



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

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SENT VIA ELECTRONIC MAIL
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March 25, 2024

Mr. James Mercer, Treasurer
Housatonic Water Works Company
80 Maple Ave Ste 1
Great Barrington, MA 01230

Great Barrington
Housatonic Water Works Company
PWS ID#: 1113003
BRP WS 22 (24-WS22-0003-APP)
Approval of Pilot Study Report

Dear Mr. Mercer:

The Massachusetts Department of Environmental Protection (MassDEP) received the above referenced permit application on February 05, 2024. The permit application was submitted by Robert Ferrari, PE of Northeast Water Solutions Inc (NWSI) on behalf of the Housatonic Water Works Company (HWWC or the Company) via EEA ePLACE Portal. The permit application to conduct a manganese (Mn) treatment pilot study was conditionally approved by MassDEP on August 1, 2022, and the final approval of the pilot equipment was issued on September 13, 2022 following a site inspection. Based on the submitted report, the piloted Greensand Plus (greensand) filtration system demonstrated consistent and effective removal of manganese. Within this letter, MassDEP approves HWWC's Pilot Study Report. This Mn treatment technology is approved as a Site-Specific New Technology Process (Type B) for HWWC.

The conditions cited in the attached document must be met or the permit is void. Note that the signature on this cover letter indicates formal issuance of the attached document. This approval does not constitute an approval with State and local requirements and procedures related to public bidding and contract laws. Please note this approval does not represent a commitment by MassDEP or the Massachusetts Water Pollution Abatement Trust to award a loan, nor does it constitute a determination of eligible project costs.

The staff engineer assigned to your project is Hem Pokharel. If you have any questions regarding this matter, please contact him at 617-455-7957 or Hem.Pokharel@Mass.Gov .

Respectfully,



Andrew Kelly, Section Chief
Drinking Water Program
Western Regional Office

Enclosures: August 1, 2022, conditional approval letter

cc: DWP, Boston, Great Barrington Board of Health, Robert Ferrari – NWSI, Hem Pokharel, MassDEP WERO - James Gibbs, Douglas Paine

DEP-WERO/WERO/BWR/WS/Permits/Treatment/Housatonic Water Works/HWWC Mn Pilot Final Report app\ 1113003-2024-03-25-PER- Conditional Approval Pilot Report-HWWC

DEP WERO - WS\2023-2025PWSCorr\G-L\1113003\1113003-2024-03-25-PER- Conditional Approval Pilot Report-HWWC

Manganese Treatment Pilot Study Report – Housatonic Water Works Company

Conditional Permit Approval BRP WS-22 Pilot Study Report Proposal

Introduction

Housatonic Water Works Company (HWWC) draws its drinking water from a single surface water supply, the Long Pond Reservoir (Long Pond), treating the raw water via slow rate media depth filtration and chlorination disinfection (sodium hypochlorite) prior to discharge to the nearby 1.1 MG water storage standpipe tank. The finished water is pumped to the water storage tank at flowrates ranging from 50 to 150 gpm, from where it discharges by gravity to the water distribution system. During 2020-2022, the system demonstrated an average daily use of approximately 104,000 to 111,000 gallons per day (gpd).

The finished water is historically compliant with MassDEP/USEPA water quality requirements for pH (6.5 to 8.5 S.U.) and free chlorine residual (≤ 4.0 mg/L), typically demonstrating pH in the range of 7.0 – 7.5 S.U. and a free chlorine residual ranging from 1.0 – 1.5 mg/L. The finished water at the distribution system point-of-entry is typically within the MassDEP/USEPA Manganese SMCL (< 0.05 mg/L) however seasonal manganese discoloration has occurred, typically from late June to September, demonstrating manganese concentrations on the order of 0.05 – 0.34 mg/L.

HWWC proposed to implement a Greensand Plus filtration system for removal of manganese from the Long Pond source water and conducted pilot plant program in accordance with the BRP WS 21B Conditions of Approval issued by MassDEP on August 1, 2022, which required the pilot study “be done for all 4 seasons”. The initial (Q1) pilot plant program was conducted in September 2022, followed by programs in January (Q2), May-June (Q3) and September (Q4) 2023. These comprehensive pilot plant evaluations, each conducted for a nominal 2-week duration, determined the Greensand Plus filtration treatment process was effective for removal of manganese, and demonstrated no deleterious side effects or by-products as an outcome of the greensand filtration process. Upon completion of each pilot plant program, NWSI conducted a shut-down of the pilot plant, for temporary storage on-site, until re-activation for the subsequent quarterly test program.

The pilot plant program was performed by NWSI under the direct supervision of a Massachusetts Registered Professional Engineer. The day-to-day pilot plant operation was performed by a Massachusetts certified public water system operator (Grade 2T, 3T-OIT).

Pilot Study Objectives

“The intent of the pilot plant study was to evaluate the greensand (Greensand Plus) filtration process, installed following the existing chlorination process, for consistent removal of manganese to ≤ 0.015 mg/l. The pilot plant program evaluated the impact of critical operational variables (hydraulic loading, manganese loading, pre-oxidation chlorine dosage, pH, backwash flowrates, differential pressure, etc.) upon finished water quality and defined the operating

criteria for a full-scale system. The pilot plant operated at a flowrate of 5 – 15 gpm, over a period of 2 – 4 weeks, to provide a rigorous evaluation of the process and application to this water source.”

Pilot Plant Design & Operation

The greensand filtration pilot plant was installed within the HWWC facility, to accept a side stream of the filtered/chlorinated water discharged to the 1.1 MG water storage standpipe tank, as illustrated in figure 1 below,

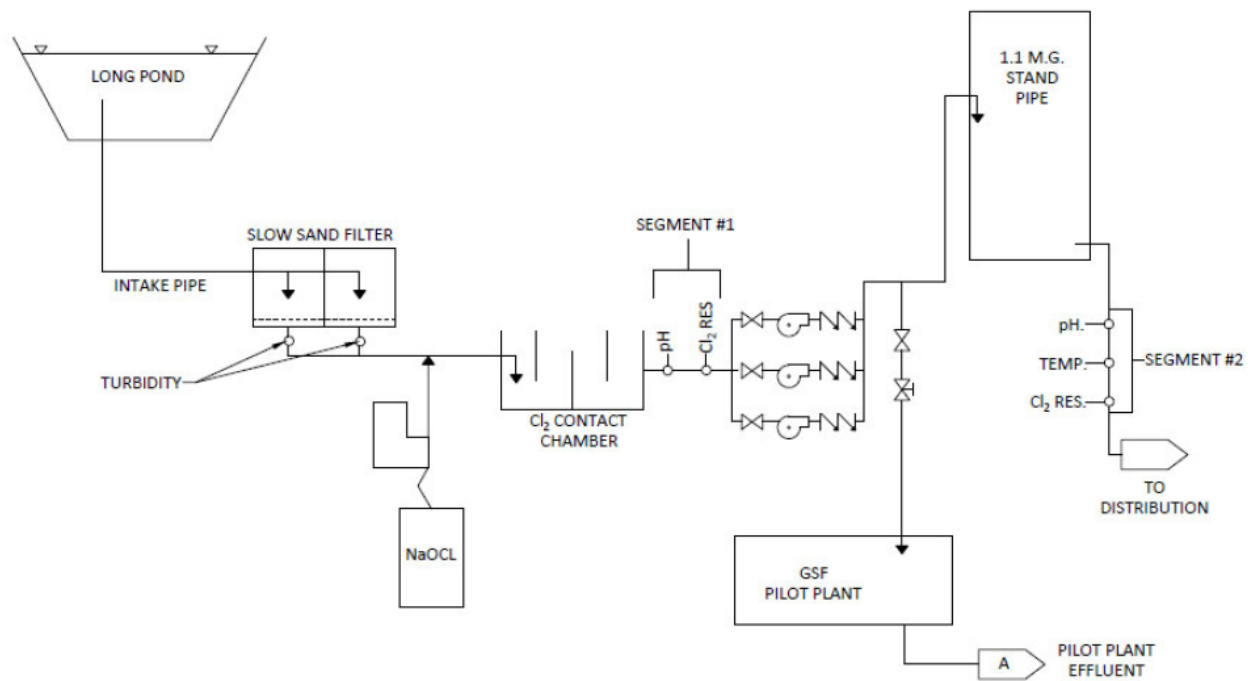


Figure 1: HWWC Water Treatment Facility Process Flow Diagram

The GSF pilot plant system was designed to simulate the operation of the full-scale greensand filtration system, including three (3) greensand (GS) media filter vessels (10" Ø x 54" Ht.) installed in parallel. Each greensand filter vessel was provided a dual media configuration of anthracite (15" bed depth) and Greensand Plus (24" bed depth).

Pilot Plan Performance Evaluation – Mn Removal

The GSF influent water samples over the course of the four (4) pilot plant testing programs demonstrated total manganese concentrations from non-detectable (<0.00204 mg/L) to 0.0273 mg/L. A total of 155 of 162 (95.7%) of the GSF effluent samples demonstrated non-detectable manganese (<0.00204 mg/L) with seven (7) GSF effluent samples demonstrating trace total manganese (0.00207-0.00372 mg/L). In all cases the GSF effluent total manganese was below the USEPA/MassDEP SMCL (0.05 mg/L). In summary, the greensand filtration system demonstrated consistent and effective removal of manganese at all hydraulic loading rates. Additional findings of the pilot plant evaluation include the following:

- The greensand filter performance regarding removal of manganese is consistently effective at hydraulic loading rates ranging from 3.5 gpm/ft² to 7.4 gpm/ft².
- The filter media hydraulic loading rates are within the manufacturers recommendations (2 – 12 gpm/ft²) and are very conservative with consideration of the very low total and dissolved manganese loading.

Conditional Approval

Based on the information submitted, MassDEP, acting under the authority of Chapter 111, Section 17 of the Massachusetts General Laws and 310 CMR 22.00 Massachusetts Drinking Water, hereby grants conditional approval of the Pilot Study Report at the Housatonic Water Works Treatment Plant. Pursuant to MassDEP's authority under 310 CMR 22.04(7) to require that each supplier of water operate and maintain its system in a manner that ensures the delivery of safe drinking water to consumers, this permit is made subject to the following conditions:

1. MassDEP finds the pilot study report to satisfactorily comply with the requirements of Policy 90-04, Pilot Study Requirements for Proposed Treatment. After HWWC approves the project and the Mn treatment design is finalized, HWWC must submit permit application BRP WS 25: Approval of Treatment Facility Modification. The design shall conform to MassDEP's Guidelines for Public Water Systems.
2. Pre-oxidation Chemicals at the proposed WTP – All chemical addition designs shall meet the requirements of 310 CMR 22.04(14) and Chapter 6 of the Guidelines for Public Water Systems. The design should include an appropriately sized containment area, a twist lock plug outlet, and the ability to flow pace the chemicals. The BRP WS 25 permit application shall be accompanied by the appropriate MassDEP checklists for the proposed chemical feed systems.
3. The pilot report provided an evaluation of final residuals handling and disposal options of the backwash water; however, these options need to be evaluated further and an approach chosen prior to the treatment facility modification. MassDEP requires solids handling be included as part of the WS 25 permit application.
4. MassDEP considers the first year of treatment to be a demonstration study, during that period HWWC will be required to closely monitor the operation of the treatment system. As part of the demonstration study, MassDEP will require water quality parameter monitoring of the source, at the entry point and at specified distribution sampling locations. MassDEP will provide the detailed schedule as a condition of its approval of the treatment plant design permit. The demonstration study is to be in operation for a minimum of one year. Upon completion of the demonstration study, HWWC is required to submit a letter report which describes the effectiveness of the treatment system, proposed optimal water quality parameters, and note any necessary changes in the equipment or layout.
5. Based on the response to MassDEP's inquiry, the most effective and efficient means to maintain a consistent chlorine residual (> 0.5 mg/L) is to provide on-line monitoring immediately downstream of the greensand filters, with feedback proportional control of the sodium hypochlorite feed. This allows the sodium hypochlorite dosage to be adjusted in response to the oxidation demand regardless of the reason for, or source of, the demand (soluble manganese, organics, etc.). MassDEP requires HWWC to include on-line monitoring of chlorine residual with the capability of feedback proportional control of the sodium hypochlorite feed. This analyzer must also be fitted with high and low alarm with operator notification capability.
6. In the event of a total loss of the sodium hypochlorite chemical feed (or feed system), the anticipated operator response would be to immediately respond, as the loss of

chlorination will impact both the performance of the greensand filtration system, and microbiological control in the water storage tank and distribution system. MassDEP will require that HWWC notifies MassDEP if it is unable to maintain a chlorine residual greater than 0.5 mg/L or higher for more than 4 hours or any persistent issue that renders the greensand filters ineffective.

7. Since the failure to maintain the desired filter effluent chlorine residual will degrade the catalytic oxidative capacity of the greensand media. HWWC must shut the valve to the greensand filter if the online chlorine residual nears zero due to either instrumentation error or less than ideal influent water quality.
8. As conditioned in the August 1, 2022, conditional approval letter, this Mn treatment technology is approved as a Site-Specific New Technology Process (Type B).
9. As conditioned in the August 1, 2022, conditional approval letter, this permit is approved for greensand influent water quality parameters encountered during the pilot study.