Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharrette/Nightingale Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

November 2, 1011

Proposed Rule for
10 CSR 20-8.300 Manure Storage Design Regulations
Public Hearing

Issue: Public Hearing on the Proposed Rule 10 CSR 20-8.300, Manure Storage Design Regulations.

Background: The Department has developed regulations specifically for the design of manure management systems. These regulations were developed by a team of experts and further analyzed in stakeholder's meetings held on September 28, 2010 and October 26, 2010.

The Regulatory Impact Report (RIR) was open for public comment from December 15, 2010 through February 14, 2011. No comments were received on the RIR.

On August 15, 2011 the proposed rule 10 CSR 20-8.300 Manure Storage Design Regulations was placed on public notice. The public comment period is from August 15, 2011, the date of publication in the *Missouri Register*, through November 16, 2011.

Recommended Action: No action is requested. This is an opportunity for staff, and the public, to present and comment on the proposed rule 10 CSR 20-8.300 Manure Storage Design Regulations.

Suggested Motion Language: Hearing only.

List of Attachments:
Proposed rule 10 CSR 20-8.300, Manure Storage Design Regulations published in the *Missouri Register* on August 15, 2011.

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

PROPOSED RULE

10 CSR 20-8.300 Manure Storage Design Regulations

PURPOSE: This rule sets forth specific design criteria for manure management systems and guidelines for preparing and submitting construction permit applications for concentrated animal feeding operations. This rule shall be used together with 10 CSR 20-6.300 Concentrated Animal Feeding Operations.

(1) Definitions.

(A) Definitions as set forth in the Missouri Clean Water Law, Chapter 644, Concentrated Animal Feeding Operation (Hog Bill) section 640.703, RSMo, 10 CSR 20-2.010, and 10 CSR 20-6.300 shall apply to the terms in this rule unless otherwise defined by subsection (1)(B) below.

(B) Other applicable definitions are as follows:

1. Design storage period—The calculated number of days that will fill the manure storage structure from the lower to the upper operating level during a period of average rainfall minus evaporation (R-E).

A. For a design storage period of fewer than three hundred sixty-five (365) days, the largest consecutive average monthly R-E, corresponding with the number of months of the storage period, shall be used.

B. For multiple storage stages, the storage period is the sum of available storage days in each stage;

2. Freeboard—The elevation difference between the bottom of the spillway to the top of the berm for an earthen manure storage basin;

3. Groundwater table—The seasonal high water level occurring beneath the surface of the ground, including underground watercourses, artesian basins, underground reservoirs and lakes, aquifers, other bodies of water located below the surface of the ground, and water in the saturated zone. For the purposes of this rule, groundwater table does not include the perched water table;

4. Manure—The fecal and urinary excretion of animals and process wastewater and dry process waste as defined in 10 CSR 20-6.300(1)(B);

5. Missouri Concentrated Animal Feeding Operation Nutrient Management Technical Standard (NMTS)—The current version of the technical standard published by the department;

6. Rainfall minus evaporation (R-E)—The average depth of monthly liquid precipitation minus evaporation as published in the most recent National Weather Service Climate Atlas for the geographical region of the proposed structure;

7. Safety depth—One foot (1') of liquid depth or the depth needed to hold the volume of the ten (10)-year, ten (10)-day storm, whichever is greater;

8. Solid manure—Manure that can be stacked without free flowing liquids;

9. Storage volume—The volume of manure between the lower and upper operating levels; and

10. Ten (10)-year, ten (10)-day storm—The depth of rainfall occurring in a ten (10)-day duration over a ten (10)-year return frequency as defined by the most recent publication of the National Weather Service Climate Atlas for the geographical region of the proposed manure storage structure.

(2) General.

(A) The manure storage design regulations shall be utilized by all animal feeding operations (AFOs) which need or desire permit coverage. These regulations shall be used when evaluating all new AFOs or new or expanded components of existing AFOs after April 30, 2012.

(B) These design regulations may also be applicable to other types of agricultural waste management systems regulated by the department. Other facilities that wish to use this regulation when preparing a permit application shall first obtain written approval from the department.

(C) Careful consideration should be given to the type of storage, treatment, and land application before choosing a final system design. Important factors to consider include: location and topography of the operation; concentration and quantity of the manure to be managed; land available for manure utilization; operating costs; and the probable type of supervision and maintenance the operation will require.

(D) New Processes, Methods, and Equipment. The policy of the department is to not obstruct the development of new methods, equipment, and management practices for manure management. The lack of inclusion in this standard of a particular type of treatment process or equipment should not be construed as precluding its use. The department will approve other types of processes or equipment under the following conditions:

1. The operational reliability and effectiveness of the process or device shall have been demonstrated with a suitably-sized prototype unit operating at its design load conditions to the extent required by the department; and

2. The department may require additional tests including:

A. Results and engineering evaluations demonstrating the efficiency of the processes or equipment; and

B. Appropriate, independent testing/evaluation conducted under the supervision of an engineer not employed by the manufacturer or developer.

(3) Permit Application Documents. Applications for a construction permit, or for an operating permit that did not previously receive a construction permit, shall submit one (1) set of documents described in this section for department approval as part of the permit application process.

(A) Engineering Documents. The engineering documents shall provide the basic information, present design criteria and assumptions, examine alternate systems, where appropriate, and provide plans and specifications. The documents shall also include process description, sizing, data, controlling assumptions, and considerations for the functional operation of a manure management system. All engineering documents shall be prepared by or under the direct supervision of a registered professional engineer licensed to practice in Missouri. The department will not examine the adequacy or efficiency of the structural, mechanical, or electrical components of the manure management systems, only adherence to rules and regulations.

1. Engineering report—The following paragraphs should be utilized as a guideline for the content of the project engineering report to be submitted to the department for review and approval:

A. Letter of transmittal. A one (1)-page letter typed on the design engineer's letterhead should be included in the submission of the report;

B. Title page. Title of project, date, operation's name and address, name and address of firm preparing the report, and seal and signature of the engineer;

C. Project location map. This map shall include state and county roads, county boundaries, and city boundaries, and show the location of the proposed project;

D. The table of contents shall include section and subsection headings. All pages of the report shall be numbered and the table of contents shall reference these numbers;

E. Narrative project summary. This section should provide an explanation of any existing conditions at the operation and a summary of the proposed modifications to the operation;

F. Technical information and design criteria. This section should include the design data, calculations, all assumptions, and all

relevant information used to justify the design. If the engineering documents contain known deviations from the design criteria contained in this rule, documentation and justification for the deviation should be submitted with the design criteria. The following items should be included:

(I) Each animal type and number within the production area, the maximum design animal capacity, and the average weight for each animal type;

(II) A detailed explanation of the process by which manure is deposited, handled, managed, and transferred within the operation;

(III) Calculations showing the estimated annual amount of manure generated at the production area.

(a) Where possible, design manure volume shall be based on past operating records or operating data from facilities with similar feed inputs and animal characteristics. Documentation of these volumes shall be included.

(b) If operating data is not available, the design manure volume shall be estimated using the most recent edition of a research-based reference. The reference name, edition, and data shall be included;

(IV) Design calculations justifying the size of manure storage structures. For anaerobic treatment lagoons, the volume of treatment shall be based on the geographical region of the proposed structure and calculated using the most recent edition of a research-based reference. The reference name, edition, and data shall be included;

(V) Depth and volume tables on at least one-foot (1') increments for all manure storage basins with design operating depths clearly identified;

(VI) Collection, treatment, and disposal of all domestic wastewater flows associated with the operation; and

(VII) If applicable, justifications for constructing an uncovered manure storage structure. Covered storages are preferred due to the lower risk of environmental damage from excessive rainfall;

G. Soils report/soils information. The engineering report shall contain county soil survey information for the soil types and characteristics of the production areas. Unless required otherwise by the department, soils information shall include soil series name, soil texture, soil permeability, and water-holding capacity. If a county soils map is available, the approximate boundaries of the different soils shall be shown. When applicable, the engineering report shall incorporate all recommendations by the Division of Geology and Land Survey. Any soil boring logs shall also be included in the report; and

H. Operation and maintenance plan—An operation and maintenance plan shall be provided to explain the key operating procedures. At a minimum, the plan shall address operation and maintenance of mechanical equipment.

2. General layout drawings. Plans shall include both an aerial and a topographic map or drawing that shows the spatial location and extent of the production area. Each drawing or map must be easily readable and include a visual scale, a north directional arrow, a fixed geographic reference point, and the date the drawing or map was completed. Each drawing or map shall include the following:

A. All confinement barns, open lots, manure storage, and control structures, along with the other various components of the operation such as areas designated for stockpiling, composting, and for the management of animal mortalities;

B. The source of the operation's water supply and all wells within three hundred feet (300') of the production area; and

C. The location of all surface water features within the boundaries or immediately adjacent to the production area.

3. Construction plan drawings. Plan drawings shall include the following:

A. The name of the operation and the scale in feet, a graphic scale, a north directional arrow, and the signed and dated engineer's seal;

B. The plans shall be clear and legible. They shall be drawn to a scale which will permit all necessary information to be plainly shown. The size of the plans generally should not be larger than thirty inches by forty-two inches (30" × 42"), with a preference for smaller sizes;

C. Locations of all test borings with date shall be shown on the plans;

D. Detail plans shall consist of plan views, elevations, sections, and supplementary views which, together with the specifications and general layouts, provide the working information for the construction of the containment facilities; and

E. Include dimensions and relative elevations of structures, the location and outline form of equipment, storage tanks, location and size of piping, and ground elevations.

4. Specifications. When specifically directed by the department, technical specifications shall accompany the plans.

(B) Other Documents.

1. Neighbor notice and buffer verification. One (1) copy of the neighbor notice letter and proof that the notification has been sent. A map shall also be included that meets the requirements of 10 CSR 20-6.300(3)(C)4.

2. Geohydrologic evaluation by the department's Division of Geology and Land Survey. This is required only for proposed earthen manure storage basins.

3. An emergency response plan, if not included in the nutrient management plan.

(C) Nutrient Management Plan. The application shall include a nutrient management plan that meets the specifications of the NMTS and the requirements of 10 CSR 20-6.300(5). This plan shall include:

1. Land application maps—An aerial, topographic, and soils map that shows the spatial boundaries of planned land application areas. The aerial map(s) must clearly show the following within three hundred feet (300') beyond the field boundaries:

A. The location and extent of all permanent flowing streams, intermittent flowing streams, wetlands, and sinkholes;

B. Open tile line intake structures that will not be plugged during land application;

C. Lakes, reservoirs, or other private and publicly-owned water impoundments;

D. Private and public wells;

E. Public roads;

F. Public use areas;

G. Public dwellings; and

H. Property boundaries; and

2. All additional components necessary to prove compliance with 10 CSR 20-6.300(5).

(4) Revisions to Approved Plans. Deviations from approved plans affecting storage capacity, flow, or location must be approved in writing before these changes are made. Revised plans shall be submitted well in advance of any construction work which will be affected by these changes to allow sufficient time for review and approval. Structural revisions or other minor changes not affecting storage capacity, flow, or location will be permitted during construction without approval. As-built plans clearly showing these alterations shall be submitted to the department after the completion of the work.

(5) Location.

(A) Protection from Flooding—Manure storage structures, confinement buildings, open lots, composting pads, and other manure storage areas in the production area shall be protected from inundation or damage due to the one-hundred (100)-year flood.

(B) The minimum setback distances from manure storage structures, manure storage areas, confinement buildings, open lots, or mortality composters are as follows:

1. Ten feet (10') to public water supply pipelines;

2. Fifty feet (50') to property lines;

3. Fifty feet (50') to public roads;

4. One hundred feet (100') to wetlands, ponds, or lakes not used for human water supply;

5. One hundred feet (100') to gaining streams (classified or unclassified; perennial or intermittent);

6. Three hundred feet (300') to human water supply lakes or impoundments; and

7. Three hundred feet (300') to losing streams (classified or unclassified; perennial or intermittent) and sinkholes.

(C) Distances from earthen manure storage basins shall be measured from the outside edge of the top of the berm.

(D) Separation distance from wells for manure storage structures or confinement buildings shall be in accordance with 10 CSR 23-3.010.

(E) An all-weather access road shall be provided from a public road to the AFO. Sufficient room shall be provided at the site to permit turning vehicles around. In determining the type of roadway and method of construction, consideration shall be given to the types of vehicles and equipment necessary to maintain and operate the AFO.

(6) Manure Storage Sizing.

(A) No Discharge Requirement. All manure storage structures shall comply with the design standards and effluent limitations of 10 CSR 20-6.300(4).

(B) Design Storage Period.

1. The recommended design storage period is three hundred sixty-five (365) days.

2. The minimum design storage period for liquid manure and for solid manure that will be used in the land application area is one hundred eighty (180) days.

3. Solid manure to be sold or used as bedding shall have a minimum design storage period of ninety (90) days unless justification is given for a shorter time period.

4. An operation proposing an uncovered, liquid manure storage structure, *with less than three hundred sixty-five (365) days of storage*, will be evaluated based upon the ability to actively manage the system. The following, at a minimum, will be evaluated:

A. Does the AFO owner(s) have at least fifty percent (50%) ownership in the land application equipment;

B. Does the AFO owner(s) own at least fifty percent (50%) of the needed annual land application area;

C. Is at least fifty percent (50%) of the needed annual land application area in permanent, perennial vegetation; and

D. Is the available equipment and labor capable of lowering the liquid level by ten percent (10%) of the storage volume in one (1) working day?

5. The design storage period must be accounted for in the Nutrient Management Plan.

6. The minimum design storage period for anaerobic treatment lagoons without an impermeable cover is three hundred sixty-five (365) days.

(C) New Class I swine, veal, or poultry operations shall evaluate proposed uncovered manure storage structures in accordance with applicable federal regulation as set forth in 40 CFR 412.46(a)(1), November 20, 2008, which is hereby incorporated by reference, without any later amendments or additions, as published by the Office of the Federal Register, National Archives and Records Administration, Superintendent of Documents, Pittsburgh, PA 15250-7954.

(D) Sizing Manure Storage Structures.

1. The structure shall be designed to hold all inputs, between the upper and lower operating levels, anticipated during the design storage period. This typically includes:

A. Animal manure;

B. Bedding material;

C. Wash water;

D. Flush water (excluding recycled flush water);

E. Cooling water for animals or from equipment; and

F. Runoff from pervious and impervious areas, due to average rainfall.

2. Uncovered liquid storages shall also include:

A. R-E from the surface of the structure, held between the operating levels; and

B. Safety depth, above the upper operating level.

3. Tanks and pits shall also include six inches (6") of depth below the lower operating level for incomplete removal allowance unless there is adequate justification for not including this depth.

4. Earthen manure storage basins shall also include:

A. Freeboard of at least one foot (1'). Two feet (2') is required for structures that receive storm water from open lots larger than the surface area of the storage structure;

B. Two feet (2') of permanent liquid depth below the lower operating level. Anaerobic treatment volume greater than two feet (2') will satisfy this requirement;

C. Sludge accumulation volume; and

D. Anaerobic treatment lagoons shall include treatment volume below the lower operating level.

(7) Construction and Maintenance of Earthen Manure Storage Basins.

(A) Geohydrologic Evaluation. A geohydrologic evaluation of the proposed earthen manure storage basin prepared by the department's Division of Geology and Land Survey shall be submitted. To obtain a geohydrologic evaluation of the proposed site, the engineer shall submit the appropriate request form to the Division of Geology and Land Survey. All potential basin sites will receive two (2) ratings from the geohydrologic evaluation. The ratings will infer the relative geological limitations for designing and constructing a basin at the site in question.

1. Collapse potential rating. If the geohydrologic evaluation gives a severe rating for collapse potential, an earthen basin is not acceptable. Concrete or steel structures or an alternate site should be considered.

2. Overall geologic limitations rating. Sites that have a severe rating for the overall geologic limitations but a slight or moderate collapse potential will be reviewed on a case-by-case basis. The department may require artificial liners or additional geotechnical exploration and design implementation and/or post-construction testing in these situations.

(B) Detailed Soils Investigation.

1. A detailed soils investigation is required to substantiate feasibility. The quantity and quality of soil materials on-site and from a borrow area must be identified and evaluated for use in the basin and/or liner.

2. Exploration shall be sufficient to identify and define the quantity and quality of the soil material. The use of test pits, split spoon (barrel), or thin-walled tube sampling or a combination of these techniques may be used depending on the total area of investigation and the depth to which exploration is needed. The following information, in whole or in part, is required:

A. Atterburg limits;

B. Standard proctor density (moisture/density relationships);

C. Coefficient of permeability (undisturbed and remolded);

D. Depth to bedrock;

E. Particle size analysis; and

F. Depth to seasonal high groundwater table.

3. Information gathered from the investigation shall be presented on a map drawn to scale. Slope, location, and other surface features should also be included. The soil profile should be shown of the representative soil material. Copies of original boring and other soil test logs shall also be included. An interpretation of the collected data shall be incorporated into the report. Any site constraints and how they will be dealt with should be discussed.

(C) Shape and Location.

1. Shape of cells. The shape of all cells should be such that there are no narrow or elongated portions. Round, square, or rectangular

cells (length not exceeding three (3) times the width) are recommended. No islands, peninsulas, or coves shall be permitted.

2. Constant elevation of floor. The floor of the structure shall be a consistent elevation. Finished elevations shall not be more than three inches (3") above or below the average elevation of the floor.

3. Distance to groundwater and bedrock. The floor of the basin shall be at least four feet (4') above the high water table or the water table as modified by subsurface drainage. In addition, the floor shall be at least two feet (2') above bedrock. For perched water tables, a curtain drain with a positive outlet may be installed around the structure to permanently lower the water table.

(D) Slopes. Inner and outer berm slopes shall not be steeper than three to one (3:1), horizontal to vertical. Inner slopes shall not be flatter than four to one (4:1). Consideration may be given to steeper inner slopes provided special attention is given to stabilizing the slope with rip-rap, concrete, or other rigid materials. These stabilization methods shall be specified. The flatness of the outer slope is of no concern provided surface water can be diverted around the lagoon. Long outer slopes should be flatter than three to one (3:1) to assist in safe mowing of vegetation.

(E) Berm Construction and Width.

1. Soil used in constructing the basin floor (not including clay liner) and berm cores shall be relatively incompressible, tight, and compacted between two percent (2%) below and four percent (4%) above the optimum water content and compacted to at least ninety percent (90%) standard proctor density.

2. Compaction of lifts for berm construction shall not exceed twelve inches (12").

3. Maximum rock size should not exceed one-half (1/2) of the thickness of the compacted lift.

4. The minimum top of berm width shall be four feet (4'). If large equipment is to be used for mowing, a top minimum width of at least eight feet (8') shall be provided.

(F) Emergency Spillway. To prevent overtopping and cutting of berms, an emergency overflow shall be provided. The spillway shall—

1. Be located in the location with the minimum amount of constructed earthen fill;

2. Provide passage of liquid at a safe velocity to a point outside of the berm(s);

3. Have a minimum bottom width of ten feet (10') and a minimum depth of one foot (1'); and

4. Be compacted and vegetated or otherwise constructed to prevent erosion due to possible flow.

(G) Compacted Clay Liner. The following criteria are for design and construction of soil liners. Engineering reports, plans, and specifications should address these criteria.

1. Soils information. The soils used for construction of an earthen basin liner should meet the following minimum specifications:

A. Be classified under the Unified Soil Classification Systems as CL, CH, GC, or SC;

B. Allow more than fifty percent (50%) passage through a Number 200 sieve;

C. Have a liquid limit equal to or greater than thirty (30);

D. Have a plasticity index equal to or greater than twenty (20); and

E. Have a coefficient of permeability equal to or less than 1×10^{-7} centimeters per second (cm/sec) when compacted to ninety percent (90%) of standard proctor density with the moisture content between two percent (2%) below and four percent (4%) above the optimum moisture content.

2. Liner construction.

A. Construction shall include scarification and compaction of base material between two percent (2%) below and four percent (4%) above the optimum water content and compacted to at least ninety percent (90%) standard proctor density.

B. Compaction of lifts shall not exceed six inches (6"). Maximum rock size should not exceed one-half (1/2) of the thickness of the compacted lift.

C. The completed seal shall be maintained at or above the optimum water content until the basin is prefilled with water in accordance with this section of the rule.

3. Permeability. All earthen basins shall be sealed so that seepage loss through the seal is minimized. The basin seal shall cover the floor and extend up the inner slope to where the side slope intersects with the top of the berm.

A. The design permeability of the basin seal shall not exceed five hundred (500) gallons per acre per day in areas where potable groundwater might become contaminated or when the wastewater contains industrial contributions of concern. Design seepage rates up to three thousand five hundred (3,500) gallons per acre per day may be considered in other areas where potable groundwater contamination is not a concern, provided that the cells will maintain adequate water levels to provide treatment and avoid nuisance conditions.

B. Liner thickness. The minimum thickness of the liner is twelve inches (12"). For soils which have a coefficient of permeability greater than 1×10^{-7} centimeter per second (cm/sec), unusual depth or potable ground water contamination potential, liner thickness of more than twelve inches (12") may be required. The following equation shall be used to determine minimum seal thickness:

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

where

K = permeability coefficient of the soil in question;

H = head (maximum water level depth) of water in the basin; and

t = thickness of the soil seal.

Units for H and t may be English (feet) or metric (meters); however, they must be the same.

4. Soil additives. Bentonite, soda ash, or other sealing aids may be used to achieve an adequate seal in systems using soil. The design shall include information on the type of soil additive and the method of application.

(H) Prefilling. The basin shall be prefilled in order to protect the liner, prevent weed growth, reduce odor, allow measurement of percolation losses, and maintain moisture content of the seal. However, the berms must be completely prepared before the introduction of water. If the clay liner is allowed to dry, the liner must be scarified and recompacted as described in this section of the rule.

(I) Protection of Berms.

1. Livestock, burrowing animals, and woody vegetation must be excluded from basins to protect the integrity of the berms and liners.

2. The berms, diversion ditches, and terraces shall be seeded and a good vegetative cover established to minimize erosion and aid in weed control. The inner berms should be seeded down to the upper operating level of the structure. Where the structure is not anticipated to reach its upper operating level during the first growing season, consideration should be given to further seeding on the berm slope. Long rooted grasses shall not be used for seeding of berms. Fertilization needs, mulching, and watering must be considered for all basins to ensure that a good growth of grass occurs rapidly and is sustained. Specifications shall detail specific amounts and variety of seeds to be used, mulching, and fertilizer requirements as appropriate and the proper time period for application to be reasonably assured that vegetative cover will be established.

3. Rip-rap or some other acceptable method of erosion control is required as a minimum around all piping entrances and exits. For aerated cell(s), the design should ensure erosion protection on the slopes and floor in the areas where turbulence will occur.

4. For basins with a surface area greater than five (5) acres, consideration shall be given to providing embankment protection from wave action.

(J) Alternative Liners. Seals consisting of asphalt, concrete, soil cement, or synthetic liners may be used provided the permeability, durability, and integrity of the proposed materials can be satisfactorily demonstrated for anticipated conditions.

(K) Percolation Losses. Measurement of percolation losses, when required, shall consider flow into and out of the lagoon, rainfall and evaporation, and changes in water level. Measured percolation losses in excess of one-sixteenth inch (1/16") per day will be considered excessive. The barrel test as described in 10 CSR 20-8.020(16) is an acceptable water balance study. Other tests will require department approval.

(L) Depth Gauges. A permanent depth measurement gauge or marker shall be installed and maintained in the basin and shall be easily readable at one-foot (1') increments or smaller. It shall clearly display the lower and upper operating levels and the spillway elevation. The gauge shall be placed in a suitable location where it is easily accessible during routine operations.

(M) Sludge Accumulation. Sludge levels shall be maintained so as to not reduce the approved storage volume of the basin.

(8) Construction of Tanks and Pits.

(A) Soils and Foundation. A thorough site investigation shall be made to determine the physical characteristics and suitability of the soil and foundation for the fabricated storage structure. The floor of the below-ground storage tanks shall be two feet (2') above the high water table unless curtain drains or interception drains are installed around the perimeter of the structure to permanently lower the water table. The drain shall be at an elevation of at least one foot (1') below the floor to permanently lower the water table. A sump or a positive outlet for the drain shall be provided.

(B) Depth Allowance for Agitation and Ventilation. An allowance of one foot (1') should be provided at the top of covered structures for agitation and/or ventilation requirements.

(C) Depth Gauges. Uncovered tanks and pits shall include a permanent depth measurement gauge or marker that is easily readable at one-foot (1') increments or smaller.

(D) Footing Drains/Perimeter Tiling. Perimeter tiling and granular backfill are required for below ground pits unless justification is given that they are not needed. Tiles should be located below the base of the outside of the footing. At least two feet (2') of granular drain material, such as pea gravel or three-quarter inch (3/4") crushed rock shall be placed around the tile. A positive outlet or sump for the drain shall be provided.

(E) Tank and pit footings are to be located at or below the maximum frost depth unless adequate justification is given that it is not needed. A compacted foundation of frost-free material such as drained granular material, extending to below frost depth, may be used as an alternate to extending the structural footing.

(F) Concrete and steel features shall be designed according to published guidelines. These guidelines must be referenced in the application packet.

(G) Watertight Requirement. Tanks and pits must be designed, constructed, and maintained to be watertight.

(9) Construction of Solid Manure Systems. This section covers the construction of poultry buildings, open lots, stacking pads, and other similar structures.

(A) Surface water shall be diverted around or away from animal confinement areas and buildings.

(B) Floors and Pads. The base of covered and uncovered lots, poultry buildings, and other solid manure storage areas can be made of concrete or other rigid, essentially watertight materials *or* from a firm, compacted, earthen base that meets the following criteria:

1. The floor shall be evaluated for suitable soils and groundwater table to a depth of four feet (4') below the proposed floor elevation;

2. The finished earthen floor shall be a minimum of two feet (2') above the apparent high water table or the water table as modified by subsurface drainage;

3. The finished earthen floor shall be at least two feet (2') above bedrock;

4. The existing soils shall have at least one (1) continuous foot of suitable soils within four feet (4') of the proposed earthen floor in order to use existing soils without amendments. Suitable soils are defined in this section as Unified Soil Classification System (USCS) class CH, MH, CL, GC, or SC and permeability group III or IV according to the United States Department of Agriculture's (USDA's) National Engineering Handbook, Agricultural Waste Management Field Handbook;

5. Existing soils can be modified using soil amendments provided that the modified soil has at least one (1) compacted, continuous foot of soil modified to meet permeability group III or IV;

6. Borrow soils can be used for the floor. Borrow soils must provide at least one (1) compacted, continuous foot of suitable soils as defined above; and

7. The use of one (1) five foot (5')-deep test pit, near the center of each proposed set of four (4) buildings, or each acre, will generally be sufficient to satisfy the intent of this section.

(C) Uncovered solids storage areas must also meet the following:

1. Have an overall slope between two percent (2%) and four percent (4%) for unpaved lots;

2. Be maintained in a way that prevents ponding; and

3. Have a runoff collection structure that meets the requirements of this rule.

(D) Roofed areas of five thousand (5,000) square feet or less, that are used for mortality composting or to store solid manure, are exempt from the requirements of this section.

(10) Temporary Stockpiling of Solid Manure.

(A) Temporary stockpiling of uncovered solid manure within the production area, without runoff collection, is not allowed.

(B) Temporary stockpiling within the land applications areas shall be in accordance with the following:

1. Location.

A. Any temporary stockpiles need to be placed to prevent storm water from draining into or through the pile. If storm water does drain through the pile, a one-foot (1') berm will be required on the up-slope side of the pile.

B. No location shall be used for stockpiling for more than two (2) weeks, unless the pile is covered.

C. Separation distances shall be maintained between the stockpile and other features as follows:

(I) Three hundred feet (300') from any losing stream, well, sinkhole, water supply (for human consumption) reservoir, non-owned dwelling or residence, public building, or public use area;

(II) One hundred feet (100') from intermittent and permanent flowing streams; and

(III) Fifty feet (50') from public roads and property lines.

D. Stockpiles cannot be placed on slopes steeper than six percent (6%).

2. Size. No temporary storage site can be larger than two (2) acres.

3. Formation. All piles shall be placed so as to minimize forming pockets, hollows, or mini-dams that would collect and hold water. One (1) pile with an angle of repose so that it forms a crust and will tend to shed water off the pile will be the desirable design. If there are two (2) or more stockpiles, they should be placed far enough apart that they do not trap and hold water.

4. In no case shall runoff from a stockpile cause a violation of water quality standards.

(11) Design and Construction of Pipelines, Pump Stations, and Land Application Systems.

(A) General. Design of pipelines shall be in accordance with sound engineering principles considering the manure properties, management operations, exposure, etc.

1. The minimum pipeline capacity from storage/treatment facilities to utilization areas shall ensure the storage/treatment facilities can be emptied within the time limits stated in the nutrient management plan.

2. All pipes shall be designed to convey the required flow without plugging, based on the type of material and total solids content.

3. All pressure pipelines shall be installed at a depth sufficient to protect against freezing.

4. Pipelines shall be installed with appropriate connection devices to prevent contamination of private or public water supply distribution systems and ground water.

5. Pumps shall be sized to transfer material at the required system head and volume. Type of pump shall be based on the consistency of the material and the type of solids. Requirements for pump installations shall be based on manufacturer's recommendations.

6. The top of all pipelines entering or crossing streams shall be at sufficient depth below the natural floor of the stream bed to protect the pipe. The top of the pipe should be a minimum of three feet (3') below the natural stream floor. Pipelines crossing streams should be designed to cross the stream as nearly perpendicular to the stream flow as possible. Aerial pipeline crossing of streams shall be in accordance with 10 CSR 20-8.120(9).

7. Buried pipeline crossings under roads shall be properly cased.

8. Potable water line and buried manure pipeline separation. There shall be no permanent physical connection between a potable water supply and buried manure pipeline or appurtenances thereto which will permit the passage of wastewater or contaminated water into the potable water supply. Whenever possible, buried manure pipelines and pump stations should be located at least ten feet (10') horizontally from any existing or proposed water line. Should local conditions prevent a lateral separation of ten feet (10'), a manure pipeline may be laid closer than ten feet (10') if it is in a separate trench or if it is in the same trench with the waterline located at one (1) side on a bench of undisturbed earth. In either case, the elevation of the top of the manure pipeline must be at least eighteen inches (18") below the base of the water line.

(B) Gravity Pipelines.

1. The minimum slope for a gravity pipe installation is one percent (1%). The design slope shall account for the head differential and the percent solids of the manure.

2. Clean-out access shall be provided for gravity pipelines at a maximum interval of one hundred fifty feet (150') unless an alternative design is approved. Gravity pipelines shall not have horizontal curves or bends except minor deflections (less than ten (10) degrees) in the pipe joints unless special design considerations are used.

3. Gravity discharge pipes used for emptying a storage/treatment structure shall have a minimum of two (2) gates or valves in series, one (1) of which shall be manually operated.

(C) Force Mains and Pressure Pipes. To minimize settling of solids in the pipeline, design velocities shall be between three (3) and six (6) feet per second.

(D) Testing. Hydro-pressure tests shall be made only after the completion of backfilling operations and after the concrete thrust blocks have set for at least thirty-six (36) hours.

1. The duration of pressure tests shall be a minimum of one (1) hour unless otherwise directed by the engineer.

2. The minimum test pressure shall be the maximum system operating pressure. All tests are to be conducted under the supervision of the engineer.

3. The pipe line shall be slowly filled with water. The specified pressure measured at the lowest point of elevation shall be applied by means of a pump connected to the pipe in a manner satisfactory to the engineer.

(E) Pump Stations.

1. Water supply protection. There shall be no physical interconnection between any potable water supply and a pump station or any of its components which under any conditions might cause contamination of a potable water supply unless otherwise approved by the department's Division of Geology and Land Survey. Manure pumping stations shall be located at least three hundred feet (300') from any potable water supply well.

2. Alarm systems. Alarm systems are required for pumping stations where a failure could cause an overflow. Alarm systems shall be activated in cases of power failure, pump failure, or any cause of high water in the wet well.

(F) Land Application Systems. The following shall be considered in the design of land application systems:

1. Any spray application equipment specified shall minimize the formation of aerosols;

2. The pumping system and distribution system shall be sized for the flow and operating pressure requirements of the distribution equipment and the application restrictions of the soils and topography;

3. Provisions shall be made for draining the pipes to prevent freezing, if pipes are located above the frost line;

4. A suitable structure shall be provided for either a portable pumping unit or a permanent pump installation. The intake to the pumping system shall provide the capability for varying the withdrawal depth. The intake elevation should be maintained twelve to twenty-four inches (12"–24") below the liquid elevation. The intake shall be screened so as to minimize clogging of the sprinkler nozzle or distribution system orifices. For use of a portable pump, a stable platform and flexible intake line with flotation device to control depth of intake will be acceptable;

5. Thrust blocking of pressure pipes shall be provided. For use of above-ground risers for sprinklers, a concrete pad and support bracing should be considered; and

6. Automatic pump or engine shut-offs, in case of pressure drop, are required.

(12) General System Details.

(A) Mechanical Equipment. Mechanical equipment shall be used and installed in accordance with manufacturers' recommendations and specifications. Major mechanical units should be installed under the supervision of the manufacturer's representative.

(B) Construction Materials. Due consideration should be given to the use of construction materials which are resistant to the action of hydrogen sulfide and other corrosives frequently present in manure.

(C) Grading and Groundcover. Upon completion of construction, the ground shall be graded and reseeded to prevent erosion and the entrance of surface water into any storage structure or animal confinement area.

(D) Potable Water Supply Protection. No piping or other connections shall exist in any part of the manure management system which, under any conditions, might cause the contamination of a potable water supply.

(13) Groundwater Monitoring. An approved groundwater monitoring program may be required around the perimeter of a manure storage site and/or land application areas to facilitate groundwater monitoring. The necessity of a groundwater monitoring program, which may include monitoring wells and/or lysimeters, will be determined by the department's Division of Geology and Land Survey on a case-by-case basis and will be based on potential to contaminate a drinking water aquifer due to soil permeability, bedrock, distance to aquifer, etc. Where the Division of Geology and Land Survey has deemed groundwater monitoring necessary, a geohydrological site characterization will be required prior to the design of the groundwater monitoring program.

(14) Mortality Management.

(A) Class I operations shall not use burial as a permanent mortality management method to dispose of routine mortalities.

(B) Operations shall first receive approval from the department before burying significant numbers of unexpected mortalities and shall conduct the burial in accordance with Missouri Department of Agriculture requirements. Rendering, composting, incineration, or landfilling, in accordance with Chapter 269, RSMo Supp. 2010,

shall be considered acceptable options and do not require prior approval.

AUTHORITY: sections 640.710 and 644.026, RSMo 2000. Original rule filed July 14, 2011.

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

PRIVATE COST: This proposed rule will cost private entities twenty-four thousand fifty dollars ($24,050) 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 rule with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, Barbara Li, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to barbara.li@dnr.mo.gov. Public comments must be received by November 16, 2011. The Missouri Clean Water Commission will hold a public hearing at 9:00 a.m., November 2, 2011, at the Lewis and Clark State Office Building, Nightingale Creek Conference Room, 1 East, 1101 Riverside Drive, Jefferson City, Missouri.

FISCAL NOTE
PRIVATE COST

I. Department Title: MISSOURI DEPARTMENT OF NATURAL RESOURCES
Division Title: Environmental Quality
Chapter Title: 10 CSR 20-8.300 Manure Storage Design Regulations

Rule Number and Title:	10 CSR 20-8.300 Manure Storage Design Regulations
Type of Rulemaking:	New rulemaking

II. SUMMARY OF FISCAL IMPACT

Estimate of the number of entities by class which would likely be affected by the adoption of the rule:	Classification by types of the business entities which would likely be affected:	Estimate in the aggregate as to the cost of compliance with the rule by the affected entities:
Four dairy operations each year	**New or expanding dairies**	**$20,400/yr**
Ten poultry operations each year	**New or expanding poultry operations**	**$2,500/yr**
One CAFO every three years	**Expanding CAFO of any animal type, currently located within the 100 year floodplain**	**$800/yr**
Seven swine operations every five years	**New or expanding swine operations with earthen basins**	**$350/yr**
Total Construction & Engineering costs		**$24,050/yr cost to comply in the aggregate**

III. WORKSHEET

1. Four new or expanding grazing dairies per year, spending an extra $4600 each to build a larger earthen manure storage basin plus $500 for additional soils investigation.

4 dairies/year x ($4,600 per dairy + $500) = $20,400/yr

2. Ten poultry operations spending $250 to conduct soils investigations per year, not previously required.

10 poultry operations/year x $250 per operation = $2,500/yr

3. One confinement operation building a levee to protect the expanding operation from the 100-year flood per year. This is estimated to happen only once every three years.

One (swine or other) operation x $2,400/3 years = $800/yr

4. Seven swine operations every five years spending an additional $500 on soils investigation per operation.

7 swine operation/5 years x $250 per operation = $350/yr

IV. ASSUMPTIONS

The past five years, January 2006 through December 2010, were used as a baseline to predict what will be built in the future.

The cost of compliance for new or expanding operations is $24,050.

All estimates were calculated based on 2010 dollar values. No inflation rate was used.

The costs are reported on an annual basis and will be incurred indefinitely.

This rule applies to new or expanding operations after the effective date of the rule. Only new operations or existing operations proposing a construction project will be impacted.

New grazing dairies will need to build larger earthen manure holding basins due to the increase in the minimum days of storage from 90 days to 180 days in an average year. Based on an analysis of the 20 grazing dairy basins permitted over the last five years, it is estimated that the rules will increase the cost of construction by about $4,600 per basin, which represents an increase of almost 30%. At four built per year, this is a total increase of $18,400/year. This cost will be incurred by the dairy owners.

There will be a new soil testing requirement before building earth-floored poultry houses. Forty-nine (49) permits have been issued for new sets of poultry houses in the last five years. The National Resource Conservation Service, NRCS, provides technical services on nearly all permitted poultry construction in Missouri. NRCS is assumed to incur the cost of analyzing the soil. They conduct a site visit already and therefore will not need to spend additional resources to classify the soil. If NRCS does not provide this service in the future, the private sector will need to provide the service. The expense of hiring a private soil scientist to conduct this evaluation is estimated at $250. For the purposes of this fiscal note, NRCS is assumed to provide this service.

The permittee will have to provide the open soils pit. Assuming that a backhoe is rented for this purpose, the cost estimate is $250 for the backhoe rental and associated costs. At approximately ten per year, the total annual cost is estimated at $2,500.

It is assumed there is no expense associated with *not* locating a poultry building at a location the previous regulations allowed. It is assumed that producers will select a different site rather than amend the soil or install a rigid floor.

The private sector will incur expenses to build a small levee to protect an expanding operation from the 100-year floodplain. For much of Missouri this will equate to two feet of elevation above the 25 year floodplain. The total cost of the small levee is estimated at $2,400. This will be a rare occurrence and will likely take place not more than once every three years. This leaves a total annual cost of $800 per year. There are no assumed expenses associated with *not* locating a new CAFO below the 100 year floodplain.

The proposed regulation will increase the required level of soil testing before building an earthen basin. NRCS provided technical services for most of the seven swine basins that the Department permitted in the last five years. NRCS reports that the increased testing will not affect them as their lab costs are fixed. Their clients building earthen basins will have to spend approximately $250 for the backhoe rental and associated costs. This was approximately five operations over the past five years, all swine operations.

The twenty dairy basins permitted in the last five years were designed by the private sector. Most private engineering firms were already using test pits and in-depth soils investigation, pre-construction. The increased cost to them for slightly more testing and preparing a soils report is estimated at $500/basin.

There were no increased costs resulting from the following assumptions.

Like the dairy basins, swine earthen basins will face increased days of storage requirements. Unlike grazing dairy basins, most swine basins are built as anaerobic lagoons with significantly more storage capacity. Over the past five years, only seven swine earthen basins were permitted and of these only three were newly built basins. Of these seven, only one would not meet the proposed regulatory changes. This anaerobic lagoon would have needed very minor modifications at negligible expense. Based on this analysis, the additional cost to meet the increased days of storage requirements for earthen basins, other than dairy, is zero.

New swine, veal and poultry basins will need to conduct an evaluation of their storage facility in accordance with federal regulations, including running a SPAW-Soil, Plant, Atmosphere and Water, model. A proposed swine or veal basin is unlikely due to the present use of superior technology. No such basins have been proposed in the last five years. Swine earthen basins are still being permitted, including seven within the last five years. Based on previous scenarios, basins with 365 days of storage need not be evaluated as the results will always be favorable. Only swine basins proposing less than 365 days of storage will need to run this scenario. Based on the swine basins built in the last five years, this is an unlikely scenario. Due to the unlikelihood, the projected cost is zero. If such an evaluation is deemed necessary, the models will likely be run by staff at MDNR or NRCS. This additional work can be absorbed by current staff without the need to hire additional people.

Neither the private nor public sector is expected to need additional staff to comply with this rule. Any additional review time will be offset by the time savings associated with having clearer guidance as to permitting requirements.

It was initially assumed that the USDA Natural Resources Conservation Service (NRCS) would incur additional expenses as a result of this rule. Upon further analysis, the Department, in conjunction with NRCS, has been determined that the additional costs will be absorbed by current staff and resources.