

**Muehlenbeck and Havlick Award
Submission for the County of Sonoma**

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The Sonoma County Main Adult Detention Facility Water Efficiency Project

The County of Sonoma is engaged in a comprehensive energy project to increase the energy efficiency of the County facilities and reduce greenhouse gas emissions from facility operations. A major part of this effort is to increase the plumbing efficiency in the Main Adult Detention Facility (MADF). The scope of work at MADF was to replace the existing valves for toilet and wash basins in each of the 700 cells with electronically controlled retrofits. These new controls will allow detention staff to prevent wasteful flushing by inmates by limiting the number of flushes per hour and to reduce the volume of water for each toilet flush.

The County of Sonoma is comprised of 26 departments and agencies that provide a full range of services to the community. It encompasses over 1,600 square miles and is home to more than 493,000 residents. Located less than one hour north of San Francisco, the County of Sonoma has a history of providing excellent and responsive public service while operating under sound fiscal principles.

The primary beneficiaries of this project are the citizens of Sonoma County, although there are benefits both internally and state-wide as well. Sewage and water fees incurred by the 21,000 inmates incarcerated in our community on an annual basis will be significantly reduced because of these new water savings measures, reducing operational expenses in this core function of County government. The community, the Sheriff's Department, the City of Santa Rosa, and the County of Sonoma will be spending less money on water and sewer bills. Shrinking demand through these measures for our scarce water resources locally and statewide provides more water for other uses – farms, other agriculture, fisheries, and residential use. As we have experienced widespread mandatory water rationing and conservation measures statewide, the State as a whole benefits.

Internally, Detention deputies will benefit from the installation of customized controls, devices, and alerts resulting in a safer and more efficient working environment for correctional personnel working in the jail.

Many conservation and efficiency measures can be seen as good suggestions and may appear impractical because of the implementation challenges. At a total cost of just over one million dollars, the MADF water efficiency retrofit was designed to address three categories of problems: Water efficiency, safety and security, and clogged sewer lines. The first is water efficiency, which includes conservation, utility cost savings and their related Greenhouse Gas Emissions reductions. The original goal was to save 16 million gallons of water annually. In the jail, each cell is designed with a flush valve and a toilet. The existing toilets were flushing between 3.5 gallons to as much as 10 gallons per flush. The number of flushes per day per inmate at MADF was as high as 44 flushes. These figures show the high volume of water used, and the associated sewer and water costs are significant.

The second category of problem concerns security and safety issues. One of the few controls inmates have while in custody is the ability to manage how they use their time in their cell. Each cell has its own sink and toilet. Inmates have 24 hours a day to find ways to distract staff or cause problems in their module, and their most effective tool to date has been this access to water. Every time they purposely flood their cell, they are immediately removed from their cell in order to provide access for staff to deal with

maintenance problems caused by this repeated plumbing abuse. The controls installed as a part of this project will ensure that facility security will be compromised less often as the inmates lose their ability to abuse the plumbing. The associated security costs of removing inmates to deal with clogged pipes, parts replacement, flooded areas, and resetting valves after low pressure situations are minimized. This system retrofit will provide added safety and security to prison staff, visitors, and inmates. Additionally, minimizing flooding and sewer back-ups will create a cleaner more sanitary environment, reducing sewer water exposure for staff and inmates.

The third category involved inmates clogging the plumbing by flushing sheets, clothing, and contraband into the piping systems or flooding the cells with the same actions, causing substantial mechanical problems and complications with the city of Santa Rosa's public sewer system. These problems culminated three years ago when the pipes backed up, causing hazardous flooding and environmental impacts in the city limits.

The County of Sonoma General Services Department, the City of Santa Rosa (Water retailer, wastewater treatment services provider), and the Sonoma County Sheriff's Office collaborated on this effort. By extension, as the MADF is the detention facility for all cities in the County, the impacts and benefits include these nine municipalities as well.

From a technology perspective, we analyzed and incorporated new electronic technologies with existing infrastructure, and integrated an electronic controls system into the existing facility's plumbing system, tied into our Programmable Logic Controller (PLC) system, which enables us to control and measure to monitor exactly how much water is being used in over 1,500 individual locations of sinks and toilets in this single structure.

The technologies have been significantly upgraded to include retrofitted valves of a solenoid type electronically controlled with time limits on multiple uses. Inmates will not be able to flush repeated times, and will use far less water per flush. Existing lavatory valves, cold and hot water, are brass fittings that inmates hold continuously for bathing in their cell, flooding their cell, and wasting water. New lavatory valves are solenoid type, electronically controlled, with limited time use, enabling inmate access for short periods. Every two detention cells has a WC plumbing chase which is accessible from the module's day room. Each plumbing chase received six new electronically controlled valves, one for each toilet and two for each lavatory. These replaced older brass valves that were not limited in flow or timing. In addition to valves and controls, retrofitting of the existing commercial detention toilet fixtures/mechanism has been a part of the project as well.

Currently, the lavatories have two buttons for hot and cold that time out, but may be pushed repeatedly without limit. Some inmates plug their sinks and fill the sinks for bathing or flooding the cell to create distractions or incidents. Clothing, contraband, and plastic bags are flushed down the toilets on a daily basis thus creating problems to the municipal sewer system. Existing toilets are 5 gallon bowls, but in practice each uses up to 10 gallons per flush. Since there is no limit to the number of times an inmate may flush, it has been estimated, based on observations and total facility water consumption, that each inmate flushes their toilet an average of 40 times a day, compared that to the average household single occupant at 4 flushes per day.

Lessons that were learned include the importance of collaboration when pursuing an aggressive water conservation project in a large detention facility where measures of this type are difficult to gain support. The main purpose of detention facilities is the safe custodial housing of inmates, and many conservation and efficiency measures can be seen as good suggestions which are impractical and create hurdles for the main purpose of the facility. This was not the case with this project or with our partnership with the Sonoma County Sheriff's Office. As a team, we were able to discuss operational concerns and to shape the project with these constraints in mind, providing a project solution that met operational imperatives and the conservation goals we had as well.

The champion of this innovational project was collaboration between the City of Santa Rosa, the Sheriff's Office and the General Services Department of the County of Sonoma. Together these groups successfully recognized the disparate needs of the water and treatment services provider, the operational department, the maintenance department, and environmental division in this unique detention setting.

Results:

Given that water systems are the single greatest users of energy in the State of California, programs that focus on water conservation can have significant impacts on overall energy savings, and will result in sustainable Green House Gas (GHG) emissions. The water-energy nexus establishes the link between water conservation, energy conservation and GHG reductions. In the City of Santa Rosa, indoor water use requires an average of 7.45 kWh per 1,000 gallons of water used. This covers the energy needed to pump the water from the ground, deliver it throughout the city, and provide wastewater treatment.

Using the first five months of the 2010-11 fiscal year, we have reduced our water and sewer use in the MADF by 46% compared to the same period last year. This is a reduction of 5,555,858 gallons (or 1.1 million gallons per month). Total water and sewer costs are down \$70,742; a savings of 39% compared to last year. We estimate that on a daily basis each inmate would have used 110 gallons before the retrofit. Today we are down to 60 gallons per inmate, a 45% reduction. Using the CPUC gal to kWh conversion factor of 3563 kWh/Million Gallons (typical energy use for combined potable and wastewater) the MADF retrofit saved 19,796 kWh YTD. This is a continuous reduction of 4MWh per month, the avoided embedded energy needed to deliver and treat the water.

In addition to less water waste, the new system has minimized the problems with clogged pipes, flooding and the related safety and security issues and maintenance costs, creating a cleaner more sanitary environment for staff and inmates. It has also significantly reduced the number of foreign objects turning up in the municipal sewer system, saving maintenance costs incurred by the City of Santa Rosa.