

**Environmental Defense Fund's Recommendations  
for a  
Plan to Phase Out the Use of  
Anaerobic Lagoons and Sprayfields**



May 1998

North Carolina Environmental Defense Fund  
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**Abstract**

With House Bill 515, the 1997 North Carolina General Assembly directed the North Carolina Department of Agriculture (NCDA) to develop a plan to phase out the anaerobic lagoon and sprayfield system used by swine operations as follows:

- (a) "The Department of Agriculture shall develop a plan to phase out the use of anaerobic lagoons and sprayfields as primary methods of disposing of animal waste at swine farms.
- (b) In developing the plan under section (a) of this section, the Department of Agriculture shall consider the feasibility of phasing in the use of solid waste management systems and aerobic wastewater management systems to treat and dispose of animal waste at swine farms, including, without limitation, package treatment plants, closed-loop systems, and central waste disposal facilities that serve multiple swine farms." (Part XII, Section 12.4).

House Bill 515 reflects wide-spread acknowledgment that the current approach to managing and disposing swine manure does not adequately protect the environment and public health. The Environmental Defense Fund (EDF) has worked with other conservation organizations to develop this detailed proposal for a plan to phase out anaerobic lagoons and sprayfields currently used to dispose high volumes of swine waste. The document identifies the measures that EDF considers would result in realistic, effective and lasting solutions to the environmental problems posed by intensive swine operations. EDF believes that the solution to addressing the impacts from swine operations is through the development of performance-based criteria for swine waste systems that are designed to achieve specific environmental and public health goals and standards.

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## **General Principles of a Plan to Phase Out the Use of Anaerobic Lagoons and Sprayfields**

**The phase-out of anaerobic lagoons and sprayfields is one of three basic components of an effective program to protect the environment:**

1. Prevent problems from getting worse by:
  - a. improving compliance with existing laws through better enforcement;
  - b. addressing growing threats associated with abandoned lagoons; and,
  - c. holding owners of animals responsible for any environmental violations.
2. Improve waste management systems for existing operations by phasing out the use of anaerobic lagoons and sprayfields.
3. Prohibit new growth in the state's swine population unless and until:
  - a. a phase-out plan for existing operations is well underway and being implemented;
  - b. alternative technologies to protect the environment are required for new systems; and,
  - c. adequate siting requirements are in place to protect neighbors and communities.

**The ultimate environmental objectives of the phase-out plan should be the following:**

1. Eliminate atmospheric emission of undesirable gases (unacceptable odor, ammonia, methane, hydrogen sulfide).
2. Eliminate waste transport beyond the boundaries of intensive swine operations via ground water contamination or surface runoff.
3. Ensure that technology is not easily susceptible to failure due to chronic rain, mismanagement, or human error.
4. Reduce the net transport of nutrients into a river basin. (Nutrients coming into the basin as animal feed should approximate nutrients being removed from the basin as a product, minimizing waste which must be absorbed by the land and water within the basin.)
5. Utilize "waste" as a resource to recoup additional treatment costs. Animal feed, energy, dry fertilizer, and composted soil represent examples of economically viable products.

**Research, development and phase-out costs should be handled according to the following funding principles:**

1. Research and Development. Public funding of research and development should continue, but the burden of paying for additional research should not fall solely on the public's shoulders. In fact, many environmental and citizen's groups have specifically asked the Governor to include in his budget additional funding for NCSU's Animal and Poultry Waste Management Center to expand its evaluation of alternative animal waste technologies. The pork industry, particularly those entities with multiple operations, should contribute significantly to research and development efforts at NCSU and elsewhere. Ultimately, the pork industry and producers will profit from the development and use of environmentally sustainable technologies.
2. Phase-out of Anaerobic Lagoons and Sprayfields. As a general principle, pork producers and the actual owners of the swine should be responsible for reducing or eliminating environmental and public health impacts from their operations. Costs of retrofitting existing waste management systems, however, should not be borne solely by contract producers, but shared by the so-called integrators and other entities that actually own the swine produced. Some public assistance may be needed to assist individual producers in meeting the nondischarge and other environmental standards, based on environmental factors, the financial need of individual producers, past compliance with environmental laws, and other relevant factors. Limited public resources should not be used as a basis for delaying implementation of the phase-out plan.

**Environmental Defense Fund's Recommendations  
for a Plan to Phase Out the Use of Anaerobic Lagoons and Sprayfields**

**EXECUTIVE SUMMARY**

**INTRODUCTION**

The phase-out of anaerobic lagoons and sprayfields as the primary method of disposing of swine waste can be divided into two major components: 1) the conversion/elimination of anaerobic lagoons and sprayfields at *existing* swine operations; and 2) the development and approval of environmentally protective waste management systems for any new and expanding swine operations. To overcome the adverse impacts to public health and the environment associated with the current approach to waste management, swine operations must use waste management technologies, systems, and practices that (1) break the reliance on land application, (2) eliminate atmospheric emissions, (3) use alternative methods to manage nitrogen from swine waste, and (4) ensure that the technology is not easily susceptible to failure due to mismanagement or above average rainfall quantities.

**EXISTING OPERATIONS: Phase-Out of Sprayfields and Anaerobic Lagoons**

*Sprayfields*

- Phase out aerial spraying as quickly as possible. To achieve this, alternative uses (to land application) for the nitrogen in the waste must be developed. This should be given the highest priority in the technology assessment.
- Limit land application of lagoon liquids (or solids) to injection into soils or surface application in a manner that minimizes the potential for ammonia volatilization or offsite dissemination of undesirable odors.
- Require operators who land apply swine waste to develop and implement nutrient management plans and mandatory BMPs such as buffers to control runoff, to observe seasonal restrictions on manure application, and to coordinate manure application with the fertilization needs of the crops.
- Implement a sampling program to evaluate the efficacy of agronomic rates in protecting groundwater from the potential of contamination.
- Conduct a sampling program to determine existing offsite groundwater contamination due to waste application on sprayfields. Sample locations should be based upon a defined set of criteria (including but not limited to soil type and proximity to populations using wells).
- Require that sprayfields resulting in offsite groundwater contamination be closed down, and animal owners be required to mitigate offsite contamination as necessary.

*Lagoons*

- Phase out open-air anaerobic lagoons on existing operations on a defined schedule to eliminate adverse impacts to public health (including odor) and the environment.
- Require that biocovers (floating material such as straw or pumice) be installed as soon as possible and replaced by more effective covers as per a defined schedule.
- Implement a sampling program to evaluate the potential for groundwater contamination from lagoon leakage.

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- Require groundwater monitoring for all lagoons that have a potential to leak, based upon a defined set of criteria (including but not limited to soil type, age, and construction standards).
- Require that lagoons resulting in offsite groundwater contamination be closed down, and that swine owners be required to mitigate offsite contamination as necessary.
- Require annual monitoring of heavy metal concentrations in lagoon sludge.
- Develop metal concentration standards for lagoons to determine when remediation and/or closure should be required.

### *Hog Houses*

- Accelerate research to develop techniques to reduce odor and ammonia emissions from hog houses.
- As already required under HB 515, the Environmental Management Commission should adopt meaningful standards to eliminate or significantly reduce the release of odor and ammonia from hog houses, lagoons, and sprayfields.

### **NEW OPERATIONS: Performance Standards**

- No new or expanding operations should be permitted under current standards.
- Eliminate reliance on land application for waste treatment.
- Approval of any waste containment vessel for new animal waste systems should be contingent upon a showing of their reliability in preventing groundwater contamination. Permits for waste-containing vessels should require groundwater monitoring to detect leakage.
- Atmospheric emissions (of unacceptable odor, ammonia, methane, or other undesirable gases) should be considered a discharge. Nondischarge permits should require covers on anaerobic components such that release of gases can be regulated.
- Rainfall should be excluded from any vessel containing high concentrations of waste.
- Low water volume systems should be pursued.
- Approval for any new hog production operation should require consideration of the cumulative impacts of surrounding hog (and other livestock) operations as well as any zoning regulations.
- Individual permits should be required for all new and expanding operations.

### **SCHEDULE**

- Years 1 and 2 Risk assessment and technology assessment.
- Years 3 and 4 40% of the anaerobic lagoons representing the highest risk should be phased out. In year 3, all aerial spraying should be eliminated, and biocovers should be placed on all lagoons.
- Years 5, 6, and 7 The remaining anaerobic lagoons should be phased out.

### **MORATORIUM**

The moratorium should not be lifted until at least 50% of the anaerobic lagoons are phased out, all aerial spraying is eliminated, and alternative technologies for new operations are identified that meet strict performance standards.

## **Environmental Defense Fund's Recommendations for a Plan to Phase Out the Use of Anaerobic Lagoons and Sprayfields**

### **I. Introduction**

The phase-out of anaerobic lagoons and sprayfields has two components: 1) the conversion/elimination of existing anaerobic lagoons and sprayfields; and 2) the implementation of waste management systems appropriate for new and expanded operations. To overcome the adverse impacts to public health and the environment associated with the current approach to waste management, swine operations must use technologies, management systems, and practices that (1) break the reliance on land application, (2) eliminate atmospheric emissions, (3) use alternative methods to manage nitrogen from hog waste, and (4) ensure that the technology is not easily susceptible to failure due to mismanagement or above average rainfall quantities.

No new and expanding operations should be permitted under the current standards. It simply does not make sense to allow additional operations to add to the immense problems caused by the existing 3600 hog operations. The open-air anaerobic lagoons and sprayfields on existing operations should be phased out based upon a set of priorities which take into consideration the most critically faulty aspects of the current technology, the size of the operation, location relative to homes, day care and senior centers, public facilities, and sensitive water resources as well as other considerations such as age of the operation.

One of the basic principles of the phase-out is maintenance of the state and federal regulations which require that intensive livestock operations (ILOs) be nondischarge systems. A new understanding of the functioning of anaerobic lagoon and sprayfield systems is evolving and has led to the realization that the basic premise of nondischarge is not being met. Preliminary results from ongoing research in North Carolina corroborate previous work done in Europe indicating that there are substantial atmospheric emissions of nitrogen as ammonia from current animal waste management systems<sup>1</sup>. Additionally, preliminary modeling projections suggest that about two thirds of the emitted ammonia is redeposited to the ground or surface water within approximately 300 miles of emission<sup>2</sup>. Together, these findings suggest that the more than 130 million pounds of nitrogen as ammonia emitted to the atmosphere by hog operations in the coastal plain of North Carolina (in 1995)<sup>3</sup> is being deposited on the nitrogen-sensitive river basins and estuaries of the Albemarle and Pamlico Estuarine Systems, the nitrogen-limited North Carolina coastal waters, and the nitrogen-sensitive Chesapeake Bay watershed.

Overcoming the problem of atmospheric emission of nitrogen as ammonia encompasses two of the major challenges in the phase out of existing anaerobic lagoons and sprayfields. First, the emission of nitrogen as ammonia must be eliminated. Second, an alternative to land application of waste will

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<sup>1</sup> Aneja, V. 1998. Atmospheric ammonia emissions and fate in eastern North Carolina. Presented at the Annual North Carolina Water Resources Research Conference on Water Resources Protection: Understanding and Management. NCSU.

<sup>2</sup> Dennis, R. 1998. Atmospheric transport and fate and links to water resources. Presented at the Annual North Carolina Water Resources Research Conference on Water Resources Protection: Understanding and Management. NCSU.

<sup>3</sup> NC Division of Air Quality. 1997. Assessment Plan for Atmospheric Nitrogen Compounds: Emissions, Transport, Transformation, and Deposition.

be needed because eliminating ammonia emissions will increase by at least threefold (relative to current quantities) the amount of nitrogen from hog waste that must be disposed of or recycled<sup>4</sup>. (In other words, unless alternatives are developed, the amount of land needed for waste disposal would more than triple once ammonia emissions are eliminated.) The solution to these particular problems can play a role in the resolution of a number of the other major problems facing these waste management systems, such as odor, vulnerability to above average rainfall, accumulation of phosphorus in soils, accumulation of heavy metals in lagoon sludge, pathogenic bacterial contamination of groundwater and adjacent surface waters, and nitrate contamination of groundwater.

## II. Existing Operations: Phase-Out of Sprayfields and Anaerobic Lagoons

The phase-out plan should be structured to take into consideration the three major components of the animal waste management system: *the sprayfield, the lagoon, and the hog house*.

### A. The Sprayfield

The current system of aerial spraying of the lagoon liquid results in the dissemination of offensive odors and in substantial volatilization of nitrogen as ammonia and its subsequent deposition on land and water. Therefore, aerial spraying should be phased out as quickly as possible. To achieve this, an alternate use (to land application) for the nitrogen in the waste must be developed. This should be given the highest priority in the technology assessment. Land application of lagoon liquids (or solids) should be limited to injection into soils or surface application in a manner that minimizes the potential for ammonia volatilization or offsite dissemination of undesirable odors.

When compared to aerial spraying, surface application will result in a higher concentration of nitrogen available for crops (per unit of lagoon liquid). Thus, the quantity of waste which can be applied to a unit of land will be decreased, or, put differently, the amount of land required will increase. Given the limits on available land for waste application, an alternative management strategy will be needed for the waste which exceeds crop needs on available land. Additionally, the application of animal waste should be better coordinated with the needs of the crops which they fertilize. Enforceable restrictions on permissible manure application times should be included as part of nutrient management planning. Land application of waste products should require nutrient management plans, mandatory BMPs such as buffers to control runoff, seasonal restrictions on manure application, and coordination of manure application with the fertilization needs of the crops.

A statistically-valid sampling program (on a subsample of the existing sprayfields) should be used to evaluate the efficacy of standard agronomic application rates in protecting groundwater from offsite contamination. In addition, a sampling program should be conducted to determine existing offsite groundwater contamination due to waste application on sprayfields. Sample locations should be based upon a defined set of criteria (including but not limited to soil type and

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<sup>4</sup> a) North Carolina Agriculture Chemicals Manual. 1997. NCSU and b) Batty, R., Batty, W., Overcash, C., and Fudge, S., 1994. Development and Selection of Ammonia Emission Factors. Prepared for US EPA, Washington, D.C.

proximity to populations using wells). Sprayfields resulting in offsite groundwater contamination should be closed down and animal owners should be required to mitigate offsite contamination as necessary.

Given the location of the highest concentrations of hog operations and the predominant wind direction, reduction of nitrogen overloading to the Neuse and Tar-Pamlico River basins as a result of atmospheric deposition of nitrogen volatilized from animal waste is clearly an important goal of the phase-out plan.

### *Action Steps*

- Phase out aerial spraying as quickly as possible. To achieve this, an alternative use (to land application) for the nitrogen in the waste must be developed. This should be given the highest priority in the technology assessment.
- Limit land application of lagoon liquids (or solids) to injection into soils or surface application in a manner that minimizes the potential for ammonia volatilization or offsite dissemination of undesirable odors.
- Require operators who land apply swine waste to develop and implement nutrient management plans and mandatory BMPs such as buffers to control runoff, to observe seasonal restrictions on manure application, and to coordinate manure application with the fertilization needs of the crops.
- Implement a sampling program to evaluate the efficacy of agronomic rates in protecting groundwater from the potential of contamination.
- Conduct a sampling program to determine existing offsite groundwater contamination due to waste application on sprayfields. Sample locations should be based upon a defined set of criteria (including but not limited to soil type and proximity to populations using wells).
- Require that sprayfields resulting in offsite groundwater contamination be closed down, and animal owners be required to mitigate offsite contamination as necessary.

### B. The Lagoon

Recent preliminary results indicate that ammonia volatilization from lagoons is much greater than anticipated. The problems associated with odor and insects are well known. Additionally, a substantial number of the current open-air lagoons have had waste management problems related to the susceptibility of lagoons to above average rainfall quantities<sup>5</sup>. These problems indicate that open-air lagoons are problematic and should be covered with a material capable of collecting emitted gases and shedding rainfall. As an intermediate step, biocovers (floating material such as straw or pumice) should be required as soon as possible and replaced by more effective covers as per a defined schedule. While biocovers lack the ability to exclude rain, they are inexpensive, hold the potential to reduce ammonia emissions, provide some level of odor and insect control, and could be installed on all lagoons very quickly.

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<sup>5</sup> Letter from Wayne McDevitt to the Environmental Review Commission, April 9, 1998, and Southern Environmental Law Center, 1997, A Report on the North Carolina Division of Water Quality's Hog Farm Inspection Program.

A covered lagoon with gas collection capability has many benefits over biocovers, including the ability to collect methane for energy production. Considering that methane is a potent greenhouse gas (21 times the global warming potential of carbon dioxide<sup>6</sup>, according to the Intergovernmental Panel on Climate Change), it seems prudent to include the ability to control methane emissions in the design of an animal waste treatment system. Since 1993, the USEPA, USDOE, and the USDA have included a methane emission reduction component in the voluntary pollution program they developed with the livestock industry<sup>7</sup>. Methane emission reductions have obvious environmental benefits and methane collection has obvious economic potential through energy production. The economic potential could be even brighter if methane reduction becomes eligible for credits in a greenhouse trading program which many have envisioned.

As with the conversion to land application via injection of lagoon liquids, coverage of lagoons (or use of tank digesters) could increase the concentration of nitrogen in the lagoons as ammonia volatilization is controlled. Alternatively, ammonia volatilization could be increased by pH manipulation beneath a lagoon cover and ammonia collected and concentrated in traps. A concentrated ammonia solution holds the potential for economic return. Systems which encourage denitrification could be operated beneath a lagoon cover without concomitant loss of ammonia to the atmosphere. (Denitrification in anaerobic hog waste lagoons would typically employ aeration which results in mixing and enhanced ammonia volatilization.) However, any denitrifying process should be examined to determine whether production of the byproduct, nitrous oxide, another greenhouse gas, is sufficient to be of concern. Additionally, a system that enhances denitrification holds as an underlying premise that the nitrogen is a waste product to be disposed. This premise does not adhere to an important basic principle of utilizing the nitrogen in the manure as a resource (i.e. a commercially-viable product) as the most economically and environmentally sensible approach.

A statistically-valid sampling program (on a subsample of the existing lagoons) should be used to evaluate the potential for groundwater contamination from lagoon leakage. In addition, groundwater monitoring should be required for all lagoons that have a potential to leak, based upon a defined set of criteria (including but not limited to soil type, age, and construction standards). These criteria should include as high priorities lagoons constructed before 1993 (when new construction standards were adopted) and lagoons where existing conditions suggest a significant potential for groundwater contamination. Lagoons found to be resulting in offsite contamination of groundwater should be closed down as soon as possible and certainly within a year, and animal owners should be required to mitigate offsite contamination as necessary. Lagoon monitoring data should be evaluated (i.e. modeled) to determine those likely to result in offsite contamination. Groundwater sampling frequency (both spatially and temporally) and well placement should be sufficient to provide the data necessary to model groundwater contamination movement. Contaminant plume movement evaluation results should be used to schedule lagoon closure such that any offsite contamination will be avoided.

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<sup>6</sup> Lusk, P., 1998. Methane Recovery from animal manures: the 1997 opportunities casebook. In: Proceedings of Manure Management In Harmony With the Environment and Society. Soil and Water Conservation Society, Ames, Iowa.

<sup>7</sup> Ibid

Heavy metal concentrations in lagoon sludge should be monitored annually. The concentration and mass at which land application (or alternate disposal techniques) becomes compromised by accumulation of heavy metals in sludge should be determined. Metal concentration standards for lagoons should be developed to determine when remediation and/or closure should be required. Once lagoon sludge approaches this limit, the lagoon should be closed down. Models to predict heavy metal accumulations in lagoon sludge should be developed to predict remaining useful life of lagoons, thereby avoiding the sudden discovery of unacceptable levels of heavy metals and problems associated with unplanned lagoon closure requirements. In addition, strict limits on the mass of heavy metals which can be applied to land such as those required for the land application of municipal sludge (including liens on deeds specifying future limitations on metal-saturated lands) should be required.

Open-air anaerobic lagoons on existing operations should be phased out on a defined schedule to eliminate adverse impacts to public health (including odor) and the environment. As with the elimination of sprayfields, lagoon coverage and evaluation should also be influenced by the timetables of the Neuse River Nutrient Sensitive Waters Management Strategy and the Tar-Pamlico Nutrient Reduction Strategy.

#### *Action Steps*

- Phase out open-air anaerobic lagoons on existing operations on a defined schedule to eliminate adverse impacts to public health (including odor) and the environment.
- Require that biocovers (floating material such as straw or pumice) be installed as soon as possible and replaced by more effective covers as per a defined schedule.
- Implement a sampling program to evaluate the potential for groundwater contamination from lagoon leakage.
- Require groundwater monitoring for all lagoons that have a potential to leak, based upon a defined set of criteria (including but not limited to soil type, age, and construction standards).
- Require that lagoons resulting in offsite groundwater contamination be closed down, and that swine owners be required to mitigate offsite contamination as necessary.
- Require annual monitoring of heavy metal concentrations in lagoon sludge.
- Develop metal concentration standards for lagoons to determine when remediation and/or closure should be required.

#### C. The Hog House

The high concentration of animals and waste in swine production houses, combined with the practice of moving large volumes of air through the buildings to reduce temperature and improve inside air quality, result in the emission of large quantities of ammonia, odor, and other undesirable gases. Steps must be taken to reduce or eliminate the release of odor and ammonia from hog houses to the atmosphere.

Passing vented air through biofilters appears to be a promising technology to achieve progress in this endeavor. A number of other avenues also hold promise and should be investigated. Since water is typically recycled from lagoons to wash manure accumulations out of pits, waste treatment technologies which produce a processed water with lower ammonia and odor

compound concentrations would be desirable. Feed reformulation also holds the potential to reduce the ammonia and odor-production potential in the waste. The phase-out plan should recommend the continuation and acceleration of research currently being conducted by numerous researchers to develop techniques to reduce odor and ammonia emissions from hog houses.

The odor reduction recommendations currently being developed by NCSU, as mandated by the HB 515 for completion by October 1998, should be considered in coordination with the anaerobic lagoon and sprayfield plan. As already required under HB 515, the Environmental Management Commission should adopt meaningful standards to eliminate or significantly reduce the release of odor and ammonia from hog houses, lagoons, and sprayfields. Phase-out plans for lagoons and sprayfields, as described above, also provide for reduction in odors.

*Action Steps*

- Accelerate research to evaluate techniques to reduce odor and ammonia emissions from hog houses.
- As already required under HB 515, the Environmental Management Commission should adopt meaningful standards to eliminate or significantly reduce the release of odor and ammonia from hog houses, lagoons, and sprayfields.

D. Schedule for Phase-out of Lagoons and Sprayfields at Existing Operations

The plan should include a firm and timely deadline and schedule for phasing out the use of anaerobic lagoons and sprayfields at existing operations. In developing a schedule, factors to be considered include the degrees of environmental risk (e.g., based upon siting, topography, soil types, assimilative capacity) and design life of systems.

Years 1 and 2	Risk assessment and technology assessment.
Years 3 and 4	40% of the anaerobic lagoons and lagoons representing the highest risk should be phased out. In year 3, all aerial spraying should be eliminated, and biocovers should be placed on all lagoons.
Years 5, 6, and 7	The remaining anaerobic lagoons and lagoons should be phased out.

E. The Moratorium

The moratorium on new or expanding hog operations should not be lifted until alternative technologies are identified that meet strict performance standards to protect neighbors, public health, and the environment. As is the case with other point sources subject to the Clean Water Act, these alternative waste systems should meet the “best available technology” standard. The moratorium should not be lifted until the phase-out is mandated and well underway (i.e., at least 50% of the anaerobic lagoons are phased out, and all aerial spraying is eliminated). Individual permits should be required for all new and expanding operations.

F. Other Issues

A number of other problems associated with current swine production techniques should be kept in mind in the remodeling of swine waste management technologies. Waste handling and treatment technologies which reduce the volume of water should be pursued. Reduction of metal concentration in feed should be one of the goals in the evaluation of feed reformulation. The concern over unregulated use of antibiotics and resultant antibiotic resistance is increasing<sup>8</sup> and it would be prudent for the livestock industry in general to consider ways to reduce this concern.

**III. New Operations: Performance Standards**

Performance standards for new operations should incorporate the following components:

- Eliminate reliance on land application for waste treatment.
- Approval of any waste containment vessel for new animal waste systems should be contingent upon a showing of their reliability in preventing ground water contamination. Permits for waste-containing vessels should require groundwater monitoring to detect leakage.
- Atmospheric emissions (of unacceptable odor, ammonia, methane, or other undesirable gases) should be considered a discharge. Nondischarge permits should require covers on anaerobic components such that release of gases can be regulated.
- Rainfall should be excluded from any vessel containing high concentrations of waste.
- Low water volume system should be pursued.
- Approval of any new hog production operation should require consideration of the cumulative impacts of surrounding hog (and other livestock operations) in permit decisions as well as zoning regulations.

**IV. Other Components Essential to a Phase-Out Plan**

A. Process for Developing Promising Alternative Technologies

The phase-out plan must establish a process to expedite the identification, testing, and permitting of the most promising alternative replacement technologies. Criteria should be developed to select the most promising technologies. (For example, systems that result in the volatilization of nitrogen should be winnowed out.) Timeliness is critical in approving/permitting farmers' use of alternative systems at existing operations that meet the established criteria as well as in approving new technologies that demonstrate results. Rigorous screening should yield a field of alternatives that deserve timely review, agency approval, and possible subsidies for research and development.

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<sup>8</sup> Witte, W., 1998. Medical consequences of antibiotic use in agriculture. *Science*. 279: Feb 13, 1998.

B. Economics: How to Pay for the Phase-Out Plan

Economics are certainly an important consideration in determining whether a particular technology can be used on a commercial scale. However, costs should not be the limiting or deciding factor in setting environmental performance standards for intensive swine operations, nor should they govern which technologies are required or promoted in the phase-out plan. Based on the United States' experience with the advancement and reform of technologies in other industrial sectors, it is clear that innovation will bring costs down. For example, the cost of technology to reduce sulfate emissions turned out to be significantly lower than originally projected by the industry.

1. Research and Development. More research will be needed to understand fully the adverse environmental and public health consequences of existing animal waste management systems. In particular, more study is needed to understand the impacts of atmospheric deposition of nitrogen from confinement houses, lagoons, and sprayfields. Additional research into alternative waste management technologies and practices will also be needed to identify systems that enable operators to achieve environmental performance standards.

Public funding of research and development should continue, but the burden of paying for additional research should not fall solely on the public's shoulders. In fact, many environmental and citizens' groups have specifically asked the Governor to include in his budget additional funding for NCSU's Animal and Poultry Waste Management Center to enable the Center to expand its evaluation of alternative animal waste technologies. The pork industry, particularly those entities with multiple operations, should contribute significantly to research and development efforts at NCSU and elsewhere. Ultimately, the pork industry and producers will profit from the development and use of environmentally sustainable technologies.

2. Phase-out of Anaerobic Lagoons and Sprayfields. The setting of environmental standards has historically been an iterative process, meaning that technical standards and practices are revised periodically in response to new and better information. As a general principle, industrial and non-industrial sources of pollution are held primarily responsible for reducing or eliminating environmental and public health impacts from their operations and, as such, for upgrading their facilities to meet changing standards. In this instance, pork producers and the actual owners of the swine should be called upon to pay a significant portion of the costs associated with retrofitting and/or upgrading existing operations to comply with the requirements of the phase-out plan. Costs of retrofitting existing waste management systems, however, should not be borne solely by contract producers, but shared by the so-called integrators and other large pork companies that actually own the swine produced.

Historically, the cost of disposing animal waste in North Carolina has been borne by the taxpayers and the individual farmers/producers. In fact, since 1993 the state has spent over \$27 million (through the Agriculture Cost Share Program) to help pork and other livestock producers upgrade their facilities and develop basic waste management plans. Livestock farmers receiving assistance under the Cost Share Program collectively contributed approximately \$10 million toward that effort. In contrast, the large companies that actually own and control the swine produced, typically do not pay any portion of the costs associated with manure disposal at their contract farms.

Some continued public assistance may be needed to assist individual producers in meeting the nondischarge and other environmental standards, provided that some of the costs of waste management is passed onto the balance sheets of the large companies that own the swine. Consistent with current state policies and programs (e.g., the Agriculture Cost Share Program), publicly-funded technical and financial assistance can be an effective tool in facilitating and expediting the implementation of environmentally sound technologies and best management practices. These programs also ease the burden on growers who must adapt their waste management systems to comply with more environmentally protective requirements. Financial and technical assistance programs should be prioritized and targeted based on environmental factors, the financial need of individual producers, past compliance with environmental laws, and other relevant factors. *Limited public resources should not be used as a basis for delaying implementation of the phase-out plan.* Finally, public dollars should only be spent on helping existing operations comply with environmental standards; new and expanding operations should be expected to pay the full costs of environmental controls.

C. Legislative Actions to Develop a Meaningful Phase-Out Plan

Specific legislative action will need to occur to provide for the development and implementation of a scientifically sound and sustainable phase-out plan. At a minimum the General Assembly should:

1. Enact in 1999 legislation making owners of swine raised at confined swine operations liable for civil penalties assessed against an operator for environmental violations (e.g., violations of permits, waste management plans, and any other environmental law or rule) and responsible for any remediation, clean-up and/or closure requirements associated with such violations.
2. Direct the Department of Environment and Natural Resources (DENR), in conjunction with the Division of Soil & Water Conservation and the Division of Water Quality, to conduct a study of issues related to the implementation of the recommendations of the Lagoon Phase-out Plan developed by the North Carolina Department of Agriculture and Consumer Services pursuant to S.L 1997-458. In conducting this study the Department should consult with North Carolina Department of Agriculture and Consumer Services, the North Carolina State University Cooperative Extension Service, the North Carolina State University Animal and Poultry Waste Management Center, and other appropriate governmental agencies and parties. Pursuant to this study, the Department shall develop specific recommendations for implementing the phase-out of anaerobic lagoons and sprayfields as the primary methods of disposal of swine waste.
3. Direct DENR, by no later than 1 October 1998, to report to the Environmental Review Commission its findings and recommendations, including legislative proposals, on the issues to be studied under subsection (a) of this section. This report should include at a minimum (i) recommendations for expeditiously eliminating emissions of ammonia, through the use of biocovers or other measures; (ii) recommended environmental and public health performance-based criteria and/or standards for swine waste treatment systems and practices; (iii) a recommended process by which to identify and evaluate alternative replacement technologies to meet performance criteria and/or standards; (iv) a recommended user-friendly process and

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timetable (no more than eight years) for the phase-out of existing lagoons and sprayfields and their replacement by alternative technologies; (v) possible private and public funding options, including ways in which to pass some of the waste management costs on to the actual owners of the animals, to ensure that the phase-out is completed in a timely manner.

4. Enact legislation to extend the moratorium on new and expanding operations. This will give the General Assembly further opportunity to evaluate whether sufficient progress is being made in solving existing waste management problems, and to determine whether new growth of the state's swine industry is sustainable. The length of the moratorium should be tied, at a minimum, to meaningful implementation of the phase-out plan and the development of environmentally protective alternative technologies for new and expanding swine operations. All new and expanding operations should be required to obtain an individual permits from DENR prior to operation. All permits should be subject to full public notice and comment.
5. Appropriate \$1 million to the NCSU Animal and Poultry Waste Management Center to expand its research and testing of alternative animal waste management technologies.
6. Enact legislation directing DENR to study the environmental problems associated with abandoned animal waste lagoons and to develop a plan for addressing such problems.