ALLIED ENGINEERING SERVICES, LLC

Engineering—Surveying—Construction

RECEIVED
MAY 10 2016
WATER PROTECTION PROGRAM

May 5, 2016

Greg Caldwell
Water Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102-0176

Dear Greg,

Enclosed please find the operating permit application for building additions to United Hog Systems Z5 Sow Farm, this is currently permitted as Z3 Sow Farm with the facility to the south. The barns and lagoon to the south have been sold and I will submit permit modification for that farm in the near future.

If you have any questions or need any additional information please feel free to contact me.

Sincerely,

Jeff E. Browning, P.E.

Enclosures

AES P.O. Box 29 Bowling Green, MO 63334 573-324-6860 Phone 573-324-6818 Fax

RECEIVED

MAY 10 2016

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM

FORM W - CONCENTRATED ANIMAL FEEDING OPERATION (CAFO) OPERATING PERMIT APPLICATION

WATER PROTECTION PROGRAM

FOR OFFICE USE ONLY	
CHECK NUMBER: 12958	
DATE RECEIVED 5/10/16	FEE SUBMITTED $100.00

Complete all applicable sections. Instructions for completing the form are located at the end of the form. Sign, date and return the form and all requested documents along with a check for the appropriate permit fee to the Missouri Department of Natural Resources. Make a copy of this completed form and keep it with your nutrient management plan.

PART 1 – PERMIT OWNERSHIP AND CONTACT INFORMATION

1.1 OPERATION NAME	CURRENT PERMIT NUMBER	COUNTY
Z5 Sow Farm	MO-GS10225	Caldwell
PHYSICAL ADDRESS	LEGAL DESCRIPTION Sec.: Twn.: Rng.:	TELEPHONE NUMBER WITH AREA CODE
CITY	STATE	ZIP CODE
1.2 OWNER (PROVIDE LEGAL NAME) United Hog Systems	EMAIL ADDRESS robertzeysing@rzeysing.com	
MAILING ADDRESS P.O. Box 158		TELEPHONE NUMBER WITH AREA CODE (660) 886-9681
CITY Marshall	STATE MO	ZIP CODE 65340
1.3 CONTINUING AUTHORITY (IF DIFFERENT THAN THE OWNER) Same		
MAILING ADDRESS		TELEPHONE NUMBER WITH AREA CODE
CITY	STATE	ZIP CODE

PART 2 – PERMIT TYPE AND PERMIT ACTION

2.1 PERMIT TYPE

☐ NPDES Site Specific Permit
Request review of draft permit prior to public notice. ☐ Yes ☐ No

☐ NPDES General Permit (MOG01)

☒ State No-Discharge General Permit (MOGS1)

2.2 PERMIT ACTION*

☐ New Permit ☐ Renewal
☒ Modification ☐ Ownership Transfer

PREVIOUS OWNERS NAME

ADRESS

CITY STATE ZIP CODE

SIGNATURE DATE

*See instructions for additional requirements and documents for the request permit action.

PART 3 – DESIGN CAPACITY FOR MANURE STORAGE AND ANIMALS OF EACH CAFO FEATURE

3.1 STORAGE STRUCTURE TYPES, AMOUNT OF STORAGE, AND AMOUNT OF MANURE GENERATED PER YEAR.

List All Manure Storage Structures at each CAFO Feature		Dry Manure Handling System		Wet Manure Handling System			
CAFO Feature	Storage Structure Type(s)	Design Dry Process Waste (tons/yr.)	Days of Storage	Total Storage Capacity (gal)	Design Wastewater per Year (gal./yr.)	Days of Storage	Design Flow MGD
001	E			7,216,708	7,216,698	365	.02
002	G	43	>365				
003							
004							
005							

3.2 LIST EACH TYPE OF ANIMAL IN CONFINEMENT AND THE NUMBER OF EACH ANIMAL TYPE.

CAFO Feature	Animal Category #1	Animal Numbers	Animal Category #2	Animal Numbers	Animal Category #3	Animal Numbers
001	5	4112				
002						
003						
004						
005						

PART 4 – OPERATIONAL INFORMATION

4.1 OPERATIONAL INFORMATION (SEE INSTRUCTIONS)
SIC Code(s) 0213 CAFO Class Size IC

4.2 Is this an export-only operation? ☐ Yes ☑ No

Completing PARTS 5 - 11 will meet the requirements of a Nutrient Management Plan (NMP) for an export only operation.

PART 5 – MANURE STORAGE

5.1 Do all manure storage structures have adequate storage, and operated and maintained as no discharge? ☑ Yes ☐ No

PART 6 – ANIMAL MORTALITY

6.1 PEMANENT METHOD OF DISPOSING OF ROUTINE ANIMAL MORTALITIES.

☑ Composting ☐ Rendering ☐ Send to a Landfill ☐ Incineration ☐ Other (Describe)

6.2 DESCRIBE METHOD OF MORTALITY HANDLING AND STORAGE THROUGH ALL PHASES TO FINAL DISPOSAL. (EXAMPLE: MORTALITIES ARE COMPOSTED WITHIN 24 HOURS OF DEATH AND FINISHED COMPOST PRODUCT IS STORED UNDER ROOF UNTIL LAND APPLIED). ALSO DESCRIBE THE TYPE OF COMPOST STRUCTURE USED, IF APPLICABLE.

Dead animals will be composted in a concrete structure or bio-vator. Finished compost will be land applied with a manure spreader.

PART 7 – DIVERSION OF CLEAN WATER

7.1 Is clean stormwater diverted from the production area? ☑ Yes ☐ No

7.2 IF YES, DESCRIBE CONTROLS AND MEASURES USED TO DIVERT STORMWATER.

Buildings prevent stormwater from entering production area. Site is graded so stormwater runs away from production barns.

7.3 IF NO, DESCRIBE HOW CONTAMINATED STORMWATER IS CONTAINED AND INCLUDE THE STORAGE CAPACITY OF THE CONTAINMENT IF NOT PREVIOUSLY PROVIDED.

PART 8 – PREVENT DIRECT CONTACT OF ANIMALS WITH SURFACE WATERS

8.1 Do the animals have access to waters of the state within the production area? ☐ Yes ☐ No

8.2 LIST MEASURES USED TO PREVENT CONFINED ANIMAL FORM HAVING DIRECT CONTACT WITH WATERS OF THE STATE.

Animals are housed inside of barns.

PART 9 – CHEMICAL HANDLING

9.1 Check the appropriate boxed below to indicate method for handling and disposal of chemicals used by the operation:

☑ Chemicals are stored, handled, and disposed of according to manufacturer labels.

☑ Chemical storage and handling areas are protected from precipitation and runoff, and any spillage is contained within these areas.

☑ Emergency procedures and equipment are in place to contain and clean up chemical spills.

☑ Equipment wash areas are designed and constructed to prevent contamination of surface waters.

☐ No chemicals are stored or handled in the production area.

PART 10 – MANURE ANALYSIS TESTING

10.1 LIST EACH TYPE OF MANURE SOURCE. (i. e. MANURE, LITTER, COMPOST, WASTE WATER.)

Wastewater; Dead Swine Compost

10.2 DESCRIBE PROCEDURES FOR ENSURING EACH MANURE SOURCE IS TESTED ANNUALLY.

Several samples are collected around the storage structure and combined in one bulk sample and taken directly to Perry Ag Lab for testing.

PART 11 – RECORD KEEPING

11.1 Are records of all inspections, manure transfers, discharges and land application maintained? ☐ Yes ☐ No

PART 12 – SIGNATURE

NAME	TITLE
Robert H. Zeysing	Owner/Operator
SIGNATURE Robert H. Zeysing	DATE 5-2-16

Part 13 - Engineer Certification

House Bill 28, which became effective Aug 28, 2013, contained provisions that changed construction permitting requirements. Construction permits are required for the construction of an earthen storage structure to hold, convey, contain, store, or treat domestic, agricultural, or industrial process wastewater. Construction of all other point source systems designed to hold, convey, contain, store, or treat domestic, agricultural, or industrial process waste must be designed by a professional engineer registered in Missouri in accordance with design regulations.

Operation Name Robert H. Zeysing Address P.O. Box 158 City Marshall MO 65340	Engineer Firm Allied Engineering Services Address P.O. Box 29 City State Zip Code Bowling Green, MO 63334
I, Project Engineer, certify that above described systems have been designed in accordance with Missouri CAFO design regulations in 10 CSR 20-8.300 PROJECT ENGINEER SIGNATURE	ENGINEER SEAL STATE OF MISSOURI JEFF ERIC BROWNING NUMBER E-28664 REGISTERED PROFESSIONAL ENGINEER

MO 780-2112 (07-14)

Z5 SOW FARM

NARRATIVE SUMMARY OF DESIGN

This facility is located in section 12, Township 57N, Range 27W, in Caldwell County Missouri. The proposed modifications will occur at the farm known as the Z3 Sow Farm-North Site. This farm will be renamed Z-5 Sow Farm and will be a three building sow farm producing weaned pigs. The modifications will occur at the north site. The south site has been sold to R&K Farms, LLC.

The farm modification will include the demolition of all existing barns on the north site and construction of a new 134'8" wide x 200' long farrowing barn, a 117'10" wide x 412' long breeding/gestation barn and an 81' wide x 173'4" long gilt development barn. Proposed animal numbers are 432 sows & litters and 3,680 breeding/gestating sows, boars and gilts. An office will be constructed adjacent to the farrowing barn. This will be a class IC CAFO as defined by the Missouri Department of Natural Resources and a class II CAFO as defined by the Caldwell County Health Ordinance.

All barns are slatted type buildings where hog manure generated from production falls beneath the floor into two-foot deep concrete pits which will be periodically drained to the existing earthen storage lagoon via permanent sewer pipes underground. The earthen storage lagoon will store the manure laden wastewater until it can be pumped to nearby farm fields.

The farm will be designed and constructed to meet the current standards of the Missouri Department of Natural Resources. The entire nutrient handling and storage structures have been designed as a no discharge system. Dead animals will be composted on-site and finished compost material will be land applied.

The average annual pumpdown volume has been calculated using the NRCS Animal Waste Management design program and is estimated to be 7,216,698 gallons per year, giving approximately one year of storage in the average year.

Land Application

Lagoon nutrients will be land applied according to recommended agronomic rates for the following crops; soybeans, corn and wheat. The land application for this facility will consist of the property outlined on the enclosed Land Application Maps and property owned by other farmers in the area whom are given wastewater for nutrients. Land application will take place via a dragline injection system.

Dead Animals

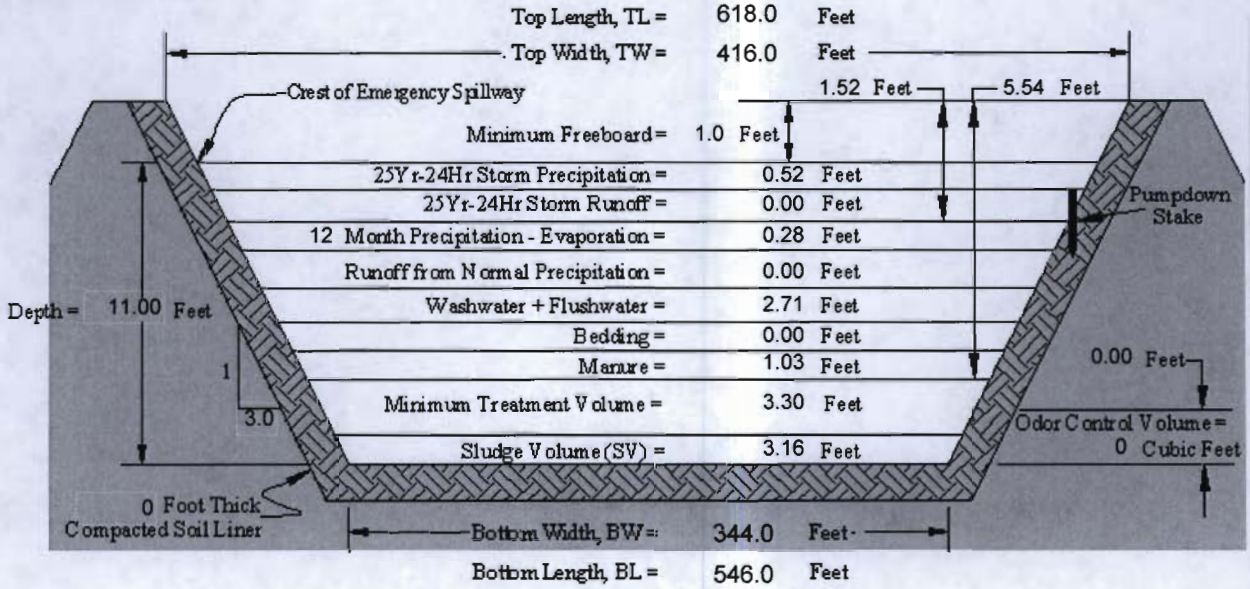
Dead animals will be disposed of in accordance with the Missouri Department of Agriculture regulations. Dead animals from this operation will be composted on-site in a BioVator and a static pile composter, finished compost will be land applied.

AWM
Anaerobic Lagoon Data for: Z-5 Sow Farm

Designed by: jeb

Facility	**Rectangular Anaerobic Lagoon #1**		
Storage Period	12	***Months***	
Manure	242,226	***Cubic Feet***	1,811,853 ***Gallons***
Bedding	0	***Cubic Feet***	0 ***Gallons***
FlushWater	0	***Cubic Feet***	0 ***Gallons***
WashWater	636,054	***Cubic Feet***	4,757,681 ***Gallons***
Runoff from Drainage Area			
Normal Rainfall	0	***Cubic Feet***	0 ***Gallons***
25Yr-24Hr Storm	0	***Cubic Feet***	0 ***Gallons***
Rainfall on Pond Surface			
25Yr-24Hr Storm	128,544	***Cubic Feet***	961,509 ***Gallons***
Normal Rainfall minus Evaporation	70,664	***Cubic Feet***	528,567 ***Gallons***
Min Treatment Volume.....	707,980	***Cubic Feet***	5,295,690 ***Gallons***
Permanent Additional Storage	454,000	***Cubic Feet***	3,395,920 ***Gallons***
Sludge Volume	165,638	***Cubic Feet***	1,238,972 ***Gallons***
Design Operating Volume...	948,944	***Cubic Feet***	7,098,101 ***Gallons***
Total Storage Volume.....	2,405,106	***Cubic Feet***	17,990,193 ***Gallons***

Structural Volume ..... 2,659,104 ***Cubic Feet***



MMP Input Data from AWM for: Z-5 Sow Farm

Assisted by: ***jeb***

Average Annual Manure Production Stored (for MMP "Analysis" tab)

Facility	Manure		Bedding		Wash Water	Flush Water	Runoff and Extr Precip	Rainfall	Annual Throughput Volume w/o 25Yr Rainfall and Runoff	
	Tons	Gallons	Tons	Gallons	Gallons	Gallons	Gallons	Gallons	Tons	Gallons
Anaerobic Lagoon #1	NA	1811851	NA	0	4757677	0	0	647170	NA	7216698
Annual Total	0	1,811,851	0	0	4,757,677	0	0	647,170	0	7,216,698

Spreadable or Pumpable Capacity (for MMP "Storage" tab)

Facility	Manure		Bedding		Wash Water	Flush Water	Runoff & Extrn Precip	Rainfall	Design Storage Period	Design Volume w/o 25Yr Rainfall and Runoff	
	Tons	Gallons	Tons	Gallons	Gallons	Gallons	Gallons	Gallons	Months	Tons	Gallons
Anaerobic Lagoon #1	NA	1811853	NA	0	4757681	0	0	647174	12	NA	7216708

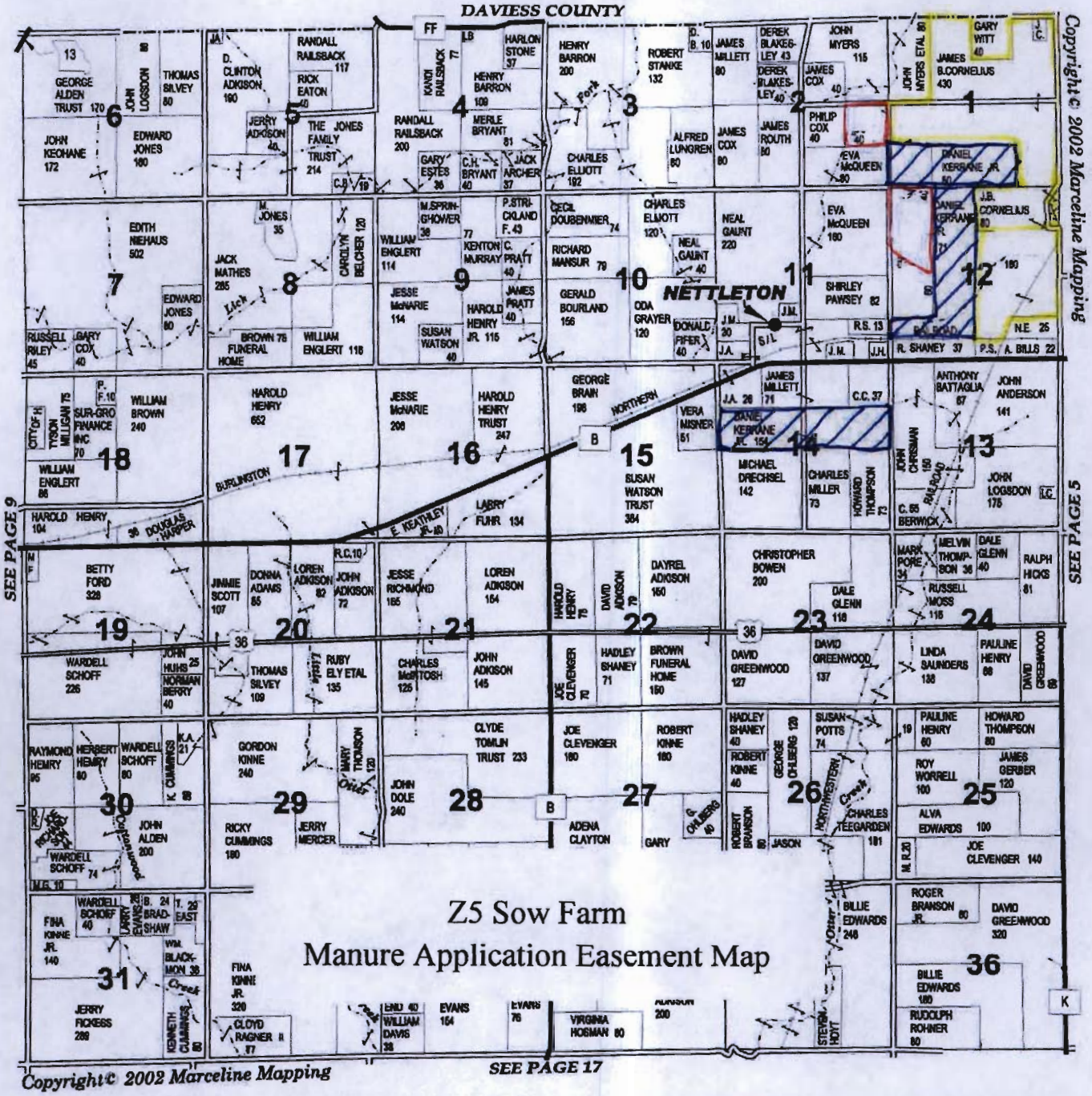
Animal Production Data

Animal	Type of Animal	Number	Weight in Lb	Manure Produced per Animal Unit in CF/Day	Total Manure Produced in CF/Day	Annual Manure Produced in CF	Annual Manure Produced in Gal
Gestating	Swine	2180	375	0.44	359.70	131,650	984,743
Lactating Sow	Swine	432	450	0.96	186.62	68,303	510,906
Grow-Finish	Swine	1500	175	0.44	115.50	42,273	316,202
Totals		4112	N/A	N/A	661.82	242,226	1,811,851

Annual Production vs Storage

Manure Stored			Manure Not Captured		
(CF)	(Gal)	(Lbs)	(CF)	(Gal)	(Lbs)
242226	1811850	14533560	0	0	0

TOWNSHIP 57N • RANGE 27W



Caldwell County

Owned Property

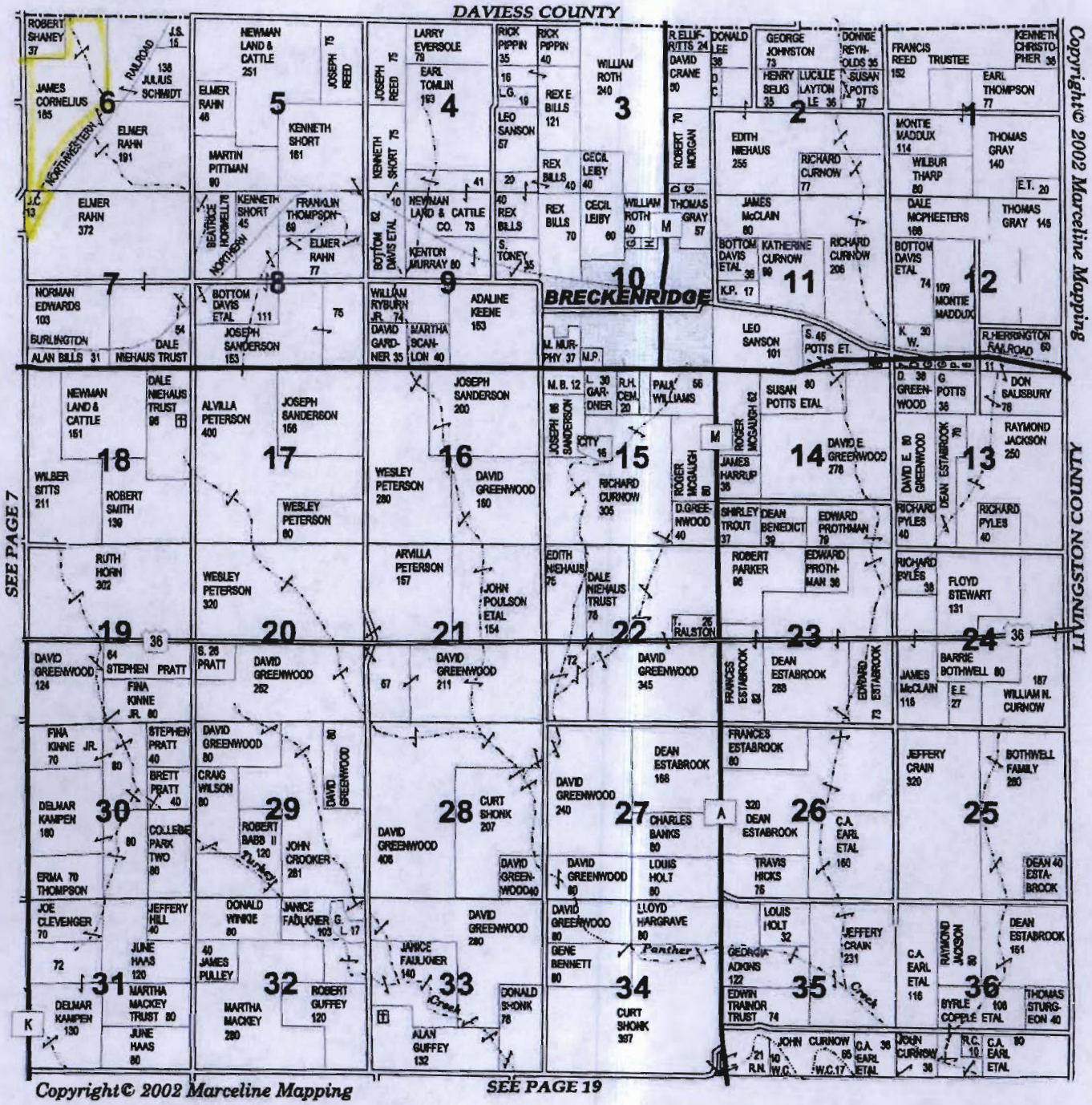
Formal Easement

Verbal Easement

210 N, Davis Street
Hamilton, MO 64644

(816) 583-2500

TOWNSHIP 57N • RANGE 26W



X

COPY

EASEMENT

THIS EASEMENT is granted this 10th day of February, 1997, by DANIEL M. KERRANE, JR. (hereinafter referred to as "Grantor") to WARREN ZELLER and BERNADETTE ZELLER, husband and wife (hereinafter collectively referred to as "Grantee").

RECITALS:

A. Contemporaneous with the execution of this Easement Agreement, Grantor purchased from Byron G. Simpson and Janice M. Simpson the following described real property, hereinafter referred to as "Tract A":

> The Southeast Quarter of the Southwest Quarter and the Southwest Quarter of the Southeast Quarter of Section 1, Township 57, Range 27, Caldwell County, Missouri.
>
> The East Half of the Northwest Quarter and the Southwest Quarter of Section 12, Township 57, Range 27, except the South 37 acres thereof, and except the North 20 acres of the West Half of the Southwest Quarter of Section 12, Township 57, Range 27, Caldwell County, Missouri.
>
> The South Half of the Northwest Quarter and the South Half of the Northeast Quarter of Section 14, Township 57, Range 27, Caldwell County, Missouri.

B. Grantee has also recently purchased a certain tract of real property from Byron G. Simpson and Janice M. Simpson, which property shall hereinafter be referred to as "Tract B" and is described as follows:

> A 59.6813 acre tract in the West 1/4 of Section 12, T57N, R27W, Caldwell County, Missouri. The tract being the SW 1/4 of the NW 1/4 and the north 20 acres of the NW 1/4 of the SW 1/4 of said Section 12 is more particularly described as follows: Beginning at the West 1/4 corner of Section 12, T57N, R27W of the Fifth Principal Meridian; Thence North 0 degrees 22 minutes 34 seconds West along the Section line, 1325.53 feet to the NW corner of SW 1/4 of the NW 1/4; Thence North 88 degrees 56 minutes 16 seconds East, 1304.42 feet to the NE corner of the SW 1/4 of the NW 1/4; Thence South 0 degrees 22 minutes 47 seconds East, 1324.81 feet to the SE corner of the SW

1/4 of the NW 1/4; Thence South 0 degrees 18 minutes 01 seconds East, 667.74 feet to the SE corner of the North 20 acres of the NW 1/4 of the SW 1/4; Thence South 88 degrees 54 minutes 23 seconds West, 1305.13 feet to the SW corner of the North 20 acres of the NW 1/4 of the SW 1/4; Thence North 0 degrees 14 minutes 49 seconds West, 677.75 feet to the point of beginning. The bearings are referenced from State Plane Grid North determined by a solar observation. This tract is subject to a 25 foot easement along the west side for use as a public road and utilities.

C. Pursuant to the Contract for Sale of Real Estate between the Grantor and Byron G. Simpson and Janice M. Simpson, Grantor agreed to provide the following easement to Grantee.

NOW, THEREFORE, Grantor does by these presents grant, bargain, sell, transfer and convey unto Grantee, as owner of "Tract B", and their successors in title and assigns, a perpetual easement for pumping and spreading hog waste products generated on "Tract B" over and through "Tract A" by pumping, spreading or any other means approved by the Missouri Department of Natural Resources.

TO HAVE AND TO HOLD the same, with all rights and appurtenances to the same belonging unto Grantee, their successors in title and assigns, until the use of the easement is relinquished or abandoned, including (a) the right of ingress and egress to and from the easement by reasonable routes across Grantor's property; and (b) the right to install temporary or permanent gates in any fences crossing the easement.

2. Grantee and their successors in title and assigns shall reimburse the owner of "Tract A" for any damage to any improvements or crops located on "Tract A" which is caused by the exercise of spreading rights granted by this Easement.

3. The easement rights and obligations provided for herein shall run with the land and shall be binding upon Grantor and Grantee and their respective successors in title and assigns.

IN WITNESS WHEREOF, Grantor and Grantee have executed this Easement effective the day and year first above written.

GRANTOR:

Lee R Schuster

DANIEL M. KERRANE, JR.

By: Lee R. Schuster

LEE R. SCHUSTER, AGENT FOR
DANIEL M. KERRANE, JR.

GRANTEE:

WARREN ZELLER

BERNADETTE ZELLER

STATE OF MISSOURI)
)SS. RECORDER'S CERTIFICATE
COUNTY OF CALDWELL)

I Beverly Graham, Recorder of Deeds of said county do hereby certify that the within instrument of writing was on the 24th of October A.D.2000, at 8 o'clock and 30 minutes A.M., duly filed in Book 185 at Page 509;

IN WITNESS WHEREOF, I hereunto set my hand and seal at Kingston, Missouri, this 24th day of October 2000.
Beverly Graham, Recorder.

(SEAL)

By Charlene Ward Deputy
Charlene Ward Fee$ 27.00 paid

STATE OF MISSOURI)
: ss.
COUNTY OF ~~BUCHANAN~~ LIVINGSTON)

On this 10th day of February, 1997, before me, a Notary Public, personally appeared LEE R. SCHUSTER, Attorney-in-Fact for DANIEL M. KERRANE, JR. under Power of Attorney dated December 25, 1996, known to me to be the person described in and who executed the foregoing instrument on behalf of said Daniel M. Kerrane, Jr., and acknowledged to me that said Daniel M. Kerrane, Jr., is now living and said Power of Attorney has not been revoked, and that he executed the foregoing instrument for the purposes therein stated, as the free act and deed of Daniel M. Kerrane,Jr., and said Attorney-in-Fact declared the said Daniel M. Kerrane, Jr. to be single and unmarried.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my office in the aforesaid county and state, the day and year last above written.

(SEAL)

Floyd A. Cleveland
NOTARY PUBLIC

My commission expires: Jan. 10, 1998.

STATE OF MISSOURI)
: ss.
COUNTY OF BUCHANAN)

On this 10th day of February, 1997, before me, a Notary Public, personally appeared WARREN ZELLER and BERNADETTE ZELLER, his wife, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my office in the aforesaid county and state, the day and year last above written.

(SEAL)

Floyd A. Cleveland
NOTARY PUBLIC

My commission expires: Jan. 10, 1998.

X

COPY

EASEMENT

THIS EASEMENT is granted this 10th day of February, 1997, by DANIEL M. KERRANE, JR. (hereinafter referred to as "Grantor") to BYRON G. SIMPSON and JANICE M. SIMPSON, husband and wife (hereinafter collectively referred to as "Grantee").

RECITALS:

A. Contemporaneous with the execution of this Easement Agreement, Grantor purchased from Grantee the following described real property, hereinafter referred to as "Tract A":

> The Southeast Quarter of the Southwest Quarter and the Southwest Quarter of the Southeast Quarter of Section 1, Township 57, Range 27, Caldwell County, Missouri.
>
> The East Half of the Northwest Quarter and the Southwest Quarter of Section 12, Township 57, Range 27, except the South 37 acres thereof, and except the North 20 acres of the West Half of the Southwest Quarter of Section 12, Township 57, Range 27, Caldwell County, Missouri.
>
> The South Half of the Northwest Quarter and the South Half of the Northeast Quarter of Section 14, Township 57, Range 27, Caldwell County, Missouri.

B. Grantee has retained a certain tract of real property which is adjacent to "Tract A". The tract of real property retained by Grantee shall be hereinafter referred to as ""Tract B"" and is described as follows:

> All of the Northwest Quarter of the Northwest Quarter of Section 12, Township 57, Range 27, Caldwell County, Missouri.

C. Pursuant to the Contract for Sale of Real Estate between the parties, Grantor agreed to provide the following easement to Grantee.

NOW, THEREFORE, Grantor does by these presents grant, bargain, sell, transfer and convey unto Grantee, as owner of "Tract B", and their successors in title and assigns, a perpetual easement for pumping and spreading hog waste products generated on "Tract B" over and through "Tract A" by pumping, spreading or any other means approved by the Missouri Department of Natural Resources.

TO HAVE AND TO HOLD the same, with all rights and appurtenances to the same belonging unto Grantee, their successors in title and assigns, until the use of the easement is relinquished or abandoned, including (a) the right of ingress and egress to and from the easement by reasonable routes across Grantor's property; and (b) the right to install temporary or permanent gates in any fences crossing the easement.

2. Grantee and their successors in title and assigns shall reimburse the owner of "Tract A" for any damage to any improvements or crops located on "Tract A" which is caused by the exercise of spreading rights granted by this Easement.

3. The easement rights and obligations provided for herein shall run with the land and shall be binding upon Grantor and Grantee and their respective successors in title and assigns.

IN WITNESS WHEREOF, Grantor and Grantee have executed this Easement effective the day and year first above written.

GRANTOR:

DANIEL M. KERRANE, JR.

By: Lee R. Schuster

LEE R. SCHUSTER, AGENT FOR
DANIEL M. KERRANE, JR.

GRANTEE:

BYRON G. SIMPSON

JANICE M. SIMPSON

STATE OF MISSOURI)
: ss.
COUNTY OF ~~BUCHANAN~~ LIVINGSTON)

On this 10th day of February, 1997, before me, a Notary Public, personally appeared LEE R. SCHUSTER, Attorney-in-Fact for DANIEL M. KERRANE, JR. under Power of Attorney dated December 25, 1996, known to me to be the person described in and who executed the foregoing instrument on behalf of said Daniel M. Kerrane, Jr., and acknowledged to me that said Daniel M. Kerrane, Jr., is now living and said Power of Attorney has not been revoked, and that he executed the foregoing instrument for the purposes therein stated, as the free act and deed of Daniel M. Kerrane,Jr., and said Attorney-in-Fact declared the said Daniel M. Kerrane, Jr. to be single and unmarried.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my office in the aforesaid county and state, the day and year last above written.

(SEAL)

NOTARY PUBLIC

My commission expires: Jan 10, 1998.

STATE OF MISSOURI)
: ss.
COUNTY OF ~~BUCHANAN~~ LIVINGSTON)

On this 20th day of February, 1997, before me, a Notary Public, personally appeared BYRON G. SIMPSON and JANICE M. SIMPSON, his wife, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my office in the aforesaid county and state, the day and year last above written.

(SEAL)

Floyd A. Clearwood
NOTARY PUBLIC

My commission expires: Jan 10, 1998.

Commitment No. See Schedule A

COPY

COMMITMENT FOR TITLE INSURANCE

ISSUED BY

First American Title Insurance Company

AGREEMENT TO ISSUE POLICY

We agree to issue a policy to you according to the terms of this Commitment. When we show the policy amount and your name as the proposed insured in Schedule A, this Commitment becomes effective as of the Commitment Date shown in Schedule A.

If the Requirements shown in this Commitment have not been met within six months after the Commitment Date, our obligation under this Commitment will end. Also, our obligation under this Commitment will end when the Policy is issued and then our obligation to you will be under the Policy.

Our obligation under this Commitment is limited by the following:

The Provisions in Schedule A.

The Requirements in Schedule B-I.

The Exceptions in Schedule B-II.

The Conditions on the other side of this page 1.

This Commitment is not valid without SCHEDULE A and Sections I and II of SCHEDULE B.

FIRST AMERICAN TITLE INSURANCE COMPANY has caused this Commitment to be signed and sealed by its authorized officers and the Commitment will become valid when countersigned by an authorized signatory as of Effective Date shown in Schedule A.

First American Title Insurance Company

BY Gary L. Kennett PRESIDENT

ATTEST Mark R. Arneson SECRETARY

COUNTERSIGNED James A. Staton

STATON ABSTRACT & TITLE CO.
516 Washington St. – PO Box 168
Chillicothe, MO 64601
(P) 660-646-1421 (F) 660-646-1441

M-0109 (8/06) 20M

Page 1

02/26/2007 15:49 6606464544 CLEAVELAND MACOUBRIE PAGE 01/05

Conditions

1. DEFINITIONS
(a) "Mortgage" means mortgage, deed of trust or other security instrument. (b) "Public Records" means title records that give constructive notice of matters affecting the title according to the state law where the land is located.

2. LATER DEFECTS
The Exceptions in Schedule B - Section II may be amended to show any defects, liens or encumbrances that appear for the first time in the public records or are created or attach between the Commitment Date and the date on which all of the Requirements (a) and (b) of Schedule B - Section I are met. We shall have no liability to you because of this amendment.

3. EXISTING DEFECTS
If any defects, liens or encumbrances existing at Commitment Date are not shown in Schedule B, we may amend Schedule B to show them. If we do amend Schedule B to show these defects, liens or encumbrances, we shall be liable to you according to Paragraph 4 below unless you knew of this information and did not tell us about it in writing.

4. LIMITATION OF OUR LIABILITY
Our only obligation is to issue to you the Policy referred to in this Commitment, when you have met its Requirements. If we have any liability to you for any loss you incur because of an error in this Commitment, our liability will be limited to your actual loss caused by your relying on this Commitment when you acted in good faith to:

comply with the Requirements shown in Schedule B - Section I

or

eliminate with our written consent any Exceptions shown in Schedule B - Section II.

We shall not be liable for more than the Policy Amount shown in Schedule A of this Commitment and our liability is subject to the terms of the Policy form to be issued to you.

5. CLAIMS MUST BE BASED ON THIS COMMITMENT
Any claim, whether or not based on negligence, which you may have against us concerning the title to the land must be based on this Commitment and is subject to its terms.

SCHEDULE A

Number: 0702068F

Effective Date: February 14, 2007 08:00 am

1. Owner's Policy to be issued: (ALTA Owner's Policy (10-17-92) **Amount: $240,000.00**

   Proposed Insured:

   TRAGER LIMESTONE, L.L.C.,
   A MISSOURI LIMITED LIABILITY COMPANY

   Loan Policy to be issued: (ALTA Loan Policy (10-17-92) **Amount: $.00**

   Proposed Insured:

2. The estate or interest in the land described or referred to in this Commitment and covered herein is a fee simple and title thereto is at the effective date hereof vested in :

   ERIC WOJCIKIEWICZ AND DR. WILLIAM HELLER, CO-TRUSTEES UNDER GST NON-EXEMPT QTIP MARITAL TRUST U/A DANIEL M. KERRANE, JR. DATED JULY 16, 2002

3. The land referred to in this Commitment is described as follows:

   Situate in the County of Caldwell, State of Missouri, to-wit:

   The Southeast Quarter (SE¼) of the Southwest Quarter (SW¼) and the Southwest Quarter (SW¼) of the Southeast Quarter (SE¼) of Section One (1), Township Fifty-seven (57), Range Twenty-seven (27), Caldwell County, Missouri; and

   The Northeast Quarter (NE¼) of the Northwest Quarter (NW¼) of Section Twelve (12), Township Fifty-seven (57), Range Twenty-seven (27), Caldwell County, Missouri.

COPY

SCHEDULE B

Upon payment of the full consideration to, or for the account of, the grantors or mortgagors, and recording of the deeds and/or mortgages, the form and execution of which is satisfactory to the Company, the policy or policies will be issued containing exceptions in Schedule B thereof to the following matters (unless the same are disposed of to the satisfaction of the Company):

1. If an owner's policy is to be issued, the mortgage encumbrance, if any, created as part of the purchase transaction.

2. Defects, liens, encumbrances, adverse claims or other matters, if any, created, first appearing in the public records or attaching subsequent to the effective date hereof but prior to the date the proposed Insured acquires for value of record the estate or interest or mortgage thereon covered by this commitment.

3. Rights or claims of parties in possession not shown by the public records.

4. Encroachments, overlaps, boundary line disputes, and any other matters which would be disclosed by an accurate survey and inspection of the premises.

5. Easements or claims of easements not shown by the public records.

6. Any lien, or right to a lien, for services, labor or material heretofore or hereafter furnished, imposed by law and not shown by the public records.

7. Taxes or special assessments which are not shown as existing liens by the public records.

8. General and special taxes and assessments as hereafter listed, if any (all amounts shown being exclusive of interest, penalties and costs):

2007 Taxes County = $325.00

X 9. Easement dated February 10, 1997, executed by Daniel M. Kerrane, Jr., to Byron G. Simpson and Janice M. Simpson, husband and wife, for the purposes therein stated, as therein described, recorded in Book 178, Page 568.

X 10. Water Easement dated February 10, 1997, executed by Daniel M. Kerrane, Jr., to Byron G. Simpson and Janice M. Simpson, husband and wife, for the purposes therein stated, as therein described, recorded in Book 178, Page 569.

X 11. Easement for pumping and spreading of hog waste to Warren and Bernadette Zeller, husband and wife, recorded in Book 185, Page 509.

X 12. Water Easement to Warren and Bernadette Zeller, husband and wife, recorded in Book 185, Page 510.

13. Deed of Trust dated January 30, 1997, recorded February 10, 1997 in Book 93, Page 126 from, Daniel M. Kerrane, Jr., a single person, to Farm Credit Services of Western Missouri, FLCA which secures a debt as more fully set forth therein.

Missouri NRCS
Comprehensive Nutrient Management Plan (CNMP)

Z-5 Sow Farm

This report is designed to document the compliance of this operation with the requirements of the Missouri NRCS Comprehensive Nutrient Management Plan (CNMP).

Prepared By:
Jeff E. Browning, PE
PO Box 29
Bowling Green, MO 63334
PHONE: (573)324-6860
FAX: 573 324-6818

Plan Period: April 2016 – March 2021

Signature Page

Manure and Wastewater Handling and Storage

Name: Jeff E. Browning
Title: Professional Engineer
Certification Credentials: Professional Engineer MO Number: E-28664, NRCS TSP 05-4871

Signature: _____ Date: _____

Nutrient Management Planner

The Nutrient Management component of this plan meets the minimum standards and specification for the Missouri Nutrient Management 590 and Waste Utilization 633 Conservation Practice Standards and Missouri DNR CAFO Nutrient Management Technical Standard.

Name: Jeff E. Browning
Title: Professional Engineer
Certification Credentials: Professional Engineer MO Number: E-28664, NRCS TSP 05-4871

Signature: _____ Date: _____

Owner/Operator

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

Signature: _____ Date: _____
Name: United Hog Systems

Revisions, Reviews and Inspections

Date of Review or Revision	Planner ID	Planner Certification	Revision Page Number(s)	Comments

Comments:

Table of Contents

Appendix

Section 1. Background and Site Information

1.1. General Description of Operation

Manure sampling frequency

It is required that a sample be taken from each manure source annually for a precise nutrient measurement.

Soil testing frequency

Soil sampling will be implemented once every five years, at a minimum, to monitor the phosphorus, potassium (K), calcium, magnesium, pH, organic matter, and cation exchange capacity (CEC) levels and adjust nutrient application rates for each field. A standard soil sampling protocol (MU Guide: "How To Get A Good Soil Sample") should be followed.

The latest soil test were performed in September of 2015. The results are summarized in Table 6-3 and copies of the test are available in the Appendix of this plan.

P levels are projected to rise in the fields most utilized for manure application over the planning period. This farm is nutrient deficient and needs the manure and commercial fertilizers to increase soil potential. The pH levels in some fields are low. It is important that lime be added to each field when necessary as a neutralizing amendment to increase the pH levels. Low pH levels prevent nutrient availability to the plants and decrease yields.

Soil test should be taken prior to January 2020. A comprehensive review of the nutrient and pH levels shall be performed between the soil samples and this plan and adjustments should be made as necessary.

Equipment calibration method and frequency

The land application system will employ an owned manure spreader. The spreading area is as noted on the Field Maps included with this plan.

The goal of the manure spreader calibration methods is to quantify the amount of manure being applied per acre and make necessary adjustments to control that rate to achieve the desired goal. It will be necessary to define the amount of manure the spreader will hold and measure the effective spreading width. You can then measure the length of one application pass and calculate the area applied and use this information to quantify the spreaders application rate. The methods in the O&M Plan can be used along with others such as calculating manure density and measuring spreader capacity accordingly. You can always call Jeff Browning when adjusting spreader rates to help with calculations and determinations.

Equipment should be adjusted annually or when there is reason to suspect the known application rates are not accurate.

Method A

The average application rate in gallons or tons per acre can be calculated if the area over which one or more loads of manure has been spread is measured.

- To measure the area covered by one spreader load:
  - Mark the tractor tire by tying a piece of rope around some point on the tire. Move the tractor forward until the rope is on the ground. Mark the ground below the rope. Drive forward until the rope on the tire is on the ground again. Mark this point. Measure the distance in feet between the two marks on the ground. This is the travel distance for one tire revolution.
  - Count the number of times the tire mark comes to the top of the tire while spreading a load of manure in a straight line. Multiply this number by the distance found for one

revolution in Step 1a. The result is the total length of manure spreader travel while unloading one load.
    - Measure the width of the spread manure path or travel lane spacing in feet.
    - Multiply the width of the path by the length of travel and divide by 43,560 to get the acres covered in spreading one load.
- Calculate the manure application rate as follows:
    - Divide the tons or gallons of manure applied by the area covered (in acres) to get tons, or gallons per acre. Also, divide the pounds of nutrients per load by the area covered to get pounds of nutrients per acre.
    - If more than one load is spread and the areas of coverage overlap, then use the net width of the coverage between the first and last path. Use the average length of a travel path multiplied by the net width to find the area.

Method B

This method can be used to measure or adjust the application rate of a spreader without measuring the entire area of application or knowing the capacity of the manure spreader. With this method, a sheet of plastic is placed on the ground in the spreader path. The spreader is passed over the sheet at the normal operating speed. The manure is collected on the sheet and weighed. The application rate is the collected manure weight divided by the sheet area.

- Collect the spread manure.
    - Select a sheet of plastic 8-by-8 feet, or larger.
    - Weigh the sheet.
    - Lay the sheet on the ground.
    - Drive over the sheet while spreading manure at the normal operating speed. Start spreading at least 50 feet away from the sheet.
    - Pick up the sheet and fold it so that you do not lose any manure.
    - Weigh the sheet and manure. Subtract the empty sheet weight to determine the manure weight.
- Calculate the application rate.
    - Determine the area of the plastic sheet by multiplying the width by the length in feet to obtain area in square feet.
    - Multiply the pounds of manure collected by 21.78, then divide the answer by the area of the sheet (in square feet) to obtain the manure application rate in tons per acre.

Repeat the process several times and develop an average to be used as the application rate of the spreader. By conducting Method B at different travel speeds and spreader settings, the proper spreader settings and travel speeds can be determined to obtain the desired application rate.

This method does not account for overlap or space missed between spreader paths and will only give a true picture of the application rate when the manure is uniformly distributed over the field.

Clean water diversion & Measures to prevent direct contact of animals with water

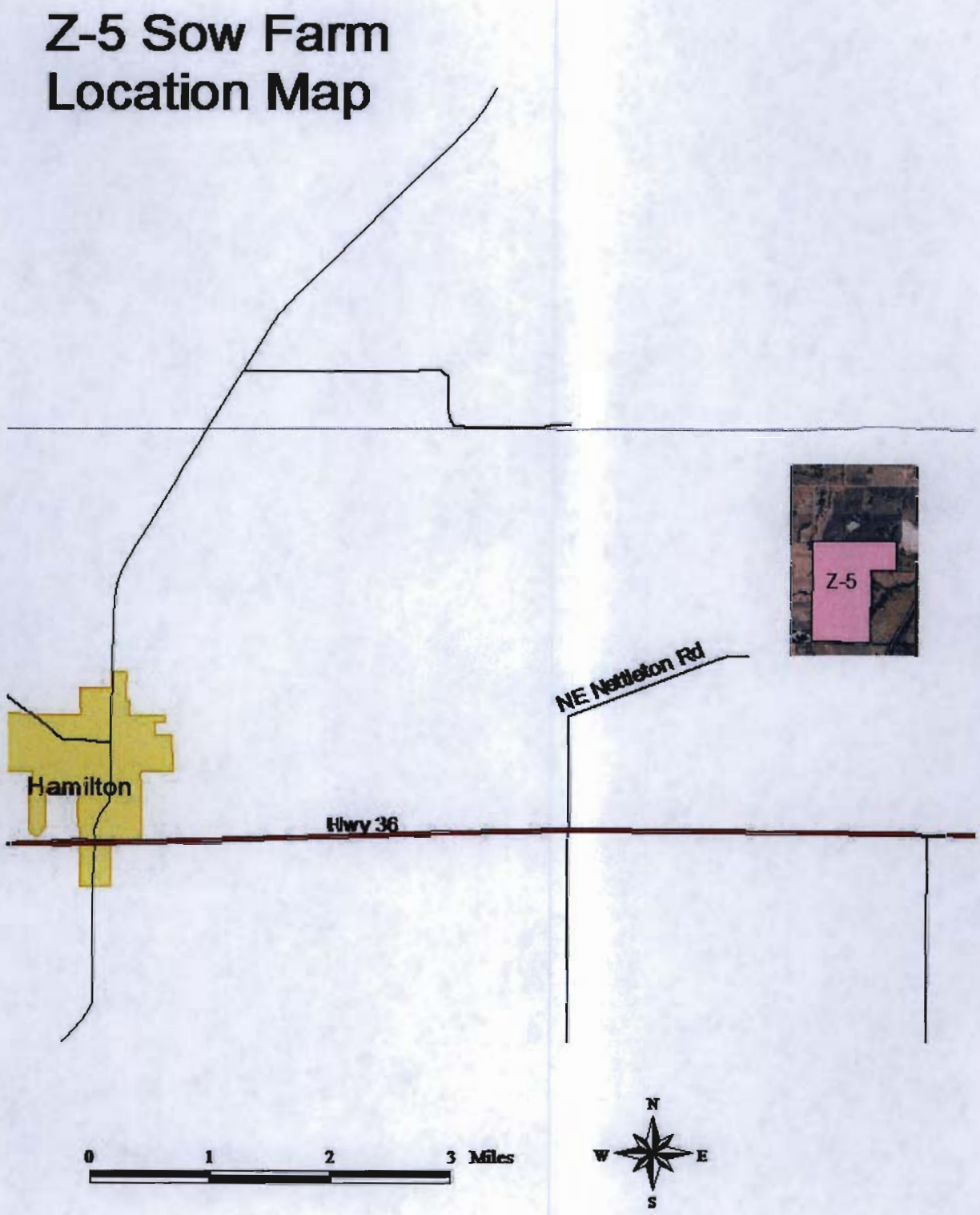
Manure storage facilities on this farm are graded to prevent surface runoff from entering the storage area.

1.3. Natural Resource Concerns

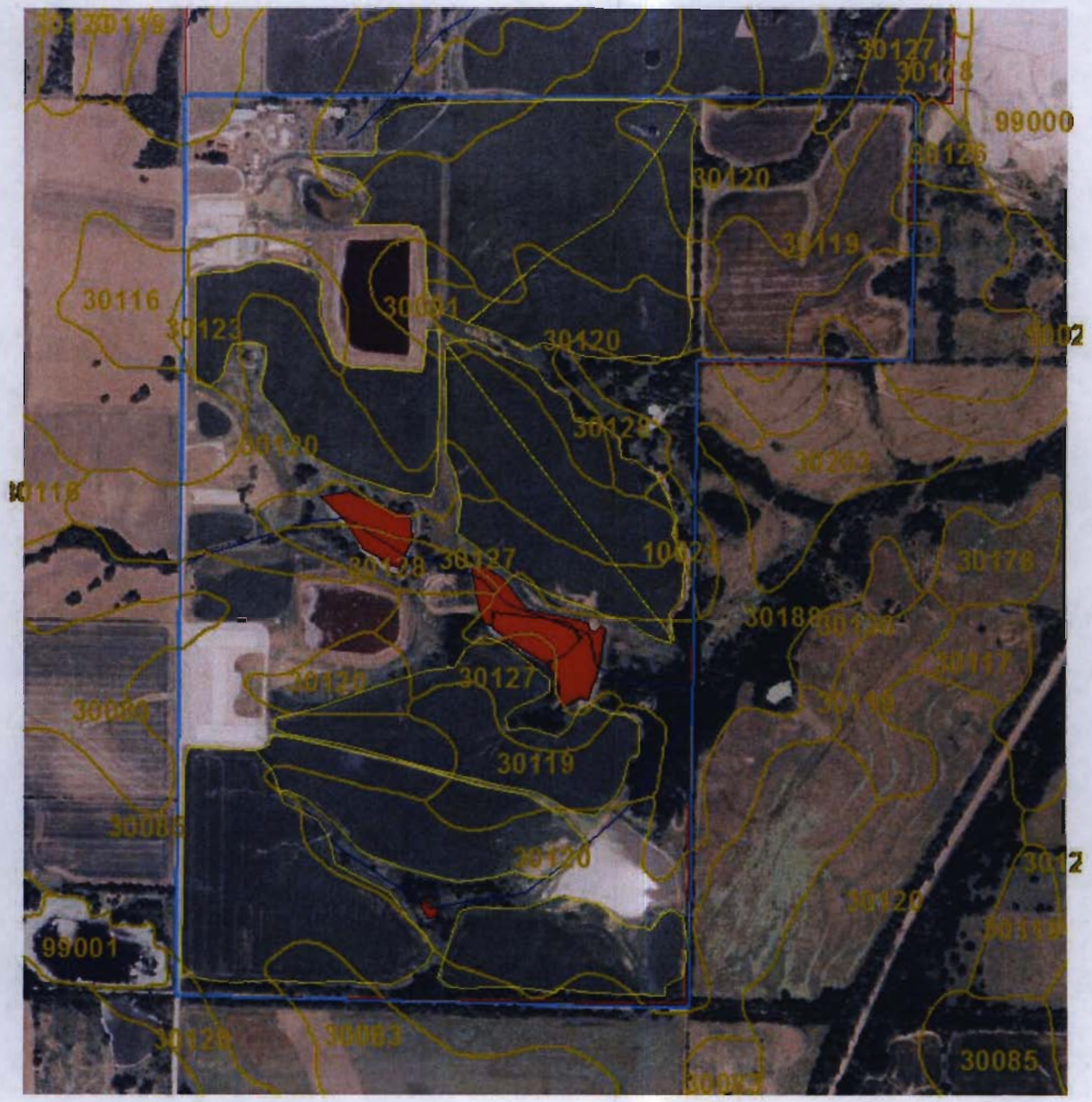
There are no abnormal resource concerns to be addressed at this time.

Section 2. Manure and Wastewater Handling and Storage

2.1. Map of Production Area



Z5 Sow Farm, Year:2016
Soils Map



Soil Map Units

0 500 1000 1500 Feet

N
W E
S

2.2. Production Area Conservation Practices

No new production practices are planned at this time.

All NRCS conservation practices shall be installed, operated and maintained according to NRCS conservation practice standards and associated technical specifications.

2.3. Manure Storage

Storage ID	Type of Storage	Pumpable or Spreadable Capacity	Annual Manure Collected	Maximum Days of Storage
Lagoon	Lagoon, 1 stage, <=15' deep	7,216,708 Gal	7,216,698 Gal	365
Composter	Animal mortality compost	50 Tons	43 Tons	>365

2.4. Animal Inventory

Animal Group	Type or Production Phase	Number of Animals	Average Weight (Lbs)	Confinement Period	Manure Collected (%)	Storage Where Manure Will Be Stored
Z5 Sow Farm	Gestating sow	2,180	375	Jan Early - Dec Late	100	Lagoon
Z5 Sow Farm - F	Sow & litter	432	450	Jan Early - Dec Late	100	Lagoon
Z5 GDU Barn	Gestating sow	1,500	175	Jan Early - Dec Late	100	Lagoon

(1) Number of Animals is the average number of animals that are present in the production facility at any one time.
(2) If Manure Collected is less than 100%, this indicates that the animals spend a portion of the day outside of the production facility or that the production facility is unoccupied one or more times during the confinement period.

2.5. Normal Animal Mortality Management

To decrease non-point source pollution of surface and ground water resources, reduce the impact of odors that result from improperly handled animal mortality, and decrease the likelihood of the spread of disease or other pathogens, approved handling and utilization methods shall be implemented in the handling of normal mortality losses. If on-farm storage or handling of animal mortality is done, NRCS Standard 316, Animal Mortality Facility, will be followed for proper management of dead animals.

It is estimated that approximately 50 tons of finished compost will be generated in the average year. Dead animals will be disposed of in accordance with the Missouri Department of Agriculture regulations. Dead animals from the sow farm will be composted and from the nursery will be incinerated.

Plan for Proper Animal Mortality Management

The following narrative describes how normal animal mortality will be managed in a manner that protects surface and ground water quality.

For dead animals that will be composted. The proper carbon to nitrogen ratio shall be maintained by using a mix of 100 cubic feet of sawdust per 1000 pounds of carcass or other mix a specified to maintain a carbon to nitrogen ratio of 20-30 to 1. Ammonium nitrate may be added as needed to reach the optimum CN ratio.
The proper moisture content shall be maintained at 50-60 percent by: 1) using damp (but not wet) sawdust, 2) Adding extra water as needed, or 3) allowing green (wet) sawdust to dry before using in compost.
The temperature of the compost shall be monitored and shall reach a minimum of 135 degrees F. The temperature probe shall penetrate one third of the distance from the outside of the pile to the center of mass. Compost that does not reach this temperature shall be dismantled, corrected, and rebuilt in order to reach optimal temperature. When the temperature of the compost reaches 105 degrees F, compost shall be turned to a secondary storage bin.
The following shall be followed: 1) One foot of sawdust shall be placed on the bottom of the bin. 2) Carcasses shall be placed in layers with at least one foot of sawdust in between each layer. 3) Carcasses shall be completely covered with at least one foot of sawdust. 4) Large carcasses shall have one foot of sawdust in between carcasses within a layer. 5) A minimum of 6 inches of sawdust shall be maintained between the carcasses and the sides of the bins.
Compost shall be loaded in bins in the following manner: 1) The first bin shall be filled over a two month period. 2) The second bin shall be filled over the second two month period. 3) After the second two month period, compost from the first bin shall be turned into the third bin for secondary composting. 4) Bin number 1 shall now be filled again for two months. 5) After the two month period, compost from bin 3 shall be removed for final disposal and bin 2 shall be turned to bin 3. 6) bin 2 shall now be filled again. This method shall then be repeated as necessary.

2.6. Planned Manure Exports off the Farm

Month-Year	Manure Source	Amount	Receiving Operation	Location
Apr 2017	Composter	30 Tons	Export Farms	
Apr 2017	Lagoon	5,000,000 Gal	Export Farms	
Apr 2018	Composter	40 Tons	Export Farms	
Apr 2018	Lagoon	5,000,000 Gal	Export Farms	
Apr 2019	Composter	45 Tons	Export Farms	
Apr 2019	Lagoon	5,000,000 Gal	Export Farms	
Apr 2020	Composter	40 Tons	Export Farms	
Apr 2020	Lagoon	5,000,000 Gal	Export Farms	
Apr 2021	Composter	40 Tons	Export Farms	

2.7. Planned Manure Imports onto the Farm

Month-Year	Manure's Animal Type	Amount	Originating Operation	Location

(None)

2.8. Planned Internal Transfers of Manure

Month-Year	Manure Source	Amount	Manure Destination

(None)

Section 3. Farmstead Safety and Security

3.1. Emergency Response Plan

In Case of an Emergency Storage Facility Spill, Leak or Failure

Implement the following first containment steps:

1. Stop all other activities to deal with the spill. Turn off the tractor or pumps that may be running.
2. Care for any personal injuries.
3. Assess the extent of the emergency.
   -determine how much help is needed.
   -call for help.
4. Contact appropriate emergency, environmental, or county authorities if assistance is needed.
5. Use a tractor with a blade to contain the spill.
6. Pump spilled manure into the manure spreader and land-apply to an open pasture or into the second pit.
7. Pump the manure in the pit down below the point of the leak or failure. Complete the clean-up and repair the necessary components.
8. File required reports.

In Case of an Emergency Spill, Leak or Failure During Transport or Land Application

Implement the following first containment steps:

1. Stop all other activities to deal with the spill. Turn off the pumps, applicator, or transport vehicle.
2. Care for any personal injuries.
3. Assess the extent of the emergency.
   -determine how much help is needed.
   -call for help.
4. Contact appropriate emergency or traffic control authorities if assistance is needed.
5. Use a tractor with a blade to contain the spill.
6. Pump spilled manure into the tank wagon or any available storage vehicle. Complete the clean-up and repair the necessary components.
7. File required reports.

The land application equipment will be constantly monitored by the person conducting the land application of manure. In order to prevent an accident or spill during land application, the applicator should complete an inspection of the land application equipment to ensure proper function prior to performing land application. In addition, weather conditions (wind speed and direction, precipitation, etc.) and field conditions (proper setbacks noted, soil moisture, etc.) should be verified prior to land application.

Table 3-1. Emergency Contacts

Department / Agency	Phone Number
Fire	911
Ambulance	911
Sheriff	(660)886-5511

Table 3-2. Available equipment/supplies for responding to emergency

Equipment Type	Contact Person	Phone Number
Nearest excavation equipment	On Farm	

Table 3-3. Contacts to be made by the owner or operator within 24 hours

Organization	Phone Number
EPA Region 7 Emergency Spill Hotline	(913) 281-0991
MO Emergency Spill Hotline	(573) 634-2436
Saline County Health Department	(660)886-3434
Saline County Emergency Management	(660)886-3434

Be prepared to provide the following information:

a. Your name and contact information.
b. Farm location and other pertinent identification information.
c. Description of the emergency.
d. Estimate of the amounts, area covered, and distance traveled.
e. Whether manure has reached surface waters or major field drains.
f. Whether there is any obvious damage; i.e., employee injury, fish kill, or property damage.
g. Current status of containment efforts.

Plan for Catastrophic Death Animal Disposal

If the cause of catastrophic loss is from disease, quarantine and euthanize all sick animals.

When catastrophic mortalities do occur contact MO-DNR and the MO state veterinarian for guidance. It is planned that the carcasses will be removed by a rendering company. Keep the carcasses covered until the rendering truck arrives. Rendering trucks often leave a mess at the docking area. Clean up all messes around the dock. Also clean up any messes that spill from the truck as it enters or leaves the facility. Sterilize the barns before bringing new animals into the barn.

3.2. Biosecurity Measures

Biosecurity is critical to protecting livestock operations. Visitors must contact and check in with the producer before visiting the operation or entering any production or storage facility.

The following narrative describes how animal veterinary wastes (including medical equipment, empty containers, sharps and expired medications) will be managed at the operation.

All animal veterinary waste on this farm is collected in rigid containers and stored in a dry secure location until taken to a certified landfill by a trash service company.

3.3. Catastrophic Animal Mortality Management

Refer to NRCS standards, or state guidance, regarding appropriate catastrophic animal mortality handling methods.

Plan for Catastrophic Animal Mortality Management

The following narrative describes how catastrophic animal mortality will be managed in a manner that protects surface and ground water quality. All national, state and local laws, regulations and guidelines that protect soil, water, air, plants, animals and human health must be followed.

If catastrophic death loss occurs the composter will be used. If the death loss exceeds the composter capacity a temporary mortality composter will be constructed with large round hay bales.

If it becomes necessary to compost, carcasses should be removed to the composting site as soon as possible. Choose a well-drained location greater than 300' from wells, springs and water supply structures for the catastrophic mortality composter. Sawdust will need to be hauled to the farm for use as a carbon source and cover. Temporary bins can be constructed from hay bales or large concrete blocks. The bin size will depend on the quantity and size of Carcasses lost. Two bins will be constructed.

Burial will be the final choice for mortality management. If in the event it is necessary to bury any animals, the following Missouri Department of Agriculture regulations shall be followed:

1) For areas defined by the Department of Natural Resources, Division of Geology and Land Survey, as not having major groundwater contamination potential (Note: this area is defined as such), the maximum loading rate shall be limited to:

a) Seven cattle, 44 swine, forty seven sheep, and beginning July 1, 1995, four hundred turkey carcasses or 2000 poultry carcasses on any given acre per year; or

b) All other species and immature cattle, swine, sheep, and beginning July 1, 1995, turkeys or poultry shall be limited to 7000 ponds of animals on any given acre per year;

2) The maximum amount of land that shall be used for on-site burial of animals on any person's property during a given year shall be limited to ten percent of the total land owned by that person or

one acre, whichever is greater; and

3) Burial sites shall not be located in low-lying areas subject to flooding; and

4) The lowest elevation of the burial pits shall be six feet or less below the surface of the ground; and

5) The dead animals shall be immediately covered with a minimum of six inches of soil and a final cover of a minimum of thirty inches of soil; and

6) Carcasses shall not be placed on the ground, in a ditch, at the base of a hill, or in a cavern and covered with soil; and

7) The abdominal cavity of carcasses over 150 pounds shall be punctured to allow escape of putrefactive gasses; and

8) The location of dead animal burial sites shall be in accordance with the following separation distances:

a) At least 300 feet from any wells, surface water intake structures, public water supply lakes, springs or sinkholes; and
b) At least 50 feet from adjacent property lines; and
c) At least 300 feet from any existing neighboring residence; and
d) More than 100 feet from any body of surface water such as a stream, lake pond, or intermittent stream.

Important! In the event of catastrophic animal mortality, contact the following authority before beginning carcass disposal:

Authority name: Missouri Department of Natural Resources
Phone number: 573-751-1300

3.4. Chemical Handling

If checked, the indicated measures will be taken to prevent chemicals and other contaminants from contaminating process waste water or storm water storage and treatment systems.

	This is not a regulatory-agency permitted facility. This section does not apply.

	Measure
X	All chemicals are stored in proper containers. Expired chemicals and empty containers are properly disposed of in accordance with state and federal regulations. Pesticides and associated refuse are disposed of in accordance with the FIFRA label.
X	Chemical storage areas are self-contained with no drains or other pathways that will allow spilled chemicals to exit the storage area.
X	Chemical storage areas are covered to prevent chemical contact with rain or snow.
X	Emergency procedures and equipment are in place to contain and clean up chemical spills.
X	Chemical handling and equipment wash areas are designed and constructed to prevent contamination of surface waters and waste water and storm water storage and treatment systems.
	All chemicals are custom applied and no chemicals are stored at the operation. Equipment wash areas are designed and constructed to prevent contamination of surface waters and waste water and storm water storage and treatment systems.

Section 4. Land Treatment

4.1. Map(s) of Fields and Conservation Practices

Z5 Sow Farm, Year:2016
Field Map

0 500 1000 1500 Feet

N
W E
S

Field Name
Acres
Spreadable Acres

Z5 Sow Farm, Year:2016
Environmental Setback Map

0 500 1000 1500 Feet

N
W E
S

Field Name
Acres
Spreadable Acres

4.2. Land Treatment Conservation Practices

All NRCS conservation practices shall be installed, operated and maintained according to NRCS conservation practice standards and associated technical specifications.

4.3. Projected Land Requirements for N-based Versus P-based Management

Calculation Basis	N-based Management	P-based Management
	acres/year	
Projected acres needed for manure application	97.6	195

This farm has 100 total acres and 85 manure spreadable acres.
Estimates based on average plant nutrient availability in manure and average nutrient utilization by crops in this plan.

For these calculations:
Average manure nitrogen availability was calculated to be 100%
Average crop N utilization was calculated to be 207 lbs. N/acre/year
Average crop P_2O_5 utilization was calculated to be 74 lbs. P_2O_5/acre/year.
Note that crop P_2O_5 utilization is based on the greater of recommended P_2O_5 and crop removal P_2O_5 for each field.

Section 5. Soil and Risk Assessment Analyses

5.1. Soil Information

Field	Soil Survey	Map Unit	Soil Component Name	Surface Texture	Slope Range (%)	OM Range (%)	Bedrock Depth (in.)	T Factor t/ac/yr	Drainage	Hydro-logic Group
H8A	025	30085	Grundy	SIL	2-5%	2-4%		5	SPoor	C/D
H8B	025	30120	Lagonda	SICL	5-9%	1-3%		5	SPoor	C/D
H7B	025	30085	Grundy	SIL	2-5%	2-4%		5	SPoor	C/D
H7A	025	30085	Grundy	SIL	2-5%	2-4%		5	SPoor	C/D
H6	025	30120	Lagonda	SICL	5-9%	1-3%		5	SPoor	C/D

5.2. Predicted Soil Erosion, N Leaching Risk & P Index Results

Field	Predominant Soil Type	Slope (%)	Conserva-tion Plan Soil Loss (Ton/A/Yr)	P	D-W	HSG	P INDEX	T Factor (Ton/A/Yr)	N LEACHING INDEX
H8A	30085 (Grundy SIL)	3.5	2.0	17	673	C	Low	5	Low
H8B	30120 (Lagonda SICL)	7.0	3.3	42	693	C	Low	5	Low
H7B	30085 (Grundy SIL)	3.5	2.8	19	434	C	Low	5	Low
H7A	30085 (Grundy SIL)	3.5	2.8	19	304	C	Low	5	Low
H6	30120 (Lagonda SICL)	7.0	4.5	125	540	C	High	5	Low

5.3. Nitrogen and Phosphorus Risk Analyses Nitrogen and Phosphorus Risk Analyses

Leaching Assessment Interpretation:

The objective of the Leaching Index is to identify fields that have high potential for contaminating the ground water with soluble nutrients.

Rating	Interpretation
Low (2 to 4)	Soils have low potential to leach mobile nutrients below the root zone.
Medium (5 to 10)	Soils have a medium potential to leach mobile nutrients below the root zone. Consider site specific land treatments to minimize the potential for leaching losses.
High (>10)	Soils have a high potential to leach mobile nutrients below the root zone. Special considerations for the method, rate, and timing of nutrient applications should be implemented to reduce the potential of losses to ground water resources.

The leaching index is an indicator of the degree to which water percolates below the root zone in certain soils. Water can contain dissolved nutrients, such as nitrates, and thus pose a potential hazard to groundwater. Therefore, the leaching index can be used to identify fields that have a high potential for contaminating groundwater with soluble nutrients.

The dominant soil type for these fields with a hydrologic soil group of C is Grundy & Lagonda, these fields have a low potential to leach mobile nutrients below the root zone. NRCS guidance indicates special considerations for the method, rate, and timing of nutrient applications should be implemented to reduce the potential of losses to groundwater.

It should be recognized that the conservation practices employed by the facility are best management practices that reduce the potential for nutrient leaching losses. Additionally, it should be recognized that manure N is in an organic form, which takes soil microbe activity to slowly convert manure N to mobile nitrate N.

The following are best management practices planned at the facility that will prevent or minimize nutrient leaching losses from application of manure solids and commercial fertilizer:

- Application of manure solids at annual rates not exceeding crop nutrient needs as outline in the NMP

P Assessment Interpretation: The objective of the Missouri P Index is to identify fields that have a high risk for phosphorus loss from erosion and elevated soil test phosphorus.

Rating	Interpretation
Low	Buildup of soil test phosphorus allowed.
Medium	Buildup of soil test phosphorus allowed. Consider implementing phosphorus-based management of manure and other conservation practices to reduce phosphorus loss from the field.
High	Phosphorus applications not to exceed phosphorus removal capacity of the field. Additional land conservation practices to reduce phosphorus loss from this field highly recommended.
Very high	No manure applications allowed. Implement land conservation practices to reduce phosphorus loss from this field.

The phosphorus index is a tool that takes several field factors into account (including soil loss, soil test P level, land cover, hydrology, and distance to surface water) to determine the likelihood of a loss of phosphorus applied in manure that impacts surface water quality. Its purpose is different than the purpose of the agronomic soil test P level—the agronomic soil test P indicates the likelihood of a crop response to added P.

For these fields P-index ratings were in the "Low" to "Medium" range with the exception of H6 which is High.

"Low" and "Medium" risk fields allow the application of phosphorus in manure at a "nitrogen-based rate." This means that manure can be applied at a rate to meet (but not exceed) the annual crop requirement of nitrogen. At this rate phosphorus will usually build in the soil, because the crop's need for phosphorus is exceeded.

Soils that have a "High" risk rating can have phosphorus applied in manure at a "phosphorus-based rate." This means that manure phosphorus can be applied at a rate that does not exceed the crop's need for phosphorus—for a cropping cycle or rotation, which may be more than one year. Typically phosphorus-based manure application rates are lower than nitrogen-based rates.

"Very High" risk fields can have no manure phosphorus applied to them. If it is anticipated that some fields are at risk for moving into the "Very High" risk category, the field should be avoided, or the cropping system can be changed to a system that removes more phosphorus. Often it is necessary to identify additional fields (e.g., a neighbor willing to accept the manure) that might receive excess manure.

At present it is not anticipated that planned manure applications will move fields into the next higher risk level for any field in the next several years.

5.4. Additional Field Data Required by Risk Assessment Procedure(s)

Missouri P Index

Field	Distance to Water (Feet)	Tillage
H8A	673	
H8B	693	
H7B	434	
H7A	304	
H6	540	

Section 6. Nutrient Management

6.1. Field Information

Field ID	Sub-field ID	Total Acres	Spread-able Acres	County	Predominant Soil Type	Slope (%)	Watershed Code	FSA Farm	FSA Tract	FSA Field
H8A		26.1	25.9	Caldwell	30085 (Grundy SIL)					
H8B		16.0	16.0	Caldwell	30120 (Lagonda SICL)					
H7B		12.5	12.5	Caldwell	30085 (Grundy SIL)					
H7A		13.2	12.6	Caldwell	30085 (Grundy SIL)					
H6		18.1	18.0	Caldwell	30120 (Lagonda SICL)					

6.2. Manure Application Setback Distances

Setback distances required for manure application from sensitive features. Distance represents the minimum distance to be maintained between the feature and manure spread on the surface or incorporated into the soil.

Feature	Setback Criteria	Setback Distance (feet)
Public or private drinking water well or other wells including un-plugged abandon wells	All application methods	300
Public or private drinking water lake or impoundment	All application methods	300
Public or private drinking water intake structure	All application methods	300
Classified waters of the state not used as a water supply as defined in 10 CSR 20-7.031(1)F	Permanently vegetated buffer1	35
	No or insufficient vegetated buffer	100
Other public and privately owned lakes and impoundments not used as a water supply including impoundments with no outlet	Permanently vegetated buffer1	35
	Up-gradient, no or insufficient vegetated buffer	100
	Down-gradient, no or insufficient vegetated buffer	35
Other perennial streams, other intermittent streams, canals, drainage ditches and wetlands	Permanently vegetated buffer1	35
	Up-gradient, no or insufficient vegetated buffer	100
	Down-gradient, no or insufficient vegetated buffer	35
Tile line inlet (if left un-plugged during manure application)	Up-gradient, permanently vegetated buffer1	35
	Up-gradient, no or insufficient vegetated buffer	100
	Down-gradient	0
Losing stream	All application methods	300
Cave entrance	All application methods	300
Spring	All application methods	300
Active Sinkhole	All application methods	300
Non-owned occupied residence	Spray irrigation	150
Public use area including non-owned businesses	Spray irrigation	150
Public road	All application methods	50
Property boundary	All application methods	50

1.Vegetated Buffer -A 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 effectively slowing water runoff, enhancing water infiltration, and minimizing the risk of any potential nutrients or pollutants from leaving the field and reaching surface waters.

6.3. Soil Test Data

Field	Test Year	OM (%)	P Test Used	P	K	Mg	Ca	Units	Soil pH	Buffer pH	CEC (meq/ 100g)
H8A	2010	2.9	Bray P1	17	250	312	2,044	ppm	5.8		16.7
H8B	2010	3.0	Bray P1	42	303	317	2,353	ppm	5.9		18.3
H7B	2015	3.6	Bray P1	19	333	258	2,330	ppm	5.7		18.6
H7A	2015	3.6	Bray P1	19	333	258	2,330	ppm	5.7		18.6
H6	2015	3.1	Bray P1	125	298	338	2,066	ppm	5.4		19.4

6.4. Manure Nutrient Analyses

Manure Source	Dry Matter (%)	Total N	NH_4-N	Total P_2O_5	Total K_2O	Avail. P_2O_5	Avail. K_2O	Units	Analysis Source and Date
Lagoon		2.8	2.8	2.0	5.2	2.0	5.2	Lb/1000Gal	PAL #968
Composter		20.0	4.0	2.0	6.0	2.0	6.0	Lb/Ton	MU - WQ 352 "Composting Dead Swine"

(1) Entered analysis may be the average of several individual analyses.
(2) Missouri assumes that 100% of manure phosphorus and 100% of manure potassium is crop available. First-year per-acre nitrogen availability for individual manure applications is given in the Planned Nutrient Applications table. For more information about nitrogen availability in Missouri, see "Calculating Plant-Available Nitrogen and Residual Nitrogen Fertilizer Value in Manure", G9186,12/07 (http://extension.missouri.edu/explore/agguides/soils/g09186.htm).

6.5. Planned Crops and Fertilizer Recommendations

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
H8A	2016	Corn grain	180.0 Bu	175	95	0	162	81	54	
H8A	2017	Soybeans	65.0 Bu	0	65	0	228	55	94	
H8A	2018	Corn grain	180.0 Bu	175	95	0	162	81	54	
H8A	2019	Soybeans	65.0 Bu	0	65	0	228	55	94	
H8A	2020	Corn grain	180.0 Bu	175	95	0	162	81	54	
H8B	2016	Corn grain	180.0 Bu	200	0	0	162	81	54	
H8B	2017	Soybeans	65.0 Bu	0	0	0	228	55	94	
H8B	2018	Corn grain	180.0 Bu	200	0	0	162	81	54	
H8B	2019	Soybeans	65.0 Bu	0	0	0	228	55	94	
H8B	2020	Corn grain	180.0 Bu	200	0	0	162	81	54	
H7B	2016	Corn grain	180.0 Bu	195	90	0	162	81	54	
H7B	2017	Soybeans	65.0 Bu	0	60	0	228	55	94	
H7B	2018	Corn grain	180.0 Bu	195	90	0	162	81	54	
H7B	2019	Soybeans	65.0 Bu	0	60	0	228	55	94	
H7B	2020	Corn grain	180.0 Bu	195	90	0	162	81	54	
H7A	2016	Corn grain	180.0 Bu	195	90	0	162	81	54	
H7A	2017	Soybeans	65.0 Bu	0	60	0	228	55	94	
H7A	2018	Corn grain	180.0 Bu	195	90	0	162	81	54	
H7A	2019	Soybeans	65.0 Bu	0	60	0	228	55	94	
H7A	2020	Corn grain	180.0 Bu	195	90	0	162	81	54	
H6	2016	Corn grain	180.0 Bu	200	0	0	162	81	54	
H6	2017	Soybeans	65.0 Bu	0	0	0	228	55	94	
H6	2018	Corn grain	180.0 Bu	200	0	0	162	81	54	
H6	2019	Soybeans	65.0 Bu	0	0	0	228	55	94	
H6	2020	Corn grain	180.0 Bu	200	0	0	162	81	54	

* Unharvested cover crop or first crop in double-crop system.
[a] Custom fertilizer recommendation.

6.6. Manure Application Planning Calendar – June 2016 through May 2017

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2016 Crop (Prev. Primary Crop)	Jun '16	Jul '16	Aug '16	Sep '16	Oct '16	Nov '16	Dec '16	Jan '17	Feb '17	Mar '17	Apr '17	May '17
H8A	26.1	25.9	Grundy SIL (30085 2-5%)	Corn grain (Soybeans)					X							
H8B	16.0	16.0	Lagonda SICL (30120 5-9%)	Corn grain (Soybeans)					X							
H7B	12.5	12.5	Grundy SIL (30085 2-5%)	Corn grain (Soybeans)					X							
H7A	13.2	12.6	Grundy SIL (30085 2-5%)	Corn grain (Soybeans)					X							
H6	18.1	18.0	Lagonda SICL (30120 5-9%)	Corn grain (Soybeans)					X							
Total	*85.9*	*85.0*							*X*							

No. indicates total loads
"X" indicates other manure apps

Manure Application Planning Calendar – June 2017 through May 2018

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2017 Crop (Prev. Primary Crop)	Jun '17	Jul '17	Aug '17	Sep '17	Oct '17	Nov '17	Dec '17	Jan '18	Feb '18	Mar '18	Apr '18	May '18
H8A	26.1	25.9	Grundy SIL (30085 2-5%)	Soybeans (Corn grain)					X							
H8B	16.0	16.0	Lagonda SICL (30120 5-9%)	Soybeans (Corn grain)					X							
H7B	12.5	12.5	Grundy SIL (30085 2-5%)	Soybeans (Corn grain)					X							
H7A	13.2	12.6	Grundy SIL (30085 2-5%)	Soybeans (Corn grain)					X							
H6	18.1	18.0	Lagonda SICL (30120 5-9%)	Soybeans (Corn grain)					X							
Total	*85.9*	*85.0*							*X*							

No. indicates total loads
"X" indicates other manure apps

Manure Application Planning Calendar – June 2018 through May 2019

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2018 Crop (Prev. Primary Crop)	Jun '18	Jul '18	Aug '18	Sep '18	Oct '18	Nov '18	Dec '18	Jan '19	Feb '19	Mar '19	Apr '19	May '19
H8A	26.1	25.9	Grundy SIL (30085 2-5%)	Corn grain (Soybeans)					X							
H8B	16.0	16.0	Lagonda SICL (30120 5-9%)	Corn grain (Soybeans)					X							
H7B	12.5	12.5	Grundy SIL (30085 2-5%)	Corn grain (Soybeans)					X							
H7A	13.2	12.6	Grundy SIL (30085 2-5%)	Corn grain (Soybeans)					X							
H6	18.1	18.0	Lagonda SICL (30120 5-9%)	Corn grain (Soybeans)					X							
Total	*85.9*	*85.0*							*X*							

No. indicates total loads
"X" indicates other manure apps

Manure Application Planning Calendar – June 2019 through May 2020

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2019 Crop (Prev. Primary Crop)	Jun '19	Jul '19	Aug '19	Sep '19	Oct '19	Nov '19	Dec '19	Jan '20	Feb '20	Mar '20	Apr '20	May '20
H8A	26.1	25.9	Grundy SIL (30085 2-5%)	Soybeans (Corn grain)					X							
H8B	16.0	16.0	Lagonda SICL (30120 5-9%)	Soybeans (Corn grain)					X							
H7B	12.5	12.5	Grundy SIL (30085 2-5%)	Soybeans (Corn grain)					X							
H7A	13.2	12.6	Grundy SIL (30085 2-5%)	Soybeans (Corn grain)					X							
H6	18.1	18.0	Lagonda SICL (30120 5-9%)	Soybeans (Corn grain)					X							
Total	*85.9*	*85.0*							*X*							

No. indicates total loads
"X" indicates other manure apps

Manure Application Planning Calendar – June 2020 through May 2021

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2020 Crop (Prev. Primary Crop)	Jun '20	Jul '20	Aug '20	Sep '20	Oct '20	Nov '20	Dec '20	Jan '21	Feb '21	Mar '21	Apr '21	May '21
H8A	26.1	25.9	Grundy SIL (30085 2-5%)	Corn grain (Soybeans)												
H8B	16.0	16.0	Lagonda SICL (30120 5-9%)	Corn grain (Soybeans)												
H7B	12.5	12.5	Grundy SIL (30085 2-5%)	Corn grain (Soybeans)												
H7A	13.2	12.6	Grundy SIL (30085 2-5%)	Corn grain (Soybeans)												
H6	18.1	18.0	Lagonda SICL (30120 5-9%)	Corn grain (Soybeans)												
Total	*85.9*	*85.0*														

[redacted] No. indicates total loads
"X" indicates other manure apps

6.7. Planned Nutrient Applications (Manure-spreadable Area)

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
H8A	Oct 2016	Soybeans	Lagoon	Injector	1-yr P	32,600 Gal	3.8 mph	844,340 Gal	25.9	88	65	170
H8A	Oct 2017	Corn grain	Lagoon	Injector	Custom	27,000 Gal	4.6 mph	699,300 Gal	25.9	73	54	140
H8A	Apr 2018	Corn grain	18-46-0	Surface broadcast	Supp. P	89 Lbs		2,305 Lbs	25.9	16	41	0
H8A	Apr 2018	Corn grain	82-0-0	Inject	Supp. N	105 Lbs		2,719 Lbs	25.9	86	0	0
H8A	Oct 2018	Soybeans	Lagoon	Injector	1-yr P	32,600 Gal	3.8 mph	844,340 Gal	25.9	88	65	170
H8A	Oct 2019	Corn grain	Lagoon	Injector	Custom	27,000 Gal	4.6 mph	699,300 Gal	25.9	73	54	140
H8A	Apr 2020	Corn grain	18-46-0	Surface broadcast	2-yr	89 Lbs		2,305 Lbs	25.9	16	41	0
H8A	Apr 2020	Corn grain	82-0-0	Inject	Supp. N	105 Lbs		2,719 Lbs	25.9	86	0	0
H8A	Oct 2020	Soybeans	Lagoon	Injector	1-yr P	32,600 Gal	3.8 mph	844,340 Gal	25.9	88	65	170
H8B	Oct 2016	Soybeans	Lagoon	Injector	1-yr P	27,600 Gal	4.5 mph	441,600 Gal	16.0	75	55	144
H8B	Oct 2017	Corn grain	Lagoon	Injector	Custom	27,000 Gal	4.6 mph	432,000 Gal	16.0	73	54	140
H8B	Apr 2018	Corn grain	82-0-0	Inject	Supp. N	155 Lbs		2,480 Lbs	16.0	127	0	0
H8B	Oct 2018	Soybeans	Lagoon	Injector	1-yr P	27,600 Gal	4.5 mph	441,600 Gal	16.0	75	55	144
H8B	Oct 2019	Corn grain	Lagoon	Injector	Custom	27,000 Gal	4.6 mph	432,000 Gal	16.0	73	54	140
H8B	Apr 2020	Corn grain	82-0-0	Inject	Supp. N	155 Lbs		2,480 Lbs	16.0	127	0	0
H8B	Oct 2020	Soybeans	Lagoon	Injector	1-yr P	27,600 Gal	4.5 mph	441,600 Gal	16.0	75	55	144
H7B	Oct 2016	Soybeans	Lagoon	Injector	1-yr P	30,000 Gal	4.1 mph	375,000 Gal	12.5	81	60	156
H7B	Oct 2017	Corn grain	Lagoon	Injector	Custom	27,000 Gal	4.6 mph	337,500 Gal	12.5	73	54	140
H7B	Apr 2018	Corn grain	82-0-0	Inject	Supp. N	132 Lbs		1,650 Lbs	12.5	108	0	0
H7B	Apr 2018	Corn grain	18-46-0	Surface broadcast	Supp. P	78 Lbs		975 Lbs	12.5	14	36	0
H7B	Oct 2018	Soybeans	Lagoon	Injector	1-yr P	30,000 Gal	4.1 mph	375,000 Gal	12.5	81	60	156
H7B	Oct 2019	Corn grain	Lagoon	Injector	Custom	27,000 Gal	4.6 mph	337,500 Gal	12.5	73	54	140
H7B	Apr 2020	Corn grain	18-46-0	Surface broadcast	2-yr	78 Lbs		975 Lbs	12.5	14	36	0
H7B	Apr 2020	Corn grain	82-0-0	Inject	Supp. N	132 Lbs		1,650 Lbs	12.5	108	0	0
H7B	Oct 2020	Soybeans	Lagoon	Injector	1-yr P	30,000 Gal	4.1 mph	375,000 Gal	12.5	81	60	156
H7A	Oct 2016	Soybeans	Lagoon	Injector	1-yr P	30,000 Gal	4.1 mph	378,000 Gal	12.6	81	60	156
H7A	Oct 2017	Corn grain	Lagoon	Injector	Custom	27,000 Gal	4.6 mph	340,200 Gal	12.6	73	54	140
H7A	Apr 2018	Corn grain	18-46-0	Surface broadcast	Supp. P	78 Lbs		983 Lbs	12.6	14	36	0
H7A	Apr 2018	Corn grain	82-0-0	Inject	Supp. N	132 Lbs		1,663 Lbs	12.6	108	0	0

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
H7A	Oct 2018	Soybeans	Lagoon	Injector	1-yr P	30,000 Gal	4.1 mph	378,000 Gal	12.6	81	60	156
H7A	Oct 2019	Corn grain	Lagoon	Injector	Custom	27,000 Gal	4.6 mph	340,200 Gal	12.6	73	54	140
H7A	Apr 2020	Corn grain	82-0-0	Inject	Supp. N	132 Lbs		1,663 Lbs	12.6	108	0	0
H7A	Apr 2020	Corn grain	18-46-0	Surface broadcast	2-yr	78 Lbs		983 Lbs	12.6	14	36	0
H7A	Oct 2020	Soybeans	Lagoon	Injector	1-yr P	30,000 Gal	4.1 mph	378,000 Gal	12.6	81	60	156
H6	Oct 2016	Soybeans	Lagoon	Injector	1-yr P	27,600 Gal	4.5 mph	496,800 Gal	18.0	75	55	144
H6	Oct 2017	Corn grain	Lagoon	Injector	Custom	27,000 Gal	4.6 mph	486,000 Gal	18.0	73	54	140
H6	Apr 2018	Corn grain	82-0-0	Inject	Supp. N	155 Lbs		2,790 Lbs	18.0	127	0	0
H6	Oct 2018	Soybeans	Lagoon	Injector	1-yr P	27,600 Gal	4.5 mph	496,800 Gal	18.0	75	55	144
H6	Oct 2019	Corn grain	Lagoon	Injector	Custom	27,000 Gal	4.6 mph	486,000 Gal	18.0	73	54	140
H6	Apr 2020	Corn grain	82-0-0	Inject	Supp. N	155 Lbs		2,790 Lbs	18.0	127	0	0
H6	Oct 2020	Soybeans	Lagoon	Injector	1-yr P	27,600 Gal	4.5 mph	496,800 Gal	18.0	75	55	144

Planned Nutrient Applications (Non-manure-spreadable Area)

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
H8A	Apr 2017	Soybeans	18-46-0	Surface broadcast	2-yr	347 Lbs	69 Lbs	0.2	62	160	0
H8A	Apr 2018	Corn grain	82-0-0	Inject	1-yr N	213 Lbs	43 Lbs	0.2	175	0	0
H8A	Apr 2019	Soybeans	18-46-0	Surface broadcast	2-yr	347 Lbs	69 Lbs	0.2	62	160	0
H8A	Apr 2020	Corn grain	82-0-0	Inject	1-yr N	213 Lbs	43 Lbs	0.2	175	0	0
H8A	Apr 2021	Soybeans	18-46-0	Surface broadcast	2-yr	347 Lbs	69 Lbs	0.2	62	160	0
H7A	Apr 2017	Soybeans	18-46-0	Surface broadcast	2-yr	326 Lbs	196 Lbs	0.6	59	150	0
H7A	Apr 2018	Corn grain	82-0-0	Inject	1-yr N	238 Lbs	143 Lbs	0.6	195	0	0
H7A	Apr 2019	Soybeans	18-46-0	Surface broadcast	2-yr	326 Lbs	196 Lbs	0.6	59	150	0
H7A	Apr 2020	Corn grain	82-0-0	Inject	1-yr N	238 Lbs	143 Lbs	0.6	195	0	0
H7A	Apr 2021	Soybeans	18-46-0	Surface broadcast	2-yr	326 Lbs	196 Lbs	0.6	59	150	0
H6	Apr 2018	Corn grain	82-0-0	Inject	1-yr N	244 Lbs	24 Lbs	0.1	200	0	0
H6	Apr 2020	Corn grain	82-0-0	Inject	1-yr N	244 Lbs	24 Lbs	0.1	200	0	0

6.8. Field Nutrient Balance (Manure-spreadable Area)

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2016	H8A	25.9	Corn grain	180	175	95	0	0	0	0	-175	-95	0	-81	-54
2017	H8A	25.9	Soybeans	65	0	65	0	88	65	170	0[a]	0	170	10	76
2018	H8A	25.9	Corn grain	180	175	95	0	175	95	140	0	0	310	24	162
2019	H8A	25.9	Soybeans	65	0	65	0	88	65	170	0[a]	0	480	34	238
2020	H8A	25.9	Corn grain	180	175	95	0	175	95	140	0	0	620	48	324
Total	**H8A**				**525**	**415**	**0**	**526**	**320**	**620**					
2016	H8B	16.0	Corn grain	180	200	0	0	0	0	0	-200	0	0	-81	-54
2017	H8B	16.0	Soybeans	65	0	0	0	75	55	144	0[a]	55	144	0	50
2018	H8B	16.0	Corn grain	180	200	0	0	200	54	140	0	109	284	-27	136
2019	H8B	16.0	Soybeans	65	0	0	0	75	55	144	0[a]	164	428	0	186
2020	H8B	16.0	Corn grain	180	200	0	0	200	54	140	0	218	568	-27	272
Total	**H8B**				**600**	**0**	**0**	**550**	**218**	**568**					
2016	H7B	12.5	Corn grain	180	195	90	0	0	0	0	-195	-90	0	-81	-54
2017	H7B	12.5	Soybeans	65	0	60	0	81	60	156	0[a]	0	156	5	62
2018	H7B	12.5	Corn grain	180	195	90	0	195	90	140	0	0	296	14	148
2019	H7B	12.5	Soybeans	65	0	60	0	81	60	156	0[a]	0	452	19	210
2020	H7B	12.5	Corn grain	180	195	90	0	195	90	140	0	0	592	28	296
Total	**H7B**				**585**	**390**	**0**	**552**	**300**	**592**					
2016	H7A	12.6	Corn grain	180	195	90	0	0	0	0	-195	-90	0	-81	-54
2017	H7A	12.6	Soybeans	65	0	60	0	81	60	156	0[a]	0	156	5	62
2018	H7A	12.6	Corn grain	180	195	90	0	195	90	140	0	0	296	14	148
2019	H7A	12.6	Soybeans	65	0	60	0	81	60	156	0[a]	0	452	19	210
2020	H7A	12.6	Corn grain	180	195	90	0	195	90	140	0	0	592	28	296
Total	**H7A**				**585**	**390**	**0**	**552**	**300**	**592**					
2016	H6	18.0	Corn grain	180	200	0	0	0	0	0	-200	0	0	-81	-54
2017	H6	18.0	Soybeans	65	0	0	0	75	55	144	0[a]	55	144	0	50
2018	H6	18.0	Corn grain	180	200	0	0	200	54	140	0	109	284	-27	136
2019	H6	18.0	Soybeans	65	0	0	0	75	55	144	0[a]	164	428	0	186

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2020	H6	18.0	Corn grain	180	200	0	0	200	54	140	0	218	568	-27	272
Total	**H6**				**600**	**0**	**0**	**550**	**218**	**568**					

Field Nutrient Balance (Non-manure-spreadable Area)

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2016	H8A	0.2	Corn grain	180	175	95	0	0	0	0	-175	-95	0	-81	-54
2017	H8A	0.2	Soybeans	65	0	65	0	62	160	0	0[a]	95	0	105	-94
2018	H8A	0.2	Corn grain	180	175	95	0	175	0	0	0	0	0	24	-54
2019	H8A	0.2	Soybeans	65	0	65	0	62	160	0	0[a]	95	0	129	-94
2020	H8A	0.2	Corn grain	180	175	95	0	175	0	0	0	0	0	48	-54
Total	**H8A**				**525**	**415**	**0**	**474**	**320**	**0**					
2016	H7A	0.6	Corn grain	180	195	90	0	0	0	0	-195	-90	0	-81	-54
2017	H7A	0.6	Soybeans	65	0	60	0	59	150	0	0[a]	90	0	95	-94
2018	H7A	0.6	Corn grain	180	195	90	0	195	0	0	0	0	0	14	-54
2019	H7A	0.6	Soybeans	65	0	60	0	59	150	0	0[a]	90	0	109	-94
2020	H7A	0.6	Corn grain	180	195	90	0	195	0	0	0	0	0	28	-54
Total	**H7A**				**585**	**390**	**0**	**508**	**300**	**0**					
2016	H6	0.1	Corn grain	180	200	0	0	0	0	0	-200	0	0	-81	-54
2017	H6	0.1	Soybeans	65	0	0	0	0	0	0	0	0	0	-55	-94
2018	H6	0.1	Corn grain	180	200	0	0	200	0	0	0	0	0	-81	-54
2019	H6	0.1	Soybeans	65	0	0	0	0	0	0	0	0	0	-55	-94
2020	H6	0.1	Corn grain	180	200	0	0	200	0	0	0	0	0	-81	-54
Total	**H6**				**600**	**0**	**0**	**400**	**0**	**0**					

[1] Fertilizer Recs are the crop fertilizer recommendations. The N rec accounts for any N credit from previous legume crop.

[2] Nutrients Applied are the nutrients expected to be available to the crop from that year's manure applications plus nutrients from that year's commercial fertilizer applications and nitrates from irrigation water. With a double-crop year, the total nutrients applied for both crops and the year's balances are listed on the second crop's line.

[3] For N, Nutrients Applied minus Fertilizer Recs for indicated crop year. Also includes amount of residual N expected to become available that year from prior years' manure applications. For P_2O_5 and K_2O, Nutrients Applied minus Fertilizer Recs *through* the indicated crop year, with positive balances carried forward to subsequent years. Negative values indicate a potential need to apply additional nutrients.

[4] Nutrients Applied minus amount removed by harvested portion of crop through the indicated year. Positive balances are carried forward to subsequent years.

[¤] Indicates a custom fertilizer recommendation in the Fertilizer Recs column.

[a] Indicates in the Balance After Recs N column that the legume crop is assumed to utilize some or all of the supplied N.

[†] Indicates in the Balance After Recs N column that the value includes residual N expected to become available that year from prior years' manure applications.

6.9. Manure Inventory Annual Summary

Manure Source	Plan Period	On Hand at Start of Period	Total Generated	Total Imported	Total Trans-ferred In	Total Applied	Total Exported	Total Trans-ferred Out	On Hand at End of Period	Units
Lagoon	Jun '16 - May '17	2,000,000	7,216,698	0	0	2,535,740	5,000,000	0	1,680,958	Gal
Composter	Jun '16 - May '17	0	43	0	0	0	30	0	13	Ton
Lagoon	Jun '17 - May '18	1,680,958	7,216,698	0	0	2,295,000	5,000,000	0	1,602,656	Gal
Composter	Jun '17 - May '18	13	43	0	0	0	40	0	16	Ton
Lagoon	Jun '18 - May '19	1,602,656	7,216,698	0	0	2,535,740	5,000,000	0	1,283,614	Gal
Composter	Jun '18 - May '19	16	43	0	0	0	45	0	14	Ton
Lagoon	Jun '19 - May '20	1,283,614	7,216,698	0	0	2,295,000	5,000,000	0	1,205,312	Gal
Composter	Jun '19 - May '20	14	43	0	0	0	40	0	17	Ton
Lagoon	Jun '20 - May '21	1,205,312	7,216,698	0	0	2,535,740	0	0	5,886,270	Gal
Composter	Jun '20 - May '21	17	43	0	0	0	40	0	20	Ton

6.10. Fertilizer Material Annual Summary

Product Analysis	Plan Period	Product Needed Jun - Aug	Product Needed Sep - Dec	Product Needed Jan - May	Total Product Needed	Units
18-46-0	Jun '16 - May '17	0	0	265	265	Lbs
18-46-0	Jun '17 - May '18	0	0	4,263	4,263	Lbs
82-0-0	Jun '17 - May '18	0	0	11,512	11,512	Lbs
18-46-0	Jun '18 - May '19	0	0	265	265	Lbs
18-46-0	Jun '19 - May '20	0	0	4,263	4,263	Lbs
82-0-0	Jun '19 - May '20	0	0	11,512	11,512	Lbs
18-46-0	Jun '20 - May '21	0	0	265	265	Lbs

6.11. Plan Nutrient Balance (Manure-spreadable Area)

	N (Lbs)	P_2O_5 (Lbs)	K_2O (Lbs)
Total Manure Nutrients on Hand at Start of Plan[1]	5,600	4,000	10,400
Total Manure Nutrients Collected[2]	105,334	72,597	188,924
Total Manure Nutrients Imported[3]	0	0	0
Total Manure Nutrients Exported[4]	59,900	40,390	105,170
Total Manure Nutrients Gained/Lost in Transfer[5]	0	0	0
Total Manure Nutrients on Hand at End of Plan[6]	16,882	11,813	30,729
Total Manure Nutrients Applied[7]	34,170	24,358	63,444
Available Manure Nutrients Applied (Utilized by plan's crops)[8]	26,135	19,299	50,229
Available Manure Nutrients Applied (Not utilized by plan's crops)[9]	6,862	5,059	13,215
Commercial Fertilizer Nutrients Applied (Utilized by plan's crops)[10]	20,044	3,931	0
Commercial Fertilizer Nutrients Applied (Not utilized by plan's crops)[11]	0	0	0
Available Nutrients Applied (Manure and fertilizer; utilized by plan's crops)[12]	46,179	23,230	50,229
Nutrient Utilization Potential[13]	87,441	32,540	29,750
Nutrient Balance of Spreadable Acres[14*]	-41,262	-9,310	20,479
Average Nutrient Balance per Spreadable Acre per Year[15*]	-97	-22	48

1. Values indicate total manure nutrients present in storage(s) at the beginning of the plan.
2. Values indicate total manure nutrients collected on the farm.
3. Values indicate total manure nutrients imported onto the farm.
4. Values indicate total manure nutrients exported from the farm to an external operation.
5. Values indicate changes in total manure nutrients due to internal transfers between storage units with differing analyses.
6. Values indicate total manure nutrients present in storage(s) at the end of plan.
7. Values indicate total nutrients present in land-applied manure. Losses due to rate, timing and method of application are not included in these values.
8. Values indicate available manure nutrients applied on the farm based on rate, time and method of application. These values are based on the total manure nutrients applied (row 7) after accounting for state-specific nutrient losses due to rate, time and method of application. Nutrients which will not be utilized by crops in the plan (row 9) are excluded from these values.
9. Values indicate manure nutrients applied that will be utilized by crops outside the plan.
10. Values indicate nutrients applied as commercial fertilizers and nitrates contained in irrigation water. Nutrients that will not be utilized by crops in the plan (row 11) are excluded from these values.
11. Values indicate nutrients applied as commercial fertilizer which will be utilized by crops outside the plan.
12. Values are the sum of available manure nutrients applied (row 8) and commercial fertilizer nutrients applied (row 10).
13. Values indicate nutrient utilization potential of crops grown. For N the value generally is based on crop N recommendation for non-legume crops and crop N uptake or other state-imposed limit for N application rates for legumes. P_2O_5 and K_2O values generally are based on fertilizer recommendations or crop removal (whichever is greatest).
14. Values indicate available nutrients applied (row 12) minus crop nutrient utilization potential (row 13). Negative values indicate additional nutrient utilization potential and positive values indicate over-application.

15. Values indicate average per acre nutrient balance. Values are calculated by dividing nutrient balance of spreadable acres (row 14) by the number of spreadable acres in plan and by the length of the plan in years. Negative values indicate additional average per acre nutrient utilization potential and positive values indicate average per acre over-application.

* Non-trivial, positive values for N indicate that the plan was not properly developed. Negative values for N indicate additional nutrient utilization potential which may or may not be intentional. For example, plans that include legume crops often will not utilize the full N utilization potential for legume crops if manure can be applied to non-legume crops that require N for optimum yield. Positive values for P_2O_5 and/or K_2O do not necessarily indicate that the plan was not developed properly. For example, producers may be allowed to apply N-based application rates of manure to fields with low soil test P values or fields with a low potential P-loss risk based on the risk assessment tool used by the state. Negative values for P_2O_5 and K_2O indicate that planned applications to some fields are less than crop removal rates.

Plan Nutrient Balance (Non-manure-spreadable Area)

	N (Lbs)	P_2O_5 (Lbs)	K_2O (Lbs)
Commercial Fertilizer Nutrients Applied[1]	440	196	0
Nutrient Utilization Potential[2]	516	317	0
Nutrient Balance of Non-spreadable Acres[3*]	-76	-121	0
Average Nutrient Balance per Non-spreadable Acre per Year[4*]	-17	-27	0

1. Values indicate nutrients applied as commercial fertilizers and nitrates contained in irrigation water.
2. Values indicate nutrient utilization potential of crops grown based on crop fertilizer recommendations.
3. Values indicate commercial fertilizer nutrients applied (row 1) minus crop nutrient utilization potential (row 2). Negative values indicate additional nutrient utilization potential and positive values indicate over-application.
4. Values indicate average per acre nutrient balance. Values are calculated by dividing nutrient balance of non-spreadable acres (row 3) by number of non-spreadable acres in plan. Negative values indicate additional average per acre nutrient utilization potential and positive values indicate average per acre over-application.

* Non-trivial, positive values for N indicate that the plan was not properly developed. Negative values for N indicate additional nutrient utilization potential which may or may not be intentional. Positive values for P_2O_5 and/or K_2O do not necessarily indicate that the plan was not developed properly. For example, multiple year applications may have been planned during the final plan year(s) and these nutrients will not be utilized by crops in the current plan. Negative values for P_2O_5 and K_2O indicate that applications to some fields may have been delayed to allow the producer to apply the nutrients in accordance with their fertilization schedule.

Section 7. Feed Management

At this time no special feed management is being practiced to have a targeted impact on waste nutrient levels.

Section 8. Other Utilization Options

At this time no other utilization options are available or planned. Additional exports off the farm will be considered if P level build-ups become high, however, this is not anticipated during this planning period.

Section 10. References

10.1. Publications

Crop Fertilizer Recommendations

"Soil Test Interpretations and Recommendations Handbook," UMC, 5/2004 revision
http://aes.missouri.edu/pfcs/soiltest.pdf

Manure Nutrient Availability

"Calculating Plant-Available Nitrogen and Residual Nitrogen Fertilizer Value in Manure", G9186,12/07
http://extension.missouri.edu/explore/agguides/soils/g09186.htm

Phosphorus Assessment

"The Missouri Phosphorus Index," Lory, et al., MU Extension, U. of Missouri-Columbia
http://extension.missouri.edu/explorepdf/agguides/soils/g09184.pdf

Missouri Interim Phosphorus Index, Version 0.2, April 2005
http://efotg.sc.egov.usda.gov/references/public/MO/Interim_P_index_0_2_4-20-05.xls

Practice Standards

Missouri NRCS Nutrient Management Standard (590), May 2001
http://efotg.nrcs.usda.gov/references/public/MO/590_standard_5_01.pdf

10.2. Software and Data Sources

MMP Version	MMP 0.3.5.0
MMP Plan File	z5.mmp 5/4/2016 7:01:01 PM
MMP Initialization File for Missouri	3/24/2015
MMP Soils File for Missouri	3/26/2015
Phosphorus Assessment Tool	2015.03.06
NRCS Conservation Plan(s)	n/a
RUSLE2 Library	Version: 2.5.2.11 Build: Aug 26 2014 Science: 20140728
RUSLE2 Database	RUSLE2318_mosesdb.gdb

Appendix 1

Operation & Maintenance Plan

Z5 FARM

OPERATION AND MAINTENANCE PLAN

INSPECTION PROCEDURE

FARM FACILITIES

FREQUENCY: Once per day.

1. Check cleanout risers to be sure that caps are present and secure and that there are no holes or cracks in the caps or pipe, and no signs of leaks. If you see a leak, follow the Emergency Response Procedure posted in the farm office.

2. Walk around the barns and check for leaks or unusual conditions. If you see a problem, follow the Emergency Response Procedure posted in the farm office.

3. Inspect the recycle lines and pump to be sure they are running properly. If you see a problem, follow the Emergency Response Procedure posted in the farm office.

4. Once per day, check general conditions around the lagoons. If a problem is noted, follow the Emergency Response Procedure posted in the farm office.

5. Visually inspect concrete basins for condition and concrete integrity. Concrete shall be evaluated to ensure the following:
    a. No cracks
    b. No leaning of walls
    c. The presence of rodent burrows/signs of rodent activities
    d. Signs of erosion (around basin foundation)

INSPECTION PROCEDURE

LAGOON

In order to ensure continuing lagoon integrity, the following monitoring procedures will be conducted:

FREQUENCY: Once per week.

1. Visually inspect lagoon for condition and berm integrity. Grass cover on the lagoon berm shall be evaluated to ensure the following:
    e. Adequate coverage – no bare spots
    f. Grass is of appropriate height (under 12")
    g. The presence of rodent burrows/signs of rodent activities
    h. The presence of encroaching woody species
    i. Signs of erosion (inside and outside slopes)

2. Inspect emergency spillway to be sure that is clear and free from obstruction.

3. Check for the presence of debris in the lagoon. If debris is present, make arrangements for removal.

4. **On A Weekly Basis:** Check lagoon levels. Read level from the permanent measuring marker in the lagoon. Measure the level to the nearest ¼ foot below the bottom of the emergency spillway.

MAINTENANCE

FARM FACILITIES

When problems (e.g. broken clean out caps, etc.) are noted that require follow up but are not considered emergency situations (i.e. no immediate threat to the environment), the following steps shall be taken to ensure the problem is corrected in a timely fashion:

1. Record repairs made to gravity sewers, recycle lines, irrigation lines, as well as other equipment associated with land and nutrient management activities. Record the following information:

   Description of problem
   Date repair made
   Material used to complete repair
   Personnel involved

2. In the event that a maintenance problem occurs which constitutes an immediate threat to the environment, employees are instructed to follow the Emergency Response Plan immediately.

MOWING

Periodic mowing is necessary at various locations on the farm to prevent potential environmental problems, and to improve aesthetics.

Lagoon

Exposed front slopes, berm tops, and back slopes on the lagoon are maintained with a cool season grass cover. The primary objectives of the lagoon vegetation maintenance program are to:

1. Mow the grass as often as necessary to maintain it at 12" or less in height and to prevent the "heading out" of any grass or weed species that are present.

2. Maintain the grass at as even level as possible.

Lagoon berms are mowed a minimum of three times per year to provide ready access to the lagoon, control weeds and brush, and maintain a pleasing

appearance. The lagoon berms shall be kept free of burrowing animals so as not to jeopardize integrity of the berms or clay liner.

DEBRIS REMOVAL

During inspections, the lagoons and basin shall be checked for the presence of floating debris. If debris is noted in the lagoons or basin, measures shall be taken to remove the debris in a timely fashion.

1. Determine what personnel should be enlisted to assist in debris removal. If an outside contractor is needed, contact Bob Zeysing for making the appropriate arrangements.

2. Remove debris using appropriate actions and personnel.

3. Dispose of removed debris in a proper location.

EMERGENCY MAINTENANCE

If a problem is discovered that requires immediate attention, take the following actions:

1. If work can be completed in-house, mobilize the appropriate personnel to rectify the problem.

2. If work cannot be completed in-house, enlist any necessary outside service directly to repair the problem.

In situations posing a potential threat to the integrity of the lagoons or basin operation or any of the land and nutrient management program refer to the **Emergency Response Plan** for guidance in formulating appropriate follow-up actions.

NUTRIENT MANAGEMENT PLANNING

OVERVIEW

Manure is a by-product of any type of livestock operation. At The Z-5Farm, the barn pits are drained routinely to keep the barn free of animal waste and to ensure a healthy environment for the employees and animals. Manure and associated wastewater (including flush water) is transported via buried PVC pipe to the anaerobic lagoons and concrete basin.

Manure components collected in the concrete pit at the nursery site, namely, nitrogen, phosphorus, and potassium, (as well as trace minerals and nutrients) are beneficial to crops and can be effectively used as replacements for chemical fertilizer in normal farming activities.

The anaerobic lagoons provide basic treatment to the animal waste, breaking it down (via the activity of anaerobic bacteria) into its primary components. These components, namely, nitrogen, phosphorus, and potassium, (as well as trace minerals and nutrients) are beneficial to crops and can be effectively used as replacements for chemical fertilizer in normal farming activities.

Typical crops raised on the farm include but may not be limited to: corn and soybeans.

WASTEWATER NUTRIENTS

The primary nutrients found in Hog manure are nitrogen, phosphorus and potassium. Nitrate nitrogen (nitrate is NO3-N, a water soluble, negatively charged ion) in water can be harmful to humans. Excessive nutrients and decomposing organic nutrients (N, P, K, S) can be responsible for algae blooms and weed growth in water, which can reduce available oxygen for aquatic species. Along with the nutrients, manure may increase salinity on some soils. Hog manure does benefit soil quality. Along with nitrogen, phosphorus and potassium, several trace minerals are also found in manure. If properly managed, the nutrients can reduce or eliminate commercial fertilizer needs for many crops. Along with the nutrient value, Hog manure can increase microorganisms and improve soil organic matter, soil tilth, and soil structure. These improvements in soil quality can reduce erosion, improve drainage, and increase soil productivity.

Nitrogen: Nitrogen is important for all plants and animals; the nitrogen in manure is no different than the nitrogen found in synthetic fertilizers. Nitrogen comes from many sources and in many different forms. The nutrient and pollution potential of manure nitrogen depends on the form and amount in the environment. Understanding the different forms allows you to better manage this important nutrient.

The two main forms of nitrogen (N) in Hog manure are organic N (proteins, amino acids and urea, which are unavailable to plants) and inorganic N (ammonium, nitrates, ammonia). Ammonium N is the predominant component of available nitrogen in manure.

When manure is applied to soil, the organic N begins to break down to inorganic N, which is available to plants. This process is called ammonification or mineralization, and is affected by temperature, moisture, and time. These same processes occur in an anaerobic storage lagoon, which is why nitrogen values are reduced in these systems. Warm conditions have a higher rate of organic N conversion than cooler temperatures. Approximately 33-55% of organic N is converted to ammonium or available N each year after the manure is land applied.

When organic N is converted to available N, it starts as ammonium N. Ammonium N is available for plant uptake and is not mobile in the soil. The process of nitrification eventually converts ammonium N to nitrate N. While nitrate N is available to plants, it is also susceptible to denitrification (loss to the air) and to leaching. Ammonia N can be quickly lost by being converted to ammonium and volatilized.

Phosphorus and Potassium: Phosphorus and potassium are also important nutrient components of manure. Both nutrients are needed for proper plant and root growth. While they generally bind tightly with soil, they can move into surface waters by moving on eroded soil particles. Phosphorus may move directly into surface waters in areas with extremely high phosphorus levels. Excessive concentrations of phosphorus in water can contribute to excessive aquatic plant growth and depletion of oxygen. However, phosphorus and potassium have little potential for leaching and have no direct toxic effects on humans or wildlife. By using proper conservation techniques (such as conservation tillage, terraces, filter strips, etc.) movement of phosphorus or potassium into surface water can be reduced.

DEVELOPING A NUTRIENT MANAGEMENT PLAN

Several factors are considered in the development of a sound nutrient management plan, including: separated solids analysis, lagoon water analysis, the amount of plant available nitrogen (PAN), amount of land available, cropping program, and application procedures.

WASTEWATER ANALYSIS

Current regulations dictate that nutrient management plans be based on nitrogen levels, therefore land requirements to fulfill land application goals are based partially on the concentration of nitrogen in the lagoon water and solid manure to be land applied. More than the other two primary nutrients in manure (phosphorus and potassium) the concentration of nitrogen in lagoon water varies with water temperature and weather

conditions. In order to develop the best overall estimate of total nitrogen levels in the lagoons, they must be sampled annually.

SAMPLING PROTOCOL

It is recommended that UMC Science and Technology Guide "Collecting and Preserving Waste and Wastewater Samples for Analysis" and University Extension Water Quality publication "Laboratory Analysis of Manure" be followed. A copy of each is included with this manual.

LAGOON AND CONCRETE BASIN WATER

1. Using plastic bottles, collect samples of lagoon water at 12 – 24 inches below surface. Collect samples from the concrete basin at 12 – 72 inches below surface.

2. Pour 50 ml of liquid into a second sample bottle. Discard the remainder of the first sample into the lagoon or basin.

3. Repeat this process at six more spots, each time pouring approximately 50 ml into the second sample bottle so that the second bottle consist of 350 ml of liquid more or less, collected from a minimum of seven different locations.

4. Secure the lid for each sample bottle and fill out and attach the appropriate sample identification label and date each bottle.

5. Deliver samples directly to laboratory.

SAMPLE ANALYSIS

Each sample shall be analyzed by a qualified analytical laboratory for the constituents identified in the following table:

Table of Analysis Constituents

Constituent	Unit
Kjeldahl Nitrogen	mg/l
Ammonia Nitrogen as N	mg/l
Nitrate Nitrogen as N	mg/l
Total phosphorus as P	mg/l

A copy of the analysis shall be used in the preparation and modification of the annual cropping plans.

DETERMINING LAND NEEDS

Nutrient management plans using DNR recommended methodologies shall be prepared each year for each field in the operation to achieve the best program for even distribution of nutrients from the manure.

It is recommended that University Extension Water Quality Guide "Reduce Environmental Problems with Proper Land Application of Animal Waste" and "Land Application Considerations for Animal Waste" be reviewed by all Land Application personnel. A copy of each is included with this manual.

Crops

Plants have different capacities to utilize nutrients, in particular nitrogen. Current state regulations dictate that cropping plans be developed to account for nitrogen loading and uptake by crops. Several references are recommended by the DNR to determine nutrient uptake potential of different crops. They are:

Midwest Plan Service. 1993. **Livestock Waste Facilities Handbook.**

Buchholz, D. 1983, Reprinted 1989. **Soil Test Interpretations and Recommendations Handbook**. University of Missouri; College of Agriculture.

Natural Resources Conservation Service. **Soil Interpretation Manual.**

Tables from these sources which identify nutrient uptake rates by various crops are included in this report.

Soil Sampling

In order to correctly estimate the available nutrients in the soil, soil tests should be conducted every year.

Sampling locations should be determined based on soil type and statistically sound sampling methods. A standard soil sampling protocol (MU Guide: "How To Get A Good Soil Sample") should be followed. A copy of the sampling protocol is included with this document.

Lagoon Pumpdown Levels

Pumping operations will be initiated before the water level reaches the upper pumpdown marker. As a precautionary safety measure, the lagoons have been designed with a safety volume depth in lagoon 3 of 5 feet below the full pool level. The lagoons shall be pumped down as close as possible to the lower pumpdown markers prior to permanent ground freezing each year to insure that full lagoon storage is available during the winter and spring months.

DETERMINING PLANT AVAILABLE NITROGEN

Plant Available Nitrogen (PAN) is a measurement of the amount of nitrogen in the soil which is in a form which is readily available for use by vegetation. As previously stated, nitrogen exists in many forms, however some forms are more easily accessed by plants than others. Nitrate nitrogen (NO) is the form most commonly used by plants. PAN calculations take into consideration the amount of nitrogen present in all forms-the amount of nitrogen available in the manure, nitrogen from "native/soil" sources {sRON} and from previous manure or applications {mRON} – and compares these values with the nitrogen needs of the crop to be grown. The Missouri DNR has developed a worksheet to determine PAN. This worksheet should be used in the formulation of a nutrient management plan. A copy of the worksheet is provided. A professional agronomist or engineer should be employed on an annual basis to aid in completing the calculations.

The procedure for determining PAN follows:

Procedure to Determine Plant Available Nitrogen

1. One Missouri DNR PAN worksheet shall be used for each field on each farm.

2. Fill out worksheet on a field by field basis, using the crop that is planed to be grown the following year in the calculation.

3. Use soil sample analysis to fill in Soil Residual Organic Nitrogen (sRON).

4. Use Lagoon analysis to determine Manure Plant Available Nitrogen (mPAN).

5. Use past pumping records, water use records, and rainfall data to calculate total volume of wastewater to be pumped in upcoming growing season.

6. Using DNR worksheet and crop to be grown, calculate nutrient loading for every field. In no case should nutrient loading projections exceed land use capacity. If PAN requirements exceed nutrient loading capacity of pumping acreage, modifications shall be made to the cropping plan to incorporate crops with a heavier nutrient loading capacity.

7. If modifications to cropping scenario do not alleviate nutrient loading concerns, then additional land shall be secured to apply waste on.

SCHEDULING APPLICATION ACTIVITIES

Several conditions (mostly weather-related) may require modification and adjustment of application schedules. These are described below.

Determining Number of Days Suitable for Application

Application is permitted to occur during seasons when the ground is not frozen, typically from March 1 through December 15 (approximately 285 days). If conditions remain favorable for application beyond the duration of the permitted pumping schedule, then application may continue.

Land application is not permitted during rain events, The normal occurrence of rainy days must be included in the preparation of application schedules for this time period. In order to develop an accurate estimate of the number of non-rainy days during the season, the following shall be conducted, prior to commencing the land application season every year.

1. Review the land application history for the three previous growing seasons.

2. Total up the number of days on which land application occurred during the previous three seasons.

3. Divide by three to determine the number of days available for the current growing season.

4. Include the estimated available land application days in upcoming year's nutrient management plan.

Adjusting Application Rates

The PAN procedure is recommended by DNR to estimate the nutrient loading capacity of each field. Land application procedures, as outlined in this manual detail proper procedures for application. In addition to following proper procedures, the applicator must be capable of modifying the application program to accommodate a number of variables. Methods of addressing several of these variables are detailed below:

Soil Conditions

Precipitation events will reduce soil infiltration capacity while increasing soil moisture content. Overall soil field capacity (to reach saturation) will be reduced as well. Land Application procedures must take into account precipitation events, so that wastewater is not over-applied to an already saturated field. Application rates must be reduced on fields that have received (or are about to receive) significant (0.5") amounts of rainfall. When planning land application activities, the Applicator must consider the following conditions:

Conditions Requiring Adjustment of Application Rates

1. No land application shall be conducted while it is raining.

2. If land application is being conducted and it starts to rain, immediately cease all land application activities.

3. Check the local weather forecast for current weather data every morning before commencing land application activities. If a greater than 80% chance of rainfall is forecast for the next 24 hours, limit land application activities locations which can be quickly stopped should rainfall begin.

4. If a significant chance of rain is forecast, continue checking storm patterns throughout the day to determine if an imminent threat for rain still remains.

5. Following a significant rainfall (>0.5") or prolonged rainfall events, visually inspect the field before commencing land application. Signs of ponding water or saturated soils, should be noted. If these are present, no land application shall be commenced on the field. Continue to check the field to determine when conditions are appropriate to commence land application.

6. Consider the previous long-term weather and site conditions (i.e has it been several days of rain?, are soils already saturated?, or has it been a prolonged dry spell with one large rain event?) when determining the appropriate time to commence pumping following a heavy rain storm.

7. Consider the prevailing wind, both in terms of intensity and direction. If wind is such that application on specific fields upwind of neighbors could result in unusual level of odor reaching that neighbor's property, than another field shall be selected for application, if possible

Neighbor Considerations

The following program is recommended to insure that pumping activities do not unduly impose on neighbors.

1. No pumping is conducted over Holidays/Holiday weekends unless **absolutely** necessary to meet management standards.

2. If neighbors contact the Farm to inform of a special outdoor event they are planning, then no land application will be conducted upwind of that neighbor's property on the given day.

3. Land application should be minimized on lands upwind of neighbors on those days when winds are excessively strong.

NUTRIENT APPLICATION EQUIPMENT

Injection Unit with Drag Hose.
Tankwagons.

Prior to commencing land application, equipment shall be inspected to ensure that it is in proper working order. If repairs to the equipment are needed, the applicator shall make the repair. It the repair is such that the integrity of land application operations will be jeopardized until it is completed, then no land application shall be conducted using the broken piece of equipment. If land application can be safely continued before the repair is made, then land application may commence. In any case, equipment should be repaired in a timely fashion.

START-UP PROCEDURES

The following general process shall be used every day before beginning land application operations:

LAND APPLICATION

1. Every morning, check the local weather forecast to be sure that conditions are right for land application.

2. Select a field for land application, check pumping summary to be sure that the selected field has not yet reached its maximum application nutrient application rate.

3. If field is still able to receive manure, then continue with start up procedures. If field has already reached its maximum loading rate, then repeat selection process to pick another field.

STANDARD PUMPING PRACTICES

1. **The maximum application rate shall be .5 inches per hour and 1.0 inches per day.**

2. Land application shall take place on the field acres defined on the SPF map enclosed.

3. No pumping shall be conducted on land with greater that 10% slope.

4. Soil-plant filter areas shall have slopes less than 10%.

5. The following separation distances shall be maintained:

Wells	300 feet
Sinkholes	300 feet
Water Supply Lake	300 feet
Permanent Flowing Streams	100 feet: 150 feet if spray irrigation is used
Intermittent Streams	50 feet
Non-Owned Dwellings	150 feet
Ponds	100 feet
State & County Roads	50 feet
Property Lines	50 feet

RECORDKEEPING

Careful record keeping is essential to the success of the Nutrient Management program. The following information shall be recorded with each land application event.

- Date
- Field location
- Pump rating
- Estimated total application

The pumping summaries will provide a detailed overview of pumping activities; specifically which fields were applied on, total manure applied per field, and a running total of manure applied per field in relation to its total projected application rate in the Land and Nutrient Management Plan developed for the crop year. The summary reports will enable the applicator to apply the proper amount of manure to fields, while properly spacing applications over an appropriate period in the growing season.

Dead Animal Disposal

Dead animal carcasses from the Hog operation will be managed according to the Missouri Department of Agriculture's requirements for dead animal disposal. Dead animals from this site will be composted.

If in the event it is necessary to bury any animals, the following Missouri Department of Agriculture regulations shall be followed:

1) For areas defined by the Department of Natural Resources, Division of Geology and Land Survey, as not having major groundwater contamination potential (Note: this area is defined as such), the maximum loading rate shall be limited to:

a) Seven cattle, **44 swine**, forty seven sheep, and beginning July 1, 1995, four hundred turkey carcasses or 2000 poultry carcasses on any given acre per year; or

b) All other species and immature cattle, **swine**, sheep, and beginning July 1, 1995, turkeys or poultry shall be limited to 7000 ponds of animals on any given acre per year;

2) The maximum amount of land that shall be used for on-site burial of animals on any person's property during a given year shall be limited to ten percent of the total land owned by that person or one acre, whichever is greater; and

3) Burial sites shall not be located in low-lying areas subject to flooding; and

4) The lowest elevation of the burial pits shall be six feet or less below the surface of the ground; and

5) The dead animals shall be immediately covered with a minimum of six inches of soil and a final cover of a minimum of thirty inches of soil; and

6) Carcasses shall not be placed on the ground, in a ditch, at the base of a hill, or in a cavern and covered with soil; and

7) The abdominal cavity of carcasses over 150 pounds shall be punctured to allow escape of putrefactive gasses; and

8) The location of dead animal burial sites shall be in accordance with the following separation distances:

a) At least 300 feet from any wells, surface water intake structures, public water supply lakes, springs or sinkholes; and

b) At least 50 feet from adjacent property lines; and
c) At least 300 feet from any existing neighboring residence; and
d) More than 100 feet from any body of surface water such as a stream, lake pond, or intermittent stream.

EMERGENCY RESPONSE

OVERVIEW

Timely response to emergencies is critical to ensure an environmentally sound operation. The Z-5 Farm Response Program provides employees with the tools to make appropriate decisions and mobilize necessary resources in the event an emergency occurs.

SPILL REPORTING

In the event of a spill or unauthorized discharge of wastewater or any other liquid, it is imperative that actions be taken in a timely manner. An **Emergency Response Plan** has been developed to provide necessary information and resources to assist personnel with remedial activities. The basis concepts detailed in the **Plan** are as follows:

SUMMARY OF EMERGENCY RESPONSE PLAN

1. Problem Occurs
2. First Response: Find immediate source if possible
3. Assess Problem
4. Contact Primary Person
5. Evaluate Extent of Impact Downstream
6. Contain Downstream Flow
7. Identify Source If Not Already Done
8. Contain/stop Source
9. Monitor, Evaluate, Report

DISTRIBUTION OF EMERGENCY RESPONSE PLAN

1. The **Emergency Response Plan** must be posted in a conspicuous place.

2. The Emergency Response Plan must be discussed with employees at routine staff meetings, so that all employees are knowledgeable of the components of the plan.

Unauthorized discharges shall be reported to the Missouri Department of Natural Resources in accordance with 10 CSR 20-3, which states that spills, leaks, or unauthorized discharges that are contained on the property must be reported to the DNR within 24 hours, if the flow exceeds 1000 gallons per day. This includes leaks from sewer lines, recycle lines, flushing systems, lagoons, or land application systems.

EMERGENCY RESPONSE PLAN

MANURE / WASTEWATER SPILL

Turn Off All Equipment – Recycle Pump, Land Application Pump, Valves, etc.

Contact David Stephens 660-493-2309

Assess Situation, contain any downstream flow, if spill needs to be contained with off-farm equipment contact David Stephens 660-493-2309 for arrangements.

Follow spill to source of problem. If source has not been shut-off, assess what is required to stop it. If you can stop it with on-site equipment and labor do so. If you cannot stop the source, initiate contacting the proper people who can.

List of contact persons:

Bob Zeysing 660-886-9681

David Stephens 660-493-2309

Jammie Stephens 660-631-3512

Jeremy Stephens 660-631-3121

Jeff Browning 573-324-6868

Missouri DNR 660-385-2129

Missouri DNR 24-hr Environmental Emergency 573-634-2436

If incident meets regulator criteria, call the Missouri DNR within 24 hours.

Make permanent Repairs as needed.

Appendix 2

P Index Worksheets

Phosphorus Index Worksheet Z5 Sow Farm
Version 0.2 April 20, 2005

		Field H8A	Field H8B	Field H7B
County	Caldwell	Caldwell	Caldwell	Caldwell
Soil test P level Units	7 ppm	17 ppm	42 ppm	19 ppm
Extraction Procedure Sampling depth	Bray-I 6 to 8 inches	Bray-I 6 to 8 inches	Bray-I 6 to 8 inches	Bray-I 6 to 8 inches
Tillage	Tilled	Tilled	Tilled	Tilled
RUSLE value - average annual (tons/ac)	4.3	0.9	1.8	2.8
Land cover	Row crop - contoured with residue	Row crop - contoured and terraced with residue	Row crop - contoured and terraced with residue	Row crop - contoured with residue
Hydrologic soil group Hydrologic condition	C Good	C Good	C Good	C Good
Distance from center of field to water feature	1901	873	693	434
Particulate P value	2.5	0.7	1.6	2.4
Soluble P value	0.1	0.2	0.6	0.3
Total P value	2.6	1.0	2.2	2.7
P index rating	LOW	LOW	LOW	LOW
Agronomic P rating (Opt.= 45 lbs/a)	LOW	MEDIUM	VERY HIGH	MEDIUM
Sensitivity value	2.5	1.6	1.9	2.5

Phosphorus Index Worksheet Z5 Sow Farm
Version 0.2 April 20, 2005

	Field H7A		Field H6	
County	Caldwell	Caldwell	Caldwell	Caldwell
Soil test P level	19	125	113	61
Units	ppm	ppm	ppm	ppm
Extraction Procedure	Bray-I	Bray-I	Bray-I	Bray-I
Sampling depth	6 to 8 inches	6 to 8 inches	6 to 8 inches	6 to 8 inches
Tillage	Tilled	Tilled	Tilled	Tilled
RUSLE value - average annual (tons/ac)	2.8	5	2.8	5
Land cover	Row crop - contoured with residue	Row crop - contoured with residue	Row crop - contoured with residue	Row crop - contoured with residue
Hydrologic soil group	C	C	C	C
Hydrologic condition	Good	Good	Good	Good
Distance from center of field to water feature	304	540	475	364
Particulate P value	2.4	5.8	3.1	5.0
Soluble P value	0.3	2.0	1.9	1.0
Total P value	2.7	7.8	5.0	6.0
P index rating	LOW	HIGH	MEDIUM	MEDIUM
Agronomic P rating (Opt = 45 lbs/a)	MEDIUM	VERY HIGH	VERY HIGH	VERY HIGH
Sensitivity value	2.5	3.1	2.5	3.1

Appendix 3

Soil & Manure Test

PERRY AGRICULTURAL LABORATORY, INC.

SEPTEMBER 8, 2015

SPECIAL REPORT

UNITED HOG SYSTEMS

SAMPLE: *L#2 8-17-15* Z - 3 Sow Unit LAB# *2015-1858*	AS IS	LBS/1000 GAL	LBS/ACRE-INCH when irrigating
	%		
MOISTURE			
SOLIDS			
VOLATILE SOLIDS			
ASH			
pH			
For Farm Use	%	LBS/1000 GAL	LBS/ACRE-INCH
Total N (TKN) as N	0.016	1.37	38
P.A.N. (sub-surface)	0.009	0.77	21
P.A.N. (surface)	0.007	0.60	17
PHOSPHORUS			
AS P2O5 for farm use	0.018	1.47	41
POTASSIUM			
AS K2O for farm use	0.060	5.01	138
For Environmental Record Keeping	mg/kg	LBS/1000 GAL	LBS/ACRE-INCH
Total N (TKN) as N	164	1.37	38
AMMONIA	59	0.49	14
NITRATE			
ORGANIC N	105	0.88	24
P.A.N. (surface)	72	0.60	17
P.A.N. (sub-surface)	93	0.77	21
PHOSPHORUS AS P	77	0.64	18
POTASSIUM AS K	509	4.24	117
CALCIUM			
MAGNESIUM			
SULFUR			
CARBON/NITROGEN RATIO			

P.A.N. is potential available N for this cropping season. It is calculated using the factors below.

P.A.N. (surface) factors: Organic N release 35% Nonvolatililized NH3 60% availability

Second Year Release	19	0.16	4

SUBSURFACE: ORGANIC N RELEASE =35%: NH3 FACTOR SUBSURFACE 95% availability

icp-mw

REPORT NUMBER 15-245-0232
ANALYSIS DATE SEP 4, 2015
ACCOUNT NO. 8926

PAGE 1/1
REPORT DATE SEP 10, 2015
COPY TO
2nd COPY TO

GROWER
ZEYSING FARMS
H 1267

CENTRAL MISSOURI AGRISERVICE
CHRIS MEYER
PO BOX 549
MARSHALL MO
65340-

SOIL ANALYSIS REPORT
VIEW YOUR SUBMITTAL FORM

LAB NUMBER	SAMPLE IDENTIFICATION	ORGANIC MATTER		PHOSPHORUS						NEUTRAL AMMONIUM ACETATE (EXCHANGEABLE) POTASSIUM		MAGNESIUM		CALCIUM		SODIUM		pH		CATION EXCHANGE CAPACITY	PERCENT BASE SATURATION (COMPUTED)				
				P_1 WEAK BRAY 1:7		P_2 STRONG BRAY 1:7		BICARBONATE P OLSEN		K		Mg		Ca		Na		SOIL	BUFFER		% K	% Mg	% Ca	% H	% Na
		L.O.I.																pH	INDEX	C.E.C.					
		PERCENT	RATE	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE	1:1		meq/100g					
28333689	H-1	3.3	M	113	VH	146	VH			328	VH	385	VH	2296	M			5.4	6.4	21.7	3.9	14.8	52.9	28.4	
28333690	H-2	2.9	M	61	VH	153	VH			179	H	355	VH	2230	M			5.4	6.4	20.4	2.2	14.5	54.7	28.6	
28333691	H-6	3.1	M	125	VH	169	VH			298	VH	338	VH	2066	M			5.4	6.5	19.4	3.9	14.5	53.2	28.4	
28333692	H-7	3.6	H	19	M	29	M			333	VH	258	H	2330	M			5.7	6.6	18.6	4.6	11.8	62.6	21.2	

Sample ID	NITRATE-N (FIA)										SULFUR S ICAP		DTPA Extraction ZINC Zn		MANGANESE Mn		IRON Fe		COPPER Cu		BORON B		EXCESS LIME RATE	SOLUBLE SALTS 1:1	
	Surface			Sub 1			Sub 2			Total															
	ppm	lbs/A	depth IN	ppm	lbs/A	depth IN	ppm	lbs/A	depth IN	lbs/A	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE	ppm	RATE		mmhos/cm	RATE
H-1			0-6								14	M	7.6	VH											
H-2			0-6								15	M	4.2	H											
H-6			0-6								16	M	6.8	VH											
H-7			0-6								10	L	4.6	H											

SEPTEMBER 10, 2015

SPECIAL ANALYSIS

SUBMITTED FOR: **UNITED HOG SYSTEMS**

SUBMITTED BY: **DAVE STEPHENS**

SAMPLE: ***Z-3 DEAD ANIMAL COMPOST 8-16-15***

LAB NO.: **2015-1860**

	AS IS %	DRY BASIS %	LBS/TONS
MOISTURE	17.22		
SOLIDS	82.78		
VOLATILE SOLIDS			
ASH			
pH			
	mg/kg	mg/kg	
NITROGEN (TKN)	23951	28933	47.90
NITRATE N			
AMMONIA N	8140		16.28
ORGANIC N			
P.A.N.			
PHOSPHORUS	2798	3379	5.60
AS P2O5	6406	7739	12.81
POTASSIUM	4458	5386	8.92
AS K2O	5350	6463	10.70
SULFUR			
CALCIUM			
MAGNESIUM			
SODIUM			
	PPM	PPM	
BORON			
IRON			
MANGANESE			
COPPER			
ZINC			
CARBON/NITROGEN			
SPECIFIC GRAVITY g/cc			
SPECIFIC GRAVITY lbs/cu.ft.			

Appendix 4

Record Keeping Documents

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM

CAFO RECORD KEEPING FORMS CHECKLIST

INSTRUCTIONS

1. Use the checklist to determine which of the record keeping forms are required for your operation and include them in your record keeping file. Forms for all record keeping requirements of the MOG01 (NPDES) and MOGS1 (State No Discharge) operating permits are included.
2. There will be multiple copies of some pages due to the unique characteristics of each operation. The forms can be filled out on a computer or they can be printed or copied and kept in a binder.
3. Information on the forms can be used to complete the annual report, which must be submitted by Feb. 15, of each year. Only specified forms need to be submitted with the annual report
4. All records must be retained for five years along with your operating permit, and nutrient management plan.

CHECKLIST

OPERATION NAME:	**PERMIT NUMBER**: MO-	**YEAR**
MANURE STORAGE		
1A. Spills and Overflows		
1B. Liquid Manure Storage Level Readings		
1C. Transfers Off-Farm		
1D. Rainfall Records (Required only for operations with open liquid storage)		
1E. Mortality Management		
TESTING RESULTS		
2A. Manure		
2B. Soils		
INSPECTIONS		
3A. Production Area Visual Inspections		
3B. Land Application Area Visual Inspections		
3C. Problems and Repairs		
LAND APPLICATION		
4A. Operational Monitoring		
4B. Nitrogen		
4C. Phosphorus		

1A - MANURE STORAGE. Spills and Overflows (List any corrective actions taken in 3B.)

PERMIT NUMBER MO-				YEAR		
Date	**Time**	**Cause of Discharge**	**Location**	**Discharge Rate** gallons or cu. ft./Sec	**Discharge Duration**	**Estimated Volume Discharged**[1] gallons or cu. ft.

Notes

[1] Estimated volume = discharge rate in gallons per second or cubic feet per second x duration (seconds). See record keeping requirements of your MOG01 or permit, for additional guidance.

Measure discharge or release of spills from manure handling and overflows from manure storages at the property line or immediately prior to entering the receiving stream.

Any discharge of manure, litter, process wastewater, or mortality by-products to surface waters of the state or release that crosses property boundaries shall be reported to the department as soon as practicable, but no later than 24 hours after the permittee becomes aware of the discharge. MOGS1 permitees see additional reporting requirements in Non-compliance reporting requirements of your permit.

If a discharge or release occurs, submit this page with the annual report.

1B - MANURE STORAGE. Liquid Manure Storage Level Readings

MANURE SOURCE	PERMIT NUMBER	YEAR
	MO	

Week	Date	Level Reading - Feet Below Overflow
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
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46		
47		
48		
49		
50		
52		

Instructions: Record the liquid level weekly for each unique liquid manure storage structure. Use a separate sheet for each separate structure.

1C - MANURE STORAGE. Transfers (Off-farm)

PERMIT NUMBER	YEAR
MO	

Source[1]	Date of Transfer	Amount Transferred (gal. or ton)	Info to Buyer (check)		Name of Buyer	Address
			Current Manure Test Results	NMTS[3]		

Notes

[1] Deep pit, lagoon, basin, tank, sludge, separated solids, litter, mortality compost.

[2] Agitated, unagitated, cake litter, with or without bedding, composted litter.

[3] The current version of the Missouri CAFO Nutrient Management Technical Standard published by the Department of Natural Resources.

1D - MANURE STORAGE. Rainfall (Required for open liquid storage only)

PERMIT NUMBER

MO

YEAR

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1												
2												
3												
4												
5												
6												
7												
8												
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25												
26												
27												
28												
29												
30												
31												
Monthly Total												
YTD												

Instructions: Collect rainfall data for operations with open liquid manure storages only.

1E - MANURE STORAGE. Method of Mortality Management

PERMIT NUMBER	YEAR
MO	

Composting	Rendering	Sent to Landfill	Incineration	Burial[1]	Other

Records[2]:

Notes

[1] In accordance with 10 CSR 20-8.300(14), Class I operations shall not use burial as a method of disposing of routine mortalities. Burial is allowed for disposal for mass mortalities.

[2] Information recorded here can include weekly/monthly mortality numbers, mortality and composting procedures, mortality by-product management, or rendering facilities information.

2A - TESTING RESULTS. Manure Test Results (Annual manure analysis is required for all CAFO's, including export only operations.)

PERMIT NUMBER: MO

YEAR:

Source of Manure[1]	Type of Manure[2]	Sample Date	Moisture/Dry Matter (%) (Circle one)	Units (lbs./1000 gal lbs/ton)	TKN	NH_3-N	P_2O_5	K_2O	NO_3-N [3]

Notes

[1] Deep pit, lagoon, basin, litter, tank, sludge, separated solids, mortality compost.

[2] Agitated liquid pit/tank manure, unagitated lagoon/basin effluent, agitated lagoon/basin manure, poultry litter, poultry litter cake, bedded pack manure, stacked manure with or without bedding, composted litter, mortality compost or other composted manure.

[3] Report nitrate nitrogen only when applicable.

MOG01 permittees must submit a copy of the lab analysis sheets or this form with the annual report.

2B - TESTING RESULTS. Soil Test

PERMIT NUMBER	YEAR
MO	

Field ID[1]	Soil Sampling Date	Units ppm or lbs/ac (circle one)	Soil Test P[2]	Soil Test P Rating	CEC (meq/100g)	Organic Matter (%)

Notes

[1] Name of field as identified in nutrient management plan; only include fields under control (owned, rented, or leased) of the CAFO owner or operator.

[2] Samples should be analyzed using the Bray-1 P soil extraction procedure. If another procedure is used by the soil testing lab, this must be noted on this sheet.

MOG01 permittees must submit a copy of the lab analysis sheet(s) or this form with the Annual Report if soil samples were taken during the year.

3A - INSPECTIONS. Production Area Visual Inspections (List any deficiencies and corrective actions taken in 3C.)

PERMIT NUMBER	YEAR
MO	

Week	Stormwater [1] Date and Initial	Water Lines [2] Date and Initial	Manure Containment Structure [3] Date and Initial
1			
2			
3			
4			
5			
6			
7			
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11			
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52			

Notes

[1] Record the weekly inspections of all stormwater diversion devices directing clean water away from the production area and channeling contaminated water to manure storages.

[2] Record each week the daily inspections of all wastewater lines within the production area and all drinking or cooling water lines that have the potential to leak into manure, litter or process wastewater structures. Record weekly that you inspected daily.

[3] Record weekly inspections of all manure, litter and process wastewater storage structures.

3B - LAND APPLICATION. Land Application Area Visual Inspections (List any deficiencies and corrective actions taken in 3C.)

PERMIT NUMBER	YEAR
MO	

Land Application Equipment[1] Date and Initial	**Perimeter of Field**[2] Date and Initial	**Drifting of Spray**[3] Date and Initial	**Aboveground Irrigation Pipelines**[4] Date and Initial

Notes

[1] Periodically inspect land application equipment for leaks.
[2] Monitor the perimeter of application field to ensure wastewater does not run off.
[3] Monitor for drifting of spray irrigation.
[4] Hourly inspections of aboveground pipelines for leaks when in use.

3C - INSPECTIONS. Problems and Repairs

PERMIT NUMBER	YEAR
MO	

Inspection Date	Deficiencies Noted	Date of Repair[1]	Corrective Actions Taken

Notes

[1] Deficiencies not corrected within 30 days shall have an explanation as to why corrective actions were delayed.

4A - LAND APPLICATION. Operational Monitoring

PERMIT NUMBER	YEAR	DATE LAND APPLICATION EQUIPMENT WAS CALIBRATED
MO		

Source of Manure[1]	Type of Manure[2]	Field ID[3]	Date of Application	Weather[4]	Rainfall[5]	Soil Condition[6]	Application Method[7]	Rate gal/ac or tons/ac	Basis[8] N or P	PAN[9] (lbs/ac)	P_2O_5 (lbs/ac)	Spreadable Acres	Total applied (gal or tons) Circle one

Notes

1 Deep pit, lagoon/basin, litter, tank, separated solids, compost.

2 Agitated liquid pit/tank manure, unagitated lagoon/basin effluent, agitated lagoon, basin manure, lagoon/basin sludge, separated solids, poultry litter, poultry litter cake bedded pack manure, stacked manure with or without bedding, composted litter, mortality compost, other composted manure.

3 Name of field receiving manure as identified in nutrient management plan; only include fields under control (owned, rented or leased) of the CAFO owner or operator.

4 Record the weather conditions at the time of application; insert the codes that apply: CL – clear sky, RN – rain, SN – snowing, OV - overcast, FR – temperature below 32 degrees F.

5 Record "Before" or "After" if a rainfall event occurred 24 hours prior to or after application.

6 Soil condition at time of application: Dry, saturated, muddy, snow-covered or frozen.

7 Injection, partial injection, surface application and incorporated (indicate number of days to incorporation), or surface application only.

8 Write N or P to indicate if the application rate of the field is nitrogen based or phosphorus based.

9 Plant Available Nitrogen.

4B - LAND APPLICATION MONITORING. Nitrogen Summary

PERMIT NUMBER
MO

YEAR

Field ID[1]	Spreadable Acres	Planned Crop	Projected Yield (bu. or ton/ac)	Planned N Recommendation[2] (lbs/ac)	Actual Applied N (lbs N/ac)			Actual Crop	Actual Yield (bu. or ton/ac)	Actual N Removal[4] (lbs/ac)	N Surplus (+) or Deficit (-)[4] (lbs N/ac)
					Manure PAN	Other N Sources[3]	Total PAN				

Notes

[1] Name of field receiving manure as identified in nutrient management plan; only include fields under control of the CAFO owner or operator.
[2] University of Missouri fertilizer recommendations should be used.
[3] Includes credits from previous legume crops and residual N from previous application.
[4] Crop N usage rate X actual crop yield, for legumes crop N content X crop yield.
[5] Total applied PAN minus actual N removal.

4C - LAND APPLICATION MONITORING. Phosphorus Summary

PERMIT NUMBER	YEAR
MO	

Field ID[1]	MO Soil Test P Rating	P Index Rating	Planned P Removal Rate[2] (lbs P_2O_5 /ac)	Actual Applied P (lbs P_2O_5 /ac)[3]			Actual P Removal[4] (lbs P_2O_5 /ac)	*Multi-year P Applications	
				P_2O_5 From Manure	Other P_2O_5 Sources	Total P_2O_5		Previous Balance[5]	Current Balance[6]

Notes

[1] Name of field as identified in nutrient management plan that is restricted to a P based application, which received manure or is utilizing a "multi-year phosphorus application;" only include fields under control of the CAFO owner or operator.

[2] Crop P usage rate X crop yield goal (University of Missouri fertilizer recommendations should be used).

[3] Enter amount applied for a yearly application or amount applied for a multi-year phosphorous application.

[4] Crop P usage rate X actual crop yield.

[5] Enter value from the current balance column from last year's form.

[6] For initial year of a multi-year phosphorous application this is the "Total P_2O_5" - Planned P Removal Rate. For subsequent years it is the previous balance - Planned P Removal Rate. If the difference is a negative number enter "0".

***In accordance with 10 CSR 20-6.300(1)(B)13, fields utilizing a "Multi-year phosphorous application" cannot receive additional applications of manure, litter, or process wastewater until the applied phosphorous has been removed. The amount applied in a multi-year phosphorous application cannot exceed that year's crop N recommendation.**

FILE NAME	16-3349
DRAWN BY	TRD
CHECKED BY	TRD
PROJECT ENGINEER	JEB
CONTACT OFFICE	BOWLING GREEN
DATE	

UNITED HOG SYSTEMS
Z5 SOW FARM

SHEET TITLE:
SET BACK MAP

ALLIED ENGINEERING SERVICES, LLC

Engineering-Surveying-Construction

224 WEST MAIN, P.O. BOX 29
BOWLING GREEN, MO 63334
PHONE: (573) 324-6860

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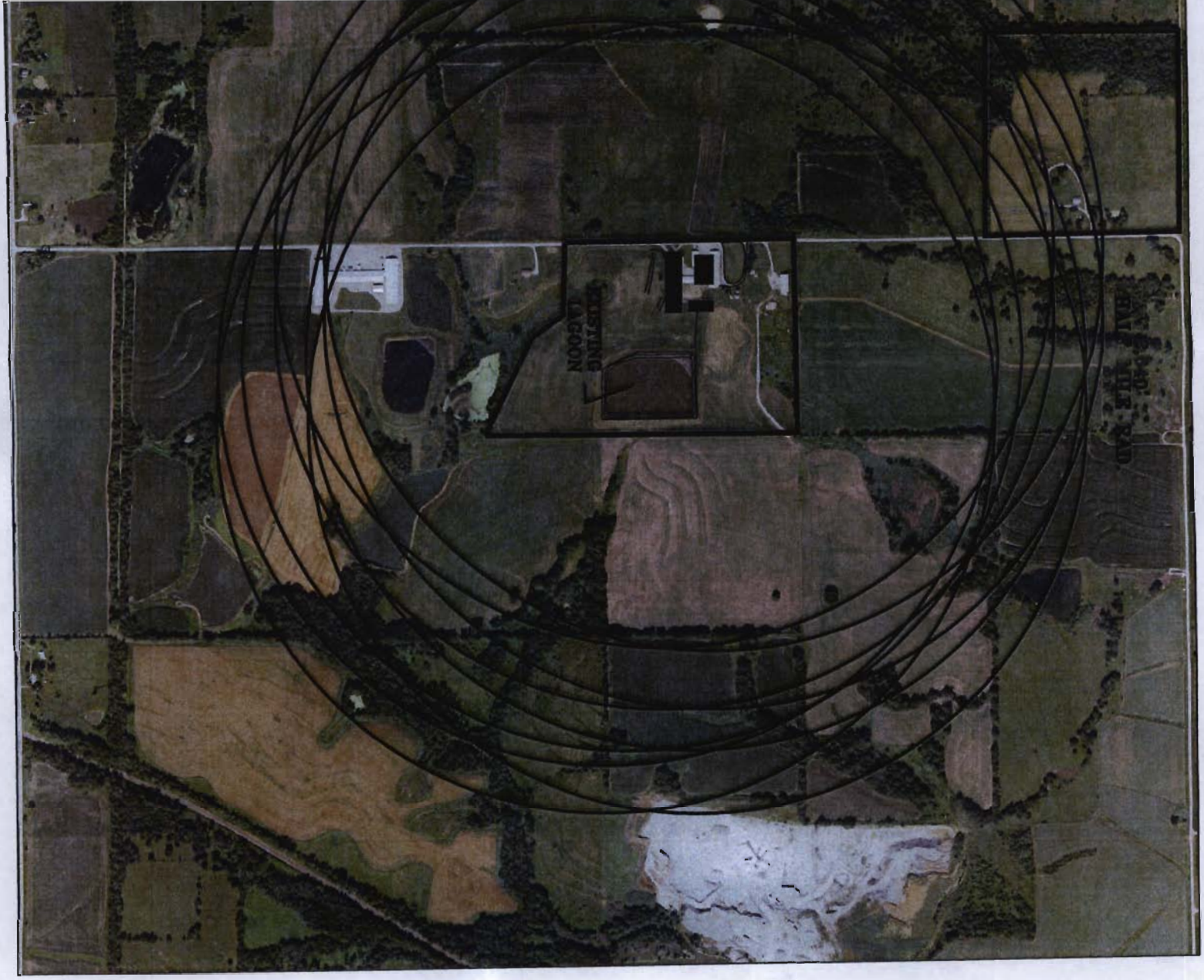

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PROJECT ENGINEER	JEB
CONTACT OFFICE	BOWLING GREEN
DATE	

UNITED HOG SYSTEMS
Z5 SOW FARM

SHEET TITLE:
CALDWELL COUNTY
SET BACK MAP

ALLIED ENGINEERING SERVICES, LLC

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BOWLING GREEN, MO 63334
PHONE: (573) 324-6860

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