TZA Water Engineers
a Lamp Rynearson Company

12596 W. Bayaud Ave., Ste. 330
Lakewood, Colorado 80228
303-971-0030
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GREATROCK NORTH WATER AND SANITATION DISTRICT
ENGINEER'S REPORT
OCTOBER 25, 2015

Concentrate Management Options

As noted at the April 2015 Board meeting, we have shifted our attention from concentrate disposal to concentrate management and are looking at several options. The GridBee mixing equipment to enhance evaporation has been tabled due to questionable case history and additional cost considerations. The beneficial reuse applications by Industrial Water Permitting and Recycling have been placed on hold in light of limited use of any State approvals. In August of 2015, the Board and Altela, Inc. executed a Letter of Intent for establishing a Charter Customer Relationship with respect to the site development, installation, and related systems integration of an AltelaRain Reserve Osmosis Wastewater Concentrator Asset Recovery Facility.

Based upon the Letter of Intent, dated August 7, 2015, and executed by Altela, Inc. on August 17, 2015, the District has initiated efforts on a number of fronts, including:

- Application for a Preliminary Effluent Limitation (PEL) Determination – The PEL request was submitted to the Water Quality Control Division (Division) via e-mail on September 2, 2015, and a hard copy mailed to the Division that day. The Division acknowledged receipt of the hard copy on September 8. The District received an invoice from the Division for the PEL determination on September 22. Payment was remitted on September 24. The Division's intent is to prepare the PEL within 45 days, beginning with receipt of a complete application and receipt of payment. On October 23, a representative of the Division, Jennifer Charles, and I spoke regarding the PEL request and I provided her with information regarding the District's 8 ground water wells.
- Application for an Industrial Individual Wastewater Discharge Permit – The application was submitted to the Division on September 24. On September 28, the Division acknowledged receipt of a complete application via e-mail.
- Conceptual Floorplan Revisions – I have produced a more detailed conceptual floor plan, taking into consideration an office/meeting room, an operations office, a small lab, a restroom, a chemical room, a room for the distribution pumps, a boiler room, and floor space for two (2) reverse osmosis units, and two (2) AltelaRain units. WE are getting a variety of cost estimates ($30 to $50 per square foot) from the structure/concrete associated with the conceptual building. We will need to refine the costs estimates, and account for the costs of doors, windows, interior finishes, mechanical/electrical, etc.

Engineer's Report
October 25, 2015
Page Two

- Water Testing – Shipping costs from Red Line Transport have been quoted and are more favorable than Altela's shipping company. Altela has indicated the shipping totes do have salvage value, but the District needs to determine if it wants to keep the totes. Brad spoke with Altela regarding offloading/tankage arrangements and we will need to coordinate the delivery. Three (3) 330-gallon totes have been procured and are being cleaned by John at his house. Brad will coordinate the water collection and shipping arrangements with Ramey, Red Line, and Altela pending installation and operation of the new RO membranes.
- Adams County Planning Department/Building Department Requirements – Based upon a September 18, 2015 telephone conversation with Adams County Planning, the proposed facility will require a major amendment to the PUD. The vacation of the lot line between Tracts C and F will require a plat correction. Both of these will require a public hearing but can be processed concurrently.

As for the evaporation ponds, attached is a memo from Lauren Goecke summarizing the evaporation pond activity, including a graph of documented pond levels in 2014 and 2015.

Greatrock North Pump Station Improvements

The design of the Greatrock North Pump Station Improvements has been put on temporary hold and may be combined for bidding purposes with the new water treatment facility being contemplated.

Alluvial Well Flow Meter Verifications

On September 4, 2015, TZA Water Engineers tested the accuracy of the flow meters for the two (2) alluvial wells. Copies of the reports to be filed with the Division of Water Resources have been provided to Jeff Rabas. Copies of the signed reports are attached.

2016 Water Rates

TZA Water Engineers has conducted a review of the District's water rates as part of the 2016 budget process, and has updated the model based upon the revised budget. I will present my recommendations to the District Manager in advance of the November Board meeting.

Other Activities

<u>Water Quality and Hardness</u> – TZA is tracking the water production data and water quality results from a series of sampling events. Attached is a memo from Lauren Goecke summarizing the water production data, water quality results, and water treatment plant observations.

Engineer's Report
October 25, 2015
Page Two

Reverse Osmosis Condition Assessment – Pure Water Solutions conducted a condition assessment on May 27, 2015 and presented its findings and recommendations to the District on June 12. Those recommendations were discussed at the July Board meeting and my recommendation was that we delay any action on their recommendations pending receipt of additional information from Pure Water Solutions. In response to my request for additional information, Pure Water Solutions indicated the following:

- The sensors are the windows into the system and the replacements are a suggestion. However, maintaining the sensor calibrations helps document the overall RO unit operation.
- They do not have confidence in the current anti-scale chemical and dosing system.
- New membranes will make all the difference in the world.
- Accurate process readings, along with correct chemical and dosing, will helps improve on over-all recovery, but the exact percentages are to-be-determined.
- Lead times on membranes vary from in-stock to 8-10 weeks.

TZA recently accompanied Jeff Rabas and Worth Hydrochem on an inspection of the RO water treatment plant. Based upon the on-site meeting with the Worth Hydrochem representative, the District is changing its anti-scalant product and will be procuring and installing new membranes per the attached memo, dated September 23, 2015.

Storage Tank Rule – The Water Quality Control Division has adopted a new version of the Colorado Primary Drinking Water Regulations (Regulation 11). Effective April 1, 2016, the District will be required to have a written plan for finished water storage tank inspections. In addition to quarterly periodic (visual) inspections, the District will need comprehensive inspections to be scheduled at least every five years. Jeff Rabas has been securing proposals for the comprehensive inspections.

New Chlorine Residual Requirements – The Water Quality Control Division has adopted a new version of the Colorado Primary Drinking Water Regulations (Regulation 11). Effective April 1, 2016, the District will be required to maintain a minimum of 0.20 milligrams per liter chlorine residual throughout the distribution system. Ramey Environmental Compliance will record chlorine residuals at the extents of the distribution system for each subdivision on a periodic basis throughout the remainder of 2015, and Jeff Rabas and I will review the data in November of this year.

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 warranty inspection was conducted by Brad Simons on January 26, 2015.

Engineer's Report
October 25, 2015
Page Four

- Rocking Horse Farms Tank Repainting – The improvements were inspected and accepted on June 11, 2014. A preliminary warranty inspection was conducted by Ramey Environmental Compliance on April 24, 2015 and Coblaco addressed some minor surface rust and some isolated coating repairs on August 5, 2015.

Utility Billings and Energy Costs – TZA is tracking the United Power utility bills and associated water operations on a monthly basis. Attached is a memo from Lauren Goecke summarizing the monthly comparisons for July each year, as well as a summary of the eight-month periods for 2014 and 2015.

Curb Stop Box Specification – The recent issues with curb stop boxes witnessed by Director Wyckoff resulted in a review of the District's Rules and Regulations and the boxes specified. TZA's previous recommendations for a screw-style Buffalo-style box having an arch pattern base and an inside diameter of 2.5 inches has been further reinforced with the recommendation the pending revisions to the Rules and Regulations specify a 6500 Series Screw Type curb box, as manufactured by Castings, Inc. (970-243-3032), having a minimum internal diameter of 2.25 inches, or an approved equal. The part number is "C.I. 95-E" and includes a 30" top section and a 39" bottom section allowing for a bury depth of 41 inches to 64 inches. For deeper installations, Castings Inc. offers extensions in 9" (Item 151), 16" (Item 152), 28" (Item 153), and 30" (Item 154) heights.

Well, Pump, and Motor Replacements – The District has 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 will need to work with Bishop-Brogden Associates to compile the historical aspects of the wells constructed, the pumps installed, and any other improvements (i.e. water level measuring devices) integrated at each site. This information will be used to evaluate 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.

Engineer's Report
October 25, 2015
Page Five

Control Valves Evaluation – During the 3rd Quarter Operational Review Meeting, conducted on August 17, 2015, it was determined the District should develop a control valve evaluation plan. As the Board may recall, the District contracted with iSiWest in 2014 (July 14-15 and September 19), to inspect and service five (5) control valves, including one (1) at the Box Elder Creek Ranch Pump Station, one (1) at Rocking Horse Farms Pump Station, and three (3) at the Greatrock North Pump Station. On March 6, 2015, the District contracted with Ramey Environmental Compliance's Equipment Services Division to service one (1) pressure relief valve at the Box Elder Creek Ranch Water Treatment Plant. Since the District has an assortment of valves in a variety of locations throughout the District, REC will update the valve inventory in the Allmax software and work with Lisa Johnson, TZA, and the budget committee to prioritize the efforts for 2016 and beyond. A sample of the valves that could be addressed in the Box Elder Creek Ranch Pump Station are tabulated below.

Valve Location	Valve Type	Valve Size
UKA-3 Check	Cla-Val Hytrol	2"
UKA-3 Air/Vacuum	Val-Matic	1/2"
UKA-3 CRL	Cla-Val Pressure Relief	1/2"
LFH-3 Check	Cla-Val Hytrol	3"
LFH-3 Pressure Relief	Cla-Val Series 50	1-1/2"
LFH-3 CRL	Cla-Val Pressure Relief	1/2"
LFH-3 Air/Vacuum	Cla-Val Series 35	1/2"
Alluvial Wells Air/Vacuum	Cla-Val Series 35	2"

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MEMORANDUM

To: Lisa Johnson, District Manager

From: Lauren Goecke, EI

Date: October 23, 2015

Re: Greatrock North Water and Sanitation District – Concentrate Management

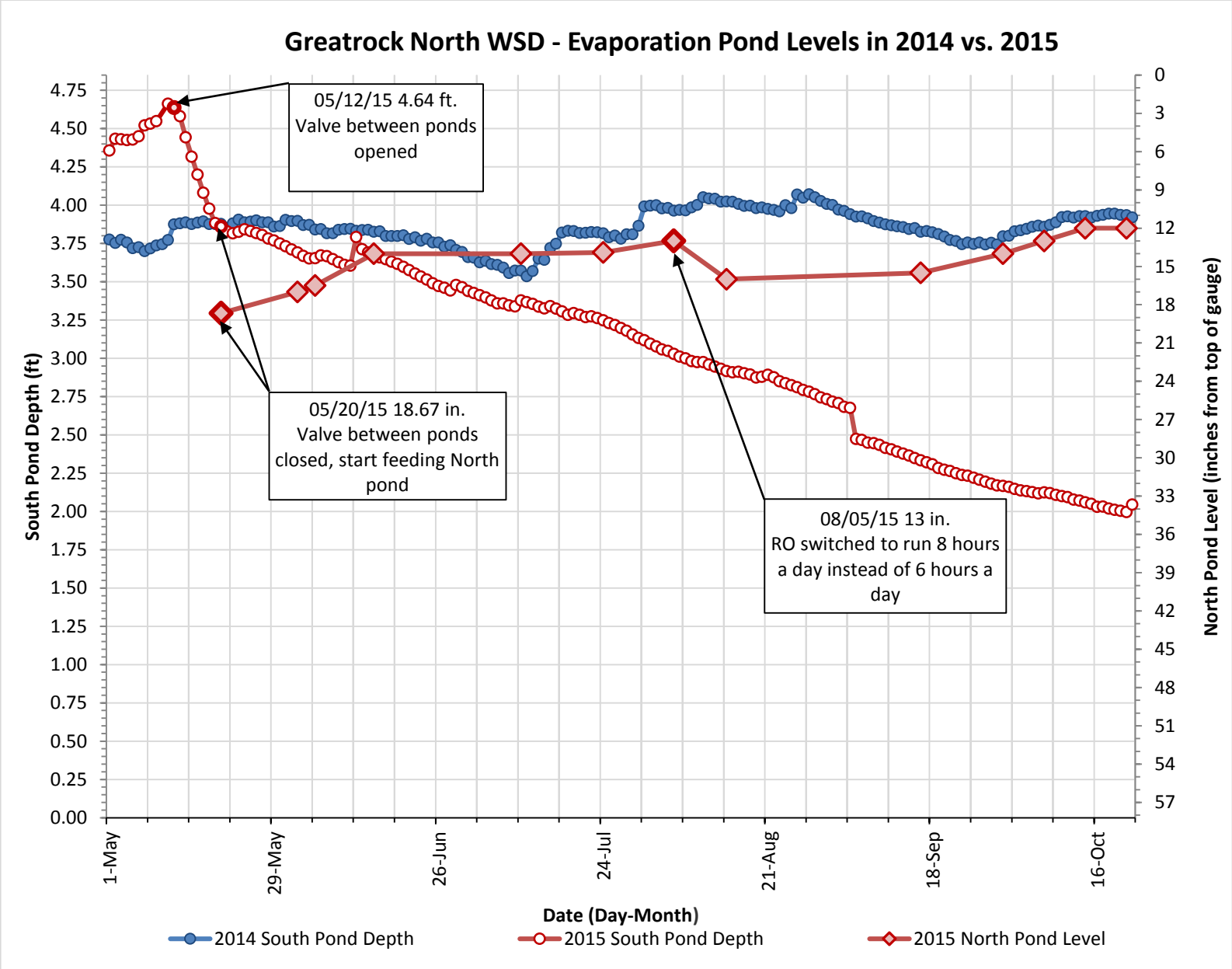
Project No.: 0414018.01-002

Evaporation Pond Summary: The south pond elevation was at 4.66 feet on May 11, 215 – an estimated 6 inches from overtopping the pond. The valve between the ponds was opened on May 12, 2015 to transfer water from the south pond to the north pond. The south pond was isolated on May 20, 2015 with a water elevation of 3.86 feet and the concentrate flows were directed to the north pond. The elevations in the south pond are tabulated below. Jeff Rabas is also providing the north pond elevations from visual observations of a temporary staff gauge, also tabulated below.

Date	South Pond Depth (feet, from daily SCADA report)
May 25, 2015	3.83
June 29, 2015	3.48
July 27, 2015	3.20
August 23, 2015	2.85
September 20, 2015	2.27
October 22, 2015	2.04

Date	North Pond Measurement (inches, from top of gauge)
May 20, 2015	18”(+)
June 3, 2015	17”
June 8, 2015	16.5”
June 15, 2015	14”
July 10, 2015	14”
July 24, 2015	13.9”
August 5, 2015	13”
August 14, 2015	16”
September 16, 2015	15.5”
September 30, 2015	14”
October 7, 2015	13”
October 14, 2015	12”
October 21, 2015	12”

The graph on the following page shows a comparison of the south pond levels in 2014, the south pond levels in 2015, and the north pond levels in 2015.


Greatrock North WSD - Evaporation Pond Levels in 2014 vs. 2015
05/12/15 4.64 ft.
Valve between ponds opened
05/20/15 18.67 in.
Valve between ponds closed, start feeding North pond
08/05/15 13 in.
RO switched to run 8 hours a day instead of 6 hours a day
South Pond Depth (ft)
North Pond Level (inches from top of gauge)
Date (Day-Month)
1-May
29-May
26-Jun
24-Jul
21-Aug
18-Sep
16-Oct
2014 South Pond Depth
2015 South Pond Depth
2015 North Pond Level

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S. Platte River – Division 1 970-352-8712 Fax 970-392-1816
810 9th Street, 2nd Floor, Greeley, CO 80631 dnr_div1spgwm@state.co.us
Republican River – Division 1 970-352-8712 Fax 970-392-1816
810 9th Street, 2nd Floor, Greeley, CO 80631 dnr_div1rrgwm@state.co.us
Arkansas River – Division 2 719-542-3368 Fax 719-544-0800
310 E. Abriendo, Suite B, Pueblo, CO 81004
Rio Grande River – Division 3 719-589-6683 Fax 719-589-6685
P.O. Box 269, 301 Murphy Drive, Alamosa, CO 81101
Designated Basins – Division 8 303-866-3581 Fax 303-866-2223
1313 Sherman St. Rm. 818, Denver, CO 80237

For Office Use Only

☐ Passed ☐ Failed

☐ Variance Approved

Date of variance _____

NOTICE OF TOTALIZING FLOW METER RE-VERIFICATION, INSTALLATION OR REPLACEMENT

Check appropriate box

☐ To be filed in Compliance with Rule 16.5 of the Rules Governing the Measurement of Tributary Ground Water Diversions in the **Republican River Basin (Complete pages 1-6)**

☐ To be filed in Compliance with Rules 3.1 of the Amended Rules Governing the Measurement of Tributary Ground Water Diversions in the **Arkansas River Basin (Complete pages 1-5)**

☐ To be filed in Compliance with Rule 3.1 of the Rules Governing the Measurement of Tributary Ground Water Diversions in the **Rio Grande River Basin (Complete pages 1-5)**

☐ To be filed in Compliance with the Ground Water Commission Rules Governing **Designated Basins (Complete pages 1-5)**

☒ To be filed in Compliance with Rule 3.1 of the Rules Governing the Measurement of Tributary Ground Water Diversions in the **South Platte River Basin (Complete pages 1-5)**

Reason for meter verification (Check all that apply):

☒	Re-Verify Previously Verified TFM		**The following MUST be provided for new & replaced meters**		
☐	New TFM (No previous meter)		Date New TFM installed:		
☐	Replacing Previous TFM (also complete area at right)		Date Previous TFM removed:		
	Previous TFM Serial No.:		Previous TFM Reading (Estimate required if not readable):		
☐	Change in Measurement Method from:	Hour Meter ☐	Slave Meter ☐	Power Co Meter ☐	Previous Meter SN
☐	Register seal replaced due to:	New Seal No.	Old Seal No.	TFM Reading	K-Factor (Test req'd. if changed)
☐	Sensor / meter seal replaced due to:	New Seal No.	Old Seal No.	TFM Reading	

Contact Information:

Well Owner			User (if not same as well owner)		
Name Greatrock North Water + Sanitation Dist.			Name		
Mailing Address 141 Union Blvd., Ste. 150			Mailing Address		
City Lakewood	State CO	Zip 80228	City	State	Zip
Phone	Email		Phone	Email	

Well Information and Location (Provide Permit No. and/or Case or Decree No. if no WDID exists or is not known)
Visit Aquamap to find well information: http://water.state.co.us/DataMaps/GISandMaps/AquaMap/Pages/default.aspx

WDID	Permit No.	Water Court Case No.	Location (¼,¼, Sec., T., R., PM)	Well GPS Coordinates must be in NAD83, UTM Zone 12/13N Northing	Easting
0109983	63024-F		NW, SE, 1, 1S, 65W, 6th	4426804	533125

Power Supply

☒ Electric ☐ Artesian ☐ Solar ☐ Windmill ☐ Fossil Fuel ☐ Other (describe):

Provide the following if the well's power supply is electric:

Power Company Name United	Power Company Service No. 1546692	Meter Manufacturer Ekter	Manufacturer's Serial No. 18318991
Power Company Meter Reading on Date of Test (including all rotating and leading zeroes): 02578		Multiplier 1	Number of Rotating Digits: 5

Uses on power company meter:

Does the same Power Company Meter serve other devices, including other wells/pumps? If yes, describe system.

☒ Yes ☐ No Provides power to both Greatrock North alluvial wells

INSTALLED TFM INFORMATION

Manufacturer: McCrometer		Model No.: —	Meter GPS Coordinates (If not same as well coordinates) NAD83 UTM Zone 12/13N
	Serial No.	Reading on Test Date	
Sensor/Meter	MX05 - 0490	1521940	Northing:
Register			Easting:
Meter Type: Magnetic	Meter Size: 3"	Multiplier: 1	No. of recording digits: 7

Meter Units

☒ Gallons ☐ Acre Feet ☐ Cubic Feet ☐ Other, describe:

Meter Orientation	Diameters of Straight Pipe		Diameter of Discharge Pipe	
	Upstream	Downstream	ID	OD
☒ Horizontal ☐ Vertical	6	6	2.86"	3.50"

Is the meter installed to manufacturer's specifications? ☐ Yes ☒ No If no, explain: no enough straigh run upstream

TEST METER INFORMATION

Test Meter Manufacturer:	Test Meter Serial Number:	Date of Last Calibration:
SIEMENS	019516	9/11/2014

Meter Orientation	Pipe Wall Thickness	Diameters of Straight Pipe		Diameter of Discharge Pipe	
		Upstream	Downstream	ID	OD
☒ Horizontal ☐ Vertical	0.32"	4	4	2.86"	3.50"

Verification of Installed Meter (if more than one meter tested for same discharge, show all tests. Use second sheet if necessary):

Date of Test:	Time of Test (Begin):	Length of time pump has been running prior to Tester's arrival:
9/4/2015	1:30 pm	1 : 30 (HH:MM)

Test Meter Calculations (Show All Work)

Collins Gauge: GPM Factor: _____ Stop Clamp Settings: _____
Ultrasonic Tranducer Space Settings: 0.41"

start: 46.77 kgal
stop: 49.26 kgal
ΔV = 2490 gal
Δt = 15 min

$$\frac{\Delta V}{\Delta t} = \frac{2490 \text{ gal}}{15 \text{ min}} = 166 \text{ gpm}$$

Installed Meter Calculations (Show All Work)

start: 1521940 gal x100
stop: 1521963 gal x100
ΔV = 2300 gal
Δt = 15 min

$$\frac{\Delta V}{\Delta t} = \frac{2300 \text{ gal}}{15 \text{ min}} = 153.33 \text{ gpm}$$

ExistingK-factor _____
Adjusted K-factor_____
Flow rate with Collins tube removed:

(Show Q to the nearest 0.00 GPM) Avg QT: 166.00

(Show Q to the nearest 0.00 GPM) Avg QI: 153.33

Correction Factor = AVG **QT** 166.00 / AVG **QI** 153.33 = 1.083 Shown to the nearest 0.000

If Correction Factor is:	Div. 1, Div. 2 and Republican River Correction Factor Policies	Div. 3 Correction Factor Policies
0.950 to 1.050	**Test will be valid for a maximum of four years.** The installed TFM is in accurate working condition. *No Request for Variance is required.* No Correction Factor is Applied to determine diversions.	
0.920 to 0.949 OR 1.051 to 1.080	**Test will be valid for a maximum of four years.** The Variance Request to Use Correction Factor portion of this Form must be completed and signed by the Owner/User. *Note: A Correction Factor will be applied to determine diversions.	**May** grant a request for a variance to allow the use of a Correction Factor. **Test will be valid for one year** from the date of the test. A variance will be allowed for a maximum of three years, after which the TFM must be repaired or replaced AND a new Test conducted. That Test must confirm accuracy within ±5.0%. The Variance Request to Use Correction Factor for TFM portion of this Form must be completed and signed by the Owner/User. *Note: A Correction Factor will be applied to determine diversions.
0.900 to 0.919 OR 1.081 to 1.100	**Test will be valid for one year only.** No later than one year from the date of this Test the installed TFM must be repaired or replaced AND a new test conducted that confirms an accuracy of within ±5.0%. The Variance Request to Use Correction Factor portion of this Form must be completed and signed by the Owner/User. *Note: A Correction Factor will be applied to determine diversions.	**Test will be rejected** and the installed TFM must be repaired or replaced AND a new Test conducted. The second Test must confirm an accuracy of within ±5.0%. If TFM fails test and is re-calibrated (k-factor modified), show failed Test, indicate below k-factor before and after, AND show new test on additional duplicate page (include failed and passed test page 3).
<0.900 OR >1.100	Test will be **rejected** and the installed TFM must be repaired or replaced AND a new Test conducted.	

Uses through this totalizing flow meter:

Does well have multiple discharges measured through TFM? ☐ Yes ☒ No

Check all that apply: ☐ Open ☒ Pressure ☐ Artesian ☐ Other

Use this space to describe all discharges Well discharges to Greatrock North RO plant

Meter Testing:

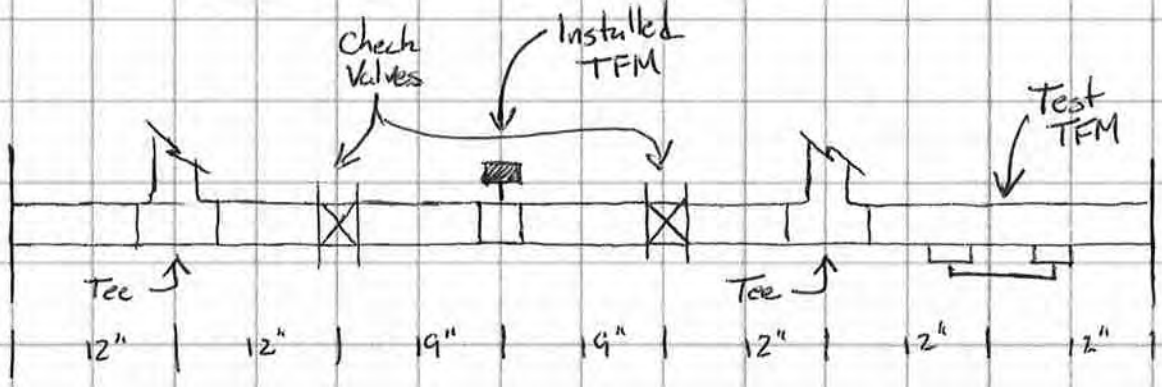
How was the well/meter tested with test equipment (open discharge, pressure, or more than one way)?

Show information in detailed sketch on next page or as an attachment

Meter was tested with a SIEMENS clamp-on ultrasonic test meter.

Detailed Sketch:

Show total system from pump to discharge, other pumps in the same well, and electrical system including other devices on the same meter. Show where test meter and pressure gauge were placed and how system was modified to perform test. Show measurements. In addition to sketch, an attached photograph is recommended.



Detailed description of system under normal operating conditions. (Example: One well pumps to two sprinklers. Each sprinkler has an end gun that operates when the sprinkler is operating.) Include number of irrigated acres.

One well pumps to an RO plant.

Tester Verification

I, the undersigned, state that I am currently a person approved by the State Engineer to conduct well tests pursuant to the Rules Governing the Measurement of Ground Water Diversions as indicated on page 1 of this form. I have determined the installed Totalizing Flow Meter to either be in accurate working condition as defined by the Rules indicated on page 1 of this form **OR** have advised the Owner/User to complete the Variance Request below of this form.

I understand that "accurate working condition" is determined when the indicated flow through the Installed Meter is within plus or minus 5% of an independent field measurement made using Calibrated Test Equipment. I understand that falsifying the accuracy and/or condition of a Totalizing Flow Meter can subject me to a fine of up to $500.00.

Signature of Tester: Nathan T Baker Date 9/4/2015

Tester Name, Company, Phone, Email

Name: Nathan T Baker	Company Name: TZA Water Engineers
Phone: 303-971-0030	Email: nbaker@tza4water.com

VARIANCE REQUEST TO ALLOW A CORRECTION FACTOR To be used when calculating use with the installed TFM:

I request a Variance to allow the use of the Correction Factor. I understand that a Variance WILL NOT be issued to allow a Correction Factor for a Totalizing Flow Meter (TFM) if the inaccuracy is due to the TFM or appurtenances being intentionally damaged or modified by the owner and/or user of the well/meter.

I understand that the Correction Factor as computed by the above Qualified Well Tester will be verified by or revised by the Division of Water Resources and that final Correction Factor will be applied to ALL use records until the TFM is repaired/replaced and/or a new test conducted for this Well.

I understand and agree to the required conditions of the variance as indicated below:

Division 1 , Division 2 or Republican River Basin (Check only one)

☐	If Correction Factor is between 0.920 to 0.949 or is between 1.051 to 1.080, the Test will be valid for no more than **four years**. The Correction Factor will be applied to determine diversions from the well.
☒	If Correction Factor is between 0.900 to 0.919 or is between 1.081 to 1.100, the Test will be valid **one year**. No later than one year from the date of this Test, a new Measurement Test must be conducted and the accuracy of the new Test must be within ±5.0%. The Correction Factor will be applied to determine diversions from the well. Further, I acknowledge that repair and/or replacement of this Meter and/or portions of the Discharge System is required within that one year AND I agree to make the necessary changes within that time.

Division 3

☐	If Correction Factor is between 0.920 to 0.949 or 1.051 to 1.080, **and** Division 3 approves this Variance Request, the Test will be valid for no more than **one year**. A new variance including new correction factor computed by a Qualified Well Tester shall be required each year thereafter. A variance will only be allowed for TFM for a maximum of three years. After three years the TFM must be repaired or replaced and working within the required ± 5%. The Correction Factor will be applied to determine diversions from the well.

For Electrically Powered Wells/Pumps, I agree to the release of information pertaining to my Electric Service and Use, including Current Transformer Factor (Ct), Voltage/Potential Transformer Factor (Pt) and Electric Meter Readings, to the Colorado Division of Water Resources by my electric supplier for the purposes of determining or verifying Water Use from the Well/Pump.

The above information is true to the best of my knowledge. I understand that falsifying the accuracy and/or condition of a Totalizing Flow Meter can subject me to a fine of up to $500.00. If any Variance is requested on my behalf to apply a Correction Factor to my TFM, I agree to such Variance.

I am the ☐Well Owner OR ☐Well User

Signature of Well Owner/User Date 9/18/15

Print Name of Well Owner/User Jeff Nabors

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S. Platte River – Division 1 970-352-8712 Fax 970-392-1816
810 9th Street, 2nd Floor, Greeley, CO 80631 dnr_div1spgwm@state.co.us
Republican River – Division 1 970-352-8712 Fax 970-392-1816
810 9th Street, 2nd Floor, Greeley, CO 80631 dnr_div1rrgwm@state.co.us
Arkansas River – Division 2 719-542-3368 Fax 719-544-0800
310 E. Abriendo, Suite B, Pueblo, CO 81004
Rio Grande River – Division 3 719-589-6683 Fax 719-589-6685
P.O. Box 269, 301 Murphy Drive, Alamosa, CO 81101
Designated Basins – Division 8 303-866-3581 Fax 303-866-2223
1313 Sherman St. Rm. 818, Denver, CO 80237

For Office Use Only

☐ Passed ☐ Failed

☐ Variance Approved

Date of variance _____

NOTICE OF TOTALIZING FLOW METER RE-VERIFICATION, INSTALLATION OR REPLACEMENT

Check appropriate box

☐ To be filed in Compliance with Rule 16.5 of the Rules Governing the Measurement of Tributary Ground Water Diversions in the **Republican River Basin (Complete pages 1-6)**

☐ To be filed in Compliance with Rules 3.1 of the Amended Rules Governing the Measurement of Tributary Ground Water Diversions in the **Arkansas River Basin (Complete pages 1-5)**

☐ To be filed in Compliance with Rule 3.1 of the Rules Governing the Measurement of Tributary Ground Water Diversions in the **Rio Grande River Basin (Complete pages 1-5)**

☐ To be filed in Compliance with the Ground Water Commission Rules Governing **Designated Basins (Complete pages 1-5)**

☒ To be filed in Compliance with Rule 3.1 of the Rules Governing the Measurement of Tributary Ground Water Diversions in the **South Platte River Basin (Complete pages 1-5)**

Reason for meter verification (Check all that apply):

☒	Re-Verify Previously Verified TFM		**The following MUST be provided for new & replaced meters**		
☐	New TFM (No previous meter)		Date New TFM installed:		
☐	Replacing Previous TFM (also complete area at right)		Date Previous TFM removed:		
	Previous TFM Serial No.:		Previous TFM Reading (Estimate required if not readable):		
☐	Change in Measurement Method from:	Hour Meter ☐	Slave Meter ☐	Power Co Meter ☐	Previous Meter SN
☐	Register seal replaced due to:	New Seal No.	Old Seal No.	TFM Reading	K-Factor (Test req'd. if changed)
☐	Sensor / meter seal replaced due to:	New Seal No.	Old Seal No.	TFM Reading	

Contact Information:

Well Owner			User (if not same as well owner)		
Name Greatrock North Water + Sanitation Dist.			Name		
Mailing Address 141 Union Blvd., Ste. 150			Mailing Address		
City Lakewood	State CO	Zip 80228	City	State	Zip
Phone	Email		Phone	Email	

Well Information and Location (Provide Permit No. and/or Case or Decree No. if no WDID exists or is not known)
Visit Aquamap to find well information: http://water.state.co.us/DataMaps/GISandMaps/AquaMap/Pages/default.aspx

WDID	Permit No.	Water Court Case No.	Location (¼,¼, Sec., T., R., PM)	Well GPS Coordinates must be in NAD83, UTM Zone 12/13N Northing	Easting
0609984	67146-F	04CW247	SW, NE, 1, 1S, 65W, 6th	4427104	533324

Power Supply

☒ Electric ☐ Artesian ☐ Solar ☐ Windmill ☐ Fossil Fuel ☐ Other (describe):

Provide the following if the well's power supply is electric:

Power Company Name United	Power Company Service No. 1546692	Meter Manufacturer Elster	Manufacturer's Serial No. 18318991
Power Company Meter Reading on Date of Test (including all rotating and leading zeroes): 02578		Multiplier 1	Number of Rotating Digits: 5

Uses on power company meter:

Does the same Power Company Meter serve other devices, including other wells/pumps? If yes, describe system.

☒ Yes ☐ No Provides power to both Greatrock North alluvial wells

INSTALLED TFM INFORMATION

Manufacturer	ABB	Model No.	—
	Serial No.	Reading on Test Date	Meter GPS Coordinates (If not same as well coordinates) NAD83 UTM Zone 12/13N
Sensor/Meter	3K620000003949	77656630	Northing:
Register			Easting:
Meter Type: Magnetic	Meter Size: 3"	Multiplier: 1	No. of recording digits: 8

Meter Units

☒ Gallons ☐ Acre Feet ☐ Cubic Feet ☐ Other, describe:

Meter Orientation	Diameters of Straight Pipe		Diameter of Discharge Pipe	
	Upstream	Downstream	ID	OD
☒ Horizontal ☐ Vertical	6	6	2.86"	3.5"

Is the meter installed to manufacturer's specifications? ☒ Yes ☐ No If no, explain:

TEST METER INFORMATION

Test Meter Manufacturer:	Test Meter Serial Number:	Date of Last Calibration:
SIEMENS	U19596	9/11/2014

Meter Orientation	Pipe Wall Thickness	Diameters of Straight Pipe		Diameter of Discharge Pipe	
		Upstream	Downstream	ID	OD
☒ Horizontal ☐ Vertical	0.32"	4	4	2.86"	3.50"

Verification of Installed Meter (if more than one meter tested for same discharge, show all tests. Use second sheet if necessary):

Date of Test:	Time of Test (Begin):	Length of time pump has been running prior to Tester's arrival:
9/4/2015	12:00 pm	0 : 15 (HH:MM)

Test Meter Calculations (Show All Work)

Collins Gauge: GPM Factor: _____ Stop Clamp Settings: _____
Ultrasonic Tranducer Space Settings: 0.41"

start: 43.96 kgal
stop: 46.19 kgal
ΔV = 2230 gal
Δt = 20 min

$$\frac{\Delta V}{\Delta t} = \frac{2230\text{ gal}}{20\text{ min}} = 111.5\text{ gpm}$$

Installed Meter Calculations (Show All Work)

start: 77656630 gal
stop: 77658890 gal
ΔV = 2260 gal
Δt = 20 min

$$\frac{\Delta V}{\Delta t} = \frac{2260\text{ gal}}{20\text{ min}} = 113\text{ gpm}$$

Existing K-factor _____
Adjusted K-factor _____
Flow rate with Collins tube removed:

(Show Q to the nearest 0.00 GPM) Avg QT: 111.50

(Show Q to the nearest 0.00 GPM) Avg QI: 113.00

Correction Factor = AVG QT 111.50 / AVG QI 113.00 = 0.987 Shown to the nearest 0.000

If Correction Factor is:	Div. 1, Div. 2 and Republican River Correction Factor Policies	Div. 3 Correction Factor Policies
0.950 to 1.050	**Test will be valid for a maximum of four years.** The installed TFM is in accurate working condition. *No Request for Variance is required.* No Correction Factor is Applied to determine diversions.	
0.920 to 0.949 OR 1.051 to 1.080	**Test will be valid for a maximum of four years.** The Variance Request to Use Correction Factor portion of this Form must be completed and signed by the Owner/User. *Note: A Correction Factor will be applied to determine diversions.	**May** grant a request for a variance to allow the use of a Correction Factor. **Test will be valid for one year** from the date of the test. A variance will be allowed for a maximum of three years, after which the TFM must be repaired or replaced AND a new Test conducted. That Test must confirm accuracy within ±5.0%. The Variance Request to Use Correction Factor for TFM portion of this Form must be completed and signed by the Owner/User. *Note: A Correction Factor will be applied to determine diversions.
0.900 to 0.919 OR 1.081 to 1.100	**Test will be valid for one year only.** No later than one year from the date of this Test the installed TFM must be repaired or replaced AND a new test conducted that confirms an accuracy of within ±5.0%. The Variance Request to Use Correction Factor portion of this Form must be completed and signed by the Owner/User. *Note: A Correction Factor will be applied to determine diversions.	**Test will be rejected** and the installed TFM must be repaired or replaced AND a new Test conducted. The second Test must confirm an accuracy of within ±5.0%. If TFM fails test and is re-calibrated (k-factor modified), show failed Test, indicate below k-factor before and after, AND show new test on additional duplicate page (include failed and passed test page 3).
<0.900 OR >1.100	Test will be **rejected** and the installed TFM must be repaired or replaced AND a new Test conducted.	

Uses through this totalizing flow meter:

Does well have multiple discharges measured through TFM? ☐ Yes ☒ No

Check all that apply: ☐ Open ☒ Pressure ☐ Artesian ☐ Other

Use this space to describe all discharges Well discharges to Greatrock North RO plant.

Meter Testing:

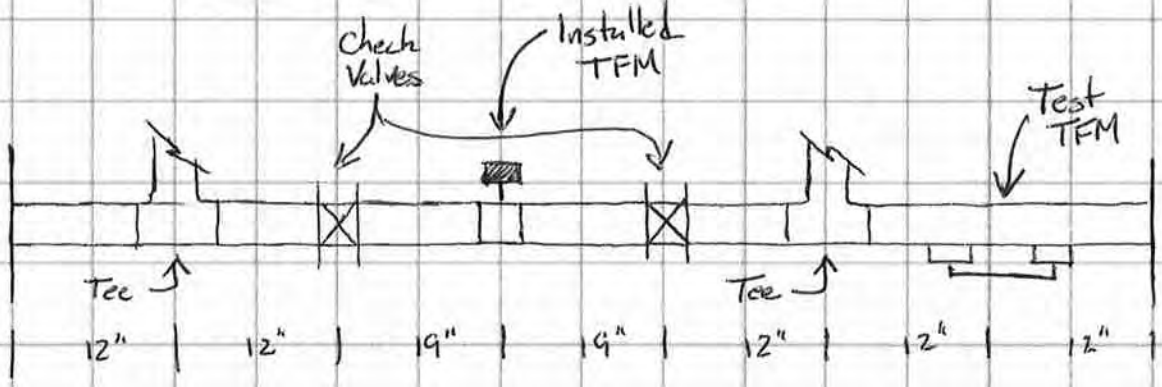
How was the well/meter tested with test equipment (open discharge, pressure, or more than one way)?

Show information in detailed sketch on next page or as an attachment

Meter was tested with a SIEMENS ultrasonic meter.

Detailed Sketch:

Show total system from pump to discharge, other pumps in the same well, and electrical system including other devices on the same meter. Show where test meter and pressure gauge were placed and how system was modified to perform test. Show measurements. In addition to sketch, an attached photograph is recommended.



Detailed description of system under normal operating conditions. (Example: One well pumps to two sprinklers. Each sprinkler has an end gun that operates when the sprinkler is operating.) Include number of irrigated acres.

One well pumps to an RO plant.

Tester Verification

I, the undersigned, state that I am currently a person approved by the State Engineer to conduct well tests pursuant to the Rules Governing the Measurement of Ground Water Diversions as indicated on page 1 of this form. I have determined the installed Totalizing Flow Meter to either be in accurate working condition as defined by the Rules indicated on page 1 of this form **OR** have advised the Owner/User to complete the Variance Request below of this form.

I understand that "accurate working condition" is determined when the indicated flow through the Installed Meter is within plus or minus 5% of an independent field measurement made using Calibrated Test Equipment. I understand that falsifying the accuracy and/or condition of a Totalizing Flow Meter can subject me to a fine of up to $500.00.

Signature of Tester: Nathan T Baker Date 9/4/2015

Tester Name, Company, Phone, Email

Name: Nathan T Baker	Company Name: TZA Water Engineers
Phone: 303-971-0030	Email: nbaker@tza4water.com

VARIANCE REQUEST TO ALLOW A CORRECTION FACTOR To be used when calculating use with the installed TFM:

I request a Variance to allow the use of the Correction Factor. I understand that a Variance WILL NOT be issued to allow a Correction Factor for a Totalizing Flow Meter (TFM) if the inaccuracy is due to the TFM or appurtenances being intentionally damaged or modified by the owner and/or user of the well/meter.

I understand that the Correction Factor as computed by the above Qualified Well Tester will be verified by or revised by the Division of Water Resources and that final Correction Factor will be applied to ALL use records until the TFM is repaired/replaced and/or a new test conducted for this Well.

I understand and agree to the required conditions of the variance as indicated below:

Division 1 , Division 2 or Republican River Basin (Check only one)

☐	If Correction Factor is between 0.920 to 0.949 or is between 1.051 to 1.080, the Test will be valid for no more than **four years**. The Correction Factor will be applied to determine diversions from the well.
☐	If Correction Factor is between 0.900 to 0.919 or is between 1.081 to 1.100, the Test will be valid **one year**. No later than one year from the date of this Test, a new Measurement Test must be conducted and the accuracy of the new Test must be within ±5.0%. The Correction Factor will be applied to determine diversions from the well. Further, I acknowledge that repair and/or replacement of this Meter and/or portions of the Discharge System is required within that one year AND I agree to make the necessary changes within that time.

Division 3

☐	If Correction Factor is between 0.920 to 0.949 or 1.051 to 1.080, **and** Division 3 approves this Variance Request, the Test will be valid for no more than **one year**. A new variance including new correction factor computed by a Qualified Well Tester shall be required each year thereafter. A variance will only be allowed for TFM for a maximum of three years. After three years the TFM must be repaired or replaced and working within the required ± 5%. The Correction Factor will be applied to determine diversions from the well.

For Electrically Powered Wells/Pumps, I agree to the release of information pertaining to my Electric Service and Use, including Current Transformer Factor (Ct), Voltage/Potential Transformer Factor (Pt) and Electric Meter Readings, to the Colorado Division of Water Resources by my electric supplier for the purposes of determining or verifying Water Use from the Well/Pump.

The above information is true to the best of my knowledge. I understand that falsifying the accuracy and/or condition of a Totalizing Flow Meter can subject me to a fine of up to $500.00. If any Variance is requested on my behalf to apply a Correction Factor to my TFM, I agree to such Variance.

I am the ☐Well Owner OR ☐Well User

Signature of Well Owner/User Date 9/18/15

Print Name of Well Owner/User Jeff Nabors

TZA Water Engineers
a Lamp Rynearson Company

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

MEMORANDUM

To: Greatrock North Water and Sanitation District

From: TZA Water Engineers

Date: October 26, 2015

Re: Water Quality and Hardness Results

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

Month	RO Permeate	Unfiltered UKA Water	Unfiltered ALV Wells
October (10/25/15)	25%	36%	39%
September (09/20/15)	17%	34%	49%
August (08/24/15)	10%	33%	57%
July (07/19/15)	17%	35%	48%
June (06/28/15)	23%	37%	40%
May (05/25/15)	39%	42%	19%
April (04/27/15)	37%	39%	24%
March (03/22/15)	41%	40%	19%

Total Dissolved Solids (TDS)			
Date	BECR Tanks	RHF Tank	GN Tank
10/14/15	414 mg/l	406 mg/l	385 mg/l
09/09/15	470 mg/l	471 mg/l	495 mg/l
08/19/15	469 mg/l	500 mg/l	482 mg/l
07/10/15	417 mg/l	449 mg/l	468 mg/l
06/11/15	369 mg/l	350 mg/l	341 mg/l
05/11/15	401 mg/l	347 mg/l	366 mg/l
04/13/15	386 mg/l	326 mg/l	322 mg/l
March 2015	274 mg/l	324 mg/l	302 mg/l
02/02/15	350 mg/l	394 mg/l	383 mg/l
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

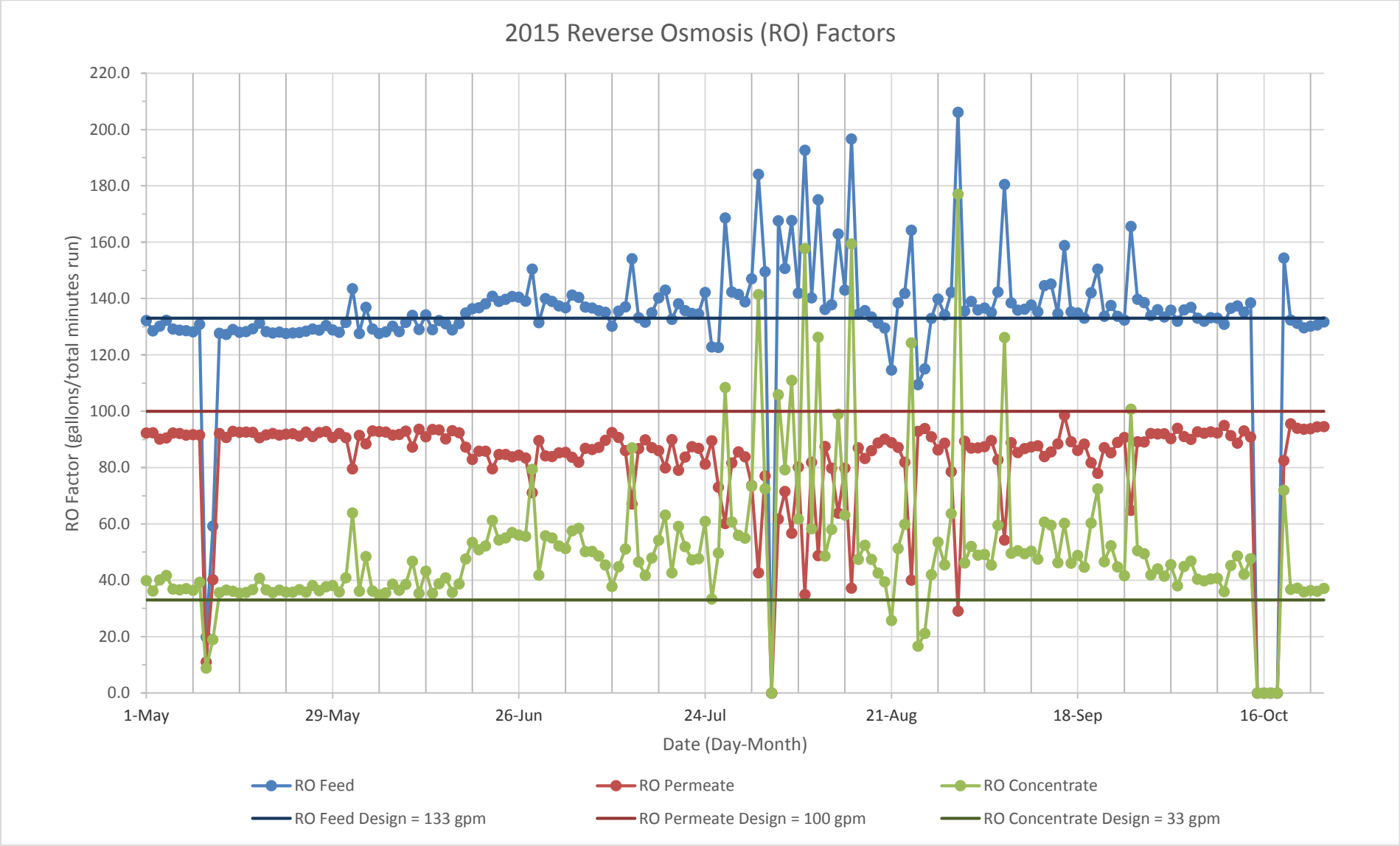
The total hardness results tabulated below reflect a moderately hard to hard water:

Total Hardness (as CaCO3)			
Date	**BECR Tanks**	**RHF Tank**	**GN Tank**
10/14/15	134.1 mg/l	117.2 mg/l	118.7 mg/l
09/09/15	152.6 mg/l	164.3 mg/l	158.4 mg/l
08/19/15	159.1 mg/l	175.6 mg/l	173.1 mg/l
07/10/15	136.2 mg/l	158.8 mg/l	156.5 mg/l
06/11/15	92.0 mg/l	78.0 mg/l	80.1 mg/l
05/11/15	84.8 mg/l	72.6 mg/l	73.9 mg/l
04/13/15	99.6 mg/l	67.7 mg/l	68.6 mg/l
March 2015	53.7 mg/l	68.3 mg/l	59.1 mg/l
02/02/15	83.4 mg/l	113.8 mg/l	104.6 mg/l
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, hardness values are generally classified as:

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

The RO production rates since June 18, 2015 have been very inconsistent with the design for the RO system. See the following figure for a graph of the RO feed, permeate, and concentrate so far this summer versus the design points of the system. Jeff Rabas indicated on September 21, 2015 that Mike Atwood is reviewing the data for a better understanding of the reporting and inconsistencies.


2015 Reverse Osmosis (RO) Factors
RO Factor (gallons/total minutes run)
220.0
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1-May
29-May
26-Jun
24-Jul
21-Aug
18-Sep
16-Oct
Date (Day-Month)
RO Feed
RO Permeate
RO Concentrate
RO Feed Design = 133 gpm
RO Permeate Design = 100 gpm
RO Concentrate Design = 33 gpm

TZA Water Engineers
a Lamp Rynearson Company

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

MEMORANDUM

To: Lisa Johnson, District Manager

From: Lauren Goecke, EI

Date: September 23, 2015

Re: Reverse Osmosis Membrane and Antiscalant Research
Greatrock North Water and Sanitation District

Project No.: 0414018.01-002

TZA has researched reverse osmosis (RO) membranes and antiscalants for Greatrock North's water treatment. The goal of this research was to first determine the best membrane for Greatrock North's well water quality to improve the percentage of recovery within the RO process. The second goal of this research was to determine the appropriate antiscalant for Greatrock North's well water quality and the proposed membrane. Membranes and antiscalants are determined by looking at the feed water analysis, the temperature of the feed water, and the feed and product water flows. Membranes are also determined by looking at the RO array.

Greatrock's RO system, shown in Figures 1 and 2, is a 3-2-1 array with each of the six housings containing 4 – 40 inch membranes. Currently they use a DOW FILMTEC BW30-365 (Serial No. F2983892) membrane and dose an AW1730 antiscalant 22.5 mg/L solution reduced to 10% resulting in a 2.3 mg/L dosage at 100 mL/min. Currently the RO system runs 8 hours per day. Prior to August 5, 2015 the RO system ran 6 hours per day. The system design is to have 133 gallons per minute feed the RO, 100 gallons per minute of permeate, and 33 gallons per minute of concentrate. Attached is an analysis of the RO membranes completed by Pure Water Solutions on December 15, 2014.

Greatrock North has received two recommendations for membrane and antiscalant replacements. Recommendation one is a GE AG8040-F400 membrane with GE MS1310 antiscalant. Recommendation two is a Toray TM720D-400 membrane with PWT Spectraguard antiscalant. Earl Young of Worth Hydrochem of Oklahoma City helped provide guidance on all recommendations as Worth is a distributor for each of the products. Both membranes will be an improvement to the current membranes since they increase the surface area from 365 to 400 square feet per membrane. The membranes are going to be equivalent in recovery as Toray and GE both use membrane sheets manufactured by Toray. The GE antiscalant is silica based for silica control, as is the PWT Spectraguard. However, the Spectraguard is a dual polymer blend which makes it more forgiving for operators to use. Similar operations such as Lochbuie and Julesburg have also started using Spectraguard. Table 1 summarizes the verbal cost estimates of each item per a conversation with Earl. Based on a review of the characteristics and cost of each item, we recommend the District use the Toray membrane and the PWT Spectraguard antiscalant for future RO operations. Attached are the projection models for both products.

Table 1: Verbal Cost Estimates of RO Membrane and Antiscalant Recommendations

Membrane	Cost	Antiscalant	Cost
GE AG8040-F400	$849 per membrane + shipping	GE MS1310	$1100 per 55 gallon drum + shipping
Toray TM720D-400	$455 per membrane + shipping	PWT Spectraguard	$1800 for 2 – 55 gallon drums including shipping, or $900 per 55 gallon drum + shipping

Figure 1: Box Elder Creek Ranch Water Treatment Plant Reverse Osmosis System

Figure 2: Box Elder Creek Ranch Water Treatment Plant Reverse Osmosis System

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

GE Power & Water
Water & Process Technologies

WATER ANALYSIS REPORT

4000170442
PURE WATER SOLUTIONS
520 D TOPEKA WAY
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UNITED STATES 80109-3137

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

	FEED	PERMEATE	BRINE
	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	

GE Power & Water
Water & Process Technologies

Fact Sheet

AG Series

Standard Brackish Water RO Elements

The A-Series, family of proprietary thin-film reverse osmosis membrane elements are characterized by high flux and high sodium chloride rejection. AG Standard Brackish Water Elements are selected when high rejection and operating pressures as low as 200 psi (1,379 kPa) are desired. These elements allow moderate energy savings, and are considered a standard in the industry.

Table 1: Element Specification

Membrane	A-Series, Thin-Film Membrane (TFM*)

Model	Average permeate flow gpd (m^3/day) [1,2]	Average NaCl rejection [1,2]	Minimum NaCl rejection [1,2]
AG2540TM	710 (2.7)	99.5%	99.0%
AG4025T	1,600 (6.0)	99.5%	99.0%
AG4026F	1,600 (6.0)	99.5%	99.0%
AG4040C	2,400 (9.1)	99.5%	99.0%
AG4040FM	2,200 (8.3)	99.5%	99.0%
AG4040FM WET	2,200 (8.3)	99.5%	99.0%
AG4040TM	2,200 (8.3)	99.5%	99.0%
AG8040C	9,900 (37.3)	99.5%	99.0%
AG8040F	9,600 (36.3)	99.5%	99.0%
AG8040F WET	9,600 (36.3)	99.5%	99.0%
AG8040F 400	10,500 (39.8)	99.5%	99.0%
AG8040F 400 WET	10,500 (39.8)	99.5%	99.0%
AG8040N	9,600 (36.3)	99.2%	98.5%
AG8040N 400	10,500 (39.8)	99.2%	98.5%
AG8340F 400	10,500 (39.8)	99.5%	99.0%

[1] Average salt rejection after 24 hours operation. Individual flow rate may vary +25%/-15%.
[2] Testing conditions: 2,000 ppm NaCl solution at 225 psi (1,551 kPa) operating pressure, 77°F (25°C), pH 7.5 and 15% recovery.

Model	Membrane area ft^2 (m^2)	Outer wrap	Part Number
AG2540TM	29 (2.6)	Tape	1206729
AG4025T	60 (5.6)	Tape	1206754
AG4026F	60 (5.6)	Fiberglass	1206756
AG4040C	90 (8.4)	Cage	1206757
AG4040FM	85 (7.9)	Fiberglass	3032513
AG4040FM WET	85 (7.9)	Fiberglass	3035659
AG4040TM	85 (7.9)	Tape	3032514
AG8040C	380 (35.3)	Cage	1222546
AG8040F	365 (33.9)	Fiberglass	3032515
AG8040F WET	365 (33.9)	Fiberglass	3032516
AG8040F 400	400 (37.2)	Fiberglass	3032518
AG8040F 400 WET	400 (37.2)	Fiberglass	3032519
AG8040N	365 (33.9)	Net	1231784
AG8040N 400	400 (37.2)	Net	1231786
AG8340F 400	400 (37.2)	Fiberglass	3048370

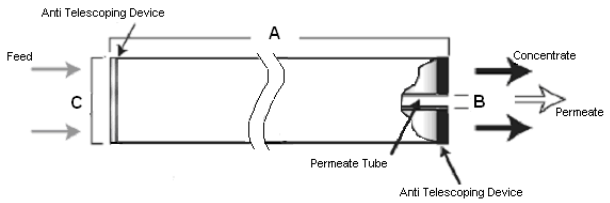

Figure 1: Element Dimensions Diagram – Female

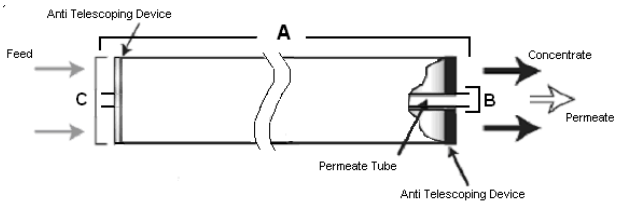

Figure 2: Element Dimensions Diagram – Male

Find a contact near you by visiting www.gewater.com and clicking on "Contact Us".

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Table 2: Dimensions and Weight

Model[1]	Dimensions, inches (cm)			Boxed
	A	B[2]	C[3]	Weight lbs (kg)
AG2540TM	40.0 (101.6)	0.75 (1.90) OD	2.4 (6.1)	5 (2.3)
AG4025T	25.0 (63.5)	0.625 (1.59)	3.9 (9.9)	5 (2.3)
AG4026F	26.0 (66.7)	0.625 (1.59)	3.9 (9.9)	6 (2.7)
AG4040C	40.0 (101.6)	0.625 (1.59)	3.9 (9.9)	8 (3.5)
AG4040FM	40.0 (101.6)	0.75 (1.90) OD	3.9 (9.9)	8 (3.5)
AG4040FM WET	40.0 (101.6)	0.75 (1.90) OD	3.9 (9.9)	8 (3.5)
AG4040TM	40.0 (101.6)	0.75 (1.90) OD	3.9 (9.9)	8 (3.5)
AG8040C	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	32 (14.5)
AG8040F	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	32 (14.5)
AG8040F WET	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	35 (16)
AG8040F 400	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	32 (14.5)
AG8040F 400 WET	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	35 (16)
AG8040N	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	32 (14.5)
AG8040N 400	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	32 (14.5)
AG8340F 400	40.0 (101.6)	1.125 (2.86)	8.3 (21.1)	42 (19.1)

[1] These elements are bagged dried, unless specified WET, before shipping.
[2]Internal diameter unless specified OD (outside diameter).
[3]The element diameter (dimension C) is designed for optimum performance in GE pressure vessels. Other pressure vessel dimension and tolerance may result in excessive bypass and loss of capacity.

Table 3: Operating and CIP parameters

Typical Operating Pressure	200 psi (1,379 kPa)
Typical Operating Flux	10-20GFD (15-35LMH)
Maximum Operating Pressure	Tape 450 psi (3,103 kPa) Other outerwrap: 600 psi (4,137 kPa)
Maximum Temperature	Continuous operation: 122°F (50°C) Clean-In-Place (CIP): 122°F (50°C)
pH Range	Optimum rejection: 7.0-7.5, Continuous operation: 4.0-11.0, Clean-In-Place (CIP): 2.0-11.5
Maximum Pressure Drop	Over an element: 12 psi (83 kPa) Per housing: 50 psi (345 kPa)
Chlorine Tolerance	1,000+ ppm-hours, Dechlorination recommended
Feedwater	NTU < 1 SDI < 5

GE Infrastructure
Water & Process Technologies

Fact Sheet

LENNTECH
info@lenntech.com Tel. +31-152-610-900
www.lenntech.com Fax. +31-152-616-289

Hypersperse™ MS1310

Antiscalant/Antifoulant

- Classified for use in producing potable water Classified to ANSI/NSF Standard 60)
- Effectively controls scales including silica, cacium carbonate, calcium sulfate, barium sulfate, and strontium sulfate
- May be feed neat or diluted
- Compatible with all of the leading RO mebranes
- Includes uniquely effective GE Infrastructure Water & Process Technologies polymer
- Maintains cleaner membrane surfaces by dispersing particulate foulants
- Effective over a wide pH range. Compatible with feedwaters that contain aluminum and iron oxides

Description and Use

Hypersperse™ MSI310 is a highly effective liquid anti-scalant/antifoulant specifically designed for silica scale. Hypersperse MSI310 includes a proprietary GE Infrastructure Water & Process Technologies polymer which is uniquely effective in pretreating silica scale. This is an enhancement to Hypersperse MSI300, which is the only silica inhibitor with extensive, field and pilot study data demonstrating efficacy on membrane systems applications. Data shows effective control of silica up to 240 ppm although applications on variant water sources may establish even higher limits. Use of this product provides longer run times and extended element life resulting in reduced operating and capital costs.

Packaging Information

Hypersperse MSI310 is a liquid material, available in a wide variety of customized containers and delivery methods. Contact your GE sales representative for details.

Application

For maximum effectiveness, Hypersperse MSI310 should be added prior to the static mixer or cartridge filter housing. It can be fed neat (undiluted) directly from the shipping container or can be diluted (see below).

For potable application, the maximum dosage is 10 mg/L and maximum recommended dilution is 10% with RO permeate or DI water at typical operating temperatures (<30°C (<86°F))

Dosing

Typical dosage range is between 3 and 6 mg/L.

Important Note: Over and under-dosing may cause membrane fouling so please contact your local GE representative to define the optimal feedpoint and dosage rate.

Maximum Dilutions

Maximum dilution is temperature related as shown below.

Temperature, °C	Maximum Dilution, %
<30°C (86°F)	10
30-35°C (86-95°F)	25
>35°C (95°F)	50

Safety Precautions

A Material Safety Data Sheet containing detailed information about this product is available on request.

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TORAY
Innovation by Chemistry

High rejection BWRO, enhanced chemical tolerance

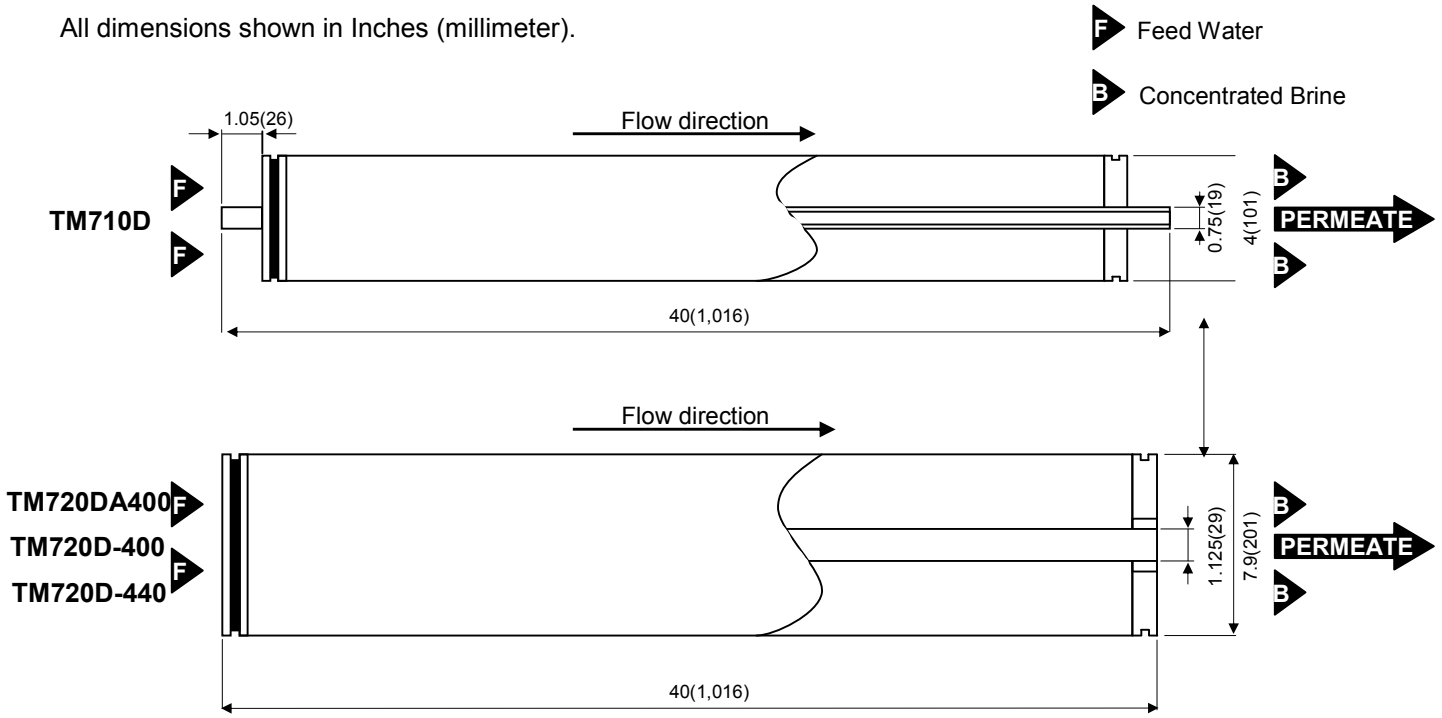
TM700D

Type	Diameter Inch	Membrane Area $ft^2(m^2)$	Salt Rejection %	Product Flow Rate $gpd(m^3 / d)$	Feed Spacer Thickness mil
TM710D	4”	87(8)	99.8	2,600(9.8)	31
TM720DA400	8”	400(37)	99.8	11,000(41.6)	31
TM720D-400	8”	400(37)	99.8	11,000(41.6)	34
TM720D-440	8”	440(41)	99.8	12,100(45.8)	28

1. Membrane Type		Cross Linked Fully Aromatic Polyamide Composite
2. Test Conditions	Feed Water Pressure Feed Water Temperature Feed Water Concentration Recovery Rate Feed Water pH	225 psi(1.55MPa) 77° F(25℃) 2,000 mg/l Nacl 15% 7
3. Minimum Salt Rejection		99.65%
4. Minimum Product Flow Rate		2,150gpd(8.2m³/d)(TM710D) 8,900gpd(33.6m³/d)(TM720DA400) 8,900gpd(33.6m³/d)(TM720D-400) 9,800gpd(37.0m³/d)(TM720D-440)

Dimensions

All dimensions shown in Inches (millimeter).



Operating Limits

Maximum Operating Pressure	600psi (4.1 MPa)
Maximum Feed Water Temperature	113° F (45℃)
Maximum Feed Water SDI_{15}	5
Feed Water Chlorine Concentration	<0.1ppm
Feed Water pH Range, Continuous Operation	2-11
Feed Water pH Range, Chemical Cleaning	1-13
Maximum Pressure Drop per Element	20psi (0.14 MPa)
Maximum Pressure Drop per Vessel	60psi (0.4 MPa)

Operating Information

1. For the recommended design range, please consult the latest Toray technical bulletin, design guide lines, computer design program, and/ or call an application specialist. If the operating limits given in this Product Information Bulletin are not strictly followed, the Limited Warranty will be null and void.
2. All elements are wet tested, treated with a 1% by weight percent sodium bisulfite storage solution, and then vacuum packed in oxygen barrier bags, or treated with tested feed water solution, and then vacuum packed in oxygen barrier bags with deoxidant inside. To prevent biological growth during short term storage, shipment, or system shutdown, it is recommended that Toray elements be immersed in a protective solution containing 500 - 1,000 ppm of sodium bisulfite (food grade) dissolved in permeate.
3. The presence of free chlorine and other oxidizing agents under certain conditions, such as heavy metals which acts as oxidation catalyst in the feed water will cause unexpected oxidation of the membrane. It is strongly recommended to remove these oxidizing agents contained in feed water before operating RO system.
4. Permeate from the first hour of operation shall be discarded.
5. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.

Notice

1. Toray accepts no responsibility for results obtained by the application of this information or the safety or suitability of Toray's products, either alone or in combination with other products. Users are advised to make their own tests to determine the safety and suitability of each product combination for their own purposes.
2. All data may change without prior notice, due to technical modifications or production changes.

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JUL. 2013

'TORAY' Innovation by Chemistry

System Overview Report

Project	TORAYMEM\seanc 239:TZA Water Engineers 100 GPM Project	
Case	1	TM720D-400 Elements
Revision	0	20 deg. C Assumed
Feed Water Type	Brackish Well, Note: Auto Balance is ON	
Warnings and Errors	Warnings:2, Errors:0. See Important Notes at end /E	
Database Info :	Project Database :C:\Users\seanc\Documents\TorayDS2\App_Data\SeanC_DB.TMEU.bak.2014.09.27.sdf.sdf Membrane Database (V.20141) :.	

		Overall	Pass 1
Raw water TDS	mg/l	766.6	766.6
Feed EC @25C / @20.00C	uS	1,169.9 / 1,036.7	1,169.9 / 1,036.7
Feed Pressure	psi	0.0	167.6
Temperature	deg C	20.00	
Total DP	psi	22.18	22.18
Brine Pressure	psi	145.4	145.4
Fouling Max	3.00 yrs		0.848
SP % Increase (Max)	3.00 yrs		33.10%
Recovery	%	75.00%	75.0%
Feed Flow	gal/min	133.3	133.3
Product Flow	gal/min	100.00	100.00
Average Flux	gfd	14.996	14.996
Concentrate Flow	gal/min	33.33	33.33
Product TDS	mg/l	3.002	3.002
Concentrate TDS	mg/l	3,053	3,053
Primary HP Pump kW	kilowatt	12.153	12.153
Power Consumption	kWh/m^3	0.535	0.535

Ions		Feed	Net Feed	Conc	Product
Ca	mg/l	90.50	90.50	361.4	0.200
Mg	mg/l	16.270	16.270	64.97	0.036
Na	mg/l	114.6	114.6	456.8	0.521
K	mg/l	6.600	6.600	26.25	0.0503
Ba	mg/l	0.08	0.08	0.319	0.0002
Sr	mg/l	1.000	1.000	3.993	0.0022
NH4	mg/l	0.0	0.0	0.0	0.0
Fe	mg/l	0.05	0.05	0.200	0.0
HCO3	mg/l	192.6	192.6	756.8	1.135
CO3	mg/l	0.819	0.819	9.115	2.15E-05
CO2	mg/l	4.826	4.826	7.095	5.265
Cl	mg/l	156.0	156.0	622.5	0.500
SO4	mg/l	149.0	149.0	595.4	0.212
NO3	mg/l	17.900	17.900	71.15	0.149
F	mg/l	0.800	0.800	3.181	0.0064
Br	mg/l	0.0	0.0	0.0	0.0
PO4	mg/l	0.500	0.500	1.999	0.0003
SiO2	mg/l	19.900	19.900	79.03	0.189
B(Boron)	mg/l	0.0	0.0	0.0	0.0
TDS	mg/l	766.6	766.6	3,053	3.002
Feed EC @25C / @20.00C	uS	1,170 / 1,037	1,170 / 1,037	4,088 / 3,629	5.9 / 5.3
pH	pH	7.800	7.800	8.185	5.531
Osmotic Press (DS1 / Pitzer)	psi	6.239 / 5.65	6.239 / 5.65	24.567 / 21.23	0.025 / 0.07
LSI / SDSI		0.47 / 0.40	0.47 / 0.40	1.86 / 1.79	-6.46 / -6.70
CaSO4 / SrSO4 %	%	3.4% / 2.9%	3.4% / 2.9%	27.2% / 16.8%	0.0% / 0.0%
BaSO4 / SiO2 %	%	339.6% / 16.9%	339.6% / 16.9%	2209.1% / 53.0%	
Pitzer % Solubility	Calcite/Dolomite	146% / 246%	146% / 246%	3,278% / 124,521%	
Pitzer % Solubility	CaSO4/SrSO4	4% / 2%	4% / 2%	28% / 15%	

Stage/Bank Data	Pass1	Stage 1	Stage 2	Stage 3
Lead Element Type		TM720D-400	TM720D-400	TM720D-400
Last Element Type		TM720D-400	TM720D-400	TM720D-400

Total Elements	24	12	8	4
Total Vessels	6	3	2	1
Elements per Vessel		4	4	4
Feed Flow	gal/min	133.3	80.28	47.84
Product Flow	gal/min	53.05	32.44	14.502
Average Flux	gfd	15.911	14.596	13.049
Brine Flow	gal/min	80.28	47.84	33.33
Recovery %	%	39.79 %	40.41 %	30.32 %
Feed Pressure	psi	167.6	160.4	154.2
dP Elements	psi	7.246	6.220	8.714
Boost Pressure	psi	0.0	0.0	0.0
Piping Loss	psi	0.0	0.0	0.0
Net (Boost - dP piping)	psi	0.0	0.0	0.0
Brine Pressure	psi	160.4	154.2	145.4
Permeate Pressure	psi	0.0	0.0	0.0
Feed TDS	mg/l	766.6	1,272	2,131
Perm TDS	mg/l	1.752	3.447	6.578
Lead Element	Pass1	Stage 1	Stage 2	Stage 3
Feed Flow	gal/min	44.44	40.14	47.84
Product Flow	gal/min	4.551	4.210	3.809
Product TDS	mg/l	1.496	2.564	5.179
Flux	gfd	16.380	15.153	13.709
Last Element	Pass1	Stage 1	Stage 2	Stage 3
Product Flow	gal/min	4.290	3.893	3.440
Product TDS	mg/l	2.194	4.582	8.306
Brine/Product Ratio	ratio	6.238	6.144	9.689
Brine Flow	gal/min	26.76	23.92	33.33
Net Driving Pressure	psi	149.2	135.2	119.2
Beta		1.238	1.230	1.165

Chemicals 100%. Disclaimer: These estimated dose rates are provided as a courtesy to Toray DS2 users and are not guaranteed.

No Chemicals Added

Warnings

1. Conc Stiff Davis Index = 1.79 Warning - the Stiff Davis Index (SDSI) is greater than 0. Scale inhibitor required.
2. Conc BaSO4 % Sat'n = 2209.14 Warning - concentrate barium sulfate exceeds saturation.

Errors

Disclaimer :
The program is intended to be used by persons having technical skill, at their own discretion and risk. The projections, obtained with the program, are the expected system performance, based on the average, nominal element-performance and are not automatically guaranteed. Toray shall not be liable for any error or miscalculation in the program.
The obtained results cannot be used to raise any claim for liability or warranty.
It is the users responsibility to make provisions against fouling, scaling and chemical attacks, to account for piping and valve pressure losses, feed pump suction pressure and permeate backpressure. For questions please contact us:

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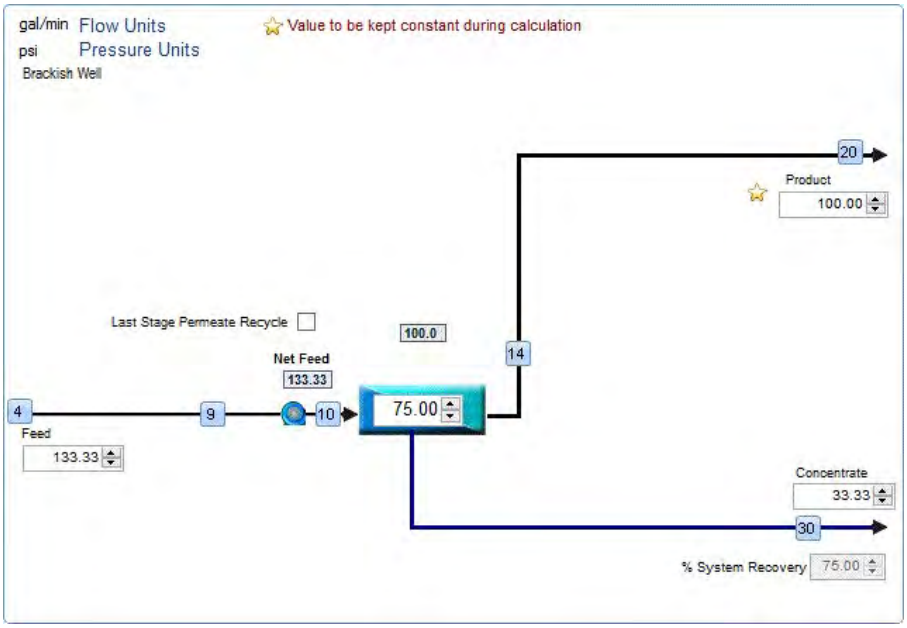
http://www.toraywater.com/

Date/Time :	9/17/2015 5:11:07 PM
Project	TORAYMEM\seanc 239:TZA Water Engineers 100 GPM Project

Case :	1:TM720D-400 Elements
Revision :	0:20 deg. C Assumed
User name :	TORAYMEM\seanc
Prepared for :	Lauren Goecke
Notes :	
Membrane Database	
Version Number:	20141
ReleaseDate:	2/24/2015
UpdateBy:	PFM
Toray DS2 version :	2.0.1.100

Flow Diagram:



SpectraGuard™ antiscalant/dispersant is a high performance chemical pretreatment that controls inorganic salts, metal hydroxides, and colloids in RO feedwater. Its unique performance characteristics provide users with more complete control of system feed water chemistry, reducing membrane fouling and minimizing cleaning requirements. SpectraGuard™ is compatible with all membrane types and system components.

Features / Benefits

- Phosphate-free formula reduces negative impact on the environment
- Stable molecular structure maintains integrity in high pH, high temperature and high salinity applications
- Classified for use in membrane systems producing drinking water (ANSI/NSF Standard 60)

Uses

- Control of calcium carbonate, calcium sulfate, barium sulfate, calcium fluoride, silica, and hydroxides of iron and aluminum
- Can be blended with other pretreatment formulations from Professional Water Technologies to reduce chemical dosing equipment

Specifications

Appearance	Clear liquid
pH	2.0 — 2.5
Density (kg/liter)	1.00 — 1.10

Packaging

Pail: 5 gallon/18.9 liter

Drum: 55 gallon/208 liter

Tote: 275 gallon/1,040 liter

Bulk: available upon request

For special packaging options, please contact PWT or your local distributor.

SpectraGuard™

LIQUID REVERSE OSMOSIS ANTISCALANT

SpectraGuard™

LIQUID REVERSE OSMOSIS ANTISCALANT

General Mixing & Application Instructions for SpectraGuard™

1. Typical dose rates are 2.0 to 6.0 mg/l.
2. Contact Professional Water Technologies™ or your local distributor for custom chemical dosing recommendation.
3. We use ProDose to determine your scaling potential and recommended chemical dosing levels.

ProDose XPRT™ – Scaling Prediction Software

PWT proprietary scaling prediction software, ProDose XPRT™ provides immediate dosage capabilities for our specialty chemicals. The software can create cases to study multiple operating conditions, and directly enter concentrate analyses leading to the optimal selection of PWT product and dosage. ProDose XPRT™ can generate complete and comprehensive reports detailing the scaling projections.

ProDose XPRT™ is available upon request only.
Please contact your PWT representative for more information.

PWT™ Forward thinking chemistry

PWT Headquarters & Manufacturing
1048 La Mirada Court, Vista, California 92081

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Email: sales@pwtchemicals.com | **www.pwtchemicals.com**

SAFETY DATA SHEET

1. Identification

Product Name: SpectraGuard™
Synonyms: N/A
Product Use: Reverse Osmosis Pretreatment / Scale Inhibitor
Manufacturer/Supplier: Professional Water Technologies
Address: 1048 La Mirada Court, Vista California, 92081, USA

General Information: 760-639-4400
Transportation Emergency Number:
CHEMTREC: 800-424-9300 (Domestic North America) OR 703-527-3887 (International, collect calls accepted)

2. Hazard Identification

Classification:

Health	Environmental	Physical
Skin Irritant – Class 2 Eye Irritant – Class 2B		

Pictograms:

Hazard Statements	Precautionary Statements
WARNING Causes skin irritation. Causes eye irritation.	Wash exposed areas thoroughly after handling. Wear protective gloves and eye/face protection. If on skin: Wash with plenty of soap and water. If in eyes: Rinse cautiously with water for 15 minutes. Remove contact lenses, if present and easy to do so. Continue rinsing. Specific treatment see Section 4 (First aid measures) If skin or eye irritation occurs/persists: Get medical advice/attention. Wash contaminated clothing before reuse.

3. Composition / Information on Ingredients

Component	CAS Number	Weight %
SpectraGuard™	52255-49-9	4%

See Section 8 for Exposure Limits.

4. First Aid Measures

Eye: Eye irritation. Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get immediate medical attention.

Skin: Itching or irritation of the skin. Immediately flush the skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash contaminated clothing before reuse.

Inhalation: For nasal irritation, headache, and/or nausea remove exposed person from source of exposure to fresh air. If not breathing, clear airway and start cardiopulmonary resuscitation (CPR). Get immediate medical attention.

Ingestion: Do not induce vomiting unless directed by medical personnel. Drink 1 to 2 glasses of water. Never give anything by mouth to an unconscious person. Call a physician.

5. Fire Fighting Measures

Suitable Extinguishing Media: Use media appropriate to primary cause of fire. Use water to cool fire-exposed containers, structures and to protect personnel. Use water to dilute spills and to flush them away from sources of ignition.

Fire Fighting Procedures: Use water spray to cool containers exposed to fire. Minimize exposure. Do not breathe fumes. Contain run-off. A respirator or NIOSH-approved positive pressure suit should be worn if conditions warrant.

Unusual Fire and Explosion Hazards: None known

Combustion Products: None known

6. Accidental Release Measures

Personal Protective Equipment: Protective clothing including chemical splash goggles, Latex, nitrile, or butyl rubber full-length gloves, rubber apron made of nitrile or butyl rubber, and rubber overshoes must be worn during spill clean-ups and deactivation of material. If this material comes into contact with the skin during clean-up operations, immediately remove all contaminated clothing and wash exposed skin with soap and water. See section 4, First Aid Measures, for further information.

Land Spill: Wearing recommended protective clothing and equipment, dike spill with soil, sand, or compatible commercial absorbent. Remove remaining liquid with a pump, vacuum truck, or absorb liquid in sand or commercial

absorbent. Place waste in approved containers for disposal. Dispose waste according to Federal, State, and local regulations.

Water Spill: Wear protective clothing and equipment. Stop flow. Dike contaminated water and remove for disposal and/or treatment. Notify proper authorities and all downstream users if possible. Dispose of Solid Waste according to Federal, State, and Local Regulations.

7. Handling and Storage

Handling: Do not get in eyes, on skin or on clothing. Do not breathe vapors or mists. Keep container closed. Use only with adequate ventilation. Use good hygiene practices. Wash hands before eating, drinking or smoking. Remove contaminated clothing and clean before re-use.

Storage Conditions: Store in tightly closed containers in cool, dry, well-ventilated area away from incompatibles. The maximum storage temperature for this material is 55°C/131°F. The minimum storage temperature for this material is 0°C/32°F.

8. Exposure Controls / Personal Protection

Exposure limits

None of the components have a listed PEL value

Engineering Controls: Use local exhaust ventilation at the point of dust or mist evolution. Have safety shower and eye wash station available where exposure can occur.

Personal Protective Equipment (PPE)

Respiratory Protection: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator use. Use air purifying respirators within use limitations associated with the equipment or else use supplied air-respirators. If air –purifying respirator use is appropriate, use a respirator with organic/acid gas cartridge and dust/mist prefilters. For emergencies or instances where the exposure levels are not known, use a full- face piece positive-pressure, air supplied respirator. Warning air purifying respirators do not protect workers in oxygen deficient atmospheres.

Eye Protection: Splash goggles and/or face shield (ANSI Z87.1 or approved equivalent).

Skin Protection: Wear impervious protective clothing. Use butyl (or Teflon for limited contact) gloves, boots, and coveralls. Remove gloves after use. Wash hands with soap and water.

9. Physical and Chemical Properties

Appearance: Clear, colorless to light amber liquid
Odor: Mild
Density: Approximately 9 lbs./gallon
Specific Gravity: 1 – 1.15 g/mL
Percentage Volatile: 90 – 96% Water - Max
Evaporation Rate: 1 (same as water)
pH of Solution: 1.5 – 3
Water Solubility: Complete
Boiling Point: 100°C (212°F)
Melting/Freezing Point: 0°C (32°F)
Vapor Pressure: That of water
Vapor Density: That of air
Auto-ignition Temperature: N/A
Flash point: N/A
Flammability: N/A
Flammable Limits:
- LEL (Lower Explosive Limits): N/A
- UEL (Upper Explosive Limits): N/A

10. Stability and Reactivity

Stability/Incompatibility: Incompatible with strong oxidizing or reducing agents. Stable under normal storage conditions; see Section 7 (Handling and Storage) for specific conditions.

Hazardous Reactions/Decomposition Products: Not a fire or explosions hazard.

11. Toxicological Information

Acute Toxicity Information
SpectraGuard: Oral (LD50) Rat – > 100,000 mg/kg

Signs and Symptoms of Overexposure: Eye and nasal irritation, headache, dizziness, nausea, vomiting, weakness, itching or burning of the skin.

Acute Affects: None known

Eye Contact: May cause conjunctival irritation.

Skin Contact: May cause irritation.

Inhalation: May cause irritation.

Medical Conditions Aggravated by Exposure: None known

12. Ecological Information

LC50 (Fathead minnow) = 750 mg/L / 96hr
EC50 (Daphnia) = 743 mg/L / 48hr

13. Disposal Considerations:

Dispose of in accordance with Federal, State, and Local regulations and permits. Refer to state and local requirements for any additional requirements, as these may be different from Federal laws and regulations. Chemical additions, processing, or otherwise altering this material may make management information presented in the SDS incomplete, inaccurate or otherwise inappropriate.

14. Transportation Information

U.S. Department of Transportation (DOT), International Maritime Organization (IMDG) and International Air Transport Association (IATA)
Proper Shipping Name: N/A
Hazard Class: Not regulated
UN/NA Number: None
Packing Group: None
Labels Required: None

15. Regulatory Information

U.S. Federal Regulations
Comprehensive Environmental Response and Liability Act of 1980 (CERCLA):
No reportable quantity (RQ) for this material. If appropriate, immediately report to the National Response Center (800/424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies.

Toxic Substances Control Act (TSCA): All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substance Control Act (TSCA) Chemical Substance Inventory.

Clean Water Act (CWA): SpectraGuard™ is not a hazardous substance under the Clean Water Act. Consult Federal, State and local regulations for specific requirements.

Clean Air Act (CAA): SpectraGuard™ is not a hazardous substance under the Clean Air Act. Consult Federal, State and local regulations for specific requirements.

Superfund Amendments and Reauthorization Act (SARA) Title III Information:
SARA Section 313 Notification (40CFR 372)
This Product Does Not Contain Toxic Chemicals Subject to the Reporting Requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

State Regulations

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

International Regulations

Canadian Environmental Protection Act: All of the components of this product are included on the Canadian Domestic Substances list (DSL).

Canadian Workplace Hazardous Materials Information System (WHMIS):

None

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.

European Inventory of Existing Chemicals (EINECS): All of the components of this product are included on EINECS.

EU Classification:

EU Risk (R) and Safety (S) Phrases:

R36/37/38: Irritating to eyes, respiratory system and skin.

S9: Keep container in a well-ventilated place.

S24/25: Avoid contact with skin and eyes.

S27/28: After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of water.

S36/37/39: Wear suitable protective clothing, gloves and eye/face protection.

S45: In case of accident or if you feel unwell, seek medical advice immediately (Section 4)

S53: Avoid exposure - obtain special instructions before use.

16. Other Information

Revision Date: July 9, 2015

Disclaimer: This SDS is provided as an information resource only. This document should not be taken as a warranty for which Professional Water Technologies assumes legal responsibility. The information contained within this SDS was provided by raw materials and other reliable sources. The buyer assumes all responsibility of using and handling the product in accordance with applicable federal, state, and local regulations.

PWT™
Forward thinking chemistry

ProDose XPRT

Program:	ProDose XPRT v:1.0.0.29	Client:	Worth Hydrochem
Project:	Great Rock, CO	Print Date/Time:	9/17/2015 3:31:09 PM
Prepared By:	Miller Truby	Location:	Colorado
Comments:	From GE analysis provided by TZA	Case Number:	1
File Name:	Great Rock, CO 9.17.15.PWT	Case Description:	

Product Selection:	**SpectraGuard Liquid**	
Recommended Dose Rate:	3.79 mg/l Feed	15.14 mg/l in Concentrate
Estimated Usage (100%)	5.93 lbs/day	1.082 US ton/yr, 981 kg/yr
Comments:	No acid dosing specified	

System Information Flow Units: Gal/min

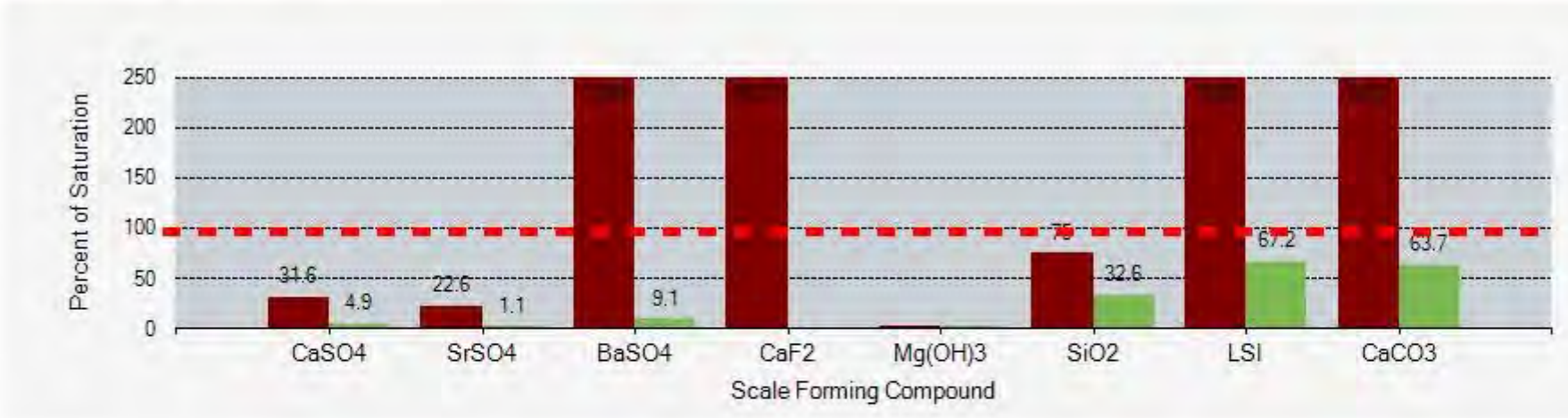
Feed Water Type:	Well Water		
Feed Water Flow:	133.0	Concentrate Flow:	33.3
Permeate Flow:	99.8	Recycle Flow:	0.0
System Recovery (%):	75.0%	RO Recovery:	75.0%
Feed Temperature:	65.0 Deg F	Membrane Rejection:	99.7%

mg/l	Sys Feed	Pretreatment	Net Feed	Permeate	Concentrate
Ca	90.50	90.50	90.50	0.17	361.50
Mg	16.27	16.27	16.27	0.03	64.99
Na	102.00	102.00	102.00	0.57	406.30
K	6.60	6.60	6.60	0.04	26.29
NH_4	0.00	0.00	0.00	0.00	0.00
Ba	0.08	0.08	0.08	0.00	0.32
Sr	1.00	1.00	1.00	0.00	3.99
Fe	0.00	0.00	0.00	0.00	0.00
Mn	0.00	0.00	0.00	0.00	0.00
Al	0.00	0.00	0.00	0.00	0.00
HCO_3	192.62	192.62	192.62	4.28	745.90
Cl	124.85	124.85	124.85	0.69	497.32
SO_4	149.00	149.00	149.00	0.27	595.18
F	0.80	0.80	0.80	0.00	3.19
NO_3	17.90	17.90	17.90	0.10	71.30
PO_4	0.50	0.50	0.50	0.00	2.00
SiO_2	19.90	19.90	19.90	0.11	79.27
pH	7.80	7.80	7.80	6.19	8.36

Saturation Index SI%	Raw Feed	Treated Feed	Concentrate	% of Max w Antiscale
LSI	0.4	0.4	2.0	67.2%, MaxLSI = 3.0
CaCO3	209.7	209.7	1,000.0	63.7
CaSO4	3.9	3.9	31.6	4.9
BaSO4	421.3	421.3	1,000.0	9.1
SrSO4	2.9	2.9	22.6	1.1
CaF2	9.4	9.4	363.5	0.0
SiO2	19.2	19.2	75.0	32.62
Fe/Iron	0.0	0.0	0.0	0.00
CaHPO4	1,000.0	1,000.0	1,000.0	0.94
MgOH3	0.0	0.0	0.1	0.00
AlOH3	0.0	0.0	0.0	0.00

Product Selection:	**SpectraGuard Liquid**	
Recommended Dose Rate:	3.79 mg/l Feed	15.14 mg/l in Concentrate
Estimated Usage (100%)	5.93 lbs/day	1.082 US ton/yr, 981 kg/yr
Comments:	No acid dosing specified	

Concentrate Solubilities



Cleaner Calculations

Stage	# Pressure Vessels	Elements Per Vessel	CIP Volume (gal)	Element Diameter (in)	Total # of Elements	C
-	-	-	-	-	-	
-	-	-	-	-	-	
-	-	-	-	-	-	

Total Cleaner Volumes

Chemical	Product	Weight %	Total CIP Vol (gal)	Lbs/Batch	Lbs/Year
Alkaline	none	2	1200	200	801
Acidic	none	2	1200	200	801

Pretreatment Chemical Summary

Runtime % 100

Chemical	Product	Dose (ppm)	Dilution %	mL/min	Gal/Day
Antiscalant	SpectraGuard Liquid	3.79	100	1.8462	0.70
Filter Aid	None	0.00	100	0.0000	0.00
Biocide	Bio Inhibitor	0.00	100	0.0000	0.00

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ProDose XPRT

Program:	ProDose XPRT v:1.0.0.29	Client:	Worth Hydrochem
Project:	Great Rock, CO	Print Date/Time:	9/17/2015 3:31:09 PM
Prepared By:	Miller Truby	Location:	Colorado
Comments:	From GE analysis provided by TZA	Case Number:	2
File Name:	Great Rock, CO 9.17.15.PWT	Case Description:	

Product Selection:	**SpectraGuard Liquid**	
Recommended Dose Rate:	3.00 mg/l Feed	27.24 mg/l in Concentrate
Estimated Usage (100%)	4.69 lbs/day	0.856 US ton/yr, 777 kg/yr
Comments:	No acid dosing specified	

System Information Flow Units: Gal/min

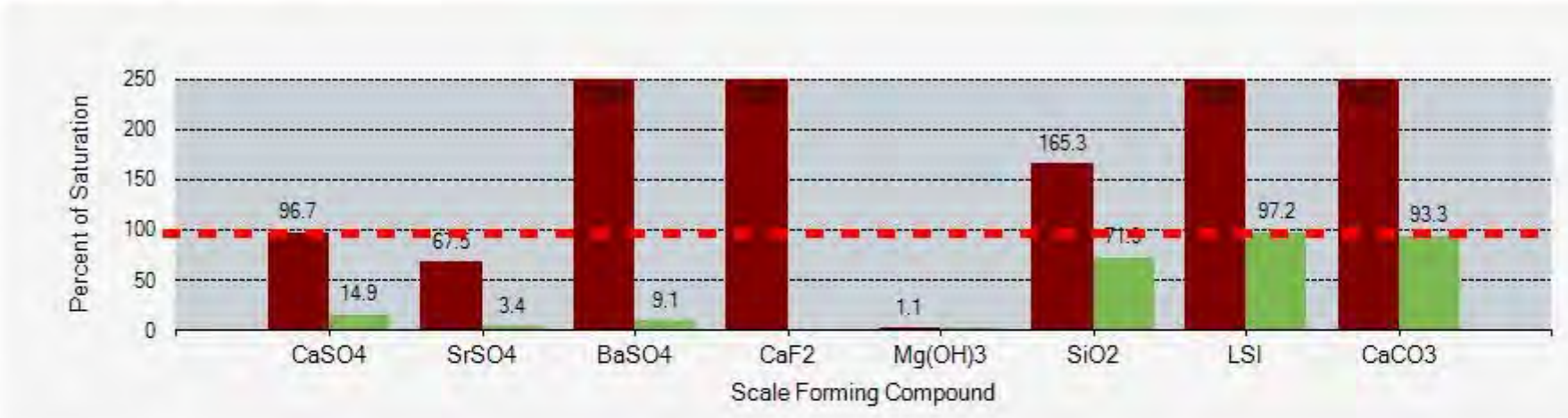
Feed Water Type:	Well Water		
Feed Water Flow:	133.0	Concentrate Flow:	14.6
Permeate Flow:	118.4	Recycle Flow:	0.0
System Recovery (%):	89.0%	RO Recovery:	89.0%
Feed Temperature:	65.0 Deg F	Membrane Rejection:	99.7%

mg/l	Sys Feed	Pretreatment	Net Feed	Permeate	Concentrate
Ca	90.50	90.50	90.50	0.22	820.93
Mg	16.27	16.27	16.27	0.04	147.59
Na	102.00	102.00	102.00	0.76	921.13
K	6.60	6.60	6.60	0.05	59.60
NH_4	0.00	0.00	0.00	0.00	0.00
Ba	0.08	0.08	0.08	0.00	0.73
Sr	1.00	1.00	1.00	0.00	9.07
Fe	0.00	0.00	0.00	0.00	0.00
Mn	0.00	0.00	0.00	0.00	0.00
Al	0.00	0.00	0.00	0.00	0.00
HCO_3	192.62	192.62	192.62	5.74	1,622.26
Cl	124.85	124.85	124.85	0.93	1,127.48
SO_4	149.00	149.00	149.00	0.37	1,351.59
F	0.80	0.80	0.80	0.01	7.22
NO_3	17.90	17.90	17.90	0.13	161.65
PO_4	0.50	0.50	0.50	0.00	4.54
SiO_2	19.90	19.90	19.90	0.15	179.71
pH	7.80	7.80	7.80	6.32	8.68

Saturation Index SI%	Raw Feed	Treated Feed	Concentrate	% of Max w Antiscale
LSI	0.4	0.4	2.9	97.2%, MaxLSI = 3.0
CaCO3	209.7	209.7	1,000.0	93.3
CaSO4	3.9	3.9	96.7	14.9
BaSO4	421.3	421.3	1,000.0	9.1
SrSO4	2.9	2.9	67.5	3.4
CaF2	9.4	9.4	1,000.0	0.0
SiO2	19.2	19.2	165.3	71.87
Fe/Iron	0.0	0.0	0.0	0.00
CaHPO4	1,000.0	1,000.0	1,000.0	0.94
MgOH3	0.0	0.0	1.1	0.00
AlOH3	0.0	0.0	0.0	0.00

Product Selection:	SpectraGuard Liquid	
Recommended Dose Rate:	3.00 mg/l Feed	27.24 mg/l in Concentrate
Estimated Usage (100%)	4.69 lbs/day	0.856 US ton/yr, 777 kg/yr
Comments:	No acid dosing specified	

Concentrate Solubilities



Cleaner Calculations

Stage	# Pressure Vessels	Elements Per Vessel	CIP Volume (gal)	Element Diameter (in)	Total # of Elements	C
-	-	-	-	-	-	
-	-	-	-	-	-	
-	-	-	-	-	-	

Total Cleaner Volumes

Chemical	Product	Weight %	Total CIP Vol (gal)	Lbs/Batch	Lbs/Year
Alkaline	none	2	1200	200	801
Acidic	none	2	1200	200	801

Pretreatment Chemical Summary

Runtime % 100

Chemical	Product	Dose (ppm)	Dilution %	mL/min	Gal/Day
Antiscalant	SpectraGuard Liquid	3.00	100	1.4614	0.56
Filter Aid	None	0.00	100	0.0000	0.00
Biocide	Bio Inhibitor	0.00	100	0.0000	0.00

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MEMORANDUM

To: Lisa Johnson, District Manager
From: Lauren Goecke, EI
Date: October 15, 2015
Re: Greatrock North Water and Sanitation District – Utility Billings and Energy Costs
Project No.: 0414018.01-002

TZA is tracking the United Power utility bills and associated water operations on a monthly basis. Below are the monthly comparisons for September each year, as well as a summary of the nine-month periods for 2014 and 2015. The 2015 energy consumption for September is 217% of the 2014 energy consumption for the similar period. The 2015 billings for September are 214% of the 2014 billings for the similar period. These increases were due to the call for augmentation requiring 90 gpm be pumped from Greatrock North's Laramie Fox Hill wells from August 5 to September 21, 2015. Laramie Fox Hills well number 2 was pumped August 5th and 6th, 2015 and Laramie Fox Hills well number 3 was pumped August 6 to September 21, 2015.

	September 2014 Billings				September 2015 Billings			
	On Peak	Off Peak	Total KWH	Billing	On Peak	Off Peak	Total KWH	Billing
Alluvial	4,279		4,279	$494.39	5,913		5,913	$677.07
BECR	2,400	8,640	11,040	$907.97	9,640	31,840	41,480	$3,418.91
GN	1,360	7,240	8,600	$671.67	2,800	10,120	12,920	$1,068.56
RHF	1,440	4,160	5,600	$492.79	880	2,920	3,800	$331.06
Totals			**29,519**	**$2,566.82**			**64,113**	**$5,495.60**

The 2015 year-to-date energy consumption is 6% more than the 2014 energy consumption for the similar period. The 2015 year-to-date billings are 6% more than the 2014 billings for the similar period.

	YTD 2014 Billings (9 months)				YTD 2015 Billings (9 months)			
	On Peak	Off Peak	Total KWH	Billing	On Peak	Off Peak	Total KWH	Billing
Alluvial	30,522		30,522	$3,556.35	30,314		30,314	$3,533.10
BECR	23,960	106,480	130,440	$9,942.73	30,080	130,120	160,200	$12,588.16
GN	13,960	56,240	70,200	$5,711.15	14,120	56,880	71,000	$5,853.52
RHF	10,920	29,000	39,920	$3,601.36	6,600	18,480	25,080	$2,312.59
Totals			**271,082**	**$22,811.59**			**286,594**	**$24,287.37**