



SECONDARY WATER QUALITY TREATMENT SYSTEM REQUEST

Mountain Vista at Luther Cove Treatment

NC 10-11-035

WSF ID No: P01

AQUA NORTH CAROLINA

A. EXECUTIVE SUMMARY

The Mountain Vista Master Water System is comprised of 2 approved and active wells, #1&2, and one combined point of entry (POE). Originally, the developer was only required to install a greensand type filter for Well #2 since the combined Iron (Fe) and Manganese (Mn) concentration was above 0.5 mg/L. Since then the water quality of both wells has deteriorated (See Table 4.). **The latest combined Fe and Mn from the wells is more than 1 mg/L which makes it one of Aqua's Group 1 Priority Secondary Water Quality Projects as per the Water Quality Plan.** Aqua proposes installing an Iron and Manganese filter system at Mountain Vista at Luther Cove Well #1 in order to provide a treated second source of supply since the number of active connections has surpassed 49. Based on studies performed by AWWA and other organizations, elevated concentrations of Mn are being linked to cause adverse health effects and there is a current EPA health advisory on Mn. Preliminary engineering studies indicate that an Fe/Mn treatment system is the most effective and permanent solution since it physically removes the Fe and Mn.

B. PROPOSED SYSTEM REQUIRING TREATMENT

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| 1. System Name: | <u>Mt. Vista @Luther Cove Well #1</u> |
| 2. PWS ID: | <u>NC 10-11-035</u> |
| 3. No. Total Active Residential Water Connections: | <u>51</u> |
| 4. No. Total Connections at Build Out: | <u>58</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						
	App.	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.)		
Mt. Vista Well #1	88	97	90	74	7	1.1	0.3	1.55	0.200	0.12	42	0.32
Mt. Vista Well #2	32	32			1							

*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.

TABLE 2: Existing Storage at Well Sites

Well Name and No.	Storage Description		Most Recent Cleaning Date	
	Type	Gallons	Tank	Dist. System
Mt. Vista System	Ground storage tank with 2 booster pumps and bladder tank	15,000	N/A	July 2019

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

Response: Sept. 2017, Nov. 2017, Dec. 2017, Feb. 2018, July 2018, Oct. 2018, May 2019, June 2019, July 2019, Aug. 2019.

7. Next Planned Distribution System Flushing Occurrence

Response: This water system will be flushed again in 2020 and on an ongoing annual 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.	Chemical Description		
	Cl ₂	NaOH	Polyphosphate
Mt. Vista Well #1	X	N/A	X
Mt. Vista Well #2	X	Permitted but not used	X

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 developer installed an Fe/Mn treatment system for well #2 during the original installation of the water system. Due to the remote location of this system in respect to the Denver office, Aqua chose not to place Well #2 and the corresponding Fe/Mn filter into service. Therefore, Well #1 went into service first. Well #1 was approved for chlorine disinfection and a sequestering agent. At this time, the number of connections is above 49 and Aqua has been required recently to place Well#2 into service. Recent raw water samples indicate that the Fe and Mn concentrations from Well #1 have increased. The greensand filter located at the combined treatment was only designed to treat Well #2 (32 gpm). It is not possible to filter the water production from both wells (32 gpm +88 gpm = 120 gpm) without adding additional filter canisters.

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

Response: None.

10. Comments on Approved/Current Well Capacity.

Response: There has been no significant deviation of the actual well capacities from the permitted well capacities.

C. CURRENT SECONDARY WATER QUALITY CONCERNS

1. How many wells require treatment? _____ 1*

*Well #2 has a greensand filter system already installed. Aqua plans to install additional filter cannisters to accommodate the flow from Well #1. Since the existing 10' x 10' building is not large enough to accommodate additional filtration equipment, the existing treatment building will have to be enlarged or a new treatment building will be constructed.

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

*The system demand cannot be met by well #2 alone (32 GPM/58 connections = 0.552 GPM/connection < the required minimum flow of 0.555 GPM/connection). This is an approved 2 well system with a combined point of entry. As per state regulations, communities with more than 49 active connections must have a second source of supply. Since the system cannot be operated with Well #2 only and the fact that the two wells pump into a combined point of entry, Well #1 should receive filtration also.

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

*The latest POE concentration is 1.75 mg/L (Fe+Mn). It should be pointed that this combined result is just for Well #1 since Well #2 just came into service. Using a combined concentration for Fe and Mn of 1.75 mg/L for Well #1 and assuming a filtered effluent concentration for Fe and Mn of 0.05 mg/L, Aqua mathematically predicts that the combined concentration for Fe and Mn from both wells to be **1.296 mg/L**. New samples are being collected that represent combined treatment for Well #1 and #2 to verify this prediction.

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

2/13/2019

TABLE 4: Past 3 Years Fe/Mn Analysis

Mt. Vista Well #1 Laboratory Analysis at POE						
Date	Iron (Fe), mg/L			Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
5/29/2012	0.6	-	-	0.119	-	-
4/9/15	0.78	-	-	0.14	-	-
5/8/2018	1.91	-	-	0.189	-	-
2/13/2019	1.55	0.548	1.002	0.200	0.179	0.021
Date	Well #1 Raw Iron (Fe), mg/L			Well #1 Raw Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
10/20/2008 (New Well IOC)	0.32	-	-	0.11	-	-
1/21/2013	0.832	0.577	0.255	~0.112	0.112	<0.010
2/13/2019	1.52	0.567	0.953	0.198	0.177	0.021
Mt. Vista Well #2 Raw Laboratory Analysis						
Date	Iron (Fe), mg/L			Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
10/20/2008 (New Well IOC)	1.82	-	-	0.09	-	-

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

Response: As you can see from the table above, the original New Well IOC did not show extremely high concentrations of Fe and Mn. Over time, the concentrations of both Fe and Mn at Well #1 have increased. 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. Well #2, which is the lesser producing well, has a greensand filter that was originally installed by the developer. This filter as mentioned above was only designed to filter the capacity of Well #2. Blending the filtered water from Well #2 with unfiltered water from Well #1 will not be adequate to reduce the concentrations to acceptable standards as mathematically predicted above.

UTILITY COMMISSION REQUIRED INFORMATION

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| 1. Well Location Map | <u>Embedded in Executive Summary</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>Attached</u> |
| 5. Inorganic Analysis Report submitted to DEH for well approval | <u>Attached</u> |
| 6. Past 6 yrs. inorganic analysis from each wellhead | <u>Attached</u> |
| 7. Past 3 yrs. Fe/Mn analyses, both soluble and insoluble. | <u>See Table 4 Above</u> |

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).

D. CUSTOMER COMPLAINT DATA

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| 1. Total number of customer complaints in past 6 months | <u>3</u> |
| 2. Total number of customer complaints in past 12 months | <u>6</u> |
| 3. For past 6 months, do customer secondary water complaints exceed 10% of the number of active customers? | <u>No</u> |
| 4. Provide 12-month list of all water quality complaints | <u>Attached</u> |
| 5. Provide 12-month list of all completed water quality work orders | <u>Attached</u> |
| 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, brown, orange water.

E. PROPOSED SECONDARY WATER QUALITY TREATMENT

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|---|---|
| 1. Proposed treatment recommendation: | <u>Greensand Treatment System</u> |
| 2. Proposed System Capital Cost Estimate: | <u>\$275,000 (filter vendor+engineering+construction)</u> |
| 3. Comments: | |

Since the current filter for well #2 was designed with a subsurface dosing tank and disposal field, a recycle system will not be necessary. As allowed by new State regulations, Aqua will manage the discharge so that no more than 5,000 gallons per week will be discharged onto the ground. Aqua has solicited bids from two different filter vendors for the purchase of greensand filters sufficiently sized to only provide treatment for the capacity of Well #1 (80 gpm) and not for Well #2 since those filters already exist. The bids received ranged from \$75,000 – \$80,000 for the filter equipment. Based on former projects, we estimate the treatment building and installation of the new greensand filters and piping to be

approximately \$150,000. Including an engineering services fee of \$30,000 and overheads, Aqua estimates a proposed cost estimate of \$275,000 for adding filtration equipment to treat an additional 88 gpm (\$3,125/gpm). Also, it should be noted that the cost impact to ANC water customers for this new filter addition will be \$0.49 annually/customer or \$0.04/month/customer.

Aqua would like to mention that cartridge filtration would not be effective due to the high concentration of Fe and the high flow rate from Well #1. We would also like to mention that well cleaning has not proven to be successful and has shown very limited improvements from years of attempts by Aqua. Therefore, Aqua proposes installing an Iron and Manganese filter system at Mountain Vista at Luther Cove Well #1 in order to provide sufficient for both wells at the combined point of entry.