July 2020

Bureau of Waste Site Cleanup
Southeast Regional Office
Massachusetts Department of Environmental Protection
C/o Angela Gallagher
Site Remediation Section
20 Riverside Drive
Lakeville, MA 02347

RE: Immediate Response Action Status and Remedial Monitoring Report #41
Barnstable County Fire Training Academy FTA Facility
155 South Flint Rock Road
Hyannis, Massachusetts
DEP Release Tracking No. 4-26179
Project Number #6206

Dear Ms. Gallagher:

BETA Group, Inc. (BETA) has prepared this Immediate Response Action (IRA) Status and Remedial Monitoring Report (RMR) for the Disposal Site (the Site) referenced as the Barnstable Country Fire Training Academy (the FTA Facility) located at 155 South Flint Rock Road in Hyannis, MA on the behalf of Barnstable County. This report was completed on behalf of Barnstable County and in accordance with Massachusetts Contingency Plan (MCP) - 310 CMR 40.0000.

This is the 41st monthly IRA RMR Status report. It documents the IRA/RMR activities being conducted to address a release of PFOS/PFOA to groundwater, soils, surface water, and sediments located at the Site. A potential Imminent Hazard (IH) condition and Condition of Substantial Release Migration were previously identified at the Site. This letter report specifically addresses the status of the Site groundwater pumping and treatment systems (GWPTS) during the monthly reporting period from April 1 to April 30, 2020.

The completed BWSC105 Immediate Response Action (IRA) Transmittal Form and attached BWSC105A and BWSC105B IRA Remedial Monitoring Report Forms are being submitted to the MassDEP electronically via the eDEP system. This letter is being submitted to the Massachusetts Department of Environmental Protection (MassDEP) as an attachment to those forms. Copies of these forms prior to electronic signature are included as Attachment A.

REMEDIAL MONITORING REPORT – APRIL 2020

During the April 2020 reporting period, the primary treatment system (GWTS #1) and secondary system (GWTS #2) were in operation for all or portions of approximately 30 days. There was one scheduled shutdown during this reporting period for GWTS #1 and GWTS #2; the systems were shut down on April 9, 2020 for several hours while Global Cycle pumped out the accumulated iron-oxide sediments from both equalization (EQ) tanks. Additionally, backwashes were conducted on the primary LGAC vessels of both GWTS #1 and GWTS #2 on April 9, 2020. On April 28, 2020, BETA collected performance samples from both GWTS #1 and GWTS #2 systems, which were both in operation at the time of sample collection.

Health Advisories and Regulatory Standards Used for Comparison

During the initial two years of the GWPTS operation (July 2016 through June 2018), the USEPA revised Health Advisory (HA) of 0.070 µg/L for two PFAS chemicals, Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS), was used for comparison to the analytical results of GWPTS performance samples. The HA (revised downward to 0.070 µg/L in July 2016) applied to each compound individually or for the total concentration of the two. Subsequently, MassDEP adopted the USEPA HA. The USEPA considers its HA to still be in effect (as of March 2020). However, for MCP purposes it has been superseded by MassDEP guidelines and regulatory actions.

On June 11, 2018, MassDEP's Office of Research and Standards (ORS) issued an updated ORS Guideline/HA that applied to the individual concentrations or the total summed of five PFAS chemicals: PFOS, PFOA, Perfluorononanoic Acid (PFNA), Perfluorohexanesulfonic Acid (PFHxS), and Perfluoroheptanoic Acid (PFHpA). From June 11, 2018 until December 2019, individual concentrations of any of these five compounds or the total concentrations of all were compared to the MassDEP ORS HA of 0.070 µg/L.

On April 19, 2019, MassDEP released the Public Comment Draft of proposed revisions to the MCP, which included proposed Method 1 groundwater risk standards for the five PFAS compounds, plus an additional PFAS compound, Perfluorodecanoic Acid (PFDA). A Method 1 GW-1 risk standard of 0.020 µg/L was proposed for the individual concentrations of any of these six compounds or the total concentrations of all six. From May 2019 through the current reporting period, tabulated treatment system analytical results have been compared to all six PFAS compounds of concern for informational purposes.

In December 2019, MassDEP published final MCP Method 1 risk standards for PFAS with an effective implementation date of December 27, 2019. The final MCP PFAS risk standards for groundwater include the 6 PFAS compounds of concern listed above and a 0.020 µg/L[1] GW-1 numerical risk standard. These MCP risk standards are included in Table 1A and Table 1B. The total PFAS concentrations reported and discussed for comparison purposes in this report are based on the six regulated PFAS compounds included in the final MCP risk standards of December 27, 2019.

[1] Concentrations of PFAS are presented in the data tables of this report in nanograms per liter (ng/L), also referred to as parts per trillion (ppt), and are reported by the laboratory in those units. However the published MCP Method GW-1 numerical risk standards are in presented in or micrograms per liter (µg/L), also referred to as parts per billion (ppb). In the relevant sections of this report, both results are shown in both units.

GWTS # 1 System Monitoring Results

As noted, system samples were collected on April 28, 2020 from the Influent (PRW-4), Midpoint and Effluent ports and were submitted to Bureau Veritas Laboratories (formerly Maxxam Analytics) of Mississauga, Ontario (Bureau Veritas) for the laboratory analysis of Total PFAs via USEPA Method 537 M.
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The total sum of the six Massachusetts regulated PFAS concentrations in the Influent (PRW-4) sample was 2,302 ng/L (2.302 µg/L), well above the GW-1 risk standards. All six individually regulated PFAS compounds were detected at concentrations exceeding the new MCP GW-1 risk standard (0.020 µg/l). Refer to the attached Table 1A, for a summary of the GWTS #1 PFAS analytical data. Recovery well PRW-4 is the source of the Influent groundwater. Based on the splitting of flow from PRW-4 to both groundwater treatment systems, the Influent analytical results apply to GWTS #2, as well as GWTS #1.

The six MA regulated PFAS compounds were detected above the laboratory reporting detection limits in the Midpoint sample, and the PFOS compound was above the MCP Method 1 GW-1 standard. For the purposes of achieving the lowest MDLs and RDLs [2](for comparison to the new MCP Method 1 Groundwater standards, Bureau Veritas reports the results for 21 PFAS compounds, including two (2) PFAS precursors; this allows the laboratory to achieve RDLs as low as 0.18 ng/L. The complete laboratory report is attached in Appendix B. The laboratory report provides details of MDLs and RDLs for each PFAS compound included in the analyte list.

Although, the six regulated PFAS compounds were detected in the Midpoint Sample, none of the six MCP regulated PFAS compounds were detected at concentrations above MDLs in the Effluent sample from System #1; in addition, the remaining 15 PFAS compounds are reported below the laboratory RDLs and MDLs, with the exception of one unregulated PFAS compound (PFHxA). The detected concentration of PFHxA (0.95 ng/L) is below the applicable Method 1 GW-1 standards (20 ng/L); however, this compound is not regulated by either Massachusetts State or USEPA. Refer to the attached Table 1A, for a summary of the GWTS #1 PFAS analytical data in the Midpoint and Effluent samples. The complete laboratory report is attached in Appendix B.

GWTS #1 Operational Details

The attached Table 2A presents the GWTS #1 performance data. For the April 2020 reporting period, the overall (average) system flow rate and gallons of groundwater treated are based on the effluent flow meter/totalizer readings reported for the system by the O&M contractor. On this basis, approximately 0.46 million gallons of groundwater were treated during the April 2020 reporting period, at an average effluent flow rate of 10.8 gpm. Based on 0.46 million gallons treated and total influent concentration of 2,302 ng/L (April 28, 2020 sample results), approximately 0.004 kilograms of PFAS were estimated to have been removed from the plume area during this reporting period.

The estimated, instantaneous combined influent flow rates (for both systems) ranged from approximately 19.2 gpm to 41.5 gpm; typically, the combined estimated instantaneous influent flow rate has been over 20 gpm.

[2] Method Detection Limits and Reportable Detection Limits.

As detailed in the IRA Status and RMR reports from the previous 2020 reporting periods, iron-oxide sediment has significantly accumulated in the equalization (EQ) tank and has caused a decrease in the observed system flow rates due to suspected accumulation in the force main piping and potentially in the recovery well PRW-4.

As previously noted, on April 9, 2020 Global Cycle was on Site and removed approximately 2,989 gallons of iron-oxide sediment and water from the EQ tanks of both systems and the exterior totes; following the backwash of the primary liquid-phase granular activated carbon (LGAC) vessel in GWTS #1, the observed average effluent flow rate increased by approximately 50% (during the next monitoring event). See Table 2A for details.

Due to the method used to estimate the instantaneous influent flow rate (timing of rise of groundwater in the GWTS #1 Equalization Tank with both force mains discharging to it), the estimated influent flow rates noted above apply to both systems, combined. Therefore, during the normal mode of operation, with the flow from each force main flowing to only one system, it is assumed that roughly 50% of the instantaneous influent rates stated above actually discharge to GWTS #1; the assumed 50% values are tabulated – (the influent flow rate for GWTS #1 is approximately 15.2 gpm). Table 2A presents the details for GWTS #1 .

GWTS # 2 Monitoring Results

As previously mentioned, BETA collected performance samples from GWTS #2 system on April 28, 2020 Samples collected from the Influent (PRW-4), Midpoint, and Effluent ports were submitted to Bureau Veritas for the laboratory analysis of Total PFAS via USEPA Method 537 M. As noted above, recovery well PRW-4 is the source of the Influent groundwater to both groundwater treatment systems. Therefore, the Influent analytical results apply to GWTS #2, as well as GWTS #1.

As previously mentioned, the tabulated treatment system analytical results from GWTS #2 have been reported and compared to all six regulated PFAS compounds and their respective MCP Method 1 GW-1 Standards. The total sum of the six PFAS concentrations in the Influent sample was 2, 302 ng/L, well above the GW-1 risk standards. All six individually regulated PFAS compounds were detected at concentrations exceeding the new MCP GW-1 risk standard (0.020 µg/l or 20 ng/L). Refer to the attached Table 1B for a summary of the GWTS #2 PFAS analytical data. The complete laboratory report is attached in Appendix B.

PFAS concentrations were detected above the RDLs or MDLs in this April 2020 Midpoint sample except for the PFOS compound – the PFOS concentration detected in the Midpoint sample was above the applicable MCP GW-1 risk standards. For the purposes of achieving the lowest MDLs and RDLs (for comparison to the new MCP Method 1 Groundwater standards, Bureau Veritas reports the results for 21 PFAS compounds, including two (2) PFAS precursors; this allows the laboratory to achieve RDLs as low as 0.18 ng/L (ppt). Laboratory analytical details are included in Table 1B and the laboratory report (in Appendix B).

Although, the six regulated PFAS compounds were detected in the Midpoint Sample, just the PFOS compound was detected at concentrations above MDLs in the Effluent sample from System #2. However, these PFOS detections was below the applicable Method 1 GW-1 standards.

The remaining 15 PFAS compounds were reported below the laboratory RDLs and MDLs. Laboratory analytical details are included in Table 1B and the laboratory report is included in Appendix B).

GWTS #2 Operational Details

For the April 2020 reporting period, effluent flow rates and influent flow rates observed have been lower than the system's optimum performance as documented during the previous 2020 reporting period. This decrease is assumed to be attributable to the iron-oxide sediment that accumulated in the EQ holding tank and was carrying over into the bag filters. In addition, precipitated iron was suspected of accumulating in the LGAC vessels. The system was shutdown on April 9, 2020 for a backwash of the primary LGAC vessel and to vacuum out the accumulated iron-oxide sediments from the system's EQ tank to help remedy the continued pressure increases. The system was shut down for approximately four hours.

The overall (average) system flow rate and gallons of groundwater treated were based on the Effluent flow rate/net totalizer readings reported for the system by the O&M contractor; approximately 0.55 million gallons of groundwater were estimated to be treated during the March 2020 reporting period, at an approximate average effluent flow rate of 13.0 gpm. Based on 0.55 million gallons treated, approximately 0.005 kilograms of PFAS were estimated to have been removed from the plume area during this reporting period. Refer to Table 2B.

As described in previous sections, during the normal mode of operation, with the flow from each force main flowing to only one system, it is assumed that roughly 50% of the instantaneous influent rates discussed above for GWTS #1 actually discharge to GWTS #2. Refer to the attached Table 2B for a summary of the GWPTS performance details.

GROUNDWATER TREATMENT PUMPING AND TREATMENT SUMMARY

During the April 2020 reporting period, the two treatment systems, GWTS #1 and GWTS #2, were in operation for all or portions of approximately 30 days. The overall (average) system flow rate and gallons of groundwater treated are based on the available Effluent flow totalizer readings reported for both systems by the O&M contractor. For the period of April 1 to April 30, 2020 both systems treated an approximate combined 1.01 million gallons of groundwater from the downgradient recovery well PRW-4 at an average, total (of the two systems) effluent flow rate of 23.8 gpm. Based on the total 1.01 million gallons treated, approximately 0.009 kilograms of PFAS were estimated to have been removed from the plume area.

Ongoing IRA Activities

Sampling results, system performance, and additional assessment work related to the ongoing response actions, such as system improvement and enhancement details, will be presented in the next IRA Status and RMR Report for the May 2020 reporting period.

Public Involvement Activities

A copy of the municipal notification to the Barnstable Town Manager, with copies to other town officials, is included as Appendix C.

The Site has been designated a Public Involvement Plan Site under the MCP. The Draft Public Involvement Plan (PIP) was presented at a public meeting held at the Barnstable Town Hall on May 2, 2019. Following the end of the comment period, the PIP was finalized and filed with MassDEP on June 30, 2019. In accordance with the final PIP, a copy of this status report will be placed in the public repository. The report will be available on-line via the County website.

Sincerely,

BETA Group, Inc.

Mykel Mendes
Environmental Engineer

Roger Thibault, P.E., LSP
Senior Environmental Engineer

Copy: Jack Yunits, Barnstable County Administrator
Steve Tebo, Assistant County Administrator

Attachments:

TABLES:

Table 1A – Summary of Groundwater Pump and Treatment System PFAS Analytical Data – System #1
Table 1B - Summary of Groundwater Pump and Treatment System PFAS Analytical Data – System #2
Table 2A - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data-System #1
Table 2B- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data-System #2

APPENDICES:

A: BWSC 105, 105A, 105B Forms
B: Laboratory Reports
C: Municipal Notification Letter to Town Manager

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

Immediate Response Action (IRA) Transmittal Form
Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

BWSC 105

Release Tracking Number
4 - 26179

A. SITE LOCATION:

1. Release Name/Location Aid: BARNSTABLE COUNTY FIRE TRAINING ACADEMY

2. Street Address: 155 SOUTH FLINT ROCK ROAD

3. City/Town: BARNSTABLE 4. Zip Code: 026300000

☐ 5. Check here if this location is Adequately Regulated, pursuant to 310 CMR 40.0110-0114.

☐ a. CERCLA ☐ b. HSWA Corrective Action ☐ c. Solid Waste Management

☐ d. RCRA State Program (21C Facilities)

B. THIS FORM IS BEING USED TO: (check all that apply)

1. List Submittal Date of Initial IRA Written Plan (if previously submitted): 9/26/2016

☐ 2. Submit an **Initial IRA Plan**.

☐ 3. Submit a **Modified IRA Plan** of a previously submitted written IRA Plan.

☐ 4. Submit an **Imminent Hazard Evaluation**. (check one)

☐ a. An Imminent Hazard exists in connection with this Release or Threat of Release.

☐ b. An Imminent Hazard does not exist in connection with this Release or Threat of Release.

☐ c. It is unknown whether an Imminent Hazard exists in connection with this Release or Threat of Release, and further assessment activities will be undertaken.

☐ d. It is unknown whether an Imminent Hazard exists in connection with this Release or Threat of Release. However, response actions will address those conditions that could pose an Imminent Hazard.

☐ 5. Submit a request to **Terminate an Active Remedial System or Response Action(s) Taken to Address an Imminent Hazard**.

☑ 6. Submit an **IRA Status Report**

☑ 7. Submit a **Remedial Monitoring Report**. (This report can only be submitted through eDEP.)

a. Type of Report: (check one) ☐ i. Initial Report ☑ ii. Interim Report ☐ iii. Final Report

b. Frequency of Submittal: (check all that apply)

☑ i. A Remedial Monitoring Report(s) submitted monthly to address an Imminent Hazard.

☐ ii. A Remedial Monitoring Report(s) submitted monthly to address a Condition of Substantial Release Migration.

☐ iii. A Remedial Monitoring Report(s) submitted every six months, concurrent with an IRA Status Report.

☐ iv. A Remedial Monitoring Report(s) submitted annually, concurrent with an IRA Status Report.

c. Number of Remedial Systems and/or Monitoring Programs: 2

A separate BWSC105A, IRA Remedial Monitoring Report, must be filled out for each Remedial System and/or Monitoring Program addressed by this transmittal form.

☐ 8. Submit an **IRA Completion Statement**.

☐ a. Check here if future response actions addressing this Release or Threat of Release notification condition will be conducted as part of the Response Actions planned or ongoing at a Site that has already been Tier Classified under a different Release Tracking Number (RTN)

b. Provide Release Tracking Number of Tier Classified Site (Primary RTN): _____ _____

These additional response actions must occur according to the deadlines applicable to the Primary RTN. Use the Primary RTN when making all future submittals for the site unless specifically relating to this Immediate Response Action.

☐ 9. Submit a **Revised IRA Completion Statement**.

☐ 10. Submit a **Plan for the Application of Remedial Additives** near a sensitive receptor, pursuant to 310 CMR 40.0046(3).

(All sections of this transmittal form must be filled out unless otherwise noted above)

C. RELEASE OR THREAT OF RELEASE CONDITIONS THAT WARRANT IRA:

1. Media Impacted and Receptors Affected: (check all that apply)

☐ a. Paved Surface ☐ b. Basement ☐ c. School
☑ d. Public Water Supply ☑ e. Surface Water ☑ f. Zone 2 ☐ g. Private Well ☐ h. Residence ☑ i. Soil
☑ j. Groundwater ☑ k. Sediments ☐ l. Wetland ☐ m. Storm Drain ☐ n. Indoor Air ☐ o. Air
☐ p. Soil Gas ☐ q. Sub-Slab Soil Gas ☐ r. Critical Exposure Pathway ☐ s. NAPL ☐ t. Unknown
☐ r. Others Specify: _____

2. Sources of the Release or TOR: (check all that apply)

☐ a. Transformer ☐ b. Fuel Tank ☐ c. Pipe
☐ d. OHM Delivery ☐ e. AST ☐ f. Drums ☐ g. Tanker Truck ☐ h. Hose ☐ i. Line
☐ j. UST Describe: _____ ☐ k. Vehicle ☐ l. Boat/Vessel
☐ m. Unknown ☑ n. Other: FIRE FIGHTING FOAM

3. Type of Release or TOR: (check all that apply)

☐ a. Dumping ☐ b. Fire ☐ c. AST Removal ☐ d. Overfill
☐ e. Rupture ☐ f. Vehicle Accident ☐ g. Leak ☐ h. Spill ☐ i. Test failure ☐ j. TOR Only
☐ k. UST Removal Describe: _____
☐ l. Unknown ☑ m. Other: HISTORIC FOAM USE

4. Identify Oils and Hazardous Materials Released: (check all that apply)

☐ a. Oils ☐ b. Chlorinated Solvents
☐ c. Heavy Metals ☑ d. Others Specify: PFAS

D. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply, for volumes list cumulative amounts)

☑ 1. Assessment and/or Monitoring Only
☑ 2. Temporary Covers or Caps
☐ 3. Deployment of Absorbent or Containment Materials
☐ 4. Temporary Water Supplies
☐ 5. Structure Venting System/HVAC Modification System
☐ 6. Temporary Evacuation or Relocation of Residents
☐ 7. Product or NAPL Recovery
☐ 8. Fencing and Sign Posting
☑ 9. Groundwater Treatment Systems
☐ 10. Soil Vapor Extraction
☐ 11. Remedial Additives
☐ 12. Air Sparging
☐ 13. Active Exposure Pathway Mitigation System
☐ 14. Passive Exposure Pathway Mitigation System

D. DESCRIPTION OF RESPONSE ACTIONS: (cont.)

☑ 15. Excavation of Contaminated Soils.

☐ a. Re-use, Recycling or Treatment ☐ i. On Site Estimated volume in cubic yards

☐ ii. Off Site Estimated volume in cubic yards

iia. Receiving Facility: Town: State:

iib. Receiving Facility: Town: State:

iii. Describe:

☐ b. Store ☐ i. On Site Estimated volume in cubic yards

☐ ii. Off Site Estimated volume in cubic yards

iia. Receiving Facility: Town: State:

iib. Receiving Facility: Town: State:

☑ c. Landfill ☐ i. Cover Estimated volume in cubic yards

Receiving Facility: Town: State:

☑ ii. Disposal Estimated volume in cubic yards 200

Receiving Facility: TAUNTON LANDFILL Town: TAUNTON State: MA

☐ 16. Removal of Drums, Tanks, or Containers:

a. Describe Quantity and Amount:

b. Receiving Facility: Town: State:

c. Receiving Facility: Town: State:

☐ 17. Removal of Other Contaminated Media:

a. Specify Type and Volume:

☐ 18. Other Response Actions:

Describe:

☐ 19. Use of Innovative Technologies:

Describe:

E. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisionsof 309 CMR 4.02(2) and (3), and 309 CMR 4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> if Section B of this form indicates that an **Immediate Response Action Plan** is being submitted, the response action(s) that is(are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is(are) appropriate and reasonable to accomplish thepurposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B of this form indicates that an **Imminent Hazard Evaluation** is being submitted, this Imminent Hazard Evaluation was developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and the assessment activity(ies) undertaken to support this Imminent Hazard Evaluation comply(ies) with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000;

> if Section B of this form indicates that an **Immediate Response Action Status Report** and/or a **Remedial Monitoring Report** is(are) being submitted, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000,(ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B of this form indicates that an **Immediate Response Action Completion Statement** or a request to **Terminate an Active Remedial System or Response Action(s) Taken to Address an Imminent Hazard** is being submitted, the response action(s) that is(are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is(are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 1443

2. First Name: ROGER P 3. Last Name: THIBAULT

4. Telephone: 508-331-2700 5. Ext: 6. Email:

7. Signature:

8. Date: *(mm/dd/yyyy)* 9. LSP Stamp:

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

Immediate Response Action (IRA) Transmittal Form
Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

BWSC 105

Release Tracking Number
4 - 26179

F. PERSON UNDERTAKING IRA:

1. Check all that apply: ☐ a. change in contact name ☐ b. change of address ☐ c. change in the person undertaking response actions

2. Name of Organization: BARNSTABLE COUNTY COMMISSIONERS

3. Contact First Name: JACK 4. Last Name: YUNITS

5. Street: 3195 MAIN ST 6. Title:

7. City/Town: BARNSTABLE 8. State: MA 9. Zip Code: 026301105

10. Telephone: 508-375-6643 11. Ext: 12. Email: JYUNITS@BARNSTABLECOUNTY.ORG

G. RELATIONSHIP TO RELEASE OR THREAT OF RELEASE OF PERSON UNDERTAKING IRA:

☐ Check here to change relationship

☑ 1. RP or PRP ☑ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☐ e. Other RP or PRP Specify Relationship:

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Undertaking Response Actions: Specify Relationship:

H. REQUIRED ATTACHMENT AND SUBMITTALS:

☐ 1. Check here if any Remediation Waste, generated as a result of this IRA, will be stored, treated, managed, recycled or reused at the site following submission of the IRA Completion Statement. If this box is checked, you must submit one of the following plans, along with the appropriate transmittal form.

☐ a. A Release Abatement Measure (RAM) Plan (BWSC106) ☐ b. Phase IV Remedy Implementation Plan (BWSC108)

☐ 2. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by MassDEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☑ 3. Check here to certify that the Chief Municipal Officer and the Local Boardof Health were notified of the implementation of an Immediate Response Action taken to control, prevent, abate or eliminate an Imminent Hazard.

☐ 4. Check here to certify that the Chief Municipal Officer and the Local Boardof Health were notified of the submittal of a Completion Statement for an Immediate Response Action taken to control, prevent, abate or eliminate an Imminent Hazard.

☐ 5. Check here if any non-updatable information provided on this form is incorrect, e.g. Release Address/Location Aid. Send corrections to BWSC.eDEP@state.ma.us.

☑ 6. Check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC 105

Immediate Response Action (IRA) Transmittal Form
Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

Release Tracking Number
4 - 26179

I. CERTIFICATION OF PERSON UNDERTAKING IRA:

1. I, _____, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form; (ii) that, based on my inquiry of the/those individual(s) immediately responsible for obtaining the information, the material information contained herein is, to the best of my knowledge, information and belief, true, accurate and complete; (iii) that, to the best of my knowledge, information and belief, I/the person(s) or entity(ies) on whose behalf this submittal is made satisfy(ies) the criteria in 310 CMR 40.0183(2); (iv) that I/the person(s) or entity(ies) on whose behalf this submittal is made have provided notice in accordance with 310 CMR 40.0183(5); and (v) that I am fully authorized to make this attestation on behalf of the person(s) or entity(ies) legally responsible for this submittal. I/the person(s) or entity(ies) on whose behalf this submittal is made is/are aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

2. By: _____ 3. Title: _____

4. For: BARNSTABLE COUNTY COMMISSIONERS 5. Date: _____ (mm/dd/yyyy)

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section F.

7. Street: _____

8. City/Town: _____ 9. State: _____ 10. Zip Code: _____

11. Telephone: _____ 12. Ext: _____ 13. Email: _____

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
IRA REMEDIAL MONITORING REPORT
Pursuant to 310 CMR 40.0400 (SUBPART D)
Remedial System or Monitoring Program: 1 of: 1

BWSC105 -A

Release Tracking Number
4 - 26179

A. DESCRIPTION OF ACTIVE OPERATION AND MAINTENANCE ACTIVITY:

1. Type of Active Operation and Maintenance Activity: (check all that apply)

☑ a. Active Remedial System: (check all that apply)

☐ i. NAPL Recovery ☐ ii. Soil Vapor Extraction/Bioventing ☐ iii. Vapor-phase Carbon Adsorption
☑ iv. Groundwater Recovery ☐ v. Dual/Multi-phase Extraction ☐ vi. Aqueous-phase Carbon Adsorption
☐ vii. Air Stripping ☐ viii. Sparging/Biosparging ☐ ix. Cat/Thermal Oxidation
☐ x. Other Describe:

☐ b. Active Exposure Pathway Elimination Measure
Active Exposure Pathway Mitigation System to address (check one): ☐ i. Indoor Air ☐ ii. Drinking Water

☐ c. Application of Remedial Additives: (check all that apply)
☐ i. To the Subsurface ☐ ii. To Groundwater (Injection) ☐ iii. To the Surface

☐ d. Active Remedial Monitoring Program Without the Application of Remedial Additives: (check all that apply; Sections C, D and E are not required; attach supporting information, data, maps and/or sketches needed by checking Section G5)
☐ i. Reactive Wall ☐ ii. Natural Attenuation ☐ iii. Other Describe:

2. Mode of Operation: (check one)
☑ a. Continuous ☐ b. Intermittent ☐ c. Pulsed ☐ d. One-time Event Only ☐ e. Other:

3. System Effluent/Discharge: (check all that apply)
☐ a. Sanitary Sewer/POTW
☑ b. Groundwater Re-infiltration/Re-injection: (check one) ☐ i. Downgradient ☑ ii. Upgradient
☐ c. Vapor-phase Discharge to Ambient Air: (check one) ☐ i. Off-gas Controls ☐ ii. No Off-gas Controls
☐ d. Drinking Water Supply
☐ e. Surface Water (including Storm Drains)
☐ f. Other Describe:

B. MONITORING FREQUENCY:

1. Reporting period that is the subject of this submittal: From: 4/1/2020 (mm/dd/yyyy) To: 4/30/2020 (mm/dd/yyyy)

2. Number of monitoring events during the reporting period: (check one)
☐ a. System Startup: (if applicable)
☐ i. Days 1, 3, 6, and then weekly thereafter, for the first month.
☐ ii. Other Describe:
☑ b. Post-system Startup (after first month) or Monitoring Program:
☑ i. Monthly
☐ ii. Quarterly
☐ iii. Annually
☐ iv. Other Describe:

☐ 3. Check here to certify that the number of required monitoring events were conducted during the reporting period.

C. EFFLUENT/DISCHARGE REGULATION: (check one to indicate how the effluent/discharge limits were established)

☐ 1. NPDES: (check one) ☐ a. Remediation General Permit ☐ b. Individual Permit
☐ c. Emergency Exclusion Effective Date of Permit: (mm/dd/yyyy)

☐ 2. MCP Performance Standard MCP Citations(s):

☑ 3. DEP Approval Letter Date of Letter: 11/18/2016 (mm/dd/yyyy)

☐ 4. Other Describe:

D. WASTEWATER TREATMENT PLANT OPERATOR: (check one)

☑ 1. Required due to Remedial Wastewater Treatment Plant in place for more than 30 days.

a. Name: TJ MCGOFF b. Grade: 4

c. License No: 15570 d. License Exp. Date: 12/31/2021 (mm/dd/yyyy)

☐ 2. Not Required

☐ 3. Not Applicable

E. STATUS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM DURING REPORTING PERIOD: (check all that apply)

☑ 1. The Active Remedial System was functional one or more days during the Reporting Period.

a. Days System was Fully Functional: 30 b. GW Recovered (gals): 458937

c. NAPL Recovered (gals): d. GW Discharged (gals): 458937

e. Avg. Soil Gas Recovery Rate (scfm): f. Avg. Sparging Rate (scfm):

☐ 2. Remedial Additives: (check all that apply)

☐ a. No Remedial Additives applied during the Reporting Period.

☐ b. Enhanced Bioremediation Additives applied: (total quantity applied at the site for the current reporting period)

☐ i. Nitrogen/Phosphorus:

Name of Additive	Date	Quantity	Units

☐ ii. Peroxides:

Name of Additive	Date	Quantity	Units

☐ iii. Microorganisms:

Name of Additive	Date	Quantity	Units

☐ iv. Other:

Name of Additive	Date	Quantity	Units

☐ c. Chemical oxidation/reduction additives applied: (total quantity applied at the site for the current reporting period)

☐ i. Permanganates:

Name of Additive	Date	Quantity	Units

☐ ii. Peroxides:

Name of Additive	Date	Quantity	Units

☐ iii. Persulfates:

Name of Additive	Date	Quantity	Units

☐ iv. Other:

Name of Additive	Date	Quantity	Units

E. STATUS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM DURING REPORTING PERIOD: (cont.)

☐ d. Other additives applied: (total quantity applied at the site for the current reporting period)

Name of Additive	Date	Quantity	Units

Name of Additive	Date	Quantity	Units

☐ e. Check here if any additional Remedial Additives were applied. Attach list of additional additives and include Name of Additive, Date Applied, Quantity Applied and Units (in gals. or lbs.)

F. SHUTDOWNS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM: (check all that apply)

☐ 1. The Active Remedial System had unscheduled shutdowns on one or more occasions during the Reporting Period.

a. Number of Unscheduled Shutdowns: _____ b. Total Number of Days of Unscheduled Shutdowns: _____

c. Reason(s) for Unscheduled Shutdowns: _____

☑ 2. The Active Remedial System had scheduled shutdowns on one or more occasions during the Reporting Period.

a. Number of Scheduled Shutdowns: 1 b. Total Number of Days of Scheduled Shutdowns: 0.2

c. Reason(s) for Scheduled Shutdowns: VACUUM REMOVAL OF IRON OXIDE SEDIMENT IN EQ TANK

☐ 3. The Active Remedial System or Active Remedial Monitoring Program was permanently shutdown/discontinued during the Reporting Period.

a. Date of Final System or Monitoring Program Shutdown: _____ (mm/dd/yyyy)

☐ b. No Further Effluent Discharges.

☐ c. No Further Application of Remedial Additives planned; sufficient monitoring completed to demonstrate compliance with 310 CMR 40.0046.

☐ d. No Further Submittals Planned.

☐ e. Other: Describe: _____

G. SUMMARY STATEMENTS: (check all that apply for the current reporting period)

☑ 1. All Active Remedial System checks and effluent analyses required by the approved plan and/or permit were performed when applicable.

☑ 2. There were no significant problems or prolonged (>25% of reporting period) unscheduled shutdowns of the Active Remedial System.

☑ 3. The Active Remedial System or Active Remedial Monitoring Program operated in conformance with the MCP, and all applicable approval conditions and/or permits.

4. Indicate any Operational Problems or Notes:

☐ 5. Check here if additional/supporting Information, data, maps, and/or sketches are attached to the form.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
IRA REMEDIAL MONITORING REPORT
MEASUREMENTS
Pursuant to 310 CMR 40.0400 (SUBPART D)
Remedial System or Monitoring Program: 1 of: 1

BWSC105 -B

Release Tracking Number
4 26179

For each Point of Measurement, related to concentration indicate the highest concentration detected during the reporting period, of each oil, hazardous material and/or remedial additive.
For each Point of Measurement for pressure differentials, indicate the lowest pressure differential detected during the reporting period.

Point of Measurement	Date (mm/dd/yyyy)	Contaminant, Measurement and/or Indicator Parameter	Influent Concentration (where applicable)	Midpoint Concentration (where applicable)	(check one) ☑ Discharge ☐ GroundWater Concentration ☐ Pressure Differential	Check here, if ND/BDL	Permissible Concentration or Pressure Differential	Units	Within Permissible Limits? (Y/N)
SYSTEM	04/28/2020	PFAS	2.302	0.105		☑	0.020	UG/L	YES

☐ Check here if any additional BWSC105 B, Measurements Form(s), are needed.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
IRA REMEDIAL MONITORING REPORT
Pursuant to 310 CMR 40.0400 (SUBPART D)
Remedial System or Monitoring Program: 2 of: 2

BWSC105 -A

Release Tracking Number
4 - 26179

A. DESCRIPTION OF ACTIVE OPERATION AND MAINTENANCE ACTIVITY:

1. Type of Active Operation and Maintenance Activity: (check all that apply)

☑ a. Active Remedial System: (check all that apply)

☐ i. NAPL Recovery ☐ ii. Soil Vapor Extraction/Bioventing ☐ iii. Vapor-phase Carbon Adsorption
☑ iv. Groundwater Recovery ☐ v. Dual/Multi-phase Extraction ☐ vi. Aqueous-phase Carbon Adsorption
☐ vii. Air Stripping ☐ viii. Sparging/Biosparging ☐ ix. Cat/Thermal Oxidation
☐ x. Other Describe:

☐ b. Active Exposure Pathway Elimination Measure
Active Exposure Pathway Mitigation System to address (check one): ☐ i. Indoor Air ☐ ii. Drinking Water

☐ c. Application of Remedial Additives: (check all that apply)
☐ i. To the Subsurface ☐ ii. To Groundwater (Injection) ☐ iii. To the Surface

☐ d. Active Remedial Monitoring Program Without the Application of Remedial Additives: (check all that apply; Sections C, D and E are not required; attach supporting information, data, maps and/or sketches needed by checking Section G5)
☐ i. Reactive Wall ☐ ii. Natural Attenuation ☐ iii. Other Describe:

2. Mode of Operation: (check one)
☑ a. Continuous ☐ b. Intermittent ☐ c. Pulsed ☐ d. One-time Event Only ☐ e. Other:

3. System Effluent/Discharge: (check all that apply)
☐ a. Sanitary Sewer/POTW
☑ b. Groundwater Re-infiltration/Re-injection: (check one) ☐ i. Downgradient ☑ ii. Upgradient
☐ c. Vapor-phase Discharge to Ambient Air: (check one) ☐ i. Off-gas Controls ☐ ii. No Off-gas Controls
☐ d. Drinking Water Supply
☐ e. Surface Water (including Storm Drains)
☐ f. Other Describe:

B. MONITORING FREQUENCY:

1. Reporting period that is the subject of this submittal: From: 4/1/2020 (mm/dd/yyyy) To: 4/30/2020 (mm/dd/yyyy)

2. Number of monitoring events during the reporting period: (check one)
☐ a. System Startup: (if applicable)
☐ i. Days 1, 3, 6, and then weekly thereafter, for the first month.
☐ ii. Other Describe:
☑ b. Post-system Startup (after first month) or Monitoring Program:
☑ i. Monthly
☐ ii. Quarterly
☐ iii. Annually
☐ iv. Other Describe:

☐ 3. Check here to certify that the number of required monitoring events were conducted during the reporting period.

C. EFFLUENT/DISCHARGE REGULATION: (check one to indicate how the effluent/discharge limits were established)

☐ 1. NPDES: (check one) ☐ a. Remediation General Permit ☐ b. Individual Permit
☐ c. Emergency Exclusion Effective Date of Permit: (mm/dd/yyyy)

☐ 2. MCP Performance Standard MCP Citations(s):

☑ 3. DEP Approval Letter Date of Letter: 11/18/2016 (mm/dd/yyyy)

☐ 4. Other Describe:

D. WASTEWATER TREATMENT PLANT OPERATOR: (check one)

☑ 1. Required due to Remedial Wastewater Treatment Plant in place for more than 30 days.

a. Name: TJ MCGOFF b. Grade: 4

c. License No: 15570 d. License Exp. Date: 12/31/2021 (mm/dd/yyyy)

☐ 2. Not Required

☐ 3. Not Applicable

E. STATUS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM DURING REPORTING PERIOD: (check all that apply)

☑ 1. The Active Remedial System was functional one or more days during the Reporting Period.

a. Days System was Fully Functional: 30 b. GW Recovered (gals): 550745

c. NAPL Recovered (gals): d. GW Discharged (gals): 550745

e. Avg. Soil Gas Recovery Rate (scfm): f. Avg. Sparging Rate (scfm):

☐ 2. Remedial Additives: (check all that apply)

☐ a. No Remedial Additives applied during the Reporting Period.

☐ b. Enhanced Bioremediation Additives applied: (total quantity applied at the site for the current reporting period)

☐ i. Nitrogen/Phosphorus:

Name of Additive	Date	Quantity	Units

☐ ii. Peroxides:

Name of Additive	Date	Quantity	Units

☐ iii. Microorganisms:

Name of Additive	Date	Quantity	Units

☐ iv. Other:

Name of Additive	Date	Quantity	Units

☐ c. Chemical oxidation/reduction additives applied: (total quantity applied at the site for the current reporting period)

☐ i. Permanganates:

Name of Additive	Date	Quantity	Units

☐ ii. Peroxides:

Name of Additive	Date	Quantity	Units

☐ iii. Persulfates:

Name of Additive	Date	Quantity	Units

☐ iv. Other:

Name of Additive	Date	Quantity	Units

E. STATUS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM DURING REPORTING PERIOD: (cont.)

☐ d. Other additives applied: (total quantity applied at the site for the current reporting period)

Name of Additive	Date	Quantity	Units

Name of Additive	Date	Quantity	Units

☐ e. Check here if any additional Remedial Additives were applied. Attach list of additional additives and include Name of Additive, Date Applied, Quantity Applied and Units (in gals. or lbs.)

F. SHUTDOWNS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM: (check all that apply)

☐ 1. The Active Remedial System had unscheduled shutdowns on one or more occasions during the Reporting Period.

a. Number of Unscheduled Shutdowns: _____ b. Total Number of Days of Unscheduled Shutdowns: _____

c. Reason(s) for Unscheduled Shutdowns: _____

☑ 2. The Active Remedial System had scheduled shutdowns on one or more occasions during the Reporting Period.

a. Number of Scheduled Shutdowns: 1 b. Total Number of Days of Scheduled Shutdowns: 0.2

c. Reason(s) for Scheduled Shutdowns: VACUUM REMOVAL OF ACCUMULATED IRON-OXIDE SEDIMENTS IN EQ TANK

☐ 3. The Active Remedial System or Active Remedial Monitoring Program was permanently shutdown/discontinued during the Reporting Period.

a. Date of Final System or Monitoring Program Shutdown: _____ (mm/dd/yyyy)

☐ b. No Further Effluent Discharges.

☐ c. No Further Application of Remedial Additives planned; sufficient monitoring completed to demonstrate compliance with 310 CMR 40.0046.

☐ d. No Further Submittals Planned.

☐ e. Other: Describe: _____

G. SUMMARY STATEMENTS: (check all that apply for the current reporting period)

☑ 1. All Active Remedial System checks and effluent analyses required by the approved plan and/or permit were performed when applicable.

☑ 2. There were no significant problems or prolonged (>25% of reporting period) unscheduled shutdowns of the Active Remedial System.

☑ 3. The Active Remedial System or Active Remedial Monitoring Program operated in conformance with the MCP, and all applicable approval conditions and/or permits.

4. Indicate any Operational Problems or Notes:

☐ 5. Check here if additional/supporting Information, data, maps, and/or sketches are attached to the form.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
IRA REMEDIAL MONITORING REPORT
MEASUREMENTS
Pursuant to 310 CMR 40.0400 (SUBPART D)
Remedial System or Monitoring Program: 2 of: 2

BWSC105 -B

Release Tracking Number
4 26179

For each Point of Measurement, related to concentration indicate the highest concentration detected during the reporting period, of each oil, hazardous material and/or remedial additive.
For each Point of Measurement for pressure differentials, indicate the lowest pressure differential detected during the reporting period.

Point of Measurement	Date (mm/dd/yyyy)	Contaminant, Measurement and/or Indicator Parameter	Influent Concentration (where applicable)	Midpoint Concentration (where applicable)	(check one) ☑ Discharge ☐ GroundWater Concentration ☐ Pressure Differential	Check here, if ND/BDL	Permissible Concentration or Pressure Differential	Units	Within Permissible Limits? (Y/N)
SYSTEM	04/28/2020	PFAS	2.302	0.081	0.001	☐	0.020	UG/L	YES

☐ Check here if any additional BWSC105 B, Measurements Form(s), are needed.

Table 1A - Summary of Groundwater Pump and Treatment System Total PFAs Analytical Data - GWTS #1
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

SAMPLE ID	INFLUENT (PRW-4)						MIDPOINT						EFFLUENT					
USEPA Method 537.2	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)
MassDEP ORS Guidline[2]	70 ng/L						70 ng/L						70 ng/L					
MCP Method 1 GW-1 Standard [3]	20 ng/L						20 ng/L						20 ng/L					
SAMPLE DATE																		
4/1/2015	760	60	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
7/17/2015	5600	460	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
8/4/2015	5900	550	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
9/30/2015	17000	840	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
10/15/2015	9900	560	--[A]	--[A]	--[A]	--[A]	BRL (<9.4)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]	9.4	BRL (<5.8)	--[A]	--[A]	--[A]	--[A]
11/12/2015	9000	BRL (<2000)	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)		--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
1/6/2016	7600	260	--[A]	--[A]	--[A]	--[A]	120	75	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
1/21/2016	5200	160	--[A]	--[A]	--[A]	--[A]	270	16	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
2/3/2016	3500	140	--[A]	--[A]	--[A]	--[A]	540	26	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
2/17/2016	4500	140	--[A]	--[A]	--[A]	--[A]	520	24	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
3/8/2016	3700	140	--[A]	--[A]	--[A]	--[A]	420	19	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
3/23/2016	5000	150	--[A]	--[A]	--[A]	--[A]	650	39	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
4/14/2016	4800	140	--[A]	--[A]	--[A]	--[A]	610	26	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
4/28/2016	6300	BRL (<200)	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<20)	BRL (<20)	--[A]	--[A]	--[A]	--[A]
5/12/2016	6800	BRL (<200)	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<20)	BRL (<20)	--[A]	--[A]	--[A]	--[A]
5/25/2016	6900	BRL (<210)	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
6/16/2016	7800	160	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
7/6/2016	7600	270	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	10	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
8/11/2016	13000	160	--[A]	--[A]	--[A]	--[A]	1600	54	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
Carbon change conducted after sample collection on 08/11/16.																		
8/18/2016	9500	210	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
9/8/2016	9500	190	--[A]	--[A]	--[A]	--[A]	8.5	5.3	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
10/6/2016	17000	250	--[A]	--[A]	--[A]	--[A]	110	8.3	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
10/20/2016	7200	130	--[A]	--[A]	--[A]	--[A]	1000	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
11/3/2016	7900	110	--[A]	--[A]	--[A]	--[A]	650	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
11/17/2016	5400	99	--[A]	--[A]	--[A]	--[A]	1200	NA	--[A]	--[A]	--[A]	--[A]	17	NA	--[A]	--[A]	--[A]	--[A]
12/1/2016	5300	100	--[A]	--[A]	--[A]	--[A]	400	14	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
12/14/2016	5700	95	--[A]	--[A]	--[A]	--[A]	82	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]	8.1	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
1/4/2017	4900	95	--[A]	--[A]	--[A]	--[A]	360	15	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
2/16/2017	2800	88	--[A]	--[A]	--[A]	--[A]	1000	39	--[A]	--[A]	--[A]	--[A]	25	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
3/1/2017	3700	120	--[A]	--[A]	--[A]	--[A]	1400	47	--[A]	--[A]	--[A]	--[A]	150	6.5	--[A]	--[A]	--[A]	--[A]
3/23/2017	3800	87	--[A]	--[A]	--[A]	--[A]	2000	71	--[A]	--[A]	--[A]	--[A]	160	9.5	--[A]	--[A]	--[A]	--[A]
5/3/2017	2400	86	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<2.6)	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
Carbon change conducted on 04/13/17.																		
4/19/2017	3200	110	--[A]	--[A]	--[A]	--[A]	160	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]	BRL (<2.6)	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
5/18/2017	3000	110	--[A]	--[A]	--[A]	--[A]	570	32	--[A]	--[A]	--[A]	--[A]	BRL (<2.6)	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
6/1/2017	3200	110	--[A]	--[A]	--[A]	--[A]	730	33	--[A]	--[A]	--[A]	--[A]	4.1	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
6/27/2017	2600	99	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	210	15	--[A]	--[A]	--[A]	--[A]
7/18/2017	3500	97	--[A]	--[A]	--[A]	--[A]	2300	72	--[A]	--[A]	--[A]	--[A]	49	25	--[A]	--[A]	--[A]	--[A]
Carbon change conducted on 8/09/17																		
8/16/2017	3000	110	--[A]	--[A]	--[A]	--[A]	BRL (<2.3)	BRL (<4.1)	--[A]	--[A]	--[A]	--[A]	BRL (<2.3)	BRL (<4.1)	--[A]	--[A]	--[A]	--[A]
8/28/2017	2900	100	--[A]	--[A]	--[A]	--[A]	27	BRL (<20)	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
10/2/2017	3200	85	--[A]	--[A]	--[A]	--[A]	510	25	--[A]	--[A]	--[A]	--[A]	BRL (<2.6)	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
10/12/2017	4500	110	--[A]	--[A]	--[A]	--[A]	960	29	--[A]	--[A]	--[A]	--[A]	BRL (<2.6)	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
11/9/2017	2400	77	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<6.0)	BRL (<3.3)	--[A]	--[A]	--[A]	--[A]
11/20/2017	2000	64	--[A]	--[A]	--[A]	--[A]	520	15	--[A]	--[A]	--[A]	--[A]	BRL (<6.0)	BRL (<3.3)	--[A]	--[A]	--[A]	--[A]
12/7/2017	1600	64	--[A]	--[A]	--[A]	--[A]	780	34	--[A]	--[A]	--[A]	--[A]	11	BRL (<3.3)	--[A]	--[A]	--[A]	--[A]
2/5/2018	2100	27	--[A]	--[A]	--[A]	--[A]	390	13	--[A]	--[A]	--[A]	--[A]	BRL (<6.0)	BRL (<3.3)	--[A]	--[A]	--[A]	--[A]
2/14/2018	2100	30	--[A]	--[A]	--[A]	--[A]	850	27	--[A]	--[A]	--[A]	--[A]	11	BRL (<3.3)	--[A]	--[A]	--[A]	--[A]
System shutdown on 2/14/18 due to transfer pump failure; system restart on 4/9/18.																		
4/9/2018	2,600	79	--[A]	--[A]	--[A]	--[A]	990	25	--[A]	--[A]	--[A]	--[A]	BRL (<20)	BRL (<20)	--[A]	--[A]	--[A]	--[A]
4/13/2018	3100	62	--[A]	--[A]	--[A]	--[A]	1500	35	--[A]	--[A]	--[A]	--[A]	30	BRL (<33)	--[A]	--[A]	--[A]	--[A]
5/9/2018	1800	73	--[A]	--[A]	--[A]	--[A]	490	26	--[A]	--[A]	--[A]	--[A]	BRL (<6.0)	BRL (<33)	--[A]	--[A]	--[A]	--[A]
System shutdown on 5/9/18 after sampling collection due to carbon breakthrough and influent pump alarm fail.																		
Carbon change conducted on 06/05/18; system restarted on 06/07/18.																		
6/14/2018	2800	120	79	540	110	--[A]	200	9.4	BRL (<8.7)	38	11	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<8.7)	BRL (<5.6)	BRL (<7.4)	--[A]
7/13/2018	2400	100	73	600	90	--[A]	1100	44	27	24	35	--[A]	BRL (<20)	BRL (<20)	BRL (<20)	BRL (<20)	BRL (<20)	--[A]
8/7/2018	2900	95	73	460	86	--[A]	630	31	22	130	34	--[A]	27	5.3	BRL (<8.7)	9.1	BRL (<7.4)	--[A]
9/27/2018	4300	69	50	360	190	--[A]	3600	69	49	330	65	--[A]	81	BRL (<3.3)	BRL (<8.7)	14	BRL (<7.4)	--[A]
Carbon change conducted on 09/28/18; system restarted on 10/01/18.																		
10/30/2018	2800	65	46	320	71	--[A]	100	6	8.7	16	78	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<8.7)	BRL (<5.6)	BRL (<7.4)	--[A]
11/16/2018	2900	62	50	290	77	--[A]	460	24	19	94	26	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<8.7)	BRL (<5.6)	BRL (<7.4)	--[A]
12/14/2018	1900	62	49	300	70	--[A]	1200	40	30	180	45	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<8.7)	BRL (<5.6)	BRL (<7.4)	--[A]
1/10/2019	2400	84	68	410	96	--[A]	2200	71	54	360	82	--[A]	21	BRL (<3.3)	BRL (<8.7)	BRL (<5.6)	BRL (<7.4)	--[A]
Carbon change conducted on 2/4/19; system restarted on 2/5/19.																		
2/15/2019	4600	130	120	550	110	--[A]	560	14	14	62	14	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<8.7)	BRL (<6.2)	BRL (<7.4)	--[A]
3/11/2019	5600	120	120	520	98	--[A]	63	BRL(<3.3)	BRL (<4.9)	BRL (<5.6)	BRL (<7.1)	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<4.9)	BRL (<5.6)	BRL (<7.1)	--[A]
Iron sediments pumped out of influent tank and transfer pump associated piping - 3/29/2019. Replaced VFD.																		
4/9/2019	6600	140	180	580	99	--[A]	400	7.4	9.9	31	BRL (<7.1)	--[A]	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	--[A]
5/21/2019	2500	83	59	290	100	8.6	3400	72	69	260	7.8	12	BRL (<12)	BRL (<7.4)	BRL(<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
Carbon change conducted on 06/13/19; system restarted on 06/14/19.																		
6/27/2019	8400	86	120	340	68	26	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
7/29/2019	9500	78	100	290	72	16	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
8/22/2019	8300	64	100	260	63	20	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
9/26/2019	4900	65	82	220	64	21	64	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
10/30/2019	3800	63	85	230	72	19	51	BRL (<7.4)	BRL (<4.9)	5.9	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
11/12/2019	4200	53	85	200	59	15	120	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
12/17/2019	1500	43	51	180	54	10	530	16	17	63	22	4.5	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
Carbon change conducted on 12/23/19; system restarted on 12/26/19.																		
1/17/2020	2200	57	60	220	69	13	11	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
2/13/2020	3100	74	66	310	92	17	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
3/3/2020	3300	72	64	300	81	14	7.4	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)	0.60	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)
4/28/2020	1900	52	42	210	56	42	86	2.7	2.2	10	3.4	0.51	BRL (<0.43)	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)

Notes:
1. Concentrations presented in ng/L - nanograms per Liter - parts per trillion
2. * - Prior to June 11, 2018, the USEPA established the EPA Health Advisory for two PFAS chemicals, PFOA and PFOS, which was 70 ng/L. Subsequently, MassDEP's Office of Research and Standards (ORS) expanded on this Health Advisory and created the ORS Guideline that applied to the total summed of five PFAS chemicals, PFOS, PFOA, PFNA, PFHxS, and PFHpA, effective June 11, 2018.
3. On December 13, 2019, MassDEP published the newly established clean up standards for PFAS in soil and groundwater. These standards were effective as of December 27, 2019 and apply to the total sum of six PFAS chemicals, PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFDA; the new standard is 20 ng/L or parts per trillion (ppt). Concentrations of the six PFAS compounds presented in the table were not compared to the new MassDEP standards until the January 2020 monthly system sample collection, which is after the effective date of December 27, 2019.
4. --[A]: Concentrations of the three additional PFAS chemicals, PFNA, PFHxS, and PFHpA were not presented prior to 06.11.18. The USEPA Health Advisory only applies to the PFOS and PFOA compounds. Concentrations of PFNA, PFHxS, and PFHpA were not presented/tabulated until after the MassDEP ORS Guideline was in effect on 06.11.18.
5. --[B] : Concentrations of the PFAS compound, PFDA, were not presented prior to the May 2019 sampling period. On April 19, 2019, MassDEP presented a draft of proposed risk standards for PFAS that included a sixth, PFAS compound, PFDA.
6. BRL - Below Laboratory Reporting Limits; reporting limit shown in parentheses.
7. Concentrations in bold exceed applicable MassDEP ORS Guideline and/or the MCP Method 1 GW-1 groundwater risk standard.
8. PFOS - Perfluorooctanesulfonic acid
9. PFOA - Perfluorooctanoic Acid
10. PFNA - Perfluorononanoic Acid
11. PFHxS - Perfluorohexanesulfonic Acid
12. PFHpA - Perfluoroheptanoic Acid
13. PFDA - Perfluorodecanoic Acid
14. NA - Concentration data not available

Table 1B - Summary of Groundwater Pump and Treatment System Total PFAs Analytical Data -GWTS #2
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

SAMPLE ID	INFLUENT (PRW-4)						MIDPOINT						EFFLUENT					
USEPA Method 537.2	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)
MassDEP ORS Guidline*	70 ng/L						70 ng/L						70 ng/L					
MCP Method 1 GW-1 Standard [15]	20 ng/L						20 ng/L						20 ng/L					
SAMPLE DATE																		
System Startup on 11/11/19.																		
11/12/2019	4200	53	85	200	59	15	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
11/15/2019	--	--	--	--	--	--	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
11/19/2019	--	--	--	--	--	--	BRL (<5.2)	44	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	42	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
12/17/2019 [16]	1500	43	51	180	54	10	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
1/17/2020	2200	57	60	220	69	13	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
2/13/2020	3100	74	66	310	92	17	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
3/3/2020	3300	72	64	300	81	14	5.6	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)	BRL (<0.43)	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)
4/28/2020	1900	52	42	210	56	42	64	2.2	1.7	9.7	3.0	0.27	0.47	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)

Notes:

1. Concentrations presented in ng/L - nanograms per Liter - parts per trillion
2. MassDEP's Office of Research and Standards (ORS) expanded upon the USEPA's Health Advisory and created the ORS Guideline that applies to the total summed of five PFAS chemicals, PFOS, PFOA, PFNA, PFHxS, and PFHpA, effective June 11, 2018.
3. Concentrations of the PFAS compound, PFDA, are presented based on the April 19, 2019, MassDEP draft of new/proposed groundwater standards for PFAS that includes a sixth, PFAS compound, PFDA. However the concentration of PFDA is not inclued in total PFAS removal calcuations.
5. BRL - Below Laboratory Reporting Limits; reporting limit shown in parentheses.
6. Concentrations in bold exceed applicable MassDEP ORS Guideline
7. PFOS - Perfluorooctanesulfonic acid
8. PFOA - Perfluorooctanoic Acid
9. PFNA - Perfluorononanoic Acid
10. PFHxS - Perfluorohexanesulfonic Acid

Table

11. PFHpA - Perfluoroheptanoic Acid
12. PFDA - Perfluorodecanoic Acid
13. --: Concentration data not available and/or sample was not collected on that date.
14. Per MCP Regulations, the system was sampled one day, three days, and seven (7) days following the initial week of startup (11/11/19).
15. On December 13, 2019, MassDEP published the newly established clean up standards for PFAS in soil and groundwater. These standards were effective as of December 27, 2019 and apply to the total sum of six PFAS chemicals, PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFDA. Concentrations of the six PFAS compounds presented in the table were not compared to the new MassDEP standards until the January 2020 monthly system sample collection.
16. The December monthly sample was collected from the system's effluent stream on 12/17/2019 following the receipt of the laboratory results from the 11/19/2019 sampling event on 12/16/2019. The effluent was resampled again to ensure significant breakthrough was not occurring from the secondary carbon vessel.

Table 2A- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - GWTS #1
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[6]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT	Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[3]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Total Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
4/9/2018	CE	No	75	NA	NA	NA	75	NA	NA	NA	0	--	--	--	--	--		Yes	Yes	Conducted system pressure checks after restart.
4/10/2018	CE	Yes	94	74	NA	NA	77	74	2.07	59.3	1	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks.
4/11/2018	CE	Yes	76	NA	NA	NA	76	NA	2.78	44.0	2	--	--	--	--	--	0.001	Yes	No	PRW-4 well pump is operating at high level, high level float is not triggering pump to shut off. CS turned off PRW-4 manually at 1243 and restarted at 14:32. Carbon vessels were backwashed individually from 1313 to 1427.
4/12/2018	CE	Yes	NA	NA	NA	NA	75	75	2.78	44.0	3	--	--	--	--	--	0.002	Yes	No	Transfer pump is drawing down influent/holding tank faster than PRW-4 well is filling tank. No bag filter changes.
4/13/2018	CE	Yes	88	74	NA	NA	75	74	2.80	43.8	4	--	--	--	--	--	0.003	Yes	Yes	Changed 3 bag filters (5 µm) and conducted system pressure checks.
4/16/2018	CE	Yes	86	74	NA	NA	74	74	2.83	43.2	7	--	--	--	--	--	0.005	Yes	No	Pressure differential at 8 psi, no bags change. PRW-4 well high level float not triggering pump to shut off. Changed 3 bag filters (5 µm) and conducted system pressure checks.
4/19/2018	CE	Yes	83		NA	NA	75		NA	NA	10	--	--	--	--	--	NA	Yes	No	Transfer pump is maintaining drawdown and flow through system ahead of the PRW-4 well pump, no bag changes.
4/20/2018	CE	Yes	89	75	NA	NA	75	75	3.07	39.9	11	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks.
4/23/2018	CE	Yes	92	76	NA	NA	77	76	3.18	38.5	14	--	--	--	--	--	0.009	Yes	No	High level float not triggering PRW-4 to shut down. Sean (B&B Electric) on site to inspect high float electrical issues. PRW-4 shut off at 13:40 to inspect control panel, PRW-4 restarted at 14:55. Transfer pump maintaining flow ahead of PRW-4 well pump. Both carbon vessels backwashed. Changed 3 bag filters (5 um).
4/24/2018	CE	Yes	74	NA	NA	NA	76		3.18	38.5	15	--	--	--	--	--	0.009	Yes	No	No bag change, conducted system pressure checks.
4/25/2018	CE	Yes	79	NA	NA	NA	75		3.30	37.1	16	--	--	--	--	--	0.009	Yes	No	Pressure differential of 4 psi, no bag filter change, transfer pump is maintaining flow ahead of the PRW-4 well pump.
4/26/2018	CE	Yes	83	NA	NA	NA	76		3.37	36.4	17	--	--	--	--	--	0.010	Yes	No	Pressure differential of 7 psi, no bag filter change, transfer pump is maintaining flow ahead of the PRW-4 well pump. While both the system transfer pump and PRW-4 well pump are on and operating, treatment takes 28 seconds to drawn down 1 inch in influent tank (~17.5 gallons)
4/27/2018	CE	Yes	84	73	NA	NA	75	75	3.42	35.8	18	--	--	--	--	--	0.010	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks.
4/30/2018	CE	Yes	87	73	NA	NA	75	75	3.53	34.7	21.00	--	--	--	--	--	0.012	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks.
Totals - April 2018										41.3	21.00						0.014			
5/1/2018	CS	Yes	83		NA	NA	75		3.83	32.0	0.00	--	--	--	--	--	0.0000	Yes	No	Adjusted /increased VFD of transfer pump from 35 psi to 40 psi to maintain drawdown ahead of PRW-4 well pump . No bag change. 1" drawdown ~ 1:41
5/2/2018	CS	Yes	94	75	NA	NA	80	75	3.63	33.7	1.00	--	--	--	--	--	0.0006	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks. Conducted a backwash on both carbon vessels, PRW-4 well pump would not shut off, float switch relay stuck in on position, PRW-4 shutoff at 0733 and restarted at 08:26 with float switch working properly. Adjusted transfer pump rate back to 35 psi.
5/4/2018	JES	Yes	110	73	NA	NA	73	75	3.65	33.6	3.00	--	--	--	--	--	0.0017	Yes	No	Changed 3 bag filters (10 um) and conducted system pressure checks.
5/7/2018	JES	Yes	110	73	NA	NA	74	74	3.7	33.1	6.00	--	--	--	--	--	0.0034	Yes	No	Changed 3 bag filters (5 um) and conducted system pressure checks.
Totals - May 2018										33.1	8.00						0.004			
6/5/2018	CE/MM	No	--	--	NR	NR	NR	NR	--	--	0	--	--	--	--	--	0	--	--	Carbon Change out- filled vessels with water and let to sit for ~24 hours, changed 3 bag filters (5 um)
6/6/2018	CE	Yes	--	--	NR	NR	NR	NR	3.45	35.5	1	--	--	--	--	--	0.001	No	No	Pump floats not operating correctly, low float turns pump off and when low float is in water again, transfer pump starts. System remained off.
6/7/2018	CE	Yes	62	52	NR	NR	NR	NR	3.18	38.5	2	--	--	--	--	--	0.001	Yes	No	Electrian on site in morning to correct float error; system operating normally.
6/11/2018	CE	Yes	56	61	NR	NR	NR	NR	3.63	33.7	6	--	--	--	--	--	0.003	Yes	No	No bag change, conducted system pressure checks.
6/12/2018	CE	Yes	56	63	NR	NR	NR	NR	3.68	33.3	7	--	--	--	--	--	0.004	Yes	No	No bag change, conducted system pressure checks.
6/13/2018	CE	Yes	58	54	NR	NR	NR	NR	3.46	35.4	8	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters.
6/13/2018	MM	Yes	--	--	NR	NR	NR	NR	--	--	8	--	--	--	--	--	--	--	Yes	Did not collect system data, only collected samples from Influent, Midpoint, and Effluent sample ports/locations.
6/16/2018	CE	Yes	77	60	NR	NR	NR	NR	--	--	11	--	--	--	--	--	--	--	No	Changed 3 bag filters.
6/19/2018	CE	Yes	92	65	NR	NR	NR	NR	--	--	14	--	--	--	--	--	--	No	No	Changed 3 bag filters and repaired holding basket for bags. Recovery well was not running, went out to the well and checked power, turned power to well on/off and did not hear contact relay pull in. System remained off until electrical issue in recovery well is fixed. Fixed at 15:45
6/20/2018	CE	Yes	72	60	NR	NR	NR	NR	3.73	32.8	15	--	--	--	--	--	0.008	Yes	No	No bag change, conducted system pressure checks.
6/21/2018	CE	Yes	79	60	NR	NR	NR	NR	--		16	--	--	--	--	--				No bag change, conducted system pressure checks. Worked by phone with Bob Simmonds on Control panel for transfer pump, pump will not change speed.
6/22/2018	CE	Yes	87	67	NR	NR	NR	NR	3.72	32.9	17	--	--	--	--	--	0.009	Yes	No	Changed 3 bag filters, conducted system pressure checks.
6/25/2018	CE	Yes	81	68	NR	NR	NR	NR	3.77	32.5	20	--	--	--	--	--	0.011	Yes	No	Changed 3 bag filters, conducted system pressure checks.
6/27/2018	CE	Yes	79	68	NR	NR	NR	NR	3.73	32.8	22	--	--	--	--	--	0.012	Yes	No	Changed 3 bag filters, conducted system pressure checks.
6/29/2018	CE	Yes	78	68	NR	NR	NR	NR	3.68	33.3	24	--	--	--	--	--	0.014	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - June 2018										33.9	24						0.013			
7/2/2018	CE	Yes	83	69	NR	NR	NR	NR	3.95	31.0	2	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/5/2018	CE	No	--	--	NR	NR	NR	NR	--	--	5	--	--	--	--	--	--	No	No	No power supplied to the recovery well.
7/6/2018	CE	Yes	86	69	NR	NR	NR	NR	3.87	31.7	5	--	--	--	--	--	0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/9/2018	CE	Yes	89	72	NR	NR	NR	NR	3.77	32.5	8	--	--	--	--	--	0.004	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/11/2018	CE	Yes	88	72	NR	NR	NR	NR	3.85	31.8	10	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/13/2018	CE	Yes	89	72	NR	NR	NR	NR	4.08	30.0	12	--	--	--	--	--	0.006	Yes	Yes	Changed 3 bag filters, conducted system pressure checks.
7/16/2018	CE	Yes	98	70	NR	NR	NR	NR	3.97	30.9	15	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/18/2018	CE	No	--	--	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	No	No	No power supplied to the recovery well. Contact relay at recovery well pump out.
7/19/2018	CE	Yes	94	72	NR	NR	NR	NR	4.03	30.4	17	--	--	--	--	--	0.008	Yes	No	Electrician replaced the contact relay; recovery well operating again. Changed 3 bag filters and collected system pressure checks.
7/20/2018	CE	Yes	81	72	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	Yes	No	Changed 3 bag filters, conducted system pressure checks. Backwashed carbon vessels.
7/23/2018	CE	Yes	84	72	NR	NR	NR	NR	4.47	27.4	21	--	--	--	--	--	0.009	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/25/2018	CE	Yes	84	72	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	Yes	No	Collected system pressure checks.
7/26/2018	CE	Yes	80	72	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	Yes	No	Collected system pressure checks.
7/27/2018	CE	Yes	88	72	NR	NR	NR	NR	4.8	25.5	25	--	--	--	--	--	0.010	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/30/2018	CE	Yes	91	71	NR	NR	NR	NR	4.95	24.7	28	--	--	--	--	--	0.011	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - July 2018										29.6	28						0.015			
8/2/2018	CE	Yes	89	70	NR	NR	NR	NR	5.17	23.7	2	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/6/2018	CE	Yes	94	72	NR	NR	NR	NR	5.22	23.5	6	--	--	--	--	--	0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/10/2018	CE	Yes	98	72	NR	NR	NR	NR	4.32	28.4	10	--	--	--	--	--	0.006	Yes	No	Changed 3 bag filters, conducted system pressure checks. System was sampled on August 7, 2018.
8/14/2018	CE	Yes	82	69	NR	NR	NR	NR	4.8	25.5	14	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/17/2018	CE	Yes	81	64	NR	NR	NR	NR	5.0	24.5	17	--	--	--	--	--	0.008	Yes	No	Changed 3 bag filters, conducted system pressure checks. Backwashed carbon vessels.
8/21/2018	CE	No	78	68	NR	NR	NR	NR	5.2	23.6	20	--	--	--	--	--	0.009	Yes	No	Recovery well down, due to contactor burnout/failure. System restarted at 14:45.
8/24/2018	CE	Yes	77	68	NR	NR	NR	NR	5.32	23.0	23	--	--	--	--	--	0.010	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/28/2018	CE	Yes	89	69	NR	NR	NR	NR	6.03	20.3	27	--	--	--	--	--	0.011	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Tab;e										24.1	30						0.014			

Table 2A- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - GWTS #1
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[6]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT	Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[3]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Total Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
9/4/2018	CE	Yes	89	67	NR	NR	NR	NR	5.87	20.9	4	--	--	--	--	--	0.002	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/7/2018	CE	Yes	82	70	NR	NR	NR	NR	6.52	18.8	7	--	--	--	--	--	0.004	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/11/2018	CE	Yes	88	70	NR	NR	NR	NR	7.03	17.4	11	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/14/2018	CE	Yes	86	70	NR	NR	NR	NR	7.18	17.1	14	--	--	--	--	--	0.006	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/18/2018	CE	Yes	91	74	NR	NR	NR	NR	8.02	15.3	18	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/21/2018	CE	No	74	70	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	No	No	Recovery well down.
9/24/2018	CE	Yes	94	70	NR	NR	NR	NR	8.03	15.3	23	--	--	--	--	--	0.010	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/28/2018	CE	Yes	--	--	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	--	--	Carbon Change out- filled vessels with water and let to sit for ~24 hours, changed 3 bag filters (5 um), system sampled on 09/27/18.
Totals - September 2018										17.4	28						0.010			
10/1/2018	CE	No	78	57	NR	NR	NR	NR	5.83	21.0	1	--	--	--	--	--	0.000	Yes	No	System restarted after scheduled shutdown for carbon exchange. Changed 3 bag filters, conducted system pressure checks.
10/5/2018	CE	Yes	65	55	NR	NR	NR	NR	6.35	19.3	5	--	--	--	--	--	0.002	Yes	No	Changed 3 bag filters, conducted system pressure checks.
10/10/2018	CE	Yes	56	57	NR	NR	NR	NR	6.95	17.6	10	--	--	--	--	--	0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
10/12/2018	CE	Yes	60	55	NR	NR	NR	NR	--	--	12	--	--	--	--	--	--	Yes	No	No bag change necessary.
10/15/2018	CE	Yes	70	60	NR	NR	NR	NR	6.9	17.8	15	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters, conducted system pressure checks. Repaired filter basket.
10/19/2018	CE	Yes	71	60	NR	NR	NR	NR	7.12	17.2	19	--	--	--	--	--	0.006	Yes	No	Changed 3 bag filters, conducted system pressure checks.
10/23/2018	CE	Yes	76	63	NR	NR	NR	NR	7.73	15.8	23	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks. Repaired holding basket in filter vessel.
10/26/2018	CE	Yes	72	64	NR	NR	NR	NR	8.83	13.9	26	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
10/30/2018	CE	Yes	80	65	NR	NR	NR	NR	7.52	16.3	30	--	--	--	--	--	0.009	Yes	Yes	Changed 3 bag filters, conducted system pressure checks. Repaired bag holder (basket) in filter vessel.
Totals - October 2018										17.4	31						0.011			
11/2/2018	CE	Yes	71	62	NR	NR	NR	NR	7.86	15.6	2	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
11/6/2018	CE	Yes	71	62	NR	NR	NR	NR	--	--	6	--	--	--	--	--		No	No	Changed 3 bag filters, conducted system pressure checks. Backwashed both carbon vessels. System shutdown at 10:00 for force main descaling and flush.
11/8/2018	CE	Yes	65	45	NR	NR	NR	NR	5.25	23.3	6	--	--	--	--	--	0.004	Yes	No	Changed 3 bag filters, conducted system pressure checks. System restarted at 12:40 following the completion of the force main descaling.
11/9/2018	CE	Yes	55	44	NR	NR	NR	NR	5.2	23.6	7	--	--	--	--	--	0.004	Yes	No	Changed 3 bag filters, conducted system pressure checks.
11/12/2018	CE	Yes	51	47	NR	NR	NR	NR	5.03	24.4	10	--	--	--	--	--	0.007	Yes	No	Conducted system pressure checks.
11/13/2018	CE	Yes	52	47	NR	NR	NR	NR	4.88	25.1	11	--	--	--	--	--	0.007	Yes	No	Conducted system pressure checks.
11/14/2018	CE	Yes	54	47	NR	NR	NR	NR	4.92	24.9	12	--	--	--	--	--	0.008	Yes	No	Conducted system pressure checks.
11/15/2018	CE	Yes	55	47	NR	NR	NR	NR	--	--	13	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
11/16/2018	CE	Yes	54	50	NR	NR	NR	NR	4.63	26.5	14	--	--	--	--	--	0.010	Yes	Yes	Changed 3 bag filters, conducted system pressure checks.
11/21/2018	CE	Yes	63	53	NR	NR	NR	NR	5.08	24.1	19	--	--	--	--	--	0.012	Yes	No	Changed 3 bag filters, conducted system pressure checks.
11/27/2018	CE	Yes	69	55	NR	NR	NR	NR	5.75	21.3	25	--	--	--	--	--	0.014	Yes	No	Changed 3 bag filters, conducted system pressure checks.
11/30/2018	CE	Yes	77	58	NR	NR	NR	NR	5.85	20.9	28	--	--	--	--	--	0.016	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - November 2018										23.0	28						0.012			
12/3/2018	CE	Yes	63	62	NR	NR	NR	NR	5.33	23.0	3	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/7/2018	CE	Yes	83	67	NR	NR	NR	NR	5.58	22.0	7	--	--	--	--	--	0.002	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/11/2018	CE	Yes	75	65	NR	NR	NR	NR	5.8	21.1	11	--	--	--	--	--	0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/14/2018	CE	Yes	70	63	NR	NR	NR	NR	5.4	22.7	14	--	--	--	--	--	0.004	Yes	Yes	Changed 3 bag filters, conducted system pressure checks.
12/18/2018	CE	Yes	70	65	NR	NR	NR	NR	6.72	18.2	18	--	--	--	--	--	0.004	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/21/2018	CE	Yes	70	67	NR	NR	NR	NR	6.7	18.3	21	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/26/2018	CE	Yes	78	71	NR	NR	NR	NR	7.38	16.6	26	--	--	--	--	--	0.006	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/28/2018	CE	Yes	82	70	NR	NR	NR	NR	7.35	16.7	28	--	--	--	--	--	0.006	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/31/2018	CE	Yes	82	71	NR	NR	NR	NR	7.38	16.6	31	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - December 2018										19.5	31						0.008			
1/4/2019	RPT	Yes	72	72	NR	NR	NR	NR	6.5	18.8	4	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks, observed hole in pre-filter basket.
1/7/2019	PCB	Yes	80	71	NR	NR	NR	NR	6.2	19.8	7	--	--	--	--	--	0.002	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/10/2018	RPT	Yes	75	70	NR	NR	NR	NR	7.03	17.4	10	--	--	--	--	--	0.003	Yes	No	Conducted system pressure checks.
1/11/2018	MDM	Yes	79	71	NR	NR	NR	NR	7.62	16.1	11	--	--	--	--	--	0.003	Yes	Yes	Change 3 bag filters, conducted system pressure checks.
1/14/2019	PCB	Yes	76	71	NR	NR	NR	NR	--	--	14	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
1/15/2019	PCB	Yes	80	71	NR	NR	NR	NR	--	--	15	--	--	--	--	--	--	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/18/2019	PCB	Yes	76	71	NR	NR	NR	NR	8.65	14.2	18	--	--	--	--	--	0.004	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/21/2019	SCT	Yes	80	71	NR	NR	NR	NR	8.15	15.0	21	--	--	--	--	--	0.005	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/24/2019	SCT	Yes	85	69	NR	NR	NR	NR	9.1	13.5	24	--	--	--	--	--	0.005	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/27/2019	SCT	Yes	85	68	NR	NR	NR	NR	8.25	14.8	27	--	--	--	--	--	0.007	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/30/2019	PCB	Yes	86	71	NR	NR	NR	NR	9	13.6	30	--	--	--	--	--	0.007	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/31/2019	PCB	Yes	83	71	NR	NR	NR	NR	--	--	31	--	--	--	--	--	--	Yes	No	Change 3 bag filters, conducted system pressure checks.
Totals - January 2019										14.5	31						0.008			
2/4/2019	RPT	Yes	--	--	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	--	No	Carbon Change out- filled vessels with water and let to sit for ~24 hours, changed 3 bag filters (5 um).
2/5/2019	RPT	No	52	35	NR	NR	NR	NR	7.33	16.7	4	--	222.7	--	--	--	0.002	Yes	No	System restarted after scheduled shutdown for carbon exchange. Changed bag filters and conducted system pressure checks.
2/11/2019	PCB	Yes	83	45	NR	NR	NR	NR	11.58	10.6	10	--	--	--	--	--	--	Yes	No	Changed 3 bag filters, conducted system pressure checks.
2/13/2019	ST	Yes	55	43	NR	NR	NR	NR	8.12	15.1	12	--	--	--	--	--	--	Yes	No	Changed 3 bag filters, conducted system checks.
2/15/2019	MDM	Yes	--	--	NR	NR	NR	NR	7.5	16.3	14	--	131.7	--	--	--	0.007	Yes	Yes	Sampled system and collected system pressure checks.
2/22/2019	ST	Yes	--	--	NR	NR	NR	NR	10.75	11.4	21	--	43.75	--	--	--	0.007	Yes	No	Changed 3 bag filters, repaired filter basket, adjusted and lowered the speed drive on the transfer/discharge pump.
2/25/2019	MDM	Yes	25	15	NR	NR	NR	NR	7.5	16.3	23	--	--	--	--	--	--	Yes	No	System shutdown at 09:33 for the replacement of the submersible pump at PRW-4 and restarted at 14:04.
Totals - February 2019										14.4	26		132.7				0.011	Yes	No	
3/1/2019	ST	Yes	43	40	NR	NR	NR	NR	7.55	16.2	1	--	76.6	--	--	--	0.001	Yes	No	Conducted system pressure checks.
3/3/2019	ST	Yes	45	40	NR	NR	NR	NR	--	--	3	--	--	--	--	--	--	Yes	No	Conducted system pressure checks, changed bag filters, installed/replaced filters baskets with new stainless steel filter baskets.
3/5/2019	PCB	Yes	46	40	NR	NR	NR	NR	--	--	5	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
3/7/2019	PCB/ST	Yes	50	40	NR	NR	NR	NR	8.16	15.0	7	--	--	--	--	--	0.004	Yes	No	Conducted system pressure checks and changed bag filters.
3/9/2019	ST	Yes	44	41	NR	NR	NR	NR	7.75	15.8	9	--	--	--	--	--	0.005	Yes	No	Changed bag filters.
3/11/2019	ST	Yes	58	50	NR	NR	NR	NR	7.92	15.5	11	--	68.1	--	--	--	0.006	Yes	Yes	Changed bag filters
3/13/2019	ST	Yes	65	50	NR	NR	NR	NR	4.62	26.5	13	--	--	--	--	--	--	Yes	No	Noticed low speed on transfer pump, adjusted VFD to increase pump speed to 55 Hz. Changed 3 bag filters twice.
3/14/2019	ST	Yes	75	50	NR	NR	NR	NR	5.16	23.7	14	--	70.0	--	--	--	0.012	Yes	No	Conducted system pressure checks and collected samples from EQ tank for analysis at County lab for disposal criteria.
3/16/2019	PCB	No	62	60	NR	NR	NR	NR	--	--	15	--	--	--	--	--	--	Yes	No	Pump at PRW-4 shut off upon arrival to system, contact relay failure, possibly due to power surge from thunderstorm. Restarted system after contact relay was replaced.
3/22/2019	ST	Yes	28	20	NR	NR	NR	NR	2.38	51.5	21	--	51.5	--	--	--	0.038	Yes	No	Replaced VFD drive for effluent transfer pump inside system shed.
3/23/2019	ST	Yes	23	20	NR	NR	NR	NR	--	--	22	--	--	--	--	--	--	No	No	Changed bag filters before system shutdown. System shutdown due to slow flow rate from transfer pump as a result of accumulating iron sediments in EQ tank from slow influent flow rate as a result of a the failing PRW-4 well pump.
3/29/2019	RPT/ST	No	--	--	NR	NR	NR	NR	--	--	23	--	--	--	--	--	--	Yes	No	Removed/pumped out the contents of the influent equalization (EQ) tank, repaired the system's pump electrical components, adjusted VFD on transfer pump, installed unions on influent piping manifold, replaced bag filters at discharge into the EQ tank, and restarted the system at 1645.
Totals - March 2019										29.3	25		63.2				0.022			

Table 2A- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - GWTS #1
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[6]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT	Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[3]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Total Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
4/1/2019	ST	Yes	--	--	40	28	40	39	2.25	54.4	1	--	--	--	--	--	0.002	Yes	No	Conducted system pressure checks and changed bag filters.
4/3/2019	ST	Yes	--	--	40	39	--	--	--	--	3	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
4/6/2019	ST	Yes	--	--	50	41	50	50	2.23	54.9	6	--	--	--	--	--	0.014	Yes	No	Conducted system pressure checks and changed bag filters.
4/9/2019	GWTT	Yes	--	--	40	50	--	--	1.6	76.6	9	--	18.85	--	--	--	0.029	Yes	Yes	Conducted system pressure checks, backwashed the primary carbon vessel for ~30 minutes; inspected the transfer pump and removed excess iron oxide sedimentation from the inlet piping.
4/10/2019	ST	Yes	--	--	50	15	23	25	--	--	10	--	--	--	--	--	--	Yes	No	Conducted system pressure checks and changed bag filters.
4/11/2019	ST	Yes	--	--	40	35	35	35	--	--	11	--	--	--	--	--	--	Yes	No	Conducted system pressure checks and changed bag filters.
4/12/2019	GWTT	Yes	--	--	50	40	44	46	3	40.8	12	--	--	--	--	--	0.020	Yes	No	Conducted system pressure checks and changed bag filters.
4/15/2019	GWTT	Yes	--	--	55	45	55	55	4.08	30.0	15	--	--	--	--	--	0.019	Yes	No	Conducted system pressure checks and changed bag filters.
4/19/2019	GWTT	Yes	--	--	58	55	35	40	2.5	49.0	19	--		--	--	--	0.039	Yes	No	Conducted system pressure checks and changed bag filters.
4/23/2019	GWTT	Yes	--	--	48	47	50	55	4.00	30.6	23	--	33.4	--	--	--	0.029	Yes	No	Conducted system pressure checks and changed bag filters.
4/26/2019	GWTT	Yes	--	--	58	50	55	60	--	--	26	--	20.3	--	--	--	--	Yes	No	Conducted system pressure checks and changed bag filters, conducted general housekeeping duties.
4/30/2019	GWTT	No	--	--	--	--	--	--	--	--	29	--	--	--	--	--	--	--	Yes	System off on arrival due to contact relay failure for transfer pump operation; system restarted at 16:29 after contact relay was replaced.
Totals - April 2019										48.1	29		24.2				0.058			
5/3/2019	GWTT	Yes	--	--	55	35	45	50	2.18	56.2	3	--	32.93	--	--	--	0.003	Yes	No	Conducted system pressure checks and changed bag filters.
5/7/2019	GWTT	Yes	--	--	58	38	50	55	2.05	59.8	7	--	31.57	--	--	--	0.007	Yes	No	Conducted system pressure checks and changed bag filters.
5/10/2019	GWTT	No	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	System down as a result of failed VFD for transfer pump operation, changed bag filters.
5/17/2019	GWTT	No	--	--	55	38	--	--	--	--	10	--	--	--	--	--	--	Yes	No	Installed new VFD drive, system shutdown due to power surge from thunderstorm. Electrician added 15 minute- electrical control delay at the control panel in the system shed; creating a 15 minute delay before the pump at PRW-4 powers on at the "high level" float switch.
5/21/2019	MDM	No	--	--	57	30	57	60	1.83	66.9	14	--	33.38	--	--	--	0.016	Yes	Yes	Power surge from rogue ground voltage at electrical easement "fried" the electrical delay at control panel in system shed. Electrican bypassed delay to allow system restart at 11:15. Electrician will change coil at PRW-4 panel to lower voltage at later date. Conducted system pressure checks and changed bag filters.
5/24/2019	GWTT	Yes	--	--	58	35	58	60	2.083	58.8	17	--	25.36	--	--	--	0.017	Yes	No	Conducted system pressure checks and changed bag filters. Bypass installed to allow 15 minute delay on PRW-4 submersible pump float switch.
5/28/2019	GWTT	Yes	--	--	56	46	55	60	2.65	46.2	21	--	52.10	--	--	--	0.016	Yes	No	Conducted system pressure checks and changed bag filters twice. Backwashed both carbon vessels.
5/31/2019	GWTT	Yes	--	--	58	35	55	60	2.17	56.5	24	--	36.90	--	--	--	0.022	Yes	No	Conducted system pressure checks and changed bag filters, 3" butterfly valve on INF of LGACS #2 replaced. Installed a 3 inch flow totalizer and meter on
Totals - May 2019										57.4	24		35.4				0.023			
6/4/2019	GWTT	Yes	--	--	57	48	57	62	2.46	49.8	4	--	20.2	--	--	--	0.010	Yes	No	Conducted system pressure checks and changed bag filter. Replaced in-kind flow meter previously installed on 5/31/19.
6/7/2019	GWTT	Yes	--	--	57	45	57	62	2.43	50.4	7	--	16.2	--	--	--	0.017	Yes	No	Conducted system pressure checks and changed bag filters.
6/11/2019	GWTT	Yes	--	--	76	78	70	82	2.53	48.4	11	--	17.3	--	--	--	0.026	Yes	No	Conducted system pressure checks and changed bag filters. System shutdown due to high pressure measurement on the LGAC vessels, (from iron fouling); carbon change to occur on 6/13/19.
6/13/2019	MDM	No	--	--	--	--	--	--	--	--	11	--	--	--	--	--	--	No	No	System off for carbon change out.
6/14/2019	GWTT	No	--	--	--	--	25	28	2.3	53.3	12	--	167.1	--	--	--	0.032	Yes	No	System restarted at 13:00; adjusted flow rate via VFD to 55 Hz. GWTT recorded Effluent flow rate from drop in site glass to be 44 seconds, immediately after adjusting the VFD.
6/18/2019	GWTT	Yes	--	--	25	10	11	15	2.23	54.9	16	--	56.2	--	--	--	0.043	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 55 GPM.
6/21/2019	GWTT	Yes	--	--	17	15	17	20	2.12	57.8	19	--	58.6	--	--	--	0.054	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 28 Hz.
6/25/2019	GWTT	Yes	--	--	20	18	20	25	2.3	53.3	23	--	59.0	--	--	--	0.060	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 28 to 35 Hz.
6/27/2019	MDM	Yes	--	--	33	21	--	--	3.2	38.3	25	--	17.5	--	--	--	0.047	Yes	Yes	Conducted system checks, system VFD at 35 Hz; pressure gauges at LGAC 2 are 0 psi.
6/28/2019	GWTT	Yes	--	--	33	22	30	35	2.4	51.0	26	--	60.9	--	--	--	0.065	Yes	No	Conducted system checks, changed bag filters, VFD at 35 Hz. Effluent flow rate increased after bag filter changeout.
Totals - June 2019										50.8	27		62.4		NR[11]		0.068			
7/2/2019	GWTT	Yes	--	--	32	20	30	32	2.52	48.6	2	NR	52.6	20575	--	--	0.005	Yes	No	Conducted system checks, changed bag filters.
7/5/2019	GWTT	Yes	--	--	25	23	30	35	2.53	48.4	5	NR	52.6	242970	222395	--	0.013	Yes	No	Conducted system checks, changed bag filters, VFD at 35 Hz. Effluent flow rate increased after bag filter changeout.
7/9/2019	GWTT	Yes	--	--	32	25	36	40	2.35	52.1	9	NR	58.6	311680	68710	--	0.026	Yes	No	Conducted system checks, changed bag filters, VFD at 35 Hz. Effluent flow rate increased after bag filter changeout. Primary LGAC vessel requires a
7/12/2019	GWTT	Yes	--	--	39	35	39	43	2.42	50.6	12	NR	55.7	407920	96240	--	0.033	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 42 Hz.
7/15/2019	GWTT	Yes	--	--	46	40	35	50	3.00	40.8	15	NR	55.7	587740	179820	--	0.034	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 42 Hz to 40 Hz.
7/18/2019	GWTT	Yes	--	--	45	28	55	60	2.83	43.3	18	NR	47.48	NR	NR	--	0.043	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 40 Hz to 45 Hz.
7/23/2019	GWTT	Yes	--	--	56	43	55	61	3.22	38.0	23	NR	25.63	717580	129840	--	0.048	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 40 Hz to 45 Hz.
7/26/2019	GWTT	Yes	--	--	56	50	56	60	--	--	26	NR	11.93	722700	5120	--	--	Yes	No	Conducted system checks, changed bag filters.
7/29/2019	GWTT	Yes	--	--	--	--	56	60	2.50	49.0	29	NR	53.3	723360	660	--	0.078	Yes	Yes	Pumped out contents of exterior totes and conducted backwash of system (6,800 gallons removed by Global). Shutdown system for ~2 hours. VFD at 23 Hz on departure.
Totals - July 2019										46.9	31		45.1		NR[11]		0.079			
8/2/2019	GWTT	Yes	--	--	15	5	18	9	2.68	50.6	2	NR	19.68	723960	0	0.0	0.006	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 23 Hz to 28 Hz.
8/5/2019	GWTT	Yes	--	--	21	8	16	20	2.50	52.8	5	NR	49.00	726280	2320	0.5	0.014	Yes	No	Conducted system checks, changed bag filters, VFD at 28 Hz.
8/8/2019	GWTT	Yes	--	--	20	19	22	27	2.23	54.9	8	NR	53.50	729450	3170	0.7	0.024	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 32 Hz and 31 Hz. Visability of site glass impaired due to iron fouling, possible obstruction in site glass causing error in flow calculations.
8/13/2019	GWTT	Yes	--	--	27	23	28	30	2.17	56.5	13	NR	56.45	738390	8940	1.2	0.040	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 23 Hz. Obstruction in site glass seems apparent, affecting flow rate calculations.
8/16/2019	GWTT	Yes	--	--	32	26	30	35	1.04	117.8	16	NR	34.83	744020	5630	1.3	0.103			Conducted system checks, changed bag filters, adjusted VFD from 23 Hz to 28 Hz.
8/20/2019	GWTT	Yes	--	--	40	27	36	38	NR	NR	20	NR	NR	757990	13970	2.4	--	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 38 Hz to 39 Hz. Could not calculate influent flow rate due to obstruction in site glass
8/23/2019	GWTT	Yes	--	--	41	29	38	44	--	--	23	NR	50.00	790720	32730	7.6	0.063	Yes	Yes	Conducted system checks, changed bag filters, and adjusted VFD from 39 Hz to 40 Hz. Collected montly system samples on 8/22/19.
8/27/2019	GWTT	Yes	--	--	45	35	44	49	--	--	27	NR	50.00	873750	83030	14.4	0.074	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 40 Hz to 42 Hz.
8/30/2019	GWTT	Yes	--	--	49	37	8	10	--	--	30	NR	49.00	976540	102790	23.8	0.081	Yes	No	Conducted system checks, changed bag filters after backwash of primary vessel.
Totals - August 2019										66.5	31		NR[11]		252580	6.5	0.113			
9/3/2019	GWTT	Yes	--	--	18	7	10	14	NA	NA	3	--	NR	1044190	67650	15.7	0.001	Yes	No	Conducted system checks, changed bag filters, "High High Level" Alarm indicated, adjusted VFD, site glass plugged due to iron oxide sludge build up at bottom of EQ tank, could not collect influent flow rate.
9/6/2019	GWTT	Yes	--	--	27	14	22	25	NA	NA	6	--	NR	NR	NR	NR	--	Yes	No	Conducted system checks, changed bag filters, "High High Level" Alarm indicated, adjusted VFD to 35 Hz from 31 Hz.
9/10/2019	GWTT	Yes	--	--	35	18	30	35	NA	NA	10	--	NR	1203690	159500	27.7	0.008	Yes	No	
9/13/2019	GWTT	Yes	--	--	40	25	40	42	NA	NA	13	--	NR	1311290	107600	24.9	0.009	Yes	No	Conducted system checks, changed bag filters, observed approximately 20 in. of sludge in EQ Tank, and adjusted VFD to 40 Hz from 38 Hz.
9/16/2019	GWTT	Yes	--	--	45	26	44	48	NA	NA	16	--	NR	1413970	102680	23.8	0.011	Yes	No	Conducted system checks, changed bag filters, and adjusted VFD to 48 Hz.
9/20/2019	GWTT	Yes	--	--	68	35	12	14	NA	NA	20	--	NR	1543040	129070	22.4	0.013	Yes	No	Conducted system checks, changed bag filters, backwashed primary GAC vessel, and adjusted VFD to 29 Hz.
9/23/2019	GWTT	Yes	--	--	24	8	23	27	NA	NA	23	--	NR	1563850	20810	4.8	0.003	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 29 Hz to 34 Hz.
9/27/2019	GWTT	Yes	--	--	32	17	42	44	NA	NA	27	--	NR	1577890	14040	2.4	0.002	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 34 Hz to 42 Hz, system samples collected on 9/26/19.
Totals - September 2019[12]										NA[7]	30		NR[11]		601350	17.4	0.015			

Table 2A- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - GWTS #1
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[6]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT	Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[3]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Total Gallons Treated	Average Effluent Flow Rate (GPM)[10]			
10/1/2019	GWTT	Yes	--	--	50	28	18	19	NA	NA	1	--	NR	1620400	--	--	--	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 42 Hz to 31 Hz. Operator noticed a loud sound on discharge pipes at LGAC #1 as well as a pressure drop across the entire system, system was instantly turned off and restarted after the VFD was adjusted. Operator assumed an obstruction (i.e. iron oxide precipitates) was in LGAC#1 restricting flow and loud sound was the obstruction being dislodged.
10/3/2019	GWTT	Yes	--	--	--	--	--	--	NA	NA	3	--	NR	1639940	19540	6.8	0.0005	Yes	No	System was shut off at 8:00 during excavation of the effluent discharge piping. The discharge piping was repaired and the system was restarted at 16:00. The bag filters were changed.
10/7/2019	GWTT	Yes	--	--	27	14	22	20	NA	NA	6	--	NR	1645550	5610	1.3	0.0002	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 31 Hz to 35 Hz.
10/11/2019	GWTT	Yes	--	--	32	30	19	20	NA	NA	10	--	NR	1683870	38320	6.7	0.0015	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 35 Hz to 32 Hz.
10/15/2019	GWTT	Yes	--	--	29	20	27	30	NA	NA	14	--	NR	1755270	71400	12.4	0.0040	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 32 Hz to 39 Hz.
10/18/2019	GWTT	Yes	--	--	38	22	30	35	NA	NA	18	--	NR	1867270	112000	19.4	0.0082	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 39 Hz to 35 Hz.
10/22/2019	GWTT	Yes	--	--	34	13	31	35	NA	NA	21	--	NR	1946590	79320	18.4	0.0090	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 35 Hz to 43 Hz.
10/25/2019	GWTT	Yes	--	--	44	34	35	42	NA	NA	24	--	NR	2043780	97190	22.5	0.0126	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 43 Hz to 40 Hz.
10/28/2019	GWTT	Yes	--	--	44	34	35	42	5.38	22.8	27	--	NR	2123880	80100	18.5	0.0117	Yes	No	Conducted system checks, changed bag filters, Global Cycle on site to vacuum pump out the contents from the EQ tank, bag filter unit, totes containing water from GAC vessel backwashes. The VFD was adjusted from 40 Hz to 24 Hz. Pressure gauge at P5 was replaced. System sampled on 10/30/19.
Totals - October 2019[12]										NA[7]	30		NR[11]		503480	11.7	0.008			
11/1/2019	GWTT	Yes	--	--	15	2	19	19	5.00	24.5	1	NR	53.26	2128040	4160	2.9	--	Yes	No	Conducted system checks, changed bag filters, and adjusted the VFD frequency.
11/4/2019	GWTT	Yes	--	--	26	8	21	17	4.28	28.60	4	NR	45.37	2131870	3830	0.9	--	Yes	No	Conducted system checks, changed bag filters, and the VFD was adjusted from 30 Hz to 29 Hz.
11/7/2019	GWTT	Yes	--	--	25	10	30	27	3.70	33.1	7	NR	44.0	2042122	--	--	--	Yes	No	Conducted system checks, changed bag filters, exchanged 3" flow meter to 2" pulse turbine flow meter/totalizer. Adjusted the VFD from 29 Hz to 34 Hz on departure.
11/11/2019	GWTT	Yes	--	--	32	18	31	35	3.70	33.1	11	35	NR	2119390	77268	13.4	0.0037	Yes	Yes	Conducted system checks, changed bag filters, VFD left at 34 Hz. Force main Influent flow was split; temporary GWTPS expansion system started. System sampled on 11/12/19.
11/15/2019	GWTT	Yes	--	--	32	21	32	36	4.47	27.4	14	43	NR	2190828	71438	16.5	0.0058	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 34 Hz to 38 Hz on departure.
11/18/2019	GWTT	Yes	--	--	40	30	42	46	4.43	27.6	17	37	NR	2273202	82374	19.1	0.0081	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 38 Hz to 39 Hz upon departure.
11/22/2019	GWTT	Yes	--	--	42	27	41	45	3.50	35.0	21	33	NR	2391315	118113	20.5	0.0108	Yes	No	Conducted system checks, changed bag filters. VFD kept at 39 Hz. Cleared sludged out of bottom of sight glass on EQ tank.
11/25/2019	GWTT	Yes	--	--	43	32	43	46	3.90	31.4	24	42	NR	2486658	95343	22.1	0.0133	Yes	No	Conducted system checks, changed bag filters. VFD kept at 39 Hz.
11/29/2019	GWTT	Yes	--	--	45	32	44	48	4.10	29.9	28	39	NR	2601976	115318	20.0	0.0141	Yes	No	Conducted system checks, changed bag filters.
Totals - November 2019[12]										30.1	29		NR[11]		559854	21.6	0.016			
12/2/2019	BETA	Yes	--	--	--	--	--	--	--	--	2	--	--	2685088	83112	28.9	0.001	No	No	System shutdown at 10:00 for force main de-scale process.
12/4/2019	BETA	No	--	--	--	--	52	60	4.55	26.9	2	--	NR	2685088	0	0.0	0.000	Yes	No	Bag filters changed prior to system restart. System (PRW-4 and system) restarted at 12:12 following the force main de-scale and purging process. Collected post-bag filter checks after system restart.
12/6/2019	GWTT	Yes	--	--	55	25	52	58	2.17	62.0	4	50	NR	2735900	50812	17.6	0.001	Yes	No	Conducted system checks, flow into system #2 shutoff PRW-4 due to high level alarm. Changed the bag filters, and adjusted the VFD from 44 Hz to 46 Hz.
12/9/2019	GWTT	Yes	--	--	59	22	58	63	2.12	62.0	7	50	NR	2854135.0	118235	27.4	0.002	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 48 Hz to increase the discharge/effluent flow rate. GWTT communicated that carbon vessels should be backwashed since the differential pressure between P3 and P4 is 50 psi.
12/13/2019	GWTT	Yes	--	--	64	66	45	71	1.95	62.8	11	--	48.0	3002260.0	148125	25.7	0.003	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 48 Hz to 49 Hz (49 GPM) at departure. GWTT noted the pressure on the carbon vessels was approaching their maximum limit.
12/16/2019	GWTT	Yes	--	--	66	70	56	74	2.02	60.6	14	--	40.0	3122091.0	119831	27.7	0.004	Yes	Yes	Conducted system pressure checks, changed bag filters, adjusted the VFD from 49 Hz to 50 Hz (45 GPM). GWTT noted the pressure on the carbon vessels was approaching their maximum limit. System sampled on 12/17/19.
12/20/2019	GWTT	Yes	--	--	45	63	41	67	NR	NR	18	--	16.00	3239075.0	116984	20.3	0.004	Yes	No	Conducted system pressure checks and changed bag filters and adjusted the VFD from 40 Hz to 47 Hz. Water waste from force main descale process removed from totes off-site by Global Cycle.
12/23/2019	GWTT	Yes	--	--	NR	NR	NR	NR	NR	NR	21	--	NR	--	--	--	--	No	No	System shutdown for carbon changeout at 08:00. Spent carbon removed from both vessels and replaced with new virgin carbon.
12/26/2019	GWTT	No	--	--	NR	11	NR	14	2.25	54.4	22	--	NR	3317372.0	78297	54.4	0.012	Yes	No	System restarted and requilibrated at 08:00 following carbon changeout and carbon hydration. Conducted system pressure checks, changed bag filters, adjusted the VFD to 23 Hz upon departure.
12/30/2019	GWTT	Yes	--	--	19	11	6	13	2.42	50.6	26	--	52.00	3460145.0	142773	24.8	0.006	Yes	No	Conducted system checks and changed bag filters, VFD at 26 Hz.
Totals - December 2019[12]										54.2	27		39.0		858169	22.1	0.006			
1/3/2020	GWTT	Yes	--	--	18	8	14	15	2.37	51.8	3	--	49.00	3588009.0	127864	29.6	0.001	Yes	No	Conducted system checks and changed bag filters, and adjusted VFD.
1/6/2020	GWTT	Yes	--	--	18	11	14	15	2.92	42.0	6	--	45.00	3692480.0	104471	24.2	0.002	Yes	No	Conducted system checks and changed bag filters, and adjusted VFD.
1/10/2020	GWTT	Yes	--	--	21	12	17	20	3.00	40.8	10	--	46.00	3809788.0	117308	20.4	0.003	Yes	No	Conducted system checks and changed bag filters, VFD at 27 Hz.
1/13/2020	GWTT	Yes	--	--	21	16	18	21	3.35	36.6	13	--	39.00	3899180.0	89392	20.7	0.004	Yes	No	Conducted system checks and changed bag filters.
1/17/2020	GWTT	Yes	--	--	25	20	23	26	3.62	33.9	17	--	24.00	3992818.0	93638	16.3	0.004	Yes	Yes	Conducted system checks and changed bag filters. Adjusted VFD to 33 Hz. Flushed iron sludge/sediment out of bottom of sight glass on EQ holding tank.
1/20/2020	GWTT	Yes	--	--	28	21	26	29	3.97	30.9	20	--	37.00	4065780.0	72962	16.9	0.005	Yes	No	Conducted system checks and changed bag filters.
1/24/2020	GWTT	Yes	--	--	29	22	27	30	5.13	23.9	24	--	34.00	4150180.0	84400	14.7	0.005	Yes	No	Conducted system checks and changed bag filters.
1/26/2020	GWTT	Yes	--	--	26	24	25	28	5.75	21.3	27	--	39.00	4205753.0	55573	12.9	0.005	Yes	No	Conducted system checks and changed bag filters.
1/31/2020	GWTT	Yes	--	--	28	23	26	30	6.80	18.0	31	--	36.00	4272375.0	66622	11.6	0.005	Yes	No	Conducted system checks, changed bag filters, cleaned sight glass on EQ tank; about 4-5 inches of sludge accumulated at bottom.
Totals - January 2020[12]										33.2	30.9		38.8		812230	18.3	0.009			

Table 2A- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - GWTS #1
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[6]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT	Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[3]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Total Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
2/4/2020	GWTT	Yes	--	--	28	22	26	30	8.00	15.3	4	--	36.00	4325997	120244	20.9	0.002	Yes	No	Conducted system checks and changed bag filters.
2/7/2020	GWTT	Yes	--	--	26	25	24	28	7.90	15.5	7	--	38.00	4360208	34211	7.9	0.001	Yes	No	Conducted system checks and changed bag filters.
2/11/2020	GWTT	Yes	--	--	26	25	26	30	11.07	11.1	11	--	43.00	4399300	39092	6.8	0.001	Yes	No	Conducted system checks and changed bag filters. Backwashed primary LGAC vessel, adjusted transfer pump from 33 Hz to 23 Hz after backwash.
2/13/2020	GWTT	Yes	--	--	9	8	7	9	12.33	9.9	13	--	42.00	4418200	18900	6.6	0.002	Yes	Yes	Conducted system checks and changed bag filters. Adjusted transfer pump from 33 Hz to 23 Hz, recycled backwash water into GWTS #2 for treatment.
2/18/2020	GWTT	Yes	--	--	12	6	8	9	16.63	7.4	18	--	42.00	4454815	36615	5.1	0.002	Yes	No	Conducted system checks and changed bag filters.
2/21/2020	GWTT	Yes	--	--	10	8	9	11	22.67	5.4	21	--	40.00	4471238	16423	3.8	0.002	Yes	No	Conducted system checks and changed bag filters.
2/24/2020	GWTT	Yes	--	--	15	5	13	15	2.65	46.2	24	--	44.00	4490425	19187	4.4	0.002	Yes	No	Conducted system checks and changed bag filters. Bag filters packed with significant iron-oixde sediments, influent flow rate into EQ tank significantly increased; slug of iron-oxide must have broke through from accumulation in the force main. Adjusted VFD from 23 Hz to 30 Hz.
2/26/2020	GWTT	Yes	--	--	25	10	20	24	2.60	47.1	26	--	37.00	4519500	29075	10.1	0.005	Yes	No	Conducted system checks and change bag filters. Increase discharge flow through VFD from 30 Hz to 35 Hz. Pressure readings at primary LGAC vessel indicating a need for a backwash.
2/28/2020	GWTT	Yes	--	--	29	10	13	15	2.55	48.0	28	--	52.00	4556491	36991	12.8	0.007	Yes	No	Conducted system checks and change bag filters. Conducted a backwash on primary LGAC vessel. Initial instantaneous Effluent flow rate was measured at 75 GPM after backwash. Adjusted VFD from 35 Hz to 26 Hz.
Totals - February 2020[12]										22.9	29		41.6		350738	8.4	0.004			
3/2/2020	GWTT	Yes	--	--	21	6	12	14	2.83	43.2	2	--	46.00	4645525	89034	20.6	0.001	Yes	Yes	Conducted system checks, changed bag filter, pumped water from large exterior tote through GWTS #2. System sampled on 3/3/2020
3/6/2020	GWTT	Yes	--	--	19	10	16	19	3.00	40.8	6	--	38.00	4723654	78129	13.6	0.002	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 26 Hz to 30 Hz.
3/9/2020	GWTT	Yes	--	--	25	18	11	15	3.00	40.8	9	--	51.00	4785425	61771	14.3	0.003	Yes	No	Conducted system checks, changed bag filters, at departure, instantaneous effluent flow rate at 51 gpm (30 Hz).
3/13/2020	GWTT	Yes	--	--	23	8	13	16	3.23	37.9	13	--	51.00	4898555	113130	19.6	0.005	Yes	No	Conducted system checks, changed bag filters.
3/16/2020	GWTT	Yes	--	--	23	9	14	17	3.75	32.7	16	--	50.00	4968818	70263	16.3	0.005	Yes	No	Conducted system checks, changed bag filters.
3/20/2020	GWTT	Yes	--	--	25	9	18	21	3.60	34.0	20	--	42.00	5052480	83662	14.5	0.006	Yes	No	Conducted system checks, changed bag filters, backwashed the primary LGAC vessel, adjusted the VFD from 30 Hz to 25 Hz: 42 GPM. Observed significant iron-oxide sedimentation accumulation in EQ tank.
3/23/2020	GWTT	Yes	--	--	17	9	15	17	3.00	40.8	23	--	48.00	5097785	45305	10.5	0.005	Yes	No	Conducted system checks; had to change the bag filters twice because the accumulated iron-oxide sediment in the EQ tank is getting pulled into the transfer pump affecting total gallons treated. Sight glass on EQ tank was flushed. Adjusted VFD from 25 Hz to 35 Hz.
3/26/2020	GWTT	Yes	--	--	34	17	27	29	3.00	40.8	26	--	48.00	5163530	65745	15.2	0.008	Yes	No	Conducted system checks, changed bag filters and increased the VFD from 35 Hz to 38 Hz.
3/30/2020	GWTT	Yes	--	--	38	14	34	38	3.27	37.5	30	--	42.00	5264195	100665	17.5	0.011	Yes	No	Conducted system checks, changed bag filters and increased the VFD from 38 Hz to 40 Hz.
Totals - March 2020[12]										38.7	31		46.2		707704	15.9	0.012			
4/2/2020	GWTT	Yes	--	--	34	30	31	35	2.95	41.5	2	--	51.00	5304740	40545	14.1	0.000	Yes	No	Conducted system checks and changed bag filters.
4/6/2020	GWTT	Yes	--	--	33	33	31	35	3.12	39.3	6	--	50.00	5354280	49540	8.6	0.001	Yes	No	Conducted system checks and changed bag filters. Transfer pump VFD at 40 Hz.
4/9/2020	GWTT	Yes	--	--	--	--	15	18	3.47	35.3	8.5	--	49.00	5413745	59465	16.5	0.002	Yes	No	System shutdown for 2-4 hours at 7am for vac out of EQ tank and backwash of primary carbon vessel. Global removed 2,989 gallons of iron-oxide water mixture from EQ tank and exterior totes. Conducted system checks and changed bag filters. Adjusted VFD from 40 Hz (74 gpm) to 28 Hz (49 gpm).
4/13/2020	GWTT	Yes	--	--	16	10	11	15	3.92	31.3	12.5	--	44.00	5497360	83615	14.5	0.002	Yes	No	Conducted system checks and changed bag filters
4/16/2020	GWTT	Yes	--	--	18	15	15	19	4.32	28.4	15.5	--	35.00	5552940	55580	12.9	0.003	Yes	No	Conducted system checks and changed bag filters
4/20/2020	GWTT	Yes	--	--	19	14	19	23	5.00	24.5	19.5	--	30.00	5620048	67108	11.7	0.003	Yes	No	Conducted system checks and changed bag filters, adjusted VFD from 28 Hz to 32 Hz to allow higher pressure/flow through bag filters to help with iron-oxide sediment fouling.
4/24/2020	GWTT	Yes	--	--	26	21	26	30	5.25	23.3	23.5	--	30.00	5679610	59562	10.3	0.003	Yes	No	Conducted system checks and changed bag filters, adjusted the VFD from 32 Hz to 35 Hz.
4/27/2020	GWTT	Yes	--	--	30	28	30	34	6.37	19.2	26.5	--	28.00	5723132	43522	10.1	0.003	Yes	Yes	Conducted system checks and changed bag filters. System sampled on 4/28/2020.
Totals - April 2020[12]										30.4	29.5		39.6		458937	10.8	0.004			

Notes:
1. CE - Coastal Engineering. GWTT - Groundwater Treatment Technologies
2. Prior to November 2019, the instantaneous Influent (INF) and effluent (EFF) flow rates are calculated based on the cross-sectional volume per vertical foot of the influent tank and the measured/timed filling (INF) rate or draining (EFF) of the tank. The diameter of the influent tank is approximately 78 inches. The cross-sectional volume of the tank is approximately 33.1 cubic feet per vertical linear foot. Therefore the flow rate calculation factor is approximately 122.5 gallons per 6 inches. Since 11/7/2019 (following the replacement of the effluent totalizer, ONLY INF flow rates (from PRW-4) are calculated based on an approximation. This Combined Influent flow rate represents the combined flow within both force main pipes from recovery well PRW-4.
3. Prior to November 2019 the total mass of PFAS removed is calculated based on the calcuated influent flow rate, the number of days the system has been operating, and the average total Infuent PFAs concentration for the month. Since November 2019, the total mass of PFAS removed is calculated based on the effluent flow rate.
4. NA or -- Not Applicable.
5. NR - Not Reported
6. As of April 1, 2019; the system's O&M data reporting was changed to include the differential pressure readings from the bag filter unit's pressure gauges before and after the bag filters are changed/replaced, if applicable.
7. Prior to November 2019, the average influent flow rate could not reliably be calculated/measured from September to (most of) October due to a blockage in the site glass on the EQ tank from accumulated iron-oxide precipitates in the bottom of the tank. The iron-oxide precipitates were removed from the EQ tank on Oct. 28, 2019.
8. Following the separation of the two force mains and the installation of GWTPS #2 on November 7, 2019, Instantaneous influent flow rates are estimated by approximating 50% of the Combined Instantaneou Influent flow rate values.
9. Instantaneous Effluent Flow Rate is recorded as the instantaneous flow rate as calculated or indicated from the totalizer flow meter on the system's effluent discharge piping - reading is collected after bag filter change and/or backwashing.
10. The Average effluent flow rate is calculated from the net gallons (Total Gallons Treated) obtained from the system's effluent totalizer flow meter and days that the system was in operation.
11. Prior to Nov. 7, 2019, calculated average effluent flow rates and the estimated PFAS removed total were calculated based on the reported totalizer readings. The totalizer flow meter readings on the effluent discharge piping were not reliable at flow rates less than 40 GPM. Therefore the data are shaded to indicate that they are approximations only and for this reason the July through October data are also considered approximates.
12. As of September 2019, the "Totals" shown (from left to right) include the Average Instantaneous Influent Flow Rate, Total Days of System Operation, Average Instantaneous Effluent Flow Rate, Total Gallons Treated, Average Net Effluent Flow Rate, and Estimated PFAS Removed for the respective monthly reporting period. Running average values shown for the effluent flow rate. Prior to November 7, 2019, totals shown (from left to right) included the Average Instantaneous Influent Flow Rate, Total Days of Operation, Average Instantaneous Effluent Flow Rate, and Estimated PFAS Removed for the respective monthly reporting period.

Table 2B - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 2 (GWTS #2)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Days System Operating	Transfer Pump Pres. (psi)	Pre-Filter Changeout Differential Pressure (psi)[2]		Post-Filter Changeout Differential Pressure (psi)		Carbon Vessels. Pre-change out (psi)		Carbon Vessels. Post-change out (psi)		Instantaneous Estimated INFLUENT[7]	EFFLUENT				Estimated Total PFAs Removal (kg)	System Operating on Departure	System Sampled	Comments
				Gauge: P1	Gauge: P2	Gauge: P3	Gauge: P2	Gauge: P3	Gauge: P4	Gauge: P5	Gauge: P4	Gauge: P5	Flow Rate (GPM)[3,4]	Totalizer (Gal)	Instant. Flow Rate (GPM)[8]	Total Net Gallons Treated[4]	Average Effluent Flow Rate (GPM)[5]				
11/11/2019	GWTT	Yes	1	38	0	0	0	0	<2	0	2	2	12.56	416900	32.00	0.0	--	0.00032	Yes	No	Influent flow stream from PRW-4 split and started system #2. Conducted system checks, changed bag filters after initial flush.
11/15/2019	GWTT	Yes	4	40	24	2	5	2	2	2	2	2	34.00	451645	34.00	34745.0	8.043	0.0008	Yes	Yes	Conducted system pressure checks and changed the bag filters. System shutdown temporarily to calculate influent flow rate at GWTPS #1. Collected system startup samples on 11/12/19 and 11/15/19.
11/18/2019	GWTT	Yes	7	--	32	2	6	6	2	2	4	4	44.00	491280	33.00	39635.0	9.175	0.0016	Yes	No	Conducted system pressure checks and changed the bag filters. System shutdown temporarily to calculate influent flow rate at GWTPS #1.
11/22/2019	GWTT	Yes	11	40	31	4	7	7	4	4	6	5	12.50	549022	34.00	57742.0	10.025	0.0028	Yes	No	Conducted system pressure checks and changed the bag filters. System shutdown temporarily to calculate influent flow rate at GWTPS #1.Collected system startup samples on 11/19/19.
11/25/2019	GWTT	Yes	14	40	15	6	7	7	4	5	5	6	12.50	594623	33.00	45601.0	10.556	0.0037	Yes	No	Conducted system pressure checks and changed the bag filters.
11/29/2019	GWTT	Yes	18	40	18	6	8	8	3	3	4	4	NR	649150	34.00	54527.0	9.466	0.0043	Yes	No	Conducted system pressure checks and changed the bag filters.
Totals - November 2019[6]			19										23.11		33	232250	8.49	0.0040			
12/2/2019	BETA	Yes	2		--	--	--	--	--	--	--	--	--	686500	--	37350.0	13.0	--	No	Yes	System shutdown at 10:00 for force main de-scale process; system locked out and tagged out.
12/4/2019	BETA	No	2	40	--	--	7	7	--	--	4	4	22.70	686700	30.00	200.0	0.069	0.00000	Yes	No	System restarted at 12:12 upon finishing the de-scale purging process and restarted PRW-4.
12/6/2019	GWTT	No	4	35	--	--	14	13	--	--	10	8	25.0	707866	47.00	21166.0	7.349	0.00029	Yes	No	System off upon arrival and bag filters were completed clogged with iron sediments. Bag filters had to be changed after 20 minutes of operation, GWTT observed a high amount of solids floating in the EQ tank and pumped down the EQ tank and observed significant iron sediment sludge on the bottom of the tank. GWTT notified BETA that they would raise the floats in EQ tank to help lessen the agitation of the sludge and carryover into the bag filters. System was on high level alarm and continued to shutoff of PRW-4, which shut off system #1 due to significant iron oxide sediment accumulation in EQ tank.
12/9/2019	GWTT	Yes	7	37	39	8	16	16	7	5	14	8	25.0	813065	46.00	105199.0	24.4	0.00171	Yes	No	Conducted system checks, changed bag filters. Raising floats in EQ tank has not affected the iron sediment at the bottom.
12/13/2019	GWTT	Yes	11	38	43	11	21	20	10	5	18	7	25.0	943807	42.00	130742.0	22.7	0.00250	Yes	No	Conducted system checks, changed bag filters.
12/16/2019	GWTT	Yes	14	45	43	13	23	22	10	3	21	5	25.0	1049390	41.00	105583.0	24.4	0.00343	Yes	No	Conducted system checks, changed bag filters. EQ tank "High Level" alarm triggered.
12/20/2019	GWTT	Yes	18	42	33	14	20	20	10	4	18	6.00	25.0	1148998	43.00	99608.0	17.3	0.00312	Yes	No	Conducted system checks and changed the bag filters. System shutdown temporarily for pump out of iron oxide sediment accumulation in EQ tank.
12/23/2019	GWTT	Yes	21	--	--	--	--	--	--	--	--	--	--	1209649	NR	60651.0	14.0	0.00296	Yes	No	System shutdown at 08:00 for carbon changeout conducted on System #1.
12/26/2019	GWTT	Yes	22	38	30	15	19	19	14	6	18	7	24.2	1209820	42.00	171.0	0.1	0.00003	Yes	No	System restarted at 09:30 AM following carbon changeout conducted on System #1. Conducted system checks and changed bag filters.
12/30/2019	GWTT	Yes	26	38	38	13	22	22	12	5	20	7	24.00	1320824	40.00	111004.0	19.3	0.00503	Yes	No	Conducted system pressure checks and changed the bag filters. Reset pump control floats in EQ tank back to original depths (following the removal of iron sediments at bottom of the tank).
Totals - December 2019[6]			27										24.49		41	671674	17.3	0.005			
1/3/2020	GWTT	Yes	3	43	35	13	20	20	10	4	18	6	--	1422315	42.00	101491.0	23.5	0.00101	Yes	No	Conducted system checks, changed bag filters.
1/6/2020	GWTT	Yes	6	40	27	15	19	19	11	5	16	8	20.98	1507290	43.00	84975.0	19.7	0.00169	Yes	No	Conducted system checks, changed bag filters.
1/10/2020	GWTT	Yes	10	38	29	15	19	19	13	5	17	6	20.42	1602935	43.00	95645.0	16.6	0.00237	Yes	No	Conducted system checks, changed bag filters.
1/13/2020	GWTT	Yes	13	38	26	16	19	19	18	6	6	8	18.28	1674840	41.00	71905.0	16.6	0.00309	Yes	No	Conducted system checks, changed bag filters.
1/17/2020	GWTT	Yes	17	--	28	16	20	20	15	6	18	7	16.94	1750933	41.00	76093.0	13.2	0.00321	Yes	No	Conducted system checks, changed bag filters.
1/20/2020	GWTT	Yes	20	38	25	16	11	11	15	6	18	7	15.44	1808630	48.00	57697.0	13.4	0.00382	Yes	No	Conducted system checks, changed bag filters. Backwashed primary LGAC vessel.
1/24/2020	GWTT	Yes	24	35	19	9	11.5	11.5	6	7	8	8	11.93	1872940	48.00	64310.0	11.2	0.00383	Yes	No	Conducted system checks, changed bag filters.
1/27/2020	GWTT	Yes	27	35	16	10	12	11	7	7	9	8.00	10.65	1915785	46.00	42845.0	9.9	0.00383	Yes	No	Conducted system checks, changed bag filters, pumped backwash water through system's influent stream.
1/31/2020	GWTT	Yes	31	36	18	10	12	12	9	8	8	7	9.01	1962050	--	46265.0	8.0	0.00356	Yes	No	Conducted system checks, changed bag filters.
Totals - January 2020[6]			31										15.46		44	641226	14.4	0.004			
2/4/2020	GWTT	Yes	4	2	18	10	12	12	9	8	8	7	7.66	2000333	46.00	38283	6.6	0.00053	Yes	No	Conducted system checks, changed bag filters.
2/7/2020	GWTT	Yes	7	36	14	11	12	11	8	7	8	6	7.75	2023878	46.00	23545	5.5	0.00076	Yes	No	Conducted system checks, changed bag filters.
2/11/2020	GWTT	Yes	11	35	14	12	13	13	9	8	10	8	5.53	2049888	47.00	26010	4.5	0.00099	Yes	No	Conducted system checks, changed bag filters.
2/13/2020	GWTT	Yes	13	36	13	12	14	13	10	8	10	8	4.97	2060169	46.00	10281	3.6	0.00093	Yes	Yes	Conducted system checks, changed bag filters. Pumped backwash water from GWTS #1 through system.
2/18/2020	GWTT	Yes	18	36	15	12	13	14	9	8	9	8	3.68	2081950	57.00	21781	3.0	0.00109	Yes	Yes	Conducted system checks, changed bag filters.
2/21/2020	GWTT	Yes	21	36	15	13	14	13	10	8	10	8	2.70	2094054	48.00	12104	2.8	0.00117	Yes	Yes	Conducted system checks, changed bag filters.
2/24/2020	GWTT	Yes	24	37	43	5	16	16	2	2	13	7	23.11	2108080	47.00	14026	3.2	0.00156	Yes	Yes	Conducted system checks, changed bag filters. Bag filters packed with significant iron-oixde sediments, influent flow rate into EQ tank significantly increased; slug of iron must have broke through. Had to change bag filters twice.
2/26/2020	GWTT	Yes	26	36	43	6	16	15	6	2	16	8	23.56	2134241	45.00	26161	9.1	0.00472	Yes	Yes	Conducted system checks and changed bag filters.
2/28/2020	GWTT	Yes	28	36	44	5	21	20	5	2	18	7	24.02	2168295	42.00	34054	11.8	0.00661	Yes	Yes	Conducted system checks, changed bag filters. Approximately 6 inch of iron-oxide sludge has accumulated on bottom of EQ tank; control float switches were raised to reduce disruption of settled sludge.
Totals - February 2020[6]			29										11.44		47	206245	4.9	0.003			
3/2/2020	GWTT	Yes	2	36	35	10	15	15	9	5	10	11	21.6	2249000	48.00	80705	18.7	0.00078	Yes	Yes	Conducted system checks, changed bag filters. Backwashed primary LGAC vessel, vaccumed the iron-oxide sludge out of the EQ tank, and into 55-gal drums on site; water from the drum can be decanted back through the system. System sampled on 3/3/2020.
3/6/2020	GWTT	Yes	6	37	25	10	16	15	8	8	12	10	20.4	2315739	47.00	66739	11.6	0.00145	Yes	No	Conducted system checks, changed bag filters. System shutdown temporarily to pump backwash water from exterior totes through system.
3/9/2020	GWTT	Yes	9	37	30	9	16	16	7	6.5	14	10	20.4	2366315	44.00	50576	11.7	0.00220	Yes	No	Conducted system checks, changed bag filters.
3/13/2020	GWTT	Yes	13	38	37	9	20	20	8	5	18	10	18.9	2476035	42.00	109720	19.0	0.00518	Yes	No	Conducted system checks, changed bag filters.
3/16/2020	GWTT	Yes	16	38	29	15	20	20	12	8	18	10	16.3	2544858	41.00	68823	15.9	0.00533	Yes	No	Conducted system checks, changed bag filters.
3/20/2020	GWTT	Yes	20	38	28	17	19	19	10	7	17	10	17.0	2615618	41.00	70760	12.3	0.00514	Yes	No	Conducted system checks, changed bag filters. Observed significant iron-oxide accumulation in EQ tank.
3/23/2020	GWTT	Yes	23	38	26	16	21	20	14	8.5	18	10	20.4	2636761	41.00	21143	4.9	0.00235	Yes	No	Conducted system checks, changed bag filters.
3/26/2020	GWTT	Yes	26	38	29	14	20	19	14	8.5	18	10	20.4	2663514	41.00	26753	6.2	0.00337	Yes	No	Conducted system checks, changed bag filters.
3/30/2020	GWTT	Yes	30	46	44	5	24	24	2	1	20	9	18.8	2721065	37.00	57551	10.0	0.00627	Yes	No	Conducted system checks, changed bag filters.
Totals - March 2020[6]			31										19.37		42	552770	12.4	0.00549			
4/2/2020	GWTT	Yes	2	42	42	13	24	23	10	3	21	5	20.8	2768543	27.00	47478	16.5	0.00041	Yes	No	Conducted system checks, changed bag filters, and slowed down the effluent discharge flow rate to reduce carry over of significant iron sludge into the bag filters.
4/6/2020	GWTT	Yes	6	42.5	42	12	27	27	10	3	25	6	19.7	2833368	25.00	64825	11.3	0.00085	Yes	No	Conducted system checks and changed bag filters.
4/9/2020	GWTT	Yes	8.5	39	--	--	9	8	7	6.5	7	6.5	17.7	2903750	39.00	70382	19.6	0.00209	Yes	No	System shutdown for 2-4 hours at 7am for vac out of EQ holding tank and backwash of primary carbon vessel. Conducted system checks and changed bag filters.
4/13/2020	GWTT	Yes	12.5	39	24.5	7	10	9	4	5	8	6.0	15.6	3004475	38.00	100725	17.5	0.00275	Yes	No	Conducted system checks and changed bag filters. Lowered transfer pump "off control" float in EQ holding tank to allow longer run time and less cycling.
4/16/2020	GWTT	Yes	15.5	40	20.8	8	11	10	7	6	8	6.0	14.2	3074510	36.00	70035	16.2	0.00316	Yes	No	Conducted system checks and changed bag filters, pumped backwash water from exterior totes into (system #2) holding tank.
4/20/2020	GWTT	Yes	19.5	40	25	8	11	10	6	5	9	6.0	12.3	3156813	37.00	82303	14.3	0.00350	Yes	No	Conducted system checks and changed bag filters. Lowered transfer pump "off control" float in EQ holding tank to allow longer run time and less cycling.
4/24/2020	GWTT	Yes	23.5	42	26	10	15	14	7	5	10	6.0	11.7	3225480	33.00	68667	11.9	0.00352	Yes	No	Conducted system checks and changed bag filters.
4/27/2020	GWTT	Yes	26.5	40	21	12	15	14	10	6	12	6.0	9.6	3271810	33.00	46330	10.7	0.00357	Yes	Yes	Conducted system checks and changed bag filters. Collected system samples on 4/28/2020.
Totals - April 2020[6]			29.5										15.2		34	550745	13.0	0.00481			

Notes:
1. GWTT - Groundwater Treatment Technologies
2. Pressure readings before filter bag changeout or if no changeout was done.
3. Influent flow is an instantaneous estimate of the flow rate from the submersible Well Pump at PRW-4.
4. During monthly reporting periods the net gallons are calculated from previous effluent totalizer readings. (Difference between the current totalizer reading - the last dated totalizer reading).
5. The Average effluent flow rate is calculated from the net gallons obtained from the system's effluent totalizer flow meter and days that the system was in operation.
6. The "Totals" shown (from left to right) include the, Total Days of System Operation, Average Instantaneous Influent Flow Rate, Average Instantaneous Effluent Flow Rate, Total Gallons Treated, Average Net Effluent Flow Rate, and Estimated PFAS Removed for the respective monthly reporting period.
7. Instantaneous influent flow rates are estimated by approximating 50% of the influent flow rate values calculated from GWPTS #1 (See Table 2A).
8. Instantaneous effluent flow rate estimated by stopwatch at totalizer meter.
9. Flow calculated based on gallons marking on EQ tank. Estimated flow rate = 25 GPM (i.e. flow is calculated based on an in-situ observation of flow into the EQ tank, and 100 gallons of groundwater flows into the EQ tank for a 4 minute duration.

Your Project #: BARNSTABLE COUNTY
Site#: 6206
Site Location: BCFRTA
Your C.O.C. #: 743101-01-01

Attention: Steven Tebo

Barnstable County
3195 Main Street
PO Box 427
Barnstable, MA
USA 02630

Report Date: 2020/05/08
Report #: R6168006
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C0A6377
Received: 2020/04/30, 11:55

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Low level PFOS and PFOA by SPE/LCMS (1)	5	2020/05/05	2020/05/05	CAM SOP-00894	EPA 537 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.
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Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Per- and polyfluoroalkyl substances (PFAS) identified as surrogates on the certificate of analysis represent the extracted internal standard.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Your Project #: BARNSTABLE COUNTY
Site#: 6206
Site Location: BCFRTA
Your C.O.C. #: 743101-01-01

Attention: Steven Tebo

Barnstable County
3195 Main Street
PO Box 427
Barnstable, MA
USA 02630

Report Date: 2020/05/08
Report #: R6168006
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C0A6377
Received: 2020/04/30, 11:55

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Stephanie Pollen, Project Manager
Email: Stephanie.Pollen@bvlabs.com
Phone# (905)817-5830

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BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

BV Labs Job #: C0A6377
Report Date: 2020/05/08

Barnstable County
Client Project #: BARNSTABLE COUNTY
Site Location: BCFRTA
Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

BV Labs ID		MNS891			MNS892			
Sampling Date		2020/04/28 08:45			2020/04/28 09:00			
COC Number		743101-01-01			743101-01-01			
	UNITS	(PRW-4)INFLLUENT	RDL	MDL	SYSTEM#1 MIDPOINT	RDL	MDL	QC Batch
Perfluorinated Compounds								
Perfluorobutanoic acid (PFBA)	ng/L	27	20	4.5	2.9	2.0	0.45	6709927
Perfluoropentanoic acid (PFPeA)	ng/L	84	20	4.8	6.1	2.0	0.48	6709927
Perfluorohexanoic acid (PFHxA)	ng/L	110	20	2.6	6.9	2.0	0.26	6709927
Perfluoroheptanoic acid (PFHpA)	ng/L	56	20	3.7	3.4	2.0	0.37	6709927
Perfluorooctanoic acid (PFOA)	ng/L	52	20	2.3	2.7	2.0	0.23	6709927
Perfluorononanoic acid (PFNA)	ng/L	42	20	4.8	2.2	2.0	0.48	6709927
Perfluorodecanoic acid (PFDA)	ng/L	12	20	1.8	0.51	2.0	0.18	6709927
Perfluoroundecanoic acid (PFUnA)	ng/L	51	20	3.8	2.0	2.0	0.38	6709927
Perfluorododecanoic acid (PFDoA)	ng/L	<2.5	20	2.5	<0.25	2.0	0.25	6709927
Perfluorotridecanoic acid (PFTRDA)	ng/L	<3.0	20	3.0	<0.30	2.0	0.30	6709927
Perfluorotetradecanoic acid(PFTEDA)	ng/L	<1.6	20	1.6	<0.16	2.0	0.16	6709927
Perfluorobutanesulfonic acid (PFBS)	ng/L	8.5	20	3.7	<0.37	2.0	0.37	6709927
Perfluoropentanesulfonic acid PFPes	ng/L	14	20	2.8	0.74	2.0	0.28	6709927
Perfluorohexanesulfonic acid(PFHxS)	ng/L	210	20	3.3	10	2.0	0.33	6709927
Perfluoroheptanesulfonic acid PFHpS	ng/L	6.5	20	6.3	<0.63	2.0	0.63	6709927
Perfluorooctanesulfonic acid (PFOS)	ng/L	1900	200	43	86	20	4.3	6709927
Perfluorononanesulfonic acid (PFNS)	ng/L	<5.5	20	5.5	<0.55	2.0	0.55	6709927
Perfluorodecanesulfonic acid (PFDS)	ng/L	<3.6	20	3.6	<0.36	2.0	0.36	6709927
Perfluorooctane Sulfonamide (PFOSA)	ng/L	<3.1	40	3.1	<0.31	4.0	0.31	6709927
6:2 Fluorotelomer sulfonic acid	ng/L	160	40	4.3	8.7	4.0	0.43	6709927
8:2 Fluorotelomer sulfonic acid	ng/L	190	40	4.7	11	4.0	0.47	6709927
Surrogate Recovery (%)								
13C2-6:2-Fluorotelomersulfonic Acid	%	90	N/A	N/A	94	N/A	N/A	6709927
13C2-8:2-Fluorotelomersulfonic Acid	%	91	N/A	N/A	90	N/A	N/A	6709927
13C2-Perfluorodecanoic acid	%	91	N/A	N/A	89	N/A	N/A	6709927
13C2-Perfluorododecanoic acid	%	91	N/A	N/A	85	N/A	N/A	6709927
13C2-Perfluorohexanoic acid	%	100	N/A	N/A	98	N/A	N/A	6709927
13C2-perfluorotetradecanoic acid	%	77	N/A	N/A	70	N/A	N/A	6709927
13C2-Perfluoroundecanoic acid	%	93	N/A	N/A	88	N/A	N/A	6709927
13C3-Perfluorobutanesulfonic acid	%	96	N/A	N/A	101	N/A	N/A	6709927
13C4-Perfluorobutanoic acid	%	98	N/A	N/A	94	N/A	N/A	6709927
13C4-Perfluoroheptanoic acid	%	99	N/A	N/A	96	N/A	N/A	6709927
13C4-Perfluorooctanesulfonic acid	%	101	N/A	N/A	90	N/A	N/A	6709927

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

BV Labs Job #: C0A6377
Report Date: 2020/05/08

Barnstable County
Client Project #: BARNSTABLE COUNTY
Site Location: BCFRTA
Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

BV Labs ID		MNS891			MNS892			
Sampling Date		2020/04/28 08:45			2020/04/28 09:00			
COC Number		743101-01-01			743101-01-01			
	UNITS	(PRW-4)INFLLUENT	RDL	MDL	SYSTEM#1 MIDPOINT	RDL	MDL	QC Batch
13C4-Perfluorooctanoic acid	%	95	N/A	N/A	95	N/A	N/A	6709927
13C5-Perfluorononanoic acid	%	93	N/A	N/A	94	N/A	N/A	6709927
13C5-Perfluoropentanoic acid	%	98	N/A	N/A	94	N/A	N/A	6709927
13C8-Perfluorooctane Sulfonamide	%	76	N/A	N/A	66	N/A	N/A	6709927
18O2-Perfluorohexanesulfonic acid	%	96	N/A	N/A	98	N/A	N/A	6709927

RDL = Reportable Detection Limit
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N/A = Not Applicable

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

BV Labs Job #: C0A6377
Report Date: 2020/05/08

Barnstable County
Client Project #: BARNSTABLE COUNTY
Site Location: BCFRTA
Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

BV Labs ID		MNS893	MNS894	MNS895			
Sampling Date		2020/04/28 09:15	2020/04/28 09:30	2020/04/28 09:45			
COC Number		743101-01-01	743101-01-01	743101-01-01			
	UNITS	SYSTEM#1 EFFLUENT	SYSTEM#2 MIDPOINT	SYSTEM#2 EFFLUENT	RDL	MDL	QC Batch
Perfluorinated Compounds							
Perfluorobutanoic acid (PFBA)	ng/L	<0.45	3.9	<0.45	2.0	0.45	6709927
Perfluoropentanoic acid (PFPeA)	ng/L	<0.48	6.1	<0.48	2.0	0.48	6709927
Perfluorohexanoic acid (PFHxA)	ng/L	0.95	5.7	<0.26	2.0	0.26	6709927
Perfluoroheptanoic acid (PFHpA)	ng/L	<0.37	3.0	<0.37	2.0	0.37	6709927
Perfluorooctanoic acid (PFOA)	ng/L	<0.23	2.2	<0.23	2.0	0.23	6709927
Perfluorononanoic acid (PFNA)	ng/L	<0.48	1.7	<0.48	2.0	0.48	6709927
Perfluorodecanoic acid (PFDA)	ng/L	<0.18	0.27	<0.18	2.0	0.18	6709927
Perfluoroundecanoic acid (PFUnA)	ng/L	<0.38	0.78	<0.38	2.0	0.38	6709927
Perfluorododecanoic acid (PFDoA)	ng/L	<0.25	<0.25	<0.25	2.0	0.25	6709927
Perfluorotridecanoic acid (PFTRDA)	ng/L	<0.30	<0.30	<0.30	2.0	0.30	6709927
Perfluorotetradecanoic acid(PFTEDA)	ng/L	<0.16	<0.16	<0.16	2.0	0.16	6709927
Perfluorobutanesulfonic acid (PFBS)	ng/L	<0.37	<0.37	<0.37	2.0	0.37	6709927
Perfluoropentanesulfonic acid PFPes	ng/L	<0.28	0.56	<0.28	2.0	0.28	6709927
Perfluorohexanesulfonic acid(PFHxS)	ng/L	<0.33	9.7	<0.33	2.0	0.33	6709927
Perfluoroheptanesulfonic acid PFHpS	ng/L	<0.63	<0.63	<0.63	2.0	0.63	6709927
Perfluorooctanesulfonic acid (PFOS)	ng/L	<0.43	64	0.47	2.0	0.43	6709927
Perfluorononanesulfonic acid (PFNS)	ng/L	<0.55	<0.55	<0.55	2.0	0.55	6709927
Perfluorodecanesulfonic acid (PFDS)	ng/L	<0.36	<0.36	<0.36	2.0	0.36	6709927
Perfluorooctane Sulfonamide (PFOSA)	ng/L	<0.31	<0.31	<0.31	4.0	0.31	6709927
6:2 Fluorotelomer sulfonic acid	ng/L	<0.43	7.9	<0.43	4.0	0.43	6709927
8:2 Fluorotelomer sulfonic acid	ng/L	<0.47	6.9	<0.47	4.0	0.47	6709927
Surrogate Recovery (%)							
13C2-6:2-Fluorotelomersulfonic Acid	%	98	77	82	N/A	N/A	6709927
13C2-8:2-Fluorotelomersulfonic Acid	%	94	73	84	N/A	N/A	6709927
13C2-Perfluorodecanoic acid	%	79	73	75	N/A	N/A	6709927
13C2-Perfluorododecanoic acid	%	72	66	70	N/A	N/A	6709927
13C2-Perfluorohexanoic acid	%	86	76	81	N/A	N/A	6709927
13C2-perfluorotetradecanoic acid	%	50	63	72	N/A	N/A	6709927
13C2-Perfluoroundecanoic acid	%	77	70	75	N/A	N/A	6709927
13C3-Perfluorobutanesulfonic acid	%	93	90	91	N/A	N/A	6709927
13C4-Perfluorobutanoic acid	%	79	80	78	N/A	N/A	6709927
13C4-Perfluoroheptanoic acid	%	85	77	79	N/A	N/A	6709927
13C4-Perfluorooctanesulfonic acid	%	90	87	92	N/A	N/A	6709927

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N/A = Not Applicable

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

BV Labs Job #: C0A6377
Report Date: 2020/05/08

Barnstable County
Client Project #: BARNSTABLE COUNTY
Site Location: BCFRTA
Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

BV Labs ID		MNS893	MNS894	MNS895			
Sampling Date		2020/04/28 09:15	2020/04/28 09:30	2020/04/28 09:45			
COC Number		743101-01-01	743101-01-01	743101-01-01			
	UNITS	SYSTEM#1 EFFLUENT	SYSTEM#2 MIDPOINT	SYSTEM#2 EFFLUENT	RDL	MDL	QC Batch
13C4-Perfluorooctanoic acid	%	83	77	77	N/A	N/A	6709927
13C5-Perfluorononanoic acid	%	84	76	79	N/A	N/A	6709927
13C5-Perfluoropentanoic acid	%	81	80	77	N/A	N/A	6709927
13C8-Perfluorooctane Sulfonamide	%	50	57	66	N/A	N/A	6709927
18O2-Perfluorohexanesulfonic acid	%	95	88	93	N/A	N/A	6709927

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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BV Labs Job #: C0A6377
Report Date: 2020/05/08

Barnstable County
Client Project #: BARNSTABLE COUNTY
Site Location: BCFRTA
Sampler Initials: MM

TEST SUMMARY

BV Labs ID: MNS891 **Collected:** 2020/04/28
Sample ID: (PRW-4)INFLLUENT **Shipped:**
Matrix: Water **Received:** 2020/04/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Low level PFOS and PFOA by SPE/LCMS	LCMS	6709927	2020/05/05	2020/05/05	Janet Dalisay

BV Labs ID: MNS892 **Collected:** 2020/04/28
Sample ID: SYSTEM#1 MIDPOINT **Shipped:**
Matrix: Water **Received:** 2020/04/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Low level PFOS and PFOA by SPE/LCMS	LCMS	6709927	2020/05/05	2020/05/05	Janet Dalisay

BV Labs ID: MNS893 **Collected:** 2020/04/28
Sample ID: SYSTEM#1 EFFLUENT **Shipped:**
Matrix: Water **Received:** 2020/04/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Low level PFOS and PFOA by SPE/LCMS	LCMS	6709927	2020/05/05	2020/05/05	Janet Dalisay

BV Labs ID: MNS894 **Collected:** 2020/04/28
Sample ID: SYSTEM#2 MIDPOINT **Shipped:**
Matrix: Water **Received:** 2020/04/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Low level PFOS and PFOA by SPE/LCMS	LCMS	6709927	2020/05/05	2020/05/05	Janet Dalisay

BV Labs ID: MNS895 **Collected:** 2020/04/28
Sample ID: SYSTEM#2 EFFLUENT **Shipped:**
Matrix: Water **Received:** 2020/04/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Low level PFOS and PFOA by SPE/LCMS	LCMS	6709927	2020/05/05	2020/05/05	Janet Dalisay

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

BV Labs Job #: C0A6377
Report Date: 2020/05/08

Barnstable County
Client Project #: BARNSTABLE COUNTY
Site Location: BCFRTA
Sampler Initials: MM

GENERAL COMMENTS

Sample MNS891 [(PRW-4)INFLLUENT] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Sample MNS892 [SYSTEM#1 MIDPOINT] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Results relate only to the items tested.

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BV Labs Job #: C0A6377
Report Date: 2020/05/08

Barnstable County
Client Project #: BARNSTABLE COUNTY
Site Location: BCFRTA
Sampler Initials: MM

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
6709927	JDA	Spiked Blank	13C2-6:2-Fluorotelomersulfonic Acid	2020/05/05		92	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/05/05		88	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/05/05		90	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/05/05		85	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/05/05		90	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/05/05		80	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/05/05		82	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/05/05		93	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/05/05		73	%	50 - 150
			13C4-Perfluoroheptanoic acid	2020/05/05		92	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/05/05		89	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/05/05		84	%	50 - 150
			13C5-Perfluorononanoic acid	2020/05/05		91	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/05/05		89	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/05/05		54	%	20 - 130
			18O2-Perfluorohexanesulfonic acid	2020/05/05		92	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/05/05		96	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2020/05/05		93	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2020/05/05		92	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2020/05/05		96	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2020/05/05		91	%	70 - 130
			Perfluorononanoic acid (PFNA)	2020/05/05		95	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2020/05/05		91	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2020/05/05		93	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2020/05/05		95	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2020/05/05		91	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2020/05/05		88	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2020/05/05		93	%	70 - 130
			Perfluoropentanesulfonic acid PFPes	2020/05/05		102	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2020/05/05		95	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2020/05/05		91	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2020/05/05		94	%	70 - 130
			Perfluorononanesulfonic acid (PFNS)	2020/05/05		89	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2020/05/05		88	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2020/05/05		93	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2020/05/05		91	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2020/05/05		90	%	70 - 130
6709927	JDA	Spiked Blank DUP	13C2-6:2-Fluorotelomersulfonic Acid	2020/05/05		83	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/05/05		84	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/05/05		93	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/05/05		87	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/05/05		92	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/05/05		83	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/05/05		80	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/05/05		96	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/05/05		84	%	50 - 150
			13C4-Perfluoroheptanoic acid	2020/05/05		94	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/05/05		92	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/05/05		82	%	50 - 150
			13C5-Perfluorononanoic acid	2020/05/05		93	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/05/05		89	%	50 - 150

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			13C8-Perfluorooctane Sulfonamide	2020/05/05		65	%	20 - 130
			18O2-Perfluorohexanesulfonic acid	2020/05/05		96	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/05/05		100	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2020/05/05		99	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2020/05/05		98	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2020/05/05		100	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2020/05/05		97	%	70 - 130
			Perfluorononanoic acid (PFNA)	2020/05/05		100	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2020/05/05		98	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2020/05/05		97	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2020/05/05		99	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2020/05/05		97	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2020/05/05		92	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2020/05/05		98	%	70 - 130
			Perfluoropentanesulfonic acid PFPes	2020/05/05		108	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2020/05/05		97	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2020/05/05		95	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2020/05/05		100	%	70 - 130
			Perfluorononanesulfonic acid (PFNS)	2020/05/05		94	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2020/05/05		92	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2020/05/05		97	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2020/05/05		98	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2020/05/05		94	%	70 - 130
6709927	JDA	RPD	Perfluorobutanoic acid (PFBA)	2020/05/05	4.5		%	30
			Perfluoropentanoic acid (PFPeA)	2020/05/05	5.9		%	30
			Perfluorohexanoic acid (PFHxA)	2020/05/05	5.9		%	30
			Perfluoroheptanoic acid (PFHpA)	2020/05/05	3.8		%	30
			Perfluorooctanoic acid (PFOA)	2020/05/05	5.7		%	30
			Perfluorononanoic acid (PFNA)	2020/05/05	5.1		%	30
			Perfluorodecanoic acid (PFDA)	2020/05/05	7.4		%	30
			Perfluoroundecanoic acid (PFUnA)	2020/05/05	4.1		%	30
			Perfluorododecanoic acid (PFDoA)	2020/05/05	4.1		%	30
			Perfluorotridecanoic acid (PFTRDA)	2020/05/05	6.3		%	30
			Perfluorotetradecanoic acid(PFTEDA)	2020/05/05	4.1		%	30
			Perfluorobutanesulfonic acid (PFBS)	2020/05/05	5.0		%	30
			Perfluoropentanesulfonic acid PFPes	2020/05/05	5.7		%	30
			Perfluorohexanesulfonic acid(PFHxS)	2020/05/05	2.9		%	30
			Perfluoroheptanesulfonic acid PFHpS	2020/05/05	4.7		%	30
			Perfluorooctanesulfonic acid (PFOS)	2020/05/05	6.4		%	30
			Perfluorononanesulfonic acid (PFNS)	2020/05/05	6.2		%	30
			Perfluorodecanesulfonic acid (PFDS)	2020/05/05	5.1		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2020/05/05	5.2		%	30
			6:2 Fluorotelomer sulfonic acid	2020/05/05	7.4		%	30
			8:2 Fluorotelomer sulfonic acid	2020/05/05	3.6		%	30
6709927	JDA	Method Blank	13C2-6:2-Fluorotelomersulfonic Acid	2020/05/05		93	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/05/05		94	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/05/05		89	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/05/05		88	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/05/05		97	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/05/05		85	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/05/05		89	%	50 - 150

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

BV Labs Job #: C0A6377
Report Date: 2020/05/08

Barnstable County
Client Project #: BARNSTABLE COUNTY
Site Location: BCFRTA
Sampler Initials: MM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			13C3-Perfluorobutanesulfonic acid	2020/05/05		94	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/05/05		94	%	50 - 150
			13C4-Perfluoroheptanoic acid	2020/05/05		95	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/05/05		95	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/05/05		94	%	50 - 150
			13C5-Perfluorononanoic acid	2020/05/05		95	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/05/05		93	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/05/05		80	%	20 - 130
			18O2-Perfluorohexanesulfonic acid	2020/05/05		94	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/05/05	<0.45		ng/L	
			Perfluoropentanoic acid (PFPeA)	2020/05/05	<0.48		ng/L	
			Perfluorohexanoic acid (PFHxA)	2020/05/05	<0.26		ng/L	
			Perfluoroheptanoic acid (PFHpA)	2020/05/05	<0.37		ng/L	
			Perfluorooctanoic acid (PFOA)	2020/05/05	<0.23		ng/L	
			Perfluorononanoic acid (PFNA)	2020/05/05	<0.48		ng/L	
			Perfluorodecanoic acid (PFDA)	2020/05/05	<0.18		ng/L	
			Perfluoroundecanoic acid (PFUnA)	2020/05/05	<0.38		ng/L	
			Perfluorododecanoic acid (PFDoA)	2020/05/05	<0.25		ng/L	
			Perfluorotridecanoic acid (PFTRDA)	2020/05/05	<0.30		ng/L	
			Perfluorotetradecanoic acid(PFTEDA)	2020/05/05	<0.16		ng/L	
			Perfluorobutanesulfonic acid (PFBS)	2020/05/05	<0.37		ng/L	
			Perfluoropentanesulfonic acid PFPes	2020/05/05	<0.28		ng/L	
			Perfluorohexanesulfonic acid(PFHxS)	2020/05/05	<0.33		ng/L	
			Perfluoroheptanesulfonic acid PFHpS	2020/05/05	<0.63		ng/L	
			Perfluorooctanesulfonic acid (PFOS)	2020/05/05	<0.43		ng/L	
			Perfluorononanesulfonic acid (PFNS)	2020/05/05	<0.55		ng/L	
			Perfluorodecanesulfonic acid (PFDS)	2020/05/05	<0.36		ng/L	
			Perfluorooctane Sulfonamide (PFOSA)	2020/05/05	<0.31		ng/L	
			6:2 Fluorotelomer sulfonic acid	2020/05/05	<0.43		ng/L	
			8:2 Fluorotelomer sulfonic acid	2020/05/05	<0.47		ng/L	

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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BV Labs Job #: C0A6377
Report Date: 2020/05/08

Barnstable County
Client Project #: BARNSTABLE COUNTY
Site Location: BCFRTA
Sampler Initials: MM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Adam Robinson, Supervisor, LC/MS/MS

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

July, 2020

Mark S. Ells, Town Manager
Town of Barnstable
200 Main Street
Hyannis, MA 02601

RE: Immediate Response Action Status and Remedial Monitoring Report #41
Barnstable County Fire and Rescue Training Academy
155 South Flint Rock Road
Barnstable, Massachusetts
DEP Release Tracking No. 4-26179
Project File #6206

Dear Mr. Ells,

As required by the Massachusetts Contingency Plan (MCP) 310 CMR 40.1403(3)(e) and 40.1403(6), BETA Group, Inc.(BETA) is notifying you on behalf of our client, Barnstable County, that an Immediate Response Action (IRA) Status and Remedial Monitoring Report (RMR) No. 38 is being submitted to the Massachusetts Department of Environmental Protection – Bureau of Waste Site Cleanup (MassDEP – BWSC) for the release site referenced as the Barnstable County Fire and Rescue Training Academy (BCFRTA) located at 155 South Flint Rock Road in Barnstable, Massachusetts (the site). This Report summarizes the IRA activities that occurred from April 1 to April 30, 2020.

Pursuant to the Massachusetts Contingency Plan (310 CMR 40.0480), an Initial Site Investigation has been performed at the site. A release of oils and/or hazardous materials has occurred at the site. In August 2016, MassDEP Southeast Regional Office issued a Notice of Responsibility (NOR) to Barnstable County, as current owner and operator of the Barnstable County Fire and Rescue Training Academy (BCFRTA), that the detection of elevated concentrations of poly- and perfluorylalkyl substances (PFAS) in groundwater at the site constituted a release under the MCP. MassDEP issued Release Tracking Number (RTN) 4-26179 to this release. As summarized in the NOR, based on the detected PFAS concentrations in soil and groundwater at the BCFRTA and the inferred groundwater flow, MassDEP determined that the releases of PFAS from the use of aqueous film-forming foam (AFFF) at the BCFRTA is a source of PFAS detected in the Mary Dunn wells.

During the April 2020 reporting period, the treatment system was operable for approximately 30 days. The overall (average) system flow rate and total gallons of groundwater treated are based on the available Effluent flow totalizer readings reported for both systems by the O&M contractor. For the April 2020 reporting period, both systems treated an approximate combined 1.01 million gallons of groundwater from the downgradient recovery well PRW-4 at an average total (of the two systems) effluent flow rate of 23.4 gpm.

BETA Group Inc.
701 George Washington Highway, Lincoln, RI 02865
P : 401.333.2832 |F: 401.333.9225 |W: beta-inc.com

Approximately 0.009 kilograms of PFAs were estimated to have been removed from the plume area during this reporting period. PFAs breakthrough into the effluent from the activated carbon treatment system was not observed.

At this time, IRA activities are ongoing. Continuing IRA activities will include operation and monitoring of the on--Site Groundwater Pump and Treatment Systems (GWPTS), including performance sampling of GWPTS, review and evaluation of the on-Site GWPTS operation and maintenance activities as they affect groundwater treatment, and periodic groundwater monitoring. Additional details regarding the continuing IRA activities are included in the IRA Status and RMR No. 41 report document.

The IRA Status and RMR document is available electronically via the searchable sites database of the MassGOV / MassDEP website via the following link:

https://eeaonline.eea.state.ma.us/portal#!/wastesite/4-0026179

If you have any questions or comments, please do not hesitate to contact our office.

Sincerely,
BETA Group, Inc.

Roger P. Thibault, P.E., LSP
Senior Environmental Engineer

Copies: Mass Department of Environmental Protection
Southeast Regional Office
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Lakeville, MA 02347

Thomas Mckean, Director
Town of Barnstable Health Division
200 Main Street
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