

# WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

## SOLID AND HAZARDOUS WASTE DIVISION

### SOLID WASTE GUIDELINE #15

## GROUNDWATER SAMPLING PROCEDURES

(A Guideline for Landfill Operators)

### I. Introduction

The purpose of this guideline is to provide guidance to sanitary landfill operators regarding proper ground water sampling techniques at sanitary landfills. Included in this guideline are sampling equipment & ground water sampling checklists which the operator can use as reference materials in the field. This guideline was not prepared for use at RCRA Subtitle C facilities or other special investigations where additional, more stringent sampling protocols may be required.

General Note: To facilitate use of the information provided in this guideline, the groundwater sampling checklist, which provides a concise step by step sampling description, is prepared in the same outline format as the text section of this guideline. As an example, if during the sampling event the applicant wishes more information (than the checklist offers) on Section II (5) measuring and recording static water levels, the operator simply has to refer back to that same section of the guideline for more specific information.

### II. Preliminary Activities

1. Prior to collecting ground water samples, the operator must contact his/her laboratory and order sample bottles, labels, chain of custody forms, lab blanks and a cooler. The operator should review his/her operating plan to determine which sampling constituents need to be analyzed and pass this information onto the laboratory. The operator should also request that the laboratory prepare the bottles with the required preservatives. This should be done several days in advance of the sampling date in order to ensure that all of the required supplies can be prepared and delivered.

2. Prior to the sampling event, the operator should prepare field notes for the upcoming sampling event. Keep thorough, complete notes of field data in a dedicated waterproof project field notebook. Entries in the notebook should include:

- the date
- names of field personnel
- weather conditions
- names (id #) of wells
- brief description of the condition of the protective casing, well casing, cover and annular seal
- time wells were measured or sampled
- total depths of wells
- static water levels (and a notation of where static water level was measured from)
- how many gallons were evacuated from each well prior to sampling

- descriptions of physical characteristics of the evacuated water (appearance, odor, etc.)
- field sampling parameters (pH, temperature, conductivity).

### III. Static Water Levels

1. Locate each well and note well I.D. in the field notebook. Record the date, time, identify person obtaining the measurements, and note the type of measurement device in the field notebook (see attached example). Water levels and ground water samples should be collected in order of the most upgradient well (least contaminated) to the most down gradient well (most contaminated).

2. Unlock and open the monitoring well. Identify the measuring point for static water level measurements. When measuring static water level in the well always measure from the same point (i.e., north side of casing, west side of casing, etc.) so measurements are consistent. Mark the casing (i.e., notch in casing, indelible marker) to guarantee consistent use of the same measuring point and note in your field notebook where the static water level was measured.

3. In order to ensure that dirt and other contaminants are not introduced into the well, new, clean surgical gloves should be worn. At a minimum, new gloves should be worn at each well.

4. Prior to measuring the static water level and total well depth for each well, the water level probe must be washed with Simple Green, Alconox or other similar detergent, rinsed with distilled water, wiped down as necessary with paper towels, and re-rinsed with distilled water. This procedure should be used prior to measuring each well at the site.

5. Lower the decontaminated water level probe into the well until the audible signal on the probe is triggered or the light comes on. Determine the precise measurement by repeatedly raising and lowering the probe to converge on the exact measurement. The water levels should be measured with a precision of  $\pm 0.01$  foot.

Record the measurement from the measuring point to the static water level in the well in the field notebook. Note any presence of product in the well.

6. The total depth of the well should be measured periodically (at least once a year). This can be accomplished by adding a weight to the probe, lowering it to the bottom of the well and reading the tape at the measuring point. Again, decontaminate all equipment prior to introduction into the well. The total depths of the wells will 1) indicate if the wells are silting in (i.e. whether or not the wells were completed properly) and 2) together with the static water level, enable you to calculate the volume of water standing in the well.

Record the measurement from the measuring point to the total depth of the well in the field notebook.

7. After obtaining the static water level and total depth of the well, calculate the volume of water in the well by multiplying the lineal feet of water standing in the well (feet) by 0.67 gallons/foot for 4" wells, or 0.16 gallons/foot for 2" wells. The resulting number is one (1) well volume. Record in the field notebook the calculated volume of water in the well and the calculated value for three (3) well volumes that will be removed.

8. If the ground water samples are not going to be immediately collected, cap and lock the well.

9. Rinse the water level probe with Simple Green, Alconox or other similar detergent, rinse with distilled water, wipe down as necessary with paper towels, and re-rinse with distilled water.

### IV. Purging/Bailing The Well

Because the water standing in a well prior to sampling may not represent existing ground water quality, stagnant water should be removed from the well prior to sampling.

Purging can be accomplished with either a bailer or a pump rig. If bailers are used, a disposable or clean bailer must be used for each well. A bailer may be re-used only if it is thoroughly decontaminated prior to bailing. If a pump rig is used, the rig must also be decontaminated before pumping each well. However, pump rigs are not recommended when analyzing for volatiles. Please contact WDEQ/SHWD for additional details regarding decontaminating pump rigs.

1. In order to ensure that dirt and other contaminants are not introduced into the well, new, clean surgical gloves should be worn. At a minimum, new gloves should be worn at each well. If purging activities will be performed immediately following static water level measurements, it is not necessary to put on new gloves, unless they have been soiled or torn.
2. Cut a slit in the center of a plastic tarp or sheet and slip the sheet over the well to create a clean surface onto which the cleaned sampling equipment and bailing rope can be placed. The tarp prevents the rope and/or bailer from contacting the ground and introducing contaminants back into the well.
3. Attach new bailing cord to the bailer that is long enough to reach the bottom of the casing. Attach the other end of the bailing cord to a secure object (e.g., well casing, sampler's wrist) to prevent loss of the bailer down the well. Ensure that the bailer has been properly decontaminated or that the bailer is properly packaged (if disposable) and has not been tampered with.

A new nylon or cotton rope must be used for each well and must be disposed after bailing and sampling of a well is completed.

4. Lower the bailer slowly into the well.. Pull the bailer out of the well, keeping the cord from contacting any contaminated surface. Purge at least 3 well volumes from the well before collecting ground water samples or bail until the well is dry, whichever occurs first. If the well is bailed dry prior to the removal of 3 well volumes, purging is complete and sampling may proceed.

Water bailed from the well can be poured into a plastic 5-gallon bucket to keep track of the volume of water bailed from the well, and, when full, can be poured onto the ground.

The bailer should be lowered to the bottom of the well during purging to ensure removal of old, standing water in the well and encourage the movement of fresh formation water into the well. Sampling fresh formation water will provide a true indication of the groundwater quality.

5. The total volume of water purged from the well should be recorded in the field notebook.
6. The operator should record in the field notebook any observations regarding the purged water (e.g., color, odor, silt, sheen etc.)

## **V. Groundwater Sampling**

After three well volumes have been purged from the well or the well is purged dry, collect groundwater samples from the well for lab analysis. Samples should be obtained in the prescribed volume and appropriate containers dictated by the lab. The lab (or operating plan) should specify the order in which the sample bottles shall be filled. (i.e., VOAs should be filled first, etc.) Sample bottles should be transported to the field in a cooler. A laboratory blank prepared by the lab consisting of deionized water shall also accompany the sample bottles from the lab. The operator should also review the approved permit application to determine the exact number and type of quality assurance samples (e.g., trip blanks, duplicates, equipment blanks, etc.) that should be collected.

If disposable or dedicated bailers are not used, bailers should be decontaminated prior to sample collection (see IV 10 for more details). If the well is sampled immediately after bailing, the bailer does not have to be cleaned between bailing and sampling. If the well water was extremely silty during bailing, wait until the sediment has settled before sampling.

1. In order to ensure that dirt and other contaminants are not introduced into the well, new, clean surgical gloves should be worn.
2. The pH, conductivity and temperature instruments shall be calibrated prior to conducting measurements, in accordance with the manufacturer's recommendations. Measurement procedures should follow the manufacturer's recommendations and recalibration should be performed at regular intervals (at a minimum once/event) and records of all calibrations should be logged in the field notebook.
3. Once collected, it is necessary to keep the ground water samples as cool as possible. Therefore, the laboratory coolers should be filled with a sufficient quantity of blue ice or double bagged ice to ensure they will remain cool during sampling and shipping. Dry ice should not be used.
4. Prior to sampling each well, one set of bottles for each well should be clearly labeled (with an indelible marker) with the date, time sample was collected, name of sampler, sample identification number, and parameters to be analyzed. To prevent the wording from coming off the label, a clear piece of plastic tape should be placed over the label for protection. The metals bottle should also be marked that the water sample was not filtered. If the lab has not added preservatives to each bottle beforehand, place the preservatives in the appropriate bottle prior to adding the water sample.
5. If not using disposable bailers, an equipment blank should be collected. This blank is collected by pouring distilled water into the decontaminated bailer and then into the sample bottle. One equipment blank per sampling event should be collected.
6. Lower the bailer and new cord into the well to be sampled. Lower it slowly into the water column to a depth sufficient to submerge the bailer. Pull the bailer out of the well, keeping the bailing cord from contacting any contaminated surface. Samples should be collected from the center of the wells water column. Avoid sampling near the bottom of the well as the water will tend to be silty.  
  
The water sample should be poured into each sample bottle, capped tightly and placed in the cooler with ice or ice packs to keep the samples cool until returned to the lab. Transfer ground water directly from the bailer into the sample containers in the collection order the laboratory or the sampling plan in the permit application requires.  
  
When filling the sample bottles, do not touch the bailer to the sample bottle. Preservatives in the sample bottle are a potential source of contamination to the well water via the bailer.
7. Following collection of all samples from the well, one additional sample should be collected. This water sample shall be used to measure pH, specific conductance and temperature. This sample shall be poured from the bailer into an inert container (Pyrex measuring cups or disposable plastic cups work well) and measured immediately. The Pyrex measuring cup and field instruments shall be rinsed with Alconox, Simple Green or other detergent and distilled water between each well.
8. Following collection of the sample, the pH, specific conductance and temperature measurements should be performed and the results recorded in the field notebook.
9. Additional field notes should be recorded to document sample number, list of sampling constituents, date and time sample was collected, type of bailer or other sampling device used and other appropriate observations.

10. Proper decontamination of bailing and sampling equipment is critical to assure that samples are representative of the groundwater being monitored in a well. If disposable or dedicated bailers are used, decontamination activities can be significantly lessened. For non-disposable bailers and other sampling equipment, the following simple four step cleaning and rinsing process should be followed.

## Setup Decontamination Station

A decontamination station should be setup. It should be comprised of three clean five gallon buckets with lids. Buckets used to contain other products are a potential source of sample contamination. Each bucket and lid should be thoroughly cleaned before use and labeled so they can be easily identified.

### Step One

One bucket should be labeled **Cleaning Solution**. This bucket should contain a mixture of Simple Green, Alconox or other similar detergent and hot tap water. All equipment should be thoroughly scrubbed with a brush and rinsed in the cleaning solution. All visible contamination should be removed before moving to the next step.

### Step Two

The second bucket should be labeled **Tap Water Rinse**. This bucket should contain hot (if possible) tap water. All equipment should be thoroughly rinsed in the tap water until all of the cleaning solution has been removed.

### Step Three

The third bucket should be labeled **Distilled Water Rinse**. This bucket should contain distilled water. All equipment should be thoroughly rinsed in the distilled water to remove any contaminants from the tap water.

### Step Four

As a final step, all equipment should be rinsed in virgin distilled water straight out of the water jug or from a garden sprayer. This step is an added precaution to ensure that all contaminants have been removed from the equipment.

## Using Equipment and Further Decontamination

Once the equipment has been decontaminated through the four step process, it should be used immediately or wrapped in aluminum foil and temporarily stored in a clean, new garbage bag prior to use or during transportation. All equipment should be decontaminated prior to use if stored overnight or longer.

If more than one well is being bailed or sampled, all equipment should be decontaminated through the four step process before bailing or sampling additional wells. If the cleaning solution or any of the rinses become visibly contaminated they should be replaced.

At the end of the day, all equipment should be decontaminated through the four step process, dried, wrapped in aluminum foil and stored in a clean location. The three buckets should also be cleaned and stored in a clean location with their lids in place.

11. A description of field decontamination activities should be recorded in the field notebook.

12. Upon completion of all sampling activities at a well, the well cap should be placed back on and the

protective casing cap padlocked. All sampling materials (e.g., plastic sheeting, paper towels, disposable bailers, bailing rope etc.) should be bagged and at the end of the day, disposed in the active trench.

## VI. Chain Of Custody

1. Once a cooler has been filled with sample bottles, and ice/blue ice, styrofoam peanuts or other inert packing materials should be placed in the cooler to prevent the bottles from moving around and becoming damaged or broken during shipping to the laboratory.
2. After the sampling is completed, chain of custody forms must be filled in with the date, project name, names of samplers, well names and number of bottles prior to packing the samples and sending them to the lab for analysis. The form must be signed and dated by the sampler. The completed chain of custody should be attached to the analytical data when returned from the lab.
3. Upon completion of the chain of custody forms, the forms should be placed inside a ziploc bag and placed inside the cooler. The chest should be sealed with custody seals and tamper-resistant tape, and the custody seals should be signed and dated by the sample custodian.
4. The samples should be shipped in ice chests by an overnight carrier such as Federal Express or UPS overnight delivery. Upon arrival at the laboratory, the cooler will be opened and the chain of custody form signed and dated by the lab personnel accepting the samples.

## VII. Further Information

The procedures and guidelines outlined above are only recommendations from the department. Other procedures may be reasonable and appropriate for the purpose of complying with the regulatory requirements. Landfill operators should obtain the department's concurrence before varying from the above procedures or from information contained in the applicant's approved Chapter 2 permit application.

Signed,

\_\_\_\_\_  
David A. Finley  
Administrator  
Solid & Hazardous Waste Division

October 25, 1995  
\_\_\_\_\_  
Date

## Further Reference:

- *RCRA Ground-Water Monitoring Technical Enforcement Guidance Document*, Chapter 4, U.S. Environmental Protection Agency, September, 1986.

Attachments: Ground Water Sampling Equipment Checklist  
Ground Water Sampling Checklist  
Typical Field notebook Example

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# GROUNDWATER SAMPLING CHECKLIST

## II. Preliminary Activities

- \_\_\_ 1. Order & pickup bottles (w/preservative), labels, chain of custody, cooler, trip blank prior to sampling date.
- \_\_\_ 2. Prepare field notebook.

## III. Static Water Level Measurements

- \_\_\_ 1. Locate well and note general conditions of well in field notebook.
- \_\_\_ 2. Unlock casing and uncap monitor well.
- \_\_\_ 3. Put on new, clean surgical gloves.
- \_\_\_ 4. Rinse/decontaminate water level probe.
- \_\_\_ 5. Measure and record ( $\pm$  .01 feet) static water level in field notebook.
- \_\_\_ 6. Measure and record ( $\pm$  .01 feet) total depth in field notebook.
- \_\_\_ 7. Calculate volume well water to be removed and record in field notebook
  - 2" well = total height water x 0.16 gallons/foot x 3 volumes
  - 4" well = total height water x 0.67 gallons/foot x 3 volumes
- \_\_\_ 8. Cap & lock well if not sampling immediately
- \_\_\_ 9. Decontaminate water level probe

## IV. Purging/Bailing the Well

- \_\_\_ 1. Put on new, clean surgical gloves.
- \_\_\_ 2. Place plastic sheet (w/slit in center) over monitor well.
- \_\_\_ 3. Attach new cord to bailer. Attach other end of cord to well or other secure object.
- \_\_\_ 4. Bail minimum of 3 well volumes (see II. 7 for actual volume) or until well bails dry. Dump bailed water into 5-gallon bucket.
- \_\_\_ 5. Record total volume of water removed in field notebook
- \_\_\_ 6. Record observations of purged water (e.g., color, odor, sediment, sheen etc.)

## V. Ground Water Sampling

- \_\_\_ 1. Put on new, clean surgical gloves.
- \_\_\_ 2. Calibrate pH, temperature and specific conductance meters.
- \_\_\_ 3. Place ice/blue ice in coolers.
- \_\_\_ 4. Label & tape bottles (use waterproof marker)
- \_\_\_ 5. Collect equipment blank if not using disposable bailer.
- \_\_\_ 6. Lower bailer and collect ground water samples (fill bottles in order described in sampling plan) & place in cooler.
- \_\_\_ 7. Collect sample for field parameters (e.g., pH, temperature & specific conductance)
- \_\_\_ 8. Measure and record pH, temperature & specific conductance in field notebook.
- \_\_\_ 9. Record sample #, well #, date, time, other observations in field notebook.
- \_\_\_ 10. Decontaminate all equipment.
- \_\_\_ 11. Record decontamination activities in field notebook.
- \_\_\_ 12. Cap & lock well, pack up and dispose of wastes.

## **VI. Chain of Custody**

- 1. Pack samples for transport.
- 2. Complete Chain of Custody
- 3. Place Chain of Custody in ziploc bag and inside cooler and seal cooler with tape.
- 4. Ship/deliver cooler with samples to lab.

## GROUNDWATER SAMPLING EQUIPMENT CHECKLIST

### Equipment

- \_\_\_\_\_ eye protection
- \_\_\_\_\_ waterproof field notebook
- \_\_\_\_\_ waterproof pen/marker
- \_\_\_\_\_ calculator
- \_\_\_\_\_ well location map
- \_\_\_\_\_ monitor well lock keys
- \_\_\_\_\_ explosimeter (if performing methane monitoring)
- \_\_\_\_\_ water level probe (extra batteries for probe) or steel tape & chalk
- \_\_\_\_\_ paper towels
- \_\_\_\_\_ plastic trash bags
- \_\_\_\_\_ pH, conductivity and temperature meters (extra batteries)
- \_\_\_\_\_ meter calibration and buffer solutions
- \_\_\_\_\_ beaker &/or pyrex cup
- \_\_\_\_\_ wash bottle (squirt type)
- \_\_\_\_\_ chem-wipes
- \_\_\_\_\_ surgical gloves (1 pair /well)
- \_\_\_\_\_ baling rope (nylon, cotton)
- \_\_\_\_\_ disposable/dedicated bailer (for purging and sample collection)
- \_\_\_\_\_ pump & tubing (optional)
- \_\_\_\_\_ compressor/generator (if using pumps)
- \_\_\_\_\_ 5 gallon plastic bucket (marked in 1 gallon calibrations)
- \_\_\_\_\_ plastic sheet/tarp
- \_\_\_\_\_ stopwatch or wristwatch with second hand
- \_\_\_\_\_ chain of custody forms (provided by lab)
- \_\_\_\_\_ sample bottle labels (provided by lab)
- \_\_\_\_\_ container seals (provided by lab)
- \_\_\_\_\_ sample bottles (cleaned, prepped with preservative and sealed by lab) (include trip blank and any other sample bottles required)
- \_\_\_\_\_ preservatives (if not added at lab)
- \_\_\_\_\_ ice chest (provided by lab)
- \_\_\_\_\_ blue ice or double bagged ice (not dry ice)
- \_\_\_\_\_ cooler packing material (e.g. styrofoam peanuts, bubble wrap)
- \_\_\_\_\_ decontamination buckets (3) (if not using disposable or dedicated bailer)
- \_\_\_\_\_ distilled water (3 gals/well)
- \_\_\_\_\_ Alconox, Simple Green or other similar detergent solution
- \_\_\_\_\_ garden sprayers (pump type) for decon fluids
- \_\_\_\_\_ scrub brushes

### optional equipment

- tyvek splash suits
- outer gloves, rubber boots, respirator
- rain gear
- toolbox (hammer, hacksaw, pipe wrench, socket set, pocket knife, duct tape etc.)
- Camera, film, batteries