PHASE 2 FIELD SAMPLING AND ANALYSIS PLAN – VOLUME 2 ADDENDUM NO. 3

NEWTOWN CREEK

Prepared by
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August 2015

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Attachment 1 Standard Operating Procedure No. NC-38 – Field Ebullition Survey (previously identified as NC-36)

(Please note that although numerous Standard Operating Procedures are applicable to both volumes of the Phase 2 Field Sampling and Analysis Plan, they are primarily housed in one document [indicated in the following list] for version control.)

Number	Title	Volume
NC-01	Field Records	Volume 1
NC-02	Equipment Decontamination	Volume 1
NC-03	Navigation and Boat Positioning	Volume 1
NC-04	Photoionization Detector Calibration and Operation	Volume 1
NC-05	Portable Hydrogen Sulfide Gas Monitor Operation	Volume 1
NC-06	Sample Custody	Volume 1
NC-07	Sample Packaging and Shipping	Volume 1
NC-08	Investigation-Derived Waste Handling and Disposal	Volume 1
NC-09	Water Quality Monitoring and Profiling	Volume 1
NC-10	Surface Water Sample Collection	Volume 1
NC-11	Surface Water Sonde Deployment and Maintenance	Volume 1
NC-12	Surface Sediment Sample Collection and Processing	Volume 1
NC-13	Benthic Community Survey	Volume 1
NC-14	Sediment Core Processing for Metals Speciation Bioavailability	Volume 1
NC-15	Fish and Crab Tissue Collection	Volume 1
NC-16	Boat-based Wildlife Survey	Volume 1
NC-17	Fish and Crab Community Survey	Volume 1
NC-18	Current Meter Deployment and Data Collection	Volume 2
NC-19	Sediment and Native Material Core Collection	Volume 2
NC-20	Sediment and Native Material Core Processing	Volume 2
NC-21	Sediment-Water Shake Test	Volume 2
NC-22	Surface Sediment Sampling Using In-Creek Sediment Traps	Volume 2

Number	Title	Volume
NC-23	Point Sources Whole-Water Manual Composite Sampling	Volume 2
NC-24	Point Sources Whole-Water Sheetflow Manual Composite Sampling	Volume 2
NC-25	Point Sources Whole-Water Wet-Weather Grab Sampling	Volume 2
NC-26	Point Sources Whole-Water Dry-Weather Grab Sampling	Volume 2
NC-27	Point Sources Bulk-Water Sampling	Volume 2
NC-28	Point Sources Discrete Total Suspended Solids Sampling	Volume 2
NC-29	Point Sources Weather Tracking	Volume 2
NC-30	Point Sources Field Facility Homogenizing and Filtering Procedures	Volume 2
NC-31	Groundwater Investigation Data Collection	Volume 2 Addendum No. 1
NC-32	Surface Sediment Porewater Sampling with Solid-Phase Microextraction	Volume 2 Addendum No. 1
NC-33	Surface Sediment Porewater Sampling with Dialysis Membrane Cells (Peepers)	Volume 2 Addendum No. 1
NC-34	Seepage Measurement	Volume 2 Addendum No. 2
NC-35	Caged Bivalve Deployment, Monitoring, Retrieval, and Field Processing	Volume 1 Addendum No. 1
NC-36	Point Sources Water Pollution Control Plant Influent Sampling	Volume 2
NC-37	Point Sources Split Sample Collection and Processing	Volume 2
NC-38	Field Ebullition Survey	Volume 2 Addendum No. 3

LIST OF ACRONYMS AND ABBREVIATIONS

DGPS	differential global positioning system
FES	field ebullition survey
GIS	geographic information system
HP	horsepower
IDW	investigation-derived waste
Phase 2 FSAP Volume 1	*Phase 2 Field Sampling and Analysis Plan – Volume 1*
Phase 2 FSAP Volume 2 Addendum No. 3	*Phase 2 Field Sampling and Analysis Plan – Volume 2 Addendum No. 3*
Phase 2 RI Work Plan Volume 1	*Phase 2 Remedial Investigation Work Plan – Volume 1*
RI	Remedial Investigation
SCUBA	self-contained underwater breathing apparatus
SOP	Standard Operating Procedure
USEPA	U.S. Environmental Protection Agency

1 FIELD EBULLITION SURVEY

The scope of work discussed in this *Phase 2 Field Sampling and Analysis Plan – Volume 2 Addendum No. 3* (Phase 2 FSAP Volume 2 Addendum No. 3) describes the approach for a field ebullition survey (FES) that looks for evidence of apparent gas ebullition in sediment based on visual observation of surface water. The FES is being performed in response to a recommendation from the U.S. Environmental Protection Agency (USEPA) that ebullition should be evaluated in the Newtown Creek Study Area.

The FES will be based on visual inspection of the water surface for bubbles, and to the extent allowed by the clarity of the water, observing the bubble rising through the water column to the water surface. However, because low water clarity limits the degree to which bubbles can be observed rising through the water column, the appearance of bubbles on the surface of the water will be considered inferred presence of ebullition in sediment, unless another potential source of bubbles (e.g., boat traffic, aeration system operation) is observed.

The purpose of the FES is as follows:

- Observe surface water for visual evidence of ebullition, and document observations
- Develop a preliminary understanding of the site conditions where ebullition is most likely to occur
- Visually characterize sheens, associated with ebullition or otherwise, observed in the survey areas

Proposed survey areas (see Figure 1) were selected for the FES based on the following factors and to capture a range of geomorphic, hydrologic, and hydrodynamic conditions:

- Capturing the range of water depths present in the Newtown Creek system to assess the effect of water depth/hydrostatic pressure on gas ebullition
- The potential for ebullition to act as a contaminant migration pathway
- Avoiding areas proximal to active aeration systems to avoid misidentification of bubbles associated with the aeration systems as gas ebullition
- Vessel traffic frequency to assess the effect of propeller wash and vessel wake on disturbance of sediment and appearance of gas bubbles in surface water

- Surveying various geomorphic settings, including tributaries, the main trunk, the Turning Basin, and the lower reach
- The proximity of the area to organic carbon sources

The survey areas are summarized in Table 1. Ebullition surveys are planned for each of the five areas described in Section 1.1.

1.1 Summary of Work to be Performed

In each of the five survey areas, the FES will include a visual reconnaissance, with a more detailed visual survey being performed in areas where visual evidence of apparent ebullition is observed. The FES will be performed concurrently from multiple vessels following mapped transects (see Figure 1 for FES transect locations) and will include field logging of visual observations and video and still photography of areas where visual evidence of apparent ebullition is observed. The movements of the survey vessels over the course of the survey will be tracked through collection of continuous coordination data, and locations where visual evidence of apparent ebullition is observed will be mapped and recorded, using differential global positioning system (DGPS) equipment. Surveys will be performed during two low tides and during one high tide, for a total of three surveys in each survey area. Additional details for the FES are discussed in the attached Standard Operating Procedure (SOP).

Because environmental conditions, such as vessel movements and the operation of aeration systems, may produce false indications of ebullition, the following conditions (including safety requirements) are deemed necessary as a baseline for conducting the FES:

- The survey can be performed safely and without interfering with/interference from vessel traffic.
- No surveying will occur during weather conditions that are unsafe or interefere with observations of the surface of the water, e.g., rain, wind-generated waves or chop.
- No surveying will occur during nighttime hours.
- For the survey to proceed in an area with aeration systems, the aeration systems will preferably be shut down a minimum of 24 hours prior to the ebullition survey start and remain shut down throughout each day that the ebullition surveys are performed.

If the aeration systems are not shut down, the survey will proceed only in those areas not obviously affected by the aeration system. Areas that are not obviously affected by the aeration system do not include bubbles that have originated from the aeration system, either rising through the water column from the aeration system, or migrating with wind and current along the surface of the water from the aeration system. Areas affected by the aeration system, which include areas where the system is located with bubbles rising through the surface water, and areas up to 100 feet from the system where wind and/or current transport bubbles persist on the water surface, will be excluded from the survey.

A field log will be maintained and will provide the rationale and describe the condition for not starting, decreasing, or terminating the FES in one of the five survey areas or altogether terminating the FES, if necessary. As with Phase 2 Remedial Investigation (RI) field work, USEPA will be notified prior to modifying the FES approach or terminating the FES prior to schedule.

1.2 Procedures

FES data collection procedures are described in this section.

1.2.1 Pre-Field Ebullition Survey Activities

Pre-FES survey activities will be completed prior to initiating any FES-related field work. Note that no intrusive sediment sampling activities are proposed in the FES and that all work will take place on the water.

Pre-FES activities include the following, as applicable:

- Notify USEPA in advance of the FES and provide a copy of this Phase 2 FSAP Volume 2 Addendum No. 3.
- Ensure that required notifications for the survey transect locations within the Study Area have been submitted and approved for each day's activities. These notifications are described in Section 3.3 of the *Phase 2 Field Sampling and Analysis Plan – Volume 1* (Phase 2 FSAP Volume 1; Anchor QEA 2014a; see Appendix B of the *Phase 2 Remedial Investigation Work Plan – Volume 1* [Phase 2 RI Work Plan

Volume 1; Anchor QEA 2014b]), and include notifications to the U.S. Coast Guard, National Grid, and harbor master as necessary.

- Review the *Phase 2 Health and Safety Plan* (Anchor QEA 2014c; see Appendix C of the Phase 2 RI Work Plan Volume 1 [Anchor QEA 2014b]) for potential hazards, appropriate personal protective equipment, and safety meetings to be conducted prior to field work.
- Identify and prepare vessels for FES use that are appropriate for waterway conditions in each of the five survey areas. Vessels proposed for work in the main branch will include work boats with 150 to 200 horsepower (HP) engines and could include the *Erin Miller*, *John Miller*, *Donna Miller*, *Mary Miller*, and *Evan Miller*. Work in the tributaries will be performed from jon boats with 4 to 6 HP engines.
- The Field Manager will provide pertinent information, including contact telephone numbers, for each of the moveable bridges to subcontractors and/or vessel operators. This includes areas where access may be limited by fixed bridge clearance and tributary headwaters and where floatable containment booms and areas of sediment accumulation will limit access, such as portions of Dutch Kills. To better facilitiate access to Dutch Kills and other limited access areas, jon boats will be used based on the smaller size and draft requirements for the boats. In areas of extreme access limitation, every practical effort will be made to perform the survey, but some locations may have to be abandoned, in consultation with USEPA, due to shallow water depth or other logistical constraints.
- Prepare and distribute to the survey crew tide charts for water-level conditions throughout the FES period.
- Check weather conditions daily starting 1 week prior to mobilizing for the FES—if rain or other adverse weather conditions are predicted for the proposed survey days, reschedule in accordance with Section 1.8 of this document.
- Obtain and record vessel Automatic Identification System transponder data for a minimum of 48 hours prior to the start of the survey.
- Once the FES starts, check weather throughout the day during the FES for changing conditions.
- Prepare a daily float plan that lists a plan for communication between the land-side and boat-based field team staff. The plan will include the transects to be surveyed,

transect coordinates, and access points along the survey areas. Target coordinates will be pre-loaded into a DGPS.

1.2.2 Field Ebullition Survey Activities

It is anticipated that each boat crew for the FES will consist of a boat captain and one Anchor QEA field staff. Anchor QEA requests to be notified at least 1 week prior to any request for onboard vessel oversight in order to make the appropriate accommodations. The boat crew will be in constant communication with the Field Team Leader during sampling activities.

On each day of surveying, the designated field team staff will check in with the Field Team Leader to confirm the schedule and transects to be surveyed and collect the appropriate equipment. Prior to leaving the dock, the Project On-Site Safety Officer or a designee will conduct a daily safety meeting and confirm that the captain for each vessel has done the following: 1) completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios); 2) conducted a communications check; and 3) filed a daily float plan.

The FES consists of the following two phases of surveying: 1) visual reconnaissance in all survey areas; and 2) detailed survey in areas where visual evidence of apparent ebullition is observed to be occurring. FES observations will be made from the vessels as the vessel moves along the survey transect at speeds ranging from 1 to 2.5 knots. Vessel speed will not exceed 2.5 knots in the main branch where surface water is deeper. Vessel speed will not exceed 1 knot in areas where water is shallower and there is greater potential for the survey vessel to disturb the sediment surface. When visual evidence of apparent ebullition is observed in any survey area, the vessel will stop to allow detailed visual reconnaissance. The vessels will not anchor at any time during the survey, except for safety reasons. If a vessel is required to anchor for safety reasons, the location and duration of the anchoring, along with observations of bubbles or sheens will be noted.

The visual reconnaissance will include visual observations noted on field logs (included with the SOP in Attachment 1). The detailed survey will include more detailed observations noted on the field logs, combined with video and still photographs of ebullition.

The following procedures will be implemented for data collection for the two FES phases:

All survey activities

- Field measurements will be collected at the start and end of each survey from three locations within each of the five survey areas
  - Time of observation/measurement
  - DGPS location for measurement/observation
  - Water temperature—within approximately 3 feet of top of sediment, at the locations shown in Figure 1
  - Water salinity—coincident with water temperature measurements within approximately 3 feet of top of sediment
  - Water clarity, using a Secchi disk
- General weather and tide conditions
  - General weather conditions (e.g., cloud coverage and wind speed/direction) will be recorded at the beginning of each survey, and any change in conditions will be documented as the survey proceeds
  - Atmospheric temperature from the project weather station located at the field facility at the beginning and end of each survey
  - Atmospheric pressure will be recorded at the beginning of each survey, during hourly intervals during each survey, and at the end of each survey
  - A record of surface water elevation versus time at the project tidal gauges located at the project field facility and at the National Grid property
  - Time of nearest high tide and low tide
  - Water surface conditions—waves, chop, and wakes
- Other information
  - Include mapped location of aeration system relative to survey observations/measurements
  - Document recent operating information for aeration system—frequency and hours of operation prior to survey and time aeration system was shut down prior to survey

Basic visual reconnaissance

- Document observations regarding evidence/no evidence of apparent ebullition located along the transects mapped in Figure 1
- Track the survey vessel movements by collecting continuous DGPS position coordinates (± 1 meter accuracy)

Detailed survey (where visual evidence of apparent ebullition or sheen is observed)

- Map and describe visual evidence of apparent ebullition and/or sheen by collecting the following information:
  - DGPS position coordinates (± 1 meter accuracy)
  - The approximate size of the area where apparent ebullition is observed, including whether a coincident sheen is observed on the surface water
  - A video survey that shows the cycle of bubble formation, still photographs, and coincident gas bubble/sheen observations (if applicable)
  - A qualitative assessment of bubble frequency, using the terminology included in the attached SOP
  - If sheens are observed, approximate frequency, diameter, visual appearance (e.g., silvery, rainbow, dark rainbow, dark), structure (e.g., brittle, non-brittle), and distribution (e.g., blossom, small spots, spotty, streaks, contiguous)
  - Note nearby activities that could potentially create false indications of ebullition by disturbing the sediment (vessel movements, wakes, and propeller scour; anchoring; spudding; pile driving; construction; sediment sampling; other activities that could disturb bottom sediment; and active aeration systems that generate gas bubbles)
  - Collect surface water quality measurements (i.e., water temperature and salinity within 3 feet of the sediment surface, and water clarity) from within the apparent ebullition observation area

If turbidity is observed in water as a result of vessel passage, or other discharges to surface water result in turbidity, use the Secchi disk to document water clarity in the area where increased turbidity is observed, and note approximate extent of area with increased turbidity and duration if increased turbidity exists in survey area

1.2.3 Field Equipment

Equipment used for field measurements and expected purposes/uses include:

- Sondes deployed to measure surface water temperature and salinity
- Secchi disk for characterizing water clarity
- Weighted line used to measure water depth
- Rod used to agitate sheens and evaluate whether the sheen rapidly coalesces as a liquid ("non-brittle sheen") or the sheen cracks, breaks, and disaggregates ("brittle sheen")
- Floating scale used for perspective when describing observed apparent ebullition and sheens

A comprehensive list of field equipment is included in the attached SOP.

1.3 Equipment Decontamination

Equipment that will be used for measurement and will contact site media will include sondes, weighted lines, rods, floating scales, and Secchi disks. Equipment will be decontaminated between surveys. Decontamination of the equipment will be performed in accordance with the procedures described in SOP NC-02 – Equipment Decontamination.

1.4 Investigation-Derived Waste

Investigation-derived waste (IDW) will be generated during equipment decontamination. Cleaning and decontamination of equipment will be completed between sampling locations. IDW will be temporarily stored at the field facility and disposed of following the procedures described in Section 13 of the Phase 2 FSAP Volume 1 and SOP NC-08 – Investigation-Derived Waste Handling and Disposal.

1.5 Standard Operating Procedures

The following SOPs are relevant to these activities:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination

- NC-03 – Navigation and Boat Positioning
- NC-08 – Investigation-Derived Waste Handling and Disposal
- NC-09 – Water Quality Monitoring and Profiling
- NC-38 – Field Ebullition Survey

1.6 Data Processing, Analysis, and Management

Data collection records from the FES will be downloaded as soon as possible and saved to the project files. Field logs will be scanned and sent to the Data Management Task Manager. Survey data will be loaded into a geographic information system (GIS)-based spatial database and added to the Study Area basemap.

1.7 Reporting

The work elements described in this section will be documented, and this documentation will be stored in the project files, as described in the *Data Management Plan Addendum No. 1* (Anchor QEA 2014d; see Appendix D of the Phase 2 RI Work Plan Volume 1 [Anchor QEA 2014b]). During on-water FES activities, Study Area conditions will be documented. Field notes will be maintained on the Daily Log (see SOP NC-01 – Field Records for sample form) and on data collection forms (see SOP NC-38 – Field Ebullition Survey) during each survey event.

Human recreational use of the Study Area will be documented during the FES (consistent with other Phase 2 sampling activities). The field team staff will record recreational activities, including kayaking or other noncommercial water craft on the water; self-contained underwater breathing apparatus (SCUBA) diving, swimming, or wading activities; fishing on the water or from the shore; and crabbing along the shore. These visual observations will be recorded on the Visual Observation Log (see SOP NC-01 – Field Records for example form).

Information obtained during the surveys will be included in the RI report.

1.8 Schedule

The FES schedule is based on the following:

- Having adequate daylight for observations approximately 1 hour prior and 1 hour after time of survey targeted low or high tide on target survey dates
- Survey to occur during the period specified in Table 2 (a backup survey period is specified in Table 3, should the survey not go forward during the period specified in Table 2)
- Survey during low tide to evaluate the potential for ebullition during lowest hydrostatic pressure conditions
- Survey during high tide to evaluate effect of increased hydrostatic pressure on ebullition
- Perform two surveys at low tide and one at high tide, totaling three surveys at each of the five survey locations

Table 2 summarizes the dates and times proposed for surveying. If the survey cannot be performed during these dates or times, then Table 3 shows a proposed backup schedule.

2 REFERENCES

Anchor QEA (Anchor QEA, LLC), 2014a. *Phase 2 Field Sampling and Analysis Plan – Volume 1*. Final. Remedial Investigation/Feasibility Study, Newtown Creek. May 2014.

Anchor QEA, 2014b. *Phase 2 Remedial Investigation Work Plan – Volume 1*. Final. Remedial Investigation/Feasibility Study, Newtown Creek. May 2014.

Anchor QEA, 2014c. *Phase 2 Health and Safety Plan*. Final. Remedial Investigation/Feasibility Study, Newtown Creek. May 2014.

Anchor QEA, 2014d. *Data Management Plan Addendum No. 1.* Final. Remedial Investigation/Feasibility Study, Newtown Creek. May 2014.

TABLES

Table 1
Summary of Proposed Survey Areas

Proposed Survey Location	Environmental Condition Assessed
Main branch CM 0.19 to 0.5	– Water depth ranges to 20 plus feet MLW – Frequent vessel traffic
Main branch CM 0.67 to 0.83/ CM 0.9 to 1.36	– Water depth ranges to 20 plus feet MLW – Includes a Category 1B NAPL area
Main branch CM 1.6 to 1.94	– Water depth ranges to 20 plus feet MLW – Includes a Category 2/3 NAPL area
Turning Basin (nearshore and main branch areas)	– Water depth ranges from 20 plus feet to less than 5 feet MLW – Category 2/3 NAPL area – Frequent vessel traffic
English Kills/East Branch/Maspeth Creek	– High organic carbon input – Water depth ranges from 20 plus feet to less than 5 feet MLW – Category 2/3 NAPL area (English Kills) – Category 1B NAPL area (East Branch) – Aeration system (English Kills)
Dutch Kills	– High organic carbon input – Water depths limit access to approximately 2 to 3 hours before and after high tide – Anecdotal observations of gas bubbles – NAPL was not observed in sediments

Notes:
CM = creek mile
MLW = mean low water
NAPL = nonaqueous phase liquid

Table 2

Proposed Survey Dates and Times (August 18, 2015 to August 21, 2015)

Date	Time of Low Tide	Low Tide Elevation (feet, MLLW)	Time of Survey	Time of High Tide	High Tide Elevation (feet, MLLW)	Time of Survey	Time of Sunrise	Time of Sunset
8/18/2015	6:36 p.m.	0.67	5:15 to 7:30 p.m.	1:02 p.m.	4.24	11:45 a.m. to 2:00 p.m.	5:54 a.m.	7:41 p.m.
8/19/2015	6:53 a.m.	0.52	6:00 to 8:15 a.m.	1:41 p.m.	4.16	12:30 to 2:45 p.m.	5:55 a.m.	7:39 p.m.
8/20/2015	7:22 a.m.	0.72	6:15 to 8:30 a.m.	2:19 p.m.	4.1	1:00 to 3:15 p.m.	5:56 a.m.	7:38 p.m.
8/21/2015	7:50 a.m.	0.89	6:30 to 8:45 a.m.	2:56 p.m.	4.08	1:45 to 4:00 p.m.	5:57 a.m.	7:36 p.m.

Notes:

– Tidal data are reported by NOAA for Hunter's Point, Newtown Creek available from the following:
http://tidesandcurrents.noaa.gov/noaatidepredictions/NOAATidesFacade.jsp?Stationid=8517673

– August 18, 2015, and August 19, 2015, are the dates initially proposed for the survey. If the survey is postponed on those days (e.g., due to weather), August 20, 2015, and August 21, 2015, would be used as backups, weather permitting.

MLLW = mean lower low water

Table 3

Potential Backup Survey Dates and Times (August 31, 2015 to September 3, 2015)

Date	Time of Low Tide	Low Tide Elevation (feet, MLLW)	Time of Survey	Time of High Tide	High Tide Elevation (feet, MLLW)	Time of Survey	Time of Sunrise	Time of Sunset
8/31/2015	5:24 p.m.	-0.51	4:15 to 6:30 p.m.	11:19 a.m.	5.22	10:15 a.m. to 12:30 p.m.	6:08 a.m.	7:20 p.m.
9/1/2015	6:16 p.m.	-0.39	5:00 to 7:15 p.m.	12:13 p.m.	5.23	11:00 a.m. to 1:15 p.m.	6:09 a.m.	7:18 p.m.
9/2/2015	6:34 a.m.	-0.54	6:00 to 8:15 a.m.	1:11 p.m.	5.16	12:00 to 2:15 p.m.	6:10 a.m.	7:16 p.m.
9/3/2015	7:25 a.m.	-0.24	6:15 to 8:30 a.m.	2:09 p.m.	5.03	1:00 to 3:15 p.m.	6:11 a.m.	7:15 p.m.

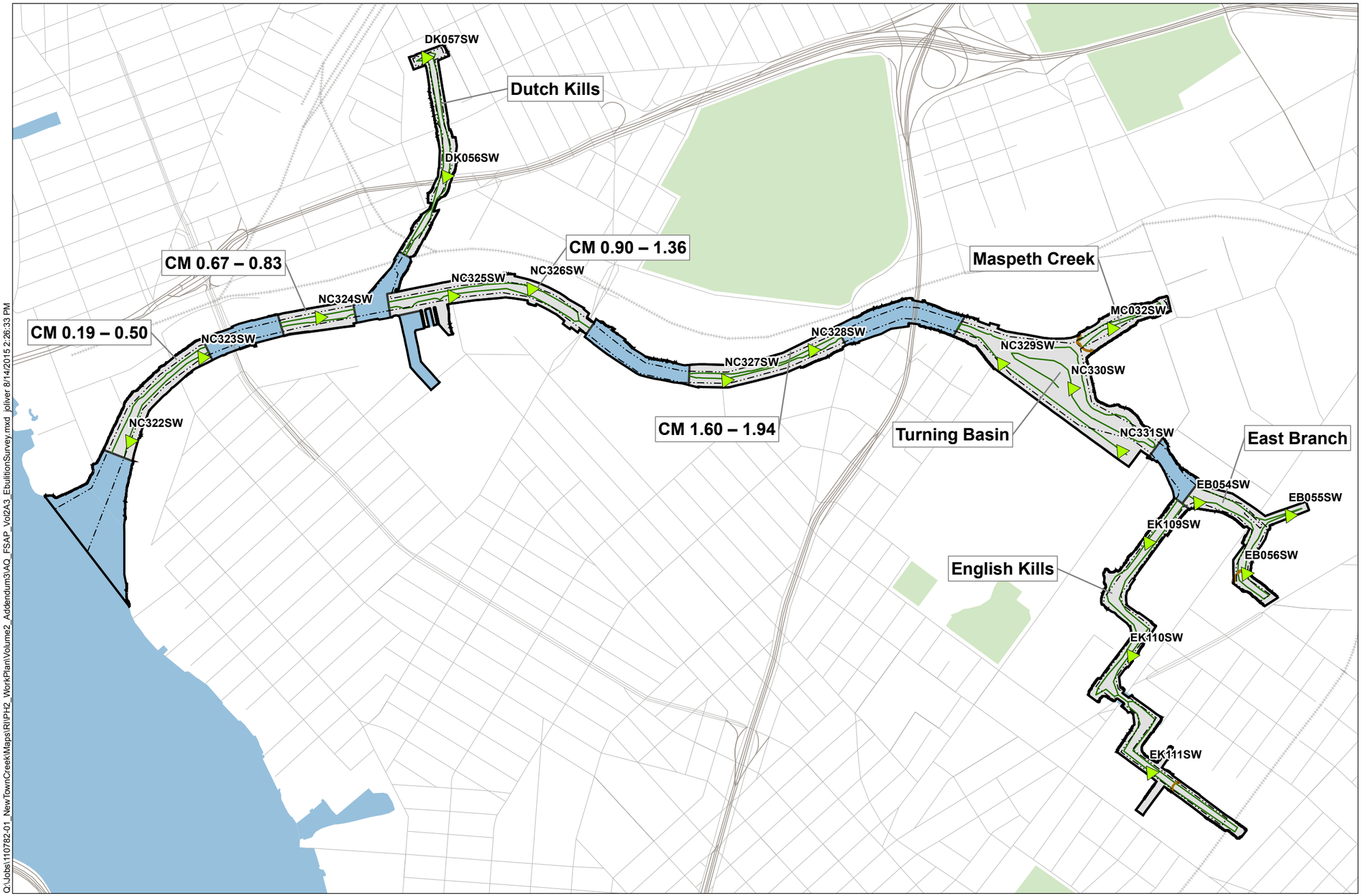
Notes:

– Tidal data are reported by NOAA for Hunter's Point, Newtown Creek available from the following:
http://tidesandcurrents.noaa.gov/noaatidepredictions/NOAATidesFacade.jsp?Stationid=8517673

– If the survey is delayed from the August 18, 2015 to August 21, 2015 period to the August 31, 2015 to September 3, 2015 period, the survey would be performed during two low tides and during one high tide within the August 31, 2015 to September 3, 2015 period, weather permitting.

MLLW = mean lower low water

FIGURE

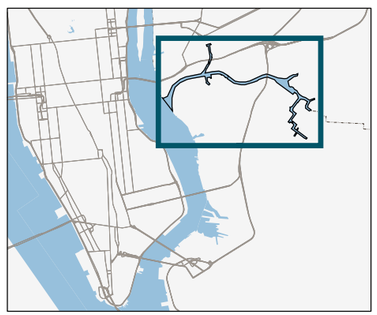


LEGEND

- Surface Water Quality Monitoring Station
- Survey Transect
- Boom
- Survey Area
- Newtown Creek Study Area
- Water
- Open Space

Notes:
1. Base data acquired from New York City Department of Information Technology and Telecommunications.

0 500 1,000 1,500 Feet



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ANCHOR QEA

Figure 1
Field Ebullition Survey Layout
Phase 2 FSAP – Volume 2 Addendum No. 3
Newtown Creek

ATTACHMENT 1
STANDARD OPERATING PROCEDURE

STANDARD OPERATING PROCEDURE
NC-38 – FIELD EBULLITION SURVEY

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 151037-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the procedures for conducting a survey to identify where visual evidence of apparent ebullition is or is not observed and for characterizing and describing visual observations of apparent ebullition and sheens, if present, as part of the Remedial Investigation/Feasibility Study (RI/FS) for the Newtown Creek Study Area. The primary components of the gas ebullition survey include the following:

- Collection of surface water quality measurements from three locations within the survey area at the start and at the end of the survey
- Visual survey of surface water for evidence of gas ebullition
- Collection of additional information where visual evidence of apparent ebullition is observed, including location, description of the apparent ebullition observation using standard terminology, photographs, and video
- Collection of information where sheen is observed within survey areas, including location, description of the sheen observation using standard terminology, whether sheen occurs coincident with apparent gas ebullition, photographs, and video

Procedures for documenting the visual observation of apparent ebullition and sheens (when observed) on surface water are outlined in this SOP. Deviations from the procedures detailed in this SOP will be recorded on the Daily Activity Log and in a Field Deviation Form (see SOP NC-01 – Field Records).

HEALTH AND SAFETY WARNINGS

Health and safety issues associated with this SOP, including physical, chemical, and biological hazards, are addressed in the *Phase 2 Health and Safety Plan* (Phase 2 HASP; Anchor QEA 2014a). The Phase 2 HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Staff performing the gas ebullition survey will have limited contact with surface water during water quality monitoring activities. Surface water may contain hazardous substances. Routes for exposure may include dermal contact, inhalation, and ingestion. Avoid surface

water contact with bare hands. Wear appropriate personal protective equipment (PPE) during survey activities.

PERSONNEL QUALIFICATIONS

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the *Phase 2 Remedial Investigation Work Plan – Volume 2* (Anchor QEA 2014b), and the corresponding documents (i.e., *Phase 2 Field Sampling and Analysis Plan – Volume 2 Addendum No. 3* [Phase 2 FSAP Volume 2 Addendum No. 3], Phase 2 Quality Assurance Project Plan [Phase 2 QAPP; Anchor QEA 2014c], and Phase 2 HASP [Anchor QEA 2014a]). Surface water observations of evidence of apparent ebullition, and a sheen when present, will be performed only by staff who have been trained in ebullition and sheen characterization procedures. Staff will complete training in the office and in the field under the guidance of an Anchor QEA staff person experienced in field observation and characterization of ebullition and sheen. Training will include review of this SOP, photographs and videos from other sites where ebullition, with and without coindent sheen, has been documented, and review of selected content from the National Oceanic and Atmospheric Administration (NOAA) Open Water Oil Identification Job Aid (NOAA 2007).

All field personnel are required to take a 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and annual refresher courses, as well as participate in a medical monitoring program prior to engaging in field activities.

EQUIPMENT AND SUPPLIES

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, based on field conditions encountered during the survey.

- Approved documents, including Phase 2 FSAP Volume 2 Addendum No. 3, Phase 2 QAPP (Anchor QEA 2014c), and Phase 2 HASP (Anchor QEA 2014a)
- Appropriate PPE and clothing as defined in the Phase 2 HASP (Anchor QEA 2014a)
- Decontamination equipment described in SOP NC-02 – Equipment Decontamination

- Standardized field log forms (field forms)
- Black ballpoint pen or Sharpie permanent marker (or equivalent)
- White board and pens
- Stop watch or watch
- Floating scale for use when photographing apparent ebullition and sheens
- Wooden or steel rod for evaluating whether the sheen rapidly coalesces as a liquid ("non-brittle sheen") or the sheen cracks, breaks, and disaggregates ("brittle sheen").
- Differential global positioning system (DGPS) unit appropriate for data collection and recording coordinates and shapes
- Digital camera with polarizing filters
- Digital video camera
- Survey vessel equipped with necessary DGPS navigation and communication equipment
- Multi-parameter water quality meter and manufacturer's operating manual (the YSI™ Model 6920 V2 Sonde outfitted with appropriate sensors to meet sampling needs is suggested for this effort)
- Meter probe cable and hand-held data logger
- Calibration standards:
  - Conductivity (10 millisiemens per centimeter [mS/cm], 30.1 mS/cm, and 50 mS/cm solutions)
  - Miscellaneous others (as necessary)
- Secchi disk and calibrated rod
- Weight-bearing line/cable
- Tape measure or graduated cabling
- Paper towels

SURVEY PROCEDURES

This section provides step-by-step procedures for conducting a gas ebullition survey.

The gas ebullition survey schedule for the day will be established prior to boat departure, and sufficient equipment to complete the work will be mobilized onto the boat. The vessel

performing the gas ebullition survey will adhere to procedures described in SOP NC-03 – Navigation and Boat Positioning.

General gas ebullition survey procedures are as follows:

1. Don appropriate PPE as described in the Phase 2 HASP (Anchor QEA 2014a).
2. Check in with the Field Team Leader to confirm schedule and area to be surveyed. Collect survey equipment and supplies.
3. Motor to the beginning of the gas ebullition survey area. Proceed slowly when approaching or traveling through a gas ebullition survey area to avoid disturbing the creek bottom.
4. At the start of the survey period, collect surface water quality measurements (water temperature, salinity, and clarity) within 3 feet of the sediment surface (or shallower for clarity, depending on water clarity) at the designated locations in the survey area.
    a. Record measurements on Attachment 1 – Gas Ebullition Survey Equipment and Surface Water Quality Monitoring Log
    b. See the Surface Water Quality Monitoring section of this SOP for calibration, operation, and data collection procedures
5. Begin the gas ebullition survey, moving along the designated transect with the DGPS programed to collect a continuous track of the vessel movements, while not exceeding the speeds indicated below. **Move slowly and avoid disturbing the creek bottom.** If creek bottom sediments are disturbed by the survey vessel, or if turbidity is observed in surface water as a result of vessel movements, note the time and location of the disturbance.
    a. In the main stem and the Turning Basin survey areas, vessel speed should not exceed 2.5 knots.
    b. In the Dutch Kills and English Kills/East Branch/Maspeth Creek survey areas, vessel speed should not exceed 1 knot.
6. Look to left and right sides within approximately 100 feet of the vessel for observations of gas bubbles on the surface water.

7. If visual evidence of apparent ebullition is observed, stop and document the following information on Attachment 2 – Gas Ebullition Survey Visual Observations Log (note that a new form will be used for each gas ebullition observation):

    a. Record the **time** of the apparent ebullition observation.
    b. Identify the **location** of the apparent ebullition observation by recording DGPS coordinates.
    c. Identify whether a sheen is observed coincident with apparent ebullition or nearby; details for documenting sheen observations are provided in Step 8.
    d. Observe and record a description of the apparent ebullition frequency over a 5-minute period. Characterize apparent ebullition frequency qualitatively according to the following terminology:

        i. **Moderate-high frequency** – bubbles are observed continuously or nearly continuously with regard to time within the area apparent ebullition is observed.
        ii. **Low-moderate frequency** – bubbles appear intermittently and/or irregularly with regard to time within the area apparent ebullition is observed.
        iii. **Trace-low frequency** – bubbles appear but less frequently than **low-moderate** with regard to time within the area apparent ebullition is observed.

    e. Characterize apparent ebullition spatial distribution within the ebullition observations area qualitatively according to the following terminology:
        i. **Moderate-high distribution** – bubbles are widespread within the area apparent ebullition is observed.
        ii. **Low-moderate distribution** – bubbles appear intermittently and/or irregularly within the area apparent ebullition is observed.
        iii. **Trace-low distribution** – bubbles occur only at specific, localized points, within the area apparent ebullition is observed.
    f. Identify the approximate **dimensions** of the area where apparent ebullition is observed, estimating the distance in feet, or if ebullition is observed across a large area, sketching the area onto a map and referencing known landmarks.
        i.

g. Note and record environmental and anthropogenic conditions that may mimic or affect ebullition or may generate false indications of ebullition, including surface water and weather conditions at the time of the apparent ebullition observation (wave action and wind) and vessel passage or other anthropogenic factors (vessel movements, wakes, and propeller scour; anchoring; spudding; pile driving; construction; sediment sampling; other activities that could disturb bottom sediment; and active aeration systems that generate gas bubbles) that may have disturbed sediments prior to or during the survey.

h. Collect surface water quality measurements (water temperature, salinity, and clarity) within 3 feet of the sediment surface (or shallower for clarity, depending on water clarity) from within the apparent ebullition observation area.

    i. Record measurements on Attachment 2 – Gas Ebullition Survey Visual Observations Log
    ii. See the Surface Water Quality Monitoring section of this SOP for calibration, operation, and data collection procedures

i. Apparent ebullition is not observed unless noted.

8. Identify whether a sheen is observed coincident with apparent gas ebullition or in the surrounding area.
9. If a sheen is observed, document the following information on Attachment 2 – Gas Ebullition Survey Visual Observations Log:

    a. Identify the **location** of the sheen by recording DGPS coordinates.
    b. Estimate the **dimensions** of the sheen (using a scale/ruler if appropriate for the size of the sheen).
    c. Observe and record sheen **color and appearance** using the following standard terminology.

Sheen (Modified from ASTM F2534-06; sheen not observed unless noted)	
Color	**Description**
Silvery	Metallic, near transparent to silver/gray
Rainbow	Multicolored
Dark Rainbow	Multicolored with some dark metallic or brown/black coloring
Dark	Dark metallic (reflects/mirrors the color of the sky) or brow/black colored

d. Observe and record sheen structure and distribution using standard terminology (see following table). Gently agitate the sheen by moving a device (e.g., stick or rod) through the sheen. While doing so, and after removing the object, observe if the sheen rapidly coalesces as a liquid ("non-brittle sheen") or if the sheen cracks, breaks, and disaggregates ("brittle sheen") (Minnesota Pollution Control Agency [MPCA] 2008).

Sheen Structure Terminology	
Term	**Description**
Brittle	Sheen cracks and breaks apart when disturbed
Non-brittle	Sheen coalesces after being disturbed
Sheen Distribution Terminology	
Term	**Description**
Blossom	Observations of a sheen area (less than 3 feet in diameter) developing when a gas bubble breaks on the water surface
Small Spots	Isolated patches (less than 3 feet in diameter) of sheen (described size and number)
Spotty	Larger areas of sheen that are comprised of many smaller patches (less than 3 feet in diameter) of sheen that may merge or separate over time (describe size and number)
Streaks	Flat lines of sheen (describe size, number, and orientation)
Contiguous	A larger patch of sheen (greater than 3 feet in diameter) (describe size)

e. Record sheen "blossom" frequency, if applicable over a 5-minute period.

- A sheen "blossom" is the occurrence of a new sheen due to the migration of a drop of nonaqueous liquid to the water surface, often (but not always) due to gas ebullition from sediments.
- If sheen "blossoms" are observed, count and record the number of "blossoms" that appear during a 1-minute period.

f. If sheen is observed but does not appear to be coincident with apparent gas ebullition, document as described in previous table, and identify potential **sheen source(s)** if obvious.
g. If sheen **is not** observed, document that on Attachment 2 – Gas Ebullition Survey Visual Observations Log.
h. Note and record environmental and anthropogenic conditions that may affect sheen or generate a false indication of ebullition, including surface water and weather conditions at the time of the observation (wave action and wind) and vessel passage or other anthropogenic forcing factors that may be a source of sheen to surface water.
i. If turbidity is observed (e.g., as a result of vessel passage, or from other discharges to surface water or disturbance of sediment), measure water clarity using the Secchi disk and record measurements on field logs. Document approximate dimensions of area of increased turbidity and duration increased turbidity exists in survey area.

10. Use a digital video camera to **record** and a digital camera to **photograph** the ebullition observations and sheen observations, where present.

a. Place a floating scale in the water adjacent to the observations for scaling purposes.
b. Record the direction (north, east, northeast, etc.) of the video/photograph and video/photograph file number on the field form.
c. **Using a digital video camera**, **record** the apparent ebullition observation for a minimum of 2 minutes and longer if warranted based on the frequency of the ebullition observations.

- Keep the video camera as still as possible to avoid blurry video.

d. **Using a digital camera**, **photograph** the apparent ebullition observation with and without standard photographic polarizing filters.

- Hold the filter between your eye and the observation area and rotate through 90 degrees to optimize the polarization by maximizing or minimizing admission of polarized light. The rotation of a polarizing filter will screen out glare from the reflective water surface. Take one or two

photographs when the polarization is parallel to the fluid surface, and one or two photographs when the polarization is perpendicular to the fluid surface.

e. Using a digital camera, **photograph** the general area where the ebullition, and sheen if present, was observed, using a white board to indicate the survey area and time of photograph.
f. **Review** videos and photographs to ensure they are clear and in focus.
    - Take additional video and photographs if needed.

11. Once apparent gas ebullition and sheen observations have been documented, recorded, and photographed, continue moving along the survey transect.
12. Once the survey is completed, collect a second set of surface water quality measurements (water temperature, salinity, and clarity) within 3 feet of the sediment surface (or shallower for clarity, depending on water clarity) at the designated locations in the survey area. After all survey activities are completed, measure the depth to the mudline at each of the water quality monitoring locations. Record the time of the water depth measurement along with the measurement.
    a. Record measurements on Attachment 1 – Gas Ebullition Survey Equipment and Surface Water Quality Monitoring Log.
    b. See the Surface Water Quality Monitoring section of this SOP for calibration, operation, and data collection procedures.
    c. Measure the depth to mudline using a weighted water level meter, tape, or other measurement device.
13. At the end of the survey, return equipment and field records to the field facility. Download electronic data (e.g., video and photographs) from equipment prior to next use to ensure adequate backup exists.

Surface Water Quality Monitoring

Calibration Procedures

Prior to use in the field, the multi-parameter Sonde (YSI™) will be examined to ensure it is in good working order. Calibration procedures will be performed prior to use and in accordance with the manufacturer's specifications per SOP NC-11 – Surface Water Sonde

Deployment and Maintenance for the parameters to be monitored (salinity and temperature). Calibration will be documented on an instrument calibration form (see Attachment 3).

The instrument will be inspected and a post-survey calibration check may be performed at the end of each day's activities to confirm that the instrument functioned properly throughout the day. The instrument will also be checked during the day if erratic or suspect readings are observed.

Instrument Operation

After the sensors are calibrated, field data can then be collected by using the hand-held data logger. Procedures for water quality measurement and profiling are described in SOP NC-09 – Water Quality Monitoring and Profiling.

Monitoring Equipment Setup

The following procedures describe equipment setup and field data collection.

Efforts will be made not to disturb the bottom sediment while collecting surface water quality measurements. Procedures are as follows:

1. Fasten the measuring tape to the water quality meter sensor unit, avoiding any obstructions to the sensors. A deployment line with incremental measurement markings may also be used.
2. Fasten a weighted deployment line to the meter so the anchor weight hangs less than 1 foot below the sensor unit.
3. Fasten the unit sensor cable to the meter.

Collection of Water Quality Measurements

1. Navigate the vessel to the target stations listed for surface water quality monitoring in the Phase 2 FSAP Volume 2 Addendum No. 3 using the navigational procedures outlined in the SOP NC-03 – Navigation and Boat Positioning.
2. Use an external Trimble GeoXH DGPS receiver capable of sub-meter accuracy to determine proximity to the target station. Once within the target station limits listed in SOP NC-03, turn off vessel engine but **do not deploy anchors**. Coordinate data will

be obtained with the DGPS. **Measure the depth to mudline using the on-board fathometer**, or estimate the depth to mudline based on the tidal stage, **so as not to disturb the sediment.**

3. Use the Secchi disk to measure water clarity by lowering the Secchi disk slowly through the water column no deeper than the maximum depth of 3 feet above the mudline (do not contact sediment with the Secchi disk) and report maximum visibility where the Secchi disk is visible. If the Secchi disk is clearly visible at the maximum depth, record measurement as "> X" where X is the maximum depth below the water line in feet.
4. Deploy the water quality meter.
5. Collect water quality measurements approximately 3 feet above the mudline.
6. The instrument must stay in the water for a maximum of 2 minutes or until all parameters have stabilized in order for all of the instrument sensors to reach equilibrium and obtain an accurate result. Care should be taken to avoid any contact between the sensor and the creek bottom.
    a. Because the vessel is not anchored, some drift is expected to occur while the instrument stabilizes. The vessel captain will use oars or the vessel motor to keep the vessel in the area of the monitoring point without disturbing the creek bottom.
    b. If the water quality instrument or vessel disturb the sediment bottom, document the time and location of the disturbance.
    c. If the vessel motor is used, make sure the line for the water quality instrument angles downward and not toward the vessel motor to avoid tangling equipment in the vessel props.
7. Record the data on the appropriate field form. The following information will be recorded:
    a. Instrument name, make, model, and serial number
    b. List of sensors on the instrument
    c. Names of field personnel involved in the monitoring effort
    d. Date and time collection
    e. Weather conditions and sea state
    f. Depth of water at the location estimated from fathometer or bathymetric elevation map

g. Station identification number (ID)
h. Water quality measurements, consisting of temperature and salinity

8. Once the monitoring event is completed, the instrument should be turned off and stowed per instructions listed under the Instrument Operation section.
9. Enter the water quality data from the field form into the electronic database upon return to the field facility to ensure adequate backup exists.

QUALITY ASSURANCE/QUALITY CONTROL

Gas ebullition and sheen characterization observations should be completed only by appropriately trained staff. Field staff will forward copies of field notes, field logs, and maps to the Task Manager for quality assurance checks during project implementation at a frequency to be determined by the Task Manager.

Standard instrument operation procedures for making in situ water quality measurements will be followed. Entries in the field forms will be double-checked by field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

REFERENCES

Anchor QEA (Anchor QEA, LLC), 2014a. *Phase 2 Health and Safety Plan*. Final. Remedial Investigation/Feasibility Study, Newtown Creek. May 2014.

Anchor QEA, 2014b. *Phase 2 Remedial Investigation Work Plan – Volume 2*. Final. Remedial Investigation/Feasibility Study, Newtown Creek. November 2014.

Anchor QEA, 2014c. *Phase 2 Quality Assurance Project Plan – Version No 3.* Final. Remedial Investigation/Feasibility Study, Newtown Creek. July 2014.

Minnesota Pollution Control Agency (MPCA), 2008. Nonpetroleum Sheens on Water. Cleanup/Emergency Response, Volume 4, No. 07. April 2008. http://www.pca.state.mn.us/index.php/view-document.html?gid=2958

National Ocean and Atmospheric Administration (NOAA), 2007. NOAA Open Water Oil Identification Job Aid, updated July 2012. http://response.restoration.noaa.gov/sites/default/files/OWJA_2012.pdf

LIST OF ATTACHMENTS

Attachment 1 – Gas Ebullition Survey Equipment and Surface Water Quality Monitoring Log

Attachment 2 – Gas Ebullition Survey Visual Observations Log

Attachment 3 – YSI Calibration Field Log

ATTACHMENTS

ANCHOR QEA

Gas Ebullition Survey Equipment and Surface Water Quality Monitoring Log

Project: Newtown Creek RI/FS

Project Number: 151037-01, Task 8.2.16

Staff:

Survey Area:

Date:

Survey Start Time:

Survey End Time:

Time of Low Tide/High Tide:

EQUIPMENT INFORMATION

Sonde Make/Model:

Sonde Serial Number:

GPS Make/Model:

GPS Serial Number:

Camera Make/Model:

Camera Serial Number:

Camcorder Make/Model:

Camcorder Serial Number:

PRE-SURVEY WATER QUALITY MONITORING

Weather Conditions:

Station ID	Time	Northing/Latitude	Easting/Longitude	Temperature (°C)	Salinity (ppt)	Secchi Disk (feet)

POST-SURVEY WATER QUALITY MONITORING

Weather Conditions:

Station ID	Time	Northing/Latitude	Easting/Longitude	Temperature (°C)	Salinity (ppt)	Depth to Mudline (leadline, feet)	Secchi Disk (feet)

NOTES/COMMENTS

Date/Time of Sonde Calibration:

ANCHOR QEA

Gas Ebullition Survey Visual Observations Log

Project: Newtown Creek RI/FS	Date:
Project Number: 151037-01	Survey Start Time:
Staff:	Survey End Time:
Survey Area:	Time of Low Tide/High Tide:

CONDITIONS AT TIME OF OBSERVATION

Time of Observation:			**Location of Ebullition/Sheen Relative to Coordinates:**	
Northing/Lat:	**Easting/Long:**			
Anthropogenic Conditions: (circle, note if others present below) Vessel Movement — Vessel Wake — Anchoring Spudding — Pile Driving — Construction Aeration System Operation — Sampling Activities			**Location and Proximity to Structures or Active Work Areas:**	
Conditions: (circle)	Wind From:	N – NE – E – SE – S – SW – W – NW		Light – Medium – High
	Weather:	Sunny – Cloudy – Rainy	Air Temp (F):	Wave Height (ft crest to trough):
Wave Action Observations: (check)	☐ Calm (glassy or ripples without crests)			
	☐ Slight (wavelets not breaking)			
	☐ Moderate (crests begin to break, scattered whitecaps)			Vessel Traffic (describe):
	☐ Heavy (fairly frequent whitecaps)			
	☐ Vessel wake			

EBULLITION OBSERVATIONS

Is Ebullition Observed?	No — Yes	If yes, proceed completing this section of the form.	
Frequency (circle):	Moderate-high — Low-moderate — Trace-low		
Rate (bubbles/min):	**Approximate Ebullition Area Dimensions (reference to landmarks if needed, ft):**		
Spatial Distribution (circle):	Moderate-high — Low-moderate — Trace-low		
Coincident Sheen Observed?	No — Yes		
Ebullition Area Water Quality Measurements:	Temperature (°C)	Salinity (ppt)	Secchi Disk (feet)

SHEEN OBSERVATIONS

Is Sheen Observed?	No — Yes	If yes, proceed completing this section of the form.			
Sheen Type (circle)	**Distribution:**	Blossom — Small Spots — Spotty — Streaks — Contiguous			
	Color:	Silvery — Rainbow — Dark Rainbow — Dark			
	Structure:	Brittle — Non—brittle			
Approximate Sheen Area Dimensions (reference to landmarks if needed, ft):			**Rate (for sheen blossoms only, blossoms/min):**		
Potential Sheen Source(s) (if not coincident with gas ebullition, and if obvious): Vessel Movement — Vessel Wake — Anchoring — Spudding — Pile Driving — Construction Aeration System Operation — Sampling Activities — Unknown — Other (describe below)					

DOCUMENTATION

Photo Nos:
Video File Names:
GPS Point Names:

COMMENTS/ADDITIONAL OBSERVATIONS

ANCHOR QEA

Gas Ebullition Survey
YSI Calibration Field Log

Calibration By:				Project: Newtown Creek RI/FS		
Date:	Time:			Project Number: 151037-01, Task 8.2.16		
Sonde Make/Model:				Sonde Serial Number:		
Calibration Type (check one): Initial □ Redeployment □ Maintenance □ Final □						
Temperature Check	NIST Thermometer Value (°C):			YSI Temp Sensor (°C):		
Pressure Calibration (0.0 m)	Initial reading (m):			Calibrated reading (m)		
Calibration – Specific Conductance						
Std Value (mS/cm)	SpCond Pre Cal (mS/cm)	Salinity Pre Cal (psu)	SpCond Post Cal (mS/cm)	Salinity Post Cal (psu)	Standard Lot Number	Standard Exp Date
30.1						
10.0						
30.1						
50.0						
Conductivity Cell Constant:					*Acceptable range: 4.55 to 5.45*	
Note: 10, 30.1 and 50 are calibration checks only. The second 30.1 standard must be a different lot number. Acceptance criteria ±5%.						
Comments:						
Deployment Checks						
Batteries Replaced: Y / N			Battery Voltage:			
Battery Life (Days):						
Comments:						