Memorandum

To: *Charles Dam, P.E.*

From: *Alan LeBlanc, P.E., BCEE*
Maddison Vidal, P.E.

Date: *April 29, 2024*

Subject: *Manchester-by-the-Sea Gravelly Pond Water Treatment Plant and Lincoln Street Well PFAS Treatment Evaluation*
Task 4 – PFAS Blending Analysis – Executive Summary

At the request of the Town of Manchester-by-the-Sea, Massachusetts (the Town or MBTS), CDM Smith performed a blending analysis with considerations for historical flows and per- and polyfluoroalkyl substances (PFAS) levels detected in two water supplies operated by the Department of Public Works (DPW). The goal of this analysis was to examine different blending scenarios to determine whether blending can achieve reliable PFAS compliance for the Town. CDM Smith is pleased to offer this executive summary, in the form of a Technical Memorandum, which summarizes key findings from the treatment evaluation and recommended next steps.

This work presents analysis examining the piping of water from the Lincoln Street Well to combine with and blend with water from the Gravelly Pond Water Treatment Plant, as a means to achieve compliance with existing PFAS regulations. Infrastructure construction spending would be required to combine these supply sources prior to entry into the water distribution system. While compliance with the existing Massachusetts Maximum Contaminant Level for PFAS6 is possible, compliance with the United States Environmental Protection Agency's Maximum Contaminant Levels for PFAS will not be possible through blending.

Introduction

The Town of MBTS has historically remained in full compliance with the Massachusetts Department of Environmental Protection's (MassDEP's) finished water quality maximum contaminant levels (MCLs) for regulated contaminants. The Massachusetts MCL (MMCL), which is 20 nanograms per liter (ng/L), regulates the sum of concentrations of six specific PFAS. The six compounds, termed "PFAS6", include perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA). Beginning in 2021, the Town initiated regular sampling of PFAS which has continued periodically, and data was provided through January 2022. The results from preliminary testing have found the regulated PFAS6 concentrations are almost in exceedance of the MMCL at the LSW. Additionally, PFAS6 concentrations are approximately half of the MMCL in the GPWTP finished water. While concentrations have remained below MassDEP's 20 ng/L standard, it is advisable that MBTS also considers future compliance with PFAS regulations from the United States Environmental Protection Agency (USEPA). On March 14, 2023, EPA released the draft PFAS National Primary Drinking Water Regulation (NPDWR),

later finalizing the PFAS NPDWR on April 10, 2024. The current federal standard in effect requires Public Water Systems be in compliance by April 2029.

The USEPA's April 2024 MCLs for both PFOS and PFOA, are set at 4 ng/L while MCLs for PFNA, PFHxS, and hexafluoropropylene oxide (HPFO-DA or GenX) are set at 10 ng/L. Blending analysis goals outlined in this memorandum were selected out of consideration of these limits, which focused on PFOS and PFOA given these were the only individually regulated PFAS that MBTS was at risk of exceeding at LSW or GPWTP based on historical data. Therefore, the blending analysis in this memorandum does not include individual examination of PFNA, PFHxS, or GenX. In addition to the MCLs adopted on April 10, 2024, the USEPA's Hazard Index (HI) was formally adopted as a means of regulating a mixture of PFAS chemicals which includes PFNA, PFHxS, GenX, and perfluorobutane sulfonate (PFBS). Based on available data, MBTS is not at risk of exceedance of the HI threshold at LSW or GPWTP. Therefore, the blending analysis in this memorandum do not include examination of the HI.

As a result of these considerations, CDM Smith was tasked to evaluate a variety of blending scenarios to investigate which sources can be operated and at what production rates while maintaining compliance. The purpose of this desktop review is to examine different blending scenarios for the GPWTP and the LSW, which may allow MBTS to achieve continued compliance with MassDEP's MCL for PFAS6 and longer-term compliance with the recently adopted federal PFAS regulations.

Existing Operations

The MBTS municipal system receives water from three sources, Gravelly Pond, Round Pond Well No. 1 and the Lincoln Street Well (LSW). The MBTS municipal system consists of the Gravelly Pond Water Treatment Plant (GPWTP), Gravelly Pond raw water pump station, LSW pump station, emergency interconnections with the Cities of Gloucester and Beverly, one storage tank, and an array of water distribution system piping.

Gravelly Pond and Round Pond Well No. 1 are surface water supplies that are the Town's primary water supply source, providing approximately 60 percent of the Town's drinking water. For the purposes of this analysis, it is assumed that the safe yield of Gravelly Pond is equivalent to the GPWTP capacity of 3 mgd. None of the existing systems on site are capable of removing PFAS.

The third raw water source, LSW, is a groundwater supply that provides the remaining 40 percent of the Town's drinking water. The approved withdrawal rate of the LSW, set by the MassDEP Water Management Act, is 0.38 mgd. None of the existing systems on site are capable of removing PFAS.

The 2021 average day demand of the MBTS system was 0.63 mgd with a maximum day demand of 1.2 mgd. Generally, the system operates less than one third of the total system capacity.

Water Quality

The available data for the regulated PFAS contaminants found in GPWTP and LSW samples are plotted in **Figure ES-1**.

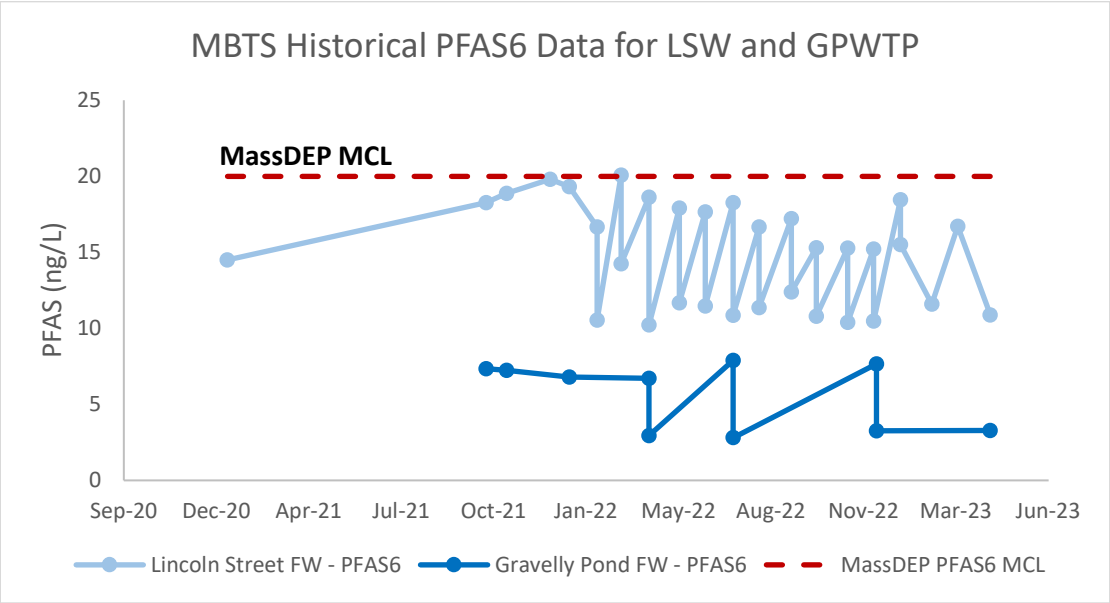

Figure ES-1. MBTS Historical PFAS6 Data

Given the available data, LSW has the most significant total PFAS6 presence, consistently indicating results above 15 ng/L and approaching the 20 ng/L MMCL. GPWTP has consistently operated at less than half the MMCL over the duration of sampling.

Blending Scenarios – Desktop Analysis

CDM Smith was tasked with evaluating various conditions at which the Town could operate while maintaining compliance with MassDEP's PFAS6 MCL and taking into consideration the recently released USEPA PFAS regulations, selected blending scenarios based on historical PFAS concentrations and capacities. Given the historical data provided, it became clear that GPWTP was least susceptible to overall PFAS variability and consistently maintained the lowest PFAS concentrations, in addition to offering the largest pumping capacity. For these reasons, GPWTP was selected as the primary supply and production from the LSW was varied to serve as supplemental supply.

The blending of MBTS's two water sources were investigated as part of this desktop analysis, various blending scenarios were selected based on adjusting the below operational criteria:

1. Varying capacities for average and maximum flow
2. Varying blending goals for compliance with current regulations and proposed future regulations.

A blended goal of 15 ng/L, or 25 percent below the current-day MMCL for PFAS6 was selected for the blended water quality. A blending goal of 2 ng/L, or non-detect (ND) for PFOS and PFOA was selected out of consideration for federal regulations, which set a proposed limit for each individual compound at 4 ng/L. A focus was put on PFOS and PFOA MCLs included in the federal regulation because other individually regulated PFAS (PFNA, PFHxS, and GenX) were appreciably below their respective MCLs.

Considering current state regulations (MassDEP 20 ng/L for PFAS6) the desktop blending analysis concluded that the LSW could be blended with the GPWTP, and the Town could expect to maintain

compliance with current MassDEP regulations for PFAS6, at both average and maximum production capacities.

Considering the April 10, 2024 federal regulations the desktop blending analysis concluded that in the average and maximum flow scenarios considering the USEPA MCLs of 4 ng/L for each compound (PFOS and PFOA), the LSW could not be blended with the GPWTP and achieve the 2 ng/L (or ND) limit selected as the blending goal. The only way the blending goal could be achieved is if both waters already had non-detectable concentrations (2 ng/L) of PFOS or PFOA prior to blending, which would negate the need for blending.

Next Steps for MBTS Consideration and Recommendations

Based on the results of the blending analysis, the conclusions suggest that meeting compliance with the current MassDEP MCL for PFAS6 through blending the two water sources is feasible. This assumes that the distribution system is configured such that the two water sources can be reliably blended. However, the blending approach cannot achieve compliance with federal regulations.

CDM Smith recommends that that the Town consider the following next steps:

- Continue to regularly monitor PFAS concentrations.
- Participate in regulatory conversations to gain insight on anticipated future regulations.
- If continued increases in PFAS concentrations approaching the regulatory limits are observed in MBTS's water supplies, the following could be considered:
    1. Individual treatment for source(s) of concern (begin with bench and/or pilot testing).
    2. Combined treatment of LSW and GPWTP water matrices at one centralized facility, which would involve conveyance of LSW to GPWTP.

cc: Dave Burnett, P.E., PMP, Michaela Bogosh, P.E., PMP, Lisa Gove, P.E. – CDM Smith