Appendix 2
Quantification of Costs and Reductions of Municipal Measures

Table A2-1. *Detailed Reductions by Measure*

Buildings Energy Use Reduction Measures

Appendix 2: Detailed Municipal Reductions by Measure												
Sector	Area	Measure	Title	Description	Metric Tons CO2e	% of Goal Reduction	% of Total Reductions	$ City Cost	City Cost	$ Private Cost	Private Cost	Annual Cost Savings
B 1: Integrate energy efficiency and other green building practices into new City facilities.												
Municipal	Building	B 1.1	Municipal Green Building Policy	*Adopt a green building policy for new construction and major renovations of municipal facilities that exceeds current Title 24 energy standards to facilitate the continued implementation of municipal green building and establish the City as a leader in the community.*	-93	6%	5%	$210,000	*Medium*	NA	NA	$45,000

Appendix 2: Detailed Municipal Reductions by Measure												
Sector	Area	Measure	Title	Description	Metric Tons CO2e	% of Goal Reduction	% of Total Reductions	$ City Cost	City Cost	$ Private Cost	Private Cost	Annual Cost Savings
Municipal	Building	B 1.2	Municipal Energy Audits and Upgrades	*Continue to conduct energy audits of all City facilities, identify opportunities for energy savings, and implement recommended, cost-effective energy efficiency retrofit upgrades, including solar and tankless water heaters, and energy-efficient ventilation and air conditioning.*	-143	10%	7%	$80,000	*Low*	NA	NA	$6,500
B 2: Conduct efficiency audits and implement energy/water efficiency retrofits to existing City facilities.												
Municipal	Building	B 2.1	Water-Conserving Equipment in Municipal Facilities	*Install water-conserving equipment (e.g., faucets, high-efficiency toilets, and, if applicable, showerheads) in all City facilities.*	-9	1%	0%	$0	*Low*	NA	NA	$0
Municipal	Building	B 2.2	Reflective Roofing on City Facilities	*Continue to install reflective roofing on select City facilities to reduce building energy (heating/cooling) consumption.*	0	0%	0%	$500	*Low*	NA	NA	$500

Appendix 2: Detailed Municipal Reductions by Measure												
Sector	Area	Measure	Title	Description	Metric Tons CO2e	% of Goal Reduction	% of Total Reductions	$ City Cost	City Cost	$ Private Cost	Private Cost	Annual Cost Savings
B 3: Establish energy and water management and operations policies and practices for City facilities.												
Municipal	Building	B 3.1	Loans for Energy Efficiency and Renewable Energy	*Establish a reinvestment loan fund to cover first costs for energy efficiency/renewable energy projects at City facilities.*	-753	52%	38%	$450,000	*Medium*	NA	NA	$350,000
Municipal	Building	B 3.2	Energy-Efficient Electronics	*Continue to replace in City facilities existing outdated electronic appliances and office equipment in favor of those that are more energy efficient.*	-48	3%	2%	$15,000	*Low*	NA	NA	$9,000
Municipal	Building	B 3.3	Demand Response Programs	*Continue to participate in demand response programs.*	-12	1%	1%	$4,000	*Low*	NA	NA	$48,000

Appendix 2: Detailed Municipal Reductions by Measure

Sector	Area	Measure	Title	Description	Metric Tons CO2e	% of Goal Reduction	% of Total Reductions	$ City Cost	City Cost	$ Private Cost	Private Cost	Annual Cost Savings
Municipal	Building	B 3.4	Reduced Lighting Usage: Lights-Out Policy at City Facilities	*Reduce lighting use by instituting a lights-out-at-night policy at City facilities where feasible.*	-140	10%	7%	$0	*Low*	NA	NA	$30,000
Municipal	Building	B 3.5	Drought-Tolerant Landscaping at Municipal Facilities	*Expand current energy-efficient and drought-tolerant landscaping practices at City facilities to exceed current levels.*	-3	0%	0%	$0	*Low*	NA	NA	$0
Municipal	Building	B 3.6	Expand Tree Cover at Municipal Facilities	*Reduce energy use by planting trees to shade City facilities where feasible.*	-6	0%	0%	$6,000	*Low*	NA	NA	$1,000

Appendix 2: Detailed Municipal Reductions by Measure												
Sector	Area	Measure	Title	Description	Metric Tons CO2e	% of Goal Reduction	% of Total Reductions	$ City Cost	City Cost	$ Private Cost	Private Cost	Annual Cost Savings
B 4: Consider clean energy alternatives for City facilities and operations.												
Municipal	Building	B 4.1	Solar Electric Arrays	*Conduct a solar feasibility study and install solar electric (PV) arrays at/on appropriate City facilities, and identify additional opportunities for increasing renewable energy systems, including wind energy generation.*	-244	17%	12%	$6,000,000	*Medium*	NA	NA	$200,000
Municipal	Building	B 4.2	Solar Water Heating	*Install solar water heating at/on appropriate City facilities.*	-2	0%	0%	$12,000	*Low*	NA	NA	$500
S 1: Implement energy management and operations practices for City-owned streetlights.												
Municipal	Streetlights	S 1.1	High-Efficiency Streetlights	*Continue to replace low-efficiency streetlights with high-efficiency light-emitting diode (LED) fixtures as funding becomes available.*	-134	100%	7%	$350,000	*Medium*	NA	NA	$80,000
MWR 1: Implement waste reduction practices in all City facilities.												

Appendix 2: Detailed Municipal Reductions by Measure												
Sector	Area	Measure	Title	Description	Metric Tons CO2e	% of Goal Reduction	% of Total Reductions	$ City Cost	City Cost	$ Private Cost	Private Cost	Annual Cost Savings
Municipal	Municipal Waste Reduction	MWR 1.1	Waste Prevention	*Require waste prevention in day-to-day operations (e.g., two-sided copying, reduced paper requirements) in all City facilities.*	-6	79%	0%	$0	*Low*	NA	NA	$3,000
MWR 2: Encourage recycling of used materials whenever feasible at City facilities.												
Municipal	Municipal Waste Reduction	MWR 2.1	Expand Recycling Programs	*Expand City Hall, Police Station, and City parks recycling programs into all City facilities.*	-1	21%	0%	$0	*Low*	NA	NA	$0
MT 1: Increase the number of fuel-efficient vehicles in the City's fleet.												
Municipal	Transportation	MT 1.1	Purchase of Alternative Fuel/Fuel-Efficient Vehicles	*Continue to require the purchase of alternative fuel and/or fuel-efficient vehicles.*	-158	47%	8%	$100,000	*Low*	NA	NA	$18,000
MT 2: Establish energy-efficient fleet management and operation practices.												

Appendix 2: Detailed Municipal Reductions by Measure

Sector	Area	Measure	Title	Description	Metric Tons CO2e	% of Goal Reduction	% of Total Reductions	$ City Cost	City Cost	$ Private Cost	Private Cost	Annual Cost Savings
Municipal	Transportation	MT 2.1	Reduce Fleet Size	*Continue to reduce fleet size (i.e., total number of vehicles) by retiring older and underused vehicles.*	-91	27%	5%	$0	*Low*	NA	NA	$25,000
Municipal	Transportation	MT 2.2	Reduce Idling	*Institute a policy to limit idling of City fleet vehicles.*	-43	13%	2%	$0	*Low*	NA	NA	$12,000
Municipal	Transportation	MT 2.3	Fleet Maintenance	*Continue to implement a maintenance regime for increased efficiency for City vehicles (e.g., regularly check tire pressure).*	-39	12%	2%	$0	*Low*	NA	NA	$11,000

Appendix 2: Detailed Municipal Reductions by Measure												
Sector	Area	Measure	Title	Description	Metric Tons CO2e	% of Goal Reduction	% of Total Reductions	$ City Cost	City Cost	$ Private Cost	Private Cost	Annual Cost Savings
Municipal	Transportation	MT 2.4	Scheduling & Routing Efficiency	*Improve scheduling and route efficiency for using City vehicles.*	0	0%	0%	$0	*Low*	NA	NA	$10,000
MT 3: Provide alternative transportation options for all City employees.												
Municipal	Transportation	MT 3.1	Municipal Commuter Programs	*Continue to implement incentive programs to reduce municipal employee commute (e.g., parking cash-out, telecommute, bike checkout).*	-3	1%	0%	$0	*Low*	NA	NA	$0
Municipal	Transportation	MT 3.2	Municipal Bicycle Program	*Provide bicycles for daily trips for City employees.*	0	0%	0%	$2,500	*Low*	NA	NA	Less than $100

Appendix 2: Detailed Municipal Reductions by Measure												
Sector	Area	Measure	Title	Description	Metric Tons CO2e	% of Goal Reduction	% of Total Reductions	$ City Cost	City Cost	$ Private Cost	Private Cost	Annual Cost Savings
Municipal	Education	MEO 1.1	Employee Education	*Conduct workplace sustainability education programs with City employees focused on energy/water conservation, waste reduction/diversion practices, and transportation/commute alternatives.*	-36	100%	2%	$0	*Low*	NA	NA	$36,000
MEPP 1: Expand City environmentally preferred purchasing (EPP) efforts.												
Municipal	Purchasing	MEPP 1.1	Expand Environmentally Preferable Purchasing	*Create and implement environmentally preferable purchasing (EPP) categories and practices in City facilities.*				$0	*Low*	NA	NA	$0

** Installation of water-efficient equipment measure and energy-efficient/drought-tolerant landscaping measure provided here are information items only. Emissions reductions from these measures are not included in the "Subtotal" or "Total Change" table above.*

TECHNICAL SUMMARY OF QUANTIFICATION OF REDUCTION MEASURES[1]

B 1: INTEGRATE ENERGY EFFICIENCY AND OTHER GREEN BUILDING PRACTICES INTO NEW CITY FACILITIES

Measure B 1.1: Municipal Green Building Policy

Implementation Cost:

Increased Green Building Cost ($/sq ft): $4. The average premium for green buildings is $3–$5 per square foot. The $4 value mid-range value was used. (Source: Kats, G. 2003. Green Building Costs and Financial Benefits. www.cap-e.com/ewebeditpro/items/O59F3481.pdf)

For 2010, increased green building cost is based on Walnut Creek's City Hall and a new LEED-certified downtown library. The City is currently looking into the feasibility of having the City Hall certified as LEED. New library size: 42,000 square feet (Source: http://www.walnut-creek.org/about/qualitylife/libraries/dlp/ default.asp). City Hall size source: 2008 Title 24 Energy Efficiency Improvements in comparison to 2005 baseline Title efficiency standards (Source: California Energy Commission. 2007. Impact Analysis: 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings)

Energy Reductions:

For 2010, energy savings and GHG emissions reduction are based on the City's City Hall and a new LEED-certified downtown library. The City is currently looking into the feasibility of having the City Hall certified as LEED.

Assumes Tier 2 (30% above) for City facilities development 2020–2030.

Assumes all growth in natural gas and electricity sectors is from new construction.

B 2: CONDUCT EFFICIENCY AUDITS AND IMPLEMENT ENERGY/WATER EFFICIENCY RETROFITS TO EXISTING CITY FACILITIES

Measure B 1.2: Municipal Energy Audits and Upgrades

Implementation Cost:

Retrofit Cost ($/sq ft): $1.00. Based on simple energy efficiency retrofit. (Source: Murry, Barbra. Private CRE to Spur Energy Retrofit Market Over Next Few Years. http://login.vnuemedia.com/cpn/business-specialties/Private-CRE-to-Spur-Energy-Retrofit-Market-Over-Next-Few-Years-1473.shtml)

Typical new construction building's annual energy use per square foot is 17.3 kWh for electricity and 0.33 therms for natural gas. (Source: ICLEI's CAPPA Beta Version2. Calculated from Tables3.1.4 and3.1.8, 2008 Building Energy Databook. DOE. March 2009. http://buildingsdatabook.eren.doe.gov/docs%5CDataBooks%5C2008_BEDB_Updated.pdf)

On average, LEED rated buildings' energy consumption is 25–30% lower than the national average. Higher average performance is correlated with the higher LEED levels; however, those buildings are more variable in individual performance. (Source: ICLEI's CAPPA Beta Version2. Turner and Frankel, Energy Performance of LEED for New Construction Buildings. March 2008. New Buildings Institute. http:///wwwnewbuildings.org/downloads/Energy_Performance_of_LEED-NC_Buildings-Final_3-4-08b.pdf)

2010 energy/GHG savings based on City data on seven projects: Tice Valley Gym lighting retrofit, Ceramics Studio EE upgrades, Network-Based Power Management, City Hall server virtualization, Panologic Thin Clients, retro-

[1] Excludes supportive measures that do not result in GHG reductions for the City (e.g., MEO 1.1).

commissioning of City Hall/Police Department, City Hall CFL switchout. (See calculations below.)

- Tice Valley Gym: Retrofit costs $16,000–8,000 rebates.
- Network-Based Power Management: Implementation costs for 325 workstations (per City) at a cost of $25/license (cost source: http://www.peoplesgasdelivery.com/business/DisplayESource.aspx?type=PA&page=PA_52)
- Server Virtualization: Costs assumed to be $2,500 x 3 servers. (Source: http://www.cites.illinois.edu /vmware/benefits.html)
- Panologic Thin Clients: Costs assumed to be $2,500 x 1 servers. (Source: http://www.cites.illinois.edu/vmware/benefits.html)
- City Hall retro-commissioning: $38,890 (Source: City-provided ABAG project agreement)
- CFL switchout: (Source: Amazon.com, CFL/conventional bulb pricing)

Energy Reductions:

- Tice Gym: From City retrofit work order (energy retrofit company). Four-lamp T5 fluorescent with wire guards. 108,326.4 kwh to 54,512.64.
- Ceramics studio: Electricity savings based on 20 4-foot T-12 to T-8 replacements (82w to 57w per bulb, 2 bulbs per lamp, x 8 hrs/day 5 days a week, 52 weeks a year). Wattages taken from ICLEI CAPPA - lighting retrofit measure.
- Network-Based Power Management: 325 desktops outfitted with NBPM software, estimated 200 kWh per workstation per year (Source:http://www.peoplesgasdelivery.com/business/DisplayESource.aspx?type=PA&page=PA_52)
- Server Virtualization: Old servers use 50 watts each (per City) each running 24/7. Replaced 30 servers with 3; savings = 50w x 30 units x 365 days x 24 hours - 50w x 3 units x 365 days x 24 hours.
- Panologic Thin Clients: Another server virtualization application - data from City 50 watts/unit, 18 units replaced with 1. Savings = 50w x 18 units x 365 days x 24 hours - 50w x 1 units x 365 days x 24 hours.
- City Hall retro-commissioning: 233,888 kwh, 7,010 therms (Source: City-provided ABAG project agreement)
- CFL switchout: Per City 110 75-watt incandescent floods replaced with Par-30 CFL; 134 can lights (75-watt incandescent) replaced with Par-38 CFL, 28 75-watt incandescent replaced with PAR-38 dimmables.

Measure B 2.1: Water-Conserving Equipment in Municipal Facilities

Implementation Cost:

Total cost is based on $8/faucet, $539/toilet, and $29/showerhead.

- Faucet: Middle of $5–$10 range. (Source: http://www.eartheasy.com/live_lowflow_aerators.htm)
- Toilet: Average price of five models of EPA WaterSense labeled toilets listed. Price range $211–$755. (Source: http://www.us.kohler.com/onlinecatalog/product_result.jsp?module=WaterSense&category=13&subcategory=120)
- Showerhead: $50. (Source: http://eartheasy.com/store/proddetail.php?prod=SS-2100CP-US)

Water cost savings are based on $0.001/gallon.

Energy cost savings are based on $0.13/kWh for electricity and $1.069/therm for natural gas.

Cost savings for water are from water savings only. Cost of electricity is included in cost of water, so is not calculated separately.

Energy Reductions:

Faucets and Showerheads:

- Energy use per gallon of water: 0.0054 kWh (indoor use). Energy use for pumping, treatment, and wastewater treatment. Value is for indoor water use in Northern California (indoor water use requires energy to both supply water and to treat wastewater). (Source: California Energy Commission. Refining Estimates of Water Related Energy Use In California. 2006. Table ES-1. http://www.energy.ca.gov/pier/ project_reports/CEC-500-2006-118.html)
- Energy use to heat gallon of water: 0.19 kWh. (Source: ICLEI's CAPPA Beta Version 2) Calculated from 8.3 lbs/gallon x 1 Btu/lb*F x (120 F hot water - 55 F cold water) x 1 therm/100,000 Btu/0.55 gas water heater energy factor. (hot water temp source: NREL. EERE Clearinghouse: Solar Water Heating. 1996. p. 6 http://www.nrel.gov/docs/legosti/fy96/17459.pdf. Cold water temp source: http://www.noaanews.noaa.gov/stories2007/ s2772.htm)
- U.S. average temperature for 2006. Water supply typically travels through underground pipes where temperature is approximately local annual average temperature. (energy factor source: http://www.eere.energy.gov/ buildings/info/components/waterheating/conventional.html.) Middle of 0.5–0.6 range. Energy factor is a measure of the overall efficiency of water heaters, including energy losses from the tank.
- Energy use to heat gallon of water: 0.0098 therms. (Source: ICLEI's CAPPA Beta Version 2) See details of assumptions above to heat a gallon of water.
- Water is heating 100% by natural gas and 0% by electricity.

Toilets:

- Energy use per gallon of water: 0.0054 kWh. Energy use for pumping, treatment, and wastewater treatment. Value is for indoor water use in Northern California (indoor water use requires energy to both supply water and to treat wastewater). (Source: ICLEI's CAPPA Beta Version 2; California Energy Commission. 2006. Refining Estimates of Water Related Energy Use in California. Table ES-1)

Water Reductions:

Faucets:

- Annual water savings per faucet: 270 gallons. (Source: ICLEI's CAPPA Beta Version2. http://www.epa.gov/watersense/docs/ faucet_suppstat_final508.pdf)
- Percentage of hot water usage fromTotal water usage: 70%. (Source: ICLEI's CAPPA Beta Version2. PNL study 1994 in Home Energy Magazine. http://www.homeenergy.org/archive/hem.dis.anl.gov/ eehem/94/940112.html)

Toilets:

- Gallons per flush saved per toilet:3.05 gallons. Based on the fact that many older toilets use3.5–5 gallons of water per flush, and newer high efficiency toilets from Kohler or Caroma use far less (0.8–1.6 gallons). (Source: http://www.getwithgreen.com/2009/06/28/save-over-1-gallon-per-flush-high-efficiency-toilets-hetswork)
- Flushes per toilet per day: 21. Based on 30 flushes per toilet per day x 260 days per year = averages to 21 flushes per day. (Source: http://www.fypower.org/com/tools/products_results.html?id=10013-9)

Showerheads:

- Annual water savings per showerhead: 2,690 gallons. (Source: ICLEI's CAPPA Beta Version2. PNL study 1994 in Home Energy Magazine. http://www.homeenergy.org/archive/hem.dis.anl.gov/eehem/94/940112.h tml)

- Percentage of hot water usage fromTotal water usage: 70%. (Source: ICLEI's CAPPA Beta Version2. PNL study 1994 in Home Energy Magazine. http://www.homeenergy.org/archive/hem.dis.anl.gov/eehem/ 94/940112.html)

Measure B 2.2: Reflective Roofing on City Facilities

Implementation Cost:

Incremental Cost of Energy Star Roofing ($ per square foot): $0.25. Based on traditional roof cost of $1.25 per square foot and reflective membrane cost of $1.50 per square foot. (Source: http://www.eoearth.org/article/Green_roofs)

Assumes 5% and 10% of City facilities' rooftop space will be available for reflective roofs in 2020 and 2030, respectively. (Source: City of Walnut Creek)

Energy Reductions:

Annual electricity savings per roof square foot (kWh): 0.790

Annual natural gas use increase per square foot (therms): -0.0046.

(Source: Calculated using coefficients from Energy Star Roofing Calculator. Based on default inputs from Energy Star roofing calculator, which calculates savings based on local weather according to zip code: http://www.roofcalc.com/ RoofCalcBuildingInput.aspx)

B 3: ESTABLISH ENERGY AND WATER MANAGEMENT AND OPERATIONS POLICIES AND PRACTICES FOR CITY FACILITIES

Measure B 3.1: Loans for Energy Efficiency and Renewable Energy

Implementation Cost:

This measure assumes the implementation year to be 2011 with an assumed $20,000 as initial seed funding. Based on $1.00 per square foot for retrofit cost, $20,000 initial seed funding equates to 200,000 projected square foot retrofit. (Source for $1.00 per square foot cost in retrofit: Murry, Barbra. Private CRE to Spur Energy Retrofit Market Over Next Few Years. http://login.vnuemedia.com/ cpn/business-specialties/Private-CRE-to-Spur-Energy-Retrofit-Market-Over-Next-Few-Years-1473.shtml) Based on simple energy efficiency retrofit.

Assumes an allocation of 65% of cost savings from implemented energy efficiency retrofit projects is reinvested into revolving funding, and an annual $100,000 cap placed on available funding/retrofit cost for energy efficiency projects.

11.5 kW projected solar PV system is based on availability of $90,000 from EECBG funding and the estimated cost of a system: 5–100kW system for $7,600/kW. (Source: Lawrence Berkeley National Laboratory. 2009. Tracking the Sun: The installed costs of photovoltaics in the U.S. from 1998–2007. http://eetd.lbl.gov/ea/emp/reports /lbnl-1516e.pdf)

Energy Reductions:

Typical new construction building's annual energy use per square foot is 17.3 kWh for electricity and 0.33 therms for natural gas. (Source: ICLEI's CAPPA Beta Version2. Calculated from Tables 3.1.4 and 3.1.8, 2008 Building Energy Databook. DOE. March 2009. http://buildingsdatabook.eren.doe.gov/ docs%5CDataBooks%5C2008_BEDB_Updated.pdf)

Percentage electricity and natural gas savings from retrofit: 25%. Average of 29%, 30%, and 15% based on the following three references:

- City of Chicago has retrofitted three buildings, which are expected to have a 29% reduction on energy costs. (Source: http://www.clintonfoundation.org/what-we-do/clinton-climate-initiative/i/katie-mcclain-is-helping-an-entire-city-become-more-energy-efficient)
- Deep building retrofits can cut energy use by 20–40% with proven techniques and off-the-shelf technologies. (Source: Center for American Progress. Rebuilding America. A Policy Framework for Investment in Energy Efficiency Retrofits. http://www.americanprogress.org /issues/ 2009/08/rebuilding_america.html)
- Retrofits typically reduce energy consumption by 10–20%. (Source: Molly Miller, Rocky Mountain Institute. Leading Example for Energy Efficiency. http://esbsustainability.com/SocMe/?id=241&pid=237&sid=241)

Measure B 3.2: Energy-Efficient Electronics

Implementation Cost:

Incremental cost refers to the difference of the cost of purchasing a non-energy-efficient appliance versus purchasing an energy-efficient appliance.

Computers (including monitors):

- Computers here include monitors. But 2010 figures are for monitors only; the City has switched to EPEAT Silver standard for new monitor purchases. Incremental cost to purchase Energy Star monitors is $78 ($189 vs. $111 for conventional monitors). (Source: http://www.energystar.gov/ia/products/power_mgt/LowCarbonITSavingsCalc.xls)
- 2020 and 2030 computer projections figures are for computers in general, which include monitors. Assumes incremental cost to purchase an Energy Start computer is $42 ($784 vs. $742). (Source: Energy Star calculator. http://www.energystar.gov /ia/business/bulk_purchasing/bpsavings_calc/Calc_computers.xls)

Printers:

- Incremental cost to purchase an Energy Star printer: $0. (Source: Energy Star calculator for printers. www.energystar.gov/ia/business/ bulk_purchasing/bpsavings_calc/Printer_Savings_Calculator-Web.xls)

Copiers:

- Incremental cost to purchase an Energy Star copier: $0. (Source: Energy Star calculator for copiers. http://www.energystar.gov/ia/business /bulk_purchasing/bpsavings_calc/Calc_copiers.xls)

Water Heaters:

- Incremental cost of efficient electric water heater: $910. (Source: ICLEI's CAPPA Beta Version2. http://www.aceee.org/consumerguide/ waterheating.htm) Low-efficiency electric cost $750; electric heat pump cost $1,660.
- Incremental cost of efficient natural gas water heater: $1,150. (Source: ICLEI's CAPPA Beta Version2. http://www.aceee.org/consumerguide/ waterheating.htm) Conventional gas heater $850; condensing gas $2,000.
- Assumes 42% of water heaters are electric water heaters and the remainder natural gas. (Source: ICLEI's CAPPA Beta Version2. 2001 Residential Energy Consumption Survey. 58.2 million households use NG from Table 1; 41.6 million households use electric from Table3. http://www.eia.doe.gov/emeu/recs/byfuels/2001/byfuels_2001.html#Natural%20Gas%20Consumption)

Water Coolers:

- Incremental cost to purchase an Energy Star water cooler: $0. (Source: Energy Star calculator for water coolers. http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/CalculatorBulkPurchasingWaterCooler.xls)

Source of number of appliances/equipment: Laura Peabody, City of Walnut Creek.

Energy Reductions:

Computers (including monitors):

- Computers here include monitors. 2010 figures are for monitors only; the City has switched to EPEAT Silver standard for new monitor purchases. Annual energy savings of one Energy Star monitor is 390 kWh (462 kWh vs 36kWh). This assumes going from one CRT monitor (non-flat panel) to an Energy Star qualified LCD with power management. City installed computer management power software to reduce energy consumption in 2008. (Source: http://www.energystar.gov/ia/products/power_mgt / LowCarbonITSavingsCalc.xls)
- 2020 and 2030 computer projections figures are for computers in general, which include monitors. (Source: Energy Star calculator. http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/Calc_computers.xls)

Printers:

- Assumes laser printer. Annual energy savings (kWh) per printer: 146 (551 kWh for conventional vs 406 kWh). (Source: Energy Star calculator for printers. www.energystar.gov/ia/business /bulk_purchasing/ bpsavings_calc/Printer _Savings_Calculator-Web.xls)

Copiers:

- Percentage of copiers < 20 cpm: 33%
- Percentage of copiers 20–40 ppm: 34%
- Percentage of copiers >40 ppm: 33%
- Annual energy savings of one Energy Star copier: <20 cpm (kWh): 12
- Annual energy savings of one Energy Star copier: 20–40 cpm (kWh): 358
- Annual energy savings of one Energy Star copier: >40 cpm (kWh): 2,084

(Source: Energy Star calculator. http://www.energystar.gov/ia/business/ bulk_purchasing/bpsavings_calc/Calc_copiers.xls)

Water Heaters:

- Annual energy savings of efficient electric water heater (kWh): 2,870. (Source: ICLEI's CAPPA Beta Version2. http://www.aceee.org/ consumerguide/waterheating.htm) Based on replacing low-efficiency electric ($463/yr @$0.095/kWh = 4870kWh/yr) with electric heat pump ($190/yr @$0.095/kWh = 2000 kWh/yr)
- Annual energy savings of efficient natural gas water heater (therms): 76. (Source: ICLEI's CAPPA Beta Version2. http://www.aceee.org/ consumerguide/waterheating.htm) Based on replacing conventional gas storage ($350/yr @$1.40/therm = 250 therms/yr) with condensing gas storage ($244/yr @$1.40/therm = 174 therms/yr).
- Assumes 42% of water heaters are electric water heaters and the remainder natural gas water heaters. (Source: ICLEI's CAPPA Beta Version2. 2001 Residential Energy Consumption Survey. 58.2 million households use NG from Table 1; 41.6 million households use electric from Table3. http://www.eia.doe.gov/emeu/recs/byfuels/2001/ byfuels_2001.html#Natural%20Gas% 20Consumption)

Water Coolers:

- Percentage of coolers producing hot/cold water: 50%

- Percentage of coolers producing cold water only: 50%
- Annual energy savings of one Energy Star hot/cold cooler (kWh): 361
- Annual energy savings of one Energy Star cold-only cooler (kWh): 47

(Source: Energy Star water cooler calculator. http://www.energystar.gov/ia/Business/bulk_purchasing/bpsavings_calc/CalculatorBulkPurchasingWaterCooler.xls)

Source of number of appliances/equipment: Laura Peabody, City of Walnut Creek.

Measure B 3.3: Demand Response Programs

Implementation Cost:

Automated Demand Response Program (ADRP):

- 91.6 kw, per Matt Huffaker, City of Walnut Creek. (only on 1 day in the year)
- PG&E incentive: $250/kw reduced (Source: http://pge.com/mybusiness/energysavingsrebates/demandresponse/adrp/index.shtml)

Scheduled Demand Response Program (SDRP):

- Growth in SLRP participation based on 0 in 2010, some amount in 2020, and 2030.
- SDRP incentive from PG&E ($/kwh): $0.10. The committed load reduction must be at least 15% of one's average monthly demand or 100 kW, whichever is greater - $0.10/ kwh saved (Source: http://pge.com/mybusiness/energysavingsrebates/demandresponse/slrp/index.shtml)

Smart AC:

- Cost of installation is associated with cost for each programmable thermostat ($50/thermostat). (Source: Matt Huffaker, City of Walnut Creek)
- Number of thermostats installed: 50. (Source: Matt Huffaker, City of Walnut Creek)

Combined two programs – ADPR and SDRP:

- Multiplied participation amounts for each program x incentives and added to energy cost savings from kwh reductions (based on assumptions).
- Source: Department of Energy (DOE). 2005. Benefits of Demand Response in Electricity Markets and Recommendations for Achieving Them. http://www.oe.energy.gov /DocumentsandMedia/congress_1252d.pdf

Energy Reductions:

Smart AC:

- Average percentage savings per thermostat installed: 5%. Based on setting back the programmable thermostat by 5 degrees, which equates to about 5% savings. According to the U.S. Department of Energy's energy-saving tips, one can save approximately 5% to 15% in heating bills by turning the thermostat back by about 10° to 15°, a savings of 1% for each degree, if the setback period is 8 hours long. (Source: http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12720)

Measure B 3.4: Reduced Lighting Use: Lights-Out Policy at City Facilities

Implementation Cost:

Assumes all applicable City facilities adopt the lights-out-at-night policy immediately.

Square feet w/lights-out-at-night policy source: City of Walnut Creek

Cost of implementation ($ per square foot): $0.06. Watt stopper 120/277 VAC, 60 Hz automatic wall switch w/plate $39.99, covers 900 square feet. Assumes 1/2 hour labor to install @ $25/hour. Total cost $52.50/900 square feet. (Source: ICLEI's CAPPA Beta Version2. http://www.westsidewholesale.com/index.cgi?HN_SessionID=@@@@1203383159.5556@@@@&sort_order=sales&pid=10013&CATEGORY=511)

Energy Reductions:

Annual lighting energy use per square foot (kWh): 6.85. kWh/sq ft*yr calculated from data from U.S. Department of Energy Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways, Table2.6. 2005. (http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/pnnl-15149_market_assessment.pdf)

55 billion square feet of lit commercial building space in U.S. uses 3.9 quadrillion BTU/year primary energy for lighting, which equals 6.85 kWh/sq ft*yr. (Source: ICLEI's CAPPA Beta Version 2)

Percentage savings with policy: 35%. 35% savings is midrange value for office buildings (between 30% and 40%). (Source: U.S. Department of Energy. 2005. http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/pnnl-15149_market_assessment.pdf)

Measure B 3.5: Drought-Tolerant Landscaping at Municipal Facilities

Implementation Cost:

Installation cost per acre of native seeded turf, average between low and high: $5,348. (Source: www.appliedeco.com/Projects/CostofNative.pdf)

Energy Reductions:

Energy use per gallon of water: 0.0035 kWh (for outdoor use). Energy use for pumping, treatment, and wastewater treatment. Value is for outdoor water use in Northern California (indoor water use requires energy to both supply water and to treat wastewater). (Source: California Energy Commission. 2006. Refining Estimates of Water Related Energy Use in California. Table ES-1. http://www.energy.ca.gov/pier/project_reports/CEC-500-2006-118.html)

Measure B 3.6: Expand Tree Cover at Municipal Facilities

Implementation Cost:

Cost of planting one tree: $224. (Source: ICLEI's CAPPA Beta Version2. Average of 15 species half cost from http://albanyny.org/_files/Government/GeneralServices/2007TreePlantingApplication.pdf)

In this calculation, it is assumed that the City will plant 25 shade trees near City facilities by 2020 and 50 trees by 2030.

Energy Reductions:

Annual energy savings of one mature tree (kWh): 204 kWh. (Source: SMUD's Tree Benefit Estimator. http://www.appanet.org/treeben/calculate.asp)

Energy and CO2 (carbon sequestration) savings per tree from SMUD's Tree Benefit Estimator. Inputs were 50% cooling load, Norway maple, 0–15 feet from house, 10-year-old tree. Savings for mature tree on west of house are 265 kWh/yr, on east 143 kWh/yr, or 204 kWh/yr average (trees on west and east sides give greatest energy savings). CO2 sequestration: 0.28 tons/yr/tree for east and west orientation.

B 4: CONSIDER CLEAN ENERGY ALTERNATIVES FOR CITY FACILITIES AND OPERATIONS

Measure B 4.1: Solar Electric Arrays

Implementation Cost:

1,068 kW projected solar PV system is based on City's EECBG project and contractor agreements. The Solar Feasibility Study of municipal facilities produced through the award determined that installation of these panels could generate

up to 1,374,412 kWh annually. Cost of the system is also based on 5–100kW system for $7,600/kW. (Cost of system source: Lawrence Berkeley National Laboratory. 2009. Tracking the Sun: The installed costs of photovoltaics in the U.S. from 1998–2007. http://eetd.lbl.gov/ea/emp/reports/lbnl-1516e.pdf)

Energy cost savings per year is based on amount of electricity that the City will be generating and using, and thus not buying from the utility power grid.

Energy Reductions:

Sun hours per day: 4 hours. (Source: Conservative estimate based on 4–5 average from: Solar Energy Calculations. http://www.find-solar.org/index.php?verifycookie=1&page=solar-calculations&subpage=)

Measure B 4.2: Solar Water Heating

Implementation Cost:

Cost of solar heater per daily gallon hot water use: $60. (Source: ICLEI's CAPPA Beta Version 2)

Based on cost of home solar water heater, providing 50 gallons per day at $3,000 installed cost. (Source: Toolbase Services. http://www.toolbase.org/ Technology-Inventory/Plumbing/solar-water-heaters; source for gallons of hot water per day: City of Walnut Creek)

Middle of $2,500–$3,500 range for active plate collectors. Collector technologies for colder climates are more complex and more expensive.

Energy Reductions:

Energy use per gallon (kWh): 0.19 kWh. (Source: ICLEI's CAPPA Beta Version 2)

For electricity, calculated from 8.3 lbs/gallon x 1 Btu/lb*F x (120 F hot water - 55 F cold water) x 1 kWh/3414 Btu/ 0.82 electric water heater energy factor.

For natural gas, calculated from 8.3 lbs/gallon x 1 Btu/lb*F x (120 F hot water - 55 F cold water) x 1 therm/100,000 Btu/0.55 gas water heater energy factor.

(Hot water temp source: NREL. 1996. EERE Clearinghouse: Solar Water Heating. p. 6 http://www.nrel.gov/docs/legosti/fy96/17459.pdf)

(Cold water temp source: http://www.noaanews.noaa.gov/stories2007/s2772.htm

U.S. average temperature for 2006. Water supply typically travels through underground pipes where temperature is approximately local annual average temperature.)

Energy use per gallon of water: (source: http://www.eere.energy.gov/buildings /info/ components/waterheating/conventional.html)

Middle of 0.7–0.95 range for electricity. Middle of 0.5–0.6 range for natural gas.

Energy factor is a measure of the overall efficiency of water heaters, including energy losses from the tank.

Percentage energy savings with solar: 67%. (Source: ICLEI's CAPPA Beta Version2. NREL. 1996. EERE Clearinghouse: Solar Water Heating. p. 6 http://www.nrel.gov/docs/legosti/fy96/17459.pdf)

Midpoint of 50–85% range.

Assumes that no water is heated with electricity.

S 1: IMPLEMENT ENERGY MANAGEMENT AND OPERATIONS PRACTICES FOR CITY-OWNED STREETLIGHTS

Measure S 1.1: High-Efficiency Streetlights

Implementation Cost:

Cost of LED streetlight is $602. Based on City of Ann Arbor's upgrade of 1,046 120 W incandescent streetlights to LED at a project cost of $630,000. (Source: http://blog.mlive.com/annarbornews/2007/10/ann_arbor_to_install_led _stree.html)

Assumes that by 2020 and 2030, 50% and 100%, respectively, of the City's streetlights will be converted to LED.

Energy use from streetlights was derived from the 2005 GHG emissions inventory and forecast conducted into 2010, 2020, and 2030.

Energy Reductions:

Percentage annual energy savings from LED streetlight replacement: 40%.

Energy savings from LED streetlights is typically 40–60% compared to high pressure sodium systems. A more conservative energy savings figure of 40% is utilized in this methodology. (Source: Los Angeles LED Street Light Program Estimated to Save $10M Annually. http://www.solidstatelightingdesign.com/documents/articles/gsedoc/118076.html)

MWR 1: IMPLEMENT WASTE REDUCTION PRACTICES IN ALL CITY FACILITIES

Measure MWR 1.1: Waste Prevention

Implementation Cost:

Pounds of paper used/employee/year: 135. Assumes that the average office worker generates between 120 and 150 pounds of recoverable white office paper a year. (Source: www.ofm.wa.gov/sustainability/resources/source_impacts.pdf)

Cost savings per year based on cost of paper: $0.50/pound of paper. Paper prices vary, but a typical bulk cost is $1,000/ton, which is $2.50 per ream of 500 sheets, half a cent per sheet, 50 cents per pound, or 3 cents per ounce. (Source: http://eetd.lbl.gov/paper/ideas/html /copyfactsA.htm)

Assumes percentage reduction in paper use with the implementation of this measure results in 10% reduction in paper use by 2020 and 20% by 2030.

Total City staff numbers source: Beverly Christie, City of Walnut Creek.

Energy Reductions:

GHG emissions avoided here represent the methane that has been prevented from being released from a managed landfill.

MWR 2: ENCOURAGE RECYCLING OF USED MATERIALS WHENEVER FEASIBLE AT CITY FACILITIES

Measure MWR 2.1: Expand Recycling Programs

Implementation Cost:

Total cost for this project includes tipping and hauling fee for recyclables.

Assumes no cost for implementing the measure and cost savings per year.

Assumes that through this measure, an average City employee will increase their recycling generation by 5 pounds/year by 2020 and 10 pounds/year by 2030.

Total City staff numbers source: Beverly Christie, City of Walnut Creek.

Energy Reductions:

GHG emissions avoided represents the methane that has been prevented from being released from a managed landfill.

MT 1: INCREASE THE NUMBER OF FUEL-EFFICIENT VEHICLES IN THE CITY'S FLEET

Measure MT 1.1: Purchase of Alternative Fuel/Fuel-Efficient Vehicles

Implementation Cost:

The City currently has 2 electric vehicles, 7 hybrid (gasoline/electric) vehicles, and 2 natural gas pickup trucks. Additionally, when available, hybrid vehicles are purchased to replace the City's aging fleet. Additionally, the City's entire

diesel fleet, consisting of 16 vehicles, uses B-5 soybean-based biodiesel fuel.

This measure pertains only to on-road/highway vehicles and not regular equipment (e.g., chainsaws).

Number of vehicles available was estimated from information provided by Joe Jorgensen, Supervisor - Vehicle & Equipment Maintenance Division, City of Walnut Creek.

Electric:

- Incremental cost: $10,000. Based on price difference between conventional 2003 Toyota RAV4 and 2003 Toyota RAV4 electric vehicle. Conventional 2003 Toyota RAV4 price: $16,625 for base model. (Source: http://www.cargurus.com/Cars/Price-c3586-2003-RAV4.htm)
- Price of RAV4 electric vehicle: $29,000 (this includes tax credits; original price is $42,000). (Source: http://www.plentymag.com/magazine/by_the_numbers.php)
- Annual cost savings from gasoline savings: cost of gasoline saved minus cost of electricity used.

Hybrid:

- Incremental cost is based on cost difference of conventional vehicles vs. hybrid: $2,530. Based on 2008 Toyota Prius base MSRP ($21,100) and 2008 Toyota Camry base MSRP ($18,570). (Source: ICLEI's CAPPA Beta Version 2; www.toyota.com)

CNG:

- Incremental cost of CNG vehicle: $3,000. Incremental cost is based on Honda Civic GX. At $25,225, the GX costs about $7,000 more than the gasoline-powered LX model but presently qualifies for a $4,000 federal tax credit and other incentives. The $3,000 figure quoted here takes into account the $4,000 federal tax credit.
- Source for price of Honda: http://www.greencar.com/articles/5-natural-gas-car-facts.php.
- Source for $4,000 tax credit: http://www.cngnow.com/EN-US/AmericaOnCNG/Incentives/Pages/FederalIncentives.aspx.

Biodiesel:

- Biodiesel does not require the purchase of specific biodiesel-using vehicles.

Energy Reductions:

Average annual miles per vehicle for all vehicle categories are based on City's 2005 GHG emissions inventory. Total gallons of gasoline and diesel consumed in 2005 were divided by average MPG of passenger/light-duty vehicles and heavy-duty vehicles, respectively.

MPG for passenger/light duty vehicles was based on 21 MPG. (Source: http://www.bts.gov/publications/national_transportation_statistics/html/table_04_23.html)

Heavy-duty vehicles' MPG was based on 7.6 MPG average. (Source: K.G. Duleep Energy & Environmental Analysis, Inc. Fuel Economy of Heavy-Duty Trucks in the USA: Historical trends and Forecasts. http://www.iea.org/work/workshopdetail.asp?WS_ID=306)

Assumes average annual miles per vehicle for all vehicle categories remains relatively constant from 2005 to 2030.

Total GHG emissions (metric tons) takes into account emissions from CNG and biodiesel use.

Forecast of number of alternative vehicle fleet. (Source: Joe Jorgensen, Supervisor - Vehicle & Equipment Maintenance Division, City of Walnut Creek)

Electric:

- Miles per gallon of vehicle replaced: 21 MPG average for U.S. passenger car 1990–2000: 21 mpg. (Source: Table 4-23: Average Fuel Efficiency of U.S. Passenger Cars and Light Trucks. http://www.bts.gov/publications/national_transportation_statistics/html/table_04_23.html)
- Annual electricity use (kWh): 12,730. (Source: ICLEI's CAPPA Beta Version 2)
- kWh used = 11.1 x gallons of gasoline saved. Based on comparison of miles per gallon and kWh per mile of 1999 Ford Ranger, 1998 Chevy S-10, and 1998 Toyota RAV4.
- Gas mpg from http://www.fueleconomy.gov/feg/findacar.htm.
- Electric kWh/mi from Idaho National Laboratory. 2006. Full Size Electric Vehicles Advanced Vehicle Testing Activity reports at avt.inel.gov.

Hybrid:

- Hybrid miles per gallon: 46 mpg. Combined city/hwy mileage for 2008 Toyota Prius. (Source: http://www.fueleconomy.gov/feg/findacar.htm)
- Miles per gallon of vehicle replaced: 21. MPG average for U.S. passenger car 1990–2000: 21 MPG. (Source: http://www.bts.gov/publications/national_transportation_statistics/html/table_04_23.html)

CNG:

- Miles per gallon of gasoline of vehicle replaced: 12. Based on combined city and highway fuel economy of a 2004 Ford F150 dual-fuel 2WD pickp truck. (Source: http://fueleconomy.gov/feg/noframes/20384.shtml)
- Miles per gallon of CNG pickup (miles/gallon equivalent): 12. Based on combined city and highway fuel economy of a 2004 Ford F150 dual-fuel 2WD pickup truck (CNG). (Source: http://fueleconomy.gov/feg/noframes/20384.shtml)

CNG Conversions:

- One equivalent gallon is equal to 121.5 cubic feet of CNG. (Source: http://fueleconomy.gov/feg/FEG2000.htm)
- 100 cubic feet of CNG equates to 100,000 Btu, or 1 Therm
- GHG emissions (metric tons) takes into account emissions from CNG use.
- Emissions calculation for CNG represents the emissions that are offset by using less carbon-intense fuel replacements. The conventional more carbon-intense fuel that CNG is compared to here is gasoline.

Biodiesel:

- Miles per gallon of conventional and biodiesel truck (miles/gallon): 7.6. Based on medium heavy-duty vehicles. (Source: K.G. Duleep Energy & Environmental Analysis, Inc. Fuel Economy of Heavy-Duty Trucks in the USA: Historical trends and Forecasts. http://www.iea.org/work/workshopdetail.asp?WS_ID=306)
- GHG emissions (metric tons) takes into account emissions from biodiesel use.
- Emissions calculations for biodiesel represent the emissions that are offset by using less carbon-intense fuel replacements. The conventional more carbon-intense fuel that biodiesel is compared to here is biodiesel.

MT 2: ESTABLISH ENERGY-EFFICIENT FLEET MANAGEMENT AND OPERATION PRACTICES

Measure MT 2.1: Reduce Fleet Size

Implementation Cost:

This measure assumes miles of eliminated vehicles are taken up by remainder of fleet or by new vehicles, both of which are more fuel efficient.

Percentage of old vehicles that can be replaced with more efficient vehicles: 50%. Assumes 50% of old vehicles can be replaced with more efficient vehicles.

Smaller/more fuel-efficient vehicle fuel economy for 2010: 29. (Source: ICLEI's CAPPA Beta Version 2)

Combined city/hwy mileage for 2008 Honda Civic, automatic transmission. (Source: http://www.fueleconomy.gov/feg/findacar.htm)

Fuel economy for smaller/more fuel-efficient vehicle for 2020 is based on the recent federal vehicle policy that will require fleets to scale up to an average fuel economy of 35.5 miles/gallon by 2016. This breaks down to 39 mpg for passenger vehicles and 30 mpg for light trucks. This is roughly equivalent to Pavley's 2016 greenhouse gas emission standard. The average fuel economy of 35.5 was utilized here to take into account both passenger and light-duty vehicles. (Source: California Office of the Attorney General. http://ag.ca.gov/ globalwarming/motorvehicle.php; http://www.greenbiz.com/news/2009/05/19/get-ready-new-auto-mileage-and-emissions-rules)

Fuel economy for smaller/more fuel-efficient vehicle for 2030 is assumed to remain the same as 2020.

Miles per gallon of vehicle replaced: 21. MPG average for U.S. passenger car 1990–2000: 21 mpg. (Source: Table 4-23: Average Fuel Efficiency of U.S. Passenger Cars and Light Trucks. http://www.bts.gov/publications/ national_transportation_statistics/html/table_04_23.html)

Assumes 2020 and 2030 fuel efficiency of vehicles being replaced equates to 25 and 30, respectively.

Average annual miles per vehicle: 8,529 miles. This figure was based on the average annual miles traveled by the City's heavy-duty and light-duty/passenger vehicles. Assumes that the miles traveled stay relatively constant in 2020 and 2030.

Source of forecast of vehicles to be retired: Joe Jorgensen, Supervisor - Vehicle & Equipment Maintenance Division, City of Walnut Creek

Energy Reductions:

Annual gasoline savings were determined by calculating the gallons saved per year for one average vehicle from switching to the use of a smaller/more fuel-efficient vehicle over the specified number of average annual miles traveled. The gallons saved per year per vehicle were then multiplied by the total number of larger/less fuel-efficient vehicles the City plans to replace.

Measure MT 2.2: Reduce Idling

Implementation Cost:

Assumes all City vehicles are affected by the no idling policy.

Forecast of number of heavy-duty vehicles/trucks and light/passenger vehicles. Assumes fleet size will stay relatively constant into the future as the City will continue to replace old vehicles with vehicles and equipment that will be even better utilized then before. (Source: Joe Jorgensen, Supervisor - Vehicle & Equipment Maintenance Division, City of Walnut Creek)

Total cost is assumed to be minimal to none, as this measure only requires City staff's behavioral changes.

Heavy-Duty Vehicles/Trucks:

- Gasoline use/hour of idling: 1 gallon/hour. (Source: IMPCO. http://www.impco.ws/anti-idling.asp)
- Assumes daily hours vehicles idle: 1 hour.

- Assumes vehicles are operating 20% of the time throughout the year.

Light/Passenger Vehicles:

- Daily minutes vehicles idle: 7.5 minutes. The average person idles their car 5–10 minutes a day. Take middle of road number 7.5 minutes. (Source: California Energy Commission's Consumer Energy Center. http://www.consumerenergycenter.org/myths/idling.html)
- Gasoline use/minute of idling: 0.125 gallons. One hour (60 minutes) of idling burns nearly 1 gallon of gasoline. (Source: California Energy Commission's Consumer Energy Center. http://www.consumerenergycenter.org/myths/idling.html)
- Based on that information, 7.5 min of idling would yield 0.125 gallons of gasoline wasted.
- Assumes vehicles are operating 20% of the time throughout the year
- Days of operation/year: Assumes 5 days/week, 48 weeks per year (four weeks vacation, holidays).

Energy Reductions:

Assumes instituting a no idling policy reduces idling time by at least 50%.

Estimated fuel savings (gallons) was derived by multiplying number of vehicles affected by time of vehicles idling times amount of fuel used/time of idling times days of operation/year.

Measure MT 2.3: Fleet Maintenance

Implementation Cost:

Gallons of fuel used by vehicle fleet were derived from the 2005 GHG emissions inventory. The projected use of gallons of fuel is assumed to remain constant, as there will be significant changes in the vehicle fleet in 2020 and 2030.

Percentage savings of fuel from maintenance: 3.3%. The U.S. Department of Energy released a statement that proper inflation of vehicles tires can save up to 3.3% of fuel usage. (Source: http://collegian.lorainccc.edu/News/Pump+it+up.htm)

Cost savings for measure in 2010 is $0 because it is not an existing measure.

Little to minimal upfront cost is associated with the implementation of this measure.

Energy Reductions:

Gallons of gasoline/diesel saved per year were estimated by calculating 3.3% fuel saved from fleet maintenance (specifically maintaining tire pressure) of the total amount of gasoline/diesel City vehicle use on average each year.

Gallons of fuel and GHG emissions avoided for measure in 2010 is 0 because it is not an existing measure.

Measure MT 2.4: Scheduling & Routing Efficiency

Supportive measure.

MT 3: PROVIDE ALTERNATIVE TRANSPORTATION OPTIONS FOR ALL CITY EMPLOYEES.

Measure MT 3.1: Municipal Commuter Programs

Implementation Cost:

Employee commute program is a combination of three measures: parking cash-out incentive (carpool 1 day/week), telecommute incentive (1 day/week), and employee bike use program (4 miles/day). See below for details on each.

Total City staff numbers source: Beverly Christie, City of Walnut Creek.

Cost savings per year for employee is based on the assumption that all fuel displaced by alternative transportation options is gasoline and the price of gasoline of $2.52/gallon (average miles x reduction x employees).

Payback period does not pertain to this measure as the cost savings that result from this measure (paid by the City) is passed onto the City employees and not directly to the City.

Percentage reduction in commute vehicle trips from telecommute and parking cash-out programs: 10%. (Source: ICLEI's CAPPA Beta Version 2; Victoria Transportation Policy Institute. http://www.vtpi.org/tdm/tdm26.htm)

Within the 10–30% range, the more conservative 10% reduction is used in this methodology. Also, assumes the same for the bicycle program. Assumes the 10% reduction is realized in 2020 and 2030.

Average one-way commute length (miles): 9.8. (Source: ICLEI's CAPPA Beta Version 2; National Household Travel Survey. 2001. 2,298 billion miles/235 billion trips = 9.8mi/trip. http://www.bts.gov/publications/highlights_of_the_2001 _national_household_travel_survey/html/table_02.htmls)

Parking Cash-Out Program:

- Cost for parking cash-out measure implementation per employee: $100. Examples of monthly cash incentives provided to employees range from $36 to $165 per month. Midrange incentive of $100 was assumed in this methodology. (Source: Hill, Elizabeth. A Commuter's Dilemma: Extra Cash or Free Parking? www.lao.ca.gov/2002/parking /031802_cash_ or_parking.pdf)
- Percentage participating in parking cash-out program: 8%. Based on a University of California Los Angeles report that assesses the results of eight case studies of employers who participated in the cash-out program. Cash-out program reduced 8 cars driven to work per 100 employees (or 8%). (Source: http://www.arb.ca.gov/research /abstracts/93-308.htm. Table 11.)
- Assumes 8% participation rate stays constant in 2020 and 2030.

Telecommuting Program:

- Cost for telecommute measure implementation per employee: $0. Assumes that there is minimal to no upfront cost for this measure for the City.
- Percentage participating in telecommute program: 25%. (Source: Telecommuting Trends in the 2009 Economy. http://www.brighthub.com/ office/home/articles/22829.aspx)
- Assumes 25% participation rate stays constant in 2020 and 2030.

Bicycle Program:

- Cost for bike use measure implementation per employee: $250. $250 upfront cost for purchase of one bicycle.
- Percentage of employees switching to bicycle commuting: 2%. (Source: Mahoney, Sarah. Bike Industry Poised for a Breakthrough. http://www.mediapost.com/publications/?fa=Articles.showArticle&art_aid=11130)

Energy Reductions:

Annual vehicle mile reduction is based on baseline assumption that employees commute to/from work five times a week for 48 weeks a year.

Annual gasoline saving (gallons) is calculated by dividing the annual vehicle mile reduction by 21 miles/gallon. MPG average for U.S. passenger car 1990–2000. (Source: http://www.bts.gov/publications/national_transportation_statistics/ html/table_04_23.html)

Average one-way commute length (miles) for parking cash-out and telecommuting programs: 9.8 miles. (Source: ICLEI's CAPPA Beta Version 2; National Household Travel Survey. 2001. 2,298 billion miles/235 billion trips = 9.8mi/trip. http://www.bts.gov/publications

/highlights_of_the_2001_national _household _travel_survey/html/table_02.htmls)

Average one-way commute length (miles) for bicycling program: 2 miles. (Source: ICLEI's CAPPA Beta Version 2)

Measure MT 3.2: Municipal Bicycle Program

Implementation Cost:

Assumes City will be able to provide 20 bicycles for daily operations to its City staff by 2020 and 40 bicycles by 2030.

Percentage of employees switching to bicycles for daily operations: 2%. Percentage of employees switching to bicycles for daily operations at work is not available. Therefore, percentage of employees switching to bicycle for commuting was utilized. (Source: Mahoney, Sarah. Bike Industry Poised for a Breakthrough. http://www.mediapost.com/publications/?fa=Articles.showArticle &art_aid=111301)

Average one-way bicycle trip length for daily operations: 2 miles. Average one-way bicycle trip length for daily operations not available. Therefore, the figure was based on commuting from work/home. (Source: ICLEI's CAPPA Beta Version 2)

Cost for measure implementation is based on $250/bicycle.

Cost savings is based on the assumption that all of the fuel used for commute is gasoline.

Energy Reductions:

Annual vehicle mile reduction is based on trip to/from location five times a week for 48 weeks a year.

Annual gasoline saving (gallons) is based on MPG average for U.S. passenger car 1990–2000: 21 mpg. (Source: http://www.bts.gov/publications/national _transportation_statistics/html/table_04_23.html)

MEO 1: INFORM CITY EMPLOYEES OF SUSTAINABILITY INITIATIVES/UPGRADES TO CITY FACILITIES AND ENGAGE EMPLOYEES IN BEHAVIOR-BASED PROGRAMMING TO COMPLEMENT THESE EFFORTS

Measure MEO 1.1: Employee Education

Implementation Cost:

Emissions reductions resulting from this measure are additional to the emission reductions impacts from the other measures recommended in the CAP.

Estimated percentage savings in energy, cost, and GHG emissions from measure: 5%. Energy and GHG emissions savings were derived by calculating 5% assumed savings of education/awareness from the energy use and GHG emissions emitted from municipal buildings, vehicle fleet, and waste operations under the City's GHG emissions inventory and forecast. Percentage (5%) is based on an education campaign, Awareness for Communities about Energy (ACE) implemented by Strategic Energy Innovations in 200 K–12 schools in California, Maryland, New Jersey, New York, North Carolina, and Pennsylvania. Schools that participated in this program achieved energy reductions of 5–15%. In this methodology, a conservative figure of 5% in reductions is applied across the building, vehicle fleet, and waste sectors.

It is assumed that the cost savings for each sector is directly proportional to the 5% in energy, cost, and GHG emissions reduction.

Growth in educational program reach estimated based on 10% municipal staff reached by 2010, 40% reached by 2020, and 100% reached by 2030.

Cost savings is based on cost of each sector that was obtained in the 2005 GHG emissions inventory.

Assumes minimal to no cost for internal City staff education and outreach.