Minnesota Pollution Control Agency

Decommissioning or Relining Domestic Wastewater Ponds

Requirements and Procedures

Purpose

The purpose of this fact sheet is to describe regulatory requirements and provide guidance for the decommissioning or relining of domestic wastewater treatment ponds.

These requirements may include (but are not limited to):

- removal and disposal of biosolids
- sealing/capping of any groundwater monitoring wells
- proper demolition, capping, and elimination of treatment components

Permittees with a domestic wastewater treatment pond system that are eliminating the use of ponds (either through replacement with a new treatment system, or closure of the treatment system altogether) **cannot abandon the ponds "as is",** due to potential safety, environmental and human health hazards. Biosolids accumulated on the pond bottom contain a number of pollutants, nutrients, and pathogenic organisms that must be handled properly before abandoning or re-using the structure.

When are Ponds Decommissioned?

After domestic wastewater ponds cease to receive wastewater for treatment and all the flows are conveyed to another facility, the biosolids in them are subject to one of the following rules and must meet requirements for use or disposal.

Rules and Regulations that Apply

- 40 Code of Federal Regulation [CFR], ch. 503 *Standards for the Use of Disposal of Sewage Sludge*. This rule covers the options for the use or disposal of biosolids that are based on risk assessments done by the Environmental Protection Agency. This rule forms the basis of Minn. R. ch. 7041 for land application.
- Minn. R. ch. 7041 – Biosolids Management Rule. This rule covers biosolids that are applied to the land for treatment and beneficial use. It also applies to the biosolids in a wastewater treatment pond once it ceases to receive wastewater.
- Minn. R. ch 4725 – Wells and Borings. This rule addresses the abandonment of wells.
- Minn. R. ch 7035. Solid Waste Rules. This rule addresses land filling biosolids.

If a permittee is considering keeping a pond for biosolids storage, it must meet stringent seepage requirements and is a permitted facility under Minn. R. ch. 7041.0900.

Planning

When planning to decommission or reline a pond (s), contact all parties that are involved in the process so things can run smoothly. This is particularly important when a pond is relined as the timing of biosolids removal becomes critical in the process. Persons involved in the process are the consulting engineer, wastewater operator, Type IV operator, and the permittee's administrative personnel and the Agency's engineer, biosolids coordinator, permit writer, and enforcement staff. The biosolids coordinator may visit the site in order to understand the site conditions and discuss possible scenarios with individuals working on the project. Each project seems to be somewhat different.

Good planning cannot take place without a Preliminary Assessment (see page 2) of the quality and quantity of biosolids in the ponds. This assessment should be done in the Facility Planning phase of the construction project in order to:

- determine feasibility of an option for use or disposal
- more accurately calculate funding needs of the project
- provide a basis for the construction bid item

Permits

The permittee will be required to submit an approvable plan for decommissioning the ponds in their NPDES/SDS permit. The plan must be based on information from the **Preliminary Assessment** and describe (but not limited to) the following:

- the time frame for decommissioning the ponds including date/s for Final Measurement and Sampling
- the analytical parameters for the final sampling event
- how the biosolids will be removed (liquid/solid or both)
- the quantity of biosolids estimated to be in the pond/s
- the quality of biosolids, include analytical data taken to date
- what method/s are planned for use or disposal
- how much land is needed, the dates for having a Type IV operator employed, and when site applications will be submitted for review and approval **if biosolids are to be land applied** .

When writing the plan, the permittee should consider a time frame of approximately two years to complete the project. This may vary depending on:

- the time of year when all wastewater will be conveyed to the other facility or the initiation of operation date
- the alternative/s chosen for use or disposal
- the amount of time necessary to discharge pond effluent and dry out, apply, or dispose of the biosolids

This amount of time is needed because even if some biosolids are removed in a liquid state, to remove **all** biosolids, the ponds need to dry out. In order to dewater the pond (s), it is important to keep a viable discharge point in the permit whether it is directly to surface water – likely the current discharge point-or-through a new plant that may have a different discharge point.

Permits will remain in effect until the decommissioning is complete – this includes submitting Discharge Monitoring Reports, any other specific reports, and payment of annual permit fees.

How to do a Preliminary Assessment

As mentioned previously, a preliminary assessment of the quantity and quality of the biosolids must be done in order to estimate the volume of biosolids that will have to be removed, and to determine what option is appropriate for use or disposal. It will also provide an estimate of number of dry tons in the ponds which affects the number of final samples that have to be taken if the biosolids are land applied. If pollutant concentrations are greater than that allowed for land application, the biosolids must be evaluated for land filling.

Quantity and quality: Develop a grid system to check the thickness or depth of the biosolids layer and for collecting samples. When setting up a grid system consider the size of the pond/s, their current condition based on operator knowledge of biosolids accumulations due to wind and depth around dikes, inlet structures, and age and condition of the pond (s). A "Sludge Judge" is used for visual observation of depths and sampling - taking care **not** to include liner material or liner cover material in samples that can skew the analysis and volume estimates. It is usually easy to distinguish between biosolids and the other sediments because of their black color.

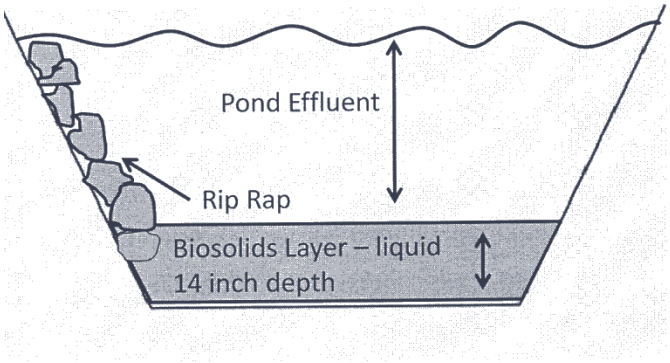
Each sample taken for analysis must be a composite sample made up of 10 sub samples. For ponds less than six acres, take at least two composite samples. For large ponds, take one composite sample per six acres at a minimum. **People experienced in sampling ponds state they prefer probing depths and sampling of the biosolids during a time when the pond is frozen, if possible, instead of from a boat.**

Parameters for analysis [Minn. R. ch. 7041.1500, subp 2] on a **dry weight basis** are:

- ✓ Total Solids [TS]
- ✓ Volatile Solids, Percent of TS
- ✓ pH
- ✓ Percent Total Kjeldahl Nitrogen (TKN)
- ✓ Percent Ammonia Nitrogen
- ✓ Percent Phosphorus
- ✓ Percent Potassium
- ✓ Concentration of metals in mg/kg of arsenic, cadmium, copper, lead, mercury, molybdenum, nickel selenium, and zinc
- ✓ PCBs if the ponds were built before 1984

After sampling, it is possible to estimate the dry tons of biosolids in the pond/s, determine whether or not the biosolids can be applied to the land, and how much nitrogen is available in biosolids which determines how many acres are needed for application.

Example: Preliminary measurement and sampling



Be sure to measure and sample the biosolids layer only – **no liner, no effluent.**

- Pond is three acres
- Liquid biosolids are 5 percent total solids
- TKN = 2.5 percent
- Ammonia N = 0.08 percent
- Metals meet the ceiling concentrations:

Metal	Ceiling concentration in mg/kg dry wt.*
Arsenic	75
Cadmium	85
Copper	4300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7500

*If any one of the metals is over the ceiling concentration, the biosolids cannot be applied to the land.

If PCB's levels are over 50 mg/kg, biosolids cannot be applied to the land and are considered a hazardous waste.

Liquid Biosolids

- **calculate the volume of biosolids**:
  14 in. x 3 acres x 27,154 gallons per acre in. = 1,140,468 gallons

Convert gallons to dry tons:

1,140,468 gallons x 8.34 lbs. per gallon = 9,511,503 lbs. ÷ 2000 lbs. per ton = 4,755.8 tons x 0.05 percent total solids = **237.8 dry tons**

- Calculate the amount of available nitrogen in biosolids with this formula:
  (organic N x 4) + (ammonia N x 20) = available nitrogen in one dry ton
  [organic N =TKN – ammonia-N: 2.5 percent – 0.08 percent =2.42 percent]
  (2.42 percent x 4) + (0.08 percent x 20) = 9.68 + 1.6
  Available nitrogen ~ 11.3 lbs./ton [estimate]

  x 237.8 dry tons ~ 2687 lbs. available nitrogen in all the biosolids

Dewater (Drying) for Final Measurement and Sampling

The final measurements and sampling of the biosolids are done **after** drying down and **before** the biosolids are moved around in the pond bottom for any reason [except to create a trench for dewatering] - so timing the pond/s dry down with respect to a construction schedule is critical. These are called "cake" (versus liquid) biosolids and can be moved with basic earthwork equipment and could be applied with a manure type spreader. If ponds are being decommissioned, some cities have done all this work on their own.

As mentioned above, it may be necessary to create a few trenches that drain to a sump area to remove excess effluent. If you have to deal with a synthetic liner, contact the biosolids coordinator and Agency engineer about possibly slitting the liner to allow for drainage. If the pond bottom is not sealed well and there is infiltration of ground water into the pond, it may be difficult to dewater. In that case, for small ponds, all the contents usually have to be pumped out during a dry time of year and land applied or transferred to another facility in the liquid state. If the pond is large, other methods of dewatering the area may have to be investigated.

After dewatering, it should be possible to differentiate the pond bottom [liner] from the biosolids – an actual visual observation. After taking measurements and getting the samples, the biosolids are generally windrowed in the pond to prepare them for removal and to help keep them as dry as possible. Removal of the biosolids can be based on visual observation of the pond bottom versus the biosolids [which are generally black]. If the pond bottom is determined to be quite level, an elevation can be specified for removal. If the pond is to be relined, the plans may indicate taking out more of the pond liner with the biosolids than if it was to be decommissioned. Any material mixed with biosolids becomes biosolids.

The minimum number of final samples to take for analysis is based on the dry tons to be applied. However, the overriding requirement is that the sample (s) is/are representative of the biosolids that are applied. This means that the person taking samples must consider any potential variability in the biosolids quality within the pond (s).

In the case above, we previously estimated there were about 237.8 dry tons. The minimum number of samples is one made up of ten subsamples and analyzing for at least TKN, ammonia –N, and total solids on this second round of testing as well as sampling to demonstrate that pathogen reduction has been met. Compliance with pathogen reduction standards is demonstrated by taking a set of seven individual samples (at the minimum sampling frequency as for other parameters) that are analyzed for fecal coliform using the most probable number [MPN] method [SM 9221E]. The geometric mean of those seven samples must be less than two million MPN per gram of total solids.

All other parameters **may** have to be analyzed for again depending on the quality of analytical data and the date the preliminary sample/s were taken.

The minimum number of samples required is:

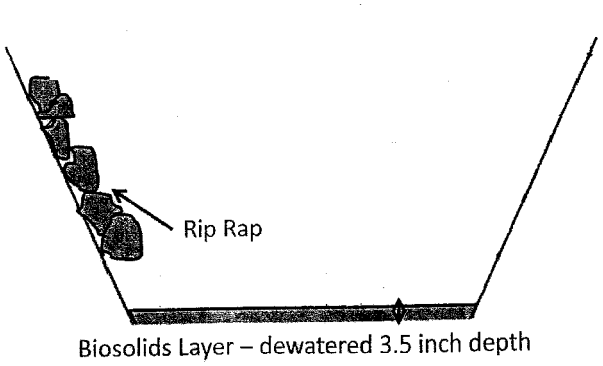
Dry tons applied	Number of samples
>0 but < 320	1
≥ 320 but < 1,650	4
≥ 1,650 but < 16,500	6
≥ 16,500	12

With the data from this sampling event, the calculations for volume and nutrients can be refined if the biosolids are to be land applied.

Since the biosolids are now dewatered and will be moved and/or applied on a cubic yard basis, the cubic yards have to be converted to dry tons in order to do any calculations because all analyses are reported on a dry weight basis. Cubic yards are converted to dry tons by using a "five gallon bucket test".

Recalculate the volume and dry tons biosolids in the dewatered state and pounds of nitrogen it contains if it is to be land applied.

Example: Final Measurement and Sampling



- Pond is three acres
- Dewatered biosolids are 25 percent total solids
- TKN = 2.0 percent
- Ammonia N = 0.05 percent

Dewatered (Cake) Biosolids

Calculate the volume of biosolids:

3.5 in. ÷ 12 in. per ft**.** x 3 acres x 43,560 sq. ft. per acre = 38,115 cu.ft. ÷ 27 cu.ft. per cu. yd. **~ 1411.7 cu. yds**.

Calculate the total dry tons using the "five gallon bucket test":

a. Weigh a five-gallon pail
b. Fill the pail with biosolids. We suggest filling it with equipment used to load the applicator [for example a bobcat].
c. Scrape the surface to level the biosolids
d. Weigh the loaded pail
e. Subtract the empty pail weight [wt.] from the full pail wt. = wt. of wet biosolids.
f. Find the dry wt. of the biosolids:

Wet wt. x percent total solids [as decimal]

Determine the dry wt. of biosolids per cu. yd. using this formula:

Dry wt. of biosolids x 0.02 = dry tons per cu. yd.

Example: 54 lbs. wet wt. x 0.25 [25 percent total solids] = 13.5 lbs. dry wt. x 0.02 **~ 0.3 dry tons per cu. yd.**

The estimate was 1411.7 cu. yds. x 0.3 dry tons per cu. yd. ~ 423.5 dry tons.

Now recalculate the available nitrogen using the analysis taken from the dewatered biosolids: (same formula as used before)

(1.95 percent organic N x 4) + (0.05 x 20)

7.8 + 1.0 = *8.8 lbs. available N per dry ton* x 423.5 dry tons ~ *3727 lbs. total available N*.

The total amount of nitrogen in the mass of biosolids is used to determine the number of acres needed to apply biosolids. The final mass of biosolids with the soil that gets mixed in with it is not sampled. It is not possible to get a good representative sample once the two are mixed because the mixture is not homogenous. **This is why it is re-measured and sampled before it is moved around and mixed with soil.**

How many acres are needed depends on the crop to be grown, yield goal, previous crop grown, method of application, and soil organic matter content. A Type IV Operator *[land application type certification]* should be taking over by this point to continue the process of making the calculations for maximum available nitrogen application [MANA] rates, determining site suitability, taking soil samples, completing site application forms, overseeing the actual application, and completing the annual report. If any of the old pond area is going to be proposed as a reclamation application site, the Type IV must also check to see if a request for modification of suitable slope or soil conditions has to be made when applying for site and application approval. **Site approvals take a minimum of 30 days**.

All proposed areas of application must go though the site approval process. Site approvals go through a 30-day notification period, and are tied to the permittees NPDES/SDS permit for enforcement purposes.

Application example: How many acres are needed for application at a certain MANA rate?

For corn with a MANA rate of 150 lbs. of nitrogen per acre – the calculation above indicates there are **3727 lbs. total available N ÷ 150 lbs. per acre that can be applied ~ 24.8 acres are needed.**

Depending on the crop and its associated MANA rate, the acres needed may increase or decrease.

Where do I find a Type IV Operator?

Any treatment facility that has a mechanical plant that generates biosolids continuously would have or subcontract with a Type IV Operator to handle their biosolids land application program.

- Contact a nearby municipality or sanitary district with a mechanical treatment plant. In this situation, the contractor would provide the actual applier who would apply under the direction of the Type IV operator.
- Visit the Agency Web site for contract appliers that are Type IV certified. *http://www.pca.state.mn.us/index.php/waste/waste-and-cleanup/cleanup-programs-and-topics/topics/land-application-of-industrial-by-products.html?menuid=&missing=0&redirect=1*
- Some engineering firms have a staff person that is Type IV certified.
- Industrial facilities that land apply various industrial by-products may also have Type IV Operators. These operators would provide services like those from a municipality.

Removal and Application or Disposal

Timing of removal and application may be hindered by weather and where the biosolids are to be applied. The biosolids must be incorporated in the soil to meet standards for vector attraction reduction, and there are timing issues related to application and seeding a site that the Type IV Operator will know about.

If it is not possible to apply the biosolids in a timely manner, the windrowed biosolids can be stored in the pond or on the inner dike of the pond to keep them dry and out of the way of construction. It is possible, under certain site conditions, to store biosolids for up to seven months on a site where it is to be applied. Discuss this with the Type IV Operator before he/she completes the site application forms.

Application to **agricultural sites** is always at agronomic rates (recommended nitrogen application rate for the crop).

Reclamation Sites - In general, reclamation sites are treated like agricultural sites for nitrogen application.

In some reclamation cases, it may be possible to apply at a greater than an agronomic rate. This type of proposal would be submitted with the site application form. The reason for applying more biosolids to a reclamation site is related to supplying enough organic matter to sustain vegetative cover for a long time.

If the biosolids nitrogen content is very low, it is sometimes possible to apply at high volumetric rates on either kind of site. The rate is then limited to amounts similar to specifying a depth of topsoil for a construction site. That would be a maximum of six inches. If the depth cannot be completely incorporated, it is necessary to seed and mulch the site to aid in creating a barrier condition to prevent movement of biosolids off the site and to comply with vector attraction reduction requirements. All sites applied to during summer months need to be seeded within 14 days of application.

Examples of reclamation sites that provide final biosolids treatment would be:

- The pond construction site – **after removal** of the biosolids, the dikes can be pushed in and leveled and graded for positive drainage for land application.
- It may be possible to provide positive drainage on the pond site to provide suitable conditions [aerobic soils] for plant growth without removing all the dikes and leave some or all of the biosolids in place (discuss this with the biosolids coordinator).
- Mining sites such as gravel pits
- Sites that have been stripped of topsoil for some other reason.
- Daily cover at landfills, particularly if there is a lot of soil removed with the biosolids. This would actually be considered as land filling if the landfill is lined as mentioned previously. In this case, a site approval is not necessary.
- Used in the final cover at a landfill - this would require a site approval.

After biosolids application, public access must be restricted for one year.

Disposal

The biosolids can be dewatered and taken to a landfill that meets the lined landfill standards of solid waste rules if the land fill agrees to accept them. They are then considered to be in compliance with 40 CFR. 503. A landfill in Minnesota will require biosolids to pass the "paint filter test", pass the toxicity characteristics leaching procedure [TCLP] test, and meet Class B pathogen reduction standards. Check with landfills for acceptance before planning on this option.

What about the rip rap and Synthetic liners or liners with bentonite in them?

- Riprap can be dozed when and if the dikes are pushed in, or it can be salvaged. If there are biosolids on it, it can be washed and/or left to dry in the sun for at least 30 days.
- If all the biosolids are removed, the pond can then be left "as is" with rip rap in place.
- Synthetic liners must be removed and taken to a landfill. In some cases, it has been possible to recycle them at a plastics recycling business.
- Liners with bentonite in them and that are scraped up with the biosolids could cause problems if the mixture was applied to cropland. This mixture may have to be land filled or applied on land owned by the permittee.

Final inspection

Once all of the solids are removed, applied, or disposed, a final inspection by Minnesota Pollution Control Agency may be necessary to ensure that the work was completed in compliance with regulations. In some cases, photo documentation of the completed job is sufficient. The permittee can now use the ponds or fill, level, or grade the site. If other alternative uses are proposed, the permittee may be required to conduct a water balance on the ponds, and may be required to maintain a permit.

If the ponds are completely removed from service and the permittee does not hold a permit for a new facility, they should submit appropriate documents for permit termination.