Sustainable Action Fund Grant Program

LARGE GRANT ABSTRACT
2018-19

SECTION 1: Project Concept.

a. Project Title:

Smart Water: *Real Time Data for Water Management at Western Washington University*

b. Describe your proposed project:

This project implements cutting edge water management technologies into 4 new meter locations on Western's campus. These locations; Fairhaven Commons, Fairhaven Stacks (3 and 4), and Biology; were chosen to represent student living and academic facilities. Real time water data collects and organizes useful information to all risk management and conservation decisions. These wireless water meters bring both faster responses for costly leaks and refined conservation data. This pilot is a case study to warrant further adoption across Western's campus as well as other Universities or similar institutions. Following the installation, the students in Stacks 3 and 4 will be shown their collective water consumption data as well as a usage breakdown. This will coincide with a behavioral campaign called the "Shower Challenge". The primary purpose of the challenge is to reduce domestic hot water consumption both on our campus and for other institutions. Success at Western would be proof of concept for others to follow. Advanced software will demonstrate how different activities affect water usage, challenging students to exercise smart water conservation. Better metering technology also provides measurement and verification tools to quantify the effects of the "Shower Challenge."

c. Who is the intended audience?

There are three main audiences for the ***Smart Water***. First, findings from this pilot program will be presented to WWU Facilities Management. Success in the pilot warrants further deployment of water management technology across Western's campus, especially in locations which the pilot program predicts having the greatest impact. Further expansion is the responsibility of Facilities Management. Tailoring these technologies to U.S. Universities is critical for future uses on campus. Similar technologies bring real time water use information to assist all risk management and conservation decisions. Real time water data benefits campus via rapid response to leak incidents and enhanced conservation tools.

Second, companies like APANA (a local leader in real time water management technologies and services), as well as other U.S. Universities, gain valuable insight from the pilot program. Success in this pilot warrants further uses for vertically integrated water management solutions beyond just Western's campus. Through Facilities Management's involvement with collective organizations like APPA (Association of Physical Plant Administrators), Western has shared previous successes conserving other resources like electricity and steam (natural gas).

Third, Western students receive both direct and indirect experiences provided by this technology. APANA, in particular, has repeatedly expresses their interests in working with Western students to help create the University application of their technology. While this technology is promising, there have been no recorded examples of a U.S. Universities using this technology. There would be a refining process of existing solutions systems to support the needs of Western. This would provide students with interest in conservation data a data driven experience for conservation in the business environment. Coordination with APANA exposes students to economic, social, and technical workings of modern conservation. Indirect experiences include those brought to students through programs like the "Shower Challenge" campaign. Those experiences are created by the data which this technology collects. Lastly, students around campus can observe how water management plays a role for the greater campus sustainability mission through integration with the Campus Energy Dashboard program.

SECTION 2: Project Goals.

a. What are the goals and desired outcomes of your project?

Improve Campus Water Management:

Using monthly billing information makes it difficult, near impossible, to detect water waste in a timely manner. This is especially true for locations that are not visible or unoccupied. Even an anomaly shows in the bill, it comes a month late and does not give any information as to where the culprit is.

Key Issues:

-Water faucets left on in unoccupied areas
-"Hidden" equipment leaks
-Timeframe and scale of waste before detection*

See incident descriptions in section 2b.* ***Economic*

Provide Access to Valuable Data to Students:

The current data on water use on campus is also not adequate to quantify water conservation strategies. Due to a high volume of variables, the current measurements cannot isolate and track certain activities or functions (like showers or leaking pipes). For the first time, Western would have data that provides measurement and verification for any project aiming to conserve water. This data would be available to both students and faculty.

Inspire Others to Pursue Sustainable Water Management Solutions:

This technology makes Western **the first U.S. University** to have a vertically integrated solution to water management and conservation. Putting industry leading technology on our campus, provides opportunities for students and faculty to work with APANA on better project design. Insight gained from this project would be shared with other institutions per our involvement with organizations like APPA (Association of Physical Plant Administrators). Many institutions require tangible examples of new technology serving a University before they are able pursue solutions. Normal budgeting procedures make pilot programs a rarity. For institutions in regions faced with sustained drought, this is particularly important. Western's drive to create and improve sustainable practices provides social good. Success on Western's campus will provide other

institutions with a University specific case study in real time water management solutions. Such case studies enable others to pursue tested solutions when faced with inevitable water constraints.

Western's appreciation for piloting sustainability programs has been well received in the past. Many important sustainability initiatives resulting from SEJF support such as: over $300,000 in LED lights upgrades (2012 & 2014), Sustainable Energy Efficient Dorms pilot (2013), and Solar Driven Sustainable Waste Management (2018) provide examples of Western's ambitious nature. Leaders like Western play an important role taking strong ideas to tangible action, ultimately setting a precedence for other institutions to proceed more comfortably. A university, like Western, is an excellent early adopter of sustainable technologies. Smart Water can use Western's community ties (like APPA and others) to spread our sustainability success stories. Successful sustainability projects also register with students; who bring these ideas with them to their future careers and communities.

b. How will your project align with the mission of the Sustainability, Equity, and Justice Funds?

Environment: Water conservation limits the impact water collection and treatment has on our local environment. Reductions in water consumption mean reductions in energy usage both on Campus (hot water) and through City Water treatment processes. It also reduces the amount of collected from Lake Whatcom. This reduces the amount of water experiencing pretreatment; a process where plants, algae, other living things must be removed to prevent filter clogging. Filtering processes are both costly and disruptive as they must dispose of large biomass quantities before delivering water to customers.

Social: The "Shower Challenge" will be the first behavioral initiative possible with this project. Behavioral campaigns are an integral part of sustainability. Unfortunately, they are often very difficult to quantify without better technology. This project creates tools which will both explain and quantify water conservation on campus. The technical designs of water systems on a university campus (residential and academic) create barriers for effective conservation. These tools ought to be considered critical for building a bridge between conservation behavior and operational success.

Economic:

Saving Water

On average APANA technology saves its customers 20% of their water consumption. Biology and Fairhaven consumed 9,566 cubic feet of water last year (7/2017-6/2018). 20% savings for these two building totals $13,400 per year.

***Responding to Incidents**

Leaks and machine failure present problems that go unresolved for long periods of time. Currently, these issues are only found by coincidence or by alerts from the city's water system. Unfortunately, those alerts come weeks later. A leak or running faucet can run for days before it is discovered.

WWU Leak Example:

- Edens Hall leak costing **$6,000** in August 2017
- Leak Ran for 11 Days
- About 6,500 cubic ft per day (Size of Fischer Fountain)
- Discovered when someone heard running water and choose to go take a look.

- The City of Bellingham Alert that detected this came a month later on Sep. 29th
- Culprit was a Flushometer (running toilet)

Biology Flood Example:

- December 31st – February 12th 2018
- Total Cost: **$58,000**
- Mechanical Failure (Reverse Osmosis Gasket)
- Most damages caused before current alarm system was triggered (overnight)

Water waste is a very important target. It is important to note that substantial incidents of water leakage are frequent and hard to detect. APANA's technology drives conservation and enables facilities to resolve existing/future water leaks which otherwise remain hidden. Many institutions are unaware of how to catch these issues in advance. That means the costs are just assumed as part of normal operations. That also means that preventable water waste will remain "business as usual" until more people are aware of better management systems. Western's influence (both directly and through graduates) can bring ideas like the Smart Water program into more institutions and community.

c. How will you measure the project's success?

Operational Success:

Facilities management will record the total cubic feet of water that is saved by faster incident response. Any other change made resulting from new data will also be added to operational successes. Data collected by this new metering system assists Facilities Management create policies to conserve water. For example, it is known the creating RI/DO water for lab uses is energy intensive. However, due to the current metering equipment the amount of RI/DO that is created and consumed is not quantified. Wasted RI/DO could likely be a conservation target that would result in both water and energy savings. Taking action on qualifying information provided through better metering is well within the scope of Facilities Management.

Incident response is another important focus item for measuring this projects success. The use of a real time water management software expects to speed incident responses substantially. For example, Facilities Management estimates that an 11 day leak (like the Edens Hall example) would be resolved in 0-5 hours. That time range would include the alert from the water management software and Facilities corresponding action. Large incidents (like the Biology flood example) would trigger an alarm almost immediately.

Both types of operational successes will be tracked by normal measurement and verification protocols. These protocols benchmark trend data against an initially created baseline.

Behavioral Success:

Post installation Wyatt Catron, Alex Hutchinson, and Sarah Harris will create a per student baseline in Stacks 3 and 4. Alex and Sarah will lead the "Shower Challenge" campaign and corresponding events. Water usage trends will be analyzed throughout the "Shower Challenge" campaign. Differences between new trends and baseline are counted as estimated successes from the "Shower Challenge". Using water consumption from showers, steam production (and its value in natural gas) is included in the total conservation effect. There are

both energy and water impacts for domestic hot water. Smart Water enables activity based analyses that would otherwise be absent from other behavioral campaigns. The scale of Western's water consumption, as well as the lack of specific metering as is, makes it nearly impossible to quantify the success of a behavioral campaign. For example, all of Fairhaven feeds to the same water meter. This means that all the water used in both Fairhaven Academic, Commons, and Residences is measured combined; creating aminiminity for the share different actions (showering, dishes, laundry, plumbing, leaks) contribute to the total. Smart Water can measure these hidden "slices of the pie". Understanding how these activities affect water consumption enables quantitative methods for verifying and influencing behavior.

SECTION 3: Project Participants.

a. Team Information: A team should consist of two to five individuals, including the advisor.

Team Advisor Information (Faculty or Staff) Student proposals must include a staff or faculty advisor. The role of the advisor is to provide assistance and guidance to the team during the development, implementation, and post-implementation stages of the proposal process.

Team Lead: There must be at least one team lead designated for the project. This individual is expected to serve as the communication liaison for the project.

Name	Department/School Students provide major/minor	Position: Faculty/staff/student Students provide expected graduation quarter/year	Western email address
Team Advisor: Scott Dorough	Facilities Management	Campus Energy Manager	Scott.dorough@wwu.edu
Team Lead: Wyatt Catron	Energy Management and Policy BA	Energy Manager Assistant Graduate Spring 2019	catronw@wwu.edu
Team Member: Alex Hutchinson	Statistics BS	Fairhaven S-Rep Graduate Spring 2022	hutchia7@wwu.edu
Team Member: Sarah Harris	Environmental Science BS	Graduate Spring 2021	harri222@wwu.edu
Team Member:			

b. Potential Project Stakeholders

Will your project potentially involve labor, include involvement, or require permission from organizations, departments, or individuals on campus or in the community? If so, these will be your stakeholders; please list them below. *Communication with stakeholders is not required for abstract approval.*

Stakeholder	**Involvement in Project**

APANA Team Lead: Matt Maher Peterson	Matt is the Chief Technology Officer for APANA™. Matt will lead the APANA team in their efforts on Western's campus. He will be the design lead for the project as well the primary coordinator with Western's staff. Moving forward, Matt will aid Western to tailor their water management system to fit university campus needs.
Facilities Management	FM will partner with APANA to install these system. APANA will train FM staff to maintain the technology. FM is the stakeholder with all of the necessary permissions to proceed with this project. FM also takes on the future subscription and service cost for the project.
Fairhaven Sustainability Reps	The S-Reps at Fairhaven have expressed their interests in working on water conservation challenges in the Stacks. Their current role would be to help educate Fairhaven residents on the Smart Water Shower Challenge; though a more active involvement from the S-Reps is welcomed and encouraged.

c. **Will any Associated Students clubs be involved?**

Club	Involvement in Project

SECTION 5: Project Budget.

- Provide a realistic budget estimate for the project, based upon research of all anticipated costs. Do not itemize estimated costs within the four categories.

Amount Asked from Sustainability, Equity and Justice Fund Grant Program: 87,500

Item	Cost
Materials	$36,830
Labor/contracts	$51,700
Services (1st Year)	$5,712
Total budget estimate	***$93,800***

- The SAF encourages the use of additional funding sources to create a collaboratively-funded project. List potential funding sources beyond the SAF that you will seek:

Funding Source	Connection to project	Potential Funds
APANA No Charge for Labor	Free installation and project management services.	$3000
APANA 50% discount on Software and Support	First year comes significantly discounted. This also includes time spent integrating software into Western's systems.	$3,356

TOTAL MATCHED FUNDS (*w/out FM annual subscription)		**$6,356**
TOTAL REMAINING (SEJF)		**$87,500**

Is there any additional information about the project that you would like to share?

Running Items:

- APANA is currently in dialogue with us to formalize the role of student involvement (i.e. dates they visit, number of students in collaboration). Currently, APANA has included direct student engagement as part of their actions in the project. First visit from APANA would be during the kick off for the Shower Challenge event. This is contingent upon the likelihood of funding as they cannot reserve time until project is in works.
- The timeline of project installation is designed but flexible depending on timeframe for funding availability. Plans are to begin working on the creation of a baseline for the shower challenge in Spring Quarter.
- Exact funding details to in works for confirmation. The current funding estimate does not include potential hardware discounts from the vendor. It also uses a 25% mark-up on internal labor and parts purchases to account for administrative costs. This was done at the advice of facilities management to include a conservative estimate of those costs.
- I, Wyatt Catron, am also working to recruit several students (not graduating this Spring) to continue work on this water project and the following shower challenge through 2019-2020. Several students have expressed interest and they will be contacted once the student roles are formalized with APANA.

Also included: Fact Sheets APANA™ (next two pages)

A few facts from the front lines:

APANA PROVIDES
22%
average water and sewer reduction

APANA PROVIDES
18
months average return on investment

APANA HAS OVER
500
installations wordwide

APANA HAS OVER
2.3
billion gallons of water under management

Common water events like the ones shown below, left undetected, can have huge impacts on the environment and your bottom line.[1]

Leaking toilet	0.5 gpm	21,600 gal/month	$2,100 per year
Drip irrigation malfunction	1.0 gpm	43,200 gal/month	$4,300 per year
Unattended water hose at night	10.0 gpm	5,400 gal/day	$16,000 per year
Stuck float valve in a cooling tower	5.0 gpm	216,000 gal/month	$21,000 per year
Broken distribution line	15.0 gpm	648,000 gal/month	$64,000 per year

1 U.S. Environmental Protection Agency; https://www.epa.gov/watersense/getting-started

We scale to your needs:

Apana ENTERPRISE™
for commercial and industrial applications

Apana ONE™
for small, single site operations

Apana CT™
for cooling towers

Customers include:

Multi-store retail chains

Hotels

Supermarkets

Food & beverage processors

Commercial buildings

Car washes

"With Apana, we expect to reduce our annual water footprint by at least 15%, and meet our 2020 efficiency goal early in 2018."

- Fetzer Winery

FETZER

All buildings use water.

But they don't have to *waste* it.

It's estimated that 20-25% of water use is avoidable. Combined with the indirect costs of water use – like electricity for heating and pumping and chemicals for treatment – the true cost of water can be many times the water and sewer bill alone.

25% It is estimated that 20-25% of water waste is avoidable. That could come in the form of mechanical failures or operational misuse.[1]

5.5% Over the past decade, water bill increases have averaged 5.5% a year, more than three times the rate of inflation, according to the Labor Department.[2]

13% Roughly 13% of energy used in the U.S. is consumed in the heating, treatment, distribution, and usage of water.[3]

You can't manage what you don't measure.

To solve a problem, you must first understand it. And water is no exception. The first step toward eliminating water waste is measuring when, where and how much you use.

That's where we come in. Our proprietary system scans, pinpoints, and guides resolution when waste events occur – saving water, money, and your reputation.

Doing nothing costs more than you think.

Mechanical Failures

Malfunctions occur routinely. Cooling towers, purification and filtration systems, and sanitization processes are common sources of water waste.

Operational Waste

Avoidable water use practices exist in all operations. Sinks and hoses get left running. Work shifts use water differently, even when tasks are the same.

Compliance Risks

Water waste can escalate into environmental violations, property damage and loss of inventory. Seldom is there any warning.

1 Longitudinal Survey of Water Reduction Initiative at Multi-Site Retailer in Southern California, 16 June, 2016
2 Harrison, David. "Why Your Water Bill Is Rising Much Faster Than Inflation." *The Wall Street Journal*, 15 March, 2018
3 Lee, Adrienne. "The Energy Cost of Water." Cockrell School of Engineering, University of Texas at Austin, 16 July, 2013

Sustainable Action Fund Grant Program

LARGE GRANT ABSTRACT - APPLICATION

PROPOSAL REVIEW

Once your project proposal is complete, you must print and receive hand-written signatures from the individuals listed below. After signatures are received, applications can be delivered as a hard copy to the SAF Grant Program Coordinator, Johnathan Riopelle at Viking Commons Room 24 or by scanning the application and emailing it to johnathan.riopelle@wwu.edu.

Please set an appointment with the Sustainable Action Fund Grant Program Coordinator to review your abstract before submitting your application.

Sustainable Action Fund Grant Program Coordinator, Johnathan Riopelle
Viking Commons, Room 24
Available by appointment
Email: johnathan.riopelle@wwu.edu
Phone: (360) 650-4501

Signature: _____ Date: _____

This signature confirms that the abstract has been accepted for SAF committee review; it does not indicate funding approval.

Comments:

Seth Vidaña, Director of Sustainability, Western Washington University
Viking Commons, Room 25
Phone: (360) 650-2491

Signature: _____ Date: _____

This signature confirms that the abstract has been accepted for SAF committee review; it does not indicate funding approval.

Comments: