Project Information:

Department: Administration – Facilities Management **Address:** 210 Martin Luther King Jr Blvd. Madison, Wisconsin 53703	**Total project costs:** $85,921 **Funding amount in current budget:** $0 **Funding amount requested:** $85,921

Project Title: Filtered Water Bottle Filling Stations

Project Location: All Facilities Serviced by Dane County Facilities Management, including: the City-County Building, Public Safety Building, Dane County Courthouse, Fen Oak Agricultural Extension Building, Job Center, Neighborhood Intervention Program Building, Stoughton Human Services Building, Northport Human Services Building, Fish Hatchery Highway Garage, and Parks Administration Building.

Project Description: Facilities Management would purchase and install Elkay EZH20 Surface Mount Filtered Bottle Filling Stations, Model #LZWSSM, above all existing drinking fountains throughout the facilities serviced by Dane County Facilities Management excepting the Public Safety Building, where Elkay EZH2O Vandal-Resistant Filtered Combination Bottle Filling Station and Bubblers, Model #LZSDWSSK, would replace the existing drinking fountains.

The requested funding amount includes the purchase of 45 Surface Mount Filtered Bottle Filling Stations, Model #LZWSSM, listed at $1,217 ea.; the purchase of 5 Vandal-Resistant Filtered Combination Bottle Filling Station and Bubblers, Model #LZSDWSSK, listed at $1,419 ea.; 50 replacement filters, Model# 51300C, listed at $125 ea.; and contracted labor for 50 installations, estimated at $200/installation for a total amount of $78,110. An additional 10 percent contingency brings the total project cost and funding amount requested to $85,921.

Describe how the proposed project moves the county toward meeting the following Sustainability Principles. (See the guiding questions in the box blow.) Responses to this section will be used to determine the relative level of sustainability for each project.

- Reduce and eventually eliminate county government's contribution to fossil fuel dependence and to wasteful use of scarce metals and minerals;
- Reduce and eventually eliminate county government's contribution to dependence upon persistent chemicals and wasteful use of synthetic substances;
- Reduce and eventually eliminate county government's contribution to encroachment upon nature and harm to life-sustaining ecosystems (e.g., land, water, wildlife, forest, soil, ecosystems); and
- Reduce and eventually eliminate county government's contribution to conditions that undermine people's ability to meet their basic human needs.

Include in your description any estimated reductions of GHGs / CO2 equivalent emissions related to your proposal. Please use the following calculator to do this: http://www.epa.gov/cleanenergy/energy-resources/calculator.html

Although marketing campaigns have driven increased consumption of bottled water throughout the US, tap water remains the purist and most economical choice. Nationally, tap water is subjected to more rigorous testing and purity standards than bottled water. (Santa Clara County, September 2007) Locally, Madison Water Utility adheres to the highest state and federal drinking water standards, consistently publishing results that meet or exceed all federal and state standards for health and safety in the Annual Drinking Water Utility Report. (City of Madison, February 2017) Additionally, tap water costs a fraction of the price of bottled water, with global expenditures of bottled water estimated at approximately $100 billion per year. (Pacific Institute, February 2017)

Bottled water is also associated with negative environmental impacts. One of the most obvious impacts is what happens to the plastic bottles after the water is consumed. Despite expanded recycling outreach and infrastructure in the United States, the Container Recycling Institute claims that 86 percent of plastic water bottles consumed in the US end up in landfills nation-wide. It is estimated that 60 million plastic water bottles are consumed daily in the US, contributing to nearly 18,824,000,000 bottles ending up in landfills annually. (Ellsbury, Hannah, August 2012) Once disposed of, the average time for a plastic bottle to completely degrade is estimated to be at least 450 years. (Postconsumers.com, February 2017)

Bottled water can also be associated with human health hazards. Many studies have shown that polycarbonate plastic, a type of plastic used to package many water cooler bottles, gradually leaches a chemical called bisphenol-A (BPA) into the water stored inside. (Ellsbury, Hannah, August 2012) Evidence also suggests that PET, which is used to package most individual-sized water bottles, also breaks down over time and leaches into the water contained inside. (Sohn, Emily, April 2009)

The bottled water production process has also been determined to be wasteful, with a significantly greater water footprint than tap water. According to the International Bottled Water Association, North American water-bottling companies used an average of 1.32 liters of water to produce the contents of 1 liter of bottled water in 2013 (IBWA, May 2015). See Figures 1 and 2. Additionally, a cradle to gate life cycle assessment on plastic resins conducted by Plastics Europe found that it takes 40.6 liters of water to produce and mold 1 kg of PET resin bottles, not including the cap which is generally made of HDPE. It takes an additional 29 liters of water to produce 1kg HDPE caps (BIER, December 2011). See Figure 3. According to these estimates and the figures published by the American Samoa Power Authority Materials Management Office, which weighs the average 500 ml PET bottle in at 10.35 grams and the average HDPE cap at 1.35 grams (ASPAMMO, June 2014), approximately 0.46 liters of water are used in the production of each 500 ml bottle and cap, equaling a total of 2.24 liters of water used in the production of every liter of bottled water consumed in 500 ml packaging. See Figure 4. For every million liters of tap water consumed vs. million liters of bottled water, it can then be estimated that 1,240,000 liters of water are conserved.

Bottled water also has a greater carbon footprint than tap water. According to the International Bottled Water Association, it also requires 0.066666667 kWh of energy to produce 1 liter of bottled water (IBWA, May 2015), which is roughly 2 times the energy that is required to produce a liter of tap water. See Figure 5. In general, the energy required by most utilities for the treatment and distribution of potable water differs from 250 kWh/MG to 3,500 kWh/MG. (Griffiths-Sattenspiel and Wilson, May 2009) See Figure 6. Using a median value of 1,625 kWh/MG, it requires 0.0004292 kWh to produce 1 liter of tap water. See Figures 7 and 8. For every million liters of tap water consumed vs. million liters of bottled water, it can then be estimated that 46.5598 Metric Tons of Carbon Dioxide Equivalent are conserved.

Describe how the proposal furthers implementation of the Dane County Government Sustainable Operations Plan goals, objectives, and strategies in your department and/or countywide. Please identify specific plan goals, objectives, and strategies accomplished.

The installation of water bottle filling stations throughout Dane County's government facilities furthers the implementation of the Dane County Government Sustainable Operations Plan by supporting the Climate Change Mitigation and Adaptation goal of committing to reduce greenhouse gas emissions generated by all county operations and facilities.

The correlating objective of working toward reducing greenhouse gas emissions in its facilities is supported by promoting tap water consumption, which has a considerably smaller carbon footprint than bottled water.

The installation of water bottle filling stations furthers the implementation of the Dane County Government Sustainable Operations Plan by supporting the Water goal of demonstrating wise water use and promoting water conservation in all county government operations to ensure access to clean and abundant water for current and future generations.

The correlating objective of promoting continuous improvement in water conservation achievement across all county operations is supported through encouraging the consumption of tap water, which has a smaller water footprint than bottled water.

The installation of water bottle filling stations throughout Dane County's government facilities furthers the implementation of the Dane County Government Sustainable Operations Plan by supporting the Waste goal of reducing consumption of resources and reducing solid waste across county operations.

The correlating objective of identifying and applying best practices to reduce resource consumption and waste production is supported through encouraging building users and employees to re-fill and re-use their water vessels as opposed to consuming bottled water and disposing of its packaging.

The installation of water bottle filling stations throughout Dane County's government facilities furthers the implementation of the Dane County Government Sustainable Operations Plan by supporting the County Buildings and Facilities goal of placing an emphasis on occupant and user health and well-being.

The correlating objective of promoting the health and well-being of occupants and users of county facilities and buildings is supported by providing filtered tap water, an amenity that enhances the work experience and provides an opportunity for improving wellness among building users and employees.

The installation of water bottle filling stations furthers the implementation of the Dane County Government Sustainable Operations Plan by supporting the Employee Experience goal of providing a sustainable, safe, equitable, and healthy work environment that promotes and enhances the health, wellbeing, and engagement of employees.

The correlating objective of increasing and maintaining employee wellness is supported through encouraging hydration, which is positively associated with many widely-recognized health benefits. The objective of increasing employee satisfaction and engagement is supported through the provision of a "water hole", which can act as a meeting point and form a hub of office productivity.

Describe how the county might build upon the outcomes of the proposed project to work toward greater sustainability.

By installing filtered water bottle filling stations throughout all of the facilities serviced by Facilities Management, Dane County has the opportunity to provide widespread equitable access to filtered tap water and to discourage the wasteful spending, packaging, water-use, and energy-use associated with bottled water. As many municipalities, counties, and state facilities across the US and Canada have similarly done, Dane County can encourage building users and employees to consume water eco-consciously.

Describe how your department will track and measure outcomes of the proposed project (i.e., annual cost savings, annual energy savings, resource use reductions, maintenance reductions, etc.). Include a timeline for measurement and reporting outcomes, and the staff member contact who is responsible for conducting the tracking and measurement.

The Elkay filtered water bottle filling station is equipped with a “Green Ticker” that aids in measuring resource use reductions by displaying the number of plastic bottles that have been saved from production, transport, and disposal in the community.

Additionally, the water bottle filling stations are equipped with an indicator light that displays when the filter needs to be changed, which is every 3,000 gallons. Filter change intervals can also be used to determine resource use reductions using the following metrics: every time a filter is changed in a single bottle filling station, it can be estimated that 14,081 liters of water are conserved and 0.528733 Metric Tons of Carbon Dioxide Equivalent are conserved.

Supporting Information:

FIGURE 1: Water Use Ratio Peformance by Facility Type (L/L), 2009-2013

	2009	2010	2011	2012	2013
ALL	**1.35**	**1.36**	**1.35**	**1.34**	**1.32**
Small Pack	1.32	1.32	1.30	1.29	1.26
Mixed Packaging	1.39	1.43	1.42	1.43	1.46
Home & Office Delivery	1.59	1.62	1.61	1.58	1.56

Source: International Bottled Water Association. May 2015. "Water and Energy Use Benchmarking Study: Executive Summary."

FIGURE 2: Beverage Industry Direct Water Use and Consumption

General category	Water use and consumption
Incorporated into the beverage product	Water packaged as part of the final product leaving the facility is considered direct consumption.
Evaporated from the beverage facility	Water lost to evaporation at the beverage facility is considered direct consumption.
Wastewater discharged from the beverage facility	Wastewater water discharged to the same watershed basin from where it was withdrawn is considered used, but not consumed. Wastewater discharged to a different basin is considered consumed.
Overhead – Embedded water in physical assets	Embedded water in buildings, structures, equipment, office furniture, vehicles and other assets is considered *de minimis*.
Overhead – Landscaping	Beverage facilities may irrigate lawns and ornamental plants with an on-site well or may use third-party water. In some cases, wastewater is recycled for this purpose. Water evaporated during landscaping at the beverage facility is considered direct consumption.
Overhead – Once through and recycled cooling water	Water evaporated is considered direct consumption. Wastewater discharged to the same watershed basin from where it was withdrawn is considered used, but not consumed.

Source: Beverage Industry Environmental Roundtable. December 2011. "A Practical Perspective on Water Accounting in the Beverage Sector."

FIGURE 3: Water Use (Liters/kg) in the Production of PET Bottles, Blow Molding, and HDPE Caps

Component of PET Bottle and HDPE Cap	Water Use (liters/kg)	Wastewater* (liters/kg)	Difference (liters/kg)
PET Resin	60.00	52.20	7.80
Blow Molding	40.00	34.80	5.20
HDPE Cap	29.00	25.23	3.77
Total Container	**129.00**	**112.23**	**16.77**

* Estimated using wastewater-water ratio of 0.87 (average of glass and aluminum containers)

Source: Beverage Industry Environmental Roundtable. December 2011. "A Practical Perspective on Water Accounting in the Beverage Sector."

FIGURE 4: Weights of Empty PET Beverage Bottles and Caps

PET Plastic water bottles

	volume		weight		cap		
brand	ml	floz	gm	oz	gm	oz	
Niagara	500	16.9	10.11	0.3559	1.35	0.0477	USA
Best	500	16.9	10.83	0.3802	1.36	0.0479	USA
	500	16.9	10.80	0.3810	1.36	0.0479	USA
	500	16.9	10.82	0.3816	1.35	0.0477	USA
Arrow head	500	16.9	9.68	0.3414	1.35	0.0477	USA
	500	16.9	10.01	0.3563	1.36	0.0479	USA
	500	16.9	9.93	0.3503	1.35	0.0477	USA

Source: ASPAMMO. June 2014. "Request for Proposals ASPA and Public Joint Venture for Recycling Services – Appendix A."

FIGURE 5: Energy Use Ratio Performance by Facility Type (MJ/L), 2009-2013

	2009	2010	2011	2012	2013
ALL	0.28	0.27	0.25	0.25	0.24
Small Pack	0.31	0.28	0.27	0.26	0.25
Mixed Packaging	0.24	0.23	0.21	0.19	0.19
Home & Office Delivery	0.11	0.10	0.11	0.12	0.12

Source: International Bottled Water Association. May 2015. "Water and Energy Use Benchmarking Study: Executive Summary."

FIGURE 6: Energy Intensity and Total Energy Use for Water Supply and Treatment

Table A.1 Energy Intensity and Total Energy Use for Water Supply and Treatment[6]

Sector ("P" refers to private supply)	Energy Use, 2005 (million kWh)	Surface Water (kWh/MG)	Groundwater (kWh/MG)	Wastewater (kWh/MG)
Public Water Supply	31910	1406	1824	-NA-
Domestic (P)	930	-NA-	700	-NA-
Commercial (P)	499	300	700	2500
Industrial (P)	3793	300	750	2500
Mining (P)	509	300	750	2500
Livestock (P)	1047	300	700	-NA-
Irrigation (P)	25639	300	700	-NA-
Power Generation (P)	14000	300	800	-NA-
Public Wastewater Treatment	24512		trickling filter	955
			activated sludge	1322
			advanced wastewater treatment	1541
			advanced wastewater nitrification	1911
Private Wastewater Treatment	49025	-NA-	-NA-	2500

Source: Griffiths-Sattenspiel and Wilson. May 2009. "The Carbon Footprint of Water."

FIGURE 7: CO2 Equivalency Result

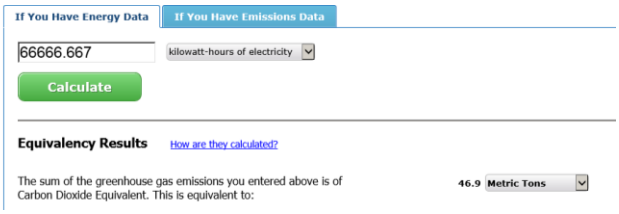
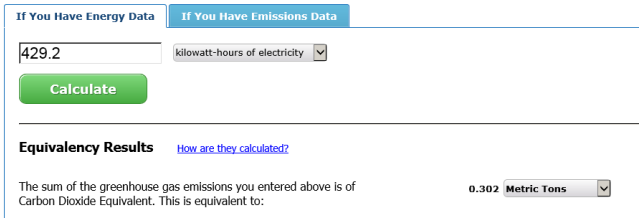


FIGURE 8: CO2 Equivalency Result



Source: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

Conversions:

0.24 megajoule (MJ) = 0.066666667 kilowatt-hour (kWh)
1 liter = 0.264172 gallons
1 million gallons = 3785411.78 liters
1 million liters = 264172.052
3,000 gallons = 11,356.24 liters

Sources:

American Samoa Power Authority Materials Management Office. June 2014. “Request for Proposals ASPA and Public Joint Venture for Recycling Services – Appendix A.”

Beverage Industry Environmental Roundtable. December 2011. “A Practical Perspective on Water Accounting in the Beverage Sector.”

Ellsbury, Hannah. “Plastic Water Bottles Impose Health and Environmental Risks.” *Ban the Bottle.* Web. 23 August 2012.

Griffiths-Sattenspiel and Wilson. May 2009. “The Carbon Footprint of Water.”

https://www.cityofmadison.com/water/water-quality

https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

http://pacinst.org/publication/bottled-water-and-energy-a-fact-sheet/

http://www.postconsumers.com/education/how-long-does-it-take-a-plastic-bottle-to-bidegrade/

International Bottled Water Association. May 2015. “Water and Energy Use Benchmarking Study: Executive Summary.”

Santa Clara County. “Santa Clara Valley Water District Takes a Stand on Tap.” Web. 25 September 2007.

Sohn, Emily. “PET bottles potential health hazard.” *ABC Science.* Web. 29 April 2009.

Contact Person: Amanda DePagter, Assistant Facilities Manager, Dane Co. Facilities Management

Phone: 608.215.6273
E-mail: DePagter.Amanda@countyofdane.com