

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

July 13, 2016

**Clean Water Commission Order of Rulemaking  
10 CSR 20-8.300 Manure Storage Design Regulations**

**Issue:** The Department has prepared an Order of Rulemaking for the Manure Storage Design Regulation with an anticipated effective date of October 30, 2016.

**Background:** The purpose of this rule amendment is to specifically remove the construction permitting requirements for Concentrated Animal Feeding Operations (CAFO's) that will not have an earthen basin. The requirement for a construction permit will remain for the construction of an earthen basin in accordance with Missouri Revised Statutes 644.051.1 as revised in 2013. Rule language was also updated and design requirements were clarified. The proposed amendment also added specific requirements related to the design and construction of earthen basins.

This proposed regulation was discussed in a stakeholder meeting held on April 3, 2014. The Regulatory Impact Report (RIR) was open for public comment from October 19, 2015 to December 21, 2015. No comments were received on the RIR. The proposed amendment was published in the Missouri Register on March 1, 2016, and the comment period was open for 79 days ending on May 18, 2016. A public hearing was held before the Clean Water Commission on April 6, 2016.

During the public hearing, two people provided verbal comments on the proposed rule. Four public comment letters were received on the proposed rule. The Department considered these comments and made several minor wording changes to improve rule clarity. The comments and responses are presented in the attached "Order of Rulemaking." As a result of a comment the Fiscal Note for Private Costs was also revised.

**Recommended Action:** The Department requests the Commission approve the changes to the proposed text and approve the filing of the Order of Rulemaking for 10 CSR 20-8.300 Manure Storage Design Regulations.

**Suggested Motion Language:** "I move the Commission adopt the proposed Order of Rulemaking for 10 CSR 20-8.300 Manure Storage Design Regulation."

**List of Attachments:** Order of Rulemaking for 10 CSR 20-8.300 and Revised Fiscal Note for Private Costs.



**Title 10–DEPARTMENT OF NATURAL RESOURCES  
DIVISION 20–Clean Water Commission  
Chapter 8–Design Guides**

**ORDER OF RULEMAKING**

By the authority vested in the Clean Water Commission under section 644.02 RSMo 2011, the Clean Water Commission amends a rule as follows:

10 CSR 20– 8.300 is amended

A notice of proposed rulemaking containing the text of the proposed amendment was published in the *Missouri Register* on March 1, 2016 (41 MoReg 322-331). Those sections with changes are reprinted here. This proposed amendment would become effective thirty (30) days after publication in the *Code of State Regulations*.

**SUMMARY OF COMMENTS:** A public hearing was held on the proposed amendment on April 6, 2016. The public comment period ended on May 18, 2016. At the public hearing the Missouri Department of Natural Resources (department) staff explained the proposed amendment. Comments were provided by Robert Brundage (Newman, Comley & Ruth P.C., Missouri Pork Producers), Darrick Steen (Missouri Soybean Association and Missouri Corn Growers Association) and Stephen Jeffrey (Jeffrey Law Group LLC, Hickory Neighbors). Samuel Leake (Clean Water Commissioner) also noted a math error in the proposed fiscal note.

**COMMENT #1:** Robert Brundage expressed his support general support for the amendment and asked that the rulemaking move forward.

**RESPONSE:** The department appreciates the support. No change has been made as a result of this comment.

**COMMENT #2:** Commissioner Leake questioned the language in paragraph (5)(B)5. regarding excluding runoff “whenever possible,” noting that the requirement was unclear. In response to this question, Darrick Steen explained that the intent of the rule was to avoid adding this additional water to the lagoon wherever practical and if the water is not excluded then this volume it will have to be managed.

**RESPONSE AND EXPLANATION OF CHANGE:** To make sure the rule is clear, language in (5)(B)5. was revised so that the diversion of stormwater from entering the lagoon is clear.

**COMMENT #3:** The Missouri Pork Association suggested that valves not be required for gravity piping that serve flow into the basin.

**RESPONSE AND EXPLANATION OF CHANGE:** The proper design of this piping does not require valves for gravity piping that flows into the basin. Rule language was added to subsection (6)(O) to make this clear.

COMMENT #4: The Missouri Pork Association recommended that the minimum pipe slope of 1% be replaced with minimum slope requirements based on the size of the pipe being installed.

RESPONSE AND EXPLANATION OF CHANGE: The department has changed the rule to be consistent with guidance elsewhere in Chapter 8. Paragraph (10)(B)1. has been revised to require a minimum pipe slope in gravity pipelines of 1 percent for 4-inch pipe, 0.6 percent for 6-inch pipe, and 0.4 percent for 8-inch pipes.

COMMENT #5: Stephen Jeffrey recommended amending section (4) to require certification from a licensed professional engineer that the production area be protected from inundation by the 100-year flood; that any structure relied upon to provide such protection will not result in an increase of more than one foot in the base flood elevations; and that the lowest floor in structures located within 300 feet of a special flood hazard area be located at or above the base flood elevation.

RESPONSE: The suggested change is not within the scope of this rulemaking. The changes to section (4) in the proposed rule amendment were limited to rule re-numbering and the deletion of an unnecessary phrase. The issues regarding inundation were not discussed in stakeholder meetings nor raised prior to public hearing. This comment may be considered in future rulemakings.

COMMENT #6: The Missouri Pork Association suggested removing a reference to the "Hog Bill" from subsection (1)(A).

RESPONSE: No changes to section (1)(A) were proposed. Therefore, no changes to the language are possible because it is beyond the scope of this rule amendment. The rule properly mentions the appropriate statute and the removal of the reference to the "Hog Bill" may be considered in future rule revisions.

COMMENT #7: The Missouri Pork Association questioned why the definition of the Nutrient Management Technical Standard deleted.

RESPONSE: No change has been made as a result of this comment. The NMTS is a document that has been approved by the CWC and is incorporated by reference in 6.300. It is not a design requirement but provides guidance to developing a nutrient management plan.

COMMENT #8: The Missouri Pork Association questioned the need for so many new definitions.

RESPONSE: The new definitions were proposed to help clarify design requirements, are necessary for permit application review, and needed for the department's permit tracking system. In many cases they were added so that applicants would be clear about particular elements that need to be included as part of their application or are specifically needed for permit review. No changes were made to the rule as a result of this comment.

COMMENT #9: The Missouri Pork Association suggested changing the wording in (2)(D) from "obstruct" to "discourage".

RESPONSE: No changes to section (2)(D) were proposed. Therefore, no changes to the language are possible because it is beyond the scope of this rule amendment. The suggested change would serve to improve the clarity of the rule and this comment may be considered in future rule revisions.

COMMENT #10: The Missouri Pork Association suggested defining the term “earthen basin” including that they are not structures that hold stormwater, process wastewater, nor are they secondary containment structures.

RESPONSE: This term “earthen basin” is broadly applicable to structures that are constructed from soils or other native materials. No changes were made to the rule as a result of this comment.

COMMENT #11: The Missouri Pork Association questioned the purpose of requiring soils information and the effect on design and operation.

RESPONSE: Soils information is needed to determine the suitabilities and limitations that exist for the design and construction of certain structures. Soils information, as prepared by USDA-Natural Resources Conservation Service, is readily available from various sources at no charge. No change was made to the rule as a result of this comment.

COMMENT #12: The Missouri Pork Association questioned why “(4) Revisions to Approved Plans” was deleted.

RESPONSE: The process by which construction permits are obtained is detailed in sections (2) and (4) of 10 CSR 20-6.010 Construction and Operating Permits. Deviations from the design requirements and construction permit application revisions are specifically addressed in 10 CSR 20-6.010. The revised proposed purpose statement for 10 CSR 20-8.300 specifically mentions deviations. For these reasons, section (4) was found to be redundant and not necessary. No changes were made to the rule as a result of this comment.

COMMENT #13: The Missouri Pork Association questioned what the differences are between waste treatment and storage lagoons.

RESPONSE: Lagoons are classified based on their storage capacity; storage lagoons have a minimum capacity of 180 days storage period, waste treatment lagoons have a minimum capacity of 365 day storage period. No changes were made as a result of this comment.

COMMENT #14: The Missouri Pork Association proposed changing the wording in (5)(B)5. from “exclude” to “divert” and renumbering within this section

RESPONSE AND EXPLANATION OF CHANGE: The suggested language change was made. The new language makes the intention of this provision clearer. The numbering of the rule has also been changed according to acceptable rulemaking practice.

COMMENT #15: The Missouri Pork Association questioned the purpose of adding the safety requirement to section (7) and suggested being more specific in regards to safety design or

eliminating it from this rule since the Occupational Safety and Health Act regulates safety, not the department.

RESPONSE: It is prudent to consider safety issues at the time of design, and there have been times that department engineers have noticed opportunities to improve the safety of a design that was found to be helpful. This element was included in the proposed rule language based on a suggestion made by a stakeholder. There are no specific requirements, e.g. for fencing lagoons, other than addressing safety at each site as needed per structure type. No changes were made to the rule as a result of this comment.

COMMENT #16: The Missouri Pork Association suggested that the 300 foot setback distance from water supply wells be from “downgradient” wells.

RESPONSE: This requirement is found in section (2) of 10 CSR 23-3.010 Location of Wells. To be consistent, the general 300 foot setback distance has been retained.

COMMENT #17: The Missouri Pork Association recommended using the term earthen basin consistently throughout the rule and asked for the source of the added definitions for manure storage structure, safety volume, storage lagoon, total storage capacity, treatment volume, waste treatment lagoon, wastewater, and wastewater flow.

RESPONSE AND EXPLANATION OF CHANGE: References to earthen storage structures have been changed to earthen basin and the term manure storage structure have been used consistently throughout the rule. The new definitions are for clarity for engineers in what information is needed in their designs.

COMMENT #18: The Missouri Pork Association suggested that the introductory paragraph in (3) is confusing with respect to applicability.

RESPONSE AND EXPLANATION OF CHANGE: Language was added to sections (2) and (3) to add clarity. In accordance with the RSMo 644.051, construction permits are only required for facilities that are constructing earthen basins. However, new facilities that do not involve the construction of earthen basins are still required to follow all of the design requirements in 10 CSR 20-8.300. For those applicants that are not constructing an earthen basin and do not need to obtain a construction permit, 10 CSR 20-6.300 Concentrated Animal Feeding Operations is being concurrently amended to require that the operating permit application includes a professional engineer’s certification that the facility has been designed in accordance with the requirements of 10 CSR 20-8.300.

COMMENT #19: The Missouri Pork Association recommended defining the term “when applicable” in (3)(B)2. and stated that the Missouri Geological Survey is not qualified to give engineering advice, therefore applicants should not have to incorporate their recommendations in their plans.

RESPONSE AND EXPLANATION OF CHANGE: The Missouri Geological Survey does not provide engineering advice. They do, however, identify site limitations upon which structures may

be constructed. Language was added to the rule to make it clear that the engineering plans must be developed using the full consideration of the site limitations that are provided by the Missouri Geological Survey when they conduct a hydrogeologic evaluation.

COMMENT #20: The Missouri Pork Association requested there be a discussion added to section (7) on how to appeal an evaluation from the Missouri Geological Survey and questioned when the Water Protection Program can ignore, amend, or revise the geohydrologic evaluations.

RESPONSE: Hydrogeologic evaluations prepared by the Missouri Geological Survey are not final actions by the department. These evaluations can be appealed as part of a final permit action, whether it involves the appeal of a permit or the appeal of a permit denial. 10 CSR 20-6.020 Public Participation, Hearings and Notice to Government Agencies includes provisions regarding permit appeals.

COMMENT #21: The Missouri Pork Association suggested that DNR not require operation and maintenance plans since nutrient management plans are substantially equivalent to an operation and maintenance plan.

RESPONSE: Detailed nutrient management plans are not required for facilities that export all wastewater. Whereas there is some potential overlap, the NMP is related to protecting water quality whereas the O&M plan pertains to operating and maintenance procedures of the facility. No change was made to the rule as a result of this comment.

COMMENT #22: The Missouri Pork Association noted that DNR does not have the authority to regulate stockpiling in fields and that it is an operational requirement rather than a design requirement.

RESPONSE: It is appropriate for the regulation to include provisions that regulate the temporary stockpiling of dry process waste when an applicant knows or anticipates that their design will involve this stockpiling. The regulation specifies a number of design criteria including setback distances and slope requirements. There were no changes made to the rule as a result of this comment. It is important to note that there will be times that temporary stockpiles of dry waste may have to be accommodated after a facility has been constructed. In these cases the operational requirements of 10 CSR 20-6.300 will apply, along with any specific permit conditions.

COMMENT #23: Commissioner Samuel Leake noted a math error in the fiscal note. This error was a multiplication mistake in the cost savings portion of the note.

RESPONSE AND EXPLANATION OF CHANGE: This error has been corrected and the revised fiscal note will appear at the end of the final order of rulemaking.

### **10 CSR 20-8.300 Manure Storage Design Regulations**

- (1)
  - (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 for a covered storage structure or from the lower to the upper operating level for an uncovered, liquid storage structure 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.
  - C. For covered liquid manure storage structures, the upper operating level is one foot (1') below the top of the structure;
2. Freeboard—The elevation difference between the bottom of the spillway to the top of the berm for an earthen 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;
5. Manure storage structure—a fabricated structure or earthen basin used to store manure, litter, and/or process wastewater;
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. Safety volume—The volume of wastewater stored between the upper pumpdown and emergency spillway crest;
10. Storage lagoon—A lagoon that does not have adequate volume to accomplish treatment;
11. Storage volume—The volume of manure, runoff, washwater, rainfall, and additional water sources between the lower and upper operating levels;
12. 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;
13. Total storage capacity—The combined volume of storage and safety volumes stored between the lower pumpdown level and emergency spillway crest;
14. Treatment volume—The permanent volume maintained below the lower pumpdown designed for anaerobic treatment of manure based on latitude;



15. Waste treatment lagoon—A lagoon that is sized to have three hundred sixty-five (365) days of storage volume and adequate treatment volume;
16. Wastewater—A combination of manure, washwater, runoff, rainfall, and process wastewater; and
17. Wastewater flow—The annual rate of wastewater contributed to an animal waste management system.

(2) General.

(A) Applicability. This rule shall apply to all new or expanding Concentrated Animal Feeding Operations (CAFOs), however only those applicants that are constructing earthen basins need to obtain construction permits.

(3) Permit Application Documents. Applicants for a construction permit for earthen basins shall include one (1) set of documents described in this section for department approval as part of the construction permit application process. Applicants who are not constructing earthen basins and are seeking an operating permit shall develop and maintain these documents and submit those required in 10 CSR 6.300. 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 an animal waste 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 animal waste management systems, only adherence to rules and regulations.

(A) Engineering report—The following paragraphs list requirements for the content of the project engineering report to be submitted to the department for review and approval:

1. 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;
2. Project location map. This map shall include state and county roads, county boundaries, and city boundaries, and show the location of the proposed project;
3. Narrative project summary. Provide an explanation of any existing conditions at the operation and a summary of the proposed modifications to the operation;
4. Summary of design. 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:
  - A. Each animal type and number within the production area, the maximum design animal capacity, and the average weight for each animal type;
  - B. A detailed explanation of the process by which manure is deposited, handled, managed, and transferred within the operation;

- C. Calculations showing the estimated annual amount of manure generated at the production area and wastewater flows with average rainfall. 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. 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;
  - D. Design calculations justifying the size of manure storage structures. This includes safety volume, storage volume, total storage capacity, design storage period, and treatment volume. For waste 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;
  - E. Stage-storage tables on at least one-foot (1') increments for all earthen basins with design operating depths (elevation of lower and upper pumpdown levels) shall be clearly identified;
  - F. Collection, treatment, and disposal of all domestic wastewater flows associated with the operation; and
  - G. 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;
- 5. 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 textural class, and physical properties and water features for earthen basins and solid manure components. The soils map shall show approximate boundaries of the different soils. When applicable, the design of all structures shall be sufficient to address the site limitations identified by the Missouri Geological Survey and should be discussed in the engineering report. Any soil boring or test pit logs shall also be included in the report; and
  - 6. 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.
- (B) 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, preferably one inch (1") per one thousand feet (1,000'), 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:
- 1. 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;

2. The source of the operation's water supply and all wells within three hundred feet (300') of the production area; and
3. The location of all surface water features within the boundaries or immediately adjacent to the production area.

- (C) Construction plan drawings. Plan drawings shall include the following:
1. 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;
  2. 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;
  3. Locations of all test borings with date shall be shown on the plans;
  4. Detail plans shall consist of plan views, elevation views, profiles, sections, and supplementary views which, together with the specifications and general layouts, provide the working information for the construction of the containment facilities; and
  5. Include dimensions and relative elevations of manure storage structures, the location of components of the animal waste management system, alignment and size of piping, and profiles of piping with grades.

- (D) Specifications. When specifically directed by the department, technical specifications shall accompany the plans.

(4)

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

(5)

- (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, solid manure, and dry process waste to be land applied is one hundred eighty (180) days.
3. Solid manure and dry process waste 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. The minimum design storage period for waste treatment lagoons without an impermeable cover is three hundred sixty-five (365) days.
5. Stormwater runoff from the production area will be diverted from lagoons as possible.

(6)

- (O) Piping. Piping through the lagoon berm shall be located at a point of minimum fill, preferably on cut slope, and must be valved. Valves are not required on gravity piping into the lagoon.

(10)

- (B) Gravity Pipelines.

1. The minimum slope for a gravity pipe installation is one percent (1%) for four inch (4") pipe, six-tenths percent (0.6%) for six inch (6-inch) pipe, and four-tenths percent (0.4%) for eight inch (8") pipe.
2. Clean-out access shall be provided for gravity pipelines at a maximum interval of three hundred feet (300') 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.

*REVISED PRIVATE COST: The aggregate net cost increase was estimated to be \$10,130 versus \$7,970, which was submitted with the original proposal.*

**FISCAL NOTE**

**PRIVATE COST**

**I. RULE NUMBER**

Rule Number and Name	<i>10 CSR 20-8.300 Manure Storage Design Regulations</i>
Type of Rulemaking	<i>Proposed Rule Amendment</i>

**II. SUMMARY OF FISCAL IMPACT**

Estimate of the number of entities by class which would likely be affected by the adoption of the proposed 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:
One facility per year	541330 Engineering services  112112 Cattle Feedlots 112210 Hog and Pig Farming 112420 Goat Farming 112410 Sheep Farming 112120 Dairy Cattle and Milk Production 112320 Broilers and Other Meat Type Chicken Production 112310 Chicken Egg Production 112330 Turkey Production 112340 Poultry Hatcheries 112390 Other Poultry Production 112920 Horses and Other Equine Production	\$10,130 increase

### III. WORKSHEET

The revisions to 10 CSR 20-8.300 *Manure Storage Design Regulations* will:

- 1) improve and add several definitions
- 2) clarify regarding the items required in an application for engineering review
- 3) remove nutrient management plan requirements that are redundant with the requirements of 10 CSR 20-6.300 Confined Animal Feeding Operations
- 4) change design requirements for lagoons
- 5) make a name change of Missouri Geological Survey

#### COST SAVINGS:

Fewer hours needed for preparing application/plans

$$2 \text{ hours/application} \times \$120.00/\text{hour (engineering fee)} \times 1 \text{ application} = \$240 \text{ savings}$$

#### COST INCREASES:

Increased number of yards needed in lagoon berms

$$17,000 \text{ cubic yards} \times 0.2 \times \$ 3.05/\text{cy} \times 1 \text{ application} = \$10,370 \text{ increased cost}$$

TOTAL COST INCREASES	\$10,370
<u>TOTAL COST SAVINGS</u>	<u>\$ 240</u>
TOTAL NET COST INCREASE	\$10,130

### IV. ASSUMPTIONS

1. An annualized aggregate cost of this rulemaking is used for the purposes of providing the aggregate cost for the life of the rule. The annualized aggregate cost is the agency estimate of the average costs that will be incurred in any future year, no matter how far distant. For convenience of calculating this fiscal note over a reasonable time period, the life of the rule is assumed to be indefinite. If the life of the rule extends beyond 1 year, the annual costs for additional years will be consistent with the assumptions used to calculate annual costs as identified in this fiscal note.
2. The number of animal waste lagoons being constructed has dropped in the last 20 years with the industry standard for swine facilities changing to the use of deep pit systems. This trend may see a reversal with the increased interest in biogas collection from covered lagoons.

Lagoons are commonly used on dairy operations however we receive very few construction permit applications for new or expanding dairies. Therefore no additional applications are calculated in for dairy. At this point we only anticipate receiving 1 application per year for a lagoon or lagoon system from the integrators.

3. With fewer requirements in the engineering report, the engineer will use 2 fewer hours to complete the design. Engineering fees are based on a Deltek Axium 2011 survey median for engineering billing rates <https://www.axium.com/blog/architecture-and-engineering-billing-rate-trends/>.
4. Top widths will increase by at least two times based on fill heights. This increase will increase the total yardage in lagoon berms by a factor of 0.2. An average yardage value of 17,000 cy was used at a construction rate of \$3.05 per cubic yard. This cost was gleaned from data collected annually by the NRCS.
5. The net cost of compliance was calculated without applying a factor for inflation.

