STANDARD OPERATING PROCEDURE

Field Notebook

1. Objective

Describe methods for documentation of field activities.

Documentation of site activities is a crucial part of the field investigation process. The field notebook serves as the record of field activities performed or observed during the project. It provides a factual basis for preparing field observation reports, if required, and reports to clients and regulatory agencies. Example field notes are provided in Attachment A.

2. Execution

- Use a separate all-weather bound notebook for each site/location/project number. Spiral notebooks should not be used because pages can be easily removed.
- Write neatly using black or blue pen, preferably a waterproof pen. Use of pencil is also acceptable only with approval of the project manager, such as in but not limited to, certain field conditions [e.g., cold or wet weather].
- Write the project name, project number, book number (i.e., 1 of 3), and date on the front cover. On the inside cover, identify the project name, project number, and "Return Book To:" the office address of the project manager.
- Number all of the pages of the field book starting with the first entry.
- Record activities as they occur. Record only facts and observations, regardless of whether they appear to be relevant at that time.
- Identify conditions or events that could affect/impede your ability to observe conditions (e.g. snow-covered ground surface, inability to access areas of interest).
- Neatly cross out mistakes using a single line and initial them. Erasures are not permitted.
    - If an error is made on an entry in the field notebook, the individual who made the entry should make the corrections. The corrections must be initialed and dated by the person making the correction.
- Sign or initial and date the bottom of every page with an entry if the project requires such documentation.
- Place a diagonal line through unused portions of a page.
- Record the following information upon each arrival at the site:
    - Date/time/weather.
    - Personnel.
    - Purpose of visit/daily objectives.
    - People (client, contractor, landowners, etc.) present upon arrival at site.

- Record the following information during the course of the day:
    - Conversations with contractors/subcontractors, clients, visitors, professional staff, landowners (site or abutters). If possible, record complete names, titles, and affiliations.
    - Time of arrival and departure of individuals.
    - Activities as they occur.

- Additional examples of observations to record may include and are not limited to:
    - Type and quantity of monitoring well construction materials used.
    - Use of field data sheets or electronic logging equipment (e.g. boring logs, monitoring well sampling logs, etc.).
    - Ambient air monitoring data.
    - Field equipment calibration information.
    - Locations and descriptions of sampling points.
    - Contractor/Subcontractor progress.
    - Sample media (soil, sediment, groundwater, etc.).
    - Sample collection method.
    - Number and volume of sample(s) collected and sample bottle preservatives used.
    - Sample identification number (s) and date and time of sample collection.
    - Approximate volume of groundwater removed before sampling.
    - Any field observations made such as pH, temperature, turbidity, conductivity, water level, etc.
    - References for maps and photographs of the sampling site(s).
    - Information pertaining to sample documentation: bottle lot numbers/ dates, method of sample shipments, chain-of custody record numbers, and overnight shipping numbers.
    - Surveying data (including sketches with north arrows).
    - Changes in weather.
    - Rationale for critical field decisions.
    - Recommendations made to the client representative and/or Project Manager(s).
    - Site sketch of conditions at the end of the day.
    - Summary of work completed/work remaining.
    - Allow time at the end of the day to complete entries in the notebook.

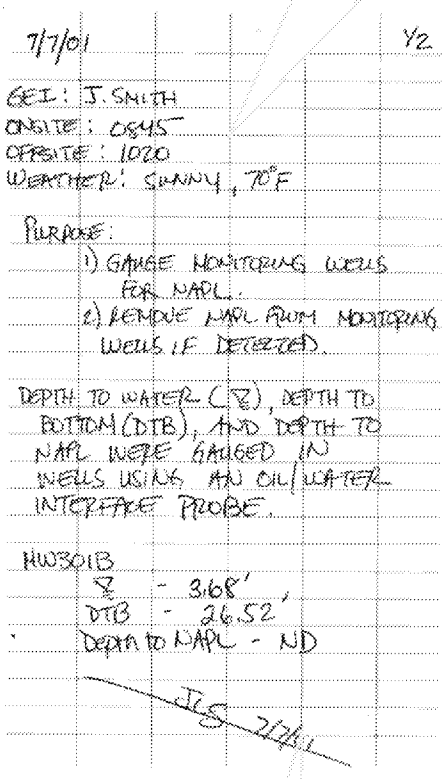
3. Attachments

Attachment A - Example Field Notes

Attachment A – Example Field Notes

Start of each day includes:
- **Date**
- **Project Number**
- **People on site**
- **Purpose of Work**
- **Weather Conditions**

Each page is numbered



7/7/01 Y2

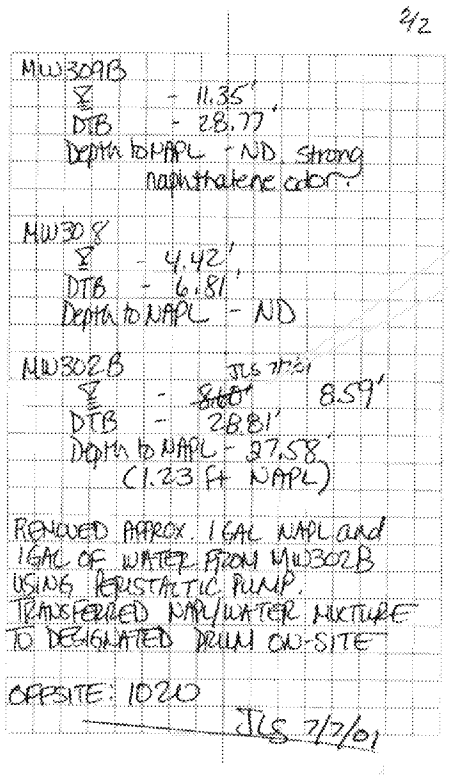
GEI: J. SMITH
ONSITE: 0645
OFFSITE: 1020
WEATHER: SUNNY, 70°F

PURPOSE:
1) GAUGE MONITORING WELLS FOR NAPL.
2) REMOVE NAPL FROM MONITORING WELLS IF DETECTED.

DEPTH TO WATER (∇), DEPTH TO BOTTOM (DTB), AND DEPTH TO NAPL WERE GAUGED IN WELLS USING AN OIL/WATER INTERFACE PROBE.

MW301B
∇ - 3.68'
DTB - 26.52'
Depth to NAPL - ND

JLS 7/7/01



2/2

MW309B
∇ - 11.35'
DTB - 28.77'
Depth to NAPL - ND. Strong naphthalene odor

MW308
∇ - 4.42'
DTB - 6.81'
Depth to NAPL - ND

MW302B JLS 7/7/01
∇ - ~~8.60'~~ 8.59'
DTB - 28.81'
Depth to NAPL - 27.58'
(1.23 ft NAPL)

REMOVED APPROX. 1 GAL NAPL and 1 GAL OF WATER FROM MW302B USING PERISTALTIC PUMP. TRANSFERRED NAPL/WATER MIXTURE TO DESIGNATED DRUM ON-SITE

OFFSITE: 1020

JLS 7/7/01

Errors are single line crossed out and initialed

Blank Space crossed out and initialed

Bottom of each page signed and dated

STANDARD OPERATING PROCEDURE

Photo Documentation

1. Objective

Describe methods to document and retain photographic records.

Keeping a record of photographs taken is crucial to their validity as a representation of existing conditions.

2. Execution

- Photographs of a site, individual samples, or other observations should be taken using a digital camera.
- Set the camera to record the time and date for each photograph.
- All photographic records, along with the following information, should be recorded in the field notebook (SOP FD-001).
    - If applicable, the compass direction describing the direction the photograph was taken (e.g. looking southeast). This may not apply to photographs of individual samples.
    - Brief description of what the photograph is intended to show.
- The field notebook should note who took the photographs.
- The photographs should be electronically backed up on a computer or other data storage device.
- If photographs will be used in a report, memo, or letter, they should be placed on a photograph record template and the relevant information describing the photograph should be inserted into the caption section for each photograph.

3. Limitations

- Some clients and regulatory agencies require photographs of every subsurface soil sample collected. These photographs typically include a "whiteboard" which indicates the site, the boring ID, and the depth of the sample, while logging details are recorded in the field notebook. Under these circumstances, it is not necessary to include compass directions or descriptions.

STANDARD OPERATING PROCEDURE

Sample Handling

1. Objective

Describe appropriate environmental sample handling procedures.

The procedures include collection and transport of environmental samples to a laboratory for chemical analysis. Appropriate sample handling should ensure that samples are properly:

- labeled and documented;
- preserved;
- packaged; and
- transported

2. Execution

- Prior to mobilizing to the field, select a shipper or arrange for a courier for sample delivery to the laboratory. If using a shipper (i.e., FedEx or UPS) determine the time constraints for pickup requests, the location and hours of the nearest shipping office, and any size/weight restrictions.
- A waterproof or permanent ink pen should be used for all labels. The label should have an adhesive backing and be placed on the jar or bottle, not on the cap. In addition, clear packing tape can be placed over the sample label to secure it to the bottle as moisture from the samples can loosen the label adhesive.
- Record the following information on the label and in the field notebook (See SOPs FD-001 and FD-003):
    - Project number
    - Sample identification (i.e. MW-201 or SS-2)
    - Date and time (military time) of collection
    - Sampler's initials
    - Analysis methods
    - Preservative, if present
- Pre-preserved laboratory jars are preferable and should be used whenever practicable. If sample jars are not pre-preserved, add preservative as appropriate.
- At each sampling location, samples should be collected in order of volatility, most volatile first. Samples collected for volatile analysis should be placed in sample containers immediately upon retrieval of the sample.
- Aqueous samples for volatile analysis should be collected without air bubbles.
- The collection and preservation method of soil samples for volatile analysis may depend on project, client, or state regulatory requirements. Check with your Project Manager and/or SOPs SM-001 and SM-002 where appropriate.

ENBDNR0007590

- Care must be taken to avoid getting soils on the threads of sample jars, which can cause a faulty seal.
- If compositing samples in the field, specify the basis for composite (i.e. volume, weight, spoon recovery, etc.) and record in the field book the procedure for compositing the sample.
- Once samples have been collected and labeled, place samples in a cooler with sufficient bagged ice or freezer packs (blue ice) (if allowed) to chill samples to 4°C. If using ice, use double-bagged ice.
- Complete the chain-of-custody (COC) (SOP FD-003).
- If transporting the samples by way of a shipper:
    i. The sample cooler should have water drains securely sealed with duct tape, both on the inside and outside of the cooler.
    ii. Place a layer of packing material on the bottom of the cooler as a cushion.
    iii. Individually wrap each sample bottle with bubble packing or suitable packing material and place the wrapped bottles upright in the cooler with sufficient packing material between samples to avoid breakage.
    iv. Methanol preserved samples for volatiles analysis should be packed so they remain upright with the soil completely covered by the methanol during transport.
    v. Place a layer of packing material on top of the sample bottles.
    vi. Place bagged ice or freezer packs on top of the packing material. Fill the remaining space in the cooler with packing material to eliminate the possibility of vertical movement of samples.
    vii. Place the completed and signed chain-of-custody form in a sealable plastic bag and place on top of the packing material in the cooler, or tape it to the inside lid of the cooler.
    viii. Fill out the appropriate shipping or courier forms and attach to the top or handle of the cooler. If necessary, place the proper shipping labels on the cooler. Have the courier sign the COC form (or write pickup by FEDEX, UPS, etc. with date and time). Place a signed and dated custody seal on the cooler.
- All samples should be submitted to the laboratory as soon as possible. In many cases, same day shipping will be required by the client or the project manager. Be clear on this before beginning the field work.
- A copy of the waybills should be kept by the field supervisor to track shipments if necessary.

3. Limitations

- If samples are shipped on a Friday, call the laboratory ahead of time to confirm that personnel will be at the laboratory to receive and log-in the samples.
- During warm weather, make sure to use plenty of ice in the shipping container.

- Field personnel should be aware of analyses which have short hold times and schedule sampling events and shipping accordingly. Shipment of samples for analyses with short hold times must be arranged for in advance. Refer to the project work plan, quality assurance project plan, or state/federal regulations for holding time and preservative information. Contact the laboratory ahead of time when shipping samples with short hold time to ensure the lab is prepared for these analyses.
- For glassware containing preservatives (e.g., HCl, HNO_3), take care not to overfill the container, thus flushing the preservative out of the bottle.
- Never composite samples for VOCs in the field. Collect individual aliquots and direct the laboratory to perform compositing, if needed.
- Collection of aqueous samples should not be performed over the opening of a monitoring well. Preservatives from overfilling, a marker pen or other objects could fall into the well.
- If the recharge volume for a monitoring well is low, completely fill all volatile vials and then collect the minimum sample volume required for each remaining analysis.
- During subsurface soil sampling, if the recovery from the split-spoon sample is inadequate, if appropriate, resample the bottom of the borehole to obtain proper sample volume.
- Laboratories will homogenize and test the contents of the sample container, unless directed otherwise. Samples should not contain rocks, twigs, leaves, etc... unless these materials are of interest.

ENBDNR0007592

STANDARD OPERATING PROCEDURE

Sample Management and Chain of Custody

1. Objective

Describe methods to label sample containers, manage the samples, and prepare Chain of Custody documentation for the samples. Sample transport is also addressed.

2. Project Setup

When setting up a sampling event, inform the recipients of the samples (laboratories) and recipients of laboratory results (data group and project managers). Discuss with the laboratory the sampling media, turnaround times, and reporting limits for appropriate regulatory criteria for the site. Include the data group on correspondence so that turnaround times, data validation, and project deliverable schedules can be tracked successfully.

- Laboratory - Number of samples, analyses needed: bottle orders and holding times, turnaround times needed, reporting limits needed for regulatory criteria.
- Data group - Number of samples, analyses requested, turnaround times and reporting limits requested, data validation needed, regulatory criteria to use for tabulating results, deliverables needed, and project name and number.
- Schedule - Inform the laboratory and Data Group of schedule delays, changes to analyses, and expediting.

3. Sampling Execution

- Review the work plan prior to sampling to determine the following:
  - Sample matrix and sampling method.
  - Required analysis and sample volumes.
  - Sample container type and preservative requirements.
  - Required analysis methods and/or report formats.
  - The turnaround time required by the project.
  - If the data will be sent directly from the laboratory to the data validator, Project Manager, or Data Group.
  - Holding time restrictions for sampling media and analytical methods.
  - Sample naming convention used for this project site.
- Sample labels should be filled out using a waterproof or permanent marker or pen. Required information includes:
  - Sample ID.
  - Date and time of sample collection.
  - Project number.
  - Sample preservatives.
  - Sampler's initials.
  - Laboratory analytical methods.

- Place the label on the jar or bottle, not on the cap. Sample custody begins at this time.
- Record the above information in the field notebook.
- Individually wrap sample jars with packing material, if needed. Place samples in a cooler with bagged ice or freezer packs (blue ice) immediately after collection. Add sufficient ice or freezer packs to cool samples to approximately 4°C.

- Complete a chain of custody (COC) for the samples as described below. Laboratory COCs may be used as long as they contain fields for all required sample information as described in Section 2.1.

3.1. Chain-of-Custody (COC) Completion

- Fill out COC neatly and in permanent ink. Alternatively, an Excel version of the COC is available and can be filled out electronically.
- Certain analyses (i.e. air analysis by TO-15) require specialized, laboratory issued COCs. Make sure any specialized COCs are available before sample collection.
- Record the project name and number, the sampler's name(s) and the state where the samples were collected.
- For each sample, enter the sample identification number, date and time (military time) collected, the number of sample containers, and any additional information to fulfill project, client or regulatory requirements.
- Record the type of analysis (including laboratory method; e.g. EPA-SW846 Method XX) requested and the preservative (if appropriate) in the vertical boxes.
- Field duplicates should be anonymous to the laboratory, but must be recorded for use by the Data Group. To keep track of this information, link the field duplicate with the proper sample in the field notebook. If required by the Project Manager or Data Group, also document this information on or attach a note to a copy of the COC.
- Trip blanks for large sites should be named similar to the samples they are collected with so that there are not two of the same sample name for the same site. For example, "OU1TB-122509" and "OU3TB-122509" would avoid any mistakes.
- Strike incorrect entries on the COC with a single line, followed by the initials of the person making the correction, the date, and the correct entry.
- When sample custody is ready to be relinquished, complete the bottom of the form with date and time (military time) and signatures of relinquisher and receiver of samples as indicated. The sample collector is always the first signature while the analytical laboratory is the final signature. Theoretically, all individuals handling the samples between collection and laboratory should sign the form; however, if a common carrier (i.e., Federal Express, UPS) is used for shipping, the carrier must be identified in the 'Received by' box on the

COC. If the sampler hand delivers the samples to the laboratory, the received box must be signed by the laboratory.

- If the samples are placed in a designated secure area (e.g. sample fridge), note this location in the "Received by" box on the COC.
- Single sheet and triplicate COCs are utilized. If using the triplicate COCs (white, yellow, and pink copies), the pink copy should be retained by the sampling personnel and provided to the Data Group for proper filing. The white and yellow copies should accompany the samples to the laboratory.
- If you are using the single sheet COC, make a copy of the COC after it has been signed by the lab courier and forward it to the Data Group.
- Prior to sample shipment by common carrier, the COC must be placed inside the cooler in a Ziplock bag or other watertight package.
- If a common carrier such as FedEx is used to transport the samples to the laboratory, include the carrier tracking number and identify the carrier in the "Received by" box on the COC.
- If a courier is used to transport samples to the laboratory the courier signs the COC in the "Received by" box.
- Place a custody seal on the cooler if shipping via common carrier.
- Transport samples to the laboratory as soon as possible. It is preferable to transport the samples directly to the laboratory from the field. Samples brought back to the office for storage prior to submission to the laboratory must be kept cold (4° C).
- Unused sampling containers/media that are sent back to the lab should be included on a separate COC.

4. Limitations

- Keep the number of people involved in handling samples to a minimum.
- Where practical, only allow people associated with the project to handle the samples.
- Always document the transfer of samples from one person to another on the COC.
- The COC should always accompany the samples.
- Give samples positive identification at all times that is legible and written with waterproof or permanent ink.
- When sending samples via a common carrier, use one COC per package.
- Where practical, avoid sending samples from more than one site with separate COCs in a single package.

ENBDNR0007595

SANICHECK® APB

Field Test Kit for Detecting Acid Producing Bacteria (APB)

INSTRUCTIONS

1. Disinfect hands with an alcohol wipe before handling any of the test kit components.
2. Open one Agar Tube and place screw cap side up on a clean, dry surface.
3. Remove sterile Sample Applicator Swab from the envelope (do not touch the swab side).
4. Insert Sample Applicator Swab into the liquid sample for approximately 10 seconds. For solid samples, use the Sample Applicator directly to swab the surface.
5. Transfer Sample Applicator into the Agar Tube by inserting it slowly into the agar to reach the bottom of the tube.
6. Slowly and carefully remove Sample Applicator from the Agar Tube. Discard used Sample Applicator.
7. Replace screw cap on Agar Tube.
8. Incubate samples for 1-5 days at 30°C.
9. Examine tubes daily for color change.
   - Color change from **red to yellow** in the Agar Tube indicates acid production. Note: any portion of the Agar Tube turning yellow indicates acid production.
   - Strong acid producers even at very low numbers can change the color overnight.
   - Slow acid producers require longer time for color change development depending on the type and number of acid producers present in the sample.
   - Visually check Agar Tubes daily for color change from red to yellow.
   - Use the evaluation chart provided below to estimate the amount of acid production due to the growth of acid producing bacteria.

Evaluation Chart for Acid Production
due to the Growth of Acid Producing Bacteria

Appearance of Yellow	Acid Production
Day 1 – Day 2	Strong
Day 3 – Day 4	Medium
Day 5	Weak

BIOSAN LABORATORIES, INC.
1950 Tobsal Court, Warren, MI 48091-1351
586-755-8970 • 800-253-6800
Fax 586-755-8978 • Email lesley@biosan.com
Website http://www.Biosan.com

BIOSAN LABORATORIES, INC. offers technical service on matters relating to its products at no charge. Call toll free 800-253-6800 from within the U.S.A. and Canada or collect 586-755-8970 from outside the U.S.A.

SANI-CHECK® SRB

Test System for Counting Sulfate Reducing Bacteria

DESCRIPTION OF TEST

Anaerobic sulfate reducing bacteria are ubiquitous in the environment. They are found in secondary oil recovery effluents, estuarine waters, deep wells, cooling waters, metalworking fluids, water-based hydraulic fluids, and petroleum based products that in some way become contaminated with water. During their growth they are responsible for fouling, objectionable hydrogen sulfide odors, corrosion of metals, and pitting of concrete. It is essential that these organisms be monitored and controlled to prevent damage caused by their metabolic activities.

SANI—CHECK SRB are tubes of culture media that is specifically formulated to promote the growth of anaerobic sulfate reducing bacteria. The medium contains reducing agents that maintain a low oxidation reduction potential and thus allows for maximal growth. When the organisms grow in this medium, sulfate is reduced to sulfide and a black precipitate of iron sulfide is formed. The degree of blackening through the medium is directly proportional to the amount of sulfate reducer growth.

SANI-CHECK SRB is designed to be used in areas where little or no formal laboratory facilities are available. Everything needed to perform 25 tests is enclosed including: 25 SANI-CHECK SRB tubes, 25 identification labels, 25 applicators, one bottle mineral oil 15 (mil), one sample vial with cap, one alligator clip, and one instruction sheet.

Collection of Sample

Oily Sample
Microorganisms are unable to grow in the absence of water. In contaminated oil/water systems, the organisms will be found at the interface and in the water layer. Therefore, it is important that sampling be done from these locations. A sample vial is included with SANI-CHECK SRB®. The vial should be filled with a freshly collected sample that has only a minimal oil layer on its surface. Excess oil can be skimmed from the surface of the sample with the enclosed dropper.

Water and Other Sample
No special sampling precautions are necessary. The sample may be tested using the provided vial or any other suitable container.

DIRECTIONS FOR USE

1. Open a SANI-CHECK SRB tube by peeling off the protective seal and removing the cap. Grip an applicator with the alligator clip and insert applicator into liquid sample. Immerse for approximately 5 seconds, withdraw, and drain excess fluid by running applicator along the inner lip of vial or other sample container. [Dry surfaces may be sampled by pre-wetting the applicator with tap water and swabbing a representative portion of the test area.]
2. Holding applicator with clip, insert into tube of agar, taking care to center it as much as possible. Push the applicator into the tube until it is about even with the surface of the agar.
3. Add 2-3 drops of mineral oil to the tube.
4. For Best results, place tube in any location where the temperature will be close (within 5 degrees) to that of the environment from which it was taken.
5. Observe the tube regularly for results and compare to the chart below.

	Sulfate Reducers/ml*				
Days of Incubation:	1	2	3	4	5
TUBE APPEARANCE					
completely black	$\geq 10^6$	$\geq 10^5$	$\geq 10^4$	$\geq 10^3$	$\geq 10^2$
narrow zone of black around applicator center .	$\geq 10^5$	$\geq 10^4$	$\geq 10^3$	$\geq 10^2$	$\geq 10^1$
no reaction	$< 10^5$	$< 10^4$	$< 10^3$	$< 10^2$	$< 10^1$

*Figures shown have been calculated by Biosan Laboratories using anaerobic plate counts and a pure culture of *Desulfovibrio desulfuricans* (ATCC #7757)

≥ greater than or equal to
< less than

Interpretation of Quantitative Results

Sulfate Reducers/ml	Interpretation
10^5 (100,000) or more/ml	Heavy
10^3-10^4 (1,000-10,000)/ml	Moderate
10^2 -10^3 (100-1,000)/ml	Low
10^1-10^2 (10-100)/ml	Very Low
10^1 (10) or less/ml	Generally Insignificant

BIOSAN LABORATORIES, INC.
1950 Tobsal Court, Warren, MI 48091-1351
586-755-8970 • 800-253-6800
Fax 586-755-8978 • EMail lesley@biosan.com
Website http://www.Biosan.com
BIOSAN

BIOSAN LABORATORIES, INC. offers technical service on matters relating to its products at no charge. Call toll free 800-253-6800 from within the U.S.A. and Canada or collect 586-755-8970 from outside the U.S.A.