



SECONDARY WATER QUALITY TREATMENT SYSTEM REQUEST

Shannon Woods New Well #4 Treatment

NC 03-92-373

WSF ID No: P28

AQUA NORTH CAROLINA

A. EXECUTIVE SUMMARY

Aqua proposes installing an AdEdge Iron (Fe) and Manganese (Mn) filter system to treat the flow at Shannon Woods New Well #4. This well is part of the Bayleaf Master System comprised of 122 active wells and 117 points of entry (POEs). **Mn levels at well #4 are greater than 0.3 mg/L which makes it one of Aqua's Group 1 Priority Secondary Water Quality Projects as per the Water Quality Plan.** The latest raw Mn concentration was 0.371 mg/L as of 12/22/2019. These results were taken during the new well twenty-four-hour drawdown test. Based on studies performed by AWWA and other organizations, elevated concentrations of Mn are being linked to cause adverse health effects. Preliminary engineering studies indicate that Green Sand filtration is the most effective and permanent solution since it physically removes Fe and Mn.

B. PROPOSED SYSTEM REQUIRING TREATMENT

1. System Name: Bayleaf Master-Shannon Woods New Well #4 Treatment
2. PWS ID: NC 03-92-373
3. No. Total Active Residential Connection: 6,122
4. No. Total Permitted Connections: 6,356
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 (hrs./day)	**Latest POE Inorganic Sampling Results						
	App.	Max, Avg., Min from Past 3 Years				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.)		
#4	100*	~	~	~	~	~	~	0.163	0.371	~0.32	~117	~1.7

*This is the well production from the attached drawdown report.

**Loading rates based on 12-hour runtimes if well is offline due to poor water quality, as in the case of well #1 above.

***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.

Figure 1. Proposed Shannon Woods Well #4 site:**TABLE 2:** Existing Storage at Well Sites

Well Name and No.	Storage Description		Most Recent Cleaning Date	
	Type	Gallons	Tank	Dist. System
Bayleaf System	Elevated	1,750,000	2018	Feb. 2020
Bayleaf System	Hydro	10,000		Feb. 2020
Bayleaf System	Ground	104,500		Feb. 2020

*These wells use existing storage in Bayleaf Master System.

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

Response: February 2018, February 2019, February 2020.

7. Next Planned Distribution System Flushing Occurrence

Response: March 2020.

8. List of chemicals being used:

TABLE 3: Existing Chemicals Used at Well Site

Well Name and No.	Chemical Description			
	Cl ₂	OP-37	NaOH	SeaQuest
#4	X	N/A	N/A	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: This will be a new well and currently does not have treatment history.

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

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

* Based on the historical demands of the Bayleaf Master System, every well is required to meet demand. Subsequently, the production from Shannon Woods #4 is required and cannot be taken offline or remain offline.

3. Are combined Fe/Mn concentrations above 1 mg/L or Mn above 0.3 mg/L? Yes*

*The latest raw Mn concentration at Well #4 is 0.371 mg/L.

4. Date of most recent raw Fe/Mn sampling results 12/22/2019

TABLE 4: Most Recent Fe/Mn Inorganic Analysis at Wells #1&7

Well #4 Laboratory Analysis						
Date	Iron (Fe) POE, mg/L			Manganese (Mn) POE, mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
12/22/2022	0.163	~	~	0.371	0.336	0.035

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

Response: This will be a new well and currently does not have treatment history. Flushed distribution system annually since 2011 and will continue to flush water mains annually. The intent of the sequestering agent is to physically chelate or 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

- | | |
|---|-----------------|
| 1. Well Location Map | <u>Attached</u> |
| 2. DEH/PWS Approval Letter | <u>Attached</u> |
| 3. Original 24 hr. Pump Status Report | <u>Attached</u> |
| 4. Past 36 months of pump status reports | <u>N/A</u> |
| 5. Inorganic Analysis Report submitted to DEH for well approval | <u>Attached</u> |
| 6. Past 6 yrs. inorganic analysis from each wellhead | <u>N/A</u> |
| 7. Past 3 yrs. Fe/Mn analyses, both soluble and insoluble. | <u>N/A</u> |

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1. Total number of customer complaints in past 6 months 6
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? 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: Brown, black, and yellow discolored water complaints.

F. PROPOSED SECONDARY WATER QUALITY TREATMENT

1. Proposed treatment recommendation: AdEdge Water Technologies Treatment system
2. Proposed System Cost:

COST ESTIMATE					
Shannon Woods New Well #4 Filtration					
TASK	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
1	Filter Skid (includes sales tax and freight cost)	1	LS	\$ 102,100	\$ 112,502
2	Construction of Filter House, Backwash Disposal System, Well House Upgrades (based on costs from similar size projects)	1	LS	\$ 150,000	\$ 150,000
3	Engineering, Permitting, Bidding & CA/CO	1	LS	\$ 27,950	\$ 27,950
4	Aqua Direct Cost @	5%			\$ 14,522.61
5	Contingencies @	5%			\$ 15,248.74
6				TOTAL CAPITAL COSTS:	\$ 320,224
7	AFUDC @	7%			\$ 22,416
TOTAL ESTIMATED PROJECT COSTS/GPM (DESIGN FLOWRATE IS 100 GPM):					\$ 3,500
TOTAL ESTIMATED PROJECT COSTS:					\$ 343,000

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. Estimated annual operating and maintenance expenses: \$1,000.00

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4. Comments: Mn levels at this well are greater than 0.3 mg/L which makes it one of Aqua's Group 1 Priority Secondary Water Quality Projects as per the 2020 Water Quality Plan. The elevated level of Mn also poses a health risk to customers that must be addressed. Aqua will use 100 GPM as the treatment system design (max) flow rate.

For these reasons, Aqua proposes installing an AdEdge Iron (Fe) and Manganese (Mn) filter system to treat the flow at Shannon Woods New Well #4.

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