



Minnesota
Pollution
Control
Agency

Guidance on General Industrial Spray Irrigation Permits

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This fact sheet is intended to outline the guidance for obtaining a permit for the irrigation of industrial wastewaters. More specific requirements can be found in sample permits located on the Minnesota Pollution Control Agency (MPCA) Web site at www.pca.state.mn.us.

Industrial wastewaters include process wastewater, clean-up water, noncontact cooling water and other residual wastewaters resulting from industrial, commercial, mining and agricultural industries that are not primary products and that are not produced separately by a process. These wastewaters are typically applied by sprinkler irrigation systems such as center pivot and traveling gun irrigators. In contrast, industrial by-products are typically applied using application vehicles such as trucks or manure spreaders.

Spray irrigation land disposal systems require a Minnesota State Disposal System permit at a minimum. If the facility discharges wastewater to surface waters in addition to land disposal, a National Pollutant Discharge Elimination System (NPDES) permit will be required.

Some industrial wastewaters can be beneficially reused through spray irrigation because they contain essential nutrients for plant growth, enhance soil structure and fertility, provide needed water for cropping systems, and reduce the amount of commercial fertilizers purchased. Some pollutants are more easily managed through spray irrigation over crops and vegetated land than by further treatment to achieve the water quality required for discharge to surface waters. Additionally,

some facilities are remote from publically owned wastewater treatment plants and building a wastewater treatment system with surface water discharge can be cost prohibitive for some facilities.

Waste characterization

A facility must fully characterize their waste stream and analyze for all pollutants reasonably expected to be present in wastewater. To do this, industrial facilities must review facility processes and identify all chemicals and additives used in facility processes that enter the waste stream planned for land application. Industrial wastewaters cannot contain a listed hazardous waste and cannot exhibit a hazardous characteristic. Material safety data sheets (MSDSs) and waste analyses must be submitted with the permit application.

Representative samples must be collected from each waste stream, if possible, to determine what pollutants are present. For new facilities not currently generating wastewater, waste analysis from a similar facility or an engineering estimate of strength may be acceptable as an initial waste characterization. At a minimum, a 24 hour flow composited sample should be collected and analyzed for five-day biochemical oxygen demand, total suspended solids, total phosphorus, total kjeldahl nitrogen, nitrate+nitrite, ammonia, chloride, sodium, calcium, magnesium, sodium adsorption ratio, specific conductivity, pH and pathogens. Sampling should be conducted at a frequency that characterizes the variability of waste strength and facility operations.

Other parameters to consider at industrial facilities are oil and grease, diesel and gas range organics, volatile organic compounds and metals. The facility permit will require that a 24 hour composite sample be collected weekly throughout the period that wastewaters are generated.

The volume of wastewater produced annually needs to be determined so an environmentally protective hydraulic and nutrient loading rate can be determined.

Waste loading

Wastewater nutrients can only be applied at the rate that is necessary for crop or vegetative cover growth. The crop to be grown, together with its realistic yield goal is used to determine crop nutrient needs. Once the nutrient requirement of the crop is known, the hydraulic loading rate that will supply this amount of nutrients can be determined. This hydraulic application rate, however, cannot result in wastewater ponding, running off or generating leachate from the irrigation site.

Facilities need to determine soil moisture deficit in order to manage wastewater application rates. The three methods of determining soil moisture deficit are:

(1) accounting for moisture inputs and outputs (ie, checkbook method), (2) soil moisture feel method, and (3) use of soil moisture monitoring devices. The maximum irrigation rate is the soil moisture deficit (in inches) minus a ½ inch buffer for possible impending rainfall.

Site selection

Once it has been determined that the facility's wastewater can be safely and effectively treated through a land treatment system, the specific land application sites that can treat the wastewater will need to be identified. Most locations where agricultural crops can be grown successfully are potential irrigation sites. However, the application rate of nutrients and water must be carefully designed based on the crop(s) grown and the wastewater and site characteristics. The use of a MPCA certified Class V spray irrigation operator, Certified Crop Consultant, and/or a professional soil scientist to plan, design and operate the spray irrigation system is recommended. A professional engineer with experience with irrigation system design will also be necessary to design the irrigation system.

The design of the spray system will depend on the quality and quantity of the wastewater generated and on the specific site characteristics of the application site.

The locations chosen for wastewater irrigation should meet the goals of treating wastewater so that surface and groundwater, soil and crops will not be adversely affected. To achieve these goals the irrigation cannot result in wastewater runoff, ponding, leaching to groundwater, saturated soil conditions or result in site soils or crops being adversely affected. Information on soil type, depth to the seasonal high water table, distance to surface waters, landslopes, drainage features, tile line maps, depth to bedrock, local land use, and locations of private and municipal water well users within one mile must be submitted with the permit application. A crop management plan which addresses the current and proposed cropping systems for each proposed spray site should also be submitted. This information must be collected and submitted to the MPCA for each proposed wastewater irrigation site. Much of this information can be found at the U.S. Department of Agriculture Natural Resources Conservation Service Web site at, <http://websoilsurvey.nrcs.usda.gov/app>.

Each proposed land application site(s) should be inspected and evaluated for features that may affect land application activities. During this on-site inspection, the collection of soil samples can be conducted. Soil samples must be a composite sample consisting of a mixture of 15 to 20 subsamples taken in the plow layer. A minimum of one composite sample per site is required. On sites that are greater than 40 acres in size, a minimum of one composite sample per 40 acres of area is required. Soils must be analyzed for texture, pH, organic matter content, extractable phosphorus, exchangeable potassium and specific conductance (soluble salt content).

The permits for industrial irrigation facilities typically require the installation of up and down gradient groundwater monitoring wells. Data from the monitoring wells are reviewed to assure that the irrigation of wastewater is not adversely impacting groundwater quality. The permit application should include proposed monitoring well locations.

The permit application should identify all surface water drainage features at the proposed irrigation sites, including tile lines, to determine possible surface water receptors. During land treatment operations, the operator will need to inspect these locations daily to assure that wastewater is not running off the irrigation site and potentially impacting surface water. If an irrigation site has a subsurface drainage system, monitoring of the drainage water at its outlet will be required by the permit and a NPDES permit may be required.

Aerial photographs, maps and/or drawings should be provided with the permit application showing the locations of proposed irrigation sites, surface drainage features, tile line maps, proposed ground and surface water monitoring locations, proximity to neighbors, road right of ways, and locations of drinking water wells within a mile of the proposed sites.

Pretreatment, storage and spray field operations

Some industrial facilities generate more wastewater during specific times of the year. These facilities may need to store wastewater. In this case, many facilities use ponds or tanks for wastewater collection and treatment. Pond systems and tanks need to be designed and certified by a professional engineer and approved by the MPCA before put into use. Wastewater holding ponds for spray irrigation must be designed and operated in accordance with MPCA criteria for stabilization ponds. Details on these systems such as design, leakage rate, holding time, etc., need to be submitted in the permit application.

Spray irrigation activities must be conducted in a manner that minimizes adverse effects resulting from odors, noise and aerosol drift. Individual irrigation events should be conducted on a load/rest cycle during the active crop growing season. Wastewater applications must not exceed any of the maximum hydraulic and waste loading rates as described earlier in this fact sheet.

Industrial facilities that operate wastewater irrigation systems must have a MPCA Class V certified operator conduct, oversee and report on the operations.

Reporting

Submission of a Spray Field Management plan is required by the permit for MPCA review and approval. This plan must include a Spill Prevention and Response Plan, a Contingency Plan, a Monitoring Plan and Groundwater Monitoring Plan and becomes an enforceable part of the permit. It is a good idea to have the requirements of these plans in mind during site selection and design. Requirements for these plans can be found in the sample spray irrigation permit online at www.pca.state.mn.us.

After every application year, an annual report must be submitted to the MPCA describing the past years spray irrigation, cropping, groundwater monitoring and wastewater analytical data. The facility permit will detail the items to be included in annual reports.

Web information sources

1. <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm> (online soil surveys)
2. http://www.soils.umn.edu/extension/extension_publications/Soil%20Sampling%20and%20Fertilizer%20Recommendations/BU-06240-S_1.pdf (MANA Rates)
3. http://www.extension.umn.edu/distribution/cropsystems/components/DC1322_02.html#available (checkbook method for irrigation)
4. <ftp://ftp-fc.sc.egov.usda.gov/MT/www/technical/soilmoist.pdf> (soil moisture feel method)

Spray permitting checklist

Task	Purpose	Action
Waste Characterization: facility review, sample collection	Determine quantity of wastewater produced and identify and analyze for all pollutants with reasonable likelihood of being present.	Submit this information with the permit application including lab sheets and MSDSs of products used at the facility.
Site Selection: soils, site geography, groundwater, surface water	Identify and describe location that can safely and effectively treat wastes.	Submit a report describing the soils, hydrogeology, surface water and drainage features of the proposed sites. Include soil sampling results and lab data sheets.
Cropping System	Select crop(s) that can utilize nutrients and water present in wastewater.	Describe in the permit application crops to be grown at the proposed irrigation site, or how the cover crop will be managed. Describe the crop monitoring program and how it will determine the amounts of nutrients and water used by the crop.
Irrigation System Design	Determine system design and application rate so that ponding, runoff and leaching to groundwater do not occur.	Provide specifications of the irrigation system design including hardware, application intensity rate, pumping rates and pressures, and operations monitoring with the permit application.

Task	Purpose	Action
Permit Application	For a permit issuance or permit reissuance, complete the Water Quality Transmittal form and the Attachment for On-Land Disposal Site Approval form. Include additional design documents as necessary.	The permitting process can take time; submit the application for a new project knowing the permit may take a few months. For a permit reissuance, an application is due 180 days prior to permit expiration.
Sprayfield Management Plan	Describes how the irrigation system will be operated and maintained.	60 days after permit issuance
Spill Prevention and Response Plan	Describes how the permittee will respond in cases of spill or release emergency	This is a part of the Sprayfield Management Plan, due 60 days after permit issuance.
Contingency Plan	Proposes what actions will be taken in cases of system failure or adverse climatic conditions.	This is a part of the Sprayfield Management Plan, due 60 days after permit issuance.
Monitoring Plan	Proposes how wastewater, crops, and soil will be sampled and analyzed.	This is a part of the Sprayfield Management Plan, due 60 days after permit issuance.
Groundwater Monitoring Plan	Proposes how groundwater will be sampled and analyzed, describes the hydrogeology at the irrigation site and identifies and describes groundwater users in a one-mile radius to the facility.	This is a part of the Sprayfield Management Plan, due 60 days after permit issuance.
Annual Report	Describes the past cropping year operations: irrigation events, crops, maintenance issues, soils, groundwater and wastewater data.	Due every year on February 1.

Who to contact with questions

If you have questions or need assistance with the use of this document, please contact the MPCA at 651-296-6300 (metro) or 1-800-657-3864 (outstate).