



Nebraska Department  
of Environmental Quality

# ENVIRONMENTAL GUIDANCE DOCUMENT

---

03-002

revised, July 2008

## Guideline for Ground Water Monitoring Plans At Livestock Waste Control Facilities

Investigations into local geologic and ground water conditions at some livestock waste control facilities (LWCFs) indicate that a potential for ground water impact exists. Some of the conditions found to be important include shallow depth to water, sandy or coarse-grained sediments, very permeable subsurface sediments, existing ground water quality, and/or use of the ground water as a drinking water source (domestic or municipal).

This Guideline is set up in a question and answer format for quick reference. The Guideline is intended for the owner/operator of the livestock operation, the consulting engineer, or other consultant to help them as they develop and implement a Ground Water Monitoring Plan (GWMP) [including the Sampling and Analysis Plan] for LWCFs. An attempt has been made to list applicable state regulations. Reasonable and well-defined plans will be considered, even if they do not correspond directly to this Guideline. Semi-annual ground water monitoring reports generated as a result of the GWMP are considered legal documents.

This Guideline builds on Chapter 13, Ground Water Monitoring, of Title 130, Livestock Waste Control Regulations. Please refer to Chapter 13 if you have more specific questions.

**NOTE:** Ground Water monitoring will not be required for Small and Medium facilities, unless one or more of the following have occurred (Title 130, Chapter 13, Section 002):

1. A spill or non-permitted release from the facility,
2. The Department determines that percolation from the facility exceeds the allowable percolation rate, or
3. Any other circumstance that the Department determines may impact ground water quality.

## Ground Water Monitoring Plan

### What is a Ground Water Monitoring Plan (GWMP)?

- A GWMP for a LWCF is a legal document outlining the process for monitoring the ground water quality at a LWCF. The plan clearly states the identity and location of the LWCF; the location, construction details and installation methods of the monitoring wells; the methods for collecting and analyzing ground water samples; and, the requirements for reporting the results of the sampling events.

- A GWMP includes a site map showing the locations of proposed monitoring wells, the well construction details, and information on how samples are taken (Sampling and Analysis Plan).
- A summary of the site's history included in the plan would be helpful (e.g. the site was formerly a cornfield, a pasture, a debris basin, a stream channel, etc.).
- **Suggestion:** Contact your local Natural Resources District (NRD) office to see if they offer assistance in preparing monitoring plans and performing sampling. Most NRDs have certified personnel, sampling equipment and existing Quality Assurance Plans. An agreement (involving reimbursement) to conduct the sampling may be possible with the NRD, but do not automatically assume they will do this work. Each NRD may have developed a policy for sampling wells for livestock operations.

### **What do I include on the site map?**

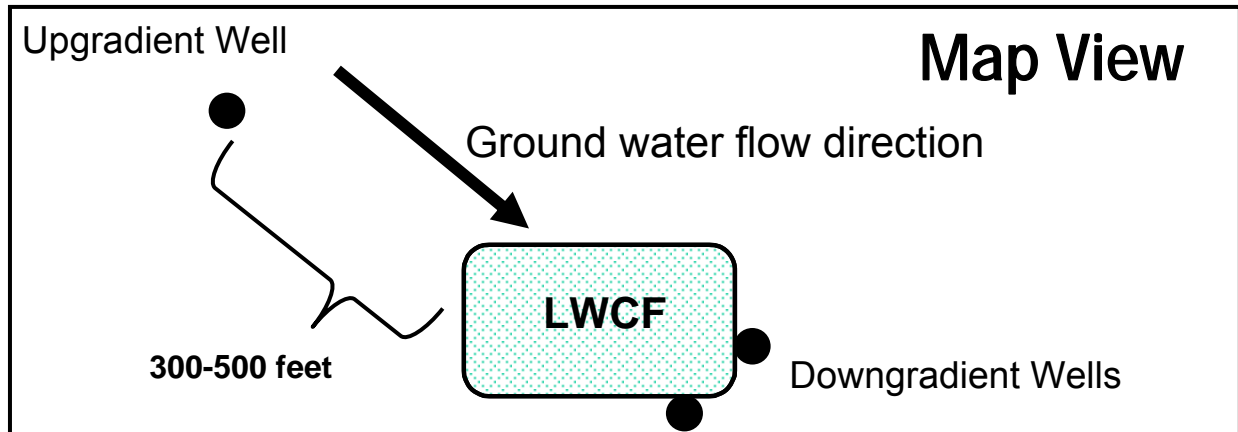
- The site map must have a north arrow, graphical scale and the proposed monitoring well locations clearly identified. The map must be drawn to scale. Include locations of all existing and planned LWCF components (lagoons, ponds, piping, etc.) and the pens, roads and other feedlot components. The site map needs to be accurate and detailed.
- Important features to include on the site map are active and inactive wells (with names and/or registration numbers) and water features (man-made and natural) such as canals, drainage ways, streams and rivers.

### **What information is needed for the proposed wells?**

- Provide a written description of the approximate total depth, construction details, screen length and slot size.
- Explain the reasoning for the placement for each proposed monitoring well. This becomes most noticeable when a well is proposed in an unexpected location. Reasons for why a well is not located as anticipated can include overhead lines, road area, sharp elevation change, land ownership issues, etc.
- If you are proposing to use an existing well(s) as a monitoring well(s), provide the ground level elevation (and how determined), as-built construction details and depth to water for the well. See "**Can I use existing wells...?**" below for more information.

### **What is a Sampling and Analysis Plan?**

- A Sampling and Analysis Plan is a written description of the methods used to conduct the water quality sampling and laboratory analyses. These plans ensure that the sampling and analyses are done consistently for each sampling event.
- A Sampling and Analysis Plan is sometimes referred to as a Quality Assurance Plan. The methods used are sometimes named Standard Operating Procedures (SOPs).
- The information needed in the plan includes the following:
  - Information on the sampler (e.g. owner, a consulting firm (name and address), the local NRD, etc.). If an NRD will do the sampling, include a letter from the NRD indicating the arrangement;
  - Purging methods (after water level and bottom of well measurement) and field parameter collection;
  - Sample preservation (if required) and transportation of the water samples to the lab;
  - Laboratory methods to analyze the samples (including reporting and method detection limits)
  - Documentation of the chain of custody; and
  - Blank and duplicate samples (also known as Quality Assurance/Quality Control [QA/QC] samples)



## Wells, Placement and Construction

### How many monitoring wells do I need and where do they go?

- ◆ Generally, a minimum of three monitoring wells is required, one upgradient and two downgradient for each pond/lagoon. Larger operations with multiple LWCFs may need more upgradient and/or (more typically) downgradient wells.
- ◆ Ground water flow gradients do not always match with runoff direction, which is due to surface topography.
- ◆ Upgradient wells must be located far enough away from the LWCF to avoid any possible impact (at least 300 - 500 feet away may be adequate).
- ◆ Downgradient wells should be located very close to the LWCF (such as right next to the outside berm) to allow detection of any possible contamination before it moves far away.
- ◆ Depending on local conditions, multi-level monitoring wells may need to be considered.
- ◆ Upgradient wells need to be located so there is no impact from any aspect of the operation on the water level and/or water quality data collected in the well. Factors to consider include:
  - Proximity to livestock pens
  - Irrigation or other pumping wells
  - Influence from streams, draws and canals
- ◆ Other factors that may impact the location of any of the monitoring wells include property boundaries and day-to-day operations at the LWCF (roads, piping, power lines, etc.).

### Why do I have to survey the wells?

- ◆ The wells must be surveyed against a benchmark to determine an accurate ground water flow direction. Properly placed monitoring wells have the water flowing from the upgradient well through the LWCF towards the downgradient wells (see figure above).
- ◆ Depth to water from the top of the well casing is measured at each monitoring well before sampling. That value is subtracted from the monitoring well elevation to give the ground water elevation.
- ◆ The depth to the bottom of the well is determined for each sampling event to find out if silting into the well(s) has taken place. An improperly developed well can lead to problems in the future.
- ◆ Additional and/or replacement wells may be required if ground water flow direction is different than initially assumed or is variable (by season).

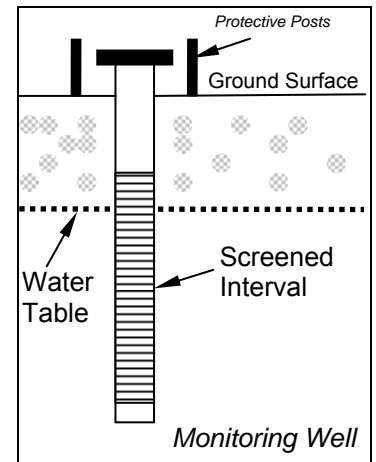
### Can I use existing wells instead of drilling new wells?

- ◆ The Department may consider the use of an existing domestic or production well as a monitoring well if the well is screened at the proper depth, is properly constructed, the depth to

water can be measured and the well allows for collection of a water sample. If you would like to consider using an existing well as one of the monitoring wells, submit complete well construction details (including screen length and placement, and gravel pack and grout placement), geologic log, depth to water, land surface elevation at the well and exact location in your ground water monitoring plan. We will consider its use as a monitoring well.

### What are the regulations for wells and their construction?

- ◆ The rules and regulations applied to well drilling, construction and registration are found in Title 178, Chapters 10 and 12 by the Nebraska Health and Human Services-Regulation and Licensure (NHHS-R&L).
- ◆ A licensed well driller must install the wells.
- ◆ Wells must be constructed according to state standards. Monitoring well construction details are found in Title 178, Chapter 12, Section 007.
  - ◆ Section 007.04 requires a bentonite seal (with a minimum thickness of one foot and recommended to be no more than 2-3 feet) placed on top of the gravel pack.
  - ◆ **All monitoring wells shall be pressure grouted from immediately above the bentonite seal to the surface. Bentonite chips are not allowed as a grout material according to Title 178.**
  - ◆ Section 007.05 requires a mounded concrete pad constructed to slope away from the well. Flush mounted installation with a watertight cap may be used where traffic may endanger the well. Section 007.06 requires above ground steel casing to protect non-steel cased wells completed above ground.
  - ◆ Address specific well-construction questions to NHHS-R&L or your well driller.
- ◆ **The monitoring wells are required to be registered with the Nebraska Department of Natural Resources (NDNR) by the well driller within 60 days of well completion.**
- ◆ Monitoring wells for livestock facilities monitor the uppermost part of the water table (generally, the upper ten feet of the aquifer). “Straddling” (i.e. 5 feet above and 5 feet below) the water table is not necessary unless great water level changes are anticipated during the year.
- ◆ Ten feet of screen is required and is usually adequate for all monitoring wells. NDEQ approval is needed to use a screen length greater than (or less than) 10 feet. Submit water table fluctuation data and/or geologic information to validate the use of a screen length other than 10 feet.



## Water Level Measurement, Sampling and Laboratories

### When is sampling done and who does it?

- Sampling is typically done twice a year, in the spring and fall. The laboratory results must be submitted to NDEQ’s Agriculture Section within 45 days of the sampling event.
- Ground water sampling events are conducted in the spring and fall of each year and when irrigation is not active. Spring is considered March 1 to May 31. Fall is considered September 1 to November 30.
- Any individual who samples a well must be licensed or certified by the DHHS. Well drillers, water well monitoring technicians and natural resources ground water technicians have certification to collect samples. Many NRDs and consulting firms have certified technicians.
- A well owner is legally permitted to sample his/her own ground water monitoring wells without certification. We recommend that the well owner be confident he/she can always measure

depth to water, purge the well, collect field parameters and take the samples according to his/her Sampling and Analysis Plan, so that reliable and consistent results are produced.

### **What do I do when I collect the water sample?**

- Note: NDEQ's Standard Operating Procedures (SOPs) for water level measurement and well sampling are published on our Internet home page ([www.deq.state.ne.us](http://www.deq.state.ne.us)). Find the appropriate SOPs by navigating "Publications", to "Ground Water Program" or "Livestock Program", to "Standard Operating Procedures". These SOPs do not directly apply to sampling at livestock facilities (except SOP GW072). Use these SOPs as a reference for preparing a livestock operation's ground water monitoring plan. If you do not have Internet access, NDEQ can provide the SOPs to you.
- The depth to water and depth to the bottom of the well are measured and recorded (to an accuracy of 0.01 foot) before purging and sampling. See NDEQ's SOP GW072 for measuring water levels in monitoring wells.
- The wells are purged prior to collecting the water samples. A well is considered purged when 3-5 well volumes are removed and the field parameters of pH, temperature and specific conductivity have achieved equilibrium.
- The laboratory performing the work should provide the appropriate bottles and preservatives to collect the water samples.
- Duplicate and blank samples must be taken and reported for each sampling event.
- Water samples must be analyzed at a certified lab for ammonia, chloride and nitrate-nitrogen.

### **What do I report to NDEQ's Agriculture Section for each sampling event?**

- The results of the sampling event must be reported within 45 days of the sampling date.
- Submit a cover letter identifying the operation, the NDEQ-designated IIS #, the date of the sampling event, and the name of the sampler and their certification #.
  - The first submittal must include a site map showing the drilled locations of the monitoring wells. In some cases, the proposed location of a well(s) is not the same as the drilled location. In addition to identifying the wells, the map must include the name of the operation, the IIS #, a north arrow, a graphic scale, the location and elevation of the benchmark, and the top of casing elevations for each monitoring well.
  - The first submittal must also include the monitoring well registration forms. This includes the registration #, well construction details and the geologic logs.
- Provide the lab-produced sheets listing the results of the analyses and the units of the results. Provide the analysis method, method detection limit and reporting limit for each parameter.
- The information reported for each monitoring well on the Field Data Sheet (see example) includes:
  - The site name, IIS #, sampling date and name of the sampler;
  - Identification of the well (e.g. MW-2), registration number (e.g. G-123456) and sample number;
  - Weather conditions;
  - Surveyed well elevation (top of casing), depth to water, depth to bottom of casing and the static water elevation;
  - The purge parameters during stabilization and stabilized: time, temperature, pH, specific conductivity, purge amount and water observations.
- The information reported in the Results Report (see example) includes:
  - The site name, IIS #, sampling date, name of the sampler, sampler's certification/license # and analyzing laboratory;
  - The laboratory sample #, well #, sample #, temperature, pH, specific conductivity, and nitrate-nitrogen, ammonia and chloride concentrations;
  - The well/ID #, well registration #, top of casing elevation, depth to water, static water elevation and the amount of water purged;

- Identify the parameters analyzed, laboratory method, detection limit and reporting limit;
- The blank and duplicate sample (QA/QC) results are reported in this table.
- Most laboratories have their own chain of custody forms. However, the detail of the form can be quite variable. The information reported in the Chain of Custody form (see example) includes:
  - The site name, IIS #, sampler's signature, name of the sampler, and sampler's certification/license #;
  - The laboratory sample #, sample #, sample date and time (except for duplicate), media, number of containers, parameters and method requested, and preservatives;
  - The relinquished by name (printed and signed), date, time and company;
  - The received by name (printed and signed), date, time and company;
  - The blank and duplicate sample (QA/QC) results are included in this form.

## **Avoiding Ground Water Monitoring**

NDEQ reviews many sources of information to make a preliminary recommendation requiring ground water monitoring at a LWCF. These sources include available information from the permit application, nearby registered wells, University of Nebraska maps and geologic well logs, US Geological Survey maps, soil surveys, and other data.

The LWCF operation may submit information to NDEQ for consideration to support a contention that site-specific conditions exist where ground water is not at risk to contamination and that ground water monitoring may not be necessary.

The submittal requesting further review must be site-specific information and may include:

- ◆ Detailed geologic logs from onsite test holes/wells, drilled to ground water,
- ◆ Local ground water flow direction map, derived from local water well measurements,
- ◆ Local survey, showing ground water use in area, and/or
- ◆ Other appropriate information.

**NOTE:** The information submitted for review must be hydrogeologic in nature. Information about the financial capability of the owner, or the construction method or size of the LWCF is **NOT** taken into account when reviewing facilities for ground water monitoring.

## **Submitting the Ground Water Monitoring Plan**

Submit the complete Ground Water Monitoring Plan to NDEQ's Agriculture Section. The Ground Water Unit reviews the plan to determine if it is adequate. You will be notified by letter when the plan is approved or denied. We will try to work with livestock operators to develop an acceptable plan if we find problems. However, an acceptable ground water monitoring plan is the responsibility of the operator.

---

### **Contacts for Information on Ground Water Monitoring at Livestock Operations**

#### **Water Well Standards and Contractor's Licensing**

DHHS – Water Well Standards Program  
402-471-0598  
www.hhs.state.ne.us

#### **Livestock Waste Control Facility Permitting**

NDEQ – Agriculture Section  
402-471-4239  
308-535-8142 (North Platte Office)  
www.deq.state.ne.us

#### **Well Registration**

Nebraska Department of Natural Resources  
402-471-2363  
www.dnr.ne.gov

#### **Ground Water Monitoring**

NDEQ – Ground Water Unit  
402-471-0096  
www.deq.state.ne.us