

Alaska Water Sewer Challenge Phase 3

Monthly Progress Report #6

Reporting Period: December 1st, 2016 – December 31st, 2016

Submission Date: January 10th, 2017

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Per the professional services agreement, monthly progress reports will include a one page overview of how the monitoring and testing of the prototype is progressing and how the system is working. All major changes done to the system in the ending month and any changes planned for the following month will be disclosed. *This progress report will extend to 2 pages due to the busyness of December.*

System Overview for December 2016

December was a busy month with many learning experiences from the system. *Overall during December, outside of one day of a hit of total coliform our system performed the stress scenarios and met the water quality goals of the project.*

Post-stress recovery for Wash Vacation Stress - We had a total coliform positive measured by SGS due to our cross-connection and operational error for a single day. This issue will be resolved in our reconfigured plumbing of version 2 we are building in January. This did give us a great opportunity whereas through internal sampling we observed that within 24 hours the wash water returned to zero total coliform (internal sampling) and further by reviewing UVT this can be seen with slight changes in reduced transmittance (99% to 93%) (students operating the system also smelled and visually observed this change in water quality).

Wash Surge Stress - All went as planned regarding water quality (no issues providing high quality wash water) but this test was not without issue for us. The 2x loading of the first day revealed that one of our batteries was not charging (we will resolve this by building a system to make it operate more like an uninterrupted power supply than the current method of operation) and thus our water delivery in the house slowed resulting in 2x loading that took almost 6 hours to have it come out of the home fixtures. Day 2, 2x loading worked better as we had replaced the battery with a 12v power supply. Further, due to some operational issues we had an accidental freeze of the RO membrane reject line overnight from the prior day most likely cause by us leaving the door open after treatment, it was thawed in a bucket of warm water and the day went as planned. Day 3, 3x loading, took almost 12 hours from start to finish with no further challenges. We took internal samples for total coliforms and had non-detects throughout the effort after any of the treatment cycles. Additionally, we learned that our drain system will allow for long showers but result in the user standing in water while the drain system is emptying.

Wash Surge Stress Post-stress recovery - after the stress, the system processed concentrate out and was put into regular operation for 2 days. At that point the system was drained (by air or shop-vac) and heat was kept on to dry out spills for the weekend. Additionally, samples were taken during the final day of operation and sent to Southern Nevada Water Authority for trace organic analysis (i.e. pharmaceuticals, personal care products, emerging disinfection byproducts).

System Freeze - The conex and house heat was turned off on Dec. 19th. As of the evening of the 21st, our temperature logger has shown it has been below 32deg for over 24 hours. We took FLIR (heat) images prior to freezing and will retake before we reheat, and after reheated. When we turn it on we

intent on letting the house come and solid surfaces come up to temperatures in the 60s prior to refilling and restarting.

Keg Freeze - We have placed a 2/3 full keg of concentrated greywater outside and are freezing this also per our team derived freeze challenge during the same period as the system freeze.

Hot/Cold Water Bacteria (on Dec 7) - We have now run an experiment on the shower and the kitchen sink (two different size water heaters) that have both shown that there were NO total coliform in water of hot (113 or 140F), cold (57F) or warm (80-93F) temperatures.

Dishwasher – Based on our December telephone call, we have reviewed our system for capability to use a dishwasher. We believe our system could include this fixture with the following caveats, 1) a break tank similar to the laundry would need to be installed, 2) food particles would need to be nearly-completely removed from dishes prior to washing and 3) water used for this activity (about 6 gallons) would be accounted for under the 10 gallons per day of kitchen sink usage.

Surface Water Sampling – Six hundred (600) gallons of water was collected from the fork of Chester Creek located between the Student Union and UAA drive. Water quality is within the characteristics of use of the professional service agreement. *Briefly, our system started with Anchorage tap water, then ran on rain water from about mid-August until December.

Considerations for January 2017 and Future

We are planning to thaw the system and the keg in early in January 2017 and begin construction of the 2nd prototype. The 2nd prototype will allow the system to be housed in a conex, vestibule (DOWL) or inside the home. It will also allow for removal of all consumable filters (except for the cartridge filter on the drinking water system) making the system more sustainable due to reusable parts. In the home, we are considering to reduce the bathroom sink water use to a low-flow fixture (while keeping concentrate at high flow concentration) and divert this flow for additional shower usage. We plan on starting the system with Anchorage tap water and switching to surface water once operating. We remain in progress for a revised QAPP, we anticipate to submit a version in January or February.

General Notice of Data Sharing

All of our data (raw and processed) are being posted publicly as well as all progress reports.

Direct link to website resources: http://reusewaterak.com/?page_id=10

Direct link to photos of water samples: http://reusewaterak.com/data_AWSC/?dir=daily_photos
(photos now taken only intermittently)

Direct link to data: http://www.reusewaterak.com/data_AWSC

End-User Interaction

We have confirmed the visit of a total of community members from Koyukuk and Kipnuk for January 17th, 2017.