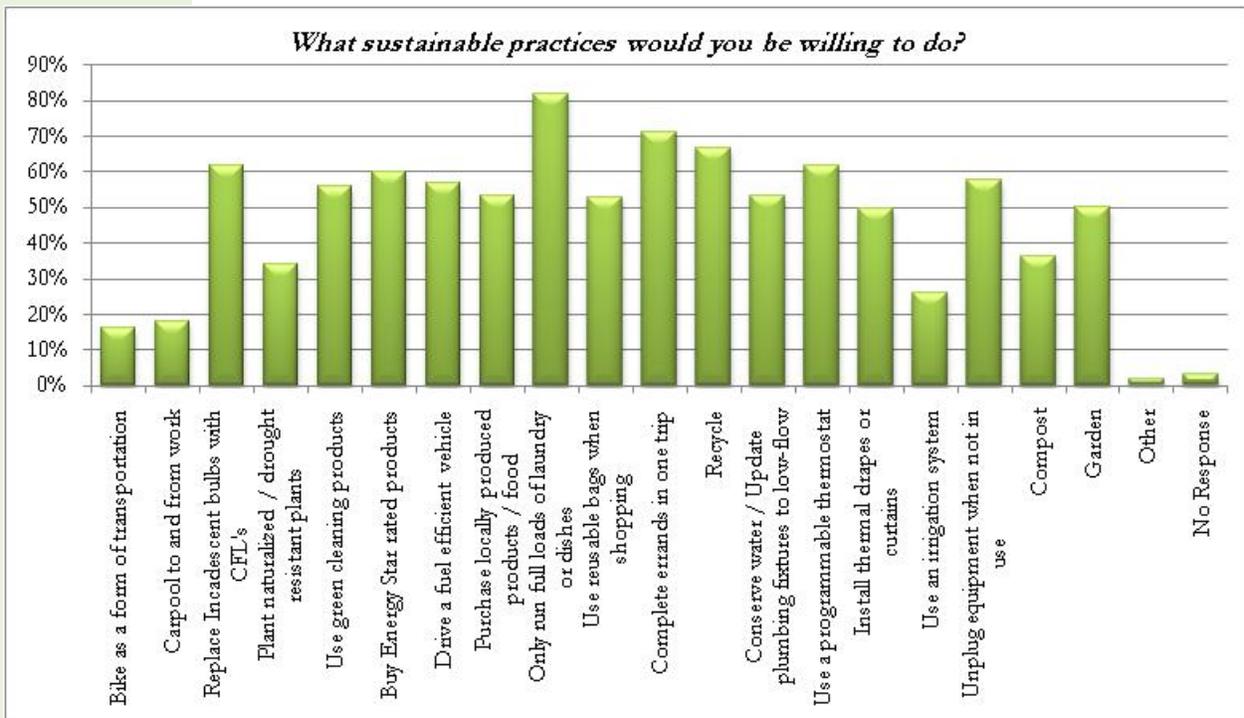


Figure 2-7



employees did not know whether or not sustainable efforts were practiced, an increase in communication across departments, would help to alleviate this number.

Also asked was what the employees felt to be the most sustainable issue the City should focus on, including what are the most common barriers and how urgent is it for the City to undertake sustainable initiatives. Figure 2-10 depicts the main areas that the employees feel are important to focus on, employees were asked to indicate three areas.

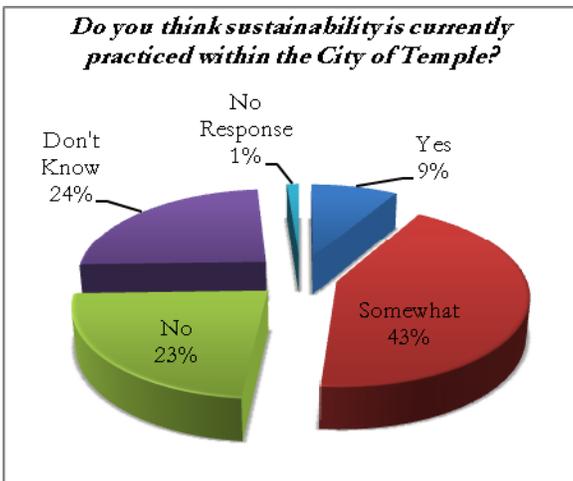


Figure 2-8

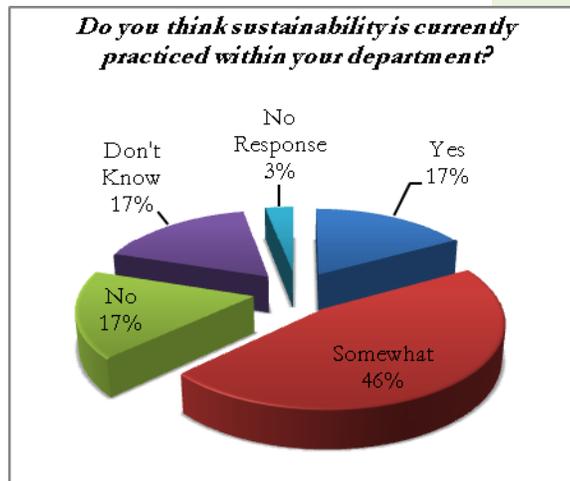


Figure 2-9

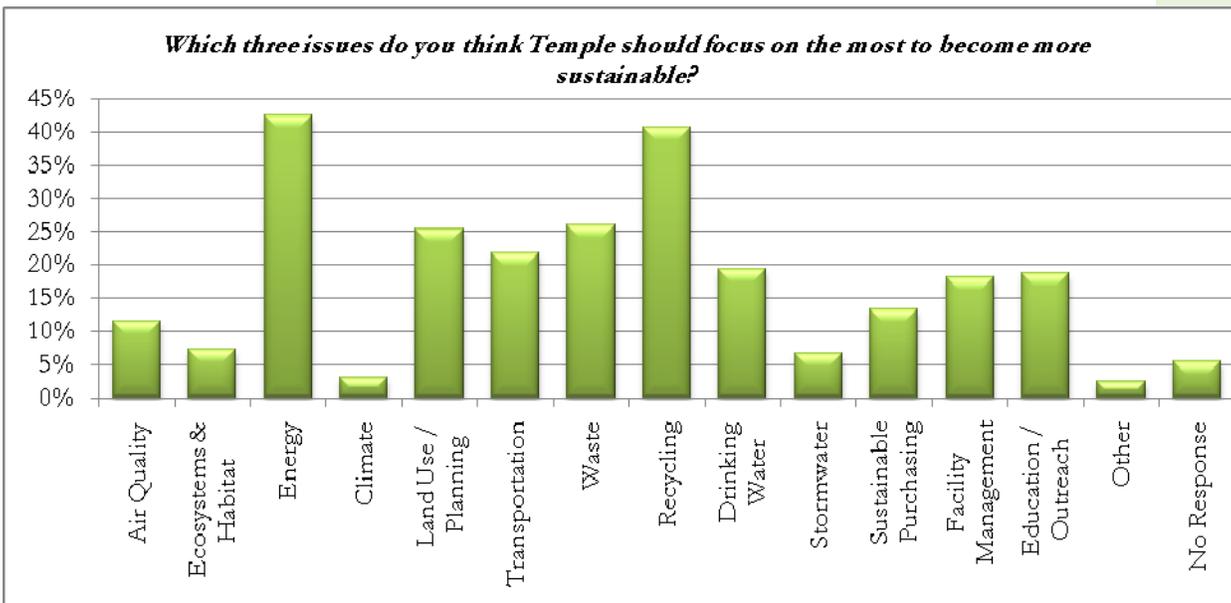


Figure 2-10

Employees were also asked to indicate what they find to be barriers to the City becoming more sustainable, 38% stated funding, Figure 2-11 shows the results. The employees were asked how urgent they found it to be for the City to participate in sustainable efforts, 33% found it somewhat urgent and 32% found it urgent or very urgent, as depicted in Figure 2-12.



In order to assess peoples general preference for personal space temperature settings, the respondents indicated a temperature between 72°F —76°F in the summer and 68°F —71°F in the winter, as comfortable. These ranges mimic those indicated by ASHRAE 90.1, which indicates 72°F—78 °F as comfortable for 80% of occupants in the cooling months and 66°F—72°F in the heating months. These results are shown in Figure 2-13 and Figure 2-14.

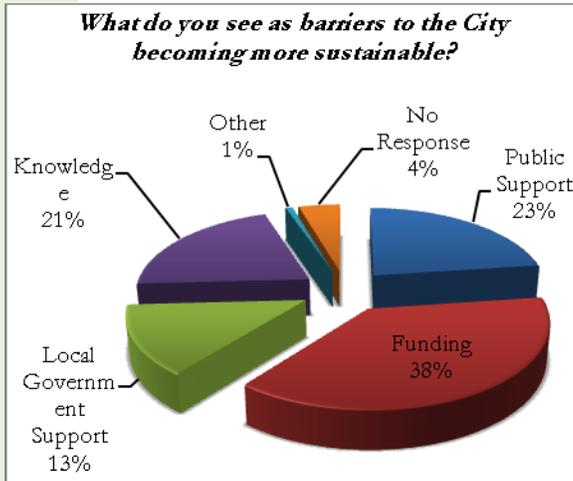


Figure 2-11

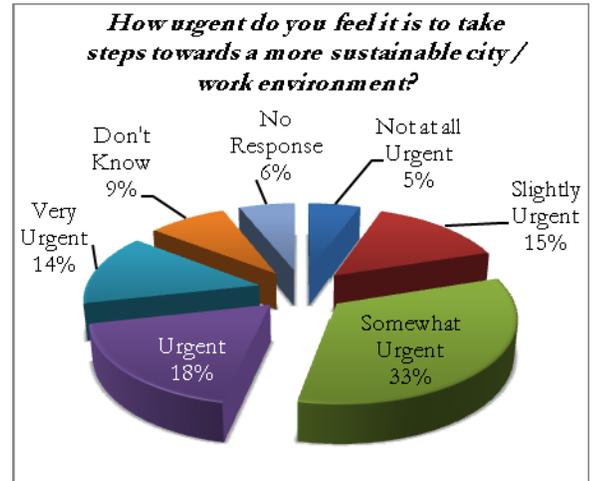


Figure 2-12

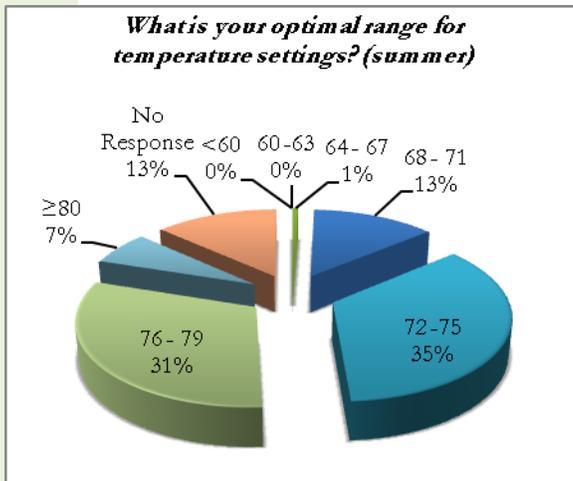


Figure 2-13

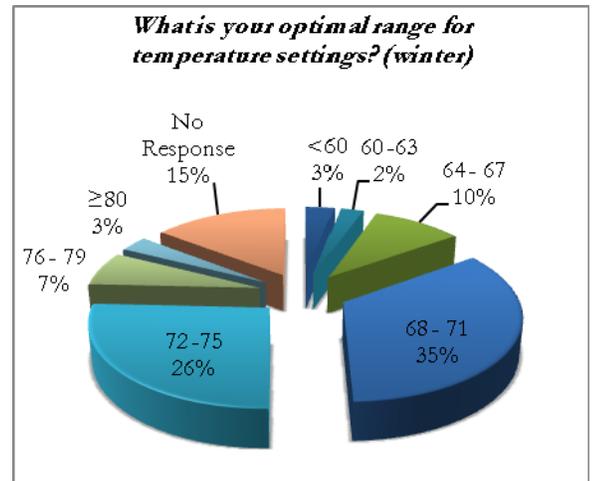


Figure 2-14

Comfort Level in Your Working Environment

A series of questions were also asked to assess the employees comfort level within their working environment. The responses are as follows in Figure 2-15 to Figure 2-26. It was determined that about half of the survey respondents worked outside and half generally worked in an office environment.

61% stated they were comfortable in their work environment, however 32% were neutral or only somewhat agreed. 73% felt there was sufficient lighting in their work environment, with 65% having access to daylight. 25% somewhat agreed or disagreed that lighting improvements are needed in their space, with 41% disagreeing.



25% of employees find that their space is impacted by surrounding spaces used for other functions, with 30% indifferent. 79% of respondents feel they dress appropriately for the weather outside and inside conditions. Generally, 53% feel that the temperature in conference rooms is set appropriately.

36% of employees surveyed do not feel they are cold at work, whereas 29% are indifferent. 23% agree or somewhat agree that they are cold. In general, more employees indicated being warm at work, 25% not warm, 33% neutral and 30% somewhat agree. 23% feel that there needs to be improvements to the HVAC systems, with 34% indifferent.

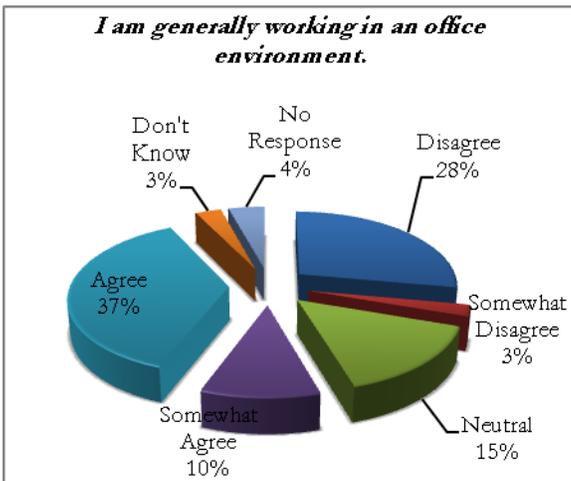


Figure 2-15

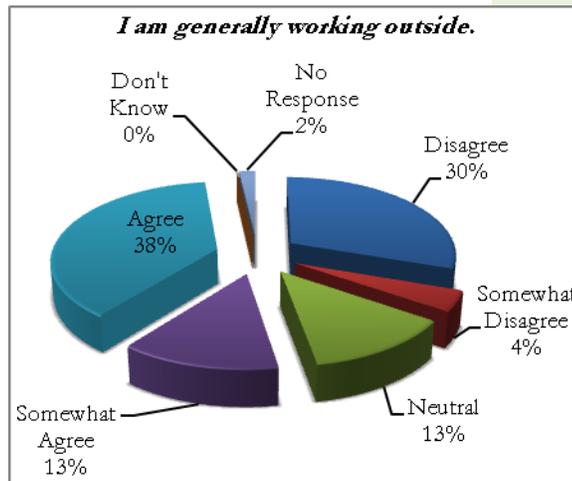


Figure 2-16

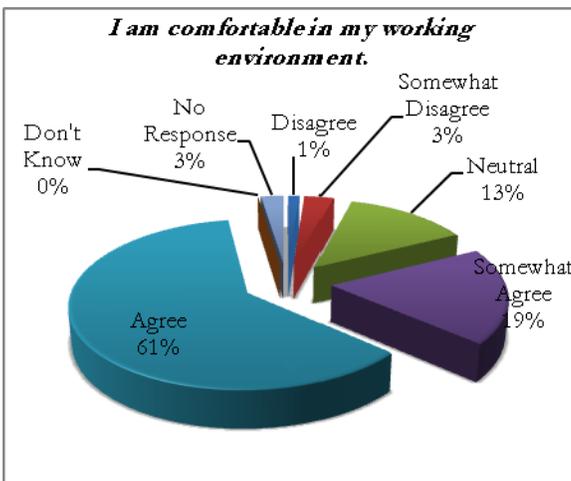


Figure 2-17

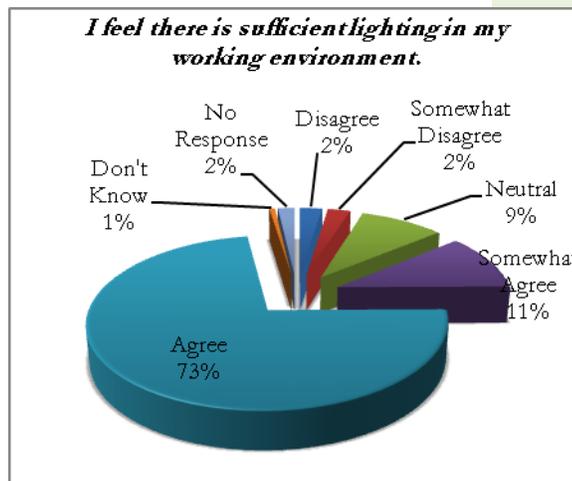


Figure 2-18

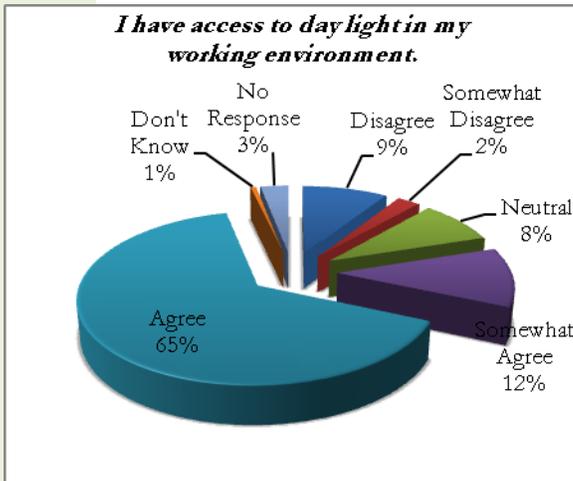


Figure 2-19

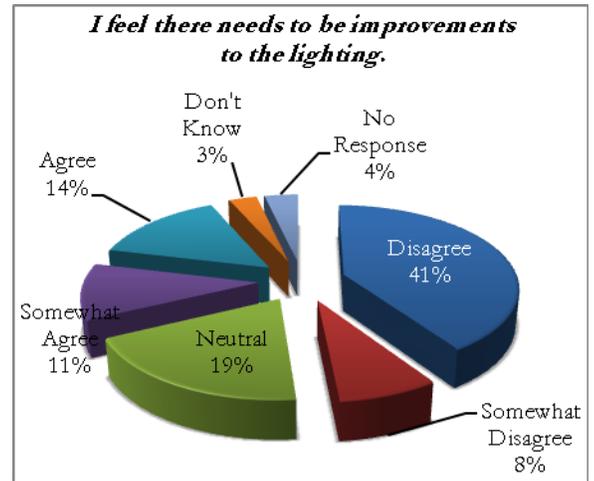


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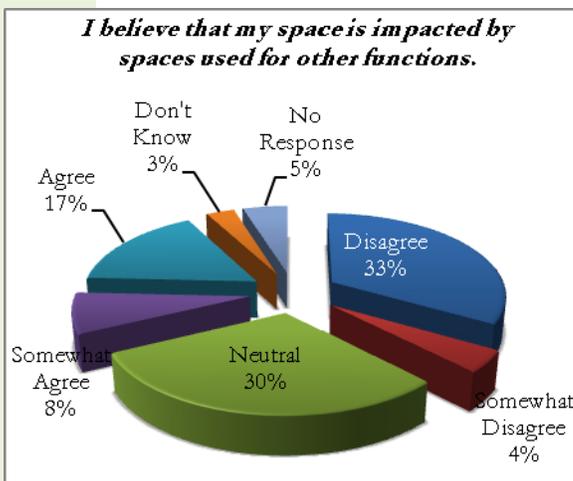


Figure 2-21

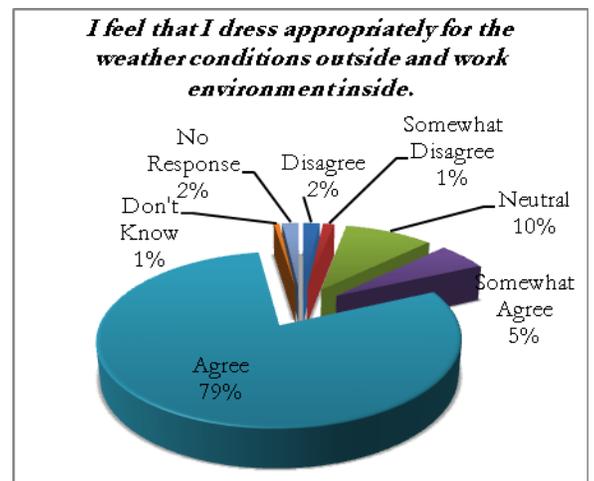


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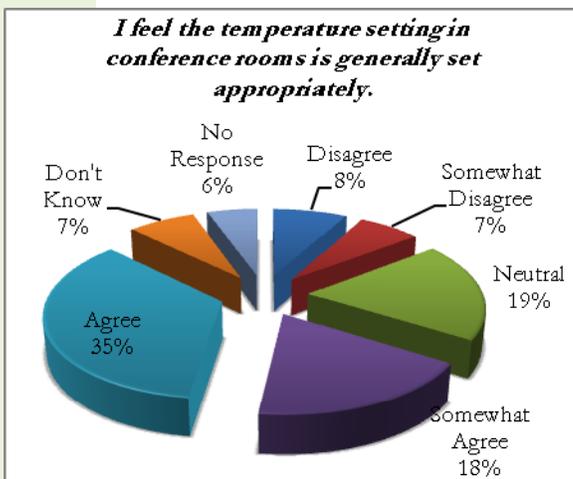


Figure 2-23

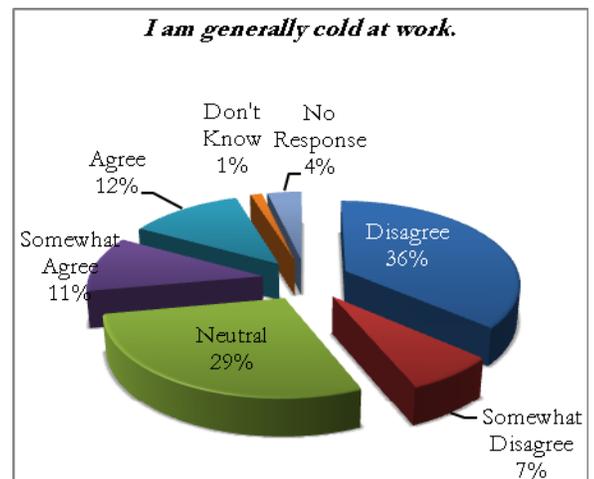


Figure 2-24

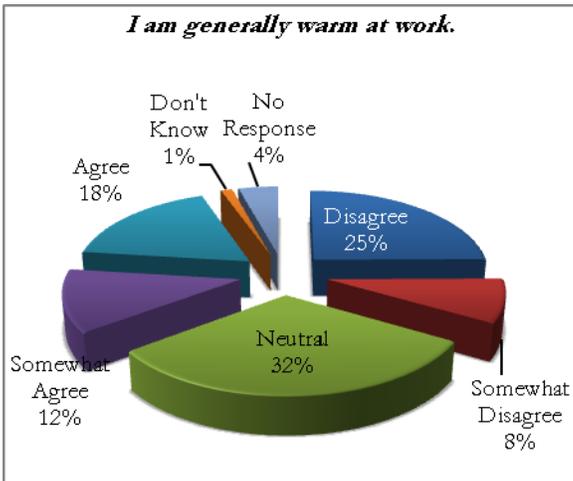


Figure 2-25

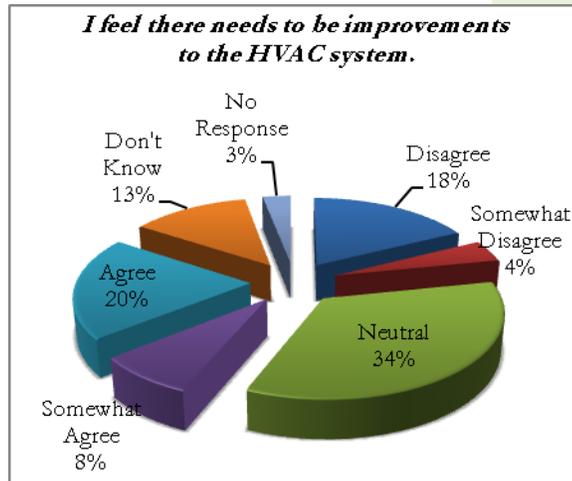


Figure 2-26

Perceptions of Potential Sustainable Practices

A final series of questions were asked to assess the employees view on sustainable actions practiced by other entities, and if the employees find it important for the City of Temple to take the same actions. These questions help to identify successful practices completed by other City's, that employees would be willing to participate in. The willingness to participate increases the chance of success in the program. The responses are as follows, in Figure 2-27 to Figure 2-43.



Figure 2-27

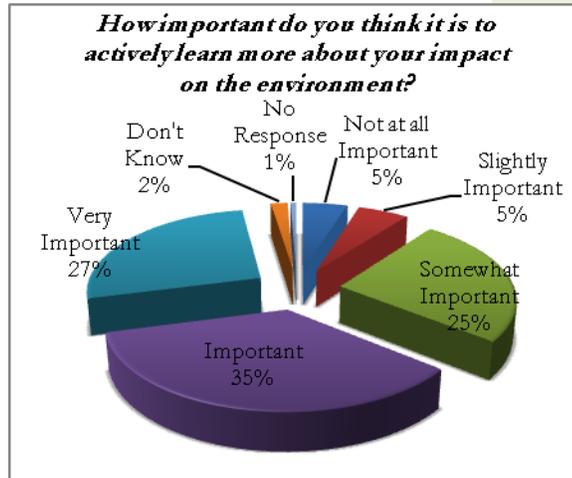


Figure 2-28

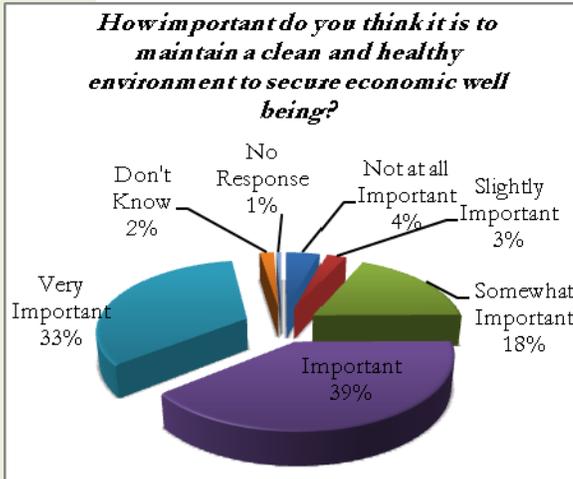


Figure 2-29



Figure 2-30



Figure 2-31

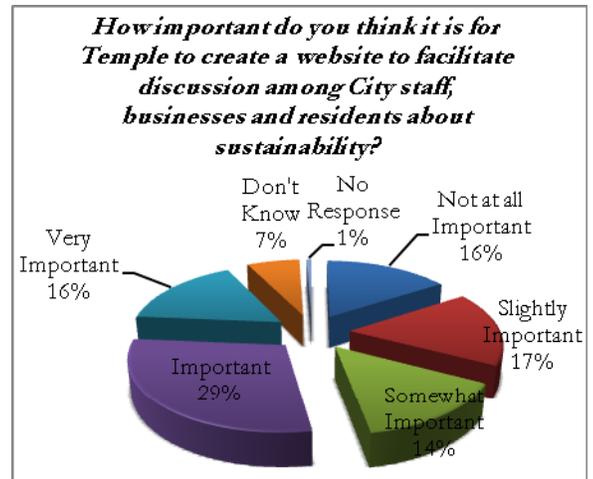


Figure 2-32

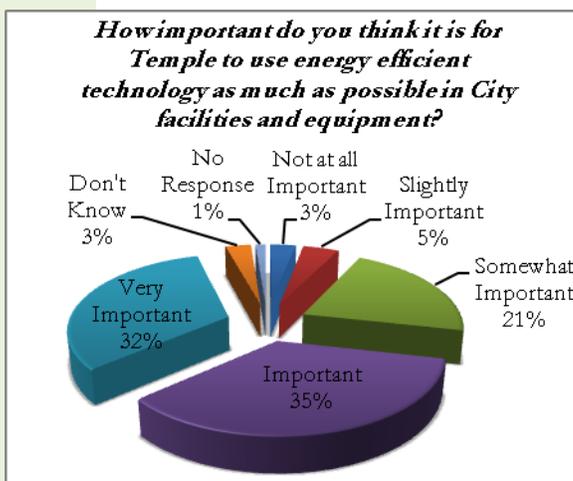


Figure 2-33

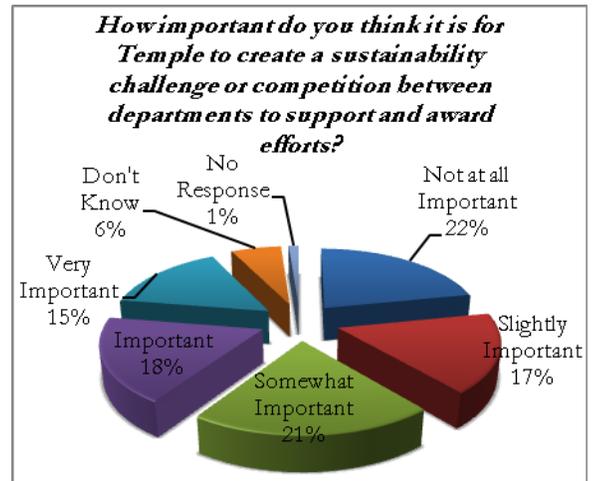


Figure 2-34

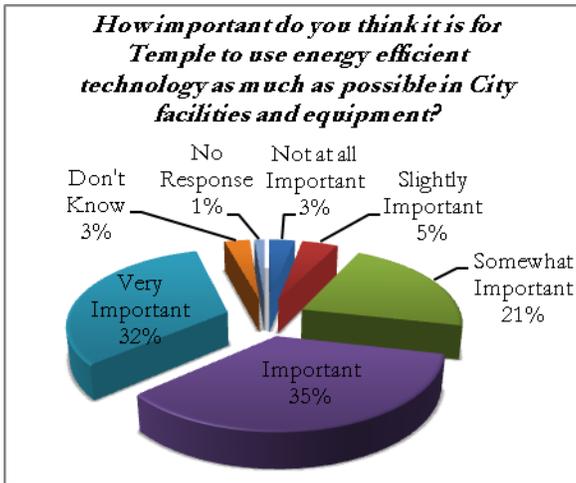


Figure 2-35

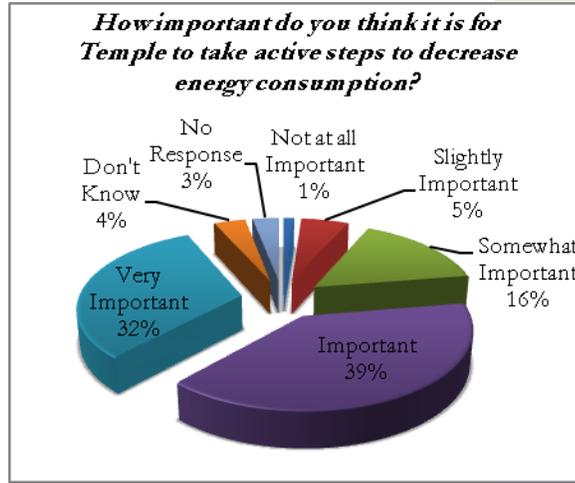


Figure 2-36

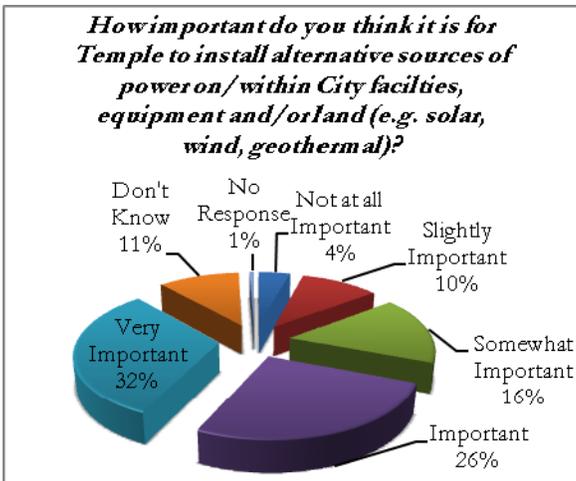


Figure 2-37



Figure 2-38



Figure 2-39

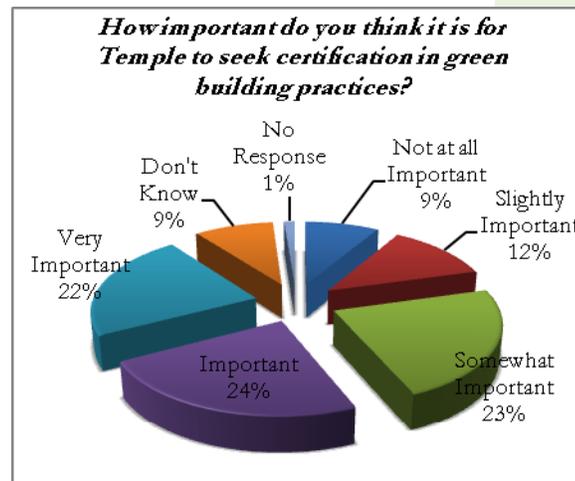


Figure 2-40

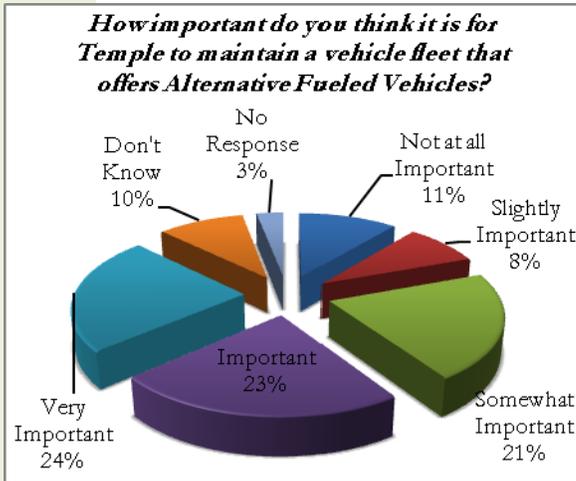


Figure 2-41

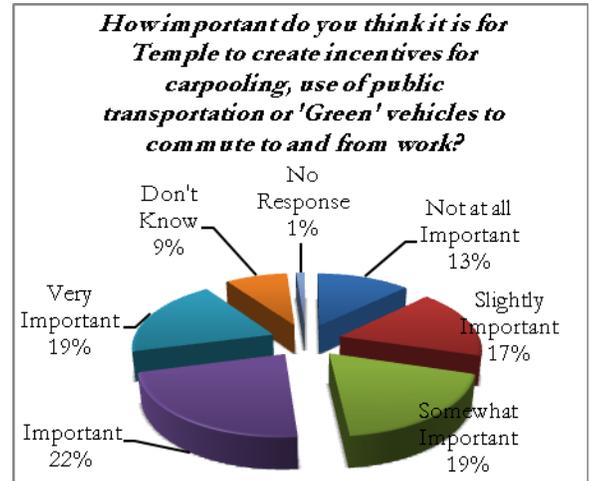


Figure 2-42

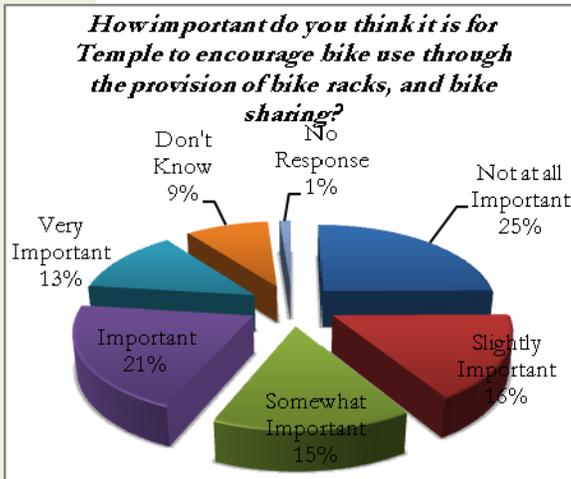


Figure 2-43

Conclusion

In general, through this survey, it has been identified that the majority of employees practice sustainability in their own lives and highly support the City in sustainable practices. The main focus areas include energy use, recycling, water, transportation, education/outreach, facility management and sustainable purchasing all discussed in this Plan.



Section 3:
***Current
Assessment***



Utility Assessment

Benchmarking

Benchmarking overall energy and water use of facilities is the first step in determining where and how to implement energy improvements within the City of Temple. Benchmarking is the process of accounting for and comparing a metered building's current energy and water performance with the utility performance of similar types of buildings, based on function. General benchmarking is used to compare performance over time at specific buildings, as well as between like facilities and users and to document top performers and poor performers within an institution.

The benchmarking assessment presented in this document discusses overall energy and water use by the City and against regional and national databases. Case studies of specific buildings are discussed later in this section, comparing use to other local, regional and national vehicles. The goals of the assessment are:

- To clearly identify the types and costs of energy and water use;
- To understand how energy and water is being used—and possibly wasted; and
- To identify alternatives such as improved user operation techniques and / or new equipment that could substantially reduce energy costs.

The benchmarking data for the study is based on several sources, including 1) previously conducted energy audits on various City owned facilities, 2) electricity, gas and water billing history for all City paid meters, 3) building occupied square footage area information, and 4) various information gathered through observation and/or conversations with users and those responsible for maintenance. To compile this data all electric, gas and water meters were assessed for all types of uses including buildings, parks, and pumps.

It was determined that the total cost for all utilities (electric, gas, and water) totaled \$3,747,590.67 in FY 2010. The cost and use of each utility is depicted in Table 3-1. The costs reflect the total cost for the specific utility, which includes the cost for customer service charges, demand charges, energy charges and adjustment and discount charges that will vary somewhat from account to account depending on the actual rate schedules and service agreements.

		Oct '08 - Sept '09 AVERAGE	Oct '09 - Sept '10 AVERAGE	Oct '08 - Sept '09 TOTAL	Oct '09 - Sept '10 TOTAL
ELEC	\$	\$263,714.61	\$265,058.65	\$3,164,575.38	\$3,180,703.83
	Elec (kwh)	2,505,457.20	2,503,972.51	30,065,486.42	30,047,670.13
NATURAL	\$	\$6,124.32	\$7,733.28	\$73,491.78	\$92,799.37
GAS	Gas (MCF)	749.90	1,058.02	8,998.85	12,696.27
WATER	\$	\$43,902.11	\$39,507.29	\$526,825.26	\$474,087.46
	Water (Gal)	10,391,083.33	9,256,904.17	124,693,000.00	111,082,850.00
TOTAL	\$	\$941,223.11	\$936,897.67	\$3,764,892.42	\$3,747,590.67
	Btu (E & G)	8,693,483,625.13	10,133,221,579.51	8,693,483,625.13	121,598,658,954.07

Table 3-1

There are 238 electric meters used by the City, with MidAmerican Energy Company as the electric supplier. The City also pays a flat fee for some streetlights, that are not metered. During FY 2010 the City consumed 30,047,670.13 kWh of electricity, amounting to a total cost of \$3,180,703.83, at an average rate of \$0.1059 per kWh.

Since most of the City does not have natural gas lines, there are only 25 natural gas meters used at



City facilities, provided by Atmos Energy. The City consumed 12,696.27 MCF of natural gas, spending a total of \$92,799.37, at an average rate of \$7.3092 per MCF.

Some City facilities also utilize propane to heat the buildings. The facilities include the Service Center and two Fire Stations. Once open, Fire Station #8 will also use propane. During FY 2009 the City used 14,494 gallons of propane, spending a total of \$33,674.31. During FY 2010 the City used 20,254 gallons of propane, spending a total of \$ 70,597.01. This is not included in the analysis, however will be assessed later due to the 28 percent increase in use and 52% increase in cost from FY 2009 to FY 2010.

The City utilizes 264 water meters, supplied by the City of Temple. The City consumed 111,082,850.00 gallons of water, amounting to a total expenditure of \$474,087.46, at an average rate of \$0.0043 per gallon, during FY 2010.

		Oct '08 - Sept '09	Oct '09 - Sept '10	DIFFERNCE	% CHANGE
		TOTAL	TOTAL		
ELEC	\$	\$3,164,575.38	\$3,180,703.83	\$16,128.45	0.51%
	Elec (kwh)	30,065,486.42	30,047,670.13	(17,816.29)	-0.06%
NATURAL	\$	\$73,491.78	\$92,799.37	\$19,307.59	26.27%
GAS	Gas (MCF)	8,998.85	12,696.27	3,697.42	41.09%
WATER	\$	\$526,825.26	\$474,087.46	(\$52,737.80)	-10.01%
	Water (Gal)	124,693,000.00	111,082,850.00	(13,610,150.00)	-10.91%
TOTAL	\$	\$3,764,892.42	\$3,747,590.67	(\$17,301.76)	-0.46%
	Btu (E & G)	104,321,803,501.58	121,598,658,954.07	17,276,855,452.49	16.56%

Table 3-2

In comparison to FY 2009 the cost for all utilities in FY 2010 decreased by 0.46%. Considering current world, national and regional circumstances it is plausible to assume that all utility costs will increase in the future, due to increase in demand and decrease in supply of natural resources, but presumably more drastically. This increase will also be due to increased consumption by purchaser. Table 3-2 illustrates the percent of cost and use increased for each utility.

Currently the City of Temple spends an average of \$936,897.67 per quarter, for all utilities. By analyzing current and past trends, and using forecasting formulas it can be projected that for FY 2011 the City will spend on average \$1,177,608.65 per quarter and \$1,503,734.43 per quarter in FY 2012 on all utilities. Figure 3-1 illustrates the forecasted total cost for utilities through FY 2012.

Without proper actions taken, by the City to conserve energy and

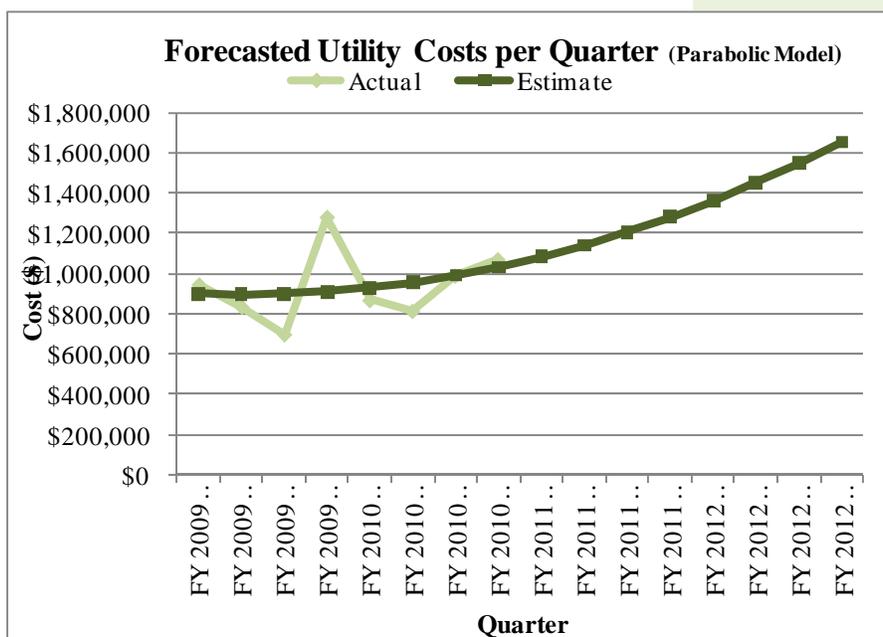


Figure 3-1



water use, the City is forecasted to spend a total of \$3,578,186.95 for utilities in FY 2011 and \$3,928,401.70 in FY 2012. This accounts for a 12.5% increase in cost between FY 2010 and FY

2011 and a 10% increase in cost between FY 2011 and FY 2012. These forecasted costs do not take into account actual consumption. Therefore, if the amount consumed decreases the cost will decrease. However, if the amount consumed increases, as past trends indicate, the cost will be higher than the projected amount. To mitigate an increase in future costs, consumption must be decreased.

The City of Temple currently uses an average of 7,511,917.53 kWh of electricity per quarter. After analyzing current and past trends it is forecasted that for FY 2011 the City will use on average 8,387,043.58 kWh of electricity per quarter in FY 2011 and 8,795,975.56 kWh per quarter in FY 2012.

The City is forecasted to consume a total of 33,548,174.33 kWh of electricity in FY 2011 and 35,183,902.24 kWh in FY 2012. This accounts for a 12% increase in use between FY 2010 and FY 2011 and a 5% increase in use between FY 2011 and FY 2012. Figure 3-2 illustrates the projected increase in electricity use per fiscal year, acting as a controllable variable in increasing overall costs.

Although cost is market driven and cannot be controlled by the City, if current and past electric cost trends are considered, the total cost of electricity for FY 2011 can be forecasted to be \$3,578,186.95. This amounts to a 12% increase in cost between FY 2010 and FY 2011. In FY 2012 costs are forecasted to total \$3,928,401.70, accounting for a 10% increase. However, unforeseen and uncontrollable market situations are not accounted for due to lack of reliability. Figure 3-3 illustrates the forecasted electric cost through FY 2012.

At this time the City uses an average of 3,174.07 MCF of natural gas per quarter. After analyzing current and past trends it is forecasted that for FY 2011 the City will use on average 3,285.29 MCF of natural gas per quarter in FY 2011 and 3,312.32 MCF per quarter in FY 2012.

The City is forecasted to consume a total of 13,141.16 MCF of natural gas in FY 2011 and 13,249.29 MCF in FY 2012. This accounts for a 7% increase in use between FY 2010 and FY 2011 and a 1% increase in use between FY 2011 and FY 2012. Figure 3-4 illustrates the projected increase in natural gas use per fiscal year, acting as a controllable variable in increasing overall costs.

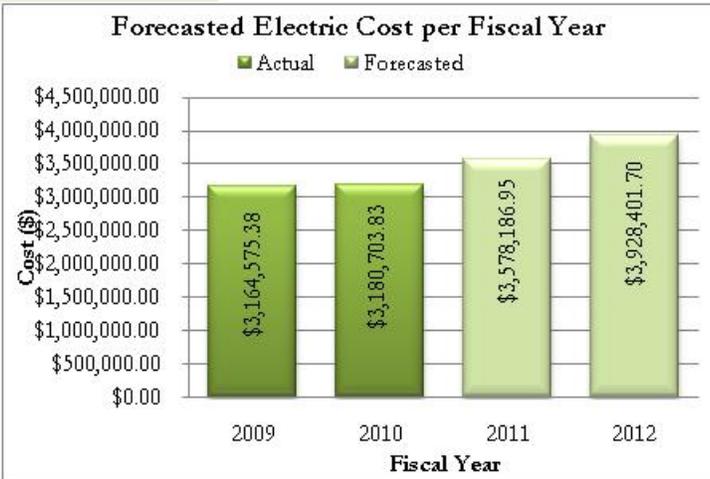


Figure 3-2

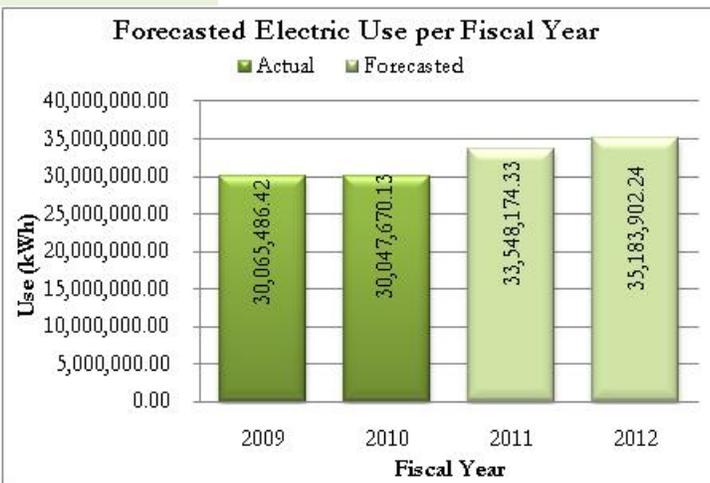


Figure 3-3

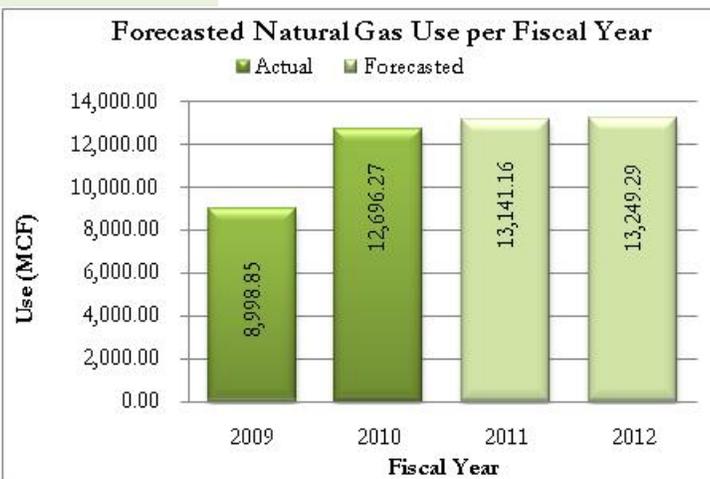


Figure 3-4



Taking into account the current and past cost trends of natural gas, in combination with use, the total cost of natural gas for FY 2011 is projected to be \$92,390.08. This increase accounts for a 3% higher cost in FY 2011 than FY 2010. In FY 2012 costs are forecasted to total \$144,807.08, accounting for a 56% increase from FY 2011. Future costs account for an increase from \$7.33 to \$10.93 in cost per unit. Figure 3-5 demonstrates the forecasted costs in natural gas per quarter through FY 2012.

Temple currently uses an average of 27,770,712.50 gallons of water per quarter. After analyzing current and past trends it is forecasted that for FY 2011 the City will use on average 37,056,684.82 gallons of water per quarter in FY 2011 and 42,113,153.87 gallons per quarter in FY 2012. This projection might be higher than the actual use, due to the fact that between FY 2009 and FY 2010 the number of meters used by the City increased, therefore use also significantly increased. This increase will reflect on a higher use projected in the future.

The City is forecasted to consume a total of 148,226,739.29 gallons of water in FY 2011 and 168,452,615.48 gallons in FY 2012. This accounts for a 34% increase in use between FY 2010 and FY 2011 and a 13% increase in use between FY 2011 and FY 2012. Figure 3-6 illustrates the projected increase in water use per fiscal year, acting as a controllable variable in increasing overall costs.

Considering current and past water cost trends, in combination with use, the total cost of water for FY 2011 is forecasted to be \$536,566.86. This amounts to a 14% increase in cost between FY 2010 and FY 2011. In FY 2012 costs are forecasted to total \$590,976.99, accounting for a 10% increase. Future costs account for the increase in past costs, and by continuing the stable costs per unit the cost remains relatively stable at \$0.0041. However, unforeseen and uncontrollable market situations are not accounted for due to lack of reliability. Figure 3-7 illustrates the projected increase in water cost per fiscal year.

It may be realized that all of the utilities are forecasted to increase in consumption and cost, however at different rates. Electric consumption and cost both show a pretty steady increase through FY 2012. Natural gas consumption remains relatively stable, however price, due to past market demands and the plausibility of increase in future market demands, increases dramatically. Whereas consumption and cost of water is forecasted to continue to follow a

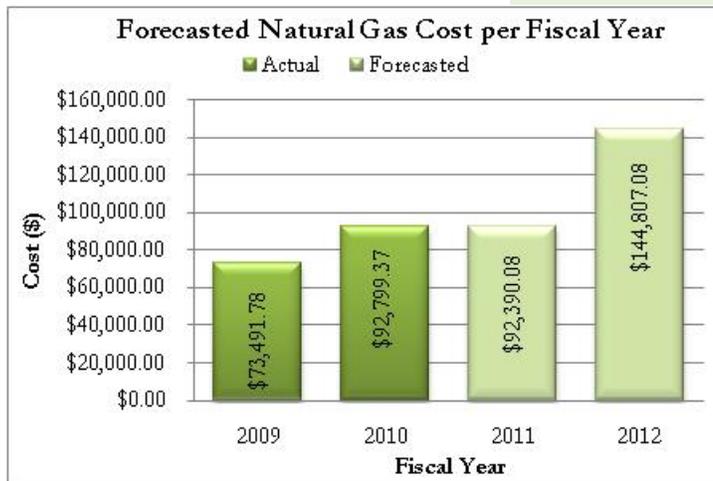


Figure 3-5

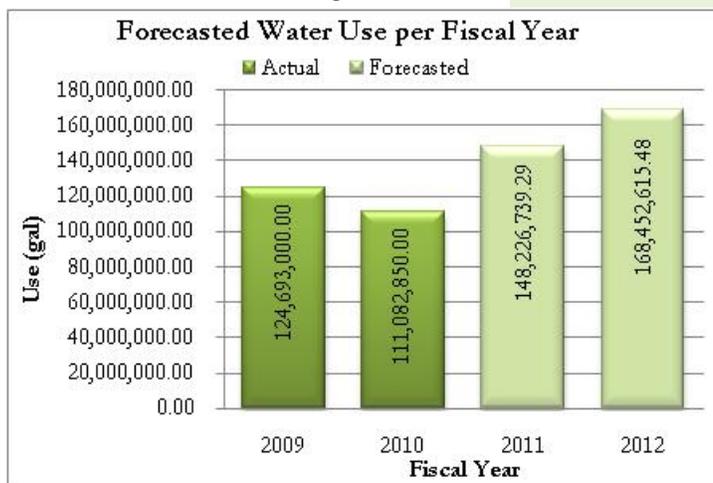


Figure 3-6

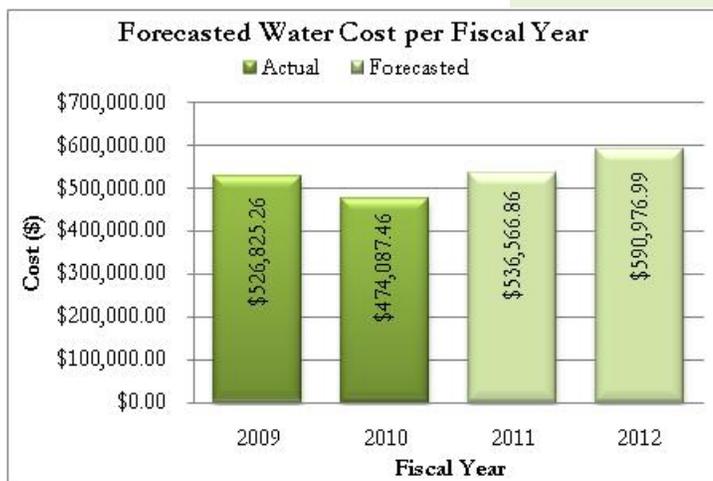


Figure 3-7



more rapid increase in consumption and cost through 2012.

As previously stated, the City cannot control the cost of the utility, because cost is market driven. However, two variables may be controlled and managed to mitigate the overall dramatic increase in end-use cost for utilities. The first variable is consumption. There are different user methods and basic equipment/maintenance changes that can be taken to decrease consumption. The second variable is changing the method of receiving utilities.

Some methods may be generated on-site, such as solar and wind, decreasing the City's reliance on other utility providers, potentially providing an increase of jobs and most importantly decreasing the cost to the City over time.

This assessment will further look at consumption and costs for each department and touch on some recommendations concerning the two controllable variables, allowing the City to become more sustainable in the ways in which it operates.



City Facilities

Roles of City Facilities in Sustainability and Energy Consumption

According to the Environmental Protection Agency, government agencies spend more than \$10 billion a year on energy to provide public services; while struggling with tightening budgets. However, it is estimated that one-third of the energy used to run typical governmental buildings is wasted. This waste is contributed to user behavior, inefficient equipment, and lack of policies and programs in place to support and reward sustainable efforts.

The City of Temple is not exempt to wasted energy and utility use in its facilities. A comprehensive review of current conditions is being conducted in order to determine future improvements to all City facilities. This action will further the following initiatives:

Identify under-performing buildings to target for energy efficiency improvements, and

Establish baselines to set goals and measure progress for energy efficiency improvement projects over time.

This section discusses the overall condition of the City's existing building portfolio. Also presented are case studies of selected City buildings and actions from other entities as to possible improvement options the City can undertake.

Existing Conditions

The City of Temple owns and operates fifty-three buildings, encompassing approximately 653,000 square feet. The buildings vary in age from 100 years old to brand new. In addition to the buildings, the City also maintains over 4,100 streetlights, 1,000 lane miles of streets, 61 signalized intersections, 593 miles of water distribution mains, 410 miles of sewer mains, 300 acre land fill and other solid waste facilities, over nearly 650 vehicles and miscellaneous fleet equipment, and approximately 750 acres of park and recreation space. These City buildings and facilities help to support the services necessary for approximately 66,000 residents. All of these buildings and facilities will be discussed in further detail throughout the Sustainability Management Plan. The following will discuss buildings only.

Figure 3-8 depicts a picture of the Police Department and Figure 3-9 displays a picture of Lion's Junction Water Park, these pictures show the varying type of facilities the City owns and operates.

To provide an understanding of the existing conditions at City facilities the following section provides a general assessment of HVAC, lighting, building envelope, water, wastewater and irrigation use, on-site renewable energy, and operations and maintenance. These descriptions are based from onsite inspections, interviews with maintenance workers, a review of past utility use and a review of completed improvement projects. Ten facilities were also inspected, and will serve as representatives of the diverse buildings and services provided by the City. Detailed case studies of these ten facilities are discussed in Section 3, focusing on efficient opportunities at these facilities.



Figure 3-5



Figure 3-6



HVAC

The City of Temple has a variety of facilities that vary in size and serve different functions. Therefore, the heating, ventilation and air conditioning systems are very diverse, in order to adequately provide for the variety of spaces. Most of the units are less than 20 ton units; however, some facilities have 100 ton roof top units. Most of the equipment is at least 10 years old, with the oldest system about 15 years old.

Facilities maintenance does a good job at keeping the equipment operational, being very reactive to situations. Maintenance also regularly replaces the systems, when funds are available, to improve efficiency and decrease maintenance needs. However; more proactive approaches would help to keep the systems running efficiently, which is difficult of most public facilities due to lack of funding and personnel. In some cases equipment and systems that have the potential for energy savings, such as variable frequency drives, or something as simple as a grate to protect the exterior filters, have been evaded or removed because repair funding has not been available. In addition, system controls are often set to bypass mode, outdated, or do not allow for best energy management practices.

Lighting

Lighting is a crucial fixture in a working environment. It is estimated by the EPA that forty-percent of total energy use in a commercial facility is attributed to lighting. The City has updated some lighting from T-12 lamps to T-8 lamps in some facilities. However, avoided costs can come from a variety of lighting control measures, not implemented during these upgrades. Some of the common lighting inefficiencies throughout the buildings and facilities are the use of inefficient lights such as T-12, metal halide and incandescent lamps. Also attributed to high energy use is lack of lighting controls. Many spaces do not have occupancy sensors, and leave the controls up to the user. In most spaces lights are left on all day, whether someone is in the space or not, this includes every space from offices and bathrooms to elevators and storage rooms.

Building envelope

The building envelope is composed of all exterior walls, including all glazing and doors. The building envelope impacts energy performance due to the amount of glazing, thermal efficiency, and availability of daylight harvesting. The age of the City's facilities vary greatly, some built as early as the 1900s. The City has recently been very proactive about replacing many of the older flat roofs with white TPO roofing materials. However, some roofs still need improvement, or need proactive maintenance. The vertical envelope on the buildings can also be improved, including tightening the seal on doorways, in some cases the seals are minimal, allowing for air leaks and infiltration. In the newer buildings daylight harvesting is not utilized, although ample glazing allows for the use of natural lighting.

Operations and maintenance

The City's facility maintenance department is good at maintaining the facilities; however, many of the measures taken are reactive, as opposed to proactive. Like most governmental facilities, City staff spends the majority of their time addressing current problems on an as-needed basis, due to budget constraints. These actions are not always the best method because it results in missed opportunities to apply more energy efficient solutions. Many of the facilities are maintained by the maintenance department that has four employees. However, the Library and Police Department utilize their own maintenance people, one each. This computes to one employee per approximately 163,000 square feet. According to the International Facility Management Association (IFMA) Operations and Maintenance staff benchmarking is approximately one staff member for every 50,000 GSF. The City does not meet this recommendation; staff is actually taking on three-times the recommended space.



Administration

Roles of Administration in Sustainability and Energy Consumption

Commercial and industrial buildings are responsible for nearly half of our nation's energy consumption, spending about \$200 billion each year. Commercial buildings in America inefficiently or unnecessarily use about 30% of the energy consumed, this is due to lack of maintenance, inappropriate operation settings and inefficient human operation. It is estimated that the energy used during a typical work day is only used towards four hours of productive work. All of these findings identify areas to where energy can be easily saved within buildings, mainly pertaining to operational settings and use.

For the purposes of this Sustainability Management Plan, administration refers to work related operations performed in office settings. This is an extension of the issues discussed in the previous Public Facilities section. Issues focused on when discussing administration roles include lighting settings and controls, general office equipment operation (i.e. unplugging equipment, computer run-time), paper use, work schedules (i.e. avoid working during peak demand times), and to incorporate sustainability into the decision making process.

Existing Conditions

Every department within the City of Temple utilizes administrative operations to provide services to the community. More often than not, many of these operations are within typical office-settings, requiring regular office functions. These functions include computer operation, paper use, communication requirements, provision of public and private meeting spaces and general building operations, among others.

Current Initiative and Plans

The City of Temple has recently committed to being more sustainable, through a Sustainability and Energy Efficiency (SEE) Policy. Prior to the adoption of this policy there was an unspoken understanding and awareness of the need to provide for more energy efficient and sustainable practices within City operations, however proper actions were not always taken. However, now with a formal written policy, the City is responsible for implementing sustainable efforts, within daily operations.

The SEE Policy commits the City to a clean, safe and healthy environment. As such, the City will exercise sustainable practices, focusing on environmental and economical stewardship in business with employees, other governments, citizens, City contractors, businesses and others in the community. Actions taken by the City will assist in reducing negative sustainability impacts in all activities including operations, maintenance, construction and waste disposal, allowing the City to achieve the following goals:

- Reduce energy costs and consumption
- Improve environmental monitoring (Model responsible energy management)
- Prevent pollution
- Increase energy efficiency
- Conserve water
- Reduce consumption and waste
- Reuse, recycle and purchase recycled content products
- Reduce reliance on non-renewable resources
- Engage and educate employees and the community
- Promote inter-departmental collaboration
- Measuring monitoring and communicating the City's progress toward a defined goal set



The Parks and Leisure Services Department has also taken pro-active steps to becoming more sustainable. The department recently established Green initiatives that focus on the following areas:

- Recycling Education / Locations / Containers
- Vehicle Use
- Copying Machines
- Lighting
- HVAC
- Roofing Materials
- Water
- Landscaping / Furniture

As the department evaluates future programs, projects and purchases they will consider sustainable options, when cost effective. The staff will also practice more sustainable measures in daily operations.

Sustainable Purchasing



Roles of Purchasing in Sustainability and Energy Consumption

Local and state governments spend more than \$1 trillion on goods and services each year. Sustainable procurement measures can help to save money, reduce harmful environmental impacts, improve worker safety, generate publicity and educational opportunities and have a positive impact on the local economy.

Sustainable procurement goes beyond the old buy-recycled goods viewpoint; it incorporates such initiatives as purchasing more energy efficient equipment, as well as healthier carpet and furniture. According to the United Nations, sustainable procurement is a strategy that “integrates requirements, specifications and criteria that are compatible and in favor of the protection of the environment, of social progress and in support of economic development, namely by seeking resource efficiency, improving quality of products and services and ultimately optimizing costs.” Most importantly, sustainable procurement requires more informed decisions when purchasing products, focusing on the environment, human health and price.

With the adoption of a variety of sustainable, environmental and climate policies many governmental, private and public entities, are seeking to promote and contribute to a more sustainable market. It is realized that by promoting sustainable procurement there is an ability to change the unsustainable patterns of consumption and production.

- Sustainable procurement is founded upon a number of considerations including:
- Buying only what’s needed,
- Finding smart solutions triggering product and service innovation,
- Life-cycle costs (i.e. production, distribution, use, disposal/recycle),
- Securing value for money,

Organizations behaving responsibly, given their large influence on the economy.

Overall, sustainable procurement is a process that allows organizations to meet their needs for goods, services, works and utilities in a manner that achieves value for money on a life-cycle basis in terms of generating benefits for the organization, but also society and minimizing damage to the environment.

With the onset of improving the “Triple Bottom Line,” as discussed in the Introduction, many entities are focusing on economic considerations, environmental aspects and social concerns alike. However, of the most interest to a variety of entities, products purchased through sustainable procurement consider the best value, price, quality, availability and functionality focusing mainly on the economics. The objective is to consider the total cost of ownership (life-cycle costs) including energy, maintenance and disposal costs, not just initial costs. By considering the life-cycle costs entities can determine cost savings over the life of the product. In some cases, although the product might be more expensive to comparable products up-front, over the life of the product, it might actually be less expensive.

Existing Conditions

The City of Temple houses a Purchasing Department that is responsible for providing bidding services for City needs, safeguarding public funds and obtaining good response to bids and from vendors. The Purchasing Department selects responsible vendors, assist in obtaining pricing information, determines that prices are reasonable and bid requirements are met, assist other City departments to develop quality specifications and control the cost of purchasing for the City. The goals of the Purchasing Department include the following:

- Purchase of quality goods and services



- Get the best possible price for goods and services
- Delivery of goods and services when and where needed
- Assure a continuing supply of needed goods and services
- Guard against misappropriation of any assets procured

Current Initiative and Plans

The City of Temple is required to follow purchasing laws outlined within chapter 252 and 271 of the Local Government Code, as well as the City of Temple's Purchasing Policies and Procedures Manual and Ordinance. These current laws and policies establish various levels of purchasing authority according to cost. However, the laws and policies do not currently define any requirements for life-cycle cost consideration, and other concerns for economical, environmental and social responsibilities.



Transportation

Roles of Transportation in Sustainability, Energy Consumption and Emissions

Transportation's role in the operation of any entity cannot be understated. A vital transportation system is a key component to sustained services. The transportation system and related assets provide access to work, mobility to provide services and connection amongst the community. The Plan will discuss both sustainable fleet and street infrastructure practices, in the following sections.

The Federal Highway Administration reported that 2,996,631 million vehicle miles were travelled across the United States in 2009. This amount is reflective of the annual miles travelled since 2001. These miles travelled contributed to the use of 171,957,953 thousand of gallons of motor-fuel in 2009 in the United States. The State of Texas used 15,776,583 thousand of gallons of motor-fuel in 2009; California is the only state that used more fuel. These statistics support a high dependence on fuel, especially in single occupancy vehicles. Therefore, by decreasing these amounts and supporting more sustainable practices, there are many ways that transportation can save energy and reduce emissions. Some benefits of applying sustainable practices to transportation initiatives include:

- Saving money;
- Reducing climate change;
- Reducing oil dependency; and
- Increasing efficiency.

A federal mandate was announced in 2009, to reduce fuel consumption and emissions standards. The mandate states that new light duty trucks vehicles to average 35.5 miles per gallon by the year 2016, which, will begin to go into effect in 2012. Then in 2010 the mandate was expanded to medium and heavy-duty trucks starting in 2014. Although these vehicles are anticipated to cost approximately \$1000 more, the life-time cost will decrease, due to the increased miles per gallon. Federal and market driven actions like this will further increase the City's ability to improve fleet sustainability.

Existing Conditions

The City of Temple has 425 vehicles in its fleet, with an additional 151 pieces of miscellaneous equipment. The vehicles and equipment are maintained by the Fleet department. The pie chart in Figure 3-10 displays the proportion of each vehicle classification type within the fleet.

The average age of the fleet vehicles is seven years. The fleet department usually plans replacement of vehicles between 120,000 to 150,000 miles and/or 9,000 to 12,000 hours.

The fleet is composed of vehicles that mainly run on gasoline (75%), all of which use a 10 percent gasoline fuel (E10). The City fleet is also com-

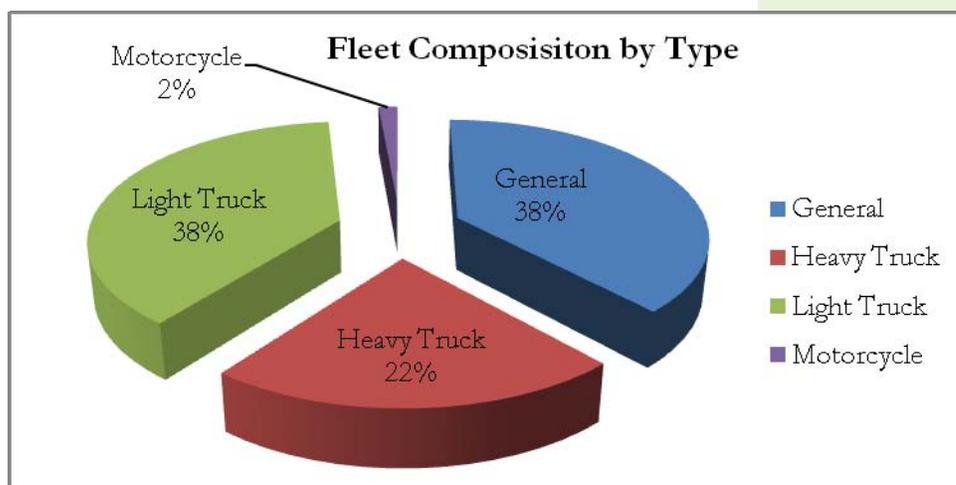


Figure 3-10



posed of diesel vehicles that make up 25%. Figure 3-11 displays the proportion of each vehicle fuel type within the fleet.

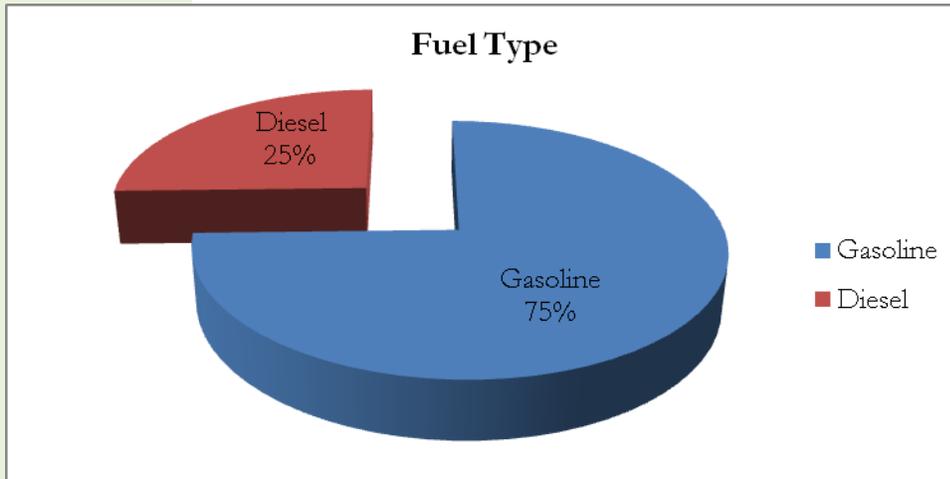


Figure 3-11

The City fleet travels approximately 2,800,000 miles per year, to provide services to the community. These miles contributed to the consumption of 481,667.28 gallons of gasoline, totaling \$1,170,905.15 during fiscal year 2010. Table 3-3 below shows consumption and cost of fuel since FY 2008.

Current Initiative and Plans

The City has adopted a City-Owned Vehicle and Equipment Use Policy. This policy includes guidance on utilization of vehicles and equipment,

use of take home City vehicles, general maintenance, accidents, operation standards, and anti-idling. Vehicle and equipment use is neither a right nor a privilege, but is a trust conferred to facilitate necessary performance of job duties.

- The objective most related to sustainability is anti-idling. This portion of the overall policy states the following:
- Engine idling shall be kept to the absolute minimum amount necessary.
- Engines shall not be idled simply to “warm up” or pre-heat the cab.
- On vehicles equipped with air conditioning, engines shall not be idled in order to “pre-cool” the cab.
- Engines shall never be allowed to idle while refueling the vehicle. This not only wastes fuel, but is both dangerous and illegal.
- Whenever feasible, vehicle operators shall try to live by the “10 second rule.” Simply stated, this means turning off the engine whenever it is anticipated that the engine will be needlessly idling for 10 seconds or more.

Also discussed in the policy are exemptions that are permitted due to improved operations of the vehicle or equipment, by idling.

During regular maintenance checks, the Fleet department runs tests on the motor oil to ensure proper life. This allows the City to ensure that good oil is not wasted, due to early changing. It also ensures that the oil is not changed too late, impacting vehicle performance.

The City of Temple does not have any set policy in purchasing efficient vehicles. However, when funding permits the most efficient vehicle is purchased.



Department	Fuel Type	Quantity			Cost		
		FY 08	FY 09	FY 10	FY 08	FY 09	FY 10
Purchasing	Regular Unld	328.00	296.20	361.00	\$1,026.13	\$590.97	\$861.53
	Subtotal	328.00	296.20	361.00	\$1,026.13	\$590.97	\$861.53
IT Services	Regular Unld	466.30	488.08	615.70	\$1,475.57	\$942.99	\$1,458.57
	Subtotal	466.30	488.08	615.70	\$1,475.57	\$942.99	\$1,458.57
Police	ULSD	185.60	484.10	543.42	\$722.58	\$970.04	\$1,358.67
	Premium Unld	985.98	1,001.61	1,185.23	\$3,240.41	\$2,235.52	\$3,068.37
	Regular Unld	109,342.88	109,507.63	113,078.17	\$339,128.93	\$211,320.38	\$267,765.36
	Unleaded Plus	3.90	22.33	28.87	\$13.79	\$52.12	\$72.32
	Subtotal	110,518.36	111,015.67	114,835.69	\$343,105.71	\$214,578.06	\$272,264.72
Animal Control	Premium Unld	--	0.60	--	--	\$1.00	--
	Regular Unld	4,982.90	5,335.60	5,201.70	\$15,561.42	\$10,424.71	\$12,381.00
	Subtotal	4,982.90	5,336.20	5,201.70	\$15,561.42	\$10,425.71	\$12,381.00
Fire	ULSD	25,614.86	26,135.14	27,817.67	\$90,688.24	\$54,293.63	\$69,201.57
	Premium Unld	--	--	57.40	--	--	\$152.94
	Regular Unld	5,612.56	5,252.10	6,606.51	\$17,404.75	\$10,333.57	\$15,743.62
	Subtotal	31,227.42	31,387.24	34,481.58	\$108,092.99	\$64,627.20	\$85,098.13
Solid Waste	ULSD	149,007.80	146,211.49	148,576.26	\$527,682.78	\$303,649.30	\$369,492.17
	Premium Unld	5.70	--	--	\$19.08	--	--
	Regular Unld	6,062.90	5,758.20	6,035.70	\$18,912.27	\$11,158.02	\$14,354.73
	Unleaded Plus	22.80	--	--	\$57.34	--	--
	Subtotal	155,099.20	151,969.69	154,611.96	\$546,671.47	\$314,807.32	\$383,846.90
Facility Services	Regular Unld	5,133.40	5,350.70	5,506.38	\$15,916.86	\$10,485.84	\$13,087.01
	Subtotal	5,133.40	5,350.70	5,506.38	\$15,916.86	\$10,485.84	\$13,087.01
Traffic Signal	ULSD	498.10	755.80	1,191.80	\$1,799.15	\$1,564.71	\$2,922.08
	Premium Unld	21.90	--	--	\$77.47	--	--
	Regular Unld	3,027.90	3,005.42	3,110.00	\$9,265.85	\$5,816.01	\$7,462.02
	Subtotal	3,547.90	3,761.22	4,301.80	\$11,142.47	\$7,380.72	\$10,384.10
Drainage	ULSD	11,356.24	8,465.65	6,192.04	\$40,226.71	\$17,759.87	\$15,338.96
	Regular Unld	3,619.30	3,501.80	3,877.22	\$11,293.42	\$6,905.72	\$9,164.55
	Subtotal	14,975.54	11,967.45	10,069.26	\$51,520.13	\$24,665.59	\$24,503.51
Leisure Services	ULSD	73.30	121.30	55.50	\$250.04	\$249.54	\$135.42
	Premium Unld	2.50	--	--	\$8.82	--	--
	Regular Unld	1,277.70	1,258.10	926.50	\$3,938.48	\$2,462.66	\$2,189.55
	Subtotal	1,353.50	1,379.40	982.00	\$4,197.34	\$2,712.20	\$2,324.97
Street	ULSD	16,665.61	19,306.78	21,321.05	\$58,529.28	\$39,708.64	\$52,989.36
	Regular Unld	7,336.51	7,322.47	6,888.29	\$22,303.05	\$14,342.45	\$16,351.38
	Subtotal	24,002.12	26,629.25	28,209.34	\$80,832.33	\$54,051.09	\$69,340.74
PALs	ULSD	9,601.79	8,966.14	9,793.50	\$34,599.20	\$18,668.09	\$24,599.38
	Premium Unld	321.70	255.80	197.00	\$1,139.76	\$558.52	\$505.31
	Regular Unld	22,888.40	23,581.81	28,064.06	\$71,518.57	\$46,733.51	\$66,784.77
	Unleaded Plus	162.30	93.50	--	\$483.88	\$170.33	--
	Subtotal	32,974.19	32,897.25	38,054.56	\$107,741.41	\$66,130.45	\$91,889.46
Airport	Premium Unld	12.90	--	--	\$35.62	--	--
	Regular Unld	58.40	17.50	--	\$157.71	\$27.24	--
	Subtotal	71.30	17.50	0.00	\$193.33	\$27.24	\$0.00
Construction Safety	Premium Unld	--	--	31.80	--	--	\$81.52
	Regular Unld	6,301.10	6,321.62	6,236.00	\$19,639.24	\$12,480.50	\$14,859.60
	Subtotal	6,301.10	6,321.62	6,267.80	\$19,639.24	\$12,480.50	\$14,941.12
Fleet	ULSD	226.80	137.50	198.50	\$781.59	\$308.19	\$487.80
	Premium Unld	3.80	--	--	\$15.19	--	--
	Regular Unld	3,399.15	4,177.58	4,260.60	\$10,542.05	\$8,412.38	\$10,133.57
	Subtotal	3,629.75	4,315.08	4,459.10	\$11,338.83	\$8,720.57	\$10,621.37



Department	Fuel Type	Quantity			Cost	
		FY 08	FY 09	FY 10	FY 08	FY 09
Construction Safety	Premium Unld	--	--	31.80	--	--
	Regular Unld	6,301.10	6,321.62	6,236.00	\$19,639.24	\$12,480.50
	Subtotal	6,301.10	6,321.62	6,267.80	\$19,639.24	\$12,480.50
Fleet	ULSD	226.80	137.50	198.50	\$781.59	\$308.19
	Premium Unld	3.80	--	--	\$15.19	--
	Regular Unld	3,399.15	4,177.58	4,260.60	\$10,542.05	\$8,412.38
Subtotal	3,629.75	4,315.08	4,459.10	\$11,338.83	\$8,720.57	
Engineering	Premium Unld	--	--	66.30	--	--
	Regular Unld	4,601.30	3,758.20	4,046.30	\$14,299.61	\$7,366.37
	Unleaded Plus	23.70	--	--	\$67.45	--
Subtotal	4,625.00	3,758.20	4,112.60	\$14,367.06	\$7,366.37	
Library	Regular Unld	602.00	644.50	661.50	\$1,868.59	\$1,245.48
Subtotal	602.00	644.50	661.50	\$1,868.59	\$1,245.48	
Mayborn Center	Regular Unleaded	398.20	515.50	488.80	\$1,277.81	\$1,013.45
Subtotal	398.20	515.50	488.80	\$1,277.81	\$1,013.45	
Water Treatment	ULSD	66.90	46.50	744.20	\$236.53	\$95.55
	Premium Unld	--	--	12.30	--	--
	Regular Unld	4,365.20	3,970.40	4,287.03	\$13,368.54	\$7,793.02
Subtotal	4,432.10	4,016.90	5,043.53	\$13,605.07	\$7,888.57	
Water Distribution	ULSD	2,975.80	2,811.30	4,592.50	\$10,330.52	\$5,802.61
	Premium Unld	--	22.90	6.30	--	\$46.38
	Regular Unld	10,698.19	9,954.82	10,286.50	\$32,996.23	\$19,395.31
Subtotal	13,673.99	12,789.02	14,885.30	\$43,326.75	\$25,244.30	
Water Metering	Premium Unld	--	18.70	--	--	\$45.67
	Regular Unld	14,911.73	14,859.97	15,260.80	\$46,119.20	\$28,636.71
	Unleaded Plus	30.20	--	--	\$81.03	--
Subtotal	14,941.93	14,878.67	15,260.80	\$46,200.23	\$28,682.38	
Water & Wastewater	ULSD	19,035.70	19,688.76	18,485.88	\$67,694.09	\$41,301.91
	Premium Unld	34.70	--	19.60	\$124.99	--
	Regular Unld	15,514.30	15,300.50	14,751.40	\$47,896.81	\$29,619.33
Subtotal	34,584.70	34,989.26	33,256.88	\$115,715.89	\$70,921.24	
	ULSD	235,308.50	233,130.46	239,512.32	\$833,540.71	\$484,372.08
	Premium Unld	1,389.18	1,299.61	1,575.93	\$4,661.34	\$2,887.09
	Regular Unld	230,530.12	229,663.20	240,061.36	\$714,633.28	\$446,493.17
	Unleaded Plus	242.90	115.83	28.87	\$703.49	\$222.45
GRAND TOTAL		467,868.90	464,724.60	481,667.28	\$1,554,816.63	\$934,988.24

Table 3-3



Streets

Roles of Streets in Sustainability, Energy Consumption and Emissions

The streets within Cities are a crucial part of livability and developing a sense of community, across the nation. Streets provide connection to other areas, generally in a safe manner. Streets serve as the main public thoroughfares in the built environment and are made up of many different components, including pavement, lighting, sidewalks, bike lanes, drainage apparatuses (curb and gutter), signs, parking, and landscaping. The components that make up a street vary and require electricity to operate lights, different drainage options to shed the streets of water, and areas for safe multiple modes of transportation, all relating to sustainability.

Existing Conditions

The streets drainage division was created in 1998 to address the City’s drainage concerns. The division is responsible for the maintenance of stormwater drainage infrastructure, including streets. Nearly one-hundred-percent of the streets within the City are surfaced with asphalt. The street department mainly employs the use of cold mix, latex based, asphalt for most of the street surfaces. This application is used mainly for filling pot holes and maintaining the road.

A Drainage Criteria and Design Manual is utilized to determine needed drainage ways, to meet the City’s drainage demands. The Manual states that “streets are significant and important in urban drainage and shall be used for storm runoff up to reasonable limits, recognizing that the primary purpose of streets is for traffic.” The Manual also sets the Design Storm Runoff Allowable by Street Use in Table 3-4. Aside from curb and gutter, and storm water conveyance facilities on the side of the roadways, the streets do not offer any natural filtration to alleviate any issues while shedding water from roadways.

Design Storm Runoff Allowable Street Use

Street Classification	Design Storm	Maximum Pavement Encroachment
Residential Street (31 feet B-B*)	10-year	Flow of water in gutters shall be limited to a flow at the curb of six (6) inches or wherever the street is just covered, whichever is the least depth.
Residential Collector Streets (36 feet B-B*)	10-year	Flow of water in gutters of a residential collector street shall be limited so that one standard lane will remain clear.
Industrial and Arterial Streets (widths above 36 feet B-B*)	25-year	Flow of water in gutters of industrial and arterial streets shall be limited so that two standard lanes will remain clear (at least one lane in each direction).

*Note: B-B is defined as back of curb to back of curb.

Table 3-4

The Department of Energy estimates that twenty-two percent of electricity used in the US is used to power lighting. The City utilizes over 4,100 street lights across the over 1,000 miles of streets. The street lighting is comprised of a variety of lamp types and wattages. The City of Temple does not own the actual light, Oncor; the electric provider owns the light. The City pays the electric distributor, at this time Mid America Electric, for the energy used to light the streetlight. In addi-



Utility Description	#	Wattage	Type	Rate Schedule	Rate Amount
175,MV,A	479	175 W	Mercury Vapor	A	\$7.35
400,MV,A	210	400 W	Mercury Vapor	A	\$11.25
<i>689</i>		<i>Total Mercury Vapor Street Lights</i>			
175,MH,A	6	175 W	Metal Halide	A	\$9.20
<i>6</i>		<i>Total Metal Halide Streetlights</i>			
100,HP,C	3	100 W	High Pressure Sodium	C	\$2.75
100,HP,A	2,142	100 W	High Pressure Sodium	A	\$6.90
200,HP,A	57	200 W	High Pressure Sodium	A	\$9.45
200,HP,B	1	200 W	High Pressure Sodium	B	\$16.35
250,HP,A	1,073	250 W	High Pressure Sodium	A	\$9.90
250,HP,B	23	250 W	High Pressure Sodium	B	\$17.00
250,HP,D	4	250 W	High Pressure Sodium	D	\$3.45
400,HP,A	81	400 W	High Pressure Sodium	A	\$14.25
<i>3,384</i>		<i>Total High Pressure Sodium Streetlights</i>			
189,IN,I	25	189 W	Induction	I	\$19.55
<i>25</i>		<i>Total Induction Streetlights</i>			

Least-Efficient
of Lamps Used



Most-Efficient
of Lamps Used

Table 3-5

tion to the kWh used the City also pays a fee based on a rate schedule per the type of light. The current number and type of street lights are listed in Table 3-5.

Out of the 4,104 streetlights, utilized by the City, nearly seventeen-percent are Mercury Vapor lamps. Mercury Vapor lamps are the least efficient lamps and current legislation now prohibits the manufacturing and importing of mercury vapor lamp ballasts. The majority of remaining streetlights are High Pressure Sodium lamps, which are greatly more efficient than Mercury Vapor, however, still not the most efficient lamps available.

Current Initiative and Plans

The City of Temple Streets department has diligently worked towards replacing all of the traffic signal lamps with LEDs. At this time the City has replaced about fifty-percent of the lamps, and continues to complete the process.



Water Systems

Roles of Water Systems in Sustainability, Energy Consumption and Emissions

Water is essential to everything on earth, including human life and communities. It is generally provided by the municipality. Water is used in residences, commercial and industrial industries, recreation and fire protection. Due to increased population and industrialization water is no longer safe to drink straight from the source and must be treated. Water is also scarce and requires long-distance conveyance to an entire population. Throughout history, water treatment has improved to provide safe and potable water for civilized areas.

The modern water system is composed of a series of pipes, pumps and pools that take raw water from a local water source. The water source is generally a river or lake, but might also be brought in from long distances via a pipe. Water treatment requires many components including energy to power the pumps and treatment systems, chemicals to condition and disinfect the water, pumping systems, personnel and vehicles to travel and inspect the numerous dispersed water system facilities, and reservoir facilities. Water is generally transported from the source as raw water, treated at a treatment plant and then distributed through a series of pumps and pipes to the community.

Existing Conditions

The City of Temple provides water services to approximately 22,800 customers. On average there are 5,500 connections established annually and 4,250 disconnects annually.

The Water Treatment Division is responsible for providing adequate supplies of water to meet current and projected demands, while ensuring that the quality of the water meets or exceeds all federal, state and local regulatory standards. In addition, the Water Treatment Division maintains all booster pump stations and storage facilities for the treated water in accordance with the standards set forth by TCEQ, while adhering to all applicable safety standards for our employees and the public. The Water Distribution Division is responsible for providing customers with superior public drinking water through the successful operation and maintenance of the City's 593 miles of water distribution mains.

The municipal water distribution system is designed with a series of pumps and elevated storage tanks located throughout the City (Figure 7 on the following page). The System includes an estimated 378 miles of water mains, 10 elevated storage tanks, 5 major pumping stations, and 2 ground storage tanks with a total capacity of 21 acre-feet. The total storage capacity of all systems is approximately 64 acre-feet.

In order to sufficiently provide water at the peak daily water demand (170% of the average daily demand), the pump stations are designed for maximum daily flow rates and the elevated storage tanks are designed to hold enough water to meet peak hour demands. The pipes in the system are designed to carry the maximum flow rate encountered during the day, normally either at the maximum hour or the minimum hour depending on location.

The City has a daily water demand of 38 acre-feet per day, with a max of 58 acre-feet per day. This is equal to approximately 13,500 acre-feet annually. The current capacity of the plant is 125 acre-feet per day.

The City of Temple's water system is characterized by high water demand fluctuations. There is a large increase in water demand during the late spring, summer and fall months (April through October). This seasonal increase is due to increase irrigation and recreational water needs during these months, as well as these months are generally those stricken by drought.

Approximately 22 million kilowatt hours were drawn by the water system operations in Fiscal Year (FY) 2010; which cost approximately \$1,950,000.00. This represents about twenty-nine per-



cent of the City's total utility bill.

Current Initiative and Plans

In order to avoid any shortfalls to the customers or mitigate the impact of periods of drought and high demand, the City has a Water Conservation Plan that establishes 'triggers.' These triggers move allotted water use, progressively, from voluntary conservation stages (Stage 1) to mandatory conservation stages (Stage 2-5). Once certain daily demand levels are reached, water conservation stages are 'triggered.' The stages are as follows:

Stage 1

When total daily water demand equals or exceeds 21 million gallons for 3 consecutive days or 24 million gallons on a single day.

Stage 2

When total daily water demand equals or exceeds 24 million gallons for 3 consecutive days or 27 million gallons on a single day.

Stage 3

When total daily water demand equals or exceeds 27 million gallons for 3 consecutive days or 28.5 million gallons on a single day.

Stage 4

Total treated water elevated storage does not refill to 50% of capacity overnight or total treated water ground storage does not refill to 60% of capacity overnight.

Stage 5

Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service

These stages are meant to be gradual in nature and provide mandatory conservation measures for water customers. The Stages are meant to mitigate the need for any emergency actions to take place, during peak water times or an unforeseen shortfall. In the case of an emergency non-critical water use, such as irrigation, washing vehicles and filling pools, is prohibited, no applications for any water service facilities will be approved, and water rationing will be instituted.



Solid Waste

Roles of Solid Waste in Sustainability, Energy Consumption and Emissions

Municipal solid waste facilities serve a vital role in communities. It is estimated that the average person creates 4.5 pounds of garbage per day, 1,650 pounds per year that is almost 230 million tons of garbage in the United States. The City is ultimately responsible for properly disposing of all this garbage.

Many municipal solid waste facilities primarily serve residential households and commercial businesses. In regards to disposing items, solid waste departments may be seen as an environmental liability in some cases. However, solid wastes departments may also be considered as a resource and revenue stream through recycling.

The major components of the municipal waste stream are recyclable. Figure 3-12 displays the typical materials in any given garbage put on the curb. Nearly forty-percent is recyclable paper and paper board, and nearly fifteen percent is yard waste. Other recyclables products include plastics, glass and metals. Generally, about thirteen percent of disposed materials are not recyclable.

Within the past two decades many solid waste facilities have begun to expand their function to serve multiple streams of waste. This action is mainly a response to the ever changing characteristics of waste and the realization of some environmental concerns due to the new types of waste, such as electronics and construction material. Cities have begun to rethink standards for solid waste management, focusing on more sustainable methods. Figure 3-13 below depicts the new solid waste hierarchy.



Source: U.S. EPA

Figure 3-12

Solid Waste Hierarchy

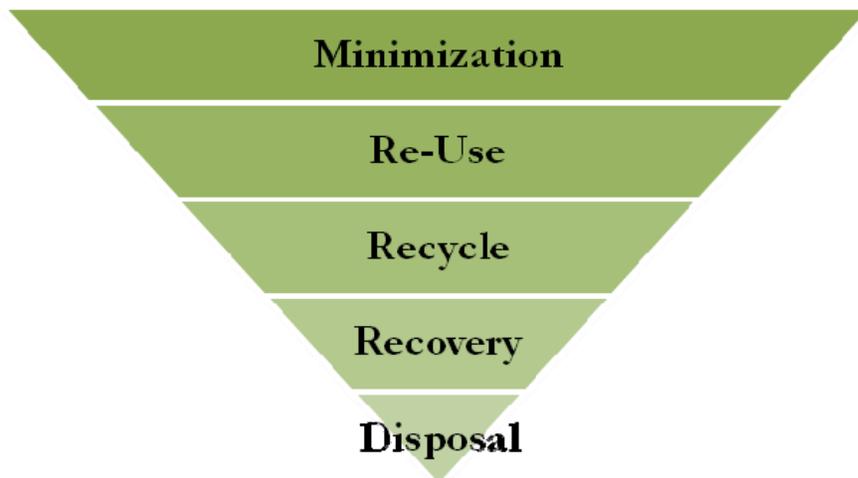


Figure 3-13



Existing Conditions

The City of Temple provides garbage collection to approximately 19,100 residential and 2,000 commercial and industrial customers. The department operates ten automated residential route trucks four days per week, two pick-ups per week per customer. Also operated is one commercial side-load truck five days per week, five commercial front-load trucks and five roll-off trucks six days per week. Brush and bulk pick-up is also available to residential customers twice per month at no extra charge. Brush items are diverted from the landfill to the Brazos River Authority, where it is composted.

The City also accepts recycling, via a drop-off program, which totals about 16,000 drop-offs annually during open hours. The City runs two-sites across the City, open to residents, one located at the landfill and the other centrally located at 1516 West Avenue H, behind Gober Party House. Currently the City collects newspaper, white office paper, cardboard, magazines, plastics (#1 and #2 clear/opaque), glass (clear and brown containers), and aluminum cans. The City uses the recycling as a revenue stream, bringing in approximately \$46,000 annually. The following tables (Table 3-6 and Table 3-7) depicts the amount of tons and revenues collected from recycling.

TONS				
	2006-2007	2007-2008	2008-2009	2009-2010
Aluminum Cans	3.10	6.63	4.93	3.72
CDBD-FEL	484.89	493.01	509.59	457.61
CDBD-ROL	178.57	166.15	108.04	167.65
Magazines	35.65	39.86	46.05	45.33
Newsprint	55.19	68.60	77.53	67.17
Other	44.89	84.52	54.46	45.74
Plastic	5.84	8.02	13.49	17.21
White Paper	11.96	11.16	13.40	12.57
Tires	0.00	0.00	0.00	0.00
Glass	0.00	0.00	0.00	0.00

Table 3-6

REVENUES				
	2006-2007	2007-2008	2008-2009	2009-2010
Aluminum Cans	\$3,906.80	\$6,362.00	\$3,634.60	\$4,026.00
CDBD-FEL	\$26,491.95	\$33,280.66	\$15,257.96	\$23,313.93
CDBD-ROL	\$9,770.01	\$10,599.94	\$2,694.46	\$8,483.34
Magazines	\$429.12	-\$112.74	\$184.95	\$181.33
Newsprint	\$1,975.57	\$3,529.63	\$925.00	\$1,602.85
Other	\$3,673.29	\$31,259.49	\$4,860.66	\$7,568.54
Plastic	\$1,268.92	\$2,171.20	\$1,348.60	\$1,592.60
White Paper	\$1,812.03	\$2,663.35	\$1,790.40	\$2,366.09
SUBTOTALS	\$49,327.69	\$89,753.53	\$30,696.63	\$49,134.68
COSTS				
Tires	\$ 3,400.00	\$ 5,100.00	\$ -	\$ 3,000.00
Glass	\$ 682.85	\$ 834.10	\$ 1,051.90	\$ 1,262.35

Table 3-7



Current Initiative and Plans

The City of Temple's Solid Waste department offers a variety of programs and services to the community. They are as follows:

Household Hazardous Waste Days: The City participates in periodic collection days for household hazardous waste, along with the Central Texas Council of Governments and other agencies.

Compost: The Brazos River Authority, along with the Cities of Temple and Belton, offer compost to purchase. The most popular product is compost humus produced with wood products, picked up by the City's brush trucks, and wastewater bio-solids.

Recycling: The City offers two recycling centers, which accept a variety of items, as discussed above. Figure 3-14 depicts the recycling center located off of Avenue H, behind the Gober Party House.

Neighborhood Pride: This program is designed to promote neighborhood beautification. The program assists neighborhoods in joining together to clean up their particular neighborhood. Clean up usually includes trash in yards, vacant lots and other areas that make up the neighborhood.



Figure 3-14



Open Space

Roles of Open Space in Sustainability, Energy Consumption and Emissions

Cities are composed of the built environment and open space surrounding it and within them. Open space includes parks and green corridors that the public can utilize as well as space for wildlife to safely live within the City. The conservation of open space ensures the protection of an ecologically functioning network of critical open space areas, restore natural habitat, and accelerate reforestation, while creating recreation areas that help to improve environmental quality.



Figure 3-15



Figure 3-16



Figure 3-17

Existing Conditions

The City of Temple has an exceptional Parks program, offering over 50 park facilities that incorporate more than 700 square acres of park land, and more than 22 miles of trails to the community. The parks are relatively spread across the community, providing access to all citizens. Figures 3-15-to 3-17 depict pictures of various park facilities located across the City.

To provide adequate and well kept, beautiful park spaces to the community, the Parks department uses a substantial amount of water for irrigation and recreational purposes. During fiscal year 2010, the Parks department used 160,000,000 gallons of water. Most of the water meters, currently utilized by the City, are with the Parks department. Some of these were used for temporary irrigation to establish new grass and plants, and are now not in use.

The open space within the City is also maintained by the Parks department. This requires use of a variety of equipment, including mowers, tractors and other lawn and tree service equipment. Currently the location to store this equipment is fairly central; however the parks are spread out, requiring increased travel and time to ensure proper maintenance at all parks, every day.

Current Initiative and Plans

The Parks and Leisure department has recently adopted Green Initiatives. The initiatives include a variety of sustainable aspects, to include office equipment, water use, vehicle use and park landscaping improvements. In relation to the open space and park areas the most relevant part of the established initiatives includes using native plants and grasses for landscaping and using benches that are made from recycled materials.

The City also has completed a Trails Master Plan, in response to the development of various trails across the City and the adoption of stricter sidewalk requirements. The development of a trails master plan provides a connected system where trail corridors and alignments are designed to enhance linkages between parks, neighborhoods, schools, retail and key civic and community destinations. This Plan will be implemented over the next decade.



Education and Outreach

Roles of Education and Outreach in Sustainability, Energy Consumption and Emissions

Education and outreach is crucial to the success of any plan, especially one like a Sustainable Management Plan that introduces methods requiring change in daily routines and work operations. Many people feel that they have neither the time nor the resources to act sustainably; education can assist them in realizing they do. Educational tools can enable employees to make practical decisions independently, along with a culture change within the workforce. These decisions can expand beyond the workforce and also impact their actions at home and within the community. This section is to serve as a conceptual overview for communication and education that can be applied to any of the areas addressed in the Plan.

Existing Conditions

The City of Temple has ample opportunities to fold sustainability education into established educational tools and programs. The Communications Office, Parks and Leisure Services department and Public Works department currently have many different means to communicate to employees and the public. Through this existing framework, the developed sustainability goals can be shared with all employees. Existing conditions include the following:

InSight Newsletter: The City publishes a monthly newsletter that highlights City activities, achievements, and tips. The newsletter includes tips on IT applications, health and wellness recommendations and recently added sustainability tips. Sustainability tips range from efficient driving tips to energy saving computer settings.

Local Government Channel: The City manages a TV channel that airs City events and information on the “Bulletin Board,” information about the HOP, Parks and Leisure services, and the “scoop” on the Temple Animal Shelter, among other local programming. Occasionally,

City Website: The City manages a website accessible to the public. The website assists the public in finding information about the City from water bills and building permits to local events and general City information, including government. The City has recently expanded its social networking capabilities, with an updated website. The City is able to communicate with the public via e-mail, Twitter and Facebook. The City also has a YouTube site for online video streams and RSS Blogs for news blasts.





Section 4:

Opportunities



City Facilities

CITY FACILITIES	Maintain a clean and healthy work environment to secure economic well being
	Be proactive
	Increase energy efficiency
	Reduce reliance on non-renewable resources

Opportunities for Innovation, Tools and Best Practices

Many industries struggle to plan and implement a long term sustainable future with regard to existing facilities. Many of existing facilities across the nation do not perform well in regard to energy and water use. The Environmental Protection Agency (EPA), through the Energy Star program, assists a variety of facilities to track their performance. It has been found that buildings over twenty years old, and those that have not gone under recent renovations, are at least fifty-percent less efficient than newly constructed sustainable buildings. To secure a successful long-term sustainable future, energy audits, renovations and upgrades, and operations and maintenance all need to be implemented.

Like many industries across the nation, the City of Temple also has many facilities that do not perform efficiently. In order to improve facility operations the City should consider a number of systematic design, construction, and operation changes to its current approach to building, lighting and operational systems. Many of these modifications are no to low cost, whereas some improvements require more capital. This section looks at a variety of City owned and operated facilities, in order to convey broad recommendations that may be applied to multiple City facilities. General recommendations include the following:

- Installation of occupancy sensors (HVAC and lighting);
- Replacement of current water pump motors with variable fan drive motors;
- Installation of programmable thermostats (to include remote computer controlled systems);
- Improve HVAC systems,
- Update interior and exterior lighting;
- Installation of day light harvesting sensors; and
- Installation of vending machine controls.

This section uses the term Energy Use Index (EUI) as a way to baseline Temple's energy use compared to other buildings of similar use as collected by the EPA. EUI depicts the total annual energy consumption per square foot of building space, and is expressed in "British Thermal Units" (BTUs). A typical office building in the U.S. has a EUI of about 90,500 BTU/SF/YR. To calculate the EUI, the consumption of electricity and gas are first converted to equivalent BTU consumption via the following formulas:

Electricity Usage

$$[Total\ kWh/yr] \times [3413\ BTUs/kWh] = \text{_____} BTUs / yr$$

Natural Gas Usage

$$[Total\ MCF/yr] \times [1,030,000\ BTUs/MCF] = \text{_____} BTUs / yr$$

After adding the BTU consumption of each fuel, the total BTUs are then divided by the total building area.



$$EUI = [Electricity\ BTUs + Gas\ BTUs] / [Total\ square\ feet]$$

This section also uses the term Energy Cost Index (ECI) depicts the total annual energy cost per square foot of building space. To calculate the ECI, the annual costs of electricity and gas are totaled and divided by the total square footage of the facility.

$$ECI = [Electricity\ Cost + Gas\ Cost] / [Total\ square\ feet]$$

Both the EUI and ECI are used to compare the facility's current cost and usage to past years, or to other similar facilities in the nation. Although comparisons will not provide specific reasons for unusual operation, they serve as indicators that problems may exist within the energy consuming systems.

The selection of facilities that were surveyed represents a mix of older and newer facilities, as well as facilities that serve a variety of uses and represent a variety of sizes. The purpose of conducting these selected buildings is to identify energy opportunities and constraints that should be considered for further evaluation and implementation. The diverse selection of facilities allows for comparison of energy strategies between various buildings. Common areas for improvement have been identified within these surveyed facilities, which can be extrapolated to inform the broader recommendations for the City's full building inventory.

The buildings that were chosen include the Parks and Leisure Administrative Office, Municipal Court / Utility Business Office building, Summit Family Fitness Recreation Center, Mayborn Convention Center, Animal Control building, Fire Station #6, Public Works Service Center and City Hall. In general these facilities are relatively comparable to like facilities across the nation. However, some perform better than others.

In Table 4-1 it is noticeable that the Mayborn Convention Center, Public Works Service Center and City Hall perform better than the average City Energy Utilization Index (EUI), although there is still room for improvement, considering the cost per square feet indicated in the Energy Cost Index (ECI). The table also indicates that the Parks and Leisure Administrative Office, Municipal Court / Utility Business Office, Summit Family Fitness Recreation Center, Animal Control building and Fire Station #6 all perform worse than the City average EUI. Positive EUI's

Facility	Energy Utilization Index (EUI)	Comparison to City Average	National Average per Building Type	Comparison to National Average	Energy Cost Index (ECI)	Comparison to City Average	National Average per Building Type
	BTUs/sf/yr		BTUs/sf/yr		\$/sf/yr		\$/sf/yr
Parks and Leisure	106,973	27%	92,900	15%	\$2.65	41%	\$1.87
Municipal Court / UBO	96,343	14%	92,900	4%	\$2.36	26%	\$1.87
Summit Family Fitness	104,332	24%	93,900	11%	\$2.31	23%	\$1.61
Mayborn Convention	73,383	-13%	93,900	-22%	\$2.24	20%	\$1.61
Animal Control	98,737	17%	92,900	6%	\$1.82	-3%	\$1.87
Fire Station #6	99,465	18%	115,800	-14%	\$1.42	-24%	\$1.93
Service Center	49,029	-42%	92,900	-47%	\$1.12	-40%	\$1.87
City Hall	45,736	-46%	92,900	-51%	\$1.07	-43%	\$1.87
City Average	84,250				\$1.87		

Table 4-1



and ECI's suggest strong potential for energy efficiency upgrades, as well as the negative ones that are more than negative twenty-five percent.

Each facility will be discussed individually and then general recommendations will be made for all facilities as appropriate.

Parks and Leisure Administrative Office

Constructed in 1986 the building (Figure 4-1) is a one-story facility with an approximate size of 3,022 square feet. The building serves the main operations for the Parks and Leisure department.



Figure 4-1

A review of the facility's utility bills has resulted in identifying the buildings EUI as 106.97 kBtu/sf/yr, which is higher than similar office buildings. The ECI has found to be \$2.65/sf/yr. These numbers are misleading because it includes exterior lighting for the surrounding park, due to a lack of separate meters.

The building is served by a Split System DX Cooled / Natural Gas Heat HVAC system. The control system includes both a programmable thermostat and a conventional thermostat. The basic lighting system includes incandescent and T12 fluorescent fixtures.

During the audit there were only two people in the building working. Some of the offices that were not occupied still had lights operating and full HVAC conditioning.

Building specific recommendations include the following:

- Replace HVAC equipment: A four-ton unit is located at this facility that is over 15 years old and near the end of its efficient life. The life expectancy of most HVAC units is 15 – 20 years, however, over that time efficiency decreases dramatically. It is recommended that the City replace these units, to avoid higher costs associated with emergency replacement if the unit is allowed to fail on its own.

Estimated Cost: \$9,295

Estimated Savings: \$1,550

Estimated Payback: 6 years

- Replace all components of the T12 linear fluorescent lighting fixtures within the building with T8 linear fluorescent lighting fixtures. T12 components produce approximately eighteen percent less light and consume about twenty percent more energy than the T8 lamps and electronic ballasts that may be retrofitted into an existing fluorescent fixture. Additionally, the T12 components are no longer produced by lighting manufacturers, due to Federal mandates. While still available, the ability to acquire replacement parts for T12 fixtures will become more difficult over time. Thirty-four fixtures were identified during the survey, however this should be verified. It is estimated that to retrofit one fixture is approximately \$35.

Estimated Cost: \$1,190 (for 34 fixtures)

Estimated Savings: \$251.56

Estimated Payback: 5 years

Municipal Court Building / Utilities Business Office

Initially constructed in 1971 the building (Figure 4-2) used to serve as a bank building with miscellaneous offices. The building was recently renovated in 2008 to house the City's Municipal Court and Utilities Business Office operations. It is a two-story building composed of 15,168 square feet. A review of the buildings utility bills has resulted in realizing the EUI as 96.34 kBtu/sf/yr, which is slightly more than similar buildings. The ECI is \$2.36 /sf/yr.

The building uses multiple rooftop unit / split system HVAC system. The basic lighting system



includes T8 fluorescent fixtures, with some occupancy sensors in offices and common areas, but not all. The facility utilizes programmable thermostats.

During the survey it was observed that the second floor, although offering multiple offices, only had one or two people occupying the entire space. It was also observed that the thermostats within the building are set in a hold/bypass status, as opposed to a programmed setting that allows for temperature adjustments due to expected occupancy times.

Building specific recommendations include the following:

- Replace occupancy sensors within the offices on the second floor. The HVAC system operates with a set-back in unoccupied areas; however this setback does not always follow the actual occupancy of the offices. It is recommended that the occupancy current occupancy sensors, that control the lighting, be replaced to also control the HVAC system to only operate when the space is occupied. It is recommended that the City install an occupancy sensor in each office that will determine when the HVAC equipment can allow the system to reach an unoccupied setpoint of 80°F. When the office occupants return, the motion sensors will trigger the system back on and call for it to satisfy an occupied setpoint of 74°F. Occupancy sensors will still also control the lighting system. It was found that approximately eight offices in this building would benefit, on the second floor. This number should be verified. It is estimated that each occupancy sensor is approximately \$95. These sensors have a lifespan of approximately twenty years. It should also be noted that this action of installing lighting/HVAC occupancy sensors in all City facilities.

Estimated Cost: \$765 (for 8 sensors)

Estimated Savings: \$255

Estimated Payback: 3 years

Summit Family Fitness Recreation Center

The Recreation Center was built in 1982, with additions added over the years (Figure 4-3). The current facility is generally a one-story building, set on different levels, composed of 23,600 square feet. A review of the buildings utility bills displayed an EUI of 104.33 kBtu/sf/yr and an ECI of \$2.31 /sf/yr. These numbers are greatly higher than the City and National average. This indicates that there are many energy cost reduction measures that may take place at this facility.

The HVAC system operated in the building includes rooftop units DX cooled / Natural Gas Heat systems. The basic lighting system includes T12 linear fluorescent fixtures in the older part of the facility and T8 linear fixtures in the new addition. The lighting system also includes inefficient metal halide fixtures. The facility utilizes programmable thermostats.

During the audit it was observed that the lights in the racquetball court (metal halide fixtures) remained on, due to the required warm-up time, whether occupied or not. Also realized was that



Figure 4-2



Figure 4-3



although the facility uses programmable thermostats, the temperature settings were not always programmed to the specific space being occupied, but more geared towards whether or not the entire building is occupied. Finally, it was also observed that exterior doors remained open for air circulation, although the HVAC system was operating.

Building specific recommendations include the following:

- Replace metal halide fixtures with T5 high bay fluorescent fixtures and occupancy sensors. One characteristic of metal halide fixtures is their inherently long re-strike. This means that if the fixtures are ever turned off, it can take up to fifteen minutes for them to come back on. This long re-strike encourages staff to leave the lights on throughout the day, even if the space is not occupied. Studies have shown that linear fluorescent fixtures offer energy savings twenty-three seconds after they have been turned off when considering the startup current required to turn the fixtures back on. To maximize the energy efficiency of installing systems that do not have a long re-strike issue when the space is unoccupied. It is recommended that the City replace all metal halides with 6-lamp T5 high bay fluorescent fixtures with occupancy sensors serving each space. It is estimated that fourteen 400w Metal Halides should be replaced at this facility in the racquetball courts. This number should be verified. It is estimated that each retrofit is approximately \$325.

Estimated Cost: \$4,550 (for 14 fixtures) Estimated Savings: \$630

Estimated Payback: 7 years

Mayborn Convention Center

Constructed in 1982 the building (Figure 4-4) serves as the City's main convention hall open to the public and other entities who would like to use the space for conferences, banquets and receptions. The one-story building encompasses 40,440 square feet, with a main ballroom centrally located that can be divided into three smaller halls and surrounded by offices and other classrooms along the exterior of the building.



Figure 4-4

According to the utility bills the ECI is 73.38 kBtu/sf/yr and an ECI of \$2.24 / sf/yr. In this case the EUI is lower than the City and National average, however, the EUI is higher. This indicates that although the amount of energy used in the

space is not high, it is not proportional to the size of the building. If energy use decreases, energy costs will also decrease allowing the ECI to be more proportional with the size of the building.

The HVAC system operated in the building includes a split system DX Cooled / Natural Gas Heat system. The basic lighting system is composed of incandescent, T12 linear fluorescent and metal halide light fixtures. The building uses a building automated system to control the temperature settings in the zoned HVAC areas, set to only operate when occupied. Other spaces have programmable thermostats.

During the building walk-through the facility air-lock entrance doors were propped open, causing the HVAC system to work inefficiently. It was also noticed that the lighting system within the building is also very inefficient, including ballroom lighting, decorative lighting and exterior lighting. Finally, although the HVAC system is operated under a building automation system, the temperature settings were observed to be liberal.

Building specific recommendations include the following:

- Replace incandescent lighting with more efficient compact fluorescent lighting (CFL). Incan-



descent fixtures are the least efficient fixtures that can be used in a facility. The Convention Center has many areas where incandescent lighting is used. The canopy covering the entrance to the building has approximately 115 incandescent can light fixtures; it is recommended that these be replaced with CFLs. The main floor of the Convention Center has 96 – 500w incandescent fixtures mounted between 92 – 400w metal halide fixtures. When turned on the incandescent fixtures alone require 48kW of demand. At the average cost for demand, this represents \$638 of demand cost each month on the utility bill.

The two different types of fixtures at the facility, incandescent and metal halide, are likely never used simultaneously; they are likely selected based on the type of presentation conducted at the facility and the presentation's requirement for accurate color rendering. Different light sources have different abilities to accurately portray colors, known as the Color Rendering Index. Sunlight and incandescent light allow people to accurately perceive the color at 100%. T5 fluorescent lamps have a coloring rendering index of 85%. It is recommended that the incandescent fixtures be replaced with T5 linear fluorescent fixtures, based on energy benefits. However, all energy efficient options should be discussed with the Convention Center staff to ensure the lower CRI will not have negative effects for scheduled events and activities. While a less attractive option for energy conservation, it may be found that replacing the existing metal halide fixtures with T5 fluorescent fixtures and retaining the incandescent fixtures for only those events requiring the high CRI.

Canopy Lighting (Incandescent to CFL)

Estimated Cost: \$750 (for 115 fixtures) Estimated Savings: \$187 Estimated Payback: 4 months

Main Ballroom Lighting (Incandescent and Metal Halide to T5 linear fluorescent)

Estimated Cost: \$33,600 Estimated Savings: \$6,720 Estimated Payback: 5 years

- Reset the temperature setback program. Currently the setbacks are 75°F cooling and 65°F heating. It is recommended that the City increase the amount of setback within the building automated system to 80°F cooling and 60°F heating. The City will save 3% on their electricity bill for every degree the setback point is increased.

Estimated Cost: \$0 Estimated Savings: 3% of utility cost per degree Estimated Payback: 0 months

- Remove T12 fluorescent fixtures that serve as emergency lighting for the metal halide fixtures. If the metal halide fixtures are replaced with T⁹ fixtures, a selection of those can serve as the new emergency lighting.

Estimated Cost: \$0 Estimated Savings: dependent upon fixture type Estimated Payback: 0 months

Animal Control

The Animal Control building was built in 2004 (Figure 4-5). It serves as the City's animal shelter. The one-story building is composed of 9,495 square feet split into office / viewing areas and kennel areas.

After assessing the past utility bills it was found that the facility's EUI is 98.74 kBtu/sf/yr and the ECI is \$1.82 /sf/yr. These numbers indicate that the use at the facility is slightly higher than average, however, the cost is lower than average, indicating room for improvement.

The building uses a split system DX cooled/ Natural Gas Heat HVAC system on the office side of the facility, as well as a fan exhaust system in the kennel area. The building has a basic lighting system of T8 linear fluorescent fixtures. The



Figure 4-5



HVAC control system used is a conventional thermostat.

During the audit it was realized that all of the lights in the building were on, even in storage areas and break rooms, when not occupied. It was also observed that the hallways were over lit.

Building specific recommendations include the following:

- De-lamp light fixtures within the hallway, to provide only the needed foot-candle for that space type. The foot-candle level in the hallway was found to be between forty and sixty-two foot-candle. The recommended light levels for a hallway in an office building is fifteen to twenty foot-candle by IESNA (Illumination Engineering Society of North America). It is recommended that the City de-lamp each of the corridor light fixtures to 2-lamps per fixture, which should still surpass the IESNA recommendation.

Estimated Cost: \$0 Estimated Savings: dependent upon fixture type Estimated Payback: 0 months

- Install occupancy sensors within all spaces. This action is discussed in general recommendation for all City facilities, however, this building is garners a lot of traffic from the public. Therefore, it should be stated that occupancy sensors should be used, but not control one-hundred percent of the lights, especially in the hallways. This action will still encourage the public to walk through the building, but will still save energy.

Fire Station #6

Constructed in 1986, the one-story fire station encompasses 5,592 square feet (Figure 4-6). The facility includes living areas for the firefighters that mimic a residence, as well as garage bay areas for trucks and other equipment. The fire station serves the northwest industrial area of the City.



Figure 4-6

After assessing the past utility bills it was identified that the facility's EUI is 99.47 kBtu/sf/yr and the ECI is \$1.42 /sf/yr. These numbers indicate that the use at the facility is slightly higher than average, with the cost slightly lower than average. If use is decreased, cost will also decrease even more.

The facility uses a split system DX cooled / Natural Gas heat HVAC system. The HVAC control system is a conventional thermostat. The garage bay utilizes a T12 fluorescent lighting system, with linear T8 fluorescent fixtures in the living area.

While completing the building walk-through the occupants were out on a call, although it is not expected that when leaving the facility for an emergency that the firefighters turn off the lights, there were lights left on in the facility. Also realized was that the HVAC equipment is outdated, and needs to be replaced.

Building specific recommendations include the following:

- Replace HVAC equipment: A five-ton unit is located at this facility that is over 15 years old and near the end of its efficient life. The life expectancy of most HVAC units is 15 – 20 years, however, over that time efficiency decreases dramatically. It is recommended that the City replace these units, to avoid higher costs associated with emergency replacement if the unit is allowed to fail on its own.

Estimated Cost: \$9,295 Estimated Savings: \$1,550 Estimated Payback: 6 years

- Replace all components of the T12 linear fluorescent lighting fixtures within the building with T8 linear fluorescent lighting fixtures. T12 components produce approximately eighteen percent less light and consume about twenty percent more energy than the T8 lamps and elec-



tronic ballasts that may be retrofitted into an existing fluorescent fixture. Additionally, the T12 components are no longer produced by lighting manufacturers, due to Federal mandates. While still available, the ability to acquire replacement parts for T12 fixtures will become more difficult over time. Sixteen fixtures were identified during the survey, however this should be verified. It is estimated that to retrofit one fixture is approximately \$35.

Estimated Cost: \$560 (for 16 fixtures) Estimated Savings: \$115 Estimated Payback: 5 years

Public Works Service Center

Constructed in 2002 the Service Center is composed of three one-story buildings, totaling 50,527 square feet. The three buildings include Public Works / Engineering offices (Figure 4-7), Fleet services (Figure 4-8) and Purchasing offices and warehouses (Figure 4-9).

After evaluating past utility bills it was found that the EUI was 49.03 kBtu/sf/yr and the ECI was \$1.12 /sf/yr. These are both greatly lower than the average for like buildings. However, these buildings also have unconditioned garage/storage areas included in the total building square feet. Therefore, general energy conservation measures can still help to improve the energy use.

The facilities utilize a split system DX cooled / Natural Gas heat HVAC system. To control the HVAC system each facility uses programmable thermostats. The basic lighting system includes metal halide fixtures in garage / warehouse areas and T8 linear fluorescent fixtures.

During the audit it was noticed that the facility hallways are over lit, requiring only 15 foot-candle of lighting. Also noticed, when talking with staff members, offices within the same area had greatly varied temperatures, as well as thermostats located in separate offices than what room they are controlling. It was also noted that lighting in the shop / warehouse areas was metal halide fixtures, which are inefficient. The last issue realized is that in many spaces daylight provided enough lighting to function within the space, however, lights remained on.

Building specific recommendations include the following:

- De-lamp light fixtures within the hallway, to provide only the needed foot-candle for that space type. The foot-candle level in the hallway was found to be between forty and sixty-two foot-candle. The recommended light levels for a hallway in an office building is fifteen to twenty foot-candle by IESNA (Illumination Engineering Society of North America). It is recommended that the City de-lamp each of the corridor light fixtures to 2-lamps per fixture, which should still surpass the IESNA recommendation.

Estimated Cost: \$0 Estimated Savings: dependent upon fixture type Estimated Payback: 0 months



Figure 4-8



Figure 4-7



Figure 4-9



- Replace metal halide fixtures with T5 high bay fluorescent fixtures and occupancy sensors. One characteristic of metal halide fixtures is their inherently long re-strike. This means that if the fixtures are ever turned off, it can take up to fifteen minutes for them to come back on. This long re-strike encourages staff to leave the lights on throughout the day, even if the space is not occupied. Studies have shown that linear fluorescent fixtures offer energy savings twenty-three seconds after they have been turned off when considering the startup current required to turn the fixtures back on. To maximize the energy efficiency of installing systems that do not have a long re-strike issue when the space is unoccupied. It is recommended that the City replace all metal halides with 6-lamp T5 high bay fluorescent fixtures with occupancy sensors serving each space. It is estimated that 123 400w Metal Halides should be replaced at this facility in the fleet garages and the purchasing warehouse. This number should be verified. It is estimated that each retrofit is approximately \$325.

Estimated Cost: \$39,975 (for 123 fixtures) Estimated Savings: \$5,535 Estimated Payback: 7 years

City Hall

Constructed in 1928, City Hall is one of the oldest facilities owned by the City. It is a three-story building that encompasses 48,144 square feet. The building houses the City Secretary office, Construction Safety and Planning offices, Human Resource offices, Information Technology offices (to include the main City server), Legal offices, Finance offices and the City Manager's office.

According to the utility bills the facility's EUI is 45.74 kBtu/sf/yr and an ECI of \$1.07 /sf/yr. These numbers are greatly lower than the average. However, this building still has some improvements that will further improve the EUI and ECI, to include employee actions.

The facility uses an air cooled chilled water / natural gas boiler for its basic HVAC equipment. The building has both conventional and programmable thermostats. The basic lighting system is T8 linear fluorescent light fixtures.

During the survey it was realized that the exterior doors do not have sufficient insulation, allowing outside air to flow in and inside air to flow out. It was also realized that many of the spaces do not have access to a return air vent, which causes the HVAC system to work inefficiently. Through conversation with the employees it was also realized that many of the spaces are impacted by other spaces and the temperatures throughout the building fluctuate.

Building specific recommendations include the following:

- Reinstall refrigerant piping insulation. Upon inspection it was noticed that multiple condenser units had missing or damaged refrigerant piping insulation. This condition minimizes the ability of the refrigerant to absorb heat from the conditioned spaces because instead it absorbs heat from the outside air.
- Install U-vents between spaces to allow for proper air circulation. During the survey it was noted that some areas of City Hall are not as comfortable as others during both the heating and cooling seasons. This is most likely caused by the lack of return air to the HVAC system by addition of walls in the building as spaces were rearranged, and the failure to provide return air access back to the units. This condition is common in large office areas as the space needs of the employees change rapidly. Offices are constructed in areas that were not originally designed as offices and the conditioned air can become trapped in a given space. Trapping supply air introduces back pressure on the supply air ductwork and these spaces may not receive significant supply air when the doors to these offices are closed or blocked. Installing return air bypasses (U-shaped ductwork assemblies with return air grill installed at both ends above the door frames or through the walls) will allow return air from the offices to reach the return air intake and enable the system to provide comfort to all spaces, even when office doors are closed. To complete a U-shaped vent the cost is approximately \$200 each and re-



quires minimal labor and clean-up. Installing a direct vent through the wall costs approximately \$100 each, however requires more labor and clean-up.

General Energy Conservation Recommendation

- The HVAC systems that serve many of the buildings are controlled by a conventional thermostat. Since the control of the unit is accompanied by the building occupants, it is likely that the unit is left operating beyond normal occupancy hours. It is recommended that all conventional thermostats, at all City facilities, are replaced with programmable thermostats that can be set to match the occupancy hours for the specific building.
- The City has two options when replacing conventional thermostats with programmable direct control versions. A general programmable thermostat, that is only controlled from the thermostat board, costs about \$100. However, the City can also purchase thermostats that offer an IP address, which can be controlled from a central computer or over the internet. These thermostats cost \$400 each, however require less maintenance and can be easily controlled from one location.
- It is recommended that the City install occupancy sensors to control the lighting and HVAC system in spaces when unoccupied. An occupancy sensor to control lighting will automatically turn the light off after the space is empty and automatically turn back on when a person occupies the space. Studies have shown that turning off fluorescent fixtures saves energy just after twenty-three seconds of the space being unoccupied. Occupancy sensors will override staff not turning off the light manually. Each light sensor costs approximately \$90 and generally has about a 2 year payback period.
- The HVAC system in unoccupied spaces can be controlled by a sensor, allowing the system to automatically switch to operating in a setback mode when unoccupied; the space would then be conditioned when reentered. Each sensor costs about \$100 and has an estimated three year payback period with a twenty year life expectancy.
- It was noted during the survey that the City Hall exterior doors had damaged or missing weatherstripping. This condition allows conditioned air to leak from the building and allows insects, humidity and non-conditioned air to infiltrate the building. It is recommended that the City replace the damaged or missing weatherstripping at all exterior doors, where necessary. This action should also take place at all City facilities.
- Replace all incandescent fixtures with fluorescent fixtures. Some spaces still use incandescent which increases demand cost on utility bills, due to significantly higher use of kW. Each fluorescent used to replace an incandescent fixtures costs approximate \$6.50, saving approximately \$20 annually, which equates to approximately a four month payback period per fixture.
- Vending machine controls can be installed to control existing advertising lighting and compressors that refrigerate food or drink. It was found that generally the lighting in vending machines were off, however, the compressor was still functioning as normal. Using a motion sensor mounted on the top of the machine will allow lights to operate whenever it senses occupants are in the area and cycles the compressor on and off to maintain food or beverages at a programmable temperature when it senses inactivity in the area. It is recommended that the City install vending machine controls on all existing vending machines. The cost is approximately \$180 each, with an expected two year payback period.
- Some exterior fixtures remain on throughout the day, due to timers being set wrong or off due to power outages. Photocell sensors should be installed on all exterior light fixtures to ensure run-time only in times where daylight is not sufficient. Each sensor costs about \$100, with an estimated annual savings of \$250 and four months estimated payback period.
- Retrofit T12 fluorescent fixtures with T8 fluorescent fixtures. T12 components produce approximately 18% less light and consume about 20% more energy than T8 lamps and elec-



tronic ballasts that may be retrofitted into the existing linear fluorescent fixtures. Each replacement fixture is approximately \$35, with an estimated savings of \$7 per fixture annually, with a five year payback.

- Comb through the condenser fins on the HVAC equipment to maximize the systems ability to absorb heat from the space. It was identified that many of the condensing equipment was damaged and had bent coil fins. If only ten percent of the coil guard fins are damaged, the units efficiency decreases by up to thirty percent. It is recommended that the City comb all bent coil guard fins and install coil guards on any unit that does not have them to prevent such damage. A condensing comb is available for approximately \$10 and a new coil guard is available for approximately \$100.
- Ensure that all programmable thermostats are not set in a hold or bypass status, this overrides all programmed schedules and forces the unit to run at all times. It is recommended reprogramming the thermostat will allow setpoint and setback times to be governed by the City's Energy Policy schedule.

General Maintenance and Operation Recommendations

Maintenance and operation procedures are strategies that can offer significant energy savings potential, yet require little or no capital investment by the City to implement. Exact paybacks are at times difficult to calculate, but are typically always less than one year. The difficulties with payback calculation are often related to the fact that the investigation required to make the payback calculation, for example measuring the air gap between exterior doors and missing or damaged weatherstripping so that exact air losses may be determined, is time and cost prohibitive when the benefits of renovating door and weather weatherstripping are well documented and universally accepted as energy and cost saving measures. Table 4-2 discusses general maintenance and operations recommendations.

Maintenance and Operation Recommendations	
HVAC	Comb condensing unit coil guard fins Replace refrigerant piping insulation Install pathway for return air through offices Re-program thermostat Eliminate doors from being propped open Wash condensing unit coil guard fins Adjust unoccupied temperature setpoint
Lighting	Install photocell sensor Eliminate T12 lighting fixtures Delamp 3-lamp corridor lighting fixtures to 2-lamp fixtures
Controls	Re-evaluate setback temperature Adjust computer settings so inactive units will sleep

Table 4-2

Financing

Financing of these projects may be provided through a variety of means such as Bond programs, municipal leases, or state financing programs like the SECO LoanSTAR Program. However, as is presumed, if the projects are financed with in-house funds, the internal rate of return for the investment would be as follows in Table 4-3, assuming the total cost for completing the proposed



projects at the audited buildings (including Wastewater Treatment projects discussed later) is \$280,335:

Proposal: Perform recommended Energy Cost Reduction Measure				
Assumptions:				
1. Equipment will last at least 15 years prior to next renovation				
2. No maintenance expenses for first five years (warranty period)				
3. \$5,000 maintenance expense next five years				
4. \$10,000 maintenance expense final five years				
5. Savings decreases 2% per year after year five				
Cash Flow	Project Cost	Project Savings	Maintenance Expense	Net Cash Flow
Time 0	(\$280,335.00)		\$0.00	(\$280,335.00)
Year 1		\$53,283.00	\$0.00	\$53,283.00
Year 2		\$53,283.00	\$0.00	\$53,283.00
Year 3		\$53,283.00	\$0.00	\$53,283.00
Year 4		\$53,283.00	\$0.00	\$53,283.00
Year 5		\$53,283.00	\$0.00	\$53,283.00
Year 6		\$52,217.34	(\$5,000.00)	\$47,217.00
Year 7		\$51,151.68	(\$5,000.00)	\$46,152.00
Year 8		\$50,086.02	(\$5,000.00)	\$45,086.00
Year 9		\$49,020.36	(\$5,000.00)	\$44,020.00
Year 10		\$47,954.70	(\$5,000.00)	\$42,955.00
Year 11		\$46,889.04	(\$10,000.00)	\$36,889.00
Year 12		\$45,823.38	(\$10,000.00)	\$35,823.00
Year 13		\$44,757.72	(\$10,000.00)	\$34,758.00
Year 14		\$43,692.06	(\$10,000.00)	\$33,692.00
Year 15		\$42,626.40	(\$10,000.00)	\$32,626.00
Internal Rate of Return				15.24%

Table 4-3

It is generally accepted that projects that have a less than seven year payback are beneficial to the City.

Case Studies

Fayetteville, AR

City Population: 77,143

Energy conservation retrofits

The City of Fayetteville, AR entered into an energy performance contract in 2007 and implemented many energy saving measures. These actions included better use of control systems including programmable thermostats (which paid for themselves in the first month of use), installation of motion/occupancy sensors, improvements in street lighting and improvements in habits of building occupants. Fayetteville experienced a \$400,000 savings, which continues, in its first year of implementation.

San Antonio, TX

City Population: 1,373,668

Energy conservation retrofits

The City of San Antonio, TX looked towards its water system to make improvements in efficiency



and save money. The San Antonio Water Systems is now taking biogas generated during the sewage treatment process and capturing and selling it through a commercial gas pipeline. The methane used to produce the biogas was previously flared off on-site. The City will receive a royalty on the sale of the biogas, amounting to approximately \$200,000 per year. The project is expected to generate an estimated \$40 million in revenue from energy and renewable energy credit sales over the first 20-year period of the project.

Henderson, NV

City Population: 256,445

Energy conservation retrofits

The City of Henderson, NV has completed two of three phases of their energy conservation projects. The City focused on upgrading traffic signals, and improved energy measures at their justice facility and a recreation center for their first project. Phase I improved energy measures include energy management control system upgrades, computer control power management software installation, boiler replacement and efficiency improvements, exterior lighting replacement, plumbing maintenance improvements, window shades, upgraded heat pump pool heater, circulation pump variable speed control, and a power conditioning system installation. Phase I amounts to an annual savings of \$264,277.

Phase II includes building improvements in 60 City operated buildings (over 1,58,213 sf) and street light upgrades. Building improvements included water conservation retrofits, boiler and chiller replacements, variable frequency drives, direct digital energy management systems, pulse powered cooling tower water treatment, vending machine controls and ultra-violet pool water treatment. These improvements amount to \$1.6 million in annual savings.

Phase III, currently underway, includes lighting upgrades of more streetlights, which will further decrease operations and maintenance requirements, saving the City \$927,580 annually. Also included in this phase is the installation of a 30 kW photovoltaic array, replacement of rooftop HVAC equipment and energy management systems at emergency service facilities.

In order to finance these money saving energy efficiency efforts, these City's utilized Energy Service Company's and entered into performance contracts. This method allows the City to complete energy saving improvements within an existing budget by financing them with money saved through reduced utility expenditures. This allows the City to avoid the need for up-front costs. Through Texas Local Government Code, Cities and Counties: Chapter 302. Energy Savings Performance Contracts for Local Governments, reduced utility expenditures must be guaranteed by the Energy Service Company. The contractor must guarantee that the savings will always be at least equal to the payments for the cost of the improvements. Appendix 2 includes Code 302, which describes the requirements of the Energy Service Company.

Suggested Metrics for Measuring Future Progress

The City should develop a rating system to track the performance of the facilities operated by the City. The rating system should help to guide operation and maintenance of the facility, as well as guide the City in future procurement. The City should assess an array of building performance rating programs that already exist, to include Leadership in Energy and Environmental Design (LEED), Energy Star and Green Globes, among others. After thorough assessment, the City can successfully develop their own and apply it to their current and future operations. The building performance rating system will enable the City to measure its performance against an industry standard, so that the City can easily recognize the performance of any given system.

Administration



ADMINISTRATIVE OPERATIONS	Promote inter-departmental collaboration
	Incorporate sustainability into the City's decision-making process

Opportunities for Innovation, Tools and Best Practices

As previously discussed the City of Temple approved the Sustainability and Energy Efficiency Policy in March 2011. The policy enables the City to pro-actively seek more sustainable and energy efficient operations. The next step is to identify opportunities for innovation, tools and best practices, to achieve the goals of the policy.

There are many actions that may be implemented at no or minimal cost to the City, that can assist the staff in being more sustainable and energy efficient. It is recommended that the City evaluate and implement opportunities concerning lighting settings and controls, general office equipment operation (i.e. unplugging equipment, computer run-time), paper use, work schedules (i.e. avoid working during peak demand times), increasing teleconferencing capabilities to decrease travel, and to incorporate sustainability into the City's decision making process.

The most efficient operational setting on all equipment is off and unplugged. Therefore, one of the easiest actions for the City to participate in is to turn off and unplug equipment when not in use. These opportunities are free and require only initiative from City staff. If it is not feasible to unplug equipment, the equipment should be turned off. This initiative includes turning off lights, computers and monitors, copiers and other office equipment at night, over the weekends and holidays, and when practical during the day.

Many employees utilize equipment at their work space to include desk-top printers, space heaters, microwaves, refrigerators, etc. These items should be prohibited, unless provided by the facilities or IT department. In all facilities the break rooms and/or copy rooms have these items for all employees to use. The individual equipment uses a lot of unnecessary energy, for minimal use. Space heaters should not be used at all for two main reasons. (1) Space heaters are a major fire hazard and are already discouraged by the Fire Marshall. (2) Space heaters also use an excessive amount of energy to provide heat to small spaces, and are usually not conducive to office like settings. In general the use of space heaters causes the whole building HVAC system to work harder in the summer, because the AC is trying to cool a space that is being heated. Also, in the winter, the heating should be left to the HVAC system, as they will both be working to heat a space that the HVAC space can manage, in most cases causing the space in the both the heating and cooling seasons to be unbalance, wasting energy and money.

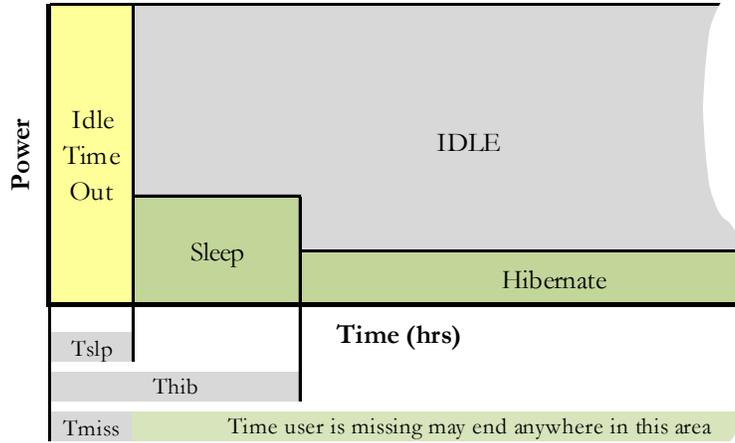
The City currently uses more than 400 computers across various departments, to achieve daily operations. In order to ensure proper updates for all computers, while saving energy and keeping computers accessible during non-working hours, the City should utilize a computer power management system and revise power scheme settings. When enabled on a correctly configured system computer power management causes the computer to go into low power state (sleep or hibernate) after some period of inactivity. Computers not configured for computer power management will stay in an idle state and will continue to consume more energy during periods of inactivity.

A typical transition sequence is shown below in Figure 4-10.

The majority of desktop computers, operated by City personnel, are set to the standard Microsoft settings for Home/Office Desk power scheme. Laptop computers are also set to the standard Microsoft power scheme for Portable/Laptop computers. It is recommended that the City decrease the length of time for the monitor to turn off and for the system to go into sleep and even-



Power reduction Sequence for User not present time out



Tslp - Idle time out to sleep state
 Thib - Sleep time out to hibernate
 Tmiss - Total time user is missing

Figure 4-10

ually hibernate. The City should adopt the following Energy Star computer power management settings recommended by the Environmental Protection Agency (EPA), to increase efficiency and save funding (Table 4-4 and 4-5):

Desktop			
	Current Default Settings	Energy Smart	Energy Star
Turn off monitor	After 20 mins	After 10 mins	After 5 mins
Turn off hard disks	After 1 hour	After 40 mins	After 20 mins
Time out to system standby (sleep)	After 1 hour	After 40 mins	After 20 mins
Time out to system hibernate	Never	After 2 hours	After 1 hour

Table 4-4

Laptop			
	Current Default Settings	Energy Smart	Energy Star
Turn off monitor	After 5 mins	After 5 mins	After 3 mins
Turn off hard disks	After 10 mins	After 10 mins	After 5 mins
Time out to system standby (sleep)	After 15 mins	After 10 mins	After 5 mins
Time out to system hibernate	Never (plugged in) After 2 hrs (batteries)	After 2 hrs (plugged in) After 1 hr (batteries)	After 1 hr (plugged in) After 30 mins (batteries)

Table 4-5

In addition to the above time-out settings, the City should eliminate the use of screensavers. Many people think using screensavers reduces energy use and saves the monitor screen. Older CRT monitors did benefit from screensavers, so that the image would not impact the clarity of the screen. However, newer monitors do not require screensavers. Screensavers also cause the



computer’s processor to ramp up, thereby increasing energy use.

By utilizing power management programs and changing power scheme settings the City can anticipate an annual savings between \$25 to \$75 per computer. This equates to a savings of approximately \$17,000 annually (Table 4-6), for over 400 computers. According to the EPA other benefits of using a computer power management system include the following:

- Reducing office cooling loads, saving an additional \$5–10 per PC annually, and as much as \$10–25 or more in warm climates
- Decreasing peak load demand charges levied by utilities, which decreases overall utility bills
- Enhancing data security by reducing the chance that valuable information is displayed on unattended PCs
- Improving user productivity by eliminating the daily wait for computers to boot up

ENERGY STAR Computer Power Management Savings Calculator		
Savings Estimate		
	Energy Saved Annually (kWh)	Dollars Saved Annually
Savings from monitors going into sleep mode:	52,668.3	\$5,424.84
Savings from notebook displays going into sleep mode:	5,018.0	\$516.85
<i>Total savings from monitor sleep mode:</i>	57,686.3	\$5,941.69
Savings from desktops going into system standby or hibernate mode:	105,423.1	\$10,858.58
Savings from notebooks going into system standby or hibernate mode:	4,717.7	\$485.93
<i>Total savings from system standby and hibernate mode:</i>	110,140.9	\$11,344.51
<i>Total savings from monitor and computer sleep settings:</i>	167,827.2	\$17,286.20

Table 4-6

The EPA offers a free program known as EZ Group Policy Objects. This program allows network administrators to centrally control computer power management settings. It is recommended that the IT department research initially using this program or a like program, to ensure proper energy settings on all computers, while maintaining the ability to provide proper updates during non-work hours.

Desktop computers are also a source of major energy consumption in work places. The City should consider purchasing only laptops for personnel, as processor types permit adequate work speed. Laptops use 40% - 80% less energy than required by desktops, which have a CPU and separate monitor.

The City should also limit paper use, and evaluate practical means to eliminate paper use in most operations. Using paper is not just limited to save trees, but also ink, landfill space, office space, personnel time and all related means requiring energy use (i.e. printing operation, computer processing, etc.). If draft items are printed they should be printed in EcoPrint mode, to save ink, and double-sided. When feasible, documents may also be printed on more than one page per piece of paper.

The Parks and Leisure Services department has implemented an initiative regarding copy paper. The initiative states the following:



“Most of our locations produce many copies of documents throughout the year. Re-cycled paper has made a lot of advances over the years. It is no longer identified with shreds of paper mixed in with the process. You really cannot tell the difference. Everyone shall use up their existing copier paper and then switch to at least a 20lb super white 30% post-consumer content paper. The one that was reviewed was from Perry’s Office Supply and the brand was Navigator.

If copies have to be made, use the double sided copy feature when appropriate.”

The City, as a whole should also adhere to this initiative. All office operations related to recycling are discussed in the Solid Waste section of this Plan.

Other options to reduce energy use in office settings include revising office hours. Numerous companies and other local governments have offered employees the option to work four – ten hour work shifts, as opposed to the standard five – eight hour work shifts, per week. In some cases the companies have extended working hours from Monday through Thursday and had no work scheduled on Friday’s. Other companies have opted to have regular work days with extended hours, Monday through Friday, and have only half of the employees work on Monday and the other half work on Friday. Some also allow employees to opt-in to a four – then hour work shifts schedule, as opposed to mandating the hours.

The City of Temple completed a study in 2009 regarding flexible work schedules. The study found that seventy percent of employees surveyed would support or strongly support a four – ten hour work shift schedule. The study also evaluated electricity savings at the Municipal Building, Utility Business Office/Municipal Court building, Service Center, and Parks office (PALs Administration and Annex). In 2009 it was found that the City could save approximately \$7,800 in electricity, annually. Potential savings for 10 take home vehicles amounted to \$15,775 (assuming a mileage reimbursement rate of 55.5¢).

Many potential service benefits were realized, to include extended customer service, increase work productivity, and reduced mobilization time. Concerns and issues were also identified to include payroll processing, utility payments, construction inspection schedules, issuing building permits, and code enforcement. However, many cities have resolved any issues with these departments, increasing the availability of online applications and payments to the community. Also, with extended hours, more of the residents will have an opportunity to resolve issues during non-traditional work hours.

Finally, and most importantly, the City should focus on incorporating sustainability into the City’s decision making process. Currently, many decisions are made based on costs, given the current economic situation. To ensure proper integration of the Sustainability Management Plan into the decision making process the City should consider the following:

- Develop performance metrics for Department Heads, as related to sustainability, and include the metrics in their annual performance review;
- Conduct bi-annual progress meetings with Department Heads;
- Develop a scorecard to monitor the City’s progress in improving overall sustainability performance on City utilities, CIP, and miscellaneous projects completed by the City; and
- Commit to publishing an annual Sustainability Report.

Case Study

State of Hawaii

State Population: 1,295,178

EPA Computer Power Management Settings

The State of Hawaii has the highest electricity rates in the country. In 2009 the government took steps to save energy by implementing a PC power management program for roughly 180 com-



puters. This program saves the state roughly \$7,000 a year. By purchasing only energy-efficient Energy Star qualified computers, the division saves an additional \$4,000 annually. The State utilized free technical support via the Energy Star Low Carbon IT Campaign to overcome several implementation challenges.

The State first focused on manual power management, training employees to turn off their computers at the end of the day. Usually about one-third of computer users turned off their machines. These efforts initially helped in saving money for the State.

The State then moved beyond manual power management, implementing a software/network controlled computer power management program. This program required computers to only go to sleep/hibernate, to ensure proper updates during non-working hours.

Abilene, TX

City Population: 117,180

iPad Agenda Packets

In an effort to save paper, personnel time, increase overall efficiency and save money the Abilene City Council received iPads to replace council meeting binders that generally include public records, documents and minutes for each semimonthly meeting.

Before purchasing the iPads, the City Secretary and IT department analyzed the overall costs to assemble council packets for each meeting. These costs include printing, materials and personnel time. The assembly of agenda packets cost approximately \$2,962 a year, therefore the avoided costs of not assembling the packets for each meeting equals \$2,962.

This estimate does not include other notebooks that are assembled throughout the year, to include budget items, or any other uses the iPad might be used for to increase the efficiency of City operations.

The cost of seven iPads totaled \$3,702, with an average three-year life span. The City would spend approximately \$9,000 over the next three years producing agenda packets, therefore the iPads more than payback within the life time of the product.

For security purposes, no data will be stored on the iPad that is not already public information.

Avondale, AZ

City Population: 85,212

Green Friday

Avondale closed City Hall on Fridays to reduce trips and improve traffic impacts on air pollution and emissions in the community and at the same time extended service hours and customer interface opportunities during Monday through Thursday. In addition to the environmental benefit, the City saw significant savings on utility costs, such as electricity, heating/cooling, and janitorial services. Employees also saw significant reduction in commute time and fuel consumption, resulting in a personal savings to them. The program affects approximately 200 employees.

The City extended official work hours to include early morning and evening hours, creating access to conduct business at City Hall between 6 a.m. and 7 p.m. Monday through Thursday, with maximum flexibility for employees.

The Water Billing/Metering department adjusted water bill due dates to no longer be due on Fridays, and offered turn on/off only from Monday through Thursday. In addition non-voluntary water disconnects were moved from Fridays to Mondays as an operation practice to allow customers the business days following disconnection to address any problems.

Construction inspection services are now no longer available on Friday, but other scheduling op-



tions can be discussed by calling an inspector. Payroll was moved from Friday to Thursday, and a holiday hour bank was established to ensure that all employees would get paid 40 hours a week regardless of what day of the week a given holiday falls on. Most services are offered on-line for easy access, when City Hall is closed. Other departments, not located within City Hall still maintained regular hours, Monday through Friday.

City Hall employees drive to and from work one day less each week, reducing about 144,000 miles driven annually. They also have an extra week day to tend to personal business.

Reduction to four day janitorial services provided \$787 in monthly savings, \$9,444 annually.

Energy savings for City Hall equaled an average of 12,040 kW per month for a monthly savings of \$1,145, totaling \$13,625 annually and representing a 13% reduction in energy costs.

Post implementation surveys provided an 82% approval rate from customers, with residents reporting that the impact was minimal. Also found in post implementation survey results is that only 8% of employees were not in favor of continuing Green Friday year round.

The program also supported the county mandated trip reduction program.

Policy Recommendations

All City facilities would greatly benefit from programmable controls and occupancy sensors for HVAC, lighting and computer equipment, as discussed in the City Facilities section. However, the City will further benefit from employees following a policy that includes the following energy conservation guidelines; these include procedures for operating HVAC equipment, lighting equipment and office, shop, personal and miscellaneous equipment. These guidelines are recommendations, and may be modified as a policy is developed.

General Operating Procedures:

Building Resource Management

- Keep windows and doors in conditioned spaces closed while HVAC equipment is operating.
- Use of the stairs rather than the elevator, except for the physically challenged and persons transporting heavy equipment, is encouraged.
- An environment will be maintained that is conducive to the safety, efficiency and comfort of the majority of City employees.

Employee Responsibility

- All City employees will be responsible for following the City's energy conservation guidelines. Everyone will be expected to be an "energy saver" not just an "energy consumer."
- The last person to leave a space or building when it is closed each evening shall turn off all non-essential equipment and lighting and ensure that the thermostat is reset to setback temperatures, where applicable.
- Bring forward ideas and suggestions for energy conservation and efficiency that may not have been identified.

Department Responsibility

- Department head to implement department specific policies and procedures that execute the City's Energy Conservation Policy. Policies should be based on department operations and provided utility cost and use information on a monthly basis.
- Research opportunities / possible effectiveness to incentivize employees to conserve energy.



Procedures for operating heating equipment:

The following energy conservation guidelines are recommended when operating heating equipment in City buildings:

- In buildings with heating controls, the start time for the heating equipment shall be set as late as possible, while still allowing time to heat the building to occupied temperatures.
- Per AHRAE 90.1 recommendation and employee survey results, temperatures in conditioned and occupied heated spaces should be set between 66°F and 72°F, except for shop like areas, which should be set no higher than 65°F.
- The unoccupied building setback temperature in heated areas should be set no higher than 62°F. After hour operations are any times the building is minimally occupied and not serving its primary function. This includes times when only security, cleaning or maintenance personnel are present.

If during extremely cold weather an unoccupied building's 62°F setback will not allow your building to heat to a comfortable level by the time the employees arrive, the City may provide the following options:

- Notify the City Manager's office and the Sustainability Manager.
- The Sustainability Manager will advise on the appropriate setting.
- Deviation from the Energy Conservation Policy temperature settings – When the Department head or employees in a department desire to deviate from the programmed temperature settings defined above, the appeal shall be made directly to the City Manager via the Sustainability Manager, by the Department head.

Procedures for operating air conditioning equipment:

The following energy conservation guidelines are recommended when operating cooling equipment in City buildings:

- Refrain from turning the cooling equipment on until the inside temperature exceeds 72°F.
- In buildings with cooling controls, the start time for the cooling equipment shall be set as late as possible, while still allowing time to heat the building to occupied temperatures.
- Per AHRAE 90.1 recommendation and employee survey results, temperatures in conditioned and occupied cooled spaces should be set between 72°F and 78°F. Air circulation typically provides needed comfort, in lieu of cooling entire space fans, provided by the facilities department, may be used and will put a smaller load on the system.
- The unoccupied building setback temperature in cooling areas should be set no higher than 82°F. After hour operations are any times the building is minimally occupied and not serving its primary function. This includes times when only security, cleaning or maintenance personnel are present.
- In the case of more than one unit at a facility, the units should be turned on in phases, where applicable, to prevent overloading the system.
- Use the minimum lighting and office equipment required. Lighting and equipment give off heat and place additional load on the cooling equipment, increasing the amount of energy needed to cool the room.
- Deviation from the Energy Conservation Policy temperature settings – When the Department head or employees in a department desire to deviate from the programmed temperature settings defined above, the appeal shall be made directly to the City Manager via the Sustainability Manager, by the Department head.



Procedures for operating lighting equipment:

The following energy conservation guidelines are recommended when operating lighting equipment in City buildings:

- **Inside Lighting:**
 - Lights in all building areas and workspaces will not be turned on unless needed. Employees will make certain that lights are turned off in unoccupied spaces, when leaving an area.
 - Lights in shop areas will not be left on, unless the shop is being utilized and enough daylighting is not provided to complete tasks.
 - During after hour operations, security, cleaning and building maintenance personnel are responsible for turning lights on as needed basis while working; that is, turning on lights only while an office or room is being cleaned, and turning lights off as soon as cleaning has been completed.
- **Outside Lighting:**
 - All outside lights will be turned off during daylight hours.
 - Outside lighting and building accent lighting will be used only when the building or facilities are occupied, unless lighting is for security purposes.
 - Nighttime security lighting will be limited to a level that is adequate to reasonably protect the building and facilities.
 - Athletic Field lights are to be operated only as needed. They should not be in operation during daylight hours.

Procedures for operating office, shop, personal and miscellaneous equipment:

The following energy conservation guidelines are recommended when operating office, shop, personal and miscellaneous equipment in City buildings:

- All office machines, including copy machines, laminating equipment, faxes (unless used for after-hour faxes), postage machines, and any other office machines should be turned off by the office staff each night. Exceptions may be made if documentation from the manufacturer states that turning the equipment off is detrimental to the equipment or its operation.
- Personal appliances, such as space heaters, refrigerators, microwaves, coffee makers, candle heaters, potpourri heaters, plug-in LCD picture frames, etc., should not be permitted. Personal fans and radios will be permitted with the permission of the department head. If any other restricted personal equipment is wanted, the employee should have to pay a non-refundable annual fee for energy usage (these items must not be a fire hazard).
- As a long-term goal, the City shall assess the use of refrigerators, microwaves and similar devices in break-rooms, for possible replacement of less energy efficient equipment with more energy efficient equipment and approaches.
- All computers should be controlled by a power management system and have proper power scheme settings applied.
- As a long-term goal, the City shall assess the use of computers for possible replacement of less energy efficient equipment with more energy efficient equipment and approaches.

Suggested Metrics for Measuring Future Progress

The City of Temple can measure its progress of meeting the proposed energy conservation measures through periodic, impromptu walk-through of facilities. This will allow the Sustainability and Facilities staff to ensure proper thermostat settings are maintained. The City can also conduct



employee comfort level surveys, to ensure and ascertain whether employees are more comfortable in their working environment, with the new settings. The City should strive for approximately 80% of employees being comfortable. The City can also monitor utility bills and record expected savings and avoided costs, by decreasing the run time of lighting, HVAC equipment and computers, among other equipment.



Sustainable Purchasing

SUSTAINABLE PROCUREMENT

Increase the City's use of sustainable procurement

Opportunities for Innovation, Tools and Best Practices

The City of Temple currently does not have any purchasing initiatives that directly support sustainable procurement. The current initiatives are more focused on initial costs and do not specifically require the evaluation of life-cycle costs and/or environmental impacts, unless explored by the individual employee requesting the purchase of a certain item. It is recommended that the City begin to analyze life-cycle costs, consider environmental impacts (when economically feasible), include sustainable purchasing guidelines in bid specifications and collaborate with regional purchasing authorities and other entities to encourage demand for a more sustainable market, as practical for the item being procured.

At market-level the purchasing power of government departments and local/regional organizations have the capacity to shift markets and drive technology toward a more sustainable model. By taking this action, within the local region, governments can improve the economies of scale in quantity buying. This action will increase the demand for sustainable procurement to be the most affordable option, short-term and long-term.

Life-Cycle Cost Requirements

Life-cycle cost considers the total cost to the City of purchasing, operating, supporting, and (if applicable) disposing of the items being purchased. The notion of analyzing life-cycle costs broadens the concept of only being concerned about up-front costs.

Consider analyzing life-cycle cost when:

- The cost of system operation, support, disposal, and other measurable costs are sizable in comparison with the purchase cost.
- When you expect that offers will include items that have considerably different operation, support and disposal costs.

Life-cycle related costs include:

Purchase costs related to:

- All cost(s) of ownership including the purchase price
- Shipping costs
- Maintenance and repair
- Longevity
- Disposal costs at the end of life

Operating and support costs are all costs, including third party contract costs, related to:

- Equipment
- Supplies
- Utilities
- Fuel
- Services needed to operate and maintain an operational system.



- Disposal costs are all costs, including third party contract costs, related to:
- Removing equipment from service
- Disposing of it

Evaluations that consider life-cycle cost should also consider any major salvage or resale value at the time of disposal.

Solicitation Recommendations for Life-Cycle Costs

When conducting a life-cycle cost award, the City should consider including that a solicitation must:

- Describe how life-cycle costs will be used in making the contract award decision.

When life-cycle costs continue over a period of years, solicitations may allow for adjustments to consider one or more of the following:

- Time value of money
- Cost uncertainty
- Inflation factors

The solicitation must clearly identify the factors and methods that will be used in the life-cycle evaluation.

Require an estimate of key elements of life-cycle cost.

Information such as, projected item usage, operating environment, and the operating period that will be considered in offer evaluation must be provided.

Clearly identify the factors or key elements that will have a life-cycle cost applied. Cost evaluation factors identified in the solicitation must be used in the evaluation and award process without changes, unless an amendment is issued prior to the closing date.

Require offerors to provide related cost estimates along with appropriate information to support life-cycle cost estimates. Estimate requirements may include:

- Average unit price, including (when appropriate) recurring and nonrecurring production costs.
- Delivery, shipping and transportation costs.
- Switching costs prepared by the State that include a reasonable estimate of what it will cost to switch from a current product or brand to another.
- Unit operating and support costs (e.g., manpower, energy, parts requirements, scheduled maintenance, training).
- Unit disposal costs (e.g., the cost of removing equipment from the state facility).
- Unit salvage or residual value.
- Related information to support costs such as testing and operational data.

All of the discussed life-cycle costs requirements may not be practically applied to all items being procured. Therefore, as the City considers options of switching from a “low-cost” to “best-value” procurement process, they should also consider the items application and possible sustainable implications. Departments should work with the Sustainability Manager throughout the purchasing process to ensure sustainable purchases.



Case Study

King County

County Population: 1,875,519

Energy-Efficient Product Procurement

Since its inception in 1989 as an initiative to promote recycled materials, the King County Environmental Purchasing Program has developed into a comprehensive purchasing program that incorporates a broad range of energy and environmental goals. In 2006, purchasing EPPs saved King County \$640,000 compared to purchasing conventional products. Since its inception, the program has earned recognition in the form of awards from EPA and the National Association of Counties.

The King County Environmental Purchasing Program is administered by the Procurement and Contract Services Section of the Finance and Business Operations Division, which is responsible for communicating policy requirements and information about price, performance, and benefits of products to purchasers. Features of the program include the following:

Model EPP policy – The program includes a model environmentally preferable product (EPP) purchasing policy for use by its constituent cities and businesses and for other counties.

Strategies for maintaining agency support – King County conducts educational seminars to train its purchasers to implement the EPP policy and distributes an Environmental Purchasing Bulletin to government agencies.

Integrated energy and environmental goal – The program includes not only includes specifications for energy-efficient office equipment, but also for a broad range of other EPPs, including biodiesel and hybrid vehicles.

Public involvement – The program promotes the benefits of EPPs throughout the community through training conferences and trade shows that involve sharing experiences with state and local government personnel. The program has also conducted training sessions for local businesses.

Annual reporting – The Procurement and Contract Services Section is responsible for developing an annual report describing program accomplishments and identifying future opportunities for improvement.

More information may be found at: http://www.kingcounty.gov/operations/procurement/Services/Environmental_Purchasing/Policies.aspx

City's within the State of Texas

A variety of City's within the State of Texas have begun to adopt sustainable procurement policies. These cities include City of Austin, Fort Worth, Dallas and Coppell, among others. Below is a sample policy from the City of Coppell.

Environmental Purchasing Policy

i) Policy

The City shall make every effort to purchase and use materials, products and services that are economically responsible, that support the City's economic, environmental and social goals and that reduce resource consumption and waste within federal, state, and local laws.

(a) Beyond the conventional purchasing decision-making process, this policy identifies the need to include economic, environmental and social factors. These are all components of the Life Cycle Assessment that may be included to determine what the "best value" is for the City.

(b) Environmental factors:



1. Pollutant releases
2. Greenhouse gasses emissions
3. Energy consumption
4. Depletion of natural resources
5. Waste generation
6. Recycled, recyclable products
7. General impact on the environment

(c) Economic Factors:

1. Best value
2. Leveraging our buying power
3. Staff time and labor
4. Technological advances

(d) Social Factors:

1. Use of locally or regionally produced products and services to minimize transportation requirements.
2. Health and safety
3. End of life disposal

City Departments should use, where practicable, products and services that perform and have the least damaging and the most beneficial environmental impact, including new environmentally preferred products, reusable, recyclable and recycled content products. The City should seek opportunities through education, pilot testing of potential new products, adopting innovative product standards, specifications and contracts, leveraging buying expertise and working with other government entities on cooperative purchasing ventures.

(e) All City departments that have responsibility for a fleet vehicle should support and implement the City of Coppel fleet sustainable policy.

(f) All departments should support and implement the City of Coppel Environmental Procurement Policy

(g) All departments should use, and encourage their contractors and consultants to use products manufactured with the maximum practicable amount of recovered material. They may also use environmentally preferred products whenever cost effective and to the extent practicable.

(h) The Purchasing Department should maintain minimum recycled content standards for the purchase of designated products. The Division may specify recycled content at higher levels than minimum to the extent practicable.

(i) All Departments should encourage that they and their contractors use recycled paper in printed material and that it bears an imprint identifying the recycle content of the paper, whenever practicable.

ii) Definitions:

(a) *Cooperative purchasing*: System for allowing organizations to combine their purchasing power in order to negotiate better prices and reduce purchasing costs of a formal bid process.

(b) *Departments*: Refers to City Departments and Departments

(c) *LEED certification*: A green building ration system developed by the US Green Building



Council designed to promote design and construct practices that reduce the negative environmental impacts of buildings and improving occupant health and wellbeing.

(d) *Life Cycle Assessment*: The comprehensive examination of a product's environmental impacts throughout its lifetime, including new material extraction, transportation, manufacturing, use and disposal.

(e) *Post-consumer recycled content*: Percentage of a product made from materials and byproducts recovered or diverted from the solid waste stream after having completed their usefulness as consumer items and used in place of raw or virgin material. Post-consumer content includes materials (such as paper, bottles, and cans) collected for recycling.

(f) *Pre-consumer recycled content*: Percentage of a product made from materials and byproducts diverted from the solid waste stream during the manufacturing process. Pre-consumer material excludes reutilization of the material such as rework, regrind or scrap generated in a process and capable of being reclaimed with in the same process that generated it such as: planer shavings, sawdust, woodchips, trimmed printed materials and overruns, over issue publications and obsolete inventories.

(g) *Performance*: the ability of a product or service to accomplish or contribute to the accomplishment of a job or task.

(h) *Practicable*: Sufficient in performance and available at a reasonable cost.

(i) *Recycled product*: A product that after its intended use can be diverted from the solid waste stream for use as a raw material in the manufacture of another product.

(j) *Recycled product*: Material and by products that have been recovered or diverted from solid waste and have been utilized in place of raw or virgin material in manufacturing a product. It is derived from post-consumer materials, manufacturing waste, industrial scrap, agricultural waste and other waste material, but does not include material or by products generated from, and commonly reused within, an original manufacturing process.

(k) *Solid waste*: Defined under USEPA 40 CFR 261.2

iii) Responsibilities

(a) The Purchasing Department should:

1. Designate products, processes and procedures to be evaluated by the City Departments and if adopted, use whenever practicable. Maintain a designated product list for Departments to reference for possible use.
2. Provide Departments with technical assistance in policy implementation.
3. Monitor and revise contracting procedures to be used by all Departments as necessary to procure designated products whenever practicable and to facilitate data collection.
4. Research and provide information for the procurement of recycled and other environmentally preferable products and communicate these to the purchasing decision makers for evaluation and purchase.
5. Collect data on purchases of recycled and other environmentally preferable products from all Departments.
6. Promote the use of the recycled and other environmentally preferred products by publicizing the policy and its implementation.

All Departments should:

7. Identify key personnel to evaluate each designated product to determine the extent to which it may be practicably used by the Department and its contractors.



8. Insure that contracting specifications do not discriminate against recycled products without justification.
9. Specify recycled and other environmentally preferable products whenever practicable and require this of contractors.
10. Monitor and report to the Purchasing Department the success or failure of all designated products.
11. Actively seek environmentally preferred products and services and report the findings to the Purchasing Department.
12. Evaluate and assess current Department policies and practices for opportunities to incorporate more environmentally preferred products.
13. Be familiar with third party certification organizations such as Energy Star and Green Seal among others to help write specifications for products and services.

iv) Exemptions

Nothing in this policy shall be construed as requiring the purchase of products that do not perform or are not available at a reasonable price to provide best value to the City.

Policy Recommendations

It is recommended that staff evaluate and develop a sustainable procurement policy. The policy should outline purchasing guidelines that ensure the most sustainable product is purchased, when practical. As recommended by the National Association of Counties, the purchasing guidelines should consider the following:

- Reduce waste at the point of purchase;
- Ask vendors for a product's environmental information;
- Purchase durable and reusable goods;
- Replace hazardous products with safer product or process;
- Specify product and packaging take-back;
- Look for opportunities to reuse, repair, lease and/or share equipment;
- Standardize purchases so any excess products are shared with other departments;
- Order supplies in bulk or in concentrated form to reduce deliveries and typically secure lower costs;
- Increase the efficiency of procurement procedures to eliminate unnecessary and/or duplicate purchases;
- Favor the purchase of durable, energy efficient and recycled-content products, when economically feasible;
- Manage surplus effectively;
- Procure commodities that are certified to meet sustainability standards;
- Purchase goods containing fewer toxic constituents;
- Reduce paper use, Reduce unnecessary print jobs and use double-sided printing as often as possible;
- Look for regional products that meet the specific needs;
- Purchase Environmentally Preferable Products, as suggested by the US EPA;



- Stipulations included in bid specifications; and
- Improve energy end-use efficiency.

As the policy is developed, it is important to set realistic goals that meet the needs of the City. While sustainable products are competitive, and sometimes less expensive, they are also more expensive at times, due to less market demand. For this reason it is important to incorporate flexibility into the policy. The City should take the following actions to ensure supported and successful implementation of the policy:

- Evaluate current purchases and identify sustainable options;
- Educate and train staff;
- Review and modify current and upcoming bids and contracts;
- Incorporate a price preference when a sustainable product is an established percent more than a comparable non-sustainable product;
- Track sustainable purchases; and
- Seek opportunities for cooperative purchasing.

The adoption of a Sustainable Procurement Policy will enable the City to achieve procurement guidelines suggested in the Sustainable and Energy Efficiency Policy, as follows:

Ensure that the relationship and impact of energy costs on the City budget/expenditures is understood and monitored

Use resources more efficiently by identifying opportunities to conserve energy and save money through smart investments with identifiable payback periods

City decision-making will be guided by the goals of increasing sustainable benefits and reducing or eliminating negative environmental impacts in all aspects of the City's activities, while maintaining fiscal integrity and the community's economic vitality

Work in partnership with local, State and Federal agencies, local businesses, educational institutions, community groups and the general public to protect, preserve and restore our community and surrounding region

Suggested Metrics for Measuring Future Progress

The City of Temple can measure its progress on purchasing more sustainable products by tracking purchases over the next two years, following the acceptance of the policy. Tracking should include identifying projected avoided costs between choosing one product over another, due to life-cycle costs. These amounts should be available as each product is assessed.

As the market for sustainable products improves and new products are introduced the policy should be amended to reflect the future efforts of sustainable purchasing. Incremental approaches, along with staff involvement and feedback, will ensure proper implementation and successful evaluation of the policy. Annual reports will allow the City to pro-actively measure performance, as well as safety, cost and environmental benefits.



Transportation

TRANSPORTATION / FLEET	Reduce vehicle miles traveled
	Reduce total fuel consumption for fleet vehicles

Opportunities for Innovation, Tools and Best Practices

There are many opportunities that exist to provide for more sustainable transportation practices. Many of these opportunities focus on saving fuel by decreasing miles travelled, reducing run-time of vehicles and equipment, and using alternative fuel types. The following are reasons to support sustainable transportation practices:

- Save Money:** Save in fuel costs each year by choosing the most efficient vehicle to perform the job-at-hand. If the fuel is an alternative fuel maintenance requirements might also decrease, due to the use of a cleaner fuel.
- Reduce Climate Change:** Carbon dioxide from burning gasoline and diesel contributes to global climate change. By saving fuel and reducing miles travelled, there will also be a reduction in emissions.
- Reduce Dependence on Foreign Oil:** Decreasing the use of fuel, decreases the demand for fuel, this will decrease the amount supplied by foreign countries. Also, most of the alternative fuels are found in the United States, further reducing dependence on foreign oil.
- Increase Energy Sustainability:** Oil is a depleting and non-renewable resource. It is predicted that we, as a country, cannot sustain our current rate of use indefinitely. Therefore, by reducing our current use, we are prolonging the use. This allows for more time to develop more alternative options that are more sustainable.

Reducing Vehicle Miles Traveled

Increasing teleconferencing capabilities to decrease travel

One way to reduce vehicle miles traveled is to increase the number of meetings that utilize teleconferencing and/or conference calls. Today's technology allows many different options to efficiently have meetings, including Skype and GoToMeeting, among other options. Since City offices are far apart the City can use this to avoid extra travel to a central meeting location. The City is currently using these systems for out-of-state interviews and other long-distance meetings.

Increase Car-pooling

City offices are very spread out across the community. This scenario makes it difficult to easily have meetings that minimize the amount of people required to drive. If teleconferencing is not an option, those traveling from like areas should carpool, as opposed to driving separately. Although, due to varying schedules, this is not always the best option, City staff should evaluate how they can drive City vehicles less, as often as they can.

Reducing Fuel Consumption by City Fleet

Install Aftermarket Fuel Enhancer Systems

On the market there is a device, used by many school districts in the area that enhances a vehicles fuel economy. The system is a powder coated steel tube with small cooper components in the middle that filter the fuel. It goes in-line between the engine block and fuel line, reducing fuel consumption (due to cleaner fuel), emissions and engine build-up. The device can be used on a variety of fuel types, including alternative fuels. The device is also transferrable from engine to engine and has a life expectancy of at least forty years. The system decreases fuel consumption by



ten-percent and has been tested to save twenty-six percent in some cases. In order to save fuel consumption and improve emissions and maintenance requirements the City should invest in these devices. Typical pay-back period varies, but is generally less than one-year.

Install Aftermarket Tire Pressure Monitoring Systems

Tire pressure monitoring systems help to ensure maximum tire and tread life by monitoring tire pressure/temperature and maintaining proper tire inflation. Newer vehicles should have a tire pressure monitoring system already installed, as the federal government mandated installation in 100% of vehicle models by year 2008.

Amount of Under-inflation	Wasted Fuel	Added Tire Wear
3 psi	+1%	+10%
6 psi	+2%	+30%
9 psi	+4%	+45%

* Under-inflated tires are *dangerous*. Cornering & braking are affected, and a low tire is much more likely to blow out. Remember, tires lose air constantly, even when the car isn't being driven.

Table 4-7

Tire pressure influences the amount of fuel consumed (Table 4-7). If tire pressure is low, there is more slump in the tire, that requires more energy to turn. If a vehicle's tire pressure is kept at an appropriate level for the vehicle and tire, gas mileage will improve, because the tire experiences less resistance from the road. Tire pressure monitoring systems help to ensure maximum tire and tread life by monitoring tire pressure/temperature and maintaining proper tire inflation.

Reasons to always keep your tires properly inflated (i.e. prevent under-inflated & over-inflated tires), tires shown in Figure 4-11 depict proper inflation:



Figure 4-11

Vehicle Safety - Proper tire inflation greatly reduces the potential of a tire blowout that can lead to unwanted road-side emergencies, damage to vehicle, and even personal injury.

Improved Fuel Economy -

- The Department of Transportation estimates that 5 million gallons of fuel per day (over 2 billion per year) are wasted due to low tire pressure.
- Under-inflated tires increase the rolling resistance of vehicles and, correspondingly, decrease their fuel economy.

Properly inflated tires save fuel and that saves you money at the pumps.

Enhanced Vehicle Performance -

Tires with low air pressures skid and hydroplane more easily.

- TPMS, through proper tire inflation, will allow optimum performance of your vehicle with greater stability, handling and braking in both wet and dry conditions.

Increased Tire & Tread Life, and save MORE money -

- When a tire is under-inflated, more pressure is placed on the casing of the tire, causing the tread to wear more rapidly than it would if the tire were inflated to the proper pressure.
- Properly inflated tires can extend the life of tire treads and casing by as much as 35%.

Seasonal refueling restrictions (April 01 – Oct 31: early morning or evening only)

The City of Temple experience both long and warm summers. High temperatures impact the



density of fuel at the pump station, therefore impacting the amount of fuel that actually goes into the tank. High temperatures cause fuel to expand, therefore a gallon of fuel in the afternoon (warm point of the day) is not equal to a gallon of fuel in the morning when the outside temperature is cooler and the fuel is denser. By restricting refueling times to the cooler parts of the day, such as morning and evening, the City can essentially get more for its money when fueling. Following the warm seasons in Central Texas, refueling between April 1st and October 31st should be limited to morning and evening time periods, to increase the amount of fuel pumped.

Increase Number of Alternative Fueled Vehicles

There are many alternative fuel vehicles on the market, and due to rising gas prices and dependence on foreign oil these vehicles are becoming more readily accessible. Alternative fuels are derived from resources other than petroleum, some produced domestically and some derived from renewable sources. In most cases they produce less pollution than gasoline or diesel. The following is a description of the type of alternative fuels available:

Ethanol: Produced domestically from corn and other starchy crops, it is an alcohol-based fuel. It can also be made from “cellulosic biomass” such as yard brush materials. Current gasoline uses 10% ethanol (E10). E85 is an 85% blend of ethanol and 15% gasoline. In the Midwest the cost is typically cheaper than regular gasoline, however there is typically a decrease in vehicle miles per gallon.

Advantages and disadvantages of E85 (Table 4-8):

Advantages	Disadvantages
Domestically produced, reducing use of imported petroleum	Can only be used in flex-fuel vehicles
Lower emissions of air pollutants	Lower energy content, resulting in fewer miles per gallon
More resistant to engine knock	Limited availability
Added vehicle cost is very small	Currently expensive to produce

Table 4-8

Biodiesel: Diesel fuel produced from vegetable oils, animal fats, or recycled restaurant greases. It is biodegradable, safe and produces less air pollutants than petroleum-based diesel. There are different blends of biodiesel, 100% biodiesel or blended with petroleum diesel. Common blends include B2 (2% biodiesel), B5 and B20. B2 and B5 can be used in most diesel engines.

Biodiesel compared to petroleum diesel (Table 4-9):

Advantages	Disadvantages
Domestically produced from non-petroleum, renewable resources	Use of blends above B5 not yet warrantied by auto makers
Can be used in most diesel engines, especially newer ones	Lower fuel economy and power (10% lower for B100, 2% for B20)
Less air pollutants (other than nitrogen oxides) and greenhouse gases	Currently more expensive
Biodegradable	More nitrogen oxide emissions
Non-toxic	B100 generally not suitable for use in low temperatures
Safer to handle	Concerns about B100's impact on engine durability

Table 4-9



Natural Gas: One of the cleanest burning alternative fuels, it is a fossil fuel comprised mainly of methane. It can be used in the form of compressed natural gas (CNG) or liquefied natural gas (LNG). Vehicles can run 100% on natural gas or offer a bi-fuel feature, also running on gasoline or diesel.

Advantages and disadvantages of natural gas (Table 4-10):

Advantages	Disadvantages
Nearly 87% of U.S. natural gas used is domestically produced	Limited vehicle availability
60-90% less smog-producing pollutants	Less readily available than gasoline & diesel
30-40% less greenhouse gas emissions	Fewer miles on a tank of fuel
Less expensive than gasoline	

Table 4-10

Propane Autogas: Also known as liquefied petroleum gas (LPG), it is a clean burning fossil fuel, produced domestically, mainly in Texas. LPG is less expensive than gasoline and produces less toxic smog-forming air pollutants. Vehicles can be easily retrofitted to include 100% propane or a bi-fuel system.

Advantages and disadvantages of LPG (Table 4-11):

Advantages	Disadvantages
Fewer toxic and smog-forming air pollutants	No new passenger cars or trucks commercially available (vehicles can be retrofitted for LPG)
85% of LPG used in U.S. comes from domestic sources	Less readily available than gasoline & diesel
Less expensive than gasoline	Fewer miles on a tank of fuel

Table 4-11

Hydrogen fuel also exists, however many options are still being explored.

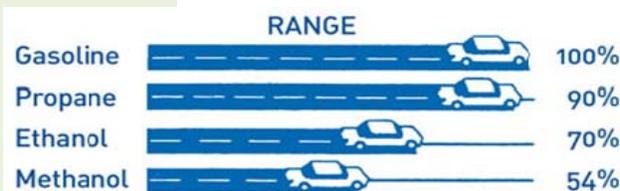


Figure 4-12

The City of Temple has previously researched and test drove CNG and propane autogas (LPG) powered vehicles. It has been determined that LPG vehicles are the best option for use in light to medium duty vehicles. The fuel range is comparable to gasoline, as shown in Figure 4-12. The installation of a fueling station at the Fleet Service Center is much more cost friendly than the

installation of a CNG fueling station (\$11,000 vs. \$1.1 million). However, CNG serves as a good alternative for heavy-duty vehicles and proves favorable with the uncertain future of fuel produced overseas, because it is produced domestically. CNG should be further evaluated for use in heavy-duty vehicles.

Right-size fleet

Right-sizing is the process of ensuring that the proper vehicles are being used to perform the job. In some cases a vehicle might be smaller or larger than is needed for the application. The City should work with each department to determine exact needs. Another step would be to imple-



ment vehicle and equipment sharing among departments. In the current fleet some vehicles and equipment that exist are not consistently used by that individual department. More use would occur if the equipment was used by multiple departments. This action would decrease the need to insure, maintain and operate multiple, limited use vehicles and equipment.

Enforcing Existing Policies

Although the City currently has an anti-idling policy, it is difficult to monitor if employees are idling vehicles off-site. The best way to encourage the anti-idling policy, is to provide anti-idling stickers on the vehicles, as a constant reminder.

Case Studies

Garland, TX

County Population: 222,013

Seven Steps to “Right-Sizing” Your Fleet

To address fuel issues in the City of Garland a strategy team approach was implemented using existing staff members. During FY 2008 the City executed a replacement program that focused on seventy-four replacement and new vehicles scheduled for the year. The team conducted utilization studies focused on vehicles one ton or under and identified opportunities for increased fuel efficiency, emissions reductions, vehicle sharing, hybrid applications, eliminating under used vehicles and equipment and examining the take home vehicle policies. The cost of the project stayed within the total budget for the 74 units. The team identified the following steps to achieve the right vehicles for each department:

Step One: Comprehensive Vehicle Utilization Analysis – compilation of vehicle statistics, assignment of vehicle to staff, passenger usage, and type of operation, among others.

Step Two: Fleet Review and Option Development – continued need for the vehicle, including sharing capabilities among departments, down-sizing or hybrid options, evaluating fuel economy and developing fuel savings versus vehicle cost analysis or life cycle cost analysis.

Step Three: Develop Fleet Recommendations – apply fleet recommendations on a department specific basis, taking into consideration expected miles to be driven, life cycle cost analysis, potential to reduce emissions and vehicle maintenance information.

Step Four: Consultation with Departments – Present options and recommendations to the individual departments, providing specific information on savings and emission reductions.

Step Five: Strategy Team Involvement – Involve the Strategy Team if an agreement cannot be achieved between fleet and the departments.

Step Six: City Manager’s Office – Involve the City Manager’s office if an agreement cannot be reached, after the involvement of the Strategy Team.

Step Seven: Replacement – Implement recommended replacement strategy.

The action of right sizing the fleet lead to overall changes in the [City of Garland’s] fleet by not automatically replacing units at the existing size, and model in all cases. Seventy-four vehicles were replaced, of which 56% were replaced by a more efficient size or type of vehicle, 30% were replaced with smaller size vehicles, 11% were replaced with larger vehicles, and 3% were relinquished. The City also added 13 new hybrid vehicles, to its existing hybrid fleet of 4. A 43% reduction in fuel consumption, 27% reduction in carbon dioxide emissions, and a 45% reduction in carbon monoxide emissions were attributed to the replacement of these units.

Policy Recommendations

The City should modify the existing City-Owned Vehicle and Equipment Use Policy to include



seasonal refueling restrictions. This will allow fueling while the gasoline is denser in cooler temperatures.

The City should also create a Fuel Conservation Plan. This plan should establish trigger points that move allotted fueling, time and amount, progressively from voluntary conservation through mandatory conservation stages. Also included in this plan should be general driving tips.

Suggested Metrics for Measuring Future Progress

In order to measure the success of implementing a more sustainable fleet the City should monitor its fuel purchases, miles travelled and average miles per gallon annually, per department, per vehicle. This measurement should be compared to historical trends to show success.



Streets

STREETS	Improve energy use in streetlighting
	Provide and expand on multiple modes of mobilization on City streets

Opportunities for Innovation, Tools and Best Practices

There are many different opportunities to contribute to sustainable actions among the many different components of a street. These include sustainable asphalt applications, porous asphalt applications, and efficient street lighting.

First, asphalt, as the main street surface material in Temple, is the most recycled material in America. The continued use of asphalt is very beneficial to the City, as due to the applicability of recycling/reusing asphalt, many governmental agencies and contractors regard old asphalt as an asset, not a waste. According to the National Asphalt Pavement Association asphalt is not only environmentally sustainable, but also economically sustainable,

“NAPA estimates that we have 18 billion tons of asphalt pavements already in place on America’s roads and highways. Because of the ability to reuse and recycle this material indefinitely, our highways are a resource for future generations. Not only are our roads a primary engine of the economy, they have a high residual value as a source of construction materials. As a note, the process of reclaiming and processing these materials has a very low environmental impact.”

Asphalt is also typically less expensive than other pavement materials, making upfront and long-term costs enticing and supportive of continuing with this application.

Asphalt can also be used in a porous form, which allows asphalt surfaces to function as linear stormwater management systems. This application enables natural infiltration, decreasing run-off. This application has the potential to restore the hydrology of a site, improve water quality, and possibly eliminate the need for detention basins. Porous asphalt also increases the safety of the roadway, reducing the amount a splash and spray kicked up by vehicles and decreasing puddling. The Texas Department of Transportation reported that “replacing a conventional surface with a [porous] friction course in a high-accident area reduced wet-weather accidents by 93 percent and reduced fatality by 86 percent.”

The design and application of porous asphalt alleviates the need to provide curb and gutter storm drainage systems, which are costly to design and build. However, for increased drainage provisions and aesthetic purposes they can easily be included, at the discretion of the City. The design also decreases the amount pollution accumulated as water flows across the roadway, because the water does not flow across a porous roadway. This increases the ability to eliminate and/or control the spread of pollutants in water ways.

Other environmental, economical and safety benefits of asphalt:

Energy Savings:

- Asphalt offers a smoother surface, which reduces fuel consumption by 4.5%.
- Lower emissions from vehicles, due to decreased fuel consumption.
- Less energy consumed in building pavements, require 50% of the energy needed to produce other pavements and are more durable decreasing energy required for maintenance and reconstruction.

•Reuse/Recycling:



- Asphalt industry reuses and recycles nearly 100 million tons of asphalt per year, through re-claimed asphalt pavement that reduces the amount of virgin asphalt cement needed for constructing new roadways.

Public Safety:

- Asphalt reduces crashes, due to improved drainage (when porous asphalt is used), and smoother roads (more contact with tires).

Performance:

- Durable, the road does not wear out; only the top surface needs to be replaced.
- Noise reduction, known as the quiet pavement, reducing noise properties.

Traffic Relief:

- Quick resurfacing time, at any time of day, alleviating need to redirect traffic.

Water Quality:

- Stormwater management (with the use of porous asphalt).
- Safe and improves infiltration of water for numerous applications.

Cool Cities:

- Reduces urban heat island effect, due to thickness, density and heat capacity of pavement heat retention, also able to use lighter color, not just black.

LIGHT TYPE AND CHARACTERISTICS							
	High-Intensity Discharge						
	Incandescent	Fluorescent	Mercury Vapor (Self-Ballasted)	Metal Halide	High-Pressure Sodium (Improved Color)	Induction	Light Emitting Diode (LED)
Wattages	10-500	1-125	50-1000	50-1000	70-400	20-165	80-95
Life (hr)	750-12000	7500-24000	16000-15000	1500-15000	24000 (10000)	100000	50000-70000
Efficacy (lumens/W) lamp only	6-24	55-100	30-65	50-100	50-100	70	
Lumen maintenance	Fair to excellence	Fair to excellent	Very good (good)	Good	Excellent	Good	Good
Color rendition	Excellent	Good to excellent	Poor to excellent	Very good	Fair (very good)	Excellent	Excellent
Light direction control	Very good to excellent	Fair	Very good	Very good	Very good	Excellent	Excellent
Source size	Compact	Extended	Compact	Compact	Compact		
Relight time	Immediate	Immediate	3 - 10 minutes	10 - 20 minutes	10 - 20 minutes	Immediate	Immediate
Power factor	1	1	0.44-0.67	0.6-0.9	0.44	0.98	0.99
Flicking	Not obvious	Obvious	Obvious	Obvious	Obvious	No	No
Surface temperature	High	Low	High	Very high	± 300°C	< 90°C	depends on color
Comparative fixture cost	Low: simple fixtures	Moderate	Higher than incandescent and fluorescent	Generally higher than mercury	High	High	High
Comparative operating cost	High: short life and low efficiency	Lower than incandescent	Lower than incandescent	Lower than mercury	Lowest of HID types	35-60% vs. HPS	35-60% vs. HPS
Auxiliary equipment needed	Not needed	Needed	Needed	Needed	Needed	Needed	Needed

Table 4-12



Second, the City utilizes 4,104 streetlights, which makes up approximately nineteen-percent of the City's total utility costs. Currently, seventeen-percent of these lights are Mercury Vapor, which are the least efficient streetlights. The City also utilizes a very small amount of Metal Halide streetlights, and a small amount of Induction lights. The largest amount of lights used (82%) are High Pressure Sodium streetlights. Light types are described in the following Table 4-12:

Mercury vapor lamp ballasts are prohibited from being manufactured and imported, according to the Energy Policy Act of 2005.

Therefore, maintenance and replacement of these fixtures is going to be more costly. It will be beneficial for the City to work with Oncor to replace these lights. The City should modify any city any utility agreement to facilitate rapid replacement of inefficient street lighting. The replacement of these lights will save the City utility costs and Oncor maintenance costs. If the City is able to upgrade the Mercury Vapor lighting to High Pressure Sodium, an anticipated savings of 337,260 kWh per year can be expected.

The City should also work with Oncor on options to include more Induction and LED lighting as technology advancements permit. These lighting options can be used to replace any of the current lights and will prove to be more efficient and require less maintenance, a win-win for the City and Oncor.

An inefficient lamp is not the only way to waste energy when utilizing a street light. Energy is also wasted in typical lamps that also emit light upward, as well as downward. Figure 4-14 is an image of North America at night that depicts all of the light pollution caused due to the lamps not directing all light downward. In this picture one is easily able to pick out the location of Tempe, due to the light pollution emitting from street and parking lots. There is currently an internationally recognized initiative to promote the use of light fixtures that decrease light pollution, known as the International Dark Sky Association.

The street lights across the City are mainly fixtures known as Cobra-heads. The current design of these fixtures uses more energy to light areas that are not used for any task, as seen in Figure 4-15. The optimal lighting situation will only light usable areas.

Oncor will work with the City to replace the current Cobra-heads with cut-off design. This option has many benefits to the City, include the following:

- Decreased energy cost, due to decrease use

<i>Existing Lamp</i>	<i>Existing Wattage</i>	<i>Equivalent Replacement Lamp</i>			
		<i>Metal Halide</i>		<i>High Pressure</i>	
		<i>Wattage</i>	<i>Potential Savings</i>	<i>Wattage</i>	<i>Potential Savings</i>
<i>Mercury Vapor</i>	175 W	150 W	48,180 kWh	100 W	153,300 kWh
<i>Mercury Vapor</i>	400 W	400 W	0 kWh	200 W	183,960 kWh

Table 4-13

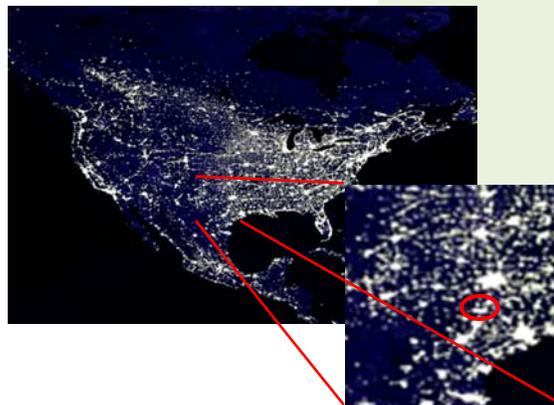


Figure 4-14



Figure 4-15



- Decreased glare, due to properly directed light
- Increased safety, due to more visibility with less glare
- Increase visibility of the night sky

The City is currently updating the remainder of traffic signals to use LED lights. Although this is very efficient, the City should also ensure all traffic signals are synchronized correctly, to limit vehicle idling at intersections. The Federal Highway Administration offers guidance on synchronization in their Traffic Signal Timing Manual.

Case Studies

Fairview, TX

City Population: 8,416

LED Lighting

The City of Fairview, TX installed new LED street lighting (owned by the electric utility). They were the first city in Texas to have a street entirely lit by LED lights. The lights provide better light quality, reduce maintenance costs, improve safety, practically eliminate light pollution and dramatically reduce energy consumption. The installed lights are expected to last an average of twelve years, with a 50% electrical-energy cost savings in comparison to traditional metal-halide lights, estimated to be \$250,000, including maintenance costs over the lifetime of the lights. The City estimated a 3-year return on investment, according to the current utility bills. The City's initiative to install LED lights was driven by their compliance with the dark-skies initiative and their own eco-friendly initiatives.

Other general benefits of LED's over the majority of the City of Temple streetlights (high pressure sodium) are listed below:

- Benefits of replacing 100,000 100-watt high pressure sodium street lights with LED fixtures:
- Energy consumption saved over 20 years: 656,880 megawatt-hours
- Reduction in greenhouse gases over 20 years: 512,120 tons
- Barrels of crude oil not consumed over 20 years: 1,063,340 barrels
- Payback period: 7.4 years
- 20-year savings per fixture: \$2,696

The U.S. DOE and its national laboratories predict that LED parking lot lights will reduce parking lot energy needs by more than 50% and maintenance costs by more than 80% compared to traditional parking lot lights. For parking lots whose lights are on 24 hours a day, traditional lights must be replaced every two years; LED lights need be replaced every 10 years on average.

Optimizing signal timing is a low-cost approach to reducing congestion, costing from \$2,500 to \$3,100 per signal, and yielding:

- Traffic delay reductions in the range of 14 - 25%.
- Fuel consumption reductions in the range of 8 - 10%.
- Reduction in harmful emissions (carbon monoxide, nitrogen oxides, volatile organic compounds) up to 22%

Policy Recommendations

The City currently uses the Drainage Criteria and Design Manual to design streets and other drainage conveyance facilities. The City should include porous surface material as an option for



drainage along roadways. The main recommendation is to update the current manual to include more sustainable directives.

The City also has a street lighting policy adopted in 1995. This policy should be updated to include more efficient lamp size and watts as the minimum requirements. The City should also include installing cut-off fixtures that direct the light to usable areas, and not into the night sky.

Suggested Metrics for Measuring Future Progress

The City of Temple can measure its progress on street improvements through tracking improved/decreased maintenance needs, decreased traffic accident counts, determining financial asset value of asphalt streets and tracking any revenue gained if and when an asphalt street is recycled. The City can easily track benefits of updated street lighting through the decrease in electric use and cost, as well as light outages and maintenance needs from Oncor. These actions should all improve as sustainable measures are adapted within the Streets department.



Water Systems

WATER SYSTEMS	Continue to provide clean drinking water
	Reduce water consumption at City facilities
	Reduce energy use associated with treatment and distribution of water

Opportunities for Innovation, Tools and Best Practices

The water treatment plant was constructed in 1978 the building is a two-story facility with an approximate size of 42,840 square feet. The building serves the main operations for the Water Treatment department. The building is surrounded by the facilities that serve as the initial water treatment areas, this includes raw water pumping, pools, and chemical processes, among other systems. The water enters this facility and goes out to the community through a variety of distribution means, to include pump stations and water tanks.



Figure 4-16

A review of the facility's utility bills has resulted in identifying the buildings EUI as 563.72 kBtu/sf/yr and an ECI of \$13.53 /sf/yr. These high numbers are expected given the operations of a water treatment plant. In the majority of communities, the water treatment plant is generally the highest user and cost of energy. Therefore, in this facility pump motors play a crucial role in energy use, as well as the lighting system, as every energy user is important.

The building is served by a split system / through the wall DX cooled / natural gas heat HVAC system. The basic lighting system includes T8 and T12 linear fluorescent fixtures. The main temperature control systems of the facility are programmable thermostats.



Figure 4-17

Figure 4-16 shows the Membrane Plant, constructed in 2004 and encompasses 16,715 square feet. The EUI is 257.40 kBtu/sf/yr and the ECI is \$6.05. This facility is located near the main water treatment plant, and is used as another form of treatment.

There are also multiple pump stations located across the City, which help to disburse water to the community. These pump stations house motors to run the pump that vary in horse power, generally from 60hp to 250hp. Nine pumps were observed during the audit, at the pump stations with the highest utility use and costs. Figure 4-17 shows the raw water pump station located off the Leon

River, near the water treatment plant.

Building specific recommendations include the following:

- Install variable frequency drives at pump stations. These drives save energy by matching the speed of the pump with the required load conditions at the time. The current single speed drives start motors more abruptly, subjecting the motor to higher torque and current surges. Variable frequency drives offer a “soft start” capability, gradually ramping up a motor to operating speed. This will lessen mechanical and electrical stress on the motor, reduce maintenance and repair costs and extend the life of the motor. It is recommended that the City in-



stall variable frequency drives on all pumps.

Estimated Cost: \$17,922 (for 1) Estimated Savings: \$3,915 (for 1) Estimated Payback: 4 years

- Replace seven incandescent lighting at Loop 363 pump station.

Estimated Cost: \$50 (for 7) Estimated Savings: \$13 per month Estimated Payback: 4 months

- Replace metal halide fixtures with T5 linear fluorescent fixtures at the Water Membrane Plant. It is estimated that thirty-five 400w Metal Halides should be replaced at this facility. This number should be verified. It is estimated that each retrofit is approximately \$325.

Estimated Cost: \$11,375 (for 35 fixtures) Estimated Savings: \$1,526 Estimated Payback: 7 years

- Wash the coil fins on the two HVAC units at this facility. During the walk-through it was realized that the condenser fins were dirty. Allowing dirt and debris to collect in between coil fins decreases the ability of a condensing unit to properly reject heat from the refrigerant into the atmosphere. It is recommended that the City clean these coils.

Suggested Metrics for Measuring Future Progress

The City should compare its current water and energy use at all water treatment and distribution facilities to that of future use and costs, to ensure success. The energy use and cost should decrease, as well as water. It should be noted that the amount of water treated and pumped is directly proportional to the amount required and used by the public, therefore energy improvements are not the only answer. The City should also track its success of water conservation education within the community.



Solid Waste

SOLID WASTE	Reduce the amount of solid waste going into landfill from City facilities
	Reuse, recycle and purchase recycled content products
	Increase recycling opportunities at City facilities

Opportunities for Innovation, Tools and Best Practices

Through improving solid waste actions the City has an opportunity to improve its landfill and instill replicable actions in its employees. The common thread among all solid waste goals is to reduce the amount of waste created, either through recycling or reuse.

The State of Texas adopted Senate *Bill No. 1340, Section 361.425. Governmental Entity Recycling* stating that a municipality shall establish a program for the separation and collection of recyclable materials generated by the entity's operations. Items to be recycled include aluminum, high-grade office paper, and corrugated cardboard. The municipality should provide procedures for collecting, storing, and selling recyclables. The entity shall also establish educational and incentive programs to encourage maximum participation.



Figure 4-18

Although the City of Temple currently has an internal recycling collection program, not all departments are aware of or participate in the program. There should be a greater effort to include all departments and educate the employees of this opportunity. It has been recognized that an increase of accessible recycling bins is needed within offices, and should only be used for recycling products. These efforts will help the City to reduce solid waste disposed at the landfill, diverting it from City facilities.

The City should also educate and encourage its employees about incorporating the whole waste stream cycle into their daily routines. The cycle includes everything listed in the sustainable solid waste hierarchy, including reducing, reusing and then recycling.

There is only so much natural resources that exist on our earth, and only so much space for us to dispose of unwanted items. To improve conditions of each the three "R's" should be practiced.

Reduce

This "R" means you stop waste before it starts by not creating scenarios where waste will be created. Some examples of reducing waste include the following:

- Composting;
- Set printer default settings to duplex;
- Bring a waste-free lunch by packing it in reusable or recyclable containers; and
- Avoid disposables. It's wasteful to only use something once and throw it away. Instead, use cloth napkins, real towels; rechargeable batteries, reusable plates, glasses and cutlery silverware instead of one-time use products.

Reuse

This "R" means you or someone else will use an item over and over instead of throwing it



away or recycling it.

- Reuse paper bags, wrapping paper, or newsprint;
- Hold a yard sale or donate items when you don't want them anymore (i.e. the City's annual auction);
- Set up a reuse box for used pencils, pens, folders and other items that are still usable; and
- Use both sides of a sheet of paper before recycling it. Figure 4-19 shows a picture of a "second chance" paper bin, for paper that was only used on one side and can be reused for drafts or scratch paper.

Recycle

This "R" means that something old is remade into something new. For example, when you are done drinking a soda, the can goes to a factory where it is remade into an aluminum baseball bat. A plastic milk jug can become a fleece jacket. Tires can become a running track.



Figure 4-19

Education is the best way to encourage the employees to practice the three 'R's'. Therefore, the City should use signs, displays, and/or other media to educate the employees on the following:

WHY they should recycle.

WHAT they should recycle.

WHERE they can recycle.

HOW they can recycle.

Include signage and/or literature at the site showing how much has been recycled already or goals that you are trying to reach. This will help to stimulate participation.

The City should not exclude the community from these efforts. Everyone contributes waste to the landfill, so to lessen the negative impacts on the landfill everyone should practice sustainable disposal options. The City is currently conducting a pilot curbside recycling program in a selected area of the City, serving approximately 1,100 households. Once proven successful, the City should offer this program to all households, as a voluntary program. According to a recent survey conducted by the City, involving community participation, more than fifty-percent of the residents would like to see a curbside recycling program offered by the City. This is backed by the internal employee sustainability survey, that indicated nearly fifty-percent of the employees already recycle, with more willing to recycle.

The City can also encourage recycling by modifying the current pick-up schedule. The City of Temple currently offers the least expensive pick up service in Texas, and also offers two-days per week pick-up. This is excessive, considering pick-up rates show that most households only put out their trash once per week. Therefore, solid waste trucks are driving twice the needed amount during each week. By offering a recycling program on the second pick-up date, the City will still go to each household twice, but disposed waste will be decreased, therefore diverted from the landfill. Considering nearly eighty-percent of the current waste stream is recyclable, waste going to the landfill can be drastically decreased through this effort.

At the conclusion of the on-going curbside recycling pilot the City should evaluate the need to pick up garbage and recycling each once per week (four-times per month) or pick up garbage once per week and recycling twice per month. The City might find that this option can also be reversed, if the community truly commits to the recycling efforts, by offering once per week recycling pick-up and twice per month garbage pick-up. Either option will reduce the need to run



pick-up routes by twenty-five percent, decreasing items going to the landfill, as well as fuel required to operate the solid waste trucks.

In order to successfully track the actual waste being disposed in the landfill, it is important to track the waste stream. This information serves as a baseline for future comparison of the amount of materials diverted from the waste stream, through recycling. It can assist the City in identifying the main items that can be considered for recycling. From this information the City can also determine a cost reduction comparison, as well as forecast the possible revenue from recycling. Waste assessments can be done in the following ways, as spot inspections:

Waste Sort

Waste sorts can focus on the entire waste stream or target specific areas. Identify each component of your venue's waste stream and calculate its percentage of total waste generation. In a waste sort, materials are taken from the trash cans, sorted, and weighed. This gives a better waste ratio but is more time-consuming than a walk-through.

Recycling rate =

Total recycled (by weight), divided by total discarded (by weight) + recycled (by weight)

Case Studies

McAllen, TX

City Population: 132,225

Curbside Recycling Program

The City of McAllen, TX has offered a curbside recycling program to its residents since 1994. They utilize an Automated Curbside Recycling Program, recognized as the first ever in the state by the Texas Natural Resource Conservation Commission. Each resident receives a container for comingled recyclables, which is picked up once per week.

Through staff's efforts the City educated over 39,000 people about the benefits of recycling and composting. This program included visiting schools, civic groups, churches, and surrounding communities, resulting in over 5,077 tons of recyclable materials collected as cardboard, paper, aluminum and tin, yielding an increase of twenty-percent in recycling revenues.

Coppell, TX

City Population: 39,663

Curbside Recycling Program

The City of Coppell, TX first offered in 1991 as a pilot program in Dallas County. Since that time it has continued to be one of the most successful programs in the area. Each single-family household received a 65-gallon cart in early 2009. The City offers a single stream recycling program to single-family households, provided through Waste Management. Acceptable recyclables include paper, all plastics, aluminum, metal and glass.

The City recently set a goal to increase the number of Coppell households that recycle from fifty-percent to sixty-five percent, and to double the diversion rate to twenty-percent. As of July 2009 the City reached and exceeded its goal of sixty-five percent participation rate, and continues to reach this goal. The diversion rate goal of twenty-percent was met in January 2010.

To encourage recycling the City encouraged recycling during its Clean Coppell, annual city-wide cleanup. The City also involved a variety of consultants and City staff to engage with the local schools during field day activities. This effort allowed the City to reach the students, who then went home and educated and encouraged their families to recycle.



Policy Recommendations

To encourage inter-office recycling, the City should adopt a Recycling Policy that has clear guidelines, strongly enforced by management. The policy should feature a list of acceptable items and unacceptable items, to avoid any confusion. This policy can help to reduce resource consumption, having a financial benefit for the City.

The City should include the following as acceptable office recyclables, as practical:

- Paper (scrap paper, newspaper, magazines, etc.);
- Cardboard (reusable and non-reusable);
- Single-sided printed paper;
- Drink boxes and/or cartons;
- Aluminum cans;
- Plastic containers;
- Metal;
- Glass;
- Styrofoam (packaging peanuts as reusable);
- Batteries; and
- Electronic equipment.

Suggested Metrics for Measuring Future Progress

To ensure success in recycling efforts, the City should compare its waste stream to the baseline waste stream. There should be marked improvement, showing that there is an increase in the amount of materials recycled, diverting the amount of materials going to the landfill, extending the life of the landfill. The City should also track the participation rate, with the expectation of an increase in participation through improved accessibility and education.



Open Space

OPEN SPACE	Naturalize City landscaping
	Provide equitable access for all residents to City open spaces

Opportunities for Innovation, Tools and Best Practices

Park systems offer many aesthetic and recreational advantages to the surrounding community. In most cases the development of open space is related to land use requirements. However, in this Sustainable Management Plan the focus is on the City's current open space. Land use will be discussed more in depth in subsequent additions to the plan.

The first item that the Parks department can benefit from is naturalizing landscaping. This action includes planting natural plants and grasses and ridding the landscape of invasive plants that consume excessive water. The benefits include the following:

- Low maintenance
- Improved biodiversity
- Improved health
- Decreased water use
- Cost savings

The Parks department utilizes numerous water meters. Many are used for irrigation purposes in parks, landscape beds and medians along roadways. The City should look at options to improve the irrigation systems. This includes the installation of rain gauges and flow gauges. These two instruments will assist Parks maintenance in ensuring that irrigation is not operating during times of sufficient rain and also allow them to find leaks easier, both decreasing the waste of water. The City can also install computer/remote controlled systems that will allow even greater control over all irrigation systems from one location for all of the parks across the City.

The City of Temple encompasses almost 80 square miles of land, making it difficult to ensure that all citizens have adequate access to parks and recreational areas. In preparation for focusing on sustainable land use, the Parks department should ensure that all citizens have access to these spaces. It is generally stated that five-percent of a community should be allocated as park/green/open space.

Policy Recommendations

The Parks and Leisure Services department should adopt a policy that stipulates the types of plants and grasses in a more specific manner, than the current initiative.

Suggested Metrics for Measuring Future Progress

The City should track maintenance requirements of landscaping with native plants, as compared to requirements of previous invasive plants. The maintenance and watering requirements should decrease; therefore the City can also track water bills to ensure a decrease, from the benchmark years of FY 2009 and FY 2010.



Education and Outreach

EDUCATION and COMMUNICATION	Engage and educate employees and the community
	Measure, monitor and communicate the City's progress toward a defined goal set
	Increase our role as sustainable leaders in Federal, State and Local initiatives

Opportunities for Innovation, Tools and Best Practices

Education and outreach programs have the opportunity to foster innovation and change that is established in this Plan. This section expands upon existing educational and outreach programs and discusses other opportunities. The purpose of educating is to empower employees by providing them with the necessary tools to have the Plan, the City and all personnel succeed.

The main goals of the Plan should be shared via education and outreach programs. These goals include engaging and educating the community; measure, monitor and communicate progress; and increase our roles as sustainable leaders. The following are methods that the City can implement:

Increase Voluntary Employee Conservation:

The City should implement a campaign that combines educational messaging and action suggestions. Messaging can be used through a variety of means, including e-mail blasts, postings on bulletin boards and conservation reminder stickers.

A Sustainability Committee was created to assist in developing this Plan. This committee should continue and serve as a cross-departmental committee to steer the City's sustainability initiatives into the future. The committee should also be responsible for ensuring the accountability, inclusivity, information sharing, cross-departmental collaboration, and identification of organizational barriers to sustainability.

The City can also offer lunch-n-learns to the employees. According to the employee survey a total of 45% of the respondents stated that they find these offerings to be important or very important. In these courses a variety of sustainable living lessons can be shared that will impact ones practices at work and home.

Increase Community Outreach:

Although most of this Plan is focused on internal City operations, there is also an increased interest in a variety of community outreach programs. These are mainly focused on classes, talks and presentations offered to the community concerning water conservation, gardening, energy use and general sustainable lifestyle practices. They City should actively engage in these discussions with the community through websites, newsletters, informational brochures, and courses offered through the Parks and Leisure Services department.

Measure, Monitor, and Communicate Progress:

As the City implements the Plan it is important to communicate its progress with employees and the community. The City should develop a website to convey this information. The website can also provide general informational documents pertaining to best practices of a sustainable lifestyle.

Suggested Metrics for Measuring Future Progress

To ensure effectiveness of the campaign, results should be continually tracked to optimize per-



formance. Due to a variety of different education and outreach programs different measures should be used to track progress. Different measurement forms include surveying class participants after the completion of a course, tracking the number of viewers on the website and direct feedback and questions received from the variety of programs that encourage communication.



Section 5:
Implementation



This Plan was established to develop a management approach for organizational sustainability applications and practices. The overall Plan identified the current status of sustainability practices, assessed current energy use, and identified opportunities and recommendations for moving forward. In order to develop a foundation for the City to proceed sustainably a vision and mission statement were also developed, for the City to use as guiding principles to build upon. In addition, this plan serves to communicate the City of Temple's commitment to sustainability, improving energy efficiency, exploring new opportunities, fostering regional partnerships and responding to change in support of environmental stewardship, social responsibility and economic vitality.

This section is provided to summarize the discussed opportunities within the document as follows:

- provide a general approach to ranking the identified opportunities;
- identify strategies and tools for developing action plans for specific opportunities for timely implementation;
- identify strategies and tools for monitoring and measuring implemented opportunities;
- identify roles and responsibilities of employees and other stakeholders;
- identify ideas to integrate the sustainability program into the overall management of City operations; and
- identify continued program development opportunities.

Summary of Recommendations

Opportunities and recommendations for improving the City's sustainability performance were identified in the previous section through a variety of activities. The opportunities and recommendations were compiled and their contribution to the achievement of the overall sustainability goals were evaluated, summarized and aligned with the overall sustainability goals. Throughout this process the committee was able to refine and solidify the goals identified in Section 1, to develop the attainable goals, aligned appropriately with the opportunities.

Table 5-1 depicts the opportunities and aligns them with the goals of each department. Also included are the ranking of opportunities.

Ranking of Opportunities/Work Plan Matrix

For implementation to be successful, mechanisms for prioritizing the recommended actions were needed. Therefore, a structure for organizing the responsible entities was identified and a ranking system was developed. To allow for maximum flexibility, the ranking system may be revised as other factors become apparent throughout the implementation of the Plan.

To help organize opportunities, the Plan contains a dynamic ranking system that prioritizes all the recommendations according to various factors. A ranking protocol was applied that generated a score for each opportunity based on the following criteria:

- Existence of current program or activity
- Environmental benefit
- Economic benefit
- Social benefit
- Financial incentive
- Personnel availability and capacity
- Technical feasibility
- Stakeholder concerns
- Regulatory requirement



- Contribution to established goals
- Timeframe to realize benefits

For each criterion an individual score of 0, 1, 2, or 3 was assigned that represents the status of the opportunity in relation to the criteria. In addition, each criterion was weighted by multiplying the individual scores by 1, 2, or 3 to reflect the relative importance to the City of Temple, as presented in Table 5-1.

The final score for each opportunity was calculated by summing the individual weighted scores for each criterion. The ranking summaries for each opportunity are presented in Table 5-1, and can be used by the City to prioritize and select opportunities. To select future actions and initiatives, users can sort the opportunities by any of the above criteria, or by a series of ranking or organizing parameters, including:

A “triple bottom line score,” which highlights how well each opportunity balances the environmental, economic and social benefits.

The opportunities matched with the focused goal.

Opportunities grouped by identified employee and stakeholder group, to help individuals in the organization identify how they contribute to implementing solutions.

Implementation Plan

Building on the sustainability goals, vision and guiding principles, as well as assessment and identification and ranking opportunities, the City of Temple can pursue the following activities to prioritize and implement opportunities:

Selection of Opportunities and Recommendations

The City should select opportunities for implementation based on current and projected status of City’s budget, external partnerships and funding sources, emerging City activities, stakeholder input, contribution toward achieving the sustainability goals, and the ranking scores. This selection should be done on an annual schedule, since the opportunities are dynamic selection can be completed more often, as needed.

Establishment of Metric and Targets for Sustainability Goals

Sustainability can be measured through a variety of both quantitative and qualitative indicators and performance metrics. Quantitative methods are the most common and easily measured. Qualitative measures are subjective and harder to define; they refer to the overall well being of an area and its health and vitality.

Metrics should be developed for the near-term opportunities and recommendations selected, based on metrics identified in Section 3. These should be aligned with common metrics used across the country, including, but not limited to the following:

- Ecosystems, water resources, air quality, waste and conservation measures;
- Transportation, parks and open space;
- Energy consumption, renewable energy sources, and sustainable buildings;
- School systems, arts and cultural opportunities, and civic engagement; and
- Affordability and social equality.

Meaningful and achievable targets should also be set for each sustainability goal. For each metric, the baseline value for the City of Temple shall be determined, if it was not previously evaluated in this Plan or other initiatives. In addition, a benchmarking study may be conducted to evaluate targets that have been set by local municipalities similar to the City of Temple. Employee and stakeholder input will also be considered along with the baseline and benchmarking data to set appropriate targets.

					GENERAL			CITY FACILITIES				ADMISTRATIVE OPERATIONS		PROCUREMENT	TRANSPORTATION / FLEET		WATER SYSTEMS			STREETS		SOLID WASTE			OPEN SPACE			EDUCATION and COMMUNICATION		
					Reduce energy costs and consumption	Improve environmental monitoring (model responsible energy management)	Prevent pollution	Maintain a clean and healthy work environment to secure economic well being	Be proactive	Increase energy efficiency	Reduce reliance on non-renewable resources	Promote inter-departmental collaboration	Incorporate sustainability into the City's decision-making process	Increase the City's use of sustainable procurement	Reduce vehicle miles traveled	Reduce total fuel consumption for fleet vehicles	Continue to provide clean drinking water	Reduce water consumption at City facilities	Reduce energy use associated with treatment and distribution of water	Improve energy use in streetlighting	Provide and expand on multiple modes of mobilization on City streets	Reduce the amount of solid waste going into landfill from City facilities	Reuse, recycle and purchase recycled content products	Increase recycling opportunities at City facilities	Naturalize City landscaping	Improve irrigation needs at City Facilities	Provide equitable access for all residents to City open spaces	Engage and educate employees and the community	Measure, monitor and communicate the City's progress toward a defined goal set	Increase our role as sustainable leaders in Federal, State and Local initiatives
SUSTAINABILITY WORK PLAN					BENEFIT SCORE (out of 51)	CAPABILITY / NEED SCORE (out of 21)	TOTAL																							

MAJOR SUPPORT NEEDED THROUGH CAPITAL DOLLARS

1	All private offices, bathrooms, storage rooms, conference rooms should have occupancy sensors installed	51	15	66	X	X		X	X	X	X																			
2	Replace lighting fixtures with T12 lamps with more energy efficient T8 lamps, any remaining incandescent lamps should be replaced with equivalent compact fluorescent lamps and exit signs replaced with LED type signs	46	12	58	X		X	X	X	X			X					X	X											
3	Upgrade vehicle fleet to more efficient vehicles and sustainable fuel source	44	14	58	X		X		X	X	X			X		X														
4	Focus on leak detection and reduction within the City's aging system to reduce unaccounted for water	45	11	56	X	X			X							X	X													
5	Employ a "night-setback strategy and employ a general temperature setting policy for all City facilities	45	10	55	X	X		X	X	X	X		X																	
6	Continued attention to water metering, accuracy assurance through periodic water meter repair and replacement, and through the proper meter size selection to match the rate being demanded by the given customer.	38	17	55	X	X			X	X	X	X																		
7	Improve building envelopes	44	9	53	X			X	X	X	X																			
8	Update public safety facilities to ensure adequate living / working spaces	38	12	50	X		X	X	X	X			X															X		
9	All inefficient motors should be replaced with premium efficiency motors	40	9	49	X				X	X	X			X					X											
10	Assess actual efficiency of water plant and distribution pumps and motors, and upgrade with more efficient pumping units	38	10	48	X				X	X				X		X			X											
11	Install a building automation system in all City facilities	38	8	46	X	X			X	X																		X		
12	Allocate capital to perform a feasibility study for solar and/or wind power at City facilities	33	13	46			X		X	X	X								X											
13	Install bicycle racks within City parking lots and bus stops	32	12	44			X	X	X		X				X	X											X		X	

MAJOR SUPPORT NEEDED BY GENERAL STAFF

14	Create lighting upgrade plan with schedule for each of the City's buildings	48	13	61		X			X	X									X												
15	Train facility staff on improved maintenance procedures	45	16	61		X			X	X			X	X																	
16	Monitor and control thermostat set points for HVAC systems in all facilities	51	9	60	X	X		X	X	X			X																		
17	Recycle in all City owned facilities	43	16	59			X		X												X	X	X								
18	Adjust operation and maintenance to improve and fix unexpected changes from baseline	46	12	58	X	X		X	X	X	X																				
19	Explore the option of electric charging stations within the City	46	12	58			X		X		X		X		X												X				
20	Create fuel conservation plan for each department	43	14	57	X				X	X					X	X											X				

					GENERAL			CITY FACILITIES				ADMISTRATIVE OPERATIONS		PROCUREMENT	TRANSPORTATION / FLEET		WATER SYSTEMS			STREETS		SOLID WASTE			OPEN SPACE			EDUCATION and COMMUNICATION		
					Reduce energy costs and consumption	Improve environmental monitoring (model responsible energy management)	Prevent pollution	Maintain a clean and healthy work environment to secure economic well being	Be proactive	Increase energy efficiency	Reduce reliance on non-renewable resources	Promote inter-departmental collaboration	Incorporate sustainability into the City's decision-making process	Increase the City's use of sustainable procurement	Reduce vehicle miles traveled	Reduce total fuel consumption for fleet vehicles	Continue to provide clean drinking water	Reduce water consumption at City facilities	Reduce energy use associated with treatment and distribution of water	Improve energy use in streetlighting	Provide and expand on multiple modes of mobilization on City streets	Reduce the amount of solid waste going into landfill from City facilities	Reuse, recycle and purchase recycled content products	Increase recycling opportunities at City facilities	Naturalize City landscaping	Improve irrigation needs at City Facilities	Provide equitable access for all residents to City open spaces	Engage and educate employees and the community	Measure, monitor and communicate the City's progress toward a defined goal set	Increase our role as sustainable leaders in Federal, State and Local initiatives
SUSTAINABILITY WORK PLAN					BENEFIT SCORE (out of 51)	CAPABILITY / NEED SCORE (out of 21)	TOTAL																							
21	Monitor a vehicle-idling reduction program	43	11	54	X	X	X		X	X	X				X													X		
22	Supplement money from energy savings for future energy efficient facility updates	43	10	53					X				X	X																
23	Limit/prohibit use of personal heaters, refrigerators, microwaves, etc.	42	11	53	X			X	X	X	X																X			
24	Work with vendors to develop a list of available environmentally preferable products and include cost differentials	40	11	51					X			X	X	X													X		X	
25	Establish means to complete cost analysis of purchases (i.e. vehicles, building improvements, and equipment)	40	9	49					X			X	X	X																
26	Improve vehicle driving practices	34	14	48	X		X		X	X					X												X			
27	Pursue reconciliation of metered electrical use	29	6	35		X			X			X																X		
28	Pursue reconciliation of metered water use	29	6	35		X			X			X																X		
MAJOR SUPPORT NEEDED BY SUSTAINABILITY COMMITTEE																														
29	Establish water conservation best practices	45	19	64	X				X	X			X														X			
30	Reduce total fuel consumption	48	15	63	X		X		X		X			X	X															
31	Develop a sustainable building standard for future City facilities	49	11	60	X	X		X	X	X	X	X	X				X													
32	Develop purchasing policy focused on sustainable procurement	49	11	60					X				X																X	
33	Establish guiding principles for employee energy conservation	48	10	58	X				X	X																	X	X		
34	Establish energy efficient building operations and maintenance requirements	42	13	55	X	X		X	X	X			X														X			
35	Incorporate energy efficiency standards into existing specs	40	15	55					X			X	X																X	
36	Establish a baseline for water used in City facilities	36	15	51		X		X	X								X													
37	Increase public access to green space, ensure equitable access	37	12	49					X																	X				
38	Establish an energy efficiency standard for all new construction, retrofits and upgrades	37	11	48	X	X		X	X	X		X	X	X				X				X	X	X			X		X	
39	Establish a water efficiency standard for all facility upgrades / retrofits	37	11	48	X				X													X	X	X						
40	Educate departments about the need to 'right-size' and share vehicles / equipment	37	11	48			X		X			X	X		X	X											X			
41	Reduce equipment miles traveled	37	11	48			X		X			X	X		X	X														
42	Increase education on water conservation measures	36	12	48			X		X																		X			

					GENERAL			CITY FACILITIES			ADMISTRATIVE OPERATIONS		PROCUREMENT	TRANSPORTATION / FLEET		WATER SYSTEMS			STREETS		SOLID WASTE			OPEN SPACE			EDUCATION and COMMUNICATION				
		BENEFIT SCORE (out of 51)	CAPABILITY / NEED SCORE (out of 21)	TOTAL	Reduce energy costs and consumption	Improve environmental monitoring (model responsible energy management)	Prevent pollution	Maintain a clean and healthy work environment to secure economic well being	Be proactive	Increase energy efficiency	Reduce reliance on non-renewable resources	Promote inter-departmental collaboration	Incorporate sustainability into the City's decision-making process	Increase the City's use of sustainable procurement	Reduce vehicle miles traveled	Reduce total fuel consumption for fleet vehicles	Continue to provide clean drinking water	Reduce water consumption at City facilities	Reduce energy use associated with treatment and distribution of water	Improve energy use in streetlighting	Provide and expand on multiple modes of mobilization on City streets	Reduce the amount of solid waste going into landfill from City facilities	Reuse, recycle and purchase recycled content products	Increase recycling opportunities at City facilities	Naturalize City landscaping	Improve irrigation needs at City Facilities	Provide equitable access for all residents to City open spaces	Engage and educate employees and the community	Measure, monitor and communicate the City's progress toward a defined goal set	Increase our role as sustainable leaders in Federal, State and Local initiatives	
63	Promote a City initiative to use Alternative Fuel Vehicles	45	12	57	X		X		X	X				X																	
63	Participate in State legislation to pass regulations favorable to recycling practices	32	11	43				X				X																		X	
64	Coordinate with neighbors and states to initiate regional sustainability planning	28	8	36				X			X	X															X		X		
65	Participate in State legislation to pass regulations favorable to installation of renewable energy systems	29	6	35				X				X															X		X		
MAJOR SUPPORT NEEDED FROM THE SUSTAINABILITY MANAGER																															
66	Work with the Environmental Protection Agency to identify and remediate Brownfield sites or other hazardous sites within the City	49	12	61			X		X																			X	X		
67	Educate the community about recycling, to decrease solid waste disposed at landfills	46	15	61			X		X												X	X					X	X			
68	Create a website to facilitate discussion among City staff, businesses and residents about sustainability	42	14	56				X			X	X															X	X			
69	Establish a sustainability website to communicate with the community	42	14	56				X			X	X															X	X			
70	Publish an annual Sustainability Report	36	17	53				X			X	X															X	X			
71	Develop a newsletter to educate employees and the community about 'Living Sustainable'	39	11	50				X			X	X															X	X			
72	Increase voluntary efforts by employees through education	40	9	49				X																			X	X			
73	Provide resources for implementation of sustainable programs specific to individual departments and community-wide companies	40	9	49				X			X	X															X	X	X		
74	Offer lunch-n-learns and other sessions about 'Living Sustainable' at home and work	37	8	45				X			X	X															X	X			
75	Develop a scorecard to monitor the City's progress in improving sustainability performance	30	10	40				X			X	X															X	X			



Development of Action Plans and Monitoring Plans

Action plans should be developed prior to the implementation of the selected opportunities and recommendations. The action plan will be used to streamline resources and foster interdepartmental coordination. The following information should be recorded in the action plans:

- Action items
- Priority
- Persons responsible for implementation
- Deliverables
- Resource needs (personnel and financial)
- Schedule and milestones
- Status

Every action plan should have an accompanying monitoring plan, which establishes a protocol to ensure that progress is measured at an appropriate frequency and correct information is collected on a consistent basis, based on the action. The monitoring plan will facilitate the recording of data, including those responsible for collecting the information.

Management Practices

To appropriately and effectively integrate the City's sustainability vision into existing decision-making processes and operational procedures, the following actions should be considered:

Develop performance metrics for Department Heads, as related to sustainability, and include the metrics in their annual performance review;

Conduct bi-annual progress meetings with Department Heads;

Develop a scorecard to monitor the City's progress in improving overall sustainability performance on City utilities, CIP, and miscellaneous projects completed by the City; and

Commit to publishing an annual Sustainability Report.

Communication

The Sustainability Manager should develop and adopt a Communication Plan to inform both internal and external stakeholders of the activities and progress related to the City's sustainability program. Components of the Communication Plan should include the publication of an annual Sustainability Report, quarterly progress meetings with Department Heads, social media postings and website updates.

Continued Program Development

The approach of this Sustainable Management Plan is to be a continually evolving document. The Plan encourages a continual reassessment of goals and emphasizes consistent monitoring of performance and communication results. These actions will allow for a feedback loop to be created for continual improvement of sustainability performance. It is critical to update and continuously re-evaluate the opportunities presented in the Plan, in order to maintain relevancy as a tool for furthering the sustainability program.

The plan should serve as a "launching pad" for further planning activities. These activities include the following:

- Community outreach programs;
- Sustainable building incentives for City owned buildings;
- Sustainable land use and development issues; and
- Climate Change and Greenhouse Gas emissions.

Overall, the Plan should expand beyond internal City operations and positively impact the entire



community. Sustainability is a very diverse topic, and when looked at on a community wide perspective, can include a wide facet of goals and opportunities. As the Plan develops the City should consider outcomes from opportunities implemented due to the current Plan, community feedback and the direction that the City and community want to take at the time of additions and revisions, in order to successfully continue the sustainable practices within the City.



Section 6:
Appendix



03/14/11

Dear Temple Employee,

As an employee for the City of Temple, you play an important role in influencing your work environment and guiding the development of your community. I ask you to take a few minutes to participate in this survey, so that we may determine what your wants and needs are for the future, concerning sustainability within the City of Temple.

Over the past few years the sustainable movement has really taken hold in many cities across the nation, making the idea of 'green' more about saving funds. For cities the term sustainability generally refers to the notion that our current actions will meet the needs of the present generations without compromising the needs of future generations. With this idea in mind, many cities are beginning to evaluate their many different operations and have proven that ***sustainability efforts are economically, environmentally and socially beneficial.***

Realizing the benefits other cities are experiencing, the City of Temple is developing a Sustainable Management Plan. This survey is crucial to beginning the steps towards a complete plan that addresses all city operations.

Please return surveys to me or the City Manager's office by ***April 4, 2011***. Your responses to this survey will remain confidential. The surveys will be evaluated by me, the Sustainability and Grant Manager. All surveys will be destroyed after data is collected and tabulated.

If there are any questions or concerns regarding the survey process, please feel free to contact me at any time. Thank you for taking the time and effort to provide your opinion on this important city matter.

Thank you,

Ashley Williams

Sustainability and Grant Manager
(254) 298-5607
awilliams@ci.temple.tx.us

EMPLOYEE SURVEY ABOUT SUSTAINABILITY

Dear Employee,

The survey will take about 5 - 10 minutes. Please complete and return to the City Manager's Office.

Thank you for participating in this survey!

DEMOGRAPHICS

These first few questions are to make sure we have surveyed a good cross-section of people.

Please circle one (1) best answer for each question.

1. Gender:

Male Female

2. Age:

< 18 18-24 25-29 30-39 40-49 50-59 60-64 65+

3. Department: _____

4. Years Employed: _____

PERSONAL BEHAVIOR

These questions are to assess you personal views / actions towards a sustainable lifestyle.

Please circle (1) best answer for each question.

5. How much would you say you know about living sustainably and general sustainable efforts?

Nothing Less than Average Average More than Average Expert

6. What are some of the green practices you partake in (check all that apply):

<input type="checkbox"/> Bike as a form of transportation	<input type="checkbox"/> Complete errands in one trip
<input type="checkbox"/> Carpool to and from work	<input type="checkbox"/> Recycle
<input type="checkbox"/> Replace Incandescent bulbs with CFL's	<input type="checkbox"/> Conserve water/Update plumbing fixtures to low-flow
<input type="checkbox"/> Plant naturalized/drought resistant plants	<input type="checkbox"/> Use a programmable thermostat
<input type="checkbox"/> Use green cleaning products	<input type="checkbox"/> Install thermal drapes or curtains
<input type="checkbox"/> Buy Energy Star rated products	<input type="checkbox"/> Use an irrigation system (with a rain sensor)
<input type="checkbox"/> Drive a fuel efficient vehicle	<input type="checkbox"/> Unplug equipment when not in use (printers, phone chargers, etc.)
<input type="checkbox"/> Purchase locally produced products/food	<input type="checkbox"/> Compost
<input type="checkbox"/> Only run full loads of laundry or dishes	<input type="checkbox"/> Garden
<input type="checkbox"/> Use reusable bags when shopping	<input type="checkbox"/> Other: _____

7. What sustainable practices would you be willing to do (check all that apply):

<input type="checkbox"/> Bike as a form of transportation	<input type="checkbox"/> Complete errands in one trip
<input type="checkbox"/> Carpool to and from work	<input type="checkbox"/> Recycle
<input type="checkbox"/> Replace Incandescent bulbs with CFL's	<input type="checkbox"/> Conserve water/Update plumbing fixtures to low-flow
<input type="checkbox"/> Plant naturalized/drought resistant plants	<input type="checkbox"/> Use a programmable thermostat
<input type="checkbox"/> Use green cleaning products	<input type="checkbox"/> Install thermal drapes or curtains
<input type="checkbox"/> Buy Energy Star rated products	<input type="checkbox"/> Use an irrigation system (with a rain sensor)
<input type="checkbox"/> Drive a fuel efficient vehicle	<input type="checkbox"/> Unplug equipment when not in use (printers, phone chargers, etc.)
<input type="checkbox"/> Purchase locally produced products/food	<input type="checkbox"/> Compost
<input type="checkbox"/> Only run full loads of laundry or dishes	<input type="checkbox"/> Garden
<input type="checkbox"/> Use reusable bags when shopping	<input type="checkbox"/> Other: _____

GENERAL QUESTIONS

These questions are to assess your view towards the City of Temple's involvement in sustainable efforts.

Please circle (1) best answer for each question.

8. Do you think sustainability is currently practiced within the City of Temple? If yes, what actions?

Yes Somewhat No Don't Know Actions: _____

GENERAL QUESTIONS (cont.)

9. Do you think sustainability is currently practiced within your department? If yes, what actions?

Yes Somewhat No Don't Know Actions: _____

10. Which three (3) issues do you think Temple should focus on the most to become more sustainable?

Air Quality Ecosystems & Habitat Energy Climate Land Use / Planning Transportation
 Waste Recycling Drinking Water Stormwater Sustainable Purchasing Facility Management
 Education / Outreach Programs Other: _____

11. What do you see as barriers to the City becoming more sustainable? (circle two)

Public Support Funding Local Government Support Knowledge Other: _____

12. How urgent do you feel it is to take steps towards a more sustainable city / work environment?

Not at all Urgent Slightly Urgent Somewhat Urgent Urgent Very Urgent Don't Know

13. What is your optimal range for temperature settings?

Summer: _____ Winter: _____

COMFORT LEVEL IN YOUR WORKING ENVIRONMENT

These questions are to assess your working environment.

Put an "X" in the appropriate box:

I...		Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Don't Know
PERSONAL COMFORT LEVEL	am generally working in an office environment.						
	am generally working outside.						
	am comfortable in my working environment.						
	feel there is sufficient lighting in my working environment.						
	have access to day light in my working environment.						
	feel there needs to be improvements to the lighting.						
	believe that my sapce is impacted by spaces used for other functions.						
	feel that I dress appropriately for the weather conditions outside and work environment inside (i.e. layers).						
	feel the temperature seeting in conference rooms is generally set appropriately.						
	am generally cold at work.						
	am generally warm at work.						
	feel there needs to be improvements to the HVAC system.						

PERCEPTIONS OF POTENTIAL SUSTAINABLE PRACTICES

These questions are to assess your views on sustainable actions practiced by other entities.

Put an "X" in the appropriate box:

How important do you think it is...		Not at all Important	Slightly Important	Somewhat Important	Important	Very Important	Don't Know
PERSONAL ATTITUDE	to practice a sustainable lifestyle as an individual?						
	to actively learn more about your impact on the environment?						
	to maintain a clean and healthy environment to secure economic well being?						
ADMINISTRATION	to purchase reusable, recyclable and/or healthy and safe materials?						
	to implement policies regarding staff participation in sustainability efforts?						
	for Temple to create a website to facilitate discussion among City staff, businesses and residents about sustainability?						
EDUCATION	to offer lunch-n-learns and other sessions about 'Living Sustainable' at home and work?						
	to create a sustainability challenge or competition between departments to support and award sustainable efforts?						
ENERGY USE	to use energy efficient technology as much as possible in City facilities and equipment?						
	to take active steps to decrease energy consumption?						
	to purchase power from renewable sources?						
	to install alternative sources of power on/within City facilities, equipment and/or land (e.g. solar, wind, geothermal)?						
	to use conservation controls (e.g. occupation sensors/programmable thermostats)?						
FACILITIES	to commit the City to a formal policy using sustainable building techniques and standards in new construction and renovations of City facilities?						
	to seek certification in green building practices?						
TRANSPORTATION	to maintain a vehicle fleet that offers Alternative Fueled Vehicles?						
	to create incentives for carpooling, use of public transportation or 'Green' vehicles to commute to and from work?						
	to encourage bike use through the provision of bike racks, and bike sharing?						

