Aquatic Invertebrate, Sediment, and Surface Water Sampling in Unnamed Stream
Commerce Street Plume Superfund Site
Williston, VT
Final Technical Memo

TDF No. 2559A,B,C
Task Order No. 86
Task No. 04

Submitted to the:

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October 4, 2012

EPA Contract EP-W-06-017

Table of Contents

Attachments:

Appendices:

1.0 PROJECT OBJECTIVES

The main objectives of this project were to determine if: (a) the invertebrate community structure and function in Unnamed Stream at different sampling stations was affected by groundwater-impacted discharges from the Commerce Street Plume Superfund Site in Williston, VT, and if (b) any observed differences in the invertebrate community could be attributed directly to the presence of Site-related contaminants (particularly, Volatile Organic Compounds [VOCs]) in surface water and/or sediment. This information will serve in future ecological risk-based decision making.

The following steps were undertaken to meet the project's objectives:

1. Conduct a site visit on March 30, 2012 with EPA Regional Project Manager (RPM) Karen Lumino and EPA risk assessor Rick Sugatt.
2. Prepare a Quality Assurance Project Plan (QAPP) Addendum for use in the field sampling effort.
3. During September 10, 2012 – September 13, 2012, collect surface water chemistry information using a YSI sonde and sample aquatic invertebrates, sediment, and surface water at previously staked sampling stations (i.e. PW-2, PW-11, PW-17, PW-20 and an off-site reference location).
4. Record the GPS coordinates of each sampling station.
5. Take pictures of the stream and riparian habitat, record observations and fill out habitat worksheets.
6. Write a technical memorandum to summarize the sampling procedures used; include copies of habitat worksheets, field notes, and a table summarizing the field surface water chemistry data.

This technical memorandum is organized as follows: Section 2.0 provides an introduction; Section 3.0 describes the field sampling procedures; Section 4.0 describes the sample processing and analyses, and Section 5.0 summarizes the deviations from the QAPP addendum.

2.0 INTRODUCTION

Unnamed Stream was visited by ESAT, EPA Regional Project Manager (RPM) Karen Lumino and EPA risk assessor Rick Sugatt on March 30, 2012 to determine the overall conditions of the stream and to identify possible sampling stations.

A field sampling plan was then developed (i.e. the QAPP Addendum to a Nobis Engineering prepared QAPP). The plan was to collect aquatic invertebrates, sediment samples, and surface water samples from Unnamed Stream for analysis of the following parameters:

- Surface water: VOCs and chlorides
- Sediment: Total Organic Carbon (TOC), Target Analytes List (TAL) metals, mercury, VOCs, and Semi-Volatile Organic Compounds (SVOCs)
- Epifaunal and infaunal aquatic invertebrates: community structure and function

The QAPP Addendum represented an attachment to the April 18, 2012 draft QAPP Amendment 2 prepared by Nobis Engineering (an EPA contractor) to support the spring 2012 groundwater and soil sampling and analysis program at the Site. The spring 2012 samples collected by Nobis were analyzed at EPA's New England Regional Laboratory (NERL) in North Chelmsford, MA for VOCs, SVOCs, and TAL metals using the same Standard Operating Procedures (SOPs) as were used for the surface water and sediment samples collected from Unnamed Stream. All of the analytical requirements pertaining to these three chemical analyses (such as the data quality objectives, detection limits, measurement performance criteria, quality control acceptance limits, corrective actions, acceptance criteria, etc.) were identical to those summarized in the April 18, 2012 document.

3.0 FIELD SAMPLING PROCEDURES

3.1 Standard operating procedures and other support documents

New England Regional Laboratory (NERL) SOPs were followed during field sampling efforts as described in the QAPP Addendum and are referred to in Table 2 of the Addendum.

3.2 Field notes

Real-time field notes were taken to provide detailed records of all the field activities (see **Appendix A**). All notebook entries were made using a ballpoint pen. All pages were dated with the initials of all personnel present. When necessary, corrections were made by striking a line through the text, dating and initialing the correction(s).

Records included in the field notebook include the following types of information, as applicable:

- the date and time when each activity started and ended
- the weather conditions at the start of the day and significant changes in weather during the day
- a summary of equipment maintenance or decontamination activities, when applicable
- a description of sample collection and processing activities, such as:
    - sampling locations
    - recording of Global Positioning System (GPS) coordinates, if applicable
    - number and type(s) of samples collected
    - records of photographs taken, if applicable
    - field measurements and observations
- descriptions of problems encountered while in the field and corrective actions taken (if any)
    - including when deviations were made from the QAPP and why

3.3 Sampling stations

All the field activities took place at five specific sampling stations in Unnamed Stream, four of which coincide with pore water sample stations used by Nobis Engineering in July 2010. These sampling stations are listed below from furthest downstream to furthest upstream. Note that PW-2 was not mentioned in the Addendum. It was determined in the field, with the approval of Rick Sugatt (EPA technical lead), to sample PW-2 instead of PW-1 because of a lack of suitable habitat. The reference location was determined in the field as well. Both instances are discussed further below. The five sampling stations were as follows:

- PW-20: Recovery (far); located about 1,000 ft downstream from PW-17.
- PW-17: Recovery (near); located about 900 ft downstream from PW-11.
- PW 11: site-impacted area; this location had the highest levels of trichloroethylene and dichloroethylene during the July 2010 pore water sampling event.
- PW-2: study area reference, located above the Site just downstream from PW-1, not far from the culvert underneath Route 2
- Off-site reference: located upstream from PW-1, north of Route 2 in a small wetland fed by urban runoff (just West of 209 Blair Park Rd. in Williston, VT)

Sampling stations PW-20 and PW-17 were sampled on Tuesday September 11, 2012 (see **Figure 1** and **Figure 2** for lotic habitat pictures).

Figure 1. PW-20 (facing east)

Figure 2. PW-17 (facing northeast)

Sampling Stations PW-11 and PW-2 were sampled on Wednesday September 12, 2012, (see **Figure 3** and **Figure 4**).

Figure 3. PW-11 (facing southeast)

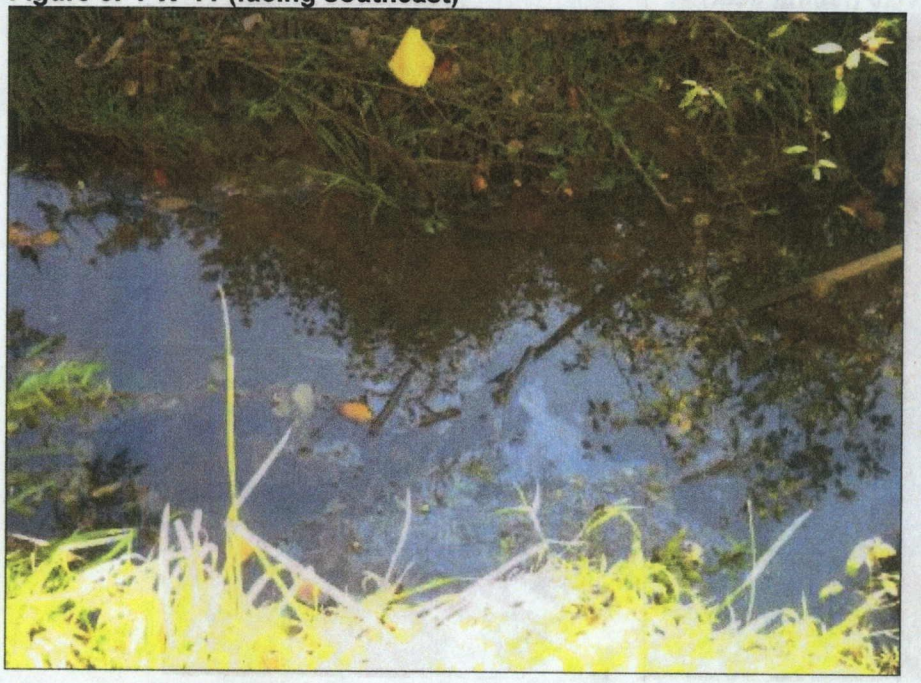


Figure 4. PW-2 (facing east)

Rick Sugatt (EPA) and Michael Ferrier (ESAT) decided not to sample PW-1, the on-site reference, as originally planned. PW-1 could not be properly sampled because the stream at this location was only a couple of inches deep and quite narrow, which made it difficult to collect a surface water sample without disturbing the sediment. In addition, the substrate consisted mostly of fine sediment (as seen in **Figure 5**).

Figure 5. PW-1 (facing northeast)

The off-site reference location was sampled on Thursday September 13, 2012, (See **Figure 6**). The sampling team received permission from Rich Watson to park in the Vermont Plastic Specialists, Inc. parking lot at 209 Blair Park Road. The stream was accessed via the Western side of the Vermont Plastics building near the loading dock. This area of the stream consisted of a small wetland fed by urban runoff. The sampling team had difficulty finding a more suitable reference location upstream of the groundwater plume without getting into more industrialized areas.

Figure 6. off-site reference (facing southwest)

Table 1 provides the Global Positioning System (GPS) coordinates of all five sampling stations. These were recorded the day they were sampled. PW-20, PW-17 and PW-11 GPS coordinates match

those provided by Nobis (see QAPP Addendum). The coordinates for PW-2 were not provided in the QAPP addendum but the PW-2 Nobis stake was located just downstream of PW-1, confirming the team was at the correct location. It should be noted that PW-11 is located in close proximity to two buildings and is at a bend in the stream. Although it may look detached from Unnamed Stream, it is not (see **Attachment 1** for the Nobis map and **Attachment 2** for the September 2012 sampling locations map).

Table 1: GPS coordinates for the sampling stations in Unnamed Stream

Station number	Sampling station	North	West
1	PW-20	44.44658066	-73.12380091
2	PW-17	44.44745849	-73.12147299
3	PW-11	44.44938290	-73.12188230
4	PW-2	44.45264118	-73.11935145
5	Upstream, off-Site reference	44.45478218	-73.11757334

3.4 Field sampling and data collection procedures

3.4.1 Introduction

The sampling effort started at the most downstream station (PW-20) on Unnamed Stream and proceeded sequentially upstream from there. On Monday September 10, 2012, an ESAT member used a Trimble GPS unit and the coordinates presented in Table 3 of the QAPP addendum to find the exact sampling stations prior to sampling. All of the Nobis stakes from the 2010 pore water sampling were found and their locations matched the coordinates provided. The off-site reference location was determined to be upstream of the plume, north of the Route 2 culvert in a small wetland fed by urban runoff. New flagging was placed on either side of the stream at each sampling station to clearly mark the banks. Steve Fiske (VT Department of Environmental Conservation) was present on Monday September 10, 2012 to show the sampling team how to use the VT method for collecting aquatic macroinvertebrates. He mentioned that Unnamed Stream was part of what VT calls Muddy Brook Tributary 4. The stream will continue to be referred to as Unnamed Stream in this report.

The YSI sonde was calibrated every morning before the start of field work. The sonde was taken to the first field sampling location of that day once all of the internal acceptability criteria were met. Sampling at each station proceeded in the following order: (1) surface water parameters were collected using the YSI sonde; (2) surface water samples were collected for VOC and chloride analysis; (3) sediment samples were collected for analysis of VOCs, SVOCs, TAL metals, mercury, and TOC; (5) benthic invertebrates were collected by two different methods; and (5) habitat assessment worksheets were filled out based on EPA's Rapid Bioassessment Protocols and the VT DEC lotic habitat assessment protocol.

The QAPP addendum noted that Unnamed Stream was quite narrow (2-4 ft) and stated that it might be necessary to collect sediment and invertebrate samples not just at the sampling station itself but also up to 15-20 ft upstream and downstream from it in order to get representative samples. The upstream and downstream portions were sampled for macroinvertebrates only at PW-2 and the reference station, both of which were located upstream from the contaminated groundwater recharge areas. On the other hand, only the downstream portions of stations PW-20, PW-17 and PW-11 were sampled for macroinvertebrates in order to follow the decreasing trend in VOC concentration and to more accurately capture where VOC-contaminated groundwater might have an effect on benthic invertebrates. Duplicate samples for all analyses were taken at sampling station PW-11, which represented the "hot spot" for the VOC-contaminated groundwater plume.

3.4.2 Surface water parameters

The temperature (°C), pH (standard units), dissolved oxygen (mg/L and % saturation), and specific conductance (microsiemens per cm [mS/cm]) of the surface water at each sampling station were measured using the YSI Model 556 Data Logger. One set of readings was taken in the center of Unnamed Stream at each sampling station, with the probe placed halfway down the water column. All readings were recorded in the field logbook and are summarized in **Attachment 3**.

3.4.3 Surface water sampling

A set of trip blanks were prepared for VOC analysis before the sampling team left the NERL on Monday September 10, 2012. These blanks consisted of 4 Volatile Organic Analysis (VOA) vials completely filled with deionized water (no headspace), placed on ice, and kept in the field cooler until the end of the trip. Trip blanks were not mentioned in the QAPP Addendum but are standard protocol for VOA sample collection.

A surface water pH test sample was prepared in a VOA vial in the field by filling the sample bottle almost to the top with stream water and counting the number of drops of HCl it took to acidify the water to a pH < 2.0. The number of drops needed to reach a pH < 2.0 was recorded and used to quickly and accurately acidify subsequent surface water samples. The pH test sample was then properly discarded. This process was repeated as needed at other sampling stations.

Two surface water samples were collected from each sampling station. The first sample was collected in four 40 mL VOA vials for VOC analysis, while the second sample was collected in one 250 mL plastic bottle for chloride analysis. Both samples were obtained by carefully immersing the sample bottles under the surface of the water. The four VOA vials were completely filled to remove any head space and limit evaporation during transport and storage. Great care was taken to avoid touching the soft substrate while filling the bottles to avoid suspending the sediment and contaminating the samples.

The four VOA vials were acidified in the field to pH < 2 using HCl, and stored on ice for return to the laboratory. The chloride sample was stored on ice without additional preservation. A duplicate VOC and chloride surface water sample were collected at PW-11. Note that the VOC duplicate consisted of another four VOA vials filled to the rim with surface water and acidified to pH < 2.

3.4.4 Sediment sampling

Two separate sediment samples were collected at each sampling station for VOC analysis. One composite sediment sample consisting of three subsamples was also collected from each sampling station for analysis of SVOCs, TAL metals, and TOC. All samples were collected from low-energy depositional areas around each sampling station to maximize the possibility of detecting contaminants.

The two samples for VOC analysis were collected first, as follows:

- VOC sample 1: A 10 mL sediment plug was collected by inserting a clean, 10 mL syringe with its tip cut off directly into the sediment bed and then carefully transferring the sample into a 40 mL Teflon-lined septum vial containing 10 mL of methanol (see Table 4 in QAPP Addendum for details). The vial was then tightly closed and placed on ice.

- VOC sample 2: A second sediment sample was collected in the same way and placed in a separate 40 mL VOC vial (this one without methanol) to determine the % moisture of the VOC sample. This sample was collected using a clean syringe, closed and placed on ice.

An Eckman dredge was then used to collect sediment for the last set of analyses (i.e. SVOCs, TAL metals, and TOC). Three 6" deep sediment samples were collected with the dredge and placed into a clean 20 L cubitainer with the top cut off. Coarse debris such as leaves, sticks, pebbles, or vegetation were removed from the cubitainer and discarded. Extra overlying water was poured off after settling to avoid losing fines. The sediment was then thoroughly homogenized with a clean plastic scoop and

distributed into labeled sample containers. Every effort was made to ensure that all of the sediment grabs had similar composition and were all collected in water < 1 ft deep. A duplicate composite sediment sample for SVOC, TAL metals, and TOC analyses was collected at station PW-11.

At location PW-11, the Eckman dredge was impractical to use because of excess woody debris. Instead, a clean plastic scoop was used to collect sediment within an area and depth equivalent to the Eckman dredge. This method was replicated with the duplicate sample as well.

The Eckman dredge was decontaminated between sampling stations but not between subsample collections at a given sampling station. The dredge was scrubbed with a brush and laboratory grade, non-phosphate detergent and tap water, rinsed 3 times with distilled deionized water and shook dry

The used soapy water and rinse water were captured and containerized for proper disposal at the NERL in North Chelmsford, MA.

A rinsate blank sample was collected at location PW-11 after the sediment sampling equipment was decontaminated. This sample was obtained by pouring 1 L of distilled deionized water over the cleaned equipment and collecting the runoff in a pre-labeled sample container. The rinsate blank was stored in the same cooler as all of the other samples. It will be analyzed for total metals and mercury at the NERL.

3.4.5 Invertebrate sampling

ESAT recorded the major habitat characteristics at each sample station on standardized habitat worksheets (see **Appendix B**). Additional descriptions were also recorded in the field logbook (see **Appendix A**). Several pictures of the habitats and sampling activities were also taken and can be viewed at G:\\ALLSHARE\ESATBIO\Commerce Street (VT).

3.4.5.1 Collecting infaunal invertebrates by sifting sediment samples

The VT DEC noted that silt, sand or gravel substrate should not be sampled as part of their standard protocol. As outlined in the next section, however, substrate was sampled around each sampling station in an effort to link sediment contamination to benthic invertebrate community composition. This method allows for a volumetric population comparison between sample stations because each subsample (i.e. core) has a definitive volume (3" high, 2 ½" diameter cylindrical dimension = 4.73 in^3 of sediment).

Four replicate sediment samples were collected in the vicinity of each sampling station using a percussion sediment corer. Each replicate sample consisted of four subsample cores collected near each other (making sure not to remove sediment from previous sediment grab sample holes). The benthic invertebrates collected from each set of four cores was combined into one replicate sample and preserved with 70% ethanol.

A 2 ½" diameter clear plastic core tube was placed into the sediment 3" deep, carefully pulled out and then emptied into a no. 30 sieve bucket. This was done four times for one replicate and all subsamples were placed into the same sieve bucket. The sieve bucket was then placed in the stream, making sure not to completely submerge it, and swirled around to rinse fines, such as clay, out of the sample. Leaf detritus was discarded. Any remaining sediment and organisms were placed into a labeled 1L plastic jar and preserved with 70% ethanol

In summary, four cores were collected from four locations per sampling station (16 cores per sampling station), resulting in at least 20 composite benthic invertebrate samples from Unnamed Stream (four composites per sampling station from five different sampling stations).

PW-11 underwent a full re-sample using the method described above in order to generate a duplicate infaunal invertebrate sample.

3.4.5.1 Collecting epifaunal invertebrates by sweep bottom kick net sampling

A kick net was used to collect a total of four jabs from representative habitats as described in the QAPP Addendum. Sampling was performed by jabbing the net into debris dams, vegetation, or root mats, pulling back rapidly to dislodge invertebrates, then sweeping forward again into the same area to scoop up the dislodged invertebrates. This jabbing and sweeping motion was repeated several times at the same point and considered one of four jabs. Each jab was taken in a general upstream direction from each subsequent point. All four jabs (from different points around the sample station) were combined into a single composite sample. Excess debris was first removed, and leaves and sticks were thoroughly rinsed off to prevent losing any attached bugs. The total contents were transferred to labeled sample bottle(s) and preserved in 70% - 80% ethanol. Two replicates were collected at each sample station and two replicates were collected at PW-11 as a duplicate sample.

The following habitats were sampled when present, as mentioned in the QAPP Addendum (see **Appendix A** field log notes for details of samples taken at each station):

- Vegetated margins – consist of overhanging bank vegetation and submerged root mats. Sampled by jabbing vigorously, with an upward motion, brushing the net against the vegetation and roots along the bank. The entire jab was taken place underwater as much as possible to avoid collecting terrestrial organisms.

- Snags and logs – consist of submerged wood, primarily dead trees, logs, branches, roots and leaf packs lodged between rocks or logs. Sampled by holding the net under the submerged wood, rubbing and shaking the area above the net and scooping organisms, bark, twigs and other dislodged organic matter into the net.

- Aquatic vegetation beds and decaying organic matter – consist of beds of submerged, green/leafy plants that are attached to the stream bottom. Sampled by jabbing vigorously, with an upward motion, against or through the plant bed. The net was kept under water as much as possible to avoid collecting terrestrial organisms.

3.4.6 Habitat assessment

The stream habitat at each sampling station was photographed and then described using the Habitat Assessment Field Data Sheet – Low Gradient Streams (see **Appendix C** for completed forms) using the descriptions and definitions provided in Chapter 5 (Habitat assessment and physicochemical parameters) of the Rapid Bioassessment Protocols (see QAPP Addendum). Note that the catchment area was not estimated for each sample location.

The habitat assessment field data sheet contains ten habitat parameters that were scored between a low of 1 (poorest condition) and a high of 20 (best possible condition). The data sheets were completed based on reaching a consensus between all of the field biologists participating in the sampling event.

4.0 SAMPLE PROCESSING AND ANALYSES

Proper paperwork, including labels and chain-of-custody forms, were maintained at all times during the project and follow the requirements outlined in Attachment 8 of the QAPP addendum.

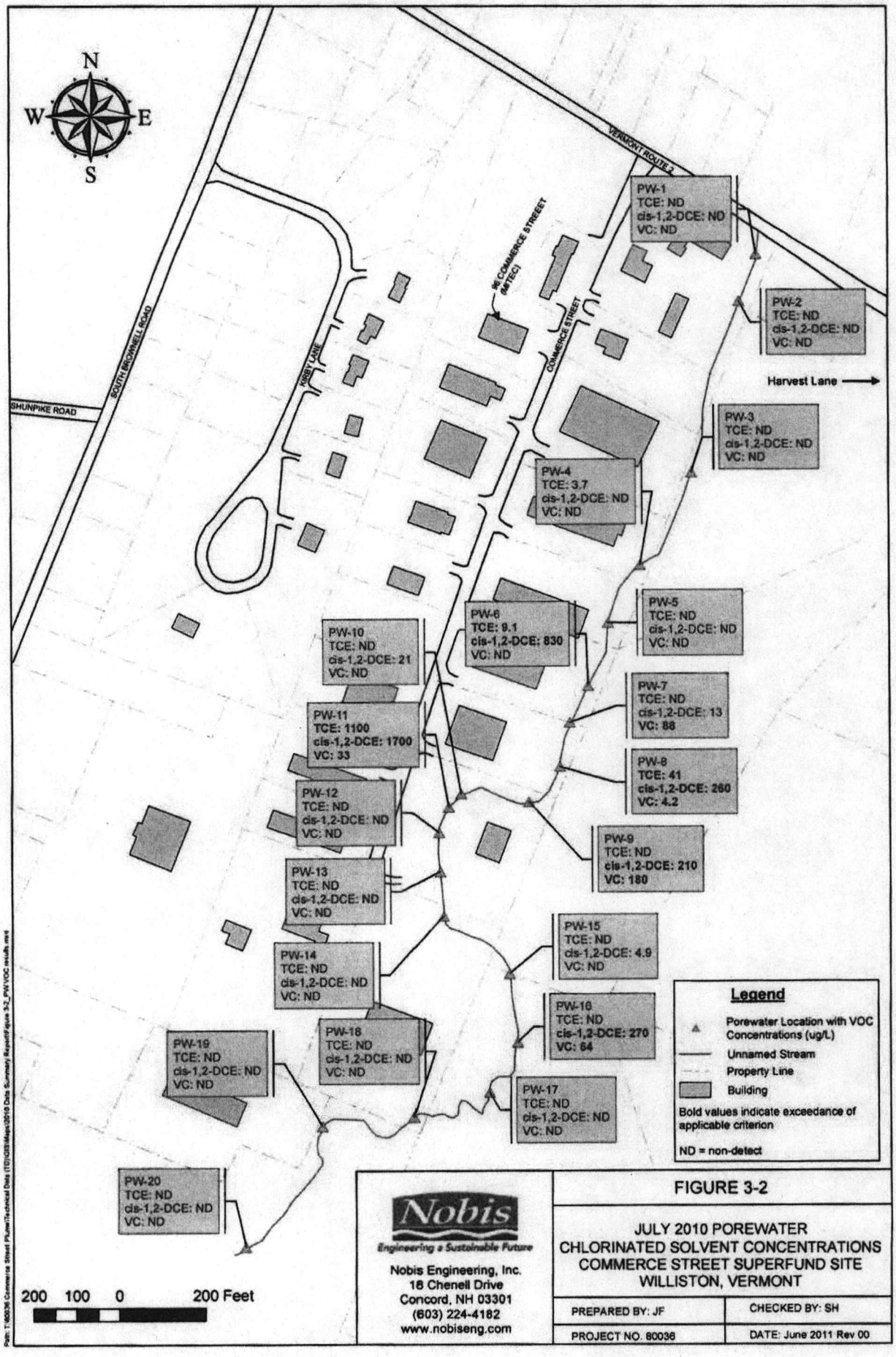
Labels were completed with the initials of the person collecting the sample, the date, and the jar number, when applicable. Labels were then wrapped in clear packing tape to protect them from water or ethanol damage and to prevent the label from accidentally detaching during transport and storage. Invertebrate samples were preserved with between 70%-80% ethanol, tightly closed, then sealed with electrical tape. Sediment and water samples were placed on ice in a cooler shortly after being collected. Ice was refreshed as necessary.

5.0 DEVIATIONS FROM THE QAPP

The following table summarizes the deviations from the QAPP or QAPP Addendum that occurred during the field sampling effort:

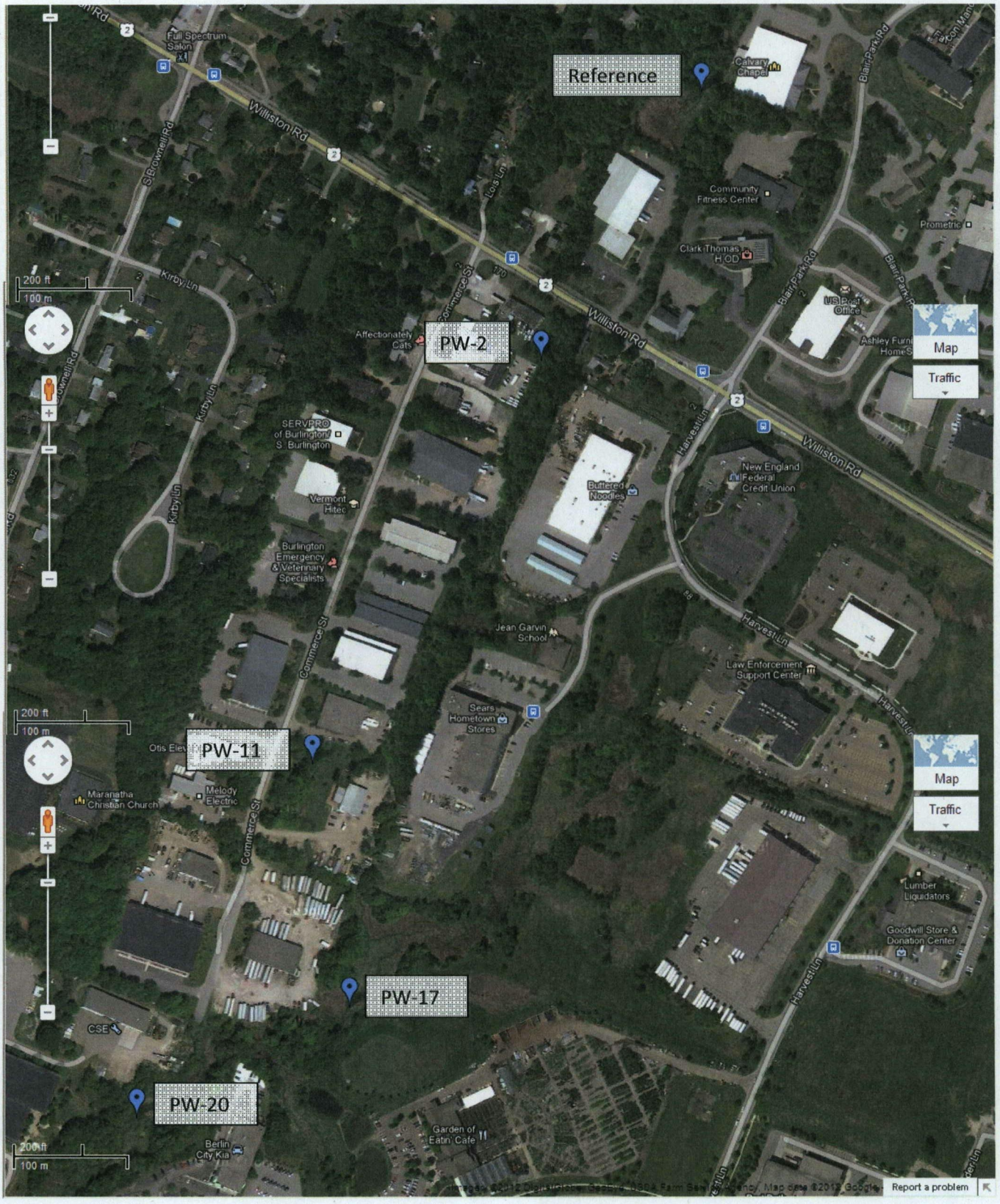
QAPP protocol	Deviation	Reason for deviation
1. Sample PW-1 as on-site reference	Sampled PW-2 in place of PW-1	PW-1 was not sampled because the stream was only a couple of inches deep and a about a foot wide, making it difficult to sample the surface water without disturbing the sediment.
2. Use 3" diameter core tube for infauna macroinvertebrate sample collection	Used a 2 ½" diameter core tube	Only 2 ½" diameter plastic core tubes were available. This does not impact the sample collection method other than changing the overall volume of the samples collected. Regardless of the change in core tube diameter, the same volume was collected across replicates.
3. No mention of collecting VOC trip blanks	Collected VOC trip blanks (deionized water from the lab)	This step was included because it is standard protocol according to the NERL SOP (EIASOP-VOAGCMS9 Rev.9 3/31/10)
4. Collect sediment VOC samples from the Eckman grab	Collected sediment VOC samples directly from the sediment bed	Removing the VOC sediment sample directly from the sediment bed insured less loss of VOCs upon extraction as the sediment was not as disturbed initially by the Eckman dredge. The water was only up to a foot deep at each location so it was easy to insert the syringe directly into the sediment bed.
5. Use Eckman or plastic sediment core tube for sediment collection	Used a clean plastic scoop at location PW-11 and it's duplicate	This was necessary because PW-11 was covered in woody debris. The Eckman may not have been able to penetrate the soil or close completely upon retrieval if a stick was in the way. Using a clean plastic scoop enabled the sampler to work around woody debris

Attachment 1. Nobis 2010 porewater sampling locations



Attachment 2. September 2012 sampling locations (as seen on Google maps)

*Note this is a combination of 3 maps placed together to show the full extent of sampling.



Attachment 3: Commerce Street: Field Surface Water Chemistry Results

Station	Analysis Date	Temperature (°C)	Conductivity (us/cm)	pH	D.O. (%)	D.O. (mg/L)
PW-20	9/11/2012	12.14	1916	7.42	73.5	7.82
PW-17	9/11/2012	15.52	2475	7.58	78.4	7.75
PW-11	9/12/2012	13.4	1004	7.57	76	7.92
PW-2	9/12/2012	16.83	916	7.85	88.2	8.51
Reference	9/13/2012	17.53	965	8.21	100.9	9.62

D.O. = dissolved oxygen

Qced: MCM 10.4.12

APPENDIX A

Field Logbook Notes

9/10/12 BGK, MCM, LB, MF, ~~Steve F~~ Rick Sougat BGK 9.10.12

Commerce St. arrival @ 1240
part cloudy, cool, no rain.
→ Met Rick (EPA) upon arrival.

~~PW-20 44.44655522 MCM~~
~~-73.12387937 9.10.12~~
~~Taken right @ NOBIS TOC.~~
~~Stake found ~20ft~~
~~upstream (unmarked~~
~~wooden)~~
~~Photos: #810, #811~~
~~(red Nikon)~~

(±1m)
PW-20 : 44.44658066 N
-73.12380091 W
- Flagging moved up to location with unmarked wooden stake
- Entered stream near old wooden steps

Met with Steve Fisk of VT DEC @ ~~approx~~ 1400 showed VT method of sampling

9.10.12 MCM, BGK, MF, LB, RS

PW-17: placed flag at stake
N: ~~44447679507~~ mcm 9.10.12
mcm 9.10.12 ~~W~~ N: 44.44745849
W: -73.12147299
(± 65 cm)
walked in by trucks

PW-11: placed flag at stake
N: 44.44993829
W: -73.12188230
walked in by large tree and woodchips

PW-01: placed flag at stake
N: 44.45291114
W: -73.11912540
walked in behind house

Left @ 1700

(Tod Delong met crew around 11:00)
↳ Avalon

9.11.12 MF, BGK, MCM, LB, RS
Commerce Street Arrival @ 0814
Sunny ~45°F, NO rain

YSI Sonde 556 calibration:
pH: 4.0 std.: 4.0
10.0 std.: 10.0
7.0 check: 7.00 ✓ (chk)
conductivity: 100 µs/cm^c: ✓
(cal) 1000 µs/cm^c: 1000 µs/cm^c
DO: 103.1% ✓ calibrated at 100%

At PW-20: 9:40 am partly cloudy no rain

Temp: 12.14°C VOA(sw) @ 0950AM
Cond: 1916 µs/cm^c
PH: 7.42
DO: 73.5% 7.82 mg/L (not calibrated)

photos: #596 + 597
(2728.JPG + 2729.JPG)
- facing East

sediment VOCs collected @ 1020
sediment grabs (3) taken @ 1025 - Sample jars filled (3)

All samples taken to cooler after sed ~~core~~ grabs sampled
BGK 9.11.12

9.11.12 BGK, MCM, LB, RS, Tod Delong (Avatech)

PW-20 (Rep1)

Macroinverts (sediment) taken @ 10:42. Took 4 plugs, 3" deep, 2½" diameter. Placed in 500 µm sieve bucket. Sediment noted to plug sieve so slow to drain sample.

- C. tentan larvae, small clam noted. Not much else. + decaying leaf matter. Fines rinsed out.

Rep2 @ 11:00 (4 plugs) 3" deep, 2½" diam.
- a few clams

Rep3 @ 11:05 (4 plugs)
- gas bubbles released on insertion
- a few clams, not much else

Rep4 @ 11:10 (4 plugs)
- slight bubbling upon insertion

Habitat (Ben invert) - overhanging vegetation on most banks. [alders = shade, nightshade, grasses, jewelweed all over, sensitive fern] muddy, decaying vegetation. some logs/sticks BGK 9.11.12

9.11.12 BGK, MCM, LB, RS, TD PW-20

Rep 1

Aquatic macros @ 11:22 (PW-20) → MF sampled
- Jabbed bank w/ roots + some overhanging veg x2
- let salamander go.
- Jabbed overhanging veg
- Jabbed log jam w/ leaf pack (downstream of PW-20.) up to 15m downstream after starting @ sampling location for sed/sw/Ben. macros.
- let small fish (unidentifable) go
- couple small crayfish noted.

1 Jar

Rep2 Aquatic macros @ 11:34 (PW-20) - MF sampled.

2 Jars

- overhanging veg/ root mat
- undercut root mat
- noted water striders
- log jam. no leaf pack x2
- noted longnose dace + odonates
- noted crayfish, odonates
- sampled a little past where rep1 was taken. (~ 16/17m?)

→

9.11.12 BGK, MCM, LB, MF, TD

PW-17 @ 1426:

YSI Sonde
pH: 7.58
Temp: 15.52°C
Cond: 2475 µS/cm
DO: 78.4%, 7.75 mg/L

-VOA (SW) sample(s) (4) taken @ 2:30pm

Chloride (SW) taken @ 1435

Sediment (VOA) taken @ 1439

Sediment grab w/ Eckman for 3 analyses taken @ 1436
-3 grabs. Composited in cut out cubitainer w/ clean plastic scoop. Distributed into amber glass vials.

All H_2O + Sed samples taken to cooler w/ ice @ 1540

AQ Inv Repl:

Jab #1: undercut rootmat
Jab #2: undercut (overhanging veg)
Jab #3: undercut with rootmat + overhanging veg
Jab #4: overhanging veg + root mat
→ All along same bank.

Sediment plug 1 @ 1500
8 ~~5~~ plugs MCM 9.11.12

9.11.12 BGK, MCM, LB, MF

sediment plugs (3rd set of 4) = much finer (clay) @ 1530

observed 4 spine? stickleback in ~~stream~~ AQ Inv Jab Repl BGK 9.11.12

AQ Inv Repl:

-Jab #1 } undercut rootmat with overhanging vegetation
-Jab #2 }
-Jab #3 }
-Jab #4: macrophyte

Left site @ 1644

~~9.12.12 MCM, BGK, LB, MF~~
~~YSI sonde 556 calibration~~
MCM 9.12.12

9.12.12 McM, BGK, LB, MF, RS
Commerce Street Arrival @ 0834 sunny ~55°F
Parked in Aquatec parking lot with permission

YSI 556 Sonde Calibration 0851
pH: 4.0 cal: 4.00 ✓
10.0 cal: 10.00 ✓
7.0 check: 7.04 ✓
conductivity: 1000 µm/cm^c cal ✓
100 µm/cm^c chk: 1092
D.O.: 102.1% ✓ cal @ 100%

PW-11 @ 1010
YSI sonde
pH: 7.57
cond: 1004 µ1/cm^c
DO%: 76
DO mg/L: 7.92
Temp: 13.40°C
surface water VOCs collected @ 1023 - MF
- Dups also collected for surface water VOCs @ PW-11 @ 1025

9.12.12 MF, BGK, LB, McM, RS

Sediment VOCs + Dup collected @ 1036 - MF @ 1038

Eckman Grabs taken @ 1043
- Too much woody debris, scoop used instead (within area equivalent to Eckman and depth of 6 in)
Dup also @ 1043

Sediment plugs taken @ 1106 Rep 1
~~Dups @ 1113~~ in cm 9.12.12 Dup 1 @ 1146
Rep 2 @ 1113 Dup 2 @ 1152
Rep 3 @ 1128 Dup 3 @ ~~1159~~ 1214 mcm 9.12.12
Rep 4 @ 1129 Dup 4 @ 1216

AQ Inv Rep 1: 2 jars (1 of 2)
Jab #1: Undercut rootmat, overhanging veg, immergent aquatic macrophytes @ 1239
Jab #2: leaf pack, stick jam @ 12:41
Jab #3: woody debris
→ Crayfish found
→ Stickelback
Jab #4: veg rootmat

9 12 12 MCM BGK, LB, MF, RS

~~Dup~~ Aq Inv Rep ~~#2~~ #2: ~~2 jars~~
2 jars ~~2 jars~~ ~~(2 of 2)~~

JCW#1 - Submergent, emergent
aquatic veg
- 2 stickleback
- crayfish

JCW#2 - woody debris

JCW#3 - woody debris

JCW#4 - aquatic veg
@ 1:30

Dup Aq Inv Rep #1: ~~(1 of 2 jars)~~
~~2 jars~~

JCW#1 - overhanging veg

JCW#2 - emergent macrophytes

JCW#3 - root mat

JCW#4 - overhanging veg
@ 1:38

Dup Aq Inv Rep #2: ~~(2 of 2 jars)~~
2 jars

JCW#1 = root mat

JCW#2 overhanging veg:
root mat

JCW#3 - undercut with root mat

JCW#4 -

9 12 12 MCM, LB, BGK, MF

PW2 @ 1551

Sonde YSI Data @ 1551
pH: 7.85
Cond 916 µs/cm
DO% 88.2
DO mg/L 8.51
Temp (°C): 16.83

Site switched from PW1 to PW2 to provide better sampling conditions. Decision confirmed with Rick Sugatt of EPA

Rinsate blank on deconed Eckman + scoop @ 1415 after PW-11 and placed in cooler.

New VOC pH blank
- 4 drops of HCl added to make sure pH still less than 2 done because of higher pH @ this site pH @ 2 use 5 drops to preserve.

Surface H_2O VOCs collected @ 1557 (4 VOCs)

9.12.12 MF, LB, BGK, MCM

1 chloride sample taken @ 1601

Sediment VOCs collected @ 1602
(and sample for % solids)

3 Eckman Grabs taken @ 1606
(Rctr, ctr, Lctr across station)

Photos: 2755.jpg - PW02 transect
2756.jpg - PW2 full transect
(both taken to East)

GPS point @ PW2 (taken by stake w/flagging left by Nobis for Porewater sample)
N: 44.45264118
W: -73.11935145
(±) 12 m

Sediment plugs taken @ 1629
(4 plugs) Rep 1
replicate 2 plugs taken @ 1630
(4 plugs) Rep 2
replicate 3 plug taken @ 1647
(4 plugs) Rep 3
replicate 4 plug taken @ 1653
(4 plugs) Rep 4

9.12.12 MF, LB, BGK, MCM

Rep 1 Jabs: @ 1702
~10 m up 1: 2758.jpg NW
~~15~~ 12 m up 2: 2760.jpg NW
~~17~~ 13 m up 3: 2761.jpg SE
~~20~~ 14 m up 4: 2762.jpg NE
All @ Log jams upstream of transect
crayfish to donate in 1st rep

Rep 2 Jabs @ 1704
~10m 1: undercut hanging roots
~12m 2: woody debris, crayfish, fish
~~MCM 9.12.12~~ 3 (small stickleback)
3: sticks and leafpack
4: submerged woody debris and leafpack

PW1
2763.jpg } (NE)
2764.jpg }
photos of transect PW1 to verify reason for moving to PW2

Decon'd Eckman and preserved sample with 80% EtOH

Left site @ 1800

9.13.12 BGK, MCM, LB, MF, RS

Reference location:

Arrival @ 0820. Parked in parking lot of Vermont Plastic Specialists, Inc. Rick S. got permission from Rich Watson (802-879-0072) @ 209 Blair Park in Williston, VT

YSI Sonde Calibration:

pH: 4.00 Cal
10.00 Cal
7.00 Cal Check: 6.99 ✓
Conductivity: 1000 um/cm Cal
1000 µs/cm 1095 ✓
DO Cal % @ 100% ✓
DO Cal Check: 100.8%, 9.65 mg/L

Walked down to reference location @ 0951

Reference

Sonde YSI 556 Data

pH: ~~8.17~~ 8.21 MCM 9.13.12
cond (µs/cm): ~~960~~ 965 MCM 9.13.12
DO%: 100.9
DO mg/L: 9.62
Temp (°C): ~~17.15~~ 17.53 MCM 9.13.12

9.13.12 BGK, MCM, LB, MF, RS

Ref GPS coord
N: 44.45478218
W: -73.11757334
(in back of plastics building past loading dock)

New pH blank done due to high pH @ 1037
5 drops HCl into blank = 1.5 on pH paper
will continue to add 5 drops to VOC samples

Surface H_2O VOCs taken @ 1040

Sediment Eckman grabs @ 1044 - 3 grabs down center channel

Rep 1 sediment plugs @ 1058
Rep 2 sediment plugs @ 1058
Rep 3 sediment plugs @ 1111
Rep 4 sediment plugs @ 1115

Rep 2 plugs - 1 in thick organic layer with sand. Dark gray

9.13.12 MCM, BGK, MF, LB

Silt sand mix as well. Tentan larvae

Rep 1 sed plug - chunks of clay

Rep 3 sed. plug - silt, sand, clay

water column invert samp

Rep 1:

jab 1: damselfly, Dragonfly larvae, odonates, other snails. Macrophytes, submerged rootmat with overhanging vegetation. @ 1116 Mollusca + arthropoda represented phyla

~5m upstr.

jab 2: submerged woody debris ~6m upstream submerged woody debri and overhanging vegetation @ 1122 ~~submerged rootpack with detritus~~ MCM 9.13.12

~7m up

jab 3: submerged rootmat with detritus. @ 1123

~8m up

jab 4: small leafpack in small wood jam @ 1125

9.13.12 MCM, BGK, LB, MF

Rep 2:

jab 1: exposed aquatic rootmat and overlying vegetation @ 1130 Some litter found in net. (Plastic bag and styrofoam, bubblewrap) ~6m up

jab 2: some woody debris exposed aquatic rootmat and overlying veg ~7m up plastic bag + metal post found submerged @ 1132 metal can set in bank

jab 3: leaf mat with woody debris @ 1135 ~9m up

jab 4: exposed aquatic rootmat. Leaf litter and woody debris @ 1136 ~10m upstream

Dace found in rep 2 jabs

Caddisfly found in rep 1 jabs

Stream not channelized but @ overflow conditions will become marsh.

Left site @ 1250

APPENDIX B

Lotic Benthos Field Sheets

(ESAT & Steve Fiske copies)

LOTIC BENTHOS FIELD SHEET
(2011 edition)

BioLab ID _____
Chem LabID _____

Site Name Muddy Brook (Unnamed Stream) River Mile _____
Site ID PW-20 Trib4
Date 9-11-12 Time 11:08 Crew MF, BGK, LB, MCM
Site Description Large riparian width

Town: Williston, VT Stream Order: _____ Drainage Area: _____ Km^2 Elevation: _____ ft
D.D° Latitude: 44.44658066 Longitude: -73.12380091 Lat/Long source (GPS – set to NAD83:) _____
Weather: partly cloudy Flow/Weather Previous (2 weeks/2days): Heavy rain/partly cloudy
Surrounding Land Use: commercial + industrial

SAMPLING INFORMATION chest
Sampler: MF Gear: waders
Effort Time: ____ min Mesh: 500 um
Area: _____ m^2 Quantitative: Y / N
#Reps: _____ Comp/rep: ____

Qual. PERIPHYTON COVER for each type 0-100% (*See back for Periphyton Cover Form*)
Diatom _____% Filamentous Green _____% and length _____in
Blue Green _____% Moss _____% Green _____% Other _____%

General Trophic Rating: _____ (0=oligo, 5=Eutroph)

EMBEDDEDNESS
(5) 0-5% Excel (4) 5-25% V Good (3) 25-50% Good (2) 50-75% Fair (1) > 75% Poor Estimate 100 %
Silt Rating: 3 (0=none, 5= chocolate) CPOM Rating (leaf packs): 1 (0= none,5=high)
Lg Woody Debris (>4"dia) #: ~~15~~ <5% /100m (reach)
~~<50%~~ MCM 9.11.12

GENERAL WATER TYPE Riffle, (Winder), or Other _____ Warm, (Cold), or Mixed Channelized: Y / (N) Upstream Dam: Y / (N) ____ mi
B.F.Width: 2.55 (m) Wetted Width: 2.25 (m) Riffle Depth: 0.5 (m) Pool Depth: _____(m) and Obs: _____
Bank Stability: (EX) VG G F Velocity estimate (circle): (S) <0.4 ft/sec, (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: _____ ft/sec

Riparian VEGETATION (both sides, does not need to add up to 100%) Riparian Width (facing upstream) L 718 m, R 718 m
Overstory: Softwood 0 % Hardwood 30 % Understory: Shrub (brush) 25 % Grass 0 % Herbaceous 75 %
Canopy %: 100 90 80 70 60 50 (40) 30 20 10 0 Overhead: Open, (Partly Open), or Closed

WATER QUALITY PARAMETERS Sampler: BGK Meter (type, #) YSI 556 sonde
Baseflow or Freshet Flow Present Flow: H - M – L Annotate? Y / N
Temp Air ~16 (C) °F Temp Water 12.14 °C fpH 7.42 lab pH _____ fCond 1916 D.O.% 73.5 D.Omg/l 7.82 Color slightly Milky
Cond pH Alk TP DP Cl ICAnions Turb TN N02-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other _____, _____,
_____, _____, _____, _____, _____, _____, _____, _____

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply) Overall Aesthetic Rating 0 (poor) – 5 (exc.) 4

A – Pollution: Sludge | Sawdust | Paper Fiber | (Sand) | (Silt) | Sewage | Oily Sheen | Trash | Iron | Scum | None
B – Water Clarity: Clear | (Slightly Turbid) | Moderately Turbid | Very Turbid | Secci Tube_____mm
C – Water Color: Clear | (Green Milky) | Brown (Tannic) L M H | Gray | Metallic | Reddish
D – Odors: (None) | Musty | Fishy | Sewage | Manure | Sulfur(eggs) | Oily/gas
Aquatic Biota Observed: Mussels, Crayfish, Gastropods, Fish, Other

Small fish, crayfish, salamander, clams
see field log book

(ESAT)

Field Sheet Complete: MCM (initial)
Photos: (Y) N
Fish Survey Conducted: Y / (N)

LOTIC BENTHOS FIELD SHEET

(2011 edition)

BioLab ID _____

Chem LabID _____

(Unnamed Stream)

Site Name Muddy Brook Tributary #4 River Mile _____

Site ID PW-17

Date 09-11-12 Time 1440 Crew MF, BGK, LB, MCM

Site Description Large riparian zone

Town: Williston, VT Stream Order: _____ Drainage Area: _____ Km^2 Elevation: _____ ft

D.D° Latitude: 44.447458499 Longitude: -73.121472999 Lat/Long source (GPS – set to NAD83:) _____

Weather: SUNNY ~75°F Flow/Weather Previous (2 weeks/2days): heavy rain / partly cloudy

Surrounding Land Use: _____

SAMPLING INFORMATION Sampler: BGK/MF Gear: chestwader VT method

Effort Time: ____ min Mesh: 500 um

Area: _____ m^2 Quantitative: Y / N

#Reps: _____ Comp/rep: ____

Qual. PERIPHYTON COVER for each type 0-100% (*See back for Periphyton Cover Form*)

Diatom _____% Filamentous Green _____% and length _____in

Blue Green _____% Moss _____% Green _____% Other _____%

General Trophic Rating: _____ (0=oligo, 5=Eutroph)

EMBEDDEDNESS

(5) 0-5% Excel (4) 5-25% V Good (3) 25-50% Good (2) 50-75% Fair (1) > 75% Poor Estimate 100%

Silt Rating: 4 (0=none, 5= chocolate)

CPOM Rating (leaf packs): 0 (0= none,5=high)

Lg Woody Debris (>4"dia) #: 0 /100m (reach)

GENERAL WATER TYPE Riffle, (Winder), or Other _____ Warm, (Cold), or Mixed Channelized: Y / (N) Upstream Dam: Y / (N) ____mi

* B.F.Width: 1.7 (m) Wetted Width: 1.8 (m) Riffle Depth: 0.2 (m) Pool Depth: _____(m) and Obs: _____

Bank Stability: EX (VG) G F Velocity estimate (circle): (S) <0.4 ft/sec, (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: _____ ft/sec

Riparian VEGETATION (both sides, does not need to add up to 100%) Riparian Width (facing upstream) L 718 m, R >18 m

Overstory: Softwood 0 % Hardwood 0 % Understory: Shrub (brush) 0 % Grass 0 % Herbaceous 100 %

Canopy %: 100 90 80 70 60 50 40 30 20 10 (0) Overhead: Open, Partly Open, or Closed

WATER QUALITY PARAMETERS Sampler: MF Meter (type, #) YSI 556 Sonde

Baseflow or Freshet Flow Present Flow: H - M – L Annotate? Y / N

Temp Air ~75 °C (°F) Temp Water 15.52 °C fpH 7.58 lab pH _____ fCond 2475 D.O.% 78.4 D.Omg/l 7.75 Color clear

Cond pH Alk TP DP Cl ICAnions Turb TN N02-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other _____, _____,

_____, _____, _____, _____, _____, _____, _____, _____

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply)

Overall Aesthetic Rating 0 (poor) – 5 (exc.) 3

A – Pollution: Sludge | Sawdust | Paper Fiber (Sand) (Silt) | Sewage | Oily Sheen | Trash | Iron | Scum | None

B – Water Clarity: (Clear) | Slightly Turbid | Moderately Turbid | Very Turbid | Secci Tube_____mm

C – Water Color: (Clear) | Green Milky | Brown (Tannic) L M H | Gray | Metallic | Reddish

D – Odors: (None) | Musty | Fishy | Sewage | Manure | Sulfur(eggs) | Oily/gas

Aquatic Biota Observed: Mussels, Crayfish, Gastropods, Fish, Other Stickleback see ~~attached~~ field log book

mcm 9.11.12

* BF width shorter because of undercut

(ESAT)

Field Sheet Complete: _____ (initial)

Photos: (Y) / N

Fish Survey Conducted: Y / (N)

LOTIC BENTHOS FIELD SHEET

(2011 edition)

BioLab ID _____

Chem LabID _____

(Unnamed Stream)

Site Name Muddy Brook Tributary 4 River Mile _____

Site ID PW-11

Date 9.12.12 Time 1113 Crew MF, BGK, mcm, LB

Site Description Near street and parking lot of Aquatec

Town: Williston, VT Stream Order: _____ Drainage Area: _____ Km^2 Elevation: _____ ft

D.D° Latitude: 44.4493829 Longitude: -73.12188230 Lat/Long source (GPS – set to NAD83:) _____

Weather: sunny, clear Flow/Weather Previous (2 weeks/2days): clear/sunny

Surrounding Land Use: commercial/industrial partly cloudy at times/ Heavy rain past 2 wks

SAMPLING INFORMATION Chest waders

Sampler: MF Gear: waders

Effort Time: ____ min Mesh: 500 um

Area: _____ m^2 Quantitative: Y / N

#Reps: _____ Comp/rep: ____

Qual. PERIPHYTON COVER for each type 0-100% (*See back for Periphyton Cover Form*)

Diatom _____% Filamentous Green _____% and length _____in

Blue Green _____% Moss _____% Green _____% Other _____%

General Trophic Rating: _____ (0=oligo, 5=Eutroph)

EMBEDDEDNESS

(5) 0-5% Excel (4) 5-25% V Good (3) 25-50% Good (2) 50-75% Fair (1) > 75%Poor Estimate 100 %

Silt Rating: 2 (0=none, 5= chocolate)

CPOM Rating (leaf packs): X3 (0= none,5=high) mcm 9.12.12

Lg Woody Debris (>4"dia) #: 4 /~~100m~~ 11.3 m (reach)

GENERAL WATER TYPE Riffle, Winder, or Other _____ Warm, Cold, or Mixed Channelized Y / N Upstream Dam: Y / N ____mi

B.F.Width: 1.8 (m) Wetted Width: 1.0 (m) Riffle Depth: 0.2 (m) Pool Depth: _____(m) and Obs: _____

Bank Stability: EX VG G F Velocity estimate (circle): (S) <0.4 ft/sec, (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: _____ ft/sec

Riparian VEGETATION (both sides, does not need to add up to 100%) Riparian Width (facing upstream) L 5 ~18 m, R 5 ~12 m mcm 9.12.12

Overstory: Softwood 0 % Hardwood 55 % Understory: Shrub (brush) 20 % Grass 0 % Herbaceous 80 %

Canopy %: 100 90 80 70 60 50 40 30 20 10 0 Overhead: Open, Partly Open, or Closed

WATER QUALITY PARAMETERS Sampler: MF + BGK Meter (type, #) YSI Sonde 556

Baseflow or Freshet Flow Present Flow: H / M / L Annotate? Y / N

Temp Air ~82 °C / °F Temp Water 13.40 °C fpH 7.57 lab pH _____ fCond 1004 D.O.% 76 D.Omg/l 7.92 Color clear

Cond pH Alk TP DP Cl ICAnions Turb TN N02-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other _____, _____,

_____, _____, _____, _____, _____, _____, _____, _____

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply)

Overall Aesthetic Rating 0 (poor) – 5 (exc.) 3

A – Pollution: Sludge | Sawdust | Paper Fiber | Sand | Silt | Sewage | Oily Sheen | Trash | Iron | Scum | None

B – Water Clarity: Clear | Slightly Turbid | Moderately Turbid | Very Turbid | Secci Tube_____mm

C – Water Color: Clear | Green Milky | Brown (Tannic) L M H | Gray | Metallic | Reddish

D – Odors: None | Musty | Fishy | Sewage | Manure | Sulfur(eggs) | Oily/gas

Aquatic Biota Observed: Mussels, Crayfish, Gastropods, Fish, Other

crayfish, stickleback

see field logbook

(ESAT)

Field Sheet Complete: M C M (initial)

Photos: Y / N

Fish Survey Conducted: Y / N

LOTIC BENTHOS FIELD SHEET

(2011 edition)

BioLab ID _____

Chem LabID _____

(Unnamed Stream)

Site Name Muddy Brook Tributary 4 River Mile _____

Site ID PW2

Date 9.12.12 Time 1710 Crew MCM, MF, LB, BGK

Site Description behind building

Town: Williston, VT Stream Order: _____ Drainage Area: _____ Km^2 Elevation: _____ ft

D.D° Latitude: 44.45264118 Longitude: -73.11935145 Lat/Long source (GPS – set to NAD83:) _____

Weather: Clear/sunny ~80°F Flow/Weather Previous (2 weeks/2days): Heavy rain/partly cloudy

Surrounding Land Use: commercial + industrial

SAMPLING INFORMATION chest waders

Sampler: MF Gear: Net

Effort Time: ____ min Mesh: 500 um

Area: _____ m^2 Quantitative: Y / N

#Reps: _____ Comp/rep: ____

Qual. PERIPHYTON COVER for each type 0-100% (*See back for Periphyton Cover Form*)

Diatom _____% Filamentous Green _____% and length _____in

Blue Green _____% Moss _____% Green _____% Other _____%

General Trophic Rating: _____ (0=oligo, 5=Eutroph)

EMBEDDEDNESS

(5) 0-5% Excel (4) 5-25% V Good (3) 25-50% Good (2) 50-75% Fair (1) > 75%Poor Estimate 100 %

Silt Rating: 2 (0=none, 5= chocolate) CPOM Rating (leaf packs): 1 (0= none,5=high)

Lg Woody Debris (>4"dia) #: 5 /100m ~~reach~~ 14.6 m MCM 9.12.12

All sand/silt

GENERAL WATER TYPE Riffle, (Winder), or Other _____ Warm, (Cold), or Mixed Channelized: Y / (N) Upstream Dam: Y / (N) ____mi

B.F.Width: 2.7 (m) Wetted Width: 1.7 (m) Riffle Depth: 0.17 (m) Pool Depth: _____(m) and Obs: _____

Bank Stability: EX (VG) G F Velocity estimate (circle): (S) <0.4 ft/sec, (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: _____ ft/sec

Riparian VEGETATION (both sides, does not need to add up to 100%) Riparian Width (facing upstream) L ~6 m, R >18 m

Overstory: Softwood 0 % Hardwood 90 % Understory: Shrub (brush) 0 % Grass 10 % Herbaceous 90 %

Canopy %: 100 (90) 80 70 60 50 40 30 20 10 0 Overhead: Open, (Partly Open), or Closed mostly closed

WATER QUALITY PARAMETERS Sampler: BGK Meter (type, #) YSI 556 Sonde

Baseflow or Freshet Flow Present Flow: H - M - L Annotate? Y / N

Temp Air 75 °C (°F) Temp Water 16.83 °C fpH 7.85 lab pH _____ fCond 916 D.O.% 88.2 D.Omg/l 8.51 Color clear

Cond pH Alk TP DP Cl ICAnions Turb TN N02-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other _____, _____,

_____, _____, _____, _____, _____, _____, _____, _____

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply) Overall Aesthetic Rating 0 (poor) – 5 (exc.) 2

A – Pollution: Sludge | Sawdust | Paper Fiber | (Sand) | (Silt) | Sewage | Oily Sheen | Trash | Iron | Scum | (None)

B – Water Clarity: (Clear) | Slightly Turbid | Moderately Turbid | Very Turbid | Secci Tube_____mm

C – Water Color: (Clear) | Green Milky | Brown (Tannic) L M H | Gray | Metallic | Reddish

D – Odors: (None) | Musty | Fishy | Sewage | Manure | Sulfur(eggs) | Oily/gas

Aquatic Biota Observed: Mussels, Crayfish, Gastropods, Fish, Other

crayfish, fish (stickleback), odonates

see field log book

(ESAT)

Field Sheet Complete: MCM (initial)

Photos: (Y) / N

Fish Survey Conducted: Y / (N)

LOTIC BENTHOS FIELD SHEET

(2011 edition)

BioLab ID _____

Chem LabID _____

(Unnamed Stream)

Site Name Muddy Brook Trib 4 River Mile _____

Site ID Reference

Date 9.13.12 Time 0955 Crew MF BGK LB MCM

Site Description behind loading dock @ Vermont Plastics, 209 Blair Park Rd

Town: Williston, VT Stream Order: _____ Drainage Area: _____ Km^2 Elevation: _____ ft

D.D° Latitude: 44.454478218 Longitude: -73.11751334 Lat/Long source (GPS – set to NAD83:) _____

Weather: Clear/sunny Flow/Weather Previous (2 weeks/2days): Sunny/~~no~~ heavy rain

Surrounding Land Use: industrial + commercial MCM 10.2.12

SAMPLING INFORMATION

Sampler: MF Gear: _____

Effort Time: ____ min Mesh: 500 um

Area: _____ m^2 Quantitative: Y / N

#Reps: _____ Comp/rep: ____

Qual. PERIPHYTON COVER for each type 0-100% (*See back for Periphyton Cover Form*)

Diatom _____% Filamentous Green _____% and length _____in

Blue Green _____% Moss _____% Green _____% Other _____%

General Trophic Rating: _____ (0=oligo, 5=Eutroph)

EMBEDDEDNESS

(5) 0-5% Excel (4) 5-25% V Good (3) 25-50% Good (2) 50-75% Fair (1) > 75%Poor Estimate 100 %

Silt Rating: 1 (0=none, 5= chocolate) CPOM Rating (leaf packs): 1 (0= none,5=high)

Lg Woody Debris (>4"dia) #: 2 /~~100m~~ (reach) MCM 9.13.12 14m

GENERAL WATER TYPE Riffle, (Winder), or Other _____ Warm, (Cold), or Mixed Channelized: Y / (N) Upstream Dam: Y / (N) ____ mi

B.F.Width: 2.3 (m) Wetted Width: 1.7 (m) Riffle Depth: 0.26 (m) Pool Depth: _____(m) and Obs: _____

Bank Stability: (EX) VG G F Velocity estimate (circle): (S) <0.4 ft/sec, (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: _____ ft/sec

Riparian VEGETATION (both sides, does not need to add up to 100%) Riparian Width (facing upstream) L ~~~~ 12 m, R 718 m MCM 9.13.12

Overstory: Softwood 0 % Hardwood 40 % Understory: Shrub (brush) 0 % Grass 40 % Herbaceous 60 %

Canopy %: 100 90 80 70 60 50 40 30 20 (10) 0 Overhead: (Open), Partly Open, or Closed

WATER QUALITY PARAMETERS Sampler: BGK Meter (type, #) YSI 556 sonde

Baseflow or Freshet Flow Present Flow: H - M - (L) Annotate? Y / N

Temp Air ~70 °C, (°F) Temp Water 17.53 °C fpH 8.21 lab pH _____ fCond 965 D.O.% 100.9 D.Omg/l 9.62 Color Clear

Cond pH Alk TP DP Cl ICAnions Turb TN N02-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other _____, _____,

_____, _____, _____, _____, _____, _____, _____, _____

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply)

Overall Aesthetic Rating 0 (poor) – 5 (exc.) 3

A – Pollution: Sludge | Sawdust | Paper Fiber | (Sand) | (Silt) | Sewage | Oily Sheen | (Trash) | (Iron) | Scum | None

B – Water Clarity: (Clear) | Slightly Turbid | Moderately Turbid | Very Turbid | Secci Tube _____mm

C – Water Color: (Clear) | Green Milky | Brown (Tannic) L M H | Gray | Metallic | Reddish

D – Odors: (None) | Musty | Fishy | Sewage | Manure | Sulfur(eggs) | Oily/gas

Loading Dock in view

Aquatic Biota Observed: Mussels, Crayfish, Gastropods, Fish, Other

odonates and snails

Dace species

see field log book

(ESAT)

Field Sheet Complete: MCM (initial)

Photos: (Y) / N

Fish Survey Conducted: Y / (N)

APPENDIX C

Habitat Assessment Field Datasheet – Low Gradient

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Unnamed Stream	LOCATION PW-20
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT 34.4465866 LONG -73.1238091	RIVER BASIN
STORET #	AGENCY Tech Law Inc, ESAT
INVESTIGATORS MCM, MF, BGK, LB	
FORM COMPLETED BY Meaghan Macri	DATE 9.11.12 TIME 0940 (AM) PM
REASON FOR SURVEY commerce street plume	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 10	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 14	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 2	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 19	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 16	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

PW-20

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 20	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 15	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 154

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

Muddy Brook (Unnamed Stream)

STREAM NAME Tributary #4	LOCATION PW-17
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT 44.44745849 LONG -73.12147299	RIVER BASIN
STORET #	AGENCY Techlaw, Inc. ESAT
INVESTIGATORS MF, BGK, LB, MCM	
FORM COMPLETED BY Meaghan Macri	DATE 9-11-12 TIME 1435 AM PM
REASON FOR SURVEY commerce street plume	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 14	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 11	20 19 18 17 16	15 14 (13) 12 (11)	10 9 (8) 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 2	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 20	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 17	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

BGK 9-11-12

MCM 9-11-12 BGK 9-11-12

PW-17

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 20	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 14	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 152

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

Muddy Brook (Unnamed Stream)

STREAM NAME Trib 4	LOCATION PW-11	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT 41.4493829 LONG -73.12188230	RIVER BASIN	
STORET #	AGENCY ESAT, Techlaw Inc.	
INVESTIGATORS MF, BGK, MCM, LB		
FORM COMPLETED BY Meaghan Macri	DATE 9.12.12 TIME 1020 (AM) PM	REASON FOR SURVEY commerce street plume

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 17	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 13	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 3	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 20	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 15	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

PW-11

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 19	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 10	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0

Total Score 151

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

Muddy Brook (Unnamed Stream)

STREAM NAME Tributary 4	LOCATION PW2	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT 44.45264118 LONG -73.11935145	RIVER BASIN	
STORET #	AGENCY ESAT Techlaw INC	
INVESTIGATORS MF, BGK, LB, MCM		
FORM COMPLETED BY Meaghan Macri	DATE 9.12.12 TIME 1637 AM PM	REASON FOR SURVEY Commercestreet plume

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (0)
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 19	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 10	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0

PW-2

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (0)
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0

Total Score 95

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

Trib 4 (Unnamed Stream)

STREAM NAME Muddy Brook	LOCATION Reference site	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT 44.45478218 LONG -73.11757334	RIVER BASIN	
STORET #	AGENCY ESAT Techlaw Inc	
INVESTIGATORS MCM, BGK, LB, MF		
FORM COMPLETED BY Meaghan Macri	DATE 9.13.12 TIME 1102 (AM) PM	REASON FOR SURVEY commerce street plume

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 15	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 12	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 18	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 19	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Reference

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 20	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length ~~1 to 2~~ times longer than if it was in a straight line. 2 to 3 MCM 9.13.12	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 14	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 6 (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 (6)	5 4 3	2 1 0

Total Score 161

APPENDIX D

Physical Characterization/Water Quality Field Datasheets

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

Muddy Brook/Unnamed Stream

STREAM NAME ~~UT Trib 4~~ Main Trib 2	LOCATION PW-20
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT 44.446586 LONG -73.123800 91	RIVER BASIN
STORET #	AGENCY ESAT Tecnlaw, Inc.
INVESTIGATORS MCM, MF, BGK, LB	
FORM COMPLETED BY Meaghan Macri	DATE 9.11.12 TIME 0940 (AM) PM — REASON FOR SURVEY Commerce Street Plume

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
20 %	%cloud cover	50 %
☐	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☒ Yes ☐ No

Air Temperature ~16 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

photos: (Red Nikon)

2728.jpg } Facing East
2729.jpg }

2730.jpg - East (sed. plug)

Benthos sampling Locations (VT)

2731.jpg - SE
2732.jpg - N
2733.jpg - S
2734.jpg - W

Available in: G:\ALLSHARE\ESATBIO\Commerce St (VT)

STREAM CHARACTERIZATION

Stream Subsystem ☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☒ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☒ Spring-fed
☐ Mixture of origins
☒ Other stream runoff

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

PW-20

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☒ Commercial
☐ Field/Pasture ☒ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☐ Some potential sources
☒ Obvious sources

Local Watershed Erosion
☒ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☒ Trees ☐ Shrubs ☒ Grasses ☒ Herbaceous
dominant species present Alder/spotted jewlweed/sensitive fern various grass mcm 9-11-12

INSTREAM FEATURES

Estimated Reach Length 16 m
Estimated Stream Width 2.25 m
Sampling Reach Area 36 m² mcm 0.86
Area in km² (m²x1000) ~~36000~~ km²
Estimated Stream Depth ~~0.6~~ m 0.5 mcm 9.11.12
Surface Velocity (at thalweg) 40.1 m/sec

Canopy Cover
☐ Partly open ☒ Partly shaded ☐ Shaded

High Water Mark 0.6 m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle ___ % ☒ Run ~~100~~ % 80
☒ Pool 20 %
MCM 9.11.12

Channelized ☐ Yes ☒ No

Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD 1 m² 27.8 m2/km2
Density of LWD ~~45%~~ ~~m²/km²~~ (LWD/ reach area)
mcm 9.13.12

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☒ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae
dominant species present ~~Alder~~ No living vegetation
Portion of the reach with aquatic vegetation ~~30~~ % 0%

WATER QUALITY

Temperature 12.14 °C
Specific Conductance 1916 µs/cm
Dissolved Oxygen 73.5%, 7.82 mg/L
pH 7.42
Turbidity —
WQ Instrument Used YSI 556 sonde

Water Odors
☒ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☒ None ☐ Other _____

Turbidity (if not measured)
☐ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☒ Other Milky

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☒ Sand
☐ Relict shells ☒ Other No deposits

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☐ No N/A

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	20
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	0	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	0			
Sand	0.06-2mm (gritty)	50	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	50			
Clay	< 0.004 mm (slick)	0			

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

Muddy Brook (Unnamed Stream

STREAM NAME Tributary 4	LOCATION PW-17	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT 44.44745849 LONG -73.12147299	RIVER BASIN	
STORET #	AGENCY Techlaw Inc, ESAT	
INVESTIGATORS MF, BGK, LB, MCM		
FORM COMPLETED BY Meaghan Macri	DATE 9.11.12 TIME 1430 AM PM	REASON FOR SURVEY commerce street plume

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
___% ☐	%cloud cover	☒ 50%
☒	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☒ Yes ☐ No

Air Temperature ~25 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

photos:

2735.jpg
2736.jpg
2737.jpg
2738.jpg
} → NE → Eckman grab

2739.jpg-NE -sed.grab(Eckman)
2740.jpg-NE -plug
2741.jpg-E-Jab#1
2742.jpg-E-Jab#2
2743.jpg-SE_Jab#3
2743.jpg-S_Jab#4
} Repl

Available in G:\ALLSHARE\ESATBIO\Commerce St(VT)

STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☒ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☒ Spring-fed
☐ Mixture of origins
☒ Other urban runoff

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

PW-17

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☒ Commercial
☐ Field/Pasture ☒ Industrial
☐ Agricultural ☒ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☐ Some potential sources
☒ Obvious sources

Local Watershed Erosion
☒ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☐ Trees ☐ Shrubs ☒ Grasses ☒ Herbaceous
dominant species present cattail, spotted jewelweed, phragmites, purple loosestrife

INSTREAM FEATURES

Estimated Reach Length 14 1.7 m because mcm 9.11.12 undercut
Estimated Stream Width 1.8 m
Sampling Reach Area 25.2 m²
Area in km² (~~m² x 1000~~) 0.0252 km² mcm 9.11.12
Estimated Stream Depth 0.2 m
Surface Velocity <0.1 m/sec (at thalweg)

Canopy Cover
☒ Partly open ☐ Partly shaded ☐ Shaded
High Water Mark 0.45 m
Proportion of Reach Represented by Stream Morphology Types
☐ Riffle ____ % ☒ Run 100 %
☐ Pool ____ %
Channelized ☐ Yes ☒ No
Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD 0 m²
Density of LWD 0 m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☒ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae
dominant species present ~~N/A no aquatic vegetation~~ unknown macrophyte mcm 9.11.12
Portion of the reach with aquatic vegetation 01 % mcm 9.11.12

WATER QUALITY

Temperature 15.52 °C
Specific Conductance 2475 µs/cm
Dissolved Oxygen 78.4%, 7.75mg/L
pH 7.58
Turbidity —
WQ Instrument Used YSI 556 sonde

Water Odors
☒ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☒ None ☐ Other _____

Turbidity (if not measured)
☒ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☒ Sand
☐ Relict shells ☒ Other NO deposits

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☐ No N/A (NO stones)

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	40
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	0	Muck-Mud	black, very fine organic (FPOM)	20
Gravel	2-64 mm (0.1"-2.5")	0			
Sand	0.06-2mm (gritty)	30	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	60			
Clay	< 0.004 mm (slick)	10			

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

Muddy Brook (Unnamed Stream)

STREAM NAME Tributary 4	LOCATION PW-11
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT 44.4493829 LONG -73.12188230	RIVER BASIN
STORET #	AGENCY ESAT, Techlaw Inc.
INVESTIGATORS MF, MCM, BGK, LB	
FORM COMPLETED BY Meaghan Macri	DATE 9.12.12 TIME 1015 (AM) PM — REASON FOR SURVEY commerce street plume

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
___% ☐	%cloud cover	☒ 20%
☒	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☒ Yes ☐ No

Air Temperature ~12 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

Photographs:

2745.jpg (SE) @transect
2746.jpg (SE) Flecks of oil
2747.jpg (S) scoops sediment
2748.jpg (SE) 1st Jab Rep 1
2749.jpg (SE) 2nd Jab Rep 1
2752.jpg (SE) 3rd Jab Rep 1
2753.jpg (E) 4th Jab Rep 1

Available in G:\ALLSHARE\ESATBIO\Commerce St(VT)

STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☒ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☒ Spring-fed
☐ Mixture of origins
☒ Other urban runoff

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

PW-11

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☒ Commercial
☐ Field/Pasture ☒ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☐ Some potential sources
☒ Obvious sources

Local Watershed Erosion
☒ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☒ Trees ☐ Shrubs ☒ Grasses ☒ Herbaceous various Grasses

dominant species present spotted jewelweed, Alder, white birch, white pine, Ash (mixed deciduous)

INSTREAM FEATURES

Estimated Reach Length 11.3 m
Estimated Stream Width 1.0 m
Sampling Reach Area 11.3 m²
Area in km² ~~(m² x1000)~~ 0.0113 km² MM 9/12/12
Estimated Stream Depth 0.2 m
Surface Velocity <0.1 m/sec (at thalweg)

Canopy Cover
☐ Partly open ☒ Partly shaded ☐ Shaded

High Water Mark 0.28 m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle 1 % ☒ Run 90 %
☒ Pool 10 %

Channelized ☐ Yes ☒ No
Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD 0.5 m²
Density of LWD 44.25 m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☒ Rooted emergent ☒ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present Submerged broadleaf

Portion of the reach with aquatic vegetation 10 %

WATER QUALITY

Temperature 13.40 °C
Specific Conductance 1004 µs/cm
Dissolved Oxygen 76%, 7.92 mg/L
pH 7.57
Turbidity —
WQ Instrument Used YSI sonde 556

Water Odors
☒ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☒ Flecks <0.5 m²
☐ None ☐ Other _____

Turbidity (if not measured)
☒ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☒ Sand
☐ Relict shells ☒ Other NO Deposits

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☐ No N/A NO stones

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	30
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	0	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	0			
Sand	0.06-2mm (gritty)	65	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	30			
Clay	< 0.004 mm (slick)	5			

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

Muddy Brook (Unnamed Stream)

STREAM NAME Tributary 4	LOCATION PW2	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT 44.45264118 LONG -73.11935145	RIVER BASIN	
STORET #	AGENCY ESAT Techlaw inc	
INVESTIGATORS MF, BGK, LB, MCM		
FORM COMPLETED BY Meaghan Macri	DATE 9.12.12 TIME 1551 AM PM	REASON FOR SURVEY commerce street plume

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
___% ☐	%cloud cover	☒ 50%
☒	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☒ Yes ☐ No

Air Temperature N 27 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

Photos: 2755.jpg - PW2 Transect (E)
2756.jpg - PW2 Full Transect (E)

Rep 1 Jabs:

2758.jpg (NW)
2760.jpg (NW)
2761.jpg (SE)
2762.jpg (NE)

} All @ log jams (woody debris) within 20m of transect PW2

Available in G:\ALLSHARE\ESATBKL\Commerce St (VT)

STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☒ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☒ Spring-fed
☐ Mixture of origins
☒ Other Urban Runoff

Catchment Area _____ km²

PW-2

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☒ Commercial
☐ Field/Pasture ☒ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☐ Some potential sources
☒ Obvious sources

Local Watershed Erosion
☒ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☒ Trees ☐ Shrubs ☒ Grasses ☒ Herbaceous

dominant species present _____

INSTREAM FEATURES

Estimated Reach Length 14.6 m
Estimated Stream Width 1.7 m
Sampling Reach Area 24.82 m²
Area in km² (m²x1000) 0.02482 km²
Estimated Stream Depth 0.17 m
Surface Velocity < 0.1 m/sec **(at thalweg)**

Canopy Cover
☐ Partly open ☒ Partly shaded ☐ Shaded MOSTLY SHADED

High Water Mark 0.62 m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle ____ % ☒ Run 90 %
☒ Pool 10 %

Channelized ☒ Yes ☐ No

Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD 1 m²
Density of LWD 40 m²/km² **(LWD/ reach area)**

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present None

Portion of the reach with aquatic vegetation 0 %

WATER QUALITY

Temperature 16.83 °C
Specific Conductance 916
Dissolved Oxygen 88.2% 8.51 mg/L
pH 7.85
Turbidity —
WQ Instrument Used YSI 556 Sonde

Water Odors
☒ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☒ None ☐ Other _____

Turbidity (if not measured)
☒ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☒ Sand
☐ Relict shells ☒ Other NO DEPOSITS

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☐ No N/A NO ROCKS

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	40
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	0	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	0			
Sand	0.06-2mm (gritty)	50	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	45			
Clay	< 0.004 mm (slick)	5			

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

Muddy Brook (Unnamed Stream)

STREAM NAME Trib 4	LOCATION Reference
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT 44.45478248 LONG -73.1757334	RIVER BASIN
STORET #	AGENCY ESAT Techlaw Inc.
INVESTIGATORS MF, BGK, LB, MCM	
FORM COMPLETED BY Meaghan Macri	DATE 9.13.12 TIME 0951 (AM) PM
REASON FOR SURVEY Commerce street plume	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
___% ☐	%cloud cover	☐ ___%
☒	clear/sunny	☒

Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature ~21 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

Photographs:

2765.jpg (SW) - Reference site
2766.jpg (SW) - sampling H_2O VOCs
2767.jpg (NW) - benthic sampling
2768.jpg (W) } Rep 1
2769.jpg (W) } Jabs 1–4
2770.jpg (W) } (in order)
2771 + 2772 (W) → both jab 4
2773 (E) } metal gas can set in
2774 (E) } bank @ 2nd jab of rep 2

Available in G:\ALLSHARE\ESATBIO\Commerce St (VT)

STREAM CHARACTERIZATION

Stream Subsystem: ☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type: ☒ Coldwater ☐ Warmwater

Stream Origin: ☐ Glacial ☐ Non-glacial montane ☐ Swamp and bog ☒ Spring-fed ☐ Mixture of origins ☒ Other Urban runoff

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Reference

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☒ Commercial
☐ Field/Pasture ☒ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☒ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☒ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☒ Trees ☐ Shrubs ☒ Grasses ☒ Herbaceous
dominant species present spotted jewelweed, mixed deciduous and hardwood nightshade grapevine, birch white oak red maple various grasses

INSTREAM FEATURES

Estimated Reach Length 14 m
Estimated Stream Width 1.7 m
Sampling Reach Area 23.8 m²
Area in km² ~~(m² x 1000)~~ 0.0238 km²
mcm 9.13.12
Estimated Stream Depth 0.26 m
Surface Velocity < 0.1 m/sec
(at thalweg) barely flowing

Canopy Cover
☒ Partly open ☐ Partly shaded ☐ Shaded
High Water Mark * m
Proportion of Reach Represented by Stream Morphology Types
☐ Riffle ___ % ☒ Run 90 %
☒ Pool 10 %
Channelized ☐ Yes ☒ No
Dam Present ☐ Yes ☒ No road culverts

LARGE WOODY DEBRIS

LWD <0.25 m²
Density of LWD 10.5 m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☒ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae
dominant species present various macrophytes
Portion of the reach with aquatic vegetation 5 %

WATER QUALITY

Temperature 17.53 °C
Specific Conductance 965
Dissolved Oxygen 100.9% 9.62 mg/L
pH 8.21
Turbidity —
WQ Instrument Used YSI 556 sonde

Water Odors
☒ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____
Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☒ None ☐ Other _____
Turbidity (if not measured)
☒ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____
Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☒ Sand
☐ Relict shells ☒ Other NO deposits
Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☐ No N/A NO ROCKS

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	50
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	0	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	0			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	45			
Clay	< 0.004 mm (slick)	45			

* overflows to marsh @ overflow condition

APPENDIX E

Chain of Custodies

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

To Alpha Lab, Calk 2023

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
12090019	Commerce Street Sampling (Williston, VT)

SAMPLERS: *(Signature)*

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TOC Lloyd Kahn Method	REMARKS
PW-20	9.11.12	1025	✓		PW20-SED	1	✓	To: Alpha Analytical Sediment Samples
PW-17	9.11.12	1436	✓		PW17-SED	1	✓	
PW-11	9.12.12	1043	✓		PW11-SED	1	✓	
PW-11(Dup)	9.12.12	1043	✓		PW11-DUP-SED	1	✓	
PW-2	9.12.12	1606	✓		PW2-SED	1	✓	
Reference	9.13.12	1044	✓		Reference-SED	1	✓	

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Bethany Fuller	9.14.12 11:18	EMT			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19060

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.: 12090019

PROJECT NAME: Commerce Street (Williston, VT) Sampling

SAMPLERS: (Signature)

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	#TCL	#VOA_MW	#METW_PE	#MERCW	REMARKS
											TO: Region 1 NERL
PW-17	9-11-12	1435		✓	PW17-SW	1	✓				
		1430		✓	PW17-SW	4		✓			Reps 1-4
Reference	9-13-12	1040		✓	Reference-SW	1	✓				
		1040		✓	Reference-SW	4		✓			Reps 1-4
PW20	9-11-12	0950		✓	PW20-SW	1	✓				
		0950		✓	PW20-SW	4		✓			Reps 1-4
PW2	9-12-12	1601		✓	PW2-SW	1	✓				
		1557		✓	PW2-SW	4		✓			Reps 1-4
PW11	9-12-12	1023		✓	PW11-SW	1	✓				
		1023		✓	PW11-SW	4		✓			Reps 1-4
PW11(Dup)	9-12-12	1025		✓	PW11-DUP-SW	1	✓				
		1025		✓	PW11-DUP-SW	4		✓			Reps 1-4
	9-12-12	1415		✓	Rinsate Blank	1			✓	✓	
	9-10-12	0900		✓	Trip Blanks	4		✓			

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Bethany Kelley	9.14.12 11:18				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature) ESAT	Date / Time	Remarks	
			9/14/12 11:18		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

4°C

1-10070

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.: 12090019 | PROJECT NAME: ~~Commerce Street (Williston, VT) Sampling~~

SAMPLERS: (Signature)

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	$VOAHS	% Solids	$METNS_PB	MERCS	ARSNMS	REMARKS
												To: Region 1 NERL
	9-11-12	1439		✓	PW17-SED	1	✓	✓				Preservative in $VOAHS jar - MeOH (32.080 g)
		1439	✓		PW17-SED	1			✓	✓	✓	
	9-13-12	1451 1602		✓	Reference-SED	1	✓	✓				Preservative in $VOAHS jar = MeOH (27.66 g)
		1605 1602	✓		Reference-SED	1			✓	✓	✓	
	9-11-12	1020		✓	PW20-SED	1	✓	✓				Preservative in $VOAHS jar = MeOH
		1020	✓		PW20-SED	1			✓	✓	✓	
	9-12-12	1602		✓	PW2-SED	1	✓	✓				Preservative in $VOAHS jar - MeOH
		1602	✓		PW2-SED	1			✓	✓	✓	
	9-12-12	1036		✓	PW11-SED	1	✓	✓				Preservative in $VOAHS jar - MeOH
		1036	✓		PW11-SED	1			✓	✓	✓	
	9-12-12	1038		✓	PW11-DUP-SED	1	✓	✓				Preservative in $VOAHS jar - MeOH
		1038	✓		PW11-DUP-SED	1			✓	✓	✓	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Bethany Kelley	9-14-12 11:18				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature) ESAT	Date / Time	Remarks	
			9/14/12 11:18		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1-10060

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.

PROJECT NAME: Commerce Street Sampling (Williston, VT)

SAMPLERS: (Signature) Bethany Kelley

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Taxonomy	REMARKS
PW-20	9-11-12	1122	✓		PW-20-AQINV-REP1	1	✓	
PW-20	9-11-12	1134	✓		PW-20-AQINV-REP2	2	✓	
PW-20		1042	✓		PW-20-BENINV-REP1 BCK 9-12-12	1	✓	
PW-20		1100	✓		PW-20-BENINV-REP2	1	✓	
PW-20		1105	✓		PW-20-BENINV-REP3	1	✓	
PW-20		1110	✓		PW-20-BENINV-REP4	1	✓	
PW-17		1600	✓		PW17-AQINV-REP1 BCK 9-12-12	1	✓	
PW-17		1600	✓		PW17-AQINV-REP2	1	✓	
PW-17		1500	✓		PW17-BENINV-REP1	1	✓	
PW-17		1500	✓		PW17-BENINV-REP2	1	✓	
PW-17		1530	✓		PW17-BENINV-REP3	1	✓	
PW-17		1530	✓		PW17-BENINV-REP4	1	✓	
PW-11	9-12-12	1239	✓		PW11-AQINV-REP1	2	✓	
PW-11	1330	1244	✓		PW11-AQINV-REP2	2	✓	
PW-11		1106	✓		PW11-BENINV-REP1	2	✓	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Bethany Kelley	9-13-12 1620				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
			9/13/12 1620		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19600

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.

PROJECT NAME: Commerce Street (Williston, VT) Sampling

SAMPLERS: (Signature) Bethany Kelley

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Taxonomy	REMARKS
PW-2	9.12.12	~~1702~~ 1713	✓		PW2-AQINV-REP1	1	✓	
PW-2		~~1704~~ 1728	✓		PW2-AQINV-REP2 MCM 9/13/12	~~2~~ 1	✓	
PW-2		1629	✓		PW2-BENINV-REP1	1	✓	
PW-2		1630	✓		PW2-BENINV-REP2	1	✓	
PW-2		1647	✓		PW2-BENINV-REP3	1	✓	
PW-2		1653	✓		PW2-BENINV-REP4	1	✓	
PW-11		1113	✓		PW11-BENINV-REP2	1	✓	
PW-11		1128	✓		PW11-BENINV-REP3	1	✓	
PW-11		1129	✓		PW11-BENINV-REP4	1	✓	
PW-11(DUP)		1338	✓		PW11DUP-AQINV-REP1	1	✓	
PW-11(DUP)		1345	✓		PW11DUP-AQINV-REP2	2	✓	
PW-11(DUP)		1146	✓		PW11DUP-BENINV-REP1	1	✓	
PW-11(DUP)		1152	✓		PW11DUP-BENINV-REP2	2	✓	
PW-11(DUP)		1214	✓		PW11DUP-BENINV-REP3	1	✓	
PW-11(DUP)	↓	1216	✓		PW11DUP-BENINV-REP4	1	✓	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Bethany Kelley	9.13.12 1620				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
			9/13/12 1620		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1-19626

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
	commerce street Sampling Williston, VT

SAMPLERS: *(Signature)*

Bethany Fuller

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Taxonomy	REMARKS
Ref	9.13.12	1116	✓		Reference-AQINV-REP1	2	✓	
Ref		1130	✓		Reference-AQINV-REP2	2	✓	
Ref		1058	✓		Reference-BENINV-REP1	1	✓	
Ref		1058	✓		Reference-BENINV-REP2	1	✓	
Ref		1111	✓		Reference-BENINV-REP3	1	✓	
Ref	↓	1115	✓		Reference-BENINV-REP4	1	✓	

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Bethany Fuller	9.13.12 1620				
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	
			7/13/12 1620		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19624