

## SAMPLING & ANALYSIS PLAN

For the:

### 2021 Monitoring Project

### James and Unkety Brooks

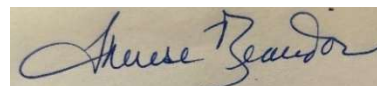
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Watershed Planning Program  
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CN 545.1  
March 2021

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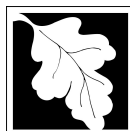
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**SAMPLING & ANALYSIS PLAN**  
2021 MONITORING  
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**NOTE: This sampling plan provides sampling locations, frequencies, analytes, etc. and is intended to augment WPP's multi-year programmatic QAPP approved by EPA for 2020 through 2024. The contents mirror selected elements of WPP's programmatic QAPP (i.e., QA-R5 EPA Guidance; USEPA 2017a). See the most recent WPP Programmatic QAPP for relevant information not provided in this SAP (MassDEP 2020).**

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## Project Organization

The National Water Quality Initiative (NWQI) was developed by the Natural Resources Conservation Service (NRCS) to address non-point sources of pollution associated with agriculture, within relatively small watersheds (Hydrologic Unit Code-12, or HUC-12), identified and prioritized by individual states (USEPA 2017b). MassDEP conducted a review of freshwater stream segments within the Massachusetts portion of the Merrimack watershed to identify high priority, HUC-12 watersheds for further monitoring and NPS protection/restoration actions (Reardon 2020). James Brook (segment MA81-20) in Groton and Ayer received a high priority score, based on its impairment by *E. coli* from unknown non-point sources, and its land use characteristics (relatively high percentage of agriculture and natural land uses, and low impervious cover). James Brook is located with the Unkety Brook-Nashua River HUC-12 watershed, as shown below in Figure 1 (USEPA 2021).

James and Unkety Brooks were included in the 2020 NWQI program, and monitoring was conducted by the USEPA; in 2021, monitoring will be conducted by MassDEP, according to the procedures outlined in the most recent QAPP (MassDEP 2020). This Sampling and Analysis Plan (SAP) provides details for collecting samples for analyses i.e., nutrients, Total Suspended Solids (TSS), and bacteria (*E. coli*), and in situ parameters (e.g., temperature and conductivity) in 2021 in James and Unkety Brooks (see Figure 1 below). These data will provide us with the information needed to determine the effectiveness of NPS implementation actions in these watersheds. Given the desire to create a strong baseline of current conditions an intensive sampling frequency was chosen. Specific descriptions of WPP staff roles and responsibilities for the project are detailed in Table 1.

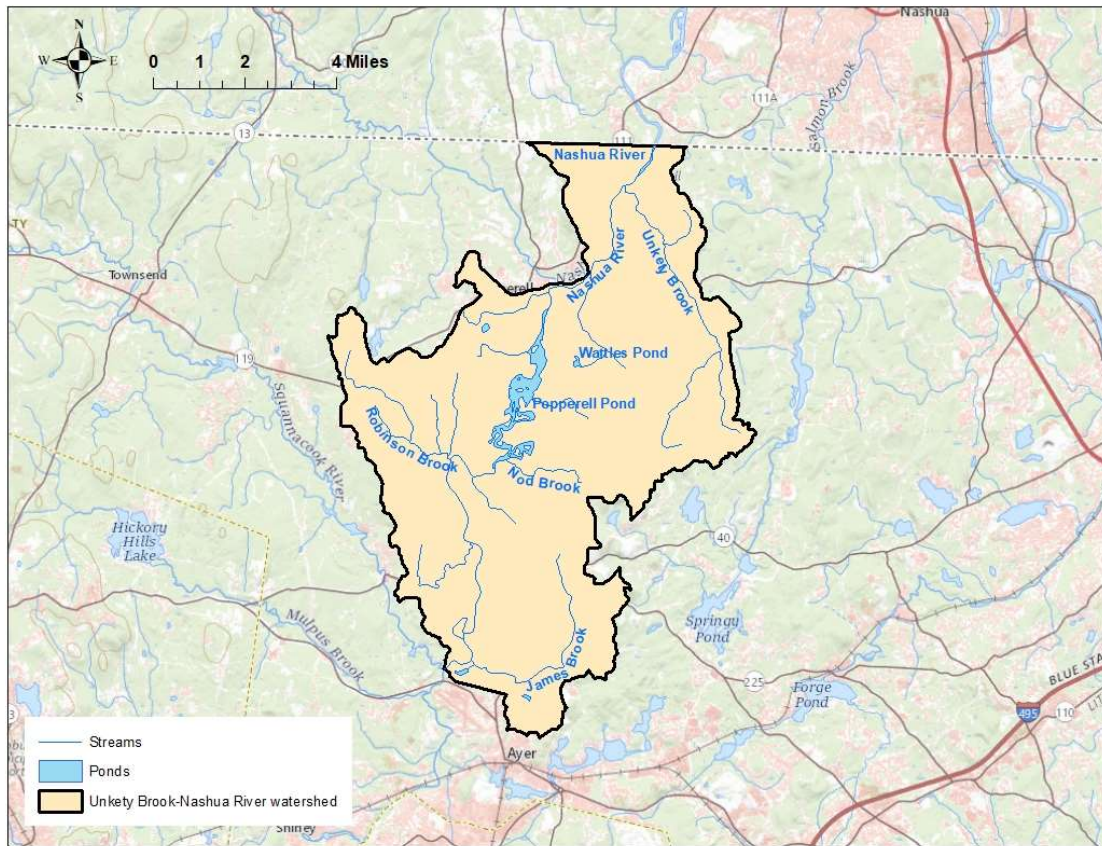
## Project Definition and Background

The Unkety Brook-Nashua River HUC-12 watershed has a drainage area of approximately 58 square miles, most of which is located in Massachusetts; the remainder is in New Hampshire. The four sampling stations on James Brook are in Ayer and Groton, MA; the two stations on Unkety Brook are in Dunstable, MA.

The types of data that will be collected at each of the sites were selected to allow us to determine the effectiveness of NPS implementation actions in the James and Unkety Brook watersheds. These include:

- Nutrients (total phosphorus, orthophosphate, total nitrogen, nitrate-nitrite as nitrogen, and ammonia as nitrogen)
- Other water quality parameters (total suspended solids)
- Instantaneous measurements (temperature, pH, dissolved oxygen, specific conductance, total dissolved solids)
- Continuous measurements (dissolved oxygen, temperature; 5 month duration)
- Aesthetics observations
- Bacteria levels (*E. coli*)

**Figure 1 Unkety Brook-Nashua River HUC-12 Watershed (USEPA 2020)**



**Table 1 Project Roles and Responsibilities related to monitoring and data use**

Project Personnel	Responsibility
<u>Project Coordinator</u> -Therese Beaudoin	Coordination with EPA, site reconnaissance, staff training in field procedures, and defining logistics for efficient monitoring and generation of useable data at assigned sites using the procedures contained in WPP SOPs.
<u>Water quality survey crews</u> -WPP staff and seasonal employees	Sample and data collection at assigned sites using the sample collection techniques and probe use procedures contained in WPP SOPs.

# Project Description

## Overview of 2021 monitoring activities in James and Unkety Brooks

As stated above, the objective of this project is to collect water quality data during the Summer and Fall of 2021 in James and Unkety Brooks, to support the NWQI goals of determining the effectiveness of NPS protection and restoration efforts in these areas of the Unkety Brook-Nashua River HUC-12 watershed.

## Sampling Process Design

Sampling will be conducted in James and Unkety Brooks on a biweekly basis from May 10 through October 25, 2021, as shown in Table 2. A total of 13 sampling events are currently planned with all sampling dates occurring on Monday with the exception of Tuesday, July 6.

**Table 2 Sampling Dates for the 2021 James and Unkety Brooks Monitoring Season**

2021 Sampling Dates*, **					
May 10	June 7	July 6	August 2	September 13	October 11
May 24	June 21	July 19	August 16	September 27	October 25
			August 30		
*Final sampling dates will reflect the laboratory schedule and the availability of equipment. Dates may also be changed to reflect weather conditions and other factors. ** Sampling activities are subject to COVID-19 restrictions and social-distancing precautions.					

The locations sampled in 2020, and to be sampled in 2021, were selected by MassDEP, based upon historical data and accessibility. The six sites are depicted in Figure 2, with further details in Table 3, and include, in order from upstream to downstream:

### James Brook

- JB01, Broad Meadow Road, Groton, MA
- JB02, Old Ayer Road, north of Peabody Street, Groton, MA
- JB03 North of Old Ayer Road near Smith Road, Groton, MA
- JB04, Route 111/Park St, Ayer MA

### Unkety Brook

- UNK01, Groton Street, Dunstable, MA
- UNK02, River Street, Dunstable, MA

Figure 2 Monitoring locations in James and Unkety Brooks (USEPA 2020)



**Table 3 Monitoring stations in James and Unkety Brooks**

Segment	River Name	Site ID	Unique ID	Latitude	Longitude	Impaired 1° or 2° E. coli <sup>1</sup>	Impaired Aesthetics <sup>1</sup>	Impaired Aquatic Life <sup>1</sup>	Impaired Fish Consumption <sup>1</sup>
MA81-20	James Brook	JB01	W3027	42.59831	-71.5694	Yes	No	No	NA <sup>2</sup>
MA81-20	James Brook	JB02	W3028	42.62648	-71.5932	Yes	No	No	NA
MA81-20	James Brook	JB03	W3029	42.60445	-71.5731	Yes	No	No	NA
MA81-20	James Brook	JB04	W1000	42.57947	-71.5886	Yes	No	No	NA
MA81-81	Unkety Brook	UNK01	W3030	42.68957	-71.5481	No	No	NA	NA
MA81-81	Unkety Brook	UNK02	W1829	42.58212	-71.572	No	No	NA	NA
<sup>1</sup> As reported in <i>Massachusetts Year 2016 Integrated List of Waters</i> (MassDEP 2019).									
<sup>2</sup> NA = Not Assessed									

#### **Water Quality (Chemical and Physical)**

At each station, surface grab samples will be collected and analyzed for the parameters and methods outlined in Table 4; the Environmental Protection Agency (EPA) in Chelmsford, MA will conduct all analyses. The survey crew will preserve all samples before submitting them to the lab for processing and analyses. For each sampling date, a minimum of one duplicate and one blank sample per analyte will be tested for QC for each sampling crew (10% of the samples) for each parameter, as well as one filter blank for orthophosphate. For the first sampling date, and each subsequent date on which bottles are used from a different batch number, a bottle blank will be collected and analyzed for each parameter. All DWM field sampling SOPs will be followed in terms of sampling collection. EPA laboratory methods/SOPs are outlined below (Table 4).

All samples will be stored on ice delivered to the EPA laboratory and delivered within 6 hours for analysis within 8 hours of collection.

In total, a minimum of approximately 433 samples bottles will be analyzed for the parameters listed in Table 4 below (6 sites, 13 visits per site, 33 total sample bottles per sampling event with 8 samples per parameter including 1 duplicate and one blank per visit, and a filter blank for orthophosphate; also, a minimum of one round of bottle blanks). There may also be additional bottles used if more than one round of bottle blanks is required. Note the samples for analysis of Total Nitrogen as N, Nitrate/Nitrite as N, Ammonia as N, and Total Phosphorus as P will originate from the same bottle.



**Table 4 Sampling and Analytical Summary (USEPA 2020)**

Parameter	# of Samples per Event	Name of Analytical Laboratory	Analytical Methods/SOP	Container	Preservation	Maximum Holding Time (from time of collection)
Total Suspended Solids	8	LSASD Chemistry	EIASOP-TSS-TDS-VRES6	1 Liter Precleaned HDPE	1-6°C	7 days
Ortho Phosphate as P	9	LSASD Chemistry	EIASOP-INGTP11	1 120 ml Precleaned HDPE	1-6 °C, Filter w/in 15 minutes	48 hours
Total Nitrogen as N	8		LSBSOP-NO2-NO30	1 500 ml Precleaned HDPE	Ultrex Sulfuric Acid 1:1 pH<2	28 days
Nitrate/Nitrite as N			LSBSOP-NO2-NO30			
Ammonia as N			EIASOP-AMMO0			
Total Phosphorus as P			EIASOP-INGTP11			
E. coli (ECMM)	8	LSASD Biology	ECASOP-ENTEROLERT Rev 3	250 ml sterile	1-6°C	8 hours
Total	33					

**Notes:**

1. All bacteria samples must have headspace.
2. All sampling collection procedures will follow the appropriate DWM SOPs.
3. Hobo conductivity and depth loggers will be checked to ensure constant submersion and the presence/absence of bio-fouling during each sampling event.
4. Orthophosphate samples will be filtered within 15 minutes of collection.
5. Filter blank will be taken on every sampling event to ensure no contamination occurs during the Ortho Phosphate filtering procedure.
6. A bottle blank will be collected on the first sampling date, and on each subsequent date in which bottles are used from a different batch number.

Water Quality multiprobes (hobo data loggers) will be deployed on a long-term basis from May through October at up to 2 sites (JB04, UNK02) to evaluate dissolved oxygen and temperature.

As available Onset temperature sensors with out of water sensors may be used proactively to catch any potential out of water conditions. QC readings will be taken using a separate meter as specified in WPP's unattended probe SOPs. After retrieval of deployed probes and post-deployment calibration checks, QC checks on the data will be performed.

In addition, for each sampling event attended probes will be used to collect instantaneous measurements of temperature, dissolved oxygen, pH, total dissolved solids and specific conductance. All stations will be initially located with GPS and photographs will be taken at the site at time of sampling. Field data will be documented through paper field sheets or as applicable electronic data capture.

**Table 5 Project Schedule for James and Unkety Brooks Monitoring-2021**

Task Proposed	Approx. Date of Initiation	Approx. Date of Completion	Attendees/Responsible Staff
EPA- DEP Coordination	2/1/2021	2/22/2021	Conville, Gould, Beaudoin, Reardon Nelson, Morgan, Faber, Dombroski
Laboratory Scoping Meeting	3/1/2021	3/15/2021	Bridges, Boudreau, Conville, Patel, Paar, Gould, Toompas, Faber
Water quality sampling surveys	5/10/2021	10/25/2021	Beaudoin and field crews
Data QA/QC review and validation	TBD (2021)	TBD (2022)	DEP Assessment and Data Section
WQ data review, analysis and preliminary reporting	11/22/2021	TBD	Beaudoin

## Non-Direct Measurements

Table 6 contains a brief list of relevant external data sources that may be used in coordinating monitoring efforts or the interpretation of monitoring data. For example, rain data from NCDC could be used to determine if a sampling event occurred during wet or dry weather.

**Table 6 External data sources used for the 2021 James and Unkety Brooks monitoring**

Organization	Data
National Climatic Data Center (NCDC) <a href="http://www.ncdc.noaa.gov/oa/ncdc.html">http://www.ncdc.noaa.gov/oa/ncdc.html</a>	Daily precipitation and temperature data weather stations within the project extent.
The Weather Underground <a href="http://www.wunderground.com/">http://www.wunderground.com/</a>	Daily precipitation and temperature data weather stations within the project extent.

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