

- 3.2.2.2 A copy of the CAFO's site-specific nutrient management plan must be maintained on site and made available to the Director upon request.
- 3.2.3 **Requirements relating to transfer of manure or process wastewater to other persons.** Prior to transferring manure, litter or process wastewater to other persons, Large CAFOs must provide the recipient of the manure, litter or process wastewater with the most current nutrient analysis. The analysis provided must be consistent with the requirements of 40 CFR 412. Large CAFOs must retain for five years records of the date, recipient name and address, and approximate amount of manure, litter or process wastewater transferred to another person.
- 3.2.4 **Annual reporting requirements for CAFOs.** The permittee must submit an annual report to the Director. The annual report all reports are due by the 31st day of January each year for the previous January – December reporting period (i.e. January 31, 2012 for Year 2011). The first report may include less than the 12 months of information and must include:
- 3.2.4.1 The number and type of animals, whether in open confinement or housed under roof (beef cattle, broilers, layers, swine weighing 55 pounds or more, swine weighing less than 55 pounds, mature dairy cows, dairy heifers, veal calves, sheep and lambs, horses, ducks, turkeys, other);
 - 3.2.4.2 Estimated amount of total manure, litter and process wastewater generated by the CAFO in the previous 12 months (tons/gallons);
 - 3.2.4.3 Estimated amount of total manure, litter and process wastewater transferred to other person by the CAFO in the previous 12 months (tons/gallons);
 - 3.2.4.4 Total number of acres available for land application covered by the nutrient management plan developed in accordance with Part 3 of the permit;
 - 3.2.4.5 Total number of acres under control of the CAFO that were used for land application of manure, litter and process wastewater in the previous 12 months;
 - 3.2.4.6 Summary of all manure, litter and process wastewater discharges from the production area that have occurred in the previous 12 months, including date, time, and approximate volume;
 - 3.2.4.7 A statement indicating whether the current version of the CAFO's nutrient management plan was developed or approved by a certified nutrient management planner; and
 - 3.2.4.8 The actual crop(s) planted and actual yield(s) for each field, the actual nitrogen and phosphorus content of the manure, litter, and process wastewater, the results of calculations conducted in accordance with Parts 3.2.5.1.b and 3.2.5.2.d of this section, and the amount of manure, litter, and process wastewater applied to each field during the previous 12 months; and, for any CAFO that implements a nutrient management plan that addresses rates of application in accordance with Part 3.2.5.2 of this section, the results of any soil testing for nitrogen and phosphorus taken during the preceding 12 months, the data used in calculations conducted in accordance with Part 3.2.5.2.d of this section, and the amount of any supplemental fertilizer applied during the previous 12 months.
- 3.2.5 **Terms of the nutrient management plan.** Any permit issued to a CAFO must require compliance with the terms of the CAFO's site-specific nutrient management plan. The terms of the nutrient management plan are the information, protocols, best management practices, and other conditions in the nutrient management plan determined by the Director to be necessary to meet the requirements of Part 3.2.1 of this section. The terms of the nutrient management plan, with respect to protocols for land application of manure, litter, or process wastewater required by Part 3.2.1.8 of this section and, as applicable, 40 CFR 412.4(c), must

include the fields available for land application; field-specific rates of application properly developed, as specified in Parts 3.2.5.1 through 3.2.5.2 of this section, to ensure appropriate agricultural utilization of the nutrients in the manure, litter, or process wastewater; and any timing limitations identified in the nutrient management plan concerning land application on the fields available for land application. The terms must address rates of application using one of the following two approaches, unless the Director specifies that only one of these approaches may be used:

3.2.5.1 Linear approach. An approach that expresses rates of application as pounds of nitrogen and phosphorus, according to the following specifications:

- a The terms include maximum application rates from manure, litter, and process wastewater for each year of permit coverage, for each crop identified in the nutrient management plan, in chemical forms determined to be acceptable to the Director, in pounds per acre, per year, for each field to be used for land application, and certain factors necessary to determine such rates. At a minimum, the factors that are terms must include: the outcome of the field-specific assessment of the potential for nitrogen and phosphorus transport from each field; the crops to be planted in each field or any other uses of a field such as pasture or fallow fields; the realistic yield goal for each crop or use identified for each field; the nitrogen and phosphorus recommendations from sources specified by the Director for each crop or use identified for each field; credits for all nitrogen in the field that will be plant available; consideration of multi-year phosphorus application; and accounting for all other additions of plant available nitrogen and phosphorus to the field. In addition, the terms include the form and source of manure, litter, and process wastewater to be land-applied; the timing and method of land application; and the methodology by which the nutrient management plan accounts for the amount of nitrogen and phosphorus in the manure, litter, and process wastewater to be applied.
- b Large CAFOs that use this approach must calculate the maximum amount of manure, litter, and process wastewater to be land applied at least once each year using the results of the most recent representative manure, litter, and process wastewater tests for nitrogen and phosphorus taken within 12 months of the date of land application;
or

3.2.5.2 Narrative rate approach. An approach that expresses rates of application as a narrative rate of application that results in the amount, in tons or gallons, of manure, litter, and process wastewater to be land applied, according to the following specifications:

- a The terms include maximum amounts of nitrogen and phosphorus derived from all sources of nutrients, for each crop identified in the nutrient management plan, in chemical forms determined to be acceptable to the Director, in pounds per acre, for each field, and certain factors necessary to determine such amounts. At a minimum, the factors that are terms must include: the outcome of the field-specific assessment of the potential for nitrogen and phosphorus transport from each field; the crops to be planted in each field or any other uses such as pasture or fallow fields (including alternative crops identified in accordance with Part 3.2.5.2.b of this section); the realistic yield goal for each crop or use identified for each field; and the nitrogen and phosphorus recommendations from sources specified by the Director for each crop or use identified for each field. In addition, the terms include the methodology by which the nutrient management plan accounts for the following factors when calculating the

amounts of manure, litter, and process wastewater to be land applied; results of soil tests conducted in accordance with protocols identified in the nutrient management plan, as required by Part 3.2.1.7 of this section; credits for all nitrogen in the field that will be plant available; the amount of nitrogen and phosphorus in the manure, litter, and process wastewater to be applied; consideration of multi-year phosphorus application; accounting for all other additions of plant available nitrogen and phosphorus to the field; the form and source of manure, litter, and process wastewater; the timing and method of land application; and volatilization of nitrogen and mineralization of organic nitrogen.

- b The terms of the nutrient management plan include alternative crops identified in the CAFO's nutrient management plan that are not in the planned crop rotation. Where a CAFO includes alternative crops in its nutrient management plan, the crops must be listed by field, in addition to the crops identified in the planned crop rotation for that field, and the nutrient management plan must include realistic crop yield goals and the nitrogen and phosphorus recommendations from sources specified by the Director for each crop. Maximum amounts of nitrogen and phosphorus from all sources of nutrients and the amounts of manure, litter, and process wastewater to be applied must be determined in accordance with the methodology described in Part 3.2.5.2.a of this section.
- c For CAFOs using this approach, the following projections must be included in the nutrient management plan submitted to the Director, but are not terms of the nutrient management plan: the CAFO's planned crop rotations for each field for the period of permit coverage; the projected amount of manure, litter, or process wastewater to be applied; projected credits for all nitrogen in the field that will be plant available; consideration of multi-year phosphorus application; accounting for all other additions of plant available nitrogen and phosphorus to the field; and the predicted form, source, and method of application of manure, litter, and process wastewater for each crop. Timing of application for each field, insofar as it concerns the calculation of rates of application, is not a term of the nutrient management plan.
- d CAFOs that use this approach must calculate maximum amounts of manure, litter, and process wastewater to be land applied at least once each year using the methodology required in Part 3.2.5.2.a of this section before land applying manure, litter, and process wastewater and must rely on the following data:
 - i a field-specific determination of soil levels of nitrogen and phosphorus, including, for nitrogen, a concurrent determination of nitrogen that will be plant available consistent with the methodology required by Part 3.2.5.2.a of this section, and for phosphorus, the results of the most recent soil test conducted in accordance with soil testing requirements approved by the Director; and
 - ii the results of most recent representative manure, litter, and process wastewater tests for nitrogen and phosphorus taken within 12 months of the date of land application, in order to determine the amount of nitrogen and phosphorus in the manure, litter, and process wastewater to be applied.

3.2.6 Changes to a nutrient management plan. Any permit issued to a CAFO must require the following procedures to apply when a CAFO operator makes changes to the CAFO's nutrient management plan previously submitted to the Director:

3.2.6.1 The CAFO operator must provide the Director with the most current version of the CAFO's nutrient management plan and identify changes from the previous version,

except that the results of calculations made in accordance with the requirements of Parts 3.2.5.1.b and 3.2.5.2.d of this section are not subject to the requirements of Part 3.2.6 of this section.

3.2.6.2 The Director must review the revised nutrient management plan to ensure that it meets the requirements of this section and applicable effluent limitations and standards, including those specified in 40 CFR part 412, and must determine whether the changes to the nutrient management plan necessitate revision to the terms of the nutrient management plan incorporated into the permit issued to the CAFO. If revision to the terms of the nutrient management plan is not necessary, the Director must notify the CAFO operator and upon such notification the CAFO may implement the revised nutrient management plan. If revision to the terms of the nutrient management plan is necessary, the Director must determine whether such changes are substantial changes as described in Part 3.2.6.3 of this section.

- a If the Director determines that the changes to the terms of the nutrient management plan are not substantial, the Director must make the revised nutrient management plan publicly available and include it in the permit record, revise the terms of the nutrient management plan incorporated into the permit, and notify the operator and inform the public of any changes to the terms of the nutrient management plan that are incorporated into the permit.
- b If the Director determines that the changes to the terms of the nutrient management plan are substantial as specified in 3.2.6.3 below, the Director must notify the public and make the proposed changes and the information submitted by the CAFO operator available for public review and comment as specified in Part 5.

3.2.6.3 Substantial changes to the terms of a nutrient management plan incorporated as terms and conditions of a permit include, but are not limited to:

- a Addition of new land application areas not previously included in the CAFO's nutrient management plan. Except that if the land application area that is being added to the nutrient management plan is covered by terms of a nutrient management plan incorporated into an existing NPDES permit in accordance with the requirements of Part 3.2.5 of this section, and the CAFO operator applies manure, litter, or process wastewater on the newly added land application area in accordance with the existing field-specific permit terms applicable to the newly added land application area, such addition of new land would be a change to the new CAFO operator's nutrient management plan but not a substantial change for purposes of this section;
- b Any changes to the field-specific maximum annual rates for land application, as set forth in Parts 3.2.5.1 of this section, and to the maximum amounts of nitrogen and phosphorus derived from all sources for each crop, as set forth in Part 3.2.5.2 of this section;
- c Addition of any crop or other uses not included in the terms of the CAFO's nutrient management plan and corresponding field-specific rates of application expressed in accordance with Part 3.2.5 of this section; and
- d Changes to site-specific components of the CAFO's nutrient management plan, where such changes are likely to increase the risk of nitrogen and phosphorus transport to waters of the State.

3.2.6.4 Non-Substantial changes:

Upon receipt of written consent by the CAFO, the Director may modify a permit to make the changes listed in this section following the procedures established in Part 3.2.6.2.a of this permit without a public notice where such changes are not likely to increase the risk of nitrogen and phosphorus transport to waters of the State, but changes will be made publicly available:

- a. Correct typographical errors;
- b. Allow for a change in ownership or operational control of a facility (transfer of the permit) where the Director determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittees has been submitted to the Director.
- c. Transfer permitted land application sites to another permit for the same waste source.
- d. Remove land application sites from a permit.

**PART 4
SPECIAL CONDITIONS FOR SUBPARTS C & D**

**REQUIREMENT TO DEVELOP AND IMPLEMENT BEST MANAGEMENT PRACTICES
(BMP)**

4.1 SPECIALIZED DEFINITIONS

Setback means a specified distance from surface waters or potential conduits to surface waters where manure, litter, and process wastewater may not be land applied. Examples of conduits to surface waters include but are not limited to: Open tile line intake structures, sinkholes, and agricultural well heads. Setback distances for streams, ponds and lakes shall be measured from the ordinary high water mark.

Vegetated buffer means a narrow, permanent strip of dense perennial vegetation established parallel to the contours of and perpendicular to the dominant slope of the field for the purposes of slowing water runoff, enhancing water infiltration, and minimizing the risk of any potential nutrients or pollutants from leaving the field and reaching surface waters.

Multi-year phosphorus application means phosphorus applied to a field in excess of the crop needs for that year. In multi-year phosphorus applications, no additional manure, litter, or process wastewater is applied to the same land in subsequent years until the applied phosphorus has been removed from the field via harvest and crop removal.

Each CAFO subject to this section that land applies manure, litter, or process wastewater, must do so in accordance with the following practices:

4.2 Nutrient Management Plan. The CAFO must develop and implement a nutrient management plan that incorporates the requirements of this section based on a field-specific assessment of the potential for nitrogen and phosphorus transport from the field and that addresses the form, source, amount, timing, and method of application of nutrients on each field to achieve realistic production goals, while minimizing nitrogen and phosphorus movement to surface waters.

4.2.1 Determination of application rates. Application rates for manure, litter, and other process wastewater applied to land under the ownership or operational control of the CAFO must minimize phosphorus and nitrogen transport from the field to surface waters in compliance with the Arkansas NRCS Conservation Service Practice Standard Code 590 (Nutrient Management), including the Arkansas Phosphorus Index, 2010 Revision. Such technical standards for nutrient management shall:

4.2.1.1 Include a field-specific assessment of the potential for nitrogen and phosphorus transport from the field to surface waters, and address the form, source, amount, timing, and method of application of nutrients on each field to achieve realistic production goals, while minimizing nitrogen and phosphorus movement to surface waters; and

4.2.1.2 Include appropriate flexibilities for any CAFO to implement nutrient management practices to comply with the technical standards, including consideration of multi-year phosphorus application on fields that do not have a high potential for phosphorus runoff to surface water, phased implementation of phosphorus-based nutrient management, and other components, as determined appropriate by the Director.

4.2.1.3 **Manure and soil sampling.** Manure must be analyzed a minimum of once annually for nitrogen and phosphorus content, and soil analyzed a minimum of once every three years for phosphorus content. The results of these analyses are to be used in determining application rates for manure, litter, and other process wastewater.

4.2.1.4 **Inspect land application equipment for leaks.** The operator must periodically inspect equipment used for land application of manure, litter, or process wastewater.

4.2.1.5 **Setback requirements.** Unless the CAFO exercises one of the compliance alternatives provided for in Part a or d of this section, manure, litter, and process wastewater may not be applied closer than 100 feet to any down-gradient surface waters, open tile line intake structures, sinkholes, agricultural well heads, or other conduits to surface waters, 300 feet of Extraordinary Resource Waters (ERW) as defined by the Department's Regulation No. 2; 50 feet of property lines; or 500 feet of neighboring occupied buildings.

- a Vegetated buffer compliance alternative. As a compliance alternative, the CAFO may substitute the 100-foot setback with a 35-foot wide vegetated buffer where applications of manure, litter, or process wastewater are prohibited.
- b The restrictions regarding property lines or neighboring occupied buildings shall not apply if the adjoining property is also approved as a land application site under a permit issued by the Department or if the adjoining property owner consents in writing.
- c Application of waste shall not be made in areas where the land application of waste is prohibited by Arkansas Department of Health regulations for the protection of public water supplies.
- d Alternative practices compliance alternative. As a compliance alternative, the CAFO may demonstrate that a setback or buffer is not necessary because implementation of alternative conservation practices or field-specific conditions will provide pollutant reductions equivalent or better than the reductions that would be achieved by above setbacks.

4.2.1.6 **Precipitation Event.** Wastes shall not be land applied to soils that are saturated, frozen, covered with snow, during rain, or when precipitation is imminent (>50% chance of rain).

4.2.1.7 **Slope Requirements:** Wastes shall not be land applied to slopes with a gradient greater than 15%. The CAFO may demonstrate that a higher slope is appropriate because implementation of alternative conservation practices or field-specific conditions will provide pollutant reduction equivalent or better than the reductions that would be achieved by a set slope of 15%

4.3 Reserved

4.4 ADDITIONAL REQUIREMENTS AREA

4.4.1 Each CAFO subject to this subpart must implement the following requirements:

4.4.1.1 **Visual inspections.** There must be documented routine visual inspections of the CAFO production area. At a minimum, the following must be visually inspected:

- a **Weekly inspections of all stormwater diversion devices, runoff diversion structures, and devices channelling contaminated stormwater to the wastewater and manure storage and containment structure;**
- b **Daily inspection of water lines, including drinking water or cooling water lines when the facility is in normal operation;**
- c **Weekly inspections of the manure, litter, and process wastewater impoundments; the inspection will note the level in liquid impoundments as indicated by the depth marker in 4.4.1.2 of this section.**

4.4.1.2 Depth marker. All open surface liquid impoundments must have a depth marker which clearly indicates the minimum capacity necessary to contain the runoff and direct precipitation of the 25-year, 24-hour rainfall event. In the case of new sources subject to effluent limitations established pursuant to 40 CFR 412.46(a)(1), all open surface manure storage structures associated with such sources must include a depth marker which clearly indicates the minimum capacity necessary to contain the maximum runoff and direct precipitation associated with the design storm used in sizing the impoundment for no discharge.

4.4.1.3 Corrective actions. Any deficiencies found as a result of these inspections must be corrected as soon as possible.

4.4.1.4 Mortality handling. Mortalities must not be disposed of in any liquid manure or process wastewater system, and must be handled in such a way as to prevent the discharge of pollutants to surface water, unless alternative technologies pursuant to 40 CFR 412.31(a)(2) and approved by the Director are designed to handle mortalities.

4.4.2 Record keeping requirements. Each CAFO must maintain on-site the records for a period of five years from the date they are created a complete copy of the information required by 40 CFR 122.21(i)(1) and 40 CFR 122.42(e)(1)(ix) and the records specified in Parts 4.4.2.1 through 4.4.2.6 of this section. The CAFO must make these records available to the Director for review upon request.

- 4.4.2.1 Records documenting the inspections required under Part 4.4.1.1 of this section;
- 4.4.2.2 Weekly records of the depth of the manure and process wastewater in the liquid impoundment as indicated by the depth marker under Part 4.4.1.2 of this section;
- 4.4.2.3 Records documenting any actions taken to correct deficiencies required under Part 4.4.1.3 of this section. Deficiencies not corrected within 30 days must be accompanied by an explanation of the factors preventing immediate correction;
- 4.4.2.4 Records of mortalities management and practices used by the CAFO to meet the requirements of Part 4.4.1.4 of this section;
- 4.4.2.5 Records documenting the current design of any manure or litter storage structures, including volume for solids accumulation, design treatment volume, total design volume, and approximate number of days of storage capacity;
- 4.4.2.6 Records of the date, time, and estimated volume of any overflow.

4.5 RECORDKEEPING REQUIREMENTS FOR THE LAND APPLICATION AREAS

Each CAFO must maintain on-site a copy of its site-specific nutrient management plan. Each CAFO must maintain on-site for a period of five years from the date they are created a complete copy of the information required by 40 CFR 412.4 and 40 CFR 122.42(e)(1)(ix) and the records specified in Parts 4.5.1 through 4.5.10 of this section. The CAFO must make these records available to the Director or his or her designee, for review upon request.

- 4.5.1 Expected crop yields;
- 4.5.2 The date(s) manure, litter, or process waste water is applied to each field;
- 4.5.3 Weather conditions at time of application and for 24 hours prior to and following application;
- 4.5.4 Test methods consistent with University of Arkansas Extension recommendations used to sample and analyze manure, litter, process waste water, and soil .
- 4.5.5 Results from manure, litter, process waste water, and soil sampling;
- 4.5.6 Explanation of the basis for determining manure application rates, as provided in the technical standards established by the Director.
- 4.5.7 Calculations showing the total nitrogen and phosphorus to be applied to each field, including sources other than manure, litter, or process wastewater;
- 4.5.8 Total amount of nitrogen and phosphorus actually applied to each field, including documentation of calculations for the total amount applied;
- 4.5.9 The method used to apply the manure, litter, or process wastewater;
- 4.5.10 Date(s) of manure application equipment inspection.

PART 5
NOI and NMP REVIEW & PUBLIC NOTIFICATION PROCESS

All applications for permit coverage under this general permit will be reviewed by ADEQ prior to undergoing a public notification process.

- 5.1 Upon receipt of Notice of Intent (NOI) and NMP, ADEQ will review the submitted documents to ensure that all permit requirements are fulfilled. ADEQ may request additional information from the CAFO operator if additional information is necessary to complete the NOI, NMP, Disclosure Statement or clarify, modify, or supplement previously submitted material. If ADEQ makes a preliminary determination that the NOI is complete, the NOI, NMP and draft terms of the NMP to be incorporated into the permit will be made available for a 30-day public review and comment period on the ADEQ website (http://www.adeg.state.ar.us/water/branch_permits/general_permits/default.htm). During this period, any interested persons may submit written comments and may request a public hearing in accordance with APCEC Regulation No. 8 to clarify issues involved in the permitting decision. ADEQ will respond to comments received during this period and, if necessary, require the CAFO operator to revise the nutrient management plan. If determined appropriate by ADEQ, CAFOs will be granted coverage under this general permit upon written notification by ADEQ.
- 5.2 Comments will only be considered if they regard a specific facility's NOI or NMP. Comments on the contents of the General CAFO Permit ARG590000 will not be considered during the public comment period for a specific facility's coverage under this permit.
- 5.3 Any CAFO wishing to modify their NMP must notify the Department of planned changes. If the Department determines the changes are a major modification as specified in 40 CFR 122.63 or Substantial changes as specified in Part 3.2.6 of this general permit, the public notification process outlined above will be followed as appropriate.

**PART 6
GENERAL CONDITIONS**

6.1 Duty To Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Federal Clean Water Act and the Arkansas Water and Air Pollution Control Act and is grounds for enforcement action or for requiring a permittee to apply for an individual NPDES permit.

6.2 Penalties for Violations of Permit Conditions

The Arkansas Water and Air Pollution Control Act provides that any person who violates any provisions of a permit issued under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject to imprisonment for not more than one (1) year, or a fine of not more than twenty-five thousand dollars (\$25,000) or by both such fine and imprisonment for each day of such violation. Any person who violates any provision of a permit issued under the Act may also be subject to civil penalty in such amount as the court shall find appropriate, not to exceed ten thousand dollars (\$10,000) for each day of such violation. The fact that any such violation may constitute a misdemeanor shall not be a bar to the maintenance of such civil action.

6.3 Permit Actions

In accordance with 40 CFR Parts 122.62 (a)(2) and 124.5, this permit may be reopened for modification or revocation and/or reissuance to require additional monitoring and/or effluent limitations when new information is received that actual or potential exceedance of State water quality criteria and/or narrative criteria are determined to be the result of the permittee's discharge(s) to a relevant water body or a Total Maximum Daily Load (TMDL) is established or revised for the water body that was not available at the time of the permit issuance that would have justified the application of different permit conditions at the time of permit issuance.

This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to the following:

- a. Violation of any terms or conditions of this permit; or
- b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
- c. A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination.
- d. Failure of the permittee to comply with the provisions of Reg. 9 (Permit fees) as required by Part II.A.8. herein.

The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

6.4 Toxic Pollutants

If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Reg. 2, as amended, (regulation establishing water quality standards for surface waters of the State of Arkansas) or Section 307(a)

of the Clean Water Act for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitations on the pollutant in this permit, this permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the permittee so notified.

The permittee shall comply with effluent standards or prohibitions established under Reg. 2 (Arkansas Water Quality Standards), as amended, or Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

6.5 Civil and Criminal Liability

Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

6.6 Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

6.7 State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Clean Water Act.

6.8 Property Rights

The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

6.9 Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

6.10 Permit Fees

The permittee shall comply with all applicable permit fee requirements for wastewater discharge permits as described in Reg. 9 (Regulation for the Fee System for Environmental Permits). Failure to promptly remit all required fees shall be grounds for the Director to initiate action to terminate this permit under the provisions of 40 CFR 122.64 and 124.5 (d), as adopted in Reg. 6 and the provisions of Reg. 8.

6.11 Reserved

6.12 Continuance of the Expired General Permit.

An expired general permit continues in force and effect until a new (renewal) general permit is issued. If this permit is not re-issued or replaced prior to the expiration date, it will be administratively continued in accordance with 40 CFR 122.6 and remain in force and effect. If applicants were granted permit coverage prior to the expiration date, they will automatically remain covered by the continued permit until the earliest of:

- 6.12.1 Re-issuance or replacement of this permit, at which time permittee must comply with the conditions of the new permit to maintain authorization to discharge; or
- 6.12.2 Permittee submit a Notice of Termination; or
- 6.12.3 Issuance of an individual permit for the project's discharges; or
- 6.12.4 A formal permit decision by the ADEQ to not re-issue this general permit, at which time you must seek coverage under an individual permit or other general permits, if available.

PART 7
OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

7.1 Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. The permittee shall provide an adequate operating staff which is duly qualified to carryout operation, maintenance and testing functions required to insure compliance with the conditions of this permit.

7.2 Need to Halt or Reduce not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power for the treatment facility is reduced, is lost, or alternate power supply fails.

7.3 Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment or the water receiving the discharge.

7.4 Bypass of Treatment Facilities

Bypass not exceeding limitation. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation.

7.4.1 Notice

7.4.1.1 Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.

7.4.1.2 Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Part 9.4 (24-hour notice).

7.4.2 Prohibition of bypass.

7.4.2.1 Bypass is prohibited and the Director may take enforcement action against a permittee for bypass, unless:

- a Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
- b There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if the permittee could have installed adequate backup equipment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
- c The permittee submitted notices as required by Part 7.4.1.

7.4.2.2 The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in 7.4.2.1.1.

7.5 Upset Conditions

7.5.1 Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Part 7.5.2 of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

7.5.2 Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

- a. An upset occurred and that the permittee can identify the specific cause(s) of the upset;
- b. The permitted facility was at the time being properly operated;
- c. The permittee submitted notice of the upset as required by Part 7.4.1; and
- d. The permittee complied with any remedial measures required by Part 7.3.

7.5.3 Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

7.6 Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of waste waters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering the waters of the State. Written approval for such disposal must be obtained from the ADEQ Director, unless management of the material is contemplated by the Nutrient Management Plan.

7.7 Power Failure

The permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failure either by means of alternate power sources, standby generators, or retention of inadequately treated effluent.

PART 8
Monitoring and Records

8.1 Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken before the effluent joins or is diluted by any other waste stream, body of water, or substance. All discharges from production areas shall be monitored.

8.2 Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit. The permittee shall calibrate and perform maintenance procedures on all monitoring analytical instrumentation at intervals frequent enough to insure accuracy of measurements and shall insure that both calibration and maintenance activities will be conducted. An adequate analytical quality control program, including the analysis of sufficient standards, spikes, and duplicate samples to insure the accuracy of all required analytical results shall be maintained by the permittee or designated commercial laboratory.

8.3 Penalties for Tampering

The Arkansas Water and Air Pollution Control Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject to imprisonment for not more than one (1) year, or a fine of not more than ten thousand dollars (\$10,000) or by both such fine and imprisonment.

8.4 Reporting of Monitoring Results

Monitoring shall be submitted to the Director at the following address:

Enforcement Branch
Water Division
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118

If permittee uses outside laboratory facilities for sampling and/or analysis, the name and address of the contract laboratory shall be included on the (Discharge Monitoring Report (DMR).

8.5 Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the summary report. Such increased frequency shall also be indicated in the summary report.

8.6 Record Contents

Records and monitoring information shall include:

- 8.6.1 The date, exact place, time and methods of sampling or measurements;
- 8.6.2 The individuals(s) who performed the sampling or measurements;
- 8.6.3 The date(s) analyses were performed;
- 8.6.4 The individual(s) who performed the analyses;
- 8.6.5 The analytical techniques or methods used; and
- 8.6.6 The measurements and results of such analyses.

8.7 Inspection and Entry

The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

- 8.7.1 Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
- 8.7.2 Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
- 8.7.3 Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
- 8.7.4 Sample, inspect or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act and/or Arkansas Water and Air Pollution Control Act, any substances or parameters at any location.
- 8.7.5 ADEQ will follow the bio-security policy of the permittee or owner of the animals when inspecting and entering the facility.

PART 9 REPORTING REQUIREMENTS

9.1 Planned Changes

The permittee shall give notice and provide plans and specification to the Director for review and approval prior to any planned physical alterations or additions to the permitted facility.

Any change in the facility discharge (including the introduction of any new source or significant discharge or significant changes in the quantity or quality of existing discharges of pollutants) must be reported to the ADEQ. In no case are any new connections, increased flows, or significant changes in influent quality permitted that cause violation of the effluent limitations specified herein.

9.2 Transfers

Facilities that are authorized under this permit, which undergo a change in ownership, facility name, or signatory authorization (i.e., a new cognizant official, responsible person, etc.), must submit a Permit Transfer form to the Director. A Permit Transfer form can be obtained from the General Permits Section of the Water Division at the following website: http://www.adeg.state.ar.us/water/branch_permits/general_permits/

For an ownership change, the permit transfer form must be submitted a minimum of 30 days prior to the date the transfer to the new operator will take place. The new owner must comply with the existing permit for the facility during the interim period. A Disclosure Form will be required. Transfer of the permit does not relieve the previous permittee from any unpaid permit fees.

9.3 Twenty-four Hour Reporting

The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrences of the noncompliance. The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

The following shall be included as information which must be reported within 24 hours:

- 9.3.1 Any unanticipated bypass which exceeds any effluent limitation in the permit; and
- 9.3.2 Any upset which exceeds any effluent limitation in the permit.

9.4 Other Noncompliance

The permittee shall report all instances of noncompliance not reported under Part and 9.3 at the time monitoring reports are submitted. The reports shall contain the information listed at Part 9.3.

9.5 Changes in Discharge of Toxic Substances for Industrial Discharges

The permittee shall notify the Director as soon as he/she knows or has reason to believe:

- 9.5.1 That any activity has occurred or will occur which would result in the discharge, in a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the "notification levels" described in 40 CFR 122.42(a)(1).
- 9.5.2 That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the "notification levels" described in 40 CFR Part 122.42(a)(2).

9.6 Duty to Reapply

This permit will expire 5 years from the effective date. If this permit is not re-issued or replaced prior to the expiration date, it will be administratively continued in accordance with APCEC Regulation No. 6 and remain in force and effect. If permit coverage was granted prior to the expiration date, permit coverage is automatically continued until the earliest of:

- 9.6.1 Reissuance or replacement of this permit, at which time the operator must comply with the conditions of the new permit to maintain authorization to discharge and, the operator is required to notify the Department of his/her intent to be covered under this permit within 120 days after the effective date of the renewal permit ; or
- 9.6.2 Submittal of a Notice of Termination; or
- 9.6.3 Issuance of an individual permit for the facility's discharges; or

A formal permit decision by the ADEQ to not re-issue this general permit, at which time the facility must seek coverage under an individual permit or other alternate permits.

9.7 Duty to Provide Information

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

9.8 Signatory Requirements

All applications, reports, or information submitted to the Director shall be signed and certified as follows:

- 9.8.1 All permit applications shall be signed as follows:

- 9.8.1.1 For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

- a A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or
 - b The manager of one or more manufacturing, production, or operation facilities, provided: the manager is authorized to make management decisions which govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
- 9.8.1.2 For a partnership or sole proprietorship: by a general partner or proprietor, respectively; or
- 9.8.1.3 For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:
- a The chief executive officer of the agency, or
 - b A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
- 9.8.2. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
- 9.8.2.1. The authorization is made in writing by a person described above;
 - 9.8.2.2. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
 - 9.8.2.3. The written authorization is submitted to the Director.
- 9.8.3. Certification. Any person signing a document under this section shall make the following certification:
- "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

9.9 Availability of Reports

Except for data determined to be confidential under 40 CFR Part 2 and APCEC Regulation No. 6, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department of Environmental Quality. As required by the Regulations, the name and address of any permit applicant or permittee, permit applications, permits and effluent data shall not be considered confidential.

9.10 Penalties for Falsification of Reports

The Arkansas Water and Air Pollution Control Act provides that any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained under this permit shall be subject to civil and/or criminal penalties specified in Part 3.2. under the authority of the Arkansas Water and Air Pollution Control Act.

PART 10 DEFINITIONS

All definitions contained in Section 502 of the Clean Water Act shall apply to this permit and are incorporated herein by reference. Additional definitions of words or phrases used in this permit are as follows:

- 10.1 "Act": the Clean Water Act, Public Law 95-217 (33.U.S.C.1251et seq.) as amended.
- 10.2 "ADEQ" the Arkansas Department of Environmental Quality.
- 10.3 "Administrator": the Administrator of the U.S. Environmental Protection Agency.
- 10.4 "Agricultural stormwater discharge" as a discharge composed entirely of stormwater, as defined in § 122.26(a)(13), from a land area upon which manure or wastewater has been applied in accordance with proper agricultural practices, including land application of manure or wastewater in accordance with either a nitrogen-based or, as required, a phosphorus-based manure application rate. In addition, as noted, the proposed effluent guidelines included technology-based requirements for a CAFO's land application areas that were based on the CAFO's use of proper agricultural practices. (See 66 FR at 3029-32). Any dry weather discharge of manure or process wastewater resulting from its application to land area under the control of a CAFO would not be considered an agricultural storm water discharge and would thus be subject to Clean Water Act requirements.
- 10.5 "Animal feeding operation" ("AFO") means a lot or facility (other than an aquatic animal production facility) where the following conditions are met:
1. Animals (other than aquatic animals) have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period, and
 2. Crops, vegetation, forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility.
- 10.6 "APCEC": the Arkansas Pollution Control and Ecology Commission.
- 10.7 "Applicable effluent standards and limitations": all State and Federal effluent standards and limitations to which a discharge is subject under the Act, including, but not limited to, effluent limitations, standards of performance, toxic effluent standards and prohibitions, and pretreatment standards.
- 10.8 "Applicable water quality standards": all water quality standards to which a discharge is subject under the federal Clean Water Act and which have been (a) approved or permitted to remain in effect by the Administrator following submission to the Administrator pursuant to Section 303(a) of the Act, or (b) promulgated by the Director pursuant to Section 303(b) or 303(c) of the Act, and standards promulgated under Reg. 2, as amended, (regulation establishing water quality standards for surface waters of the State of Arkansas).
- 10.9 "Bypass": the intentional diversion of waste streams from any portion of a treatment facility.
- 10.10 "Concentrated animal feeding operation" ("CAFO") means an AFO that is defined as a Large CAFO or as a Medium CAFO by the terms of this Part, or that is designated as a CAFO in accordance with 40 CFR 122.23(c). Two or more AFOs under common ownership are considered to be a single AFO for the purposes of determining the number of animals at an operation, if they adjoin each other or if they use a common area or system for the disposal of wastes.

Table of Regulatory Definitions of Large CAFOs, Medium CAFO, and Small CAFOs

A Large CAFO confines at least the number of animals described in the table below.

A Medium CAFO falls within the size range in the table below and either:

- has a manmade ditch or pipe that carries manure or wastewater to surface water; or

- the animals come into contact with surface water that passes through the area where they're confined.

If an operation is found to be a significant contributor of pollutants, the permitting authority may designate a medium-sized facility as a CAFO.

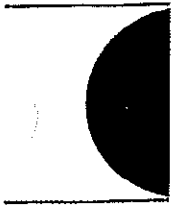
A **Small CAFO** confines fewer than the number of animals listed in the table and has been designated as a CAFO by the permitting authority as a significant contributor of pollutants.

Animal Sector	Size Thresholds (number of animals)		
	Large CAFOs	Medium CAFOs	Small CAFOs
Subpart A			
sheep or lambs	10,000 or more	3,000 - 9,999	less than 3,000
horses	500 or more	150 - 499	less than 150
Subpart B			
ducks (other than a liquid manure handling systems)	30,000 or more	10,000 - 29,999	less than 10,000
ducks (liquid manure handling systems)	5,000 or more	1,500 - 4,999	less than 1,500
Subpart C			
cattle or cow/calf pairs	1,000 or more	300 - 999	less than 300
mature dairy cattle	700 or more	200 - 699	less than 200
Subpart D			
veal calves	1,000 or more	300 - 999	less than 300
swine (weighing over 55 pounds)	2,500 or more	750 - 2,499	less than 750
swine (weighing less than 55 pounds)	10,000 or more	3,000 - 9,999	less than 3,000
turkeys	55,000 or more	16,500 - 54,999	less than 16,500
laying hens or broilers (liquid manure handling systems)	30,000 or more	9,000 - 29,999	less than 9,000
chickens other than laying hens (other than a liquid manure handling systems)	125,000 or more	37,500 - 124,999	less than 37,500
laying hens (other than a liquid manure handling systems)	82,000 or more	25,000 - 81,999	less than 25,000

- 10.11 "Daily Maximum": discharge limitation means the highest allowable "daily discharge" during the calendar month.
- 10.12 "Department": the Arkansas Department of Environmental Quality (ADEQ).
- 10.13 "Director": the Administrator of the U.S. Environmental Protection Agency and/or the Director of the Arkansas Department of Environmental Quality.
- 10.14 "Discharge" means a discharge of any wastes in any manner which directly or indirectly permits such wastes to reach any of the waters of the state.
- 10.15 "Fecal Coliform" means the bacterial count at 40 CFR 136.3 in Table 1A, which also cites the approved methods of analysis.

- 10.16 **"Grab sample"**: an individual sample collected in less than 15 minutes in conjunction with an instantaneous flow measurement.
- 10.17 **"Land application area"** means land under the control of an AFO operator, whether it is owned, rented, or leased, to which manure, litter or process wastewater from the production area is or may be applied.
- 10.18 **"Manure"** is defined to include manure, bedding, compost and raw materials or other materials commingled with manure or set aside for disposal.
- 10.19 **"mg/l"**: milligrams per liter; it is essentially equivalent to parts per million in dilute aqueous solutions.
- 10.20 **"Monitoring and Reporting"**: When a permit becomes effective, monitoring requirements are of the immediate period of the permit effective date. Where the monitoring requirement for an effluent characteristic is Monthly or more frequently, the Discharge Monitoring Report shall be submitted within 30 days following the sampling.
- 10.21 **"National Pollutant Discharge Elimination System (NPDES)"**: the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under section 307, 402, 318 and 405 of the Clean Water Act.
- 10.22 **"New source"** means any building, structure, facility, or installation from which there is or may be a "discharge of pollutants," the construction of which commenced:
1. After promulgation of standards of performance under section 306 of CWA which are applicable to such source, or
 2. After proposal of standards of performance in accordance with section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with section 306 within 120 days of their proposal.
- 10.23 **"Operator"** for the purpose of this permit, means any person (an individual, association, partnership, corporation, municipality, state or federal agency) who has the primary management and ultimate decision-making responsibility over the operation of a facility or activity. The operator is responsible for ensuring compliance with all applicable environmental regulations and conditions.
- 10.24 **"Overflow"** means the discharge of manure or process wastewater resulting from the filling of wastewater or manure storage structures beyond the point at which no more manure, process wastewater, or stormwater can be contained by the structure.
- 10.25 **"Point source"** means any discernible, confined and discrete conveyance from which pollutants are or may be discharged. Point source discharges of storm water result from structures which increase the imperviousness of the ground or which acts to collect runoff, with runoff being conveyed along the resulting drainage or grading pattern.
- 10.26 **"Pollutant"** means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water.
- 10.27 **"Pollution"** means such contamination or other alteration of the physical, chemical, or biological properties of any waters of the state, or such discharge of any liquid, gaseous, or solid substance in any waters of the state as will, or is likely to, render the waters harmful, detrimental, or injurious to public health, safety, or welfare; to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses; or to livestock, wild animals, birds, fish, or other aquatic life.
- 10.28 **"Process wastewater"** means water directly or indirectly used in the operation of the AFO for any or all of the following: spillage or overflow from animal or poultry watering systems; washing, cleaning, or flushing pens, barns, manure pits, or other AFO facilities; direct contact

- swimming, washing, or spray cooling of animals; or dust control. Process wastewater also includes any water which comes into contact with any raw materials, products, or byproducts including manure, litter, feed, milk, eggs or bedding.
- 10.29 **"Production area"** means that part of an AFO that includes the animal confinement area, the manure storage area, the raw materials storage area, and the waste containment areas. The animal confinement area includes but is not limited to open lots, housed lots, feedlots, confinement houses, stall barns, free stall barns, milkrooms, milking centers, cowyards, barnyards, medication pens, walkers, animal walkways, and stables. The manure storage area includes but is not limited to lagoons, runoff ponds, storage sheds, stockpiles, under house or pit storages, liquid impoundments, static piles, and composting piles. The raw materials storage area includes but is not limited to feed silos, silage bunkers, and bedding materials. The waste containment area includes but is not limited to settling basins, and areas within berms and diversions which separate uncontaminated stormwater. Also included in the definition of production area is any egg washing or egg processing facility, and any area used in the storage, handling, treatment, or disposal of mortalities.
- 10.30 **"Severe property damage"**: substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in productions.
- 10.31 **"Ten (10)-year, 24-hour rainfall event, 25-year, 24-hour rainfall event, and 100-year, 24-hour rainfall event"** mean precipitation events with a probable recurrence interval of once in ten years, or twenty five years, or one hundred years, respectively, as defined by the National Weather Service in Technical Paper No. 40, "Rainfall Frequency Atlas of the State," May, 1961, or equivalent regional or State rainfall probability information developed from this source.
- 10.32 **"Total Suspended Solids (TSS)"**: the amount of solid material suspended in water, commonly expressed as a concentration, in terms of mg/l.
- 10.33 **"Treatment works"** means any devices and systems used in storage, treatment, recycling, and reclamation of municipal sewage and industrial wastes, of a liquid nature to implement section 201 of the Act, or necessary to recycle reuse water at the most economic cost over the estimated life of the works, including intercepting sewers, sewage collection systems, pumping, power and other equipment, and alterations thereof; elements essential to provide a reliable recycled supply such as standby treatment units and clear well facilities, and any works, including site acquisition of the land that will be an integral part of the treatment process or is used for ultimate disposal of residues resulting from such treatment.
- 10.34 **"Upset"**: an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventive maintenance, or careless or improper operations.
- 10.35 **"Waters of the State"** means all streams, lakes, marshes, ponds, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, which are contained within, flow through, or border upon this state or any portion of the state.



**DeHaan, Grabs
& Associates, LLC**

Consulting Engineers

www.dgaengineering.com

Comprehensive Nutrient Management Plan

For

C&H Hog Farms

Newton County, AR

Prepared by DeHaan, Grabs & Associates, LLC,

May 2012

*Proposed
Site*

North Dakota Office

P.O. Box 522

Mandan, ND 58554-0522

(701) 663-1116

Fax (701) 667-1356



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Section A: Introduction

Nutrient Management Plan Table of Contents

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 - 1. Narrative for Nutrient Management Plan
 - 2. Signature Page
 - 3. Contact Information
 - 4. References Page
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- B. Nutrient Utilization Plan**
- C. Land Application Calculations**
 - 1. Land Application Calculation Spreadsheet
 - 2. Phosphorus Index & RUSLE 2 Calculations
 - 3. 5 Year Crop Rotation, Yield Goals & Crop Nutrient Uptake
- D. Phosphorus Based Field list**
- E. Inventory of Water Wells**
- F. Land Treatment Information and Land Application Maps**
 - 1. Waste Utilization Summary Sheet
 - 2. Overall Site Map
 - 3. WQRA Maps
 - 4. Soil Survey Maps
- G. Signed Manure Application Lease Agreements**
- H. Soil Test Reports**
- I. Nutrient Tests Results and How to**
- J. Mortality Disposal Actions**
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- L. Odor Control**
- M. Waste Storage Pond Pumping Plan**
- N. Record Keeping and Land Application Log Forms**
 - 1. Manure Source Details
 - 2. Annual Report Form for Permitted Confined Animal Facilities
 - 3. Previous Manure Applications and Nitrogen Credits
 - 4. Calculating Residual/Supplemental Nitrogen Amounts
 - 5. Fertilizer Recommendations and Crop Requirements
 - 6. Determining the Manure Application Rate
 - 7. Animal Waste Land Application Record for Permitted Confined Animal Facilities

NARRATIVE FOR C&H HOG FARMS NUTRIENT MANAGEMENT PLAN

This Nutrient Management Plan was developed for C&H Hog Farms. The farm located approximately 1.6 miles to the west of Mt. Judea AR. Driving directions from Mt. Judea is approximate 0.8 miles southwest on County Rd 54 and right on County rd 41 approximately 0.75 miles. The site is located on the left hand side of the road on a logging trail. The legal location is Section 26, Township 15 North, Range 20 West, Newton County, Arkansas. This Nutrient Management Plan was developed as a joint effort between C&H Hog Farms, the Natural Resources Conservation, and DeHaan, Grabs & Associates, LLC.

The total available for crop uptake of N (18,497 lbs) and available P₂O₅ (14,213 lbs) produced annually by the livestock was determined by DeHaan, Grabs & Associates, LLC using Arkansas Nutrient Management Planner with 2009 PI. The Waste Storage Ponds have capacity of 3,495,464 gallons (this includes the shallow pits). The Waste Storage Ponds have capacity at the Must Pumpdown Elevation of 2,469,903 gallons. The volume between the Freeboard and the Must Pumpdown Elevation is 35,564 gallons. Effluent from Waste Storage Pond 1 will be applied through a Vac Tanker, whereas the effluent from Waste Storage Pond 2 will applied through a traveling gun and a permanent pipeline. The rate will be calculated in accordance to the crop needs using the Nutrient Management Planner with 2009 PI. The NMP includes 670.4 acres of agricultural land, most of which is available for manure application. After excluded acres the land available is approximately 630.7 acres. The typical crops grown are native grass (Bermudagrass and Fescue) either taken off as rotated pasture or hay. When calculating projected land base requirements and RUSLE 2 calculations, predicted crop yield goals was used. When calculating annual nutrient application needs, actual yields on a per field basis will be used.

The record keeping section is important for the proper application of nutrients from the facility. Records of commercial fertilizer will also be maintained. The facility will maintain the following documentation from each application of manure or wastewater: current soil sample analysis, current manure or wastewater analysis, records showing equipment calibration, a Water Quality Risk Assessment (WQRA) map showing actual area application, and a completed Arkansas Nutrient Management Planner summary showing calculated application rate.

Nutrient Management Plan

The Nutrient Management Plan (NMP) is an important part of the conservation management system (CMS) for your Animal Feeding Operation (AFO). This NMP documents the planning decisions and operation and maintenance for the animal feeding operation. It includes background information and provides guidance, reference information and Web-based sites where up-to-date information can be obtained. Refer to the Producer Activity document for information about day-to-day management activities and recordkeeping. Both this document and the Producer Activity document shall remain in the possession of the producer/landowner.

Farm contact information: C&H Hog Farms, (Jason Henson) 870-688-1318
HC 72 PO Box 10
Latitude/Longitude: 35, 55', 13.60" & -93, 4' 51.0" Mount Judea, AR 72655
Plan Period: 2012-2017
Animal Type: Swine Animal Units: 999

Owner/Operator

As the owner/operator of this NMP, I, as the decision maker, have been involved in the planning process and agree that the items/practices listed in each element of the NMP are needed. I understand that I am responsible for keeping all the necessary records associated with the implementation of this NMP. It is my intention to implement/accomplish this NMP in a timely manner as described in the plan.

Signature: _____ Date: _____
Name: Jason Henson

Conservation Planner

As a Conservation Planner, I certify that I have reviewed both the Nutrient Management Plan and Producer Nutrient Management Activities documents for technical adequacy and that the elements of the documents are technically compatible, reasonable and can be implemented.

Signature: Nathan A. Pesta Date: June 1, 2012
Name: Nathan A. Pesta, P.E.
Title: Senior Project Engineer

Manure and Wastewater Handling and Storage

Signature: _____ Date: _____
Name: Geoffrey H. Bates, P.E.
Title: President

Nutrient Management

The Nutrient Management component of this plan meets the AR Nutrient Management 590 Practice Standard.

Signature: _____ Date: _____
Name: Geoffrey H. Bates P.E.
Title: President

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NUTRIENT MANANGEMENT PLAN CONTACT INFORMATION

1. **Facility:**
NAME: C&H Hog Farms
ADDRESS: HC 72 PO Box 10
Mount Judea, AR 72655
PHONE NUMBER: (870) 688-1318
EMAIL: jasonh@rittermail.com
MANAGER: Jason Henson

2. **Owners:**
NAME: Jason Henson
ADDRESS: HC 72 PO Box 10
Mount Judea, AR 72655
PHONE NUMBER: (870) 715-9468

3. **NMP Developed by:**
NAME: DeHaan, Grabs & Associates, LLC
Nathan A. Pesta
ADDRESS: P.O. Box 522
Mandan, ND 58554
PHONE NUMBER: (701) 663-1116
CELL NUMBER: (701) 400-3950

4. **Legal Location of Facility**
Middle, Section 26, T-15-N, R-20-E, Newton County, AR

NUTRIENT MANAGEMENT PLAN INFORMATION

Type of Livestock:..... Swine
Number of head: 6503
Average Weight:.....153.6 lbs

Total Number of
Acres Included in NMP after excluded acres:.....630.7 acres

References

The nutrient management plan was developed based on compliance criteria described in the following documents:

- Arkansas Pollution Control and Ecology Commission Regulation 5 dated March 28, 2008
- USDA, Natural Resources Conservation Service (NRCS) conservation practice standard Nutrient Management ("590") dated December 2004
- _____ County zoning ordinance for animal feeding operations dated/amended

Land Base

The nutrient management plan has sufficient land base to meet land application on a Nitrogen (N)-based for fields 5-9. Fields 1-4 and 10-17 are in addition and will be applied on a Phosphorus (P)-based manure application rate. P-based levels for spreading manure generally requires a significantly greater land base the N-based. When necessary, fields targeted for phosphorus-based manure application are identified in the Manure Application Planning section of this plan.

Local Zoning Ordinances

Operator Name: C&H Hog Farms County: Newton

The livestock operator is responsible for complying with all local ordinances. The operator shall address all of the following items and ensure any local requirements are met and/or included in this plan.

1. Does the county have any ordinances that require special permitting or approvals for siting animal feeding operations or land application of manure? ___ Yes X No

If yes, has the county permitted or approved this site? ___ Yes ___ No

If no, do you intend to get approval or obtain local permits prior to land application of manure? ___ Yes ___ No

Application of manure cannot occur until the operator obtains all local approvals.

2. Is the land application area, or any portion, located within the jurisdictional area of a city or town? ___ Yes X No

If yes, does the city or town have any special permitting for siting animal feeding operations or application of manure within their jurisdictional area? ___ Yes X No

If yes, has the city or town permitted or approved this site? ___ Yes ___ No

If no, do you intend to get approval or obtain local permits prior to land application of manure? ___ Yes ___ No

Application of manure cannot occur until the operator obtains local approval.

3. Are there specific setback distances that the county or city requires for application of manure? (For example, some local governments require specific setbacks from residences and public right-of-ways.) ___ Yes X No

If yes, show the applicable setbacks on the required field maps and exclude these areas from the total number of acres.

4. Is the land application site located in a wellhead protection area? ___ Yes X No

If yes, the producer needs to contact the local county, city or public water supply official to discuss specific requirements.

(Operator Signature)

(Date)

Section B: Nutrient Utilization Plan

B. NUTRIENT UTILIZATION PLAN

The Following is in this section:

1. Location
2. Record Keeping
3. Soil Sampling
4. Manure Sampling
5. Nutrient Budget for Land Application
6. Timing, Rate, and Frequency of Liquid and Solid Manure Applications
7. Land Application of Liquid Manure
8. Amounts of Nitrogen Applied
9. Solid Accumulation in the Retention Storage Pond
10. Check Valves/Safety Switches
11. Effluent/Solids Easement Agreement
12. Prevention of Destruction of Endangered or Threatened Species
13. Setback Requirements
14. Typical Crops Grown and Crop Yields for the Land Application Areas
15. Nutrient Utilization Plan Amendments

B. NUTRIENT UTILIZATION PLAN

1. **Location**

This plan is for C& H Hog Farms which is located in Newton County, Arkansas with a legal description of Section 26, Township 15 North, Range 20 West.

2. **Record Keeping.**

- a. A liquid manure pumping data sheet will be completed at the end of all pumping events by the person(s) responsible for monitoring the application event.

The pumping data sheet will include calculations for rate, gallons applied, hours of application time, type of crop applied to, method of application and total acres to be applied.

- b. A solids manure application data sheet will be completed at the end of all land application events by the person(s) responsible for monitoring the application event.

The application data sheet will include calculations for rate, cubic feet or tons applied, type of crop applied to, method of application and total acres to be applied.

- c. During Periods of Land Application, daily inspections shall be conducted and record the following

- 1) Record the days each field is applied to, as well as weather conditions including; temperature, wind speed and wind direction.
- 2) Inspect and record the condition of the land application fields being used.
- 3) Inspect and record the condition of all land application equipment being used.
- 4) Inspect and record the condition of the waste storage pond liner and embankment near the pump intake if pumping is taking place

- d. Inspections after Rainfall events shall be conducted and record the following:

- 1) Record the depth of the water in all retention ponds.
- 2) Inspect risers and pipe to ensure they are not plugged or damaged. Clean any significant sediment build up as soon as possible.
- 3) Inspect storage ponds for signs of leaking or seepage, excessive settling, excessive vegetation growth or damage due to vehicles or equipment, rodents or erosion. Report any leakage as detailed above and make plans to rectify any problems.

- 4) Inspect fences and safety signs around the facility, if applicable, to ensure they are present and in good condition. If necessary repair immediately.
 - 5) Record any livestock mortalities and how the carcasses were properly disposed of. (i.e. rendering service receipts, location of burial, etc.)
- f. Annual inspections shall be conducted and record the following.
- 1) Conduct soil and manure testing as required by this plan.
 - 2) Prepare an annual Nutrient Management Plan based on current data.
 - 3) Annual reporting should be completed as referenced in http://www.adeq.state.ar.us/water/forms_inst.htm
3. **Soil Sampling.**
- a. Composite base-line soil test samples for a new facility or a new land application area and land receiving liquid manure will be taken at least annually.
 - b. Soil samples will be taken before the land application of liquid and solids manure to determine the manure application rate appropriate to the land application area.
 - c. Samples will be taken as follows:
 - 1) At least 20 cores taken to a depth of 24 inches shall be collected for each field.
 - a) One composite sample shall consist of the top six inches of no fewer than 20 combined. The other sample shall be the remaining six to 24 inches of at least 6-8 combined.
 - b) Phosphorus, copper and zinc shall be tested from the combined top six inches of the cores from a field.
 - c) Nitrate-N and chloride shall be tested from the combined six to 24 inches of the cores from a field.
 - d) The core composite portions of any sample, when mixed together, shall represent the field at the depths from the cores.
 - e) The soil samples shall be taken at least every 40 acres.

- 2) The samples will then be mixed in a plastic bucket (not metal) to form a representative composite sample for the field.
- 3) A subsample will be taken from the mixed composite and placed in the cloth bag provided by the analytical laboratory.
- 4) Soil samples for Nitrate-N and Phosphorus shall be taken no less than annually. The soil samples shall be certified by the person taking the samples as being a representative sample of the soil and of the nutrient values of the field being tested.
- 5) A copy of the certification of each composite soil sample and the laboratory results for each sample shall be maintained in the office of the facility and made available to the Department of Health or designee upon inspection. The certification will show the date the sample was taken, the approximate locations in the field from which the cores were taken, the depth or depths of the cores that constitutes the sample, the name of the person who took the sample and the date the sample delivered to a laboratory.

4. Manure Sampling.

- a. Manure samples in conjunction with soil samples, will be taken prior to land application to determine land application rate.
- b. Liquid and solid manure samples will be analyzed by a certified laboratory for pH, total dissolved salts, potassium, total nitrogen, ammonium-nitrogen and phosphorus.

5. Nutrient Budget for Land Application.

- a. Nutrient loss due to volatilization, evaporation, and crop uptake will be accounted for each time liquid manure is applied to the land application area.
- b. In addition, communications with the farmer(s) will ensure proper planning of commercial fertilizer applications with liquid manure applications so that excess nutrients will not be applied to the land.

6. Timing, Rate, and Frequency of Liquid and Solid Manure Applications.

- a. Liquid and solid manure will be applied at agronomic rates.

Weather conditions and nutrient holding capacity of the soil will determine the timing and rate of application.

- b. Liquid and solid manure will not be applied to land classified as highly erodible according to the conservation compliance provisions of the Federal Food Security Act of 1985, saturated or frozen ground, or during a rainfall event.

Most land applications will be conducted in the spring, summer and fall.

- c. Liquid manure will not be applied to land classified as highly erodible according to the conservation compliance provisions of the Federal Food Security Act of 1985, saturated or frozen ground, or during a rainfall event.

Most land applications will be conducted in the spring, summer and fall.

- d. Land application will be conducted in a manner which will prevent a discharge or drainage of manure to ground or surface waters of the State.
- e. Land application practices are managed so as to reduce or minimize ponding or puddling of liquid manure on the site, contamination of ground or surface waters, and occurrence of nuisance conditions such as odors, flies, and rodents.
- f. Land application practices will minimize the possibility of contamination of surface and groundwaters of the State.

7. Land Application of Liquid Manure

- a. Careful scheduling of the land application activities will reduce the threat of odor emissions to residents near the facility.
- b. Days with low humidity are best for land application.
 - Applications on holidays and weekends when people are most likely to be outdoors will be avoided when possible.
- c. The use of sprinkler for land application will be one of the methods for liquid application. The use of a vactanker and equipment to knife inject or spread the nutrients on top the land for land application will be one of the methods for land application.

8. Amounts of Nitrogen Applied.

Section C: Land Application Calculations

SECTION C. Land Application Calculations

The following information is attached

1. Land Application Calculation Spreadsheet
2. Phosphorus Index & RUSLE 2 Calculations
3. Yield Goal & Crop Nutrient Uptake

C. Land Application Calculations

C&H Hog Farms
01-Jun-12

1. Estimate the total nutrients (NPK) in the excreted manure.

Nutrients per storage period = # of animals x weight (lbs) x daily nutrient production (lb/day/1,000 lb)

	# of Animals	Average Weight (lbs.)	Daily Nutrient Production (lb/day/1,000 lbs)	Storage Period	Total Nutrients
Nitrogen					
Farrowing Sows	400	425	0.47	365	29,164
Breeding/Gestation	2100	375	0.19	365	54,613
Boars	3	450	0.16	365	74
Nursery Pigs	4000	10	0.60	365	8,760
Finisher Pigs	0	150	0.42	365	0
Total Nitrogen	6,503				92,611
Phosphorus					
Farrowing Sows	400	425	0.15	365	9,308
Breeding/Gestation	2100	375	0.063	365	18,109
Boars	3	450	0.05	365	25
Nursery Pigs	4000	10	0.26	365	3,660
Finisher Pigs	0	150	0.16	365	0
Total Phosphorus	6,503				31,091
Potassium					
Lactating Sows	400	425	0.3	365	18,615
Breeding/Gestation	2100	375	0.123	365	35,355
Boars	3	450	0.10	365	49
Nursery Pigs	4000	10	0.35	365	5,110
Finisher Pigs	0	150	0.22	365	0
Total Potassium	6,503				59,129

2. Add nutrients contained in wastewater.

Nutrients in the wastewater = Number of animals x daily wastewater production (gal./day/cow) x daily nutrient production (lb/day/1,000 gal)

	# of Animals	Daily Wastewater Production (gal./day/cow)	Daily Nutrient Production (lb/day/1,000 gal)	Storage Period	Total Nutrients
Nitrogen					
Farrowing Sows	400	0	0	365	0
Breeding/Gestation	2100	0	0	365	0
Boars	3	0	0	365	0
Nursery Pigs	4000	0	0	365	0
Finisher Pigs	0	0	0	365	0
Total Nitrogen	6,503				0
Phosphorus					
Farrowing Sows	400	0	0	365	0
Breeding/Gestation	2100	0	0	365	0
Boars	3	0	0	365	0
Nursery Pigs	4000	0	0	365	0
Finisher Pigs	0	0	0	365	0
Total Phosphorus	6,503				0
Potassium					
Farrowing Sows	400	0	0	365	0
Breeding/Gestation	2100	0	0	365	0
Boars	3	0	0	365	0
Nursery Pigs	4000	0	0	365	0
Finisher Pigs	0	0	0	365	0

Total Potassium 6,503

Total Nutrients Produced	
Total N	92,611 lbs
Total P	31,091 lbs
Total K	69,129 lbs

Convert to Fertilizer Form	
Total N	92,611 lbs
Total P ₂ O ₅	71,198 lbs
Total K ₂ O	71,546 lbs

3. Subtract nutrients lost during storage

Nutrients after storage losses = Total nutrients produced x fraction retained = Amount for land applic

Solids (assume 0% of nutrients retained in solids)

Item	Nutrients (lbs)	Percent of Orig.	Available for Land Application (lbs)
Total N	0	0.65	0
Total P ₂ O ₅	0	0.80	0
Total K ₂ O	0	0.80	0

Liquids (assume 100% of nutrients retained in liquids)

Item	Nutrients (lbs)	Percent of Orig.	Available for Land Application (lbs)
Total N	92,611	0.73	67,143
Total P ₂ O ₅	71,198	0.85	60,518
Total K ₂ O	71,546	0.85	60,814

4. Determine the plant available nutrients

Estimate the amount of nutrients that will be available each year after the third consecutive year of a Plant available nutrients = Amount applied x fraction available

Solids (assume 0% of nutrients retained in solids)

Item	Nutrients (lbs)	Percent Avail.	Available for Land Application (lbs)
Total N	0	0.73	0
Total P ₂ O ₅	0	0.90	0
Total K ₂ O	0	0.93	0

Liquids (assume 100% of nutrients retained in liquids)

Item	Nutrients (lbs)	Percent Avail.	Available for Land Application (lbs)
Total N	67,143	0.73	49,014
Total P ₂ O ₅	60,518	0.90	54,468
Total K ₂ O	60,814	0.93	56,557

5. Determine the nutrients required by the crop and soil to produce the yield goal

5a (1). Estimate the amount of nutrients removed by the crop using table 6-6.

Assume using an average of Bermudagrass (3.25 tons/acre) x (2 cuttings)

Nutrient Uptake	
N	244.4 lbs/acre
P	24.7 lbs/acre
K	182 lbs/acre

Convert to Fertilizer Form	
N	244 lbs/acre
P ₂ O ₅	57 lbs/acre
K ₂ O	220 lbs/acre

5a (2). Add to the plant requirements additional nitrogen to replace anticipated denitrification losses

SECTION C2: DESIGN CALCULATIONS

Waste Production Calculations

A. Facility Information

1. Type of Construction: existing, proposed-new, or expansion
 2. Building Area, Barn 1 Gestation Barn (Proposed): 421.3 feet by 117.5 feet
 Barn 2 Farrowing Barn (Proposed): 367.1 feet by 82.5 feet
 3. Animal Capacity

	<u>3</u> head of <u>Boars</u>	@	<u>450</u> lbs,	<u>1,350</u> lbs Total
	<u>2,100</u> head of <u>Gestation Sows</u>	@	<u>375</u> lbs,	<u>787,500</u> lbs Total
	<u>400</u> head of <u>Lactating Sow</u>	@	<u>425</u> lbs,	<u>170,000</u> lbs Total
(maximum head counts and average weights)	<u>4,000</u> head of <u>Nursery Pig</u>	@	<u>10</u> lbs,	<u>40,000</u> lbs Total
	_____ head of _____	@	_____ lbs,	_____ lbs Total
- Total: 6,503 head Total Animal Weight (TAW): 998,850 lbs

B. Determine Minimum Storage Requirement

The Minimum Storage Requirement is the sum of the animal waste produced (or treatment volume for an anaerobic lagoon), plus the spillage and washwater, plus the pit recharge produced in 180 days. Generally, outside or contributing drainage area runoff is to be diverted. Runoff which is not diverted must be included in the storage requirement.

The following is completed for either Liquid Manure Storage or Anaerobic Lagoon

Liquid Manure Storage

Unit Waste Production (UWP) in cubic feet per day per 1,000 pounds of animal:

<u>Cattle</u>	<u>Swine</u>	<u>Poultry</u>	<u>Other</u>
<input type="checkbox"/> Dairy = 1.3	<input checked="" type="checkbox"/> Nursery Pig = 1.4	<input type="checkbox"/> Layers = 0.9	<input type="checkbox"/> Horse = 0.8
<input type="checkbox"/> Beef = 1.0	<input type="checkbox"/> Grower/Finisher = 1.0	<input type="checkbox"/> Broiler = 1.3	<input type="checkbox"/> Sheep = 0.6
	<input checked="" type="checkbox"/> Boar/Gestating Sow = 0.41	<input type="checkbox"/> Turkey = 0.7	
	<input checked="" type="checkbox"/> Sow and Litter = 0.97		

- (a) Manure produced: (TAW x (UWP x 180 days/1,000)) = 97,979 cubic feet / 1,000 lbs
 (TAW x UWP for each type calculated separately and added to find total manure produced)
- (b) Spillage and Washwater generated in 180 days: 19,596 cubic feet
 (If unknown, 20% of (a) is used)
- (c) Total Manure plus Spillage and Washwater, (a)+(b): 117,575 cubic feet.

Rainfall Data

- (d) 25 Year- 24 Hour Rainfall Event: 0.58 Feet

- (e) Precipitation-Evaporation October 1 – April 1) 0.92 Feet
- (f) Top of Waste Storage Pond 1 20,857 Square feet
- (g) Top of Waste Storage Pond 2 35,262 Square feet

- (h) Waste Storage Pond 1 25 Yr-24 Hr Storage Requirement (d) x (f): 12,097 cubic feet
- (i) Waste Storage Pond 2 25 Yr-24 Hr Storage Requirement (d) x (g): 20,452 cubic feet
- (j) Waste Storage Pond 1, 180 Day Net Precip. Requirement (e) x (f): 19,119 cubic feet
- (k) Waste Storage Pond 2, 180 Day Net Precip. Requirement (e) x (g): 32324 cubic feet

Recharge Water -The farrowing barn will be pulled once every three weeks and the Gestation Barn will be pulled once every five weeks on a conservative estimate and will be recharged with 2" of fresh water .

- (l) Recharge Water Produced Average: 366(cubic feet per day) x 180 (180 days in storage period)
= 65,880 cubic feet per 180 days.

Runoff

- (m) Sand Lane and Stacking Pad Area: _____ feet x _____ feet = _____ square feet
- (n) Manure Stacking Pad Area: _____ feet x _____ feet = _____ square feet
- (o) Feed Stacking Pad Area: _____ feet x _____ feet = _____ square feet
- (p) Total Runoff Area: _____ square feet
- (q) Minimum Runoff (Figure 1 from Appendix): _____ inches

NOTE: If a covered storage is used which collects runoff, then the sum of the 25 year, 24 hour storm runoff and the expected runoff for the 180 day storage period is used as the Minimum Runoff in (m).

- (r) Minimum Runoff Storage Requirement (l) x (m)/12 = _____ cubic feet

Minimum Overall Storage Requirement

- (s) Minimum Storage Requirement (c or g) + (h) + (n): 279,436 cubic feet

Waste Storage Calculations

A. Determine Storage Provided

Type of storage: Earthen Storage Pit Earthen Lagoon Concrete Tank
 Underfloor Concrete Pit Outside Concrete Pit
 Other (describe) _____

NOTE: A scale drawing, calculations and other supporting information will be included. Indicate the location of all diversions, diversion dimensions, and flow directions of surface runoff for the entire facility. Concrete pit or tank storage is assumed to be covered unless specified otherwise.

Rectangular Concrete Pit or Tank (capacity = length x width x depth)

$$\begin{aligned} & \underline{420.3} \text{ feet} \times \underline{114.3} \text{ feet} \times \underline{1.5} \text{ feet} = \underline{72,060} \text{ cubic feet (Manure Pit \#1)} \\ & \underline{227.3} \text{ feet} \times \underline{76.3} \text{ feet} \times \underline{1.7} \text{ feet} = \underline{29,483} \text{ cubic feet (Manure Pit \#2)} \\ & \hspace{15em} = \underline{101,543} \text{ cubic feet TOTAL} \end{aligned}$$

Waste Storage Pond 1 Volume = $[(4 \times \text{sideslope}^2 \times \text{depth}^3) / 3] + (\text{sideslope} \times \text{bottomlength} \times \text{depth}^2) + (\text{sideslope} \times \text{bottomwidth} \times \text{depth}^2) + (\text{bottomwidth} \times \text{bottomlength} \times \text{depth})$

Bottom Length: _____ Bottom Width: _____

Design Full Depth: 9.7 feet, Overflow Depth: 10.7 feet

Side Slopes: 3 :1 and 3 , End Slopes: 3 :1 and 3 :1

Note: Inside slopes for earthen pits or lagoons will be at least 2:1.

Earthen Storage Pit or Lagoon Capacity: 111,122 cubic feet

Waste Storage Pond 2 Volume = $[(4 \times \text{sideslope}^2 \times \text{depth}^3) / 3] + (\text{sideslope} \times \text{bottomlength} \times \text{depth}^2) + (\text{sideslope} \times \text{bottomwidth} \times \text{depth}^2) + (\text{bottomwidth} \times \text{bottomlength} \times \text{depth})$

Bottom Length: _____ Bottom Width: _____

Design Full Depth: 11.7 feet, Overflow Depth: 12.7 feet

Side Slopes: 3 :1 and 3 , End Slopes: 3 :1 and 3 :1

Note: Inside slopes for earthen pits or lagoons will be at least 2:1.

Earthen Storage Pit or Lagoon Capacity: 254,643 cubic feet

NOTE: A minimum of 1.0 foot of freeboard is required for uncovered storage.

TOTAL STORAGE PROVIDED: 467,308 cubic feet

NOTE: The Total Storage Provided will meet or exceed the Minimum Storage Requirement (Item o) from Waste Productions Calculation

5 Year Crop Rotation & Yield Goal & Crop Nutrient Needs

Table 1. 5 Year Crop Rotation

Years	Fields	Commodity
One-Five	1, 2, & 4	Bermudagrass teamed with Tall Fescue, Rotational Pasture
One-Five	3 & 5-17	Bermudagrass teamed with Tall Fescue, Hay

Table 2. Plant Nutrient Uptake

County	State	Commodity	#Yield Goals (Tons)	% of the Dry Harvested Material			Nutrient Uptake, lb of nutrients		
				N	P	K	N	P	K
Newton	NORTH DAKOTA	#FORAGE, HAY (BERMUDAGRASS)	6.5	1.88	0.19	1.4	244.4	24.7	182
McHenry	NORTH DAKOTA	PASTURE (BERMUDAGRASS)	6.5	1.88	0.19	1.4	244.4	24.7	182

* From Table 6.6 of Part 651 Agricultural Waste Management Field Handbook

#U of A Cooperative Extension Service, yield goal for Northern Arkansas

Table 3. Convert Plant Nutrient Needs (N, P, K) to Fertilizer Form

	Hay	Pasture
N	244.4	244.4
P ₂ O ₅	56.6	56.6
K ₂ O	220.2	220.2

Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)

Planner: Nathan A. Pesta, P.E. Date: 5/25/2012
 Plan Description: Jason Henson: Fields 1-10

This worksheet is intended to assist in the writing of Nutrient Management Plans for the application of manure to pasture and hay land. To do this, the worksheet estimates the litter production for the farm, estimates the P index risk value for the defined conditions of each field, assists with the allocation of nutrients to the various receiving fields, and estimates the amount of litter available for off farm use. This worksheet is the result of an effort to develop a reliable training/planning tool faithful to the 2009 Arkansas P Index developed by a multi-agency effort. However, no guarantees are made, and any observed problems or suggestions for improvement should be directed to Karl VanDevender at kvan@uaex.edu.

County Information	
Farm County	Newton
R	270
10-Yr EI	110
Kf adjusted for frost?	Yes

Nutrient Source and Description Information

Manure Source	Source Type	Amount Available	N Concentration		P205 Concentration		K2O Concentration		Water Extractable P		Alum Used?
			lb/1000 gal	lb/1000 gal	lb/1000 gal	lb/1000 gal	lb/1000 gal	lb/1000 gal	lb/1000 gal	lb/1000 gal	
WSP#1	Liquid Biosolids	1230	37.60	28.90	29.10	1.90				No	
WSP#2	Liquid Manure	1531	30.20	23.20	23.40	0.07				No	

Nutrient Loss and Mineralization Factors

Nutrient Source Description	N		P205		K2O	
	Storage Losses (%)	Appl. Losses (%)	Storage Losses (%)	Appl. Losses (%)	Storage Losses (%)	Appl. Losses (%)
WSP#1	60%	50%	80%	80%	80%	80%
WSP#2	60%	50%	80%	80%	80%	80%

Estimated Plant Available Nutrients

Nutrient Source Description	N		P205		K2O		Water Extractable P	
	Concentration lb/1000 gal	Total (lb)	Concentration lb/1000 gal	Total (lb)	Concentration lb/1000 gal	Total (lb)	Concentration lb/1000 gal	Total (lb)
WSP#1	7.52	9,250	5.78	7,109	5.82	7,159	1.90	2,337
WSP#2	6.04	9,247	4.64	7,104	4.68	7,165	0.07	107.17
Totals		18,497		14,213		14,324		2,444

Field P Index Calculations

Field	Soil Test P		Soil Map			Slope Gradient (%)			Slope Length (ft)			Flooding Frequency	
	ppm	lb/ac	Unit	Min	Max	Rep	Used	Min	Max	Rep	Used	Frequency	

Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)

Planner:	Nathan A. Pesta, P.E.									
Plan Description:	Jason Henson: Fields 1-10									
Date:	5/25/2012									
H1	83	110	42	3	5	5.5	15	75	45	None
H2	72	96	43	8	14	14	15	30	20	None
H3	42	56	48	0	3	14	15	75	45	Occasional
H4	50	67	43	8	20	14	15	30	20	None
H5	55	86	48	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	5
H6	76	101	48	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	4
H7	178	237	48	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	4
H8	46	61	51	2	5	3.5	15	75	45	None
H9	52	69	50	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	7
H10	69	92	51	2	5	3.5	15	75	45	None

Field	Field Area (ac)	Buffer Length (ft)	Buffer Width (ft)	Appl Area (ac)	Predominate Vegetation	Percent Ground Cover	Conservation Support Practices (P)	RUSLE 1 (ton/ac)	RUSLE 2 (ton/ac)
H1	197.0	1800	100	15.57	Grass	95-100	None in place	0.12	0.18
H2	19.30	1000	100	17.00	Grass	95-100	None in place	0.34	6.60
H3	15.90	1000	100	13.60	Grass	95-100	None in place	0.24	0.01
H4	10.40	700	100	8.79	Grass	95-100	None in place	0.28	5.40
H5	24.90	500	100	23.75	Grass	95-100	None in place		0.05
H6	36.60	900	100	34.53	Grass	95-100	None in place		0.05
H7	79.80	2400	100	74.29	Grass	95-100	None in place		1.10
H8	15.50	1680	100	15.50	Grass	95-100	None in place	0.06	1.30
H9	45.10	1680	100	41.24	Grass	95-100	None in place		0.49
H10	34.30	500	100	33.15	Grass	95-100	None in place	0.06	1.30

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Field	Pasture Use	Application Method	Application Timing	Nutrient Source	Application Rate	Pre BMP PI Value	P Index Range	Target Post BMPs PI Values
H1	Rotational Grazing	Surface Applied	March-June	WSP#1	25.00 1000 gal/ac	65	Medium	
H2	Rotational Grazing	Surface Applied	March-June	WSP#1	9.90 1000 gal/ac	80	High	
H3	Hayland	Surface Applied	March-June	WSP#1	10.00 1000 gal/ac	47	Medium	
H4	Rotational Grazing	Surface Applied	March-June	WSP#1	9.90 1000 gal/ac	75	High	
H5	Hayland	Surface Applied	March-June	WSP#2	81.00 1000 gal/ac			
H6	Hayland	Surface Applied	March-June	WSP#2	81.00 1000 gal/ac			
H7	Hayland	Surface Applied	March-June	WSP#2	81.00 1000 gal/ac			
H8	Hayland	Surface Applied	March-June	WSP#2	81.00 1000 gal/ac			
H9	Hayland	Surface Applied	March-June	WSP#2	81.00 1000 gal/ac	56	Medium	
H10	Hayland	Surface Applied	March-June	WSP#1	18.00 1000 gal/ac	52	Medium	

Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)

Planner: Nathan A. Pesta, P.E. Date: 5/25/2012
 Plan Description: Jason Henson; Fields 1-10

Best Management Practices

Field	Diversion	Terrace	Pond	Filter Strip	Grassed Waterway	Fencing	Riparian Forest Buffer	Riparian Herbaceous Cover	Field Borders	Post BMP PI Value	P Index Range
H1										56	Medium
H2										50	High
H3										57	Medium
H4										53	High
H5											
H6											
H7											
H8											
H9										56	Medium
H10										52	Medium

Field Nutrient Application Planning

Field	Nutrient Source	Application		Nutrient Recommendation (lb/ac)			Nutrients Applied (lb/ac)			Surpluses / Deficits (lb/ac)		
		PI Max	Planned	N	P205	K20	N	P205	K20	N	P205	K20
H1	WSP#1	25.00	25.00	489	57	220	188	145	146	301	88	-75
H2	WSP#1	9.90	9.90	489	57	220	74	57	58	415	0	-162
H3	WSP#1	10.00	10.00	489	57	220	75	58	58	414	1	-162
H4	WSP#1	9.90	9.90	489	57	220	74	57	58	415	0	-162
H5	WSP#2	81.00	81.00	489	57	220	489	376	379	0	319	159
H6	WSP#2	81.00	81.00	489	57	220	489	376	379	0	319	159
H7	WSP#2	81.00	81.00	489	57	220	489	376	379	0	319	159
H8	WSP#2	81.00	81.00	489	57	220	489	376	379	0	319	159
H9	WSP#2	81.00	81.00	489	57	220	489	376	379	0	319	159
H10	WSP#1	18.00	18.00	489	57	220	135	104	105	354	47	-115

Per Field Basis

Field	Nutrient Source	Application			Nutrient Recommendation (lbs)			Nutrients Applied (lbs)			Surpluses / Deficits (lb)		
		PI Max	Planned	1000 gal	N	P205	K20	N	P205	K20	N	P205	K20
H1	WSP#1	389.19	389.19	1000 gal	7,613	887	3,425	2,927	2,250	2,265	-4,686	1,382	-1,160
H2	WSP#1	168.34	168.34	1000 gal	8,315	969	3,741	1,266	973	980	-7,049	4	-2,761
H3	WSP#1	136.04	136.04	1000 gal	6,653	775	2,993	1,023	786	792	-5,629	11	-2,201
H4	WSP#1	87.05	87.05	1000 gal	4,300	501	1,934	655	503	507	-3,645	2	-1,428
H5	WSP#2	1923.92	1923.92	1000 gal	11,615	1,354	5,225	11,621	8,927	9,004	6	7,573	3,778
H6	WSP#2	2797.24	2797.24	1000 gal	16,867	1,968	7,597	16,895	12,979	13,091	8	11,011	5,494
H7	WSP#2	6017.52	6017.52	1000 gal	36,928	4,235	16,344	36,346	27,921	28,162	18	23,687	11,818
H8	WSP#2	1255.50	1255.50	1000 gal	7,580	884	3,410	7,583	5,826	5,876	4	4,942	2,466
H9	WSP#2	3340.70	3340.70	1000 gal	20,168	2,351	9,074	20,178	15,501	15,634	10	13,150	6,551
H10	WSP#1	596.74	596.74	1000 gal	16,211	1,890	7,293	4,487	3,449	3,473	-11,724	1,559	-3,820
				Totals	135,659	15,814	61,037	102,981	79,115	79,784	-32,688	63,301	18,747

Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)

Planner: Nathan A. Pesta, P.E. Date: 5/25/2012
 Plan Description: Jason Henson: Fields 1-10

**Manure Distribution Summary
 Units Applied by Field and Source**

Field	Source	
	WSP#1 (1000 gal)	WSP#2 (1000 gal)
H1	389.19	
H2	188.34	
H3	136.04	
H4	87.05	
H5	1,923.92	
H6	2,797.24	
H7	6,017.92	
H8	1,255.50	
H9	3,340.70	
H10	596.74	
Total Applied	1,377	15335
Available	1,230	1531
Deficit/Surplus	-147	-13804

Supplemental Documentation of Inputs and Results for P Index and RUSLE Calculations

Field	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
Soil Map Unit	42	43	48	43	48	48	48	51	50	51
Soil Name	Noark very c	Noark very c	Razort loam	Noark very c	Noark very c	Spadra loam	Spadra loam	Spadra loam	Spadra loam	Spadra loam
Primary Litter Source	WSP#1	WSP#1	WSP#1	WSP#1	WSP#1	WSP#2	WSP#2	WSP#2	WSP#2	WSP#1
Source Type	Liquid Biosol	Liquid Biosol	Liquid Biosol	Liquid Biosol	Liquid Biosol	Liquid Manur	Liquid Manur	Liquid Manur	Liquid Manur	Liquid Biosol
WEP (lb/ton)	1.9	1.9	1.9	1.9	1.9	0.07	0.07	0.07	0.07	1.9
TP Used (lb/ton)	12.6200873	12.6200873	12.6200873	12.6200873	10.1310044	10.1310044	10.1310044	10.1310044	10.1310044	12.6200873
Litter Appl. Rate (tons/acre)	25	9.9	10	9.9	81	81	81	81	81	18
WEP rate (lb/ac)	315.502183	124.938865	124.938865	124.938865	820.611354	820.611354	820.611354	820.611354	820.611354	34.2
TP rate (lb/ac)	47.5	18.81	19	18.81	5.67	5.67	5.67	5.67	5.67	1.9
Alum Used	No	No	No	No	No	No	No	No	No	No
Mineralization Coef	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
WEP coef	0.029	0.029	0.029	0.029	0.031	0.031	0.031	0.031	0.031	0.029
WEP Source Value	1.76610317	0.69937685	0.70644127	0.69937685	1.4389291	1.4389291	1.4389291	1.4389291	1.4389291	0.029
Soil Test P	110.39	95.76	55.96	66.5	86.45	101.08	236.74	61.18	69.16	1.27159428
Soil coef	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	91.77
Soil P Source Value	0.198702	0.172368	0.100548	0.1197	0.15661	0.181944	0.426132	0.110124	0.124488	0.0018
Total P Source Value	1.96480517	0.87174485	0.80698927	0.81907685	1.5945391	1.6208731	1.8650611	1.5490531	1.5634171	0.165186
R factor	270	270	270	270	270	270	270	270	270	1.43678028
Kf	0.43	0.43	0.37	0.43	0.43	0.37	0.37	0.37	0.37	270
Adj Kf For Freezing?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.37
Kf Used	0.35	0.35	0.3	0.35	0.35	0.3	0.3	0.3	0.3	Yes
Slope Gradient (%)	5.5	14	14	14	0.2	0.2	0.2	0.2	0.2	0.3
Slope Length (ft)	45	45	23	23	5	4	4	4	12	3.5

Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)

Planner:	Nathan A. Pesta, P.E.		Date:	5/25/2012								
Plan Description:	Jason Henson, Fields 1-10											
Rusle LS	0.44	1.2	0.98	0.98	0.05	0.05	0.26	0.05	0.26	0.05	0.26	0.26
Vegetal Canopy, Type	Grass	Grass	Grass	Grass	Grass	Grass	Grass	Grass	Grass	Grass	Grass	Grass
Percent of Ground Cover	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100
C Factor	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Cons. Support Practices (P)	None in place	None in place	None in place	None in place	None in place	None in place	None in place	None in place	None in place	None in place	None in place	None in place
Calc. P Factor?	No	No	No	No	No	No	No	No	No	No	No	No
Soil Hydrologic Group	B	B	B	B	B	B	B	B	B	B	B	B
EI	110	110	110	110	110	110	110	110	110	110	110	110
P Factor	1	1	1	1	1	1	1	1	1	1	1	1
RUSLE 1 (ton/ac)	0.12474	0.3402	0.23814	0.27783	0.05	0.05	0.06318	0.05	0.06318	0.05	0.06318	0.06318
RUSLE 2 (ton/ac)	0.18	6.6	0.0061	5.4	0.05	1.1	1.3	0.49	1.3	0.49	1.3	1.3
RUSLE ? Used (ton/ac)	0.18	6.6	0.0061	5.4	0.05	1.1	1.3	0.49	1.3	0.49	1.3	1.3
Soil Erosion LRV	0	1	0	1	0	0	0	0	0	0	0	0
Pasture Use	Rotational G	Rotational G	Rotational G	Rotational G	Rotational G	Rotational G	Rotational G	Rotational G	Rotational G	Rotational G	Rotational G	Rotational G
Runoff Curve Numbers	61	61	58	61	61	61	58	61	61	61	58	58
Soil Runoff Class	VL	L	N	L	L	L	N	L	L	L	N	N
Soil Runoff Class LRV	0.15	0.2	0.1	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1
Flooding Frequency	None	None	Occasional	None	None	None	None	None	None	None	None	None
Flooding Frequency LRV	0	0	0.5	0	0	0	0	0	0	0	0	0
Application Method	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl
Application Method LRV	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Application Timing	March-June	March-June	March-June	March-June	March-June	March-June	March-June	March-June	March-June	March-June	March-June	March-June
Application Timing LRV	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total P Transport Value	0.6	1.65	1.05	1.65	0.25	0.25	0.65	0.25	0.65	0.25	0.65	0.65
Calc PI	0	0	0	0	9	9	0	9	0	9	0	0
Pre BMP PI Value	65	80	47	75	High	High	56	High	56	High	52	52
PI Range	Medium	High	Medium	High	High	High	Medium	High	Medium	High	Medium	Medium
Diversion %	0	0	0	0	0	0	0	0	0	0	0	0
Terrace %	0	0	0	0	0	0	0	0	0	0	0	0
Pond %	0	0	0	0	0	0	0	0	0	0	0	0
Filter Strip %	0	0	0	0	0	0	0	0	0	0	0	0
Grassed WaterWay %	0	0	0	0	0	0	0	0	0	0	0	0
Fencing %	0	0	0	0	0	0	0	0	0	0	0	0
Riparian Forst Buffer %	0	0	0	0	0	0	0	0	0	0	0	0
Riparian Herbaceous Buffer %	0	0	0	0	0	0	0	0	0	0	0	0
Field Borders %	0	0	0	0	0	0	0	0	0	0	0	0
Total SMV	1	1	1	1	1	1	1	1	1	1	1	1
Post BMP PI Value	65	80	47	75	High	High	56	High	56	High	52	52
PI Range	Medium	High	Medium	High	High	High	Medium	High	Medium	High	Medium	Medium

Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)

Planner: C&H Hog Farms - Fields 1-17 Date: 5/25/2012

This worksheet is intended to assist in the writing of Nutrient Management Plans for the application of manure to pasture and hay land. To do this, the worksheet estimates the litter production for the farm, estimates the P Index risk value for the defined conditions of each field, assists with the allocation of nutrients to the various receiving fields, and estimates the amount of litter available for off farm use. This worksheet is the result of an effort to develop a reliable training/planning tool faithful to the 2009 Arkansas P Index developed by a multi-agency effort. However, no guarantees are made, and any observed problems or suggestions for improvement should be directed to Karl VanDevender at kvan@baex.edu.

County Information

Farm county	Newton
R	270
10-Yr EI	110
K _f adjusted for frost?	Yes

Nutrient Source and Description Information

Manure Source	Source Type	Amount Available		N Concentration		P205 Concentration		K20 Concentration		Water Extractible P		Alum Used?
		Liquid Biosolids	Liquid Manure	lb/1000 gal	lb/1000 gal	lb/1000 gal	lb/1000 gal	lb/1000 gal	lb/1000 gal	lb/1000 gal	lb/1000 gal	
WSP#1	Liquid Biosolids	1250	1000 gal	37.60	30.20	28.90	23.20	29.10	23.40	1.90	0.70	No
WSP#2	Liquid Manure	1531	1000 gal									No

Nutrient Loss and Mineralization Factors

Nutrient Source Description	N			P205			K20		
	Storage Losses (%)	Appl. Losses (%)	Storage Losses (%)	Storage Losses (%)	Appl. Losses (%)	Storage Losses (%)	Storage Losses (%)	Appl. Losses (%)	
WSP#1	60%	50%	80%	60%	30%	60%			
WSP#2	60%	50%	80%	60%	30%	60%			

Estimated Plant Available Nutrients

Nutrient Source Description	N			P205			K20			Water Extractible P		
	Concentration	Total (lb)	Concentration	Total (lb)	Concentration	Total (lb)	Concentration	Total (lb)	Concentration	Total (lb)	Concentration	Total (lb)
WSP#1	7.52 lb/1000 gal	9,250	5.78 lb/1000 gal	7,109	5.82 lb/1000 gal	7,159	1.90 lb/1000 gal	2,337				
WSP#2	6.04 lb/1000 gal	9,247	4.64 lb/1000 gal	7,104	4.68 lb/1000 gal	7,165	0.70 lb/1000 gal	1,071.7				
Totals		18,497		14,213		14,324		3,409				

Field P Index Calculations

Soil Test P	Soil Map	Slope Gradient (%)	Slope Length (ft)	Erndham
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Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)

Planner:	Date: 5/25/2012											
Plan Description:	C&H Hog Farms: Fields 11-17											
Field	ppm	lb/ac	Unit	Min	Max	Rep	Used	Min	Max	Rep	Used	Frequency
H11	57	76	43	8	20	14	14	15	30	20	20	None
H12	19	25	50	0	3	2	2	15	75	45	45	Occasional
H13	48	64	43	8	20	14	14	15	30	20	20	None
H14	52	69	43	8	20	14	14	15	30	20	20	None
H15	15	20	43	8	20	14	14	15	30	20	20	None
H16	48	64	50	0	3	2	2	15	75	45	45	Occasional
H17	50	67	1	3	8	5	5.5	15	75	45	45	None

Field	Field Area (ac)	Buffer Length (ft)	Buffer Width (ft)	Appl Area (ac)	Predominate Vegetation	Percent Ground Cover	Conservation Support Practices (P)	RUSLE 1 (ton/ac)	RUSLE 2 (ton/ac)
H11	20.70			20.70	Grass	95-100	None in place	0.28	5.20
H12	28.70	2,200	100	23.65	Grass	95-100	None in place	0.05	0.91
H13	66.90	2,300	100	61.62	Grass	95-100	None in place	0.28	5.20
H14	18.00			18.00	Grass	95-100	None in place	0.28	5.20
H15	66.30	2,300	100	61.02	Grass	95-100	None in place	0.28	5.20
H16	79.60			79.60	Grass	95-100	None in place	0.05	0.91
H17	88.70			88.70	Grass	95-100	None in place	0.12	1.10
	369			353					

Field	Pasture Use	Application Method	Application Timing	Nutrient Source	Application Rate	Pre BMP PI Value	P Index Range	Target Post BMPs PI Values
H11	Hayland	Surface Applied	March-June	WSP#1	9:90	77	High	
H12	Hayland	Surface Applied	March-June	WSP#1	15:00	64	Medium	
H13	Hayland	Surface Applied	March-June	WSP#1	9:90	20	High	
H14	Hayland	Surface Applied	March-June	WSP#1	9:90	77	High	
H15	Hayland	Surface Applied	March-June	WSP#1	9:90	63	Medium	
H16	Hayland	Surface Applied	March-June	WSP#1	14:00	64	Medium	
H17	Hayland	Surface Applied	March-June	WSP#1	18:00	58	Medium	

Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)
 Planner: C&H Hog Farms, Fields 11-17
 Date: 5/25/2012

Best Management Practices

Field	Diversion	Terrace	Pond	Filter Strip	Grassed Waterway	Fencing	Riparian Forest Buffer	Riparian Herbaceous Cover	Field Borders	Post BMP PI Value	P Index Range
H11										64	High
H12										64	Medium
H13										70	High
H14										63	High
H15										64	Medium
H16										58	Medium
H17										58	Medium

Field Nutrient Application Planning
 Per Acre Basis

Field	Nutrient Source	Application Planned		Nutrient Recommendation (lb/ac)		Nutrients Applied (lb/ac)		Surpluses / Deficits (lb/ac)			
		PI Max	Planned	N	P2O5	N	P2O5	N	P2O5		
H11	WSP#1	9.90	19.90	489	57	220	57	58	0	-162	-162
H12	WSP#1	15.00	15.00	489	57	220	87	87	30	-376	-133
H13	WSP#1	9.90	9.90	489	57	220	57	58	0	-162	-162
H14	WSP#1	9.90	9.90	489	57	220	57	58	0	-162	-162
H15	WSP#1	9.90	9.90	489	57	220	57	58	0	-162	-162
H16	WSP#1	14.00	14.00	489	57	220	81	81	24	-384	-139
H17	WSP#1	18.00	18.00	489	57	220	104	105	47	-354	-115

Per Field Basis

Field	Nutrient Source	Application Planned		Nutrient Recommendation (lbs)		Nutrients Applied (lbs)		Surpluses / Deficits (lb)			
		PI Max	Planned	N	P2O5	N	P2O5	N	P2O5		
H11	WSP#1	204.93	204.93	10,122	1,180	4,554	1,184	1,193	5	-8,581	-3,361
H12	WSP#1	354.74	354.74	11,565	1,348	5,203	2,050	2,065	702	-8,897	-3,138
H13	WSP#1	610.04	610.04	30,132	3,512	13,556	4,587	3,550	14	-25,545	-10,006
H14	WSP#1	178.20	178.20	8,802	1,026	3,960	1,030	1,037	4	-7,462	-2,923
H15	WSP#1	604.10	604.10	29,839	3,478	13,424	3,492	3,516	14	-25,296	-9,909
H16	WSP#1	1114.40	1114.40	38,924	4,537	17,512	6,441	6,486	1,904	-30,544	-11,026
H17	WSP#1	1596.60	1596.60	43,374	5,056	19,514	9,228	9,292	4,172	-31,368	-10,222

Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)

Planner:	Date: 5/25/2012									
Plan Description:	C&H Hog Farms: Fields 11-17									
Totals	172,768	20,137	77,724	35,066	26,952	27,139	-137,593	6,815	-50,585	

Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)

Planner:	
Plan Description:	C&H Hog Farms: Fields 11-17
Date:	5/25/2012

Manure Distribution Summary
Units Applied by Field and Source

Field	WSP#1 (1000 gal)	WSP#2 (1000 gal)	Source
H11	204.93		
H12	354.74		
H13	610.04		
H14	178.20		
H15	604.10		
H16	1,114.40		
H17	1,596.60		
Total Applied	4,663		
Available	1,230	1531	
Deficit/Surplus	-3,433		

Supplemental Documentation of Inputs and Results for P Index and RUSLE Calculations

Field	H11	H12	H13	H14	H15	H16	H17
Soil Map Unit	43	50	43	43	43	50	1
Soil Name	Noark very c	Spadra loam	Noark very c	Noark very c	Noark very c	Spadra loam	Arkana very c
Primary Litter Source	WSP#1	WSP#1	WSP#1	WSP#1	WSP#1	WSP#1	WSP#1
Source Type	Liquid Biosol	Liquid Biosol	Liquid Biosol	Liquid Biosol	Liquid Biosol	Liquid Biosol	Liquid Biosol
WEP (lb/ton)	1.9	1.9	1.9	1.9	1.9	1.9	1.9
TP Used (lb/ton)	12.6200873	12.6200873	12.6200873	12.6200873	12.6200873	12.6200873	12.6200873
Litter Appl. Rate (tons/acre)	9.9	15	9.9	9.9	9.9	14	18
WEP rate (lb/acre)	18.81	28.5	18.81	18.81	18.81	26.6	34.2
TP rate (lb/acre)	124.938865	189.30131	124.938865	124.938865	124.938865	176.681223	227.161572
Alum Used	No	No	No	No	No	No	No
Mineralization Coef	0.05	0.05	0.05	0.05	0.05	0.05	0.05
WEP coef	0.029	0.029	0.029	0.029	0.029	0.029	0.029
WEP Source Value	0.69937685	1.0596619	0.69937685	0.69937685	0.69937685	0.98901777	1.27159428
Soil Test P	75.81	25.27	63.84	69.16	19.95	63.84	66.5
Soil coef	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018
Soil P Source Value	0.136458	0.045486	0.114912	0.124488	0.03591	0.114912	0.1197
Total P Source Value	0.83583485	1.1051479	0.81428885	0.82386485	0.73528685	1.10392977	1.39129428
R factor	270	270	270	270	270	270	270
Kf	0.43	0.37	0.43	0.43	0.43	0.37	0.43
Adj Kf For Freezing?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kf Used	0.35	0.3	0.35	0.35	0.35	0.35	0.35

Comments:

Arkansas Nutrient Management Planner with 2009 PI (ver 3/3/2010)

Planner:	C&H Hog Farms: Fields 11-17										Date:	5/25/2012
Slope Gradient (%)	14	2	14	14	14	14	14	14	14	14	2	5.5
Slope Length (ft)	20	45	20	20	20	20	20	20	20	20	45	45
Rusle LS	0.98	0.21	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.21	0.44
Vegetal Canopyr. Type	Grass	Grass	Grass	Grass	Grass	Grass	Grass	Grass	Grass	Grass	Grass	Grass
Percent of Ground Cover	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100
C Factor	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Cons. Support Practices (P)	None in place	None in place	None in place	None in place	None in place	None in place	None in place	None in place	None in place	None in place	None in place	None in place
Calc. P Factor?	No	No	No	No	No	No	No	No	No	No	No	No
Soil Hydrologic Group	B	B	B	B	B	B	B	B	B	B	B	C
EI	110	110	110	110	110	110	110	110	110	110	110	110
P Factor	1	1	1	1	1	1	1	1	1	1	1	1
RUSLE 1 (ton/ac)	0.27783	0.05103	0.27783	0.27783	0.27783	0.27783	0.27783	0.27783	0.27783	0.27783	0.05103	0.12474
RUSLE 2 (ton/ac)	5.2	0.91	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	0.91	1.1
RUSLE 7 Used (ton/ac)	5.2	0.91	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	0.91	1.1
Soil Erosion LRV	1	0	1	1	1	1	1	1	1	1	0	0.1
Pasture Use	Hayland	Hayland	Hayland	Hayland	Hayland	Hayland	Hayland	Hayland	Hayland	Hayland	Hayland	Hayland
Runoff Curve Numbers	58	58	58	58	58	58	58	58	58	58	58	71
Soil Runoff Class	N	N	N	N	N	N	N	N	N	N	N	L
Soil Runoff Class LRV	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Flooding Frequency	None	Occasional	None	None	None	None	None	None	None	None	Occasional	None
Flooding Frequency LRV	0	0.5	0	0	0	0	0	0	0	0	0.5	0
Application Method	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl	Surface Appl
Application Method LRV	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Application Timing	March-June	March-June	March-June	March-June	March-June	March-June	March-June	March-June	March-June	March-June	March-June	March-June
Application Timing LRV	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total P Transport Value	1.55	1.05	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.05	0.75
Calc PI	0	0	0	0	0	0	0	0	0	0	0	0
Pre BMP PI Value	72	64	70	71	63	63	63	63	63	63	64	58
PI Range	High	Medium	High	High	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Diversion %	0	0	0	0	0	0	0	0	0	0	0	0
Terrace %	0	0	0	0	0	0	0	0	0	0	0	0
Pond %	0	0	0	0	0	0	0	0	0	0	0	0
Filter Strip %	0	0	0	0	0	0	0	0	0	0	0	0
Grassed WaterWay %	0	0	0	0	0	0	0	0	0	0	0	0
Fencing %	0	0	0	0	0	0	0	0	0	0	0	0
Riparian Forst Buffer %	0	0	0	0	0	0	0	0	0	0	0	0
Riparian Herbaceous Buffer %	0	0	0	0	0	0	0	0	0	0	0	0
Field Borders %	0	0	0	0	0	0	0	0	0	0	0	0
Total SMV	1	1	1	1	1	1	1	1	1	1	1	1
Post BMP PI Value	72	64	70	71	63	63	63	63	63	63	64	58
PI Range	High	Medium	High	High	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium



RUSLE2 Erosion Calculation Record

Info: Field 1: SW 1/4, Section 25, T 15 N, R 20 W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County
Soil: 42 NOARK VERY CHERTY SILT LOAM, 3 TO 8 PERCENT SLOPESNOARK very gravelly silt loam 100%
Slope length (horiz): 45 ft
Avg. slope steepness: 5.5 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Pasture\Cont grz warm seas past cmz17

Outputs:

T value: 5.0 t/ac/yr
Soil loss for cons. plan: 0.18 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 2: SW 1/4 Section 25 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County
Soil: 43 NOARK VERY CHERTY SILT LOAM, 8 TO 20 PERCENT SLOPES\NOARK very gravelly silt loam 100%
Slope length (horiz): 45 ft
Avg. slope steepness: 14 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Pasture\Rot grz warm seas past cmz17

Outputs:

T value: 5.0 t/ac/yr
Soil loss for cons. plan: 6.6 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 3: SW ¼, Section 25, T 15 N, R 20 W

profiles\Newton Default

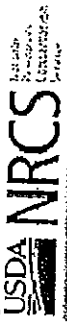
Inputs:

Location: Arkansas\Newton County
Soil: 48 RAZORT LOAM, OCCASIONALLY FLOODED\RAZORT loam 95%
Slope length (horz): 20 ft
Avg. slope steepness: 1.5 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay; NT, z17*

Outputs:

T value: 5.0 t/ac/yr
Soil loss for cons. plan: 0.0061 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 4: NW ¼ Section 36 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County
Soil: 43 NOARK VERY CHERTY SILT LOAM, 8 TO 20 PERCENT SLOPES\NOARK very gravelly silt loam 100%
Slope length (horiz): 23 ft
Avg. slope steepness: 14 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Pasture\Rot grz warm seas past cmz17

Outputs:

T value: 5.0 t/ac/yr
Soil loss for cons. plan: 5.4 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 5: NE1/4 Section 26 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County
Soil: 48 RAZORT LOAM, OCCASIONALLY FLOODED\RAZORT loam 95%
Slope length (horiz): 5.0 ft
Avg. slope steepness: 0.010 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay, NT, z17*

Outputs:

T value: 5.0 t/ac/yr
Soil loss for cons. plan: 0.050 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 6: NE ¼ Section 26 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County
Soil: 48 RAZORT LOAM, OCCASIONALLY FLOODED\RAZORT loam 95%
Slope length (horiz): 4.0 ft
Avg. slope steepness: 0.010 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay, NT, z17*

Outputs:

T value: 5.0 t/ac/yr
Soil loss for cons. plan: 0.050 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 7: E 1/2 Section 26 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County
Soil: 48 RAZORT LOAM, OCCASIONALLY FLOODED\RAZORT loam 95%
Slope length (horiz): 4.0 ft
Avg. slope steepness: 3.0 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\ Bemudagrass\ Bemudagrass hay; NT, z17*

Outputs:

T value: 5.0 t/ac/yr
Soil loss for cons. plan: 1.1 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 8: NE ¼ Section 35 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County

Soil: 51 SPADRA LOAM, 2 TO 5 PERCENT SLOPES\SPADRA loam 95%

Slope length (horiz): 12 ft

Avg. slope steepness: 3.5 %

Contouring: a. rows up-and-down hill

Strips/barriers: (none)

Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass hay, NT, z17*

Outputs:

T value: 5.0 t/ac/yr

Soil loss for cons. plan: 1.3 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 9: NE 1/4 Section 35 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County
Soil: 50 SPADRA LOAM, OCCASIONALLY FLOODED\SPADRA loam 95%
Slope length (horiz): 7.0 ft
Avg. slope steepness: 1.0 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Hay\ Bermudagrass\Bermudagrass hay; NT, z17*

Outputs:

T value: 5.0 t/ac/yr
Soil loss for cons. plan: 0.49 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 10: NE ¼ Section 35 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County
Soil: 51 SPADRA LOAM, 2 TO 5 PERCENT SLOPES\SPADRA loam 95%
Slope length (horiz): 15 ft
Avg. slope steepness: 3.5 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay; NT, z17*

Outputs:

T value: 5.0 t/ac/yr
Soil loss for cons. plan: 1.3 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 11: N 1/2 Section 35 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County

Soil: 43 NOARK VERY CHERTY SILT LOAM, 8 TO 20 PERCENT SLOPESINOARK very gravelly silt loam 100%

Slope length (horiz): 20 ft

Avg. slope steepness: 14 %

Contouring: a. rows up-and-down hill

Strips/barriers: (none)

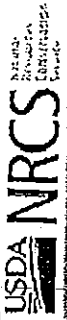
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay, NT, z17

Outputs:

T value: 5.0 t/ac/yr

Soil loss for cons. plan: 5.2 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 12: SE ¼ Section 35 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County

Soil: 50 SPADRA LOAM, OCCASIONALLY FLOODED\SPADRA loam 95%

Slope length (horiz): 45 ft

Avg. slope steepness: 2.0 %

Contouring: a. rows up-and-down hill

Strips/barriers: (none)

Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay, NT, z17*

Outputs:

T value: 5.0 t/ac/yr

Soil loss for cons. plan: 0.91 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 13: South ½ and North ¼ of Sections 35 and 2 Township 15N and 14N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County

Soil: 43 NOARK VERY CHERTY SILT LOAM, 8 TO 20 PERCENT SLOPES\NOARK very gravelly silt loam 100%

Slope length (horiz): 20 ft

Avg. slope steepness: 14 %

Contouring: a. rows up-and-down hill

Strips/barriers: (none)

Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay, NT, z17*

Outputs:

T value: 5.0 t/ac/yr

Soil loss for cons. plan: 5.2 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 14: SW ¼ Section 35 Township 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County
Soil: 43 NOARK VERY CHERTY SILT LOAM, 8 TO 20 PERCENT SLOPESINOARK very gravelly silt loam 100%
Slope length (horiz): 20 ft
Avg. slope steepness: 14 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay, NT, z17*

Outputs:

T value: 5.0 t/ac/yr
Soil loss for cons. plan: 5.2 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 15: NE ¼ Section 2 Township 14N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County

Soil: 43 NOARK VERY CHERY SILT LOAM, 8 TO 20 PERCENT SLOPESINOARK very gravelly silt loam 100%

Slope length (horiz): 20 ft

Avg. slope steepness: 14 %

Contouring: a. rows up-and-down hill

Strips/barriers: (none)

Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay; NT, z17*

Outputs:

T value: 5.0 t/ac/yr

Soil loss for cons. plan: 5.2 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 16: All and SE ¼ Sections 2 and 3 Township 14N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County

Soil: 50 SPADRA LOAM, OCCASIONALLY FLOODED\SPADRA loam 95%

Slope length (horiz): 45 ft

Avg. slope steepness: 2.0 %

Contouring: a. rows up-and-down hill

Strips/barriers: (none)

Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay, NT, z17*

Outputs:

T value: 5.0 t/ac/yr

Soil loss for cons. plan: 0.91 t/ac/yr



RUSLE2 Erosion Calculation Record

Info: Field 17: NE ¼ and S ½ Sections 3 and 34 Township 14N and 15N Range 20W

profiles\Newton Default

Inputs:

Location: Arkansas\Newton County
Soil: 1 ARKANA VERY CHERY SILT LOAM, 3 TO 8 PERCENT SLOPE\ARKANA very gravely silt loam 100%
Slope length (horiz): 45 ft
Avg. slope steepness: 2.0 %
Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)

Base management: a.Single Year/Single Crop Templates\Bermudagrass\Bermudagrass hay; NT, z17*

Outputs:

T value: 2.0 t/ac/yr
Soil loss for cons. plan: 1.1 t/ac/yr

Section D: Phosphorous Based Field List

Section E: Inventory of Water Wells

Inventory of Water Wells

Field ID	Location (Legal)	Well Depth (Ft.)	Use of Well <u>1</u> /	Required Setback Distance From Well For Manure Application (Ft.)	
				Distance From Field	State Rule
4	SW/4 of, Sec 25, T 15N, R 20 W	846	Private	NA	100
10	SE/4 of, Sec 35 T 15 N, R 20 W	700	Private	NA	100
14	SW/4, Sec 35, T 15 N, R 20 W	1035	Private	NA	100

- 1/ Well Use Categories:**
- Producer (Owned)
 - Private
 - Public
 - Irrigation

Section F: Land Treatment Information and Land Application Maps

SECTION F. Land Treatment Information and Land Application Maps

The following information is attached

1. Waste Utilization Summary Spreadsheet
2. Overall Site Map
3. WQRA Maps
4. Soil Survey Maps

C H Hog Farms
 Newton County, AR

F.1 Waste Utilization Summary Spreadsheet

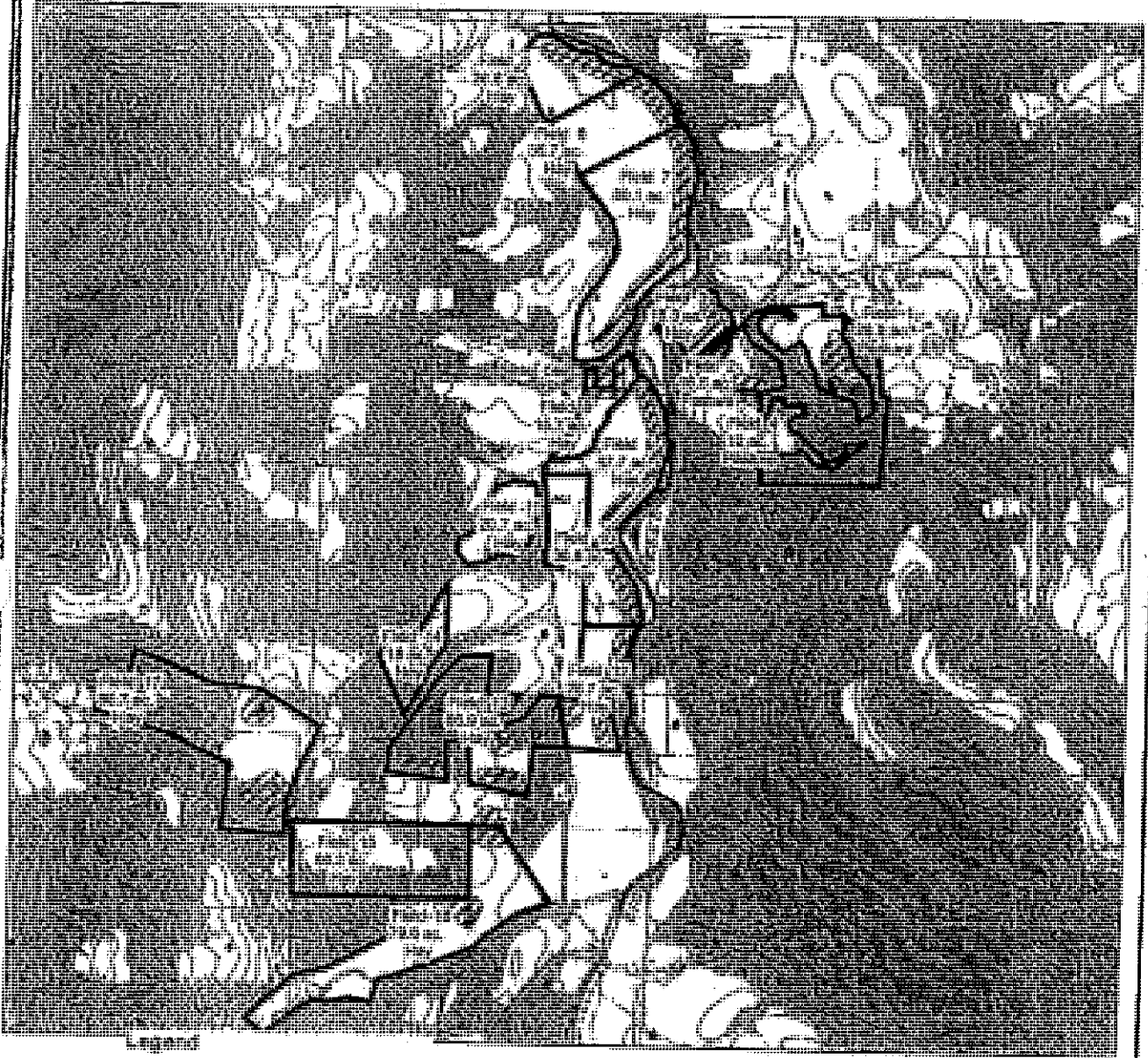
Field ID Area	Acreage (Acres)	Setbacks (Acres)	Useable Acreage (Acres)	Land Use	Quarter	Section	Township	Range	County	Owner of Land
1	19.7	4.1	15.6	Grassland	SW 1/4	25	15N	20W	Newton	Jason Henson
2	19.3	2.3	17.0	Grassland	SW 1/4	25	15N	20W	Newton	Jason Henson
3	15.9	2.3	13.6	Grassland	SW 1/4	25	15N	20W	Newton	Charles Campbell
4	10.4	1.6	8.8	Grassland	NW 1/4	36	15N	20W	Newton	Jason Henson
5	24.9	1.2	23.8	Grassland	NE 1/4	26	15N	20W	Newton	Sean Crickets/Ricketts
6	36.6	2.1	34.5	Grassland	NE 1/4	26	15N	20W	Newton	William Ricketts/Crickets
7	79.8	5.5	74.3	Grassland	E 1/2	26	15N	20W	Newton	E.G. Campbell
8	15.5	0.0	15.5	Grassland	NE 1/4	35	15N	20W	Newton	Charles Campbell
9	45.1	3.9	41.2	Grassland	NE 1/4	35	15N	20W	Newton	Charles Campbell
10	34.3	1.2	33.2	Grassland	NE 1/4	35	15N	20W	Newton	Charles Campbell
11	20.7	0.0	20.7	Grassland	N 1/2	35	15N	20W	Newton	Charles Campbell
12	28.7	5.1	23.7	Grassland	SE 1/4	35	15N	20W	Newton	Barbara Hurfley
13	66.9	5.3	61.6	Grassland	S 1/2 & N 1/2	35&2	15N&14N	20W	Newton	Barbara Hurfley
14	18.0	0.0	18.0	Grassland	SW 1/4	35	15N	20W	Newton	Charles Campbell
15	66.3	5.3	61.0	Grassland	NW 1/4	2	14N	20W	Newton	Barbara Hurfley
16	79.6	0.0	79.6	Grassland	All & SE 1/4	2&3	15N&14N	20W	Newton	Clayel Criner
17	88.7	0.0	88.7	Grassland	NE 1/4&S 1/2	3&3&4	15N&14N	20W	Newton	Barbara Hurfley
Total	670.4	39.7	630.7							Jason Criner

DeHaan, Grabs Associates, LLC
 Mandan, ND Dodge City KS

Topographic

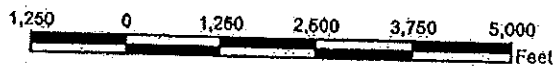
Customer(s): JASON HENSON

Approximate Acres: 685



Legend

- Henson
- Buffer_Output5.shp
- Resource Inventory (Line)
- Buffer_Output.shp
- Resource Inventory (Polygon)
- Resource Inventory (Line)









Conservation Map

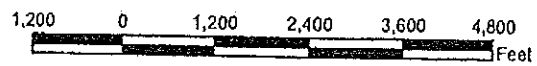
Customer(s): JASON HENSON

Approximate Acres: 685

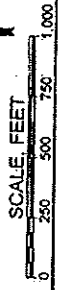


Legend

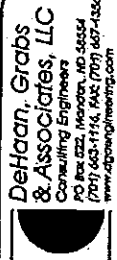
-  Henson
-  Buffer_Output5.shp
-  Resource Inventory (Line)
-  Buffer_Output.shp
-  Resource Inventory (Polygon)
-  Resource Inventory (Line)



GENERAL NOTES



No.	Revision/Issue	Date



DeHaan, Grabs & Associates, LLC
 Consulting Engineers
 PO Box 222, Mountain, MO 65554
 (707) 633-1114, FAX (707) 647-4366
 www.dgpe.com

C&H HOG FARMS
 GESTATION-FARROWING FARM
 SECTION 26, R. 10 E., R. 20 W
 NEWTON COUNTY, MO

FIELDS 1-4

DATE: MAY 29, 2012

SCALE: 1" = 500'

DRAWN BY: N.A.P.

CHECKED BY: DLD

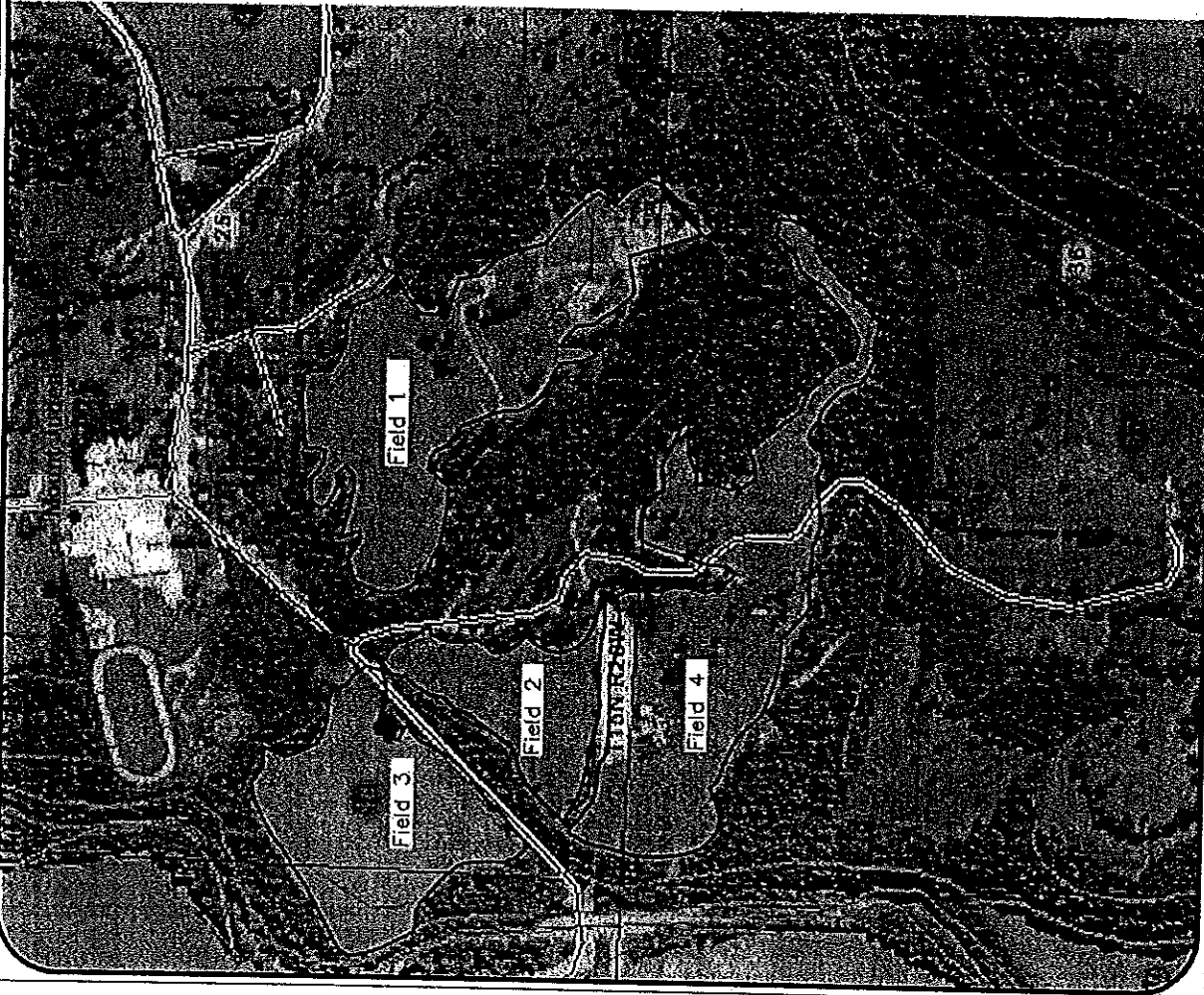
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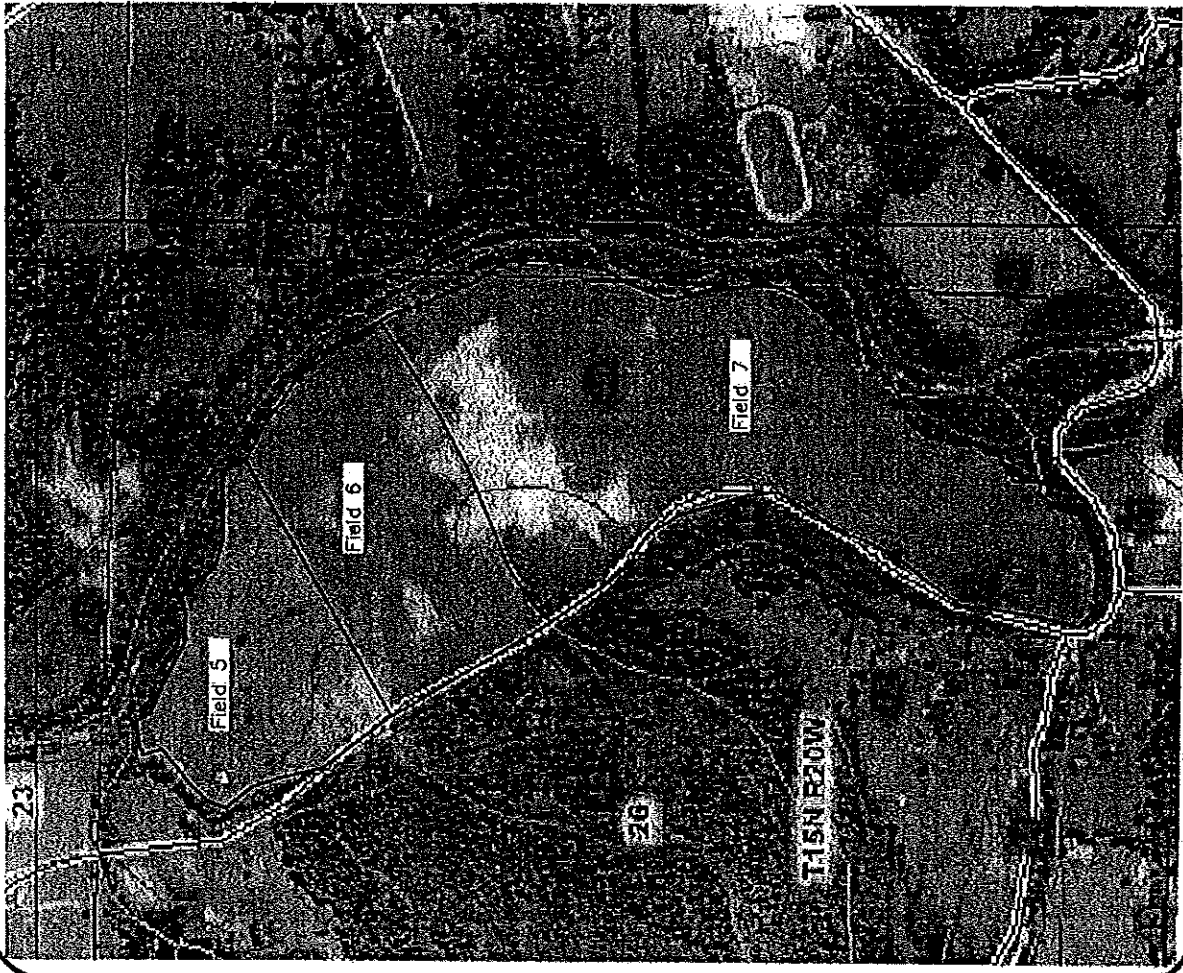
1

FILE NAME: DE PROJECT FIELD/7/16/12/0001/0001.DWG

LEGEND

- 2 Arkana-Moko complex, 8 to 20 percent slopes
- 3 Arkana-Moko complex, 20 to 40 percent slopes
- 6 Cedo-Kenn complex, frequently flooded
- 7 Clarksville very cherty silt loam, 20 to 50 percent slopes
- 8 Eden-Newnata complex, 8 to 20 percent slopes
- 9 Eden-Newnata complex, 20 to 40 percent slopes
- 15 Enders-Leesburg stony loams, 8 to 20 percent slopes
- 16 Enders-Leesburg stony loams, 20 to 40 percent slopes
- 26 Moko-Rock outcrop complex, 15 to 50 percent slopes
- 37 Nella-Steppock complex, 8 to 20 percent slopes
- 38 Nella-Steppock-Mountinburg very stony loams, 20 to 40 percent slopes
- 39 Nella-Steppock-Mountinburg very stony loams, 40 to 60 percent slopes
- 42 Noark very cherty silt loam, 3 to 8 percent slopes
- 43 Noark very cherty silt loam, 8 to 20 percent slopes
- 44 Noark very cherty silt loam, 20 to 40 percent slopes
- 48 Razart loam, occasionally flooded
- 50 Spadra loam, occasionally flooded
- 51 Spadra loam, 2 to 5 percent slopes
- 54 Water





LEGEND

- 3 Arkano-Moko complex, 20 to 40 percent slopes
- 6 Ceda-Kenn complex, frequently flooded
- 11 Enders gravelly loam, 3 to 8 percent slopes
- 13 Enders stony loam, 3 to 20 percent slopes
- 25 Moko-Rock outcrop complex, 15 to 50 percent slopes
- 35 Nella-Enders stony loams, 8 to 20 percent slopes
- 42 Noark very cherty silt loam, 3 to 8 percent slopes
- 43 Noark very cherty silt loam, 8 to 20 percent slopes
- 44 Noark very cherty silt loam, 20 to 40 percent slopes
- 48 Razart loam, occasionally flooded
- 50 Spadra loam, occasionally flooded
- 51 Spadra loam, 2 to 5 percent slopes
- 54 Water

GENERAL NOTES

SCALE, FEET

No.	Revision/Issue	Date

DeHaan, Grabs & Associates, LLC
 Consulting Engineers
 PO Box 622, Moberly, MO 65054
 (767) 683-1196, (660) 687-1686
www.dgaengineering.com

C&H HOG FARMS
 GESTATION-FARROWING FARM

SECTION 24, T 15 N, R 20 W
 NEWTON COUNTY, AR

FIELDS 5-7

DATE: MAY 29, 2012

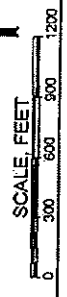
SCALE: 1" = 600'

DRAWN BY: NAP

CHECKED BY: DLD

SHEET: 2

GENERAL NOTES



No.	Revision/Issue	Date

DeHaan, Grabs & Associates, LLC
 Consulting Engineers
 PO Box 622, Newton, MO 64664
 (707) 663-1116, FAX (707) 647-1866
 www.dgawengineering.com

O&E HOG FARMS
 GESTATION-BARROWING FARM
 SECTION 28, T. 18 N., R. 20 W
 NEWTON COUNTY, AR
FIELDS 8-15

DATE: MAY 29, 2012
 SCALE: 1" = 600'
 DRAWN BY: NAP
 CHECKED BY: DLD
 SHEET: **3**

FILE NAME: DE PROJECT FILE/2012/AR/NEWTON/O&E/28/3

LEGEND

- 1 Arkano very cherty silt loam, 3 to 8 percent slopes
- 2 Arkana-Moko complex, 8 to 20 percent slopes
- 6 Ceda-Kenn complex, frequently flooded
- 11 Enders gravelly loam, 3 to 8 percent slopes
- 13 Enders stony loam, 3 to 20 percent slopes
- 26 Moko-Rock outcrop complex, 15 to 50 percent slopes
- 35 Nella-Enders stony loams, 8 to 20 percent slopes
- 37 Nella-Stepprock complex, 8 to 20 percent slopes
- 42 Noark very cherty silt loam, 3 to 8 percent slopes
- 43 Noark very cherty silt loam, 8 to 20 percent slopes
- 44 Noark very cherty silt loam, 20 to 40 percent slopes
- 48 Razart loam, occasionally flooded
- 50 Spadra loam, occasionally flooded
- 51 Spadra loam, 2 to 5 percent slopes
- 54 Water



GENERAL NOTES

SCALE FEET



No.	Revision/Issue	Date

DeHaan, Grabs & Associates, LLC
 Consulting Engineers
 PO Box 622, Newton, MO 64554
 (781) 663-1116, FAX: (781) 667-1256
www.dgengineering.com

C&H HOG FARMS
GESTATION-FARROWING FARM
 SECTION 3, T. 14 N., R. 20 W.
 NEWTON COUNTY, AR
FIELDS 15-16

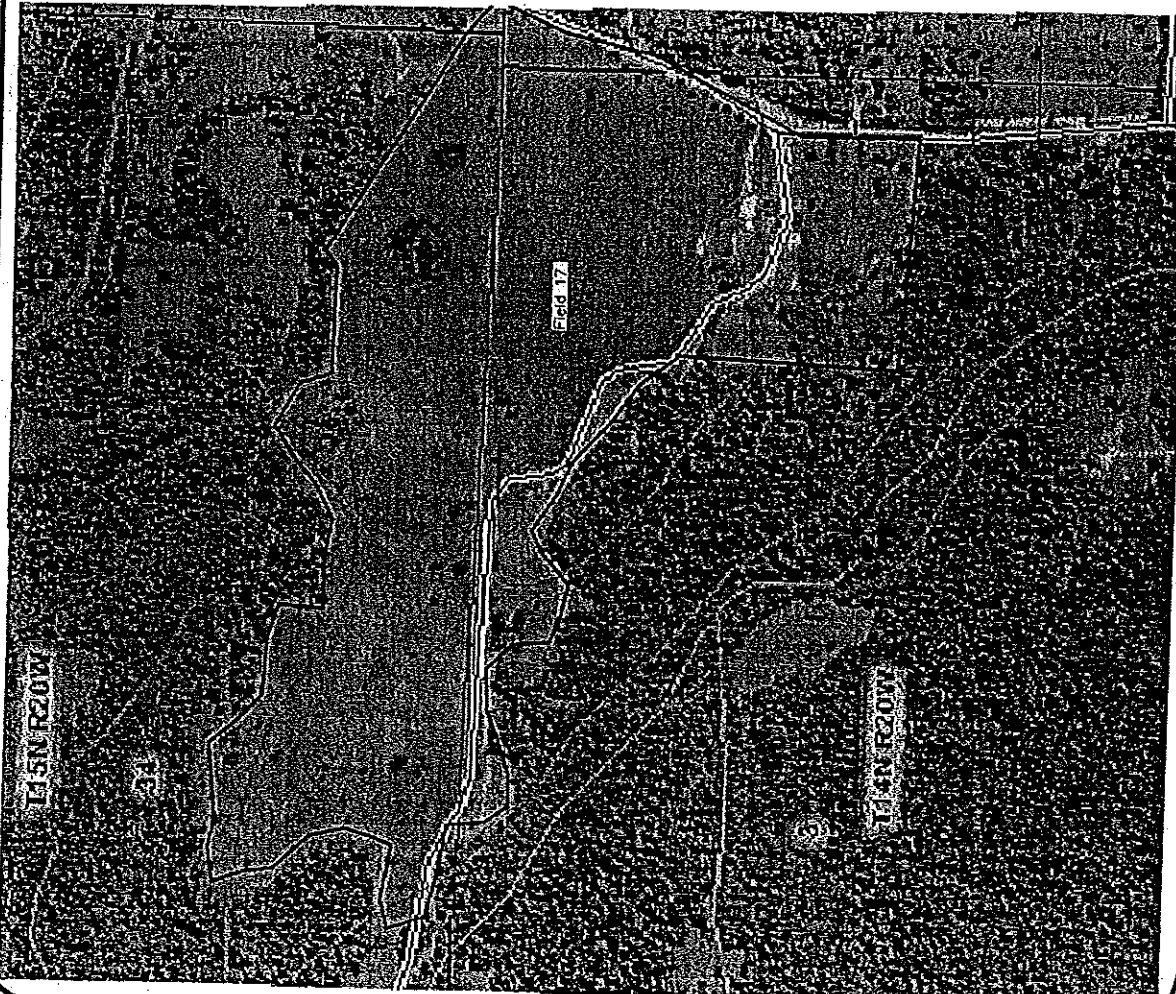
DATE: MAY 29, 2012
 SCALE: 1" = 500'
 DRAWN BY: NAP
 CHECKED BY: DLD
 SHEET: 4

PROJECT FILE: 1409010001/012/01/01

LEGEND

- 1 Arkana very cherty silt loam, 3 to 8 percent slopes
- 2 Arkana-Moko complex, 8 to 20 percent slopes
- 6 Ceda-Kenn complex, frequently flooded
- 8 Eden-Newnata complex, 8 to 20 percent slopes
- 9 Eden-Newnata complex, 20 to 40 percent slopes
- 26 Moko-Rock outcrop complex, 15 to 50 percent slopes
- 37 Nella-Stepprock complex, 8 to 20 percent slopes
- 38 Nella-Stepprock-Mountainburg very stony loams, 20 to 40 percent slopes
- 39 Nella-Stepprock-Mountainburg very stony loams, 40 to 60 percent slopes
- 42 Noark very cherty silt loam, 3 to 8 percent slopes
- 43 Noark very cherty silt loam, 8 to 20 percent slopes
- 44 Noark very cherty silt loam, 20 to 40 percent slopes
- 50 Spadra loam, occasionally flooded
- 54 Water

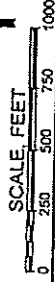




LEGEND

- 1 Arkona very cherty silt loam, 3 to 8 percent slopes
- 2 Arkona-Moko complex, 8 to 20 percent slopes
- 8 Eden-Newnato complex, 8 to 20 percent slopes
- 13 Enders stony loam, 3 to 20 percent slopes
- 26 Moko-Rock outcrop complex, 15 to 50 percent slopes
- 36 Nello-Enders stony loams, 20 to 40 percent slopes
- 37 Nello-Steprock complex, 8 to 20 percent slopes
- 39 Nello-Steprock-Mountainburg very stony loams, 40 to 60 percent slopes
- 43 Noark very cherty silt loam, 8 to 20 percent slopes
- 44 Noark very cherty silt loam, 20 to 40 percent slopes

GENERAL NOTES



No.	Revision / Issue	Date

DeHaan, Grabs & Associates, LLC
 Consulting Engineers
 PO Box 522, Mendenhall, MO 65254
 (707) 682-1116, FAX (707) 687-1306
www.dgaengineering.com

C&E HOG FARMS
 GESTATION-FARROWING FARM
 SECTION 5, T. 14 N., R. 20 W
 NEWTON COUNTY, AR
FIELD 17

DATE: MAY 29, 2012
 SCALE: 1" = 500'
 DRAWN BY: NAP
 CHECKED BY: DLD

DATE: MAY 29, 2012
 SHEET: 5

Section G: Signed Manure Application
Lease Agreements

SECTION G. SIGNED MANURE APPLICATION LEASE AGREEMENTS

Signed easements are shown for Fields 1-17.

LAND USE CONTRACT

I, Shan Ricketts, Landowner, agree to allow Jason Henson, Operation Owner, to land apply waste from his/her Hog Farm operation located in the 1/4 of Section 26 in Township 15N and Range 20W in Newton County to 23.8 acres of my property located in Newton County. A description of the areas to be used as land application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage*
5	NE	26	15N	20W	35.928	-93.071	23.8

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Operation Owner Signature _____ Date _____
Shan Ricketts _____ 5-19-12
 Landowner Signature _____ Date _____

LAND USE CONTRACT

I, Jason Criner, Landowner, agree to allow Jason Henson, Operation Owner, to land apply waste from his/her Hog Farm operation located in the 1/4 of Section 26 in Township 15 N and Range 20 W in Newton County to 88.7 acres of my property located in Newton County. A description of the areas to be used as land application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage*
17	NE	3	14N	20W	35.901	-93.087	88.7
and	SW	34	15N	20W			
and	SE	34	15N	20W			

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Operation Owner Signature _____ Date _____ Jason Criner Landowner Signature _____ Date _____

LAND USE CONTRACT

I, Jason Henson Landowner, agree to allow Jason Henson Operation Owner
 to land apply waste from his/her hog farm Type of Operation operation located in the 1/4 1/4 of
 Section 26 in Township 15 N Township and Range 20 W Range in
Newton Section County to 41.4 Total Acreage Available acres of my property located in
Newton County of Operation County. A description of the areas to be used as land
Newton County of Application Site application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage*
1	SW	25	15 N	20 W	35.917	-93.058	15.6
2	SW	25	15 N	20 W	35.916	-93.062	17.0
4	NW	36	15 N	20 W	35.914	-93.062	8.8

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Jason Henson Operation Owner Signature 3-21-12 Date Jason Henson Landowner Signature 3-21-12 Date

LAND USE CONTRACT

I, E. G. Campbell Landowner, agree to allow Jason Henson Operation Owner to land apply waste from his/her Hog Farm Type of Operation operation located in the 1/4 of Section 26 in Township 15 N and Range 20 W in Newton County to 74.3 acres of my property located in Newton County. A description of the areas to be used as land application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage*
7	NE	26	15 N	20 W	35.922	-93.067	74.3
and	SE						

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Jason Henson Operation Owner Signature 3-21-12 Date E. G. Campbell Landowner Signature 3-21-12 Date

LAND USE CONTRACT

Attachment 1

I, Charles W. Campbell, Landowner agree to allow Jason Henson, Operation Owner
to land apply waste from his/her Hog Farm, Type of Operation operation located in the 1/4 of
Section 26 in Township 15 N and Range 20 W in
Newton County to 103.5 acres of my property located in
Newton County. A description of the areas to be used as land
application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage
3	SW	25	15N	20W	35.918	-93.065	13.6
8	NE	35	15N	20W	35.914	-93.071	15.5
9	NE	35	15N	20W	35.911	-93.068	41.2
10	NE	35	15N	20W	35.910	-93.071	33.2

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Jason Henson
Operation Owner Signature

10-24-11
Date

Charles W Campbell
Landowner Signature

10-24-11
Date

LAND USE CONTRACT

I, Charles W. Campbell, Landowner, agree to allow Jason Henson, Operation Owner, to land apply waste from his/her Hog Farm operation located in the 1/4 of Section 26 in Township 15N and Range 20W in Newton County to 61.6 acres of my property located in Newton County. A description of the areas to be used as land application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage*
13	SW	35	15N	20W	35.902	-93.076	61.6
and	SE	35	15N	20W			
and	NW	2	14N	20W			
and	NE	2	14N	20W			

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Jason Henson
Operation Owner Signature

10-24-11
Date

Charles W Campbell
Landowner Signature

10-24-11
Date

LAND USE CONTRACT

I, Barbara Hufley Landowner agree to allow Jason Henson Operation Owner to land apply waste from his/her Hog Farm Type of Operation operation located in the 1/4 1/4 of Section 26 in Township 15N Township and Range 20W Range in Newton County of Operation County to 63.4 Total Acreage Available acres of my property located in Newton County of Application Site County. A description of the areas to be used as land application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage*
11	NW	35	15N	20W	35.910	-93.074	20.7
and	NE	35	15N	20W			
12	SE	35	15N	20W	35.901	-93.069	23.7
14	SW	35	15N	20W	35.905	-93.078	18.0

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Jason Henson
Operation Owner Signature

11/1/11
Date

Barbara Hufley
Landowner Signature

11/1/11
Date

LAND USE CONTRACT

I, Barbara Hufley, Landowner, agree to allow Jason Henson, Operation Owner, to land apply waste from his/her Hog Farm operation located in the 1/4 of Section 26 in Township 15 N and Range 20 W in Newton County to 79.6 acres of my property located in Newton County. A description of the areas to be used as land application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage
16	All	2	14N	20W	35.894	-93.076	79.6
and	SE	3	14N	20W			

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Jason Henson
Operation Owner Signature

11/1/11
Date

Barbara Hufley
Landowner Signature

11/1/11
Date

LAND USE CONTRACT

I, Clayel Criner, Landowner, agree to allow Jason Henson, Operation Owner, to land apply waste from his/her Hog Farm operation located in the 1/4 of Section 26 in Township 15 N and Range 20 W in Newton County to 61 acres of my property located in Newton County. A description of the areas to be used as land application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage*
15	NW	2	14N	20W	35.896	-93.078	61

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Jason Henson
Operation Owner Signature

3-21-12
Date

Clayel Criner
Landowner Signature

3-21-12
Date

LAND USE CONTRACT

Attachment 1

I, Barbara Hufley, Landowner agree to allow Jason Henson, Operation Owner
 to land apply waste from his/her Hog Farm, Type of Operation operation located in the 1/4 of
 Section 15 IV in Township 20 and Range _____ in
Section Township Range
 _____ County to _____ acres of my property located in
County of Operation Total Acreage Available
 _____ County. A description of the areas to be used as land
County of Application Site
 application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage*

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Jason Henson
 Operation Owner Signature

Date

Barbara Hufley 11/1/11
 Landowner Signature Date

LAND USE CONTRACT

I, Billy F. Cheatham, Landowner agree to allow Jason Henson, Operation Owner
 to land apply waste from his/her Hog Farm, Type of Operation operation located in the 1/4 of
 Section in Township 15 N, Township and Range 20 W, Range in
Newton, County of Operation County to acres of my property located in
Newton, County of Application Site County. A description of the areas to be used as land
 application sites are as follows:

Site No.	1/4 Section	Section	Township	Range	Latitude	Longitude	Available Acreage*

*Available acreage is the total acreage minus buffer zone areas.

I am also aware that the land applicator or the owner of the operation is to apply waste according to the management plan and guidelines and conditions set forth by the Arkansas Department of Environmental Quality.

In addition to these guidelines, the following requirements must also be satisfied when applying waste to my land:

Jason Henson
 Operation Owner Signature

Date

Billy F. Cheatham
 Landowner Signature

11-1-2011
 Date

Section H: Soil Test Reports

SECTION H. SOIL TESTS REPORTS

Land application soil tests for nutrient application are attached. Prior to application the results will be recorded in the analysis sheets.

Cooperative Extension Service
Soil Analysis Report
Soil Testing And Research Laboratory
Marianna, AR 72360
<http://www.uark.edu/depts/soiltest>

The University of Arkansas is an equal opportunity/affirmative action institution

JASON HENSON HC 72 BOX 10 MTN JUDEA	Client ID: 8706881318 AR 72655
Date Processed:	2/17/2012
Field ID:	1
Acres	23
Lime Applied in the last 4 years:	No
Leveled in past 4 years:	No
Irrigation:	Unknown
County:	Pope
Lab Number:	36722
Sample Number:	931074

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich 3)
	ppm	lb/acre	
P	83	166	Above Optimum
K	191	382	Above Optimum
Ca	1397	2794	--
Mg	114	228	--
SO ₄ -S	16	32	--
Zn	4.4	8.8	--
Fe	123	246	--
Mn	205	410	--
Cu	1.0	2.0	--
B	0.0	0.0	--
NO ₃ -N	24	48	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	6.6	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	11	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
77.2	63.6	8.7	4.5	0.5

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop		N	P ₂ O ₅	K ₂ O	SO ₄ S	Zn	B	Lime
Last Crop	Pasture (207)	----- lb/acre -----						
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	0	0	0	0	0
Crop 2	Warm-Season Grasses (MNT) (207)	60	0	0	0	0	0	0
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

5. Crop 2 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

6. Crop 3 Notes:

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Cooperative Extension Service
Soil Analysis Report
Soil Testing And Research Laboratory
Marianna, AR 72360
<http://www.uark.edu/depts/soiltest>

The University of Arkansas is an equal opportunity/affirmative action institution

JASON HENSON	Client ID:	8706881318
HC 72 BOX 10		
MTN JUDEA	AR	72055
Date Processed:	2/17/2012	
Field ID:	2	
Acres	20	
Lime Applied in the last 4 years:	No	
Leveled in past 4 years:	No	
Irrigation:	Unknown	
County:	Pope	
Lab Number:	36723	
Sample Number:	931075	

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Meq/100g)
	ppm	lb/acre	
P	72	144	Above Optimum
K	224	448	Above Optimum
Ca	1247	2494	--
Mg	90	180	--
SO4-S	15	30	--
Zn	3.5	7.0	--
Fe	96	192	--
Mn	235	470	--
Cu	0.8	1.6	--
B	0.0	0.0	--
NO3-N	31	62	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	6.6	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	10	cmole/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
75.3	61.6	7.4	5.7	0.6

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop		N	P2O5	K2O	SO4S	Zn	B	Lime
		lb/acre						
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	0	0	0	0	0
Crop 2	Warm-Season Grasses (MNT) (207)	60	0	0	0	0	0	0
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

5. Crop 2 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

6. Crop 3 Notes:

U of A UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE

Cooperative Extension Service
 Soil Analysis Report
 Soil Testing And Research Laboratory
 Marianna, AR 72360
<http://www.uark.edu/depts/soiltest>

The University of Arkansas is an equal opportunity/affirmative action institution

JASON HENSON HC 72 BOX 10 MTN JUDEA	Client ID: 8706881318 AR 72655
Date Processed:	2/17/2012
Field ID:	3
Acres:	30
Lime Applied in the last 4 years:	No
Leveled in past 4 years:	No
Irrigation:	Unknown
County:	Pope
Lab Number:	36724
Sample Number:	931076

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich 3)
	ppm	lb/acre	
P	42	84	Optimum
K	65	130	Low
Ca	3329	6658	--
Mg	59	118	--
SO4-S	11	22	--
Zn	6.1	12.2	--
Fe	95	190	--
Mn	162	304	--
Cu	1.6	3.2	--
B	0.0	0.0	--
NO3-N	10	20	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	7.5	--
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	19	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silty Clay Loam - Clay Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
89.7	85.8	2.5	0.9	0.4

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop		N	P2O5	K2O	SO4S	Zn	B	limo
		lb/acre						
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	110	0	0	0	0
Crop 2	Warm-Season Grasses (MNT) (207)	60	0	110	0	0	0	0
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

5. Crop 2 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

6. Crop 3 Notes:

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DIVISION OF AGRICULTURE

Cooperative Extension Service
 Soil Analysis Report
 Soil Testing And Research Laboratory
 Marianna, AR 72360
<http://www.uark.edu/depts/soiltest>

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JASON HENSON	Client ID:	0706881318
HC 72 BOX 10		
MTN JUDEA	AR	72855
Date Processed:	2/17/2012	
Field ID:	4	
Acres	13	
Lime Applied in the last 4 years:	No	
Leveled in past 4 years:	No	
Irrigation:	Unknown	
County:	Pope	
Lab Number:	36725	
Sample Number:	931077	

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mahlich's)
	ppm	lb/acre	
P	60	100	Optimum
K	120	240	Medium
Ca	1230	2460	--
Mg	118	236	--
SO4-S	12	24	--
Zn	2.7	6.4	--
Fe	135	270	--
Mn	46	92	--
Cu	0.7	1.4	--
S	0.0	0.0	--
NO3-N	15	30	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	5.6	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	12	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam - Silty Clay Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
62.5	51.3	8.2	2.6	0.4

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede those agronomic recommendations.)

Crop		N	P2O5	K2O	SO4S	Zn	B	Lime
		lb/acre						
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	60	0	0	0	4000
Crop 2	Warm-Season Grasses (MNT) (207)	60	0	60	0	0	0	4000
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 60 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

5. Crop 2 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

6. Crop 3 Notes:

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JASON HENSON HC 72 BOX 10 MTN JUDEA	Client ID: 8706881318 AR 72655
Date Processed:	2/17/2012
Field ID:	5
Acres:	40
Lime Applied in the last 4 years:	No
Leveled in past 4 years:	No
Irrigation:	Unknown
County:	Pope
Lab Number:	36726
Sample Number:	931078

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Meq/100g)
	ppm	lb/acre	
P	65	130	Above Optimum
K	108	216	Medium
Ca	2507	5014	..
Mg	118	236	..
SO4-S	12	24	..
Zn	6.1	12.2	..
Fe	134	268	..
Mn	128	256	..
Cu	1.7	3.4	..
B	0.0	0.0	..
NO3-N	15	30	..

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	6.7	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	17	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silty Clay Loam - Clay Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
82.2	74.4	5.8	1.6	0.3

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop		N	P2O5	K2O	SO4S	Zn	B	Lime
		lb/acre						
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	60	0	0	0	0
Crop 2	Warm-Season Grasses (MNT) (207)	60	0	60	0	0	0	0
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 60 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

5. Crop 2 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 8 weeks of grazing. For fall grazing apply 60 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

6. Crop 3 Notes:

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JASON HENSON	Client ID:	0706081310
HC 72 BOX 10		
MTN JUDEA	AR	72655
Date Processed:	2/17/2012	
Field ID:	6	
Acres	40	
Lime Applied in the last 4 years:	No	
Leveled in past 4 years:	No	
Irrigation:	Unknown	
County:	Pope	
Lab Number:	36727	
Sample Number:	931079	

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich-3)
	ppm	lb/acre	
P	76	152	Above Optimum
K	136	272	Optimum
Ca	876	1752	--
Mg	59	118	--
SO4-S	13	26	--
Zn	2.1	4.2	--
Fe	128	256	--
Mn	188	376	--
Cu	0.5	1.0	--
B	0.0	0.0	--
NO3-N	15	30	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	6.2	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	8	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
67.8	56.4	6.3	4.5	0.6

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop		N	P2O5	K2O	SO4S	Zn	B	Lime
		lb/acre						
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	0	0	0	0	0
Crop 2	Warm-Season Grasses (MNT) (207)	60	0	0	0	0	0	0
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

5. Crop 2 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

6. Crop 3 Notes:

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JASON HENSON	Client ID:	8706881318
HC 72 BOX 10		
MTN JUDEA	AR	72855
Date Processed:	2/17/2012	
Field ID:	7	
Acres	150	
Lime Applied in the last 4 years:	No	
Leveled in past 4 years:	No	
Irrigation:	Unknown	
County:	Pope	
Lab Number:	36728	
Sample Number:	931080	

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich-3)
	ppm	lb/acre	
P	178	356	Above Optimum
K	207	414	Above Optimum
Ca	1228	2456	..
Mg	154	308	..
SO4-S	14	28	..
Zn	14.5	29.0	..
Fe	210	436	-
Mn	168	336	..
Cu	3.2	6.4	..
B	0.0	0.0	..
NO3-N	12	24	..

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	6.3	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	11	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
72.8	55.7	11.6	4.8	0.7

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop:		N	P2O5	K2O	SO4S	Zn	B	Lim
		-----lb/acre-----						
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	0	0	0	0	0
Crop 2	Warm-Season Grasses (MNT) (207)	60	0	0	0	0	0	0
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 8 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

5. Crop 2 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

6. Crop 3 Notes:

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Cooperative Extension Service
Soil Analysis Report
Soil Testing And Research Laboratory
Marianna, AR 72360
<http://www.uark.edu/depts/soiltest>

JASON HENSON HC 72 BOX 10 MTN JUDEA	Client ID: 8706081318 AR 72656
Date Processed:	2/17/2012
Field ID:	8
Acres:	12
Lime Applied in the last 4 years:	No
Leveled in past 4 years:	No
Irrigation:	Unknown
County:	Pope
Lab Number:	36729
Sample Number:	931081

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Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich 3)
	ppm	lb/acre	
	46	92	Optimum
	46	90	Very Low
	1948	3896	--
	52	104	--
	8	16	--
	2.1	4.2	--
	124	248	--
	193	386	--
	0.8	1.6	--
	0.0	0.0	--
	6	12	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	7.0	--
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	12	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam - Silty Clay Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
83.8	78.9	3.5	0.9	0.5

Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop	Nutrient						
	N	P2O5	K2O	SO4S	Zn	MB	Lim
Pasture (207)	----- lb/acre -----						
Warm-Season Grasses (MNT) (207)	60	0	160	0	0	0	0
Warm-Season Grasses (MNT) (207)	60	0	160	0	0	0	0

Top 1 Notes:

Use recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 50 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If nutrient deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

Top 2 Notes:

Use recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 50 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If nutrient deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

Top 3 Notes:

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Marlanna, AR 72360
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JASON HENSON	Client ID:	8706881318
HC 72 BOX 10		
MTN JUDEA	AR	72655
Date Processed:	2/17/2012	
Field ID:	9	
Acres	40	
Lime Applied in the last 4 years:	No	
Leveled in past 4 years:	No	
Irrigation:	Unknown	
County:	Pope	
Lab Number:	36730	
Sample Number:	931082	

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich 3)
	ppm	lb/acre	
P	52	104	Above Optimum
K	45	90	Very Low
Ca	2276	4552	--
Mg	59	118	--
SO4-S	9	18	--
Zn	1.6	3.2	--
Fe	121	242	--
Mn	109	218	--
Cu	1.3	2.6	--
B	0.0	0.0	--
NO3-N	7	14	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	7.2	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	14	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam - Silty Clay Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
85.8	81.0	3.5	0.8	0.4

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop		N	P2O5	K2O	SO4S	Zn	B	Lim
		lb/acre						
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	160	0	0	0	0
Crop 2	Warm-Season Grasses (MNT) (207)	60	0	160	0	0	0	0
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

5. Crop 2 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

6. Crop 3 Notes:

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JASON HENSON HC 72 BOX 10 MTN JUDEA	Client ID: 8706881318 AR 72655
Date Processed:	2/17/2012
Field ID:	10
Acres:	35
Lime Applied in the last 4 years:	No
Leveled in past 4 years:	No
Irrigation:	Unknown
County:	Pope
Lab Number:	36731
Sample Number:	931083

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich 3)
	ppm	lb/acre	
P	69	138	Above Optimum
K	114	228	Medium
Ca	2153	4306	--
Mg	99	198	--
SO4-S	13	26	--
Zn	3.8	7.6	--
Fe	157	314	--
Mn	135	270	--
Cu	1.3	2.6	--
S	0.0	0.0	--
NO3-N	132	264	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	6.8	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	14	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silty Clay Loam - Clay Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
82.7	74.4	5.7	2.0	0.0

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop		N	P2O5	K2O	SO4S	Zn	B	Lime
		lb/acre						
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	60	0	0	0	0
Crop 2	Warm-Season Grasses (MNT) (207)	60	0	60	0	0	0	0
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

5. Crop 2 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

6. Crop 3 Notes:

Arkansas Department of Environmental Quality
Permits Branch, Water Division
5301 Northshore Drive
North Little Rock, AR 72118

ARKANSAS DEPARTMENT OF ENVIRONMENTAL QUALITY
ANNUAL REPORT FORM FOR PERMITTED
CONFINED ANIMAL FACILITIES

REPORTING PERIOD: _____

PERMITTEE NAME: _____ PERMIT NUMBER: _____

PHONE NUMBER: _____ AFIN NUMBER: _____

FACILITY TYPE AND SIZE: _____
(i.e., 200 Cow Dairy, 2,500 Swine Finishing, 80,000 Bird Layer Operation, etc.)

WASTE DISPOSAL SYSTEM CONSISTS OF: _____
(i.e., Holding Pond, Holding Pond & Settling Basin, Concrete Holding Tank, etc.)

WASTE APPLICATION METHOD: _____
(i.e., Tank Spreader, Irrigation System, etc.)

NO. OF APPLICATION FIELDS: _____

TOTAL AVAILABLE ACREAGE: _____

WASTEWATER SAMPLE LOCATION: _____
(Lagoon During Pumping or Field During Application)

YOU MUST SUBMIT A COPY OF THE WASTEWATER ANALYSIS FOR EACH SAMPLE PROVIDED TO THE COOPERATIVE EXTENSION SERVICE OR A PRIVATE LAB. THE WASTEWATER ANALYSIS MUST INCLUDE: pH (su), TOTAL NITROGEN, AMMONIA NITROGEN, TOTAL POTASSIUM, TOTAL PHOSPHORUS, AND PERCENT SOLIDS.

IN ADDITION, YOU MUST SUBMIT A COPY OF THE SOIL ANALYSIS FOR EACH FIELD WITH THIS FORM. THE SOIL ANALYSIS MUST INCLUDE: pH (su), POTASSIUM (lbs/ac), PHOSPHORUS (lbs/ac), AND NITRATES (lbs/ac). AT LEAST ONE SOIL ANALYSIS SHOULD BE DONE FOR EACH 30 ACRE TRACT.

PLEASE COMPLETE THE TABLE ON THE BACK FOR THE LAND APPLICATION REPORT. YOU MUST SIGN AND DATE THIS REPORT AND SUBMIT IT TO THE DEPARTMENT **PRIOR TO MAY 30th** OF EACH YEAR. PLEASE KEEP A COPY OF THIS REPORT, THE SOIL ANALYSIS, AND THE WASTEWATER ANALYSIS FOR YOUR RECORD AT THE FACILITY.

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION.

OWNER OR OPERATOR (Please Print)

SIGNATURE

DATE

Mail complete annual report form and annual application report to:



Keeping records plays a critical role in a manure management system. Records are essential to determine appropriate rates of manure to apply to the land while protecting surface and groundwater resources. It enables operators to make good annual and long-term decisions concerning efficient use of manure. Additionally, records serve to document compliance with regulations or voluntary adoption of best management practices.

Records should be maintained for five years or as otherwise instructed by specific federal and state laws, local county ordinances and/or program requirements.

At a minimum, track manure applications by collecting and keeping records of the following information:

- Soil test results and recommendations for all fields receiving manure (sampled and tested prior to hauling manure).
- Manure test results.
- Identity of the fields hauled to (including acres spread on and where in the field).
- Calculated "planned" manure application rate per field.
- Calculated "actual" manure application rate per field.
- Method of manure application.
- Date(s) and time(s) of manure application.

The following additional records are recommended if the goal is to implement a whole farm nutrient budget program:

- Soil test results and recommendations for the remaining fields receiving nutrients from other sources (i.e. commercial fertilizer).
- Form/rates of other nutrient sources applied per field.
- Crop planting and harvest dates and yields per field.

Soil testing on a whole farm basis provides fertility level information on all fields allowing operators to make decisions as to where manure nutrients can best be utilized.

The Manure Nitrogen and Phosphorus Application Worksheets provided with this plan serve as excellent recordkeeping tools to document test results and manure applications.

SECTION N. LAND APPLICATION LOG FORMS

The following log forms are enclosed:

1. Manure Source Details
2. Annual Report Form For Permitted Confined Animal Facilities
3. Previous Manure Applications and Nitrogen Credits
4. Calculating Residual/Supplemental Nitrogen Amounts
5. Fertilizer Recommendations and Crop Requirements
6. Determining the Manure Application Rate
7. Animal Waste Land Application Record For Permitted Confined Animal Facilities

Section N: Record Keeping and Land
Application Log Forms

The land application rate should be calculated based on (1) the nutrient content of the wastewater, (2) current soil tests, (3) crop needs and (4) the water intake capacity (inches/hour) of the soil if an irrigation system is used.

For more information and/or assistance in calculating application rates, contact your local NRCS and Conservation District Office.

Plan for Pumping Waste Storage Ponds

Operator Name C&H Hog Farms Date 05/25/2012

County Newton Pond ID or Legal Description Waste Storage Pond 1 & 2

• Method Selected for Land Application of Wastewater

- Pipeline/Sprinkler System (Permanent): *Waste Storage Pond 2*
 Big Gun Sprinkler (Temporary)
 Drag Hose System
 Tank Wagon: *Waste Storage Pond 1*
 Other (Explain)

• Pre-Arranged Source of Application Equipment (List all necessary equipment and access to it).

Type Equip.	Obtain Where
<u>Pump</u>	<u>Proposed to Field 5-9</u>
<u>Pipe</u>	<u>Proposed to Field 5-9</u>
<u>Sprinkler</u>	<u>Proposed to Field 5-9</u>
<u>Vac Tanker</u>	<u>Fields 1-4 and 10-17</u>

• Fields Available for Land Application of Wastewater in an Emergency

Legal Description	Landuse	Acres Available	Predom. Soil
<u>Sec. 26, T15N, R20W</u>	<u>Grass</u>	<u>74.3</u>	<u>48</u>

• Holding Capacity of Ponds at Must Pumpdown Level 2,469,903 gallons
Bottom of 25-year, 24-hour storage level. Pond is to be pumped within 10 days below level.

• Holding Capacity of Ponds at High Water Line 3,495,464 gallons
Top of 25-year, 24-hour storage level (bottom of freeboard)(Includes Concrete Pits).

• Holding Capacity of Ponds between Freeboard and Must Pumpdown Elevation 35,564 gallons
Bottom of freeboard- Must Pumpdown Elevation.

• Application Rates

The fertilizer value of wastewater in waste storage ponds is variable. Prior to land application, it is recommended to collect a representative sample from the pond and sent to a testing laboratory for analysis. If time does not permit waiting for test results, estimates of the nutrient content can be made from data previously collected at other facilities or from publications.

SECTION M. MANAGEMENT OF WASTE STORAGE PONDS

Waste Storage ponds are an efficient and practical means to collect and store manure effluent from a confined livestock farm. A properly designed pond must store, at a minimum 180 days of manure effluent including a 25 year 24 hour storm event. Waste storage ponds should never be full and always have sufficient storage for the next precipitation event.

Runoff collected from the livestock farm contains various amounts of manure nutrients, bacteria, and other materials. Every livestock operation is unique when taking into account the amount and intensity of different rainfall events, and number and species of animals.

Livestock operators have difficulty in dealing with the collected wastewater when there are larger than normal amounts of runoff. Operators can find themselves faced with full waste storage ponds and often less than ideal conditions for land applying or otherwise utilizing the wastewater.

Producers who operate a facility with a waste storage pond must be ready to handle emergency situations when the pond may become full or near overflowing. Eliminating pond overflows is a critical factor in reducing pollutants from entering streams and other water bodies.

Following are important recommendations to implement when operating a facility with a waste storage pond:

- Foremost, routinely monitor the level of the pond to assure there is enough storage remaining (plus freeboard) to hold the designed volume of a 25 year 24 hour storm event. This must Pumpdown level should be marked with a permanent depth gauge in the pond. If wastewater is above this line, the operator normally must pump the pond down below this level within 14 pump-able days.
- Plan ahead and develop a pumping plan. Identify specific fields and equipment needs for the pumping plan.
- Consider using cropping practices that will expand the "window of opportunity" for land application during the growing season. Decide on field access alternatives during wet weather conditions.
- Review and follow the Operation & Maintenance (O & M) guidelines provided with your manure management system design and constructions plans.
- Contact the Arkansas Department of Environmental Quality (501-682-7890) within 24 hours concerning a wastewater discharge.

Section M: Waste Storage Pond Pumping
Plan

Table 1. Odor reduction practices for swine operations (cont.)

Section 3: Increase Dispersion of Odor						
Practice	Description	Advantages	Disadvantages	Effectiveness	Cost	Comments
a. Shelterbelts	Create a vegetation barrier for dust and odorous compounds emitted from the building exhaust	Cost. Environment. Aesthetics	Requires planning and time	Low	Low	
b. Windbreak walls	Solid or porous wall constructed 10 to 15 feet from the exhaust fans will cause dust to settle	Rapid implementation	Cost. Aesthetics	Low	Low to moderate	
c. Setback distances	Optimize distance between odor emission sources and urban areas.	Cost.	Not applicable for facilities currently in operation	High	Variable	Effectiveness can be calculated through the OFFSET model (Univ. of Minn.)

Section 4: Land Application of Manure						
Practice	Description	Advantages	Disadvantages	Effectiveness	Cost	Comments
a. Manure injection or incorporation	Manure injected directly into soil. Can be done in pasture or bare soil or into a growing crop	No emission of odors from manure when applied to soil	Takes more horsepower and more sophisticated equipment	Very high	Low	Should be considered a BMP

Table 1. Odor reduction practices for swine operations (cont.)

Section 2: Decrease Emission of Odor						
Practice	Description	Advantages	Disadvantages	Effectiveness	Cost	Comments
a. Flush systems for manure removal	Removes manure frequently by flushing all the pits	Effective in reducing emission from pit	Increased labor, need for outside storage	Moderate	Moderate	
b. Pit systems w/ reduced manure surface	Sloped bottom of pits make sure manure surface is reduced	Reduces emission from pits	None	Moderate	Moderate	Usually combined with increased flushing
c. Oil spraying	Vegetable oil sprayed in facilities at regular intervals	Bound dust also odors present in the dust	More slicky surface	Moderate	Moderate	Reduces health risk for human workers in barns
d. Biofilters	Air exhausted through a biofilter made from organic material that captures the odors. Clean, odorless air is released.	Very effective. Simple to construct. Environmentally friendly	Building design. Aesthetics	High	Low to moderate	Odor reduced by 96% in SDSU research. Cannot be used with curtain-sided barns
e. Storage additives	Additives added to manure storage facility	Supposed to reduce odor generation	Not a proven technique	Low	High	Questionable technique
f. Rigid manure storage covers	Mechanical cover is applied to the manure storage unit	Very effective	Can be costly	High	High	
g. Flexible manure storage cover	Flexible material applied on top of storage facility. May be textile or plastic membrane or floating clay balls		Can cause problems when agitating manure, support structure may be needed	High	Moderate	Several different materials can be used
h. Biodegradable manure storage cover	Straw is applied on top of storage facilities	Inexpensive	Needs to be filled every three months. More difficult to agitate storage unit	Moderate	Low	Effectiveness highly dependent on how the cover is managed
i. Manure separators	Separates manure into a solid and a liquid fraction	Decreases odor generation from storage	Relatively expensive, only applicable to large operations	Moderate	High	More effective separators are available in Europe
k. Methane digesters	Treat waste with 3 to 10% total solids. Biogas methane production from manure	Manure treatment can decrease odor at application time. Generation of electricity can help pay for treatment costs	Costs: \$250,000 O + M = \$7,500/year Cost effectiveness dependent on contract with electrical company.	High	High	May be combined with manure separators

Table 1: Odor Reduction Practices for Swine Operations

Section 1: Reduce generation of odor						
Practice	Description	Advantages	Disadvantages	Effectiveness	Cost	Comments
a. Low protein diets	Diets are lowered 3-4% in CP compared to NRC rec. Crystalline AA are added to diets so that AA levels follows NRC rec	Avoid overfeeding CP. Fewer problems with enteric diseases in pigs. Reduced N in manure, reduced ammonia emission	Reduced consumption of byproducts and alternative ingredients	Moderate	Low. (Sometimes the cost of L.P diets are actually lower than regular diets)	Cost offset by increased productivity and more efficient nutrient use. Should be considered a BMP
b. Low sulfur diets	Diets using no micro-minerals on sulfate form and no excess sulfur containing AA	Reduced production of H ₂ S	Some restrictions apply to the mineral sources that can be used	Moderate	Low	Should be considered a BMP
c. Phase feeding	Diets are changed frequently during the production phases to match the nutrient requirement of the pigs	Overfeeding and underfeeding with nutrients can be reduced	More diets are required on the farm	Low	Low	Should be considered a BMP
d. Precision diet formulation	Diets are formulated based on digestible contents of amino acids and minerals and the net energy content of the diets. Also, the ideal protein concept is used in diet formulation	Diets that more precisely match the requirement of the animals can be formulated. Reduction of excess nutrients in diets and thus in manure	Research is needed to establish digestible contents of nutrients in feed ingredients and the animals requirements for digestible nutrients	Low	Low	At least 3-5 years of research needed before concept can be implemented
e. Pelleting diets	All diets used in the operation are pelleted prior to use	Reduces dust generation and decreases amount of feed wasted in the manure pit	None	Low	Low (\$10/ton for mixing, this cost offset by increased nutrient digestibility)	

Conclusions and Recommendations

A number of practices are available to reduce odor from swine facilities. A reduction in odor coming off a swine facility is achieved only if the odors emitted by the unit itself, from the storage facility, and from the land application of the manure are reduced.

At this time, the following practices are recommended:

1. The odor from the unit itself can be reduced by a combination of dietary practices and the installation of a biofilter.
2. The odor from the storage facility can be reduced by installing an effective lagoon cover. In larger units this may be combined with a manure separator and (or) a methane digester.
3. The odor from the land application of manure can be reduced by injecting the manure into the soil.

Research into odor reduction is ongoing, and many new technologies are being developed. As independent research using these technologies becomes available, some of these technologies may prove to be even more effective than the ones listed in the table. SDSU swine research being conducted at the Southeast Research Farm near Beresford has demonstrated that biofilters reduce odor emissions from confined buildings by 96%.

RECOMMENDED STRATEGIES FOR ODOR CONTROL IN CONFINEMENT SWINE OPERATIONS

*Hans Stein¹, Alvaro Garcia², Kent Tjardes¹, Charles Ullery³,
Stephen Pohl³, and Christopher Schmit⁴*

¹Animal and Range Sciences Department, ²Dairy Science Department,
³Agricultural and Biosystems Engineering Department, and
⁴Civil and Environmental Engineering Department,
South Dakota State University, Brookings S.D.

Summary:

Odors coming off a swine facility are generated from three different sources: the unit itself, from the storage facility, or the land on which the manure is applied.

To reduce the total amount of odor generated from a swine facility, odor generation and emission by each of these three sources needs to be reduced. Within each area, several options for odor reduction are available. Practices that have been proven to be effective and that can be immediately implemented are listed in Table 1. Other options are being developed or tested. Research into these practices will reveal whether or not they can be successfully implemented in the future.

Table 1 is organized in four sections covering practices that:

1. reduce odor generation in barns,
2. reduce odor emission from facilities and storage units,
3. increase odor dispersion, and
4. reduce odor emission from manure application.

For each practice, advantages and disadvantages are listed. The effectiveness and the cost of implementing each practice is indicated using odor generation from a standard swine facility as a base line. This unit is assumed to be constructed using state-of-the-art recommendations including deep pits or an uncovered manure storage facility, curtain sidings or mechanical ventilation, and no dietary modifications to reduce odor generation.

To obtain an overall reduction in odors from a facility, reductions need to be made in odor generated by the unit itself, the storage facility, and from land application.

Some practices listed in Table 1 are best management practices (BMP). These are practices with well-documented beneficial effects on sustainability of a production system. Their implementation should be encouraged even without considering their potential for odor reduction.

The cost of each practice is indicated. A "low" cost is assumed to be less than \$0.50 per GF pig produced (\$1.25/Animal Unit); "moderate" is assumed to add \$0.50-\$1.50 per GF pig produced (\$1.25-3.75/Animal Unit), and "high" is assumed to add more than \$1.50 per GF pig produced (\$3.75/Animal Unit) to total production costs, as compared to the base line unit.

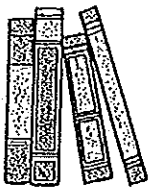
Section L: Odor Control

Section K: Livestock Feed Management

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technologies that would allow this goal to be achieved. Some individual technologies will have a greater impact on reduced nutrient excretion than others. Furthermore, employing these technologies together in an environmental nutrition approach to swine feeding has the potential to significantly reduce excess nutrients for disposal in swine production.



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TABLE 6. Theoretical model of the effects of reducing dietary protein and supplementing with amino acids on N excretion by 90-kg finishing pigs^a.

N balance	14 % CP	12% CP + Lys	10% CP + Lys + Thr + Trp + Met
N intake, g/d	67	58	50
N digested and absorbed, g/d	60	51	43
N excreted in feces, g/d	7	7	7
N retained, g/d	26	26	26
N excreted in urine, g/d	34	25	17
N excreted, total, g/d	41	32	24
Reduction in N excretion, %	-	22	41

^aAssumes an intake of 3,000 g/d, a growth rate of 900 g/d, a carcass lean tissue gain of 400 g/d, a carcass protein gain of 100 g/d (or 16 g of N/d), and that carcass N retention represents 60% of the total N retention. Adapted from Cromwell (23).

TABLE 7. Effect of feeding strategy during the growing-finishing period (25 to 105 kg) on N output^a.

Item	Single-feed 17% CP	Two-feeds ^b 17-15% CP	Three-feeds ^c 17-15-13% CP
N output, g/d	31.9	29.0	26.7
Percentage of two-feed strategy	110	100	92

^aAdapted from Henry and Dourmad (40).

^bCrude protein changed at 55 kg.

^cCrude protein changed at 50 and 75 kg.

TABLE 8. Feed waste impacts on nutrient management^a.

Feed waste (%)	Feed loss per pig (kg)	Income loss per pig (\$)	Feed N waste per pig (g)	Feed P waste per pig (g)
1	2.8	0.36	63	18
3	8.2	1.07	195	50
5	13.6	1.77	327	82
7	19.1	2.48	459	114

^aBased on growing-finishing pigs from 22.7 to 113.5 kg body weight, 3:1 feed:gain ratio, 2.4% N and 0.60% P in the diet and \$0.13/kg diet cost. Adapted from Harper (36).

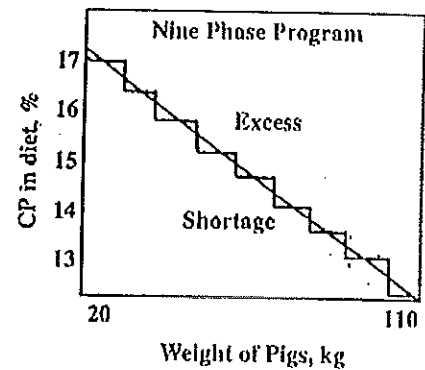
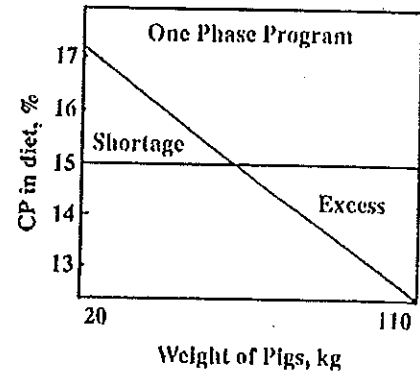


Figure 4. Example of a one phase and a nine phase feeding program for the growing and finishing phase.

and careful adjustment of feeders is essential for the prevention of excessive feed waste.

Conclusions

As swine production units have become larger and more intensive, the need for environmentally sound methods to use and dispose of excreted nutrients has increased. Safe and effective disposal of waste nutrients in swine production depends on reducing the quantity of nutrients excreted by the animals coupled with recycling of the excess nutrients in a manner that is not harmful to the environment. In the future, swine feed formulators must focus on optimizing swine performance while reducing or minimizing nutrient excretion. This review describes existing and emerging

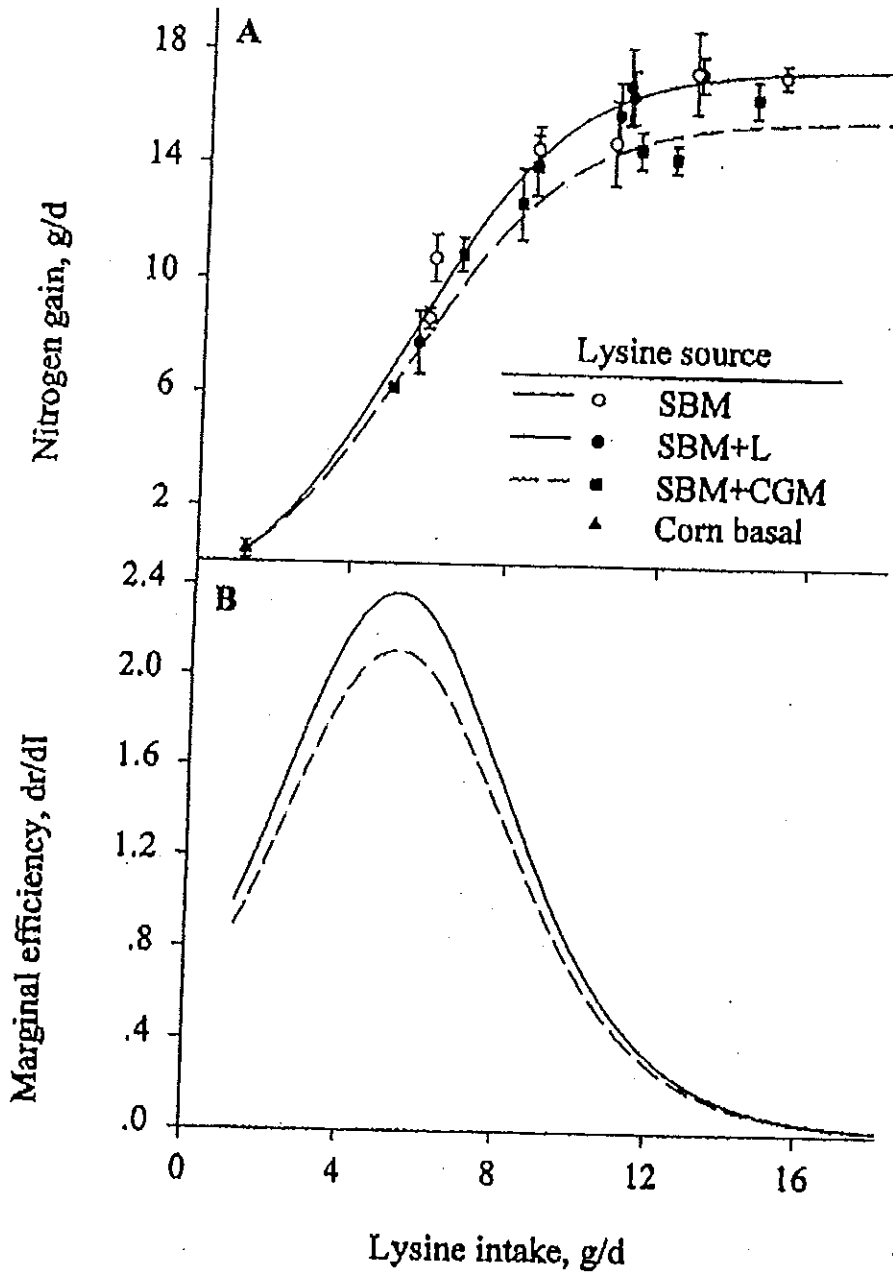


Figure 3. Diminishing returns in nitrogen gain (grams per day) of pigs fed diets with graded concentrations of lysine. Panel A: Predicted curves estimated using a logistic equation. Data points \pm SE ($n = 4$) for each treatment group. Panel B: Marginal efficiency of nitrogen gain with respect to lysine intake calculated as the first derivative of the predicted curves in Panel A. Marginal efficiency is defined as the incremental response in nitrogen gain to an incremental unit of lysine intake. Taken from Gahl et al. (34).

the feeding of 14% CP diet was initiated at 60 kg body weight, rather than the continuous feeding of 16% CP grower diet to market weight. In a further study, Chauvel and Ganier

(14) reported a 9% reduction in N excretion between a multiphase system in which the proportions of an 18.9 and 14.9% CP (4.1 and 2.6 g digestible lysine/Mcal net energy,

respectively) were changed weekly from 24 to 107 kg vs a two-phase system, in which an 18.1% CP (3.6 g lysine/Mcal net energy) diet was fed to 66 kg and a 16.1% CP (3.1 g lysine/Mcal net energy) diet was fed to 107 kg. Also, the excretion of P and other minerals would be reduced a similar amount, if the finishing diet contained a lower level of these minerals. Henry and Dourmad (41) suggested that this change could be made gradually by changing the ratio in which a "high" protein and P (and other minerals) grower diet is mixed with a "low" protein and P (and other minerals) finishing diet.

Separate-sex or split-sex feeding of swine can further improve feed efficiency. It is well established that gilts consume less feed on an ad libitum basis and require greater diet nutrient density than barrows (25). By penning and feeding gilts and barrows separately, producers can more precisely formulate diets for specific sexes and avoid overfertilization and excessive excretion of nutrients. Furthermore, increased fat deposition and decreased rate of lean deposition occurs at an earlier growth stage in barrows than in gilts; therefore, dietary protein and amino acid levels can be more precisely changed at different growth stages for each sex. Under such precise feeding conditions, the total quantity of N and other minerals fed and excreted can be reduced.

Reduction of Feed Waste. Another simple, yet sometimes difficult and overlooked way to improve feed efficiency is to improve design and operation of feeders, so that feed waste is minimized. Studies have shown that feed waste accounts for up to 3 to 8% of the feed fed. The impact that feed waste has on feed efficiency and income loss, as well as the amount of N and P excreted in pigs is shown in Table 8 (36). A 5% level of feed waste can result in an income loss of \$1.77 per market pig depending on market condition, and an additional 327 g of N and 82 g of P excreted per pig. The use of proper feeder designs, regular maintenance,

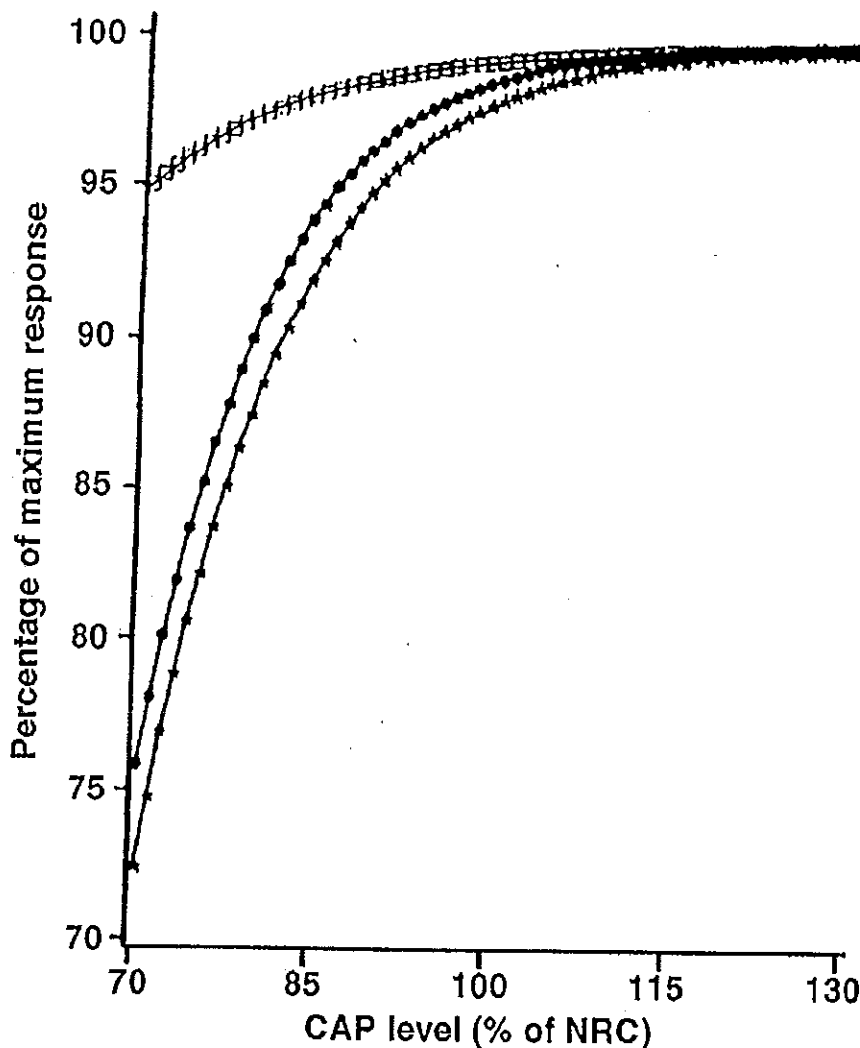


Figure 2. Percentage of maximum average daily gain (*) average daily feed intake (*) and gain:feed ratio (□) associated with each increase in average daily Ca and P (CAP) intake for growing-finishing pigs. Taken from Combs et al. (16).

The model included study as a fixed effect and the linear and quadratic effects of phytase level (units per kilogram). The quadratic effect was not significant ($P < 0.97$) and was removed from the model used to derive the following equation: $Y = 25.57 + 0.0106X$, $R^2 = 0.95$, where Y equals the fecal P reduction (percentage of adequate P level), and X = supplemental phytase level (units per kilogram). Based on this equation, 500 U/kg of dietary phytase would result in a 30.9% decrease in fecal P,

which is higher than 21.5% observed in a recent growing-finishing study (37). Assuming that a 21% reduction in P excretion results in a similar reduction in P content of land applied manure, then 21% less application area would be needed under a given P loading rate.

The nutritional, environmental, and economic considerations for using phytase in pig and poultry diets were recently reviewed (53). Based on response surface equations and nonlinear and linear equations

calculated from the data, it was concluded that the magnitude of the response to microbial phytase is influenced by the dietary level of available P (and total P including phytate P), the amount of phytase activity added, and the Ca to available P ratio. Currently in the U.S., based on replacement values of inorganic P by microbial phytase calculated from nonlinear and linear equations, the cost of adding phytase range from one to three times the cost of an equivalent amount of inorganic P (53). This cost, however, does not include any cost for P disposal. Based on a representative feeder-to-finish swine farm generated from the Duplin County, NC Swine Database, Zhu et al. (99) estimated that for a 20% reduction in P excretion, with the inclusion of 500 U/kg of phytase, the savings in manure disposal cost would be \$0.42 per hog with a net advantage of \$0.16 per hog for using phytase. A genetically engineered microbial phytase is now being marketed in the several countries, including the U.S. The addition of microbial phytase to high phytate diets also releases Ca (57, 77, 78, 92), Zn (10, 60, 96), and some amino acids (48, 97) that may be bound by the phytate complex.

Use of Phase Feeding and Separate-Sex Feeding. The requirement of animals for most available amino acids and minerals, expressed as a percentage of the total diet, decreases as the animals grow heavier. Phase feeding, as some have described it, is a way to more precisely meet the nutrient needs of growing and finishing pigs. This concept applied to dietary crude protein is illustrated in Table 7 and Figure 4. It is known that nutrient requirements change (perhaps weekly) as pigs grow; if a producer is able to change the formulation of the diet as the nutrient requirements change, then the nutrient needs of the animal can be met more precisely, thereby, reducing the total quantity of nutrients excreted. Henry and Dourmad (41) reported that N excretion could be reduced approximately 15% when

TABLE 5. Mineral concentrations in sow and finishing swine diets^a.

Minerals	Sow			
	Requirement NRC (69)	Range	Median ^b	Median requirement
Calcium, %	0.75	0.62 to 2.01	1.21	1.61
Phosphorus, %	0.60	0.45 to 1.17	0.84	1.40
Sodium, %	0.15	0.13 to 0.45	0.22	1.47
Magnesium, %	0.04	0.12 to 0.44	0.21	5.25
Potassium, %	0.20	0.43 to 1.15	0.78	3.90
Copper, ppm	5	12 to 222	22	4.40
Iron, ppm	80	162 to 698	376	4.70
Manganese, ppm	10	28 to 203	77	7.70
Zinc, ppm	50	79 to 497	167	3.34

Minerals	Finishing swine			
	Requirement	Range	Median ^b	Median requirement
Calcium, %	0.50	0.57 to 1.38	0.96	1.92
Phosphorus, %	0.40	0.45 to 0.78	0.62	1.55
Sodium, %	0.10	0.13 to 0.29	0.19	1.90
Magnesium, %	0.04	0.13 to 0.21	0.16	4.00
Potassium, %	0.17	0.48 to 0.93	0.72	4.23
Copper, ppm	3	9 to 281	20	6.67
Iron, ppm	40	131 to 503	311	7.76
Manganese, ppm	2	37 to 160	62	31.0
Zinc, ppm	50	103 to 205	149	2.98

^aResults are from analyses conducted recently at the North Carolina Feed Testing Laboratory (n=26 for sow and n=17 for finishing diets). Adapted from Spears (85).

^bThe median level for each mineral indicates that 50% of the sample analyzed were below and 50% were above the median value.

cost of disposing of P increases, the Ca and P levels fed will decrease. In the future, nutritionists will formulate for 95 to 98% of maximum response rather than trying to approach 100% of maximum response. Therefore, the industry will feed below rather than above the nutrient requirements of animals to maximize growth and bone development. How much of a safety margin will be desirable will depend upon the availability of accurate knowledge of the requirements and compositional information for the feedstuffs.

Use of Crystalline Amino Acids and High Quality Protein. The concept of ideal protein and the use of crystalline amino acids are now

widely accepted. The use of crystalline amino acids in nonruminant feeding can substantially reduce the amount of N excreted without affecting performance (23, 41, 49, 89). Henry and Dourmad (41) and Van der Honing et al. (89) reported that N excretion can be reduced 15 to 20% when crude protein levels are reduced two percentage units and crystalline amino acids are added to correct amino acid balance. Cromwell (23) reported that the crude protein level of swine diets can be reduced about two percentage units (i.e., 14 vs 16% crude protein) by using crystalline lysine; this can result in a 22% decrease in N excreted (Table 6). The crude protein

level of corn-soybean meal diets can be reduced about four percentage units (i.e., 10 vs 14% crude protein) by using four amino acids (lysine, threonine, tryptophan, and methionine); this can result in a 41% decrease in N excreted. After summarizing the results of 10 studies, Kerr and Easter (49) suggested that for each 1 percentage unit reduction in dietary protein combined with crystalline amino acid supplementation, total N losses (fecal and urinary) could be reduced approximately 8%. The use of low quality protein sources such as hydrolyzed hog hair meal, and high levels of crude fiber increase N excretion (50, 51). Also, as nonruminant animals are fed more precisely to meet their amino acid needs, feed efficiency will be improved, which can further reduce N excreted as well as the excretion of other nutrients.

Improve the Availability of P and Some Other Minerals. The amount of P excreted can be significantly decreased, if the availability of the bound (or unavailable) P, known as phytate P, in plants is improved. It has been demonstrated in pigs and poultry that the use of an exogenous enzyme, phytase, can improve plant P availability, thereby reducing P excretion. For example, in a corn soybean meal diet, commonly used for pigs and poultry, two-thirds of the P is bound and is unavailable (24). However, by using the appropriate amount of microbial phytase, 20 to 50% of the bound P can be released and made available to the animal. Thus, the amount of inorganic P that must be added to meet the P requirement is reduced. If total dietary P levels are decreased, then the amount of P excreted can be decreased 20 to 50% (27, 46, 47). Estimates of reductions in fecal P resulting from different levels of supplemental phytase representing 25 studies and 17 references (26, 29, 30, 31, 37, 39, 55, 60, 63, 66, 67, 68, 72, 82, 83, 93, 96) were used in a data set (Kornegay, unpublished data) to determine the relationship between supplemental phytase levels and fecal P reduction.

TABLE 4. Comparison of Ca and P requirements and allowances recommended by universities and feed companies^a.

Mineral	Growing-Finishing		Gestation	Lactation
	20 to 50 kg	50 to 100 kg		
	(%)			
Calcium				
NRC (69)	0.60	0.50	0.75	0.75
1986 Survey ^a				
Universities	0.66	0.59	0.82	0.79
Feed industry	0.74	0.63	0.95	0.93
1988 Survey ^b				
Universities	0.64	0.58	0.84	0.84
Feed industry	0.73	0.62	0.93	0.90
Phosphorus				
NRC (69)	0.50	0.40	0.60	0.60
1986 Survey ^a				
Universities (n=25)	0.55	0.49	0.66	0.63
Feed industry (n=35)	0.60	0.52	0.77	0.76
1988 Survey ^b				
Universities (n=7)	0.54	0.49	0.68	0.68
Feed industry (n=21)	0.60	0.52	0.76	0.74

^aOverfield (70) reported by Cromwell (22).

^bSurvey conducted in 1988 (Cromwell, 22).

and it may be necessary to increase the percentage composition if pigs eat less than the predicted feed intakes. However, most of this information must be developed and tested. Also, the requirements of barrows, gilts and boars are probably different, especially during the finishing phase of production.

Feeding for Optimal Rather than Maximum Performance. In the future, diets can be formulated so that animals perform at slightly less than maximum because the benefit of adding additional units of a nutrient to achieve maximum performance produces benefits at a decreasing rate. This practice increases nutrient costs per unit of performance improvement at an increasing rate as the animal approaches maximum performance. As the maximum response is reached, or as the performance curve reaches a plateau, a greater amount of the nutrient is required to get a change in the response (Figure 1). In a series of three trials, Combs et al. (16) fit

asymptotic models of the effect of total Ca+P intake (varied above and below NRC recommended requirement) and days on test (weaning to market). Diminishing returns in response to Ca-P input are shown in Figure 2 for performance measurements. This principle of diminishing returns in response to nutrient input is not new. Heady et al. (38) reported that in 14 of 16 yr, swine diets formulated using the diminishing return concept would have produced greater profits than diets formulated for maximum gain. Diminishing returns were also observed when Kornegay (52) fit asymptotic models to combined data from a number of research trials conducted from 1969 to 1986 to evaluate the Ca+P needs of growing-finishing swine. More recently, Gahl et al. (34) reported that the most economical daily weight gain does not necessarily occur when daily weight gain is maximized and would change as feedstuffs and input costs change. Diminishing returns for N gain of

pigs fed six levels of lysine from three supplemental sources (Figure 3) has been demonstrated by Gahl et al. (34); their paper includes a good discussion of the diminishing returns in response to nutrient input.

Another consideration in evaluating nutrient addition is the response criteria measured. It is well known that the amount of P required to maximize growth is less than the amount required to maximize bone integrity (69). Perhaps, from the perspective of animal well-being, attempts to maximize bone integrity are most important. But from an environmental perspective, attempts to maximize bone integrity results in excessive excretion of P (20). Combs et al. (17) observed that growing-finishing pigs fed diets that provided NRC (69) requirements for Ca and P maintained approximately 100% of maximum growth and feed efficiency, but approximately 120 to 130% of the NRC (69) Ca and P requirement was required to maximize bone development. Although maximizing bone development is not necessary for the production of a market pig, a more difficult question is how much bone development is required to prevent damage to the carcass during mechanical processing that occurs during slaughter. As the

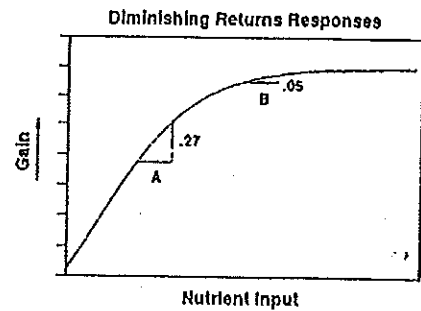


Figure 1. Example of diminishing returns for nutrient inputs as the level of nutrient fed increases. Adapted from Crenshaw et al. (21). At point A, one unit of input produces 0.27 units of gain, whereas, at point B, one unit of input produces 0.05 units of gain.

TABLE 3. Mehlich-3 extractable Cu, Zn, and P concentrations in three soil types after 16 annual applications of Cu-rich manure and CuSO₄.

Horizon	Depth (cm)	Class ^a	Cu			Zn			P		
			Control	Cu manure	Cu sulfate	Control	Cu manure	Cu sulfate	Control	Cu manure	Cu sulfate
			(ppm ^b)			(ppm ^b)			(ppm ^b)		
Bertie											
A _p	0 to 29	fsl	4.3 ^d	35.3 ^c	42.1 ^c	15.8 ^d	32.7 ^c	15.1 ^d	295.0 ^d	697.5 ^c	295.0 ^d
Upper B	30 to 61	fsl	0.4 ^d	2.2 ^c	1.5 ^c	0.8 ^d	1.6 ^c	0.8 ^c	9.1 ^d	230.2 ^c	11.9 ^d
Lower B	62 to 86	fsl	0.4 ^c	0.3 ^c	0.3 ^c	0.5 ^c	0.4 ^c	0.6 ^c	0.8 ^c	11.4 ^c	0.1 ^c
Upper C	87 to 112	sil	0.3 ^c	0.2 ^c	0.4 ^c	0.4 ^c	0.4 ^c	0.4 ^c	0.1 ^c	0.9 ^c	0.1 ^c
Lower C	113 to 133	sil	0.2 ^c	0.5 ^c	0.4 ^c	0.4 ^c	0.6 ^c	0.5 ^c	0.1 ^c	0.9 ^c	0.1 ^c
Guernsey											
A _p	0 to 25	sil	3.1 ^d	59.6 ^c	62.2 ^c	19.5 ^d	49.4 ^c	21.2 ^d	176.3 ^d	1011.7 ^c	199.1 ^d
Upper B	26 to 50	sic	0.6 ^d	3.0 ^c	1.6 ^{cd}	1.1 ^d	2.2 ^c	0.8 ^d	15.4 ^d	83.2 ^c	19.1 ^d
Middle B	51 to 75	sicl	1.1 ^c	0.7 ^c	0.7 ^c	0.9 ^c	0.5 ^c	0.5 ^c	1.9 ^c	1.2 ^c	3.6 ^c
Lower B	76 to 100	sic	0.6 ^c	1.2 ^c	1.4 ^c	0.5 ^c	0.7 ^c	0.7 ^c	0.1 ^c	0.1 ^c	0.7 ^c
Starr-Dyke											
A _p	0 to 11	sicl	14.8 ^d	53.7 ^c	54.2 ^c	16.9 ^d	43.2 ^c	23.1 ^d	38.3 ^d	447.9 ^c	77.2 ^d
A ₂	12 to 25	sic	1.8 ^d	9.8 ^c	9.2 ^c	2.5 ^d	7.6 ^c	3.4 ^d	0.2 ^d	130.7 ^c	0.3 ^d
Upper B	26 to 50	c	1.0 ^c	1.1 ^c	1.2 ^c	1.0 ^c	0.9 ^c	0.8 ^c	0.1 ^c	2.0 ^c	0.1 ^c
Middle B	51 to 75	c	0.5 ^c	0.5 ^c	0.5 ^c	0.5 ^c	0.4 ^c	0.4 ^c	0.1 ^c	0.1 ^c	0.1 ^c
Lower B	76 to 100	c	0.8 ^c	0.6 ^c	0.7 ^c	1.0 ^c	0.5 ^d	0.7 ^{cd}	0.1 ^c	0.1 ^c	0.1 ^c

^afsl = fine sandy loam, scl = sandy clay loam, sil = silt loam, sicl = silty clay loam, and c = clay.

^bppm = mg/dm³. Multiply mg/dm³ (ppm) by 1.78 to get lb/acre.

^{cd}Means on the same line with different superscript letters are different ($P < 0.05$).

nutrients fed will reduce the amount of nutrients excreted.

More Accurate Estimates of Animal Nutrient Requirements and Compositional Information for Feed Ingredients. Recommended nutrient requirements have been published for the various classes of pigs in a number of countries, including the U.S. (69), United Kingdom (4), Australia (78), Netherlands (12, 13), and France (42). However, these recommendations often vary and, in many cases, are only estimates for an "average" type of animal under "average" environmental conditions. Some of the variation in the estimated nutrient requirements developed by the different countries could be explained by differences in genetic potential, feeding methods, environmental conditions, ingredients used,

animal response criteria, and even the philosophy of the authors. With the exception of P, nutrient requirements are generally based on the total nutrient rather than the available nutrient. In some cases, such as NRC (69), nutrient requirements are based on corn-soybean meal diets or diets with similar availabilities of nutrients as in a corn-soybean meal diet. Also, these requirements are often based upon the use of certain feed-grade mineral sources. In pigs, the use of the "ideal protein" concept as first proposed by ARC (4) is being developed and may be incorporated in a new revision of U.S. NRC nutrient guidelines for swine. Reassessment of "ideal protein" continues as indicated by recent publications (5, 6, 9, 33). Along with the use of ideal protein is the use of ileal digestibility values of amino acids (8, 61, 88),

which allow for more precise dietary formulation when using a variety of feed ingredients.

Available nutrient requirements of animals can only be accurately met if the compositional data of feed ingredients are expressed on an available nutrient compositional basis. Thus, more knowledge of the availability of the nutrients in ingredients will be required to take the full benefit of more precisely balancing the needs of animals.

Pig type has changed during the last decade because of strong consumer pressure for leaner, heavier muscled carcasses. For example, the nutrient needs of the high lean growth lines of pigs may be greater than those of pigs with lower potential for lean growth. Daily feed intake could influence the percentage composition of nutrients required,

TABLE 2. Soil analyses for a Sampson County, NC bermuda-grass pasture fertilized with swine lagoon effluent^a.

Depth (cm)	P ^b		K ^b		Zn		Cu	
	1990	1992	1990	1992	1990	1992	1990	1992
0 to 15	118	212	147	191	1.28	5.28	0.47	2.65
15 to 30	39	190	184	183	0.38	2.39	0.48	1.65
30 to 61	4	46	355	1389	0.20	1.38	0	1.78
61 to 91	3	14	298	797	0.26	1.02	0	1.21

^aSwine lagoon effluent was added at a rate to meet the N needs of the bermudagrass pasture. Initial sample was taken June 28, 1990 and final sample taken December 2, 1992. Adapted from Mueller et al. (65).

^bAssumed P₂O₅ contained 43.64% P and K₂O contained 82.98% K.

nutrient requirements of animals and compositional information for feed ingredients; 4) Feeding for optimal rather than maximum performance; 5) Use of crystalline amino acids and high quality protein; 6) Improvement of the availability of P and some other minerals; 7) Use of phase feeding and separate-sex feeding; and 8) Reduction of feed waste. Other strategies, such as controlling disease and parasites, providing a comfortable environment, and reducing stress are also very important and can lead to improved efficiency, but will not be discussed in this paper. Some strategies have a much greater potential for reducing nutrients excreted than others, and some strategies will be more applicable than others depending on the individual farm situation.

Improvement of Feed Efficiency. Improvements in overall feed efficiency can produce a major reduction in the excretion of nutrients. Coffey (15) reported that a reduction in the feed to gain ratio of 0.25 percentage units (i.e., 3.00 vs 3.25), would reduce N excretion by 5 to 10%. Henry and Dourmad (40) reported for growing-finishing pigs that for each 0.1 percentage unit decrease in feed to gain ratio there was a 3% decrease in N output. Feed efficiency can be improved in several

ways: 1) Improvements in the genetic potential of animals can have a tremendous impact on feed efficiency. 2) Proper formulation of diets using high quality ingredients will also improve feed efficiency. 3) The use of certain processing and feeding methods can further improve feed efficiency. 4) Although sometimes controversial, the use of repartitioning agents can result in improvements in feed efficiency and major improvements in carcass muscling.

Reduction of Overformulation or Nutrient Excesses. The amount of nutrients excreted can be reduced by decreasing "overformulation" or the inclusion of excess levels of nutrients in the diet. Traditionally, the main consideration of diet formulation was to maximize the growth and health of the animal. Little concern was shown for excess nutrients excreted. Results of numerous surveys of the nutrient composition of diets being fed indicate that excesses of several nutrients continues to be included in the diet. Some nutritionists refer to these excesses as a safety factor. Excess nutrients may be included in the diet to account for the variability of nutrient composition of feed ingredients, or to make up for a lack of knowledge concerning the availability of the nutrients in the feed

ingredients used. More recently, it has been argued that higher nutrient levels are required because of possible genetic differences in nutrient requirements. Whether this is true or not remains to be proven. Results of surveys reported by Cromwell (22) of the Ca and P recommendations of several universities and feed companies indicated that feeding excess P may be a common practice (Table 4). The average range of university recommendations were 110 to 120% of NRC (69) guidelines, whereas the average range of industry recommendations were 120 to 130% of NRC (69) guidelines. Spears (85) reported results of diets analyzed by the North Carolina Feed Testing Laboratory for sows and finishing pigs (Table 5). Excesses of most minerals were observed. The median levels as a percentage of NRC (69) guidelines were 140 to 192 for Ca, P, and Na; 390 to 525 for K and Mg; 334 to 776 for Cu, Fe, and Zn; and 770 to 3,100 for Mn. Minerals such as P, Cu, and Zn may be of greater environmental concern. Other surveys in the past have reported similar results of the inclusion of excess nutrients in the diet.

A large decrease in the excretion of minerals can be obtained by diet formulation to more accurately meet nutrient requirements. Latimer and Pointillart (59) reported that finishing pigs fed diets containing 0.5% P grew as fast and as efficiently as those fed 0.6% P, but P excretion was 33% less for pigs fed the lower level of P. Walz et al. (95) reported that supplemental amino acids (lysine, methionine + cystine, threonine, and tryptophan) improved protein retention of pigs fed a low protein diet (25% less than recommended by German guidelines); N excretion was reduced approximately 30%. The use of more precise composition and nutrient availability data for feed ingredients, and better defined nutrient requirements for animals, will allow for the formulation of diets that better meet the needs of the animal at the various stages of production. A reduction in the amount of excess

TABLE 1. Digestion and retention of nitrogen and minerals by different classes of pigs.

Minerals	Class or size of pigs			
	Young	Finishing	Gestating	Lactating
Nitrogen				
Digested, %	75 to 88	75 to 88	88	-
Retained, %	40 to 50	40 to 50	35 to 45	20 to 40
Calcium				
Digested, %	55 to 75	40 to 50	10 to 37	19 to 26
Retained, %	40 to 72	25 to 50	35	-
Phosphorus				
Digested, %	20 to 70	20 to 50	3 to 45	1 to 35
Retained, %	20 to 60	20 to 45	20 to 35	20
Magnesium				
Digested, %	20 to 45	28 to 38	14 to 21	7 to 18
Retained, %	20 to 38	15 to 26	-	-
Sodium				
Digested, %	-	35 to 70	-	-
Retained, %	-	13 to 26	-	-
Potassium				
Digested, %	-	60 to 80	-	-
Retained, %	5 to 10	10 to 20	-	5
Zinc digested, %	20 to 45	10 to 20	-	-
Copper digested, %	18 to 25	10 to 20	-	-
Iron digested, %	30 to 35	5 to 35	-	-
Manganese digested, %	17 to 40	8 to 18	-	-

Data for this table was adapted from Adeola (1), Adeola et al. (2), Apgar and Kornegay (3), Bruce and Sundstal (11), Coppoolse et al. (18), Dungelhoeft et al. (29), Everts (32), Jongbloed (43), Jongbloed et al. (46, 47), Kornegay et al. (56), Kornegay (50), Kornegay and Kite (54), Kornegay and Qian (55), Lantzsch and Drochner (58), Lindemann et al. (62), Moore et al. (64), Näsl (66), Pallauf et al. (71, 72, 73, 74), Qian et al. (76), Swinkels et al. (87), Verstegen (91), Vipperman et al. (94), Yi et al. (98).

recent surveys reveal that several states had found greater than 50% of the soil samples tested for crop production to be rated high or excessive in P. These states include Maine, Connecticut, Delaware, Maryland, Michigan, Minnesota, Virginia, North Carolina, South Carolina, Ohio, Iowa, Idaho, Indiana, Illinois, Utah, Wisconsin, Wyoming, Arizona, and Washington. The impact of high P levels in the soil has been reviewed recently by Pierzynski et al. (75), Sharpley (79), Sharpley et al. (80, 81), and Crenshaw and Johanson (20). Phosphorus currently is the nutrient that regulates the amount of waste that can be applied to the land in some countries and

will probably replace N in other countries, but in the long-term Cu and Zn may be of concern.

Soil analyses of a Sampson County, NC, bermudagrass pasture that was fertilized with swine lagoon effluent to satisfy N requirements showed approximately a 400% increase in P and Zn, a 100% increase in K, and a 300% increase in Cu to a depth of 91 cm during the 3-yr period of application (Table 2; 65).

Starting in 1978 through 1992, the application of Cu-rich pig manure (from pigs fed 255 ppm Cu as CuSO_4) at an average annual rate of 80 ton/acre (22.4% DM) to three soil types increased the soil DTPA (diethylenetriaminepentaacetic acid)

extractable concentration of P, Cu, and Zn in the Ap and upper B horizon (D. C. Martens and E. T. Kornegay, unpublished data). The average annual rate of application per acre was 21.9 lb of Cu, 7.1 lb of Zn, and 378.6 lb of P. The application of a similar amount of Cu from CuSO_4 resulted in similar increases in Cu. For example, high quality deep core soil samples taken in the spring of 1996 revealed that the increases varied based on soil type and treatment (Table 3). There were 9.0-, 19.6-, and 3.6-fold increases in extractable Cu for silt loam (0 to 12 in), sandy loam (0 to 10 in), and clay loam (0 to 4 in) soils, respectively, in the Ap horizon when Cu-rich pig manure and CuSO_4 were added. There were 2.1-, 2.5-, and 2.6-fold increases in extractable Zn, respectively, when Cu-rich pig manure was added. Also, there were 2.4-, 5.7-, and 11.7-fold increases in extractable P, respectively, when Cu-rich pig manure was added. There were some increases in the upper B or A₂ horizons, but the magnitude of the increases was much less and the total concentration for all soils and treatments was much less. Little effect of treatments for the different soil types was observed below the upper B or A₂ horizon. The Cu (2.3 to 2.6 ppm) and Zn (16.8 to 20.3 ppm) concentrations of the grain grown on these soils were not changed. Corn ear leaf tissue had a slightly higher Cu concentration (113 to 172% of controls) but Zn concentrations were similar. Phosphorus was not measured in plant tissue and grain. Grain yield was not decreased by Cu application during any year on the three soil types.

Strategies for Reducing Nutrients Excreted

The following strategies for reducing nutrients excreted will be briefly discussed and examples given: 1) Improvement of feed efficiency; 2) Reduction of "overformulation" or nutrient excesses; 3) More accurate

erosion and run-off, as well as a potential reduction in crop yield.

To avoid leakage to the environment and potential pollution, governments in many countries are passing legislation requiring nutrient management plans for each farm; thus the amount of manure that can be applied to the land is being regulated (35). Most states in the U.S. are starting to monitor farms where large numbers of food-producing animals are maintained on a small acreage. Coffey (15) has stated that technology does exist for concentrated production of livestock in an environmentally sound manner. However, he also said that even though good technology exists today, there are opportunities for reducing nutrients excreted, and thus reducing land requirements.

Managing manure in swine confinement systems has always been a problem, and it will be a much greater problem and challenge in the future because the volume of manure per production unit has increased as production units have increased in size and intensity. Also, environmental concerns have increased and will continue to increase in the future as indicated by all trade magazines and newspapers for livestock and poultry agriculture. Two equally important approaches must be taken in dealing with this challenge: first, the amount of nutrients being excreted must be reduced; and second, the nutrients that are excreted must be recycled in a manner that is not damaging to the environment. It was stated in 1981 by the Agricultural Research Council (4) that the concept of a minimum requirement of a mineral that sustains an acceptable standard performance of pigs needed to be developed and should be cost-beneficial. Environmental nutrition is defined as the concept of formulating cost-effective diets and feeding animals to meet their minimum mineral needs for acceptable performance, reproduction, and carcass quality with minimal excretion of minerals. This paper discusses methods of reducing nutrient excretion in manure as an

important component of the solution to this environmental problem.

Assumptions and Nutrients of Concern

There are four basic assumptions in this concept of environmental nutrition. 1) All animals will excrete some nutrients; therefore, 100% efficiency will not be reached. 2) The total farm production system must be sustainable and nutrients should not become detrimental to the environment. 3) Manure is biodegradable — It is made up of various organic and inorganic nutrients and can serve as a source of nutrients for both plants and animals when managed properly. 4) Swine producers want to contribute to a healthy environment; consumers, however, must recognize that additional production costs may result and must ultimately be paid by them.

Digestion and retention coefficients for N and several minerals are given in Table 1 for various sizes of pigs. Generally, pigs only retain from 20 to 55% of the N consumed. The amount of Ca and P retained can vary from 20 to 72% with slightly more Ca retained than P. The retention of Mg, Na, and K vary from 5 to 38% of that consumed. The retention of Zn, Cu, Fe, and Mn is also low, with values ranging from 8 to 45% of the intake. Younger animals may be slightly more efficient than older animals, but there is also a larger database for the younger animals. Other factors can influence the retention of N and minerals. The amount of minerals retained as a percentage of intake decreases as intake increases. The retention of chemically bound forms of some minerals will be increased if they are released in the digestive tract. For example, phytase can enhance the retention of Ca, P, and Zn. Fiber is known to decrease the retention of some minerals. Therefore, the bioavailability of the mineral source will influence the retention of minerals.

Of the nutrients present in manure, N, P, K, and trace minerals (probably Cu and Zn) are of greatest concern. There is general agreement that P and N are currently the two elements in manure that limits the rate of land application, but there is disagreement as to which one is of greatest concern. In the Netherlands, manure disposal is a major concern on swine and poultry farms because of the small land base of these farms (28). However, within Dutch animal agriculture, the dairy and swine industries are the largest contributors to manure production. In the Netherlands, there are laws that regulate the amount and method of waste disposal. These regulations will become more restrictive by the yr 2000 (28).

Nitrogen is used as the base to regulate the amount of manure that can be applied to the land in many areas, including the U.S. However, in the future it is likely that N and P will be the nutrients that limit land application of manure in more intensive swine and poultry producing areas. Results of a recent livestock nutrient assessment in North Carolina (7) supports the position that P may well be the nutrient that determines the amount of manure that can be applied to many soils and crops. Barker and Zublena (7) reported that statewide animal and poultry manure could provide about 20% of the N and 66% of the P requirements of all nonlegume agronomic crops and forage. However, these researchers found that 3 of 100 counties in North Carolina had enough manure to exceed all crop N requirements, and 18 counties had enough manure to exceed crop P needs.

High P levels in the soil have also been reported for many states. Sweeten (86) estimated that for the 145.5 metric tons of manure produced annually by livestock and poultry in the U.S., pigs excrete about 23% of the P and poultry excrete about 13%. Dairy cattle excreted 12% of the total P in all manure. Sims (84) reported that



Environmental Nutrition: Nutrient Management Strategies to Reduce Nutrient Excretion of Swine

E. T. KORNEGAY, PAS and A. F. HARPER, PAS

Department of Animal and Poultry Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0306

Abstract

Intensive production of swine has brought an increase in the volume of manure produced on farms with limited land area. Exceeding the capacity of soil and crops to handle this volume of manure results in nutrient accumulation in and on the soil that can produce leakage of nutrients to the environment and pollution could result. Environmental nutrition is defined as the concept of formulating cost-effective diets and feeding animals to meet their minimum mineral needs for acceptable performance, reproduction, and carcass quality with minimal excretion of minerals. Pigs normally excrete 45 to 60% of N, 50 to 80% of Ca and P, and 70 to 95% of K, Na, Mg, Cu, Zn, Mn, and Fe when fed diets containing commonly used feedstuffs. Although it is not possible to make pigs 100% efficient in utilization of nutrients, it is possible to reduce the amount of nutrients excreted through careful nutrient management. Several strategies are possible for reducing nutrients excreted: 1) improvements in feed efficiency, 2) more accurate nutrient requirement information for animals and compositional data for feed ingredients,

3) reduced feeding of excess nutrients through overformulation, 4) feeding for optimal rather than maximum performance, 5) use of crystalline amino acids and high quality protein, 6) improving the availability of P and some other minerals, 7) use of phase feeding and separate-sex feeding, and 8) reduced feed waste. Some strategies have a much greater potential for reducing nutrients excreted than other strategies. In the future, diet formulation and feeding systems must be integrated into total production systems so that swine production systems are environmentally safe as well as economically viable.

(Key Words: Environment, Nutrient Management, Pigs.)

Introduction

Pigs traditionally have been fed to maximize performance with little or no regard for nutrients excreted. During the past decades, advances in genetics, nutrition, housing, physiology, disease control, and management have resulted in major improvements in the efficiency of swine production. Along with these improvements has been an increase in the size and intensity of production units to maximize the benefits from these improvements and to optimize the use of capital, labor, and

facilities. This large increase in size of animal units, however, has led to an overall increase in environmental burdens, such as excessive amounts of waste and odor. Commercial swine production is an essential component of our food supply. However, this important agricultural enterprise is being restricted in some countries and will be restricted in other countries if solutions to the problem of manure disposal and odor control are not developed and implemented.

Because of the high nutrient content of manure, and thus fertilizing value, land application has been the major means of manure disposal. However, there are limits to the amount of manure that can be applied to the land because of nutrient build-up in and on the soil. The potential environmental impact of nutrient contamination of the environment is perceived as a major issue facing livestock producers in many countries (15, 19, 40, 90). A major concern for surface water quality is the eutrophication of lakes and streams (20), and P, not N, is the limiting nutrient for algae and other aquatic plant growth (75, 80). Also, an excessive build-up of nutrient levels in the soil is of long-term concern because of potential pollution through ground water and soil

Section K: Livestock Feed Management

May 24, 2012

SECTION J. Livestock Mortality Management Plan

Mortalities will be disposed of in the LWCF. The primary method of carcass disposal is composting by use of a In-Vessel Composter called a BIOvator. If the BIOvator is not functioning rendering will be used, the mortalities will be picked up within 24 hours if possible, and temporary storage areas will be placed in a manner that runoff does not affect water of the state.

The following is an Excerpt from Act 87 of 1963-Code 2-33-101 and Act 150 of 1985-Code 19-6-448 by the Arkansas Livestock and Poultry Commission

Carcasses may be buried at a site at least 100 yards away from a well and in a place where a stream cannot be contaminated. Anthrax carcasses are to be covered with 1 inch of lime. Other carcasses may be covered with lime, particularly when needed to control odors. All carcasses are to be covered with at least 2 feet of dirt. Carcasses are not to be buried in a landfill, without prior approval of the State Veterinarian.

Act 87 of 1963, Act 150 of 1985, and Act 522 of 1993: Disposal of carcass of animal dying from contagious or infectious disease.

9141. Any person that has the care or control of any animal that dies from any contagious disease shall immediately cremate or bury the animal.

9142. An animal which has died from any contagious disease shall not be transported, except to the nearest crematory. The transportation of the animal to the crematory shall be pursuant to such regulations as the director may adopt.

9143. An animal which has died from any contagious disease shall not be used for the food of any human being, domestic animal, or fowl.

Section J: Mortality Disposal Actions

manure with litter should also be sampled in the following manner.

- Remove manure from 10 to 20 locations throughout the dry stack and place it in a pile using a pitchfork or shovel. Manure should be collected from the center of the stack as well as from near the outside walls, to get samples that represent all ages and moisture levels of manure in the stack. A bucket loader can cut a path into the center of the pile to provide access for sampling. Subsamples should be collected to the depth the litter will be removed for application.
- Thoroughly mix manure with the shovel by continuously scooping the outside of the pile to the center of the pile.
- Collect a composite manure sample as described below (Steps 1-3, Composite Sample Collection).

Composite Sample Collection for Dry or Solid Samples

1. Whether collecting from a plastic tarp in the field, a feedlot, a storage facility, or a barn, sample in a grid pattern so that all areas are represented. Combine 10 to 20 subsamples in a bucket or pile and mix thoroughly. More subsamples will produce more accurate results and are often required to produce a composite that best represents nutrient levels.
2. The final composite sample that will be submitted for nutrient analysis should be collected using the hand-in-bag method. To collect a composite sample from the mixed subsamples, place a one-gallon resealable freezer bag turned inside out over one hand. With the covered hand, grab a representative handful of manure and turn the freezer bag right side out over the sample with the free hand. Be careful not to get manure in the sealable tracks.
3. Squeeze excess air out of the bag, seal, and place it in another plastic bag to prevent leaks. Label the bag with your name, date, and sample identification number with a water-proof pen and freeze it immediately to prevent nutrient losses and minimize odors. For manure with a high degree of variability, multiple samples may need to be analyzed. Manure samples should be mailed or delivered to the laboratory as soon as possible after sampling.

Manure samples should be sent to a lab for chemical analysis as quickly as possible to avoid nutrient losses. For a list of commercial laboratories, please call your ISU Extension office or visit the Web at: <http://extension.agron.iastate.edu/immag/sp.html>.

Table 1. Conversion Factors

To switch from	Multiply by	To get
mg/l	1.0	ppm
ppm	0.0001	percent
ppm	0.00834	lb/1,000 gal
ppm	0.002	lb/ton
ppm	0.2265	lb/acre-inch
lb/1,000 gal	0.012	percent
lb/ton	0.05	percent
percent	83.4	lb/1,000 gal
percent	20.0	lb/ton
percent	2265	lb/acre-inch
P (elemental)	2.29	P ₂ O ₅
K (elemental)	1.2	K ₂ O

Additional Information and Resources

Basic manure analyses determined by laboratories include total nitrogen, total phosphorus, and total potassium. Results from commercial laboratories are presented either as a percent of the sample weight, as pounds per ton, as pounds per 1,000 gallons of manure, or in parts per million (ppm). Table 1 shows factors used to convert between measurements. Usually, nutrients are expressed as N, P₂O₅, or K₂O on a wet or "as received" basis, but some labs may instead report data on an elemental (P instead of P₂O₅, K instead of K₂O) or dry (without water) basis; so, be sure to confirm the units. In any case, manure values from commercial laboratories express nutrients as the total amount of nutrient in the manure sample. Some primary nutrients, such as N and P, may not be completely available for plant growth the first year manure is applied. A portion of some nutrients present in manure are in an organic form and unavailable for immediate plant uptake. Organic forms require transformation to an inorganic form to be available for plant uptake. This transformation is dependent on temperature, moisture, chemical environment, and time. Availability of nutrients can be limited by field losses, which are affected by the type of manure and by manure application methods. These losses are not accounted for in laboratory results. Refer to the ISU Extension publication *Managing Manure Nutrients for Crop Production* (PM 1811) for nutrient availability estimates and losses due to types of manure application methods.

- PM 1518k *Manure Storage Poses Invisible Risks*
- PM 1941 *Calibration and Uniformity of Solid Manure Spreaders* (12/03)
- PM 1948 *Calibrating Liquid Manure Applicators* (02/04)
- PM 1811 *Managing Manure Nutrients for Crop Production*

Additional resources may be found on the Iowa Manure Management Action Group (IMMAG) Web page at: <http://extension.agron.iastate.edu/immag/default.htm>

Prepared by Angela Rieck-Hinz, extension program specialist, Dept. of Agronomy; Jeffery Lorimor, associate professor, and Tom L. Richard, associate professor, Dept. of Agricultural and Biosystems Engineering and Kris Kahl, ISU field specialist- Agricultural Engineering.

Photos submitted by John Sawyer, Kris Kahl, Joel DeJong, Jeff Lorimor and Charles Wittman

Reviewed by: John Sawyer, ISU; Chris Murray, Iowa Natural Resources Conservation Service and Marty Schwager, Iowa Pork Producers Association.

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take a ladle full and carefully pour into a sample bottle.

- Repeat again and take another sample until sample bottle is three-quarters full. Make sure the manure solids have not settled to the bottom of the bucket as each dipper is extracted; it is important to include the solids in the sample. Screw the lid on tightly.



Figure 3. Rubber stopper attached to a metal rod to serve as a stopper for PVC manure sampling tube.

Pre-Sampling Nitrogen and Potassium from Liquid Manure

If the procedures described above for sampling liquid manure are impractical due to lack of sampling equipment, or the inability to agitate the manure, manure samples can be clipped off the top of stored liquid manure to analyze for N and K concentrations. Research has shown that top-dipped liquid samples represent approximately 90 percent of the N concentration measured in mixed, field-collected samples. Multiply the results of the N concentration from top-dipped samples by 1.1 for a better estimate of the N concentration of the liquid storage facility. Dipping a sample from the surface of a liquid storage pit does NOT provide a good estimate of P concentration in the pit and is not recommended.

How to Sample Dry or Solid Manure

In solid manure handling systems, many of which include bedding, the proportions of fecal matter, urine, and bedding will vary from one location to another within sites, and often from season to season as well. It is necessary to take samples from various places in the manure pile, stack, or litter to obtain a representative sample for analysis. It may even be beneficial to sample several times per year based on the bedding content.

Manure sampling is best done in the field as manure is applied. This ensures that losses that occur during handling, storage, and application are taken into account and that manure is better mixed, reducing stratification found during sampling storage facilities. As with field sampling of liquid manure, results will not be available in time to adjust current application rates. However, sampling during application will still allow producers to adjust any planned future commercial fertilizer rates and manure application in subsequent years. The following method describes a procedure for collecting dry or solid manure samples from the field.

Dry Manure Sampling During Land Application

Collect manure samples according to the following field sampling procedure.

- Spread a sheet of plastic or tarp on the field. A 10-foot-by-10-foot sheet works well for sampling manure.
- Fill the spreader with a load of manure.
- Drive the tractor and manure spreader over the top of the plastic to spread manure over the sheet.
- Collect subsamples as described below (Steps 1-3, Com-

posite Sample Collection).

- Samples should be collected to represent the first, middle and last part of the storage facility or loads applied and should be correlated as to which loads are applied on certain fields to track changes in nutrient concentrations throughout the storage facility.

Sampling from Dry or Solid Storage Facilities and Open Lots

Manure should be sampled at the time of application, but if time and management practices prevent this, manure samples can be collected from the storage facility. Sampling from storages is not generally recommended due to difficulty in collecting a representative sample. Although solid manure storages are generally not fully enclosed and gases are somewhat diluted, always exercise caution when sampling from storage facilities. If you have to enter a confined storage facility, follow the safety recommendations described previously in the section on sampling liquid manure storages.

Open Paved Lots

Manure that accumulates on paved feedlots and is scraped and hauled to the field is classified as scrape-and-haul feedlot manure. Manure is usually removed from the feedlot daily or several times a week.

- Collect manure by scraping a shovel across approximately 25 feet of the paved feedlot. This process should be repeated ten or more times, taking care to sample in a direction that slices through the large-scale variations of moisture, bedding, depth, age, etc. (See Figure 4). Avoid manure that is excessively wet (near waterers) or contains unusual amounts of feed and hay.
- Use the shovel to thoroughly mix manure by continuously scooping the outside of the pile to the center of the pile.
- Collect subsamples from this pile using the hand-in-bag



Figure 4. Sampling a feed-lot for manure sample.

method that is described below (Steps 1-3 Composite Sample Collection).

- This may need to be done several times to collect several composite samples for analysis.

Barn Gutter

Manure that accumulates in a barn or

housing facility, is temporarily stored in a gutter, and then removed by a barn cleaner is classified as barn gutter manure. Manure is usually removed from the barn once or twice daily.

- Shovel a vertical "slice" of manure from the gutter, making sure the shovel reaches to the bottom of the gutter.
- Remove manure from the gutter and pile it on the barn floor. Mix the manure with a shovel or pitchfork to ensure that bedding is mixed thoroughly with manure. When collecting samples from a gutter, be sure to include the liquid that accumulates in the gutter's bottom. Discard foreign material and also take care not to add large amounts of barn lime.
- Repeat steps one and two from various locations along the gutter.
- Mix each pile thoroughly and collect subsamples from each pile using the hand-and-bag method that is described below (Steps 1-3, Composite Sample Collection).

Dry Stack and Manure with Litter

Manure that is stored outside in a solid waste storage facility, such as a stacking shed or horizontal concrete silo located above ground, is classified as a dry stack. These facilities are usually covered to prevent the addition of extra water. Dry

year, take samples when you plan to apply the bulk of manure. For example, it may be appropriate to sample in the spring when manure that has accumulated all winter will be applied. If storages are emptied twice a year, it may be necessary to sample in both spring and fall since the different storage temperatures in summer versus winter will affect manure nutrient levels. **NOTE: Implementation of future federal regulations may require concentrated animal feeding operations (> 1,000 animal units) to sample annually. Please check state and federal requirements to determine sampling frequency.**

How to Sample Semi-Solid or Liquid Manure

In liquid and semi-solid systems, settled solids can contain over 90 percent of the phosphorus (P), so complete agitation is needed to accurately sample the entire storage if all the manure in the storage structure is going to be applied. If, however, solids will purposely be left on the bottom of the storage structure when the manure is pumped out, as is sometimes the case with lagoons, then complete agitation during sampling may generate artificially high nutrient values. In this case agitation of the solids or sludge on the bottom of a lagoon is not needed for nutrient analysis.

Liquid manure is best sampled during land application, for it is potentially more difficult and dangerous to sample from liquid storage facilities than dry manure systems. When sampling manure during application is not possible, or pre-application analysis is desired for determining rates, refer to the section on sampling from a storage facility. If sampling from a liquid storage facility, use caution to prevent accidents, such as falling into the manure storage facility or being overcome with hazardous gases produced by manure. Have two people present at all times. Never enter confined manure storage spaces without appropriate safety gear such as a self-contained breathing apparatus.

Ideally, liquid manure should be agitated so a representative sample can be obtained for laboratory analysis. When agitating a storage pit below a building, be sure to provide adequate ventilation for both animals and humans. When agitating outdoor unformed pits, monitor activities closely to prevent erosion of berms or destruction of pit liners.

Liquid Manure Sample Preparation

All liquid samples should be handled as follows:

- Prior to sampling label a plastic bottle with your name, date and sample identification number using a waterproof pen.
- If the sample cannot be mailed or transported to a laboratory within a few hours, it should be frozen. Place the container in a tightly sealed plastic bag and keep it cold or frozen until it arrives at the laboratory.
- Most manure analysis laboratories do have plastic bottles available for sample collection. Do not use glass containers, as expansion of the gases in the sample can cause the container to break.

Liquid Manure Sampling During Land Application

Liquid Manure Applied with Tank Wagons

- Since settling begins as soon as agitation stops, samples should be collected as soon as possible after the manure tank wagon is filled unless the tanker has an agitator.
- Immediately after filling the tank wagon, use a clean plastic pail to collect manure from the loading or unloading port or the opening near the bottom of the tank. Be

sure the port or opening does not have a solids accumulation from prior loads.

- Use a ladle to stir the sample in the bucket to get the solids spinning in suspension. While the liquid is spinning remove a ladle full and carefully pour in the sample bottle. See Figure 1.
- Repeat this procedure and take another sample until the sample bottle is three-quarters full (Make sure the manure solids have not settled to the bottom of the bucket as each ladle is extracted; it is important to

include the solids in the sample). Screw the lid on tightly.

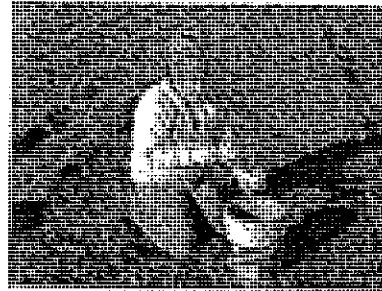


Figure 1. Collecting a liquid manure sample.

Liquid Manure Applied by Irrigation Systems

- Place catch pans or buckets randomly in the field to collect liquid manure that is applied by an irrigation system. Inexpensive aluminum roasting

pans or plastic buckets can be used as catch pans. Use several pans at different distances from the sprinkler head.

- Immediately after the manure has been applied, collect manure from catch pans or buckets and combine the manure in one bucket to make one composite sample.
- Use a ladle to stir the sample in the bucket. While the liquid is spinning remove a ladle full and carefully pour into a sample bottle. See Figure 1.
- Repeat this procedure and take another sample until the sample bottle is three-quarters full. Screw the lid on tightly.

Liquid Manure Sampling from Storage Facilities

For best sampling results, samples should be taken with a sampling probe or tube (see Figure 2). Probes can be constructed out of 1.5-inch diameter PVC pipe. Cut the PVC pipe a foot longer than the depth of the pit. Run a 1/4-inch rod or string through the length of the pipe and attach a plug such as a rubber stopper or rubber ball (see Figure 3). The rod or the string must be longer than the pipe. If using a rod, bend the top over to prevent it from falling out of the pipe.

- Insert the pipe slowly into the pit or lagoon, with the stopper open, to the full depth of the pit.

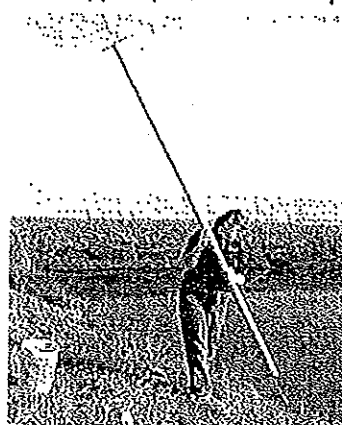


Figure 2. Sampling earthen basin with sampling probe.

- Pull the string or rod to close the bottom of the pipe and extract the vertical profile sample inside the pipe (be careful not to tip the pipe and dump the sample).

- Release the sample carefully into a bucket.
- Repeat the process at least three times around the pit or lagoon creating a composite sample in the bucket.
- Use a ladle to stir the sample in the bucket to get the solids spinning in suspension. While the liquid is spinning,

How to Sample Manure for Nutrient Analysis

A field-by-field nutrient management program requires multiple components to maintain adequate fertility for crop growth and development. A well-designed soil sampling plan, including proper soil test interpretations along with manure sampling, manure nutrient analysis, equipment calibration, appropriate application rates and application methods are all necessary components of a nutrient management plan. Implementing these components allows manure to be recognized and used as a credible nutrient resource, potentially reducing input costs and the potential of environmental impacts.

Animal manure has long been used as a source of nutrients for crop growth. Standard nutrient values are guides to determine the amount of nutrients that animal manure will supply as a fertilizer source. Iowa State University Extension publication, *Managing Manure Nutrients for Crop Production* (PM 1811), recommends manure nutrient content and credits by type of animal, handling system and application methods.

While "book values" like those in PM-1811 are reasonable average values, an individual farm's manure analyses can vary from those averages by 50 percent or more. Species, age of animal, feed rations, water use, bedding type, management, and other factors make every farm's manure different. Two key factors affecting the nutrient content of manure are manure handling and type of storage structures used. Each handling system results in different types of nutrient losses—some unavoidable and others that can be controlled to a certain degree. Because every livestock production and manure management system is unique, the best way to assess manure nutrients is by sampling and analyzing the manure at a laboratory.

This publication describes how to sample solid, semi-solid, and liquid manure. Manure with greater than 20 percent solids (by weight) is classified as dry manure and is handled as a solid, usually with box-type spreaders. Manure with 10 to 20 percent solids is classified as semi-solid manure and can usually be handled as a liquid. Semi-solid manure usually requires the use of chopper pumps to provide thorough agitation before pumping. Manure with less than 10 percent solids is classified as liquid manure and is handled with pumps, pipes, tank wagons, and irrigation equipment.

A representative manure sample is needed to provide an accurate reflection of the nutrient content. Unfortunately, manure nutrient content is not uniform within storage structures, so obtaining a representative sample can be challenging. Mixing and sampling strategies should therefore insure that samples simulate as closely as possible the type of manure that will be applied.

When to Sample Manure

Sampling manure prior to application will ensure that you receive the analysis in time to adjust nutrient application rates based on the nutrient concentration of the manure. However, sampling manure prior to application may not completely reflect the nutrient concentration of the manure due to storage and handling losses if long periods of time pass before application begins or when liquid storage facilities are not adequately agitated while sampling. "Pre-sampling" such as dipping samples off the top of storage structure for nitrogen (N) and potassium (K) concentrations, can be done to estimate application rates. (See page 3 for more on pre-sampling). Producers must remember to go back and determine the actual nutrient rates applied by using manure samples collected during application and calculating volumes.

For best results, manure should be sampled at the time of application or as close as possible to application. Sampling during application will help to ensure that samples are well-mixed and representative of the manure being applied. Because manure nutrient analysis typically takes several days at a lab, sampling at the time of application will not provide immediate manure nutrient recommendations. The results can, however, be used for subsequent manure applications and to adjust commercial fertilizer application. This is why it is important to develop a manure sampling history and use those analyses in a nutrient management plan. A manure sampling history will also help you recognize if unplanned changes have occurred to your system if management and other factors have remained constant. A manure sampling history will give you confidence in using manure, and show you how consistent nutrient concentration is from year to year.

Take manure samples annually for three years for new facilities, followed with samples every three to five years, unless animal management practices, feed rations, or manure handling and storage methods change drastically from present methods. If you apply manure several times a

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University Extension

PM 1558 Revised November 2003

SECTION I. NUTRIENT TESTS RESULTS & HOW TO

The nutrient tests have not been conducted at this time; however, the nutrient tests will be conducted prior to application and recorded on the log forms shown in Section N.

Laboratories Providing Manure Testing Services

- Agvise Laboratories
902 13th St. N, P.O. Box 187
Benson, MN 56215
(320) 843-4109
<http://www.agviselabs.com>
- A&L Heartland Labs, Inc.
111 Linn Street, P.O. Box 455
Atlantic, IA 50022
(800) 434-0109
(712) 243-5213
<http://allabs.com>
- Servi-Tech Laboratories
1602 Park Dr. West
Hastings, NE 68902
(402) 463-3522
(800) 557-7509
<http://www.servitechlabs.com>
- Ward Laboratories
4007 Cherry Ave., P.O. Box 788
Kearney, NE 68848
(308) 234-2418
(800) 887-7645
<http://www.wardlab.com/>
- Midwest Laboratories
13611 "B" St.
Omaha, NE 68144
(402) 334-7770
<https://www.midwestlabs.com/>
- Stearns DHIA Laboratories
825 12th Street South, PO Box 227
Sauk Centre, MN 56378
(320) 352-2028
<http://www.stearnsdhialab.com/>
- University of Arkansas
1366 West Altheimer Dr
Fayetteville, AR 72704
(479) 575-3908

Section I: Nutrient Test Results and How to

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Cooperative Extension Service
Soil Analysis Report
Soil Testing And Research Laboratory
Marianna, AR 72360
<http://www.uark.edu/depts/soiltest>

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JASON HENSON HC 72 BOX 10 MTN JUDEA	Client ID: 8706881318 AR 72655
Date Processed:	2/17/2012
Field ID:	17
Acres	110
Lime Applied in the last 4 years:	No
Leveled in past 4 years:	No
Irrigation:	Unknown
County:	Pope
Lab Number:	36720
Sample Number:	931068

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich 3)
	ppm	lb/acre	
P	50	100	Optimum
K	57	114	Very Low
Ca	1641	3282	--
Mg	49	98	--
SO4-S	10	20	--
Zn	3.6	7.2	--
Fe	139	278	--
Mn	181	362	--
Cu	1.0	2.0	--
B	0.0	0.0	--
NO3-N	15	30	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	7.5	--
Soil EC (1:2 soil-water)		umhos/cm
Soil EC/EC	11	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
81.5	75.9	3.8	1.4	0.5

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop	N	P2O5	K2O	SO4S	Zn	B	Lime
Last Crop Pasture (207)							
Crop 1 Warm-Season Grasses (MNT) (207)							
Crop 2	60	0	160	0	0	0	0
Crop 3							

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

5. Crop 2 Notes:

6. Crop 3 Notes:

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JASON HENSON	Client ID:	8706881318
HC 72 BOX 10		
MTN JUDEA	AR	72655
Date Processed:	2/17/2012	
Field ID:	16	
Acres	60	
Lime Applied in the last 4 years:	No	
Leveled in past 4 years:	No	
Irrigation:	Unknown	
County:	Pope	
Lab Number:	38719	
Sample Number:	931067	

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich 3)
	ppm	lb/acre	
P	48	96	Optimum
K	160	320	Optimum
Ca	632	1264	--
Mg	89	178	--
SO4-S	11	22	--
Zn	2.4	4.8	--
Fe	136	272	--
Mn	142	284	--
Cu	0.8	1.6	--
B	0.0	0.0	--
NO3-N	6	12	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	5.4	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	9	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
49.2	35.6	6.4	4.6	0.6

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop		N	P2O5	K2O	SO4S	Zn	B	Lime
		lb/acre						
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	0	0	0	0	5000
Crop 2								
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

5. Crop 2 Notes:

6. Crop 3 Notes:

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JASON HENSON	Client ID:	8706881318
HC 72 BOX 10		
MTN JUDEA	AR	72655
Date Processed:	2/17/2012	
Field ID:	15	
Acres	65	
Lime Applied in the last 4 years:	No	
Leveled in past 4 years:	No	
Irrigation:	Unknown	
County:	Pope	
Lab Number:	38718	
Sample Number:	931066	

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich3)
	(ppm)	lb/acre	
P	15	30	Very Low
K	86	172	Low
Ca	525	1050	--
Mg	50	100	--
SO4-S	11	22	--
Zn	1.8	3.6	--
Fe	110	220	--
Mn	382	764	--
Cu	0.4	0.8	--
B	0.0	0.0	--
NO3-N	10	20	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	5.8	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	7	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
45.3	35.9	6.7	3.0	0.8

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop	N	P2O5	K2O	SO4S	Zn	B	Lime
Last Crop Pasture (207)							
Crop 1 Warm-Season Grasses (MNT) (207)	60	100	110	0	0	0	0
Crop 2							
Crop 3							

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

5. Crop 2 Notes:

6. Crop 3 Notes:

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JASON HENSON HC 72 BOX 10 MTN JUDEA	Client ID: 8706881318 AR 72655
Date Processed:	2/17/2012
Field ID:	14
Acres	15
Lime Applied in the last 4 years:	No
Leveled in past 4 years:	No
Irrigation:	Unknown
County:	Pope
Lab Number:	36717
Sample Number:	931065

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich 3)
	ppm	lb/acre	
P	52	104	Above Optimum
K	144	288	Optimum
Ca	2840	5680	--
Mg	89	178	--
SO4-S	12	24	--
Zn	10.8	21.6	--
Fe	83	166	--
Mn	254	608	--
Cu	1.3	2.6	--
B	0.3	0.6	--
NO3-N	27	54	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	7.8	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	17	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silty Clay Loam - Clay Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
88.5	81.8	4.3	2.1	0.2

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop	N	P2O5	K2O	SO4S	Zn	B	Lime
Last Crop	Pasture (207)						
Crop 1	60	0	0	0	0	0	0
Crop 2							
Crop 3							

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

5. Crop 2 Notes:

6. Crop 3 Notes:

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JASON HENSON	Client ID:	8706881318
HC 72 BOX 10		
MTN JUDEA	AR	72655
Date Processed:	2/17/2012	
Field ID:	13	
Acres	60	
Lime Applied in the last 4 years:	No	
Leveled in past 4 years:	No	
Irrigation:	Unknown	
County:	Pope	
Lab Number:	36716	
Sample Number:	931064	

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich-3)
	ppm	lb/acre	
P	48	96	Optimum
K	165	330	Optimum
Ca	1626	3252	--
Mg	131	262	--
SO4-S	15	30	--
Zn	5.6	11.2	--
Fe	84	168	--
Mn	409	818	--
Cu	0.7	1.4	--
B	0.0	0.0	--
NO3-N	29	58	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	7.1	--
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	12	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
82.9	69.6	9.3	3.6	0.3

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop		N	P2O5	K2O	SO4S	Zn	B	Lime
		lb/acre						
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	0	0	0	0	0	0
Crop 2								
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 60 lb N/Acre in early August. Do not apply N after September 1.

5. Crop 2 Notes:

6. Crop 3 Notes:

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JASON HENSON	Client ID:	8706881318
HC 72 BOX 10		
MTN JUDEA	AR	72655
Date Processed:	2/17/2012	
Field ID:	12	
Acres	30	
Lime Applied in the last 4 years:	No	
Leveled in past 4 years:	No	
Irrigation:	Unknown	
County:	Pope	
Lab Number:	36715	
Sample Number:	931063	

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich 3)
	ppm	lb/acre	
P	19	38	Low
K	52	104	Very Low
Ca	1173	2346	--
Mg	26	52	--
SO4-S	8	16	--
Zn	1.6	3.2	--
Fe	101	202	--
Mn	326	652	--
Cu	0.8	1.6	--
S	0.0	0.0	--
NO3-N	12	24	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	6.9	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	9	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
71.5	66.9	2.5	1.5	0.6

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop		N	P2O5	K2O	SO4S	Zn	B	Lime
Last Crop	Pasture (207)							
Crop 1	Warm-Season Grasses (MNT) (207)	60	70	160	0	0	0	0
Crop 2								
Crop 3								

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1. If S deficiency has occurred previously on this field apply 20 lb SO4-S/Acre.

5. Crop 2 Notes:

6. Crop 3 Notes:

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JASON HENSON	Client ID:	8706881318
HC 72 BOX 10		
MTN JUDEA	AR	72655
Date Processed:	2/17/2012	
Field ID:	11	
Acres	20	
Lime Applied in the last 4 years:	No	
Leveled in past 4 years:	No	
Irrigation:	Unknown	
County:	Pope	
Lab Number:	38732	
Sample Number:	931084	

1. Nutrient Availability Index

Nutrient	Concentration		Soil Test Level (Mehlich3)
	ppm	lb/acre	
P	57	114	Above Optimum
K	292	584	Above Optimum
Ca	737	1474	--
Mg	170	340	--
SO4-S	17	34	--
Zn	2.9	5.8	--
Fe	132	264	--
Mn	92	184	--
Cu	0.6	1.2	--
B	0.0	0.0	--
NO3-N	46	92	--

2. Soil Properties

Property	Value	Units
Soil pH (1:2 soil-water)	6.3	---
Soil EC (1:2 soil-water)		umhos/cm
Soil ECEC	10	cmolc/kg
Organic Matter (Loss on Ignition)		%
Estimated Soil Texture	Silt Loam	

Estimated Base Saturation (%)				
Total	Ca	Mg	K	Na
56.8	35.4	13.6	7.2	0.6

3. Recommendations (Notice: State and/or federal nutrient management regulations may supersede these agronomic recommendations.)

Crop	N	P2O5	K2O	SO4S	Zn	B	Lime
Last Crop	Pasture (207)						
Crop 1	Warm-Season Grasses (MNT) (207)						
Crop 2	60	0	0	0	0	0	5000
Crop 3	60	0	0	0	0	0	5000

4. Crop 1 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

5. Crop 2 Notes:

Apply the recommended rates of N, P, and K, in spring when night temperatures are > 60 degrees F for 1 week. For higher production, topdress an additional 60 lb N/Acre after every 4 to 6 weeks of grazing. For fall grazing apply 50 lb N/Acre in early August. Do not apply N after September 1.

6. Crop 3 Notes:

ADEQ

ARKANSAS
Department of Environmental Quality

August 13, 2012

Mr. Jason Henson
C & H Hog Farms, Inc.
Hc 72 PO.Box 10
Mount Judea, AR 72655

RE: NPDES Stormwater Construction General Permit, C & H Hog Farms, Mount Judea, AR
Permit Tracking No. ARR153893 AFIN 51-00164

Dear Mr. Henson:

The initial permit fee and Notice of Intent (NOI) for coverage under Stormwater Construction General Permit ARR150000 were deemed complete on 8/7/2012. For tracking purposes, the project has been assigned permit tracking number, ARR153893 and AFIN 51-00164. Please use these numbers in all future correspondence related to this construction project.

The Stormwater Pollution Prevention Plan (SWPPP) has been reviewed and all elements required by the SWPPP checklist were included. Please note that review of the SWPPP does not constitute approval. The permittee must comply with all the requirements of the Stormwater Construction General Permit ARR150000. Additionally, the permittee may modify the SWPPP as necessary to protect the Waters of the State from erosion and/or sediment runoff.

Based upon the information submitted in the NOI and SWPPP, this permit tracking number only applies to the acreage that was originally reviewed by the Department. If additional acreage is required, a revised site map containing the additional acreage and meeting all the permit requirements set forth in Part II.A.4.F of the Construction Stormwater General Permit must be submitted to the Department for review prior to any construction activity taking place on the requested acreage. Please note that review of the SWPPP in no way guarantees satisfactory operation of the tools and techniques proposed in the Plan. The permittee is responsible for ensuring that water quality standards are not violated and that off-site impacts (e.g., off-site vehicle tracking) do not occur.

Please find enclosed for your use: the Notice of Coverage, a copy of the Stormwater Construction General Permit, and a Notice of Termination (NOT). If you have any questions concerning this matter or need additional information, please feel free to contact Katherine Yarberry, General Permits Engineer at (501) 682-0627 or myself at (501) 682-0616.

Sincerely,



Mo Shafii
Assistant Chief, Water Division

MS: kay

Attachment

cc: Electronic Filing (ARR153893, w/ attachments)
Craig Uyeda, Branch Manager, Enforcement Branch
Eric Fleming, Branch Manager, Field Services Branch
Jim Purvis, Administrative Analyst, Fiscal Division
David Ramsey, ICIS Program Coordinator, Enforcement Branch

ARKANSAS DEPARTMENT OF ENVIRONMENTAL QUALITY

5301 NORTHSHORE DRIVE / NORTH LITTLE ROCK / ARKANSAS / 2118-5317 / TELEPHONE 501-682-0744 / FAX 501-682-0880

www.odeq.state.ar.us

**AUTHORIZATION LETTER TO DISCHARGE STORMWATER UNDER
THE NPDES STORMWATER CONSTRUCTION GENERAL PERMIT NUMBER ARR150000.**

THIS IS THE NOTICE OF COVERAGE UNDER GENERAL PERMIT ARR150000

The stormwater discharge shall be in accordance with all monitoring requirements and other conditions set forth in the NPDES Stormwater Construction General Permit ARR150000.

C & H Hog Farms, Inc.
Hc 72 PO Box 10
Mount Judea, AR 72655

is authorized to discharge stormwater from a facility located as follows:

C & H Hog Farms
On CR 276, 0.5 miles west of intersection of CR 41 & CR 276; West of Mount Judea, AR
Mount Judea in Newton County, Arkansas

Coverage under this permit is for swine barns. In accordance with the NOI there will be only 8.20 acres disturbed out of 8.20 acres total. This permit allows only disturbance for the 8.20 acres identified in the submitted and reviewed SWPPP and site map. If additional acreage is going to be disturbed, a new site map indicating the new disturbed area and all requirements of the site map set forth in Part II.A.4.F of the Construction Stormwater General Permit, ARR150000, must be submitted to the Department prior to any activity taking place on the additional acreage.

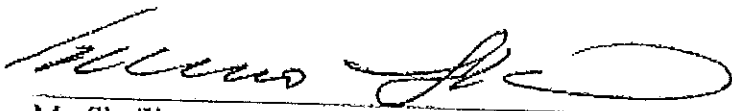
The Stormwater Pollution Prevention Plan will be located in the construction trailer.

The Project Contact Person for this construction site is Jason Henson, 870-715-9468.

This authorization must be posted at the construction site in a prominent place per the general permit.

Issued date: 08/13/2012

Expiration date: 10/31/2016



Mo Shafii
Assistant Chief, Water Division
Arkansas Department of Environmental Quality



**DeHaan, Grabs
& Associates, LLC**
Consulting Engineers
www.dgaengineering.com

Arkansas Department of Environmental Quality
Permit Branch, Water Division
5301 Northshore Drive
North Little Rock, AR 72118-5317

July 3, 2012

Dear Sir:

I have enclosed one copy of the *Notice of Intent For Discharges of StormWater Runoff Associated with Large Construction Activity Under the NPDES General Permit ARR150000*. The application is for the construction of a proposed 1,500 head swine facility for C & H Hog Farms located in Newton County, AR. Please review and process the enclosed documents accordingly.

Sincerely,

Greg Grabs, PE
Vice-President

Enclosures

cc: Jason Henson

North Dakota Office
P.O. Box 522
Mandan, ND 58554-0522
(701) 663-1116
Fax (701) 667-1356

Arkansas Department of Environmental Quality
Permits Branch, Water Division
5301 Northshore Drive
North Little Rock, AR 72118
(501) 682-0623

NOTICE OF INTENT
FOR DISCHARGERS OF STORMWATER RUNOFF
ASSOCIATED WITH LARGE CONSTRUCTION ACTIVITY
AUTHORIZED UNDER NPDES GENERAL PERMIT ARR150000

Application Type: New Renewal (Permit Tracking Number ARR(____))

I. PERMITTEE/OPERATOR INFORMATION

Permittee (Legal Name): Jason Henson

Permittee Mailing Address: Hc 72 PO Box 10

Permittee City: Mount Judea

Permittee State: AR Zip: 72655

Permittee Telephone Number: 870-715-9468

Permittee Fax Number

Permittee E-mail Address jasonh@rittermail.com

* The legal name of the Permittee must be identical to the name listed with the Arkansas Secretary of State.

Operator Type:

- STATE PARTNERSHIP
 FEDERAL CORPORATION*
 SOLE PROPRIETORSHIP
 PUBLIC OTHER

*State of Incorporation: _____

II. INVOICE MAILING INFORMATION

Invoice Contact Person: Jason Henson

Invoice Mailing Company: C&H Hog Farms

Invoice Mailing Address: Hc 72 PO Box 10

City: Mount Judea

State: AR Zip: 72655

Telephone: 870-715-9468

III. FACILITY/PROJECT CONSTRUCTION SITE INFORMATION

1 acre = 43,560 square feet

Project Name: C&H Hog Farms

Project County: Newton

Directions to the Project: Project is approximately

1.6 miles west of Mt. Judea, AR.

Project Estimated

Start Date: Summer 2012

Project Estimated

End Date: Fall 2013

Project Latitude: 35 degrees 55 minutes

Project Longitude: 93 degrees 4 minutes 13.6 seconds

Type of Project: Subdivision School Other: Swine Barns

Is the Project part of a larger common plan of development or sale? Yes No

Linear Project Starting Coordinates (if applicable):

Latitude: _____ Longitude: _____

Linear Project Ending Coordinates (if applicable):

Latitude: _____ Longitude: _____

Arkansas Department of Environmental Quality
Permits Branch, Water Division
5301 Northshore Drive
North Little Rock, AR 72118
(501) 682-0623

IV. DISCHARGE INFORMATION

Name of Receiving Stream (i.e. an unnamed tributary of Mill Creek, thence into Mill Creek; thence into Arkansas River):
A unnamed tributary to Big Creek

Choose Your Ultimate Receiving Stream: Red River Ouachita River Arkansas River
White River St. Francis River Mississippi River

Name of Receiving Municipal Storm Sewer System (If applicable): _____

V. FACILITY/SITE PERMIT INFORMATION

NPDES Individual Permit Number (If Applicable): AR00

NPDES General Permit Number (If Applicable): ARG

NPDES General Industrial Stormwater Permit Number (If Applicable): ARR00

NPDES General Construction Stormwater Permit Number (If Applicable): ARR15

VI. OTHER INFORMATION:

Location of SWPPP on the
Construction Site:

Construction Trailer

Consultant Company:

DeHaan Grabs & Associates

Consultant Contact Name:

Nathan Pesta

Consultant Email Address:

nathanpdga@btinet.net

Consultant Address:

PO Box 522

City: Mandan

State: ND

Zip: 58554

Consultant Phone Number:

701-663-1116

Consultant Fax
Number:

701-667-1356

Arkansas Department of Environmental Quality
Permits Branch, Water Division
5301 Northshore Drive
North Little Rock, AR 72118
(501) 682-0623

VII. CERTIFICATION OF OPERATOR

_____ (Initial) "I certify that, if this facility is a corporation, it is registered with the Secretary of State of Arkansas. Please provide the full name of corporation if different than that listed in Section I above."

_____ (Initial) "I certify that as a whole the stormwater discharge(s), and the construction and implementation of Best Management Practices (BMP's) to control stormwater runoff, are not likely to adversely affect species of critical habitat for a listed species."

_____ (Initial) "I certify that a stormwater pollution prevention plan has been prepared for this facility in accordance with Part II.A of this permit, which provides for, or will provide for, compliance with local sediment and erosion plans, local stormwater permits or stormwater management plans, in accordance with Part II.A.4.c of this permit."

_____ (Initial) "I certify that the cognizant official designated in Part VIII of this Notice of Intent is qualified to act as a duly authorized representative under the provisions of 40 CFR 122.22(b). If no cognizant official has been designated, I understand that the Department will accept reports signed by the applicant"

"I certify under penalty of law that this document and all attachments such as Inspection Form were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Responsible Official Printed Name: Jason Henson Title: Manager
Responsible Official Signature: _____ Date: _____

VIII. COGNIZANT OFFICIAL

Cognizant Official Printed Name: Jason Henson Title: Manager
Cognizant Official Signature: _____ Telephone: 870-715-9468

IX. PERMIT REQUIREMENT VERIFICATION

Please check the following to verify completion of permit requirements.

- | | Yes | No* |
|-----------------------------------|-------------------------------------|--------------------------|
| Submittal of Complete NOI? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Submittal of Required Permit Fee? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Check Number: _____ | | |
| Complete SWPPP? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

* If you answer No to any of the above questions, then a permit can not be issued!



**DeHaan, Grabs
& Associates, LLC**

Consulting Engineers

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Arkansas Department of Environmental Quality
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Vice-President

Enclosures

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NOTICE OF INTENT
FOR DISCHARGERS OF STORMWATER RUNOFF
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Operator Type:

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Permittee City: Mount Judea

FEDERAL CORPORATION*

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Telephone: 870-715-9468

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1 acre = 43,560 square feet

Project Name: C&H Hog Farms

Contact Person: Jason Henson

Project County: Newton

Project Physical Address: Hc 72 PO Box 10

Directions to the Project: Project is approximately

Project City: Mount Judea Zip: 72655

1.6 miles west of Mt. Judea, AR.

Telephone Number: 870-715-9468

Project Estimated

Total amount of soil to be disturbed

Start Date: Summer 2012

(estimate to nearest 1/2 acre): 8.2

Project Estimated

End Date: Fall 2013

Total Project Acreage

(Estimate to nearest 1/2 acre): 8.2

Project Latitude: 35 degrees 55 minutes 13.6 seconds

Project Longitude: 93 degrees 4 minutes 51.0 seconds

Type of Project: Subdivision School Other: Swine Barns

Is the Project part of a larger common plan of development or sale? Yes No

Linear Project Starting Coordinates (if applicable): Linear Project Ending Coordinates (if applicable):

Latitude: ____° ____' ____" Longitude: ____° ____' ____" Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Arkansas Department of Environmental Quality
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Responsible Official Printed Name: Jason Henson

Title: Manager

Responsible Official Signature: _____

Date: _____

VIII. COGNIZANT OFFICIAL

Cognizant Official Printed Name: Jason Henson

Title: Manager

Cognizant Official Signature: _____

Telephone: 870-715-9468

IX. PERMIT REQUIREMENT VERIFICATION

Please check the following to verify completion of permit requirements.

	Yes	No*
Submittal of Complete NOI?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Submittal of Required Permit Fee?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Check Number: _____		
Complete SWPPP?	<input checked="" type="checkbox"/>	<input type="checkbox"/>

* If you answer No to any of the above questions, then a permit can not be issued!

C & H Hog Farms Storm Water Pollution Prevention Plan (SWPPP)

Project Name

C & H Hog Farms

Project Type

The construction of a gestation barn, and a farrowing barn with corresponding waste controls, roads and diversions.

Project Location

The project is located in the SW $\frac{1}{4}$, Section 26, Township 15 North, Range 20 West, Newton County, Arkansas. Driving Directions: Are as follows: from Mt. Judea is approximately 0.8 miles southwest on county Rd. 54 and right on County Rd. 41 for approximately 0.75 miles. The site is located on the left side of the road on a logging trail.

Estimate of Project Size

Total area disturbed will be approximately 8.2 acres to include 1 gestation barn, 1 farrowing barn, 2 waste storage ponds, 1 cleanwater diversion, and roads.

Description of the Nature of Activity

Excavation of building pads, waste storage ponds and diversions, with fill being placed on roads & building pads

Description of Existing Soils, Fill Material, and Erodibility of Such Soils

According to the USDA Survey, the soil in the area of the construction is a Noark Very Cherty Silt Loam (42).

Proposed Timetable for Construction Activities

Earthwork construction will start summer (2012) and end fall (2013).

Name of Receiving Waters

A tributary to Big Creek is located approximately 355 feet to the southeast.

Runoff Coefficient

The final coefficient of runoff for the pond area, upon completion of construction activities will be $C = 0.45$. No data exists for the quality of any discharge from the site.

Significant Materials

The only significant materials on site will be fuel for vehicles. Vehicle fueling operations will not occur next to drainage swales, wetlands or streams. Any on-site storage of petroleum products will occur on level or gently sloping land, at least 200 feet from standing or flowing water. No temporary aboveground petroleum storage tank will be located on site with greater than 500 gallons storage capacity, nor will greater than 1000 gallons in aggregate aboveground petroleum storage tanks be allowed.

Temporary chemical storage will be provided in secure locations to prevent accidental release of chemicals. Should a petroleum or other chemical release occur, appropriate measures to contain, cleanup and prevent its recurrence will be implemented. Any chemical release must be immediately reported to the Arkansas Department of Environmental Quality - Permit Branch, Water Division, 5301 Northshore Drive, North Little Rock, AR 72118-5317. Phone: (501) 682-0623.

- a) may impact or directly threaten surface water or groundwater
- b) may endanger human health or safety or wildlife
- c) exceeds 5 gallons
- d) causes a sheen on surface water
- e) exceeds surface or ground water quality standards, or
- f) results in stained soil.

Discharge of more than 1000 gallons or oil into regulated waters in a single spill event, or discharge of a harmful quantity in two spill events in any twelve month period requires reporting to the USEPA National Response Center (1-800-424-8802).

Tentative Schedule

The project will utilize a majority of the fill material to construct the containment dikes for the holding ponds and for the clean water diversion ditches. Construction will be expedited, which will help to ensure that the silt material will be contained and not distributed downstream. In addition, temporary drain diversions, temporary sediment traps, silt fences, and earthen dikes will be utilized as required.

The construction schedule will include the following to minimize silt erosion:

- 1) Permanent Grass will be established on all fill areas and on back slopes using a quick established grass variety along with straw to hold the grass seed in place which will reduce erosion.
- 2) Good compaction methods will enhance soil bonding thus reducing further erosion of earthwork areas.
- 3) If areas exist during construction with signs of visible soil erosion; temporary seeding, mulching and straw silt fences will be utilized for erosion reduction.

Storm Water Discharges

The soils in the project area are gently sloping, well drained soils that have slow runoff. Therefore, the potential for runoff and erosion from the site is quite low. A well-defined drainage channel does not exist and runoff is not likely to enter the lakes or streams of the area.

Inspections

Inspections will be routinely performed by the Owner or Owner's Representative of all disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to rain, and locations where vehicles enter or exit the site. Inspections shall be performed at least weekly during the months of March through August and at least monthly during the months of September through February, inclusive. When snow cover does not exist, inspections shall be made at the end of each storm even greater than 0.5 inches.

Based on the inspections, revisions to this plan will be made, as needed, within seven days.

Inspections shall be recorded and kept on file with this plan for a period of three years following final site stabilization.

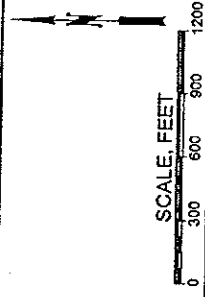
Record Keeping

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Plan Updating

If there is a change in design, construction, operation or maintenance, which may impact the potential for pollutants to be discharged; or if this Storm Water Pollution Prevention Plan proves to be ineffective in controlling the discharge of pollutants, then this Plan must be amended.

GENERAL NOTES



No.	Revision/Issue	Date

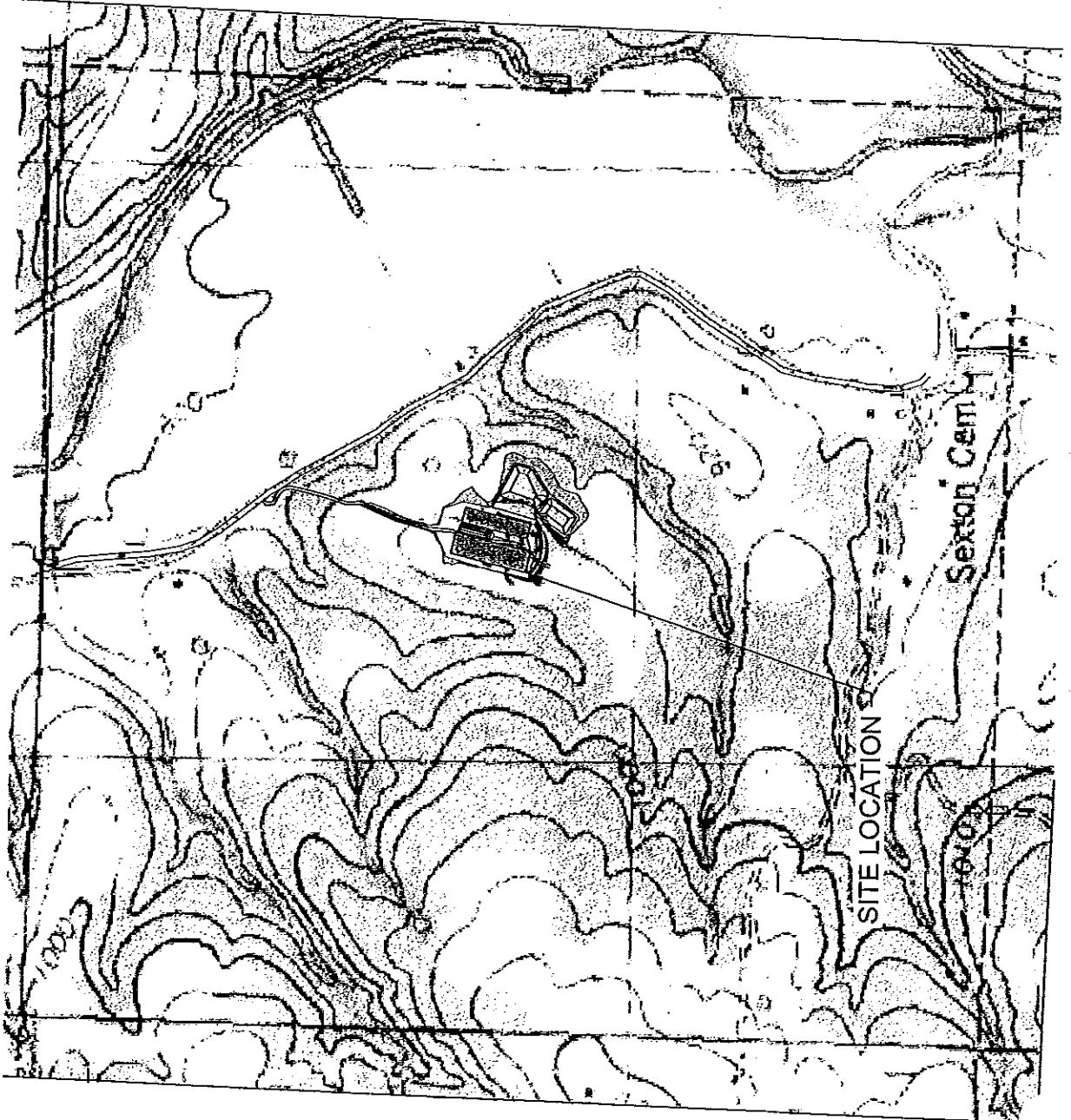
DeHaan, Grabs & Associates, LLC
 Consulting Engineers
 PO Box 822, Monroeville, MO 64654
 (701) 663-1116, FAX (701) 667-1556
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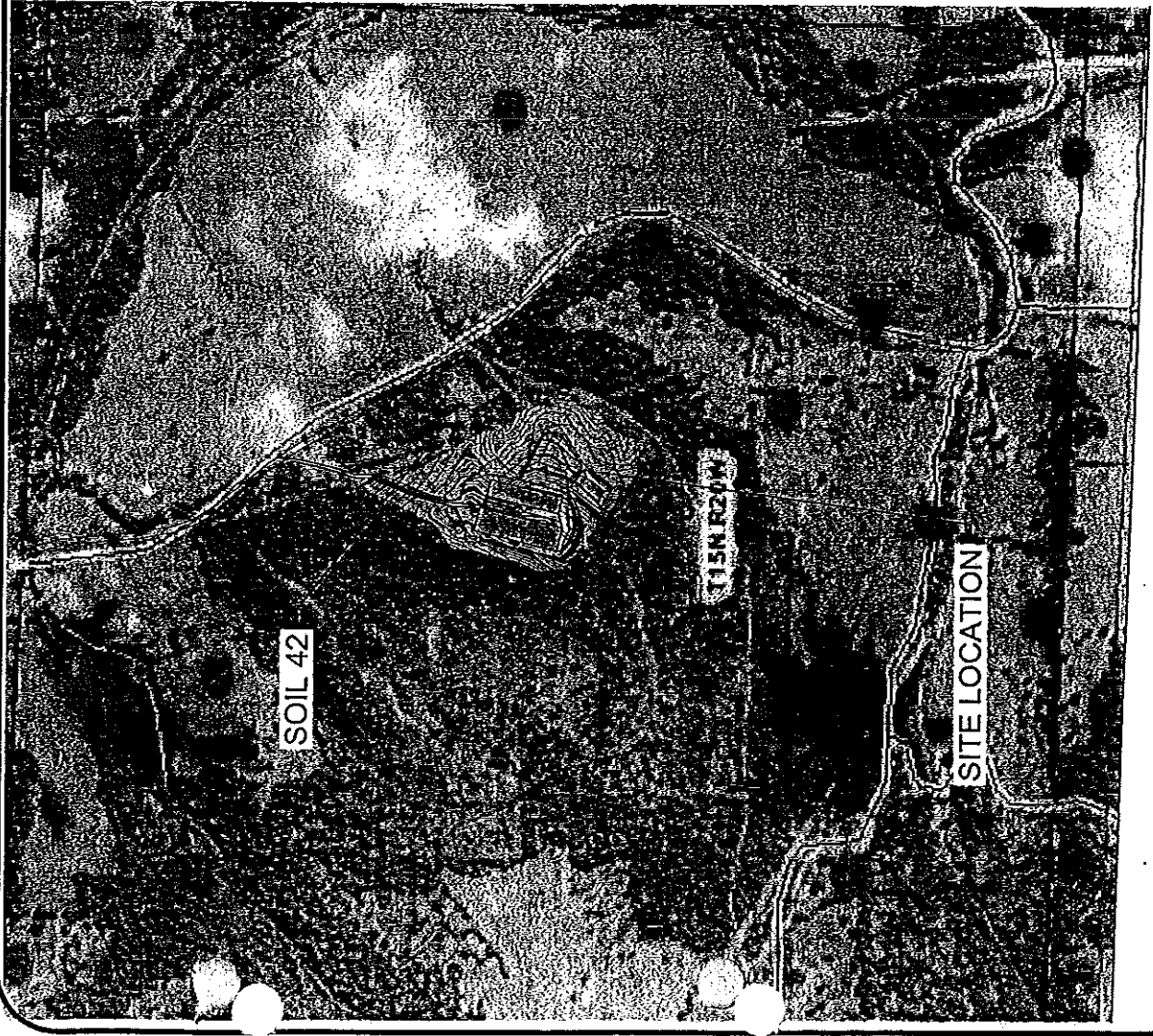
C&H HOG FARMS
 GESTATION-FARROWING FARM
 SECTION 28, T. 18 N., R. 20 W.
 NEWTON COUNTY, AR

**DETAILED USGS
 TOPOGRAPHICAL MAP**

DATE: MAY 22, 2012
 SHEET: 2
 SCALE: 1" = 500'
 DRAWN BY: CAS
 CHECKED BY: DLD

FILE NAME: DE PROJECT FILES\2012\NEWTON\FILES\AK





LEGEND

- 3 Arkana-Moko complex, 20 to 40 percent slopes
- 6 Ceda-Kenn complex, frequently flooded
- 11 Enders gravelly loam, 3 to 8 percent slopes
- 13 Enders stony loam, 3 to 20 percent slopes
- 26 Moko-Rock outcrop complex, 15 to 50 percent slopes
- 35 Nella-Enders stony loams, 8 to 20 percent slopes
- 42 Noark very cherty silt loam, 3 to 8 percent slopes
- 43 Noark very cherty silt loam, 8 to 20 percent slopes
- 44 Noark very cherty silt loam, 20 to 40 percent slopes
- 48 Razort loam, occasionally flooded
- 50 Spadra loam, occasionally flooded
- 51 Spadra loam, 2 to 5 percent slopes
- 54 Water

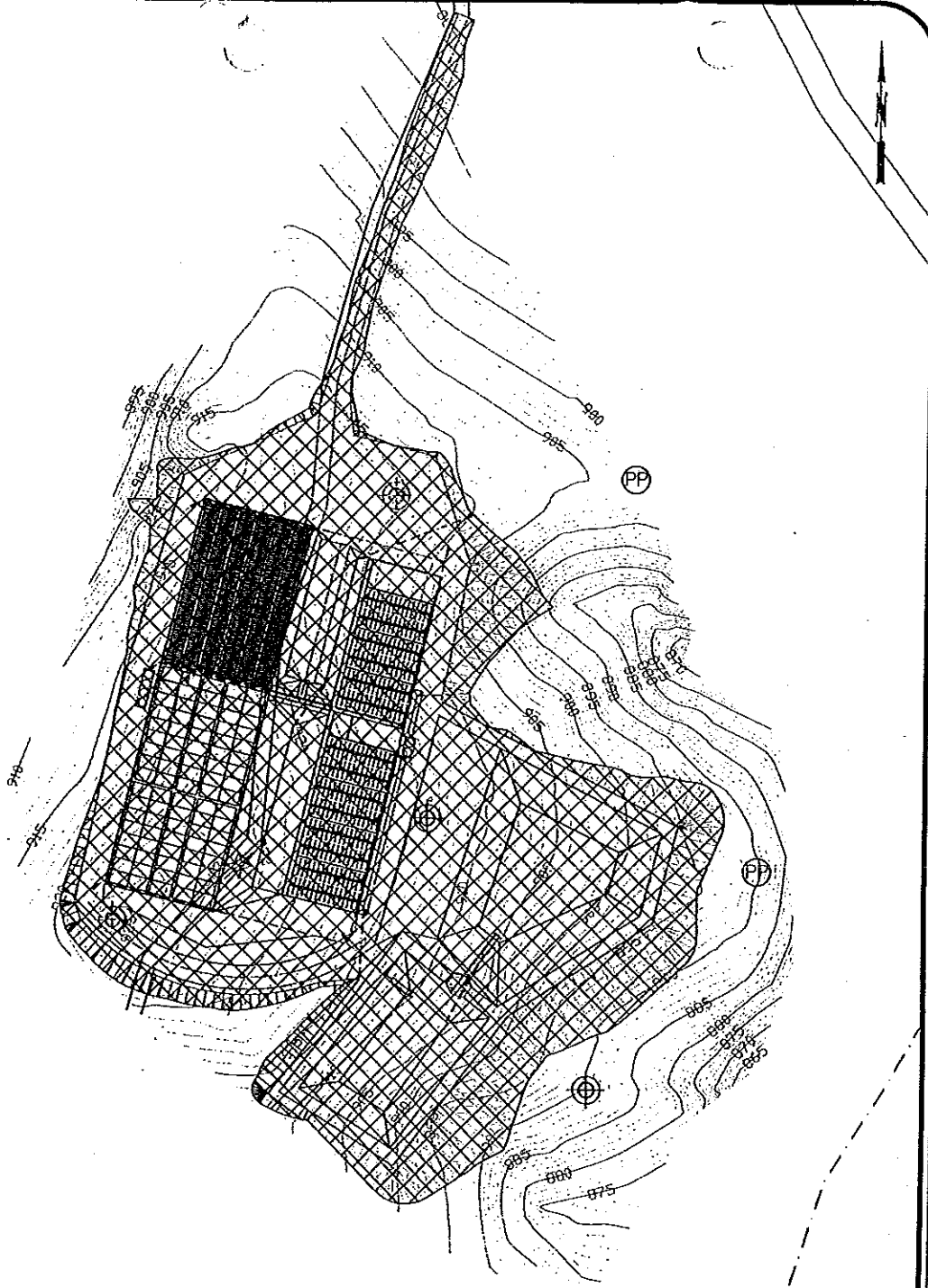
GENERAL NOTES

No.	Revision/Issue	Date

DeHaan, Grabs & Associates, LLC
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 PO Box 822, Menden, MO 63554
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C&H HOG FARMS
 GESTATION-FARROWING FARM
 SECTION 26, T. 18 N., R. 20 W.
 NEWTON COUNTY, AR
**USDA SOIL
 SURVEY MAP**

DATE:	MAY 22, 2012	SHEET:	3
SCALE:	1" = 600'		
DRAWN BY:	CAS		
CHECKED BY:	DLD		



 MAXIMUM DISTURBED AREA = 8.2 ACRES


GENERAL NOTES

- BENCHMARK
- BUILDINGS
- - - FENCELINE
- - - CULTVERT/PIPE
- DRAINAGE ARROW

SCALE, FEET



No.	Revision/Issue	Date



**DeHaan, Grabs
& Associates, LLC**
 Consulting Engineers
 PO Box 622 Houston, TX 77264
 (713) 633-1116, FAX (713) 633-1156
www.dgpaengineers.com

C & H HOG FARMS
 GRISTLATION-FARROWING FARM
 SECTION 28, T 18 N, R 20 W
 NEWTON COUNTY, AR
**MAXIMUM DISTURBED
 AREA MAP**

DATE: JUN 19, 2012 SHEET: **5**
 SCALE: 1" = 120'
 DRAWN BY: CAS
 CHECKED BY: DLD

FILE NAME: B:\PROJECT FILES\NEW\NEWTON\NEWTON.dwg

C & H Hog Farms Storm Water Pollution Prevention Plan (SWPPP)

Project Name

C & H Hog Farms

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DRAW

LOGGING ROAD

COUNTY ROAD 41

DRAINAGE ARROWS

APPROXIMATE MIDDLE OF SECTION 26

APPROXIMATE PROPERTY BOUNDARY

DRAW


Benchmarks

TBM #	Northing	Easting	Elevation	Description
1	580,264.50	994,267.97	925.68	Elevation
2	580,715.06	994,563.20	915.64	Elevation
3	580,375.60	994,600.08	914.71	Elevation
4	580,090.02	994,770.77	889.80	Elevation

DATE PLOTTED: 04/30/2012 10:00 AM

DATE: APR 30, 2012
 SCALE: 1" = 200'
 DRAWN BY: NAP
 CHECKED BY: DLD

C & H HOG FARMS
 GESTATION-FABRICATING FARM
 SECTION 26, T. 18 N., R. 20 W.
 NEWTON COUNTY, AR
EXISTING SITE



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 Consulting Engineers
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 www.dehgan-grabs.com


No.	Revision/Issue	Date

GENERAL NOTES

LEGEND

- ◆ BENCHMARK
- ▣ BUILDINGS
- FENCELINE
- CULVERT/PIPE
- ← DRAINAGE ARROW

SCALE FEET



GENERAL NOTES

SCALE, FEET



No.	Revision/Issue	Date

DeHaan, Grabs & Associates, LLC
 Consulting Engineers
 PO Box 672, Abbeville, MO 63254
 (707) 667-1116, FAX (707) 667-7366
 www.opengrounding.com

C&H HOG FARMS
 GESTATION-FARROWING FARM

SECTION 26, T 16 N, R 20 W
 NEWTON COUNTY, AR

**DETAILED USGS
 TOPOGRAPHICAL MAP**

DATE: MAY 22, 2012
 SHEET:

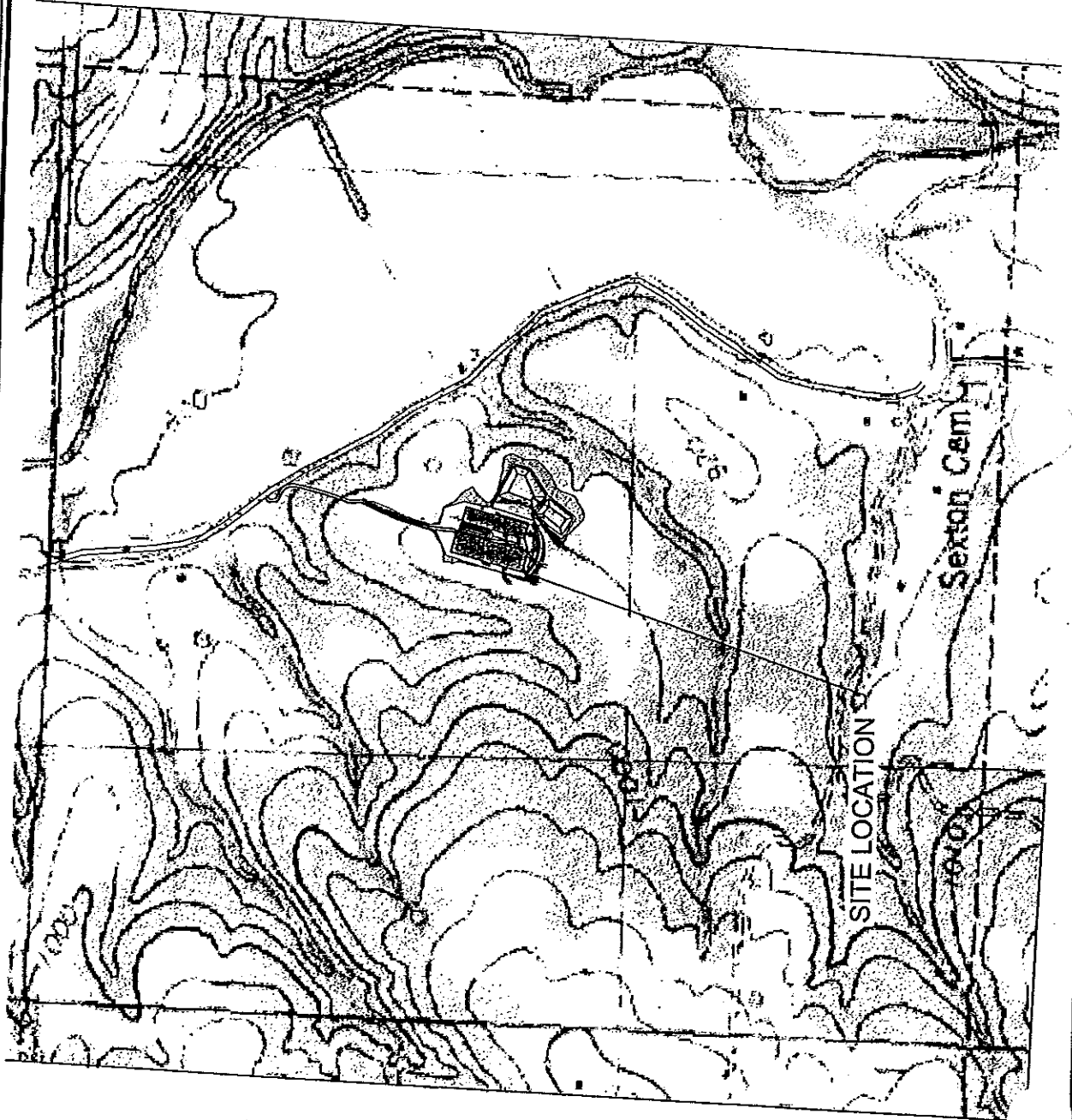
SCALE:
 1" = 600'

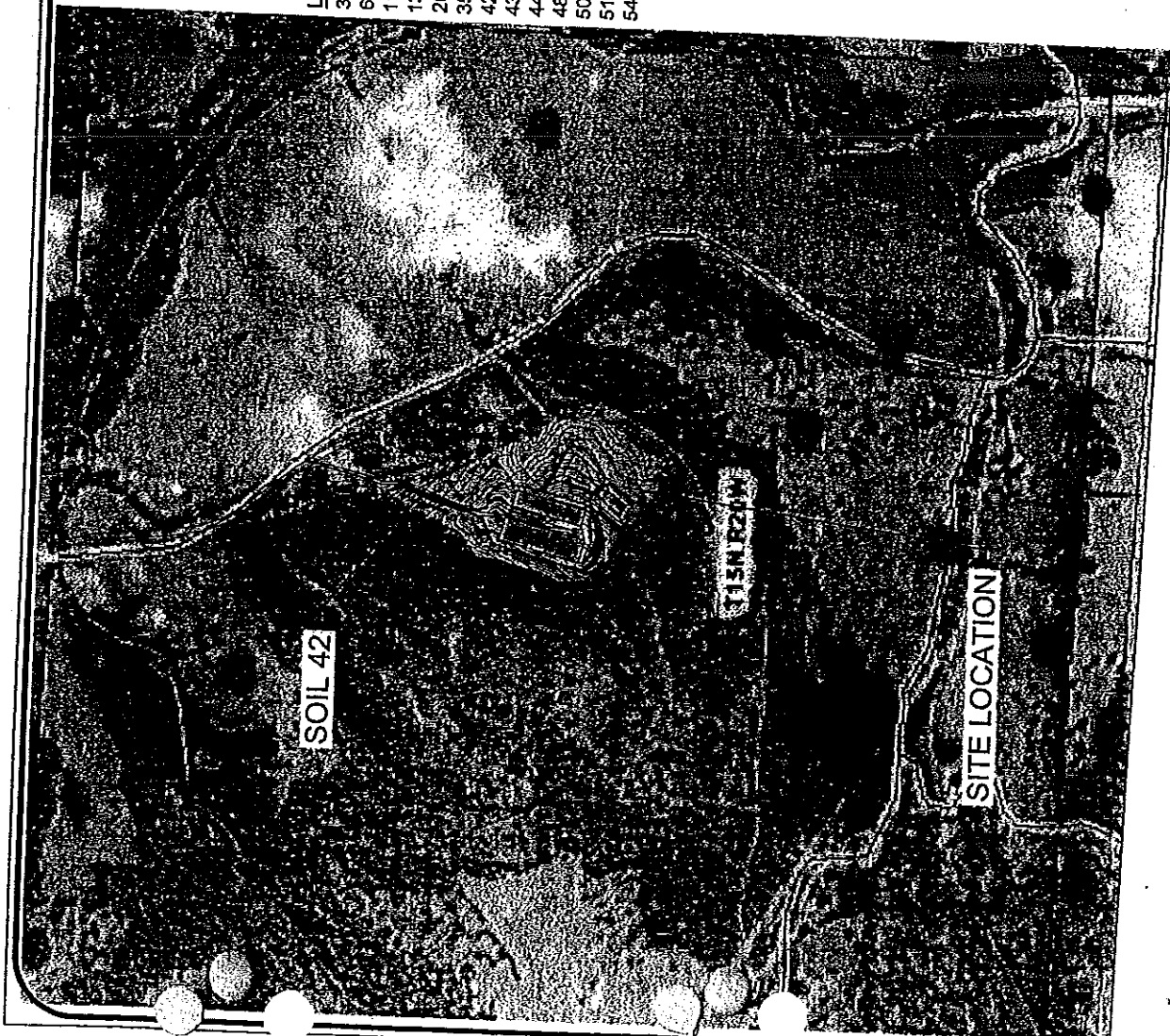
DRAWN BY:
 CAS

CHECKED BY:
 DLO

2

FILE NAME: G:\PROJECT FILES\MO\NEWTON\26\26.DWG

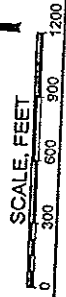




LEGEND

- 3 Arkana-Moko complex, 20 to 40 percent slopes
- 6 Ceda-Kenn complex, frequently flooded
- 11 Enders gravelly loam, 3 to 8 percent slopes
- 13 Enders stony loam, 3 to 20 percent slopes
- 26 Moko-Rock outcrop complex, 15 to 50 percent slopes
- 35 Nella-Enders stony loams, 8 to 20 percent slopes
- 42 Noark very cherty silt loam, 3 to 8 percent slopes
- 43 Noark very cherty silt loam, 8 to 20 percent slopes
- 44 Noark very cherty silt loam, 20 to 40 percent slopes
- 48 Razzot loam, occasionally flooded
- 50 Spadra loam, occasionally flooded
- 51 Spadra loam, 2 to 5 percent slopes
- 54 Water

GENERAL NOTES

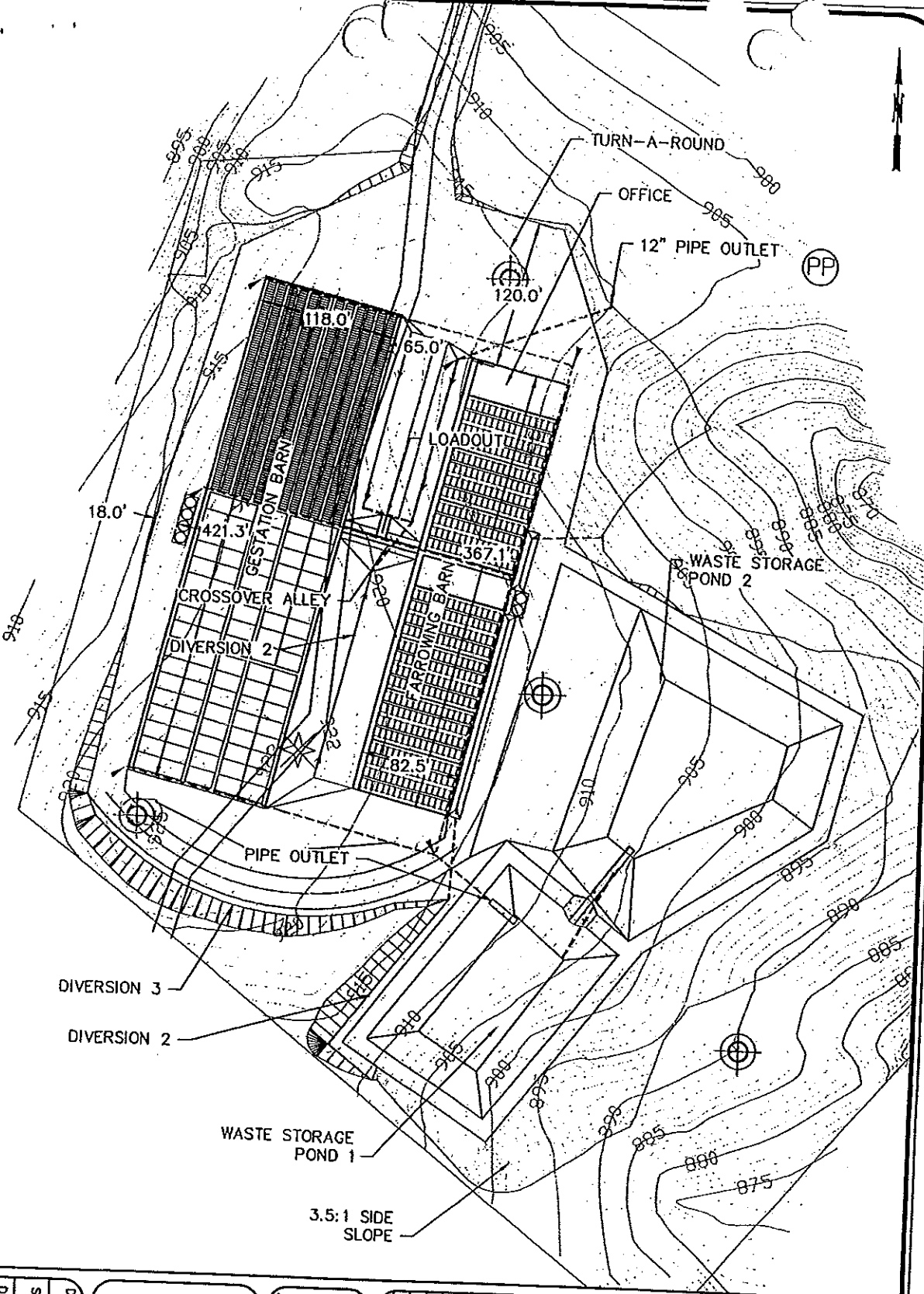


No.	Revision/Issue	Date

DeHaan, Grabs & Associates, LLC
 Consulting Engineers
 20 Box 622, Mendenhall, MO 65554
 (707) 663-1116, FAX (707) 667-1366
www.dgaengineering.com

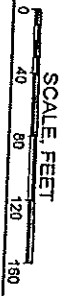
C&H HOG FARMS
 GESTATION-FARROWING FARM
 SECTION 26, T. 16 N., R. 20 W.
 KEFFYON COUNTY, AR
USDA SOIL SURVEY MAP

DATE: MAY 22, 2012	SHEET: 3
SCALE: 1" = 800'	
DRAWN BY: CAS	
CHECKED BY: OLD	



GENERAL NOTES

- LEGEND
- ◆ BENCHMARK
 - ▭ BUILDINGS
 - - - FENCELINE
 - - - CULVERT/PIPE
 - ← DRAINAGE ARROW



No.	Revision/Issue	Date

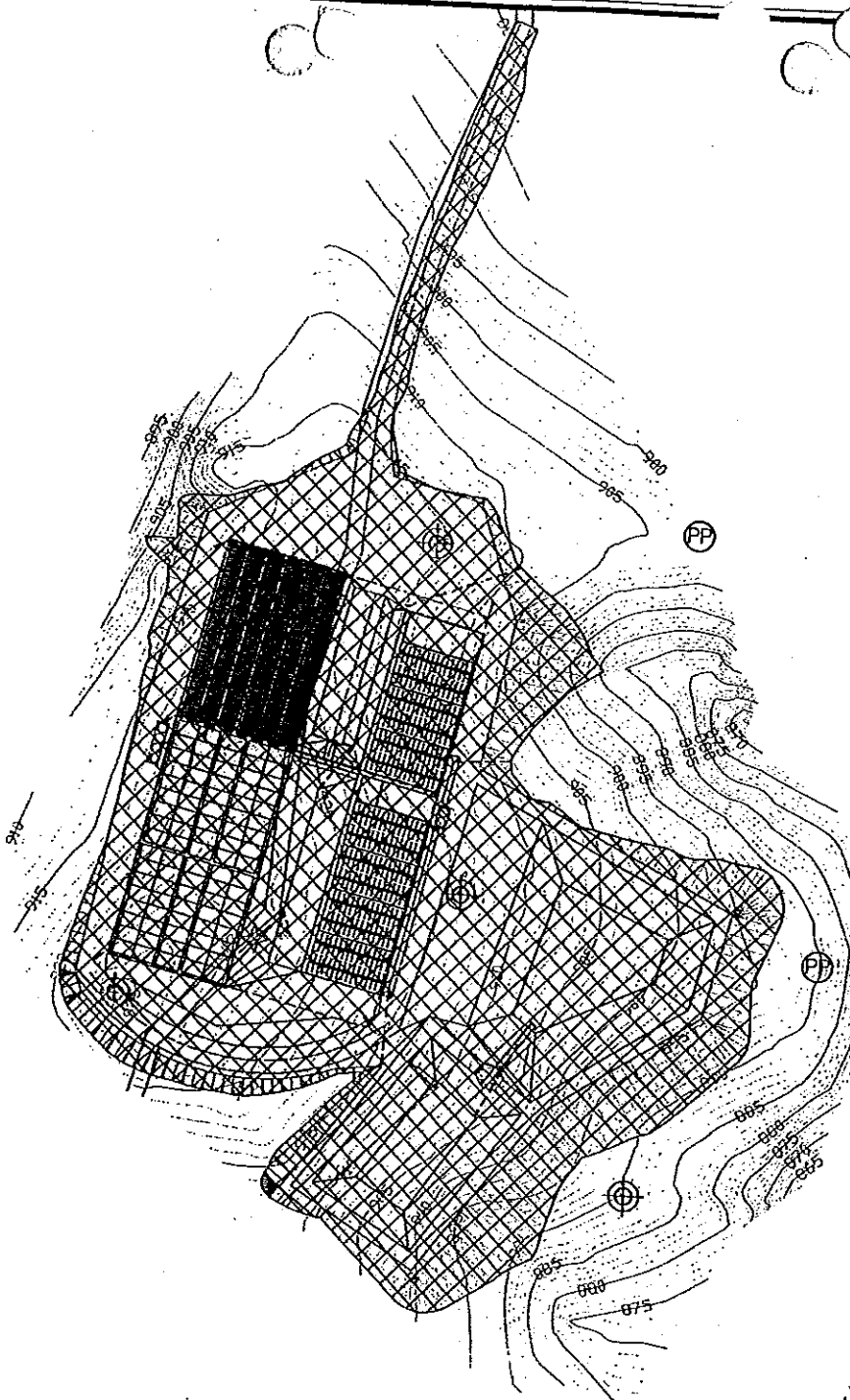
DeHaan, Grabs & Associates, LLC
 Consulting Engineers
 PO Box 122, Mendon, MA 01854
 (508) 548-1100, FAX (508) 548-4385
www.dgengineering.com


C & H HOG FARMS
 GESTATION-FARROWING FARM
 SECTION 26, T. 18 N. R. 20 W
 NEWTON COUNTY, MA
 DETAILED
 PROPOSED SITE PLAN

DATE: APR 30, 2012
 SCALE: 1" = 80'
 DRAWN BY: NAP
 CHECKED BY: DLD

SHEET: 4

FILE NAME: G:\PROJECT FILES\2012\40000\02\26\26.PLT

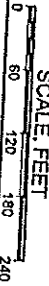


 MAXIMUM DISTURBED AREA = 8.2 ACRES


GENERAL NOTES

- ◆ BENCHMARK
- BUILDINGS
- - - FENCELINE
- - - CULVERT/PIPE
- ← DRAINAGE ARROW

SCALE FEET



No.	Revision/Issue	Date



DeHaan, Grubs & Associates, LLC
 Consulting Engineers
 P.O. Box 622, Memphis, TN 38064
 (901) 663-1116, FAX (901) 667-1366
www.dgaw.com

C & H HOG FARMS
 GESTAYLTON-FARROWING FARM
 SECTION 28, T 16 N, R 20 W
 NEWTON COUNTY, AR
MAXIMUM DISTURBED AREA MAP

DATE: JUN 19, 2012 SHEET: **5**

SCALE: 1" = 120'

DRAWN BY: CAS

CHECKED BY: DLD

Arkansas Democrat Gazette

STATEMENT OF LEGAL ADVERTISING

TANA HENSON
 HC 72 BOX 10
 MOUNT JUDEA AR 72655

REMIT TO:
 ARKANSAS DEMOCRAT-GAZETTE, INC.
 P.O. BOX 2221
 LITTLE ROCK, AR 72203

ATTN: same
 DATE : 08/08/12
 ACCT #: L6005752
 INVOICE #: 2768983
 P.O. #:

BILLING QUESTIONS CALL 378-3812

STATE OF ARKANSAS,
 COUNTY OF PULASKI } ss.

I, Elizabeth Myers do solemnly swear that I am the Legal Billing Clerk of the Arkansas Democrat - Gazette, a daily newspaper printed and published in said County, State of Arkansas; that I was so related to this publication at and during the publication of the annexed legal advertisement in the matter of:

notice pending in the Court, in said County, and at the dates of the several publications of said advertisement stated below, and that during said periods and at said dates, said newspaper was printed and had a bona fide circulation in said County; that said newspaper had been regularly printed and published in said County, and had a bona fide circulation therein for the period of one month before the date of the first publication of said advertisement; and that said advertisement was published in the regular daily issues of said newspaper as stated below.

AD COPY

USDA - Farm Service Agency
 Notice of Availability
 C & H Hog Farms Inc, Arkansas
 Draft Environmental Assessment
 U.S. Department of Agriculture
 Farm Service Agency (FSA)
 Announces the availability of a
 Draft Environmental Assessment
 For C & H Hog Farms Inc. The
 primary objective of the activity is
 to construct (1) 82'6" x 337'1"
 Swine Farrowing Barn, and (1)
 117'6" x 421'4" Swine Gestation
 Barn. Barns to be located in Section
 28, Township 15 North,
 Range 20 West Newton County,
 Arkansas. FSA is accepting comments
 on the Draft EA through
 August 23, 2012. The Draft EA can
 be reviewed in person at the local
 FSA County Office. Comments
 should be submitted to Lonnie
 Ewing, Farm Loan Manager at
 2888 Point Circle Fayetteville, AR
 72704
 714399204

DATE	DAY	LINAGE	RATE	DATE	DAY	LINAGE	RATE
08/06	Mon	33	1.25				
08/07	Tue	33	1.25				
08/08	Wed	33	1.25				

TOTAL COST -----
 Billing Ad #: 71439920 123.75

Elizabeth Myers
 Subscribed and sworn to me this 8
 day of Aug, 2012
Bennie J. Fuller
 Notary Public

OFFICIAL SEAL - # 12361364
BENNIE J. FULLER
 NOTARY PUBLIC - ARKANSAS
 PULASKI COUNTY
 MY COMMISSION EXPIRES: 3-21-2021

United States Department of Agriculture
Farm Service Agency

FINDING OF NO SIGIFICANT IMPACT (FONSI)
For

Construction of 82'6" x 337' 1" Swine Farrowing Barn and 1 117' 6" X 421' 4"
Swine Gestation Barn for C & H Hog Farms Inc. located in S26, T15N, R20W in
Newton County, Arkansas.

The United States Department of Agriculture, Farm Service Agency (FSA) has prepared a Final Environmental Assessment (EA) to evaluate the environmental consequences associated with construction of 82' 6" X 337' 1" swine farrowing barn and 1 117'6" X 421'4" swine gestation barn for C & H Hog Farms, Inc. located in S26, T15N, R20W in Newton Co., Arkansas.

The purpose of this action is to allow C & H Hog Farms, Inc. to produce hogs for Cargill in up to date structures in Newton County, AR..

Proposed Action

The proposed action is to construct a 82'6" X 337'1" swine farrowing barn and 1 117'6" X 421'4" swine gestation barn. In consideration of the analysis documented in the Class II EA and the reasons outlined in this FONSI, the preferred alternative would not constitute a major State or Federal action that would significantly affect the human environment. Therefore, an Environmental Impact Statement will not be prepared. The determination is based on the following:

1. Both beneficial and adverse impacts of implementing the preferred alternative have been fully considered within the EA. The beneficial impacts outweigh any adverse impacts. Adverse cumulative impacts are expected to be minor as implementation of the preferred alternative will cause very little if any adverse impact on the area of potential effect and the human environment.
2. The preferred alternative would not significantly affect public health or safety.
3. The preferred alternative would not significantly affect any unique characteristics which includes historic and cultural resources, parklands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
4. The preferred alternative does not involve effects to the quality of the human environment that are likely to be highly controversial.
5. The preferred alternative would not impose highly uncertain or involve unique or unknown risks.
6. The preferred alternative would not establish a precedent for future actions with significant effects and does not represent a decision in principle about a future consideration.
7. The preferred alternative is not related to other actions with individually insignificant but cumulative significant impacts. The Environmental Consequences section of the Environmental Assessment discusses potential cumulative impacts of implementing the preferred alternative. Cumulative impacts of implementing the preferred alternative were determined to not be significant.
8. The preferred alternative would not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural, or historical resources. Consultation with the State Historic Preservation Office was completed.
9. The preferred alternative would not have adverse effects on threatened or endangered species or designated critical habitat. In accordance with section 7 of the Endangered Species Act, the effects of implementing the preferred alternative on threatened and endangered species and designated critical habitat were addressed in the Environmental Assessment. Informal consultation with the U.S. Fish Wildlife Service was completed.
10. The preferred alternative does not threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

Arkansas Democrat Gazette

STATEMENT OF LEGAL ADVERTISING

TANA HENSON
 HC 72 BOX 10
 MOUNT JUDEA AR 72655

REMIT TO:
 ARKANSAS DEMOCRAT-GAZETTE, INC.
 P.O. BOX 2221
 LITTLE ROCK, AR 72203

ATTN: same
 DATE : 08/27/12 INVOICE #: 2772093
 ACCT #: L6005752 P.O. #:

BILLING QUESTIONS CALL 378-3812

STATE OF ARKANSAS, }
 COUNTY OF PULASKI, } ss.

I, Elizabeth Myers do solemnly swear that I am the Legal Billing Clerk of the Arkansas Democrat - Gazette, a daily newspaper printed and published in said County, State of Arkansas; that I was so related to this publication at and during the publication of the annexed legal advertisement in the matter of:


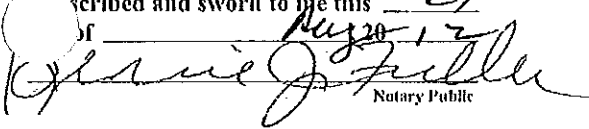
hog farm

pending in the Court, in said County, and at the dates of the several publications of said advertisement stated below, and that during said periods and at said dates, said newspaper was printed and had a bona fide circulation in said County; that said newspaper had been regularly printed and published in said County, and had a bona fide circulation therein for the period of one month before the date of the first publication of said advertisement; and that said advertisement was published in the regular daily issues of said newspaper as stated below.

DATE	DAY	LINAGE	RATE	DATE	DAY	LINAGE	RATE
08/25	Sat	56	1.25				
08/26	Sun	56	1.45				
08/27	Mon	56	1.25				

TOTAL COST ----- 221.20
 Billing Ad #: 71479758

OFFICIAL SEAL - # 12381364
BENNIE J. FULLER
 NOTARY PUBLIC - ARKANSAS
 PULASKI COUNTY
 MY COMMISSION EXPIRES: 3-21-2021


 subscribed and sworn to me this 27
 of August 2012

 Notary Public

AD COPY

UNITED STATES
 Department of Agriculture
 Farm Service Agency
 Notice of Availability
 C & H Hog Farms Inc.
 Swine House Construction
 Finding of No Significant
 Impact (FONSI)
 The United States Department
 of Agriculture, Farm Service
 Agency (FSA) issues FONSI for C
 & H Hog Farms Inc. Construction
 of 11,826 sq ft Farrowing
 Barn, And 11,176 sq ft Gestation
 Barn. Barns located in Sec-
 tion 26, Township 15 North,
 Range 20 West Newton County,
 Arkansas.
 FSA has completed an Envi-
 ronmental Assessment (EA) and
 has determined that C & H Hog
 Farms Inc. swine construction will
 not have significant effect on the
 human environment; therefore, no
 environmental impact statement
 shall be prepared.
 FSA is accepting comments on
 this FONSI and EA through Sep-
 tember 11, 2012.
 The final EA can be reviewed in
 person at the FSA office located at
 Washington County FSA Office,
 2899 Point Circle, Fayetteville,
 AR, between 8:30 a.m. and 4:30
 p.m., Monday through Friday.
 Comments should be submitted to
 Lonnie Ewen, Farm Service Man-
 ager at the FSA address above or
 by email to Lonnie.Ewen@ars.us-
 da.gov. For questions or direc-
 tions to the FSA office, please
 contact our office at (479)
 621-1630.
 71479758