Rocky Hill Water Situation Section 6.

Resident Summary.

The previous Sections have been quite extensive, describing in detail the circumstances of the Rocky Hill Water Situation that the Rocky Hill Community faces at this time.
The website was intended to provide an extensive informational and factual database which can be accessed and read by all members of the Rocky Hill Community.

The nature of the PFAS contamination, the various processes that are employed in attempts to remove such contaminants, and the problems involved with these various methods have all been explained in detail in Section 1.
The very recent and important work and studies of ion exchange with PFAS specific resins have been presented in Section 2, and the design of a Rocky Hill system based on adding ion exchange into the aeration stages is presented in Section 3.

Several residents have suggested the presentations overall have sometimes been too detailed and perhaps sometimes too technically complicated for the average resident.

The suggestion was made some while ago that a short overview and summary written by an independent Rocky Hill resident could be very useful and would present an additional perspective on the situation.
The Resident Summary that was submitted is presented here as Section 6, and is very appropriate as Borough Council discussions on the Water issue are now beginning to wind down.

The Resident Summary.

In 2020 Rocky Hill, as operator of a municipal water system, was informed by the New Jersey Department of Environmental Protection of new limits on the allowed levels in drinking water of a class of fluorine-based compounds (PFAS) that are hazardous to health.

An extensive report was prepared by a group of Rocky Hill citizens for our community. Sections 1-4 of the report provide detailed discussions of this PFAS problem, of the Rocky Hill Water system, and of a proven and economical approach to meeting these new DEP requirements. In additional a separate issue has been raised about a DEP requirement called Firm Capacity, which is discussed in Section 5.

These pages present below a brief summary of the main points in the five detailed sections.

Section 1. The Problem

In 2020 the NJDEP set new limits for a group of chemicals called perfluoroalkyls (PFAS) in drinking water. The new limits for the three PFAS chemicals detected in Rocky Hill water and the levels measured in Rocky Hill water in 2020 are listed here:

Chemical	NJDEP Limit.	Measured in Rocky Hill water	Comment
PFNA	13 parts/trillion	less than 2 parts/trillion,	RH meets
PFOA	14 parts/trillion	12 parts/trillion	RH meets
PFOS	13 parts/trillion	17 parts/trillion	RH above

Since PFOS is present above the new limits, Rocky Hill must undertake mitigation of this problem. Also, since PFAS are known serious health hazards, there is strong reason to seek a solution that lowers all PFAS well below the required limits and totally eliminates them. The aeration process that Rocky Hill uses to purify water cannot eliminate these PFAS compounds.

Section 2. A Pilot Program

In 2014 the Horsham Township PA was faced with meeting similarly reduced limits on PFAS, but with much higher levels (400 parts/trillion) in some of its wells. In response Horsham undertook a detailed pilot study of ion exchange technology to solve the problem. In ion exchange, water is passed through a column of resin particles that are designed to have a high, specific attraction for chemicals like PFAS.

The pilot study showed that water with total PFAS levels above 40 parts/trillion, after passing at a rate of 50 gallons per minute through an ion-exchange resin column 3 ft high and 2-1/2 ft in diameter, had undetectable levels of PFAS in the outflow even after almost two (1.6) years of operation. As a result of this study, the Horsham Water Authority installed a twin tank ion exchange resin system in October 2018 that is now in full operation and is being evaluated towards the construction of further resin systems for additional wells in Horsham.

Coincidentally, Rocky Hill's total water flow averages 50 gallons per minute, so the Horsham pilot study at this flow rate increases confidence in the approach. The Horsham operating cost estimate of only 16¢/1000 gallons for this approach in the pilot study is also very favorable.

Section 3. The Rocky Hill Solution

The Horsham pilot study was carried out on an operating deep well with levels of PFAS in excess of Rocky Hill's at water flows comparable to Rocky Hill's and for a time period of two years. This provided plenty of data for design of a

system that can be integrated with Rocky Hill's current two-stage aeration system, as follows:

- the ion-exchange system will have two modules, each consisting of a filter tank 6 ft high and 4 ft in diameter filled with the Purolite resin used by Horsham. The two stages enable the switching in and out procedure for resin recharging (called lead-lag operation) without disruption of the water supply.
- the ion exchange modules will be connected after the first stage of the aeration system where water pressure is low and where 98% of volatile compounds have been eliminated that might shorten resin life. The water from the ion exchange filters is pumped through the second aeration stage and then up to the water tower.
- a small extension to the current water treatment building will also be required to accommodate the two 4-ft diameter ion exchange filter tanks.

The capital cost for the ion exchange equipment is estimated at $25,000 with addition cost for the building extension. Operating cost is primarily the replacement of resin material in one tank every four years at a cost of $8000, which at Rocky Hill water use rate of 26,000,000 gallons per year adds about 8¢/1000gallons to the cost of water.

Section 4. Review and Summary

What has been presented in Sections 1-3 is the background of, and solution to, the current problem of PFAS. Rocky Hill is fortunate to have the benefit of the extensive data generated by nearby Horsham PA for both valuable guidance and serious confidence-building. No doubt still more valuable information could be available from consultation with Horsham, which would be advisable for Rocky Hill officials to engage in earlier rather than later.

Section 5. The Aeration System and Firm Capacity

NJDEP regulations cite a requirement for "Firm Capacity", defined as "a measure of the physical ability to provide treated water at adequate pressure when the largest pumping unit or treatment unit is out of service". For large water systems Firm Capacity is satisfied by multiple wells or other sources that can be utilized immediately.

For Rocky Hill, Firm Capacity is satisfied by its system design and the modular nature of its mechanical elements. These comprise only five devices: a main well pump, a pump between aeration stages, a pump to lift water to the water tower and two air extraction blowers, one for each of the two aeration stages, all of which are stock items available from local suppliers. When an extraction blower failed several years ago, it was replaced within hours with no system down time. When the main well pump failed many years ago, replacement took within 3 days, during which an existing emergency backup connection to Elizabethtown Water (now American Water) supplied water to the Borough.

The simplicity and modularity of Rocky Hill's water system provides a level of backup capability, i.e. Firm Capacity, that much larger systems satisfy by having multiple wells or other water sources. In Rocky Hill's case an additional well would add nothing to its reliability for delivering water. It has operated autonomously for more than 37 years without any major interruption, and is still doing so today.

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Observations.

From all the previous information, it is clear that the only way for Rocky Hill to realistically and completely eliminate all PFAS contamination from the water supply is through the use of PFAS selective ion exchange resin filters, as described in detail in Section 3.

Ion exchange removes all PFAS members, including the very soluble ones that GAC (granular activated carbon) cannot adsorb. These C4 and C6 members of the PFAS family are the ones of recent major concern, and are present in groundwater and are accumulating in the food chain through vegetables and fruit and animal feedstock. Although not presently being tested for, and not at present being listed with MCL regulatory limits, it is inevitable that they will be so listed in the near future.

The key to the successful use of ion exchange in PFAS removal is to have a low water content of dissolved organic matter (DOM). This is explained in detail in Section 3, pages 2 and 3 and in Section 4, pages 6 and 7. The Rocky Hill aquifer water is initially low in DOM and the aeration process reduces it even further, so the Rocky Hill water system has optimum and rather exceptional conditions for the use of ion exchange and for extended resin life.

Overall, the Rocky Hill aeration system provides for a design that totally eliminates PFAS at very low cost.

I.J.T. May 3, 2021.