Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 8—Design Guides

PROPOSED AMENDMENT

10 CSR 20-8.200 Wastewater Treatment Lagoons and Wastewater Irrigation Alternatives. The Department of Natural Resources is amending the following sections by removing text, adding text, or changing the order of text - section (1), section (2), section (4), section (6).

PURPOSE: This amendment contains changes that are administrative in nature. It changes the term "geohydrological" to "geohydrologic", adds language to inform applicants who are required to request a geohydrologic evaluation that supplemental information can be submitted to the department for consideration, adds the phrase "unless additional information supports an alternative determination by the department for the proposed location" to existing language stating that earthen basins shall not be located in areas with a severe collapse potential rating, clarifies storage requirement calculations to correct an error in a previous rulemaking, revises the applicability statement to include earthen basins and revises wording in several place to include earthen basins, revises the applicability statement to specifically exclude lagoons or earthen basins built to contain or control the release of only storm water, revises a reference to the head of water used in calculating seal thickness to reference the design operating depth of water, alphabetizes the county lists for minimum storage days required for surface irrigation of wastewater, corrects the following typographical errors and omissions in the lists: corrects the spelling of one county (Greene), adds two counties that were missing (Wright and Washington), and moves one county that was incorrectly listed in the wrong subparagraph (Cooper).

PUBLISHER'S NOTE: The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. This material as incorporated by reference in this rule shall be maintained by the agency at its headquarters and shall be made available to the public for inspection and copying at no more than the actual cost of reproduction. This note applies only to the reference material. The entire text of the rule is printed here.

(1) Applicability. Wastewater systems that utilize lagoons**, earthen basins,** and wastewater irrigation alternatives shall be designed based on criteria contained in this rule, published standards, applicable federal and state requirements, standard textbooks, current technical literature, and applicable safety standards. In the event of any conflict between the above criteria, the requirement in this rule shall prevail.

(A) This rule shall not apply to treatment units covered in 10 CSR 20-8.300.

(B) This rule shall not apply to treatment units covered in 10 CSR 20-8.500.

(C) This rule shall not apply to lagoons or earthen basins built to contain or control the release of only storm water, provided that the storm water does not come in contact with process waste or process wastewater.

(2) Supplementary Field Data for the Facility Plan. The facility plan shall contain pertinent information on location, geology, soil conditions, area for expansion, and any other factors that will affect the feasibility and acceptability of the proposed project, including the information required per 10 CSR 20-8.110. The following information must be submitted:

(A) Lagoons and spray irrigation fields shall be located where stormwater runoff from the watershed is minimized.

(B) Geohydrologic*[al]* Evaluation. A geohydrologic*[al]* evaluation shall be requested on all new earthen basins, earthen basin major modifications, new wastewater irrigation sites, and subsurface absorption fields. **Supplemental information may be submitted for consideration by the department.**

1. Severe Collapse Potential. Earthen basins shall not be located in areas with a severe collapse potential rating **unless additional information supports an alternative determination by the department for the proposed location**.

(C) Soils investigation. Detailed soils investigations and reports shall be submitted for facilities surface irrigating more than twenty-four inches per year (24"/ yr) and for all subsurface absorption fields. Soils reports shall comply with 10 CSR 20-8.110(7).

(D) Where geosynthetic liners are used in storage or treatment basins for wastewaters of an industrial nature, the application shall:

1. Document that the liner or storage structure material is capable of containing the wastewater for at least twenty (20) years;

2. Specify repair or replacement procedures in the event of leakage or damage to the seal; and

3. Include an evaluation of secondary containment or leakage detection and collection devices for corrosive or reactive wastewaters and for toxic materials.

(3) Basis of Design.

(A) Area and Loadings for Discharging Lagoons.

1. Lagoon design for BOD_5 loadings shall not exceed thirty-four pounds per day per acre (34 lbs/day/acre) at the three-foot (3') operating depth in the primary cells.

2. Aerated Lagoons. Aeration equipment shall be capable of:

A. Maintaining the design level of dissolved oxygen within a particular cell with one (1) unit in the cell out of service;

B. Maintaining a minimum dissolved oxygen level of two milligrams per liter (2 mg/L) in the lagoon at all times;

C. Delivering one and four tenths pounds of oxygen per pound of biochemical oxygen demand removed (1.4 lbs O_2/1 lb BOD); and

D. Delivering an additional four and sixth tenths pounds of oxygen per pound of ammonia nitrogen removal (4.6 lbs O_2/1 lb NH_3).

(B) Area and Loadings for Wastewater Irrigation Storage Basins. Treatment prior to surface irrigation shall provide performance equivalent to that obtained from a primary wastewater lagoon cell designed and constructed in accordance with section (4) of this rule, except that the lagoon depth may be increased to include wastewater storage in addition to the primary volume.

(4) Lagoon **and Earthen Basin** Construction Details.

(A) Embankments and Berms.

1. Berms shall be constructed of relatively impervious material and compacted to at least ninety-five percent (95%) maximum dry density test method to form a stable structure.

2. The minimum berm width shall be eight feet (8') to permit access of maintenance vehicles.

3. Minimum freeboard shall be two feet (2').

4. An emergency spillway shall be provided that—

A. Prevents the overtopping and cutting of berms;

B. Is compacted and vegetated or otherwise constructed to prevent erosion; and

C. Has the ability for a representative sample to be collected, if discharging.

(B) Lagoon **and Earthen Basin** Bottom. Soil shall be compacted with the moisture content between two percent (2%) below and four percent (4%) above the optimum water content and compacted to at least ninety-five percent (95%) maximum dry density test method.

(C) Lagoon **and Earthen Basin** Seal.

1. The lagoon **or earthen basin** shall be sealed to ensure that seepage loss is as low as possible and has a design permeability not exceeding 1.0 x 10-7 cm/sec.

2. Soil Seals. The minimum thickness of the compacted clay liner must be twelve inches (12"). For permeability coefficients greater than 1.0 × 10-7 cm/sec or for heads over five feet (5') such as an aerated lagoon system, the following formula shall be used to determine minimum seal thickness, Equation 200-1:

Equation 200-1

$$t = \frac{H \times K}{5.4 \times 10^{-7\ \text{cm/sec}}}$$

where:

K = the permeability coefficient of the soil in question;

H = the **design average operating depth** *[head]* of water in the lagoon **or earthen basin, excluding the inner berm depth**; and

t = the thickness of the soil seal.

3. Synthetic Liners. Synthetic seals thickness may vary due to liner material, but the liner thickness shall be no less than two-hundredths inch (.02") or twenty (20) mil and be the appropriate material to perform under existing conditions.

4. Seep collars shall be provided on drainpipes where they pass through the lagoon **or earthen basin** seal.

(D) Influent Lines.

1. Unlined corrugated metal pipe shall not be used due to corrosion problems.

2. A manhole shall be installed with its invert at least six inches (6") above the maximum operating level of the lagoon **or earthen basin**, prior to the entrance into the primary cell, and provide sufficient hydraulic head without surcharging the manhole. For manhole installation, follow the provisions listed in 10 CSR 8.120(4).

3. The influent line(s) shall be located along the bottom of the lagoon **or earthen basin** so that the top of the pipe is just below the average elevation of the lagoon **or earthen basin** seal; however, there shall be an adequate seal below the pipe.

(5) Covers for Lagoon Retrofits.

(A) Lagoon covers shall be constructed with a minimum thickness of 2 mil or meet the manufacturer’s recommendations, and be ultraviolet and weather resistant.

(B) Trial seams shall be used to verify acceptable installation techniques.

(C) The cover shall include a stormwater removal system that conveys collected precipitation to sumps or includes drainage areas in the membrane within the acceptable leakage rate to allow stormwater to drain into the lagoon.

(6) Surface Irrigation of Wastewater.

(A) Site Considerations. For site considerations, follow the provision in section (2) of this rule.

(B) Wetted Application Area. The wetted application area is the land area that is normally wetted by wastewater application. The wetted application area must be:

1. Located outside of flood-prone areas having a flood frequency greater than once every ten (10) years;

2. Established—

A. At least one hundred fifty feet (150') from existing dwellings or public use areas, excluding roads or highways;

B. At least fifty feet (50') inside the property line;

C. At least three hundred feet (300') from any sinkhole, losing stream, or other structure or physiographic feature that may provide direct connection between the ground water table and the surface;

D. At least three hundred feet (300') from any existing potable water supply well not located on the property. Adequate protection shall be provided for wells located on the application site;

E. One hundred feet (100') to wetlands, ponds, gaining streams (classified or unclassified; perennial or intermittent); and

F. If an established vegetated buffer or the wastewater is disinfected, the setbacks established in subsections (A)–(E) above may be decreased if the applicant demonstrates the risk is mitigated.

3. Fenced, or if not fenced, provide in the construction permit application or the facility plan, the—

A. Method of disinfection being utilized;

B. Suitable barriers in place, or

C. Details on how public access is limited and not expected to be present.

(C) Preapplication Treatment. At a minimum, treatment prior to irrigation shall provide performance equivalent to that obtained from a primary wastewater lagoon cell designed and constructed in accordance with sections (3) and (4) of this rule, except that the lagoon depth may be increased to include wastewater storage in addition to the primary volume.

1. The size of storage basins shall be based on the design wastewater flows and net rainfall minus evaporation expected for a one (1) in ten (10) year *[twenty-four (24) hour return]* frequency for the storage period selected and shall meet the minimum storage days listed below.

A. Seventy-five (75) days for facilities located in **Barry, Barton, Bollinger, Butler, Cape Girardeau, Carter, Christian, Dade, Dent, Douglas, Dunklin, Greene, Howell, Iron, Jasper, Lawrence, Madison, McDonald, Mississippi, New Madrid, Newton, Oregon, Ozark, Pemiscot, Perry, Reynolds, Ripley, Scott, Shannon, Stoddard, Stone, Taney, Texas, Wayne, Webster, and Wright counties.***[Scott, Stoddard, Butler, Dunklin, New Madrid, Pemiscot, Mississippi, McDonald, Newton, Jasper, Lawrence, Barry, Stone, Taney, Christian, Green, Webster, Douglas, Ozark, Howell, Texas, Dent, Shannon, Oregon, Ripley, Carter, Reynolds, Iron, Madison, Wayne, Cape Girardeau, Barton, Dade, Perry, and Bollinger counties.]*

B. Ninety (90) days for facilities located in **Bates, Benton, Camden, Cedar, Cole, Crawford, Dallas, Franklin, Gasconade, Henry, Hickory, Jefferson, Laclede, Maries, Miller, Moniteau, Morgan, Osage, Phelps, Polk, Pulaski, St. Charles, St. Clair, St. Francois, St. Louis, St. Louis City, Ste. Genevieve, Vernon, and Washington counties.***[Vernon, Bates, Henry, St. Clair, Cedar, Dallas, Polk, Hickory, Benton, Cooper, Morgan, Moniteau, Miller, Cole, Camden, Laclede, Pulaski, Phelps, Maries, Osage, Gasconade, Franklin, Jefferson, St. Louis, Ste. Genevieve, St. Francois, St. Charles, and Crawford counties.]*

C. One hundred five (105) days for facilities located in **Audrain, Boone, Callaway, Carroll, Cass, Chariton, Clay, Cooper, Howard, Jackson, Johnson, Lafayette, Lincoln, Monroe, Montgomery, Pettis, Pike, Platte, Ralls, Randolph, Ray, Saline, and Warren counties.***[Cass, Johnson, Pettis, Platte, Jackson, Clay, Ray, Lafayette, Carroll, Saline, Chariton, Randolph, Howard, Boone, Callaway, Audrain, Monroe, Ralls, Pike, Lincoln, Warren, and Montgomery counties.]*

D. One hundred twenty (120) days for facilities located in **Adair, Andrew, Atchison, Buchanan, Caldwell, Clark, Clinton, Daviess, DeKalb, Gentry, Grundy, Harrison, Holt, Knox, Lewis, Linn, Livingston, Macon, Marion, Mercer, Nodaway, Putnam, Schuyler, Scotland, Shelby, Sullivan, and Worth counties.***[Atchison, Holt, Andrew, Nodaway, Worth, Gentry, DeKalb, Harrison, Daviess, Grundy, Mercer, Putnam, Sullivan, Linn, Macon, Adair, Schuyler, Scotland, Clark, Knox, Lewis, Shelby, Buchanan, Clinton, Caldwell, Livingston, and Marion counties.]*

E. Seasonal facilities. For facilities that operate and generate flows only from April through October season, a minimum storage capacity of forty-five (45) days shall be provided. For facilities that operate or generate flows only from November through March, the minimum storage listed in subsection (A)–(D) above is required.

(D) Application Rates and Soils Information. The application rates for each individual site shall be based on topography, soils, geology, hydrology, weather, agricultural practice, adjacent land use, and application method. Application of wastewater shall not be allowed during periods of ground frost, frozen soil, saturated conditions, or precipitation events. In design of the application rates, the following shall apply:

1. Do not exceed the hourly application rate at the design sustained permeability rate except for short periods when initial soil moisture is significantly below field capacity. Do not exceed an hourly rate of one-half (½) the design sustained permeability for slopes exceeding ten percent (10%).

2. Base the daily and weekly application rates on soil moisture holding capacity, antecedent rainfall, and depth to the most restrictive soil permeability.

A. For facilities applying at twenty-four inches per year (24"/yr), the application rate cannot exceed one inch (1") per day and three inches (3") per week.

B. For facilities applying above twenty-four inches per year (24"/yr), the application rate cannot exceed the values determined in the soils report and loading design. Follow the provisions in 10 CSR 20-8.110(7), Soils Reports for additional information.

3. Design the maximum annual application rate not to exceed ten percent (10%) of the design sustained soil permeability rate for the number of days per year when soils are not frozen.

(E) The applicant shall defer the grazing of animals or harvesting of forage crops, as listed below, following wastewater irrigation, depending upon ambient air temperature and sunlight conditions.

1. Fourteen (14) days from grazing or forage harvesting during the period from May 1 to October 31 of each year; and

2. Thirty (30) days from grazing or forage harvesting during the period from November 1 to April 30 of each year.

(F) Public Access Areas. Wastewater shall be disinfected prior to irrigation (not storage) in accordance with 10 CSR 20-8.190.

1. The wastewater shall contain as few of the indicator organisms as possible and in no case contain more than one hundred twenty-six (126) Escherichia coliform colony forming units per one hundred milliliters (126 cfu/ 100 ml);

2. The public shall not be allowed into an area when irrigation is being conducted; and

3. For golf courses utilizing wastewater, all piping and sprinklers associated with the distribution or transmission of wastewater shall be color-coded and labeled or tagged to warn against the consumptive use of contents.

(G) Alarm System. An automatic notification alarm system shall be installed on the pressure monitoring system, on each pivot and pump system, and be capable of notifying an on-call operator when a fault occurs in the system.

(7) Subsurface Absorption Systems.

(A) Site Restrictions.

1. Subsurface systems shall—

A. Exclude unstabilized fill and soils that have been highly compacted and/or disturbed, such as old road beds, foundations, or similar things;

B. Provide adequate surface drainage where slopes are less than two percent (2%);

C. Provide surface and subsurface water diversion where necessary, such as a curtain or perimeter drain; and

D. Have a ten foot (10') buffer from the property line.

2. The vertical separation between the bottom of the drip lines and/or the trench and a limiting layer, including but not limited to, bedrock; restrictive horizon; or seasonal high water table, shall be no less than:

A. Twenty-four inches (24"); or

B. Twelve inches (12") for systems dispersing secondary or higher quality effluent; or

C. Forty-eight inches (48") where karst features are present unless the site can be reclassified.

(B) Preliminary treatment. Subsurface systems shall be, at a minimum, preceded by preliminary treatment. For design of a secondary treatment system, follow the provisions in 10 CSR 20-8.180 or section (3) of this rule.

(C) Loading rates shall not exceed the values assigned by the site and soil evaluation.

(8) Low Pressure Pipe (LPP) Subsurface Systems.

(A) Design.

1. The LPP system shall be sized in accordance with the following equations, Equation 200-2 and Equation 200-3:

Equation 200-2

$$A = \frac{Q}{LTAR}$$

and

Equation 200-3

$$L = \frac{A}{5\ ft}$$

where:

A = Minimum LPP soil treatment area (square feet (sq.ft))

L = Minimum total length of LPP trench (ft)

Q = Maximum daily wastewater flow (gallons per day (gpd))

LTAR = Long term acceptance rate (gpd/sq.ft). This is the lowest reported LPP soil loading rate between the soil surface and at least twelve inches (12") below the specified LPP trench bottom, or as approved by the Missouri Department of Natural Resources (department).

2. All network piping and low pressure distribution piping and fittings with polyvinyl chloride (PVC) shall meet ASTM Standard D 1785 *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, or 120* as approved and published August 1, 2015, or equivalent rated to meet or exceed ASTM D2466 *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings* as approved and published August 1, 2017. These standards shall hereby be incorporated by reference into this rule, as published by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. This rule does not incorporate any subsequent amendments or additions.

3. Manifold design shall address freeze protection while assuring uniform distribution and to minimize drain down of laterals into other laterals at a lower elevation between dosing events.

(B) Dosage. The dosing frequency shall be based on the soils report and the dosing volume in zoned systems.

(C) Orifices and Orifice Shielding.

1. The orifice number and spacing shall be designed to provide a distribution of no more than six square feet per orifice with an orifice size of not less than one-eighth inch.

2. The distal pressure shall be designed and maintained at the end of each lateral to be no less than two feet (2 ft) (0.87 psi) when using three-sixteenth inch (3/16") or larger diameter orifices, and no less than five feet (5 ft) (2.18 psi) when using orifices smaller than three-sixteenth inch (3/16").

(9) Drip Dispersal Subsurface Systems.

(A) Design.

1. The location and size of the drains and buffers must be factored into the total area required for the drip dispersal system.

2. The drip dispersal system shall be sized with the minimum soil treatment area and total length, in accordance with the following equations, Equation 200-4 and Equation 200-5:

Equation 200-4

$$A = \frac{Q}{HLR}$$

Equation 200-5

$$L = \frac{A}{2 \text{ feet}}$$

Where:

A = Minimum soil treatment area (square feet (sq. ft))

Q = Maximum daily wastewater flow (gallons per day (gpd))

HLR= Maximum hydraulic loading rate determined in the soils report (gpd/sq.ft)

L = Minimum total length (ft)

(B) Lines.

1. The drip dispersal lines shall be placed at a minimum depth of six inches (6") below the surface.

2. Emitters and drip dispersal lines shall be placed at a minimum on a two foot (2') spacing to achieve even distribution of the wastewater and maximum utilization of the soil.

AUTHORITY: section 644.026, RSMo 2016. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed June 15, 2018, effective Feb. 28, 2019.*

**Original authority: 644.026, RSMo 1972, amended 1973, 1987, 1993.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PUBLIC COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS; Anyone may file a statement in support of or in opposition to this proposed amendment in writing, with the Department of Natural Resources, Water Protection Program, Attn: Cindy LePage, P.O. Box 176, Jefferson City, MO 65102, by email at cindy.lepage@dnr.mo.gov, or by using the Regulatory Action Tracking System, or RATS, at https://apps5.mo.gov/proposed-rules/welcome.action#OPEN. To be considered, comments must be received by the end of the public comment period, which is 5 pm XX/XX/XXXX. A public hearing is scheduled for XX/XX/XXXX at the Department of Natural Resources, Lewis and Clark State Office Building, 1101 Riverside Drive, Jefferson City, MO 65101. Attendance by Webex is also available at