



SECONDARY WATER QUALITY TREATMENT SYSTEM REQUEST

Cabarrus Acres Well #1

NC 01-13-146

WSF ID No: P01

AQUA NORTH CAROLINA, INC.

A. EXECUTIVE SUMMARY

The Cabarrus Acres Master Water System is comprised of 1 active well and a single point of entry (POE). The system is permitted for 49 customers and there are 12 active customers being served. **The latest combined concentrations of Fe and Mn are over 1 mg/L, which makes this well one of Aqua's Group 1 Priority Secondary Water Quality Projects per the Water Quality Plan.**

The City of Concord (City) previously installed water mains in the Cabarrus Acres system that parallels Aqua's water distribution system. Each of Aqua's 12 remaining customers in this system are eligible to connect to the City water system if they choose to do so. Based on a ¾" meter size, the City charges a residential water installation and meter fee of \$1,327 per unit plus the System Development Fee of \$1,262 per unit; the City fee per residential unit for water service is \$2,589. Additional plumbing fees may be incurred by each residence to connect the City's water service to the residence after the City's meter.

Alternatives to address the secondary water quality issues:

- 1. Install Manganese Dioxide filtration at the Cabarrus Acres well.**
 - a. Capex ≈ \$190,000
 - b. Annual Opex ≈ \$9,000
- 2. Bulk purchase water from the City of Concord.**
 - a. The City of Concord Water Resources Director, Jeff Corley, confirmed the City is not interested in selling bulk purchase water to Aqua. See attached email.
 - b. Capex ≈ \$60,000
- 3. Sell/convey water system assets to the City of Concord.**
 - a. The City of Concord Water Resources Director, Jeff Corley, confirmed the City is not interested in acquiring the system (even at a loss). See attached email.
- 4. Convey Aqua's 12 Cabarrus Acres customers to the City of Concord, abandon existing Aqua water system assets.**
 - a. Aqua pays \$2,589 connection charge (\$31,068 total) to the City to remove these 12 customers from Aqua's water system and connect them to the City's system.
 - b. 11 of the 12 customers are currently on City sewer; 1 is on septic. This one residence with their own septic would need to send in an application for City water service.
 - c. Aqua files for water system abandonment with NCDEQ.

- d. To facilitate Alternative #4, Aqua proposes full recovery of all costs in future rates that are associated with the provisioning of this alternative, including:
 - i. Remaining net book value (NBV) at the date of conveyance (\$79,749.75 as of 8/2021)
 - ii. Amounts paid to connect the remaining Aqua customers to the City (~\$31,068)
 - iii. Net remaining amounts paid to abandon the system (~\$10,000)
- e. Upon connection to the City, customers would be required to pay the City's water rates and fees.
 - i. City of Concord FY 2021-22 Adopted Fees, Rates and Charges may be found here (pgs. 47-50): <https://concordnc.gov/Departments/Finance/Adopted-Fees-Schedule>

NOTE: Detailed capex estimates For Alternatives 1, 2, and 4 are summarized in Section D.2.

B. PROPOSED SYSTEM REQUIRING TREATMENT

- 1. System Name: Cabarrus Acres Well #1
- 2. PWS ID: NC 01-13-146
- 3. No. Active Residential Connections, as of September 2021: 12
- 4. No. Permitted Residential Connections: 49
- 5. List of DEH/PWSS Approved Wells and Storage

TABLE 1: Approved and Active Wells in Proposed System

Well Name and No.	Capacity (GPM)			Max, Avg., Min Pump Runtime from Past 12 Months (hrs./day)	Latest POE Inorganic Sampling Results							
	Well Yield**	Max, Avg, Min from Past 12 Months			Fe (mg/L)*	Mn (mg/L)	Fe/Mn Loading Rate (lbs./day)	Fe/Mn Loading Rate (lbs./yr.)	Average Fe/Mn Loading Rate Per Residential Customer (lbs./yr.)			
Well #1	74	78	47	27	7	2	0.3	2.09	0.215	0.7	237	17

*Raw samples are taken directly at the wellhead before chemical treatment and point of entry (POE) samples are taken after chemical injection and treatment but before the tank and distribution system

**Loading rates are normalized based on a 12-hour per day well runtime and average production.

TABLE 2: Existing Storage at Well Sites

Well Name and No.	Storage Description		Most Recent Cleaning Date
	Type	Gallons	Dist. System
Well #1	Hydro	2,000	Oct. 2020

6. Past Three (3) Years Flushing Occurrences, list month/year:

Response: Mar. 2018, June 2018, June 2019, Aug. 2020, Oct. 2020.

7. Next Planned Distribution System Flushing Occurrence:

Response: This water system will be flushed again Dec. 2021 and on an ongoing annual basis. Disclaimer: Flushing does not completely remove the mineral accumulation in the distribution mains when utilizing water with exceptionally high levels of iron and manganese in the source water.

8. List of chemicals being used:

TABLE 3: Existing Chemicals Used at Well Site

Well Name and No.	State Approved Treatment			
	Disinfectant	Caustic	Sequestrant	Fe/Mn Filter
Well #1	X	N/A	X	N/A

9. Current description of the water treatment system for each well over the past three (3) years, including specific names of chemicals and dates of changes:

Response: Seaquest feed is installed and operational. Cartridge filter operational and installed Dec. 2017.

10. Planned changes (if any) for chemical treatment within the next six (6) months:

Response: None.

11. Comments on Approved/Current Well Capacity.

Response: None.

C. CURRENT SECONDARY WATER QUALITY CONCERNS

- 1. How many wells require treatment? 1
- 2. Can system operate with single well offline? No*

* Single well system.

- 3. Are combined Fe/Mn concentrations above 1 mg/L? Yes
- 4. Date of most recent POE Fe/Mn sampling results 2/3/2021

TABLE 4: Past 3 Years Fe/Mn Analysis

Cabarrus Acres Well #1 Laboratory Analysis at POE						
Date	Iron (Fe), mg/L			Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
02/13/2018	1.48	-	-	0.17	-	-
05/08/2018	1.25	<0.022	1.25	0.203	<0.0015	0.203
06/26/2018	2.24	<0.022	2.24	0.222	0.022	0.2
02/03/2021	2.09	-	-	0.215	-	-

- Describe previous actions to improve secondary water quality and describe results (i.e., installation of particulate filters and sequestering agents).

Response: Aqua is flushing the distribution system annually and feeding Seaquest. The intent of the sequestering agent is to hold Fe and Mn in a soluble state, ideally decreasing the insoluble concentration and resolving water discoloration issues. Because Fe usually reaches the surface in mostly an insoluble state, it is very challenging to convert insoluble Fe back into a soluble state unless the chemical dose of the sequestering agent is increased heavily. Also, sufficiently long contact time is a necessary criterion to make this happen. Because sequestering does not physically remove Mn, Aqua is concerned that its efforts to reduce total Mn will not be effective without adding a Fe/Mn treatment system or equivalent treatment system such as a those using solid phase Manganese Dioxide.

D. UTILITY COMMISSION REQUIRED INFORMATION

- Well Location Map Attached
- DEH/PWS Approval Letter Attached
- Original 24 hr. Pump Status Report Attached
- Past 36 months of pump status reports Attached
- Inorganic Analysis Report submitted to DEH for well approval Attached
- Past 6 yrs. inorganic analysis from each wellhead Attached
- Past 3 yrs. Fe/Mn analyses, both soluble and insoluble. See Table 4 Above

Note: For item (6) above, provide information on baseline (w/o treatment – raw samples taken at the well head) and point of entry (after treatment).

E. CUSTOMER COMPLAINT DATA

- Total number of customer complaints in past 6 months 2
- Total number of customer complaints in past 12 months 8
- For past 6 months, do customer secondary water complaints

- exceed 10% of the number of active customers? Yes
4. Provide 12-month list of all water quality complaints Attached
 5. Provide 12-month list of all completed water quality work orders Attached
 6. Describe most common customer complaint over the past 12-month period relating to secondary water quality, i.e., discolored water, taste, or odor.

Response: Dirty, discolored water.

D. PROPOSED SECONDARY WATER QUALITY TREATMENT

1. Proposed treatment recommendation: **Aqua recommends Alternative #4 based on availability of alternatives and least impact to customer rates.**
2. System Capex Estimate (Alternatives 1, 2, and 4):

Alternative 1. Capex					
	Total design flow rate =	47	GPM		
TASK	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
1	Filter Skid, no recycle, sludge management systems required	1	EACH	\$ 50,000	\$ 50,000
2	Freight (based on shipping costs of similar size filters)	1	EACH	\$ 1,000	\$ 1,000
3	Engineering Design, Permitting, Bidding, & CA/CO (based on design costs of similar size filters)	1	EACH	\$ 42,500	\$ 42,500
4	Construction Bonding, Mobilization and Demobilization	1	EACH	\$ 2,000	\$ 2,000
5	Site Clearing, Grubbing, Grading, Gravel, erosion control	1	EACH	\$ 15,000	\$ 15,000
6	Existing Well House Piping Modifications	1	EACH	\$ 3,500	\$ 3,500
7	Filter Equipment Installation-Including but not limited to all water piping, water treatment filter installation, and necessary appurtenances, within the existing filter building. Also includes all extension piping near filter building	1	EACH	\$ 15,000	\$ 15,000
8	Filter Building Construction-Including but not limited to concrete floor slab, well house erection, finishing, and necessary appurtenances	1	EACH	\$ 35,000	\$ 35,000
9	Yard Piping-Including but not limited to all underground pipe, fittings, and valve	1	EACH	\$ 10,000	\$ 10,000
10	Electrical/Controls-Including but not limited to all electrical power and controls wiring, conduit, panels, fixtures, electric heaters, thermostats, junction boxes, control equipment not provide by filter manufacturer, and miscellaneous appurtenances	1	EACH	\$ 10,000	\$ 10,000
11	Aqua Direct Cost (payroll, water quality sampling) @	3%			\$ 5,520
TOTAL COST/TREATED GPM:					\$ 4,100
TOTAL ESTIMATED PROJECT COSTS:					\$ 190,000

Note: The above information is for planning purposes only and is subject to change based on further engineering evaluations, water quality analyses, site conditions, and other site-specific discoveries and information

Alternative 2. Capex					
	Total design flow rate =	47	GPM		
TASK	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
	Connection Charge				
1	System Development Fee	1	EACH	\$ 6,730	\$ 6,730
2	Installation Fee	1	EACH	\$ 1,865	\$ 1,865
3	2in Meter Fee	1	EACH	\$ 774	\$ 774
4	Engineering and Permitting Costs	1	EACH	\$ 15,000	\$ 15,000
5	HOT TAP WITH VALVE AND BLOWOFF ASSEMBLY	1	EACH	\$ 10,000	\$ 10,000
6	DCVA and Hot Box	1	EACH	\$ 10,000	\$ 10,000
7	MOB/DEMOB	1	EACH	\$ 5,000	\$ 5,000
8	Aqua Direct Cost (payroll, water quality sampling, etc.) @	3%			\$ 1,481
TOTAL COST/TREATED GPM:					\$ 1,300
TOTAL ESTIMATED PROJECT COSTS:					\$ 60,000

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Alternative 4. Capex to abandon the System Assets					
	Total design flow rate =	47	GPM		
TASK	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
1	Abandon well	1	EACH	\$ 5,000	\$ 5,000
2	Remove hydro tank	1	EACH	\$ 5,000	\$ 5,000
3	Contractor mobilize and demo well house	1	EACH	\$ 10,000	\$ 10,000
4	Sale of property	1	EACH	\$ (18,000)	\$ (18,000)
5	Aqua Direct Cost @	10%			\$ 2,000
TOTAL COST/TREATED GPM:					\$ 300
TOTAL ESTIMATED PROJECT COSTS:					\$ 10,000

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