# TECHNICAL MEMORANDUM

**TO:** Karen Joseph, Town Planner

**CC:** Kevin Cafferty, Director of Public Works
Sean McCarthy, Town Engineer
Stephen Rafferty, OPM

**PREPARED BY:** Rebecca Paustian, P.E.

**REVIEWED BY:** Steve Robbins, P.E

**DATE:** August 10, 2023

**RE:** Stearns Meadow Water Treatment Plant Process Description

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The new Stearns Meadow Water Treatment Plant (WTP) is an element in the Town of Scituate's (Town) ongoing commitment to substantively improve their water quality and specifically to reduce the brown water complaints resulting from insufficient manganese removal at the existing Old Oaken Bucket (OOB) WTP, and to address the total trihalomethanes (TTHM) exceedance that occurred in 2020 which resulted in an administrative consent order.

The process design of the new WTP has been defined by the water treatment process pilot testing effort that occurred over three seasons spanning both 2021 and 2022. The pilot test evaluated the treatment efficacy of the new WTP on the OOB source water. The selected treatment scheme will maintain continuing compliance with all drinking water treatment rules including, but not limited to the Revised Total Coliform Rule, the Surface Water Treatment Rules, and the Disinfection-By-Product Rule.

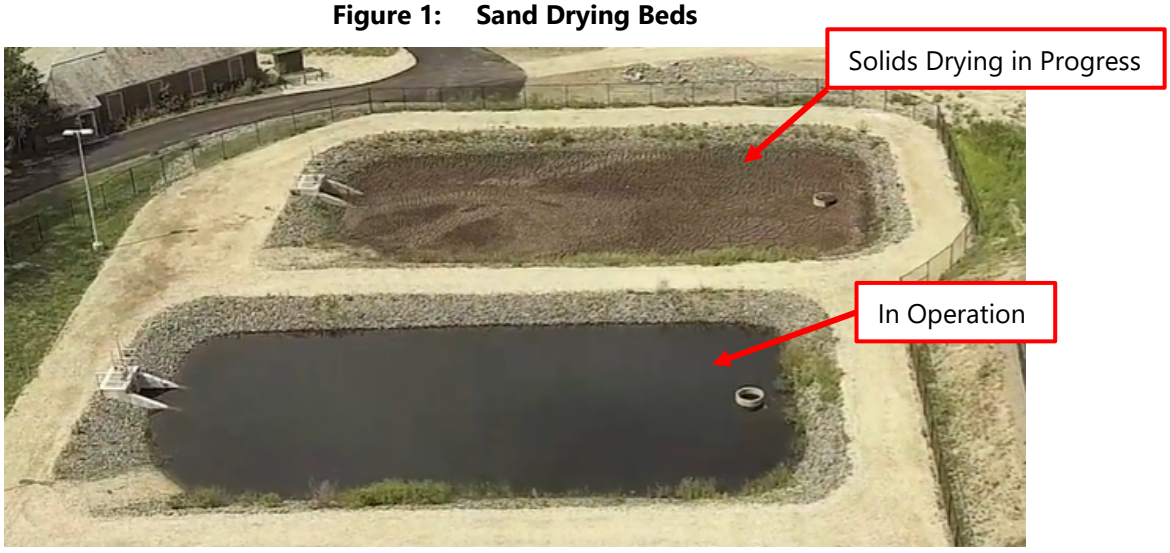
The new treatment plant is being designed to treat the full range of permitted flows from the OOB Pond. Additional capacity has been included in the WTP design to incorporate flow from the Town's existing wells for potential future PFAS treatment that may be needed as regulations or water quality changes. The new WTP will have a design capacity of 3 million gallons per day (MGD) with full redundancy and a hydraulic capacity of 4.5 MGD.

The WTP process is as follows:

1. Raw water will enter the plant from the existing OOB raw water pump station. Sodium Hydroxide and Polyaluminium Chloride (PACL) will be added into the raw water for pH adjustment and coagulation.
2. A mixer will be used for rapid mixing to evenly disperse the chemicals throughout the raw water, and the adjusted raw water will be split evenly between three pre-treatment process trains and enter the flocculation basin.
3. The flocculation basin will have two stages separated by a weir. The flocculated water will exit the flocculation basins into the clarification basins.

4. Plate settlers will be utilized for clarification.
    a. Settled solids removed from the plate settler clarification basin will be removed and sent to the sand drying beds.
5. Water from the clarification basins will have chlorine dioxide added for iron and manganese oxidation and will flow into a granular activated carbon (GAC) filter to remove both organics and PFAS.
    a. Backwash from the filters will be sent to the sand drying beds.
6. Filtered water will then enter the chlorine contact tank where sodium hypochlorite will be added for disinfection. The chlorine contact tank will provide the detention time required to achieve 2-log Cryptosporidium, 3-log Giardia, and 4-log Virus removal.
7. Disinfected water will have sodium hydroxide added for pH adjustment and sodium fluoride added for dental health and pumped to the manganese contactor pressure vessels prior to distribution.
8. Manganese contactors will be operated as pressure filters and will consist of a manganese oxide coated media.
    a. Backwash water from the manganese contactors will be sent to a separate holding tank to have the supernatant recycled to the head of the plant.
9. The WTP will be a zero liquid discharge plant with respect to process waste. The sand drying beds allow solids additional time to settle from the liquid and will consist of an underdrain and decant system to recycle the water back to the head of the plant at a rate not greater than 10% of the incoming raw water flow rate. See Figure 1 of sand drying beds in use from another surface water treatment facility.

**Figure 1: Sand Drying Beds**




The chemicals to be utilized as described above will be stored in a separate chemical room at the north end of the building. This storage will include secondary containment of at least 110% of the bulk chemical volume for each chemical and fire suppression as required for each chemical. No floor drains will be included

in the design of the chemical room. Any potential spill will be contained within the secondary containment area and will be manually cleaned and removed by the WTP operators or a specialized chemical cleanup contractor. A summary of the chemicals to be stored and utilized in the WTP is included in Table 1.

**Table 1: Process Chemicals**

| Chemical | Purpose | Approximate Quantity Stored |
|---|---|---|
| Polyaluminium Chloride (PACL) | Coagulation | 10,320 gallons |
| Sodium Hydroxide | pH adjustment for process optimization and corrosion control | 4,900 gallons |
| Sodium Hypochlorite | Disinfection and Chlorine Dioxide Generation | 1,380 gallons |
| Hydrochloric Acid | Chlorine Dioxide Generation | 110 gallons |
| Sodium Chlorite | Chlorine Dioxide Generation | 220 gallons |
| Sodium Fluoride | Dental Health | 4,800 pounds |