TZA Water Engineers
a Lamp Rynearson Company

12596 W. Bayaud Ave., Ste. 330
Lakewood, Colorado 80228
303-971-0030
tza4water.com

GREATROCK NORTH WATER AND SANITATION DISTRICT
ENGINEER'S REPORT
JANUARY 26, 2015

Concentrate Disposal and Discharger Specific Variance

This activity was previously associated with efforts to reclassify Box Elder Creek. The proposed variance is to allow the District to discharge reverse osmosis concentrate to Box Elder Creek under certain conditions (i.e. certain minimum stream flows) by blending the concentrate with Lararmie-Fox Hills well water to reduce the concentration of constituents of concern.

TZA Water Engineers has contacted the Water Quality Control Division to discuss our concept for a Discharger Specific Variance. The meeting with the Division is expected to occur the second week of February, most likely on February 11 or 12.

Curb Stops

The two form letters previously drafted will be issued, pending the District Manager's assessment of the water meter locations in Box Elder Creek Ranch in relation to the platted utility easements and the Board's direction.

Greatrock North Pump Station Improvements

The District is in the process of negotiating an Independent Contractor Agreement with High Plains Engineering and Design for the geotechnical investigation and foundation recommendations. Upon execution, this work will be scheduled. Following the geotechnical investigation, PWSI, Inc. will perform a topographic survey of the existing improvements on Tract A. TZA Water Engineers has developed preliminary plans for the new pump station, and will finalize the design upon receipt of the foundation recommendations.

Reverse Osmosis Condition Assessment

Pure Water Solutions conducted an on-site condition assessment of the Box Elder Creek Ranch Water Treatment Plant's reverse osmosis unit on November 25, 2014. The results of Pure Water Solutions' water quality analysis are attached. I will present a summary to the Board at the February Board meeting.

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Well, Pump, and Motor Replacements

The District has recently initiated efforts to better understand its well infrastructure and the potential need for replacement of pumps and motors, as well as the well structures themselves. As a part of that effort, TZA Water Engineers is compiling the historical aspects of the wells constructed, the pumps installed, and any other improvements (i.e. water level measuring devices) integrated at each site. TZA is evaluating the benefits of a pump, motor, and well maintenance program to detect changes in well performance. Early detection of deterioration in well performance will allow less expensive repairs, rehabilitation, or treatment procedures in order to maximize production capacity. This preventative maintenance program will be discussed with the District's Manager, and a formal proposal will be brought to the Board if deemed appropriate.

Other Activities

Water Quality and Hardness – Below are tables of water quality data from a series of sampling events:

The total dissolved solids tabulated below show improved water quality as a result of reduced outdoor water usage and the ratio of reverse osmosis permeate to unfiltered water. The current ratios are approximately:

- 44% reverse osmosis permeate
- 44% unfiltered Upper Arapahoe well water
- 12% unfiltered alluvial well water

Total Dissolved Solids (TDS)			
Date	BECR Tanks	RHF Tank	GN Tank
01/14/15	350 mg/l	394 mg/l	417 mg/l
12/03/14	417 mg/l	552 mg/l	511 mg/l
10/01/14	538 mg/l	603 mg/l	594 mg/l
07/11/14	565 mg/l	597 mg/l	599 mg/l
03/05/14	586 mg/l	543 mg/l	566 mg/l
01/08/14	553 mg/l	559 mg/l	575 mg/l
10/28/13	677 mg/l	643 mg/l	594 mg/l

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The total hardness results tabulated below also show improved water quality as a result of reduced outdoor water usage and the ratio of reverse osmosis permeate to unfiltered water.

Total Hardness (as CaCO3)			
Date	BECR Tanks	RHF Tank	GN Tank
01/14/15	105.2 mg/l	123.0 mg/l	111.7 mg/l
12/03/14	115.3 mg/l	194.5 mg/l	169.8 mg/l
10/01/14	188.8 mg/l	231.7 mg/l	225.6 mg/l
07/11/14	221.5 mg/l	222.7 mg/l	220.4 mg/l
05/16/14	165.2 mg/l	209.6 mg/l	198.1 mg/l

For comparison, the hardness values are generally classified as:

Classification	Mg/l
Soft	0 – 60
Moderately hard	61 – 120
Hard	121 – 180
Very hard	GTE 181

Utility Billings and Energy Costs – TZA Water Engineers continue to track the United Power utility bills and associated water operations. For 2014, the District used 48% of the electricity and reduced its costs by 62% over the last two years.

Energy Usage (KWH)			
	2012 YTD	2013 YTD	2014 YTD
Alluvial Wells	59,143	42,466	38,829
RO WTP and BECR Pump Station	350,560	265,880	161,320
GN Pump Station	121,000	96,960	87,000
RHF Pump Station	162,880	114,720	46,480
Totals	**693,583**	**520,026**	**333.629**

Billing Amounts			
	2012 YTD	2013 YTD	2014 YTD
Alluvial Wells	$8,098.03	$5,164.37	$4,533.07
RO WTP and BECR Pump Station	$34,444.70	$20,767.40	$12,350.46
GN Pump Station	$14,034.16	$7,871.44	$7,094.38
RHF Pump Station	$17,463.16	$9,513.35	$4,226.58
Totals	**$74,040.05**	**$43,316.56**	**$28,204.49**

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Draft Storage Tank Rule – The Water Quality Control Division has drafted a Storage Tank Rule (https://docs.google.com/file/d/0B0tmPQ67k3NVUzAyd2dEekt5Tnc/edit) that will be considered by the Water Quality Control Commission in January of 2015 and will become effective January of 2016. In addition to quarterly periodic (visual) inspections, this rule will require comprehensive inspections to be scheduled at least every five years.

Warranty Inspections – Ramey Environmental Compliance is tracking the 11-month warranty inspections for the following projects:

- Rocking Horse Farms Pump Station – The warranty inspection was conducted by Jeff Rabas on July 18, 2014.
- Box Elder Creek Ranch Pump Station – The improvements were placed into service on March 13, 2014.
- Rocking Horse Farms Tank Repainting – The improvements were inspected and accepted on June 11, 2014.

Greatrock North Flow Meter – TZA Water Engineers is supporting Ramey Environmental Compliance with the procurement of a magnetic flow meters to replace the suspect and/or failed meters at the Greatrock North water facilities.

GE Power & Water
Water & Process Technologies

WATER ANALYSIS REPORT

4000170442
PURE WATER SOLUTIONS
520 D TOPEKA WAY
Castle Rock, CO
UNITED STATES 80109-3137

Sampled: 25-NOV-2014
Reported: 15-DEC-2014
Field Rep: Fleming, William
91005616

	FEED	PERMEATE	BRINE
	Y1205020	Y1205021	Y1205022
pH	7.8	6.7	8.0
Specific Conductance, at 25°C, µmhos	1100	123	3600
Alkalinity, "P" as $CaCO_3$, ppm	0	0	0
Alkalinity, "M" as $CaCO_3$, ppm	158	16.3	553
Sulfur, Total, as SO_4, ppm	149	6.4	510
Chloride, as Cl, ppm	156	22	468
Hardness, Total, as $CaCO_3$, ppm	295	12.0	1080
Calcium Hardness, Total, as $CaCO_3$, ppm	226	8.2	837
Magnesium Hardness, Total, as $CaCO_3$, ppm	67	3.8	239
Barium, Total, as Ba, ppm	0.08	0.005	0.28
Strontium, Total, as Sr, ppm	1.0	0.054	3.6
Copper, Total, as Cu, ppm	< 0.05	< 0.002	< 0.05
Iron, Total, as Fe, ppm	< 0.05	0.002	< 0.05
Sodium, as Na, ppm	102	18.6	321
Potassium, as K, ppm	6.6	1.1	22
Aluminum, Total, as Al, ppm	< 0.1	< 0.01	< 0.1

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	Y1205020	Y1205021	Y1205022
Manganese, Total, as Mn, ppm	< 0.01	< 0.005	< 0.01
Nitrate, as NO_3, ppm	17.9	6.9	
Phosphate, Total, as PO_4, ppm	0.5	< 0.4	
Phosphate, Ortho-, as PO_4, ppm	< 0.2	< 0.2	
Silica, Total, as SiO_2, ppm	19.9	3.2	63
Fluoride, as F, ppm	0.8	0.1	
Carbon, Total Organic, as C, ppm	2.0	< 1	
Turbidity, NTU	0.1	< 0.1	