DRAFT PUBLIC COMMENT
PHASE II COMPREHENSIVE SITE ASSESSMENT
SCOPE OF WORK
RTN 4-26179

Barnstable County Fire & Rescue Training Academy, Barnstable, MA

July 2021

BETA
701 George Washington Hwy
Lincoln, Rhode Island 02865
401.333.2382
www.BETA-Inc.com

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JULY 2021

Prepared by: BETA GROUP, INC.
Prepared for: Massachusetts Department of Environmental Protection - SERO

cc: Barnstable County

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DRAFT PHASE II COMPREHENSIVE SITE ASSESSMENT (CSA) SCOPE OF WORK

1.0 INTRODUCTION

On behalf of Barnstable County, BETA Group, Inc. (BETA) submits this Public Comment Draft Scope of Work (SOW) for the Phase II Comprehensive Site Assessment (CSA) for the Barnstable County Fire and Rescue Training Academy (FTA) PFAS release Site. The PFAS release Site is associated with the FTA facility located at 155 South Flint Rock Road in Barnstable, Massachusetts. The Massachusetts Department of Environmental Protection (MassDEP) Bureau of Waste Site Cleanup (BWSC) Release Tracking Number (RTN) for the Site is 4-26179.

For the purposes of this MCP submittal, the property on which the Barnstable County Fire and Rescue Training Academy FTA is located will be referred to as the FTA or facility. FTA or facility will also refer to the structures, land and former or current limited functions of the FTA. In accordance with the MCP definition, where contamination attributable to the PFAS Release associated with firefighting foams and training on the FTA have come to be located will be referred to as the Disposal Site or Site.

The Massachusetts Contingency Plan requires the preparation of a Phase II SOW following the submission of the Phase I Initial Site Investigation (ISI). A conceptual Phase II SOW was included with the MCP Phase I ISI and Tier Classification submitted to DEP in May 2018. However, MassDEP indicated in email correspondence that a formal, full Phase II CSA SOW submittal was required for the RTN 4-26179 Site. This document presents the formal proposed Phase II CSA SOW. In accordance with the Public Involvement Plan (PIP) for the Site, this document is being submitted as a Public Comment Draft.

This document is being submitted as an attachment the completed BWSC107 Tier Classification Transmittal Form being submitted to the Massachusetts Department of Environmental Protection (MassDEP) electronically via the eDEP system. A copy of the BWSC 107 form prior to electronic signature is included as Appendix A.

Site Owner and Site Contacts

As current owners of the FTA, Barnstable County, as represented by the Barnstable County Commissioners, have been named as the Potentially Responsible Party (PRP) for this release. The contact person for the Disposal Site and release is:

Stephen Tebo
Barnstable County Asset and Infrastructure Manager
Barnstable County
3195 Main Street
Barnstable, MA 02630

Telephone: 508-375-6643
Email: stebo@barnstablecounty.org

The Licensed Site Professional of Record for this Site is:

Roger Thibault, P.E., LSP No. 1443
Associate
BETA Group Inc.
701 George Washington Highway
Lincoln, RI 02865
Phone: (401) 333-2382

2.0 RELEASE BACKGROUND

In November 2013 soil and groundwater samples were collected from the FTA property and submitted for laboratory analysis of PFAS. Groundwater analytical results revealed that groundwater at the FTA was impacted by PFOS and MassDEP was subsequently notified. RTN 4-26179 was assigned to the Site in August 2016. PFOS was also detected in soil at the FTA and in surface water and sediment within the adjacent Flintrock Pond.

As a voluntary measure, Barnstable County refurbished the former perchlorate pumping and treatment system located at the FTA to help remediate and contain the PFOS apparently migrating from the facility. The groundwater pumping and treatment system (GWPTS) was re-started using granular activated carbon (GAC) for treatment in July 2015. The system utilizes a groundwater recovery well, PRW-4, located approximately 925feet southeast of the FTA. The current groundwater treatment system (GWTS) itself is located in a structure on the FTA grounds.

In August 2015, Barnstable County funded a more detailed hydrogeological assessment and continued implementation of groundwater pumping and treatment. The soil results indicated a broad area of PFOS contamination throughout the subsurface. The highest PFOS concentrations were detected near the southwestern corner of the FTA, a location subsequently referred to as the "Hot Spot". Groundwater analytical results from the 2015 assessment revealed PFOS contamination ranging from less than 0.070 µg/L) (the current US EPA HA)[1] to greater than 70 µg/L. Like the soil results, the highest PFOS concentrations were detected near the southwestern corner of the FTA.

On August 4, 2016, MassDEP issued a Notice of Responsibility (NOR) to Barnstable County. As summarized in the NOR, based on the detected PFAS concentrations in soil and groundwater at the FTA and the inferred groundwater flow direction being to the southeast (toward the Mary Dunn wells), MassDEP determined that the releases of PFAS from the historic use of AFFF (for training) at the FTA is a source of PFAS detected in the Mary Dunn wells. The NOR required submittal of an Immediate Response Action (IRA) Plan no later than September 15, 2016. MassDEP requested that the Site owner evaluate potential Imminent Hazards relative to downgradient public and private water supply wells. MassDEP stated that the IRA Plan should include measures to prevent, eliminate, and/or abate any hazards associated with the consumption of drinking water impacted by PFAS above the HA level of 0.070 ug/L.

[1] 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 applies to the total summed of five PFAS chemicals, PFOS, PFOA, PFNA, PFHxS, and PFHpA, effective June 11, 2018. MassDEP released drafted Method 1 groundwater risk standards for PFAS on April 19, 2019 that applies to the total sum and individual concentrations of six PFAS compounds (PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFDA) , which is 20 ng/L. These drafted groundwater standards were finalized and became effective on December 27, 2019.

On September 27, 2016, on behalf of Barnstable County, the Cape Cod Commission (acting as LSP for the Site on behalf of the County) submitted an IRA Plan to MassDEP to address the PFOS/PFOA impacts. Key elements of the IRA Plan included a proposed soil removal action at the Hot Spot, evaluation of expansion of the groundwater pumping and treatment system and addressing other possible groundwater receptors.

Approximately 200 tons of heavily impacted soil were removed from the Hot Spot area in January 2017, reducing the primary source of PFOS contamination leaching into groundwater. However, post-removal grading and settling of the backfill in the Hot Spot area left it prone to infiltration of runoff from the southern portion of the FTA.

In May 2018, a Phase I Initial Site Investigation (ISI) Report and Tier Classification Submittal was submitted to MassDEP by Nover-Armstrong Associates on behalf of Barnstable County. The Phase I ISI confirmed that the primary contaminant of concern is PFOS and, to a lesser extent, PFOA. A Tier Classification was submitted to MassDEP concurrently with the Phase I Report. The RTN 4-26179 release was classified as Tier I.

Groundwater monitoring of PFAS compounds across the Site has been ongoing since November 2013. BETA, formerly Nover-Armstrong Associates, has conducted groundwater monitoring activities since June 2018. Elevated PFAS concentrations (relative to MCP risk standards and the MassDEP drinking water maximum contaminant levels) remain in Site groundwater, as they have been documented to be since the onset of monitoring. However, concentrations have trended towards a significant decrease especially in the Hot Spot area since PFAS assessment and partial remediation started at the Site in 2015 with some exceptions. Groundwater flow direction has been calculated by the Cape Cod Commission and BETA to be in a southeasterly direction from the FTA Site towards the Mary Dunn well field.

As noted above, response actions to address PFAS included the renovation of a GWPTS in July 2015. The operational GWPTS was later noted in the NOR issued by MassDEP in August 2016 as part of the on-going IRAs. As noted the NOR also requested that Barnstable County install additional recovery wells or increase the groundwater recovery rate to increase PFAS removal. In November 2019, a temporary supplemental treatment system was installed, designated as GWTS#2, to treat water from the existing recovery well. The second force main was re-piped and connected via hose and hard piping to temporary treatment system GWTS#2. The system is contained in a temporary structure and is designed to treat PFAS-impacted groundwater (via adsorption technology with liquid phase granular activated carbon) at a target flow rate of approximately 30 gpm.

In response to the Request for Expedited Immediate Response Action Plan Modification/Interim Deadline-Enforcement Document Number 6694, dated May 1, 2019 issued by the Massachusetts Department of Environmental Protection (MassDEP) and amended by email correspondence by the MassDEP, BETA (on behalf of the County) submitted a Draft IRA Plan Modification to DEP detailing preliminary plans for the expansion of the groundwater recovery and treatment system and capping measures to prevent infiltration of precipitation through the soils at the Site. Following the receipt of public comment, the IRA Plan Modification was finalized in December 2019 and design plans for Sitewide capping were submitted for approval to the Town of Barnstable via a Notice of Intent in February 2020. Final design approval and an Order of Conditions was obtained in November 2020 and January 2021 respectively. The construction of the capping design will be funded via the Clean Water

Trust State Revolving Fund (CWTSRF); the County received Bids for the project in April 2021. The project was awarded in July 2021. Construction is anticipated to begin in August 2021.
Additionally, the continued expansion of the groundwater recovery and treatment system is contingent upon the receipt of additional funding for the County.

As detailed in previous IRA Status and Remedial Monitoring Reports, specifically reports for the January and May 2021 reporting periods, elevated PFAS concentrations are still present in Site groundwater.

Public Involvement

In January 2019, a petition from a group of residents of Barnstable and Hyannis, MA was received, requesting that the Site be designated a Public Involvement Plan (PIP) Site. In response to the request from the local petitioners, Barnstable County designated the Site as a PIP site, prepared Draft and Final Public Involvement Plans and conducts all relevant MCP response actions under public involvement procedures. As stated in the Final PIP, prior to the completion of a major regulatory milestone, public comment will be solicited, and comments received will potentially be incorporated prior to the implementation of the milestone/response action.

3.0 PHASE II SCOPE OF WORK - OVERVIEW

3.1 Introduction

Based on the compiled Phase I Initial Site Investigation data, BETA opined in the Phase I report that continuation of the IRA activities, additional assessment and, potentially, additional remedial Response Actions are warranted at the Disposal Site. Continuing IRA remediation and assessment work at the Site conducted since submittal of the Phase I ISI Report confirm those conclusions.

A Phase II Conceptual Scope of Work (SOW) was submitted with the Phase I ISI outlining the scope, nature of investigation, and sample programs proposed to characterize the risk of harm posed to health, safety, public welfare, and the environment (for regulatory closure). As noted, MassDEP indicated in email correspondence that a formal, full Phase II CSA SOW submittal was required for the RTN 4-26179 Site.

The Site does not currently meet the criteria for a Permanent Solution and requires additional Comprehensive Response Actions (CRAs). Accordingly, pursuant to 310 CMR 40.0834 – Phase II Scope of Work, the scope and nature of proposed investigation and sampling programs are described herein.

3.2 Objectives

In accordance with MCP 310 CMR 40.0833, the Phase II CSA will focus on achieving the following objectives:

1. Assessing and determining to the extent feasible, the nature and extent of the MCP-regulated PFAS contamination at the Site.

2. Evaluating the fate and transport of MassDEP-regulated PFAS at the Site as supported by the currently available science and research.
3. Evaluate the potential exposure and risk of adverse impacts to human health and the environment as a result of the PFAS release to the environment.
4. Develop a conceptual site model (CSM).
5. Derive conclusions based on the data obtained to support the evaluation and selection of Comprehensive Remedial Response Actions.

The Release associated with RTN 4-26179, at the Site, has already been the subject of extensive assessment with over 55 monitoring wells installed and greater than 25 additional soil borings advanced to date. Assessment conducted to date also includes numerous test pits, subsurface and surficial soil sampling and analytical testing, and testing of surface water and numerous sediment samples from the adjacent Flintrock Pond. The Site is subject to IRA quarterly Site-wide groundwater monitoring.

Lastly, pumping and treatment of impacted groundwater from a recovery well located approximately 925 feet downgradient of the FTA is on-going as an IRA; this remedial action continues to provide empirical hydrogeologic and groundwater quality data for the Site. Therefore, the media sampling components of the Phase II CSA SOW presented herein are focused on identifying and then addressing data gaps regarding: i) groundwater impacts at large distances from the source area, ii) soil impacts at and in close proximity to the FTA itself, and iii) contaminant conditions in adjacent surface water bodies.

Previous investigators for the Site identified PFAS impacts to the south of Mary Dunn Pond located over 0.5 mile southeast of the FTA source area, which they attributed to the FTA Site. Recent submittals to MassDEP for the documented PFAS release (RTN 4-26347) at the Barnstable Municipal Airport assert that the FTA-related PFAS impacts extend to the Airport and potentially beyond, a total of approximately 0.5 to 1.0 mile. However, recent groundwater assessment for the FTA PFAS Site has not revealed PFAS impacts to the groundwater at the upgradient side (north) of Mary Dunn Pond and low to non-detect PFAS concentrations at the currently identified southeast edge of the plume located approximately 875 feet southeast of the facility perimeter. The validity of the previous and current assertions regarding the southeasterly extent of the FTA Disposal Site, as defined by the MCP, has not been definitively established in the opinion of BETA and Barnstable County. These assertions will be addressed within the limitations of the resources available to the County during this Phase II CSA. However, formally and completely addressing the assertions regarding the southeasterly extent of historic PFAS impacts to groundwater from the FTA source area would require a regional study approaching the magnitude of site assessments associated with US EPA Superfund and US Department of Defense hazardous waste sites. Such assessment is beyond the resources of the County at this time.

The applicable components of the Phase II CSA SOW presented below include initial tasks to assess the current extent of the PFAS impacts to groundwater immediately south of Mary Dunn Pond and southeast of the FTA along the currently identified edge of the PFAS plume. If significant FTA-related PFAS groundwater impacts are detected in these locations, supplemental Phase II assessment, not included in this SOW, may be required. Such assessment would be the subject of a Supplemental Phase II CSA SOW.

3.3 Organization of the Proposed Phase II Scope of Work

Numerous tasks are proposed in an attempt to achieve the Phase II CSA objectives. Sections 4.0 through 8.0 of this document present the proposed tasks that comprise the proposed Phase II CSA SOW. The sections are organized into major categories of assessment of environmental media or Site features (such as soil, groundwater and surface water bodies), evaluations of exposures and risks, and evaluation of hydrogeologic conditions. Proposed tasks are numbered within each section of the scope of work.

4.0 PHASE II CSA SURFICIAL AND SUBSURFACE ASSESSMENT

Task 4.1 Soil Assessment

Recent and historic subsurface assessment revealed elevated concentrations of PFAS in soils, specifically within the vadose zone and/or at the water table interface, dominated at most locations by the PFOS, PFHxS, and PFDA compounds (PFAS compounds typical of a PFAS release from the use of AFFF); PFAS concentrations decrease with increasing depth below the vadose zone and are typically below the MCP Method 1 S-1 Soil Standards from 12 to 14 feet below ground surface (bgs). The Cape Cod Commission and BETA have advanced a total of 37 soil borings and 5 test pits throughout the FTA property, including recent IRA activities that have significantly increased the data on PFAS concentrations in soils on the FTA facility. However, data gaps are identified for subsurface soils in limited locations on the FTA itself and for surficial soils on the FTA and in close proximity to the facility. Downgradient of the FTA facility, the impacts from the FTA are considered to be only to groundwater.

4.1.1 Supplemental Soil Borings

Based on the results of previous assessments, Task 4.1.1 will focus on further assessing PFAS impacts to surficial and shallow subsurface soils within the vadose zone. BETA is proposing to conduct additional assessment of the soil on the FTA and potentially downgradient of the FTA for purposes of determining the nature and extent of the PFAS in soil and its influence on the groundwater PFAS contaminant plume. BETA is proposing to advance up to 12 soil borings, with up to 4 finished as monitoring wells (see Task 4.3 for additional discussion of monitoring well installations) on the FTA facility and in areas immediately to the east and south of the FTA property; Figure 1 depicts the proposed boring locations. Soil borings will be advanced to a maximum depth of 15 feet with the exception of borings to be finished as monitoring wells, which will be advanced to depths of 15 to 20 feet bgs depending on location and depth of groundwater.

Drilling methods will be direct push via a Geoprobe drilling rig and/or auguring via a hollow stem auger drilling rig and soil samples will be collected via polyacetate sleeves and/or split spoon samplers.

Phase II soil boring assessment will include:

a) Soil samples will be field screened and geologic descriptions will be logged.

b) Soil samples will be collected at each borehole in shallow soils, within the vadose zone, and at select depths based on previous assessment data and Site history. Selected soil samples collected will be submitted for laboratory analysis of PFAS via ASTM Method 6978-17m, Total Organic Carbon, Total Iron, Total Manganese, pH, Conductivity, and ORP.

c) All displaced soils will be placed back in the borehole.

d) Horizontal GPS coordinates of each boring location will be logged.

4.1.2 Surficial and Shallow Soil Sampling

To assess for PFAS impacts from possible aerial transport of AFFF or related aerosols during historic fire training exercises, Task 4.0 will also include manual sampling of shallow soils along up to six 45 foot long transects extending to the south or east from the existing fence line of the FTA. Approximate proposed locations of the transects are shown on Figure 1. Along each transect soil samples will be collected at zero, 15, 30 and 45 feet from the fence line of the FTA and from two depths at each location, 0 - 4 inches and 16-20 inches below grade. Soil samples collected will be submitted for laboratory analysis of PFAS via ASTM Method 6978-17m, Total Organic Carbon, Total Iron, Total Manganese, pH, Conductivity, and ORP.

Task 4.2 Exploration and Documentation of Historic and Current Subsurface Site Features

In an effort to determine potential additional PFAS sources on the FTA property, BETA proposes to oversee the excavation of test pits within the central and northern portions of the FTA facility to locate and identify the septic system, explore an existing basin (reportedly used historically for recharge of treated groundwater) beneath the northern paved area, and explore other potential locations of undocumented historic structures or subsurface site features, such as the reported burn pits. Test pits and features observed will be documented via logs and photos and located via GPS surveying methods. Soil in the area of these structures would be field screened and geologic descriptions will be noted.

Depending on observations, soil samples will be collected and submitted for the laboratory analysis of PFAS via ASTM Method 6978-17m, Total Organic Carbon, Total Iron, Total Manganese, pH, Conductivity, and ORP. Soil samples collected will be focused on overt indications of contamination such as staining, soils below remnants of historic features, if observed, and soil at the vadose/smear zone and in shallow depths into the water table.

Task 4.3 Groundwater Monitoring and Assessment

During the Phase II CSA groundwater quality will continue to be updated and monitored via continued quarterly and annual rounds of groundwater sampling and analyses. Site-wide groundwater monitoring will follow the 2018 MassDEP approved sampling plan. Currently the sampling plan includes the quarterly sampling of 12 select monitoring wells and an additional 8 monitoring wells as part of the annual sampling plan. The current groundwater monitoring program is included in Appendix B.

As part of the Phase II CSA, additional monitoring will be conducted to:

- Supplemental spatially and geographically the Site groundwater data,
- Sample newly or recently installed monitoring wells,
- Assess groundwater in new areas of concern such as west of Flintrock Pond.

Up to 12 additional wells will be added to the 20 locations used for annual monitoring for a total of 32 sampling locations for Phase II purposes; see Task 3.2 below.

BETA will review the existing available groundwater data to refine the current understanding of the nature and extent of the PFAS contamination that has been detected in Site groundwater and make final

determinations regarding the number and specific locations of additional monitoring wells to be installed under this Task 4.3.1 below.

Similarly, the review will be used to make final determinations regarding the number and specific locations of additional monitoring wells to be sampled under Task 4.3.2.

Task 4.3.1 Supplemental Monitoring Well Installations

As noted in Task 1.0, up to four(4) new borings installed for soil assessment purposes will be finished as monitoring wells on or near the FTA facility specifically adjacent to the septic system leaching field, on the northern portion of the facility, and south and east of the FTA facility. Figure 1 and Figure 2 depict the proposed monitoring well/boring locations. Drilling will be by direct push via a Geoprobe drilling rig and/or auguring via hollow stem auger drilling rig. The depicted proposed locations are subject to change.

In addition, up to six (6) additional monitoring wells will be installed at locations away from the FTA facility, including:

- Up to four (4) monitoring wells west of Flintrock Pond, consisting of at least one couplet.
- Up to three (3) wells at the currently indicated southeast limits of the PFAS plume to increase the spatial coverage in this area.
- One well will replace a key quarterly monitoring well, PC-9, that is no longer functional.
- Two monitoring wells will be installed east of the FTA to provide spatial coverage around Mary Dunn Well #3.

Figure 2 depicts the proposed monitoring well/boring locations.
Wells will be installed using hollow stem auger or drive and wash drilling methods, depending on the required depths to reach groundwater and soil conditions. Monitoring wells will consist of the following construction details:

- Monitoring wells will be constructed as 2.0" diameter, schedule 40, Poly Vinyl Chloride (PVC) pipe; well sections are connected with a flush threaded joint;
- Well screens will be at least 10 feet from the bottom depth of the well with a slot size of 0.010".
- Well screens will be backfilled with washed silica sand and a bentonite pellet seal above the well screen. Well casings (steel standpipes) will be installed above at each monitoring well.
- The standpipes will be secured with keyed locks.

Task 4.3.2 Phase II CSA Groundwater Monitoring

BETA will sample the wells listed as annual monitoring points, the selected additional existing monitoring wells, and the newly installed monitoring wells, in order to more accurately delineate and monitor the groundwater contaminant plume. Two rounds of this expanded Phase II CSA groundwater monitoring program will be conducted during two different seasons: the typical, historically low and high groundwater times of year.

Groundwater monitoring as part of this Phase II CSA will include:

a) All wells to be sampled, as well as all accessible and viable existing monitoring wells will be gauged prior to purging for sampling.

b) Groundwater sampling will be conducted via EPA Low Flow Method Rev. 4. The standard groundwater quality parameters (pH, dissolved oxygen, oxidation- reduction potential (ORP), specific conductivity , temperature, and turbidity) will be recorded in-situ during purging and sampling and specific PFAS sampling methods and protocols will be employed.

c) Collect and submit groundwater samples from up 32 wells for the laboratory analysis for (at a minimum) PFAS via EPA Method 537 modified, Dissolved Iron, and Total Organic Carbon (TOC). Additional parameters (through various methods) will be added as necessary to help in assessing the fate and transport of the contaminant plume.

Task 4.4 Comprehensive Compilation and Evaluation of Groundwater Analytical Data

All groundwater analytical data will be collected, compiled into expanded tables, and reviewed. Contaminant plume maps will be prepared and updated quarterly based on new data. The fate and transport of PFAS will be assessed based on the evaluation of received data with published scientific research.

5.0 HYDROGEOLOGICAL ASSESSMENT

BETA in conjunction with Bristol Engineering will conduct a Site-wide hydrogeological assessment with focuses on addressing the concerns of potential PFAS migration (from the FTA) to the west towards the Barnstable Fire District (BFD) public water supply wells, potential migration to the southeast of the Site, and potential migration of PFAS from Flintrock Pond to underlying and adjacent groundwater. In addition, the fate and transport of the current PFAS plume as it relates to the Mary Dunn municipal well system will be evaluated. This hydrogeologic assessment will be conducted in conjunction with modelling to evaluate the expansion of groundwater pumping as part of the design alternatives for the expansion of the current groundwater pumping and treatment system. All collected data will be compiled and reviewed in conjunction with Bristol Engineering.

The hydrogeologic assessment described in this section, in particular, the modelling efforts, will be partially dependent on obtaining reasonably detailed pumping records for the municipal wells in question.

Task 5.1 Site-Wide Hydrogeological Assessment

a) Update the hydrogeologic evaluation of Site conditions by collecting groundwater gauging data from new and existing monitoring wells, calculating elevations, and inferring groundwater flow direction from elevation data.

b) Review available USGS data and reports, including Zone II Study reports. Review hydrogeologic characteristics, history, components, design capacity and actual flow rates of existing groundwater pumping systems (if data are available and if operation will continue in the future). This review will focus on Mary Dunn Wells 1, 2 and 3 and on Barnstable Fire District Well #5.

c) Conduct pump tests on the existing recovery well and/or a new or existing monitoring well with appropriate characteristics for the evaluation of overall hydrogeology and preliminary design of the expanded groundwater treatment system. The aquifer response and yields, PFAS concentrations in the recovered groundwater, and modeled capture zone of a potential new well from pump tests results will be important factors in the groundwater recovery evaluation and design, as well as the overall evaluation of comprehensive remedial response actions.

d) Obtain approximate horizontal GPS coordinates and estimated elevations of identified existing monitoring wells, not already surveyed.

e) Install gauging equipment such as piezometers in Flintrock Pond.- Calculate groundwater elevations and evaluate inferred flow from the pond to underlying and adjacent groundwater.

Task 5.2 Hydrogeological Assessment West of Flintrock Pond

BETA in conjunction with Bristol Engineering is currently conducting research and preliminary non-intrusive assessment of groundwater conditions west of Flintrock Pond in an initial attempt to address concerns regarding potential PFAS migration from the FTA and/or Flintrock Pond to the west towards the BFD public water supply wells. On February 16, 2021, BFD provided property access and permission to conduct initial reconnaissance and inspection of existing monitoring wells west of Flintrock Pond following the exchange of written correspondence. BETA and Bristol Engineering are performing research and review regarding BFD Well No. 5, existing monitoring wells between Flint Rock Pond and No. 5, and the hydrogeology of the zone between the well and the pond. The relevant information obtained will be compiled and summarized to support additional Phase II CSA subsurface assessment, described below, as well as address recent claims by the BFD about potential impacts to their wells from the FTA.

a) Following the completion and review of the data collected from the tasks described above up to four (4) additional monitoring wells will be installed west of Flintrock Pond on BFD property. The preliminary proposed locations (approximate only) are depicted in Figure 2.; Specific locations will be determined following the initial research and assessment; therefore, these locations may be subject to change/relocation.

b) Monitoring wells will be installed via direct push via via hollow stem auger drilling methods.

c) Groundwater sampling will be conducted via EPA Low Flow Method Rev. 4. The standard groundwater quality parameters (pH, dissolved oxygen, oxidation- reduction potential (ORP), specific conductivity , temperature, and turbidity) will be monitored in-situ during purging and sampling. Specific PFAS sampling methods and protocols will be used.

d) Collect and submit groundwater samples for the laboratory analysis (at a minimum) for PFAS via EPA Method 537 modified, Dissolved Iron , Total Organic Carbon (TOC), additional parameters will be added as necessary to help in determining the fate and transport of the contaminant plume.

e) Update the hydrogeologic evaluation of groundwater conditions west of the Site by collecting groundwater gauging data and calculating groundwater flow direction.

6.0 FLINTROCK POND ASSESSMENT

Flintrock Pond is considered a typical, small shallow Cape Cod kettle pond with no inlet or outlet streams and no man-made controls. There is no known public access to the pond. As noted above, it is approximately 6.5 acres in area. Water depths have yet to be studied methodically; available information indicates shallow slopes along the perimeter with maximum depths of 8 to 15 feet at high water.

The Phase II assessment of Flintrock Pond will include extensive sampling in an attempt to assess more comprehensively the nature, extent, fate, and transport (as feasible) of PFAS contamination in the Pond to meet Phase II requirements, support environmental risk characterization, and support Phase III remedial alternative evaluations. This assessment will also support the compliance with the Order of Conditions: Special Conditions of Approval (SE3-5606) issued by the Barnstable Conservation Commission in October 2018. The Pond's hydrogeological interaction with underlying and adjacent groundwater and/or role in the fate and transport of the PFAS from pond media to underlying and/or adjacent groundwater will be evaluated. The CSA scope of work will comply with the environmental risk characterization requirements of the Phase II including at CMR 310 40.0830 and particularly at 40.0995. Both Stage I and II environmental risk screening are included in the proposed scope of work if needed. However, in accordance with the MCP and based on Site-specific criteria, a stepwise approach is proposed that may obviate the need for the Stage II risk screening. If substantial harm is detected during the Stage I screening and/or if hydrogeologic and groundwater quality assessment indicate that the surface water, sediment, or sediment porewater is substantially contributing significant PFAS impacts to the underlying or adjacent groundwater (thus indicating the need for remedial actions), the Stage II environmental risk screening may not be conducted or may be truncated.

PFAS are "emerging contaminants" and scientific data are continuously evolving. Currently, a significant body of scientific information indicates that PFAS are highly stable compounds that are persistent in the environment due to the chemical composition of the PFAS compounds, specifically the carbon-fluorine bond. These characteristics indicate that relatively frequently repeated sediment sampling in similar locations may be of limited utility. The historic and most recent sediment sampling data obtained from Flintrock Pond support this; PFAS concentrations have not significantly changed in between sampling rounds and the most current data are not significantly different from the historic data collected in 2015, with some exceptions. However, spatial data on sediment concentrations as well as thicknesses of sediment, PFAS concentrations in non-muck soils below the pond sediment and other related data are identified as data gaps for the Site. Therefore, additional sampling, especially spatially, will be conducted (Task 6.1) to complete the overall conceptual site model and evaluate remedial alternatives for the pond component of the Disposal Site.

Sediment pore water is a major route of exposure to contaminants for many benthic organisms, as reported in the technical literature. Contaminants in pore water can be transported to groundwater or to overlying water by a variety of processes, thus also potentially exposing fish or other aquatic species in the water column. Therefore, in addition to the laboratory analysis of whole sediment samples, selected sediment samples will be processed by the laboratory using established laboratory techniques to separate the porewater from the solids. A standard analytical method for PFAS will then be run on the separated porewater. See Task 6.2.

Task 6.1 Sediment Assessment – Flintrock Pond

Sediment data collected to date from Flintrock Pond has been collected from 40 to 60 ft. transects off the eastern, adjacent shoreline and 10 to 25 feet from the northeastern bank. The proposed Phase II assessment includes collecting samples across the entire width of the pond and at multiple depths, to the extent feasible. However, sediment samples will be primarily collected from the top 0-6 inches of sediment where contaminants are most readily bioavailable as a result of significant sediment mixing.

Barnstable County and BETA, in conjunction with Barnstable County dredging department, will construct cable crossings of the pond with a means to move a small float or a boat systematically across the pond along the cables.

Sediment samples will be obtained from documented semi-permanent locations throughout the Pond; the sampling locations will be replicated within practical limits. BETA proposes two (2) transects, one crossing from the north to the south (approximately 700 feet) and the other from east to west (approximately 450 feet). See attached Figure 1, Phase II CSA Sampling Plan for the proposed transects/crossings. Sediment sampling is proposed on a 50 linear foot interval. Due to previously obtained PFAS data near the eastern and northern shores and the persistent and non-volatile nature of PFAS compounds observed within the Pond, BETA is proposing to collect a total of approximately 25 sediment samples, including up to 3 samples where an attempt will be made to penetrate the sediment layer and sample granular soil below.

The samples will be collected for laboratory analysis of PFAS6 via ASTM Method 6978-17m, Total Organic Carbon, and Total Iron. pH, Conductivity, and ORP will be measured in the field. Solids content will also be measured as standard part of the laboratory analysis.

Task 6.2 Porewater Assessment

During the sediment assessment, porewater will be collected from the same 40 to 60 ft. transects off the eastern, adjacent shoreline and 10 to 25 feet from the northeastern bank. Porewater samples will be prepared from selected sediment samples collected in conjunction with the sediment samples obtained from the transect locations across the Pond. BETA proposes having up to 12 porewater samples prepared. The sediment porewater samples will laboratory extracted/separated and analyzed for PFAS6 via USEPA Method 537 modified. Select porewater samples may also be submitted for the laboratory analysis of Total Organic Carbon, and Total Iron, as necessary. Analytical results will be used to support the ecological risk assessment, by developing a better understanding of the bioavailability of the PFAS6 and aid in developing/determining toxicity benchmarks for benthic invertebrates.

Task 6.3 Surface Water Assessment

In conjunction with the sediment assessment, surface water will be collected along the proposed transects. Surface water samples collected in October 2020 were collected approximately 100 feet from the shoreline and at approximately 6 inches and 36 inches below the surface of the Pond. The results from these samples were not significantly different from one another; however. this is a small data set. Due to the hydrophobic and hydrophilic nature of PFAS, BETA is proposing to assess the Pond's water column by collecting water samples at various depths within the Pond for the laboratory analysis of PFAS. Up to six (6) surface water samples will be collected from multiple depths in the pond and submitted for PFAS analysis via EPA Method 537M.

Task 6.4 Fish Tissue Sampling and Assessment

In conjunction with the sampling of the environmental media of Flintrock Pond, evaluation of the presence and species of fish in Flintrock Pond will be performed by a qualified zoologist. If fish are present and can be caught, up to 10 fish will be collected and submitted to a laboratory for fish tissue analysis. The samples will be analyzed for the presence of PFAS using currently available and certified analytical methods.

Task 6.5 Assessment of Unnamed Water Body North of FTA and Mary Dunn Pond

A very small water body with associated bordering vegetated wetlands is present approximately 100 feet north of the entrance to the FTA, north of Flint Rock Road.

Concerns have been raised regarding possible runoff migration from the FTA to the water body, although direct drainage patterns are not definitive. Phase II CSA environmental assessment of the water body will include collection of up to 3 sediment samples with a sediment sampler while wading and collection of a standing water sample. Sediment samples will be submitted for laboratory analysis of PFAS6 via ASTM Method 6978-17m, Total Organic Carbon, and Total Iron. pH, Conductivity, and ORP will be measured in the field. At least one water sample will be submitted for PFAS analysis via EPA Method 537M.

PFAS data collected since January 2019 from the monitoring wells located adjacent to Mary Dunn have been below the laboratory reporting limits. However, to address concerns, two (2) sediment and up to four (4) water samples will be obtained from Mary Dunn at various locations and depths. BETA and the County will attempt to to cooperatively work with the Town of Barnstable on the assessment of Mary Dunn Pond.

Task 6.6 Ecological Risk Assessment

In accordance with 310 CMR 40.0995, a Stage I and Stage II ecological risk assessment will be conducted at the Site. The risk assessment will be undertaken in stepwise/iterative fashion to rapidly identify if readily apparent harm and unacceptable ecological risk from exposure to environmental media (i.e., surface water, sediment, and soil), is present.

The risk analysis phase of the ecological risk assessment (ERA) will be conducted by GHD, Inc. on behalf of Barnstable County. The risk analysis will incorporate the Phase II CSA findings (specifically at Flintrock Pond) used to develop the conceptual site model as well as characterize the potential ecological exposure and effects (if any). The ecological exposure assessment involves the identification of potential exposure pathways and the evaluation of the magnitude of exposure of potential ecological receptors. The ecological effects assessment evaluates the potential adverse effects associated with exposure to chemicals of potential ecological concern (COPEC)s by ecological receptors and reflects specific assessment endpoints. The risk assessment will incorporate and summarize the surface water, sediment, sediment porewater, and fish tissue data (if fish are present in Flintrock Pond) collected throughout the Phase II CSA.

The results of the ecological risk analysis will be analyzed and interpreted to determine the likelihood of adverse environmental effects, and to determine whether a conclusion of no significant risk can be reached for each assessment endpoint evaluated.

The ERA will integrate a variety of methodologies to assess potential ecological risks. The conclusions regarding overall risk(s) to ecological receptors will be based on a weight-of-evidence approach, which will consider the results of all components of the assessment methodology (i.e., an approach that integrates results of physical, biological, toxicological, and field measurement endpoints to draw risk-based conclusions). The weight-of-evidence components will be designed to provide measures of potential risks for different ecological receptors and exposure pathways. Details outlining the methodology and reasoning behind the ecological risk assessment are included in the full proposed ecological risk assessment scope of work in Appendix C.

7.0 CONCEPTUAL SITE MODEL

In accordance with 310 CMR 40.0830, the Phase II CSA is developed and evaluated to support conclusions and opinions regarding: the source, nature, extent, migration pathways and potential impacts of releases of oil and/or hazardous material for the development of the Disposal Site Conceptual Site Model (CSM). As part of the Phase II CSA, BETA will thoroughly evaluate the results and provide reasoning to support the development of the CSM for the Site. The CSM will be documented and evaluated as part of the conclusions of the Phase II CSA report

8.0 METHOD 3 RISK CHARACTERIZATION – HUMAN HEALTH, SAFETY AND PUBLIC WELFARE

A Method 3 risk characterization (M3RC) will be conducted in accordance with 310 CMR 40.0900 and will characterize the risk associated with the current identified PFAS contamination at the Site to all human receptors. The M3RC will also address risks to safety and public welfare. Environmental risk will be characterized under tasks described in Section 6.0. This risk characterization will be the first iterative characterization at the Site that will aid in determining the comprehensive remedial actions as part of the subsequent Phase III Remedial Action Plan. BETA in conjunction with Sovereign Consulting will conduct the risk characterization. The Risk Characterization will also include an updated preliminary Imminent Hazard evaluation in accordance with MCP requirements.

9.0 REPORT PREPARATION

Following the completion of the Phase II SOW/Assessment activities, BETA and the County will review and evaluate the collected data and prepare a comprehensive report detailing the results and conclusions of the Phase II CSA. Per the requirements of 310 CMR 40.0835, the report will present all relevant information (maps, graphs, tables, and appendices), findings, and opinions related to the CSA. Additionally, the Phase II CSA report will present the environmental fate and transport, nature and extent, and exposure assessment as appropriate and present the risk characterization.

<u>Public Involvement</u>

The Phase II CSA report will initially be submitted as a DRAFT document subject to public comment per the requirements of the final Public Involvement Plan for the Site. In accordance with the finalized Public Involvement Plan, dated June 2019, this drafted document will be subject to the following process:

1. Notification will be provided to those listed on the Site's public involvement mailing list of the Phase II CSA reports availability.

2. The document will be made available to the public for review on the Barnstable County's website and posted at the Hyannis Public Library.
3. Barnstable County will hold a public involvement meeting (virtual if required by continuing public health concerns) to present findings and conclusions documented in the Draft Phase II CSA and the status of the release at the Site.
4. BETA and Barnstable County will solicit public comments on the Phase II CSA for a minimum 20 calendar day period. Public comments will be incorporated into the Phase II CSA if feasible.

10.0 SCHEDULE OF IMPLEMENTATION

Phase II Site assessment work will proceed throughout 2021 after the receipt of public comment and finalization of this Phase II SOW document. Initial assessment work to be conducted will focus on soil and groundwater assessment and monitoring as well as Flintrock Pond. In addition to the Phase II CSA, BETA (on behalf of the County) will continue to submit monthly MCP IRA Status and RMR Reports to MassDEP until IH conditions are no longer present at the Site; if a follow-up Imminent Hazard (IH) evaluation determines that an IH condition does not exist, then status reporting will be reduced to a semi-annual submittal.

Following the submission of the final Phase II CSA SOW (after the receipt of public comments) BETA anticipates the Phase II CSA will proceed as follows:

Task or Component	Public Comment Period, MassDEP Review and Respond To Comments	Implementation: Anticipated start – anticipated completion
Final Phase II CSA SOW	42 days	Submit Final Phase II CSA SOW approximately 42 days after public comment draft submittal
Task 4.1 and 4.2 – Soil Assessment	NA	September 2021 – November 2021[3]
Task 4.3 – Groundwater Monitoring and Assessment	NA	September 2021 – December 2021[2]– concurrent with quarterly and annual sampling events
Task 5.0 -Hydrogeological Assessment	NA –	November 2021 – February 2021[1] [3]
Task 6.0 – Flintrock Pond Assessment	NA	September 2021-December 2021
Public Comment Draft Phase II CSA	NA	May 2022
Final Phase II CSA	Following the public comment period	July 2022

Notes:
1. Approximate period for conducting subsurface explorations.
2. Supplemental Phase II groundwater monitoring.
3. Dependent on weather conditions and access approvals for off-property locations.

FIGURES

APPROXIMATE LOCATION OF SEPTIC SYSTEM

GWTS RECHARGE BASINS

PHASE I IMPROVEMENTS FORMER HOT SPOT AREA

POND S1/D1

SOUTH FLINT ROCK (APPROX. CENTERLINE)

ROAD

PARCEL: 31 30 007 6.22± AC

LEGEND

PFW-1	EXISTING MONITORING WELL	RW-1	RECOVERY WELL
MD-1	PUBLIC WATER SUPPLY WELL	B-1	SOIL BORING
TP-1	TEST PIT	SED-101	SEDIMENT SAMPLE
SW-501	SURFACE WATER SAMPLE	PB-601	PROPOSED SOIL BORING
PMW-305	PROPOSED BORING/MONITORING WELL	SS-101	PROPOSED SURFICIAL SOIL SAMPLE
	APPROX. PROPERTY BOUNDARY	FPS-601	PROPOSED SEDIMENT/SURFACE WATER SAMPLE
	FORCE MAIN		SAMPLING TRANSECT LINES
	FACILITY BLDG. STRUCTURES		

GRAPHIC SCALE

100 75 50 25 0 50 100 200

(IN FEET)

1 inch = 100 ft.

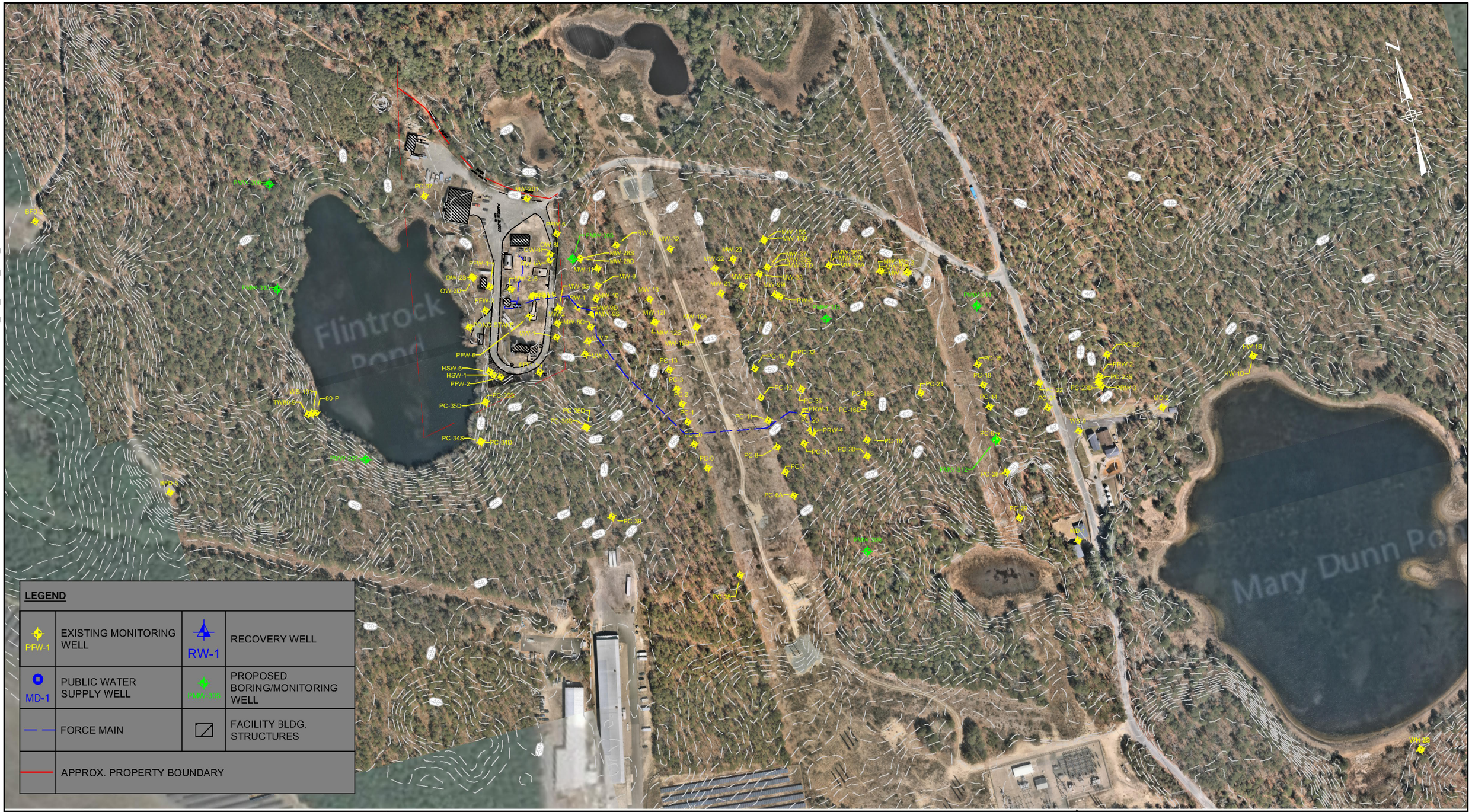
BETA

www.BETA-Inc.com

BARNSTABLE FIRE & RESCUE TRAINING ACADEMY
BARNSTABLE, MA
RTN 4-26179

FIGURE 1
PHASE II CSA
PROPOSED SAMPLING PLAN

Print Date: 06/21/2021



LEGEND

PFW-1	EXISTING MONITORING WELL	RW-1	RECOVERY WELL
MD-1	PUBLIC WATER SUPPLY WELL	PMW-32S	PROPOSED BORING/MONITORING WELL
	FORCE MAIN		FACILITY BLDG. STRUCTURES
	APPROX. PROPERTY BOUNDARY		

BETA

www.BETA-Inc.com

FIGURE 2
PHASE II CSA SAMPLING PLAN - DISPOSAL SITE

Barnstable County Fire & Rescue Training Academy

155 South Flint Rock Road, Barnstable, MA

Plot Date: 04/27/2021 Drawn By: MM

GRAPHIC SCALE

250 125 0 125 250 500

(IN FEET)

1 inch = 250 ft.

K:\6206 BARNSTABLE COUNTY\MCP LSP BASE SERVICES FMRLY 2018-2019 SERVICES\DRAWINGFILES\XREFS\GW CONTOUR\6206_EX_BASE_MM_2020.DWG

APPENDIX A

BWSC Forms

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

TIER CLASSIFICATION TRANSMITTAL FORM
Pursuant to 310 CMR 40.0500 (Subpart E)

BWSC 107

Release Tracking Number
4 - 26179

A. DISPOSAL SITE LOCATION:

1. Disposal Site Name: BARNSTABLE COUNTY FIRE TRAINING ACADEMY

2. Street Address: 155 SOUTH FLINT ROCK ROAD

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

5. Coordinates: Latitude: N _____ Longitude: W _____

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

☐ 1. Submit a new **Tier Classification Submittal**, including a **Tier Classification Compliance History** (BWSC107B). Check the tier classification category:

☐ a. Tier I ☐ b. Tier II

c. Check all Tier I criteria that apply, pursuant to 310 CMR 40.0520(2):

☐ i. Groundwater is located within an Interim Wellhead Protection Area, Zone II, or within 500 feet of a Private Water Supply Well, and there is evidence of groundwater contamination by an Oil or Hazardous Material at the time of Tier Classification at concentrations equal to or exceeding the applicable RCGW-1 Reportable Concentration set forth in 310 CMR 40.0360.

☐ ii. An Imminent Hazard is present at the time of Tier Classification.

☐ iii. One or more remedial actions are required as part of an Immediate Response Action pursuant to 310 CMR 40.0414(2).

☐ iv. One or more response actions are required as part of an Immediate Response Action to eliminate or mitigate a Critical Exposure Pathway pursuant to 310 CMR 40.0414(3).

☐ d. Check here if including an **Eligible Person, Eligible Tenant, or Other Person Certification** (BWSC107D)

☐ 2. Submit a **Phase I Completion Statement** as per 310 CMR 40.0480.

If previously submitted, provide date _____
mm/dd/yyyy

☑ 3. Submit a **Phase II Scope of Work** as per 310 CMR 40.0834.

If previously submitted, provide date _____
mm/dd/yyyy

☐ 4. Submit a **Phase II Conceptual Scope of Work supporting a Tier Classification Submittal.**

☐ 5. Submit a **Tier Classification Extension Submittal** for Response Actions at a Tier Classified Site including the **Tier Classification Compliance History** (BWSC107B).

☐ 6. Submit a Tier Classification Transfer Submittal for a change in person(s) undertaking Response Actions at a Tier Classified Site including the **Tier Classification Compliance History** (BWSC107B) and the **Tier Classification Transferor Certification** (BWSC107C).

Proposed effective date of transfer : _____
mm/dd/yyyy

B. THIS FORM IS BEING USED TO: (cont.)

☐ 7. Submit a **Revised Tier Classification Submittal.**
Check the revised Tier Classification Category. If the Tier Classification Category is not changing, indicate the current classification.

☐ a. Tier I ☐ b. Tier II

c. Check all Tier I criteria that apply, pursuant to 310 CMR 40.0520(2):

☐ i. Groundwater is located within an Interim Wellhead Protection Area, Zone II, or within 500 feet of a Private Water Supply Well, and there is evidence of groundwater contamination by an Oil or Hazardous Material at the time of Tier Classification at concentrations equal to or exceeding the applicable RCGW-1 Reportable Concentration set forth in 310 CMR 40.0360.

☐ ii. An Imminent Hazard is present at the time of Tier Classification.

☐ iii. One or more remedial actions are required as part of an Immediate Response Action pursuant to 310 CMR 40.0414(2).

☐ iv. One or more response actions are required as part of an Immediate Response Action to eliminate or mitigate a Critical Exposure Pathway pursuant to 310 CMR 40.0414(3).

☐ d. Check here if including an **Eligible Person, Eligible Tenant, or Other Person Certification** (BWSC107D)

☐ 8. Provide a **Notice that an additional Release Tracking Number(s) is (are) being linked to this Tier Classified Site** (Primary RTN). Future response actions addressing the Release or Threat of Release notification condition associated with additional Release Tracking Numbers (RTNs) will be conducted as part of the Response Actions planned or ongoing at the Primary Site listed above. For a previously Tier Classified Primary Site, if there is a reasonable likelihood that the addition of the new secondary RTN(s) would change the classification of the site, a **Revised Tier Classification Submittal** must also be made.

Provide Release Tracking Number(s): a. ____ - ____ b. ____ - ____

All future Response Actions must occur according to the deadlines applicable to the Primary RTN. Use only the Primary RTN when making future submittals for this site unless specifically relating to response actions started before the linking occurred.

C. 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 provisions of 309 CMR 4.02(2) and (3), and 309 CMR4.03(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 a* ***Tier Classification Submittal*** *is being submitted,* this Tier Classification Submittal has been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and, 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) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B of this form indicates that a* ***Phase I Completion Statement*** *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;

> *if Section B of this form indicates that a* ***Phase II Scope of Work*** *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 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 a* ***Tier Classification Extension Submittal*** *or a* ***Tier Classification Transfer Submittal*** *is 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) complies(y) 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:

D. PERSON MAKING SUBMITTAL:

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: STEPHEN 4. Last Name: TEBO

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: stebo@BARNSTABLECOUNTY.ORG

E. RELATIONSHIP OF PERSON MAKING SUBMITTAL TO DISPOSAL SITE:

☐ Check here to change relationship

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

☐ e. Other RP or PRP Specify:

☐ 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 Making Submittal Specify Relationship:

F. REQUIRED ATTACHMENT AND SUBMITTALS:

☑ 1. 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 DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☑ 2. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of any Phase Reports to DEP.

☐ 3. Check here to certify that a copy of the Legal Notice of a Tier Classification or Re-classification Submittal is attached, and a cover letter and a copy of the notice is sent to the Chief Municipal Officer and the Local Board of Health pursuant to 310 CMR 40.0510(3) and 40.1403.

☑ 4. Check here to certify that the owner of a Public Water Supply has been provided written notice pursuant to 310 CMR 40.0510(3).

☐ 5. For a Tier Classification Extension Submittal, check here to certify that a statement summarizing why a Permanent or Temporary Solution has not been achieved at the Disposal Site is attached.

☐ 6. For a Tier Classification Transfer Submittal, check here to certify that a statement summarizing the reasons for the proposed change in person(s) undertaking the Response Actions is attached. All Response Actions must be completed by the deadline applicable to the person who first filed a Tier Classification Submittal for the Disposal Site.

☐ 7. 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.

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

G. CERTIFICATION OF PERSON MAKING SUBMITTAL:

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 those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

If submitting a Tier II Classification, Extension or Transfer, I also attest under the pains and penalties of perjury that (i) I/the person(s) or entity(ies) on whose behalf this submittal is made has/have personally examined and am/is familiar with the requirements of M.G.L. c. 21E and 310 CMR 40.0000; (ii) based upon my inquiry of the/those Licensed Site Professional(s) employed or engaged to render Professional Services for the disposal site which is the subject of this Transmittal Form and of the person(s) or entity(ies) on whose behalf this submittal is made, and my/that person's(s') or entity's(ies') understanding as to the estimated costs of necessary response actions, that/those person(s) or entity(ies) has/have the technical, financial and legal ability to proceed with response actions for such site in accordance with M.G.L. c. 21E, 310 CMR 40.0000 and other applicable requirements; and (iii) 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 aware of the requirements in 310 CMR 40.0172 for notifying the Department in the event that I/the person(s) or entity(ies) on whose behalf this submittal is made learn(s) that it/they is/are unable to proceed with the necessary response actions.

2. By: _____ (Signature) 3. Title: _____

4. For: BARNSTABLE COUNTY COMMISSIONERS (Name of person or entity recorded in Section D) 5. Date: _____ mm/dd/yyyy

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

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):

APPENDIX B

GROUNDWATER MONITORING PROGRAM

Table 1 - Long-Term Groundwater Monitoring Locations
Barnstable County Fire Training Academy PFAS Relelase Site - RTN 4-26179
Proposed Long-Term Monitoring Locations
As of February 2019

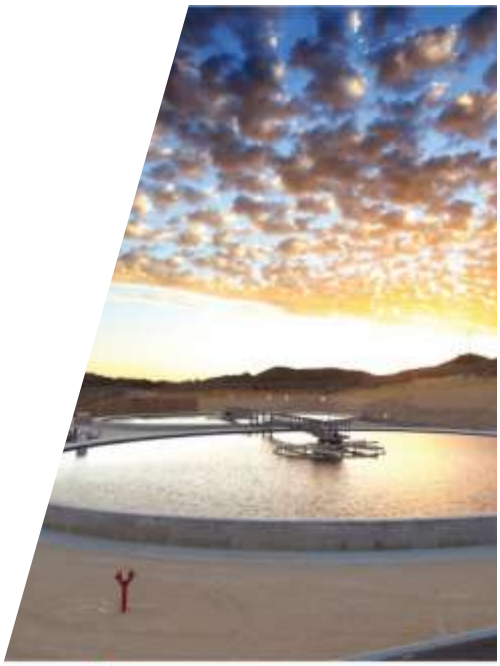
Well ID	Location	Mon. Wells Sampled - February & June 2018 [2]						Proposed Long-Term Quarterly Monitoring Locations		
		Feb-18			Jun-18			Proposed Long-Term Quarterly Mon. Wells	Proposed Additional Mon. Wells for Annual Rd. [4][5]	Rationale
		PFOS [ng/L]	PFOA [ng/L]	Total Five PFAs [ng/L]	PFOS [ng/L]	PFOA [ng/L]	Total Five PFAs [ng/L]			
HSW-6/HS-2(a)	FTA	25,000	160	25,160	950	15	1,006	X*		* Either, or for Quarterly Mon. - HS-1(a) is approx. 15 ft. away
HSW-1/HS-1(a)	FTA	13000	320	13320	--	--	--		X*	* Either, or for Quartly Mon. - HS-2(a) is approx. 15 feet away.
PFW-1	FTA	8100	470	8570	76000	1500	89410	X		Downgradient of fmr. hot spot - key location.
PFW-2	FTA	32000	400	32400	--	--	--		X	[within 25 ft. of HS-2(a)]
OW-8A	FTA	--	--	--	2800	65	3468	X		General coverage (FTA) & downgradient of recharge galleries
PFW-5	FTA	--	--	--	--	--	--	X		General coverage (FTA) & previous detections
PFW-6	FTA	--	--	--	--	--	--		X	Centrally located in FTA.
"Primary" PFAS Plume:										
PC-1	West of PTLE[3]	9000	370	9370	10000	190	11380	X		Central plume monitoring.
PC-6A	East of PTLE[3]	--	--	--	1300	60	1790	X		Central plume monitoring.
PC-11	East of PTLE[3]	4000	180	4180	9600	250	11780	X		Central plume monitoring.
PC-36	SE of FTA	--	--	--	--	--	--		X	Central plume monitoring.
Downgradient of Recovery Well:										
PC-16d	East of PRW-4	980	64	1044	1900	150	2990	X		Plume and recovery monitoring.
PC-18	East of PRW-4	890	70	960	--	--	--		X	Plume and recovery monitoring.
PC-30	East of PRW-4	1900	98	1998	1600	99	2419	X		Plume and recovery monitoring.
PC-28	East of PRW-4	--	--	--	--	--	--	X		Plume and recovery monitoring.
PC-9	East of PRW-4	--	--	--	--	--	--		X	Plume and recovery monitoring.
Other:										
MW-12	northerly	--	--	--	3000	280	4666	X		Monitor in direction of MD-3
MW-22	northerly	--	--	--	320	30	502	X		Monitor in direction of MD-3
MW-35	northeasterly								X	Monitor in direction of MD-3
HW-1D or 1S	close to Mary Dunn Pond								X	groundwater reported to be upgradient of Mary Dunn Pond
								Total = 12	Total = 8 [4]	Quarterly monitoring - 12 mon. wells. Annual monitoring - 20 mon. wells. See note 4.

Notes:

1. FTA = within the Barnstable County Fire Training Academy facility.
2. Not all wells sampled on these dates are listed or were selected for future monitoring; see February 2018 and June 2018 Status Reports for details.
3. PTLE = Power Transmission Line Easement (the larger easement with central access road.)
4. Eight additional monitoring wells to be included in annual sampling round. Optional additional wells (greater than 8) may be included for specific monitoring purposes.
5. Additional monitoring wells do NOT include wells required for Petroleum Hydrocarbon Release (RTN 4-190) annual monitoring.

APPENDIX C

Ecological Risk Assessment Scope of Work, prepared by GHD



Ecological Risk Assessment Scope of Work

Barnstable County Fire and Rescue
Training Academy
Barnstable, MA

Draft for Review

This document is in draft form. A final version of this document may differ from this draft As such, the contents of this draft document shall not be relied upon. GHD disclaims any responsibility or liability arising from decisions made based on this draft document.

Table of Contents

1. Introduction

1.1 Purpose

This document presents the Baseline Ecological Risk Assessment (BERA) Scope of Work as part of the Phase II Comprehensive Site Assessment (CSA) Scope of Work related to known poly- and perfluoroalkyl substances (PFAS) contamination at the Barnstable County Fire and Rescue Training Academy (BCFRTA or "the Site") located at 155 South Flint Rock Road in Barnstable, Massachusetts. This release has been assigned Release Tracking Number (RTN) 4-26179.

An Imminent Hazard (IH) condition and Condition of Substantial Release Migration for human health were identified previously for the Site and include PFAS, commonly referred to as the PFAS 6. These include perfluorooctane sulfonic acid (PFOS); perfluorooctanoic acid (PFOA); perfluorohexane sulfonic acid (PFHxS); perfluorononanoic acid (PFNA); perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA).

This ecological risk assessment will be undertaken in stepwise fashion to rapidly identify unacceptable ecological risk from exposure to environmental media (i.e., surface water, sediment, and soil), should it exist. Each stage will be used to inform the Site investigation and remediation strategy, and ultimately, the remediation itself, as necessary.

2. Stage I Ecological Screening

As prescribed in 310 CMR 40.0995, the risk of harm to the site biota and habitats will be characterized by evaluating ecological parameters using a two-stage approach. A Stage I ecological screening will be undertaken to determine if a potentially significant exposure pathway is indicated by the available information per 310 CMR 40.0995(3)(a) and (c). If so, a Stage II Environmental Risk Characterization will be required to characterize the risks posed by those exposures.

As part of the Stage I ecological screening, a qualified biologist will characterize the site biota and habitats and use available evidence to determine whether there is current or potential future exposure of Environmental Receptors to contamination at site. The biologist will evaluate historical records, available site data, field observations, statements by present and past residents or employees, and any other relevant source. Evidence of current or potential exposure will be evaluated per 310 CMR 40.0995(3)(a). If any current or potential future exposure is identified through this process, then for each such exposure, site conditions will be evaluated to determine whether significant environmental harm is "readily apparent" based on the requirements under CMR 310 40.099(3)(b).

If readily apparent harm is not determined, each current and potential future exposure Pathway identified in 310 CMR 40.0995(3)(a) will be evaluated to determine whether it could result in potentially significant exposure. 310 CMR 40.00995(3)(c)(1) provides screening criteria that can be used identify a 'potentially significant exposure." None of these screening sources contain criteria for the assessment of environmental impacts of PFAS. As such, GHD will research available screening criteria adopted by other states or countries for PFAS. These criteria will be then used to evaluate whether there are potential exposures. If current or potential future exposures to contaminants in

any media are not ruled out in this Stage I Screening, those exposures will be considered to be "potentially significant exposures" and a Stage II Environmental Risk Characterization will be undertaken to determine whether a condition of "no significant risk of harm" exists.

3. Stage II Ecological Risk Assessment

It is anticipated that the Stage I ecological screening will necessitate the initiation of a Stage II risk assessment and characterization of ecological risk. The Stage II risk assessment will be conducted in close coordination with the investigation activities being undertaken as part of the Phase II CSA. Those activities will be used to inform the Stage II risk assessment and assist in determining whether specific tasks are necessary.

However, in accordance with the MCP and based on Site-specific criteria, a stepwise approach is proposed that may obviate the need to complete a Stage II study. If hydrogeologic and groundwater quality assessment indicate that the surface water, sediment or sediment pore water is substantially contributing significant PFAS impacts to the underlying or adjacent groundwater, thus indicating the need for remedial actions, some aspects of the Stage II risk assessment may not be conducted.

The following sections provide an outline for the Stage II ecological risk assessment.

3.1 Problem Formulation

3.1.1 Ecological Conceptual Site Model

As noted above, a Site visit will be conducted by a qualified biologist. As part of this visit, the biologist will use available information to develop an ecological conceptual site model (CSM), which is needed to identify the ecological assessment endpoints. Assessment endpoints are "an explicit expression of the environmental value to be protected, operationally defined as an ecological entity and its attributes" (USEPA 1998a). A representation of the links between the following will be developed:

- Contaminants and sources
- Fate and transport of chemicals of potential ecological concern (COPECs)
- Potential ecological receptors
- Exposure pathways

Based on the Phase I Initial Site Investigation Report and Tier Classification Submittal (Nover-Armstrong, 2018), PFAS are the COPECs. In addition, surface water and sediment in Flintrock Pond and site soils contaminated with PFAS are the media of concern that will be evaluated in the BERA. A more robust ecological CSM will be developed as part of the Phase II CSA.

3.1.2 Selection of Assessment and Measurement Endpoints

Once the ecological CSM is developed, assessment and measurement endpoints will be selected. Assessment endpoints are used to evaluate the potential ecological effects associated with exposure the COPECs. Measurement endpoints are measurable responses to a stressor that are

related to the valued characteristics chosen as the assessment endpoints (Suter, 1990). Assessment endpoints are the ultimate focus in risk characterization and link the measurement endpoints to the risk management process (USEPA 1998a). However, because assessment endpoints often cannot be measured directly, measurement endpoints (measures of effect) are selected that relate to the assessment endpoints and have measurable attributes (e.g., comparison of media concentrations to effects levels, results of food web models, etc.) (USEPA, 1997, 1998). These measures of effect provide a metric for evaluating potential effects of contaminants on the ecosystem components potentially at risk.

The preliminary assessment endpoints identified for the BERA based on the preliminary ecological CSM include:

Assessment Endpoint 1 – Protection and maintenance of benthic macroinvertebrate communities in Flintrock Pond.

Assessment Endpoint 2 – Protection and maintenance of fish communities in Flintrock Pond (if present).

Assessment Endpoint 3 – Protection and maintenance of soil invertebrate communities.

Assessment Endpoint 4 – Protection and maintenance of piscivorous (fish eating) bird populations.

Assessment Endpoint 5 – Protection and maintenance of invertivorous (invertebrate eating) bird populations.

Assessment Endpoint 6 – Protection and maintenance of carnivorous bird populations.

Assessment Endpoint 7 – Protection and maintenance of invertivorous mammal populations.

Assessment Endpoint 8 – Protection and maintenance of carnivorous mammal populations

To support the measure of effects associated with the proposed assessment endpoints, bulk sediment, sediment pore water (interstitial water), and fish tissue will be collected as discussed in the Phase II CSA Scope of Work.

3.2 Study Design

This section describes the details of the site investigation activities that will be used to support the BERA. The following subsections present the environmental sampling that will be conducted to support the measures of effect for the BERA and quantitative methods that will be used to evaluate potential ecological risks.

3.2.1 Terrestrial Assessment

Risks posed to terrestrial receptors will be assessed based on results of the surficial (0 – 6 inches) soil sampling proposed as part of the Phase II CSA. These analytical data will be compiled for statistical analysis and evaluated against available soil toxicity benchmarks. Soil concentrations will also be used to assess direct exposure to terrestrial invertebrates and indirect exposure to higher-trophic level organisms through food chain exposure.

3.2.2 Aquatic Assessment

Assessment of ecological risks associated with Flintrock Pond will be made using a variety of environmental media (sediment, surface water, and pore water) and biota concentrations. A benthic community analysis is not being proposed. The ecology of kettle ponds is unique and dependent on pH, depth, temperature, sediment grain size, plant community, and a variety of natural processes. It is unlikely that a suitable control or "background" location can be found without extensive research into these factors. The following sections summarize the media that will be used to evaluate ecological risks associated with Flintrock Pond.

3.2.2.1 Sediment Data

Surficial sediment samples (0 – 6 inches) will be collected as part of the Phase II CSA. The analytical results from these samples will be used to support the assessment of potential risk pose to ecological receptors. These analytical data will be compiled for statistical analysis and evaluated against available sediment toxicity benchmarks. However, there is a severe paucity of ecologically based sediment toxicity benchmarks. As such, this assessment may not be very informative. The sediment pore water described below presents a much better approach to assessing the ecological impacts to benthic invertebrates. However, an attempt will be made to assess if there is a significant risk of environmental harm using sediment analytical results.

3.2.2.2 Pore Water Data

Sediment pore water is a major route of exposure to contaminants for many benthic organisms (Doe et al., 2003). Contaminants in pore water can be transported to groundwater or to overlying water by a variety of processes, thus potentially exposing benthic invertebrates.

In conjunction with the bulk sediment collected as part of the Phase II CSA, eight (8) samples will be used to for interstitial pore water sampling. The sediment pore water will be collected via laboratory extraction to support the BERA analysis and to develop a better understanding of bioavailability of the PFAS 6. The analytical results will be used to evaluate whether direct exposures to sediment pore water has the potential to cause toxicity to benthic invertebrates by comparison to toxicity benchmarks.

3.2.2.3 Sediment Toxicity

The MADEP recommends that sediment toxicity tests should be included as a measure of effects in all quantitative site-specific risk assessments that are conducted to evaluate the effects of sediment contaminants on benthic invertebrates. However, in the case of PFAS, the drivers for ecological risk are almost always associated with bioaccumulation and not related to toxicity of sediment dwelling invertebrates (Arblaster, et al., 2019, SERDP 2020). In addition, toxicity to benthic organisms is generally a result of exposure to chemicals in the sediment pore water, and not to sediment particles. Therefore, the potential impacts to sediment-dwelling organisms can be assessed based on a comparison of pore water sample results to benthic invertebrate toxicity benchmarks, as discussed above in Section 3.2.2.2.

3.2.2.4 Fish Tissue

To support the assessment of risk posed to fish as well as piscivorous birds, fish tissue samples from Flintrock Pond will be collected if the pond supports a sufficient fish population. The overall goal of the fish tissue sampling and analysis is to collect fish and analyze the samples for the presence of the PFAS 6 to support the risk characterization for the fish community and for piscivorous birds through food chain exposure. Because individual fish of sufficient body mass may be difficult to collect, either larger whole fish or composite samples of smaller fish will be targeted for this effort. If possible, ten (10) whole or composite fish samples weighing 250 grams or more will be collected throughout Flintrock Pond and whole fish body burdens will be analyzed for the PFAS 6 using a certified proprietary method developed by Bureau Veritas.

Fish will be collected from Flintrock Pond using a variety of methods. These may include:

- Electrofishing
- Rod and reel
- Minnow traps
- Seine/cast nets
- Gill nets
- Trotlines

3.3 Stage II Risk Analysis

The risk analysis phase of the BERA is based on the ecological CSM and includes the characterization of potential ecological exposure and effects. The ecological exposure assessment involves the identification of potential exposure pathways and the evaluation of the magnitude of exposure of potential ecological receptors. The ecological effects assessment evaluates the potential adverse effects associated with exposure to COPECs by ecological receptors and reflects specific assessment endpoints. The data and methods that will be used to identify and characterize ecological exposure and effects are described below.

3.3.1 Media Concentrations

3.3.1.1 Data Treatment

Analytical data for each medium will be compiled and tabulated in a database for statistical analysis. Data for samples and their duplicates will be averaged before summary statistics are calculated, such that a sample and its duplicate will be treated as one sample for calculation of summary statistics. Where both the sample and the duplicate are not detected, the resulting values are the average of the sample-specific quantitation limits (SSQLs). Where both the sample and the duplicate are detected, the resulting values are the average of the detected results. Where one of the pair is reported as not detected and the other is detected, the detected concentration is used.

3.3.1.2 Terrestrial Risk Analysis

The analytical results from surface soil samples collected as part of the Phase II CSA will be used to support the assessment of potential risk posed to ecological receptors. These analytical data will be compiled for statistical analysis and the average concentration will be compared to soil benchmarks

protective of soil invertebrates. In addition, food chain modeling will be conducted, and modeled doses will be compared to toxicity reference values (TRVs) for higher trophic level receptors.

3.3.1.3 Benthic and Aquatic Risk Analysis

3.3.1.3.1 Macroinvertebrate Risk Analysis

The protection and maintenance of freshwater benthic invertebrate communities in Flintrock Pond is one of the assessment endpoints identified in Section 3.1.2. To assess potential risks to these receptors, sediment, and sediment pore water data, will be evaluated with respect to protection of the benthic invertebrate community as described in the sections below.

3.3.1.3.1.1 Surficial Sediment

Surficial sediment samples collected as part of the Phase II CSA will be evaluated. These analytical data will be compiled for statistical analysis and the average concentration will be compared to sediment quality benchmarks protective of benthic invertebrates.

3.3.1.3.1.2 Pore Water

As noted in Section 3.2.2.2, sediment for interstitial pore water analysis will be collected via laboratory extraction from samples collected as part of the Phase II CSA. Surficial pore water provides a direct measure of the bioavailable fraction of COPECs in sediment. The theory of equilibrium partitioning (EqP) has been the basis for the study of sediment toxicity for decades and has been the basis for sediment guidelines since the early 1990s (e.g., USEPA, 1993; 2005). EqP theory maintains that certain chemicals, such as PFAS, may be present in sediment but partitioned to binding factors, such as organic carbon and black carbon, and are generally not bioavailable. Only the freely dissolved fraction of pollutants, therefore, is available for partitioning and bio-uptake (Reichenberg and Mayer 2006).

The surficial sediment pore water data will be used in conjunction with the whole sediment concentration data to evaluate potential COPEC risk drivers. Pore water analytical data will be compiled for statistical analysis and the average concentration will be compared to water quality benchmarks protective of benthic invertebrates.

3.3.1.4 Aquatic Receptor Risk Analysis

The aquatic risk analysis will assess risk to the fish community and higher trophic level receptors that feed on fish in Flintrock Pond.

3.3.1.4.1 Fish Tissue

As detailed in Section 3.2.2.4, fish tissue samples will be to support the assessment of risk posed to fish directly (direct exposure) and to piscivorous birds through food chain exposure. The analytical results from the fish tissue samples will be compiled for statistical analysis and the average concentration will be compared to tissue benchmarks protective of freshwater fish. In addition, food chain modeling will be conducted, and modeled doses will be compared to TRVs for piscivorous birds.

3.4 Stage II Risk Characterization

The results of the ecological risk analysis will be analyzed and interpreted to determine the likelihood of adverse environmental effects, and to determine whether a conclusion of no significant risk can be reached for each assessment endpoint evaluated. The ecological risk characterization will summarize the results of the risk analysis phase of work and will provide interpretation of the ecological significance of findings. Aspects of ecological significance that will be considered to help place the Site into a broader ecological context include the nature and magnitude of effects and the spatial and temporal patterns of effects.

The BERA will integrate a variety of methodologies to assess potential ecological risks. The conclusions regarding overall risk(s) to ecological receptors will be based on a weight-of-evidence approach, which will consider the results of all components of the assessment methodology (i.e., an approach that integrates results of physical, biological, toxicological, and field measurement endpoints to draw risk-based conclusions). The weight-of-evidence components will be designed to provide measures of potential risks for different ecological receptors and exposure pathways.

4. References

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