

APPENDIX F
FIELD SAMPLING PLAN

FIELD SAMPLING PLAN

BARKER CHEMICAL SITE SITE NO. 932119 SOMERSET, NEW YORK

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1.0 INTRODUCTION

This Field Sampling Plan (FSP) provides procedures for the field activities to be completed as part of site management. The field procedures presented in this FSP should be followed by all field personnel, as adherence can help to ensure the quality and usability of the data collected. The FSP should be used in concert with, the following documents:

- The Health and Safety Plan (HASP) – Appendix H;
- The Quality Assurance Project Plan (QAPP) – Appendix G; and
- The Site Management Plan (SMP).

2.0 GROUNDWATER SAMPLING

2.1 Well Installation Procedures

A monitoring well network exists at the Barker Chemical Site. In the event that additional wells need to be installed, or an existing well needs to be replaced, the following procedure outlines a NYSDEC-approved method of constructing overburden groundwater monitoring wells. The following is a step-by-step method of installing a well once a borehole has been drilled to the desired depth:

1. Thread a cap on the bottom section of the well screen. If more than one section of well screen is required, thread the sections together.
2. Lower the screen into the borehole with the riser section ready.
3. Add the 1st riser section to the screen. Do not drop the screen in the borehole.
4. Add riser sections as required until the bottom screen section touches the bottom of the borehole.
5. If completing the well with a road box, mark the riser two inches below ground surface and cut the riser. If completing the well with a protective casing, the riser should stick up above the ground surface.
6. Place a slotted cap or J-plug onto (into) the riser.
7. Place sand (filter-pack) into the annular space between the borehole and the PVC screen and riser to approximately 2 feet above the top of the well screen. Place the sand in very slowly so it does not bridge in the well bore.
8. Place bentonite chips above the sand-pack.
9. Grout the road box or protective casing in place with a concrete mix.

2.2 Well Development Procedures

Wait at least 48 hours after completing well installation before beginning well development. Well development is completed by pumping or bailing groundwater from the well until the discharged water is relatively sediment free and the field parameters (e.g., turbidity, pH, temperature, specific conductivity, oxidation-reduction potential (ORP), dissolved oxygen, etc.) have stabilized. Development removes sediment from the well and can improve the hydraulic properties of the formation. Well development water can be discharged onto the ground surface downgradient of the well unless gross contamination is observed (e.g., NAPL, heavy sheens, odors, high PID readings, etc.). In these cases, the well development water must be containerized and sampled prior to discharge or disposal.

1. Select an appropriate well development method based upon water depth, well productivity, and sediment content of the water. Well development options include manual bailing or pumping. Surging of the well can also be completed using an appropriately sized surge block.
2. Assemble the necessary equipment on a plastic sheet surrounding the well.
3. Remove the slotted cap or J-plug ensuring that no foreign material enters the well.
4. Monitor the interior of the riser pipe for organic vapors using a PID. If a reading greater than 5 ppm is recorded, the well must be vented until levels are below 5 ppm before purging is started.
5. Measure depth to water and the total depth of the monitoring well using an electronic water level indicator.
6. Calculate the volume of water within the well.
7. Wash the end of the probe with soap and rinse with deionized water between wells.
8. Begin development and measure the initial turbidity, pH, temperature, specific conductivity, ORP, dissolved oxygen, etc. of the water and record the information on the Well Development Logs (see **Appendix I** – Site Management Forms). Note the initial color, clarity, and odor of the water.
9. Continue to develop the well and periodically measure the water quality parameters indicated in step 8 above. Development should continue until the purged water has a turbidity less than 50 nephelometric turbidity units (NTUs) and the field parameters have stabilized.
10. Record depth to water, total well depth, volume of water removed, the field

parameters, initial and final color, clarity, odors, sheens, the presence of NAPL, etc. on the Well Development Logs.

2.3 Well Purging Procedures

To collect representative groundwater samples, the monitoring wells must be adequately purged prior to sampling. Purging will require removing three to five volumes of standing water in rapidly recharging wells and at least one volume from wells with slow recharge rates. Sampling should commence as soon as adequate recharge has occurred.

1. Remove the slotted cap or J-plug ensuring that no foreign material enters the well.
2. Monitor the interior of the riser pipe for organic vapors using a PID. If a reading greater than 5 ppm is recorded, the well must be vented until levels are below 5 ppm before purging is started.
3. Measure depth to water and the total depth of the monitoring well using an electronic water level indicator.
4. Calculate the volume of water within the well.
5. Wash the end of the probe with soap and rinse with deionized water between wells.
6. Utilize dedicated, new polyethylene tubing (preferably ½ inch diameter HDPE) for each well.
7. Begin purging the well using the low-flow method. Measure the initial turbidity, pH, temperature, specific conductivity, ORP, dissolved oxygen, etc. of the water and record the information on the Well Purging and Sampling Logs (see **Appendix I** – Site Management Forms). Note the initial color, clarity, and odor of the water.
8. Continue purging the well until the required volume is removed and periodically measure the water quality parameters indicated in step 7 above. If the well purges to dryness and sufficiently recharges within 15 minutes, water can be removed as it recharges. If the well purges to dryness and does not sufficiently recharge within 15 minutes, contact the NYSDEC project manager to determine if purging can be terminated.
9. Record depth to water, total well depth, volume of water removed, the field parameters, initial and final color, clarity, odors, sheens, the presence of NAPL, etc. on the Well Purging and Sampling Logs.

2.4 Well Sampling Procedures

1. Complete well sampling immediately after purging if recharge is sufficient. Otherwise, complete well sampling within 24 hours of purging if the well has recovered sufficiently to sample. If sufficient volume for analytical testing cannot be obtained from a well or if recharge exceeds 24 hours, contact the NYSDEC project manager to determine analytical priorities and validity of the sample.
2. Label sample bottles using a waterproof permanent marker per the procedures outlined in Section 7.0.
3. Collect the sample using the low-flow method by pumping groundwater directly into laboratory certified analyte-free sample bottles containing preservatives as required.
4. Place the sample bottles on ice in coolers.
5. Complete the chain-of-custody form.
6. Collect a separate sample into a 120 milliliter (mL) plastic container to measure field parameters (e.g., pH, temperature, specific conductivity, ORP, dissolved oxygen, etc.) if a flow-through cell is not being utilized. Measure the turbidity of the sample with a turbidity meter.
7. Record the field parameters on the Well Purging and Sampling Logs (see **Appendix I** – Site Management Forms).
8. Transport the samples to the analytical laboratory.

3.0 SURFACE WATER SAMPLING

3.1 General

This section of the FSP describes procedures and equipment to be used by field personnel when collecting surface water samples at the Barker Chemical Site. The samples should be collected with as little agitation or disturbance of the surface water body as possible.

3.2 Equipment Selection Considerations

Surface water sampling is generally accomplished by using one of the following samplers or techniques:

- Kemmerer Bottle

- Van Doren Sampler
- Bacon Bomb Sampler
- Dip Sampler
- Direct Method

For the Barker Chemical Site, the dip sampler and direct method are the most appropriate.

3.3 Sample Collection

Surface water samples will typically be collected either by directly filling the container from the surface water body being sampled or by decanting the water from a collection device such as a dip sampler.

3.3.1 Direct Method

For most surface water bodies at the Barker Chemical Site surface water samples can be collected using the direct method as follows:

1. Dip the laboratory certified analyte-free sample bottle into the surface water body being sampled to directly fill the bottle.
2. Pre-preserved sample bottles should not be used with the direct method as sample collection may dilute the concentration of preservative in the bottle. For these bottles, collect surface water directly into a laboratory certified analyte-free sample bottle and transfer this water into the preserved sample bottles.
3. Label sample bottles using a waterproof permanent marker per the procedures outlined in Section 7.0.
4. Place samples on ice (or blue ice) in coolers.
5. Complete the chain-of-custody form.
6. Record any field parameters measured and observations (e.g., water depth, clarity, odors, sheens, etc.) on the Surface Water Sampling Logs (see **Appendix I** – Site Management Forms).
7. Transport the samples to the analytical laboratory.

3.3.2 Dip Sampler

A dip sampler is useful in situations where a sample is to be recovered from a surface water body where direct access is limited. The long handle on such a device allows access

from a discrete location. The following procedures should be used when collecting surface water with a dip sampler:

1. Assemble the device in accordance with the manufacturer's instructions.
2. Extend the device to the sample location and collect the sample by dipping the sampler into the water.
3. Retrieve the sampler and transfer the sample to laboratory certified analyte-free sample bottles. Make sure that the dip sampler does not come in contact with the sample bottles.
4. Label sample bottles using a waterproof permanent marker per the procedures outlined in Section 7.0.
5. Place samples on ice (or blue ice) in coolers.
6. Complete the chain-of-custody form.
8. Record any field parameters measured and observations (e.g., water depth, clarity, odors, sheens, etc.) on the Surface Water Sampling Logs (see **Appendix I** – Site Management Forms).
7. Transport the samples to the analytical laboratory.

4.0 SURFACE WATER pH MEASUREMENTS

4.1 General

This section of the FSP describes procedures to be used by field personnel when completing pH measurements of surface water bodies at the Barker Chemical Site. The pH of surface water is a common field measurement that can be made with any pH meter. Some meters measure both the temperature and pH of the sample with a single probe. This is the preferred meter to use.

4.2 Instrument Calibration

Many brands of instruments are commercially available to measure pH that incorporate a wide variety of technologies. In most cases, these meters are rented by consultants and come pre-calibrated from the rental company. Due to the low pH surface water historically documented at the Barker Chemical Site, the rental company should be asked to pre-calibrate the pH meter with the pH 4 and 7 buffer solutions. If recalibration is required, the manufacturer's instruction manual should be consulted for specific procedures.

4.3 Field Measurement Procedures

4.3.1 Grab Sample Measurements

The following procedure should be used when completing pH measurements of a grab sample:

1. Collect a sample of surface water in a wide-mouth sample bottle. If the meter's thermistor is to be used for the temperature, the temperature should be read as soon as the reading stabilizes and prior to measuring the pH.
 - Note: When the pH meter response is slow, unstable, or non-reproducible, it may be necessary to check the conductivity. If the conductivity is lower than 20 to 30 $\mu\text{mhos/cm}$, it is permissible to add 1 ml of 1M potassium chloride solution per 100 ml of sample to improve response time for the probe.
2. Immerse the lower part of the probe into the wide-mouth sample bottle. In the field, the pH probe is typically not kept away from the bottom or sides of the bottle as this is not practical. Allow ample time for the probe to equilibrate with the sample. On some meters, when a stable reading is achieved, the "pH" icon will stop flashing and the screen will freeze with the stable values displayed. Once equilibrated, take the readings.
3. Rinse the probe with de-ionized water.
4. Repeat the procedure with a fresh surface water sample until successive sample readings are within 0.1 pH unit of each other.
5. Record the pH and temperature measurements on the Surface Water pH Measurement Recording Form (see **Appendix I** – Site Management Forms).
6. Rinse the probe with de-ionized water and replace the end cap if applicable. For longer term storage, place probe in the manufacturer's recommended storage solution.

4.3.2 Flow-Through Cell Measurements

The following procedure should be used when completing pH measurements with a flow-through cell and a multi-meter:

1. Collect a sample of surface water in the flow through cell.
2. Immerse the bottom portion of the probe in the flow through cell. Allow ample time for the probe to equilibrate with the sample. Once equilibrated, take the readings.

3. Rinse the flow through cell and probe with de-ionized water.
4. Repeat the procedure with a fresh surface water sample until successive sample readings are within 0.1 pH unit of each other.
5. Record the measurements (e.g., pH, temperature, specific conductivity, ORP, dissolved oxygen, etc.) on the Surface Water pH Measurement Recording Form (see **Appendix I** – Site Management Forms).
6. Rinse the flow through cell and probe with de-ionized water.

4.3.3 In-Situ Measurements

These procedures should be followed when conducting in-situ field pH measurements:

1. Place the probe into the surface water body to be measured and allow ample time for the probe to equilibrate with the water. Once equilibrated, take the readings.
2. Rinse the probe with de-ionized water.
3. Repeat the procedure until successive sample readings are within 0.1 pH unit of each other.
4. Record the pH and temperature measurements on the Surface Water pH Measurement Recording Form (see **Appendix I** - Site Management Forms).
5. Rinse the probe with de-ionized water and replace the end cap if applicable. For longer term storage, place probe in the manufacturer's recommended storage solution.

5.0 FIELD DOCUMENTATION

Field notebooks should be used during all on-site work but should be supplemented with the site management forms of **Appendix I** (e.g., Well Development Logs, Well Purging and Sampling Logs, Surface Water Sampling Log, Surface Water pH Measurement Recording Form). A dedicated field notebook is maintained by the field technician overseeing the site activities. Field activities should also be photo-documented. The field notes, at a minimum, should include the following information:

- General observations
- Weather conditions
- Name(s) of the field personnel

- Types of samples collected
- Sample identification numbers
- Date and time of sample collection
- Sampling methods and devices
- Purge volumes (wells)
- Field parameters (e.g., turbidity, pH, temperature, specific conductivity, ORP, dissolved oxygen, etc.)
- Water depth (surface water)
- Chain of Custody and shipping information

6.0 SAMPLE BOTTLE SELECTION

The selection of sample bottles is based on the media being sampled and the required analysis. The analytical laboratory should supply certified analyte-free sample bottles containing the appropriate preservatives.

7.0 SAMPLE BOTTLE LABELING

The following procedure helps to prevent misidentification of samples and to clarify the location of samples collected during site management:

1. Write the following information with permanent marker on each laboratory supplied sample label:
 - Site name and number
 - Sample identification number
 - Date and time of sample collection
 - Sampler's initials
 - Sample preservation
 - Analysis required.
2. Fix the label to each sample bottle.
3. Wrap each sample bottle with 2-inch cellophane tape to ensure that the label stays on the bottle.

Each sample is assigned a unique alpha-numeric identification code using the following abbreviations:

- SW = Surface Water
- MSB = Matrix Spike Blank
- EB = Equipment Rinse Blank
- MW = Monitoring Well (Groundwater)
- TB = Trip Blank
- RB = Rinse Blank
- MS/MSD = Matrix Spike/Matrix Spike Duplicate

An example of this code for a groundwater sample would be MW-1, specifying that the groundwater sample was collected from monitoring well MW-1. Field duplicate samples will be assigned a unique alpha-numeric identification code that specifies the date of collection, the letters FD (for field duplicate) and an ascending number that records the number of duplicate samples collected that day. For example, the first field duplicate collected on November 22, 2021, would be assigned the sample number in the format YYYYMMDD-FD-1 = 20211122-FD-1. Subsequent duplicates collected on the same day will be assigned FD-2, FD-3 etc. Field personnel will record the duplicate sample information in the field book and on the appropriate Sample Logs (see [Appendix I](#) – Site Management Forms).

8.0 CHAIN OF CUSTODY PROCEDURES

Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody procedures. Chain-of-custody procedures are essential for (1) presenting analytical results in a legal or regulatory forum (e.g., evidence in litigation or administrative hearings), (2) minimizing loss or misidentification of samples, and (3) ensuring that unauthorized persons do not tamper with the collected samples.

The following chain-of-custody guidelines should be utilized during sample collection as outlined in the National Enforcement Investigations Center (NEIC) Policies and Procedures of the USEPA Office of Enforcement:

1. Complete the chain-of-custody (COC) form with all relevant information.
2. Ship the original COC with the samples in a sealed, waterproof bag taped inside the lid of sample cooler. Place any additional paperwork in the sealed bag with the original COC.

3. Retain a copy of the COC.
4. Place adequate inert cushioning material (e.g., corrugated plastic, polypropylene foam wrap, etc.) in the bottom of the cooler.
5. Place bottles in the cooler so they do not touch (use cushioning material for dividers).
6. Place VOA vials in sealed/waterproof bags in the center of the cooler.
7. Pack cooler with ice in sealed/waterproof plastic bags. Blue ice can also be utilized.
8. Pack cooler with cushioning material.
9. Transport the samples to the analytical laboratory.

If the coolers need to be shipped to the analytical laboratory, the following should also be completed:

1. Tape the cooler drain shut.
2. Wrap the cooler with packing tape at two locations to secure the lid.
3. Attach the lab address to the top of the cooler.
4. Ship samples via overnight carrier the same day that they are collected.
5. Label the top of the cooler with "This End Up" or "This Side Up". Upward-pointing arrows should be placed on the sides of the cooler.
6. Fix custody seals on the front and back of the cooler and cover with packaging tape.
7. Ship the samples to the analytical laboratory.

More details concerning the chain of custody, custody seals, and sample handling, packaging, and shipping are provided in **Appendix G** (Quality Assurance Project Plan) of this SMP.

9.0 QUALITY CONTROL

The number of Quality Control samples to be collected during sampling activities at the Barker Chemical Site is described in the Quality Assurance Project Plan (**Appendix G**).