



SECONDARY WATER QUALITY TREATMENT SYSTEM REQUEST

Greymoss/Fitzford Well #3

NC 03-32-111

WSF ID No: P03

AQUA NORTH CAROLINA, INC.

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A. EXECUTIVE SUMMARY

The Greymoss/Fitzford Master Water System is comprised of 3 approved and active wells, Greymoss/Fitzford Well #3, 5 and 6, and two points of entry (POE), P01 and P03. Well #6 is a satellite well that combines with Well #5 at P01 before going through an Fe/Mn filter and entering the distribution system. Well #3 is a single POE that enters a 5,000-gallon and 2,500-gallon pressure storage tank before entering the distribution system. **The latest Mn concentration at Greymoss/Fitzford Well #3 is 0.709 mg/L on 9/15/2021 which makes it one of Aqua's Group 1 Priority Secondary Water Quality Projects as per the Water Quality Plan.**

Aqua proposes installing an oxidation-filtration system at Greymoss/Fitzford Well #3 in order to remove Fe/Mn below the sMCLs.

Aqua has previously analyzed purchased water (PW) with the City of Durham 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 near Greymoss, 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.

PROPOSED SYSTEM REQUIRING TREATMENT

- | | |
|--|----------------------------------|
| 1. System Name: | <u>Greymoss/Fitzford Well #3</u> |
| 2. PWS ID: | <u>NC 03-32-111</u> |
| 3. No. Active Residential Connections, as of September 2021: | <u>231</u> |
| 4. No. Permitted Residential Connections: | <u>299</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 3	26	40	29	17	10	5	1.4	0.0844	0.709	0.1	50	0.2
Well 5	95	62	35	12	8	4	0.5	0.0351	0.0143	0.0	13	0.1
Well 6	90	128	84	21	12	5	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

***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
Greymoss/Fitzford Well #3	Hydro	(1)5,000, (1)2,500	Nov. 2020
Greymoss/Fitzford Well #6	Hydro	5,000	Nov. 2020

*No tank located at Well #5

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

Response: Oct. 2018, Apr. 2020, Nov. 2020

7. Next Planned Distribution System Flushing Occurrence:

Response: This water system will be flushed again by 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 3	X	N/A	X	N/A
Well 5	X	N/A	N/A	Greensand Filtration at well #5
Well 6	X	N/A	N/A	Greensand Filtration at well #5

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: Harmsco cartridge filter installed and currently feeding sequestrant at Well #3. Manganese Dioxide filtration installed 2016 for Wells #5&6 at #5.

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

Response: The system has been unable to maintain consistent copper results below the Copper ALE which has necessitated the installation of orthophosphate at all POE's to meet compliance requirements. Well #3 will no longer satisfy secondary water quality standards which is necessitating the need to install filtration to meet the intent of the rule. Currently seeking NCDEQ approval to install an orthophosphate-based inhibitor at both combined entry points (Wells #3 & 5) with the related chemical feed and storage equipment, as well as a backwash supply system to upgrade the existing Fe/Mn filter system at Well #5.

11. Comments on Approved/Current Well Capacity.

Response: Well #5 pump/motor recently replaced.

B. CURRENT SECONDARY WATER QUALITY CONCERNS

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

* Based on the approved number of connections and the current average well flow, the required minimum flow is 165 gpm. Aqua must include the production of Well #3 to meet system demand.

- 3. Are combined Fe/Mn concentrations above 1 mg/L? _____ No*

*However, the latest POE Mn concentration from Well #3 is over 0.3 mg/L (0.709 mg/L)

- 4. Date of most recent POE Fe/Mn sampling results _____ 9/15/2021

TABLE 4: Past 3 Years Fe/Mn Analysis

Greymoss/Fitzford Well #3 Laboratory Analysis at POE						
Date	Iron (Fe), mg/L			Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
05/19/2017	0.06	-	-	0.117	-	-
04/06/2020	0.0997	-	-	0.436	-	-
06/29/2021	0.144	0.107	0.037	0.589	0.574	0.015
06/29/2021	0.17	0.142	0.028	0.573	0.564	0.009
08/11/2021	0.094	0.05	0.044	0.449	0.419	0.03
09/15/2021	0.0844	0.0477	0.0367	0.709	0.697	0.012
Greymoss/Fitzford Well #5,6 Laboratory Analysis at POE						
Date	Iron (Fe), mg/L			Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
11/17/2017 (Before Filter)	3.44	-	-	1.14	-	-
12/13/2017 (After Filter)	<0.022	-	-	<0.00039	-	-
10/07/2020	0.0351	-	-	0.0143	-	-

- 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. Harmsco cartridge filter installed and currently feeding sequestrant at Well #3. Manganese Dioxide filtration installed 2016 for Wells #5&6 at #5.

UTILITY COMMISION 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).

C. CUSTOMER COMPLAINT DATA

- 1. Total number of customer complaints in past 6 months 0
- 2. Total number of customer complaints in past 12 months 1
- 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: Customer reported dirty water.

D. PROPOSED SECONDARY WATER QUALITY TREATMENT

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

Filter Capex					
	Total design flow rate =	30	GPM		
TASK	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
1	Filter Skid, no recycle, sludge management systems required	1	EACH	\$ 135,600	\$ 135,600
2	Freight (based on shipping costs of similar size filters)	1	EACH	\$ 6,613	\$ 6,613
3	Engineering Design, Permitting, Bidding, & CA/CO (based on design costs of similar size filters)	1	EACH	\$ 30,000	\$ 30,000
4	Construction Bonding, Mobilization and Demobilization	1	EACH	\$ 5,000	\$ 5,000
5	Site Clearing, Grubbing, Grading, Gravel, Erosion Control	1	EACH	\$ 20,000	\$ 20,000
6	Existing Well House Piping Modifications	1	EACH	\$ 5,000	\$ 5,000
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	\$ 45,000	\$ 45,000
	Backwash Supply Tank Installation: 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	\$ 10,000	\$ 10,000
9	Yard Piping-Including but not limited to all underground pipe, fittings, and valve	1	EACH	\$ 15,000	\$ 15,000
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	\$ 20,000	\$ 20,000
11	Aqua Direct Cost (payroll, water quality sampling) @	3%			\$ 9,216
TOTAL COST/TREATED GPM:					\$ 10,667
TOTAL ESTIMATED PROJECT COSTS:					\$ 320,000

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. Opex Estimate: \$10,000