



## SECONDARY WATER QUALITY TREATMENT SYSTEM REQUEST

High Grove Well #1&2

NC 40-92-096

WSF ID No: P02

AQUA NORTH CAROLINA, INC.

### A. EXECUTIVE SUMMARY

The High Grove Master Water System is comprised of 3 approved and active wells, High Grove Well #1, 2 and 3, and three points of entry (POE), P01, P02 and P03. The system consists of the following:

The High Grove Subdivision Water System consists of three (3) wells with a combined yield of 151 gpm (Well #1 — 48 gpm; Well #2 — 53 gpm; Well #3 — 50 GPM), two (2) 5,400 ASME coded hydropneumatic tanks, chlorination, and Aqua Mag polyphosphate chemical feed systems at each well, well houses, and distribution water mains and valves serving a total of 155 service connections.

**The total Fe and Mn concentration at High Grove Well #1 was 1.27 mg/L on 4/26/2021 which makes it one of Aqua’s Group 1 Priority Secondary Water Quality Projects as per the Water Quality Plan.**

Aqua has previously analyzed purchased water (PW) for other systems. Purchase water is not available unless the homeowners all petition for annexation and extension of city sewer service.

Aqua has evaluated if interconnecting with an adjacent Aqua water system is possible. Based on the systems nearby, they too have similar secondary water quality issues. Therefore, Aqua does not believe it would be prudent to invest in interconnecting these systems together at this time.

Capex and Opex estimates are given below in Section D.2.

Well #1 is directly beside Well #2 and already has a water main interconnecting the two wells. The existing 4-inch main between the wells will be used as the finished water main from the well with the combined filter to the distribution system that splits between the east and west sides of the system. A new length of 470-foot 4-inch raw water main will take the water from Well #2 to the combined filter at Well #1.

Well #1 and #2 have similarly poor secondary water quality.

Because of this, Aqua proposes installing a combined oxidation-filtration system at High Grove Well #1 in order to remove Fe/Mn below the sMCLs for both wells. See attached system map.

### PROPOSED SYSTEM REQUIRING TREATMENT

|  |                                 |
|--|---------------------------------|
| 1. System Name:  | <u>High Grove Well #1&amp;2</u> |
| 2. PWS ID:   | <u>NC 40-92-096</u>             |
| 3. No. Active Residential Connections, as of March 2022: | <u>149</u>                      |
| 4. No. Permitted Residential Connections:                | <u>155</u>                      |

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**         | 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            | 48             | 60                                | 31 | 13   | 22                                    | 7         | 0.2                           | 1.10                          | 0.172  | 0.2 | 86  | 0.6 |
| Well 2            | 53             | 88                                | 56 | 10   | 17                                    | 4         | 0.3                           | 0.841                         | 0.264  | 0.4 | 136 | 0.9 |
| Well 3            | 50             | 89                                | 41 | 11   | 24                                    | 8         | 0.7                           | 0.373                         | 0.168  | 0.1 | 49  | 0.3 |

\*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

\*\*\*Loading calculations based on 12-hour per day runtime.

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

| Well Name and No. | Storage Description |         | Most Recent Cleaning Date |
|-------------------|---------------------|---------|---------------------------|
|                   | Type                | Gallons | Dist. System              |
| Well 1            | Hydro               | 5,400   | Jan. 2022                 |
| Well 2            | N/A                 | N/A     | Jan. 2022                 |
| Well 3            | Hydro               | 5,400   | Jan. 2022                 |

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

Response: May. 2017, Oct. 2020, Jan. 2022

7. Next Planned Distribution System Flushing Occurrence:

Response: This water system will be flushed again by Aug. 2022 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           | Proposed     |
| Well 2            | X                        | N/A     | X           | Proposed     |
| Well 3            | 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: Started feeding sequestrant at all three wells on Sept. 2015. A cartridge filter was installed at Well #1 in 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.

**B. CURRENT SECONDARY WATER QUALITY CONCERNS**

1. How many wells require treatment? 2

\*15 A NCAC 18C.1511 and 15 A NCAC 18C.1512 requires systems to provide treatment for concentrations of iron greater than 0.3 mg/L and for manganese greater than 0.05 mg/L.\*

2. Can system operate with single well offline? No

3. Are combined Fe/Mn concentrations above 1 mg/L? Yes for Well #1 & #2\*

4. Date of most recent POE Fe/Mn sampling results 2/28/2022

\*See Appendix 1 attached for past three years of Fe/Mn analyses at each POE\*

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 annually in this system. Started feeding sequestrant at all three wells in Sept. 2015.

**UTILITY COMMISSION REQUIRED INFORMATION**

1. Well Location Map Attached
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. Attached

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 1
2. Total number of customer complaints in past 12 months 6
3. For past 6 months, do customer secondary water complaints exceed 10% of the number of active customers? No
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: Customers reported dirty/orange/dark water in tub, not usable for washing clothes, etc.

### D. PROPOSED SECONDARY WATER QUALITY TREATMENT

1. Proposed treatment recommendation: Oxidation-Filtration Treatment System
2. System Capex Estimate:

| Filter Capex                             |  |     |      |            |                |
|--|--|-----|------|------------|----------------|
|  | Total design flow rate =   | 85  | GPM  |            |                |
| TASK                                     | DESCRIPTION  | QTY | UNIT | UNIT COST  | TOTAL          |
| 1  | Filter Skid, no recycle, sludge management systems required  | 1   | EACH | \$ 133,200 | \$ 133,200     |
| 2  | Backwash Supply System   | 1   | EACH | \$ 30,900  | \$ 30,900      |
| 3  | Freight (estimate from AdEdge)   | 1   | EACH | \$ 4,700   | \$ 4,700       |
| 4  | Engineering Design, Permitting, Bidding, & CA/CO (based on design costs of similar size filters)   | 1   | EACH | \$ 29,850  | \$ 29,850      |
| 6  | Construction Bonding, Mobilization and Demobilization  | 1   | EACH | \$ 5,000   | \$ 5,000       |
| 7  | Site Clearing, Grubbing, Grading, Gravel, Erosion Control  | 1   | EACH | \$ 25,000  | \$ 25,000      |
| 8  | Existing Well House Piping Modifications   | 1   | EACH | \$ 5,000   | \$ 5,000       |
| 9  | 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      |
| 10                                       | Filter Building Construction-Including but not limited to concrete floor slab, well house erection, finishing, and necessary appurtenances   | 1   | EACH | \$ 50,000  | \$ 50,000      |
| 11                                       | Backwash Supply Tank Installation:<br>Including but not limited to all piping from 12" above grade to 4" air gap, concrete pad, tank setting, electrical, and necessary appurtenances.   | 1   | EACH | \$ 15,000  | \$ 15,000      |
| 12                                       | Yard Piping-Including but not limited to all underground pipe, fittings, and valve   | 1   | EACH | \$ 15,000  | \$ 15,000      |
| 13                                       | 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      |
|  | PROP. 470 LF 4" C900 PVC RAW WATERLINE FROM WELL #2 TO WELL #1   | 470 | FOOT | \$ 100     | \$ 47,000      |
| 14                                       | Aqua Direct Cost (payroll, water quality sampling) @   | 3%  |      |            | \$ 10,310      |
| <b>TOTAL COST/TREATED GPM: \$</b>        |  |     |      |            | <b>5,000</b>   |
| <b>TOTAL ESTIMATED PROJECT COSTS: \$</b> |  |     |      |            | <b>410,000</b> |

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. Opex Estimate: \$10,000