Leak Detection Sampling

Purpose	Provide guidance on how to collect samples and relevant information from leak detection systems at confined feeding operations Ensure samples are correctly and consistently collected, to provide accurate information and to support management decisions
Relevant Legislation	*Agricultural Operation Practices Act* • Standards and Administration Regulation
Related Technical Guidelines	Agdex 096-52 Leak Detection Monitoring Parameters
Technical Guideline Listing	Agdex 096-100 Technical Guideline Listing

1. Introduction

This guideline is for consultants or contractors conducting leak detection monitoring activities at confined feeding operations. Samples from groundwater monitoring wells or leachate collection systems at liquid manure storage facilities must be collected correctly and consistently to ensure accurate information and monitoring results.

This guideline is used in conjunction with Technical Guideline Agdex 096-52, *Leak Detection Monitoring Parameters*.

The procedures outlined in this guideline should be followed in most circumstances. For unusual or site-specific circumstances, consult the NRCB before samples are collected and analyzed.

2. Professional Qualifications

A party responsible for reporting the results of a leak detection monitoring program should be qualified in a practice area related to environmental monitoring through a professional regulatory body. All sample analysis should be performed by an ISO/IEC 17025 accredited laboratory.

3. Groundwater Monitoring Well Procedures

3.1 Monitoring well elevation surveys

Elevation surveys should be completed when the monitoring well is installed and repeated as necessary or as directed by the NRCB (e.g., if well is damaged).

Elevation measurements are used to develop groundwater contour maps and thereby determine flow direction. Elevation surveys do not need to be conducted for leachate collection systems. However, elevations for the ground level and top of the well casing should be collected for each monitoring well (see Figure 1). All monitoring wells should be referenced to a benchmark that is easy to observe and not likely to move due to damage or frost heaving.

3.2 Depth to groundwater

The depth to groundwater should be recorded for each monitoring well before it is purged and sampled. The well should be measured from a fixed reference point—typically the top of the well casing—using an electric sounding tape. The reference point should be marked on the casing. All efforts should be made to limit cross-contamination from the groundwater level measuring device, such as wiping clean and rinsing with distilled water before and after each measurement.

3.3 Groundwater elevation calculation

Relative groundwater elevation is calculated by subtracting the depth to water from the elevation of the top of casing (see Figure 1). The depth to water measurement and relative groundwater elevation calculation should be completed at each sample event and reported to NRCB field services staff using the digital reporting template provided by the NRCB.

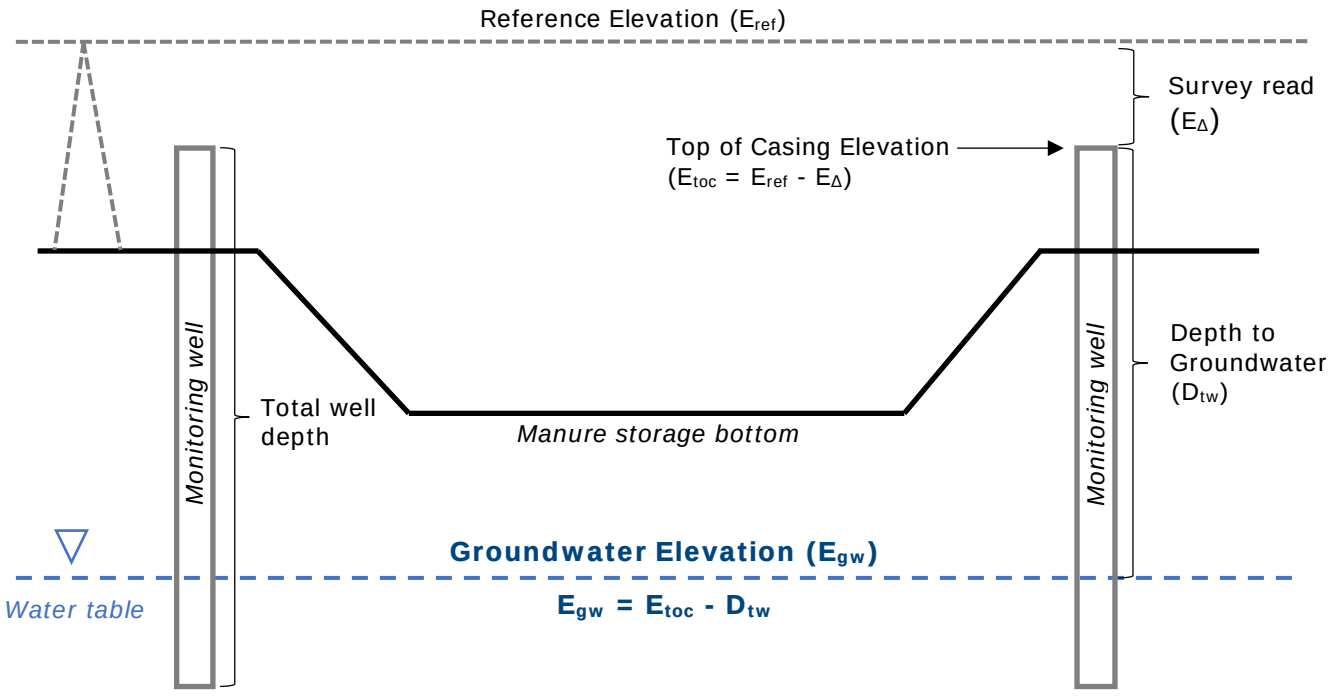

Figure 1. Conceptual overview of information required to calculate groundwater elevation from monitoring wells using surface elevation surveys and measured depth to groundwater. Figure not to scale.

3.4 Purging

Before sampling, wells should be purged by bailing or pumping to ensure that samples accurately represent ambient groundwater quality. The volume of water to be purged will depend on the yield of the well. Removing the equivalent volume of one well casing may be sufficient for low yielding wells. Monitoring wells that produce groundwater at a reasonable rate may require removing the equivalent of at least three well volumes.

After purging, samples should be taken once the water level has recovered to at least 80 per cent of the static water level. Typically, it will recover within minutes, hours or a day after purging. In low-yielding monitoring wells, recovery may take several days to weeks. When the recovery is slow, the consultant will need to return at a later date to collect the groundwater samples.

3.5 Sampling

Monitoring wells at a site should be sampled beginning with those least likely to be contaminated and ending with those with more potential for contamination (the least contaminated wells are usually located upgradient of the facility).

Bailers, inertial or peristaltic pumps, or other tools can be used for groundwater sampling. Bailers are most common as they are relatively inexpensive and easy to use.

An alternative method to purging the well is low-flow sampling. This can be achieved by setting up a pump (such as a peristaltic pump) using a flow-through cell with new tubing and tubing connections.

Regardless of the method used, foreign material contamination and cross-contamination between wells are best prevented by using new or properly cleaned sampling equipment. If bailers are used, a new bailer should be used for each well at each sampling event. This will significantly reduce the potential for cross-contamination and minimize uncertainties about data accuracy. If inertial or peristaltic pumps are used, new tubing should be used for each sample.

4. Leachate Collection Systems

4.1 Monitoring

In accordance with the monitoring condition, the operator may check the leachate collection systems for the presence of liquid and record the results. Records must be made available to the NRCB upon request, and NRCB field services staff may conduct a site inspection to confirm records. Samples or additional investigation may be required based on findings.

4.2 Sampling

Depending on the volume of leachate in the collection system, different sampling methods may be used. If there is sufficient liquid, a bailer may be the most practical and cost-effective method. In the event of low leachate volumes, a submersible pump may be used. If a submersible pump is used, it must be thoroughly flushed with distilled water prior to sampling to prevent potential cross-contamination. New tubing must be used with all types of pumps to prevent cross-contamination.

5. Sample Collection

5.1 Preparing samples

1. Document the name of the person conducting the sampling, the well identification number, project number (e.g., legal land description or NRCB permit number), and the sampling date and time. Consistent sample identification is crucial for documentation and record keeping purposes.
2. Ensure the sampler wears new nitrile or latex gloves for each well to prevent cross-contamination.
3. Use pre-cleaned sample bottles provided by an accredited laboratory.
4. Do not touch the inside of the cap or bottle.
5. Follow the laboratory's protocol for filling the bottles and for required preservatives.
6. After sampling, store filled bottles in a cool, dark environment (e.g., an ice-packed cooler).
   - Chill samples to below 10°C immediately after sampling to stabilize the sample by reducing microbial activity and slowing reaction times; this is important to reduce sample degradation.
   - If using ice, place the samples in a plastic bag to prevent degradation of the sample label.
7. Complete the Chain of Custody (COC) and include with your sample submission.
8. Promptly deliver the samples within 24 hours of sampling or by the holding times specified by the laboratory. Same day delivery is preferable or overnight delivery via courier. Samples exceeding hold times substantially may be rejected and a re-sample may be required.

5.2 Preparing samples for specific parameters

- Collect the samples in bottles provided by the laboratory.
- Do not rinse the bottles with groundwater before filling the bottle.

Electrical conductivity, chloride, and nitrate-nitrogen:

- Samples for these parameters normally do not need a preservative. Confirm the requirement for a preservative with the laboratory before sampling.

Total Kjeldahl nitrogen:

- Preservative is required for this analysis. Some laboratories provide bottles with the preservative added and others provide the preservative separately; in the latter case, add the preservative after filling the bottle.

Ammonia-nitrogen and total dissolved phosphorus:

- Field filtration is required for these analyses. Some laboratories will provide filtration kits; follow the instructions provided. If you are not able to complete field filtration, be sure to indicate on the COC.
- Some laboratories provide bottles with the preservative added. If the laboratory provides the preservative separately, add it after filling the bottle.

Escherichia coli (*E. coli*):

- Follow the laboratory's protocol for filling the bottles. Most laboratories provide bottles with the preservative added.
- Do not fill sample to the top of the bottle. The level is specified and normally marked on the bottle by the laboratory.

For more information

Contact your nearest NRCB field office or Alberta government staff

Government of Alberta
alberta.ca/manure-management-guidelines-and-legislation

Phone	310-FARM (3276)
Publications	see Technical Guideline Listing on open.alberta.ca
Email	310FARM@gov.ab.ca

Natural Resources Conservation Board
nrcb.ca

Morinville	780-939-1212
Red Deer/Airdrie	403-340-5241
Lethbridge	403-381-5166
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This guideline was developed by the Technical Advisory Group, a partnership among the Government of Alberta, the Natural Resources Conservation Board (NRCB) and the agriculture industry.