MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
FORM W - CONCENTRATED ANIMAL FEEDING OPERATION
(CAFO) OPERATING PERMIT APPLICATION

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 OPERATIONS NAME
R & F MO

PHYSICAL ADDRESS
County Road 231
CITY Auxvasse
STATE MO
ZIP CODE 65231

LEGAL DESCRIPTION
Sec.: 25 Twn.: 49N Rng.: 10
TELEPHONE NUMBER WITH AREA CODE
507-825-7032

MAILING ADDRESS
1300 S. Hwy 75, P.O. Box 188
CITY Pipestone
STATE MN
ZIP CODE 56164

TELEPHONE NUMBER WITH AREA CODE
507-825-7032

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
Permit fees may be paid online by credit card or eCheck through a system called JetPay. Use the URL provided to make an online payment.

NPDES Site Specific Permit - https://magic.collectorsolutions.com/magic-uib/payments/mo-natural-resources/591/

NPDES General Permit (MOG01) - https://magic.collectorsolutions.com/magic-uib/payments/mo-natural-resources/599/

State No-Discharge General Permit (MOGS1) - https://magic.collectorsolutions.com/magic-uib/payments/mo-natural-resources/742/

☐ Renewal

☐ Modification
Permit fees may be paid online by credit card or eCheck through a system called JetPay. Use the URL provided to access JetPay and make an online payment. Modification fee: https://magic.collectorsolutions.com/magic-uib/payments/mo-natural-resources/596/

☐ Ownership Transfer

PREVIOUS OWNERS NAME

ADDRESS

CITY STATE ZIP CODE

SIGNATURE DATE

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

Permit fees may be paid online by credit card or eCheck through a system called JetPay. Use the URL provided to access JetPay and make an online payment. Modification fee: https://magic.collectorsolutions.com/magic-uib/payments/mo-natural-resources/596/
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.

<table>
<thead>
<tr>
<th>Permitted Feature</th>
<th>Storage Structure Type(s)</th>
<th>Design Dry Process Waste (tons/yr.)</th>
<th>Days of Storage</th>
<th>Total Storage Capacity (gal)</th>
<th>Design Wastewater per Year (gal/yr.)</th>
<th>Days of Storage</th>
<th>Design Flow MOD</th>
</tr>
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<tbody>
<tr>
<td>001</td>
<td>C - Gestation</td>
<td>2,688,543</td>
<td></td>
<td>781</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>002</td>
<td>C - Farrowing (drains into Gestation)</td>
<td>175,163</td>
<td></td>
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<td>003</td>
<td>C - New GDU</td>
<td>783,943</td>
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<td>781</td>
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<td>004</td>
<td>C - Existing GDU</td>
<td>515,198</td>
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<td>1131</td>
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<tr>
<td>005</td>
<td>G</td>
<td>450</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Permitted Feature</th>
<th>Animal Category #1</th>
<th>Animal Numbers</th>
<th>Animal Category #2</th>
<th>Animal Numbers</th>
<th>Animal Category #3</th>
<th>Animal Numbers</th>
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<tbody>
<tr>
<td>001</td>
<td>5 - Gestation</td>
<td>2104</td>
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<tr>
<td>002</td>
<td>5 - Farrow</td>
<td>520</td>
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<tr>
<td>003</td>
<td>5 - GDU</td>
<td>1347</td>
<td>4 - GDU</td>
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<tr>
<td>004</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>005</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

PART 4 – OPERATIONAL INFORMATION

4.1 OPERATIONAL INFORMATION (SEE INSTRUCTIONS)
   SIC Code(s) 0213
   CAFO Class Size 1C

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 PERMANENT 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.

Mortalities are composted within 24 hours of death. Compost material is land applied.

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.

Production area is roofed.

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 confined.

PART 9 – CHEMICAL HANDLING

9.1 Are chemicals and other contaminants handled, managed, stored, and disposed of in accordance with 10 CSR 20-8.300(5)(E)?  Yes  No

PART 10 – MANURE ANALYSIS TESTING

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

Manure, compost

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

Manure samples are collected and sent to a laboratory for nutrient analysis.

PART 11 – RECORD KEEPING

11.1 Are records of all inspections, manure transfers, discharges and land application maintained?  Yes  No
**PART 12 - CERTIFICATION**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and accumulate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

**Title**
Claude Greiner

**Position**
Owner/Manager

**Date**
8-23-19

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**PART 13 - ENGINEER CERTIFICATION**

As of August 28, 2013, construction permits are only 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.

<table>
<thead>
<tr>
<th>Operation Name</th>
<th>Engineer Firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Address</td>
</tr>
<tr>
<td>City</td>
<td>City State Zip Code</td>
</tr>
</tbody>
</table>

I, Project Engineer, certify that above described systems have been designed in accordance with Missouri CAFO design regulations in 10 CSR 20-a.300.
July 29, 2019

Dear Landowners,

R&F MO, LLC would like to inform you of their intentions to expand a sow complex in Callaway County.

The site will consist of four buildings, all of which have or will have below building manure storage pits. The site’s total capacity will be 2,624 sows and 1683 swine in the gilt development unit. The expansion includes the construction of one new gilt development building. This building will house an additional 1,176 gilts from 3 weeks of age to 25 weeks of age.

This site will have a manure management plan filed with the Missouri Department of Natural Resources. Nutrients from the pits will be land applied using an injected hose applicator system and will be incorporated within 24 hours of applications. The nutrients will be applied on cropland in Callaway County at an application rate based on a manure sample pulled from the pits yearly, and the nutrient uptake of the crops. If you have any questions or comments contact the Water Protection Program at the Missouri Department of Natural Resources. They will accept comments 30 days from the date of this letter. Their contact information is:

Water Protection Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102
(573) 751-1300

The site is located in the southern 1/2 of Section 25, Township 49-N Range 10-W, Callaway County, Missouri.

The CAFO site owner’s contact information is:

R&F MO, LLC
1300 S. Hwy 75
PO Box 188
Pipestone, MN 56164

If you require additional information please contact the following:

The Pinnacle Group
620 Country Club Road
Iowa Falls, IA 50126
(641) 648-7300

Thank you,
The Pinnacle Group
Proof of Delivery

Dear Customer,

This notice serves as proof of delivery for the shipment listed below.

**Tracking Number**
1Z0675WE4493175311

**Weight**
1.00 LBS

**Service**
UPS Next Day Air®
Saturday Delivery

**Shipped / Billed On**
08/23/2019

**Delivered On**
08/24/2019 11:45 A.M.

**Delivered To**
23 FLAGSTICK CT
SAINT LOUIS, MO, 63127, US

**Received By**
DRIVER RELEASE

**Left At**
Front Door

Thank you for giving us this opportunity to serve you. Details are only available for shipments delivered within the last 120 days. Please print for your records if you require this information after 120 days.

Sincerely,

UPS

Tracking results provided by UPS: 08/26/2019 10:53 A.M. EST
USPS Tracking®

Track Another Package +

Tracking Number: 70150640000713859752

Your item was picked up at the post office at 10:37 am on August 5, 2019 in AUXVASSE, MO 65231.

☑ Delivered
August 5, 2019 at 10:37 am
Delivered, Individual Picked Up at Post Office
AUXVASSE, MO 65231

Get Updates ✓

Text & Email Updates

Tracking History

Product Information

See Less △

Tracking Number: 70150640000713859745

The delivery status of your item has not been updated as of August 1, 2019, 12:14 am. We apologize that it may arrive later than expected.
Tracking Number: 70150640000713859769

Your item was delivered to an individual at the address at 9:42 am on August 1, 2019 in FULTON, MO 65251.

☑ Delivered
August 1, 2019 at 9:42 am
Delivered, Left with Individual
FULTON, MO 65251

Can’t find what you’re looking for?
Go to our FAQs section to find answers to your tracking questions.
Alert
August 1, 2019 at 12:14 am
Awaiting Delivery Scan
Get Updates  
See More  

Tracking Number: 70150640000713859714  -  Dsl Heidenbauer  

Your item was delivered to an individual at the address at 2:12 pm on August 1, 2019 in AUXVASSE, MO 65231.

Delivered
August 1, 2019 at 2:12 pm
Delivered, Left with Individual
AUXVASSE, MO 65231
Get Updates  
See More  

Tracking Number: 70150640000713859738  -  Ers Rossier  

Your item was delivered at 8:38 am on August 2, 2019 in JEFFERSON CITY, MO 65109.

Delivered
August 2, 2019 at 8:38 am
Delivered
JEFFERSON CITY, MO 65109
Your item was delivered to an individual at the address at 12:42 pm on July 31, 2019 in SAINT LOUIS, MO 63128.

☑ Delivered
July 31, 2019 at 12:42 pm
Delivered, Left with Individual
SAINT LOUIS, MO 63128

Can’t find what you’re looking for?
Go to our FAQs section to find answers to your tracking questions.

FAQs (https://www.usps.com/faqs/uspstracking-faqs.htm)
R & F MO Project Summary

R & F MO is a swine gestation, farrowing and gilt development site located in Section 25 of T49N R10W, Callaway County. The site's main farm has 1,977 sows in its gestation unit and 520 sows in the farrowing unit. A separate 507-head isolation and gilt development unit supplies the sow operation with replacement gilts. The main farm and gilt development units are separated by land not owned by R & F MO, LLC.

R & F MO, LLC intends to build an additional 1,176-head gilt develop unit next to the existing GDU. Once completed, R & F MO, LLC proposes to combine the main farm and GDUs under one operating permit with a total capacity of 2,624 sows at the main farm and 1,683 swine in the gilt development/isolation unit. Calculations by Willett Hofmann & Associates, Inc. demonstrate the site's existing structures and the proposed construction have adequate storage capacity to accommodate the projected increase in manure and compost material production (see the enclosed Manure Production and Storage Calculations.) R & F MO would then be an export-only Class 1C CAFO, with a total 1,722.8 animal unit capacity.
Site: 19 (0.36 ac.)

PROPOSED R&F MO LAYOUT

Date: Jul 26, 2019
Field Name: Site; 19
Location: Callaway Co., Missouri, U.S.
Farm Name: R and F MO
Client Name: P-Index
Total Acres: 0.36
Field Boundary Start Location:
Latitude: 38.99118800
Longitude: -91.98662372

pinnacle
190 Country Club Road
Office: 618.649.7300
Fax: 618.649.7320
www.pinnacleinc.com

(0.4ac.) Field Boundary
MANURE PRODUCTION AND STORAGE CALCULATIONS

FOR

PRECISION STRUCTURES, INC.

R-F MO
SWINE FACILITY EXPANSION
PROPOSED CONDITIONS

AUXASSE, MO

2019

Calculations prepared in accordance with Missouri Code, 10 CSR 20-8.300

Brian K. Converse, P.E., S.E.
President and General Manager
License No. 2008012188
Expires: 12/31/2020
WHA # 1236M19
**PROPOSED EXPANSION - INCLUDE ALL FACILITIES UNDER ONE PERMIT**

**Proposed Head Counts:**
- Gestation: - 2104 (INCREASE 127 ABOVE EXISTING)
- Farrow: - 520 (NO CHANGE)
- GDU Isolation: 1183 (INCREASE 1176 ABOVE EXISTING)

**Note:** A NEW ISOLATION BUILDING IS PROPOSED AS PART OF THE EXPANSION.

**Manure Production Rates & Waste Water Volumes ARE THE SAME AS FOR CURRENT CONDITIONS:**
- Gestation: 400^a avg - 1.10 gal/day
- Farrow: 275^a incoming - 2.08 gal/day
- Isolation: 120^a avg - 1.97 gal/day (78% of head count)
- 25^a avg: 0.25 gal/day (30% of head count)

Existing gestation and farrow buildings will be utilized for additional animals and wastewater volume will remain the same.

GDU isolation for additional animals (11,76 head) with wastewater for 0.95 optimum price per year = 14,400 gal (19.75 cu ft) for assumed 43 hours totaling 0.5 gal/mo, same as existing facility.

From achieved spreadsheets:
- Gestation + Farrow = REQURED STORAGE: 11
- 14,869 cu ft + 64,329 cu ft = 79,198 cu ft (farrowing waste removed to gestation every three weeks)

- Gestation + Farrow Capacity Required = 359,440 cu ft + 23,416 cu ft = 382,856 cu ft

\[ \Rightarrow \text{382,856 / 79,198 = 2.14 years storage provided} \]

**Note:** This neglects additional area provided by A Mumlots.
PROPOSED EXPANSION

FROM ANCHOR SPREADSHEET FOR ISOLATION BUILDINGS:

EXISTING ISOLATION - VOLUME REQUIRED = 22,212 cu ft

\[ \text{Volume Provided} = \frac{68,872}{22,212} = 3.1 \text{ years of capacity} \]

PROPOSED ISOLATION - VOLUME REQUIRED = 48,981 cu ft

\[ \text{Volume Provided} = \frac{104,798}{48,981} = 2.14 \text{ years of capacity} \]
### Table 6. Daily manure production and characteristics, as-excreted (per head per day)*

*Values are as-produced estimations and do not reflect any treatment. Use these values only for planning purposes. The actual characteristics of manure for individual situations can vary ± 30% or more from table values due to genetics, dietary options and variations in feed nutrient concentration, animal performance, and individual farm management.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Size† (lbs)</th>
<th>Total manure‡ (lbs)</th>
<th>Waters (l) (gal)</th>
<th>(%)</th>
<th>Density§ (lb/ft²)</th>
<th>TS † (lb/day)</th>
<th>VS ‡ (lb/day)</th>
<th>BOD₆ (lb/day)</th>
<th>Nutrient content (lbs N) † (lbs Pₒ₃) † (K₂O) †</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<td>65</td>
<td>1.4</td>
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<td>Calf (confined)</td>
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<td>11.0</td>
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<td>62</td>
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<td>89</td>
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<td>1.63</td>
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<tr>
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<td>0.11</td>
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<td>91</td>
<td>62</td>
<td>0.61</td>
<td>0.52</td>
<td>0.21</td>
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<tr>
<td></td>
<td>400</td>
<td>9.1</td>
<td>0.15</td>
<td>1.10</td>
<td>91</td>
<td>62</td>
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<td>0.70</td>
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<td>500</td>
<td>11.4</td>
<td>0.18</td>
<td>1.37</td>
<td>91</td>
<td>62</td>
<td>1.02</td>
<td>0.87</td>
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<tr>
<td>Lactating</td>
<td>375</td>
<td>17.5</td>
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<td>90</td>
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<td>0.58</td>
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<tr>
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<td>500</td>
<td>23.4</td>
<td>0.37</td>
<td>2.78</td>
<td>90</td>
<td>63</td>
<td>2.34</td>
<td>2.11</td>
<td>0.76</td>
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<tr>
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<td>600</td>
<td>28.1</td>
<td>0.46</td>
<td>3.33</td>
<td>90</td>
<td>63</td>
<td>2.81</td>
<td>2.53</td>
<td>0.93</td>
</tr>
<tr>
<td>Boar*</td>
<td>300</td>
<td>6.2</td>
<td>0.10</td>
<td>0.74</td>
<td>91</td>
<td>62</td>
<td>0.57</td>
<td>0.61</td>
<td>0.20</td>
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<tr>
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<td>400</td>
<td>8.2</td>
<td>0.13</td>
<td>0.86</td>
<td>91</td>
<td>62</td>
<td>0.76</td>
<td>0.67</td>
<td>0.26</td>
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<td>500</td>
<td>10.3</td>
<td>0.17</td>
<td>1.24</td>
<td>91</td>
<td>62</td>
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<td>0.84</td>
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<tr>
<td>Poultry</td>
<td>Broiler</td>
<td>2</td>
<td>0.19</td>
<td>0.03</td>
<td>74</td>
<td>63</td>
<td>0.050</td>
<td>0.038</td>
<td>0.011</td>
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<tr>
<td></td>
<td>Layer</td>
<td>3</td>
<td>0.15</td>
<td>0.02</td>
<td>0.017</td>
<td>75</td>
<td>65</td>
<td>0.037</td>
<td>0.027</td>
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<tr>
<td></td>
<td>Turkey (f)</td>
<td>10</td>
<td>0.47</td>
<td>0.007</td>
<td>0.056</td>
<td>75</td>
<td>63</td>
<td>0.117</td>
<td>0.088</td>
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<tr>
<td></td>
<td>Turkey (m)</td>
<td>20</td>
<td>0.74</td>
<td>0.012</td>
<td>0.088</td>
<td>75</td>
<td>63</td>
<td>0.186</td>
<td>0.139</td>
</tr>
<tr>
<td></td>
<td>Duck</td>
<td>4</td>
<td>0.44</td>
<td>0.007</td>
<td>0.053</td>
<td>73</td>
<td>62</td>
<td>0.118</td>
<td>0.089</td>
</tr>
<tr>
<td>Sheep</td>
<td>Feeder lamb</td>
<td>100</td>
<td>4.1</td>
<td>0.06</td>
<td>0.5</td>
<td>75</td>
<td>63</td>
<td>1.05</td>
<td>0.91</td>
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<tr>
<td>Horse</td>
<td>Sedentary</td>
<td>1,000</td>
<td>54.4</td>
<td>0.88</td>
<td>6.56</td>
<td>86</td>
<td>62</td>
<td>7.61</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td>Intense</td>
<td>1,000</td>
<td>55.5</td>
<td>0.90</td>
<td>6.70</td>
<td>86</td>
<td>62</td>
<td>7.78</td>
<td>6.6</td>
</tr>
</tbody>
</table>

TS = total solids; VS = volatile solids; BOD₆ = the oxygen used in the biochemical oxidations of organic matter in five days at 68°F, which is an industry standard that shows wastewater strength.

* Use linear interpolation to obtain values for weights not listed in the table.

* Calculated using TS divided by the solids content percentage.

* Based on MWPS historical data.

* Values calculated or interpreted using diet based formulas being considered for the ASAE Standards D384: Manure Production and Characteristics.
**Formed Storage Capacity for Manure Production**

**Main Farm Gestation Facility - Expanded Facility**

<table>
<thead>
<tr>
<th>Space Capacity</th>
<th>Daily Manure Production</th>
<th>Manure Production</th>
<th>Structure Volume Required</th>
<th>Actual Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Head</td>
<td>Gal/day/head (Swine)</td>
<td>Gal/year</td>
<td>C.F.</td>
<td>C.F.</td>
</tr>
<tr>
<td>2104</td>
<td>1.1</td>
<td>844,756</td>
<td>112,935</td>
<td>1,925</td>
</tr>
</tbody>
</table>

* Washwater Volume

| A   | Length of Structure | 519   | ft    |
| B   | Width of Structure  | 76.167 | ft    |
| C   | Depth of Structure  | 9.17  | ft    |
| D   | Column Volume       | 9.8   | ft³   |
| E   | # of Columns        | 315   |       |

Actual Storage = (A*B*C)-(D*E)

* Building will be cleaned out twice a year when there is a turn over in hogs. Worse case scenario would be that it takes 24 hours to clean the building each time or 48 hours per year. With a maximum usage of 5 gallons/ minute the total yearly usage would be 14,400 gallons or 1,925 C.F. per year.

Calc by: MRL
Date: 7/22/2019
### 1153M19 - Stormy Hollow

**Gestation Building Depth and Volume Table**

<table>
<thead>
<tr>
<th>Manure Depth Above Pit Floor (ft)</th>
<th>Depth Below Bottom of Slat (ft)</th>
<th>Depth Below Bottom of Beams (ft)</th>
<th>Storage Volume (Cubic Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.00</td>
<td>8.17</td>
<td>39,194</td>
</tr>
<tr>
<td>2</td>
<td>8.00</td>
<td>7.17</td>
<td>78,387</td>
</tr>
<tr>
<td>3</td>
<td>7.00</td>
<td>6.17</td>
<td>117,581</td>
</tr>
<tr>
<td>4</td>
<td>9.00</td>
<td>8.17</td>
<td>156,774</td>
</tr>
<tr>
<td>5</td>
<td>5.00</td>
<td>4.17</td>
<td>195,968</td>
</tr>
<tr>
<td>6</td>
<td>4.00</td>
<td>3.17</td>
<td>235,162</td>
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<td>7</td>
<td>3.00</td>
<td>2.17</td>
<td>274,355</td>
</tr>
<tr>
<td>8</td>
<td>2.00</td>
<td>1.17</td>
<td>313,549</td>
</tr>
<tr>
<td>8.17</td>
<td>1.83</td>
<td>1.00</td>
<td>320,212</td>
</tr>
<tr>
<td>9</td>
<td>1.00</td>
<td>0.17</td>
<td>352,743</td>
</tr>
<tr>
<td>9.17</td>
<td>0.83</td>
<td>0.00</td>
<td>359,406</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A</th>
<th>Building Length (ft)</th>
<th>519</th>
<th>Inside Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Building Width (ft)</td>
<td>76.167</td>
<td>Inside Dimensions</td>
</tr>
<tr>
<td>C</td>
<td>Divider Wall Thickness (ft)</td>
<td>0</td>
<td>0 walls</td>
</tr>
<tr>
<td>D</td>
<td>Pump-Out Pit Area (sq ft)</td>
<td>0</td>
<td>0 pits</td>
</tr>
<tr>
<td>E</td>
<td>Column Area (sq ft)</td>
<td>1.07</td>
<td>(1.17 ft diameter)</td>
</tr>
</tbody>
</table>

**Available storage/Ft**

\[(A)(B) -(1* C *B) -(0*D) -(315* E)\] = 39,193.62
SIDE WALL DETAIL

END WALL DETAIL

COLUMN AND FOOTING DETAIL

PUMP-OUT DETAILS

NOTES:
1) ALL WALLS SHALL BE FORMED WITH MOLD FORMING SYSTEMS AND SHALL NOT BE EMPLAINTED.
2) BACK FILLING OF THE WALLS SHALL NOT START UNTIL THE FLOOR SLATS OR PERMANENT BRACING HAVE BEEN INSTALLED.
3) BACK FILLING SHALL BE PERFORMED WITH MATERIAL FREE OF VEGETATION, LARGE ROCKS AND DEBRIS.
**Formed Storage Capacity for Manure Production**

<table>
<thead>
<tr>
<th>Space Capacity # of Head</th>
<th>Daily Manure Production Gal/day/head (Swine)</th>
<th>Manure Production Gal/Month</th>
<th>Structure Volume Required C.F.</th>
<th>Actual Storage C.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>520</td>
<td>2.08</td>
<td>394,784</td>
<td>52,779</td>
<td>11,550</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23,416</td>
</tr>
</tbody>
</table>

*Washwater Volume*

A Length of Gutter 65.083 ft
B Width of Gutter 6.583 ft
C Depth of Gutter 1.333 ft
D Number of Gutters 41.0

Actual Storage = \((A \times B \times C \times D)\)

* 1/3 of Building is cleaned out weekly and the entire house is cleaned every three weeks when there is a turn over in hogs. Worse case scenario would be that it takes 24 hours to clean the building per month. With a maximum usage of 5 gallons/ minute the total yearly usage would be 86,400 gallons or 11,550 C.F. per month.
**Formed Storage Capacity for Manure Production**

<table>
<thead>
<tr>
<th>Space Capacity</th>
<th>Daily Manure Production Gal/day/Head (Swine)</th>
<th>Manure Production Gal/year</th>
<th>Structure Volume Required C.F.</th>
<th>Actual Storage C.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Head 507</td>
<td>0.82</td>
<td>151,745</td>
<td>20,287</td>
<td>68,872</td>
</tr>
</tbody>
</table>
* Washwater Volume

<table>
<thead>
<tr>
<th>A</th>
<th>Length of Structure</th>
<th>243.667</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Width of Structure</td>
<td>39.833</td>
<td>ft</td>
</tr>
<tr>
<td>C</td>
<td>Depth of Structure</td>
<td>7.17</td>
<td>ft</td>
</tr>
<tr>
<td>D</td>
<td>Column Volume</td>
<td>7.7</td>
<td>ft</td>
</tr>
<tr>
<td>E</td>
<td># of Columns</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Divider Wall Width</td>
<td>0.83</td>
<td>ft</td>
</tr>
<tr>
<td>G</td>
<td>Number of Dividers</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Actual Storage** = \( (A \times B \times C) - (D \times E) - (F \times B \times C \times G) \)

* Building will be cleaned out twice a year when there is a turn over in hogs. Worse case scenario would be that it takes 24 hours to clean the building each time or 48 hours per year. With a maximum usage of 5 gallons/minute the total yearly usage would be 14,400 gallons or 1,925 C.F. per year.

Calc by: MRL
Date: 7/22/2019
### 1236M19 - R-F MO
### Existing Isolation Building Depth and Volume Table

<table>
<thead>
<tr>
<th>Manure Depth Above Pit Floor (ft)</th>
<th>Depth Below Bottom of Slats (ft)</th>
<th>Depth Below Bottom of Beams (ft)</th>
<th>Storage Volume (Cubic Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>6.17</td>
<td>9,606</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>5.17</td>
<td>19,211</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>4.17</td>
<td>28,817</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>3.17</td>
<td>38,422</td>
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<tr>
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<td>3</td>
<td>2.17</td>
<td>48,028</td>
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<td>6</td>
<td>2</td>
<td>1.17</td>
<td>57,633</td>
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<tr>
<td>6.17</td>
<td>1.83</td>
<td>1</td>
<td>59,266</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>0.17</td>
<td>67,239</td>
</tr>
<tr>
<td>7.17</td>
<td>0.83</td>
<td>0</td>
<td>68,872</td>
</tr>
</tbody>
</table>

| A Building Length (ft)          | 243.667                          | Inside Dimensions                |
| B Building Width (ft)           | 39.833                           | Inside Dimensions                |
| C Divider Wall Thickness (ft)   | 0.83                             | Inside Dimensions                |
| D Pump-Out Pit Area (sq ft)     | 0                                | Inside Dimensions                |
| E Column Area (sq ft)           | 1.07                             | Inside Dimensions                |

- Available storage/ft \( (A)(B)-(1*C*B)+(0*D)-(63*E) \) = 9,605.52
Willett, Hofmann Associates, Inc.  
WHA #1236M19 - R-F MO

**Formed Storage Capacity for Manure Production**  
**GDU Isolation Facility - New Building and Additional Animals**

<table>
<thead>
<tr>
<th>Space Capacity # of Head</th>
<th>Daily Manure Production Gal/day/head (Swine)</th>
<th>Manure Production Gal/year</th>
<th>Structure Volume Required C.F.</th>
<th>Actual Storage C.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1176</td>
<td>0.82</td>
<td>351,977</td>
<td>47,056</td>
<td>1,925</td>
</tr>
</tbody>
</table>

* Washwater Volume

- **A** Length of Structure: 169.167 ft
- **B** Width of Structure: 89.667 ft
- **C** Depth of Structure: 7.17 ft
- **D** Column Volume: 7.7 ft³
- **E** # of Columns: 99
- **F** Divider Wall Width: 0.83 ft
- **G** Number of Dividers: 6

**Actual Storage = (A*B*C)-(D*E)-(F*B*C*G)**

* Building will be cleaned out twice a year when there is a turn over in hogs. Worse case scenario would be that it takes 24 hours to clean the building each time or 48 hours per year. With a maximum usage of 5 gallons/ minute the total yearly usage would be 14,400 gallons or 1,925 C.F. per year.

**Calc by:**  
Date: 7/22/2019
### Proposed Isolation Building Depth and Volume Table

<table>
<thead>
<tr>
<th>Manure Depth Above Pit Floor (ft)</th>
<th>Depth Below Bottom of Slats (ft)</th>
<th>Depth Below Bottom of Beams (ft)</th>
<th>Storage Volume (Cubic Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>6.17</td>
<td>14,616</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>5.17</td>
<td>29,232</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>4.17</td>
<td>43,849</td>
</tr>
<tr>
<td>4</td>
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</tr>
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<td>6</td>
<td>2</td>
<td>1.17</td>
<td>87,697</td>
</tr>
<tr>
<td>6.17</td>
<td>1.83</td>
<td>1</td>
<td>90,182</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>0.17</td>
<td>102,314</td>
</tr>
<tr>
<td>7.17</td>
<td>0.83</td>
<td>0</td>
<td>104,798</td>
</tr>
</tbody>
</table>

### Inside Dimensions

- **A** Building Length (ft): 169.167
- **B** Building Width (ft): 89.667
- **C** Divider Wall Thickness (ft): 0.83
- **D** Pump-Out Pit Area (sq ft): 0
- **E** Column Area (sq ft): 1.07

### Notes
- 6 walls
- 13 pits (1.17 ft diameter)

### Available storage/Ft

\[
A \times B - (C \times B) + (D \times E) = 14,616.23
\]
MANURE PRODUCTION AND STORAGE CALCULATIONS

FOR

PRECISION STRUCTURES, INC.

R-F MO
SWINE FACILITY EXPANSION
GDU/ISOLATION
EXISTING CONDITIONS

AUXASSE, MO

2019

Calculations prepared in accordance with Missouri Code, 10 CSR 20-8.300

Brian K. Converse, P.E., S.E.
President and General Manager
License No. 2008012188
Expires: 12/31/2020
WHA # 1236M19
GDY - ISOLATION BUILDING - CURRENT MANURE PRODUCTION AND STORAGE

CURRENT HEAD COUNT PER PSI/OWNER = 315 G. BARN + 192 DIARY = 507 HEADS

ASSUME 70/30 SPLIT OF 185% & 25% ANIMALS

= 507 (0.7) = 355 @ 185% AVERAGE WT
507 - 355 = 152 @ 25% AVERAGE WT

FROM MURS-18, SECTION 1 - SECOND ADDITION

185% MANURE PRODUCTION = 1.07 GPD/Day = 0.14 Cu Ft/Day
25% MANURE PRODUCTION = 0.23 GPC/Day = 0.03 Cu Ft/Day

WEIGHTED AVERAGE = (1.07 GPD/Day) (0.7) + (0.23 GPD/Day) (0.3) = 0.82 GPD/Day

ISOLATION BUILDING WILL BE CLEANED TWICE PER YEAR

CONSERVATIVELY ASSUME 40 HOURS/ YEAR AT 5 GALLONS/MIN MAX USAGE

= Volume = 18 Hours/ (60 Min/ Hour) (5 Gal/ Min) = 15,400 Gal/ Year
= 15,400/244 = 63.25 Cu Ft/ Year

From Attached Spreadsheet

TOTAL STORAGE CAPACITY REQUIRED FOR 1 YEAR STORAGE = 22,212 Cu Ft
TOTAL STORAGE PROVIDED = 68,872 Cu Ft

= EXISTING ISOLATION BUILDING HAS CAPACITY FOR
68,872/22,212 = 3.1 YEARS

NOTE: THIS INCLUDES WASH WATER AND NEGLECTS ADDITIONAL STORAGE FROM PUMPOUTS
Table 6. Daily manure production and characteristics, as-excreted (per head per day)*.

Values are as-produced estimations and do not reflect any treatment. Use these values only for planning purposes. The actual characteristics of manure for individual situations can vary ± 30% or more from table values due to genetics, dietary options and variations in feed nutrient concentration, animal performance, and individual farm management.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Size† (lbs)</th>
<th>Total manure‡ (lbs)</th>
<th>Water (%)</th>
<th>Density (lb/ft³)</th>
<th>TS § (lb/day)</th>
<th>VS ‡ (lb/day)</th>
<th>BOD₅ (lb/day)</th>
<th>Nutrient Content</th>
<th>Nutrient Content</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(lbs)</td>
<td>(lb)</td>
<td>(gal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dairy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calf</td>
<td>150</td>
<td>12</td>
<td>0.18</td>
<td>1.38</td>
<td>88</td>
<td>65</td>
<td>1.4</td>
<td>2.0</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>250</td>
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<td>0.31</td>
<td>2.30</td>
<td>88</td>
<td>65</td>
<td>2.4</td>
<td>2.0</td>
<td>0.31</td>
</tr>
<tr>
<td>Heifer</td>
<td>750</td>
<td>45</td>
<td>0.70</td>
<td>5.21</td>
<td>88</td>
<td>65</td>
<td>6.7</td>
<td>5.7</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>1,000</td>
<td>60</td>
<td>0.93</td>
<td>6.95</td>
<td>88</td>
<td>65</td>
<td>8.7</td>
<td>7.6</td>
<td>0.92</td>
</tr>
<tr>
<td>Lactating cow</td>
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<td>62</td>
<td>7.78</td>
<td>6.6</td>
<td>1.56</td>
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</tbody>
</table>

TS = total solids; VS = volatile solids; BOD₅ = the oxygen used in the biochemical oxidations of organic matter in five days at 68°F, which is an industry standard that shows wastewater strength.

* Use linear interpolation to obtain values for weights not listed in the table.

§ Calculated using TS divided by the solids content percentage.

Based on MWPS historical data.

*Values calculated or interpreted using diet based formulas being considered for the ASAE Standards D384: Manure Production and Characteristics.
Willett, Hofmann Associates, Inc.
WHA #1236M19 - R-F MO

**Formed Storage Capacity for Manure Production**
**GDU Isolation Facility - Existing Conditions**

<table>
<thead>
<tr>
<th>Space Capacity</th>
<th>Daily Manure Production</th>
<th>Manure Production</th>
<th>Structure Volume Required</th>
<th>Actual Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Head</td>
<td>Gal/day/head (Swine)</td>
<td>Gal/year</td>
<td>C.F.</td>
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</tr>
<tr>
<td>507</td>
<td>0.82</td>
<td>151,745</td>
<td>20,287</td>
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</table>
* Washwater Volume

**Actual Storage:**

\[ \text{Actual Storage} = (A\times B\times C)-(D\times E)-(F\times B\times C\times G) \]

A Length of Structure: 243.667 ft
B Width of Structure: 39.833 ft
C Depth of Structure: 7.17 ft
D Column Volume: 7.7 ft³
E # of Columns: 63
F Divider Wall Width: 0.83 ft
G Number of Dividers: 1

Building will be cleaned out twice a year when there is a turn over in hogs. Worse case scenario would be that it takes 24 hours to clean the building each time or 48 hours per year. With a maximum usage of 5 gallons/minute the total yearly usage would be 14,400 gallons or 1,925 C.F. per year.

Calc by: MRL
Date: 7/22/2019

Willett Hofmann & Associates Inc.
### 1236M19 - R-F MO
Existing Isolation Building Depth and Volume Table

<table>
<thead>
<tr>
<th>Manure Depth Above Pit Floor (ft)</th>
<th>Depth Below Bottom of Slats (ft)</th>
<th>Depth Below Bottom of Beams (ft)</th>
<th>Storage Volume (Cubic Feet)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>6.17</td>
<td>9,606</td>
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<td>6</td>
<td>5.17</td>
<td>19,211</td>
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<td>5</td>
<td>4.17</td>
<td>28,817</td>
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<td>4</td>
<td>3.17</td>
<td>38,422</td>
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<td>1.83</td>
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<tr>
<td>7</td>
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<tr>
<td>7.17</td>
<td>0.833</td>
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<td>68,872</td>
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</table>

| A | Building Length (ft) | 243.667 | Inside Dimensions |
| B | Building Width (ft)  | 39.833  | Inside Dimensions |
| C | Divider Wall Thickness (ft) | 0.83     | 1 walls          |
| D | Pump-Out Pit Area (sq ft) | 0        | 0 pits           |
| E | Column Area (sq ft)   | 1.07    | (1.17 ft diameter) | 63 |

Available storage/ft \( ((A*(B)-(1*C*B)+(0*D)+63*E))/((A*(B))^2) \) = 9,605.52
MANURE PRODUCTION AND STORAGE CALCULATIONS

FOR

PRECISION STRUCTURES, INC.

R-F MO
SWINE FACILITY EXPANSION
MAIN FARM
EXISTING CONDITIONS

AUXASSE, MO

2019

Calculations prepared in accordance with Missouri Code, 10 CSR 20-8.300

Brian K. Converse, P.E., S.E.
President and General Manager
License No. 2008012188
Expires: 12/31/2020
WHA # 1236M19
Main Farm - Current Manure Production and Storage

Current Head Count Per Pen/Owner
- Gestation Building: 1,977 Heads (Avg. Wt. = 500 lb)
- Farrowing Building: 520 Heads (Avg. Wt. = 375 lb)

From WAPPS-1B, Section 1 - Second Edition

400 lb Gestation Manure Production = 1.10 gal/pen = 0.15 cfm/pen
375 lb Lactation Manure Production = 2.08 gal/pen = 0.28 cfm/pen

Gestation Building is cleaned twice per year when turned
1/3 of Farrowing House is cleaned weekly, entire Farrowing House every 3 weeks, when turned.

Conservatively Assume 48 Hours/Year of Water for
Gestation and 24 Hours/Year of Water/Month for Farrowing.
5 gal/minute max usage.

Gestation: 48 hrs. (60 min/hr) (5 gal/min) = 14,400 gal/yr
Farrowing: 24 hrs. (60 min/hr) (5 gal/min) (12 months) = 8,640 gal/yr

Gestation Volume of Washwater = 14,400/2.48 = 5,825 cu ft
Farrowing Volume of Washwater = 8,640/2.48 = 3,500 cu ft

The Farrowing Building Waste and Washwater are spread to the
Gestation Pit every 3 weeks, when turned.

The Attached Spread Sheets Show the Manure Production (Including)
(Washwater) and Available Storage Volume

Total Capacity Required = 102,045 cu ft + 61,329 cu ft = 173,374 cu ft

Total Capacity Planned = 339,406 cu ft + 13,716 = 353,122 cu ft

The Storage Capacity is Enough for 353,122/173,374 = 2.02 years

In Existing Conditions (Note: This Neglects Capacity in Pump Outs)
Table 6. Daily manure production and characteristics, as-excreted (per head per day). 

*Use linear interpolation to obtain values for weights not listed in the table.
*Calculated using T5 divided by the solids content percentage.
*Based on MWPS historical data.
*Values calculated or interpreted using diet based formulas being considered for the ASAE Standards D384: Manure Production and Characteristics.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Size1 (lbs)</th>
<th>Total manureb (lbs)</th>
<th>Waterc (%)</th>
<th>Densityd (lb/ft³)</th>
<th>TSd (lb/day)</th>
<th>VSd (lb/day)</th>
<th>BOD5 (lb/day)</th>
<th>Nutrient content (lbs N/e)</th>
<th>Nutrient content (lbs P2O5/f)</th>
<th>Nutrient content (K2O)</th>
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<td>1.51</td>
<td>11.0</td>
<td>91</td>
<td>62</td>
<td>0.82</td>
<td>0.70</td>
<td>0.28</td>
<td>0.06</td>
</tr>
<tr>
<td>Calf</td>
<td>500</td>
<td>11.4</td>
<td>0.18</td>
<td>1.37</td>
<td>91</td>
<td>62</td>
<td>1.02</td>
<td>0.87</td>
<td>0.35</td>
<td>0.08</td>
</tr>
<tr>
<td>Layer</td>
<td>3</td>
<td>0.15</td>
<td>0.002</td>
<td>0.017</td>
<td>75</td>
<td>65</td>
<td>0.037</td>
<td>0.027</td>
<td>0.008</td>
<td>0.0026</td>
</tr>
<tr>
<td>Turkey (female)</td>
<td>10</td>
<td>0.47</td>
<td>0.007</td>
<td>0.056</td>
<td>75</td>
<td>63</td>
<td>0.117</td>
<td>0.088</td>
<td>0.024</td>
<td>0.0078</td>
</tr>
<tr>
<td>Turkey (male)</td>
<td>20</td>
<td>0.74</td>
<td>0.012</td>
<td>0.086</td>
<td>75</td>
<td>63</td>
<td>0.186</td>
<td>0.139</td>
<td>0.054</td>
<td>0.0111</td>
</tr>
<tr>
<td>Duck</td>
<td>4</td>
<td>0.44</td>
<td>0.007</td>
<td>0.053</td>
<td>73</td>
<td>62</td>
<td>0.118</td>
<td>0.089</td>
<td>0.016</td>
<td>0.0043</td>
</tr>
<tr>
<td>Sheep</td>
<td>100</td>
<td>4.1</td>
<td>0.06</td>
<td>0.15</td>
<td>75</td>
<td>63</td>
<td>1.05</td>
<td>0.91</td>
<td>0.10</td>
<td>0.04</td>
</tr>
<tr>
<td>Horse</td>
<td>1,000</td>
<td>54.4</td>
<td>0.88</td>
<td>6.56</td>
<td>86f</td>
<td>62</td>
<td>7.61</td>
<td>6.5</td>
<td>1.52</td>
<td>0.18</td>
</tr>
<tr>
<td>Sedentary Horse</td>
<td>1,000</td>
<td>55.5</td>
<td>0.90</td>
<td>6.70</td>
<td>86f</td>
<td>62</td>
<td>7.78</td>
<td>6.6</td>
<td>1.56</td>
<td>0.30</td>
</tr>
</tbody>
</table>

TS = total solids; VS = volatile solids; BOD5 = the oxygen used in the biochemical oxidations of organic matter in five days at 88 F, which is an industry standard that shows wastewater strength.
Willett, Hofmann Associates, Inc.
WHA #1236M19 - R-F MO

**Formed Storage Capacity for Manure Production**
Main Farm Gestation Facility - Existing Conditions

<table>
<thead>
<tr>
<th>Space Capacity</th>
<th>Daily Manure Production</th>
<th>Manure Production</th>
<th>Structure Volume Required</th>
<th>Actual Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Head</td>
<td>Gal/day/head (Swine)</td>
<td>Gal/year</td>
<td>C.F.</td>
<td>C.F.</td>
</tr>
<tr>
<td>1977</td>
<td>1.1</td>
<td>793,766</td>
<td>106,118</td>
<td>359,406</td>
</tr>
</tbody>
</table>

* Washwater Volume

| A | Length of Structure | 519 | ft |
| B | Width of Structure  | 76.167 | ft |
| C | Depth of Structure  | 9.17 | ft |
| D | Column Volume       | 9.8 | ft³ |
| E | # of Columns        | 315 |

Actual Storage = \((A \times B \times C) - (D \times E)\)

* Building will be cleaned out twice a year when there is a turn over in hogs. Worse case scenario would be that it takes 24 hours to clean the building each time or 48 hours per year. With a maximum usage of 5 gallons/ minute the total yearly usage would be 14,400 gallons or 1,925 C.F. per year.
### Gestation Building Depth and Volume Table

<table>
<thead>
<tr>
<th>Manure Depth Above Pit Floor (ft)</th>
<th>Depth Below Bottom of Slats (ft)</th>
<th>Depth Below Bottom of Beams (ft)</th>
<th>Storage Volume (Cubic Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.00</td>
<td>8.17</td>
<td>39,194</td>
</tr>
<tr>
<td>2</td>
<td>8.00</td>
<td>7.17</td>
<td>78,387</td>
</tr>
<tr>
<td>3</td>
<td>7.00</td>
<td>6.17</td>
<td>117,581</td>
</tr>
<tr>
<td>4</td>
<td>9.00</td>
<td>8.17</td>
<td>156,774</td>
</tr>
<tr>
<td>5</td>
<td>5.00</td>
<td>4.17</td>
<td>195,968</td>
</tr>
<tr>
<td>6</td>
<td>4.00</td>
<td>3.17</td>
<td>235,162</td>
</tr>
<tr>
<td>7</td>
<td>3.00</td>
<td>2.17</td>
<td>274,355</td>
</tr>
<tr>
<td>8</td>
<td>2.00</td>
<td>1.17</td>
<td>313,549</td>
</tr>
<tr>
<td>8.17</td>
<td>1.83</td>
<td>1.00</td>
<td>320,212</td>
</tr>
<tr>
<td>9</td>
<td>1.00</td>
<td>0.17</td>
<td>352,743</td>
</tr>
<tr>
<td>9.17</td>
<td>0.83</td>
<td>0.00</td>
<td>359,406</td>
</tr>
</tbody>
</table>

### Inside Dimensions
- Building Length (ft): 519
- Building Width (ft): 76.17
- Divider Wall Thickness (ft): 0
- Pump-Out Pit Area (sq ft): 0
- Column Area (sq ft): 1.07

**Available storage/Ft**

\[
(A)^*(B)-(1*^C*B)+(0*D)-(315*^E) = 39,193.62
\]
** DRAWING IS NOT TO SCALE **
**NOTES:**

1) **ALL WALLS SHALL BE FORGED WITH RISER FORMERS**
   - SYSTEMS AND SHALL NOT BE EMPTIED FORGOTTEN.

2) **PLACE FORMS OF THE WALLS ON THE RISER AND SHOE WITH EBC**
   - BLOCK FORMS SHALL BE PERFORMED WITH MATERIAL FREE OF
   - VEGETATION, LISSING RUBBER, AND DEBRIS.
Formed Storage Capacity for Manure Production
Main Farm Farrowing Facility - Existing Conditions

<table>
<thead>
<tr>
<th>Space Capacity # of Head</th>
<th>Daily Manure Production (Swine)</th>
<th>Manure Production</th>
<th>Structure Volume Required</th>
<th>Actual Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gal/day/heading</td>
<td>Gal/Month</td>
<td>C.F.</td>
<td>C.F.</td>
</tr>
<tr>
<td>520</td>
<td>2.08</td>
<td>394,784</td>
<td>52,779</td>
<td></td>
</tr>
<tr>
<td>* Washwater Volume</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Length of Gutter 65.083 ft
B Width of Gutter 6.583 ft
C Depth of Gutter 1.333 ft
D Number of Gutters 41.0

Actual Storage = \((A \times B \times C \times D)\)

* 1/3 of Building is cleaned out weekly and the entire house is cleaned every three weeks when there is a turn over in hogs. Worse case scenario would be that it takes 24 hours to clean the building per month. With a maximum usage of 5 gallons/minute the total yearly usage would be 86,400 gallons or 11,550 C.F. per month.

Calc by: MRL
Date: 7/22/2019
COMPOST VOLUME AND STORAGE CALCULATIONS

FOR

PRECISION STRUCTURES, INC.

R-F MO
SWINE FACILITY EXPANSION
EXISTING AND PROPOSED CONDITIONS

AUXASSE, MO

2019

Calculations prepared in accordance with Missouri Code, 10 CSR 20-8.300

Brian K. Converse, P.E., S.E.
President and General Manager
License No. 2008012188
Expires: 12/31/2020
WHA # 1236M19
Main Farm - Composting - Current Conditions

Assumptions and info from owner:
- Average # of Animals in Gestation = 900
- Average # of Piglets in Farrowing = 10
- Only account for piglets in farrowing since sow will be accounted for in gestation
- Piglets in farrowing for 21 days = 365/21 = 18 per year
- Mortality Rate of Piglets = 12.5% (reported by owner)
- Mortality Rate of Adult Sows = 8.5%

From Attached Spreadsheets:
- Volumes - Mortality Rates:
  - Gestation Volume Required = 3083 CF
  - Farrowing Volume Required = 641 CF
  - Total Required = 4324 CF

Current GDU - Identifying Current Conditions

From Manure Production Units:
- 375 Head @ 185# Avg = 53,725 lbs
- 192 Head @ 25# Avg = 4,800 lbs
- Total 58,525 lbs / 507 Head = 116# Avg

Per owner assume 8.5% Mortality

From Spreadsheets:
- Mortality Volume = 5344 # / yr = 19.6 lbs/day
COMPOSTING (CONTINUED)

CURRENT GDU (CONTINUED)

TOTAL STORAGE REQUIRED = 293 cu ft for GDU

TOTAL COMPOST VOLUME REQUIRED FOR MAIN FARM + GDU (EXISTING)

- GESTATION = 3683
- FARROWING = 641
- GDU = 293

4617 cu ft

VOLUME PROVISION = 8840 cu ft at full height

VOLUME ASSUMING 4' CARBON LAYERS = 4420 cu ft

CURRENT CONTINUOUS ALLOW FOR (8840 - 4420) / 8 = 8.8' of carbon layers

PROPOSED EXPANSION

- AVERAGE MORTALITY RATE PIGLETS = 12.5% PER QUAR
- AVERAGE MORTALITY RATE OF CARBON SEASON = 5% PER QUAR
- AVERAGE W/ GESTATION = 400 &
- AVERAGE W/ FARROWING = 10 # (PIGLETS ONLY)
- AVERAGE W/ ISOLATION = 124 # (70/30 split same as expansion)
- GESTATION HEAD = 210 #
- FARROWING HEAD = 520
- ISOLATION HEAD = 1483
# Composting (Continued)

## Proposed Expansion (Cont.)

From Attached Spreadsheets:

<table>
<thead>
<tr>
<th>Mortality Rate Volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GESTATION: 42,080 lbs/year = 115.3 lbs/day</td>
</tr>
<tr>
<td>Farrow: 11,700 lbs/year = 32.1 lbs/day</td>
</tr>
<tr>
<td>Escalation: 10,485 lbs/year = 28.6 lbs/day</td>
</tr>
<tr>
<td>10/24/14 lbs/year = 176.0 lbs/day</td>
</tr>
</tbody>
</table>

## Required Storage Volume

<table>
<thead>
<tr>
<th>Mortality Rate Volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GESTATION: 2300 CF</td>
</tr>
<tr>
<td>Farrow: 441 CF</td>
</tr>
<tr>
<td>Escalation: 572 CF</td>
</tr>
<tr>
<td>Total = 3579 CF</td>
</tr>
</tbody>
</table>

Volume Provided = 8840 CF w/o Carbon Layers

= 4420 CF w/o 1' Carbon Layers > 3579 CF

↑ Sheet 2
WHA # 1236 - R-F MO
Main Farm Gestation Current Conditions

Composting Facility calculations

Average death rate for a gestation facility equals 8.5 percent.

Average weight of hogs in gestation equals 400 pounds.

Average number of turns per year = 1 turns

Number of hogs on this facility = 1977 head

Hogs lost per year = 8.5% * number of head * number of turns/ year = 168,045 hogs

Pounds per year = number of hogs lost/ year * Average Weight = 67,218 lbs/ year

Mortality rate in pounds per day = 184.2 lbs/ day

Calculated By: MRL
Date: 7/22/2019
Sizing of composting bays

Using research from the Virginia Cooperative Extension that was developed with the assistance of the Virginia State University and Virginia Tech (Pub 414-020, November 2003) The primary and secondary bins shall be sized for at least 20 C.F. for every pound/day average daily mortality.

Primary and secondary bin sizing = 184.2 * 20 = 3,683 C.F.

Composter has five (5) bins 11’ 4” x 19’ 6” x 8’.

Total Volume available = 11.333 * 19.5 * 8 * 5 bins = 8,840 C.F.

Account for an average height of 4 feet of Carbon Layers, adjusted volume = 4420 CF
Composting Facility calculations

Average death rate for a farrowing facility equals 12.5 percent (piglets only, sows included in gestation calcs).

Average weight of hogs in farrowing equals 10 pounds (piglets only, sows included in gestation calcs).

Average number of turns per year = 18 turns

Number of hogs on this facility = 520 head

Hogs lost per year = 12.5% * number of head * number of turns/ year = 1170 hogs

Pounds per year = number of hogs lost/ year * Average Weight = 11,700 lbs/ year

Mortality rate in pounds per day = 32.1 lbs/ day

Calculated By: MRL
Date: 7/22/2019
Sizing of composting bays

Using research from the Virginia Cooperative Extension that was developed with the assistance of the Virginia State University and Virginia Tech (Pub 414-020, November 2003) The primary and secondary bins shall be sized for at least 20 C.F. for every pound/day average daily mortality.

Primary and secondary bin sizing = 
32.1 * 20 = 641 C.F.

Composter has five (5) bins 11' 4" x 19' 6" x 8'.

Total Volume available = 
11.333 * 19.5 * 8 * 5bins = 8,840 C.F.

Account for a average height of 4 feet of Carbon Layers, adjusted volume = 4420 CF
Composting Facility calculations

Average death rate for a GDU isolation facility equals 8.5 percent.

Average weight of hogs in isolation equals 124 pounds.

Average number of turns per year = 1 turns

Number of hogs on this facility = 507 head

Hogs lost per year = 8.5% * number of head * number of turns/year = 43,095 hogs

Pounds per year = number of hogs lost/year * Average Weight = 5,344 lbs/year

Mortality rate in pounds per day = 14.6 lbs/day

Calculated By: MRL
Date: 7/22/2019
Sizing of composting bays

Using research from the Virginia Cooperative Extension that was developed with the assistance of the Virginia State University and Virginia Tech (Pub 414-020, November 2003) The primary and secondary bins shall be sized for at least 20 C.F. for every pound/day average daily mortality.

Primary and secondary bin sizing = 14.6 * 20 = 293 C.F.

Composter has five (5) bins 11' 4" x 19' 6" x 8'.

Total Volume available = 11.333 * 19.5 * 8 * 5bins = 8,840 C.F.

Account for a average height of 4 feet of Carbon Layers, adjusted volume = 4420 CF
Composting Facility calculations

Average death rate for a gestation facility equals 5 percent.

Average weight of hogs in gestation equals 400 pounds.

Average number of turns per year = 1 turns

Number of hogs on this facility = 2104 head

Hogs lost per year = 5% * number of head * number of turns/year = 105.2 hogs

Pounds per year = number of hogs lost/year * Average Weight = 42,080 lbs/year

Mortality rate in pounds per day = 115.3 lbs/day

Calculated By: MRL
Date: 7/22/2019
Sizing of composting bays

Using research from the Virginia Cooperative Extension that was developed with the assistance of the Virginia State University and Virginia Tech (Pub 414-020, November 2003) The primary and secondary bins shall be sized for at least 20 C.F. for every pound/day average daily mortality.

Primary and secondary bin sizing = $115.3 \times 20 = 2,306$ C.F.

Composter has five (5) bins 11' 4" x 19' 6" x 8'.

Total Volume available = $11.333 \times 19.5 \times 8 \times 5$ bins = $8,840$ C.F.

Account for an average height of 4 feet of Carbon Layers, adjusted volume = $4,420$ CF
WHA # 1236 - R-F MO
Proposed Expansion - Farrowing

**Composting Facility calculations**

Average death rate for a farrowing facility equals 12.5 percent (piglets only, sows included in gestation calcs).

Average weight of hogs in farrowing equals 10 pounds (piglets only, sows included in gestation calcs).

**Average number of turns per year** = 18 turns

Number of hogs on this facility

Hogs lost per year = 12.5% * number of head * number of turns/ year = 1170 hogs

Pounds per year = number of hogs lost/ year * Average Weight = 11,700 lbs/ year

Mortality rate in pounds per day = 32.1 lbs/ day

**Calculated By:**

**Date:** 7/22/2019
Sizing of composting bays

Using research from the Virginia Cooperative Extension that was developed with the assistance of the Virginia State University and Virginia Tech (Pub 414-020, November 2003) The primary and secondary bins shall be sized for at least 20 C.F. for every pound/day average daily mortality.

Primary and secondary bin sizing = 32.1 * 20 = 641 C.F.

Composter has five (5) bins 11' 4" x 19' 6" x 8'.

Total Volume available = 11.333 * 19.5 * 8 * 5bins = 8,840 C.F.

Account for an average height of 4 feet of Carbon layers, adjusted volume = 4420 CF
Composting Facility calculations

Average death rate for a GDU isolation facility equals 5 percent.

Average weight of hogs in Isolation equals 124 pounds.

Average number of turns per year = 1 turns

Number of hogs on this facility = 1683 head

Hogs lost per year = 5% * number of head * number of turns/ year = 84.15 hogs

Pounds per year = number of hogs lost/ year * Average Weight = 10,435 lbs/ year

Mortality rate in pounds per day = 28.6 lbs/ day
Sizing of composting bays

Using research from the Virginia Cooperative Extension that was developed with the assistance of the Virginia State University and Virginia Tech (Pub 414-020, November 2003)

The primary and secondary bins shall be sized for at least 20 C.F. for every pound/day average daily mortality.

Primary and secondary bin sizing = \(28.6 \times 20 = 572\) C.F.

Composter has five (5) bins 11' 4" x 19' 6" x 8'.

Total Volume available = \(11.333 \times 19.5 \times 8 \times 5\) bins = 8,840 C.F.

Account for a average height of 4 feet of Carbon Layers, adjusted volume = 4420 CF
Site; 19 (0.36 ac.)

Distances to occupied dwellings

Written agreement for dwelling 670' from CAFO

Document #

Date: Jul 24, 2019
Field Name: Site; 19
Location: Callaway Co., Missouri, U.S.
Farm Name: R and F MO
Client Name: P-Index
Total Acres: 0.36
Field Boundary Start Location:
Latitude: 38.99118800
Longitude: -91.98662372

Distance To Residences

\[ 670.095 \]
\[ 1751.931 \]
\[ 2124.082 \]
\[ 2586.318 \]

(0.4 ac.) Field Boundary
Easement and Waiver of Separation Distance

Prepared by: Sean R. Simpson

Return to: Sean R. Simpson

Address: 1300 S. Hwy 75
          Pipestone, MN 56164

1. Re: Grantor’s property: The Southeast Quarter of Section 25, Township 49 North, Range 10 West in Callaway County, Missouri

2. And concerning Grantee’s property and site of the Swine Facility: The Southeast Quarter of Section 25, Township 49 North, Range 10 West in Callaway County, Missouri

Grantors: Esther L. and Stephen A. Rosner

Grantee’s: R&F MO, LLC

3 pages
Easement and Waiver of Separation Distance

Grantee currently has an easement over Grantor's property for the use and operation of a Gilt Development Unit ("GDU") Operation (the "GDU Easement"). Grantor consents and acquiesces to the activities conducted within the GDU pursuant to the GDU Easement. Grantee is expanding the GDU Operation and Grantor hereby further consents and acquiesces to the expansion, construction and operation of the GDU Easement and therefore covenants for themselves, and for Grantor's successors, heirs and assigns (as a restrictive covenant running with the land) to not make any claim or assert any cause of action against the Grantee or Grantee's successors, heirs and assigns for construction of the expanded GDU or its operation, including, without limitation, causes of action or claims for nuisance, trespass, easement or any other legal or equitable theory. Grantor further waives the enforcement of any county, state or federal regulation or law regarding the emission of any odors, gases, vapors or other airborne pollutants from the GDU operations.

In addition and without limitation of the foregoing, Grantor grants to Grantee and Grantee's successors, heirs and assigns a perpetual easement (as an easement appurtenant running with the land) for the GDU (as currently proposed as provided herein), on and over the Grantor's real estate for use by the GDU to emit odors or other gases or vapors produced by the GDU.

The undersigned are titleholders to the above-described property #1. Stephen and Esther Rosner are titleholders to the above-described property, property #2. Pursuant to applicable Missouri Code, a separation distance of 1,000 feet is required between the covered formed manure storage structures and the undersigned's land where the residence is located. Pursuant to Missouri Code, the undersigned as titleholders to the land where the residence is located hereby waive the enforcement of this separation distance requirement between the Grantors' residence and the covered formed manure storage structures. This waiver shall apply only to the facilities described in this agreement, shall be perpetual and shall run with the land.

(Remainder of the page intentionally blank)
Granted this _____ day of _____ 2019

Esther L. Rosner, Grantor
900 Esther Lane
Jefferson City, MO 65109

STATE OF MISSOURI )
COUNTY OF COLE ) ss:

On this 26th day of Aug., 2019, before me, the undersigned, a Notary Public in and for said county and state, personally appeared Esther Rosner, to me personally known to be the identical person named in and who executed the within and foregoing instrument, and acknowledges that they executed the same as their voluntary act and deed.

Notary Public in and for the State of

[SEAL]

Stephen A. Rosner, Grantor
900 Esther Lane
Jefferson City, MO 65109

STATE OF MISSOURI )
COUNTY OF CALLAWAY ) ss:

On this 26th day of Aug., 2019, before me, the undersigned, a Notary Public in and for said county and state, personally appeared Stephen Rosner, to me personally known to be the identical person named in and who executed the within and foregoing instrument, and acknowledges that they executed the same as their voluntary act and deed.

Notary Public in and for the State of Missouri

[SEAL]
Granted this 22nd day of August 2019

[Signature]
Esther L. Rosner, Grantor
900 Esther Lane
Jefferson City, MO 65109

STATE OF Virginia )
COUNTY OF Alpena ) ss:

On this 22nd day of August 2019, before me, the undersigned, a Notary Public in and for said county and state, personally appeared Esther Rosner, to me personally known to be the identical person named in and who executed the within and foregoing instrument, and acknowledges that they executed the same as their voluntary act and deed.

[Signature]
Notary Public in and for the State of Virginia

Stephen A. Rosner, Grantor
900 Esther Lane
Jefferson City, MO 65109

STATE OF MISSOURI )
COUNTY OF CALLAWAY ) ss:

On this ___ day of _______, 2019, before me, the undersigned, a Notary Public in and for said county and state, personally appeared Stephen Rosner, to me personally known to be the identical person named in and who executed the within and foregoing instrument, and acknowledges that they executed the same as their voluntary act and deed.

[SEAL]