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September 5, 2018

Mr. Tom Hansen
Abenaki Water Company
32 Artisan Court #2
Gilford, NH 03249

Subject: Analysis and Recommendations Summary - Abenaki Water Company Rosebrook Water System

Introduction

Abenaki Water Company (“AWC”) has filed a petition with the New Hampshire Public Utilities Commission to support comprehensive water system improvement projects which, among other things will reduce extreme pressures in portions of the Rosebrook Water System (“System”). The Rosebrook system is part of the Abenaki Water Company, a subsidiary of New England Service Company (“NESC”). Horizons Engineering, Inc. (“Horizons”) staff is familiar with the System since its initial work on the System in 1987. AWC has requested that Horizons analyze the System and provide recommendations on future capital improvements.

Background

The System dates back to the early 1970s and it is Horizon’s understanding that it was initially constructed to serve the Bretton Woods Ski Area and appurtenant commercial and residential developments. The System relies on two overburden wells in the valley adjacent to the Ammonoosuc River, a 650,000 gallon concrete atmospheric storage tank on the ski slope to provide storage and maintain system pressure, and a network of distribution piping, mostly ductile iron ranging in size from 8 to 16 inches in diameter. The system serves 407 customers including the Mount Washington Hotel, several other commercial properties and a community of second homes and condominiums. The estimated serviced population is in excess of 1,100 people. The system has 63 fire hydrants and provides water for internal sprinkler systems. The System is routinely assessed by the New Hampshire Department of Environmental Services (“NHDES”). The NHDES has raised concerns that AWC address the System’s high pressure.

Owing to significant topography within the service area, static pressures in the system vary from 35 pounds per square inch (psi) at the higher elevations to approximately 190 psi in the valley along the Ammonoosuc River. Intermittent pressure surges (water hammer) have reportedly increased this pressure significantly higher. The higher pressures in the system have reportedly caused problems with

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leakage and premature failure of valves, fittings, pumps and other appurtenances and pose operational and safety challenges in the day to day operation and maintenance of the system. These higher pressures exceed typical design operational ranges. Per the “Recommended Standards for Water Works” (aka Ten State Standards), PART 8 Distribution System Piping and Appurtenances, 8.2.1 Pressure, recommended system pressures”...should be approximately 60 to 80 psi...” These design standards have been adopted by the NHDES for large drinking water systems under Part Env Dw-404.

Since acquiring the System in September 2016, AWC has recognized the hazards associated with operating the water system at high pressures. Past incidents of pressure related issues have reportedly disrupted service. The following are examples of the difficulties of system operation reported by Abenaki:

- Rosebrook Water Company was informed that their commercial package and property policy, running from 6/23/15 through 6/23/16 could not be renewed. This event was triggered by an extensive damage claim by Rosebrook following a water hammer incident which flooded several townhouses during a hydrant flushing operation.
- In 2010, a high pressure event during a repair at the System’s well house caused major damage to that facility and forced the Mt. Washington Hotel to close for three days.
- Recently, Abenaki has been unable to effect timely repair of two fire hydrants because the excessively high pressures posed a serious safety and construction concern for the contractor. (See Attached e-mail from of F.X. Lyons dated August 22, 2018).

NHDES has reportedly been aware of the high pressure situation for some time. In its Sanitary Survey report dated August 4, 2014 (attached) NHDES concluded “...pressure in the distribution system, as a result of storage tank elevation, is much higher than necessary for adequate water service and fire flow. This pressure presents serious questions about power consumption and about safety of the operation when making pipe repairs. We urge the system owner to consider alternate ways of using the existing tank and adopting a lower pressure gradient”.

In January 2017, NHDES stated in a letter to AWC (attached), “We are in support of and recommend system modifications which will reduce the public health risk and will maintain pressures within the recommended range. Not only will this provide for a safer and less costly system to operate, it also creates the ability for the company to take back ownership of system maintenance from home and commercial owners who are currently maintaining their own PRVs.”

The Town of Twin Mountain Fire Department is also concerned about the high pressures. In February, 2017 the department sent a letter to AWC (attached) in support of the project to reduce system pressure to a maximum of 100 psi. The department stated that they believe such a project will “...improve safety and reliability of the system.”

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Recommendations

The primary concern is that the System is presently operated at one pressure gradient despite the topography varying widely across the service area. Typically, a water service area with such varying terrain would be designed with multiple pressure zones served by booster pump stations as needed.

At the request of the AWC, Horizons evaluated the System in July 2016 and recommended alternative methods to lower the maximum system pressure to 100 psi maximum. The recommendations include installing pressure reducing valves and constructing three new pump stations while maintaining the temporary use of the existing tank.

To mitigate rate shock to customers, AWC recommends the plan be conducted over the following phases:

Phase I. Design the System improvements, including the tank and pump stations. The plan would include constructing a new water storage tank at a lower elevation. This would preclude the need for pressure reducing valves. The new tank will enable Rosebrook to lower the maximum system pressure to a more reasonable 100 psi.

Phase II. Construct a new water transmission main and one booster pump station. The pressure at the well will be reduced to 100 psi. The overall system pressure will remain at 200 psi max. The Phase II improvements will become part of the overall pressure reduction project when it is completed. The phased construction approach will also reduce a safety concern associated with operating the wells at 200 psi.

Phase III. Construct two additional pump stations and install pressure reducing valves to lower the maximum service area pressure to 100 psi. The high elevations will be serviced by the pump stations which will have adequate fire flow capabilities and standby power.

Phase IV. Construct the new storage tank. The tank will replace the existing partially buried storage tank that is now on one of the resort ski slopes. Upon completion of Phase IV, the System will meet AWCs design and safety standards. The mitigation of unsafe pressure will allow for better maintenance, scalability, and less concern for damage and disruptions over the next 40 years.

In conclusion, Horizons recommends adoption of this multi-phased project. In addition to mitigating rate shock, Horizons believes the phased project components will ensure operational reliability and control, reduce the potential for increased water losses, and optimize scalability of the water system.

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Please feel free to contact me if you have any questions or if you need any additional information.

Sincerely,



Stephen LaFrance, P.E.
Principal Engineer
Horizons Engineering, Inc.

Enclosures

C:\Users\SysAdmin\Desktop\New England Water - Rosebrook Letter 2018-09-04.docx

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Don Vaughan

From: F. X. LYONS <fxlyons@hotmail.com>
Sent: Wednesday, August 22, 2018 3:05 PM
To: Don Vaughan
Subject: Re: Rosebrook Hydrants

Difficult undertaking with a high risk. In reviewing the P&L system prints page 3 shows a 16" valve adjacent to the broken hydrant. Their survey dated 11/3/99 labeled it as 3A, they apparently operated the valve, documented the turns and added a comment 'Seems OK'. This valve must still be in place. If a metal detector can not pick up the gate box that would lead me to believe that the gate box top section was removed following some event. That area can be excavated, 'carefully', a new gate box installed and the valve tested. Without this valve being operational there is 4500+/- feet of 16" pipe between the tank and the north side of Rt 302 with out an operational valve. That is not a risk I am willing to take. Would you want us to attempt to locate that valve. We could schedule that next week. Thanks FX



The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

August 4, 2014

Charles Adams
 Rosebrook Water Co
 123 E Main St 2nd Floor
 Charlottesville VA 22902

Subject: Rosebrook Water; PWS ID 0382010; Carroll
Sanitary Survey

Dear Mr. Adams:

On 10/23/2013 I met with Nancy Oleson and Brian Sullivan to review facilities and management of the Rosebrook Water Company. The purpose of this survey is to review the capacity of the system's source, treatment, distribution and management to continuously produce safe drinking water. I thank Ms. Oleson and Mr. Sullivan for their assistance.

FACILITIES SUMMARY

The Rosebrook water system consists of two gravel packed wells, a single 650,000-gallon storage tank and a network of distribution piping, mostly ductile iron from 8 to 16 inches in diameter. The system serves 407 service connections, among which are the Mount Washington Hotel, several other commercial properties, and a community of second homes and condominiums. Estimated peak population served is in excess of 1,000 people. The system serves fire demand by way of some internal sprinkler systems and 63 exterior hydrants. There is also some limited outdoor water use, including minor snowmaking at the Nordic Center.

Water demand varies widely with the seasons and occupancy of the facilities served. Average year-round daily demand had been placed at about 154,000 gallons per day (gpd) historically. A 2007 report put estimated maximum daily demand as high as 500,000 gpd. Although construction is not moving forward at this time, residential and commercial construction is estimated to increase peak demand to about 740,000 gpd at full build-out.

The two gravel packed wells are summarized as follows:

Well	DES No.	Depth	Nominal well capacity (gpm)	Treatment
1	001	43'	350	Chlorine, soda ash
2	002	52'	450	Chlorine, soda ash

Well 1 is located within the pumping station, while well 2 is located 90 feet away. Well 1 is equipped with soft start to minimize hydraulic surges at startup. Injection of chlorine for disinfection and soda ash for corrosion control takes place within the pumphouse. Discharge pressure is normally about 185 psi, which is exceptionally high for residential water supplies.

A pipe break in the pump discharge main within the pumphouse in May 2010 did extensive damage to the pumphouse structure, electrical and instrumentation. The incident pointed out sub-standard piping and structural work at the facility. Repairs to the immediately affected infrastructure have since been completed. A generator has also been added to provide back-up power for the well pumps and pumphouse.

The 650,000-gallon tank is located adjacent to ski trails toward the south westerly side of the service area. Tank water level is now transmitted to the pumping station by way of line communication replacing the former battery-powered radio signal relay. Pump operating range is reportedly from 10 to 12 feet in tank depth, with a total tank depth of 13 feet.

The distribution system is primarily ductile iron. However maximum pressure is about 185 psi, significantly higher than the 100 psi allowed in state design standards. A backflow prevention program was adopted in 2013. There are a number of reduced-pressure zone devices and double-check valves in place, on high and low hazard classified service connections within the distribution system, which are tested routinely.

STAFFING AND CERTIFIED OPERATOR VERIFICATION

This water system is required to retain a primary certified operator certified at treatment grade 1 and distribution grade 2. The following certified operators are affiliated with Rosebrook Water and show adequate levels of certification:

<u>Operator</u>	<u>Certificate No.</u>	<u>Treatment Level</u>	<u>Distribution Level</u>
Nancy Oleson	2767	2	2
Brian Sullivan	3059	2	2

Significant Deficiencies

1. No significant deficiencies were noted during the site visit

Minor Deficiencies

Though less urgent than deficiencies noted above, the following deficiencies should be addressed in the course of system operation:

1. Pressure in the distribution system, as a result of storage tank elevation, is much higher than necessary for adequate water service and fire flow. This pressure presents serious questions about power consumption and about safety of the operator when making pipe repairs. We urge the system owner to consider alternate ways of using the existing tank and adopting a lower pressure gradient.

DES recommends developing an asset management plan to ensure that you get the most value from each of your assets and have the financial resources to rehabilitate and replace them when necessary. Asset management helps a system make critical decisions about how to achieve the desired level of service at the lowest appropriate cost to customers. For assistance contact Luis Adorno, by phone at (603) 271-2472, or email luis.adorno@des.nh.gov.

I can be reached at 271-2410 or wade.pelham@des.nh.gov if there are any questions regarding this letter.

Sincerely,

A handwritten signature in black ink, appearing to read 'Wade Pelham', with a long, sweeping horizontal flourish extending to the right.

Wade Pelham
Drinking Water and Groundwater Bureau

cc. Nancy Oleson, Primary Operator
Michael Hahaj, Rosebrook Water Co



The State of New Hampshire
Department of Environmental Services



Clark B. Freise, Assistant Commissioner

January 26, 2017

Alex Cranshaw
Abenaki Water Co.
37 Northwest Drive
Plainville, CT 06062

Subject: Rosebrook Water (0382010)
Pressure Reduction Project

Dear Mr. Cranshaw:

We understand that you are in the process of presenting drinking water system upgrades to the community. The biggest issue that you plan to address is the high pressure areas throughout the system and in some locations are high enough to pose safety concerns. A normal system pressure range recommended by this department is 60 to 80 psi, with a minimum and maximum of 35 psi and 100 psi, respectively. It is our understanding that the existing water system owned by Rosebrook Water can exceed 200 psi in some locations. This extremely high pressure creates a safety risk, increased water loss through water main breaks or leaks, increased operating costs, and the necessity of home pressure reducing valves (PRVs). You have also indicated that the system lost insurance coverage because of numerous claims caused by the excessive pressure.

We are in support of and recommend system modifications which will reduce the public health risk and will maintain pressures within the recommended range. Not only will this provide for a safer and less costly system to operate, it also creates the ability for the operating company to take back ownership of system maintenance from home and commercial owners who are currently maintaining their own PRVs.

If you have any questions, please do not hesitate to reach out to me at Randal.Suozzo@des.nh.gov or 271-1746.

Sincerely,

Randal A. Suozzo, P.E.
NHDES Drinking Water & Groundwater Bureau

cc: Don Vaughan, Abenaki Water Company



Twin Mountain Fire Department

Twin Mountain Fire Department
PO Box 119
104 Route 3 North.
Twin Mountain, NH 03595

Phone: 603-846-5545
FAX: 603-278-7944
email: twinmountainfirerescue@
townofcarroll.org

February 25, 2017

Mr. Donald J. T. Vaughan
Abenaki Water Company
37 Northwest Drive
Plainville, CT 06062

Re: Rosebrook Water System

Dear Mr. Vaughan:

The Twin Mountain Fire Department is a municipal department providing fire protection services for Bretton Woods, served by the Rosebrook water system. As presently configured, the Rosebrook system has pressures as high as 200 psi in some areas. This pressure is excessively high and potentially dangerous from the perspective of operating fire hydrants and other equipment. Typically, municipal systems operate between 50 and 75 psi which is generally adequate for fire fighting purposes.

As the current owner and operator of the Rosebrook system, Abenaki has presented a plan for improvements to the system that would lower the maximum pressure to 100 psi while still maintaining adequate fire flows. The Twin Mountain Fire Department supports this project and believes that it would improve safety and reliability of the system.

Respectfully,

Jeremy Oleson
Fire Chief

Cc: TMFD - File