



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

<b>Name(s)</b> <b>William Olsen; Garrett Takei</b>	<b>Project Number</b>  38706
<b>Project Title</b> <b>Engineering Your Bathroom to Conserve Water</b>	
<b>Objectives/Goals</b> The prototype product consisted of a Shower water diversion module to divert water from the shower into the toilet tank and a Toilet tank filling module that allows the toilet tank filling to be regulated. Cost vs complexity trade-offs and safety were the main criteria in the 4 <b>Abstract</b> The prototype product consisted of a Shower water diversion module to divert water from the shower into the toilet tank and a Toilet tank filling module that allows the toilet tank to be empty when needed. Cost, complexity and safety were the main criteria in the prototype design comparisons. We considered multiple prototype options and the safety concerns in the design process at a minimal cost < \$100. Additional water savings features for the future are enabled by the toilet tank module. <b>Methods/Materials</b> Micro-switches, Time delay Relays, DC power supply Solenoid valves, Metal pipe and plastic tubing installed into existing shower and toilet tank were used in the design process to save the 2 gallons of water wasted during the heat up cycle of a shower. The prototype product consisted of a Shower water diversion module to divert water from the shower into the toilet tank and a Toilet tank filling module that allows the toilet tank to be empty when needed. Cost, complexity and safety were the main criteria in the prototype design comparisons. We considered multiple prototype options and the safety concerns in the design process at a minimal cost < \$100. Additional water savings features for the future are enabled by the toilet tank module. <b>Results</b> 4 Prototypes were considered in the design phase to use solenoid valves to divert water into a toilet tank with a modified filling valve, so the tank would remain empty to capture stagnant cold water from the shower hot water line. Testing of multiple house configurations showed that >75% of the warm up cycle water can be captured by a 2 gallon toilet tank. <b>Conclusions/Discussion</b> Droughts in CA can impact, reduction in Water Reservoir reserves, Soil compaction within Wells, Sea Water intrusion into land, Reduction of water allocation for wetland or fish restoration. Our mitigation water diversion prototype if installed in 90% of the single family homes in CA, could conserve 46M gallons per day and 16.8 Billion gallons per year.	
<b>Summary Statement</b> This environmental engineering prototype diverts clean water from the shower to the toilet tank to save 46M out of 68M gallons usable water that goes down the drain every day in California during the warm up cycle in a shower.	
<b>Help Received</b> One partner consulted Mrs. Dorothy Lubin on the environmental impact of a drought and while we built our prototype, Mr. Christopher Olsen assisted in soldering, wiring, and piping.	