Overall Site Evaluation

Why is the site evaluation important?

How farmstead practices affect water quality depends in part on the physical characteristics of your farmstead site: soil type, aquifer characteristics, and depth to groundwater. That's why evaluating the soils and aquifer characteristics of your farmstead is such an important step in protecting the water you drink.

What's involved in completing this evaluation?

This evaluation has three parts:

1. **Evaluate the soil on your farmstead**
2. **Determine your depth to groundwater**
3. **Evaluate your site**

How do soils affect the potential for groundwater contamination?

Soil characteristics are very important in determining how a contaminant breaks down into harmless compounds or moves through soil and into the groundwater. Because most breakdown occurs in the soil, there is a greater potential for groundwater contamination in areas where contaminants are able to move quickly through the soil. For example:

Sandy soils, which have low organic-matter contents have large spaces between individual soil particles, and the particles provide relatively little surface area for attachment of most contaminants. Large amounts of rainfall can move through these soils and cause dissolved contaminants to move rapidly through the soil and into groundwater.

Clayey soils, on the other hand, are made up of extremely small particles that slow the movement of water and dissolved contaminants through the soil. Some contaminants also stick tightly to clay surfaces.

While held securely to soil particles, contaminants are broken down by bacteria, other soil organisms, and reactions with minerals and natural chemicals in the soil. Most chemical and biological breakdown takes place in the loose, cultivated surface layers, where the soil tends to be warm, moist, well-aerated, and high in organic matter. Soil organic matter is also important in holding contaminants. Soils high in organic matter provide an excellent environment for chemical and biological breakdown of these contaminants.

Part 1: Evaluating the Soil on Your Farmstead

To complete Part 1, you need to get a copy of your county's soil survey publication from your county soil and water conservation office.

Step 1

Start by locating your farmstead on the aerial photos in the soil survey. A soil survey report has on its inside front cover a section entitled "How To Use This Soil Survey." This helps you find your property or other tract of interest on the photo-based soil maps and directs you to other places in the report to gain understanding of the occurrence and nature of soils found there. One page that you will refer to repeatedly is the "Index to Map Sheets," a fold-out page that usually follows the General Soil Map but precedes the photo-based maps.

On the photo-based maps, you will notice that there are many sorts of map symbols employed to identify landscape features, including streams, roads, boundaries of soil delineations, soil map unit symbols (one in each delineation), section corners and numbers, and a variety of spot symbols representing small but significant features such as sinkholes, sandy spots, wet spots, rock outcrops, and so forth. In addition, around the borders of the individual maps there are map scales, township and range numbers, and other information. These symbols and other information are described and defined on the fold-out Index to Map Sheets page and/or on its reverse, which contains the Soil Legend and the Conventional and Special Symbols Legend.

Once you have determined the soil map unit symbol or symbols that are in the delineations shown for your field, you should go first to the Soil Legend to learn the full name of the soil map unit(s) found in your field. For a description of the nature and range of soils likely to be found in areas thus mapped, read the full map unit description(s) in the text of the report.

For tabulations of various soil physical and chemical properties and interpretations of the soil map units for different uses, peruse the tables in the report, looking especially for the soil map unit symbol(s) and names(s) of interest to you. Contrast them with other soils found throughout the various regions of your county.

If you have more than one soil mapping unit, and/or if you have a map unit having more than one soil in its name (e.g., "Pedro-Jonesville complex, 0 to 5 percent slopes) on your farmstead, rank each soil individually. Transfer soil map unit boundary lines from the soil survey to a separate sheet for use in step 4, your farmstead diagram.

Step 2

For each of the five characteristics highlighted in the left column (texture of surface, finest texture found in the typical profile of this soil, soil drainage class, permeability of the soil profile, organic matter content in the first 6” of soil - Ap horizon), find information about your soil in the soil survey. Then, match your soil description to the description in the middle column to determine your score in the right column.

For example, the soil survey says that the surface texture of one of your soils is a clay loam. Your score for that characteristic would be 8. Enter your scores for up to 3 soils in the spaces indicated. (Please use white spaces or a separate page for more entries.)

For characteristics 1-5 that follow, consult the soil profile description and text, and the soil mapping unit text in the "Description of the Soils" section of your county soil survey.

1.	Texture of surface (A horizon)		Score
		Loam, silt loam, sandy clay loam, silt	9
		Clay, sandy clay, silty clay, clay loam, silty clay loam	8
		Loamy fine sand, loamy very fine sand, fine sandy loam, very fine sandy loam	4
		Sand; coarse, fine & very fine sand, loamy sand, loamy coarse sand, coarse sandy loam, sandy loam, organic materials, all "O" horizons, and all textural classes with coarse fragment class modifiers - such as "gravelly loam"	1

YOUR SCORES:	Soil #1	Soil #2	Soil #3

2.	**Finest texture found in the typical profile of this soil.**		**Score**
		Clay, sandy clay, silty clay, silt	10
		Sandy clay loam, loam, silt loam, clay loam, silty clay loam	7
		Loamy fine sand, loamy very fine sand, fine sandy loam, very fine sandy loam	4
		Sand; coarse, fine & very fine sand, loamy sand, loamy coarse sand, coarse sandy loam, sandy loam, organic materials, and all textural classes with coarse fragment modifiers such as "gravelly loam"	1

YOUR SCORES:	Soil #1	Soil #2	Soil #3

3.	Soil drainage class		Score
		Well drained	10
		Well to moderately well drained	7
		Moderately well drained	4
		Somewhat poorly, poorly and very poorly drained; somewhat excessively and excessively drained	1

YOUR SCORES:	Soil #1	Soil #2	Soil #3

4.	Permeability of the soil profile		Score
a.	If your soil series description indicates that bedrock is found within 20 inches of the surface or if bedrock is present in the soil mapping unit within 40 inches of the surface, use the following ranking:		
		Bedrock at 20-40 inches	3
		Bedrock within 20 inches	1
	If this does not apply then go to 4b.		
b.	For soils without bedrock in the upper 40 inches, look up the permeability rating(s) of your soil(s) in the appropriate table in the soil survey report. Permeability estimates may be found in one of the tables of data in most soil survey reports. In recent reports (published since about the mid-1970s), the table showing permeabilities is usually entitled "Physical and Chemical Properties of Soils." In older reports, the same information on permeability may be in tables having a different title, such as "Estimated (engineering) properties of soils." Apply the following guidelines to the slowest permeability found in the typical profile of the soil in question:		
		Slowest permeability in typical profile is .6 inches per hour or less.	10
		Slowest permeability in typical profile is between .6 and 6.0 inches per hour.	5
		Slowest permeability in typical profile is 6.0 inches per hour or more.	1

YOUR SCORES:	Soil #1	Soil #2	Soil #3

5.	**Organic matter content in Ap horizon or 0-6" depth from surface**		**Score**
	Obtain the organic matter percentage from a soil test (specifically for OM) for your farmstead area (the preferred source of this information), from the local soil and water conservation office soil data bank in the Field Office Computing System, or a table in the soil-survey report published after 1979 (probably the same table you used to determine soil permeability; see item 4 above).		
	Dark-colored	High organic matter (≥ 4%)	10
	Light-colored, nearly level landscape	Medium organic matter (2-4%)	7
	Light-colored, slightly eroded, sloping landscape	Moderately low organic matter (1-2%)	5
	Light-colored, moderately eroded	Low organic matter (.5 – .9%)	3
	Light-colored, severely eroded	Very Low organic matter (< .5%)	1

YOUR SCORES:	Soil #1	Soil #2	Soil #3

Step 3

Add your five scores together for each soil you ranked.

	Soil 1	Soil 2	Soil 3	Soil 4	Soil 5	Soil 6	Soil 7	Soil 8
1-Texture of surface								
2-Finest texture found								
3-Soil drainage class								
4-Permeability of the soil								
5-Organic matter content								
Totals:								
Rank (from step 4)								

Step 4

From the box below, find your score in the listed ranges in the left column. Then identify your soil's "potential to protect groundwater" and find the rank number assigned to your score.

Total Score	**Soil's Potential to Protect Groundwater**	**Rank**
45-49	Best	4
41-44	Good	3
31-40	Marginal	2
0-30	Poor	1

Step 5: Understand Your Soils' Rankings

- One of Ohio's best soils for groundwater protection, the Miamian silt loam, could rank a score as high as 46, depending on degree of erosion. Deep, medium, or fine-textured, well-drained soils that contain a high percentage of organic matter (3% or more) have a low risk for groundwater contamination. Potential contaminants move slowly through the soil, allowing them to become attached to soil particles. Sunlight, air, and microorganisms then have time to break down the contaminant into harmless compounds.
- A soil with a score of 30 or less (ranking 1) is probably a sandy, excessively drained soil with less than 1% organic matter. Such a soil would allow most contaminants to move rapidly down toward the water table.

Overall, the higher your ranking number, the more likely that your soil conditions will help to reduce the risk of groundwater contamination from farmstead practices.

Please note that the soil evaluation might have indicated a moderate potential for groundwater protection. However, on sites where the surface is within 60" to fractured limestone or sandy or gravelly textures, the potential for groundwater contamination is probably higher than indicated by the soil evaluation alone.

Part 2: Determining Your Depth to Groundwater

The soil's natural remediation capability is limited. Certain conditions, such as heavy rainfall and chemical spills, may cause the soil's remediation capacity to be exceeded, allowing the chemical to move through the soil relatively quickly. In such cases, the subsurface geologic material and the distance a contaminant must travel to groundwater are important in determining when and in what quantities a contaminant actually reaches the groundwater.

How do subsurface and geologic materials affect the potential for groundwater contamination?

Depth to groundwater is important because it determines two important factors:

1. the thickness of material through which contaminants must travel before reaching the local aquifer and
2. the length of time contaminants are in contact with the soil.

Other factors being equal, the greater the thickness of material above the groundwater, the less chance of contamination from degradable compounds such as pesticides applied to the ground surface. Nondegradable or slowly degradable contaminants (such as nitrates) however, can eventually reach groundwater even when surficial deposits are quite deep.

Aquifer geology also influences groundwater pollution migration. Confined aquifers are less susceptible to contamination from surface activities because infiltrating water typically moves slowly through the confining clay layer. However, the confining layers may be fractured and missing in many places. Thus, contaminated water may move horizontally on

top of the confining layer before recharging the confined aquifer through a breach in the confining layer. Movement of contaminants in fractured rock is difficult to predict, and pollutants can travel far from their source in short time periods.

Determining Your Depth to Groundwater

- It is sometimes available from the soil survey report, although this differs from county to county.
- You can also obtain this information from your well construction report or permit. If your well is large enough to require a permit, this information should be on file at Ohio Department of Natural Resources Division of Water at 614-265-6747.
- You can find additional information from other well construction reports in your area, hydrogeological reports and groundwater flow maps for some counties. These may be available from the U.S. Geological Survey. Generalized groundwater maps, however, and may not accurately reflect the depth to groundwater or direction of flow at your farmstead.

Part 3: Evaluating Your Site

Please complete the following livestock facility site scoring sheet. This worksheet was developed the combined effort of Menke Consulting, Darke OSUE, and soil and water conservation offices.

1. What distance separates the manure-handling site from the nearest nonparticipating resident? (300 ft. minimum)				
> 1,000 feet	600-1000 feet	300-600 feet	<300 feet	***Score:**
10 points	5 points	2 points	0 points	
*Subtract 1 point per nonparticipating resident within the prevailing wind direction quadrant, up to a maximum of 2,500 feet. A maximum of 5 points can be deducted.				
2. What distance separates the manure-handling site from the nearest well, regardless of well ownership? (300 feet minimum)				
> 600 feet	300-600 feet	100-300 feet with the approval of a geologist	<300 feet	**Score:**
10 points	5 points	2 points	0 points	
3. For lagoons, what will be the primary source of water used to reach the proper odor control volume (OCV) level?				
No water is needed or surface water is used or subsurface tile is used	Combination surface and ground water	Groundwater		**Score:**
5 points	4 points	See #3a		

Only answer question 3a if you are using groundwater to reach proper OCV levels. **3a. If groundwater is being used to reach the proper OCV level, what is the safe yield of the aquifer? (Please note that a groundwater source may require a pumping plan.)**				
>150 gallons per minute (gpm)	50-150 gpm	< 50 gpm		**Score:**
4 points	3 points	1 point		
4. What is the proximity of the closest "public water source"? (1,000 feet minimum) Public water source is defined as any water source accessible to the general population.				
>2,000 ft.	1,500-2,000 ft.	1,000-1,500 ft.		**Score:**
10 points	6 points	3 point		
5. How far from the manure handling facility is the nearest public road? Consider road quality when evaluating this category.				
>600 ft.	300-600 ft.	0-300 ft.		**Score:**
5 points	3 points	0 point		

6. Will any manure (excluding anaerobic lagoon manure) be incorporated within 48 hours?					
Lagoon effluent or incorporated manure	Partially incorporated	Not incorporated			**Score:**
5 points	3 points	0 point			
7. Are there any land slope limitations on the spreading area?					
100% NHEL not in floodplain	75% NHEL not in floodplain	50% NHEL not in floodplain	25% NHEL not in floodplain	0% NHEL not in floodplain	**Score:**
5 points	4 points	3 point	1 point	0 points	
8. Choose one of the following selections					
An approved conservation plan and manure nutrient management (MNM) plan	Inject manure	Same day incorporation of manure			**Score:**
3 points	2 points	1 point			
9. Will the manure handling facility be visible from the nearest public road? The use of landscaping can be used to maximize score.					
Not visible	Partially visible	Clearly visible			**Score:**
10 points	5 points	0 point			
10. Is the spreading area owned or rented?					
Owned	> 5 year spreading agreement	< 5 year spreading agreement	No agreement		**Score:**

5 points	4 points	3 points	0 points	
11. With respect to the manure handling facility and the spreading area, how many nonowned dwellings are within 100 feet? (Each dwelling is to be used only once. Total deductions are not to exceed 10 points.)				
Dwelling within 1,000 feet of storage structure and animal holding facility	Dwelling within 1,000 feet of the spreading area			**Score:**
-2 points per dwelling	-1 point per dwelling			

12. Number of animal units (A. U.) present? Animal unit is a term used to compare animal operations of different species. 1 animal unit = 1 beef = 2.5 swine over 55 lbs. = .5 horse = .7 dairy cow = 10 sheep = 55 turkeys = 100 chickens w/ continuous flow waterers = 30 chickens w/ liq. manure system = 5 ducks = 1 animal unit.					
< 300 A.U.	300-600 A.U.	600-1,000 A.U.	1,000-2,000 A.U.	> 2,000 A.U.	**Score:**
5 points	4 points	3 points	points		
13. Ratio of animal units to application area. # animal units/ # application acres = # A.U./acre					
< .5 A.U./acre	.5-1 A.U./acre	1-1.5 A.U./acre	1.6-2 A.U./acre	> 2 A.U./acre	**Score:**
5 points	3 points	0 points	-3 points	-5 points	
14. Groundwater DRASTIC map scoring. DRASTIC maps can be obtained from your local soil and water conservation district.					
Index Range 80-99	Index Range 100-119	Index Range 120-139	Index Range 140-159	Index Range 160-179	**Score:**
5 points	3 points	0 points	-3 points	-5 point	

15. Add 5 points for a sealed storage (example: artificial liners, above ground sealed storage, underground pits, etc.)	
Score:	

Total:	
-Deductions	
GRAND TOTAL	

Understanding Your Site Evaluation Score

	Good	Adequate	Poor
Liquid manure storage	>60	45-60	<45
Anaerobic lagoon storage	>50	40-50	<40
Dry manure storage	>40	25-40	<25

Your site evaluation score will help identify which activities or characteristics of your farm have a greater likelihood of causing environmental challenges. Please use this information to help evaluate new sites, as well as to prepare yourself to make better decisions about critical areas in your current operation.