Redacted to Protect Confidential Information -
System Map is considered proprietary and confidential.



**SECONDARY WATER QUALITY TREATMENT SYSTEM REQUEST**
**Blue Water Cove Well #1**
**NC 30-34-012**
**WSF ID No: P01**
**AQUA NORTH CAROLINA**

## A. EXECUTIVE SUMMARY

The Blue Water Cove (BWC) Master Water System is comprised of 1 approved and active well, Blue Water Cove #1 and one point of entry (POE), P01. **The latest combined Fe and Mn concentration from Blue Water Cove Well #1 is 1.06 mg/L which makes it one of Aqua's Group 1 Priority Secondary Water Quality Projects as per the Water Quality Plan.** Also, Aqua has an Action Level exceedance for Lead. As a result, the recommendation from Cornwell Engineering is to install equipment for Fe/Mn removal and provide pH adjustment. PWSS is requiring installation of Caustic Soda by May 2021. Aqua believes that pH adjustment without Fe/Mn filtration will only exacerbate the discolored water issues. Therefore, Aqua has received multiple quotes for a Fe/Mn filtration system including a quote for a Chem-Free treatment system. The Chem-Free filter utilizes media that adjusts pH and also removes Fe/Mn.

Aqua proposes installing a Chem-Free treatment system at Blue Water Cove Well #1 in order to provide Fe/Mn removal as well as naturally raise the low raw pH.

### PROPOSED SYSTEM REQUIRING TREATMENT

1. System Name: Blue Water Cove Well #1
2. PWS ID: NC 30-34-012
3. No. Total Active Residential Water Connections: 18
4. No. Total Connections at Build Out: 25
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 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | APPC/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 | 25/31 | 40 | 32 | 16 | 6 | 1 | 0.4 | 1.05 | 0.0148 | 0.02 | 8 | 0.2 |

*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

**APPC = Approved Pumping Capacity

**TABLE 2**: Existing Storage at Well Sites

| Well Name and No. | Storage Description | | Most Recent Cleaning Date | |
|---|---|---|---|---|
| | Type | Gallons | Tank | Dist. System |
| Blue Water Cove Well #1 | Hydro-Installed 2004 | 5,000 | N/A | July 2020 |

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

   Response: Feb. 2018, June 2018, Dec. 2018, May 2019, Aug. 2019, Feb. 2020, July 2020

7. Next Planned Distribution System Flushing Occurrence:

   Response: This water system will be flushed again in Jan. 2021 and on an ongoing biannual basis. Disclaimer: Flushing does not completely remove the mineral accumulation 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 | X (approved but not feeding) | 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: The first cartridge filter was installed on 4/23/19 in an attempt to remove the high levels of Iron. A second cartridge filter was installed in series with the first on 3/12/2020.

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

    Response: None.

11. Comments on Approved/Current Well Capacity.

    Response: There has been no significant deviation of the average well production from the APPC.

## B. CURRENT SECONDARY WATER QUALITY CONCERNS

1. How many wells require treatment? 1

2. Can system operate with single well offline? No*

   *Per attached capacity calculations, the system is currently only supported by Well #1 at 1.53 GPM/active connection during the peak demand month of Aug. 2020 (above the 0.555 State design standard).

3. Are combined Fe/Mn concentrations above 1 mg/L? Yes*

   *The latest POE concentration is 1.06 mg/L (Fe+Mn)

4. Date of most recent POE Fe/Mn sampling results 7/16/2020

**TABLE 4**: Past 3 Years Fe/Mn Analysis

| Blue Water Cove Well #1 Laboratory Analysis at POE | | | | | | |
|---|---|---|---|---|---|---|
| **Date** | **Iron (Fe), mg/L** | | | **Manganese (Mn), mg/L** | | |
| | **Tot.** | **Sol.** | **Insol.** | **Tot.** | **Sol.** | **Insol.** |
| 7/16/2020 | 1.05 | 0.418 | 0.632 | 0.0148 | 0.0059 | 0.0089 |
| 6/11/2020 | 0.733 | 0.365 | 0.368 | 0.0108 | 0.00528 | 0.00552 |
| 5/7/2020 | 0.863 | 0.452 | 0.411 | 0.0119 | 0.00633 | 0.00557 |
| 4/23/2020 | 0.886 | 0.124 | 0.762 | 0.0124 | 0.00212 | 0.01028 |
| 4/16/2020 | 0.869 | 0.34 | 0.529 | 0.0122 | 0.00498 | 0.00722 |
| 4/14/2020 | 0.832 | 0.155 | 0.677 | 0.0119 | 0.00267 | 0.00923 |
| 4/9/2020 | 0.888 | 0.473 | 0.415 | 0.0119 | 0.00666 | 0.00524 |
| 5/10/2019 | 1.19 | 0.212 | 0.978 | 0.016 | 0.00289 | 0.01311 |
| 4/24/2019 | 1.36 | - | - | 0.0153 | - | - |
| 8/9/2018 | 1.27 | - | - | 0.0145 | - | - |

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

   Response: Aqua flushes the water mains biannually in this system. A first cartridge filter was installed on 4/23/19 in an attempt to remove the high levels of Iron. A second cartridge filter was installed in series with the first on 3/12/2020. Because the double cartridge filtration only removed the Iron levels to slightly below three times the sMCL of 0.3 mg/L, Aqua is concerned that its efforts to reduce total Fe will not be effective without adding a Fe/Mn treatment system.

**UTILITY COMMISION REQUIRED INFORMATION**

1. Well Location Map — Embedded in Executive Summary
2. DEH/PWS Approval Letter — Attached
3. Original 24 hr. Pump Status Report — Attached
4. Past 36 months of pump status reports — Attached
5. Inorganic Analysis Report submitted to DEH for well approval — Attached
6. Past 6 yrs. inorganic analysis from each wellhead — Attached
7. 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).

**C. CUSTOMER COMPLAINT DATA**

1. Total number of customer complaints in past 6 months — 2
2. Total number of customer complaints in past 12 months — 10
3. 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: Orange, yellow, brown dirty water.

**D. PROPOSED SECONDARY WATER QUALITY TREATMENT**

1. Proposed treatment recommendation: Chem-Free Treatment System
2. System Capex Estimate:

| FILTER CAPEX | | | | | |
|---|---|---|---|---|---|
| **TASK** | **DESCRIPTION** | **QTY** | **UNIT** | **UNIT COST** | **TOTAL** |
| **1** | Chem-Free filter equipment | 1 | EACH | $ 16,500 | $ 16,500 |
| **2** | Freight (based on shipping costs of similar size filters) | 1 | EACH | $ 500 | $ 500 |
| **3** | Engineering Design, Permitting, Bidding, & CA/CO (based on design costs of similar size filters) | 1 | EACH | $ 25,000 | $ 25,000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **4** | Construction Bonding, Mobilization and Demobilization | 1 | EACH | $ | 5,000 | $ | 5,000 |
| **5** | Site Work | 1 | EACH | $ | 15,000 | $ | 15,000 |
| **6** | 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 | $ | 30,000 | $ | 30,000 |
| **7** | Filter Building Construction | 1 | EACH | $ | 35,000 | $ | 35,000 |
| **8** | 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 | $ | 15,000 | $ | 15,000 |
| **9** | Aqua Direct Cost (payroll, water quality sampling) @ | 5% | | | | $ | 7,100 |
| **10** | Contingencies @ | 10% | | | | $ | 14,910 |
| | | | | **TOTAL ESTIMATED PROJECT COSTS/GPM:** | | **$** | **6,800** |
| | | | | **TOTAL ESTIMATED PROJECT COSTS:** | | **$** | **170,000** |

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

3. System Opex Estimate: $5,000
4. Comments:

Aqua will use 25 GPM as the treatment system design (max) flow rate.

**Aqua proposes installing a Chem-Free treatment system at Blue Water Cove Well #1.**