August 30, 2022

Randall A. Suozzo, PE
NH Department of Environmental Services (DES)
29 Hazen Drive
Concord, NH 03302

Re: **Rosebrook (PWS ID 0382010) Wellfield Improvements**
Design Review #170093

Dear Mr. Suozzo:

This letter provides responses to your July 26, 2022 comments on the design of proposed improvements to the Rosebrook Wellfield Treatment Plant. This project is Phase 1 of a two-phase plan for improvements to comply with DES' December 1, 2020 Letter of Deficiency (LOD). This project will improve operator safety and treatment reliability at the facility. Plans for Phase 2 of the project, which will be designed to reduce distribution system pressure, will be submitted to DES for review and approval at a later date.

Responses to each of your comments is provided below:

1. Provide an argument that the costs of Option 1A exceeds the benefit of reducing the pressures within the system to 100 psi, or other reasoning that Option 1A should not be selected over 4E, apart from maintaining existing pressure along the base road water service main.

Option 1A consists of upgrading the existing Rosebrook Wellfield to lower the wellfield discharge pressure, and adding three new pump stations and a new pressure reducing valve (PRV) to the distribution system. The expected capital cost for this option is $6.35 million, including the estimated costs of easements for constructing each of the three pump stations. This option is almost $2.5 million higher than the cost of the selected option 4E.

Option 1A would provide system-wide pressure reduction and generally maintain system pressure below 100 psi; however, it would not meet one of the project's primary objectives of maintaining domestic pressure and available fire flow at the Omni properties (Mount Washington Hotel, Bretton Arms, and Bretton Woods), as requested by Omni - the system's largest customer. In addition, other customers would experience a pressure drop of more than 50 psi, with some areas of the system experiencing 35 psi (See Figure 1 attached). This magnitude of pressure reduction is expected to result in complaints from customers across the system.

Option 1A would also provide less reliable service than Option 4E. The Crawford Ridge and Mount Washington Place pump stations required in Option 1A would pump out of the "closed" (i.e. no atmospheric storage) system created by the new Rosebrook Treatment Plant. Pumping into closed systems, particularly multiple closed system in series as required in Option 1A, increases the risk of distribution system and home plumbing damage related to water hammer. Closed systems are also inherently less reliable than systems with gravity storage, particularly for fire protection, because they rely on mechanical and electrical equipment and automated controls/communications. Even with standby power at each facility there will be short-term loss of service as the generators start-up following loss of street power.

Finally, the additional pump stations required for Option 1A would require additional labor and maintenance costs putting further pressure on increasing rates.

While the increased risk and reduced service described above are manageable, when combined with the significantly higher capital and operating costs, the "costs" of Option 1A are considered to exceed the benefit of additional pressure reduction.

2. Has the option of providing dedicated fire flow pumps at the well treatment station for services to the Omni properties been considered?

Options 2A and 2B consider installing fire pumps at the well treatment station. These pumps would not be dedicated to the Omni properties but would provide service to the entire distribution system. To provide pressure reduction in the distribution system, lower discharge pressure from the treatment plant and booster pumps similar to Option 1A would be required.

Because Omni's fire flow requirement of 3,500 gpm for 3 hours is greater than the excess capacity of the wells, these alternatives also require a minimum 630,000 gallons (750,000 gallons proposed in the alternative analysis) of additional storage at the well site. With the new pumped storage the existing gravity storage tank could be abandoned, but service reliability would be further reduced.

Providing fire flow pumps at the treatment station that are dedicated to Omni properties would also require dedicated piping to these properties. To provide fire protection to the rest of the system, additional fire pumps would be required, or the existing tank would need to remain in service.

3. The flow meters on Drawings M-100 and M-101 are specified to have straight pipe runs before and after. However, I do not believe that reducers placed within the straight run are allowed, as shown.

Per the manufacturer's specifications, concentric reducers are allowed within the required straight runs before and after the proposed flow meter.

4. The Water System Improvements Notes:

a. Drawing G-003 indicate under note 9 that less than 10-feet horizontal separation between water and storm or sewer drains "will be allowed". This is not allowed without an approved waiver from DES. Recommend submitting a waiver request or changing the wording to "will be considered".

This project should not require less than 10-feet horizontal separation between water and storm or sewer drains. Note 9 will be modified to indicate that 10-feet separation distance shall be maintained. If field conditions during construction require that the water main be closer than the allowed separation distances a waiver request will be submitted to DES.

b. Note 4 indicates 5 feet of cover, which contradicts with the site details on drawing C-501 which indicates 4-feet and 6-inches of cover.

The minimum cover will be 5 feet. The detail on drawing C-501 will be updated accordingly.

5. The AWWA disinfecting of water mains procedure requires a minimum flushing velocity of 3 ft/sec. Recommend changing the specifications to match the latest AWWA procedures.

Specification Section 02501 Table 3.1-1 indicates the required flushing velocity of 3 ft/sec. The text in Section 3.1 A2 of the specification will be updated to be consistent with the Table.

6. Not mentioned in the Notes or specifications is the plugging of hydrant drains, which is required unless a waiver is submitted for approval and contains evidence of the high-groundwater elevation below the hydrant drain.

Although no new hydrants are proposed for this project, the specifications will be updated to reflect this requirement.

7. The design flows for each of the pumps are as follows, please provide design calculations for the flow rate of the booster pumps.
- **a. Well pump No. 1 design flow is 300 gpm**
- **b. Well pump No. 2 design flow is 350 gpm**
- **c. Three booster pumps are sized for 125 gpm**

The three booster pumps will send water from the two clearwells to the distribution system and atmospheric storage tank. The booster pumps are sized to meet the system's maximum day demand (214 gpm - Table 1) with one pump out of service. With all three pumps in service the booster pumps will meet the capacity of the largest well. Only one well is operated at a time.

Table 1
Maximum Day Demands

Year	Maximum Day Production (gpd)	(gpm)
2019	239,233	166
2020	242,500	168
2021	308,200	214

8. Submit electronic copies of the engineered stamped final design Plans and Specifications to this department for review prior to bidding this project, which should include all required documentation for the funding source(s), which at this time is the Drinking Water and Groundwater Trust Fund (DWGTF).

Electronic copies of the stamped final plans and specifications will be submitted to NHDES for review prior to bidding this project.

We hope that these responses adequately address your comments. If you have any additional questions, or would like to schedule a meeting to review, please contact us.

Very truly yours,

TIGHE & BOND, INC.

Amanda P. Keyes, PE
Project Manager

Copy: Robert Gallo, John Walsh, Dan Lawrence, Carl McMorran - Aquarion
Peter Galant- Tighe & Bond

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FIGURE 1
MODELED SYSTEM PRESSURE OPTION 1A

Alternative 1A: Wellfield Discharge Pressure Reduced to 90 psi

Alternative 1A: Mount Washington Place Booster Pump Station

Alternative 1A: Crawford Ridge Booster Pump Station

Alternative 1A: Rosebrook Booster Pump Staiton and PRV

Alternative 1A: Approximate Location of Closed Valve to Isolate New Boosted Pressure Zone

58 psi
52 psi
52 psi
82 psi
59 psi
58 psi
84 psi
63 psi
55 psi
35 psi
39 psi
75 psi
70 psi
94 psi
86 psi
55 psi
63 psi
82 psi
83 psi
80 psi
67 psi
105 psi
78 psi
82 psi
103 psi
92 psi
59 psi
80 psi
98 psi
55 psi
71 psi
75 psi
59 psi
69 psi
74 psi
72 psi
69 psi
56 psi
46 psi
58 psi
47 psi
47 psi
46 psi
48 psi
63 psi
60 psi
70 psi
80 psi
43 psi
55 psi
36 psi
49 psi
70 psi
63 psi
53 psi
54 psi
35 psi
123 psi
126 psi
111 psi
118 psi
95 psi

Legend
- Well
- Water Tank
- Hydrant
- Alternative Booster Pump Station

Water Mains Size (in)
2, 4, 6, 8, 10, 12, 16, Unknown

LOCUS MAP

N

0 300 600
Feet
1:7,200 1 in = 600 ft

NOTES
1. Orthophotography courtesy of ESRI
2. Water system GIS provided by Aquarion Water Company (2022)
3. Pressure and AFF results based on model assumptions and may differ from actual field conditions.

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Rosebrook Water System
Carroll, NH
Aquarion Water Company

August 2022

Tighe&Bond

V:\Water_Modeling\Aquarion\2022 Misc Modeling Tasks\Rosebrook NH - Model Development\GIS\Figures\Updated4SeriesNaming\FigX_Option1A_Pressure.mxd

The State of New Hampshire
Department of Environmental Services

Robert R. Scott, Commissioner

January 30, 2023

Amanda Keyes, PE
Tighe & Bond
177 Corporate Drive
Portsmouth, NH 03801
via email: apkeyes@tighebond.com

Subject: Rosebrook Water Company PWS 0382010
Wellfield Improvements (Phase 1 of the Pressure Reduction Project)
(Final) Design Review #170093

Dear Ms. Keyes:

The New Hampshire Department of Environmental Services Drinking Water and Groundwater Bureau (DWGB) has reviewed the final design documents dated December 2022 for the subject project. I performed a review of the project in accordance with the design standards for large public water systems listed under Env-Dw 400 and referencing the Recommended Standard for Water Works. DWGB conditionally approves this project for bidding with the following conditions:

1. Include the DWGTF project number on the cover of both the plans and specifications, as well as included on the project sing. DWGT-68 is the DES project number.
2. Include DES as an additional insured in the Supplemental Conditions, SC-27 Insurance Requirements for the purposes of onsite inspections.
3. The NHDES website has been updated more recently than the links included in the specifications, which no longer work. Update electronic links found in the specifications, e.g. 01570 – Selective Demolition forms.
4. Schedule 09900-C – Colors in the specifications need to be edited to differentiate the three chemicals being used. For reference, color guidelines are included in the Recommended Standards for Water Works.
5. There is no indication of a hi chlorine alarm to shut down the station. This should be added to the sequence of operations.
6. The flow rate from one of the wells exceeds the flow rates of the booster pumps if one were offline. All pumps are VFD operated, but there are no automatic control adjustments to the well pumps if a booster pump is offline for maintenance. Instead, the control must be manually set by the operator or a high-level switch in the clearwell tanks will shut down the wells if contacted. With only two booster pumps, shutdown would occur less than every 20 minutes in this scenario. Preferably, larger booster pumps would be installed so two pumps could match the flow of the largest well pump. Alternatively, field training for this scenario should be included during startup and sequencing written in the O&M manual.
7. Prepare a final **O&M Manual** and maintain a copy on file with the water system owner. Water system copies of the O&M manual and Record Drawings shall be available for review during NHDES site inspections, when requested.

8. Submit electronic copies (PDF) of final **Record Drawings** to this department and maintain copies on file with the water system owner.

In addition to the above comments, the following general comments are offered:

1. The Energy Chart on A-002 indicates an asphalt roof, but A-101 shows a metal roof.
2. There is no cut or callout to show transition from 4-inch piping at existing well station to 6-inch piping to new facility.
3. There is no cut to show vertical orientation of the mechanical piping. At what height does the well water enter into the 1,050 gallon tanks? Is there a benefit to not entering through the top of the tanks?
4. NH design rules require a minimum containment of 100% of the largest chemical tank. Containment shown is in excess of this amount. No change is required.
5. There was no drawing M-301 provided in the final plan set. Comments from the previous submittal on this drawing are:
   a. Water recycled from the analyzers would be better protected from contamination without an air gap. Consider hard-piping.
   b. How will the calibration column be filled if it is located above the tank? Recommend alternate piping for calibration checks.
6. Table 1 is included at the end of this letter for informational purposes. Please provide comment if discrepancies are found.

<u>NHDES DWSRF and DWGT Funding Conditions</u>

In addition to responses to the comments above, we will require submission of the following materials prior to our written authorization to award the construction contract:

A. An estimate of eligible project costs, with monthly cash flow projections, including construction engineering and other costs.
B. Evidence of advertisement for bids.
C. A tabulation of all bids which were received.
D. A letter signed by the water system's Authorized Representative, indicating the name of the bidder to whom a contract will be awarded.
E. The bid proposal of the bidder to whom a contract will be awarded
F. Certification that all necessary permits, land acquisitions and easements have been secured.
G. Certification that all conditions of a completed Environmental Review have been incorporated into the contract documents.

Please contact me with any questions or comments at 603-271-1746 or Randal.A.Suozzo@des.nh.gov.

Sincerely,

Randal A. Suozzo, P.E.
Drinking Water and Groundwater Bureau

ec: Robert Gallo, John Walsh, Carl McMorran, Daniel Lawrence; Aquarion Water Company
Peter Galant; Tighe & Bond

Enclosure

Table 1 – Design Summary of Well Station

<table>
<tr><td>Design Flow</td><td>
<table>
<tr><th>Source</th><th>HP</th><th>TDH (feet)</th><th>Flow (gpm)</th></tr>
<tr><td>GPW-1</td><td>7.5</td><td>52</td><td>300</td></tr>
<tr><td>GPW-2</td><td>10</td><td>65</td><td>350</td></tr>
<tr><td>BP 1-3</td><td>25</td><td>440</td><td>125</td></tr>
</table>
</td></tr>
<tr><td>Chemical Treatment Description</td><td>
<table>
<tr><th>Chemical Name</th><th>Bulk Storage</th><th>Day Tanks</th><th colspan="2">Chemical Injection</th></tr>
<tr><th></th><th></th><th>(gal)</th><th>Pump (gph)</th><th>Use (gph)</th></tr>
<tr><td>36% Ortho-PO_4</td><td>Liquid Drums</td><td>30</td><td>0.0002-33.3</td><td>0.02-34</td></tr>
<tr><td>12.5% NaOCl</td><td>Liquid Drums</td><td>30</td><td>0.0002-33.3</td><td>0.05-25</td></tr>
<tr><td>Na_2CO_3</td><td>Dry Bags</td><td>495</td><td>0.0028-158.5</td><td>4.5-93</td></tr>
</table>
</td></tr>
<tr><td>Storage</td><td>
<table>
<tr><th>Source</th><th>Type</th><th>Volume (gal)</th><th>Number</th></tr>
<tr><td>Clearwell</td><td>FRP Tank</td><td>1,050</td><td>2</td></tr>
</table>
</td></tr>
<tr><td>Waste Disposal</td><td>1,000 gallon tight tank</td></tr>
<tr><td>Safety Equipment</td><td>Spill containment, emergency shower, and eyewash station.</td></tr>
<tr><td>Emergency Power</td><td>An existing standby generator connected to a 500-gallon above-ground propane tank.</td></tr>
</table>