

DATE: January 13, 2025

TO: Septage Operators-in-Charge (OICs)

FROM: Wisconsin Department of Natural Resources (DNR) Septage Program
Fred Hegeman, DNR Statewide Residuals Coordinator
Steve Warrner, DNR Statewide Site Review Coordinator

SUBJECT: Considerations for Septage Landspreading Equipment and Testing Standard
Operating Procedures (SOPs)

DISCLAIMER

This correspondence memo is intended solely as an information document for the creation of landspreading standard operating procedures (SOPs). This memo does not contain mandatory requirements except where requirements found in statute or administrative rule are referenced.

SUMMARY

The beneficial use of septage and its recycling to the land as a fertilizer or soil conditioner is encouraged (s. NR 113.01, Wis. Adm. Code). The department regulates the land application of septage per ch. NR 113, Wis. Adm. Code in order to protect public health from unsanitary and unhealthful practices and conditions as well as protect surface waters and groundwaters of the state.

Septage businesses must verify that septage landspreading practices comply with ch. NR 113, Wis. Adm. Code requirements. Often Operators-in-Charge (OICs) develop written standard operating procedures (SOPs) that reflect:

- Current landspreading procedures (examples: splash plate, disc plow, and injector), and
- Septage testing procedures (example: septage pH measurements for alkali addition).

Written SOPs are helpful for operators to reference and implement. A clear and concise SOP can minimize compliance issues and demonstrate compliance with ch. NR 113, Wis. Adm. Code.

GOAL

The goal of this memo is to provide suggestions to OICs for the creation of landspreading SOPs. This document is separated into the three main categories of landspreading:

- Surface application (with alkali addition),
- Incorporation, and
- Injection.

This document includes questions that the OIC should consider when developing SOPs, as well as a checklist to ensure that all items are adequately covered.

The department recommends that the OIC periodically review these written SOPs with operators that landspread septage. The department recommends that the OIC periodically review and update these written SOPs as necessary.

Important Note: Each business operates distinctly, and additional considerations may be necessary to comply with ch. NR 113, Wis. Adm. Code. Please discuss unique or business-specific considerations with your regional Septage Coordinator.

SURFACE APPLICATION (WITH ALKALI ADDITION) PROCEDURES

1. Ch. NR 113, Wis. Adm. Code references:
 - a. Definition: spreading of septage on the surface of the land without mixing the septage with the soil (sub. NR 113.03(66), Wis. Adm. Code).
 - b. Proper surface application meets vector attraction reduction requirements (par. NR 113.07(3)(e), Wis. Adm. Code)
 - c. **IMPORTANT:** Septage applied to the land surface shall be treated with alkali (lime) and without the addition of more alkali, shall remain at pH 12.0 standard units (or “su”) or higher for 30 minutes.
2. Ensuring landspreading practices meet pathogen control requirements (subds. NR 113.07(3)(d)2.a. through d, Wis. Adm. Code) for food, feed, and fiber crops. The OIC should consider asking the below questions prior to septage landspreading.
 - a. What type of crop (examples: corn grain, soybeans, hay, and alfalfa) is the site owner or farmer growing this crop year?
 - b. What type of crop is the site owner or farmer anticipate growing for the next 2 crop years?
 - c. **IMPORTANT:** Harvesting restrictions may apply if the property owner/farmer anticipates planting:
 - i. Food crops (examples: sweet corn, peas, potatoes, strawberries, and tomatoes),
 - ii. Feed crops (examples: corn grain, soybeans, wheat, and hay), or
 - iii. Fiber crop (examples: hemp, cotton, jute, and flax).
3. Verifying field and inspection procedures (recommended annually)
 - a. How does my surface application equipment achieve uniform distribution of septage? Uniform application means evenly spreading septage over the site through the use of a splash plate, injector, or other department approved spreading method (reference: NR 113.03(68m), Wis. Adm. Code).
 - b. Is my surface application equipment well maintained? What is my backup plan if repairs to the splash plate are necessary?
 - c. Routine hydraulic application rate calibration procedures
 - i. What is the hydraulic application rate of my surface application equipment? (example: 13,000 gallons/acre)?
 - ii. *Note: “Table 4” (par. NR 113.09(6)(b), Wis. Adm. Code) identifies the maximum weekly hydraulic application rate for septage (example: holding tank waste is limited to 13,000 gallons/acre/week).*
 - iii. See “Hydraulic Rate Calculation Example #1”
4. Developing Standard Operating Procedures (SOPs) for alkali addition
 - a. Determine standard lime “dosing” for each vehicle.
 - i. Example #1: 32 + pounds lime/1,000 gallons for septic tank
 - ii. Example #2: 16 + pounds lime/1,000 gallons for holding tank
 - b. Add alkali (lime) to vehicle. *Note: Timing of lime addition can be very important...see “Representative sampling (pH readings) for septage” section below*
 - c. Agitate vehicle tank. *Note: Duration of tank agitation can be very important...see representative septage sample collection below.*
 - d. Detail septage testing procedures and equipment:
 - i. **pH paper.**

1. Narrow range pH paper strips (Example: Sanitation Tools pH strips with range 11.0 su to 13.0 su.
 2. OIC should use pH strips from at least 3 separate lots.
- ii. **Temperature correcting pH meter.**
 1. Verify (meter product manual) that pH meter temperature corrects pH.
 2. Ensure meter is well maintained and routinely calibrated.
- e. If septage pH ≥ 12.0 su, record initial pH reading and time (daily log book or invoice record system). pH reading must be recorded to three significant digits (example: 12.3 su).
 - i. If septage pH < 12.0 su, then add more lime and retest.
 - ii. Once septage pH ≥ 12.0 su, then the 30-minute timer begins.
- f. After 30 minutes from initial pH test, retest septage.
 - i. Record pH reading and time (daily log book or invoice record system). pH reading must be recorded to three significant digits (example: 12.3 su).
 - ii. If septage pH ≥ 12.0 su, then commence landspreading septage.
 - iii. If septage pH < 12.0 su, then add more lime and retest.
 1. Initial pH and time.
 2. Second pH (30 minutes later) and time
5. Documenting field verification and inspection procedures. The department recommends that the OIC document verification and inspection procedures, including:
 - a. Date(s),
 - b. Individual(s),
 - c. Written observations,
 - d. Photographs, and
 - e. Description of potential changes to improve compliance.
6. Importance of representative sampling (septage pH readings) to ensure septage complies with pathogen control and vector attraction reduction requirements (references: NR 113.07(3)(d) and (e), Wis. Adm. Code).
 - a. Indicators of improper or insufficient alkali addition (lime) include, but are not limited to:
 - i. Do I notice odors when landspreading septage?
 - ii. Have I received odor complaints?
 - iii. Has the DNR been notified of odor complaints?
 - b. How am I representatively sampling my septage to determine field pH?
 - c. What field verification and established SOPs do I have to minimize potential for odor complaints?
 - d. Review of septage pH testing supplies and equipment.
 - i. **pH paper strips**
 1. Narrow range (example Sanitation Tools pH Strips with range 11.0—13.0 su)
 2. To achieve accurate pH monitoring results, use 3 lots of narrow range pH paper/strips with 3 distinct lot numbers. *Note: If there is a discrepancy between pH results from Lot 1 and Lot 2, use Lot 3 pH as a tie breaker.*
 3. Replace pH paper strips on an annual basis.
 - ii. **Temperature correcting pH meter**

1. Weekly calibration
 2. Record calibration results (recommended DNR form # 3400-229)
 3. Ensure buffer solutions have not expired.
 4. Retain “backup” pH meter(s)...typically the same model for easier calibration.
 5. Consider replacement of temperature correcting pH meters if meter has been damaged, has difficulty holding a battery charge, and/or is difficult to calibrate.
- iii. Verification of representative sample collection location
1. Do I add and mix enough lime in the vehicle’s tank?
 - a. Depends on the volume, and
 - b. Depends on the type of waste (septic tank, holding tank, grease interceptor, portable restroom)
 2. Do I agitate the vehicle’s tank enough to allow thorough mixture of lime/septage? *Note: Many businesses add lime after last client, and then drive to the landspreading field. The length of the drive often provides adequate mixing of lime and septage.*
 3. Where and when do I collect my pH sample?
 4. How can I ensure my sample is representative?
 - a. Consider collecting three evenly spaced grab samples and measure the pH of each grab.
 - b. All three grab samples should have a pH result of ≥ 12.0 su.
 - c. Document grab sample results.
 - d. Analyze results.
 - i. How do I know I am code compliant throughout the entire landspreading event?
 - ii. If any grab sample is less than 12.0 su, then identify potential (causes), including insufficient lime addition and/or insufficient mixing of lime with septage.
 - iii. You may need to adjust the timing of lime addition to the tank. Example scenario: Septage business services domestic holding tanks at two businesses (5,000 gallons total). Then business adds 80 lbs. lime on the way to landspreading field. Tank is agitated ~15-20 minutes (during transit) before initial pH test. Previous field verification (grab samples) supports sufficient lime and agitation to meet code requirements.
7. Review of daily log book and invoice record system. Does the daily log book comply with par. NR 113.11(3)(c), Wis. Adm. Code? **IMPORTANT:** This is the most common issue with landspreading records!
- a. Landspreading field (DNR# or site/field name) clearly identified? Example: DNR# 12345 (site/field name: SMITH-1).
 - b. Application method (surface application) clearly identified?
 - c. Initial pH time and reading?
 - d. Second pH time (30 minutes later) and reading?
 - e. Additional pH measurements (if necessary)?

- f. pH results reported to three significant digits?
 - g. Date/time of landspreading completed?
 - h. Pathogen control and vector attraction reduction certification statement? Signed?
 - i. Descriptions for meeting pathogen control and vector attraction reduction?
 - j. Some operators tally spreading events (daily AND weekly). This practice allows the operator to know when the site is reaching its maximum weekly AND annual application rates.
8. Review of alkali (lime) storage
- a. Is the lime storage area adequately protected from the elements?
 - b. Do I maintain an adequate supply of lime?
 - c. How do I ensure there is an ample supply of lime? When should I reorder lime to prevent running out of lime during landspreading season?
 - d. **IMPORTANT:** Lime purchase receipts must be retained and provided upon department request.
 - i. OIC should verify that copies of lime receipts are provided from lime distributor.
 - ii. OIC should ensure lime receipts are retained within the office for a period of five calendar years.

SURFACE APPLICATION (WITH ALKALI ADDITION) CHECKLIST

Standard Operating Procedure Category	Sufficient
Landspreading practices meet pathogen control requirements (food, feed, and fiber crops)	
Communication plan with property owner/farmer regarding intended crops	
Surface application equipment achieve uniform distribution of septage	
Surface application equipment well maintained	
Backup plan if primary spreading equipment breaks	
Procedures for routine calibration of spreading equipment (gallons/acre)	
Procedures for alkali (lime) addition	
Procedures for alkali testing (pH paper or pH meter)	
Representative sampling collection procedures (for pH testing)	
Documentation of routine field verification and inspection procedures	
Daily log book and invoice records include all required items	
Alkali lime storage and supply	

INCORPORATION PROCEDURES

1. Ch. NR 113, Wis. Adm. Code references:
 - a. Definition: mixing of septage with topsoil by methods such as discing, mold-board plowing, chisel plowing, or rototilling to a minimum depth of 4 inches (sub. NR 113.03(28), Wis. Adm. Code)
 - b. Incorporation requires two different types of spreading equipment:
 - i. Surface application (typically a vehicle equipped with a splash plate) or a combination trash screen and splash plate.
 - ii. Incorporation (disc, mold-board plow, chisel, rototill)
 - c. Proper incorporation meets vector attraction reduction requirements (par. NR 113.07(3)(e), Wis. Adm. Code).
 - d. **IMPORTANT:** Septage applied to the land surface shall be incorporated within 6 hours after landspreading.
2. Review of pathogen control requirements (subd. NR 113.07(3)(d)2.a. through h., Wis. Adm. Code)? Do my fields meet any of the below categories? The OIC should consider asking the below questions prior to septage landspreading.
 - a. What type of crop (examples: corn grain, soybeans, hay, and alfalfa) is the site owner or farmer growing this crop year?
 - b. What type of crop is the site owner or farmer anticipate growing for the next 2 crop years?
 - c. Food, Feed, and Fiber Crops? **IMPORTANT:** Harvesting restrictions may apply if the property owner/farmer anticipates planting:
 - i. Food crops (examples: sweet corn, peas, potatoes, strawberries, and tomatoes),
 - ii. Feed crops (examples: corn grain, soybeans, wheat, and hay), or
 - iii. Fiber crop (examples: hemp, cotton, jute, and flax).
 - d. Animal grazing? *Note: Livestock animals (examples: cows and horses) may not graze on land for 30 days after land application of septage. The OIC may need to discuss grazing restrictions further with the site owner and/or farmer.*
 - e. Turf? *Note: Turf may not be harvested for one year after land application of septage, unless otherwise specified by the department.*
 - f. Public access to land with a high potential for public exposure? **IMPORTANT:** High potential sites must restrict access for one year after application of septage.
 - g. Public access to land with a low potential for public exposure? **IMPORTANT:** Low potential sites must restrict access for 30 days after application of septage.
3. Routine field verification and inspection procedures (recommended annually)
 - a. Does the disc/plow or other department-approved digging equipment mix soil to a minimum depth of 4 inches?
 - i. In some instances, the septage business may not own this equipment, and delegate this task to one (or more) farmers. Field verification may need to occur for multiple pieces of equipment.
 - ii. Verify that the farmer is incorporating the waste within 6 hours of surface application. While the septage business may have delegated the task of incorporation, the septage business is still responsible for ensuring incorporation of septage within 6 hours after septage land application.

- b. Is each disc/plow well maintained? What is my backup plan if repairs to the plow are necessary?
 - i. Example 1: The septage business has other equipment that can be used on a field site when equipment is being repaired.
 - ii. Example 2: The business has an agreement with the farmer to incorporate septage in an emergency situation.
 - iii. Example: 3: The business hauls septage to wastewater treatment facility (WWTF) when equipment is being repaired. In this situation, the OIC should include this back-up plan in the standard operating procedure.
 - c. Is any septage visible on the land surface after incorporation?
 - d. Does my surface application equipment achieve uniform distribution of septage? Uniform application means evenly spreading septage over the site through the use of a splash plate, injector, or other department approved spreading method (reference: NR 113.03(68m), Wis. Adm. Code).
 - e. Is my surface application equipment well maintained? See “*Surface Application*” section above.
 - f. What is the hydraulic application rate of my surface application equipment? (example: 13,000 gallons/acre)?
 - i. *Note: “Table 4” (par. NR 113.09(6)(b), Wis. Adm. Code) identifies the maximum weekly hydraulic application rate for septage (example: holding tank waste is limited to 13,000 gallons/acre/week).*
 - ii. See “Hydraulic Rate Calculation Example #1” (surface application)
 - g. Documenting field verification and inspection procedures. The department recommends that the OIC document verification and inspection procedures, including:
 - i. Date(s),
 - ii. Individual(s),
 - iii. Written, observations,
 - iv. Photographs, and
 - v. Description of potential changes to improve compliance.
4. Review of daily log book and invoice record system. Does the daily log book comply with par. NR 113.11(3)(c), Wis. Adm. Code? **IMPORTANT: This is the most common issue with landspreading records!**
- a. Landspreading field (DNR# or site/field name) clearly identified? Example: DNR# 12345 (site/field name: SMITH-1).
 - b. Application method (injection) clearly identified?
 - c. Date/time of landspreading completed?
 - d. Date/time of incorporation completed? Individual who completed incorporation list?
 - e. Pathogen control and vector attraction reduction certification statement? Signed?
 - f. Descriptions for meeting pathogen control and vector attraction reduction?
 - g. Some operators tally spreading events (daily AND weekly). This practice allows the operator to know when the site is reaching its maximum weekly AND annual application rates.

INCORPORATION CHECKLIST

Standard Operating Procedure Category	Sufficient
Landspreading practices meet pathogen control requirements (food, feed, and fiber crops)	
Communication plan with property owner/farmer regarding intended crops	
Surface application equipment achieve uniform distribution of septage	
Surface application equipment well maintained	
Backup plan if primary spreading equipment breaks (surface application and incorporation)	
Procedures for routine calibration of spreading equipment (gallons/acre)	
Verification of incorporation within 6 hours of surface application	
Documentation of routine field verification and inspection procedures	
Daily log book and invoice records include all required items	

INJECTION PROCEDURES

1. Ch. NR 113, Wis. Adm. Code references:
 - a. Definition: subsurface placement of septage to a depth of 4-12 inches (sub. NR 113.03(30), Wis. Adm. Code) *Note: AerWays are not approvable as an injector to meet vector attraction reduction requirements for compliant subsurface placement of septage. This type of equipment is considered “surface application.”*
 - b. Proper injection meets vector attraction reduction requirements (par. NR 113.07(3)(e), Wis. Adm. Code).
 - c. **IMPORTANT:** No significant amounts of septage shall be present on the land surface within one hour after landspreading.
2. Does my landspreading practices meet pathogen control requirements (subd. NR 113.07(3)(d)2.a. through h., Wis. Adm. Code)? The OIC should consider asking the below questions prior to septage landspreading.
 - a. What type of crop (examples: corn grain, soybeans, hay, and alfalfa) is the site owner or farmer growing this crop year?
 - b. What type of crop is the site owner or farmer anticipate growing for the next 2 crop years?
 - c. Food, Feed, and Fiber Crops? **IMPORTANT:** Harvesting restrictions may apply if the property owner/farmer anticipates planting:
 - i. Food crops (examples: sweet corn, peas, potatoes, strawberries, and tomatoes),
 - ii. Feed crops (examples: corn grain, soybeans, wheat, and hay), or
 - iii. Fiber crop (examples: hemp, cotton, jute, and flax).
 - d. Animal grazing? *Note: Livestock animals (examples: cows and horses) may not graze on land for 30 days after land application of septage. The OIC may need to discuss grazing restrictions further with the site owner and/or farmer.*
 - e. Turf? *Note: Turf may not be harvested for one year after land application of septage, unless otherwise specified by the department.*
 - f. Public access to land with a high potential for public exposure? **IMPORTANT:** High potential sites must restrict access for one year after application of septage.
 - g. Public access to land with a low potential for public exposure? **IMPORTANT:** Low potential sites must restrict access for 30 days after application of septage.
3. Routine field verification and inspection procedures (recommended annually)
 - a. Does my injector place septage to a minimum depth of 4 inches?
 - i. Depth depends on type of injector unit
 - ii. Example: An injector with spring loaded shanks (2,200 pounds of down pressure) will stay at a consistent depth (greater than 4 inches) unless a rock is hit. If a rock is hit, the injection will come up and snap right back into the soil.
 - b. Are all of my injector hoses, knives, etc. properly connected and well maintained?
 - i. What is my backup plan if repairs to equipment are necessary?
 - ii. Some operators keep spare parts in the tractor (example: shear bolts) for quick repairs in the field.
 - iii. Consider hoses and connections with cam lock fittings, if the hose or tip is damaged the operator can cap the hose and finish for the day. The repair can then occur at a later date.

- iv. Some operators walk around and inspect the injector after each spreading event. If there is a problem with the hoses (leak), then the equipment is often wet around the hoses.
 - c. Is any septage visible on the land surface >1 hours after injection?
 - d. Does my injector achieve uniform distribution of septage? Uniform application means evenly spreading septage over the site through the use of a splash plate, injector, or other department approved spreading method (reference: NR 113.03(68m), Wis. Adm. Code). *Note: Clogs, holes in pipes/tubing, disconnected injection hoses may result in non-uniform land application of septage.*
 - e. What is the hydraulic application rate of my injector application equipment? (example: 13,000 gallons/acre)?
 - i. *Note: "Table 4" (par. NR 113.09(6)(b), Wis. Adm. Code) identifies the maximum weekly hydraulic application rate for septage (example: holding tank waste is limited to 13,000 gallons/acre/week).*
 - ii. Flow meter (measured volume). *Note: A flow meter is not required for injectors under ch. NR 113, Wis. Adm. Code.*
 - 1. Has the flow meter recently been calibrated? DNR recommends annual calibration of flow meters.
 - 2. Do I have (or can I readily obtain) a “backup” flow meter?
 - 3. Calculated hydraulic application rate (metered volume divided by acres landspreading) must meet weekly and yearly hydraulic loading rate limits. *Note: Accurate rate is contingent on accurate estimate of acres landspread.*
 - iii. Estimated volume
 - 1. Field verification
 - 2. See “Hydraulic Rate Calculation Example #2”
 - f. Documenting field verification and inspection procedures. The department recommends that the OIC document verification and inspection procedures, including:
 - i. Date,
 - ii. Individual(s),
 - iii. Written observations,
 - iv. Photographs, and
 - v. Description of potential changes to improve compliance.
4. Review of daily log book and invoice record system. Does the daily log book comply with par. NR 113.11(3)(c), Wis. Adm. Code? **IMPORTANT: This is the most common issue with landspreading records!**
- a. Landspreading field (DNR# or site/field name) clearly identified? Example: DNR# 12345 (site/field name: SMITH-1).
 - b. Application method (injection) clearly identified?
 - c. Date/Time of landspreading completed?
 - d. Pathogen control and vector attraction reduction certification statement? Signed?
 - e. Descriptions for meeting pathogen control and vector attraction reduction?
 - f. Some operators tally spreading events (daily AND weekly). This practice allows the operator to know when the site is reaching its maximum weekly AND annual application rates.

INJECTION CHECKLIST

Standard Operating Procedure Category	Sufficient
Landspreading practices meet pathogen control requirements (food, feed, and fiber crops)	
Communication plan with property owner/farmer regarding intended crops	
Surface application equipment achieve uniform distribution of septage	
Surface application equipment well maintained	
Backup plan if primary spreading equipment breaks	
Procedures for routine calibration of spreading equipment (gallons/acre)	
Documentation of routine field verification and inspection procedures	
Daily log book and invoice records include all required items	

ACKNOWLEDGEMENTS

This correspondence memo was developed by the Wisconsin DNR Septage Team in partnership with the Wisconsin Liquid Waste Carriers Association (WLWCA). Specifically, The DNR Septage Team would like to thank John Bowen, Dave Kons, and Lance Petrsek for their contributions to this correspondence memo. The DNR Septage Team includes Michelle BalkLudwig, Alison Canniff, Peter Carlson, Teresa Hall, Fred Hegeman (Co-Coordinator) Kassie Schultz, Heidi Schmitt Marquez, and Steve Warrner (Co-Coordinator). Please contact your regional septage coordinator for any questions on this memo.

Hydraulic Rate Calculation Example #1



Application Method: Splash Plate

Truck Capacity: 4,000 gallons

Area Spread

Area = length x width

Area = 14,000 sq. ft.

Convert Square Feet to Acres

14,000 sq. feet x 1 acre/43,560 sq. feet

14,000/43,560= 0.321 Acres

Hydraulic rate

4,000gal/0.321acre= **12,460 gallons/acre**

700 ft

20 ft

Hydraulic Rate Calculation Example # 2



Application Method: Injector

Truck Capacity: 4,000 gallons

Area Spread

Area = length x width

Area = 19,500 sq. ft.

Convert Square Feet to Acres

19,500 sq. feet x 1 acre/43,560 sq. feet

19,500/43,560= 0.448 Acres

Hydraulic rate

4,000gal/0.448acre= **8,928 gallons/acre**

1300 ft

15 ft