Arrow Creek Homeowners Association

Reclaimed Water Quality Review/ Options for Water Quality Improvement

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Reclaimed Water Quality Analysis and Options for Improvement of Reclaimed Water Quality

Background Information

The Arrow Creek Homeowners Association (HOA), under contract with the Washoe County Department of Water Resources, utilizes treated effluent (Reclaimed Water) from the County's South Truckee Meadows Water Reclamation Facility (STMWRF) to irrigate certain common areas within the Arrow Creek development. Per HOA staff, approximately 50 percent of irrigation demand is met with reclaimed water with the other 50 percent being supplied with potable water from the Truckee Meadows Water Authority. During the irrigation season, reclaimed water is delivered to two (2) points of connection. Per discussions with Arrow Creek staff, monthly reclaimed demand is approximately 15 MG with an approximate average daily demand of 50-60 gpm.

Per discussion with Arrow Creek HOA operational staff, the Association has noticed stunted growth on landscape vegetation and trees where reclaimed water is exclusively used, particularly with evergreens and pines. Staff is looking to study and implement options to improve landscape along the Arrow Creek Parkway which also includes an analysis of water treatment options to improve reclaimed water quality relative to sustainability and health of landscaping along the Arrow Creek Parkway corridor.

Study Elements

Tri Sage overall study protocol includes the following elements:

- On-Site Observations of Common Area landscaping irrigated by reclaimed water.
- A Discussion of previous water quality projects completed in the area, the purpose of which is to cite commonality with current issues facing the Arrow Creek HOA.
- Procurement and Review of water and soil chemistry data relevant to landscape health.
- Meetings with Staff from the Washoe County Department of Water Resources and Truckee Meadows Water Authority (TMWA). Included in these meetings were

discussions of future operational strategies and capital projects which may impact reclaimed water quality.

- Conclusions as to why common area landscaping may be negatively impacted by the cumulative effects of reclaimed water

- Recommendations to the Arrow Creek Homeowners Association on cost effective measures to improve reclaimed water quality and landscape health.

Landscape Observations

Escorted by Arrow Creek facility staff, Tri Sage personnel were able to examine common area landscaping irrigated with reclaimed water within the Arrowcreek development. As shown on Figures 1, 2, and 3, pines irrigated with reclaimed water exhibit signs of stunted growth and are not healthy. Figure 1 is particularly relevant as it depicts pines irrigated with reclaimed (foreground) water as compared to pines irrigated with domestic water (background). Pines irrigated with domestic are clearly more vigorous and robust.

Previous Water Quality Improvement Projects

It is worth discussing previous water quality improvement projects in close proximity to Arrowcreek that bear some similarity to the Arrow Creek situation.

Virginia Foothills Project

Prior to the merger with TMWA and in the 1990's, Washoe County owned the municipal system serving the Virginia Foothills/Toll Road area. Water supply to this system was provided by groundwater wells with high levels of arsenic and boron. Groundwater quality was influenced by nearby geothermal activity which included boron. The County alleviated this problem in the 1990's by switching the source of supply with the construction of groundwater wells on Zolezzi Lane. The important "take away" is that boron is associated with geothermal activity and can be present in the South Truckee Meadows aquifer.

Jeppson Lane Project

Several years ago, a group of property owners in the Jeppson Lane, Trinity Lane, and Spruce Lane area off South Virginia Street petitioned TMWA and Washoe County for domestic water

service. The properties in question had for years utilized private domestic wells for drinking water. When the wells were first drilled, water quality was acceptable, but over time water quality deteriorated with increasing levels of antimony, arsenic and boron. The existence of high levels of boron was also exhibited in the stunted nature of landscaping, particularly evergreens. Although no formal groundwater studies were conducted, there is anecdotal indication that geothermal and municipal well development changed the water chemistry of the shallow aquifer which included increased levels of boron. High levels of boron can be toxic to certain plants, particularly pines.

TMWA provided service to these properties to mitigate the water quality issue.

Review of Existing Water and Soil Chemistry

Tri Sage has conducted a review of water and soil chemistry relative to overall health of HOA landscaping as it relates to use of reclaim water for irrigation. It is important to note the following as it relates to overall health of landscape shrubs and trees in Northern Nevada:

- **pH**: pH is a measurement of the relative acidy. Neutral pH is 7.0. pH levels below 7.0 are acidic, whereas pH levels above 7.0 are alkaline. Most evergreens planted in northern Nevada prefer pH levels that are moderately to slightly acidic, or below a pH level of 7. Most plants and trees prefer a pH between 6 and 7 which allows for assimilation of micronutrients, including nitrogen, iron and phosphorus.

- **Alkalinity:** Alkalinity is a parameter used to determine the buffering capacity of water or soil medium to resist a downward change in pH. The higher the alkalinity, the more difficult it becomes to lower pH levels, particularly lowering pH via water treatment or with soil amendments.

- **Total Dissolved Solids (TDS): TDS** is a measurement of salt content in water or soils. Constituents which increase TDS include sodium, potassium and other minerals. Groundwater in Northern Nevada is higher in TDS and hardness as compared to surface water. Reclaim effluent also tends to have higher levels of TDS due to concentration of dissolved solids which occurs in the wastewater treatment process. High TDS levels can be harmful to landscape plants

- **Boron:** Boron is a naturally occurring element in the soil and, in small amounts, is beneficial to plant health. However, higher levels of boron can become toxic to some

plants, particularly pines. High levels of boron can impede the assimilation of important minerals to plants necessary for growth and sustainability.

HOA Soil Chemistry

The HOA common area landscaping includes many pines and other evergreens. These species benefit from soil that is moderately to slightly acidic. The HOA contracted with the University of Idaho, Analytical Services Laboratory, to conduct soil and reclaimed water analyses. These tests indicate that native soil is moderately acidic (pH 5.5), which should be an indicator of soil beneficial to pines and evergreens. However, soil tests taken at other locations where reclaimed water is used indicate much higher pH levels, approaching 8 on the pH scale at several locations. The laboratory also conducted tests on a reclaimed water sample. This test indicated a pH of 8 (alkaline) and an alkalinity of 190 mg/L, which indicates a water/soil environment resistant to downward changes in pH.

Reclaimed Water Quality

Tri Sage has reviewed a reclaimed water quality report provided by the Washoe County Department of Water Resources. A review of this report along with the results of the water sample tested by the HOA indicate the following:

- High Reclaim Water pH along the order of 8.0 and possibly higher
- High Reclaim Water TDS approaching 500 ppm.
- High Alkalinity approaching 200 ppm or mg/L.
- Boron Levels between 2 and 3 ppm and possibly approaching threshold levels for evergreens and pines.

Based upon these results, Tri Sage believes that current water quality parameters in regards to pH, alkalinity, TDS and boron are adversely affecting landscaping, particularly pines, in the common areas of the HOA currently served by County reclaim water. The following sections of this report will deal with current and future actions which could improve reclaim water quality.

Source Water Quality (Potable Water becoming Wastewater)

Prior to 2016, a large portion of wastewater treated at the County's South Truckee Meadows Reclamation Facility came from groundwater wells in the South Truckee Meadows. Groundwater, by its very nature, will have higher levels of pH, alkalinity, TDS, and, in regards to issues affecting South Truckee Meadows groundwater, higher levels of boron. It stands to

reason that if more treated surface water, with much lower levels of TDS and alkalinity, were introduced into the potable system, then water quality benefits would accrue to reclaim water quality.

Tri Sage has met and discussed with TMWA officials its ongoing plans for water supply for the South Truckee Meadows. TMWA has implemented a water supply plan to introduce more treated Truckee River Water into the South Truckee Meadows. In 2016, TMWA completed water main improvements and 3 pump stations on Zolezzi Lane. These improvements allowed for the introduction of 1,400 gpm of treated surface water into areas of the Mount Rose fan that previously depended upon groundwater. A second round of improvements on Arrowcreek Parkway will add another 1,400 gpm of treated surface water extending past Saddlehorn. In addition, TMWA will construct a 4 MGD Whites Creek Treatment Plant which will be used to serve customers in the Mount Rose fan and also for groundwater recharge purposes. The ultimate goals are to restore groundwater levels through recharge and to preserve groundwater for drought protection and for peaking during periods of high demand.

The end result, but difficult to quantify, is that wastewater entering the collection system should have lower levels of alkalinity, TDS, and boron, with pH remaining about the same. The TMWA improvements should provide reclaim water quality improvement to the Arrowcreek HOA in regards to alkalinity, TDS, and boron. Treated surface water provided to the Mount Rose Fan will contain no boron, will have alkalinity of approximately 50 ppm, and TDS of less than 100 ppm. These benefits will accrue to operation of the South Truckee Meadows Reclamation Facility and ultimately the reclaim effluent. Landscaping within the Arrowcreek development dependent upon domestic water for irrigation should benefit as well.

Operation/Improvements to the South Truckee Meadows Reclamation Facility

Tri Sage staff has met on two different occasions with County staff concerning operation of the wastewater plant and potential capital improvements which may improve reclaim water quality. Included was a site visit of the plant. Discussions with staff were cordial and indicative that the County is sensitive to the needs of reclaim water customers and is intent on improving reclaim water quality.

The following summarizes these discussions:

- The plant employs primary and secondary treatment which includes the reduction of organics and nutrients such as phosphorus and nitrogen.

- After undergoing treatment, reclaim effluent is pumped and distributed to reclaim customers through a reclaimed water distribution system which includes three (3) reservoirs (See Figure 4).

- The primary reservoir, the Huffaker Reservoir, has experienced issues with high concentrations of nutrients which have led to algae issues in the reservoir and distribution system. These issues can lead to daily fluctuations in pH and alkalinity with distributed effluent.

- Reclaimed water for irrigation is provided with direct effluent supplemented with releases from Huffaker Reservoir, which is filtered and disinfected to meet requirements.

- Improvements have been made to plant processes including a bio-solids removal project. Future improvements are planned to help de-stratify and improve water quality at the Huffaker Reservoir, and filtration enhancements to reduce turbidity and algae formation.

- Staff indicated they are strongly considering satellite water quality improvement projects including an improvement project for pH adjustment at the reclaim reservoir on Arrow Creek Parkway. Staff indicated they would like to pursue a demonstration pH adjustment project and would consider some mixing with surface water, possibly from Steamboat Ditch.

- Staff indicated that boron is present in reclaim effluent and is primarily due to groundwater leaking into the wastewater collection system. Staff indicated that the City of Reno has initiated a program to seal man-holes in an effort to help mitigate the problem.

Boron

As previously discussed, boron in high levels can be toxic to plants and trees. The only effective means of eliminating boron is through treatment via reverse osmosis, a very expensive treatment. In Tri Sage's opinion**,** a more reasonable approach is to reduce boron levels through other means such as (1) Utilizing source water with less or no boron, (2) Encouraging the City of

Reno to seal the wastewater collection system from groundwater intrusion, and (3) Blending reclaim water with untreated surface water. Both items 1 and 2 are currently being pursued by TMWA and the City of Reno respectively.

HOA Reclaim Treatment Options/ Customer Side

Based upon Tri Sage's review, the only possible treatment option for the HOA consists of pH adjustment treatment at the two (2) reclaim water service connections. This option has negatives including the following:

- Cost: $20,000- $25,000 per station (ball park)
- Maintenance: Acid/pH adjustment treatment would require training of HOA staff, would pose safety concerns, and require continual maintenance and monitoring. Control of such a system would be problematic.

It is not recommended that HOA staff implement its own water treatment system.

Recommendations for Improving Reclaim Water Quality

Tri Sage recommends the following relative to each water quality parameter:

TDS and Alkalinity: The fact that TMWA is introducing more treated surface water into the Mount Rose fan should reduce TDS and alkalinity loading on the County's South Truckee Meadows Plant and, therefore, improve reclaim effluent relative to these two parameters. The County's planned process improvements to reduce algae should also help. The HOA should continue to monitor these developments. This option has no cost to the HOA.

pH Adjustment: The HOA should encourage the County to pursue implementation of permanent pH adjustment facilities capable of adapting to alkalinity fluctuations. The demonstration project at the Arrow Creek Parkway Reservoir should be implemented as soon as possible. This option has no direct cost to the HOA.

Boron: The HOA should get more involved in the boron issue and coordinate efforts with other reclaim water customers to ensure that boron infiltration from groundwater is mitigated as much as possible in the South Truckee Meadows. Mixing with untreated surface water is a strategy the County could employ.

Attachments

Figures 1, 2, and 3: Pines irrigated with reclaim

Figure 4: Reclaim water distribution system

Figure 1

Figure 2

Figure 3

Figure 4

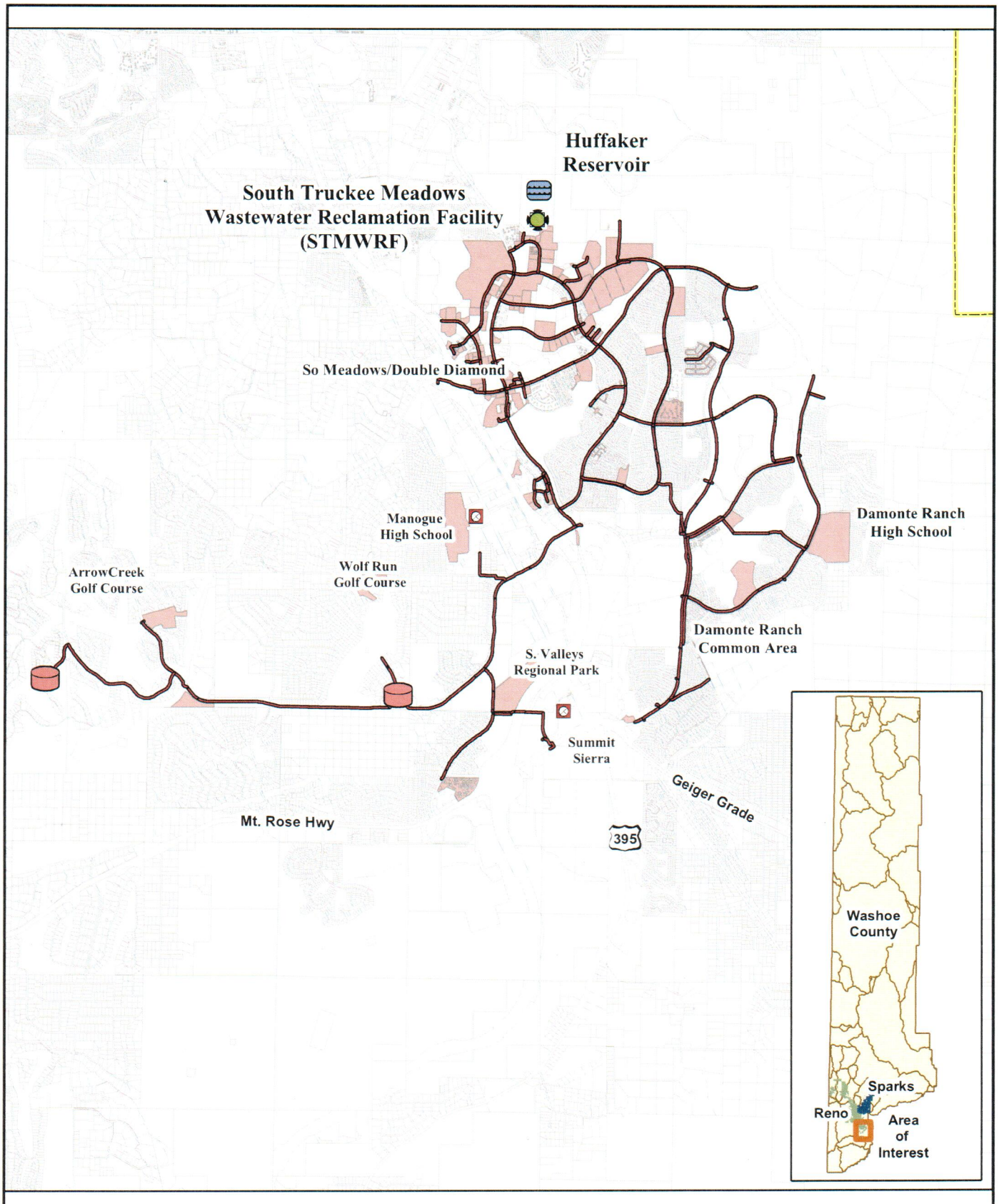

Figure 3-6 Effluent Reuse System
STMWRF - Washoe County Sites

Notes: The Scale and configuration of all Information shown heron are approximate only and are not intended as a guide for design or survey work. Reproduction is not permitted without prior written permission from the Washoe County Department of Water Resources.

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