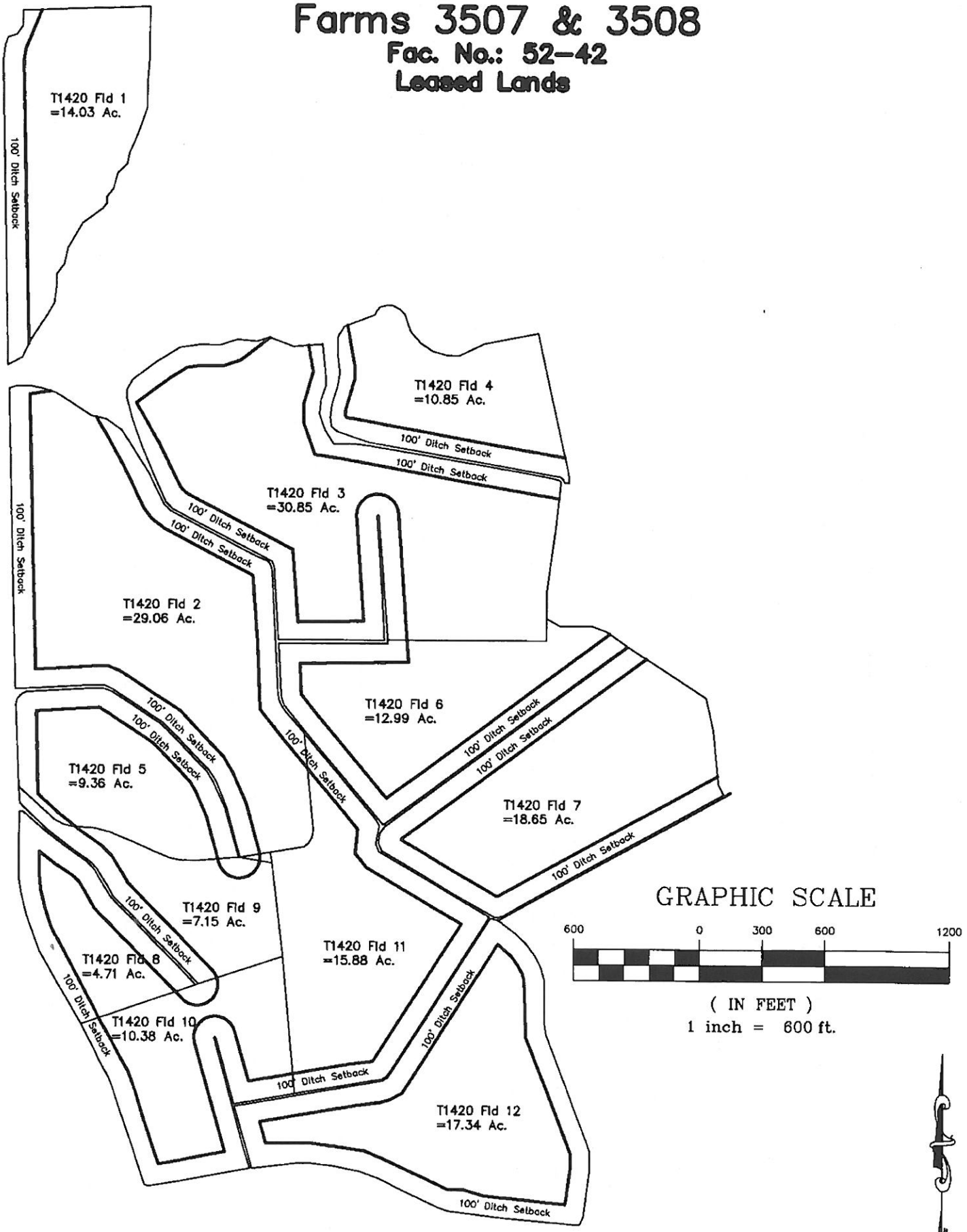
Farms 3507 & 3508
Fac. No.: 52-42
Leased Lands



IRRIGATION SYSTEM DESIGN PARAMETERS

Landowner/Operator Name: Murphy-Brown, LLC - 3507 & 3508; Fac. No. 52-42
Address: P.O. Box 856
Warsaw, NC 28398
Telephone: (910) 293-3434

County: Jones

Date: 3/17/2008
Revised: 8/22/2017

Table 1 - Field Specifications

Field Number	Approximate Maximum Useable Size of Field (acres)	Soil Type	Slope %	Crop(s)	Maximum Application Rate (In/hr)	Maximum Application per Irrigation Cycle (inches)	Comments
T1425	162.11	GoA/NoB/AuB	0-2	Bermuda/Small Grain	0.4	1	Hydrants 1 - 37

TABLE 2 - Travelling Irrigation Gun Settings

Make, Model and Type of Equipment: Traveler w/ 3"x1200' hose w/ Nelson SR 150; two center pivots

Field No. and Hydrant No.	Travel Speed (ft/min)	Application Rate (in/hr.)	TRAVEL LANE Effective Width(ft.)	TRAVEL LANE Effective Length(ft)	Wetted Diameter (feet)	Nozzle Diameter (inches)	Operating Pressure at Gun(psi)	Operating Pressure at reel(psi)	Arc Pattern	Comments - Acres per pull
7	3.13	0.3	240	382	280	0.97	60	90	330	3.27
8	3.13	0.3	240	481	280	0.97	60	90	330	3.82
11	3.13	0.3	252	293	280	0.97	60	90	330	2.75
22	2.61	0.3	260	606	280	0.97	60	90	330	4.86
23	3.83/2.61	.45/.3	152/260	530/102	280	0.97	60	90	220/330	3.70
25A	4.59	0.45	159	381	280	0.97	60	90	220	1.78
25B	5.74	0.55	100	164	280	0.97	60	90	180	0.70
26A	5.74/3.13	.55/.3	132/200	407/460	280	0.97	60	90	180/330	3.92
26B	5.74/3.13	.55/.3	100/200	321/283	280	0.97	60	90	180/330	2.61
27A	4.59	0.45	173	902	280	0.97	60	90	220	4.07
27B	4.59	0.45	147	658	280	0.97	60	90	220	2.70
28A	3.83	0.45	190	718	280	0.97	60	90	220	3.64
28B	3.83	0.45	219	668	280	0.97	60	90	220	3.93
29A	4.78/2.61	.55/.3	120/260	147/155	280	0.97	60	90	180/330	2.01
29B	2.61	0.3	240	787	280	0.97	60	90	330	5.00
30	2.61/2.83	.3/.45	260/222	74/195	280	0.97	60	90	330/220	2.40
31	2.61	0.3	240	88	280	0.97	60	90	330	1.69
32	2.61	0.3	260	163	280	0.97	60	90	330	2.22
37	5.74/4.59	.55/.45	126/252	375/63	280	0.97	60	90	180/220	2.26
16	Center pivot - acreage computer calculated - 1200' w/100' end gun radius									62.57
36	Center pivot - acreage computer calculated - 767.4' w/80.2' end gun radius									24.19
								Total		**144.09**

TABLE 3 - Solid Set Irrigation Gun Settings

Make, Model and Type of Equipment Senninger 7025 sprinklers

Field No and Line No.	Number of Hydrants	Wetted Diameter (feet)	Hydrant Spacing(ft) Along Pipelines	Between Pipelines	Application Rate (in/hr)	Operating Parameters Nozzle Diameter (inches)	Operating Pressure at Gun(psi)	Operating Time at Hydrant(hr.)	Comments-Acres per zone
Zone 13	23	135	80	80	0.25	#18 -9/32	50	1.63	2.73
Zone 14	27	135	80	80	0.25	#18 -9/32	50	1.63	3.84
Zone 17	20	135	80	80	0.25	#18 -9/32	50	1.63	2.85
Zone 18	15	135	80	80	0.25	#18 -9/32	50	1.63	2.10
Zone 19	5	135	80	80	0.25	#18 -9/32	50	1.63	0.80
Zone 20	13	135	80	80	0.25	#18 -9/32	50	1.63	1.43
Zone 21A	23	135	80	80	0.25	#18 -9/32	50	1.63	2.22
Zone 21B	20	135	80	80	0.25	#18 -9/32	50	1.63	2.05
									0.00
									0.00
									0.00
									0.00
									0.00
									0.00
									0.00
									0.00
Note: Part circle sprinklers are Senninger 4123 with #10 nozzles (turquoise).									0.00
									0.00
									0.00
									0.00
									0.00
									0.00
									0.00
									0.00
									0.00
									0.00
								Total	**18.02**

TABLE 4 - Irrigation System Specifications

	Traveling Irrigation Gun	Solid Set Irrigation
Flow Rate of Sprinkler (gpm)	143	16.3
Operating Pressure at Pump (psi)	103.5	69.6
Design Precipitation Rate (in/hr)	0.28	0.25
Hose Length (feet)	1200	XXXXXXXX
Type of Speed Compensation	Mechanical	XXXXXXXX
Pump Type (PTO, Engine, Electric)	Engine	Engine
Pump Power Requirement (hp)	17.3	29.8

TABLE 5 - Thrust Block Specifications	
	THRUST BLOCK
LOCATION	AREA (sq. ft.)
90 degree bend	8.77
Dead End	6.22
Tee	4.35
Gate Valve	6.22
45 degree bend	4.72

IRRIGATION SYSTEM DESIGNER

Name: Micah Kevin Weston, CID
Company: Murphy-Brown, LLC dba Smithfield Hog Production
Address: 2822 Hwy 24 West, P.O. Box 856 Warsaw, NC 28398
Phone: (910) 293-3434

Required Documentation

The following details of design and materials must accompany all irrigation designs:

1. A scale drawing of the proposed irrigation system which includes hydrant locations, pipelines, thrust block locations and buffer areas where applicable.
2. Assumptions and computations for determining total dynamic head and horsepower requirements.
3. Computations used to determine all mainline and lateral pipe sizes.
4. Sources and/or calculations used for determining application rates.
5. Computations used to determine the size of thrust blocks and illustrations of all thrust block configurations required in the system
6. Manufacturer's specifications for the irrigation pump, traveler and sprinkler(s).
7. Manufacturer's specifications for the irrigation pipe and/or USDA-NRCS standard for IRRIGATION WATER CONVEYANCE.
8. The information required by this form are the minimum requirements. It is the responsibility of the designer to consider all relevant factors at a particular site and address them as appropriate.
9. Irrigation pipes should not be installed in lagoon or storage pond embankments without the approval of the designer.

NOTE: A buffer strip of 25' or wider must be maintained between the limits of the irrigation system and all perennial streams and surface waters per NC Statutes.

Narrative of Irrigation System Operation

This is a "wetted acre" determination for an existing facility. This farm has hydrants that are spaced from 71 - 86% of the wetted diameter, solid set sprinklers that are spaced at 60% of the wetted diameter and two center pivots. The acres were calculated based on the equipment specified on sheets 2 and 3 and the tables developed by NCSU for calculating Area Allowances for Existing Hard Hose Traveler Systems and Area Allowances for Stationary Sprinkler Systems.

This revision (11/22/2011) done to include the corrected acres for the new center pivot that replaces pulls 1-6 and recalculates the wetted acreage of the remaining systems based on a new GPS map of the fields. Also, this revision takes all of Zone 10 out of use due to the new wells and septic system location. The recalculation was necessary due to the conversion of the farms from Farrow-Finish to Farrow-Wean.

This revision (12/21/2011) done to show the removal of pull 24 and the replacement of pull 21 with solid sets zones 21A & 21B. No other parameters were changed.

The new solid sets (zones 21A & 21B) were designed and installed by Benchmark Irrigation & Buildings, Inc.

This revision (12/22/2015) done to show the removal of zones 9 & 15. No other parameters were changed.

This revision (8/22/2017) done to show the removal of usable acres due to inclusion of NPDES setbacks.

CALCULATIONS

Sprinkler Specifications

Sprinkler Type:	Nelson 150	
Nozzle Size:	0.97	inches
Sprinkler Pressure:	60	psi
Flowrate(GPM):	143	gpm
Wetted Diameter:	280	feet

Lane Spacings

Desired Spacing (%):	70	%
Design Spacing(feet):	196	*PVC irrigation pipe normally comes in 20' pieces, so round to the nearest multiple of 20.
Actual Spacing (feet):	240	feet
Actual Spacing (%):	86	%

Application Rate

Application Rate = (96.3xFlowrate)/(3.1415x(.9xradius)squared)

Design App. Rate =	0.28 in/hr		
300 degree arc =	0.33 in/hr	330 degree arc =	0.30 in/hr
220 degree arc =	0.45 in/hr		
180 degree arc =	0.55 in/hr		

Traveller Speed

Travel speed = 1.605 x Flowrate / Desired application amount x Lane Spacing

Desired app. (in.) =	0.4 inches	360 degree arc =	2.39 ft/min
300 degree arc =	2.87 ft/min	330 degree arc =	2.61 ft/min
220 degree arc =	3.83 ft/min		
180 degree arc =	4.78 ft/min		

Mainline Velocity

Velocity = .408 x Flowrate / pipe diameter squared feet/sec.**
**For buried pipelines, velocity should be below 5 feet per second

Pipe size:	6 inches
Velocity=	1.62 ft/sec.

CALCULATIONS

Sprinkler Specifications

Sprinkler Type:	Nelson 150	
Nozzle Size:	0.97	inches
Sprinkler Pressure:	60	psi
Flowrate(GPM):	143	gpm
Wetted Diameter:	280	feet

Lane Spacings

Desired Spacing (%):	70	%
Design Spacing(feet):	196	*PVC irrigation pipe normally comes in 20' pieces, so round to the nearest multiple of 20.
Actual Spacing (feet):	200	feet
Actual Spacing (%):	71	%

Application Rate

Application Rate = (96.3xFlowrate)/(3.1415x(.9xradius)squared)

Design App. Rate =	0.28	in/hr		
300 degree arc =	0.33	in/hr	330 degree arc =	0.30 in/hr
220 degree arc =	0.45	in/hr		
180 degree arc =	0.55	in/hr		

Traveller Speed

Travel speed = 1.605 x Flowrate / Desired application amount x Lane Spacing

Desired app. (in.) =	0.4	inches	360 degree arc =	2.87 ft/min
300 degree arc =	3.44	ft/min	330 degree arc =	3.13 ft/min
220 degree arc =	4.59	ft/min		
180 degree arc =	5.74	ft/min		

Mainline Velocity

Velocity = .408 x Flowrate / pipe diameter squared feet/sec.**
**For buried pipelines, velocity should be below 5 feet per second

Pipe size:	6	inches
Velocity=	1.62	ft/sec.

CALCULATIONS

Sprinkler Specifications

Sprinkler Type:	Senninger 7025	
Nozzle Size:	#18 -9/32	inches
Sprinkler Pressure:	50	psi
Flowrate(GPM):	16.3	gpm
Wetted Diameter:	135	feet

Sprinkler Spacings

Desired Spacing (%):	60	%
Design Spacing(feet):	81	*PVC irrigation pipe normally comes in 20' pieces, so round to the nearest multiple of 20.
Actual Spacing (feet):	80	feet
Actual Spacing (%):	59	%

Application Rate

Application Rate = (96.3xFlowrate)/sprinkler spacing squared

Design App. Rate = 0.25 in/hr

Run Time per Set

Run time per set = Desired application / Design application rate = hours

Desired app. (in.) = 0.4 inches

Run time per set = 1.63 hours

Mainline Velocity

Velocity = .408 x Flowrate / pipe diameter squared feet/sec.**
**For buried pipelines, velocity should be below 5 feet per second

Pipe size:	6	inches
# Sprinklers Oper.:	27	
Velocity=	4.99	ft/sec.

Maximum Lateral Line Entrance Velocity

Pipe size:	2	inches
# Sprinklers Oper.:	4	
Velocity =	6.6504	ft/sec.

Maximum Mainline Friction Loss

Lateral Used:	14	
Total distance:	1200	feet

Friction Loss is figured using Hazen/William's Equation

Friction Loss=	1.25	feet/100 feet		
Max. Mainline Loss =	14.9	feet or	6.5	psi

Maximum Lateral Line Loss

Lateral line friction loss is determined using the assumption that 3/4 of the Friction Loss occurs in the first 1/3 of the lateral line

Total Lateral Length:	400	feet		
# sprinklers on Lat.:	4			
Frict. Loss at 1/3 lat.	10.18	feet		
Max. Lateral Loss:	13.58	feet	or	5.88 psi

Total Dynamic Head

Sprinkler Pressure:	50	psi		
Lateral Line Loss:	5.88	psi		
Elevation head:	2.17	psi		
Mainline loss:	6.5	psi		
Suction head and lift:	1.73	psi		
5% fitting loss:	3.3	psi		
TOTAL(TDH) =	69.6	psi	or	160.7 feet

Horsepower Required

Horsepower = Flowrate x TDH(feet) / 3960 / Pump effeciency

Pump Description:	Berkeley	
Pump Efficiency:	60	%
Horsepower Req'd:	29.8	Hp

Thrust Blocking

Thrust Block Area = Thrust / Soil Bearing Strength

Thrust:	7460 feet
Soil Bearing Strength:	1200 feet

End Cap:	6.2 ft2
90 degree elbow:	8.8 ft2
Tee:	4.4 ft2
45 degree elbow:	4.7 ft2

Pipe Pressure Rating Check

Pressure Rating of Pipe to be Used:	200 psi
Max. Pressure on system when running:	69.6 psi
70% of Pressure Rating:	140 psi

If Max. Pressure on system is less than 70% of Pressure Rating, OK

Net Positive Suction Head Check

NPSHA: 18'

NPSHR: 10' *from pump curve

If NPSHA>NPSHR, OK

Farm # 3507 & 3508; AWS520042
Acreage Calculation 8/22/2017

Zone #	Sprinkler Coverage	# Int.	Acres per Int.Sprink.	Total Int. Acres	# Ext.	Acres per Ext.Sprink.	Total Ext. Acres	# Single	Acres per Sin.Sprink.	Total Sin. Acres		Total Acres
13	Full	11	0.147	1.62	5	0.159	0.80	0	0.000	0.00		2.73
	Half	0	0.147	0.00	4	0.159	0.32	0	0.000	0.00		
14	Full	11	0.147	1.62	12	0.159	1.91	0	0.000	0.00		3.84
	Half	0	0.147	0.00	4	0.159	0.32	0	0.000	0.00		
17	Full	1	0.147	0.15	15	0.159	2.39	0	0.000	0.00		2.85
	Half	0	0.147	0.00	4	0.159	0.32	0	0.000	0.00		
18	Full	4	0.147	0.59	8	0.159	1.27	0	0.000	0.00		2.10
	Half	0	0.147	0.00	3	0.159	0.24	0	0.000	0.00		
19	Full	0	0.147	0.00	5	0.159	0.80	0	0.000	0.00		0.80
	Half	0	0.147	0.00	0	0.159	0.00	0	0.000	0.00		
20	Full	0	0.147	0.00	5	0.159	0.80	0	0.000	0.00		1.43
	Half	0	0.147	0.00	8	0.159	0.64	0	0.000	0.00		
21A	Full	7	0.147	1.03	0	0.159	0.00	0	0.000	0.00		2.22
	Half	0	0.147	0.00	15	0.159	1.19	0	0.000	0.00		
21B	Full	8	0.147	1.18	0	0.159	0.00	0	0.000	0.00		2.05
	Half	0	0.147	0.00	11	0.159	0.87	0	0.000	0.00		
	Full	0	0.147	0.00	0	0.159	0.00	0	0.000	0.00		0.00
	Half	0	0.147	0.00	0	0.159	0.00	0	0.000	0.00		
	Full	0	0.147	0.00	0	0.159	0.00	0	0.000	0.00		0.00
	Half	0	0.147	0.00	0	0.159	0.00	0	0.000	0.00		
	Full	0	0.147	0.00	0	0.159	0.00	0	0.000	0.00		0.00
	Half	0	0.147	0.00	0	0.159	0.00	0	0.000	0.00		
	Full	0	0.147	0.00	0	0.159	0.00	0	0.000	0.00		0.00
	Half	0	0.147	0.00	0	0.159	0.00	0	0.000	0.00		
										Total Acres =		**18.02**

Farm # 3507 & 3508

Acreage Calculations 8/22/2017

Pull #	Width (ft.)	Length (ft.)	Acres (midsection)	Total Acres (midsection)	Start End (ac.)	Stop End (ac.)	Total Pull Acres
7	240	382	2.105	2.105	0.644	0.524	3.27
8	240	481	2.650	2.650	0.644	0.524	3.82
11	252	293	1.695	1.695	0.570	0.480	2.75
22	260	606	3.617	3.617	0.682	0.564	4.86
23	152	530	1.849	2.458	0.682	0.564	3.70
	260	102	0.609	0.000	0.000	0.000	0.00
25A	159	381	1.391	1.391	0.386	0.000	1.78
25B	100	164	0.376	0.376	0.322	0.000	0.70
26A	132	407	1.233	3.345	0.576	0.000	3.92
	200	460	2.112	0.000	0.000	0.000	0.00
26B	100	321	0.737	2.036	0.576	0.000	2.61
	200	283	1.299	0.000	0.000	0.000	0.00
27A	173	902	3.582	3.582	0.483	0.000	4.07
27B	147	658	2.221	2.221	0.483	0.000	2.70
28A	190	718	3.132	3.132	0.512	0.000	3.64
28B	219	668	3.358	3.358	0.574	0.000	3.93
29A	120	147	0.405	1.330	0.682	0.000	2.01
	260	155	0.925	0.000	0.000	0.000	0.00
29B	240	787	4.336	4.336	0.664	0.000	5.00
30	260	74	0.442	1.435	0.682	0.282	2.40
	222	195	0.994	0.000	0.000	0.000	0.00
31	240	88	0.485	0.485	0.664	0.544	1.69
32	260	163	0.973	0.973	0.682	0.564	2.22
37	126	375	1.085	1.449	0.570	0.240	2.26
	252	63	0.364	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
			0.000	0.000	0.000	0.000	0.00
						Total Acres	**57.33**

Grower: MB Farm 3507 Designed By: KBW
Address: PO Box 487 Checked By: DSE
Warsaw, NC 28398 Date: 07/19/11
County: Jones Sheet 1 of 7

ANAEROBIC WASTE LAGOON DESIGN

FARM INFORMATION

		Farm Population:
Nursery:	----------	0
Wean to Finish:	----------	0
Finishing:	----------	0
Farrow to weanling:	----------	3927 Hd.
Farrow to feeder:	----------	0
Farrow to finish:	----------	0
Boars:	----------	0
Storage Period:	----------	180 Days
25 Yr. / 24 Hr Storm Event	----------	7.5 In.
"Heavy Rain" Factor	Not Applicable	
Rainfall in Excess of Evaporation	----------	7.0 In.
Additional Water Usage:	----------	0
Additional Drainage Area:	----------	0

~~LAGOON INFORMATION~~

Is Lagoon Designed as an Irregular Shape?	(Y/N) ----------		N
Does Operator Want Emergency Spillway?	(Y/N) ----------		N
Was This Design Built Prior to Sept. 1996?	(Y/N) ----------		Y
Is Drain Tile Req'd to Lower SHWT?	(Y/N) ----------		N
Seasonal High Water Table Elev:	----------		0.00
Freeboard:	----------		1.0 Ft.
Emergency Spillway Flow Depth:	Not Applicable		
Side Slopes:	----------		3 :1 (H:V)
Inside Top Length:	----------		541.5 Ft.
Inside Top Width:	----------		541.5 Ft.
Top of Dike Elevation:	----------	Depth	48.50 Ft.
Finished Bottom Elevation:	----------	12.00 Ft.	36.50 Ft.
Start Pump Elevation:	----------	19.8 In.	46.85 Ft.
Stop Pump Elevation:	----------	50.04 In.	44.33 Ft.

~~LAGOON VOLUME~~	~~REQUIRED VOL.~~	~~DESIGN VOLUMES~~	~~% REQ'D.~~
Storm Stor =	**183264 (Cu.Ft.)**	**185,442 (Cu.Ft.)**	101.19%
Temporary =	**586293 (Cu.Ft.)**	**691,820 (Cu.Ft.)**	118.00%
~~**Permanent =**~~	~~**1700391 (Cu.Ft.)**~~	~~**1,905,167 (Cu.Ft.)**~~	~~112.04%~~
Total Volume =	**2,469,948 (Cu.Ft.)**	**2,782,429 (Cu.Ft.)**	112.65%

1/2 Treatment Volume =	**850,196 (Cu.Ft.)**	
1/2 Treatment Volume Elevation =	**41.02 Ft.**	89.77 In.
~~**90 Temporary Storage Volume Elevation =**~~	~~**45.50 Ft.**~~	36.05 In.

Min. Required Liner Thickness	----------	1.8 Ft.
Lagoon Surface Area: (Inside TOD)	----------	293,222 S.F.

Grower:	MB Farm 3507	Designed By:	KBW
Address:	PO Box 487	Checked By:	DSE
	Warsaw, NC 28398	Date:	07/19/11
County:	Jones	Sheet 2 of 7	

ACTUAL DESIGN VOLUME CALCULATIONS

BASE VOLUME: [ ] Cu. Ft.

LAGOON STAGE-AREA VOLUMES

Elevation (FT.)	Contour Area (SF)	Incr. Vol. (Cu. FT)	Cumul. Vol. (Cu. FT)
36.50	220,430		0
37.00	223,256	110,922	110,922
38.00	228,962	226,109	337,031
39.00	234,740	231,851	568,882
40.00	240,590	237,665	806,547
41.00	246,512	243,551	1,050,099
42.00	252,506	249,509	1,299,608
43.00	258,572	255,539	1,555,147
44.00	264,710	261,641	1,816,788
45.00	270,920	267,815	2,084,604
46.00	277,202	274,061	2,358,665
47.00	283,556	280,379	2,639,044
48.00	289,982	286,769	2,925,813
48.50	293,222	145,801	3,071,615

These volumes were calculated using the vertical average end area method.

~~TOTAL REQD VOL~~	~~2,469,948~~	~~CF~~	~~CUMULATIVE~~	~~VOL.~~		~~ZONE VOL.~~	~~112.65%~~
END PUMP = = = =	44.33	FT	1,905,167	CF	TR'MT	1,905,167	112.04%
START PUMP = = :	46.85	FT	2,596,987	CF	TEMP	691,820	118.00%
MAX STORAGE =	47.50	FT	2,782,429	CF	STORM	185,442	101.19%

MINIMUM REQUIRED VOLUME CALCULATIONS

Permanent Storage:

Required Treatment Volume:

Animal Type	Capacity	* ALW	* (cu.ft./lb)	= Total
Nursery	0	30	1.00	0
Wean to Finish	0	115	1.00	0
Finishing	0	135	1.00	0
Farrow to weanling	3,927	433	1.00	1,700,391
Farrow to feeder	0	522	1.00	0
Farrow to finish	0	1,417	1.00	0
Boars	0	400	1.00	0

Total Required Treatment Volume (cu. ft.)= 1,700,391

Sludge Storage Volume:

Animal Type	Capacity	* ALW	* (cu.ft./lb)	= Total
Nursery	0	30	0.00	0
Wean to Finish	0	115	0.00	0
Finishing	0	135	0.00	0
Farrow to weanling	3,927	433	0.00	0
Farrow to feeder	0	522	0.00	0
Farrow to finish	0	1,417	0.00	0
Boars	0	400	0.000	0

Total Required Sludge Storage Volume (cu. ft.)= 0

~~Temporary Storage Volume:~~

Manure Production:

Animal Type	Capacity *	Sto. Period d./day) = Total		
Nursery	0	180	0.30	0
Wean to Finish	0	180	1.17	0
Finishing	0	180	1.37	0
Farrow to weanling	3,927	180	4.39	3,106,048
Farrow to feeder	0	180	5.30	0
Farrow to finish	0	180	14.38	0
Boars	0	180	4.06	0

Total Manure Production (gals.)= 3,106,048

Total Manure Production (cu.ft.)= 415,247

Excess Fresh Water:

Animal Type	Capacity *	Sto. Period d./day) = Total		
Nursery	0	180	0.00	0
Wean to Finish	0	180	0.00	0
Finishing	0	180	0.00	0
Farrow to weanling	3,927	180	0.00	0
Farrow to feeder	0	180	0.00	0
Farrow to finish	0	180	0.00	0
Boars	0	180	0.00	0

Total Fresh Water Excess (gals.)= 0

Total Fresh Water Excess (cu.ft.)= 0

Temporary Storage Volume: (Cont.)

Rainfall in Excess of Evaporation:

Vol.=(Lagoon Surface Area + Additional Drainage Area) * Rainfall / 12in./ft

Vol.= (293222 sq.ft. + 0 sq.ft.) * 7 in. /12 in./ft.

Total Required Volume for Rainfall in Excess of Evap. (cu.ft.)= 171,046

Storm Storage:

Vol.=(Lagoon Surf. Area + Addt'l Drainage Area) * 25Yr./24Hr. Storm(in) / 12in./ft.

Vol.= (293222 sq.ft + 0 sq.ft.) * 7.5 in. /12 in./ft.

Total Required Volume for 25Yr./24Hr. Storm Event (cu.ft)= 183,264

"Heavy Rain" Storage:

Vol.=(Lagoon Surf. Area + Addt'l Drainage Area) * "Heavy Rain" Factor (in) / 12in./ft.

Vol.= (293222 sq.ft + 0 sq.ft.) * 0.0 in. /12 in./ft.

Total Required Volume for "Heavy Rain" (cu.ft.) = 0

(for Extended Periods of Chronic Rainfall)

Additional Water Storage:

No Additional Water Storage is Required

0 **0**

Total Required Storm Storage

(25Yr. / 24Hr. Storm + 'Heavy Rain')= **183,264 (CU.FT)**

Total Required Temporary Storage

(Manure Prod. + Excess Fr. Water + Rainfall Excess + Additional Water Storage) = **586,293 (CU.FT)**

Total Required Permanent Storage

(Treatment + Sludge) = **1,700,391 (CU.FT)**

TOTAL REQUIRED VOLUME = 2469948 (CU.FT.)

LAGOON DESIGN SUMMARY

Top of Dike Elevation	48.50	FT.
Emergency Spillway Crest Elevation	Not A|	Applicable
Top of 25Yr. / 24Hr. Storm Storage	47.50	FT.
Top of "Heavy Rain" Storage	Not	Applicable
Start Pump Elevation	46.85	FT.
End Pump Elevation	44.33	FT.
Top of Sludge Storage	Not	Applicable
Seasonal High Watertable Elev.	0.00	
Finished Bottom Elevation	36.50	FT.
Inside Top Length	541.50	FT.
Inside Top Width	541.50	FT.
Side Slopes	3:1	H:V
Lagoon Surface Area	293,222	SF
Min. Liner Thickness (if required)	1.8	FT.
Freeboard Depth	1.00	FT.
Temporary Storage Period	180	Days

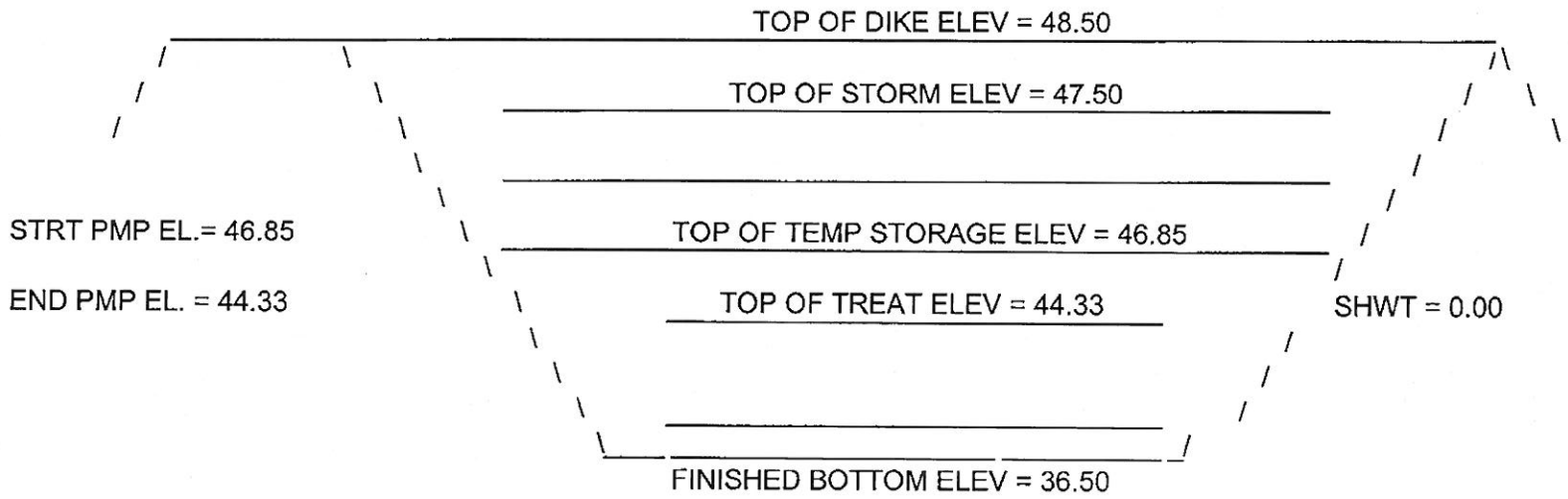
TOTAL DESIGN VOLUME = 2782429 (CU.FT.)

~~**Zone Depths:**~~

Treatment / Sludge Storage Zone Depth	7.8	FT.
Temporary Storage Zone Depth	2.5	FT.
Freeboard / Storm Storage Zone Depth	1.7	FT.
Total Lagoon Depth	12.0	FT.

Grower:	MB Farm 3507	Designe	KBW
Address:	PO Box 487	Checke	DSE
	Warsaw, NC 28398	Date:	07/19/11
County:	Jones	Sheet	6 of 7

ZONE ELEVATIONS



Grower:	MB Farm 3507	Designed By:	KBW
Address:	PO Box 487	Checked By:	DSE
	Warsaw, NC 28398	Date:	07/19/11
County:	Jones	Sheet 7 of 7	

This livestock waste treatment lagoon is designed in accordance with the United States Natural Resources Conservation Service PRACTICE STANDARD 359- WASTE TREATMENT LAGOON, revised prior to June, 1996.

Emergency Spillway:

An Emergency Spillway is not required.

NOTE: See attached Waste Utilization Plan

DESIGNED: David S Elkin

DATE: 7/19/11

NORTH CAROLINA PROFESSIONAL SEAL 023994 ENGINEER DAVID S. ELKIN

COMMENTS:

This design is update of start and stop pump elevations and to show the 1/2 treatment volume level for sludge storage. This design does not supercede the original certification of the farm.

Grower: 3508 Designed By: KBW

Address: PO Box 856 Checked By: DSE

Warsaw NC 28398 Date: 07/19/11

County: Jones Sheet 1 of 7

ANAEROBIC WASTE LAGOON DESIGN

FARM INFORMATION

		Farm Population:
Nursery:	----------	0
Wean to Finish:	----------	0
Finishing:	----------	0
Farrow to weanling:	----------	3927 Hd.
Farrow to feeder:	----------	0
Farrow to finish:	----------	0
Boars:	----------	0
Storage Period:	----------	180 Days
25 Yr. / 24 Hr Storm Event	----------	7.5 In.
"Heavy Rain" Factor	Not Applicable	
Rainfall in Excess of Evaporation	----------	7.0 In.
Additional Water Usage:	----------	0
Additional Drainage Area:	----------	0

~~LAGOON INFORMATION~~

Is Lagoon Designed as an Irregular Shape?	(Y/N) ----------		N
Does Operator Want Emergency Spillway?	(Y/N) ----------		N
Was This Design Built Prior to Sept. 1996?	(Y/N) ----------		Y
Is Drain Tile Req'd to Lower SHWT?	(Y/N) ----------		N
Seasonal High Water Table Elev:	----------		0.00
Freeboard:	----------		1.0 Ft.
Emergency Spillway Flow Depth:	Not Applicable		
Side Slopes:	----------		3 :1 (H:V)
Inside Top Length:	----------		700.0 Ft.
Inside Top Width:	----------		363.0 Ft.
Top of Dike Elevation:	----------	Depth	48.50 Ft.
Finished Bottom Elevation:	----------	12.50 Ft.	36.00 Ft.
Start Pump Elevation:	----------	19.8 In.	46.85 Ft.
Stop Pump Elevation:	----------	49.2 In.	44.40 Ft.

~~LAGOON VOLUME~~	~~REQUIRED VOL.~~	~~DESIGN VOLUMES~~	~~% REQ'D.~~
Storm Stor =	**158813 (Cu.Ft.)**	**160,108 (Cu.Ft.)**	100.82%
Temporary =	**563472 (Cu.Ft.)**	**578,075 (Cu.Ft.)**	102.59%
~~**Permanent =**~~	~~**1700391 (Cu.Ft.)**~~	~~**1,713,157 (Cu.Ft.)**~~	~~100.75%~~
Total Volume =	**2,422,676 (Cu.Ft.)**	**2,451,341 (Cu.Ft.)**	101.18%

1/2 Treatment Volume =	**850,196 (Cu.Ft.)**	
1/2 Treatment Volume Elevation =	**40.48 Ft.**	96.25 In.
~~**90 Temporary Storage Volume Elevation =**~~	~~**45.37 Ft.**~~	37.61 In.

Min. Required Liner Thickness	----------	1.8 Ft.
Lagoon Surface Area: (Inside TOD)	----------	254,100 S.F.

Grower:	3508	Designed By:	KBW
Address:	PO Box 856	Checked By:	DSE
	Warsaw NC 28398	Date:	07/19/11
County:	Jones	Sheet 2 of 7	

ACTUAL DESIGN VOLUME CALCULATIONS

BASE VOLUME: [ ] Cu. Ft.

LAGOON STAGE-AREA VOLUMES

Elevation (FT.)	Contour Area (SF)	Incr. Vol. (Cu. FT)	Cumul. Vol. (Cu. FT)
36.00	180,000		0
37.00	185,514	182,757	182,757
38.00	191,100	188,307	371,064
39.00	196,758	193,929	564,993
40.00	202,488	199,623	764,616
41.00	208,290	205,389	970,005
42.00	214,164	211,227	1,181,232
43.00	220,110	217,137	1,398,369
44.00	226,128	223,119	1,621,488
45.00	232,218	229,173	1,850,661
46.00	238,380	235,299	2,085,960
47.00	244,614	241,497	2,327,457
48.00	250,920	247,767	2,575,224
48.50	254,100	126,255	2,701,479

These volumes were calculated using the vertical average end area method.

~~TOTAL REQD VOL~~	~~2,422,676~~	~~CF~~	~~CUMULATIVE~~	~~VOL.~~		~~ZONE VOL.~~	~~101.18%~~
END PUMP = = = =	44.40	FT	1,713,157	CF	TR'MT	1,713,157	100.75%
START PUMP = = :	46.85	FT	2,291,232	CF	TEMP	578,075	102.59%
MAX STORAGE =	47.50	FT	2,451,341	CF	STORM	160,108	100.82%

MINIMUM REQUIRED VOLUME CALCULATIONS

Permanent Storage:

Required Treatment Volume:

Animal Type	Capacity	* ALW	* (cu.ft./lb)	= Total
Nursery	0	30	1.00	0
Wean to Finish	0	115	1.00	0
Finishing	0	135	1.00	0
Farrow to weanling	3,927	433	1.00	1,700,391
Farrow to feeder	0	522	1.00	0
Farrow to finish	0	1,417	1.00	0
Boars	0	400	1.00	0
Total Required Treatment Volume (cu. ft.)=				**1,700,391**

Sludge Storage Volume:

Animal Type	Capacity	* ALW	* (cu.ft./lb)	= Total
Nursery	0	30	0.00	0
Wean to Finish	0	115	0.00	0
Finishing	0	135	0.00	0
Farrow to weanling	3,927	433	0.00	0
Farrow to feeder	0	522	0.00	0
Farrow to finish	0	1,417	0.00	0
Boars	0	400	0.000	0
Total Required Sludge Storage Volume (cu. ft.)=				**0**

~~Temporary Storage Volume:~~

Manure Production:

Animal Type	Capacity *	Sto. Period d./day) = Total		
Nursery	0	180	0.30	0
Wean to Finish	0	180	1.17	0
Finishing	0	180	1.37	0
Farrow to weanling	3,927	180	4.39	3,106,048
Farrow to feeder	0	180	5.30	0
Farrow to finish	0	180	14.38	0
Boars	0	180	4.06	0
Total Manure Production (gals.)=				**3,106,048**
Total Manure Production (cu.ft.)=				**415,247**

Excess Fresh Water:

Animal Type	Capacity *	Sto. Period d./day) = Total		
Nursery	0	180	0.00	0
Wean to Finish	0	180	0.00	0
Finishing	0	180	0.00	0
Farrow to weanling	3,927	180	0.00	0
Farrow to feeder	0	180	0.00	0
Farrow to finish	0	180	0.00	0
Boars	0	180	0.00	0
Total Fresh Water Excess (gals.)=				**0**
Total Fresh Water Excess (cu.ft.)=				**0**

Temporary Storage Volume: (Cont.)

Rainfall in Excess of Evaporation:

Vol.=(Lagoon Surface Area + Additional Drainage Area) * Rainfall / 12in./ft

Vol.= (254100 sq.ft. + 0 sq.ft.) * 7 in. /12 in./ft.

Total Required Volume for Rainfall in Excess of Evap. (cu.ft.)= 148,225

Storm Storage:

Vol.=(Lagoon Surf. Area + Addt'l Drainage Area) * 25Yr./24Hr. Storm(in) / 12in./ft.

Vol.= (254100 sq.ft + 0 sq.ft.) * 7.5 in. /12 in./ft.

Total Required Volume for 25Yr./24Hr. Storm Event (cu.ft)= 158,813

"Heavy Rain" Storage:

Vol.=(Lagoon Surf. Area + Addt'l Drainage Area) * "Heavy Rain" Factor (in) / 12in./ft.

Vol.= (254100 sq.ft + 0 sq.ft.) * 0.0 in. /12 in./ft.

Total Required Volume for "Heavy Rain" (cu.ft.) = 0

(for Extended Periods of Chronic Rainfall)

Additional Water Storage:

No Additional Water Storage is Required

0 **0**

Total Required Storm Storage

(25Yr. / 24Hr. Storm + 'Heavy Rain')= **158,813 (CU.FT)**

Total Required Temporary Storage

(Manure Prod. + Excess Fr. Water + Rainfall Excess + Additional Water Storage) = **563,472 (CU.FT)**

Total Required Permanent Storage

(Treatment + Sludge) = **1,700,391 (CU.FT)**

TOTAL REQUIRED VOLUME = 2422676 (CU.FT.)

Grower:	3508	Designed By:	KBW
Address:	PO Box 856	Checked By:	DSE
	Warsaw NC 28398	Date:	07/19/11
County:	Jones	Sheet 5 of 7	

LAGOON DESIGN SUMMARY

Top of Dike Elevation	48.50	FT.
Emergency Spillway Crest Elevation	Not A	Applicable
Top of 25Yr. / 24Hr. Storm Storage	47.50	FT.
Top of "Heavy Rain" Storage	Not	Applicable
Start Pump Elevation	46.85	FT.
End Pump Elevation	44.40	FT.
Top of Sludge Storage	Not	Applicable
Seasonal High Watertable Elev.	0.00	
Finished Bottom Elevation	36.00	FT.
Inside Top Length	700.00	FT.
Inside Top Width	363.00	FT.
Side Slopes	3:1	H:V
Lagoon Surface Area	254,100	SF
Min. Liner Thickness (if required)	1.8	FT.
Freeboard Depth	1.00	FT.
Temporary Storage Period	180	Days

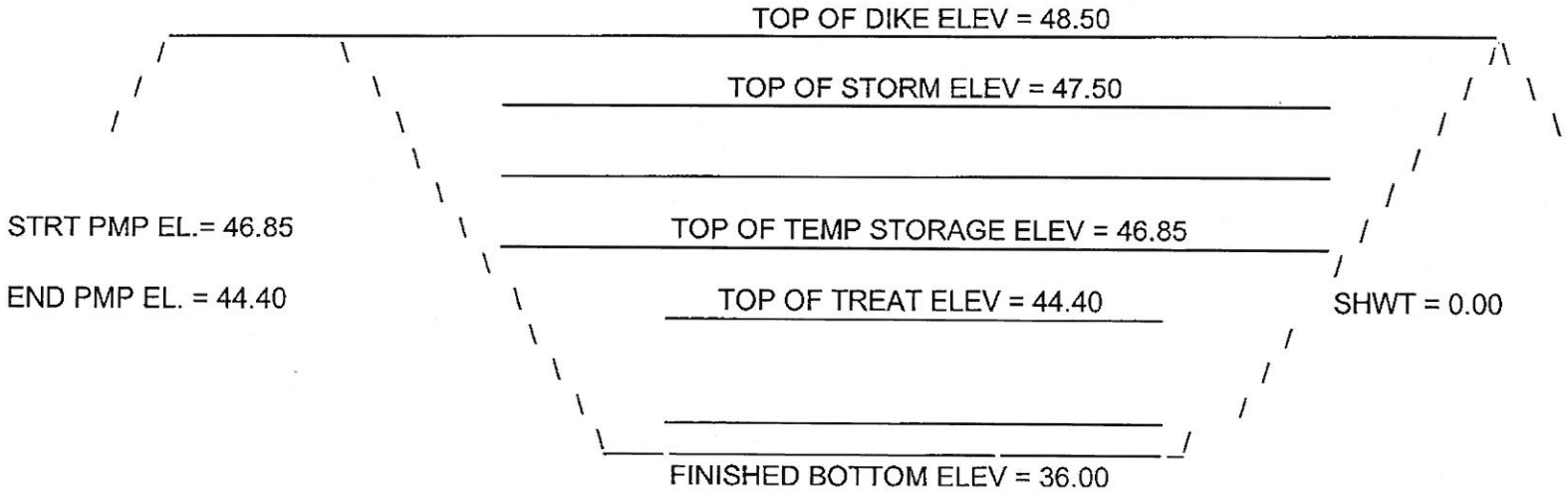
TOTAL DESIGN VOLUME = 2451341 (CU.FT.)

~~**Zone Depths:**~~

Treatment / Sludge Storage Zone Depth	8.4	FT.
Temporary Storage Zone Depth	2.5	FT.
Freeboard / Storm Storage Zone Depth	1.7	FT.
Total Lagoon Depth	12.5	FT.

Grower:	3508	Designe KBW
Address:	PO Box 856	Checke DSE
	Warsaw NC 28398	Date: 07/19/11
County:	Jones	Sheet 6 of 7

ZONE ELEVATIONS



Grower:	3508	Designed By:	KBW
Address:	PO Box 856	Checked By:	DSE
	Warsaw NC 28398	Date:	07/19/11
County:	Jones	Sheet 7 of 7	

This livestock waste treatment lagoon is designed in accordance with the United States Natural Resources Conservation Service PRACTICE STANDARD 359- WASTE TREATMENT LAGOON, revised prior to June, 1996.

Emergency Spillway:

An Emergency Spillway is not required.

NOTE: See attached Waste Utilization Plan

DESIGNED: David S. Elkin

DATE: 7/19/11

COMMENTS:

This design is update of start and stop pump elevations and to show the 1/2 treatment volume level for sludge storage. This design does not supercede the original certification of the farm.

Farm 3507
+
3508

System Calibration

Information presented in manufacturer's charts are based on average operation conditions with relatively new equipment. Discharge rates and application rates change over time as equipment gets older and components wear. In particular, pump wear tends to reduce operating pressure and flow. With continued use, nozzle wear results in an increase in the nozzle opening which will increase the discharge rate while decreasing the wetted diameter.

You should be aware that operating the system differently than assumed in the design will alter the application rate, diameter of coverage, and subsequently the application uniformity. For example, operating the system with excessive pressure results in smaller droplets, greater potential for drift, and accelerates wear of the sprinkler nozzle. Clogging of nozzles can result in pressure increase. Plugged intakes or crystallization of mainlines will reduce operating pressure. Operating below design pressure greatly reduces the coverage diameter and application uniformity.

For the above reason, you should calibrate your equipment on a regular basis to ensure proper application rates and uniformity. Calibration at least once every three years is recommended. Calibration involves collecting and measuring flow at several locations in the application area. Any number of containers can be used to collect flow and determine the application rate. Rain gauges work best because they already have a graduated scale from which to read the application amount without having to perform additional calculations. However, pans, plastic buckets, jars, or anything with a uniform opening and cross-section can be used provided the liquid collected can be easily transferred to a scaled container for measuring.

For stationary sprinklers, collection containers should be located randomly throughout the application area at several distances from sprinklers. For traveling guns, sprinklers should be located along a transect perpendicular to the direction of pull. Set out collection containers 25 feet apart along the transect on both sides of the gun cart. You should compute the average application rate for all nonuniformity of the application. On a windless day, variation between containers of more than 30 percent is cause for concern. You should contact your irrigation dealer or technical specialist for assistance.

**Reprinted for Certification Training for Operations of Animal Waste Management Systems Manual*

OPERATION & MAINTENANCE PLAN

Proper lagoon management should be a year-round priority. It is especially important to manage levels so that you do not have problems during extended rainy and wet periods.

Maximum storage capacity should be available in the lagoon for periods when the receiving crop is dormant (such as wintertime for bermudagrass) or when there are extended rainy spells such as a thunderstorm season in the summertime. This means that at the first sign of plant growth in the later winter / early spring, irrigation according to a farm waste management plan should be done whenever the land in dry enough to receive lagoon liquid. This will make storage space available in the lagoon for future wet periods. In the late summer / early fall the lagoon should be pumped down to the low marker (see Figure 2-1) to allow for winter storage. Every effort should be made to ***maintain*** the lagoon close to the minimum liquid level as long as the weather and waste utilization plan will allow it.

Waiting until the lagoon has reached its maximum storage capacity before starting to irrigated does not leave room for storing excess water during extended wet periods. Overflow from the lagoon for any reason except a 25-year, 24-hour storm is a violation of state law and subject to penalty action.

The routine maintenance of a lagoon involves the following:

- Maintenance of a vegetative cover for the dam. Fescue or common bermudagrass are the most common vegetative covers. The vegetation should be fertilized each year, if needed, to maintain a vigorous stand. The amount of fertilized applied should be based on a soils test, but in the event that it is not practical to obtain a soils test each year, the lagoon embankment and surrounding areas should be fertilized with 800 pounds per acre of 10-10-10, or equivalent.

- Brush and trees on the embankment must be controlled. This may be done by mowing, spraying, grazing, chopping, or a combination of these practices. This should be done at least once a year and possibly twice in years that weather conditions are favorable for heavy vegetative growth.

NOTE: If vegetation is controlled by spraying, the herbicide must not be allowed to enter the lagoon water. Such chemicals could harm the bacteria in the lagoon that are treating the waste.

Maintenance inspections of the entire lagoon should be made during the initial filling of the lagoon and at least monthly and after major rainfall and storm events. Items to be checked should include, as a minimum, the following:

Waste Inlet Pipes, Recycling Pipes, and Overflow Pipes -- look for:

1. separation of joints
2. cracks or breaks
3. accumulation of salts or minerals
4. overall condition of pipes

Lagoon surface -- look for:

1. undesirable vegetative growth
2. floating or lodged debris

Embankment -- look for:

1. settlement, cracking, or "jug" holes
2. side slope stability -- slumps or bulges
3. wet or damp areas on the back slope
4. erosion due to lack or vegetation or as a result of wave action
5. rodent damage

Larger lagoons may be subject to liner damage due to wave action caused by strong winds. These waves can erode the lagoon sidewalls, thereby weakening the lagoon dam. A good stand of vegetation will reduce the potential damage caused by wave action. If wave action causes serious damage to a lagoon sidewall, baffles in the lagoon may be used to reduce the wave impacts.

Any of these features could lead to erosion and weakening of the dam. If your lagoon has any of these features, you should call an appropriate expert familiar with design and construction of waste lagoons. You may need to provide a temporary fix if there is a threat of a waste discharge. However, a permanent solution should be reviewed by the technical expert. Any digging into a lagoon dam with heavy equipment is a serious undertaking with potentially serious consequences and should not be conducted unless recommended by an appropriate technical expert.

Transfer Pumps -- check for proper operation of:

1. recycling pumps
2. irrigation pumps

Check for leaks, loose fittings, and overall pump operation. An unusually loud or grinding noise, or a large amount of vibration, may indicate that the pump is in need of repair or replacement.

NOTE: Pumping systems should be inspected and operated frequently enough so that you are not completely "surprised" by equipment failure. You should perform your pumping system maintenance at a time when your lagoon is at its low level. This will allow some safety time should major repairs be required. Having a nearly full lagoon is not the time to think about switching, repairing, or borrowing pumps. Probably, if your lagoon is full, your neighbor's lagoon is full also. You should consider maintaining an inventory of spare parts or pumps.

- Surface water diversion features are designed to carry *all* surface drainage waters (such as rainfall runoff, roof drainage, gutter outlets, and parking lot runoff) away from your lagoon and other waste treatment or storage structures. The only water that should be coming from your lagoon is that which comes from your flushing (washing) system pipes and the rainfall that hits the lagoon directly. You should inspect your diversion system for the following:
    1. adequate vegetation
    2. diversion capacity
    3. ridge berm height

Identified problems should be corrected promptly. It is advisable to inspect your system during or immediately following a heavy rain. If technical assistance is needed to determine proper solutions, consult with appropriate experts.

You should record the level of the lagoon just prior to when rain is predicted, and then record the level again 4 to 6 hours after the rain (assumes there is no pumping). This will give you an idea of how much your lagoon level will rise with a certain rainfall amount (you must also be recording your rainfall for this to work). Knowing this should help in planning irrigation applications and storage. If your lagoon rises excessively, you may have an overflow problem from a surface water diversion or there may be seepage into the lagoon from the surrounding land.

Lagoon Operation

Startup:

1. Immediately after construction establish a complete sod cover on bare soil surfaces to avoid erosion.

2. Fill new lagoon design treatment volume at least half full of water before waste loading begins, taking care not to erode lining or bank slopes.

3. Drainpipes into the lagoon should have a flexible pipe extender on the end of the pipe to discharge near the bottom of the lagoon during initial filling or another means of slowing the incoming water to avoid erosion of the lining.

4. When possible, begin loading new lagoons in the spring to maximize bacterial establishment (due to warmer weather).

5. It is recommended that a new lagoon be seeded with sludge from a healthy working swine lagoon in the amount of 0.25 percent of the full lagoon liquid volume. This seeding should occur at least two weeks prior to the addition of wastewater.

6. Maintain a periodic check on the lagoon liquid pH. If the pH falls below 7.0, add agricultural lime at the rate of 1 pound per 1000 cubic feet of lagoon liquid volume until the pH rises above 7.0. Optimum lagoon liquid pH is between 7.5 and 8.0.

7. A dark color, lack of bubbling, and excessive odor signals inadequate biological activity. Consultation with a technical specialist is recommended if these conditions occur for prolonged periods, especially during the warm season.

Loading:

The more frequently and regularly that wastewater is added to a lagoon, the better the lagoon will function. Flush systems that wash waste into the lagoon several times daily are optimum for treatment. Pit recharge systems, in which one or more buildings are drained and recharged each day, also work well.

- Practice water conservation --- minimize building water usage and spillage from leaking waterers, broken pipes and washdown through proper maintenance and water conservation.
- Minimize feed wastage and spillage by keeping feeders adjusted. This will reduce the amount of solids entering the lagoon.

Management:

- Maintain lagoon liquid level between the permanent storage level and the full temporary storage level.

- Place visible markers or stakes on the lagoon bank to show the minimum liquid level and the maximum liquid level. (Figure 2-1).

- Start irrigating at the earliest possible date in the spring based on nutrient requirements and soil moisture so that temporary storage will be maximized for the summer thunderstorm season. Similarly, irrigate in the late summer / early fall to provide maximum lagoon storage for the winter.

- The lagoon liquid level *should never* be closer than 1 foot to the lowest point of the dam or embankment.

- Don not pump the lagoon liquid level lower than the permanent storage level unless you are removing sludge.

- Locate float pump intakes approximately 18 inches underneath the liquid surface and as far away from the drainpipe inlets as possible.

- Prevent additions of bedding materials, long-stemmed forage or vegetation, molded feed, plastic syringes, or other foreign materials into the lagoon.

- Frequently remove solids from catch basins at end of confinement houses or wherever they are installed.

- Maintain strict vegetation, rodent, and varmint control near lagoon edges.

- Do not allow trees or large bushes to grow on lagoon dam or embankment.

- Remove sludge from the lagoon either when the sludge storage capacity is full or before it fills 50 percent of the permanent storage volume.

- If animal production is to be terminated, the owner is responsible for obtaining and implementing a closure plan to eliminate the possibility of a pollutant discharge.

Sludge Removal:

Rate of lagoon sludge buildup can be reduced by:

- proper lagoon sizing,
- mechanical solids separation of flushed waste,
- gravity settling of flushed waste solids in an appropriately designed basin, or
- minimizing feed wastage and spillage.

Lagoon sludge that is removed annually rather than stored long term will:

- have more nutrients,
- have more odor, and
- require more land to properly use the nutrients.

Removal techniques:

- Hire a custom applicator.

- Mix the sludge and lagoon liquid with a chopper - agitator impeller pump through large - bore sprinkler irrigation system onto nearby cropland; and soil incorporate.

- Dewater the upper part of lagoon by irrigation onto nearby cropland or forageland; mix remaining sludge; pump into liquid sludge applicator; haul and spread onto cropland or forageland; and soil incorporate.

- Dewater the upper part of lagoon by irrigation onto nearby cropland or forageland; dredge sludge from lagoon with dragline or sludge barge; berm an area beside lagoon to receive the sludge so that liquids can drain back into lagoon; allow sludge to dewater; haul and spread with manure spreader onto cropland or forageland; and soil incorporate.

Regardless of the method, you must have the sludge material analyzed for waste constituents just as you would your lagoon water. The sludge will contain different nutrient and metal values from the liquid. The application of the sludge to fields will be limited by these nutrients as well as any previous waste applications to that field and crop requirement. Waste application rates will be discussed in detail in Chapter 3.

When removing sludge, you must also pay attention to the liner to prevent damage. Close attention by the pumper or drag-line operator will ensure that the lagoon liner remains intact. If you see soil material or the synthetic liner material being disturbed, you should stop the activity immediately and not resume until you are sure that the sludge can be removed without liner injury. If the liner is damaged it must be repaired as soon as possible.

Sludge removed from the lagoon has a much higher phosphorus and heavy metal content than liquid. Because of this it should probably be applied to land with low phosphorus and metal levels, as indicated by a soil test, and incorporated to reduce the chance of erosion. Note that if the sludge is applied to fields with very high soil-test phosphors, it should be applied only at rates equal to the crop removal of phosphorus. As with other wastes, always have your lagoon sludge analyzed for its nutrient value.

The application of sludge will increase the amount of odor at the waste application site. Extra precaution should be used to observe the wind direction and other conditions which could increase the concern of neighbors.

Possible Causes of Lagoon Failure

Lagoon failures result in the unplanned discharge of wastewater from the structure. Types of failures include leakage through the bottom or sides, overtopping, and breach of the dam. Assuming proper design and construction, the owner has the responsibility for ensuring structure safety. Items which may lead to lagoon failures include:

- Modification of the lagoon structure -- an example is the placement of a pipe in the dam without proper design and construction. (Consult an expert in lagoon design before placing any pipes in dams.)
- Lagoon liquid levels -- high levels are a safety risk.
- Failure to inspect and maintain the dam.
- Excess surface water flowing into the lagoon.
- Liner integrity -- protect from inlet pipe scouring, damage during sludge removal, or rupture from lowering lagoon liquid level below groundwater table.

NOTE: If lagoon water is allowed to overtop the dam, the moving water will soon cause gullies to form in the dam. Once this damage starts, it can quickly cause a large discharge of wastewater and possible dam failure.

EMERGENCY ACTION PLAN

PHONE NUMBERS

DIVISION OF WATER QUALITY (DWQ)	252-946-6481
EMERGENCY MANAGEMENT SERVICES (EMS)	252-448-1221
SOIL AND WATER CONSERVATION DISTRICT (SWCD)	252-448-2731
NATURAL RESOURCES CONSERVATION SERVICE (NRCS)	252-448-2731
COOPERATIVE EXTENSION SERVICE (CES)	252-448-9621

This plan will be implemented in the event that wastes from your operation are leaking, overflowing or running off site. You should not wait until wastes reach surface waters or leave your property to consider that you have a problem. You should make every effort to ensure that this does not happen. This plan should be posted in an accessible location for all employees at the facility. The following are some action items you should take.

1. Stop the release of wastes. Depending on the situation, this may or may not be possible. Suggested responses to some possible problems are listed below.

A. Lagoon overflow - possible solutions are:
   a) Add soil to berm to increase elevation of dam.
   b) Pump wastes to fields at an acceptable rate.
   c) Stop all flow to the lagoon immediately.
   d) Call a pumping contractor.
   e) Make sure no surface water is entering lagoon.

B. Runoff from waste application field-actions include:
   a) Immediately stop waste application.
   b) Create a temporary diversion to contain waste.
   c) Incorporate waste to reduce runoff.
   d) Evaluate and eliminate the reason(s) that cause the runoff.
   e) Evaluate the application rates for the fields where runoff occurred.

C. Leakage from the waste pipes and sprinklers - action include:
   a) Stop recycle pump.
   b) Stop irrigation pump.
   c) Close valves to eliminate further discharge.
   d) Repair all leaks prior to restarting pumps.

D. Leakage from flush systems, houses, solid separators - action include:
   a) Stop recycle pump.
   b) Stop irrigation pump.
   c) Make sure siphon occurs.
   d) Stop all flow in the house, flush systems, or solid separators.

E. Leakage from base or sidewall of lagoon. Often this is seepage as opposed to flowing leaks - possible action:
   a) Dig a small sump or ditch from the embankment to catch all seepage, put in a submersible pump, and pump back to lagoon.
   b) If holes are caused by burrowing animals, trap or remove animals and fill holes and compact with a clay type soil.
   c) Have a professional evaluate the condition of the side walls and the lagoon bottom as soon as possible.

2. Assess the extent of the spill and note any obvious damages.

   a. Did the waste reach surface waters?
   b. Approximately how much was released and for what duration?
   c. Any damage notes, such as employee injury, fish kills, or property damage?
   d. Did the spill leave the property?
   e. Does the spill have the potential to reach surface waters?
   f. Could a future rain event cause the spill to reach surface waters?
   g. Are potable water wells in danger (either on or off the property)?
   h. How much reached surface waters?

3. Contact appropriate agencies.

   a. During normal business hours call your DWQ regional office; Phone #, After hours, emergency number: (919) 733-3942. Your phone call should include: your name, facility number, telephone number, the details of the incident from item 2 above, the exact location of the facility, the location or direction of the movement of the spill, weather and wind conditions. The corrective measures that have been under taken, and the seriousness of the situation.
   b. If the spill leaves property or enters surface waters, call local EMS phone number.
   c. Instruct EMS to contact local Health Department.
   d. Contact CE's phone number, local SWCD office phone number and the local NRCS office for advice / technical assistance phone number.

4. If none of the above works call 911 or the Sheriff's Department and explain your problem to them and ask the person to contact the proper agencies for you.

5. Contact the contractor of your choice to begin repair or problem to minimize offsite damage.

   a. Contractors Name: Murphy Brown, LLC
   b. Contractors Address: P.O. Box 856, Warsaw, NC 28398
   c . Contractors Phone: (910)293-3434

6. Contact the technical specialist who certified the lagoon (NRCS, Consulting Engineer, etc.)

   a. Name: Kraig Westerbeek
   b. Phone: (910) 293 - 5330

7. Implement procedures as advised by DWQ and technical assistance agencies to rectify the damage, repair the system, and reassess the waste management plan to keep problems with release of wastes from happening again.

INSECT CONTROL CHECKLIST FOR ANIMAL OPERATIONS

Source	Cause	BMP's to Minimize Odor	Site Specific Practices
		(Liquid Systems)	
Flush Gutters	Accumulation of solids	(✓) Flush system is designed and operated sufficiently to remove accumulated solids from gutters as designed. ( ) Remove bridging of accumulated solids at discharge	
Lagoons and Pits	Crusted Solids	(✓) Maintain lagoons, settling basins and pits where pest breeding is apparent to minimize the crusting of solids to a depth of no more than 6-8 inches over more than 30% of surface.	
Excessive Vegetative Growth	Decaying vegetation	(✓)Maintain vegetative control along banks of lagoons and other impoundment's to prevent accumulation of decaying vegetative matter along water's edge on impoundment's perimeter.	
		(Dry Systems)	
Feeders	Feed Spillage	( ) Design, operate and maintain feed systems (e.g., bunkers and troughs) to minimize the accumulation of decaying wastage. ( ) Clean up spillage on a routine basis (e.g. 7-10 day interval during summer; 15-30 day interval during winter).	
Feed Storage	Accumulation of feed residues	( ) Reduce moisture accumulation within and around immediate perimeter of feed storage areas by insuring drainage away from site and/or providing adequate containment (e.g., covered bin for brewer's grain and similar high moisture grain products). ( ) Inspect for and remove or break up accumulated solids in filter strips around feed storage as needed.	
Animal Holding Areas	Accumulation of animal wastes and feed wastage	( ) Eliminate low area that trap moisture along fences and other locations where waste accumulates and disturbance by animals is minimal. ( ) Maintain fence rows and filter strips around animal holding areas to minimize accumulations of wastes (i.e. inspect for and remove or break up accumulated solids as needed).	

Dry Manure Handling Systems	Accumulations of animal wastes	( ) Remove spillage on a routine basis (e.g. 7-10 day interval during summer; 15-30 days interval during winter) where manure is loaded for land application or disposal. ( ) Provide for adequate drainage around manure stockpiles ( ) Inspect for and remove or break up accumulated wastes in filter strips around stockpiles and manure handling areas as needed.

The issues checked ( ) pertain to this operation. The landowner / integrator agrees to use sound judgment in applying insect control measures as practical.

I certify the aforementioned insect control Best Management Practices have been reviewed with me.

_____

(Landowner Signature)

For more information contact the Cooperative Extension Service, Department of Entomology, Box 7613, North Carolina State University, Raleigh, NC 27695-7613.

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SWINE FARM WASTE MANAGEMENT ODOR CONTROL CHECKLIST

Source	Cause	BMP's to Minimize Odor	Site Specific Practices
Farmstead	Swine production	(✓)Vegetative or wooded buffers: (✓)Recommended best management practices; (✓)Good judgment and common sense	
Animal body surfaces	Dirty manure covered animals	( )Dry floors	
Floor surfaces	Wet manure-covered floors	(✓)Slotted floors; (✓)Waterers located over slotted floors; (✓)Feeders at high end of solid floors; (✓)Scrape manure buildup from floors; ( )Underfloor ventilation for drying	
Manure collection pits	Urine Partial microbial decomposition	(✓)Frequent manure removal by flush, pit recharge or scrape ( )Underfloor ventilation	
Ventilation exhaust fans	Volatile gases Dust	(✓)Fan maintenance; (✓)Efficient air movement	
Indoor surfaces	Dust	(✓)Washdown between groups of animals ( )Feed additives; ( )Feeder covers; ( )Feed delivery downspout extenders to feeder covers	
Flush Tanks	Agitation of recycled lagoon liquid while tanks are filling	( )Flush tank covers ( )Extend fill lines to near bottom of tanks with anti-siphon vents	
Flush alleys	Agitation during waste water conveyance	( )Underfloor flush with underfloor ventilation	
Pit recharge points	Agitation of recycled lagoon liquid while pits are filling	( )Extend recharge lines to near bottom of pits with anti-siphon vents	
Lift stations	Agitation during sump tank filling and drawdown	( )Sump tank covers	
Outside drain collection or junction boxes	Agitation during waste water conveyance	( )Box Covers	
End of drain pipes at lagoon	Agitation during waste water	( )Extend discharge point of pipes underneath lagoon liquid level	
Lagoon surfaces	Volatile gas emissions Biological mixing Agitation	(✓)Proper lagoon liquid capacity (✓)Correct lagoon startup procedures ( )Minimum surface area-to-volume ratio (✓)Minimum agitation when pumping ( )Mechanical aeration ( )Proven biological additives	
Irrigation sprinkler nozzles	High pressure agitation Wind draft	(✓)Irrigate on dry days with little or no wind (✓)Minimum recommended operation pressure (✓)Pump intake near lagoon liquid surface ( )Pump from second-stage lagoon	

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Storage tank or basin surface	Partial microbial decomposition Mixing while filling Agitation when emptying	( )Bottom or midlevel loading ( )Tank covers ( )Basin surface mats of solids ( )Proven biological additives or oxidants
Settling basin surface	Partial microbial decomposition Mixing while filling Agitation when emptying	( )Extend drainpipe outlets underneath liquid level ( )Remove settled solids regularly
Manure, slurry or sludge spreader outlets	Agitation when spreading Volatile gas emissions	( )Soil injection of slurry/sludges ( )Wash residual manure from spreader after use ( )Proven biological additives or oxidants
Dead animals	Carcass decomposition	( )Proper disposition of carcasses
Dead animal disposal pits	Carcass decomposition	( )Complete covering of carcasses in burial pits ( )Proper location / construction of disposal pits
Incinerators	Incomplete combustion	( )Secondary stack burners
Standing water around facilities	improper drainage Microbial decomposition of organic matter	(✓)Farm access road maintenance away from facilities
Manure tracked onto public roads from farm access	Poorly maintained access roads	(✓)Farm access road maintenance

Additional Information:	Available From:
Swine Manure Management 0200 Rule / BMP Packet	NCSU-County Extension Center
Swine Production Farm Potential Odor Sources and Remedies, EBAE Fact Sheet	NCSU-BAE
Swine Production Facility Manure Management:Pit Recharge--Lagoon Treatment:EBAE128-88	NCSU-BAE
Swine Production Facility Manure Management:Underfloor Fluse-Lagoon Treatment 129-88	NCSU-BAE
Lagoon Design and Management for Livestock Manure Treatment and Storage; EBAE103-83	NCSU-BAE
Calibration of Manure and Wastewater Application Equipment EBAE Fact Sheet	NCSU-BAE
Controlling Odors from Swine Buildings; PIH-33	NCSU-Swine Extension
Environmental Assurance Program: NPPC Manual	NC Pork Producers Assoc
Options for Managing Odor; a report from the Swine Odor Task Force	NCSU Agri Communication
Nuisance Concerns in Animal Manure Management: Odors and Flies; PR0101, 1995 Conference Proceedings	Florida Cooperative Extension

The issues checked ( ) pertain to this operation. The landowner / integrator agrees to use sound judgment in applying odor control measures as practical.

I certify the aforementioned odor control Best Management Practices have been reviewed with me.

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(Landowner Signature)

MORTALITY MANAGEMENT METHODS

(Check which method(s) are being implemented)

( ) Burial three feet beneath the surface of the ground within 24 hours after knowledge of the death. The burial will be at least 300 feet from any flowing stream or public body of water.

(✓) Rendering at a rendering plant licensed under G. S. 106 - 168.7

( ) Complete incineration

( ) In the case of dead poultry only, placing in a disposal pit of a size and design approved by the Department of Agriculture.

( ) Any method which in the professional opinion of the State Veterinarian would make possible the salvage of part of a dead animal's value without endangering human or animal health. (Written approval of the State Veterinarian must be attached)