SWEETWATER AUTHORITY

Water Quality Committee
May 13, 2024

Consideration to Authorize a Sole-source Purchase of a Residual Control System for the Bonita Valley Reservoir from PSI Water Technologies

RECOMMENDATION
Staff recommends that the Governing Board award a contract to PSI Water Technologies (A cleanwater1 Company) of Milpitas, CA, in the amount of $398,499.15 for the purchase of a Residual Control System.

OVERVIEW

Bonita Valley Reservoir (BVR) is the Authority's largest treated water storage tank in the distribution system. The reservoir, located in Bonita at the top of Randy Lane, is below grade and divided by a concrete wall into two 9 MG basins that can be operated independently. Because BVR is somewhat intermediary in the system and the total volume it contains is relatively large, the water quality in this basin largely influences water quality in most of the Authority's service area. The additional storage capacity that BVR provides is critical to maintaining system reliability. Staff is recommending for the sole-source purchase of a Residual Control System to maintain water quality and reduce imported water costs.

Water Quality (Nitrification)

Under certain conditions, water quality in BVR (as in any storage tank) can degrade. Primarily, water quality degrades when the source water being treated has a high chlorine demand, water usage is low (long system water detention times), and water temperatures are warm. The Authority utilizes chloramine (chlorine and ammonia) as the residual disinfectant in the distribution system to ensure bacteriological protection of water quality from the treatment plant to the point of use. As the chloramine residual decays in the system, ammonia is released. It serves as a food source for ammonia oxidizing bacteria, which convert ammonia to nitrite, causing a downward spiral in water quality known as nitrification. Ultimately, nitrification causes a decrease in chlorine residual, which can become problematic if not remediated.

Water Quality Remediation (Typical)

- Deep cycling
    - Increases water turnover by moving larger volumes of water through the tank during each fill/drawdown cycle.
- Water treatment plant operational adjustments
    - Increase chlorine residual levels leaving the Perdue Water Treatment Plant to counteract nitrification.
- Tank draining/disinfection
    - All water in the tank is discharged, then the tank is entered and disinfected prior to refilling with new water from the distribution system. This option requires significant staff time, wastes water to the storm drain system, and has the potential to create negative public perception.

- Placing basins out of service
    - To increase water turnover (reduce water age) one of the 9 MG basins at BVR can be taken out of service. This is a common practice in the water industry; however, it does reduce the amount of available storage in the distribution system, limiting operational flexibility.
- Changing water sources
    - Occasionally, the only way to remediate water quality quickly in the distribution system is to change water sources. This means purchasing expensive imported water from the San Diego County Water Authority (SDCWA) at a current rate of $1,389/acre-foot (CY 2024).

Residual Control System History

The FY 2020-21 Strategic Workplan identified a Water Quality goal to pilot test the ability of a Residual Control System (RCS) to stabilize chlorine residual in a distribution system storage tank, and the FY 2021-22 Strategic Workplan identified a Water Quality Goal to purchase an RCS. Ultimately, on August 11, 2021, the Board approved the sole-source purchase of an RCS from PSI Water Technologies for installation at the 2.5 million-gallon (MG) O.D. Arnold tank in National City, which was chosen due to a history of water quality challenges.

Prior to the installation of an RCS, the O.D. Arnold tank zone was frequently impacted by nitrification, requiring corrective actions such as deep cycling, zone flushing, and draining/disinfection/refilling the storage tank. During the five-year period leading up to this project, approximately 19 million gallons of treated drinking water had to be discharged from the O.D. Arnold tank zone to remediate water quality issues (i.e. nitrification and/or low chlorine residuals).

Since the installation of an RCS at the O.D. Arnold tank, no water from this tank has had to be wasted from the system to maintain water quality.

Residual Control System Components

The system being proposed for BVR is almost identical to the one currently operating at the O.D. Arnold tank. The main differences are the system would be installed in the existing above ground structure at the site rather than in a trailer, and the mixers, chemical feeders, and chemical storage tanks are larger to accommodate the additional storage volume. In addition, redundancy of most components is necessary since the site is composed of two independent 9 MG storage reservoirs.

The main system components are listed below:

Smart Control Center (2 each)	The smart controller contains the programmable logic controller (PLC), human machine interface (HMI), telemetry connections, and chemical dosing controllers.

Water Quality Station (2 each)	The water quality station includes dual total chlorine analyzers, an oxidation reduction potential analyzer (ORP), a pH analyzer, and temperature measurement.
Sodium Hypochlorite Feed System (2 each)	The chemical feed system consists of a peristaltic pump to inject sodium hypochlorite.
Liquid Ammonium Sulfate Feed System (2 each)	The chemical feed system consists of a peristaltic pump to inject liquid ammonium sulfate
Sodium Hypochlorite Storage Tank (1 each)	The tank provides 1,000 gallons of storage (30-day supply).
Liquid Ammonium Sulfate Storage Tank (1 each)	The tank provides 220 gallons of storage (30-day supply).
Tank Mixer (2 each)	The tank mixer is submersible, consisting of a stainless-steel impeller that is powered by a 3-horsepower motor.

Residual Control System Operation

The RCS is an automated, proprietary packaged system with multiple patents (Attachment 2). The Water Quality Station continually monitors the water quality in the tank. The Smart Controller interprets the water quality data utilizing patented programming/algorithms to make chemical dosing decisions. The chemical dosing systems receive commands from the Smart Controller and dose chlorine and/or ammonia directly to the tank mixer to achieve the desired operator programmable water quality target for total chlorine residual (chloramine). Maintaining a consistent and stable chloramine residual with the correct ratio of chlorine to ammonia prevents water quality degradation due to nitrification. The system is designed to run unattended and, as such, is programmed with a number of shutdown alarms that are designed to protect water quality. The system would be fully integrated into the Authority's Supervisory Control and Data Acquisition System (SCADA) so that it could be monitored and controlled remotely 24/7 by certified and trained operators. Periodic site visits are required to verify operation, calibrate/maintain equipment, and accept chemical deliveries.

Residual Control System Permitting

Prior to operation, staff would engage the State Water Resources Control Board, Division of Drinking Water (DDW), to initiate a domestic water supply permit amendment process. Because this technology has already been permitted elsewhere in the Authority's system, the process should be relatively straightforward for staff.

Rational for Sole Sourcing

RCS technology has already been successfully demonstrated at the Authority. If a different system were to be chosen, staff would recommend performing a demonstration pilot for several months, which would first require DDW approval. The prior pilot at the O.D. Arnold site took four months (August 2020 through November 2020) and cost approximately $18,000 in rental fees. Because the RCS technology has already been

proven, staff does not feel a need to perform another pilot test before installing a system at BVR. Operations staff is trained on operating and maintaining the RCS, integrating a second system into SCADA provides cost savings and efficiencies, and from an operational efficiency standpoint, it makes sense to standardize the RCS equipment.

The PSI RCS has multiple patents (Attachment 2) and has proven to be effective at the OD Arnold tank site. Other chlorine boosting systems exist; however, they would not operate exactly the same as the RCS and, as described above, would require extensive pilot testing to demonstrate their efficacy.

FISCAL IMPACT

Residual Control System Project Cost Estimation

A summary of the RCS cost and ancillary items are included in Table 1 below (detail provided below).

Table 1

Item	**Cost**
Residual Control System	$366,436
Residual Control System Sales Tax (8.75%)	$32,063.15
SCADA Integration	$25,000
Electrical Upgrades	$97,000
Chemical Containment	$30,000
Contingency (9%)	$49,500.85
Total Estimated Project Cost	$600,000

Residual Control System (PSI Water Technologies)

Staff has requested a cost proposal (Attachment 1) from PSI Water Technologies (A cleanwater1 Company*) for the system described in the sections above. The proposal cost is $366,436** and is valid for 180 days from February 22, 2024. Funding is included in the proposed FY 2024-25 Capital Budget.

For comparison, the Authority spent $135,000*** for an RCS at the 2.5 MG O.D. Arnold site in FY 2021-22. The 18 MG BVR is 7.2 times larger than the O.D. Arnold tank and contains two basins; however, the cost to purchase this system for BVR is only 2.7 times what was spent in FY 2021-22.

* PSI Water Technologies was previously a USGI Solutions Company.
** Total cost, including 8.75 percent sales tax, is $398,499.15
*** Total purchase price includes cost spent for pilot rental that was applied back to the purchase cost.

SCADA Integration Costs

Costs for SCADA integration are $25,000 and included in the draft FY 2024-25 Capital Budget. Historically, authorization for a scope of work for the SCADA integrator is brought to the Board in June or July.

Since the system being proposed is similar to what was already integrated at the O.D. Arnold site and the programming parameters have already been developed; the cost to add a second system to the SCADA system is estimated to cost $15,000 less than if a different type of system were to be selected.

Electrical Upgrades

To power the RCS at BVR electrical upgrades are necessary, a minimum of 70 Amps is required and does not currently exist at the site. Upgrades are estimated to cost $97,000. Costs for electrical upgrades are included in the proposed FY 2024-25 Capital Budget.

Chemical Containment (Concrete/Cover)

Chemical storage tanks are the only items that will need to be stored outside as space inside of the structure at BVR is limited. Concrete housekeeping pads and containment walls will need to be installed to safely store the chemicals. Additionally, covering the tanks with a shade structure will protect the tank materials from degradation by sunlight and increase chemical shelf life. Chemical containments are estimated to cost $30,000 and are included in the proposed FY 2024-25 Capital Budget.

Purchased Imported Water Savings

One of the strategies to recover water quality in BVR and the distribution system is changing source waters at the Perdue Water Treatment Plant to import raw water from SDCWA. Although this strategy is effective, it comes at a high cost to the Authority. Because BVR is a large intermediary reservoir in the Authority's system that subsequently supplies a large portion of the system downstream, maintaining water quality at this location would maximize the benefit of an RCS and reduce the need to purchase expensive imported water to remediate water quality.

September 2023 Nitrification Event

On August 20, 2023, tropical storm Hilary passed over San Diego. Operations was well prepared for the event, topping off all storage tanks to provide maximum system reliability in the event of a prolonged power outage. In the weeks following the storm, nitrification started to occur in BVR and other areas of the distribution system. All of the typical causal factors were present: warm water temperatures, water with relatively high chlorine demand from Sweetwater Reservoir was being treated, and low water usage (long detention times) existed in the system. Staff took several corrective actions to remediate water quality, but ultimately, it became necessary to switch to the raw imported water supply source. From September 13, 2023, through September 28, 2023, the Authority purchased 529 acre-feet of imported water at a cost of $1,258/acre-foot (CY 2023 rates), totaling $665,482. Had an RCS been in place at BVR, it is probable the system could have been

recovered without expensive water purchases. In essence, it is possible that the RCS could pay for itself by remediating a single water quality event in the distribution system. All water provided by the Authority during the September 2023 event met state and federal drinking water standards; however, swift corrective actions were necessary to prevent further degradation of water quality.

NEXT STEPS

1. Award a contract to PSI Water Technologies (A cleanwater1 Company) of Milpitas, CA, in the amount of $398,499.15 for the purchase of a Residual Control System.

2. Direct staff to initiate a competitive process for the purchase of a chloramine boosting system and bring a recommendation back to the Governing Board.

3. Other direction as determined by the Governing Board.

Staff Contact:
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SUPPORTING INFORMATION

Attachments

1. Cost Proposal - PSI Water Technologies
2. Patents Letter – PSI Water Technologies
3. Presentation – Residual Control System

Strategic Plan

Strategic Plan Goal 1: Water Quality (WQ) – Provide high quality water that meets regulatory requirements.

Past Board Actions

August 11, 2021	The Governing Board awarded a contract in the amount of $129,000 to PSI Water Technologies (a USGI Solutions Company) for the purchase of a Residual Control System.