June 28, 2024

Nicholas T. Maple, Contact
Top Grade Production LLC
2667 East State Road 18
Kokomo, Indiana 46901

Re: Confined Feeding Operation
Approval Renewal
Reauthorization of Construction
Approval Facility Change
Top Grade Production LLC
Howard County
Farm ID #3713
Animal Waste Number AW-6822

Dear Nicholas T. Maple:

Your confined feeding operation (CFO) application seeking approval to renew your existing swine operation in Howard County with planned construction is approved. This office received this application March 11, 2024 with public notice requirements being met.

This approval is reauthorizing the timeframe to construct the previously approved 8P, 9P, and 10P swine confinement buildings. These structures were originally approved on April 22, 2019 (AW# 6822).

The requested facility change is approved. It included a narrative description of your changes and an updated farmstead plan. Your notification indicates the following changes:

- The designs of swine confinement structures 8P and 9P have been modified to accommodate the floodway and floodplain fringe that have been mapped on the site after the structures were originally approved.

As a result of this change, your CFO is approved for total capacity of: 4,789 breeding/gestation sows and 773 farrowing sows with litters as detailed on the attached facility detail sheet. The requested changes and supporting information was determined to satisfy both the Confined Feeding Control Law (IC 13-18-10), and the Confined Feeding Operation regulation (327 IAC 19). No further action is required on your part.

The application and supporting information was determined to satisfy both the Confined Feeding Control Law (IC 13-18-10), and the Confined Feeding Operation regulation (327 IAC 19). Your CFO Approval and the other enclosures to this letter provide important information about your responsibilities as a CFO owner or operator. Please take time to review these documents before putting them in your operating record. Feel free to contact us if you have any questions.

Your CFO meets the definition of a Concentrated Animal Feeding Operation (CAFO). Please note that CAFOs have additional requirements. The requirements are explained in more detail in the CFO Approval.

Your application proposed an alternative compliance approach (ACA) under 327 IAC 19-5-1(c). Details of this ACA are included in your CFO Approval.

You can view this document along with the final approved application and design sheets as well as all public records for the CFO on IDEM's Virtual File Cabinet (VFC) website. Go to https://www.in.gov/idem/legal/public-records/virtual-file-cabinet, which is the VFC page. Once there, click on the ***Virtual File Cabinet*** in the blue box. Select the ***"Quick Search"*** option in the upper right hand corner. Select **"CFO/CAFO #"** from the dropdown menu. Type in the farm ID #, **3713**, in the box to the right of the ***"Quick Search".*** Click the ***Search arrow*** button. You can sort the search results by clicking on the title at the top of the column for each of the following categories: ***Content Id, Document Date, or Document Type***. IDEM posts documents within approximately 5 days of when we send or receive them. Contact us if you cannot locate a particular document.

A weekly posting of pending permits is located on our agency website at: http://www.in.gov/idem/cfo/2329.htm.

This decision becomes effective immediately upon issuance unless a person aggrieved or adversely affected by the decision files a request for an administrative review and stay of the decision. For more information on appealing this decision, please refer to the attached "*Notice of Right to Administrative Review*" document.

CONTACT INFORMATION

Questions concerning issuance of this approval should be directed to the Confined Feeding Program at (317) 232-4473, or by FAX at (317) 232-3403.

Sincerely,

Joseph D Goetz

Joseph D Goetz, Section Chief
Confined Feeding Permits Section
Office of Land Quality

Enclosures: Notice of Right to Administrative Review
CFO Approval
CAFO Operating Record Checklist
CFO Record Book
CFO/CAFO Compliance Assistance
Office of Indiana State Chemist Licensing Handout
CFO Construction Checklist
CFO Construction Notification
CFO Construction Affidavit
CFO Professional Engineer Certification Construction for Concrete

cc: Michael Veenhuizen – Livestock Engineering Solutions, Inc.
Howard County Health Department (without enclosures)
Howard County Board of Commissioners (without enclosures)
Kokomo, Indiana Mayor/Town Council President (without enclosures)
Howard County USDA-Natural Resources Conservation Service (without enclosures)

Notice of Right to Administrative Review

If you wish to challenge this decision, you must file a Petition for Administrative Review with the Office of Environmental Adjudication (OEA), and serve a copy of the petition upon IDEM. The requirements for filing a Petition for Administrative Review are found in IC 4-21.5-3-7, IC 13-15-6-1 and 315 IAC 1-3-2. A summary of the requirements of these laws is provided below.

A Petition for Administrative Review must be filed with the Office of Environmental Adjudication (OEA) within fifteen (15) days of the issuance of this notice (eighteen (18) days if you received this notice by U.S. Mail), and a copy must be served upon IDEM. Addresses are:

Director
Office of Environmental Adjudication
Indiana Government Center North
Room N103
100 North Senate Avenue
Indianapolis, Indiana 46204

Commissioner
Indiana Department of Environmental Management
Indiana Government Center North
Room 1301
100 North Senate Avenue
Indianapolis, Indiana 46204

The petition must contain the following information:

1. The name, address and telephone number of each petitioner.
2. A description of each petitioner's interest in the approval.
3. A statement of facts demonstrating that each petitioner is:
    a. a person to whom the order is directed;
    b. aggrieved or adversely affected by the approval; or
    c. entitled to administrative review under any law.
4. The reasons for the request for administrative review.
5. The particular legal issues proposed for review.
6. The alleged environmental concerns or technical deficiencies of the approval.
7. The approval terms and conditions that the petitioner believes would be appropriate and would comply with the law.
8. The identity of any persons represented by the petitioner.
9. The identity of the person against whom administrative review is sought.
10. A copy of the approval that is the basis of the petition.
11. A statement identifying petitioner's attorney or other representative, if any.

Failure to meet the requirements of the law with respect to a Petition for Administrative Review may result in a waiver of your right to seek administrative review of the approval. Examples are:

1. Failure to file a Petition by the applicable deadline;
2. Failure to serve a copy of the Petition upon IDEM when it is filed; or
3. Failure to include the information required by law.

If you seek to have the approval stayed during the administrative review, you may need to file a Petition for a Stay of Effectiveness. The specific requirements for such a Petition can be found in 315 IAC 1-3-2 and 315 IAC 1-3-2.1.
Pursuant to IC 4-21.5-3-17, OEA will provide all parties with notice of any pre-hearing conferences, preliminary hearings, hearings, stays, or orders disposing of the review of this action. If you are entitled to notice under IC 4-21.5-3-5(b) and would like to obtain notices of any pre-hearing conferences, preliminary hearings, hearings, stays, or orders disposing of the review of this action without intervening in the proceeding you must submit a written request to OEA at the address above.
More information on the review process is available at the website for the Office of Environmental Adjudication at http://www.in.gov/oea.

IDEM INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

CONFINED FEEDING OPERATION (CFO) APPROVAL

Applicant: (Permittee) Top Grade Production LLC Farm ID : 3713 AW#: 6822

Operation Name: Top Grade Production LLC County: Howard

Property Owner: Top Grade Production LLC Contact Person: Nicholas T. Maple

Operation Location: 5504 N 400 W, Kokomo, Indiana 46901

Approval Type									
x	Construction		Approval w/o Construction	x	Renewal		Amendment	x	Facility Change
	Transfer		Other		Notes:	Reauthorization of Construction			

Effective Date: June 28, 2024

Expiration Date: June 28, 2029

Renewal Submission Deadline: May 28, 2029

Permit renewal applications must be submitted no less than 30 days prior to the permit expiration date. If the renewal submission deadline falls on a Sunday or holiday, the renewal must be submitted prior to that date.

The purpose of the CFO approval program is to protect water quality in Indiana through standards for constructing and operating CFOs and associated manure management structures.

As the owner/operator, you must:

- meet all terms and conditions of this approval, the Confined Feeding Control Law IC 13-18-10, the Confined Feeding Operation regulations 327 IAC 19, and the Spill Rule 327 IAC 2-6.1;
- allow representatives of IDEM to enter your CFO and review your records, inspect the operation, and sample or monitor the operation when needed; and
- keep a copy of this approval as part of your operating record.

In order to receive approval to operate your CFO beyond the expiration date listed above, you must submit a complete application for an approval renewal to the IDEM by the renewal submission deadline.

This CFO Approval is authorized under IC 13-18-10 and becomes effective on the date listed above.

Joseph D Goetz, Section Chief
Confined Feeding Permits Section

Applicant: (Permittee) **Top Grade Production LLC** Farm ID #: **3713**

FACILITY DESCRIPTION

Your CFO meets the definition of a Concentrated Animal Feeding Operation (CAFO). [See 40 CFR 122.23(b) (2)]

The existing CFO and associated manure control facilities were previously renewed April 22, 2019, Animal Waste Number AW-6822. The following **existing** and or previously approved structures are reapproved:

- One previously approved (November 13, 1991; AW# 4418) swine confinement structure, labeled 1E, with a shallow concrete pit for the storage of liquid manure from 650 breeding/gestation sows. Manure from this structure flows to the concrete lift station, labeled 5E, where it is then pumped to the earthen manure storage impoundment, labeled 4E, for long-term storage.
- One previously approved (November 13, 1991; AW# 4418) swine confinement structure, labeled 2E, with a shallow concrete pit for the storage of liquid manure from 635 breeding/gestation sows. Manure from this structure flows to the concrete lift station, labeled 5E, where it is then pumped to the earthen manure storage impoundment, labeled 4E, for long-term storage.
- One previously approved (November 13, 1991; AW# 4418) swine confinement structure, labeled 3E, with a shallow concrete pit for the storage of liquid manure from 297 farrowing sows with litters. Manure from this structure flows to the concrete lift station, labeled 5E, where it is then pumped to the earthen manure storage impoundment, labeled 4E, for long-term storage.
- One previously approved (November 13, 1991; AW# 4418) earthen manure storage impoundment, labeled 4E, which provides long-term manure storage for the entire operation.
- One previously approved (November 13, 1991; AW# 4418) concrete lift station, labeled E5, which facilitates the transportation of manure from swine confinement structures 1E, 2E, 3E, 7E, 8P, and 9P to the earthen manure storage impoundment, 4E, for long-term storage.
- One previously approved (July 11, 2005; AW# 5472) swine confinement building, labeled 6E, with a deep concrete pit beneath slatted floors for the storage of liquid manure from 1,752 breeding/gestation sows. Earthen manure storage impoundment, 4E, provides additional storage for this structure. 6E includes a perimeter tile drainage system to manage the seasonal high-water table which discharges to a rock distributor to the northeast of the building. The observation port is located near the northeast corner of the building.
- One previously approved (July 11, 2005; AW# 5472) swine confinement structure, labeled 7E, with a shallow concrete pit for the storage of liquid manure from 208 farrowing sows with litters. Manure from this structure flows to the concrete lift station, labeled 5E, where it is then pumped to the earthen manure storage impoundment, labeled 4E, for long-term storage. 7E includes a perimeter tile drainage system to manage the seasonal high-water table which discharges to a rock distributor to the northeast of the building. The observation port is located near the southeast corner of the building.

The following **proposed** structures were originally approved (April 22, 2019; AW# 6822) and construction, as defined in IC 13-11-2-40.8, must begin at least 30 days prior to the expiration of this CFO Approval, or if construction has not begun the applicant must submit a renewal application and meet the requirements for notification in IC 13-18-10-2(b) at least 30 days prior to expiration of this approval. The construction approval will expire if these approval conditions are not met.

- One previously approved (April 22, 2019; AW# 6822) swine confinement building, labeled 8P, with a shallow concrete pit for the storage of liquid manure from 208 farrowing sows with litters. Manure from this structure flows to the concrete lift station, labeled 5E, where it is then pumped to the earthen manure storage impoundment, labeled 4E, for long-term storage.
- One previously approved (April 22, 2019; AW# 6822) swine confinement building, labeled 9P, with a shallow concrete pit for the storage of liquid manure from 60 farrowing sows with litters. Manure from this structure flows to the concrete lift station, labeled 5E, where it is then pumped to the earthen manure storage impoundment, labeled 4E, for long-term storage.
- One previously approved (April 22, 2019; AW# 6822) swine confinement building, labeled 10P, with a deep concrete pit beneath slatted floors for the storage of liquid manure from 1,752 breeding/gestation sows. Earthen manure storage impoundment, 4E, provides additional storage for this structure. 10P includes a perimeter tile drainage system to manage the seasonal high-water table which discharges to a rock distributor to the northeast of the building. The observation port is located near the northeast corner of the building.

In Addition:

Perimeter drainage tiles are or will be located around the 6E, 7E, and 10P swine confinement buildings to manage the seasonal high-water table associated with these structures. Monitoring will be conducted during all future routine compliance inspections if flow is occurring at the time of the inspection. ***Please see the Facility Detail section for details on individual buildings.***

Mortalities are handled via the on-site compost facility 11E.

Your CFO is approved for total capacity of 4,789 breeding/gestation sows and 773 farrowing sows with litters as detailed on the attached facility detail sheet and farmstead plan. The manure control facilities, including the availability of acreage for manure application, meet or exceed the requirements of the Confined Feeding Operation regulations 327 IAC 19.

SPECIAL APPROVAL CONDITIONS

Please note that CFOs meeting the definition of a CAFO have three requirements that differ from those for farms not defined as CAFOs. These include storm water management practices (327 19-11-1(a)), manure application rate limitations (327 IAC 19-14-3(d)) and manure application activities (327 IAC 19-14-4(e)).

The storm water management practices refer to requirements of the federal regulation for CAFOs (40 CFR 122.42(e) (2)). The CFO Guidance Manual outlines those requirements and can be viewed in the section of the Guidance Manual titled "*Storm Water Management for CAFOs and NPDES CAFO Individual Permit Holders*". It may be

accessed using the following internet address:
https://www.in.gov/idem/cfo/files/guidance_manual_cfo_program.pdf .

Earthen Storage Impoundment Maintenance (327 IAC 19-13-1):

In the event that heavy equipment comes in contact with any of the interior slopes and/or bottom of the compacted earthen manure storage impoundment, labeled E4; the liner must be re-inspected for damage before re-use. If damage is encountered, you must notify IDEM of this damage. A record of all repairs to correct the damage must be kept in the Operating Record at the facility for inspection by IDEM personnel. (See 327 IAC 19-12-4(q)).

Monitoring of Perimeter Drains:

Monitoring of Perimeter Drains: (327 IAC 19-12-4) The perimeter drain for structure **10P** will be monitored monthly, and any flow detected will be checked for presence of ammonia nitrogen with a field test/sample kit, and will be visually inspected for discoloration, odor, and other indicators of the presence of livestock waste. No other drainage tile may be added to this perimeter drain. An ammonia nitrogen field test kit may be used for on-site monitoring. The record of monitoring will be kept in the operating record (327 IAC 19-9-1). If ammonia nitrogen, discoloration, or other indicators are found during the monthly check of the perimeter drain outflow will be directed back into the waste storage structure. Monitor until clear, if it does not clear up contact your compliance inspector.

This monthly monitoring will continue until reviewed by the CFO Compliance Inspector during their first full compliance review. If ammonia nitrogen, discoloration, or other indicators are not noted in any monthly monitoring or during the first full compliance inspection (not the initial compliance assistance inspection) and with the compliance inspector's written concurrence in the inspection report that the monitoring has not indicated the presence of livestock waste, then the monthly monitoring will no longer be required.

If the planned outlet system is modified, it may change this monitoring period. For instance, if the outlet of the perimeter drain is connected to an existing field tile the monitoring will be required for the life of the waste storage structures. Monitoring will be conducted during all future compliance routine inspections if flow is occurring at the time of inspection. If possible, the owner/operator should sample the liquid from the perimeter tile riser observation point prior to any animals being introduced to structure **10P** to establish a base line test for the site.

Berm/Drainage Diversion, Swale:

The existing earthen bank diversion shown on the farmstead plan serves as a surface water berm or swale which will divert surface water drainage away from the Mason-Kingery Ditch. Each berm or drainage diversion that was constructed has positive drainage to a protected outlet that allows for a minimum of 300 feet of surface runoff prior to being released to a water feature. The berm/drainage diversion is a permanent protective measure that must be maintained and remain functional for the life of the facility. This is approved in accordance with an Alternative Compliance Approach per 327 IAC 19-5-1.

Property Line Setback Waiver: (327 IAC 19-12-3)

The submitted application included a signed property line setback waiver as allowed in 327 IAC 19-12-3(e) for property line setbacks as described in 327 IAC 19-12-3(a)(3)(B)]. IDEM determined the proposed waiver meets the performance standards in 327 IAC 19-3-1. This waiver applies to the following approved swine confinement buildings 8P, 9P, & 10P and the associated east, west, and south property lines. A waiver was also granted to allow for outlet of the perimeter drain rock distributor and vegetative infiltration area for building 10P.

Latitudinal and Longitudinal Coordinates:

Due to the proximity to the flood fringe area, it is required that the latitudinal and longitudinal coordinates of the corners of the completed structures 8P, 9P, and 10P be as follows:

For 8P:	NW corner -	40° 33’ 23.19” N, 86° 11’ 53.85” W
	SW corner -	40° 33’ 22.42” N, 86° 11’ 53.85” W
	NE corner -	40° 33’ 23.25” N, 86° 11’ 51.87” W
	SE corner -	40° 33’ 22.48” N, 86° 11’ 51.87” W
For 9P:	NW corner -	40° 33’ 22.91” N, 86° 12’ 00.60” W
	SW corner -	40° 33’ 22.25” N, 86° 12’ 00.60” W
	NE corner -	40° 33’ 22.91” N, 86° 11’ 59.75” W
	SE corner -	40° 33’ 22.25” N, 86° 11’ 59.75” W
For 10P:	NW corner -	40° 33’ 20.61” N, 86° 11’ 57.07” W
	SW corner -	40° 33’ 19.85” N, 86° 11’ 57.07” W
	NE corner -	40° 33’ 20.73” N, 86° 11’ 51.70” W
	SE corner -	40° 33’ 19.97” N, 86° 11’ 51.70” W

These are drawn from the updated location information submitted to IDEM on June 28, 2024.

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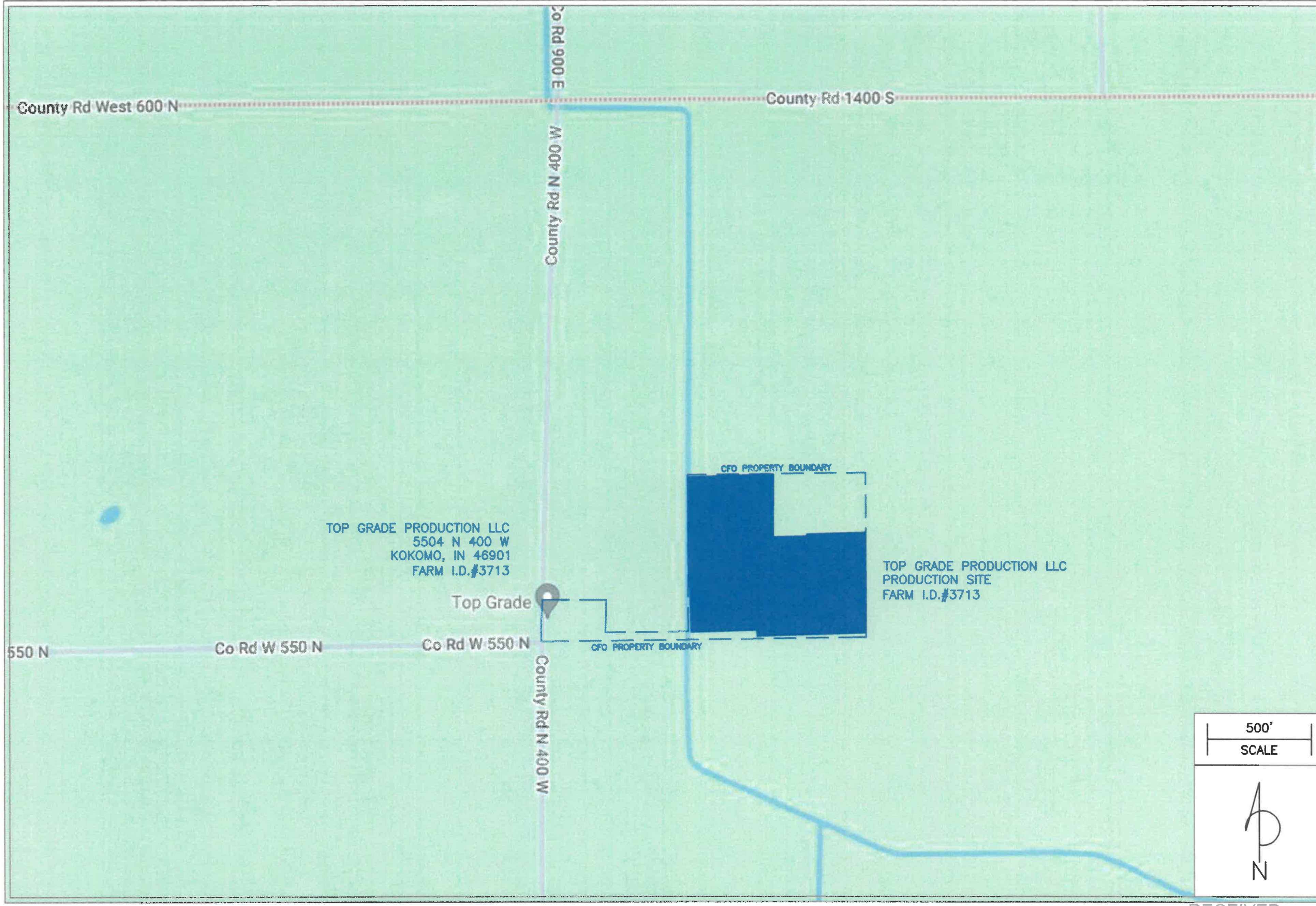
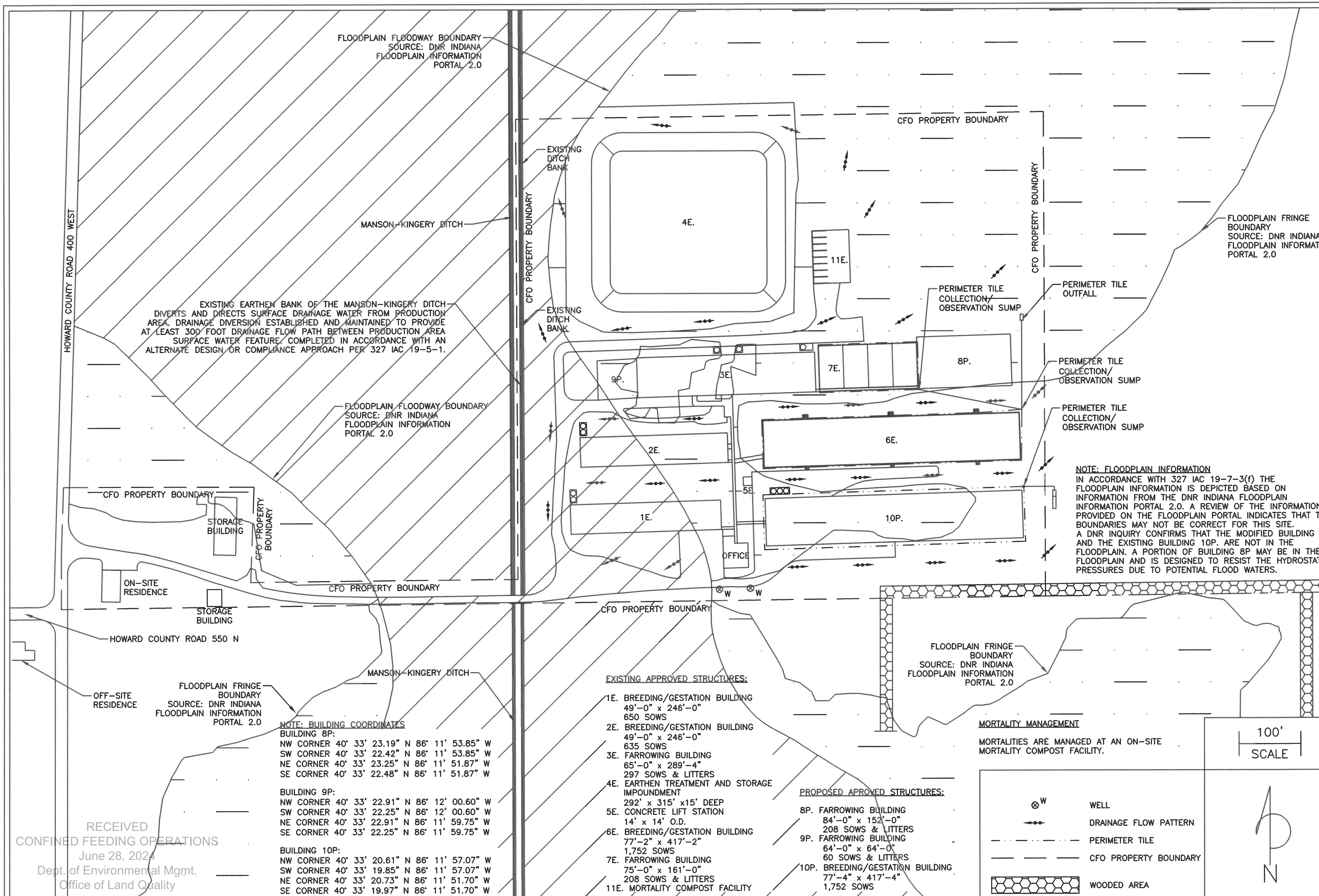


TOP GRADE PRODUCTION LLC 2667 EAST STATE ROAD 18 KOKOMO, INDIANA 46901 2024 CFO RENEWAL—#3713	FARMSTEAD PLAN SITE LOCATION MAP S4 T24N R3E	DATE: 02/21/24 DRAWN BY: DL LIVESTOCK ENGINEERING SOLUTIONS, INC. MICHAEL A. VEENHUIZEN 2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143	SHEET: 1A of 2A	DRAWING NO: TGP0124— 01A

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality



NOTE: FLOODPLAIN INFORMATION

IN ACCORDANCE WITH 327 IAC 19-7-3(f) THE FLOODPLAIN INFORMATION IS DEPICTED BASED ON INFORMATION FROM THE DNR INDIANA FLOODPLAIN INFORMATION PORTAL 2.0. A REVIEW OF THE INFORMATION PROVIDED ON THE FLOODPLAIN PORTAL INDICATES THAT THE BOUNDARIES MAY NOT BE CORRECT FOR THIS SITE. A DNR INQUIRY CONFIRMS THAT THE MODIFIED BUILDING 9P. AND THE EXISTING BUILDING 10P. ARE NOT IN THE FLOODPLAIN. A PORTION OF BUILDING 8P MAY BE IN THE FLOODPLAIN AND IS DESIGNED TO RESIST THE HYDROSTATIC PRESSURES DUE TO POTENTIAL FLOOD WATERS.

NOTE: BUILDING COORDINATES

BUILDING 8P:
NW CORNER 40° 33' 23.19" N 86° 11' 53.85" W
SW CORNER 40° 33' 22.42" N 86° 11' 53.85" W
NE CORNER 40° 33' 23.25" N 86° 11' 51.87" W
SE CORNER 40° 33' 22.48" N 86° 11' 51.87" W

BUILDING 9P:
NW CORNER 40° 33' 22.91" N 86° 12' 00.60" W
SW CORNER 40° 33' 22.25" N 86° 12' 00.60" W
NE CORNER 40° 33' 22.91" N 86° 11' 59.75" W
SE CORNER 40° 33' 22.25" N 86° 11' 59.75" W

BUILDING 10P:
NW CORNER 40° 33' 20.61" N 86° 11' 57.07" W
SW CORNER 40° 33' 19.85" N 86° 11' 57.07" W
NE CORNER 40° 33' 20.73" N 86° 11' 51.70" W
SE CORNER 40° 33' 19.97" N 86° 11' 51.70" W

EXISTING APPROVED STRUCTURES:

1E. BREEDING/GESTATION BUILDING
49'-0" x 246'-0"
650 SOWS
2E. BREEDING/GESTATION BUILDING
49'-0" x 246'-0"
635 SOWS
3E. FARROWING BUILDING
65'-0" x 289'-4"
297 SOWS & LITTERS
4E. EARTHEN TREATMENT AND STORAGE IMPOUNDMENT
292' x 315' x15' DEEP
5E. CONCRETE LIFT STATION
14' x 14' O.D.
6E. BREEDING/GESTATION BUILDING
77'-2" x 417'-2"
1,752 SOWS
7E. FARROWING BUILDING
75'-0" x 161'-0"
208 SOWS & LITTERS
11E. MORTALITY COMPOST FACILITY

PROPOSED APROVED STRUCTURES:

8P. FARROWING BUILDING
84'-0" x 152'-0"
208 SOWS & LITTERS
9P. FARROWING BUILDING
64'-0" x 64'-0"
60 SOWS & LITTERS
10P. BREEDING/GESTATION BUILDING
77'-4" x 417'-4"
1,752 SOWS

MORTALITY MANAGEMENT

MORTALITIES ARE MANAGED AT AN ON-SITE MORTALITY COMPOST FACILITY.

W WELL
DRAINAGE FLOW PATTERN
PERIMETER TILE
CFO PROPERTY BOUNDARY
WOODED AREA

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TOP GRADE PRODUCTION LLC
2667 EAST STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

FARMSTEAD PLAN
BUILDING SITE DETAILS
SECTION 4 T24N R3E

DATE: 06/28/24
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

DRAWN BY: MV

SHEET: 2A of 2A

DRAWING NO: TGP0424- 02A

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
1E.	Breeding/ Gestation sows	650 breeding/gestation sows	Liquid	1991	Building wash water 6,500 gallons per year **Total Usage:** 6,500 gallons per year	Approved November 13, 1991. Farm ID #3713, AW-4418. Breeding/gestation sow building with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 49'-0" x 246'-0" O.D. Below-building concrete manure storage: 1) 47'-8" x 244'-8" x 2'-0" deep Total capacity: 23,325 cu ft Available capacity: 11,662 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 89 days

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
2E.	Breeding/ Gestation sows	635 breeding/gestation sows	Liquid	1991	Building wash water 6,350 gallons per year **Total Usage:** 6,350 gallons per year	Approved November 13, 1991. Farm ID #3713, AW-4418. Breeding/gestation sow building with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 49'-0" x 246'-0" O.D. Below-building concrete manure storage: 1) 47'-8" x 239'-8" x 2'-0" deep Total capacity: 22,848 cu ft Available capacity: 11,424 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 89 days

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
3E.	Farrowing (sows & litters)	297 sows & litters	Liquid	1991	<u>Building wash water</u> 1,635 gallons Up to 13 times per year **Total Usage:** 21,255 gallons per year	Approved November 13, 1991. Farm ID #3713, AW-4418. Farrowing building (sows and litters) with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding operation structure. Not shared with another confined feeding structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 65’-0” x 289’-4” O.D. Below-building concrete manure storage: 1) 60’-0” x 272’-4” x 2’ deep Total capacity: 32,679 cu ft Available capacity: 16,339 cu ft (6” freeboard and 6” residual solids storage) Storage capacity: 128 days

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

D. FACILITY DETAIL INFORMATION						
Label on Farmstead Plan	**Animal Type**	**Number of Approved Animals**	**Solid or Liquid**	**Date Constructed** *(for existing buildings)*	**Water Uses** *(gallons/unit of time)*	**Brief Description**
4E.	Earthen treatment and storage impoundment	-----	Liquid	1991	-----	Approved November 13, 1991. Farm ID #3713, AW-4418. Earthen treatment/storage impoundment. Provides supplemental storage for concrete manure storage structures (1E, 2E, 3E, 6E, 7E, 8P, 9P). Manure from the below-building concrete manure storages gravity flow to lift station 5E and is pumped to earthen treatment/storage impoundment. As needed, manure from buildings 6E and 10P is pumped to earthen/treatment impoundment for supplemental storage. Earthen impoundment dimensions: 292' x 315' x 15' deep Total capacity (top of berm): 1,066,388 cu ft Available capacity: 888,431 cu ft (24" freeboard) Residual solids storage: 53,231 cu ft (12" solids) Net rainfall: 85,611 cu ft Available storage capacity: 749,589 cu ft Storage capacity: 568 days

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
5E.	Concrete lift station	-----	Liquid	1991	-----	Approved November 13, 1991. Farm ID #3713, AW-4418. Concrete lift station transfers manure from buildings 1E, 2E, 3E, 7E, 8P, and 9P to the earthen treatment/storage impoundment for long-term manure storage. Lift station dimensions: 14’-0” x 14’-0” O.D. 12’-8” x 12’-8” I.D. Concrete lift station top of wall elevation 30” above existing ground elevation and 6” above building top of floor elevation. Available storage capacity: 0 days

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D. FACILITY DETAIL INFORMATION						
Label on Farmstead Plan	**Animal Type**	**Number of Approved Animals**	**Solid or Liquid**	**Date Constructed** *(for existing buildings)*	**Water Uses** *(gallons/unit of time)*	**Brief Description**
6E.	Breeding/ Gestation sows	1,752 breeding/gestation sows	Liquid	2005	Building wash water 17,520 gallons per year **Total Usage:** 17,520 gallons per year	Approved July 11, 2005. Farm ID #3713, AW-5472. Breeding/gestation sow building with below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding structure. As needed, manure from building 6E is pumped to earthen/treatment impoundment for supplemental storage. Total building dimensions: 77'-2" x 417'-2" O.D. Below-building concrete manure storage: 1) 75'-10" x 415'-10" x 7'-8" deep Total capacity: 241,770 cu ft Available capacity: 210,236 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 596 days

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D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
7E.	Farrowing (sows & litters)	208 sows & litters	Liquid	2005	Building wash water 1,144 gallons Up to 13 times per year **Total Usage:** 14,872 gallons per year	Approved July 11, 2005. Farm ID #3713, AW-5472. Farrowing building (sows and litters) with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding operation structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 75'-0" x 161'-0" O.D. Below-building concrete manure storage: Sixteen (16) shallow manure storages 1) 6'-9" x 70'-0" x 2'-0" deep (individual tanks) Total capacity: 15,120 cu ft Available capacity: 7,560 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 84 days

D. FACILITY DETAIL INFORMATION						
Label on Farmstead Plan	**Animal Type**	**Number of Approved Animals**	**Solid or Liquid**	**Date Constructed** *(for existing buildings)*	**Water Uses** *(gallons/unit of time)*	**Brief Description**
8P.	Farrowing (sows & litters)	208 sows & litters	Liquid	Not constructed Originally approved April 22, 2019 Construction authorization renewal requested.	Building wash water 1,144 gallons Up to 13 times per year **Total Usage:** 14,872 gallons per year	Approved April 22, 2019. Farm ID #3713, AW-6822. Farrowing building (sows and litters) with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding operation structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 84'-0" x 152'-0" O.D. Below-building concrete manure storage: Eight (8) shallow manure storages 1) 7'-2.5" x 151'-0" x 2'-0" deep (individual tanks) Total capacity: 17,415 cu ft Available capacity: 8,707 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 97 days

D. FACILITY DETAIL INFORMATION						
Label on Farmstead Plan	**Animal Type**	**Number of Approved Animals**	**Solid or Liquid**	**Date Constructed** *(for existing buildings)*	**Water Uses** *(gallons/unit of time)*	**Brief Description**
9P.	Farrowing (sows & litters)	60 sows & litters	Liquid	Not constructed Originally approved April 22, 2019 Construction authorization renewal requested.	Building wash water 660 gallons Up to 13 times per year **Total Usage:** 8,580 gallons per year	Approved April 22, 2019. Farm ID #3713, AW-6822. Farrowing building (sows and litters) with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding operation structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 64'-0" x 64'-0" O.D. Below-building concrete manure storage: Six (6) shallow manure storages 1) 7'-2.5" x 63'-0" x 2'-0" deep (individual tanks) Total capacity: 5,449 cu ft Available capacity: 2,724 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 106 days

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D. FACILITY DETAIL INFORMATION						
Label on Farmstead Plan	**Animal Type**	**Number of Approved Animals**	**Solid or Liquid**	**Date Constructed** *(for existing buildings)*	**Water Uses** *(gallons/unit of time)*	**Brief Description**
10P.	Breeding/ Gestation sows	1,752 breeding/gestation sows	Liquid	Not constructed Originally approved April 22, 2019 Construction authorization renewal requested.	Building wash water 17,520 gallons per year **Total Usage:** 17,520 gallons per year	Approved July 11, 2005. Farm ID #3713, AW-5472. Breeding/gestation sow building with below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding structure. As needed, manure from building 10P is pumped to earthen/treatment impoundment for supplemental storage. Total building dimensions: 77'-4" x 417'-4" O.D. Below-building concrete manure storage: 1) 75'-8" x 416'-0" x 10'-0" deep Total capacity: 314,774 cu ft Available capacity: 283,297 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 803 days
11E.	Mortality compost facility	-----	Solid (not manure)	Existing	-----	Existing mortality compost facility. Self-contained mortality compost facility. Composting process includes mixing mortalities with sawdust, wood shavings, straw, corn stover, or comparable in compost bins. Not a manure storage structure.

Applicant: (Permittee) **Top Grade Production LLC** Farm ID #: **3713**

GENERAL APPROVAL CONDITIONS

1. An Approval Renewal application must be submitted to IDEM no less than 30 days prior to the approval expiration date to maintain a valid approval for your operation. The application must include a Manure Management Plan (MMP) which details any changes made at the operation, outline procedures for soil testing and manure testing, and include a current farmstead plan and Natural Resource Conservation Service (NRCS) soil survey maps of application ground. The soil survey maps must detail the boundaries of the field(s) and include the property owner name and available spreadable acres after setbacks are subtracted. The MMP must also contain a request for land application acreage requirement waiver if a manure distribution program is used, or contain a description of alternate methods proposed for managing the manure.
2. This approval does not authorize any injury to any person or private property; the invasion of other private rights; the infringement of federal, state, or local laws or regulations; nor does it preempt any duty to comply with other federal, state or local requirements, permits or approvals.
3. Your request for an approval modification, revocation and reissuance, or termination does not suspend any approval term or condition. The approval may be modified, revoked and reissued, or terminated, for causing or threatening to cause harm to the environment.
4. The conditions of this approval are separable and if any condition of the approval is determined to be invalid the application of the condition to other circumstances and the remainder of this approval will not be affected.
5. You may not start construction of a CFO, or expansion of a CFO that increases animal capacity and/or manure containment capacity, without obtaining prior approval from IDEM as required by 327 IAC 19-1-2(b).
6. Prior to any construction/land-disturbing activities of one acre or more, contact IDEM's Stormwater Program and the local county Soil and Water Conservation District (SWCD) office for permitting information. Visit IDEM's Stormwater Program website at http://www.in.gov/idem/stormwater/construction-land-disturbance-permitting or http://www.in.gov/idem/stormwater/2331.htm or call 317-233-8488. Technical resources are also available through the local Soil and Water Conservation District (SWCD) and in the Indiana Storm Water Quality Manual (http://www.in.gov/idem/stormwater/2363.htm). Please Note: Applicable permits are required prior to any land disturbing activities including site preparation.
7. The Clean Water Act (CWA) Wetland Delineation and US Army Corps of Engineer (USACE) Jurisdictional Determinations and possibly Indiana Administrative Code 327 IAC 17 Wetland Permits may be needed in conjunction with the Construction/Land Disturbance Permit or to begin construction if there are potential wetland on or within 300 feet of a proposed waste storage structure. For more information see the IDEM Wetland website at https://www.in.gov/idem/wetlands/2343.htm or call 317-233-8488. Any wetland issue that may be affected by construction activities must be completed prior to submitting a construction start notice under this approval.

8. You must follow the construction requirements of 327 IAC 19-12. Please find the enclosed construction checklist and forms required to be submitted to IDEM to ensure compliance with construction requirements of this approval and 327 IAC 19-12.
9. Permittees must submit to IDEM the enclosed Construction Notification Form (State Form 50210) within two (2) days prior to the commencement of construction.
10. Permittees must submit to IDEM the enclosed Construction Completion Affidavit (State Form 51255) within thirty (30) days after the date construction of an approved waste management structure is completed, and **prior** to the introduction of any animals or manure into the structures. **This includes buildings 8P, 9P, and 10P.** The affidavit must be completed, signed by the responsible party, notarized, and returned to IDEM assuring that the waste management system was constructed and will be operated in accordance with the requirements of the approval.
11. If a permittee performs partial construction of an approved project involving multiple approved units and wishes to utilize a completed unit prior to completing construction of other approved units, multiple construction start notices, affidavits, and if applicable PE Certifications, must be submitted.
12. Soil borings presented for this site indicate the presence of inorganic clay (Unified Classification **CH**) soil layers that may not be used for backfill around the concrete structure of the building. This soil material should be segregated during the excavation of the pit area and marked as not usable for backfill. The soil borings indicate that there are other soils at the site that can be used as backfill. As an option, other granular material such as gravel may be brought in and substituted for the layer of **CH** material in the profile. The non-**CH** soils should be stockpiled and marked as backfill material. This requirement for this site must be verified specifically within the PE certification for this concrete structure.
13. All liquid manure storage facilities must be certified upon completion by a registered professional engineer (PE) on a form provided by IDEM. The completed PE Certification Form must be submitted with the Construction Completion Affidavit for structures 8P, 9P, and 10P. A "Construction Completion Affidavit" and PE Certification Form (if applicable) can be duplicated from the IDEM CFO Record Book to be used for the notification process.

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ALTERNATIVE COMPLIANCE APPROACH

Setbacks:

There is a ditch within 300 feet of building 9P. The application requests an Alternative Compliance Approach (ACA) for the setback of the Mason-Kingery Ditch from building 9P. An existing earthen bank will divert surface water the required 300 feet building 9P to the Mason-Kingery Ditch. See special conditions. This diversion barrier will be maintained for the life of building 9P. IDEM determined the proposed alternative specifications meet the performance standards in 327 IAC 19-3-1 and approve your alternative compliance approach under 327 IAC 19-5-1(c).

Property Line Waiver:

The submitted application included a signed property line setback waiver as allowed in 327 IAC 19-7-5 and was determined in 327 IAC 19-12-3(e) for property line setbacks as described in 327 IAC 19-12-3(a)(3)(B). IDEM determined the proposed waiver meets the performance standards in 327 IAC 19-3-1. This waiver applies to the P1 solid manure storage/litter stack building east side setback distance.

Concrete:

Your application proposed an alternative compliance approach to the use of concrete specifications required by 327 IAC 19-12-4(e). IDEM determined the proposed alternative specifications meet the performance standards in 327 IAC 19- 3-1 and have approved your alternative compliance approach under 327 IAC 19-5- 1(c).

Your application contained an alternative compliance approach to the design of multiple structural components of the concrete manure storage tank. The design options were found to meet or exceed the requirement for maintaining structural integrity. IDEM determined the proposed alternative specifications meet the performance standards in 327 IAC 19-3-1 and approve this design as an alternate compliance approach under 327 IAC 19-5-1(c). These alternatives include:

1. 12” x 12” Reinforced Concrete Square Column Design
2. 14” Round Concrete Column Design
3. 12” x 16” Concrete Masonry Column Design
4. Round Footer Design for Column
5. Continuous Column Footer Design Potential use of masonry columns.
6. Use of concrete column reinforcement different from that specified in the MWPS–36.

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION
CFO APPROVAL RENEWAL/
MANURE MANAGEMENT PLAN/
CONSTRUCTION AUTHORIZATION RENEWAL

327 IAC 19 CONFINED FEEDING OPERATIONS
327 IAC 19-8-2 Approval Renewals

Farm ID #3713

ORIGINAL SUBMISSION

Submitted to:
Indiana Department of Environmental Management
Office of Land Quality
Confined Feeding Program
100 N Senate Avenue, IGCN Rm 1101
Indianapolis, Indiana 46204-2251

Prepared for:
Top Grade Production LLC
2667 East State Road 18
Kokomo, Indiana 46901

CFO Site Location:
5504 N 400 W
Kokomo, Indiana 46901
Howard County
USGS Quad: Galveston
Section 4, T24N, R3E

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CONFINED FEEDING OPERATIONS
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Office of Land Quality

Prepared by:
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Indiana Department of Environmental Management
2024 Confined Feeding Operation Approval Renewal and Manure Management Plan Construction Authorization Renewal Application

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Indiana Department of Environmental Management
2024 Confined Feeding Operation Approval Renewal
and Manure Management Plan
Construction Authorization Renewal
Facility Change Request
for
Top Grade Production LLC
2667 East State Road 18
Kokomo, Indiana 46901

Introduction:
Attached for your review are a CFO / CAFO Application Packet, State Form 55051 (R5 10-22) and supporting documentation requesting that the Confined Feeding Operation Approval (Farm ID#3713) and Confined Feeding Operation Approval Construction Authorization (AW-6822) issued to Top Grade Production LLC be renewed. Since the last approval, the Indiana Department of Natural Resources, Division of Water Floodplain information has been updated. According to the DNR Indiana Floodplain Information Portal 2.0 approximate floodplain floodway and approximate floodplain fringe maps a portion of the approved confined feeding operation is located in the floodplain. The information available from the DNR Indiana Floodplain Information Portal 2.0 has been reviewed and changes are required to Buildings 8P and 9P. A portion of Building 8P may be located in the floodplain fringe and has been designed and updated to resist the hydrostatic pressures due to flood waters. A portion of Building 9P may be located in the floodplain floodway. In accordance with 327 IAC 19-12-2(2)(2), a waste management system must not be constructed in a floodway. A portion of Building 9P is not in the floodway or floodplain fringe. So that the portion of Building 9P that is not in the floodway and the floodplain fringe can be constructed the dimensions of Building 9P have been changed to 64'-0' x 64'-0" O.D. and the operating capacity has been changed to 60 sows and litters. The CFO Approval Renewal and Construction Authorization Renewal application also acts as a Facility Change Request to document these changes.

The confined feeding operation is owned and operated by Top Grade Production LLC. Nicholas T Maple is the contact for the confined feeding operation. The animal feeding operation is located in Howard County, Indiana in the Galveston USGS Quadrangle, Section 4, Township 24 North, Range 3 East.

The most recent confined feeding operation approval (Farm ID#3713) and construction authorization (AW#6822) was issued April 22, 2019. The most recent confined feeding operation approval and construction authorization approved the construction of two (2) farrowing (sows and litters) buildings and one (1) breeding and gestation sow building with below-building concrete manure storage.

A request for approval transfer from Top Grade, LLC to Top Grade Production LLC was approved on January 30, 2019.

According to the most recent Confined Feeding Operation Approval with Construction issued by the Indiana Department of Environmental Management, the confined feeding operation is approved for a total capacity of 4,789 breeding and gestation sows and 833 farrowing sows (sows and litters) in eight (8) production buildings with self-contained, below-building concrete storages. The existing confined feeding operation includes a concrete lift station and earthen treatment/storage impoundment. Manure from the buildings is transferred from the concrete lift station to the earthen treatment/storage impoundment for long-term storage.

The construction of the two (2) farrowing buildings (sows and litters) and the one (1) breeding and gestation sow building has not begun or been completed. A request to renew the existing construction authorization (AW-6822) is submitted as a part of the confined feeding operation approval renewal and manure management plan. The approved construction plans are in compliance with the current design requirements outlined in Indiana NRCS FOTG Code 313 – October 2016. However, an interpretation by the Indiana Department of Environmental Management regarding the density of manure value to be used in design calculations requires that the construction plans for the approved below-building concrete manure storage be updated. Updated building plans are submitted in accordance with the requirements of IC 13-18-10-2(d). A written notice has been sent in accordance with the requirements of IC13-18-10-2(b).

No changes to the approved operating capacity, number of confined feeding buildings to be constructed, and location and dimensions of the confined feeding buildings are requested as part of the Confined Feeding Operation Approval Renewal, Manure Management Plan, and Construction Authorization Renewal.

Operating Capacity:
This confined feeding operation is operated as a breed-to-wean pig production site. The current approved operating capacity for this confined feeding operation is 5,622 sows (4,789 breeding and gestation sows and 833 sows and litters (farrowing) housed in eight (8) buildings. The updated operating capacity for this confined feeding operation is 5,562 sows (4,789 breeding and gestation sows and 773 sows and litters (farrowing) housed in eight (8) buildings. The confined feeding operation includes five (5) existing production building and three (3) approved, not yet constructed production buildings including two (2) farrowing (sow and litters) buildings and one (1) breeding and gestation sow building with below-building concrete manure storage.

Once the proposed construction is completed, the operating capacity is 5,622 sows housed in eight (8) buildings. Based on the animal categories defined in 40 CFR 122.23(b)(2) and 40 CFR 122.23 (b)(4) this animal feeding operation is defined as a large concentrated animal feeding operation with an operating capacity of 5,622 pigs weighing fifty-five (55) pounds or more.

The production buildings and operating capacities are summarized below.

Table 1: Building Dimension and Operating Capacity

ID	Structure Type	Building Dimensions	Animal Capacity
1E.	Breeding & gestation	49’-0” x 246’-0” (building dimensions) 47’-8” x 244’-8” x 2’-0” deep (storage dimensions)	650 sows
2E.	Breeding & gestation	49’-0” x 246’-0” (building dimensions) 47’-8” x 239’-8” x 2’-0” deep (storage dimensions)	635 sows
3E.	Farrowing (sows & litters)	65’-0” x 289’-4” (building dimensions)	297 sows and litters
4E.	Earthen treatment/storage impoundment	292’-0” x 315’-0” x 15’ deep (top of berm)	-----
5E.	Concrete lift station	14’-0” x 14’-0” O.D.	-----
6E.	Breeding & gestation	77’-2” x 417’-2” (building dimensions) 75’-10” x 415’-10” x 7’-8” deep (storage dimensions)	1,752 sows
7E.	Farrowing (sows & litters)	75’-0” x 161’-0” (building dimensions) 16 – 6’-9” x 70’-0” x 2’-0” deep (storage dimensions)	208 sows and litters
8P.	Farrowing (sows & litters)	84’-0” x 152’-0” (building dimensions) 8 – 7’-2.5” x 151’-0” x 2’-0” deep (storage dimensions)	208 sows and litters

Table 1 (continued): Building Dimension and Operating Capacity

ID	Structure Type	Building Dimensions	Animal Capacity
9P.	Farrowing (sows & litters)	64'-0" x 64'-0" (building dimensions) 6 – 7'-2.5" x 63'-0" x 2'-0" deep (storage dimensions)	60 sows and litters
10P.	Breeding & gestation	77'-4" x 417'-4" (building dimensions) 75'-8" x 416'-0" x 10'-0" deep (storage dimensions)	1,752 sows
	TOTAL		**773 sows and litters 4,789 breeding/gestation sows**

Land Application Acres:

Required land application acres (minimum):

IDEM Guidance Determination: For manure management planning, this confined feeding operation is operated as a breed-to-wean swine production site. The Indiana Department of Environmental Management (IDEM) Guidance Manual for Indiana's Confined Feeding Program – December 29, 2014 (Guidance Manual) "Manure Application Land Base Estimates" Table (page 52) states that one acre per 13 farrowing (sows & litters) and one (1) acre per 25 breeding/gestation sows per year is required to provide sufficient land application acres to land apply the manure and process wastewater.

The required manure application land requirement is determined as follows.

Breeding/Gestation – 4,789 sows (1E, 2E, 6E, & 10P)

Breeding/gestation sows

4,789 sows ÷ 25 sows/acre = 191.6 acres

Farrowing Building – 833 sows and litters (3E, 7E, 8P, & 9P)

Sows & litters

833 sows & litters x 13 groups/yr x 25 days/group ÷ 365 days/yr ÷ 13 sows/acre = 57.1 acres

Total land application acres required: (191.6 + 57.1) 248.7 acres

Available land application acres:

Liquid manure and process wastewater land application methods utilized are typically injection or single-pass incorporation. When necessary, manure and process wastewater land application methods utilized may include surface application with incorporation and surface application. In the case where surface application of manure and process wastewater is conducted, it is not expected that the annual volume of manure and process wastewater would be land applied using surface application methods. The available land application acres are determined after setbacks are calculated.

The required setbacks for incorporation or single-pass incorporation were calculated based on a setback of:

- 0 feet from property lines and public roads;
- 5 feet from drainage inlets;
- 50 feet from wells;
- 25 feet from sinkholes;
- 25 feet from surface water; and
- 500 feet from public water supply wells & surface intake structures.

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When surface application is conducted on land application fields with less than 6% slope the required setbacks used to calculate available acres are:

- 50 feet from property lines and public roads;
- 100 feet from drainage inlets;
- 100 feet from wells;
- 100 feet from sinkholes;
- 100 feet from surface water; and
- 500 feet from public water supply wells & surface intake structures.

If surface application is conducted on land application fields with greater than 6% slope the required setbacks used to calculate available acres are:

- 50 feet from property lines and public roads;
- 200 feet from drainage inlets;
- 200 feet from wells;
- 200 feet from sinkholes;
- 200 feet from surface water; and
- 500 feet from public water supply wells & surface intake structures.

The total number of available land application acres after setbacks are calculated when using injection or single-pass incorporation included in the areas designated for land application is approximately 257.91 acres.

A review of the requirement to submit Land Application Agreements indicates that "Copies of all land application agreements must accompany construction applications (application type A-D, H-K, and L) [identified in Application Checklist of the CFO / CAFO Application Packet]. A CFO Approval Renewal / Manure Management Plan is identified as an application type G in the Application Checklist. It is concluded that the Land Application Agreements are not required to be submitted as part of a Confined Feeding Operation Approval Renewal and Construction Authorization Renewal Application packet. It is confirmed that the Land Use Agreements for land application sites included in the original Confined Feeding Operation Approval and Construction Authorization have not changed and are still valid. For reference, the original Land Application Agreement is included.

A review of the original Land Application Agreement indicates that the total land parcel acreage was included as the acres identified in the agreement and may not have included the calculated setbacks. The total number of acres included in the Land Application Agreement is 258.84 acres. The total number of acres owned by Top Grade Production LLC is 4.12 acres. A determination of the calculated setbacks when using injection or single-pass incorporation is summarized below. The calculated setbacks for the land application acres when using injection or single-pass incorporation includes 5.05 acres.

Land Application Agreement Information

Acres					
Total	**Calculated Setback**	**Available**	**Section**	**Township**	**Range**
11.34	0.45	10.89	4	24N	3E
17.00	0.94	16.06	4	24N	3E
20.00	0.00	20.00	4	24N	3E
37.80	1.52	36.28	4	24N	3E
37.69	0.00	37.69	4	24N	3E
39.99	0.76	39.23	3	24N	3E
43.00	0.81	42.19	4	24N	3E
52.02	0.57	51.45	4	24N	3E
258.84	5.05	253.79			

Top Grade Production LLC Information

----------- Acres --------------					
Total	**Calculated Setback**	**Available**	**Section**	**Township**	**Range**
4.12	0.00	4.12	4	24N	3E

The available land application acres after setbacks are calculated is 257.91 acres (253.79 acres [land application agreement] + 4.12 acres [applicant owned]).

Available land application acres are indicated on the USDA-NRCS soil survey map (plot map). Available acres presented on the plot maps are determined based on the setbacks required for liquid injection or single-pass incorporation (liquid or solid). Land application agreements are included and maintained in the operating record for all land application acres not owned by Top Grade Production LLC.

The available land application acres when using incorporation or single-pass incorporation (257.91 acres) exceeds the minimum number of acres required by 327 IAC 19-14-2 (248.7 acres).

Approved Construction (Construction Authorization Renewal):

Design/Construction Plans:
The requirements of 327 IAC 19-12-4(d) state that "*All liquid manure storage facilities must be constructed according to the Indiana NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016***." The requirements of the Indiana NRCS Conservation Practice Standard Code 313; Waste Storage Facility were considered in the design and planned construction of the concrete manure storage structures. The approved construction plans are in compliance with the current design requirements outlined in the Indiana Conservation Practice Standard Code 313: Waste Storage Facility, October 2016. However, a new interpretation by the Indiana Department of Environmental Management regarding the density of manure value to be used in design calculations requires that the design calculations and construction plans for the approved below-building concrete manure storage be updated. Updated design calculations and building plans are submitted in accordance with the requirements of IC13-18-10-2(d).

Updated design calculations for the following building components are provided:

- 58" x 58" x 10" thick concrete column footer – 12" x 12" square and 14" diameter round column (1,500 psf soil bearing capacity)
- 46" x 46" x 10" thick concrete column footer – 12" x 12" column and 14" diameter round column (2,000 psf soil bearing capacity)
- 58" x 58" x 8" thick concrete column footer – 12" x 16" masonry concrete column (1,500 psf soil bearing capacity)
- 46" x 46" x 8" thick square column footer for a 12" x 16" concrete masonry block column. (2,000 psf soil bearing capacity) -- previously 44" x 44" x 8" thick square column footer
- 66" diameter x 10" thick round column footer for a 12" x 12" square and 14" diameter round concrete column. (1,500 psf soil bearing capacity) -- previously 64" diameter x 10" thick round column footer
- 50" diameter x 10" thick round column footer - 12" x 12" square and 14" diameter round concrete column. (2,000 psf soil bearing capacity)
- 42" wide x 11" thick continuous concrete footer – 12" x 12" square and 14" diameter round column (1,500 psf soil bearing capacity)
- 36" wide x 10" thick continuous concrete footer – 12" x 12" square and 14" diameter round column (2,000 psf soil bearing capacity)
- 42" wide x 11" thick continuous concrete footer – 12" x 16" masonry concrete column (1,500 psf soil bearing capacity)
- 36" wide x 9" thick continuous concrete footer – 12" x 16" masonry concrete column (2,000 psf soil bearing capacity)
- 44" wide x 10" thick continuous concrete footer – End wall and concrete column

Some of the planned and proposed construction details for the approved breeding and gestation building construction plans have changed since the original approval. The planned changes include:

- 46" x 46" x 10" thick concrete column footer – 12" x 12" column and 14" diameter round column (2,000 psf soil bearing capacity)
- 66" diameter x 10" thick round column footer for a 12" x 12" square and 14" diameter round concrete column. (1,500 psf soil bearing capacity) -- previously 64" diameter x 10" thick round column footer
- 46" x 46" x 8" thick square column footer for a 12" x 16" concrete masonry block column. (2,000 psf soil bearing capacity) -- previously 44" x 44" x 8" thick square column footer

It is noted that the other proposed footer dimensions do not change due to the change in the design manure density from 62.5 pcf to 65.0 pcf.

A review of the floor construction joint spacing calculations identified a rounding error in the determination of the allowable floor construction joint spacing for 60,000 psi welded wire reinforcement. The updated floor construction joint spacing options include:

- 6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 42' on center, (previously 43')
- 6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 20'on center (previously 21')

A review of the site specific analysis and designs and alternative design or compliance approach designs confirms that no changes are required for the following designs.

- End wall lateral support design
- 12" x 12" reinforced concrete column design
- 14" diameter round reinforced concrete column design
- 12" x 16" concrete masonry column design
- Concrete construction specification

Seasonal Water Table Management (Perimeter Tile):
Since the original Confined Feeding Operation Approval (Farm ID#3713) and Confined Feeding Operation Approval Construction Authorization (AW-6822), a demonstration of the adequacy of the subsurface perimeter tile system seasonal water table management has been added to the requirements of a Confined Feeding Operation Approval Application packet. A perimeter tile system design is provided for building 10P (South Gestation) to determine the size of the perimeter tile and to demonstrate the adequacy of the perimeter tile seasonal water table management system

An on-site soil investigation was completed by John Bowman, Chestnut Ridge Consulting, Inc. on September 28, 2018. Two (2) soil borings were completed within the footprint of proposed building 8P (East Farrowing), two (2) soil borings were completed within the footprint of proposed building 9P (West Farrowing), and three (3) borings were completed within the footprint of proposed building 10P (South Gestation). A total of seven (7) soil borings within the footprint of the proposed buildings were completed to determine the soil characteristics and presence or absence of a seasonal water table. The on-site soil investigation report identifies the soil profile from the ground surface to the bottom of the excavation using the Unified Soil Classification System (USCS) soil classification designation. The soil classifications identified in the soil investigation report for borings representing the proposed buildings include silt loam (ML), clay loam (CL) clay (CH), and sandy loam (SM).

The on-site soil investigation demonstrated that a seasonal water table exists within the footprint of the proposed concrete manure storage structures. The depth to the seasonal water table below the ground surface according to the on-site soil investigation is:

Building 8P – East Farrowing

Boring #1 (west boring)	11" below the ground surface
Boring #2 (east boring)	12" below the ground surface

Building 9P – West Farrowing

Boring #1 (west boring)	12" below the ground surface
Boring #2 (east boring)	12" below the ground surface

Building 10P – South Gestation

Boring #1 (east boring)	10" below the ground surface
Boring #2 (middle boring)	21" below the ground surface
Boring #3 (west boring)	7" below the ground surface

Referring to the on-site soil investigation the soil profile log indicates the following.

Building 8P – East Farrowing

Boring #1 (west boring):

Depth	Texture
0"-11"	silt loam (ML)
11"-20"	clay loam (CL)
20"-31"	clay (CH)
31"-41"	clay (CH)
41"-50"	sandy loam (SM)
50"-132"	sandy loam (SM)

Seasonal water table – 11" below surface

Boring #2 (east boring):

Depth	Texture
0"-12"	silt loam (ML)
12"-22"	clay (CH)
22"-34"	clay loam (CL)
34"-42"	silt loam (ML)
42"-60"	sandy loam (SM)
60"-132"	sandy loam (SM)

Seasonal water table – 12" below surface

Building 9P – West Farrowing

Boring #1 (west boring):

Depth	Texture
0"-9"	clay loam (CL)
9"-22"	clay (CH)
22"-32"	clay (CH)
32"-48"	clay loam (CL)
48"-65"	clay loam (CL)
65"-132"	silt loam (ML)

Seasonal water table – 12" below surface

Boring #2 (east boring):

Depth	Texture
0"-10"	clay loam (CL)
10"-25"	clay loam (CL)
25"-33"	clay (CH)
33"-46"	clay (CH)
46"-70"	clay loam (CL)
70"-100"	silt loam (ML)
100"-132"	sandy loam (SM)

Seasonal water table – 12" below surface

Building 10P – South Gestation
Boring #1 (east boring):

Depth	Texture
0"-10"	silt loam (ML)
10"-18"	silt loam (ML)
18"-28"	clay loam (CL)
28"-42"	clay (CH)
42"-56"	silt loam (ML)
56"-96"	sandy loam (SM)
96"-132"	silt loam (ML)

Seasonal water table – 10" below surface

Boring #2 (middle boring):

Depth	Texture
0"-10"	silt loam (ML)
10"-21"	clay (CH)
21"-31"	clay (CH)
31"-41"	clay (CH)
41"-52"	clay loam (CL)
52"-92"	sandy loam (SM)
92"-132"	silt loam (ML)

Seasonal water table – 21" below surface

Boring #3 (west boring):

Depth	Texture
0"-7"	silt loam (ML)
7"-18"	clay loam (CL)
18"-38"	clay (CH)
38"-48"	clay (CH)
48"-56"	clay loam (CL)
56"-72"	silt loam (ML)
72"-132"	sandy loam (SM)

Seasonal water table – 7" below surface

The information provided by the on-site soil investigation indicates that the soil properties are uniform and that a seasonal water table exists within the footprint of the proposed below-building concrete manure storages. The depth of the foundation and floor of the farrowing buildings (8P & 9P) below-building concrete manure storages will be located approximately on grade after the topsoil is removed (0"-10" below the existing ground surface). The depth of the foundation and floor of the gestation building (10P) will be located approximately 60" – 96" below the existing ground surface.

A perimeter tile drainage system is not required for buildings 8P (East Farrowing) and 9P (West Farrowing) since the seasonal water table identified by the on-site soil investigation is below the proposed below-building concrete manure storage. A perforated perimeter tile drainage system with a tile riser observation point located at the northeast corner of building 10P will be used to collect and direct

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groundwater away from the building foundation. Groundwater from the tile riser observation sump will be pumped to a surface rock distributor located at least 50 feet from the proposed concrete manure storage. The rock distributor outlet is located on the adjoining property. A waiver letter from the adjoining land owner was provided as part of the original confined feeding operation approval confirming that the adjoining land owner is aware of the planned perimeter tile outfall and has no objection to the location of the perimeter tile outfall. Water from the rock distributor will be directed to a grassed infiltration area and is planned to join the natural drainage patterns around the building and surrounding area.

A perimeter tile system design is provided for building 10P (South Gestation) to determine the size of the perimeter tile and to demonstrate the adequacy of the perimeter tile seasonal water table management system. Based on the assumption that the entire gestation building floor and foundation is at the maximum depth below the existing ground surface (96") and a seasonal water table depth of 7" below the ground surface a 5" diameter corrugated (corrugated inside wall) perimeter tile is required. The building plans and perimeter tile plans have been updated to include a 5" diameter (corrugated inside wall) perimeter tile around the building foundation as part of the perimeter tile seasonal water table management system.

Site Features and Details:

Plot maps (327 IAC 19-7-1(c)(2)):
The specific plot maps, which must be submitted for each application type defined in the "Application Types and Requirements Worksheet" of the CFO / CAFO Application Packet are detailed in Section A. Plot Maps and Section E. Application Type and Required Plot Maps of the CFO / CAFO Application Packet Section X – Plot Maps.

A review of the plot map requirements for a Confined Feeding Operation Approval Renewal Application (CFO / CAFO Application Packet Section X – Plot Maps; E. Application Type and Required Plot Maps) indicates that "1. USDA NRCS Soil Survey Map – The boundaries of all manure application areas. and 2. USDA NRCS Soil Survey Map – The location of the waste management system, boundaries of the confined feeding operation, and boundaries of livestock and poultry production areas." are required to be submitted. A review of CFO / CAFO Application Packet Section X – Plot Maps; E. Application Type and Required Plot Maps indicates that "3. USGS Topographic Maps – The location of the waste management system, the boundaries of the confined feeding operation, boundaries of livestock and poultry production areas, identify any public water supply wells and public water supply surface intake structures within one thousand (1000) feet of the manure storage structures, and boundaries of all manure application areas." are not required as part of a Confined Feeding Operation Approval Renewal Application packet.

Based on the plot map requirements outlined in Section E of the CFO / CAFO Application Packet Section X, USDA NRCS Soil Survey Maps are required to be submitted and USGS Topographic Maps are not required to be submitted. It is confirmed that the land application acres included in the original Confined Feeding Operation Approval and Construction Authorization have not changed. USDA NRCS Soil Survey maps and the current land application agreements are included in the Confined Feeding Operation Approval Renewal and Construction Authorization Renewal application to confirm that there have been no changes to the available land application acres.

In accordance with 327 IAC 19-7-2, United States Department of Agriculture Natural Resources Conservation Service soil survey maps are included to confirm the location of the existing confined feeding operation (CFO). The plot maps show the location of the waste management systems, boundaries of the CFO property, boundaries of the production areas, boundaries and owners of the manure application areas, and available manure application acres.

Adjacent or contiguous animal feeding operation (327 IAC 19-7-1(c)(11):
The requirements listed in 327 IAC 19-7-1(c)(11) state that a complete application must include "*a statement affirming that AFOs adjacent to or contiguous with the CFO are not under common ownership or control of the applicant.*" It is confirmed that there are no animal feeding operations (AFOs) that

exist adjacent to or contiguous with the existing confined feeding operation (CFO) owned and operated by Top Grade Production LLC. The answer to Item A.6 of Section 1. General Information of the CFO / CAFO Application Packet is "No" indicating that there are no AFOs adjacent to or contiguous with the CFO that are under common ownership or control of Top Grade Production LLC. However, because there are no animal feeding operations adjacent to or contiguous with the existing confined feeding operation Top Grade Production LLC. is not able to submit an affirmation statement that is consistent with the requirements of 327 IAC 19-7-1(c)(11).

In place of a statement affirming that AFOs adjacent to or contiguous with the CFO are not under common ownership or control of the applicant, Top Grade Production LLC. affirms that there are no animal feeding operations (AFOs) located adjacent to or contiguous with the existing confined feeding operation (CFO).

Farmstead Plan (327 IAC19-7-1(c)(3):
Farmstead plans are included to confirm the confined feeding operation location and confined feeding operation property boundaries. Farmstead plan sheet 1A is a site location map identifying the location of the confined feeding operation, confined feeding operation property boundaries, and the production area; is legible and drawn to scale; and is submitted on eight and one-half (8-½) inch by eleven (11) inch paper.

Farmstead plan sheet 2A to the best knowledge of Top Grade Production LLC includes all features identified in 327 IAC 19-7-3(a) within 500 feet of the below building concrete manure storages and within the area depicted on the farmstead map, where applicable. Specifically, farmstead plan sheet 2A includes: 1) surface waters of the state; 2) public and private roads; 3) water well locations; 4) production area surface drainage patterns; 5) property boundary lines; 6) outfalls of known subsurface drainage structures including perimeter drain outfalls; 7) drainage inlets including water and sediment control basins; 8) mortality management sites; and 9) residences. No karst features exist within 500 feet of the below-building concrete manure storages.

In accordance with 327 IAC 19-7-3(b)-(g), farmstead plan sheet 2A shows the diversion of uncontaminated surface water, includes the number and type of animals, is legible and drawn to scale, shows distances between the waste management system and features of concern within at least 500 feet (as applicable), includes a reference to true north, indicates the presence or absence of a one hundred (100) year flood plain, and is submitted on eleven (11) inch by seventeen (17) inch paper.

Mortality Management (327 IAC 19-7-6):
Mortalities are managed at an existing on-site mortality compost facility. Mortalities are removed from the buildings and delivered to the mortality compost facility to ensure that there will not be a discharge of mortalities or liquids that have come in contact with mortalities to waters of the state and that mortalities will not be disposed of in the manure storage structures.

The mortality compost facility is constructed with a concrete floor to control leaching. The mortality compost facility is constructed and located to control run-on of uncontaminated surface water and to control runoff from the mortality compost facility. The mortality compost facility includes sidewalls to contain compost within the designated area of the compost facility and to control run-on and runoff from the mortality compost facility. The mortality compost facility does not include a roof or cover, precipitation that falls on the compost area is managed to prevent runoff.

The mortality compost facility is operated in accordance with the requirements of IC 15-17-11. The mortality compost facility is constructed to promote and maintain diversion of storm water away from the compost facility to prevent run-on of storm water into the compost facility. The area around the compost facility is graded to create a slope away from the compost floor or base. The mortality compost site has been located to maintain the setback requirements identified in 327 IAC 19-12-3. The location of the on-site mortality compost site is identified on the farmstead plan in accordance with 327 IAC 19-7-3.

Alternate mortality management methods may be used when necessary in accordance with the methods described in 345 IAC 7-7-3.

CFO / CAFO APPLICATION PACKET

State Form 55051 (R5 / 10-22)
Confined Feeding Operation (CFO)
National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation (NPDES CAFO)
Approved by State Board of Accounts, 2022

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

INSTRUCTIONS: Use this application packet to submit the following types of Confined Feeding Operation (CFO) and Concentrated Animal Feeding Operation (CAFO) applications under 327 IAC 19, and for NPDES Individual Permits under 327 IAC 15-16, to the Indiana Department of Environmental Management (IDEM):

1. *CFO Approval – New Approval, Construction Approval (Expansion), Amendments, and Renewals*
2. *NPDES CAFO Individual Permit – Construction and Permit Coverage*
3. *NPDES CAFO Individual Permit – Permit Modification*
4. *NPDES CAFO Individual Permit – Permit Renewal*

The application packet contains the following checklist, worksheet, and forms:

- *I. Application Type and Requirements Worksheet*
- *II. General Information*
- *III. Notification Format for Agency Correspondence*
- *IV. Fee Transmittal*
- *V. CFO and CAFO New Construction Permit Application Checklist*
- *VI. NPDES Application*
- *VII. Animal Capacity*
- *VIII. Farmstead Plan*
- *IX. Construction*
- *X. Manure Management Plan (MMP)*
- *XI. Plot Maps*
- *XII. Disclosure Statement*
- *XIII. Notification Requirements*
- *XIV. Marketing and Distribution of Manure*
- *XV. Certification of Required Acreage for Land Application*

The checklist, worksheet, and forms are required and supersede all previous versions. IDEM will not accept substitutes, altered or previously supplied forms.

Start with the "Application Type and Requirements Worksheet." *The worksheet will assist you in identifying the application type and necessary application forms for a complete application. You do not have to submit any forms that are not required for the type of application you are submitting. The worksheet and the "CFO and CAFO New Construction Permit Application Checklist" are designed to help you submit a complete application. An incomplete application will delay approval of your project.*

The application fee will not be refunded if a construction application is deemed significantly incomplete and is returned to the applicant. If IDEM estimates that missing items will take more than thirty (30) days for the applicant to produce the application would be considered incomplete.

You must submit three (3) complete copies of all applications that include construction, expansion or an amendment of your permit, one (1) of which may be electronic in a PDF file format.

This application packet is based on the requirements in IC 13-18-10, 327 IAC 19, and 327 IAC 15-16. You can view the Indiana Code (IC) and Indiana Administrative Code (IAC) references in this application at iga.IN.gov. IC references are under the "Laws" link. IAC references are under the "Publications" link.

NOTE: *If your CFO has a bio-digester on the CFO property, you must also submit a "BIOMASS ANAEROBIC DIGESTER/GASIFICATION FACILITY REGISTRATION APPLICATION" (State Form 55309) that is not included in this packet. Submit this form with your CFO Application Packet.*

If you need assistance in identifying your specific application type, materials that must be submitted, or have questions regarding the permitting process, please contact IDEM, Confined Feeding Permits Section, at the phone number above.

Definitions:

Construction: means the fabrication, erection, or installation of a facility or manure control equipment at the location where the facility or manure control equipment is intended to be used. This would include any addition to any confinement, manure, silage storage or leachate collection system, or any item that is a permitted structure on a farm *(see expansion application)*.

Construction or expansion Application: If you will be constructing new facilities that will house livestock or poultry and/or store manure or silage, then you must select a construction application (permit type "A" or "D" in the Application Type Table). In addition, if you have an existing approval that has expired, then you must submit application type "C"; if you have an existing operation that has never been permitted but you now wish to obtain an approval, select application type "B". A change in design that increases the amount of storage of an approved or new waste storage facility requires a new construction approval.

Amendment of an existing Approval: An owner/operator may request to amend the approval to address changes at the CFO that do not require new Construction or Expansion Approval. The amendment may be a change in the number of animals. An amendment is required to address an increase in manure production on the site that does not involve construction that will increase animal or manure storage capacity. An amendment of your approval must be requested if you wish to replace old outdated buildings with newer designs as long as the change does not result in an increase in animals or manure containment capacity and the new buildings are constructed in the same footprint of the existing structure. An amendment must be approved prior to implementing the proposed changes.

Facility Change: Any alteration of an approved design that does not increase manure storage capacity or other changes on the production area that do not change, or that decrease the amount of manure stored on the production site. IDEM may determine what is being proposed under a Facility Change may need to be submitted as an Amendment or a Construction or expansion Application. The most common facility change requests are items such as moving the outlet of a perimeter drain, changing some design criteria of a building that meets or exceeds the original design.

Renewal: If you have an existing approval and you are still operating in the same manner you were when you were approved, you must renew your approval every five (5) years. If you do not renew your approval, it will expire and you would have to reapply as an existing operation with an expired approval. IDEM will try to send out a notice to all expiring approvals at least three (3) months before expiration, though this is not guaranteed and it is the responsibility of the permittee to submit your renewal at least thirty (30) day prior to its expiration date.

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**See special note for NPDES required Nutrient Management Plans.*

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<table>
<tr><th colspan="2" rowspan="2">Application Type</th><th colspan="15">Application Checklist and Sections from this Form which Must Be Completed for Application Type</th></tr>
<tr><th>Required Number of Copies</th><th>SEC I General Information</th><th>SEC II Correspondence</th><th>SEC III Fee Transmittal</th><th>SEC IV CFO CAFO Const. Checklist</th><th>SEC V NPDES Application</th><th>SEC VI Animal Capacity</th><th>SEC VII Farmstead Plan</th><th>SEC VIII Construction</th><th>SEC IX MMP</th><th>SEC X Plot Maps</th><th>SEC XI Disclosure</th><th>SEC XII Notice</th><th>SEC XIII Marketing and Distribution</th><th>SEC XIV Acreage Certification</th></tr>
<tr><td colspan="17">CFO Approval – Construction and/or Operation (Including Renewals) Permitted Under 327 IAC 19</td></tr>
<tr><td>A.</td><td>Completely New Operation (Currently Undeveloped Site)</td><td>3</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td></tr>
<tr><td>B.</td><td>Existing Operation without Existing CFO Approval</td><td>3</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td></tr>
<tr><td>C.</td><td>Existing Operation with Expired CFO Approval</td><td>3</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td></tr>
<tr><td>D.</td><td>Expansion of Operation with Current CFO Approval</td><td>3</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td>E.</td><td>Amendment of Existing CFO Approval – Permit Condition</td><td>3</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes*</td><td>Yes</td><td>No</td></tr>
<tr><td>F.</td><td>Amendment of Existing CFO Approval – Change in the type or number of animals or that increases manure production</td><td>3</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes*</td><td>Yes</td><td>No</td></tr>
<tr><td>G.</td><td>CFO Approval Renewal/Manure Management Plan</td><td>1</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td><td>Yes</td><td>No</td></tr>
<tr><td colspan="17">NPDES CAFO Individual Permit – Construction and Permit Coverage Permitted under 327 IAC 15-16</td></tr>
<tr><td>H.</td><td>Completely New Operation (Currently Undeveloped Site)</td><td rowspan="4">3</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td><td rowspan="4">No*</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td><td rowspan="2">No</td><td rowspan="4">No</td></tr>
<tr><td>I.</td><td>Existing Operation without Current CFO Approval or NPDES Permit</td></tr>
<tr><td>J.</td><td>Existing Operation with Current CFO Approval</td><td rowspan="2">Opt</td></tr>
<tr><td>K.</td><td>Current NPDES CAFO Individual Permit Holder Proposing Construction</td></tr>
<tr><td colspan="17">NPDES CAFO Individual Permit – Permit Modification Permitted under 327 IAC 15-16</td></tr>
<tr><td>L.</td><td>Construction or Expansion of Storage or Animals – No Permit Extension</td><td rowspan="2">3</td><td rowspan="2">Yes</td><td rowspan="2">Yes</td><td rowspan="2">Yes</td><td>Yes</td><td rowspan="2">Yes</td><td rowspan="2">Yes</td><td rowspan="2">Yes</td><td>Yes</td><td>No*</td><td rowspan="2">Yes</td><td>Yes</td><td rowspan="2">Yes</td><td rowspan="2">Opt</td><td rowspan="2">No</td></tr>
<tr><td>M.</td><td>No Construction or Expansion of Storage or Animals – No Permit Extension</td><td>No</td><td>No</td><td>No</td><td>No</td></tr>
<tr><td colspan="17">NPDES CAFO Individual Permit – Renewal Permitted under 327 IAC 15-16</td></tr>
<tr><td>N.</td><td>Renewal of Coverage for Operation with Current NPDES CAFO Individual Permit</td><td>1</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td><td>Yes</td><td>No</td><td>Yes</td><td>Opt</td><td>No</td></tr>
</table>

Yes = Required Form for Application Type
No = Not Applicable Form for Application Type (Not Required and Not Appropriate for Application Type)
Opt = Optional Form for Application Type (See Specific Form Listed for Details)
** Applicants using the form to request amendments do not have to notify county officials and affected parties that they submitted an application. For amendment applications, complete these pages so IDEM can notify county officials and affected parties of the decision.*
*** Submittal of a nutrient management plan per 327 IAC 15-16-9 by a CAFO that meets the requirements of 327 IAC 15-16-9 satisfies the requirements of IC 13-18-10-2(a)(2) regarding submission of a manure management plan.*

CFO / CAFO APPLICATION PACKET
SECTION I - General Information

Part of State Form 55051 (R5 / 10-22)
Confined Feeding Operation (CFO)
National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation (NPDES CAFO)
Approved by State Board of Accounts, 2022

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

INSTRUCTIONS:

1. ***COMPLETE THIS SECTION FOR ALL APPLICATION TYPES.***
2. ***Complete all general application information solicited below.***
3. ***Provide the required signature(s) as directed.***
4. ***Select the application type.***

This form is required and supersedes all previous versions. IDEM will not accept substitutes, altered or previously supplied forms.

A. GENERAL APPLICATION INFORMATION

1. OPERATION INFORMATION

Operation Name:	Top Grade Production LLC	Farm ID Number:	3713
Operation Address:	5504 N 400 W		
Operation City:	Kokomo, Indiana	Operation ZIP Code:	46901
Operation Telephone:	765-863-1720		
Operation County:	Howard		
Nearest Crossroads to Operation:	N 400 W & W 550 N		

2. APPLICANT *(Person or entity the CFO Approval is issued to - permittee)*

The Applicant is the Owner/Operator that applies for or has received a CFO Approval under IC 13-18-10, 327 IAC 19, or 327 IAC 15-16 including renewals and amendments. An Applicant may be an individual, a partnership, a co-partnership, a firm, a company or any other entity listed under IC 13-11-2-158(b). There may be more than one entity that constitutes an Owner/Operator. Each entity that meets the definition of Owner/Operator for the CFO must submit the requested information below.

Name:*	Top Grade Production LLC		
Mailing Address:	2667 East State Road 18		
City:	Kokomo		
State:	Indiana	ZIP Code:	46901
Telephone *(Home)*:			
Telephone *(Business)*:	765-863-1720		
Telephone *(Cell)*:			
Facsimile:		E-mail Address:	

***A limited liability company (LLC) or corporation (Inc. or Corp.) must be registered and active with the Indiana Secretary of State.**

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Office of Land Quality

3. PROPERTY OWNER *(At the Time of Application Submittal)*

☐ Same as Applicant Listed in Section 2; if not, please complete below.

Name:	Top Grade Production LLC		
Mailing Address:	2667 East State Road 18		
City:	Kokomo		
State:	Indiana	ZIP Code:	46901
Telephone *(Home)*:			
Telephone *(Business)*:	765-863-1720		
Telephone *(Cell)*:			
Facsimile:		E-mail Address:	

4. OPERATION MANAGER, OPERATOR, AND/OR LESSEE
(If Different than Applicant or manager and/or authorized agent for Entity)

☐ Same as Applicant Listed in Section 2 OR Person listed below is: ☐ Manager ☒ Operator ☐ Lessee

Name:	Top Grade Production LLC (Nicholas T. Maple, contact)		
Mailing Address:	2667 East State Road 18		
City:	Kokomo		
State:	Indiana	ZIP Code:	46901
Telephone *(Home)*:			
Telephone *(Business)*:	765-863-1720		
Telephone *(Cell)*:			
Facsimile:		E-mail Address:	

5. CURRENT OPERATION PERMIT INFORMATION

Current Permit/Approval Type *(check one)*:

☒ CFO Approval

☐ None - Expired Approval or Expired Permit

☐ NPDES CAFO Individual Permit

☐ None - New Facility

3713
Farm ID (Log ID) Number (Current or expired)

6822
Current/Last Approval (Animal Waste) Number

6. ADJACENT OR CONTIGUOUS ANIMAL FEEDING OPERATIONS (AFOs)

Are there any AFOs adjacent to or contiguous with the CFO that are under common ownership or control of the applicant? ☐ Yes ☒ No

If yes, provide a statement identifying the AFOs and describing the common ownership. The response to this item will determine whether the AFOs will have to be incorporated into the CFO approval. Attach additional sheets as necessary.

Top Grade Production LLC affirms that there are no animal feeding operations (AFOs) located adjacent to or contiguous with the existing confined feeding operation (CFO).

B. SIGNATURES

I swear or affirm, under penalty of perjury as specified by IC 35-44.1-2-1 and other penalties specified by IC 13-30-10, IC 13-18-10-1.4, IC 13-18-10-2.2, and IC 13-15-7-1(3), that the statements and representations in this application and the accompanying forms and application materials are true, accurate, and complete.

The agency decision based on the application and accompanying form and application materials will be issued in the name of the person or entity listed as the applicant(s).

THIS SECTION MUST BE SIGNED.

I warrant that I have the authority to sign this Application on my own behalf, and on behalf of any entity for which I am signing in a representative capacity.

Nicholas T. Maple; Top Grade Production LLC

Title and Name of Operation Owner or Authorized Agent* – ***Type or Print***

X Nichs T Mpl

Signature of Applicant or Authorized Agent

X 3/8/24

Date Signed *(month, day, year)*

Printed Name and Signature of Property Owner If Different than Operation Owner **

Date Signed *(month, day, year)*

* A signature by an Authorized Agent will require Power of Attorney (POA) if not a member of the entity.

** A signed letter from the property owner acknowledging the submittal of an application on their property may substitute for signature.

C. APPLICATION TYPE

Using the Application Type and Requirements Worksheet, in the list below, select the application type that you are submitting. Please note that an Amendment of Existing CFO Approval (E. or F.) and CFO Approval Renewal (G.) are the only situations where more than **one box may be selected.**

CFO Approval – Construction and/or Operation (Including Renewals)		
☐	A.	Completely New Operation (Currently Undeveloped Site)
☐	B.	Existing Operation Without Existing CFO Approval
☐	C.	Existing Operation with Expired CFO Approval
☐	D.	Expansion of Operation with Current CFO Approval
☐	E.	Amendment of Existing CFO Approval – Permit Condition [1]
☐	F.	Amendment of Existing CFO Approval – Change in the type or number of animals that increases manure production [1]
☒	G.	**CFO Approval Renewal/Manure Management Plan**
NPDES CAFO Individual Permit – Construction and Permit Coverage		
☐	H.	Completely New Operation (Currently Undeveloped Site)
☐	I.	Existing Operation without Current CFO Approval or NPDES Permit
☐	J.	Existing Operation with Current CFO Approval
☐	K.	Current NPDES CAFO Individual Permit Holder Proposing Construction
NPDES CAFO Individual Permit - Permit Modification		
☐	L.	Construction or Expansion of Storage or Animals [1]
☐	M.	No Construction or Expansion of Storage or Animals [1]
NPDES CAFO Individual Permit - Renewal		
☐	N.	Renewal Coverage for Operation with Current NPDES CAFO Individual Permit

[1] Action does not provide for or allow an extension of the Approval (Permit).

CFO / CAFO APPLICATION PACKET
SECTION II - Notification Format for Agency Correspondence

Part of State Form 55051 (R5 / 10-22)
Confined Feeding Operation (CFO)
National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation (NPDES CAFO)
Approved by State Board of Accounts, 2022

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

INSTRUCTIONS: ***THIS SECTION IS COMPLETED FOR ALL APPLICATION TYPES.*** ***The Indiana Department of Environmental Management (IDEM) normally notifies applicants of final decisions by mail. In 2012, Indiana Law changed to allow IDEM to use electronic mail instead of US Postal Service mail. This form allows you to specify whether you want to receive correspondence and notices related to your CFO or CAFO application by mail, by e-mail or both. It also allows you to specify if you want correspondence directed to a consultant by e-mail. Please complete the information below to indicate your preference.***

A. GENERAL INFORMATION

Operation Name: Top Grade Production LLC   Farm ID Number: 3713

Applicant Name *(printed)*: Top Grade Production LLC; Nicholas T. Maple (contact)

Applicant Consent for Notification Only for This Permit Application *(initials and date)*: ______

Applicant Consent for Notification on All Future Applications/Correspondence *(initials and date)*: X NTM 3/8/24

B. NOTIFICATION FORMAT

Applicant should understand that, as a result of consenting to electronic notification, e-mail address(es) listed below would be part of the agency's public record.

Please indicate your preference for the method of receiving these notifications by initialing and dating the appropriate lines below and then return the completed form to our office with your application.

Initials	Date *(month, day, year)*	
X NTM	X 3/8/24	Please continue sending via US Postal Service mail.
		AND/OR
		Please send correspondence to the e-mail address as indicated below: *I understand that my e-mail address will be part of the public record.* E-mail address: ______
X NTM	X 3/8/24	Please send copies of correspondence for this application to the following consultant e-mail address(es): *I understand that this e-mail address will be part of the public record.* Consultant e-mail address(es): mveenhuizen@livestockeng.com; Michael A. Veenhuizen jcase@livestockeng.com; Livestock Eng. Solutions, Inc.

CFO / CAFO APPLICATION PACKET
SECTION VI - Animal Capacity

Part of State Form 55051 (R5 / 10-22)
Confined Feeding Operation (CFO)
National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation (NPDES CAFO)
Approved by State Board of Accounts, 2022

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

INSTRUCTIONS: ***<u>This Section is completed for ALL application types.</u> Complete the table below by listing the total approved capacity of animals confined by the provided animal type listed. For applications that include a construction or expansion proposal, the total number of animals listed should reflect the total proposed maximum for any forty-five (45) day period within a twelve (12) month period as described on the Facility Detail Sheet submitted with the application. For renewal applications, the total number of animals listed should reflect the total approved animal capacity.***

A. ANIMAL INFORMATION

Animal Type			Total Approved Animal Capacity
Swine *Weighing More Than Fifty-five (55) Pounds*	Finishers		
	Sows		5,622
	Boars		
Swine *Weighing Less Than Fifty-five (55) Pounds*	Nursery Pigs		
Cattle or Cow/Calf Pairs	Beef Cattle		
	Beef Calves		
	Dairy Heifers		
	Dairy Calves		
Mature Dairy Cattle	Dairy Cattle		
Veal Calves	Veal Calves		
Chickens Other than Laying Hens *Other Than a Liquid Manure Handling System*	Pullets		
	Broilers	*Dry*	
Laying Hens and Broilers *Liquid Manure Handling System*		*Liquid*	
	Layers	*Liquid*	
Laying Hens *Other Than a Liquid Manure Handling System*		*Dry*	
Turkeys	Toms		
	Hens		
	Poults (0 to 5 Weeks old)		
Ducks *Other Than a Liquid Manure Handling System*	Ducks	*Dry*	
Ducks *Liquid Manure Handling System*		*Liquid*	
Sheep and Lambs			
Horses			
Other *(Specify)*:			
Total			**5,622**

CFO / CAFO APPLICATION PACKET
SECTION VII - Farmstead Plan

Part of State Form 55051 (R5 / 10-22)
Confined Feeding Operation (CFO)
National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation (NPDES CAFO)
Approved by State Board of Accounts, 2022

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

INSTRUCTIONS: ***This Section is completed for ALL application types.*** ***Prepare a Farmstead Plan that meets the requirements noted in the Section A. Farmstead Plan Checklist. Attach the Farmstead Plan to this form. Complete the Facility Detail Information in Section D. using the Section B. Checklist and the examples in Section C. Check the boxes next to each item in Sections A. and B. as you verify that the Farmstead Plan and Facility Detail Information sheets are complete. Failure to complete this section accurately will cause delays in processing this application.***

A. FARMSTEAD PLAN CHECKLIST

☒	1. The farmstead plan must be on a sheet no less than $8^1/_2$ inches by 11 inches in size.
☒	2. The farmstead plan must show all existing and proposed waste management systems, and all of the following features within 500 feet of the waste management systems *(label each feature)*: a) Residences b) Surface waters of the state c) Public and private roads d) Water well locations e) Characteristics of karst terrain as identified in 327 IAC 19-2-24 f) Drainage patterns g) Property boundary line h) All outlets of known tile drains or any other type of subsurface or surface drainage outlet i) Drainage inlets, including water and sediment control basins showing their outlets, and ponds with outlets j) Mortality management sites
☒	3. The farmstead plan must be legible and either: a) Drawn to approximate scale; or b) Show specific distances between the waste management systems and the features listed immediately above in section 2 that are within 500 feet of the existing or proposed waste management system.

B. FACILITY DETAIL INFORMATION CHECKLIST

Using the instructions below, complete Part D. of this section, "Facility Detail Information" sheet for all confinement and waste structures present or proposed at the site. If the rows of the provided Section D. "Facility Detail Information" sheet are not properly sized for your needs, you may create your own table with the same column headers and required information listed below.

☒	1.	Label the Farmstead Plan – The waste management systems (confinement and waste structures) must be uniquely identified on the farmstead plan. Existing structures should be labeled with an "E". Proposed structure should be labeled with a "P". After labeling each building with a "P" or "E", number the structures. Your structures should be labeled as "E1", "E2", "E3", etc.; or "P1", "P2", "P3", etc.; or a combination of the two. Other unique labeling systems will be accepted.
☒	2.	Animal Type – Animal type(s) listed on Animal Information Attachment.
☒	3.	Number of Animals – The MAXIMUM APPROVED CAPACITY of the unit at any one time.
☒	4.	Solid or Liquid – Denote if the manure in the unit is handled as a solid or liquid.
☒	5.	Date Constructed – List the approximate date of construction for existing waste storage structures.
☒	6.	Water Uses (gallons/unit of time) – If the inside of the building is washed, indicate how much water is used and how often the bulding is cleaned. Also include any excess non-contact cooling water or drinking water directed to the waste management system.
☒	7.	Brief Description – Provide a brief description of the facility and waste management system. Indicate if the unit shares manure storage with another unit (i.e. common lagoon system, slurry store, etc.). **Previously approved structures must have the approval number and date approved listed.**

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CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

C. FACILITY DETAIL SHEET EXAMPLES

Example 1

Existing Previously Approved Swine Facility Proposing an Expansion

You are seeking approval for a proposed 1,000 head finishing building with a flush gutter system to a proposed lagoon. The lagoon will service the new building as well as two existing buildings that were approved on 12/17/1994, AW #1234. One of the existing buildings contains 1,500 nursery pigs, the other 300 gestating sows. The new finishing building will be washed out between groups of hogs with about 5,000 gallons of water per cleaning. You labeled the 1,000 head finisher "P1" and the lagoon "P2" on the farmstead map.

FACILITY DETAIL INFORMATION

Label on Farmstead Map	Animal Type	Number of Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description:
P1	Finishing Hogs	1,000	Liquid	N/A	5,000 gallons/ 3 times a year	A finishing building with flush gutter system to lagoon that will service two (2) other buildings on site.
E1	Nursery Pigs	1,500	Liquid	3/95	N/A	Shallow pits, previously approved on 12/17/1994, AW# 1234. Pit will be connected to new lagoon.
E2	Gestating Sows	300	Liquid	3/95	N/A	Six (6) foot concrete pit, previously approved on 12/17/1994, AW# 1234. Pit will be connected to new lagoon.
P2	N/A	N/A	Liquid	N/A	N/A	A clay lined lagoon will service the proposed building as well as the two (2) buildings previously approved on 12/17/1994, AW#1234

Example 2

Existing Turkey Facility with No Prior Approval Proposing an Expansion

You currently own/operate a 20,000-bird broiler barn that does not require an approval, and wish to expand your operation by adding another 20,000-bird broiler barn and a manure compost building. Your total capacity will rise from 20,000 to 40,000 birds. You now must seek approval for both the existing barn and the proposed barn.

FACILITY DETAIL INFORMATION

Label on Farmstead Map	Animal Type	Number of Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description:
E1	Broiler	20,000	Solid	~ 1995	N/A	A broiler barn with earthen floors
P1	Broiler	20,000	Solid	N/A	N/A	A broiler barn with earthen floors
P2	N/A	N/A	Solid	N/A	N/A	Concrete floored, additional manure storage

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
See attached						

D. FACILITY DETAIL INFORMATION (Continued)

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description

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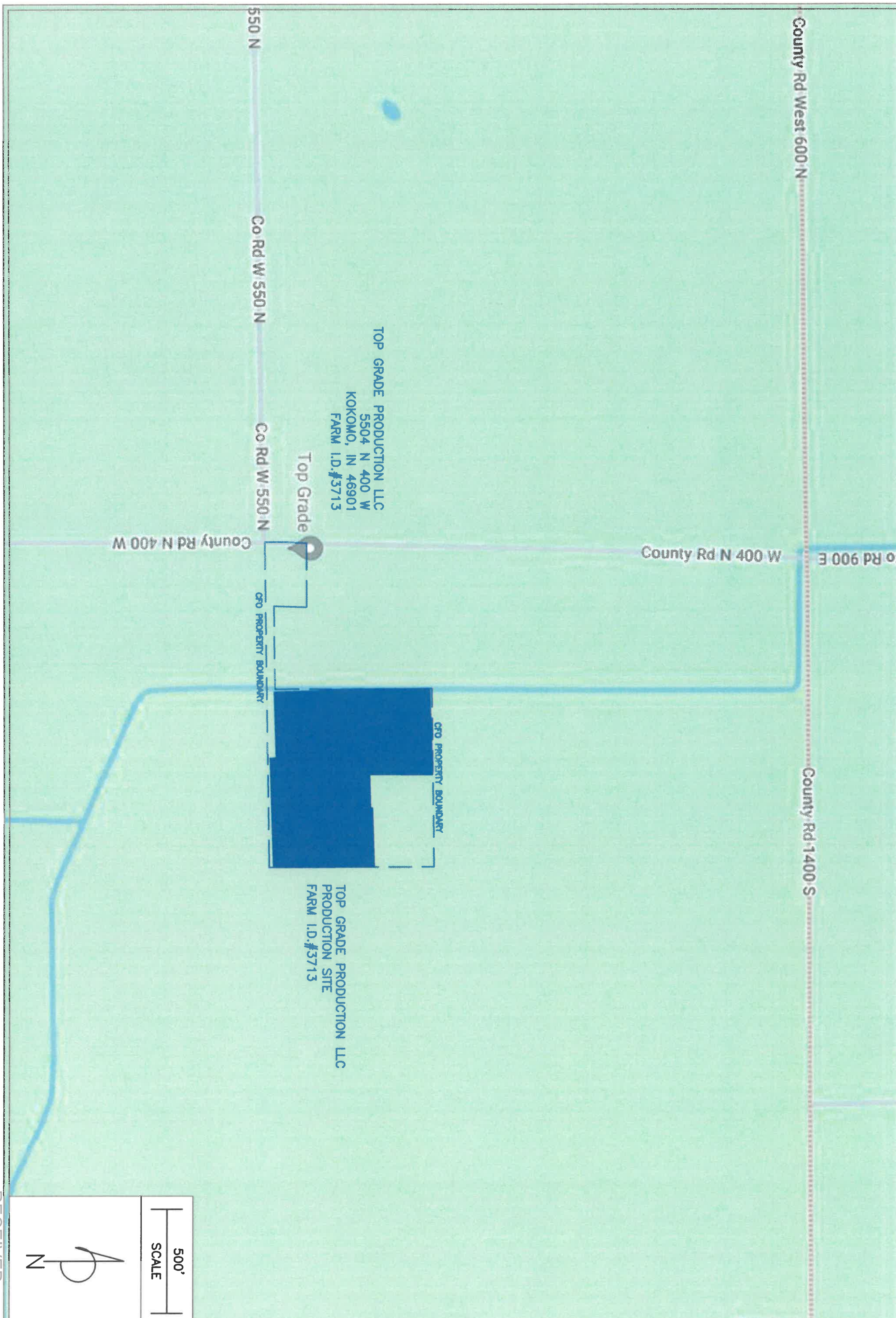
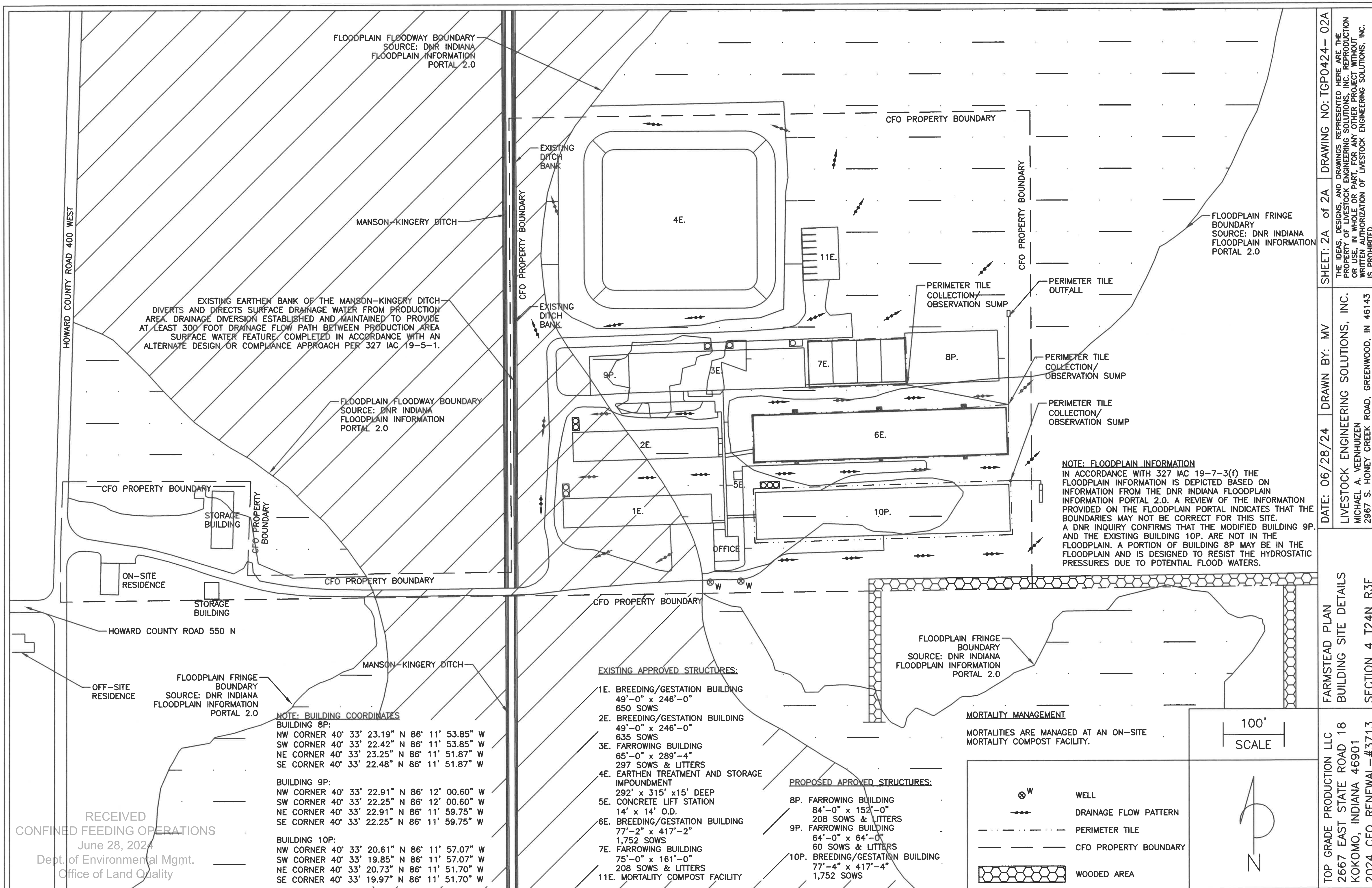
Office of Land Quality



TOP GRADE PRODUCTION LLC 2667 EAST STATE ROAD 18 KOKOMO, INDIANA 46901 2024 CFO RENEWAL—#3713	FARMSTEAD PLAN SITE LOCATION MAP S4 T24N R3E	DATE: 02/21/24	DRAWN BY: DL	SHEET: 1A of 2A	DRAWING NO: TGP0124— 01A
		LIVESTOCK ENGINEERING SOLUTIONS, INC. MICHAEL A. VEENHUIZEN 2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143		THE IDEAS, DESIGNS, AND DRAWINGS REPRESENTED HERE ARE THE PROPERTY OF LIVESTOCK ENGINEERING SOLUTIONS, INC. REPRODUCTION OR USE, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF LIVESTOCK ENGINEERING SOLUTIONS, INC. IS PROHIBITED.	


FLOODPLAIN FLOODWAY BOUNDARY
SOURCE: DNR INDIANA
FLOODPLAIN INFORMATION
PORTAL 2.0
CFO PROPERTY BOUNDARY
EXISTING DITCH BANK
CFO PROPERTY BOUNDARY
4E.
11E.
CFO PROPERTY BOUNDARY
MANSON-KINGERY DITCH
HOWARD COUNTY ROAD 400 WEST
EXISTING EARTHEN BANK OF THE MANSON-KINGERY DITCH DIVERTS AND DIRECTS SURFACE DRAINAGE WATER FROM PRODUCTION AREA. DRAINAGE DIVERSION ESTABLISHED AND MAINTAINED TO PROVIDE AT LEAST 300 FOOT DRAINAGE FLOW PATH BETWEEN PRODUCTION AREA SURFACE WATER FEATURE. COMPLETED IN ACCORDANCE WITH AN ALTERNATE DESIGN OR COMPLIANCE APPROACH PER 327 IAC 19-5-1.
EXISTING DITCH BANK
FLOODPLAIN FRINGE BOUNDARY
SOURCE: DNR INDIANA
FLOODPLAIN INFORMATION
PORTAL 2.0
PERIMETER TILE COLLECTION/ OBSERVATION SUMP
PERIMETER TILE OUTFALL
9P.
3E.
7E.
8P.
PERIMETER TILE COLLECTION/ OBSERVATION SUMP
PERIMETER TILE COLLECTION/ OBSERVATION SUMP
FLOODPLAIN FLOODWAY BOUNDARY
SOURCE: DNR INDIANA
FLOODPLAIN INFORMATION
PORTAL 2.0
6E.
2E.
5E.
1E.
10P.
OFFICE
CFO PROPERTY BOUNDARY
STORAGE BUILDING
CFO PROPERTY BOUNDARY
ON-SITE RESIDENCE
STORAGE BUILDING
CFO PROPERTY BOUNDARY
CFO PROPERTY BOUNDARY
W
W
NOTE: FLOODPLAIN INFORMATION
IN ACCORDANCE WITH 327 IAC 19-7-3(f) THE FLOODPLAIN INFORMATION IS DEPICTED BASED ON INFORMATION FROM THE DNR INDIANA FLOODPLAIN INFORMATION PORTAL 2.0. A REVIEW OF THE INFORMATION PROVIDED ON THE FLOODPLAIN PORTAL INDICATES THAT THE BOUNDARIES MAY NOT BE CORRECT FOR THIS SITE. A DNR INQUIRY CONFIRMS THAT THE MODIFIED BUILDING 9P. AND THE EXISTING BUILDING 10P. ARE NOT IN THE FLOODPLAIN. A PORTION OF BUILDING 8P MAY BE IN THE FLOODPLAIN AND IS DESIGNED TO RESIST THE HYDROSTATIC PRESSURES DUE TO POTENTIAL FLOOD WATERS.
HOWARD COUNTY ROAD 550 N
OFF-SITE RESIDENCE
FLOODPLAIN FRINGE BOUNDARY
SOURCE: DNR INDIANA
FLOODPLAIN INFORMATION
PORTAL 2.0
MANSON-KINGERY DITCH
FLOODPLAIN FRINGE BOUNDARY
SOURCE: DNR INDIANA
FLOODPLAIN INFORMATION
PORTAL 2.0
NOTE: BUILDING COORDINATES
BUILDING 8P:
NW CORNER 40° 33' 23.19" N 86° 11' 53.85" W
SW CORNER 40° 33' 22.42" N 86° 11' 53.85" W
NE CORNER 40° 33' 23.25" N 86° 11' 51.87" W
SE CORNER 40° 33' 22.48" N 86° 11' 51.87" W
BUILDING 9P:
NW CORNER 40° 33' 22.91" N 86° 12' 00.60" W
SW CORNER 40° 33' 22.25" N 86° 12' 00.60" W
NE CORNER 40° 33' 22.91" N 86° 11' 59.75" W
SE CORNER 40° 33' 22.25" N 86° 11' 59.75" W
BUILDING 10P:
NW CORNER 40° 33' 20.61" N 86° 11' 57.07" W
SW CORNER 40° 33' 19.85" N 86° 11' 57.07" W
NE CORNER 40° 33' 20.73" N 86° 11' 51.70" W
SE CORNER 40° 33' 19.97" N 86° 11' 51.70" W
EXISTING APPROVED STRUCTURES:
1E. BREEDING/GESTATION BUILDING
49'-0" x 246'-0"
650 SOWS
2E. BREEDING/GESTATION BUILDING
49'-0" x 246'-0"
635 SOWS
3E. FARROWING BUILDING
65'-0" x 289'-4"
297 SOWS & LITTERS
4E. EARTHEN TREATMENT AND STORAGE IMPOUNDMENT
292' x 315' x15' DEEP
5E. CONCRETE LIFT STATION
14' x 14' O.D.
6E. BREEDING/GESTATION BUILDING
77'-2" x 417'-2"
1,752 SOWS
7E. FARROWING BUILDING
75'-0" x 161'-0"
208 SOWS & LITTERS
11E. MORTALITY COMPOST FACILITY
PROPOSED APROVED STRUCTURES:
8P. FARROWING BUILDING
84'-0" x 152'-0"
208 SOWS & LITTERS
9P. FARROWING BUILDING
64'-0" x 64'-0"
60 SOWS & LITTERS
10P. BREEDING/GESTATION BUILDING
77'-4" x 417'-4"
1,752 SOWS
MORTALITY MANAGEMENT
MORTALITIES ARE MANAGED AT AN ON-SITE MORTALITY COMPOST FACILITY.
100'
SCALE
WELL
DRAINAGE FLOW PATTERN
PERIMETER TILE
CFO PROPERTY BOUNDARY
WOODED AREA
N
SHEET: 2A of 2A
DRAWING NO: TGP0424- 02A
THE IDEAS, DESIGNS, AND DRAWINGS REPRESENTED HERE ARE THE PROPERTY OF LIVESTOCK ENGINEERING SOLUTIONS, INC. REPRODUCTION OR USE, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF LIVESTOCK ENGINEERING SOLUTIONS, INC. IS PROHIBITED.
DATE: 06/28/24
DRAWN BY: MV
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143
FARMSTEAD PLAN
BUILDING SITE DETAILS
SECTION 4 T24N R3E
TOP GRADE PRODUCTION LLC
2667 EAST STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

D. FACILITY DETAIL INFORMATION						
Label on Farmstead Plan	**Animal Type**	**Number of Approved Animals**	**Solid or Liquid**	**Date Constructed** *(for existing buildings)*	**Water Uses** *(gallons/unit of time)*	**Brief Description**
1E.	Breeding/ Gestation sows	650 breeding/gestation sows	Liquid	1991	Building wash water 6,500 gallons per year **Total Usage:** 6,500 gallons per year	Approved November 13, 1991. Farm ID #3713, AW-4418. Breeding/gestation sow building with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 49'-0" x 246'-0" O.D. Below-building concrete manure storage: 1) 47'-8" x 244'-8" x 2'-0" deep Total capacity: 23,325 cu ft Available capacity: 11,662 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 89 days

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March 11, 2024
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Office of Land Quality

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
2E.	Breeding/ Gestation sows	635 breeding/gestation sows	Liquid	1991	Building wash water 6,350 gallons per year **Total Usage:** 6,350 gallons per year	Approved November 13, 1991. Farm ID #3713, AW-4418. Breeding/gestation sow building with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 49'-0" x 246'-0" O.D. Below-building concrete manure storage: 1) 47'-8" x 239'-8" x 2'-0" deep Total capacity: 22,848 cu ft Available capacity: 11,424 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 89 days

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
3E.	Farrowing (sows & litters)	297 sows & litters	Liquid	1991	Building wash water 1,635 gallons Up to 13 times per year **Total Usage:** 21,255 gallons per year	Approved November 13, 1991. Farm ID #3713, AW-4418. Farrowing building (sows and litters) with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding operation structure. Not shared with another confined feeding structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 65'-0" x 289'-4" O.D. Below-building concrete manure storage: 1) 60'-0" x 272'-4" x 2' deep Total capacity: 32,679 cu ft Available capacity: 16,339 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 128 days

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
4E.	Earthen treatment and storage impoundment	-----	Liquid	1991	-----	Approved November 13, 1991. Farm ID #3713, AW-4418. Earthen treatment/storage impoundment. Provides supplemental storage for concrete manure storage structures (1E, 2E, 3E, 6E, 7E, 8P, 9P). Manure from the below-building concrete manure storages gravity flow to lift station 5E and is pumped to earthen treatment/storage impoundment. As needed, manure from buildings 6E and 10P is pumped to earthen/treatment impoundment for supplemental storage. Earthen impoundment dimensions: 292' x 315' x 15' deep Total capacity (top of berm): 1,066,388 cu ft Available capacity: 888,431 cu ft (24" freeboard) Residual solids storage: 53,231 cu ft (12" solids) Net rainfall: 85,611 cu ft Available storage capacity: 749,589 cu ft Storage capacity: 568 days

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
5E.	Concrete lift station	-----	Liquid	1991	-----	Approved November 13, 1991. Farm ID #3713, AW-4418. Concrete lift station transfers manure from buildings 1E, 2E, 3E, 7E, 8P, and 9P to the earthen treatment/storage impoundment for long-term manure storage. Lift station dimensions: 14'-0" x 14'-0" O.D. 12'-8" x 12'-8" I.D. Concrete lift station top of wall elevation 30" above existing ground elevation and 6" above building top of floor elevation. Available storage capacity: 0 days

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
6E.	Breeding/ Gestation sows	1,752 breeding/gestation sows	Liquid	2005	Building wash water 17,520 gallons per year **Total Usage:** 17,520 gallons per year	Approved July 11, 2005. Farm ID #3713, AW-5472. Breeding/gestation sow building with below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding structure. As needed, manure from building 6E is pumped to earthen/treatment impoundment for supplemental storage. Total building dimensions: 77'-2" x 417'-2" O.D. Below-building concrete manure storage: 1) 75'-10" x 415'-10" x 7'-8" deep Total capacity: 241,770 cu ft Available capacity: 210,236 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 596 days

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
7E.	Farrowing (sows & litters)	208 sows & litters	Liquid	2005	Building wash water 1,144 gallons Up to 13 times per year **Total Usage:** 14,872 gallons per year	Approved July 11, 2005. Farm ID #3713, AW-5472. Farrowing building (sows and litters) with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding operation structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 75'-0" x 161'-0" O.D. Below-building concrete manure storage: Sixteen (16) shallow manure storages 1) 6'-9" x 70'-0" x 2'-0" deep (individual tanks) Total capacity: 15,120 cu ft Available capacity: 7,560 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 84 days

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Dept. of Environmental Mgmt.
Office of Land Quality

D. FACILITY DETAIL INFORMATION						
Label on Farmstead Plan	**Animal Type**	**Number of Approved Animals**	**Solid or Liquid**	**Date Constructed** *(for existing buildings)*	**Water Uses** *(gallons/unit of time)*	**Brief Description**
8P.	Farrowing (sows & litters)	208 sows & litters	Liquid	Not constructed Originally approved April 22, 2019 Construction authorization renewal requested.	Building wash water 1,144 gallons Up to 13 times per year **Total Usage:** 14,872 gallons per year	Approved April 22, 2019. Farm ID #3713, AW-6822. Farrowing building (sows and litters) with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding operation structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 84'-0" x 152'-0" O.D. Below-building concrete manure storage: Eight (8) shallow manure storages 1) 7'-2.5" x 151'-0" x 2'-0" deep (individual tanks) Total capacity: 17,415 cu ft Available capacity: 8,707 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 97 days

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
9P.	Farrowing (sows & litters)	60 sows & litters	Liquid	Not constructed Originally approved April 22, 2019 Construction authorization renewal requested.	<u>Building wash water</u> 660 gallons Up to 13 times per year **Total Usage:** 8,580 gallons per year	Approved April 22, 2019. Farm ID #3713, AW-6822. Farrowing building (sows and litters) with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding operation structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 64'-0" x 64'-0" O.D. Below-building concrete manure storage: Six (6) shallow manure storages 1) 7'-2.5" x 63'-0" x 2'-0" deep (individual tanks) Total capacity: 5,449 cu ft Available capacity: 2,724 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 106 days

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
10P.	Breeding/ Gestation sows	1,752 breeding/gestation sows	Liquid	Not constructed Originally approved April 22, 2019 Construction authorization renewal requested.	<u>Building wash water</u> 17,520 gallons per year **Total Usage:** 17,520 gallons per year	Approved July 11, 2005. Farm ID #3713, AW-5472. Breeding/gestation sow building with below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding structure. As needed, manure from building 10P is pumped to earthen/treatment impoundment for supplemental storage. Total building dimensions: 77'-4" x 417'-4" O.D. Below-building concrete manure storage: 1) 75'-8" x 416'-0" x 10'-0" deep Total capacity: 314,774 cu ft Available capacity: 283,297 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 803 days
11E.	Mortality compost facility	-----	Solid (not manure)	Existing	-----	Existing mortality compost facility. Self-contained mortality compost facility. Composting process includes mixing mortalities with sawdust, wood shavings, straw, corn stover, or comparable in compost bins. Not a manure storage structure.

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APR 11 2019

DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
OFFICE OF LAND QUALITY

Ortman to Ortman, LLC
5083 N 300 W
Kokomo, IN 46901

December 20, 2018

Indiana Department of Environmental Management
Confined Feeding Section
Office of Land Quality
100 N Senate Ave
Indianapolis, IN 46206

To Whom It May Concern:

Top Grade Production, LLC has notified Ortman to Ortman, LLC that they will be applying to the Indiana Department of Environmental Management for an approval to construct three new swine confinement buildings at their existing confined feeding operation. We own the land to the east and to the west of the proposed buildings. It is our understanding that a setback of 100 feet from a property boundary to a manure storage structure is required by the Indiana Department of Environmental Management.

The proposed building locations are approximately 35' from our east common property boundary and approximately 88' from our west common property boundary of the proposed buildings.

By the presentation of this letter, a variance to the property boundary setback is granted from Ortman to Ortman, LLC to Top Grade Production, LLC.

Jeffery M. Ortman — 1-14-19

Ortman to Ortman, LLC — Date

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March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

Ortman to Ortman, LLC
5083 N 300 W
Kokomo, IN 46901

December 20, 2018

Indiana Department of Environmental Management
Confined Feeding Section
Office of Land Quality
100 N Senate Ave
Indianapolis, IN 46206

To Whom It May Concern:

Top Grade Production, LLC has notified Ortman to Ortman, LLC that they will be applying to the Indiana Department of Environmental Management for an approval to construct three new swine confinement buildings at their existing confined feeding operation. We own the land to the east and to the west of the proposed buildings. It is our understanding that a setback of 100 feet from a property boundary to a manure storage structure is required by the Indiana Department of Environmental Management.

The proposed building locations are approximately 35' from our east common property boundary and approximately 88' from our west common property boundary of the proposed buildings.

By the presentation of this letter, a variance to the property boundary setback is granted from Ortman to Ortman, LLC to Top Grade Production, LLC.

Top Grade Production, LLC has also notified Ortman to Ortman, LLC. that the perimeter tile vegetative management area will be located on our property approximately 50' from P3.

Jeffery M. Ortman
Ortman to Ortman, LLC

1-14-19
Date

Terry Henninger

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APR 15 2019

DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
OFFICE OF LAND QUALITY

March 12, 2019

Indiana Department of Environmental Management
Confined Feeding Section
Office of Land Quality
100 N Senate Ave
Indianapolis, IN 46206

To Whom It May Concern:

Top Grade Production, LLC has notified Terry Henninger that they will be applying to the Indiana Department of Environmental Management for an approval to construct three new swine confinement buildings at their existing confined feeding operation. I own the land to the south of the existing operation and one of the proposed buildings.

It is my understanding that a setback of 100 feet from a property boundary to a manure storage structure is required by the Indiana Department of Environmental Management. The proposed building location is approximately 75' from our common property boundary.

By the presentation of this letter, a variance to the property boundary setback is granted from Terry Henninger to Top Grade Production, LLC.

Terry Henninger 3-18-19

Terry Henninger Date

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Timothy W. Henninger

March 12, 2019

Indiana Department of Environmental Management
Confined Feeding Section
Office of Land Quality
100 N Senate Ave
Indianapolis, IN 46206

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APR 15 2019

DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
OFFICE OF LAND QUALITY

To Whom It May Concern:

Top Grade Production, LLC has notified Timothy W. Henninger that they will be applying to the Indiana Department of Environmental Management for an approval to construct three new swine confinement buildings at their existing confined feeding operation. I own the land to the south of the existing operation and one of the proposed buildings.

It is my understanding that a setback of 100 feet from a property boundary to a manure storage structure is required by the Indiana Department of Environmental Management. The proposed building location is approximately 75' from our common property boundary.

By the presentation of this letter, a variance to the property boundary setback is granted from Timothy W. Henninger to Top Grade Production, LLC.

Timothy W. Henninger — 3-12-2019

Timothy W. Henninger — Date

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Office of Land Quality

First Merchants
Private Wealth Advisors
A Division of First Merchants Bank

10333 N MERIDIAN ST | SUITE 350 | INDIANAPOLIS, IN 46290

ERIN L. PASSETTI, JD, CTFA
Vice President &
Senior Trust Advisor

February 11, 2019

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DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
OFFICE OF LAND QUALITY

Top Grade Production, LLC
2667 E St Rd 18
Kokomo, IN 46901

Re: Construction of New Swine Building

To Whom It May Concern:

The Samuel C. Gray Trust #2, with First Merchants Bank as Trustee, is owner of property bordering to the south of Top Grade Production, LLC's swine operation in Howard County. First Merchants Bank as Trustee received notification of your application to build new swine confinement buildings at your existing confined feeding operation. The proposed building location is approximately 75' from the property boundary which is 25 feet short of the Indiana Department of Environmental Management's setback requirement of 100' for manure storage structures.

We do not have any objections to your application to build approximately 75' from our common property boundary.

I encourage you to contact me with any questions on the matter.

Very truly yours,

Erin L. Passetti
Vice President & Senior Trust Advisor

CC: Halderman Farm Management, A J Jordan

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Dept. of Environmental Mgmt.
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Office of Land Quality

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

INSTRUCTIONS: ***This Section is completed for ALL application types except NPDES applications.*** ***The below required information supplements the general information and plot maps attachments for a complete CFO Approval Renewal application or construction application. CFO Approval Renewal applications and construction applications for expansions at currently regulated operations may also utilize the Marketing and Distribution of Manure attachment, if appropriate. Complete all portions of the form below. This form is required and supersedes all previous versions. IDEM will not accept substitutes, altered, or previously supplied forms.***

A. MANURE MANAGEMENT PLAN

1. Manure Testing

Consult Purdue University Cooperative Extension Service Publications AY-277, ID-101, ID-205 "Swine Manure Management Planning", ID-206 "Poultry Manure Management Planning", ID-208 "Dairy Manure Management Planning" for guidance on procedures for manure testing.

a) Manure Sample Collection Procedures:

See attached

b) Nutrient Assessment:

☒ Private laboratory does a nutrient analysis of sample(s).

☒ Other *(explain)*: See attached

c) Sampling Frequency:

☒ Minimum of once every year for CFOs.

☐ Annual sampling required for CAFOs with a NPDES permit.

2. Soil Testing

You can consult Purdue University, Cooperative Extension Service Publication AY-368-W for guidance on procedures for soil testing. A soil test must provide sufficient information about soil fertility to allow for nutrient recommendations for existing or planned crops. Soil tests may not represent more than twenty (20) acres per sample.

a) Do, or will, you perform soil testing for this operation?

☒ Yes, all or a portion of manure is, or will be, applied to land controlled by the operator *(complete b), c), and d) below)*.

☐ No, 100 % of manure is, or will be, either marketed or distributed *(stop here - b), c), and d) below do not need to be completed)*.

b) Sample Collection Method:

☒ Management unit (field level)
☐ Grid method
☐ By soil type
☒ Other *(explain)*: See attached

c) Nutrient Assessment:

☒ Private laboratory does nutrient analysis.

☒ Other *(explain)*: See attached

d) Sampling Frequency:

☒ Minimum of once every four (4) years for all CFOs *(sampling may be done more often)*.

B. SPRAY IRRIGATION

1. Does the operation currently, or propose to, apply manure by spray irrigation?
   ☐ Yes ☒ No
2. If yes, is the spray irrigation in a flood plain?
   ☐ Yes ☐ No
3. CAFOs with NPDES permits must conduct spray irrigation in a flood plain in accordance with the NPDES CAFO individual permit rule for the operation, as applicable.
4. CFOs may only conduct spray irrigation in a flood plain in accordance with a spray irrigation plan approved by IDEM. (327 IAC 19-14-5(d))

C. SURFACE APPLICATION OF MANURE TO FROZEN OR SNOW-COVERED GROUND

1. CFOs which are not large CAFO-sized farms and have 120 days or less of approved storage capacity may request approval to surface apply manure to frozen or snow-covered ground based on a case-by-case authorization from the commissioner per 327 IAC 19-14-4(i).

   Have you included additional information to obtain or renew a commissioner's authorization?
   (You must attach State Form 55162 (R2 / 3-16) to be considered for this exemption.)

   ☐ Yes ☒ No
2. CAFOs with a NPDES permit and CFOs (not CAFO-sized) with 180 days of approved storage can request approval for surface application of manure to frozen or snow-covered ground under the provisions of 327 IAC 19-5-1 as an Alternate Design or Compliance Approach which meets the performance standards of 327 IAC 19-3-1.

   Does the operation plan to submit a request for approval of an Alternate Design or Compliance Approach?

   ☐ Yes ☒ No
3. CFOs, which are not large CAFO-sized farms, may request approval to surface apply manure to frozen or snow-covered ground resulting from an unforeseen emergency condition per 327 IAC 19-14-4(g-h). Improper design or management of manure storage facilities will not qualify as an emergency condition.

D. CFO APPROVAL RENEWAL INFORMATION
(THIS SECTION IS ONLY FOR CFO APPROVAL RENEWAL APPLICATIONS.)

1. Farm ID Number: 3713
2. Total number of approved confinement barns currently present at operation: 5 (existing); 3 (propose)
3. Total number of open confinement lots (earthen or concrete) currently present at operation *(include calf hutch areas here)*: 0
4. Total **approved** capacity of animals which can be confined at operation: 5,622
5. Are earthen lagoon(s) or pit(s) currently present at operation? ☒ Yes ☐ No
6. Separate from confinement barn(s), are any concrete or metal tanks currently present at operation? ☒ Yes ☐ No
7. Separate from confinement barn(s), are any solid manure storage building (litter stack, barn, etc.) currently present at operation? ☐ Yes ☒ No
8. Since the last renewal, have any confinement barns been closed? If yes, detail in 11. below which barn(s) and the animal number(s) housed within. ☐ Yes ☒ No
9. Since the last renewal, have any lagoon(s), pit(s), or tank(s) been closed? If yes, detail in 11. below which structure(s). ☐ Yes ☒ No
10. Do you have any buildings that have been approved for Frozen or Snow Covered ground spreading? If Yes, list the barns from your Facility Detail Sheet that are approved *(include State Form 55162 with this application)*: ☐ Yes ☒ No
11. Detail any changes in manure storage capacity or animal capacity (number/species/type) at the operation that have been made since the time of the last CFO approval/renewal.

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Office of Land Quality

2024 Confined Feeding Operation Approval Application
Manure Management Plan Attachment
for
Top Grade Production LLC
2667 East State Road 18
Kokomo, Indiana 46901

A. MANURE MANAGEMENT PLAN

1. Manure Testing

Consult Purdue University, Cooperative Extension Service Publications AY-277, ID-101, ID-205 "Swine Manure Management Planning," ID-206 "Poultry Manure Management Planning," ID-208 "Dairy Manure Management Planning" for guidance on procedures for manure testing.

a) Manure Sample Collection Procedures:

A representative sample of manure and process wastewater will be collected and analyzed prior to the first land application event. A representative sample from each type of manure will be collected (i.e. animal type and size, phase of production, storage structure, and treatment structure).

To obtain the most representative sample a composite sample using a method appropriate to represent the manure and process wastewater being land applied will be collected. A composite sample will be obtained by collecting multiple (2-5) samples from the manure storages. Typically, to get the most representative sample, a core sampling device will be used prior to land application or sampling will be conducted at the time of agitation and land application. The sample will be placed in a plastic bucket or container to create a mixed sample. A mixed sample will be drawn and placed in a sample bottle. The sample bottle will be sent to a private analytical laboratory for analysis.

When animal type and size in multiple buildings are similar it is expected that the manure generation and characteristics in each building will be the same or similar. When animal type and size are similar one manure storage may be sampled each year to represent the manure nutrient concentration for that building type or phase of production. When manure and process wastewater from different buildings and/or animal type and size are commingled in a common manure storage or treatment/storage impoundment the common manure storage will be sampled each year to represent the manure nutrient concentration for the manure storage or treatment impoundment. Once the first sample is collected prior to land application, future land application decisions may be made based on previous and historical analysis results.

b) Nutrient Assessment:

☒ Private Laboratory does a nutrient analysis of sample(s)
☒ Other (explain) ______________________________

A private analytical laboratory qualified to analyze manure and wastewater will analyze the composite sample. Specific testing protocols will be determined by the analytical laboratory. At a minimum, manure and wastewater samples will be analyzed for available Nitrogen, Phosphorus, Potassium, and Moisture Content.

c) Sampling Frequency:

☒ Minimum of once every year for CFOs.
☐ Annual sampling required for CAFOs with a NPDES permit

The expected sampling frequency is at least once every year.

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2. Soil Testing

You can consult Purdue University, Cooperative Extension Service Publication AY-281 for guidance on procedures for soil testing. A soil test must provide sufficient information about soil fertility to allow for nutrient recommendations for existing or planned crops. Soil test may not represent more than twenty (20) acres per sample.

a) Do, or will, you perform soil testing for this operation

☒ Yes, all or a portion of manure is, or will be, applied to land controlled by the operator (complete b), c), and d) below)

☐ No, 100% of manure is, or will be, either marketed or distributed (stop here – b), c), and d) below do not need to be completed).

b) Sample Collection Method:

☒ Management unit (field level)

☐ Grid method

☐ By soil type

☒ Other (explain) ______

Fields used for manure application will be soil sampled by management unit. Soil samples from each field used for manure application will be collected and analyzed. Multiple composite soil samples are collected from each land application field depending on the size of the land application field. Multiple soil cores from the top 0" to 8" of the soil profile will be collected and combined. Typically, a composite soil sample is taken from multiple soil samples from within a land area of up to 20 acres. The composite samples collected and prepared from each land application field will be sent to a private analytical laboratory for analysis.

c) Nutrient Assessment:

☒ Private laboratory does nutrient analysis.

☒ Other (explain) ______

Soil samples will be collected and composited. The composite sample will be analyzed by a private analytical laboratory qualified to analyze soil nutrient content and soil properties. Specific testing protocols will be determined by the analytical laboratory. At a minimum, soil samples will be analyzed for Phosphorus.

d) Sampling Frequency:

☒ Minimum of once every four (4) years for CFOs and CAFOs.

The expected sampling frequency is at least once every four years.

CFO / CAFO APPLICATION PACKET
SECTION X - Plot Maps

Part of State Form 55051 (R5 / 10-22)
Confined Feeding Operation (CFO)
National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation (NPDES CAFO)
Approved by State Board of Accounts, 2022

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

INSTRUCTIONS: ***THIS SECTION IS COMPLETED FOR ALL APPLICATION TYPES.*** *Plot maps must be submitted with applications as directed in the "Application Types and Requirements Worksheet." The specific plot maps, which must be submitted for each application type, are detailed in Section A. and Section E. The submitted plots must conform with the application requirements noted in Section B., Section C., and Section D. This form is required and supersedes all previous versions. IDEM will not accept substitutes, altered, or previously supplied forms.*

A. PLOT MAPS

Listed below are plot maps required to be submitted with CFO and CAFO applications. **Please note** each plot map type is labeled (1, 2, and 3). Based on the application type previously determined in the "Application Type and Requirements Worksheet" and noted on the "General Information" form, locate the application type in Section E. below. The columns to the right of each listed application type note the required plot maps, as labeled here. As directed in Section A. above, based on the application type determined in the "Application Type and Requirements Worksheet" and noted on the "General Information" form, locate the application type below. The columns to the right of each listed application type note the required plot maps, as labeled in Section A., which are required to be submitted.

1. USDA NRCS Soil Survey Map – The boundaries of all manure application areas.
2. USDA NRCS Soil Survey Map – The location of the waste management system, boundaries of the confined feeding operation, and boundaries of livestock and poultry production areas.
3. USGS Topographic Map – The location of the waste management system, the boundaries of the confined feeding operation, boundaries of livestock and poultry production areas, identify any public water supply wells and public water supply surface intake structures within one thousand (1,000) feet of the manure storage structures, and boundaries of all manure application areas.

B. TOTAL AVAILABLE ACREAGE FOR LAND APPLICATION

1. Considering setbacks, which must be subtracted from the total acres, and any and all other limitations, what is total acreage available for land application? 257.91
2. On all plot maps submitted showing the boundaries of land application areas, note the total available acreage for land application in each separate area considering the applicable setbacks for land application method and slope.

C. MARKETING AND DISTRIBUTION

For operations utilizing marketing and distribution of manure, refer to Section VIII, "Marketing and Distribution of Manure", contained within this application packet. Review the directions in this section carefully for information regarding when a marketing and distribution waiver may be used. If you meet the requirements for Marketing and Distribution of your manure then no manure application area plot maps would be required. Manure Storage Structure location maps would still be required.

D. LAND USE AGREEMENTS

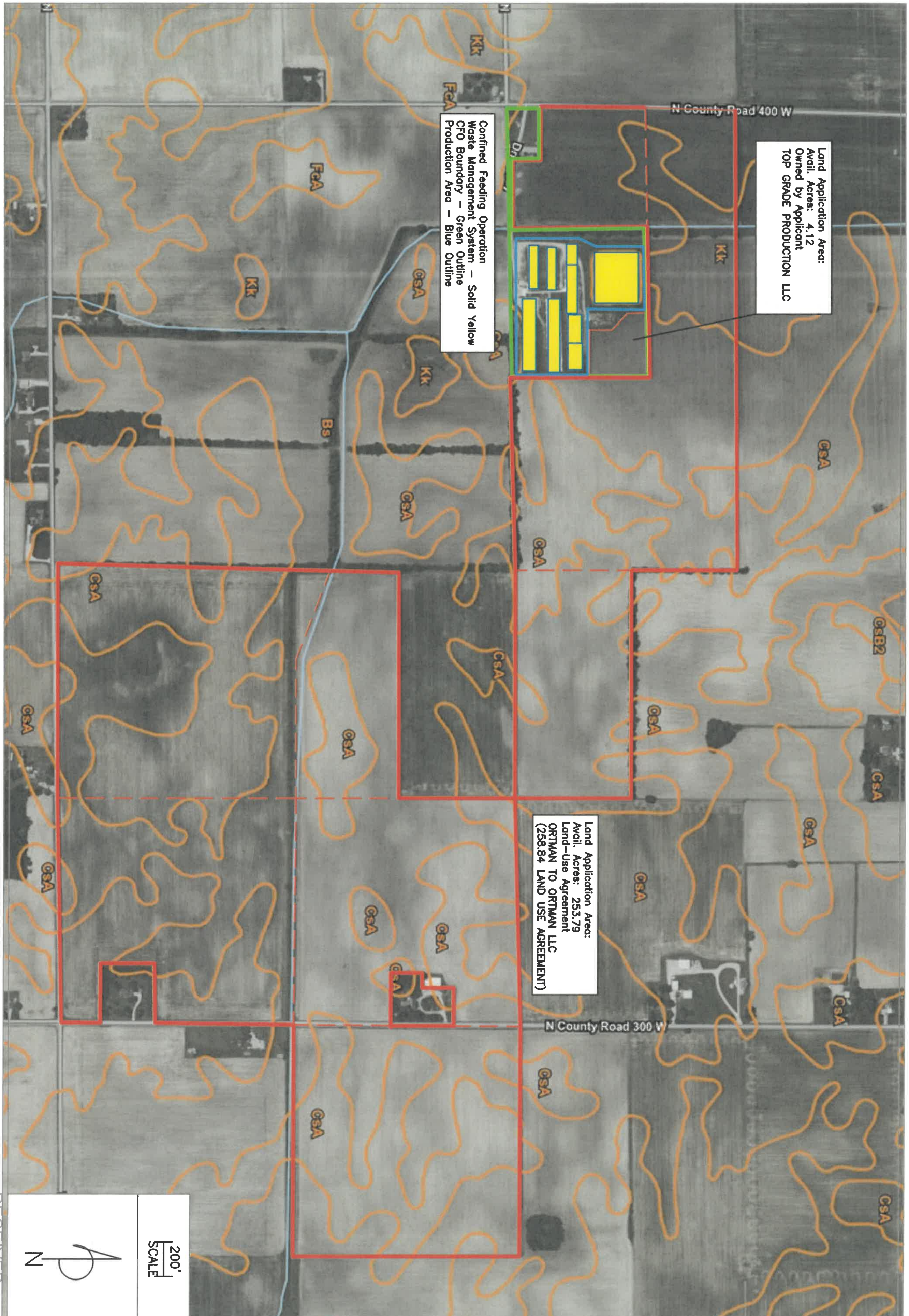
Any acreage identified as part of the minimum required acreage for the application of manure that is not owned by the Applicant of the operation must be documented in the operating record via land use agreements.

1. Copies of all land use agreements must accompany construction applications (application types A-D, H-K, and L).
2. If a land use agreement submitted in item 1. above has expired, new land use agreements must be submitted with a renewal.
3. The land use agreements must be signed by the property owners on whose property the manure will be applied.
4. Plot maps accompanying construction applications must have the property owner clearly labeled for each land application area submitted.

E. APPLICATION TYPE AND REQUIRED PLOT MAPS

As directed in Section A. above, based on the application type determined in the "Application Type and Requirements Worksheet" and noted on the "General Information" form, locate the application type below. The columns to the right of each listed application type note the required plot maps, as labeled in Section A., which are required to be submitted.

<table>
<tr><th colspan="2" rowspan="2">Application Type</th><th colspan="3">Required Plot Maps
(as labeled in Section A.)</th></tr>
<tr><th>1</th><th>2</th><th>3</th></tr>
<tr><th colspan="5">CFO Approval – Construction and/or Operation (Including Renewals)</th></tr>
<tr><td>1.</td><td>Completely New Operation (Currently Undeveloped Site)</td><td rowspan="7">Yes</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td></tr>
<tr><td>2.</td><td>Existing Operation Without Existing CFO Approval</td></tr>
<tr><td>3.</td><td>Existing Operation with Expired CFO Approval</td></tr>
<tr><td>4.</td><td>Expansion of Operation with Current CFO Approval</td></tr>
<tr><td>5.</td><td>Amendment of Existing CFO Approval – Permit Condition</td><td rowspan="2">No</td><td rowspan="3">No</td></tr>
<tr><td>6.</td><td>Amendment of Existing CFO Approval – Change in the type or number of animals that increases manure production</td></tr>
<tr><td>7.</td><td>CFO Approval Renewal/Manure Management Plan</td><td>Yes</td></tr>
<tr><th colspan="5">NPDES CAFO Individual Permit – Construction and Permit Coverage</th></tr>
<tr><td>8.</td><td>Completely New Operation (Currently Undeveloped Site)</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td><td rowspan="4">Yes</td></tr>
<tr><td>9.</td><td>Existing Operation without Current CFO Approval or NPDES Permit</td></tr>
<tr><td>10.</td><td>Existing Operation with Current CFO Approval</td></tr>
<tr><td>11.</td><td>Current NPDES CAFO Individual Permit Holder Proposing Construction</td></tr>
<tr><th colspan="5">NPDES CAFO Individual Permit - Permit Modification</th></tr>
<tr><td>12.</td><td>Construction or Expansion of Storage or Animals – No Permit Extension</td><td rowspan="2">Yes</td><td rowspan="2">Yes</td><td>Yes</td></tr>
<tr><td>13.</td><td>No Construction or Expansion of Storage or Animals – No Permit Extension</td><td>No</td></tr>
<tr><th colspan="5">NPDES CAFO Individual Permit – Renewal</th></tr>
<tr><td>14.</td><td>Renewal Coverage for Operation with Current NPDES CAFO Individual Permit</td><td>Yes</td><td>Yes</td><td>No</td></tr>
</table>



TOP GRADE PRODUCTION LLC 2667 E. ST. RD 18 KOKOMO, IN 46901 2024 CFO RENEWAL–#3713	USDA SOILS MAP SITE LOCATION LAND APPLICATION AREAS SECTIONS 3 & 4 T24N R3E	DATE: 02/23/24 DRAWN BY: DL LIVESTOCK ENGINEERING SOLUTIONS, INC. MICHAEL A. VEENHUIZEN 2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143	SHEET: 1S of 1S DRAWING NO: TGP0124– 01S THE IDEAS, DESIGNS, AND DRAWINGS REPRESENTED HERE ARE THE PROPERTY OF LIVESTOCK ENGINEERING SOLUTIONS, INC. REPRODUCTION OR USE, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF LIVESTOCK ENGINEERING SOLUTIONS, INC. IS PROHIBITED.

Soil Map—Howard County, Indiana
(Top Grade Production LLC)

Map Scale: 1:11,100 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 150, 300, 600, 900

Feet: 0, 500, 1000, 2000, 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

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March 11, 2024
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Office of Land Quality

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Howard County, Indiana
Survey Area Data: Version 28, Sep 1, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 16, 2022—Jun 21, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Bs	Brookston silty clay loam, 0 to 2 percent slopes	167.7	61.0%
CsA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	95.4	34.7%
FcA	Fincastle silt loam, Tipton Till Plain, 0 to 2 percent slopes	0.1	0.1%
Kk	Kokomo silty clay loam, 0 to 2 percent slopes	9.9	3.6%
W	Water	1.8	0.7%
Totals for Area of Interest		**274.9**	**100.0%**

LAND APPLICATION AGREEMENT

This agreement is made between, Ortman to Ortman LLC "land owner" and, Top Grade Production LLC "confined feeding operation owner".

The "land owner" has given permission to the "confined feeding operation owner" to exclusively apply manure and wastewater, as a crop nutrient source, generated from pork production facilities on the following farm land;

Acres	County	USGS Quadrangle	Section	Township	Range
11.340	Howard	Clay	4	24	3
17.000	Howard	Clay	4	24	3
20.000	Howard	Clay	4	24	3
37.800	Howard	Clay	4	24	3
37.690	Howard	Clay	4	24	3
39.990	Howard	Clay	3	24	3
43.000	Howard	Clay	4	24	3
52.020	Howard	Clay	4	24	3

This is a written agreement for a period of 15 years upon commencement between the "land owner" and the "confined feeding operation owner."

The "land owner" grants the "confined feeding operation owner" the right and access to the above described cropland to apply manure and wastewater.

The "confined feeding operation owner" agrees that it will not exercise its right to spread manure and wastewater in such a way as to damage growing crop, to impair the ability of the cropland to grow productive crops or operate in such a manner that is not consistent with standard management practices and local and customary farming practice.

The "confined feeding operation owner" agrees to operate consistent with Federal and State regulations and the rules and regulations put forth by the Environmental Protection Agency and the Indiana Department of Environmental Management.

This easement and agreement shall be binding and inure to the benefit of the heirs, successors, and the assigns of the parties hereto.

FINAL APPROVED
CONFINED FEEDING OPERATION
APR 22 2019
Dept. of Environmental Mgmt.
Office of Land Quality

This agreement may be assigned by the parties hereto.

The "land owner" and "confined feeding operation owner" have the opportunity to amend this agreement in writing and initialing the amendments by all parties.

The parties have here unto set their hands and fixed their signatures this ____ day of October, 2018.

Landowner:

Ortman to Ortman LLC
LANDOWNER'S NAME

Jeffrey M. Ortman Pres
SIGNATURE

10/26/18
DATE

Confined Feeding Operation Owner:

Top Grade Production LC
FACILITY NAME

Nichols T. Nagel
SIGNATURE

10-1-18
DATE

Russell E. Hunt

10/1/2018

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

STATE OF INDIANA

Howard COUNTY, SS:

Before me, the undersigned, a Notary Public in and for said County and State this 1 day of October, 2018 personally appeared Nicholas Marcie & Russell Merritt and acknowledges the execution of the forgoing document.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my official seal.

My Commission Expires:

11/9/2019

Signed:
Printed: John D. Kirk
Notary Public
Resident of Miami County, Indiana

THIS INSTRUMENT PREPARED BY: Kristina Hiers, Commercial Loan Documentation Assistant, First Farmers Bank & Trust

"I AFFIRM, UNDER THE PENALTIES FOR PERJURY, THAT I HAVE TAKEN REASONABLE CARE TO REACT EACH SOCIAL SECURITY NUMBER IN THE DOCUMENT, UNLESS REQUIRED BY LAW." Kristina Hiers

NOTARY PUBLIC NOTARY SEAL INDIANA
John D. Kirk
Notary Public
Miami County, Indiana
My Commission Expires 11/9/2019

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL RENEWAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

CONSTRUCTION ATTACHMENT UPDATE

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

WASTE MANAGEMENT SYSTEM DRAWINGS
AND
SUPPORTING INFORMATION

DESIGN SUMMARY

SITE PREPARATION AND BACKFILL

CONCRETE DESIGN SPECIFICATION
NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS
CONCRETE CONSTRUCTION
MAY 2015
(ADAPTED TO ADDRESS PROJECT SPECIFIC DETAILS)

CONCRETE MANURE STORAGE DESIGNS
SITE SPECIFIC ANALYSIS AND DESIGN

ALTERNATE DESIGN OR COMPLIANCE APPROACH: 327 IAC 19-5-1 & 327 IAC 19-3-1
ALTERNATE DESIGN OR COMPLIANCE APPROACH ANALYSIS AND DESIGN

SEASONAL WATER TABLE MANAGEMENT

DESIGN AND CONSTRUCTION PLANS
BELOW-BUILDING CONCRETE MANURE STORAGE DESIGN PLANS
EAST FARROWING (8P): 84'-0" x 152'-0" x 2'-0" DEEP (Plan Sheets 1B – 8B)
WEST FARROWING (9P): 64'-0" x 64'-0" x 2'-0" DEEP (Plan Sheets 1C - 8C)
SOUTH GESTATION (10P): 77'-4" x 417'-8" x 10'-0" DEEP (Plan Sheets 1D – 17D)

PERIMETER TILE (SEASONAL WATER TABLE) PLANS
SOUTH GESTATION (10P): (Plan Sheets 1E-5E)

Prepared by:
LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829

RECEIVED
CONFINED FEEDING OPERATIONS
June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

2024 Confined Feeding Operation Approval Application
Below-Building Concrete Manure Storage Design Plans
Design Summary
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

The proposed waste treatment control structures for the swine confined feeding operation include below-building concrete storage structures. The following details pertain to all of the below-building concrete manure storage plans.

1. Subgrade preparation. The presumptive bearing capacity of the subgrade soils is 1,500 psf. Large rocks, organic vegetation, or foreign material shall be removed.

   For the design, the presumptive soil bearing capacity of the foundation soils beneath the structure footings was assumed to be 1,500 psf. The soil texture classifications within the soil profile in the area of the proposed concrete manure storage structures are silt loam (ML), clay loam (CL), clay (CH), and sandy loam (SM). Table 3 "Presumptive Allowable Foundation and Lateral Pressure" of the NRCS Conservation Practice Standard, Waste Storage Facility, Code 313 indicates that clay, sandy clay, silty clay, clayey silt, silt, and sandy silt (CL, ML, MH, CH) have a presumptive bearing capacity of 1,500 psf. No on-site investigation was conducted to verify the soil bearing capacity.

2. A design for a presumptive soil bearing capacity of 2,000 psf for the foundation soils beneath the structure footings for Building 10P – South Gestation is included. If the 2,000 psf soil bearing capacity design is used, the soil bearing capacity will be tested by a geotechnical testing company using standard test methods to confirm the soil bearing capacity. Soil bearing capacity testing will be completed prior to commencing construction. If the soil bearing capacity meets or exceeds 2,000 psf, the design details for a soil bearing capacity of 2,000 psf can be used. Soil bearing capacity test results will be submitted to the Indiana Department of Environmental Management confirming the soil bearing capacity and design details used during construction.

3. All concrete work shall conform to the ACI Manual of Concrete Practices, ACI 301.

4. All concrete used on manure tank walls and floors, beams, and columns shall have a minimum 28-day compressive strength of 4,000 psi.

5. Footers formed and placed monolithically with the floor slab shall have a minimum 28-day compressive strength of 4,000 psi. Footers formed and placed independent of the floor slab shall have a minimum 28-day compressive strength of 4,000 psi.

6. Slats shall have a minimum 28-day compressive strength of 4,500 psi.

7. Lintels shall have a minimum 28 day compressive strength of 5,000 psi.

8. Solid floors and support beams shall meet a minimum design live load due to animals of:
   -- 70 pounds per square foot, psf, for sows and boars (up to 500 lbs).
   (adapted from Table 2-4, MWPS-36 Rectangular Concrete Manure Storages, second edition)

9. Slats shall meet a minimum design live load due to animals of:
   -- 170 pounds per lineal foot, plf for sows and boars (up to 500-lb pig).
   (adapted from Table 2-4, MWPS-36 Rectangular Concrete Manure Storages, second edition)

10. Finishes of concrete walls -- standard form finish.

11. All reinforcing steel, as rebar, shall be Grade 60 or higher, deformed bars of new billet steel conforming to ASTM A615, Grade 60.
12. Rebar – Minimum 12" lap on all reinforcing steel. Provide a minimum 19" lap on all #5 rebar, a minimum 15" lap on all #4 rebar, and a minimum 12" lap on reinforcing steel smaller than #4 rebar. Provide a minimum spacing of 3' between laps in rebar.
13. All reinforcing steel, as welded wire reinforcement, shall have a tensile strength (yield strength) of 60,000 psi or higher. Design specifications are based on 60,000 psi and 90,000 psi tensile strength (yield strength). If the welded wire reinforcement tensile strength is less than 90,000 psi, the design requirements for a tensile strength of 60,000 psi shall be used.
14. Welded wire reinforcement – Minimum lap between welded wire reinforcement sheets is at least one mesh width.
15. Welded wire reinforcement shall be placed as sheets rather than rolls.
16. Welded wire reinforcement shall be placed, adequately supported, and sufficiently secured to minimize displacement during concrete placement.

Farrowing building, 8P

17. The manure storage tank will be constructed in a mapped floodplain and may be subject to additional hydrostatic pressures. The concrete tank walls will be constructed above the base flood elevation (BFE) and are not subject to additional hydrostatic pressures. The floor may be subject to additional hydrostatic pressures. The floor is designed to resist the upware hydrostatic pressure due to potential flood waters.
18. Design loads for the concrete tank sidewalls and concrete tank end walls are due to lateral earth pressures. The lateral earth pressure (soil load) was assumed to be 100 psf per foot of depth (NRCS-313; Table 4 – Minimum Lateral Earth Pressure Values"). No vehicle surcharge load is included in the design of the concrete tank sidewalls and concrete tank end walls. No vehicle loads are required since vehicle traffic and activities do not occur within five feet of the walls due to the placement of ventilation fans, feed storage tanks, loadouts, and access doors.
19. Design loads for the concrete tank floor are due to upward hydrostatic pressure. The upward hydrostatic pressure was determined to be 45 psf.
20. The manure storage tanks will be constructed on-grade with backfill, so the design is controlled by soil pressure when the tank is empty. The soil load is due to approximately 2' of backfill. The reinforcement steel spacing requirement for structural integrity exceeds the spacing requirements for temperature and shrinkage steel.
21. Temperature and shrinkage steel controls the concrete tank sidewall reinforcement steel design.
22. Minimum exterior concrete pit wall thickness is 6".
23. Minimum floor thickness is 5".
24. Minimum concrete cover between the earth and rebar and/or welded wire reinforcement in floor slabs in contact with the earth is 3".
25. Minimum concrete cover between the interior surface of the floor slab and reinforcement steel is 1-1/2".
26. Minimum concrete cover between the interior surface of the wall and vertical rebar in the walls is 2". Minimum concrete cover between the interior surface of the wall and horizontal rebar in the wall is 1-1/2".

27. Rebar specifications and spacing for the sidewalls and endwalls of the concrete tank are:
    - Vertical reinforcement steel; #4, Grade 60 rebars at 18.0" (max.) on-center spacing or #5, Grade 60 rebars at 18.0" (max.) on-center spacing
    - Horizontal reinforcement steel; #4, Grade 60 rebars at 16" (max.) on-center spacing or #5, Grade 60 rebars at 18.0" (max.) on-center spacing.

28. Rebar specifications and spacing for the interior concrete tank dividing walls are:
    - Vertical reinforcement steel; #4, Grade 60 rebars at 18.0" (max.) on-center spacing or #5, Grade 60 rebars at 18.0" (max.) on-center spacing
    - Horizontal reinforcement steel; #4, Grade 60 rebars at 16" (max.) on-center spacing or #5, Grade 60 rebars at 18" (max.) on-center spacing.

29. Rebar specifications and spacing for the floor slab are:
    - Vertical (flexure) reinforcement steel; #3, Grade 60 rebars at 12.0" (max.) on-center spacing.
    - Horizontal (temperature and shrinkage) reinforcement steel; #3, Grade 60 rebars at 11" (max.) on-center spacing.

30. Floor construction joint specifications for the floor slabs are:
    - #3 rebar, Grade 60 reinforcement (60,000 psi tensile strength) with floor construction joints every 81' on center

31. Footings (footers) are designed to carry the bearing load from walls. Wall footers are continuous footers centered under the walls.

    Footers for walls are:
    - 24" wide x 8" thick continuous footers for the 6" outside wall.
    - 16" wide x 8" thick continuous footers for the interior 6" thick manure storage partition walls.

Farrowing building, 9P

32. Design loads for the concrete tank sidewalls, concrete tank end walls, and the manure pump out sidewalls (perpendicular to the concrete tank walls) are due to lateral earth pressures. The lateral earth pressure (soil load) was assumed to be 100 psf per foot of depth (NRCS-313; Table 4 – Minimum Lateral Earth Pressure Values"). No vehicle surcharge load is included in the design of the concrete tank sidewalls and concrete tank end walls. No vehicle loads are required since vehicle traffic and activities do not occur within five feet of the walls due to the placement of ventilation fans, feed storage tanks, loadouts, and access doors.

33. The manure storage tanks will be constructed on-grade with backfill, so the design is controlled by soil pressure when the tank is empty. The soil load is due to approximately 2' of backfill. The reinforcement steel spacing requirement for structural integrity exceeds the spacing requirements for temperature and shrinkage steel.

34. Temperature and shrinkage steel controls the reinforcement steel design.

35. Minimum exterior concrete pit wall thickness is 6".

36. Minimum floor thickness is 5".

37. Minimum concrete cover between the earth and rebar and/or welded wire reinforcement in floor slabs in contact with the earth is 3".

38. Minimum concrete cover between the interior surface of the wall and vertical rebar in the walls is 2". Minimum concrete cover between the interior surface of the wall and horizontal rebar in the wall is 1-1/2".

39. Rebar specifications and spacing for the sidewalls and endwalls of the concrete tank are:
    - Vertical reinforcement steel; #4, Grade 60 rebars at 18.0" (max.) on-center spacing or #5, Grade 60 rebars at 18.0" (max.) on-center spacing
    - Horizontal reinforcement steel; #4, Grade 60 rebars at 16" (max.) on-center spacing or #5, Grade 60 rebars at 18.0" (max.) on-center spacing.

40. Rebar specifications and spacing for the interior concrete tank dividing walls are:
    - Vertical reinforcement steel; #4, Grade 60 rebars at 18.0" (max.) on-center spacing or #5, Grade 60 rebars at 18.0" (max.) on-center spacing
    - Horizontal reinforcement steel; #4, Grade 60 rebars at 16" (max.) on-center spacing or #5, Grade 60 rebars at 18" (max.) on-center spacing.

41. Welded wire reinforcement specifications for the floor slabs are:
    - 6 x 6, #6 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 64' on center, or
    - 6 x 6, #10 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 31'on center, or
    - 6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 42' on center, or
    - 6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 20'on center

42. Footings (footers) are designed to carry the bearing load from walls. Wall footers are continuous footers centered under the walls.

    Footers for walls are:
    - 24" wide x 8" thick continuous footers for the 6" outside wall.
    - 16" wide x 8" thick continuous footers for the interior 6" thick manure storage partition walls.

Gestation building, 10P

43. Design loads for the concrete tank sidewalls, concrete tank end walls, and the manure pump out sidewalls (perpendicular to the concrete tank walls) are due to lateral earth pressures. The lateral earth pressure (soil load) was assumed to be 100 psf per foot of depth (NRCS-313; Table 4 – Minimum Lateral Earth Pressure Values"). No vehicle surcharge load is included in the design of the concrete tank sidewalls, concrete tank end walls, and manure pump out sidewalls. No vehicle loads are required since vehicle traffic and activities do not occur within five feet of the side walls due to the placement of the manure pump outs and feed bins, within five feet of the end walls due to air intake plenum placement, and within five feet of the manure pump out side walls due to the orientation and placement of the manure pump outs.

44. Design loads for the front face of the manure pump outs are due to lateral earth pressures and vehicle loads. The lateral earth pressure (soil load) was assumed to be 100 psf per foot of depth for the soil pressure (NRCS-313; Table 4 – "Minimum Lateral Earth Pressure Values"). A uniform vehicle surcharge of 200 psf is assumed for the walls subject to vehicle loads within five (5) feet of the wall (MWPS-36, Rectangular Concrete Manure Storages, second edition). The front face of the manure pump out (parallel to the concrete sidewall) is assumed to be subject to a vehicle load and the vehicle surcharge is included in the design.

45. The manure storage tanks will be below ground, so the design is controlled by soil pressure and vehicle surcharge, where applicable, when the tank is empty.

46. Minimum exterior concrete pit wall thickness is 10".

47. Minimum floor thickness is 5".

48. Minimum concrete cover between the earth and rebar and/or welded wire reinforcement in floor slabs in contact with the earth is 3”.

49. Minimum concrete cover between the interior surface of the wall and vertical rebar in the walls is 2”. Minimum concrete cover between the interior surface of the wall and horizontal rebar in the wall is 1-1/2”.

50. Rebar specifications and spacing for the principle sidewalls and endwalls of the concrete tank are:
    - Vertical reinforcement steel; #5, Grade 60 rebars at 12.0” (max.) on-center spacing or #4, Grade 60 rebars at 7.5” (max.) on-center spacing
    - Horizontal reinforcement steel; #5, Grade 60 rebars at 15” on-center spacing or #4, Grade 60 rebars at 9.75” on-center spacing.

51. Rebar specifications and spacing for the manure pumpout sidewalls (perpendicular to the principle concrete tank sidewalls) are:
    - Vertical reinforcement steel; #5, Grade 60 rebars at 12.0” (max.) on-center spacing or #4, Grade 60 rebars at 7.5” (max.) on-center spacing
    - Horizontal reinforcement steel; #5, Grade 60 rebars at 15” on-center spacing or #4, Grade 60 rebars at 9.75” on-center spacing.

52. Rebar specifications and spacing for the manure pumpout front face (parallel to the concrete tank sidewall) to withstand the vehicle surcharge are:
    - Vertical reinforcement steel; #5, Grade 60 rebars at 11.25” on-center spacing or #4, Grade 60 rebars at 7.0” on-center spacing
    - Horizontal reinforcement steel; #5, Grade 60 rebars at 15” on-center spacing or #4, Grade 60 rebars at 9.75” on-center spacing.

53. Welded wire reinforcement specifications for the floor slabs are:
    - 6 x 6, #6 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 64’ on center, or
    - 6 x 6, #10 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 31’on center, or
    - 6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 42’ on center, or
    - 6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 20’on center

54. Top of the wall support in the sidewalls is provided by the bearing surface of the slats. No additional top of wall reinforcement is necessary to provide top of wall support. A design lateral earth pressure (soil load) of 100 psf per foot of depth (NRCS-313; Table 4 – Minimum Lateral Earth Pressure Values”) was assumed to determine the sidewall design. No vehicle traffic occurs within five feet of the sidewalls. Therefore, no vehicle surcharge load is included in the sidewall design.

55. Top of the wall support in the end walls is provided by the lintels and side supports of the gang slats. The lintels are typically spaced ten (10’) feet on center. Gang slats are placed against the end wall providing lateral top of wall support. The gang slats are typically ten (10’) feet long and have support beam cross members at either five (5’) feet or ten (10’) feet on center. To be conservative it is assumed that the slat support is ten (10’) feet on center.

    A design soil load pressure of 100 psf per foot of depth (NRCS-313; Table 4 – “Minimum Lateral Earth Pressure Values”) was assumed to determine adequate end wall lateral top support. No vehicle traffic occurs within five feet of the end walls. Therefore, no vehicle surcharge load is applied in the end wall top of wall beam design. Four (4) #5, Grade 60 rebar spaced 3.5 inches on center or six (6) #4, Grade 60 rebar spaced 2” on-center are placed in the upper 14" of the wall to provided adequate top of wall lateral support. The top of wall beam is centered on the lintel support beam.

56. Columns are spaced 12' on-center. Lintels spanning between columns are 8"x 10"x 12' concrete beams supporting the concrete slats. Support columns for the lintels and concrete slats are either:
    - 12"x12" square columns The 12"x12" square columns are reinforced with 4 - #5 vertical rebars tied with #3 rebar every 12" or 4-#4 vertical rebar tied with #3 rebar every 12". Columns are secured to the floor by extending the reinforcement steel into the floor slab or securing a dowel rebar in the floor slab and tying the reinforcement steel to the dowel rebar.
    - 14" diameter round columns. The 14" diameter round columns are designed as 11"x11" square columns and are reinforced with 4 - #5 vertical rebars tied with #3 rebar every 12" or 4-#4 vertical rebar tied with #3 rebar every 12". Columns are secured to the floor by extending the reinforcement steel into the floor slab or securing a dowel rebar in the floor slab and tying the reinforcement steel to the dowel rebar.
    - 12"x16" masonry concrete columns. The masonry concrete columns are reinforced with a continuous rebar in each core of the block column. The continuous rebar can be either #4 or #5 rebar. Columns are secured to the floor by extending the reinforcement steel into the floor slab or securing a dowel rebar in the floor slab and tying the reinforcement steel to the dowel rebar.
    - See plans for details.

57. Footings (footers) are designed to carry the bearing load from columns and walls. Wall footers are continuous footers centered under the walls. Column footers are square area footers or continuous footers centered under the columns.

    Footers for walls are:
    - 24" wide x 10" thick continuous footers for the 10" outside wall.

    Footers for the columns are:

    <u>Presumptive Soil Bearing Capacity – 1,500 psf</u>
    (NRCS Code 313, Table 3)
    Clay, sandy clay, silty clay, clayey silt, silt, and sandy silt soil types
    (CL, ML, MH, CH)
    - 12" x 12" reinforced concrete columns
        - 58" x 58" x 10" thick square plain concrete footer
        - 66" diameter x 10" thick round plain concrete footer
        - 42" wide x 11" thick continuous plain concrete footer
    - 14" diameter round reinforced concrete columns
        - 58" x 58" x 10" thick square plain concrete footer
        - 66" diameter x 10" thick round plain concrete footer
        - 42" wide x 11" thick continuous plain concrete footer
    - 12" x 16" masonry concrete columns
        - 58" x 58" x 8" thick square plain concrete footer
        - 42" wide x 11" thick continuous plain concrete footer
    - See plans for details.

<u>Presumptive Soil Bearing Capacity – 2,000 psf</u>
(NRCS Code 313, Table 3)
Sand, silty sand, clayey sand, silty gravel, clayey gravel soil types (SW, SP, SM, SC, GM, GC)

- 12” x 12” reinforced concrete columns
  - 46” x 46” x 10” thick square plain concrete footer
  - 50” diameter x 10” thick round plain concrete footer
  - 36” wide x 10” thick continuous plain concrete footer
- 14” diameter round reinforced concrete columns
  - 46” x 46” x 10” thick square plain concrete footer
  - 50” diameter x 10” thick round plain concrete footer
  - 36” wide x 10” thick continuous plain concrete footer
- 12” x 16” masonry concrete columns
  - 46” x 46” x 8” thick square plain concrete footer
  - 36” wide x 9” thick continuous plain concrete footer
- See plans for details.

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

BUILDING DESIGN AND CONSTRUCTION PLANS

BELOW-BUILDING CONCRETE MANURE STORAGE DESIGN PLANS

8P. East Farrowing: 84'-0" x 152'-0" x 2'-0" deep
Building Plans (Plan Sheets 1B-8B)

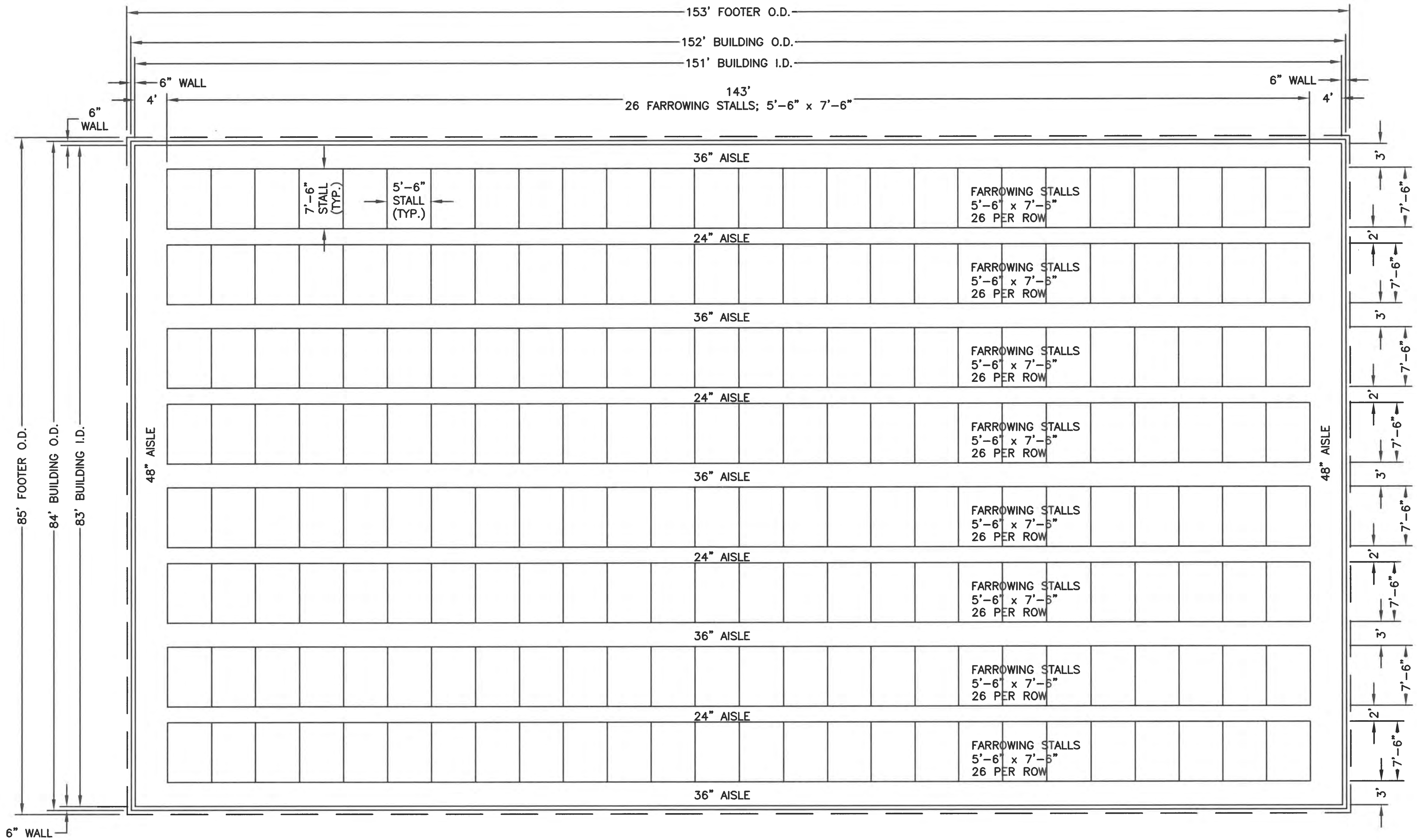
9P. West Farrowing: 64'-0" x 64'-0" x 2'-0" deep
Building Plans (Plan Sheets 1C-8C)

10P. South Gestation: 77'-4" x 417'-4" x 10'-0" deep
Building Plans (Plan Sheets 1D-17D)

Seasonal Water Table Management System – Perimeter Tile
10P. South Gestation (Plan Sheets 1E-5E)

Prepared by:
LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829



FARROWING BUILDING
84'-0" x 152'-0" O.D.
8-ROWS; 26 STALLS PER ROW
208 SOWS AND LITTERS

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

RECEIVED
CONFINED FEEDING OPERATIONS
June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

DRAWING NO: TGP0324-01B

SHEET: 1B of 8B

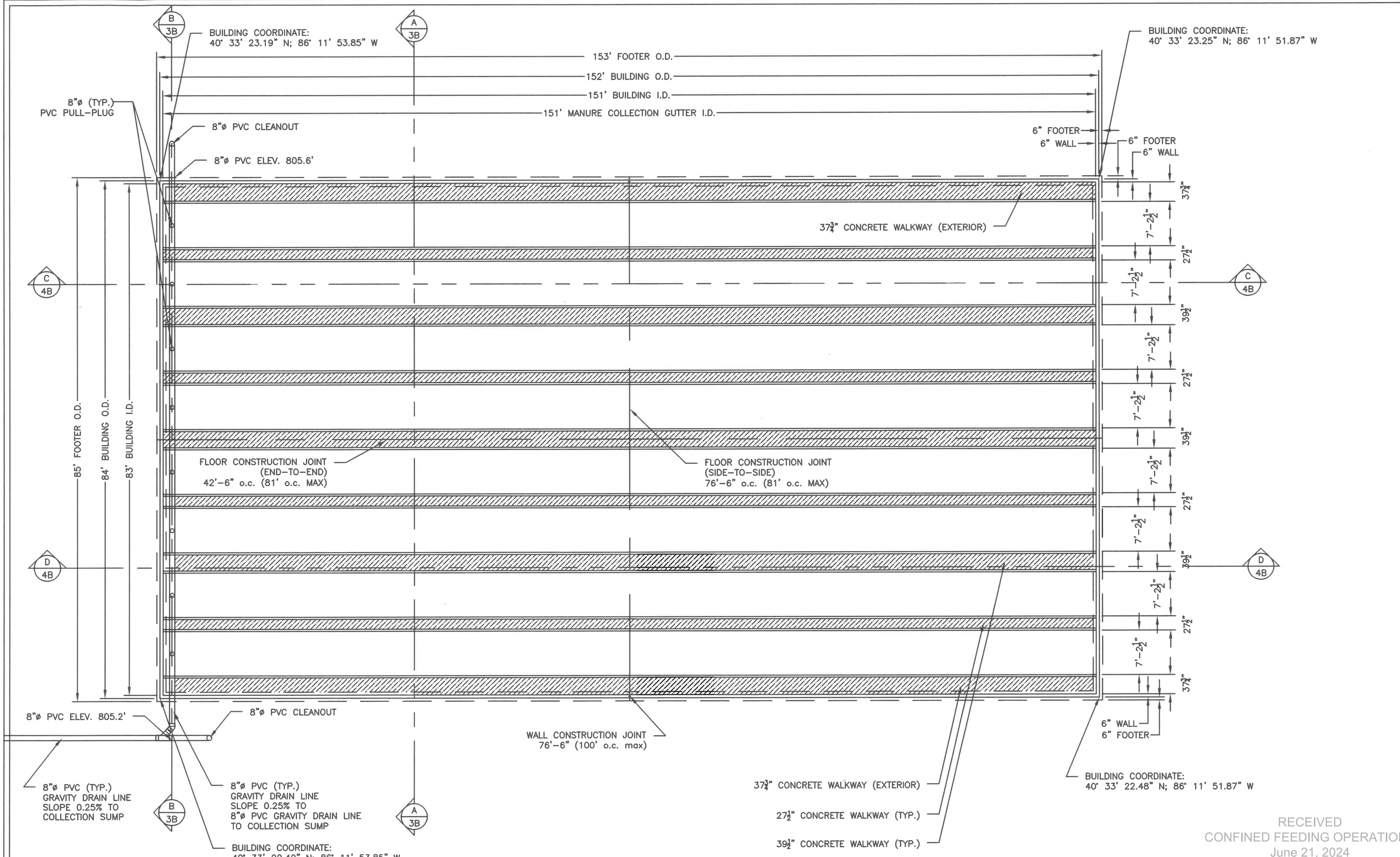
DATE: 06/03/24

DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
FLOOR PLAN
BUILDING 8P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



FARROWING BUILDING
84'-0" x 152'-0" O.D.
8-ROWS; 26 STALLS PER ROW
208 SOWS AND LITTERS

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

RECEIVED
CONFINED FEEDING OPERATIONS
June 21, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

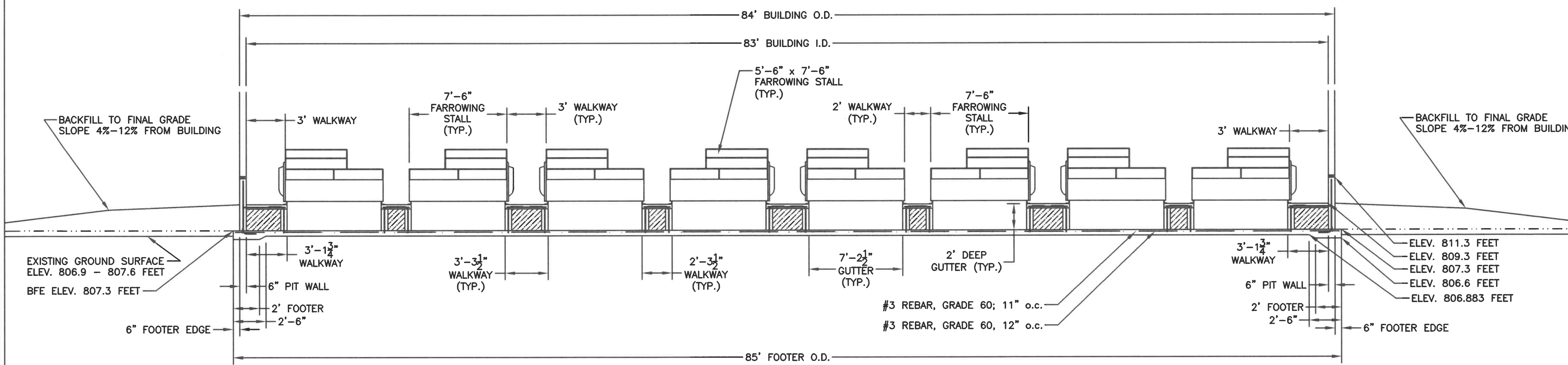
NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

DRAWING NO: TGP0424-02B
SHEET: 2B of 8B
DATE: 06/20/24
DRAWN BY: MV

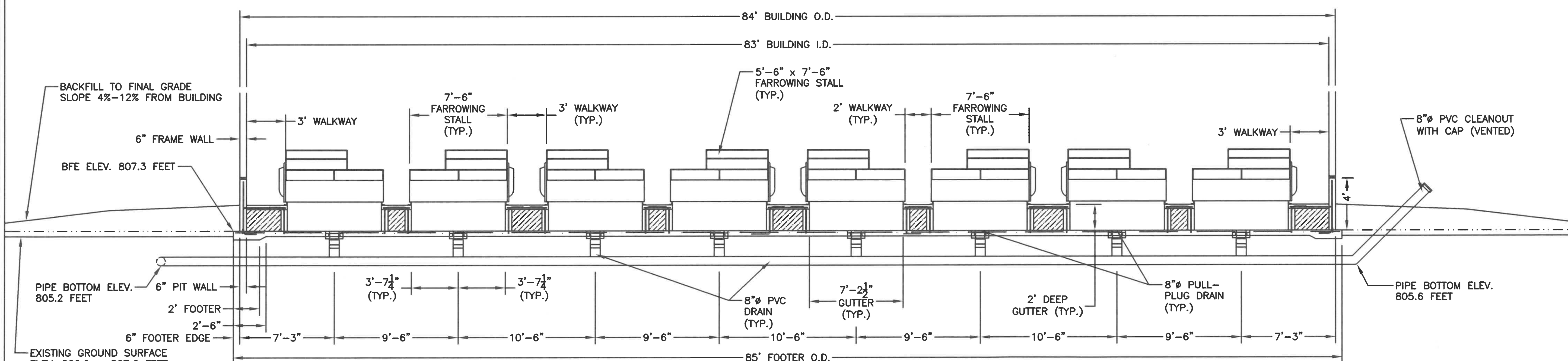
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
FOUNDATION PLAN
BUILDING 8P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



A / 3B CONCRETE PIT CROSS-SECTION
THRU FARROWING STALLS AND COLLECTION GUTTERS



B / 3B CONCRETE PIT CROSS-SECTION
THRU PULL PLUG DRAINS AND COLLECTION GUTTERS

NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

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Office of Land Quality

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Dept. of Environmental Management
Office of Land Quality

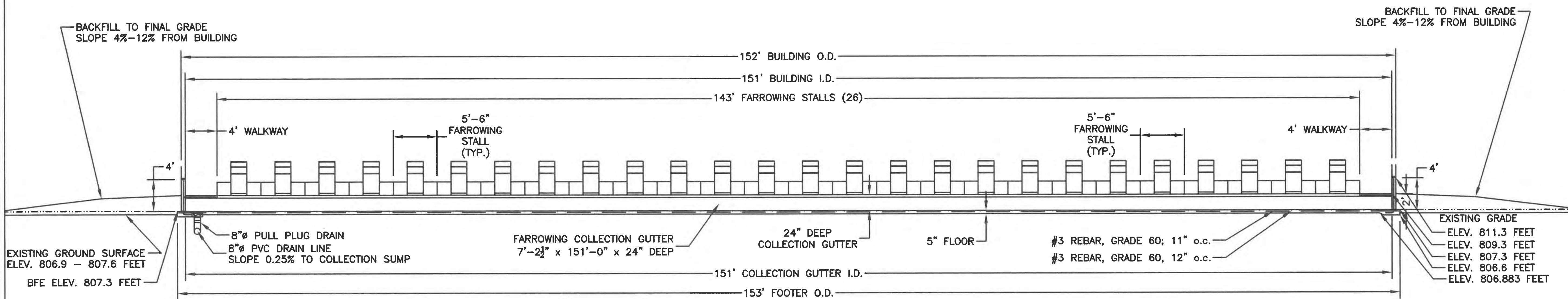
SHEET: 3B of 8B | DRAWING NO: TGP0424- 03B

DATE: 06/20/24 | DRAWN BY: MV

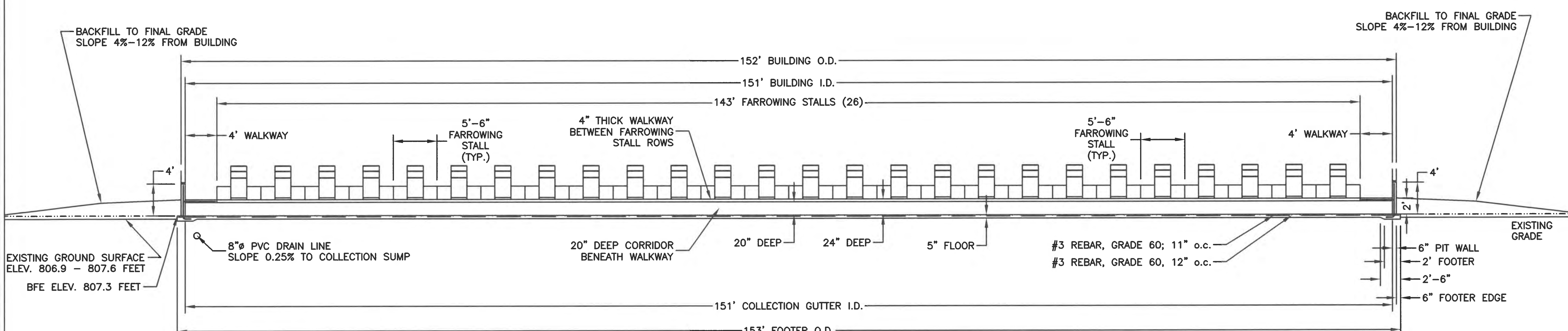
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTION
BUILDING 8P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



C / 4B CONCRETE PIT CROSS–SECTION
SIDE ELEVATION THROUGH DRAIN LINE AND COLLECTION GUTTER



D / 4B CONCRETE PIT CROSS–SECTION
SIDE ELEVATION THROUGH CONCRETE WALKWAY

RECEIVED
CONFINED FEEDING OPERATIONS
June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

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CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

NOTE:
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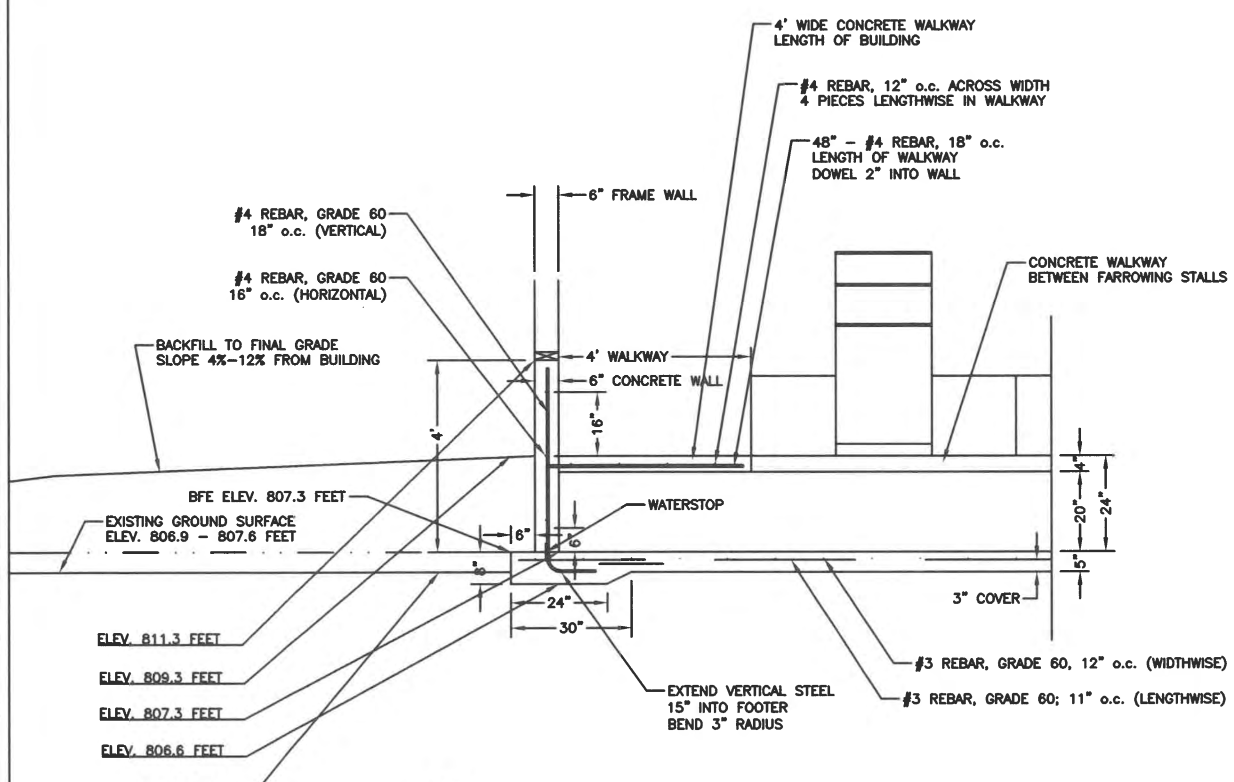
SHEET: 4B of 8B
DRAWING NO: TGP0324– 04B

DATE: 06/03/24
DRAWN BY: MV

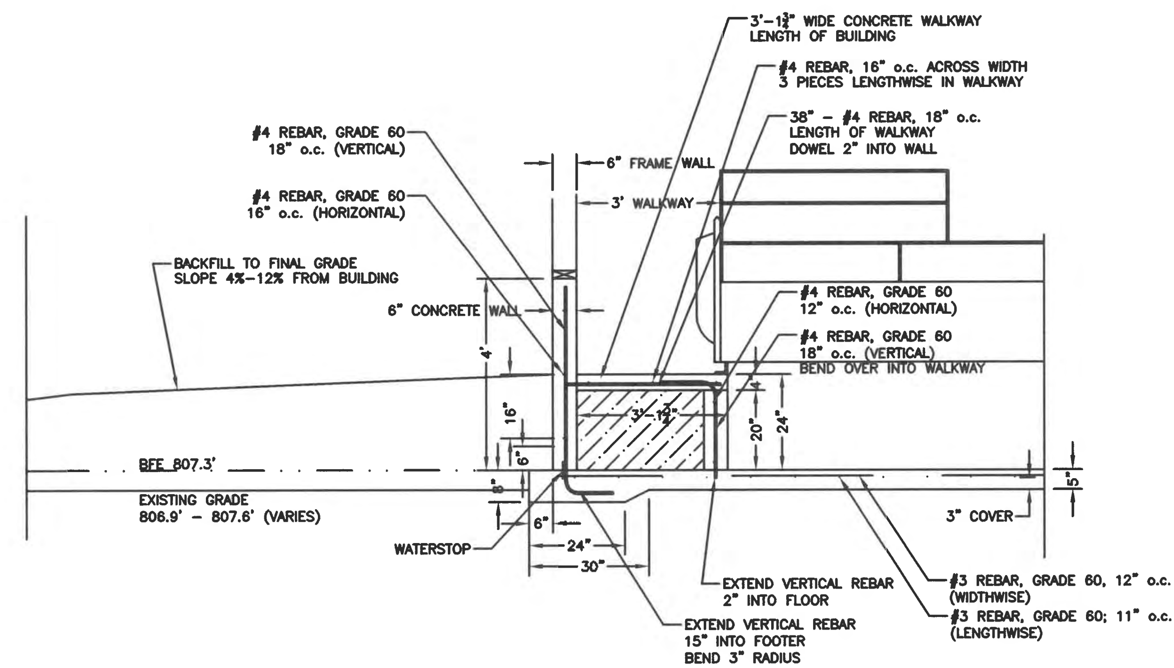
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
SIDE ELEVATION
BUILDING 8P

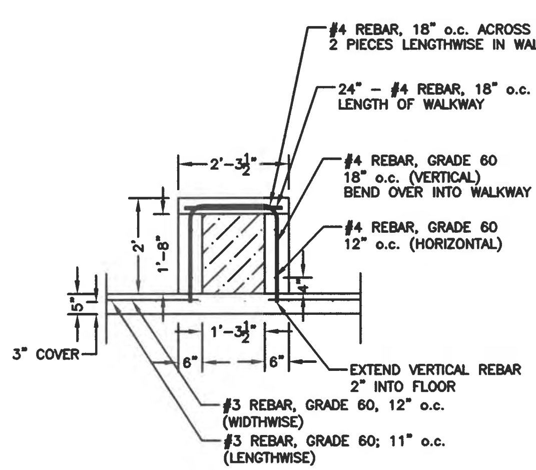
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL–#3713



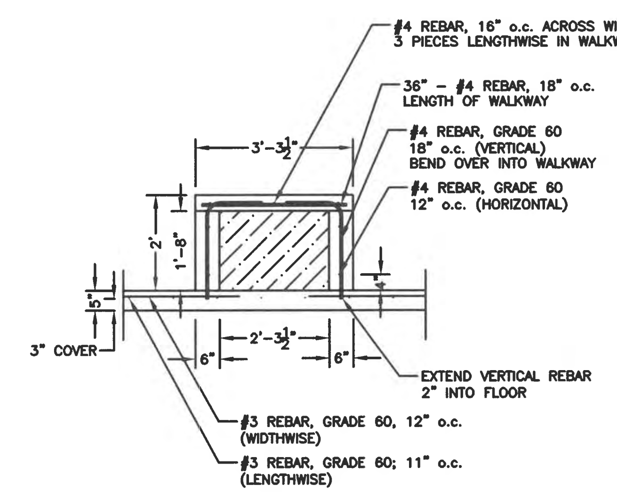
5B CONCRETE PIT END WALL DETAIL
FARROWING COLLECTION GUTTER



5B CONCRETE PIT SIDE WALL DETAIL
FARROWING SIDEWALL



5B CONCRETE WALKWAY DETAIL
2'-3 1/2" CONCRETE WALKWAY (24" NOMINAL)



5B CONCRETE WALKWAY DETAIL
3'-3 1/2" CONCRETE WALKWAY (36" NOMINAL)

FINAL APPROVED
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Dept. of Environmental Management
Office of Land Quality

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Dept. of Environmental Mgmt.
Office of Land Quality

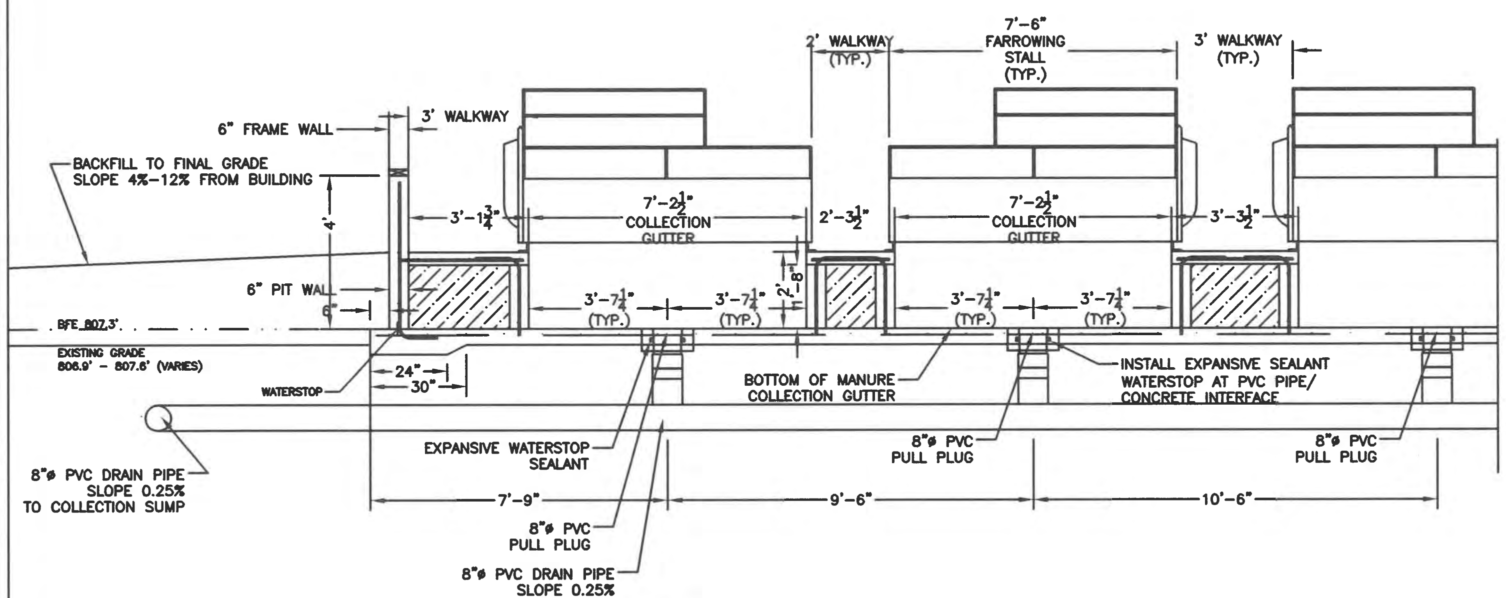
SHEET: 5B of 8B | DRAWING NO: TGP0324-05B

DATE: 06/03/24 | DRAWN BY: MV

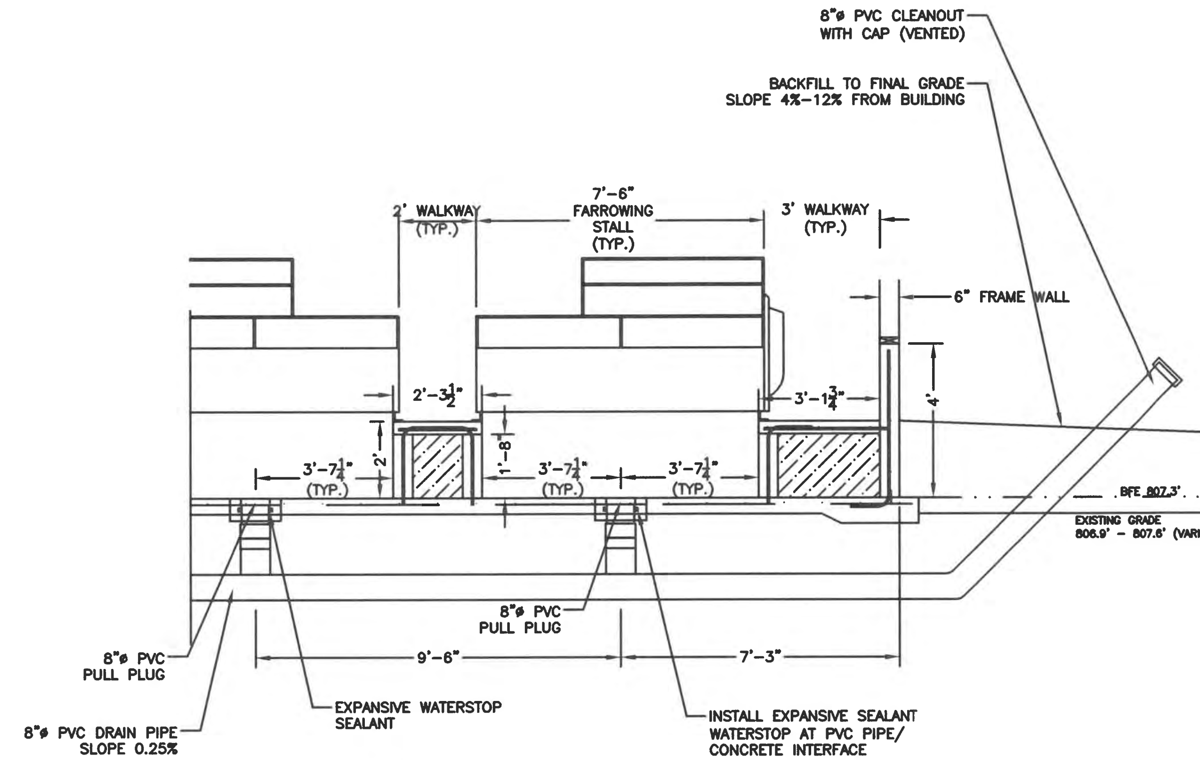
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTIONS
END WALL; SIDEWALL;
WALKWAYS

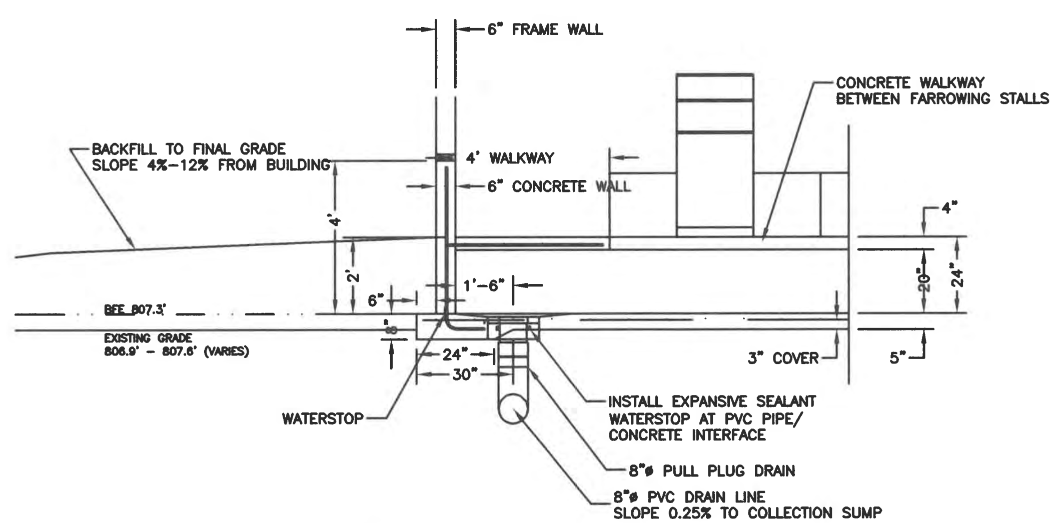
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



6B GRAVITY DRAIN LINE DETAIL
CROSS-SECTION-SOUTH SIDEWALL



6B GRAVITY DRAIN LINE DETAIL
CROSS-SECTION-NORTH SIDEWALL



6B GRAVITY DRAIN LINE DETAILCONCRETE PIT END WALL DETAIL
SIDE ELEVATION-END WALL

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
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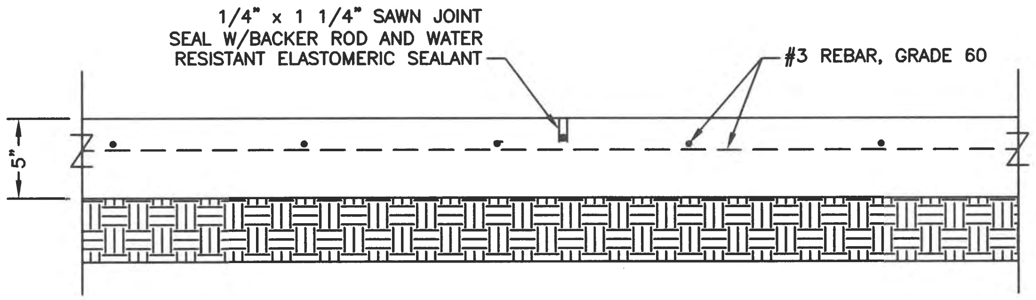
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

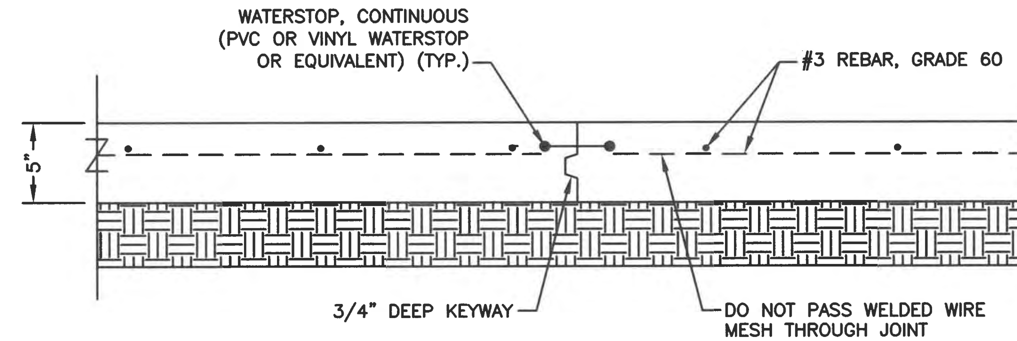
FARROWING BUILDING
CROSS-SECTION
DRAIN DETAILS

DATE: 06/03/24 | DRAWN BY: MV | SHEET: 6B of 8B | DRAWING NO: TGP0324- 06B

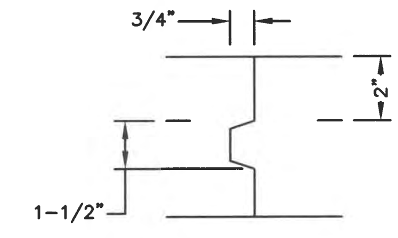
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143



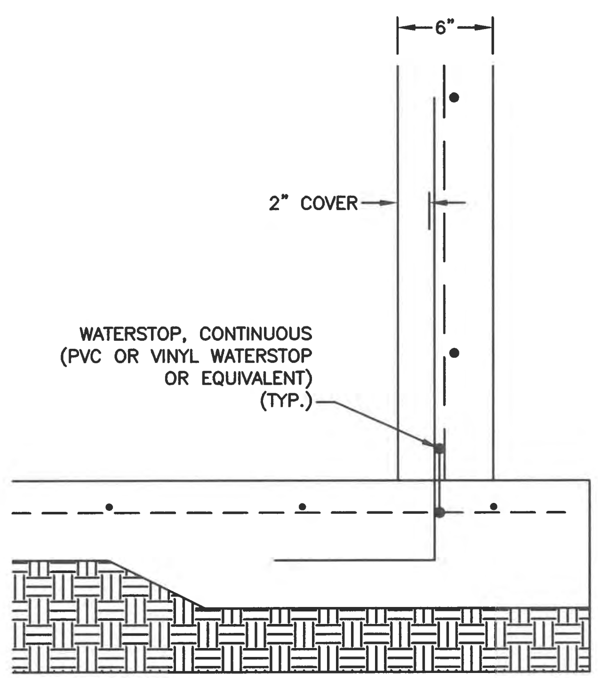
SAWN CONSTRUCTION JOINT WITH #3 REBAR REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 81'–0" SPACING (MAX.)



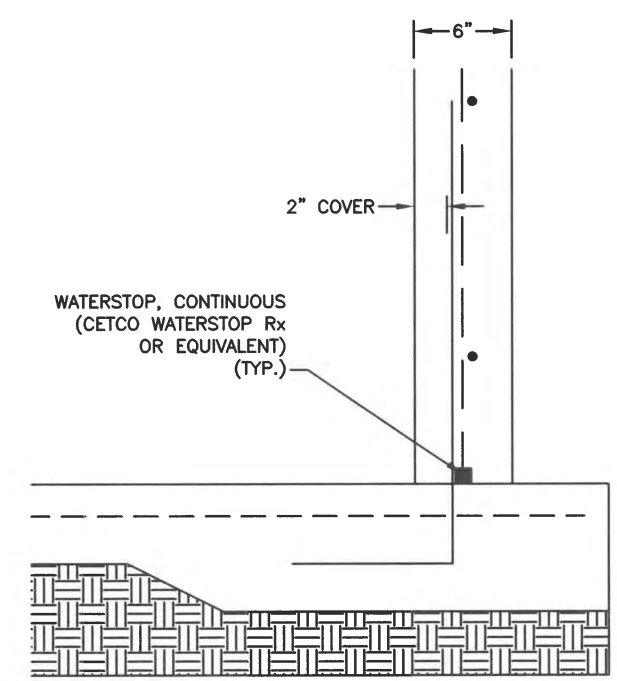
PVC OR VINYL WATERSTOP WITH #3 REBAR REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 81'–0" SPACING (MAX.)



KEYWAY DETAIL



PVC OR VINYL WATERSTOP



COLLOIDAL WATERSTOP

WALL FOOTER DETAIL OPTIONS – 6" WALL

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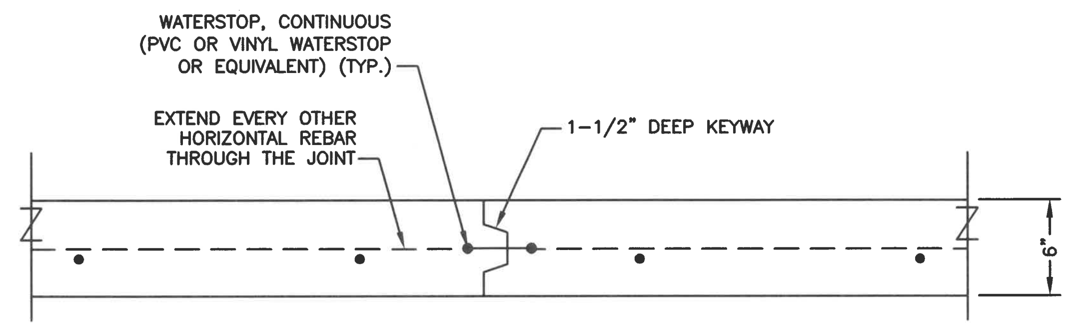
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL–#3713

FLOOR DETAILS, JOINT AND
WATERSTOP DETAILS;
WALL/FOOTER WATERSTOP

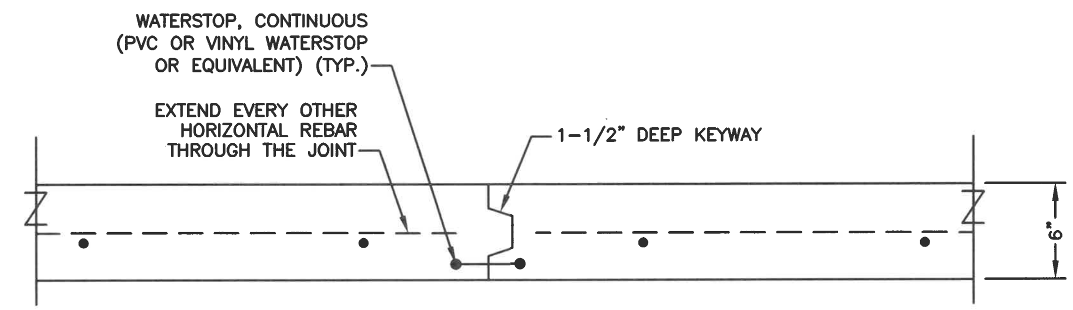
DATE: 06/03/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

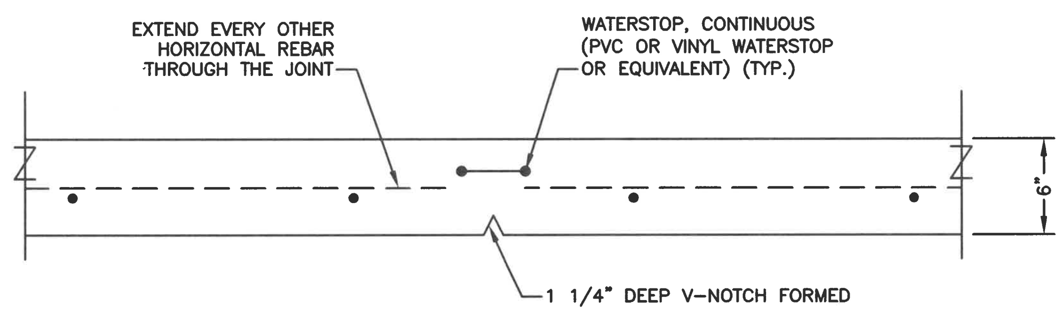
SHEET: 7B of 8B | DRAWING NO: TGP0324–07B



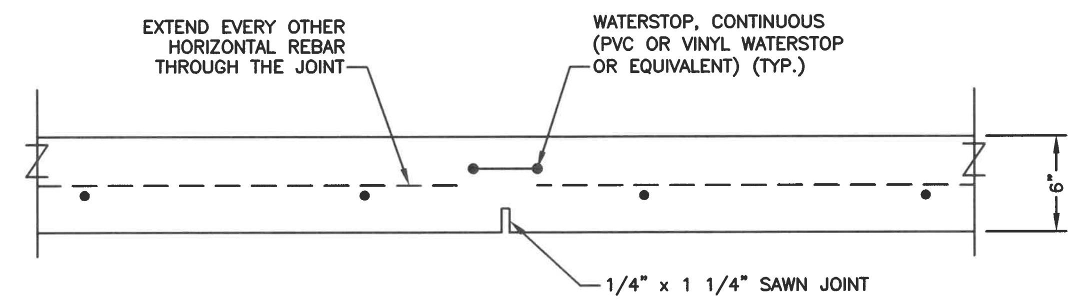
WATERSTOP PLACED IN MIDDLE OF KEYWAY FORM
SPLIT FORM AND PLACE WATERSTOP BETWEEN
TWO HALVES OF FORM



WATERSTOP PLACED OUTSIDE KEYWAY FORM
PLACE WATERSTOP AT LEAST 1-1/2"
FROM WALL

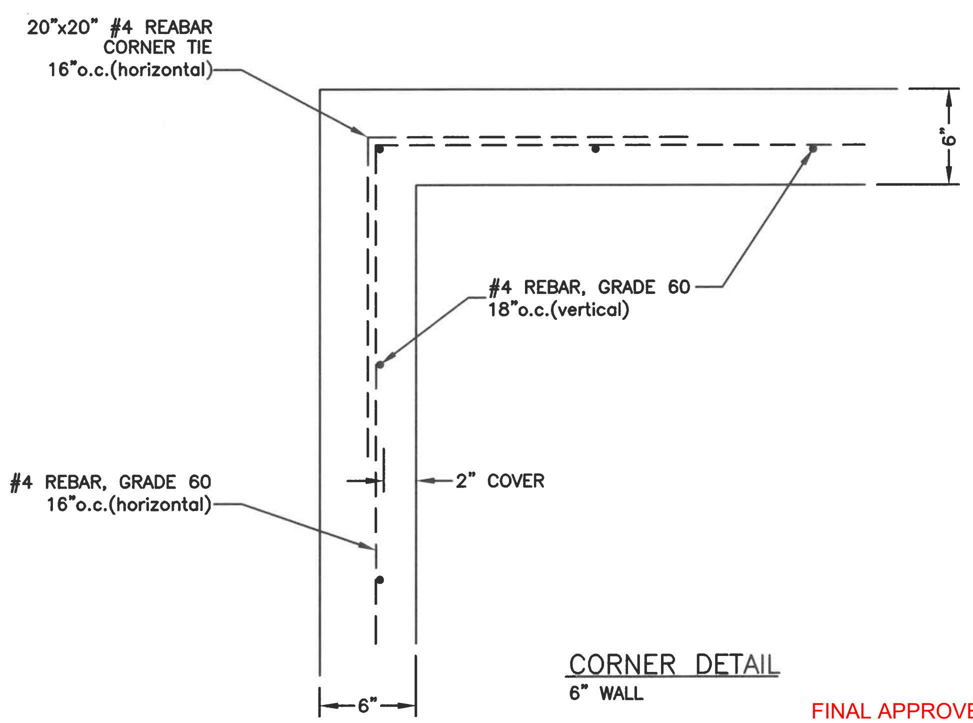


WATERSTOP PLACED IN MIDDLE OF WALL
1-1/4" DEEP x 1-1/4" WIDE 'V'-NOTCH
GROOVE FORMED IN THE WALL



WATERSTOP PLACED IN MIDDLE OF WALL
SAWN JOINT IS CUT INTO THE WALL

WALL CONSTRUCTION JOINT OPTIONS
PVC OR VINYL WATERSTOP



CORNER DETAIL
6" WALL

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Dept. of Environmental Management
Office of Land Quality

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June 4, 2024
Dept. of Environmental Mgmt.
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DRAWING NO: TGP0324- 08B

SHEET: 8B of 8B

DATE: 06/03/24

DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

WALL AND JOINT DETAILS
WATERSTOP OPTIONS
CORNER REINFORCEMENT

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

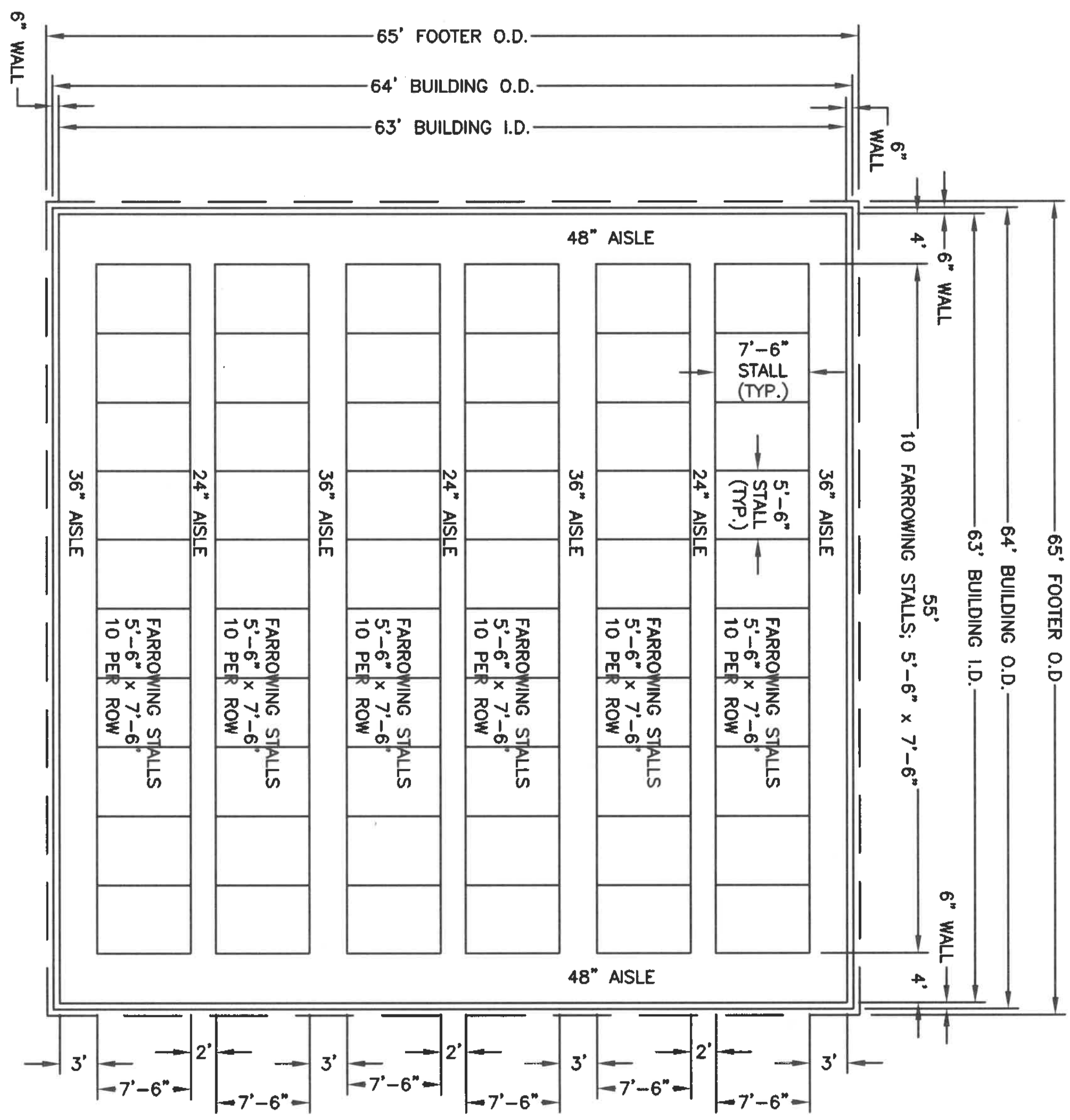
BUILDING DESIGN AND CONSTRUCTION PLANS

BELOW-BUILDING CONCRETE MANURE STORAGE DESIGN PLANS

9P. West Farrowing: 64'-0" x 64'-0" x 2'-0" deep
Building Plans (Plan Sheets 1C-8C)

Prepared by:
LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829



FARROWING BUILDING
64'-0" x 64'-0" O.D.
6-ROWS; 10 STALLS PER ROW
60 SOWS AND LITTERS

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

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June 4, 2024
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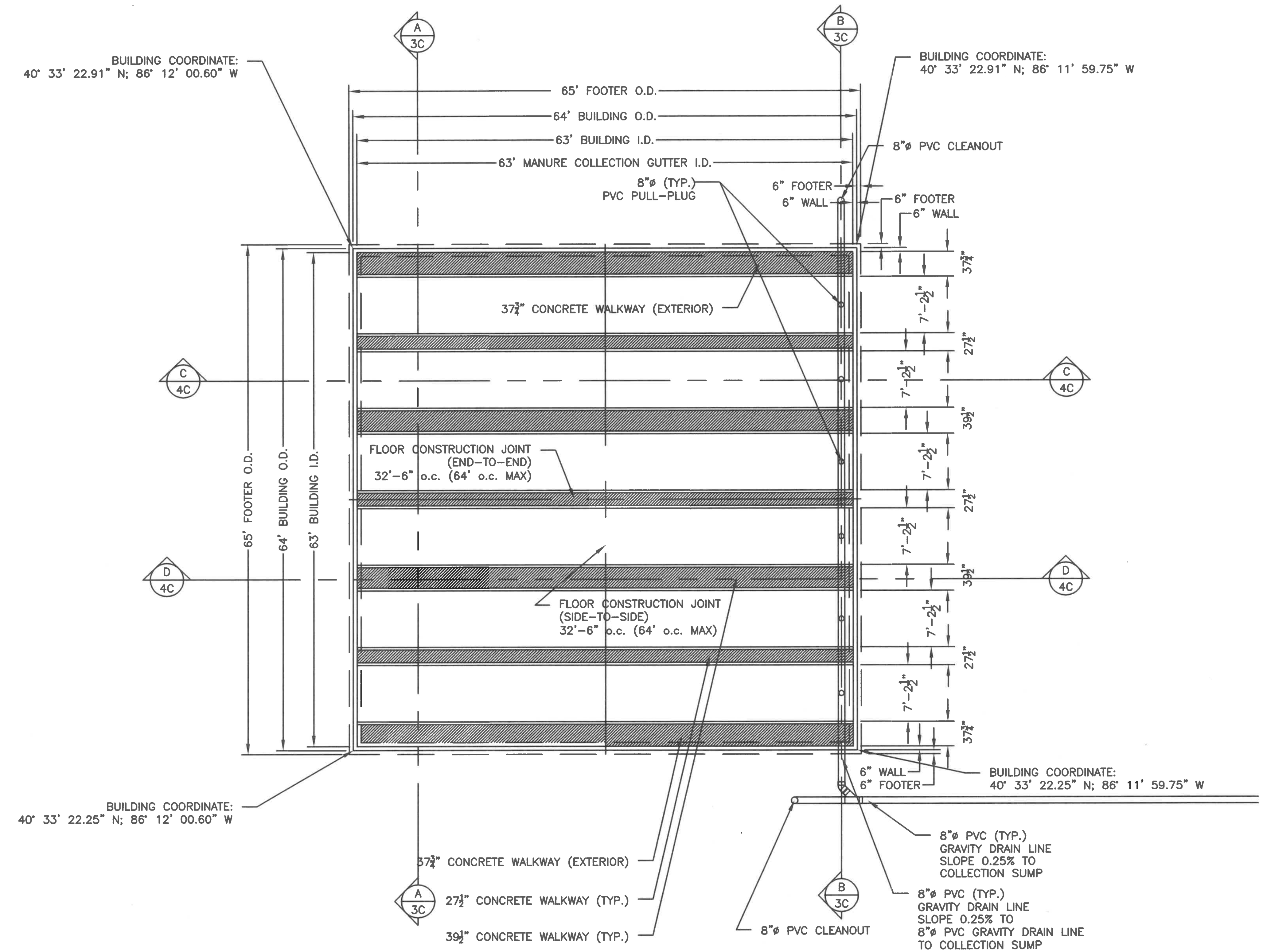
TOP GRADE PRODUCTION LLC 2667 E STATE ROAD 18 KOKOMO, INDIANA 46901 2024 CFO RENEWAL-#3713	WEST FARROWING BUILDING FLOOR PLAN BUILDING 9P	DATE: 06/03/24 DRAWN BY: MV LIVESTOCK ENGINEERING SOLUTIONS, INC. MICHAEL A. VEENHUIZEN 2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143	SHEET: 1C of 8C DRAWING NO: TGP0324- 01C THE IDEAS, DESIGNS, AND DRAWINGS REPRESENTED HERE ARE THE PROPERTY OF LIVESTOCK ENGINEERING SOLUTIONS, INC. REPRODUCTION OR USE, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF LIVESTOCK ENGINEERING SOLUTIONS, INC. IS PROHIBITED.



FARROWING BUILDING
64'-0" x 64'-0" O.D.
6-ROWS; 10 STALLS PER ROW
60 SOWS AND LITTERS

NOTE:
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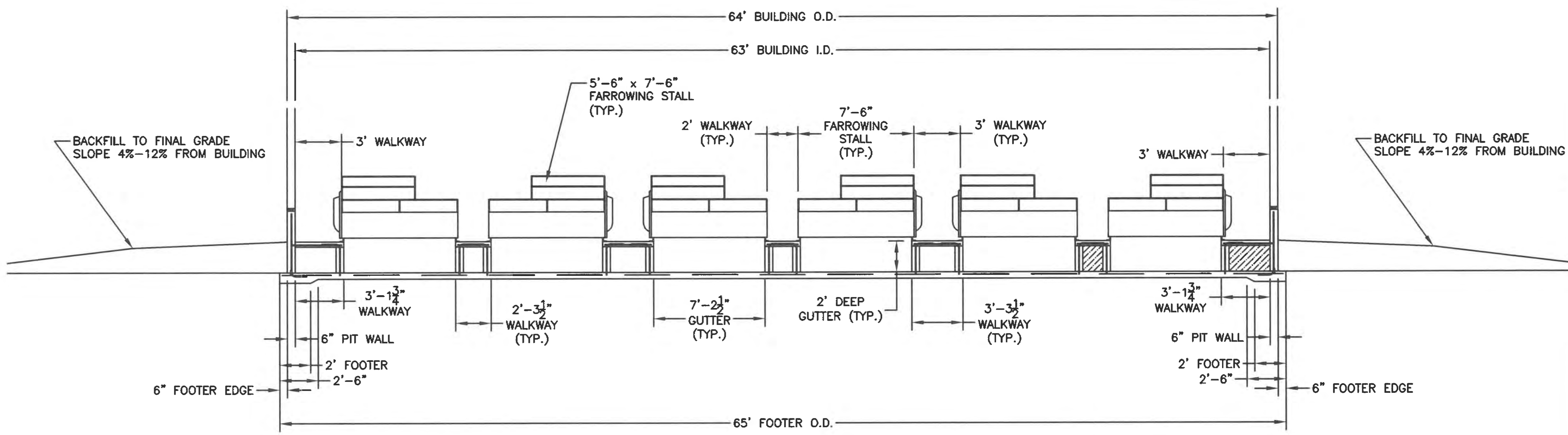
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

FARROWING BUILDING
FOUNDATION PLAN
BUILDING 9P

DATE: 06/28/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

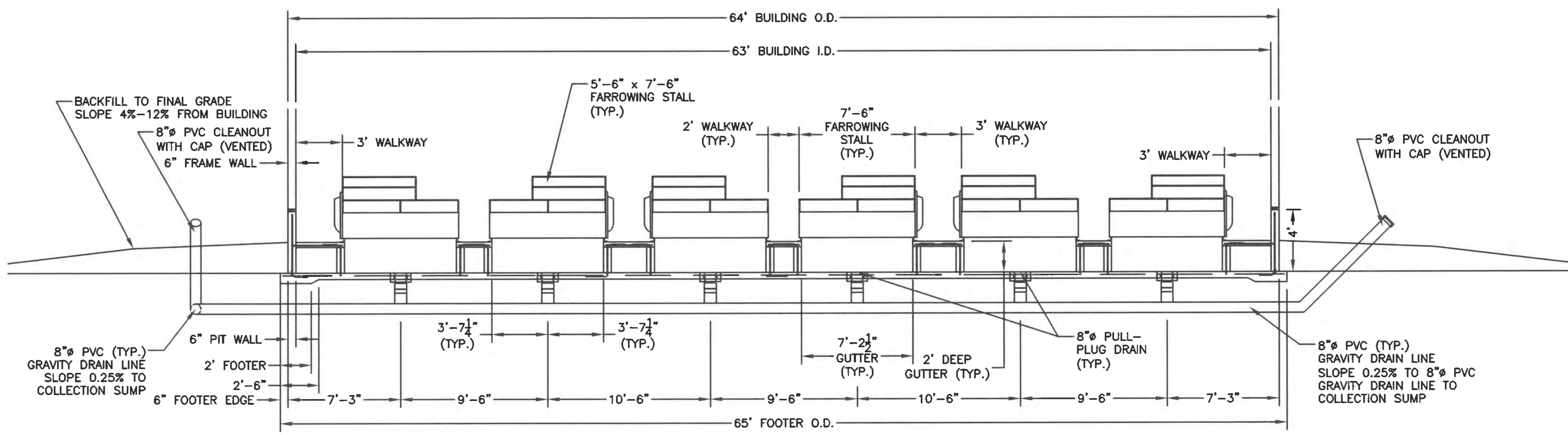
SHEET: 2C of 8C | DRAWING NO: TGP0524- 02C



A
3C

CONCRETE PIT CROSS-SECTION

THRU FARROWING STALLS AND COLLECTION GUTTERS



B
3C

CONCRETE PIT CROSS-SECTION

THRU PULL PLUG DRAINS AND COLLECTION GUTTERS

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June 4, 2024
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Dept. of Environmental Management
Office of Land Quality

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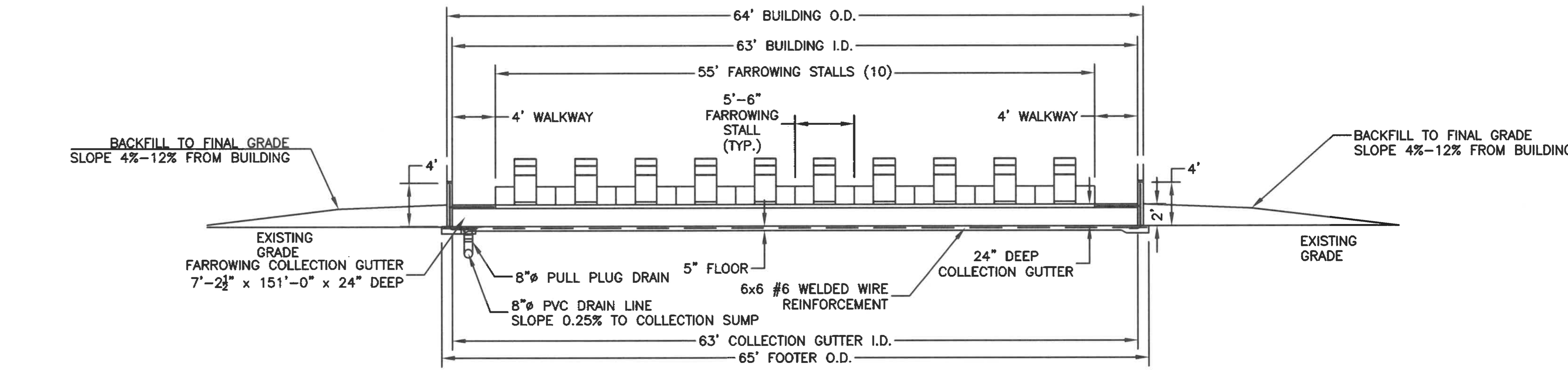
SHEET: 3C of 8C | DRAWING NO: TGP0324-03C

DATE: 06/03/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

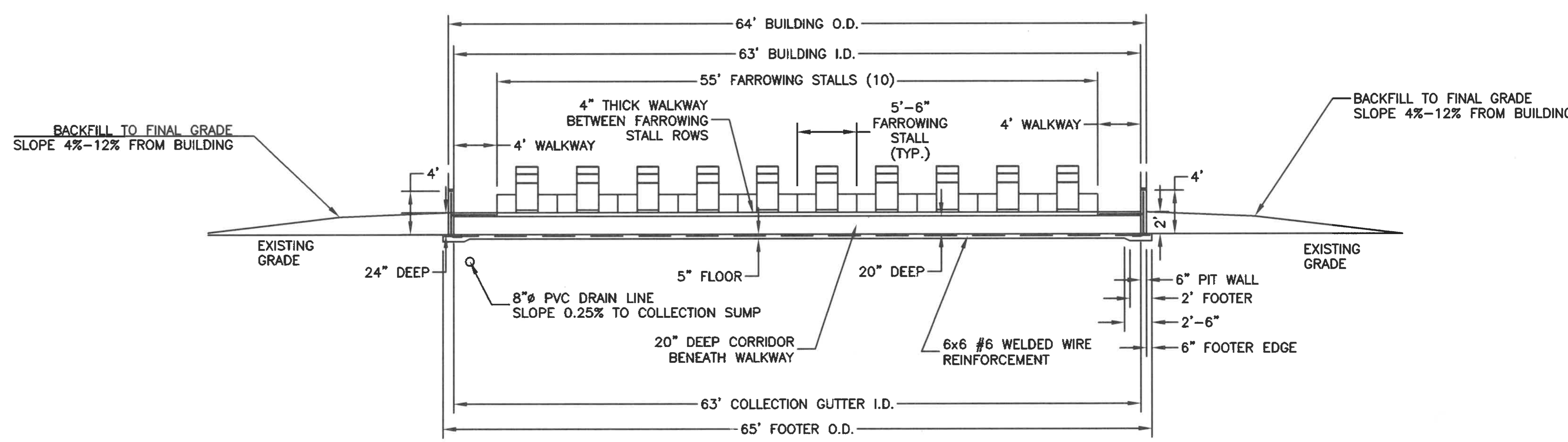
FARROWING BUILDING
CROSS-SECTION
BUILDING 9P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



C / 4C CONCRETE PIT CROSS-SECTION

SIDE ELEVATION THROUGH DRAIN LINE AND COLLECTION GUTTER



D / 4C CONCRETE PIT CROSS-SECTION

SIDE ELEVATION THROUGH CONCRETE WALKWAY

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June 4, 2024
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CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

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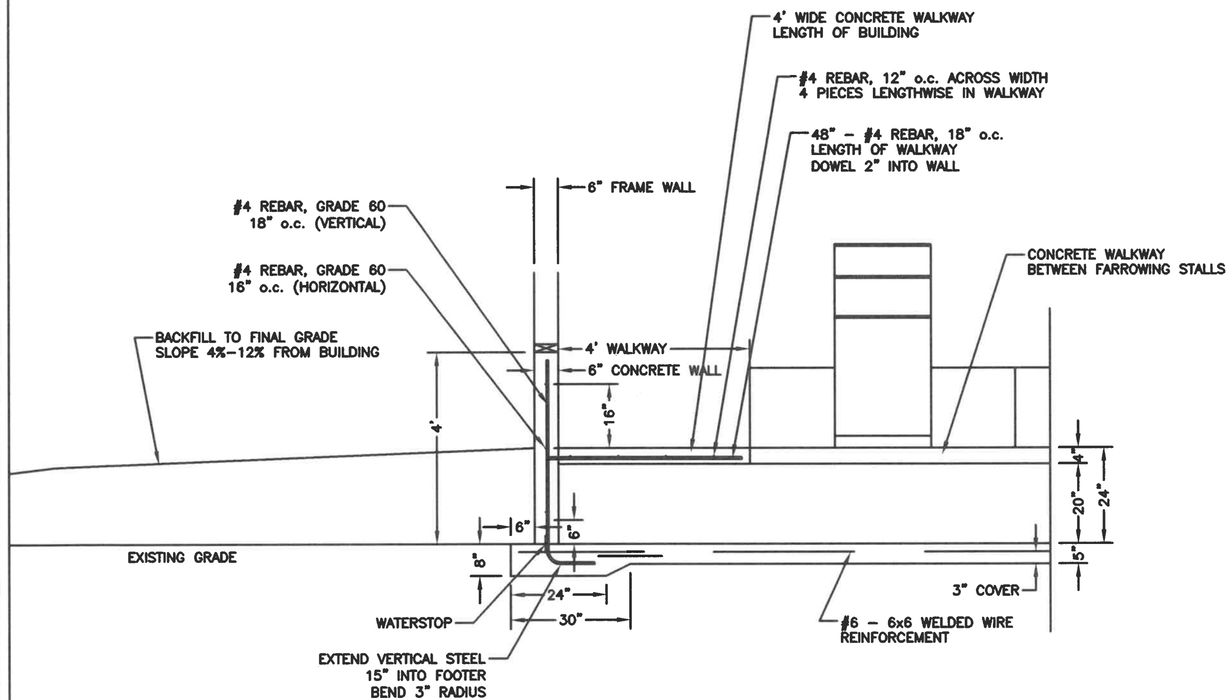
SHEET: 4C of 8C | DRAWING NO: TGP0324- 04C

DATE: 06/03/24 | DRAWN BY: MV

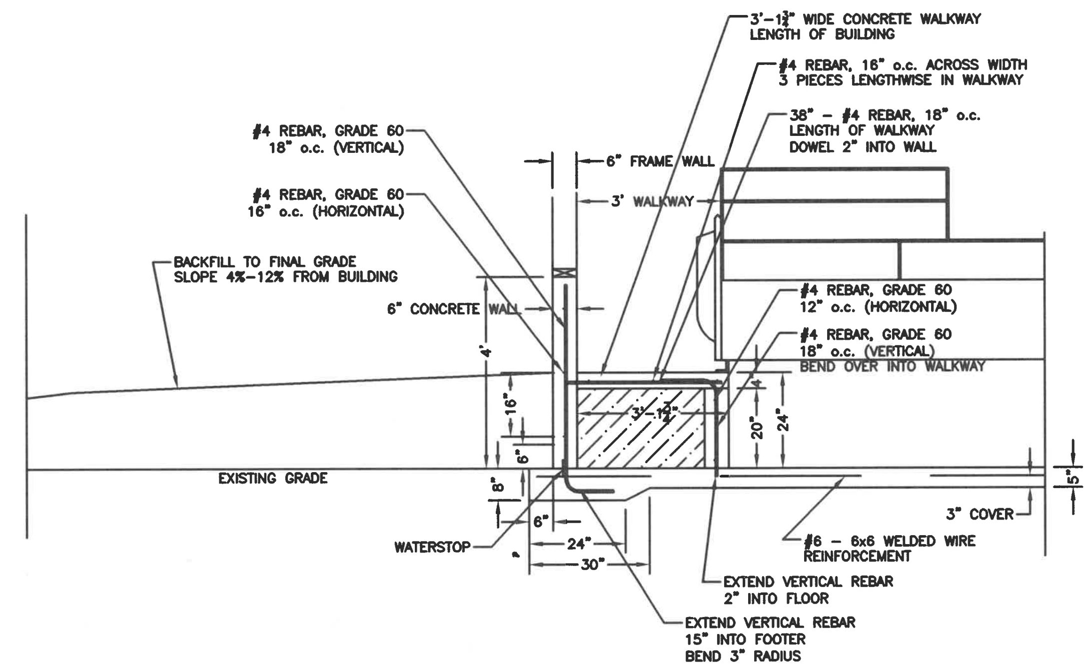
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
SIDE ELEVATION
BUILDING 9P

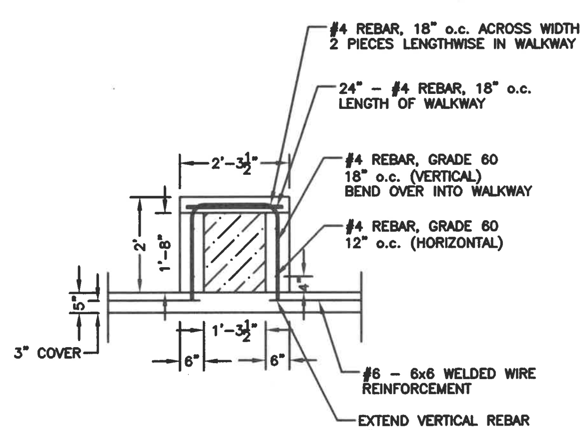
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



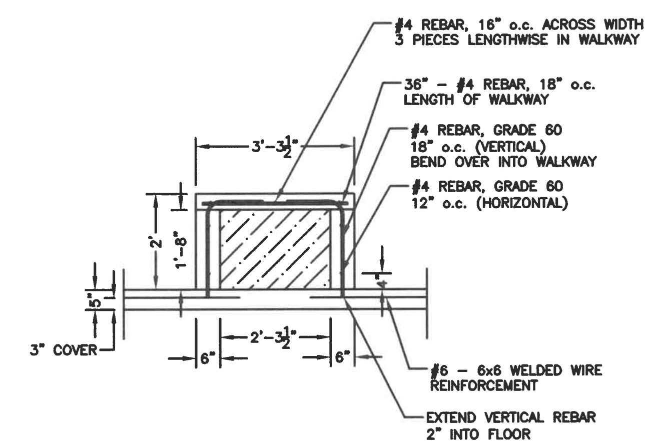
5C CONCRETE PIT END WALL DETAIL
FARROWING COLLECTION GUTTER



5C CONCRETE PIT SIDE WALL DETAIL
FARROWING SIDEWALL



5C CONCRETE WALKWAY DETAIL
2'-3 1/2" CONCRETE WALKWAY (24" NOMINAL)



5C CONCRETE WALKWAY DETAIL
3'-3 1/2" CONCRETE WALKWAY (36" NOMINAL)

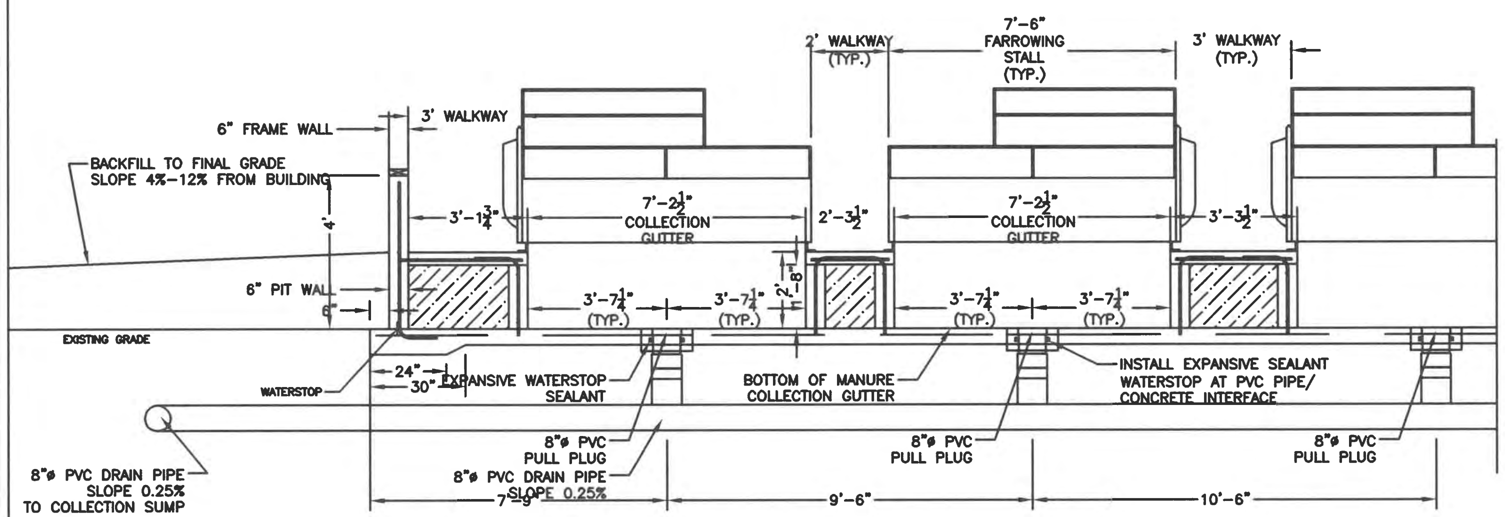
SHEET: 5C of 8C | DRAWING NO: TGP0324-05C

DATE: 06/03/24 | DRAWN BY: MV

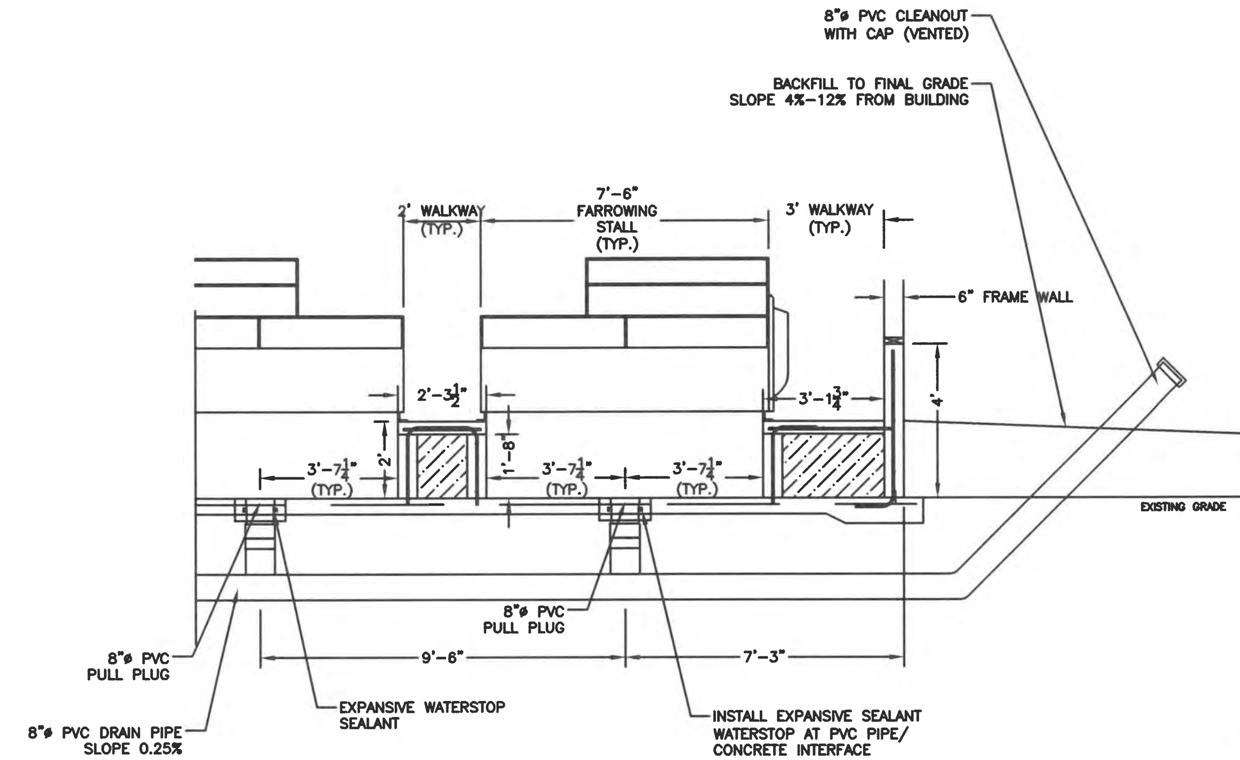
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTIONS
END WALL; SIDEWALL;
WALKWAYS

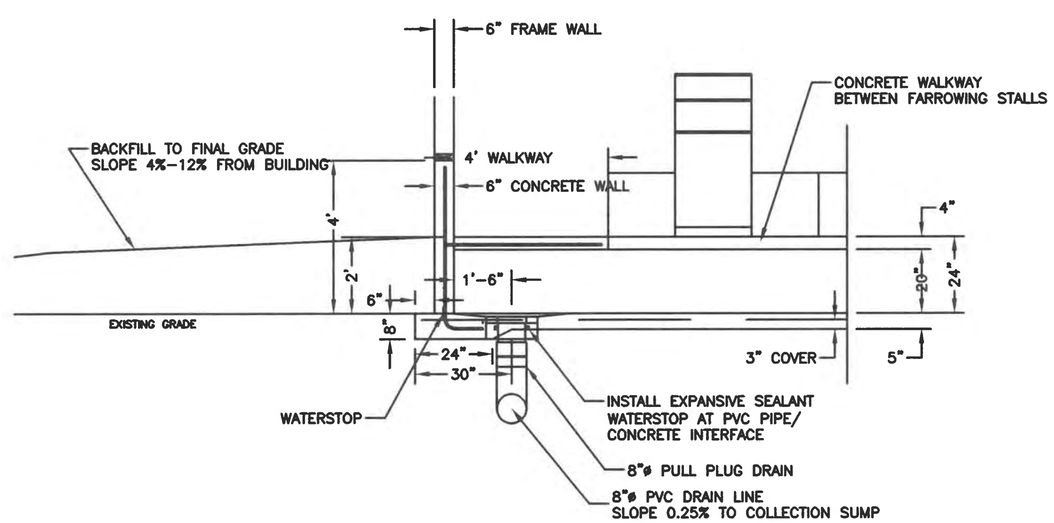
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



6C GRAVITY DRAIN LINE DETAIL
CROSS-SECTION-SOUTH SIDEWALL



6C GRAVITY DRAIN LINE DETAIL
CROSS-SECTION-NORTH SIDEWALL



6C GRAVITY DRAIN LINE DETAILCONCRETE PIT END WALL DETAIL
SIDE ELEVATION-END WALL

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June 4, 2024
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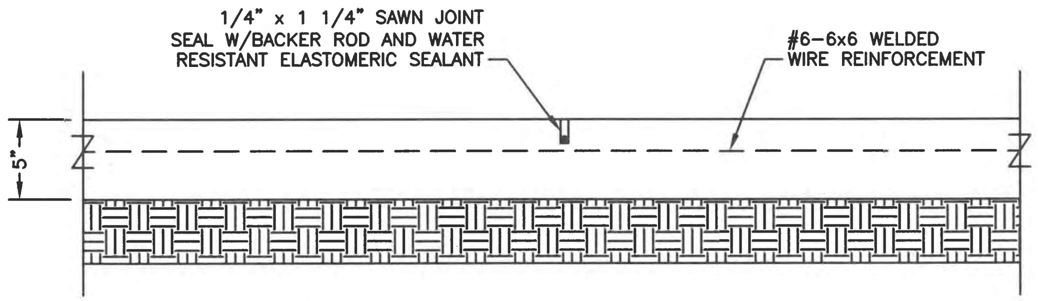
DRAWING NO: TGP0324- 06C
SHEET: 6C of 8C
DRAWN BY: MV
DATE: 06/03/24

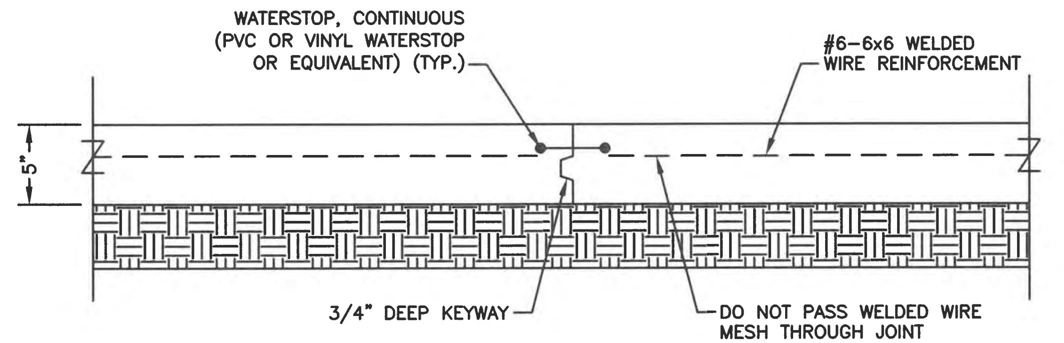
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTION
DRAIN DETAILS

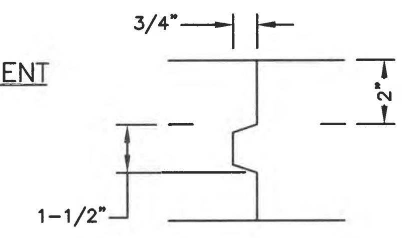
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



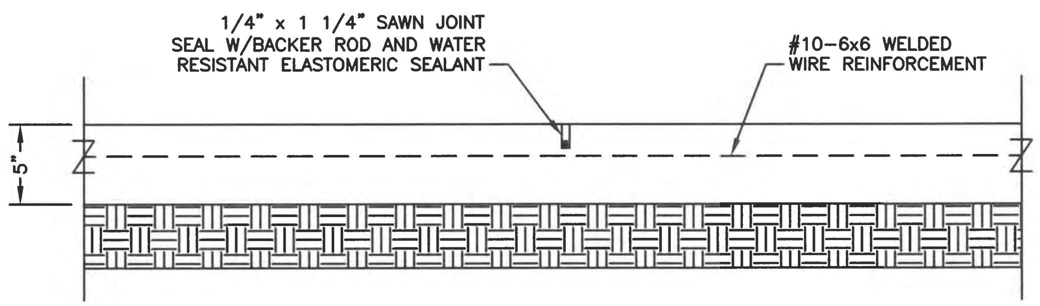
SAWN CONSTRUCTION JOINT WITH #6-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 43'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 64'-0" SPACING (MAX.)



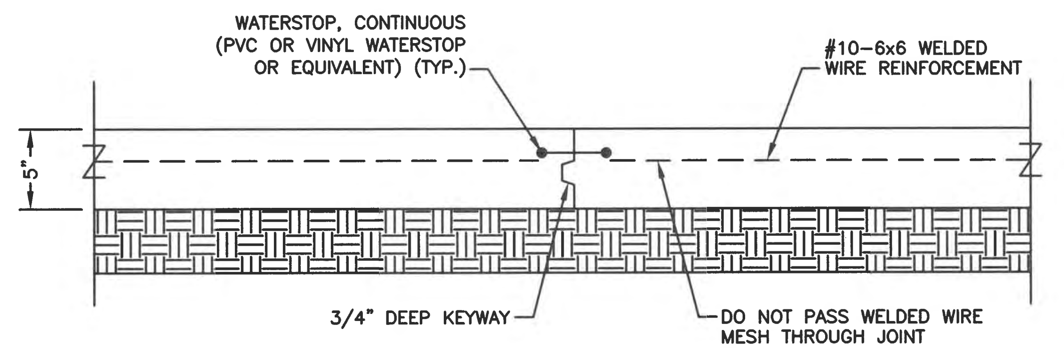
PVC OR VINYL WATERSTOP WITH #6-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 43'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 64'-0" SPACING (MAX.)



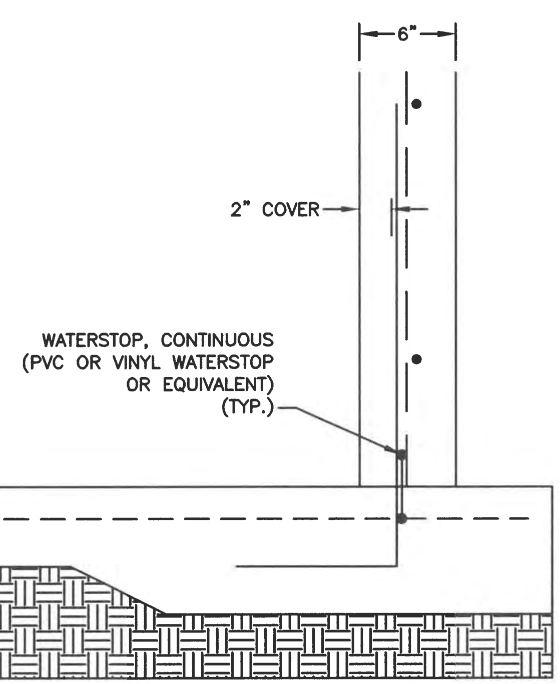
KEYWAY DETAIL



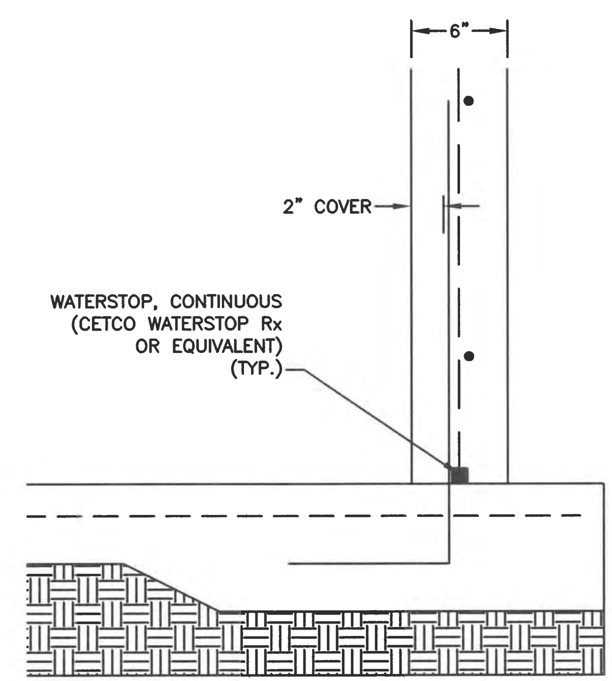
SAWN CONSTRUCTION JOINT WITH #10-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 21'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 31'-0" SPACING (MAX.)



PVC OR VINYL WATERSTOP WITH #10-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 21'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 31'-0" SPACING (MAX.)



PVC OR VINYL WATERSTOP



COLLOIDAL WATERSTOP

WALL FOOTER DETAIL OPTIONS – 6" WALL

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

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CONFINED FEEDING OPERATIONS
June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

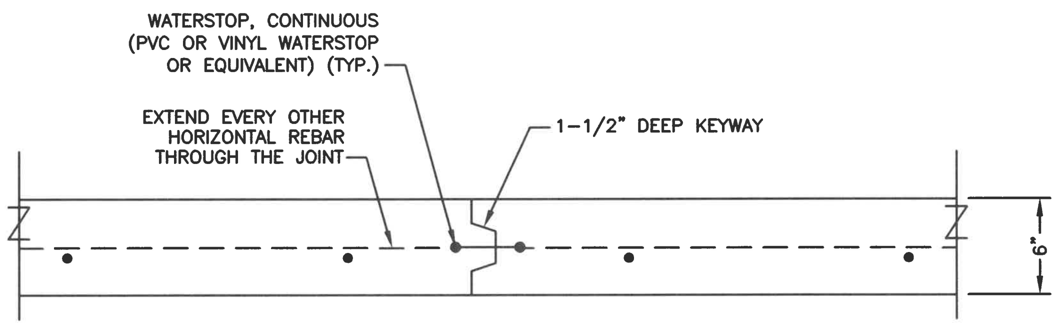
DRAWING NO: TGP0324- 07C
SHEET: 7C of 8C

DRAWN BY: MV
DATE: 06/03/24

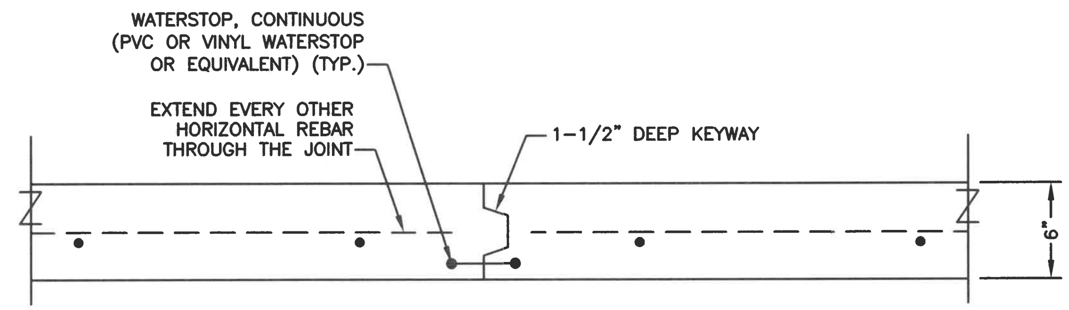
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FLOOR DETAILS, JOINT AND WATERSTOP DETAILS; WALL/FOOTER WATERSTOP

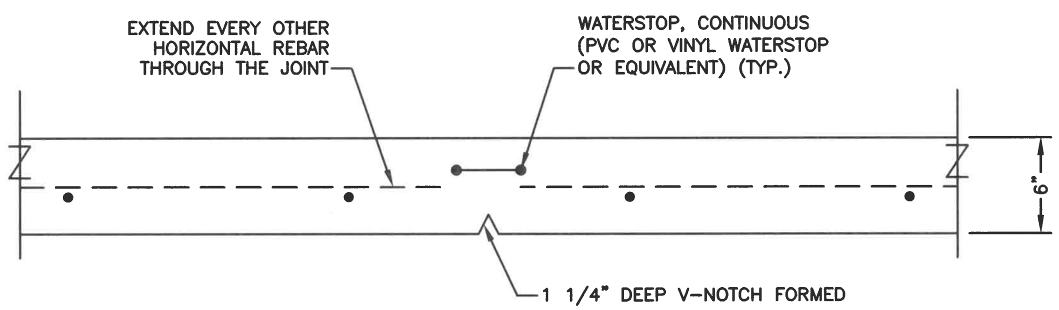
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



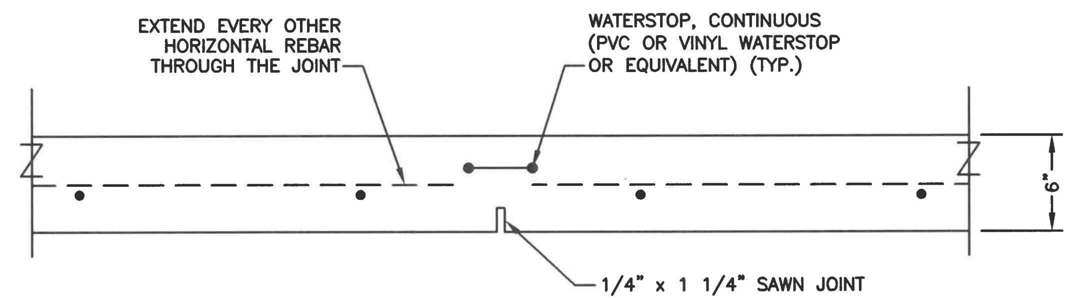
WATERSTOP PLACED IN MIDDLE OF KEYWAY FORM
SPLIT FORM AND PLACE WATERSTOP BETWEEN
TWO HALVES OF FORM



WATERSTOP PLACED OUTSIDE KEYWAY FORM
PLACE WATERSTOP AT LEAST 1-1/2"
FROM WALL

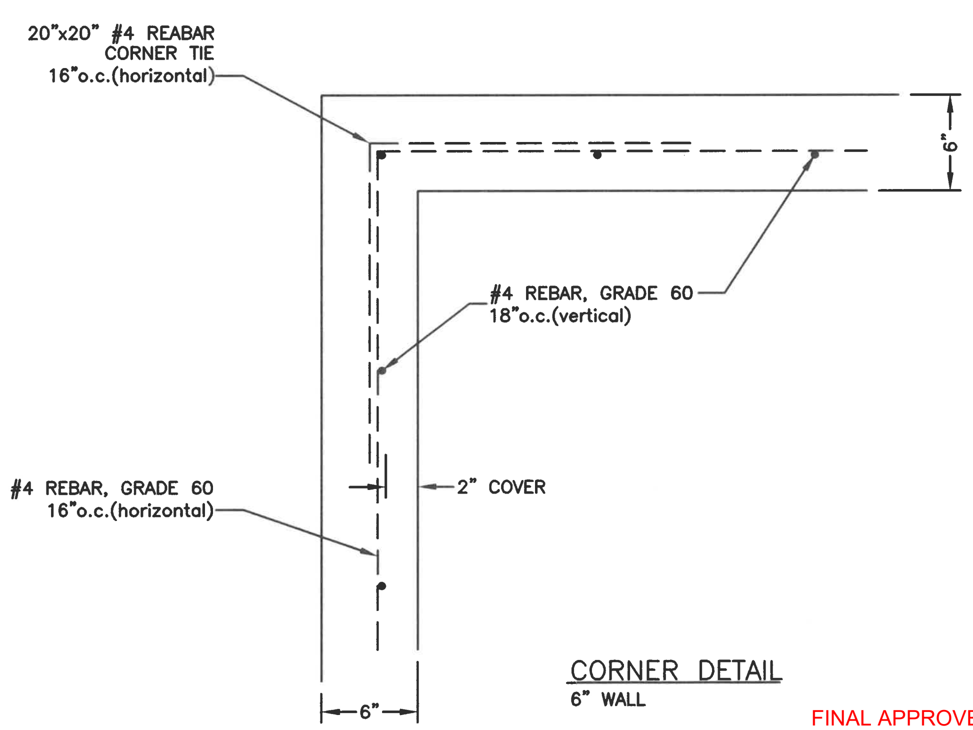


WATERSTOP PLACED IN MIDDLE OF WALL
1-1/4" DEEP x 1-1/4" WIDE 'V'-NOTCH
GROOVE FORMED IN THE WALL



WATERSTOP PLACED IN MIDDLE OF WALL
SAWN JOINT IS CUT INTO THE WALL

WALL CONSTRUCTION JOINT OPTIONS
PVC OR VINYL WATERSTOP



CORNER DETAIL
6" WALL

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

RECEIVED
CONFINED FEEDING OPERATIONS
June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

DRAWING NO: TGP0324- 08C
SHEET: 8C of 8C

DRAWN BY: MV
DATE: 06/03/24

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

WALL AND JOINT DETAILS
WATERSTOP OPTIONS
CORNER REINFORCEMENT

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

BUILDING DESIGN AND CONSTRUCTION PLANS

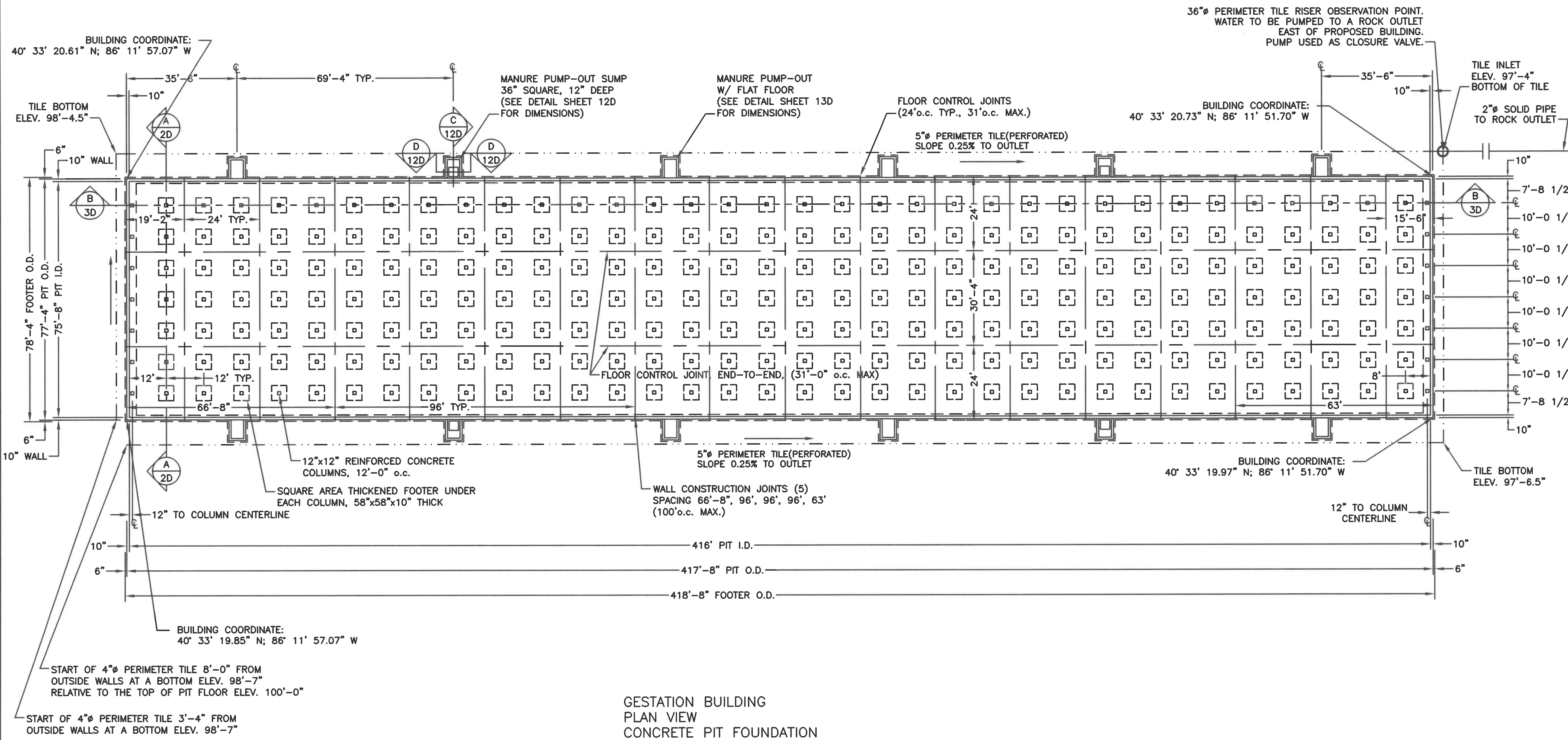
BELOW-BUILDING CONCRETE MANURE STORAGE DESIGN PLANS

10P. South Gestation: 77’-4” x 417’-4” x 10’-0” deep
Building Plans (Plan Sheets 1D-17D)

Prepared by:

LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829



GESTATION BUILDING
PLAN VIEW
CONCRETE PIT FOUNDATION

RECEIVED
CONFINED FEEDING OPERATIONS
June 21, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

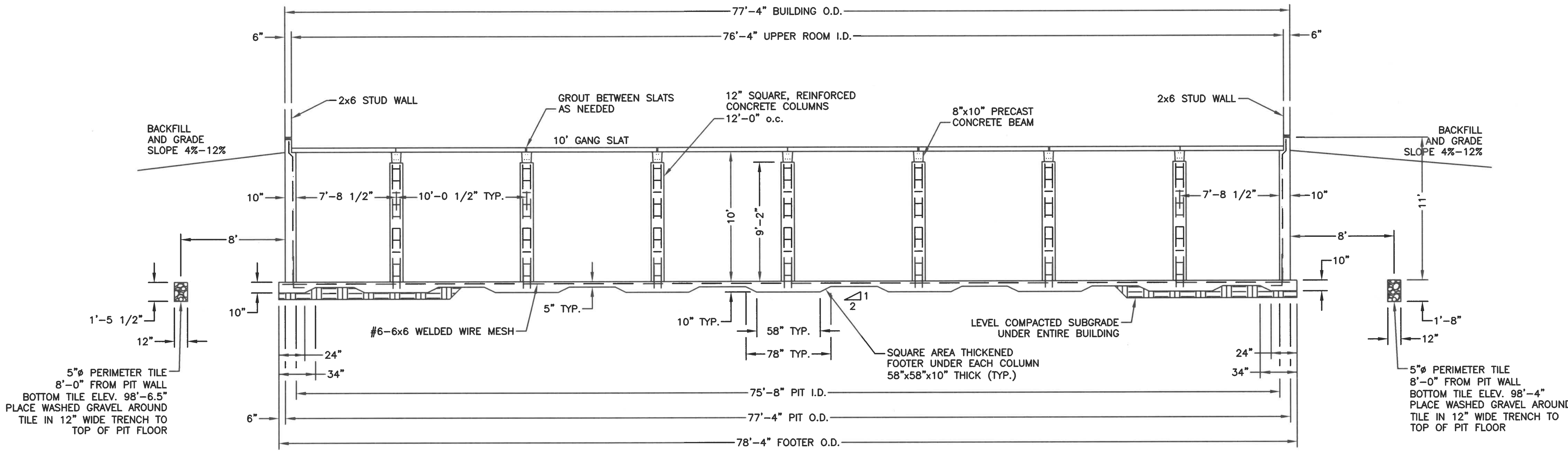
SHEET: 1D of 17D
DRAWING NO: TGP0424-01D

DATE: 06/20/24
DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

CONCRETE PIT
FOUNDATION PLAN
BUILDING 10P.

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



A / 2D CONCRETE PIT CROSS-SECTION
ENDVIEW

NOTE:

1. SOLID FLOOR AND SUPPORT BEAMS SHALL MEET A MINIMUM DESIGN LIVE LOAD DUE TO ANIMALS OF 70 POUNDS PER SQUARE FOOT, PSF (UP TO 500 LB SOW) IN THE SOW HOUSING PORTION.
2. SLATS SHALL MEET A MINIMUM DESIGN LIVE LOAD DUE TO ANIMALS OF 170 POUNDS PER LINEAL FOOT, PLF (UP TO 500 LB SOW) IN THE SOW HOUSING PORTION.
3. ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.
4. REINFORCEMENT STEEL FOR TANK WALLS
   10" OUTSIDE WALL: VERTICAL REBAR -- #5, GRADE 60 12" o.c.
   HORIZONTAL REBAR -- #5 GRADE 60, 15" o.c.
   TOP OF WALL 14" BEAM: 4 - #5 GRADE 60, 3.5" O.C.
5. ALTERNATIVE REINFORCEMENT STEEL FOR TANK WALLS:
   10" OUTSIDE WALL: VERTICAL REBAR --#4 GRADE 60, 7.5" O.C.
   HORIZONTAL REBAR -- #4 GRADE 60, 9.75" O.C.
   TOP OF WALL 14" BEAM: 6 - #4 GRADE 60, 2.0" O.C.
6. ACCEPTABLE SOIL MATERIALS FOR BACKFILL SHALL HAVE A UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) DESIGNATION OF CL, CL-ML, ML, SC, SM-SC, SM SP, SW, GC, GM, GP, AND GW.
7. SOIL MATERIALS WITH A UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) DESIGNATION OF OL, MH, CH, AND OH SHALL NOT BE USED FOR BACKFILL DIRECTLY AGAINST THE CONCRETE WALLS.
8. NATURALLY OCCURRING SOIL MATERIALS ON-SITE INCLUDED SOILS WITH A UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) DESIGNATION OF ML, CL, CH, AND SM.
9. ACCEPTABLE BACKFILL MATERIALS SHALL CONSIST OF THE NATURALLY OCCURRING SOILS FROM THE EXCAVATION OR DESIGNATED BORROW AREA. ON-SITE SOILS WITH A CLASSIFICATION OF ML, CL, AND SM ARE SUITABLE FOR BACKFILLING DIRECTLY AGAINST THE CONCRETE MANURE STORAGE WALLS.
10. ON-SITE SOILS WITH A CLASSIFICATION OF CH SHALL NOT BE USED FOR BACKFILL AGAINST THE CONCRETE STORAGE WALLS.
11. LARGE ROCKS, ORGANIC MATERIALS, VEGETATION, DEBRIS, SNOW, ICE AND FOREIGN MATERIALS SHOULD BE REMOVED FROM BACKFILL.
12. BACKFILL ADJACENT TO THE CONCRETE WALLS SHOULD NOT BEGIN:
   A. UNTIL THE SLATS OR FLOOR ARE IN PLACE, AND
   B. IN LESS THAN 10 DAYS AFTER PLACEMENT OF CONCRETE, OR
   C. UNTIL THE CONCRETE STRENGTH IS AT LEAST 3,000 PSI.
13. HEAVY EQUIPMENT SHOULD NOT BE OPERATED WITHIN 5 FEET OF THE CONCRETE WALLS.
14. COMPACTION OF BACKFILL MATERIALS WILL BE BY NATURAL SETTLING AND COMPACTION OR BY MANUAL TAMPING OR HAND COMPACTION EQUIPMENT WITHIN 5 FEET OF THE CONCRETE WALLS.
15. BACKFILL SHOULD BE GRADED TO ESTABLISH AND MAINTAIN AT LEAST A 4%-12% SLOPE AWAY FROM THE BUILDING.

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

RECEIVED
CONFINED FEEDING OPERATIONS
May 13, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

NOTE:

SEE FOR DETAILS:

*SHEET 4D - SIDE WALLS AND FOOTERS
*SHEETS 6D THRU 11D - COLUMNS AND FOOTERS

*INCLUDING DIMENSIONS AND REBAR LOCATION

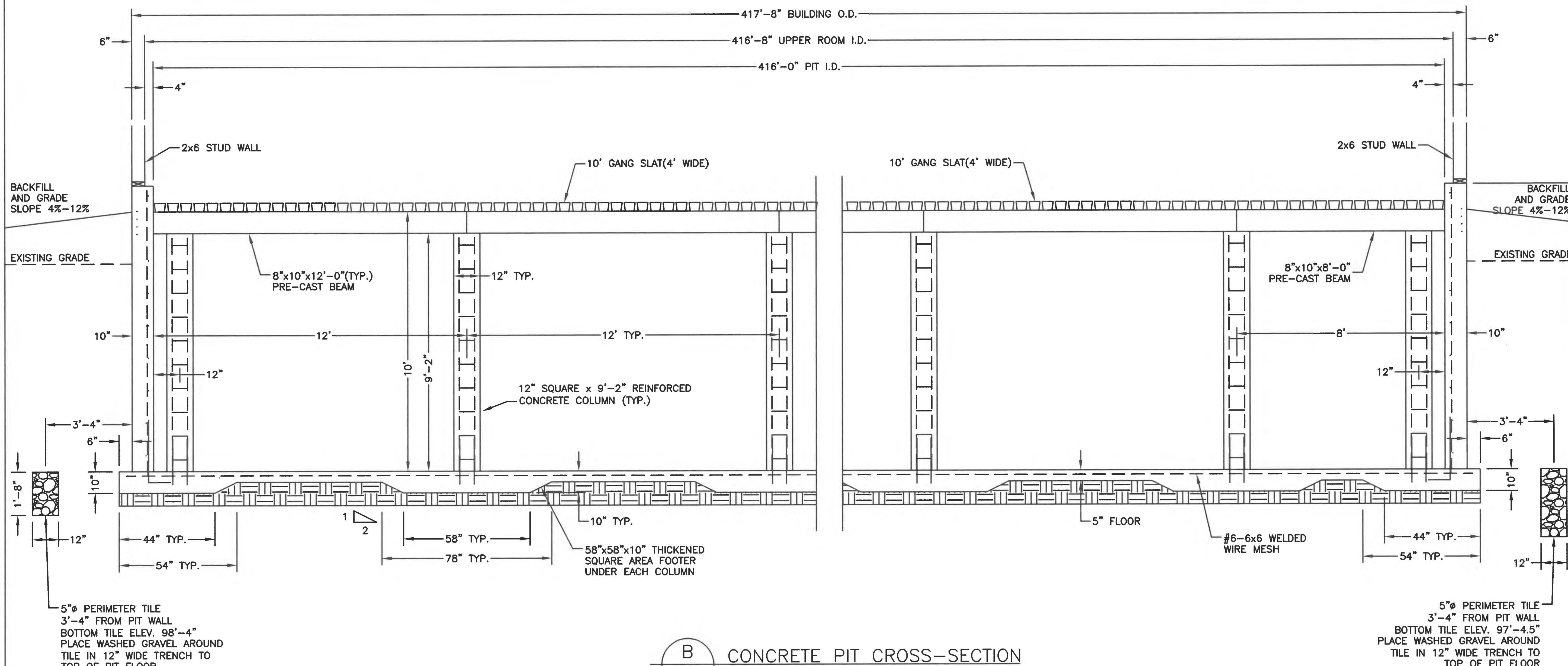
SHEET: 2D of 17D | DRAWING NO: TGP0224- 02D

DATE: 05/10/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

ENDVIEW BUILDING
CROSS-SECTION
SECTION A
BUILDING 10P.

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



B
3D

CONCRETE PIT CROSS-SECTION

SIDE ELEVATION

RECEIVED
CONFINED FEEDING OPERATIONS
May 13, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

NOTE:

SEE FOR DETAILS:

*SHEET 5D – END WALLS AND FOOTERS
*SHEETS 6D THRU 11D – COLUMNS AND FOOTERS

*INCLUDING DIMENSIONS AND REBAR LOCATION

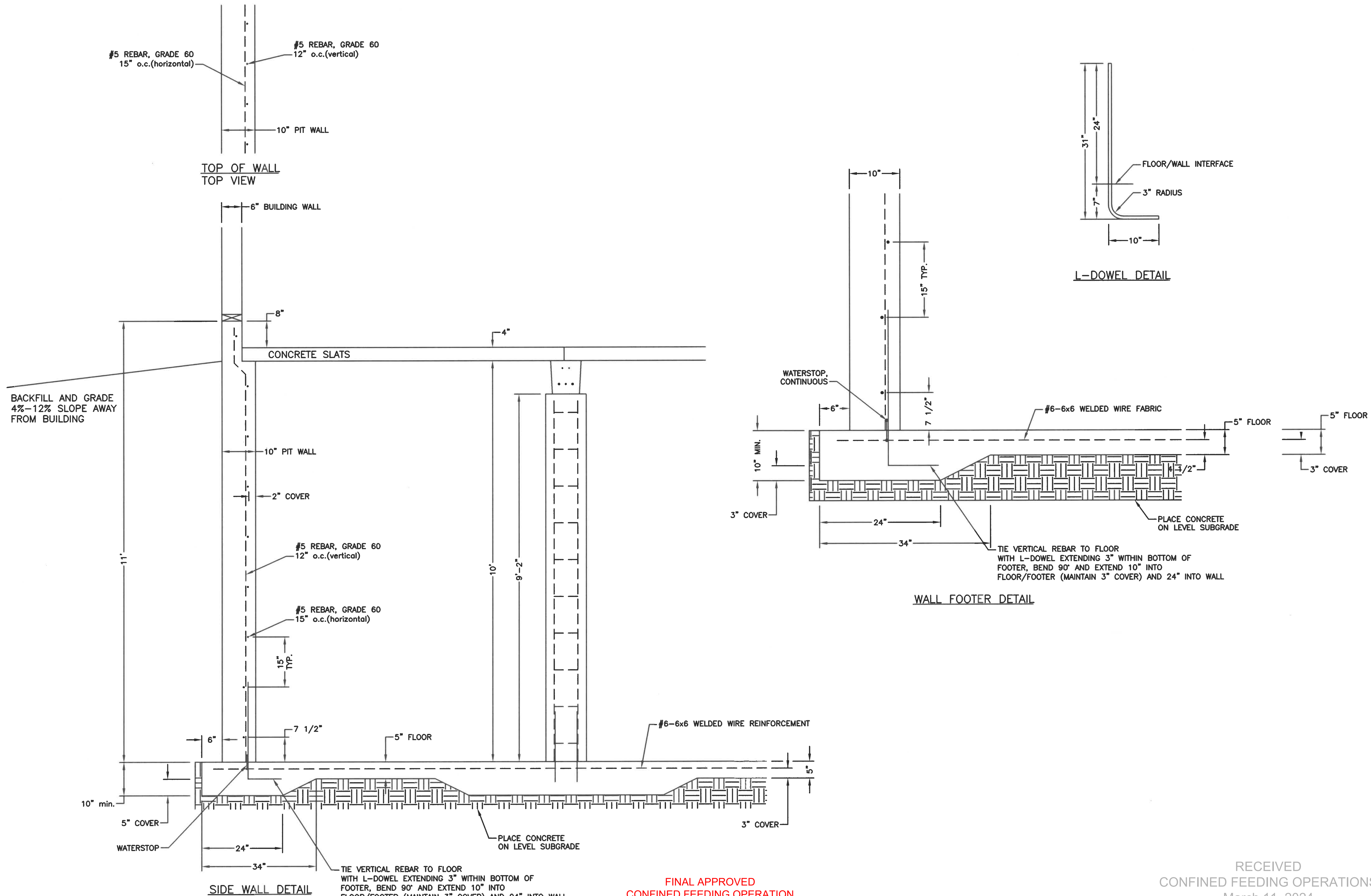
SHEET: 3D of 17D | DRAWING NO: TGP0224-03D

DATE: 05/10/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

SIDE ELEVATION
CROSS-SECTION
SECTION B
BUILDING 10P.

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



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CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

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March 11, 2024
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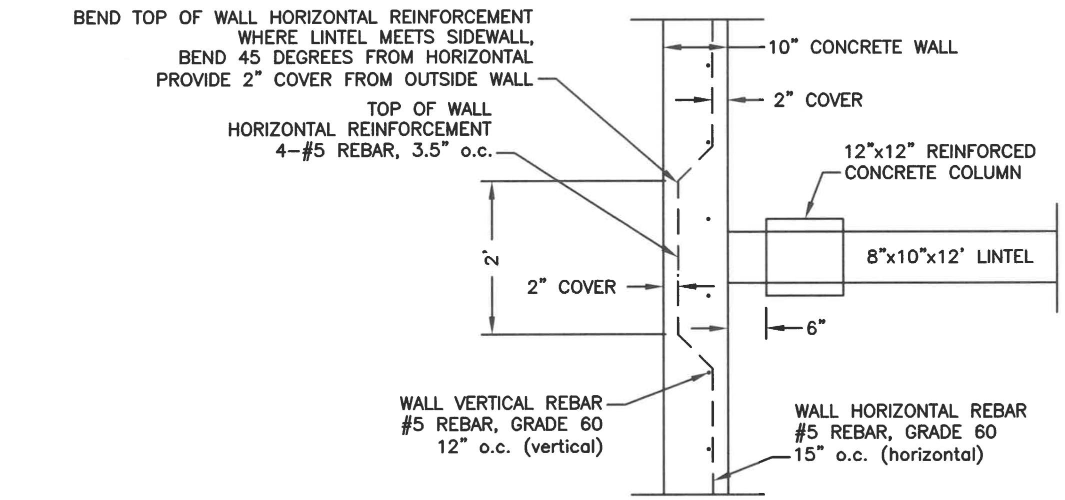
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

CONCRETE PIT WALL DETAILS
SIDEWALL DETAIL
FOOTER DETAIL
BUILDING 10P.

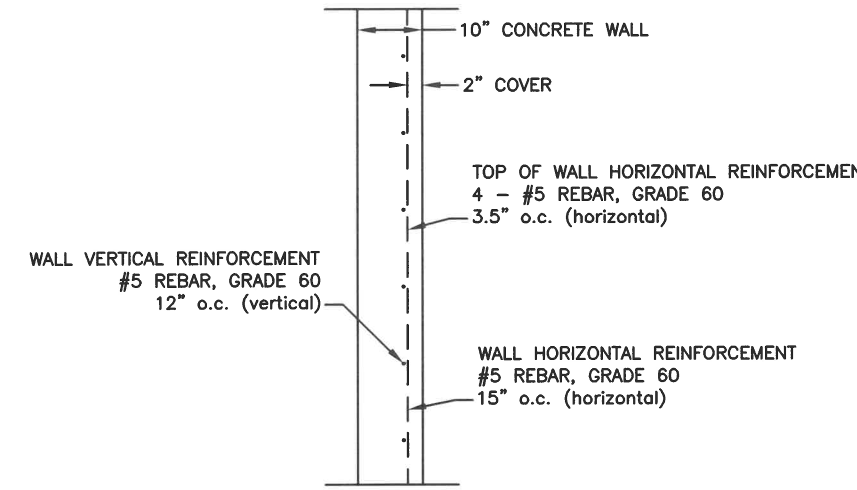
DATE: 02/23/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

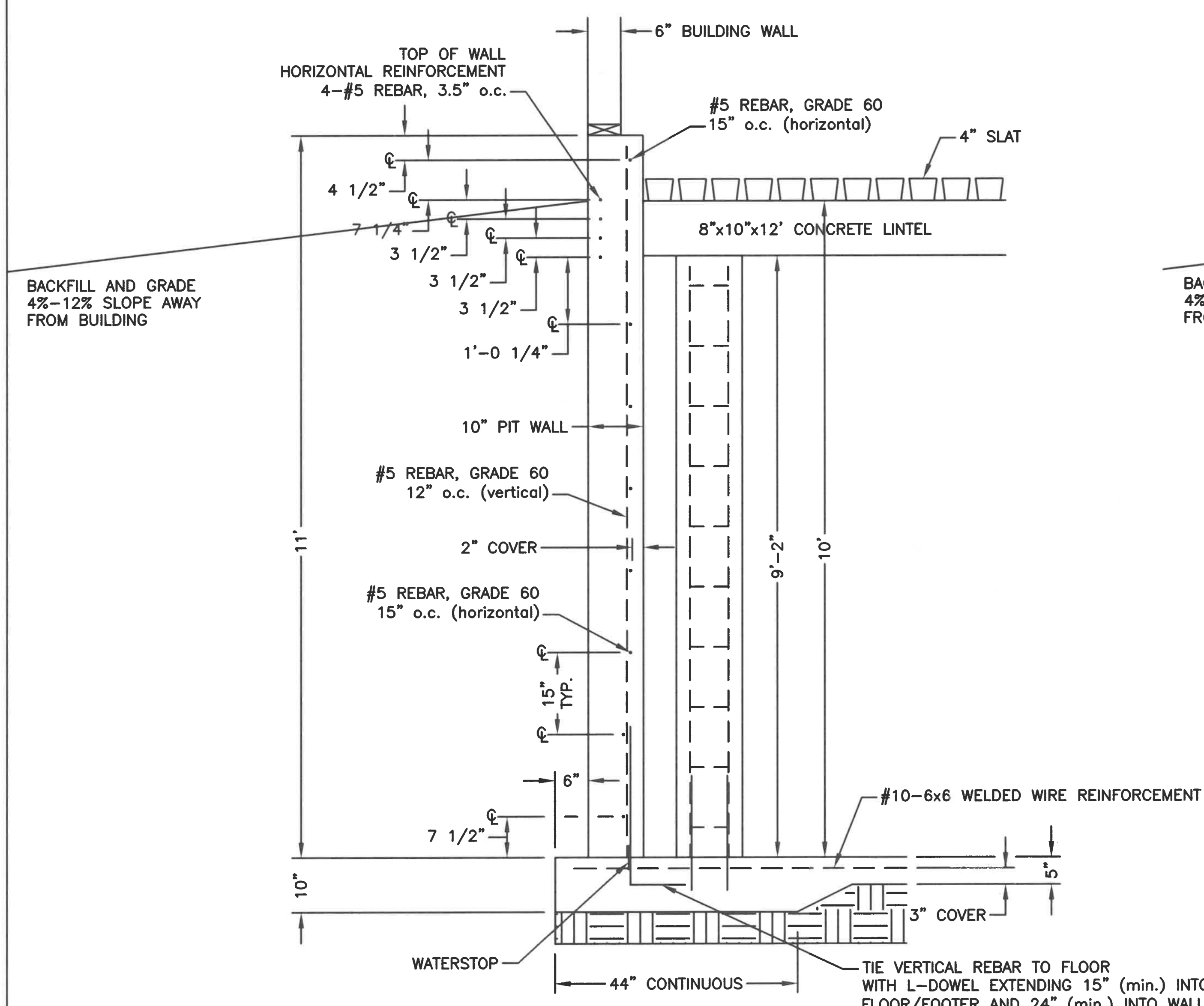
SHEET: 4D of 17D | DRAWING NO: TGP0124-04D



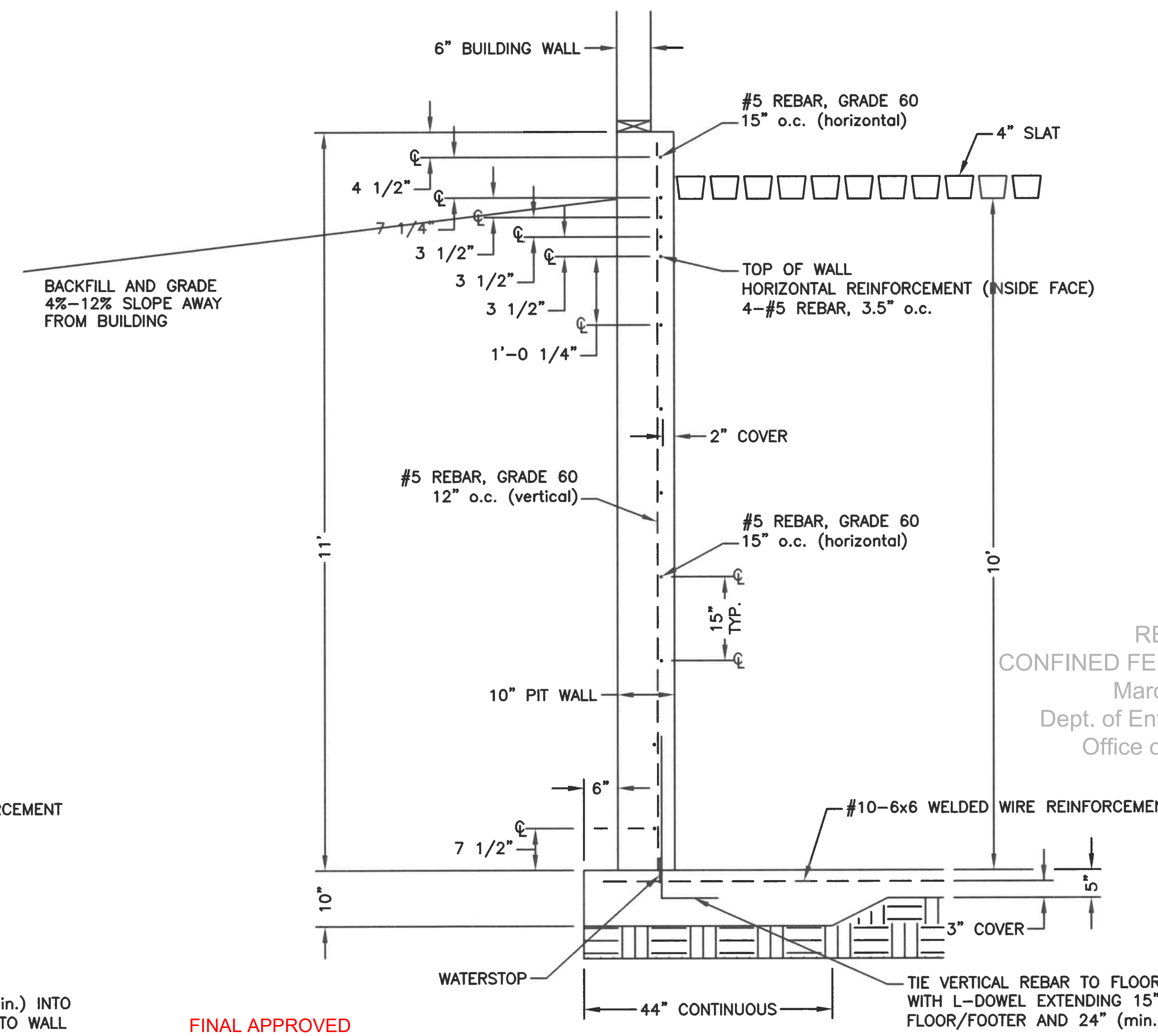
TOP OF WALL AT LINTEL AND COLUMN SUPPORT
TOP VIEW: PLACE TOP OF WALL REINFORCEMENT IN OUTSIDE FACE



TOP OF WALL BETWEEN LINTEL AND COLUMN SUPPORTS
TOP VIEW: PLACE TOP OF WALL REINFORCEMENT IN INSIDE FACE



END WALL DETAIL
AT LINTEL COLUMN SUPPORT



END WALL DETAIL
BETWEEN LINTEL COLUMN SUPPORT

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March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

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Dept. of Environmental Management
Office of Land Quality

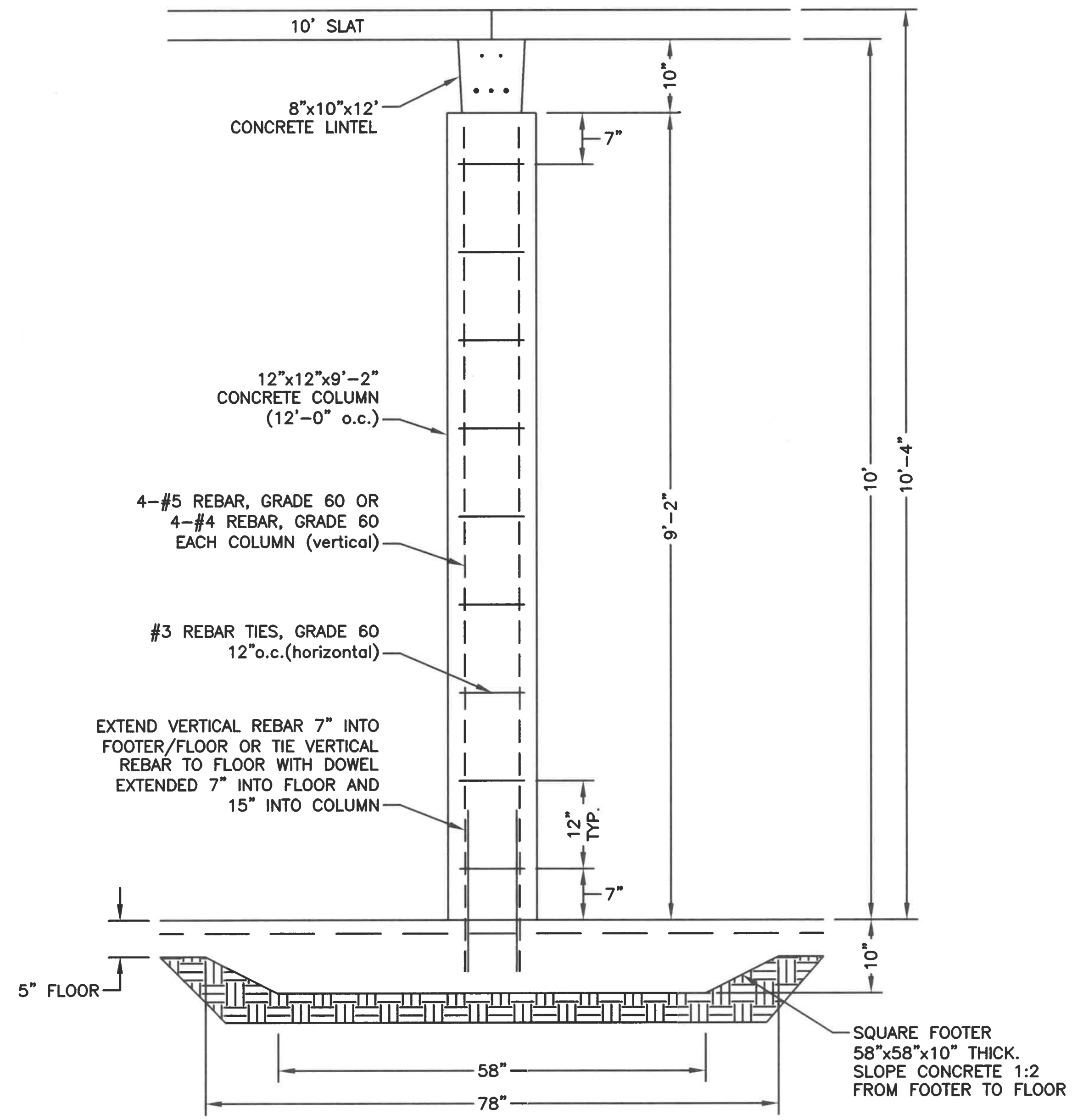
SHEET: 5D of 17D DRAWING NO: TGP0124-05D

DATE: 02/23/24 DRAWN BY: MV

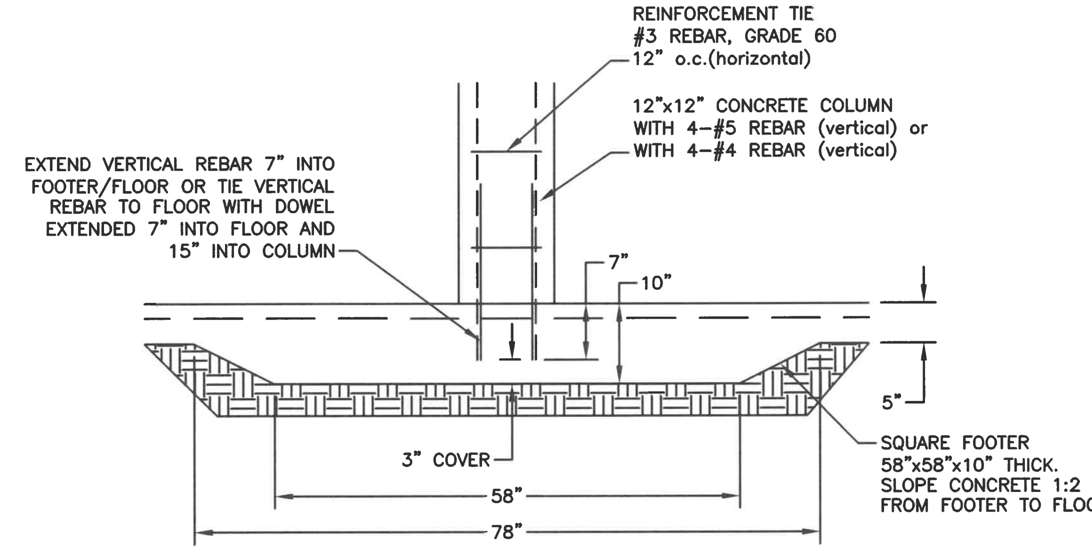
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

CONCRETE WALL DETAILS
END WALL DETAIL
TOP OF WALL REINFORCEMENT
BUILDING 10P.

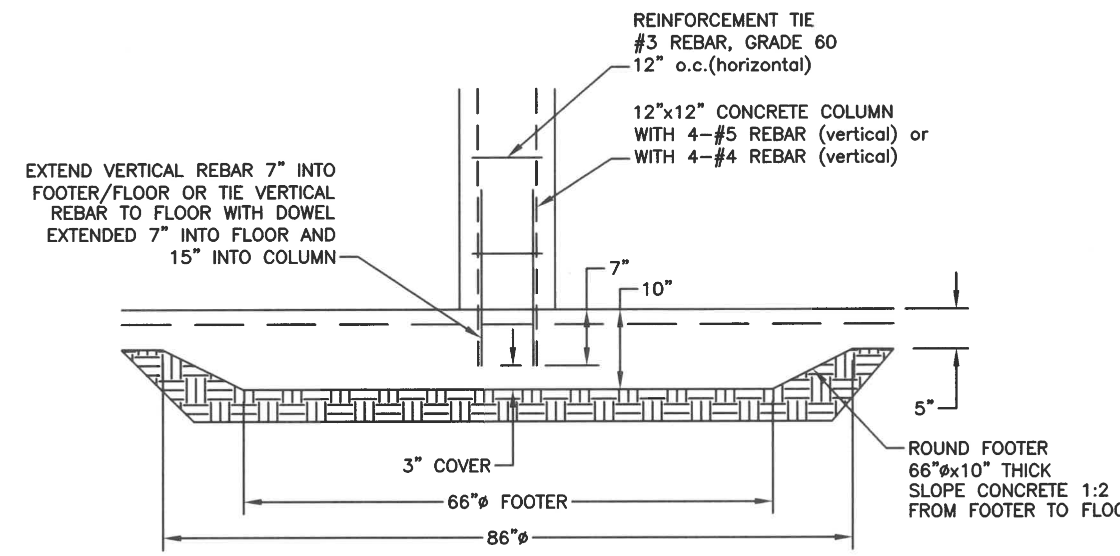
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



COLUMN DETAIL
REINFORCED CONCRETE COLUMN
4-#5 OR 4-#4 REBAR



SQUARE FOOTER DETAIL OPTION



ROUND FOOTER DETAIL OPTION

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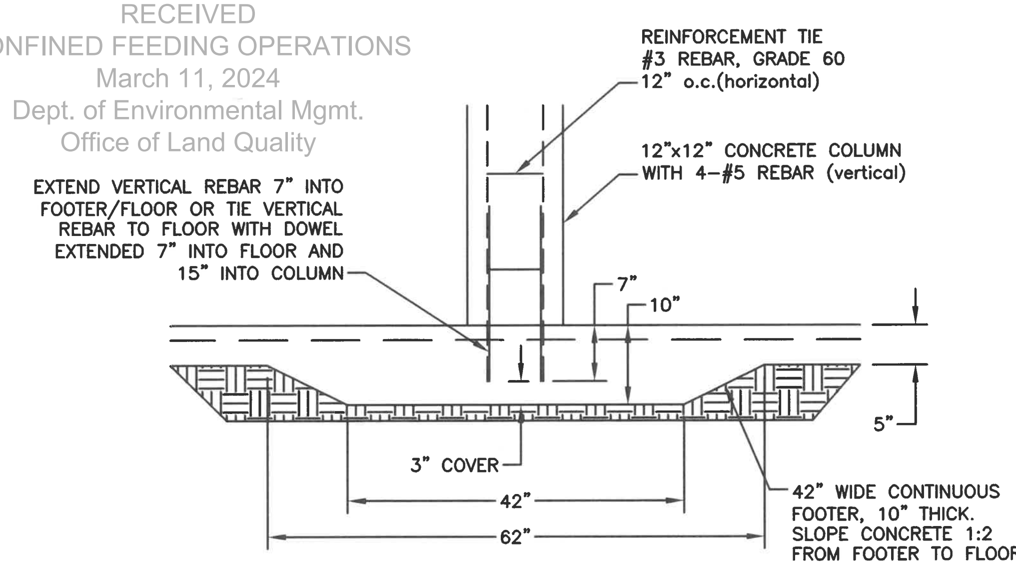
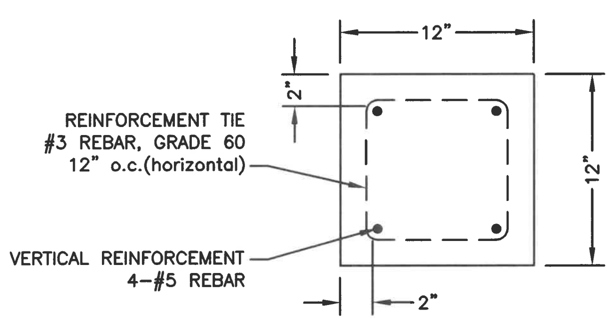
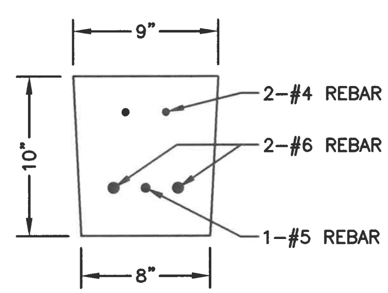
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality



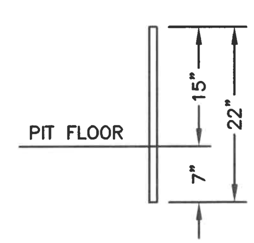
CONTINUOUS FOOTER DETAIL OPTION



12"x12" REINFORCED COLUMN DETAIL
TOP VIEW
4-#5 OR 4-#4 REBAR (vertical)
#3 REBAR TIE (horizontal) 12" o.c.



8"x10"x12' CONCRETE LINTEL
(REBAR GRADE 60)
(5000 PSI CONCRETE)
(HOG SLAT, INC. OR COMPARABLE)



DOWEL DETAIL
#4 OR #5 REBAR, GRADE 60

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

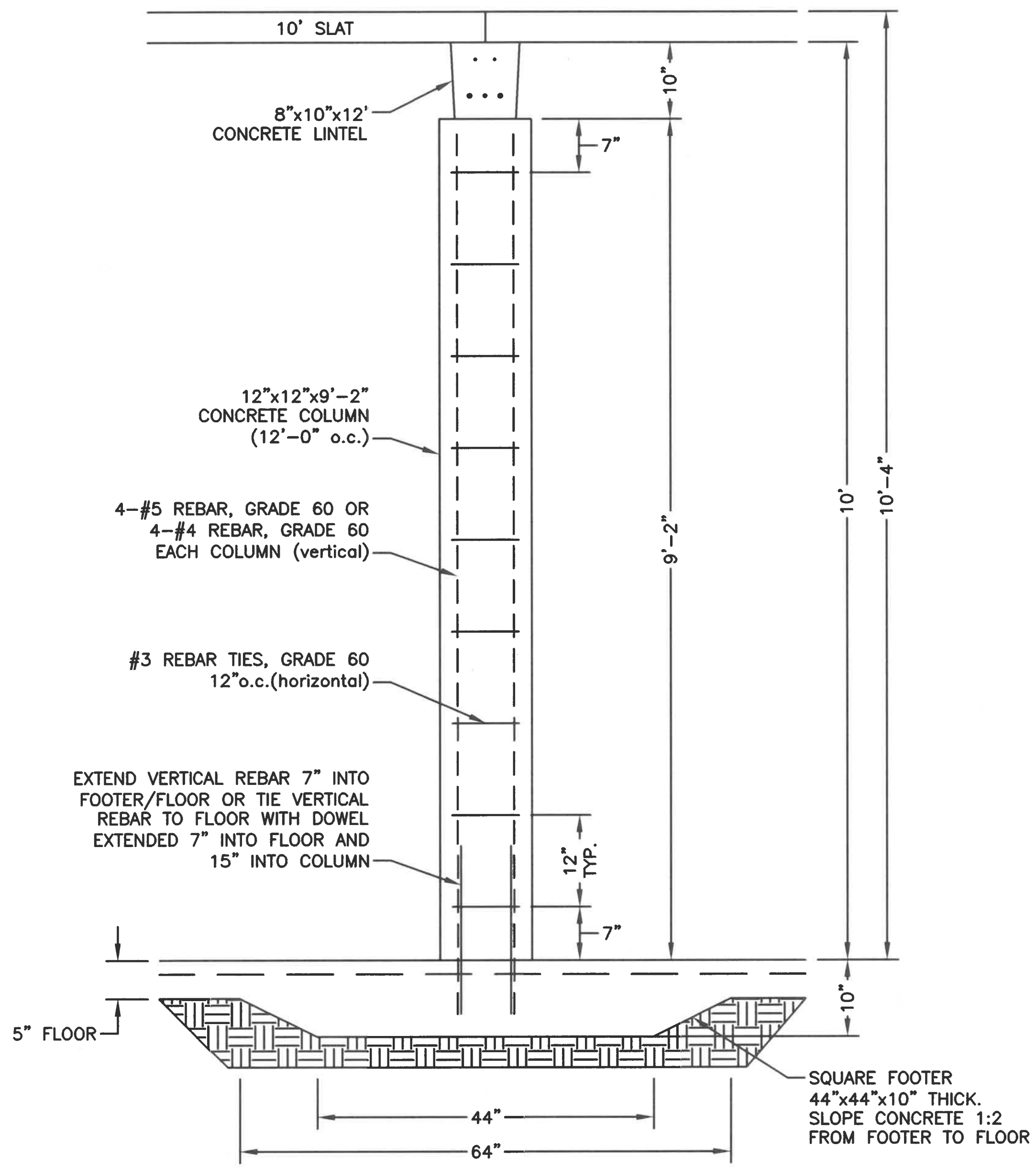
SHEET: 6D of 17D DRAWING NO: TGP0124-06D

DATE: 02/23/24 DRAWN BY: MV

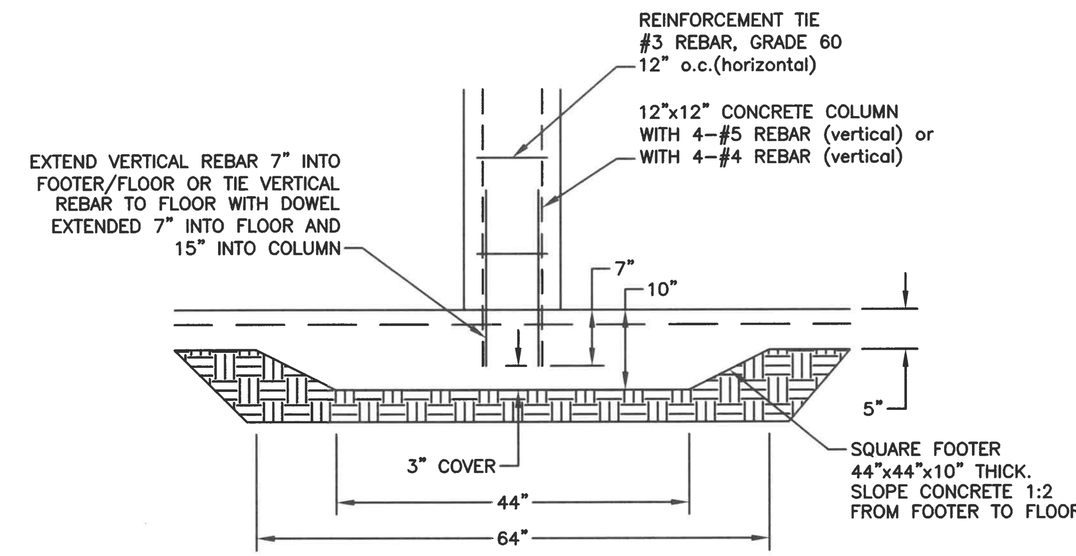
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

COLUMN DETAILS
REINFORCED CONCRETE
12"x12" SQUARE
1,500 PSF SOIL BEARING

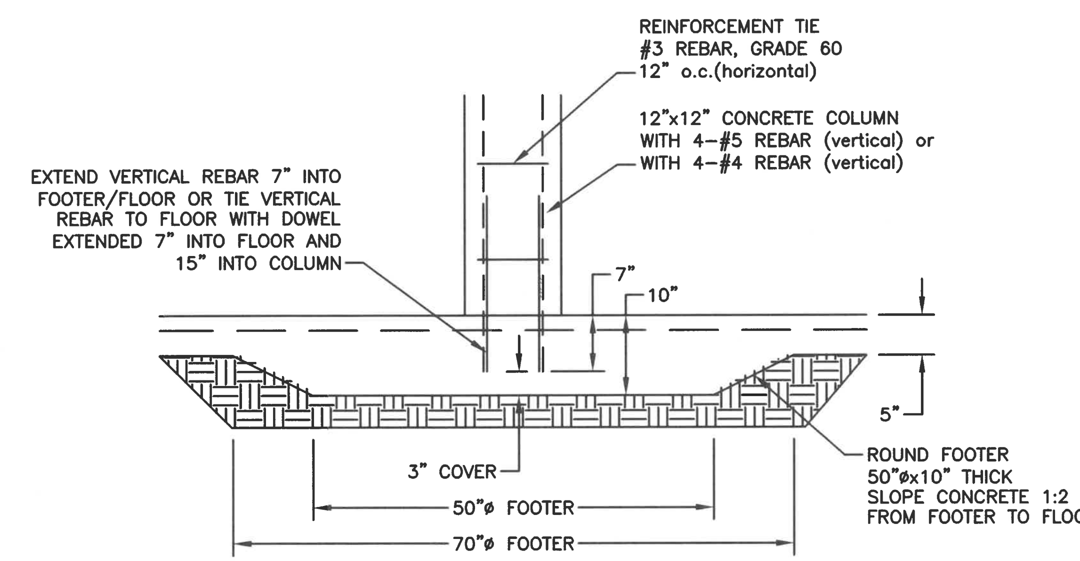
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



COLUMN DETAIL
REINFORCED CONCRETE COLUMN
4-#5 OR 4-#4 REBAR



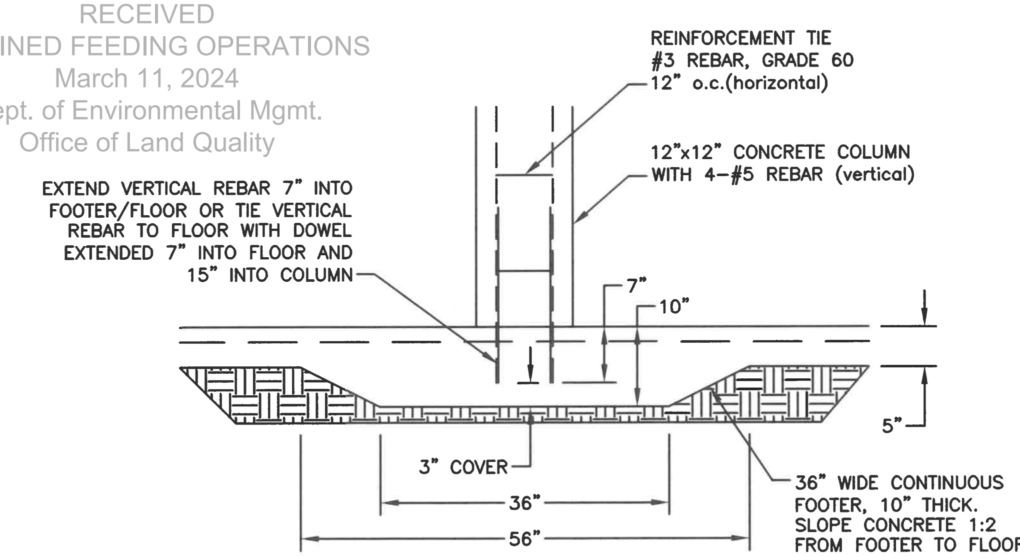
SQUARE FOOTER DETAIL OPTION



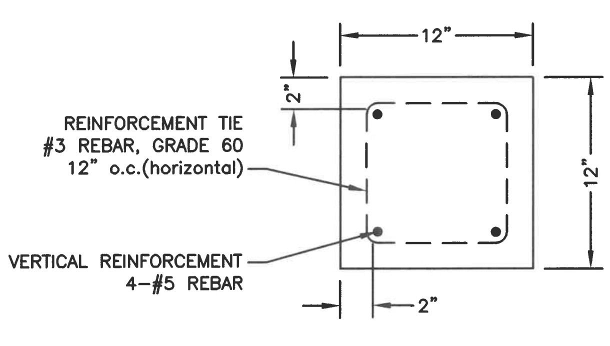
ROUND FOOTER DETAIL OPTION

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

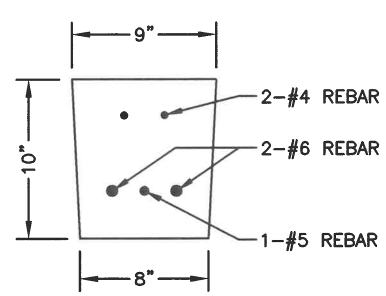
RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality



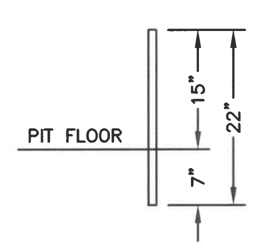
CONTINUOUS FOOTER DETAIL OPTION



12"x12" REINFORCED COLUMN DETAIL
TOP VIEW
4-#5 OR 4-#4 REBAR (vertical)
#3 REBAR TIE (horizontal) 12" o.c.



8"x10"x12' CONCRETE LINTEL
(REBAR GRADE 60)
(5000 PSI CONCRETE)
(HOG SLAT, INC. OR COMPARABLE)



DOWEL DETAIL
#4 OR #5 REBAR, GRADE 60

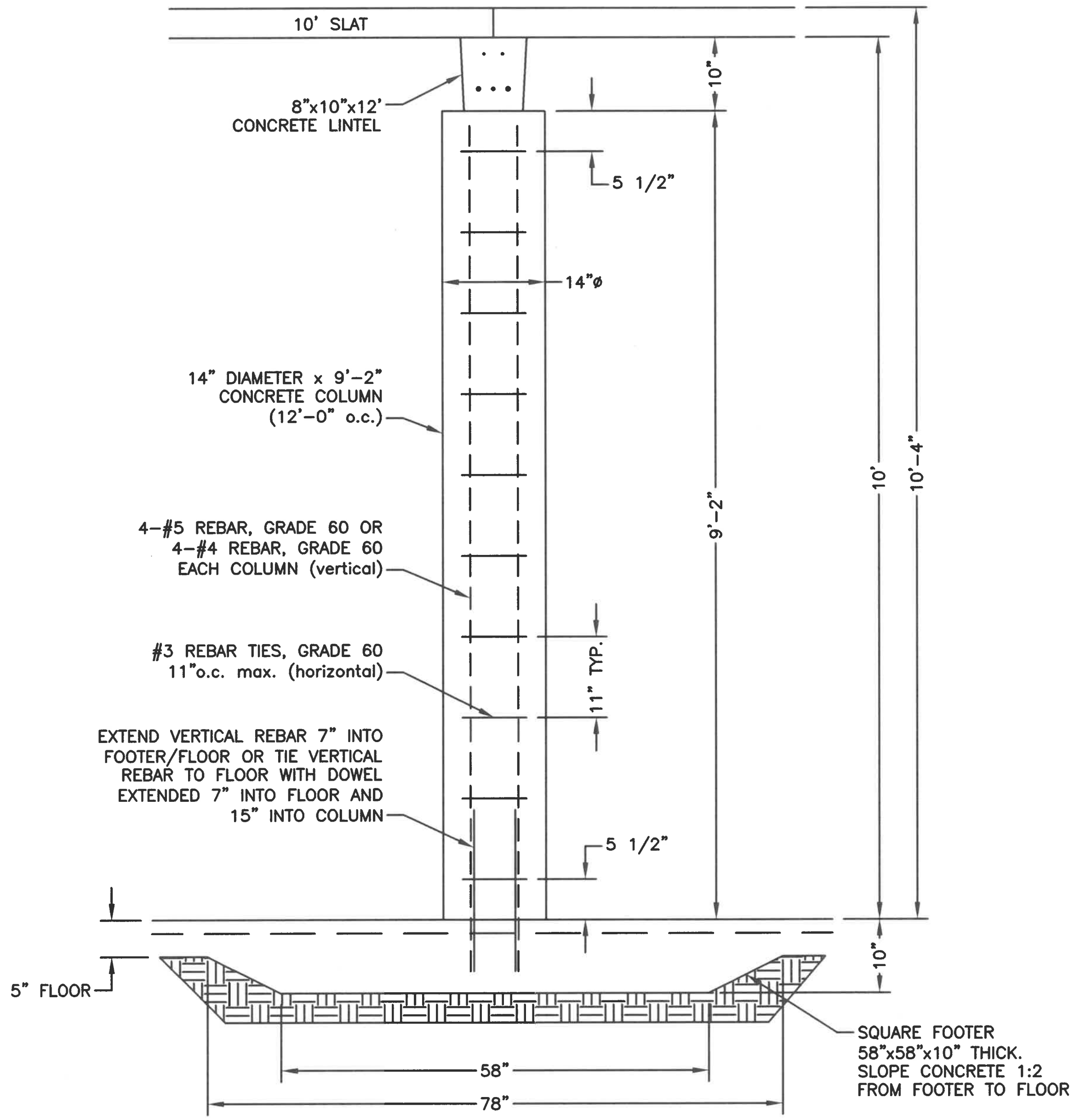
SHEET: 7D of 17D DRAWING NO: TGP0124-07D

DATE: 02/23/24 DRAWN BY: MV

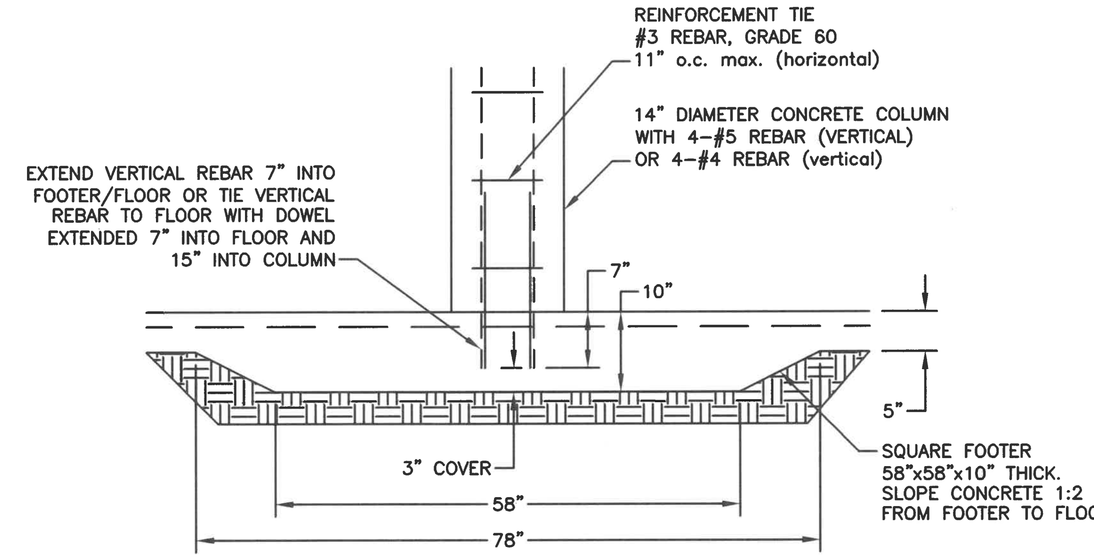
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

COLUMN DETAILS
REINFORCED CONCRETE
12" X 12" SQUARE
2,000 PSF SOIL BEARING

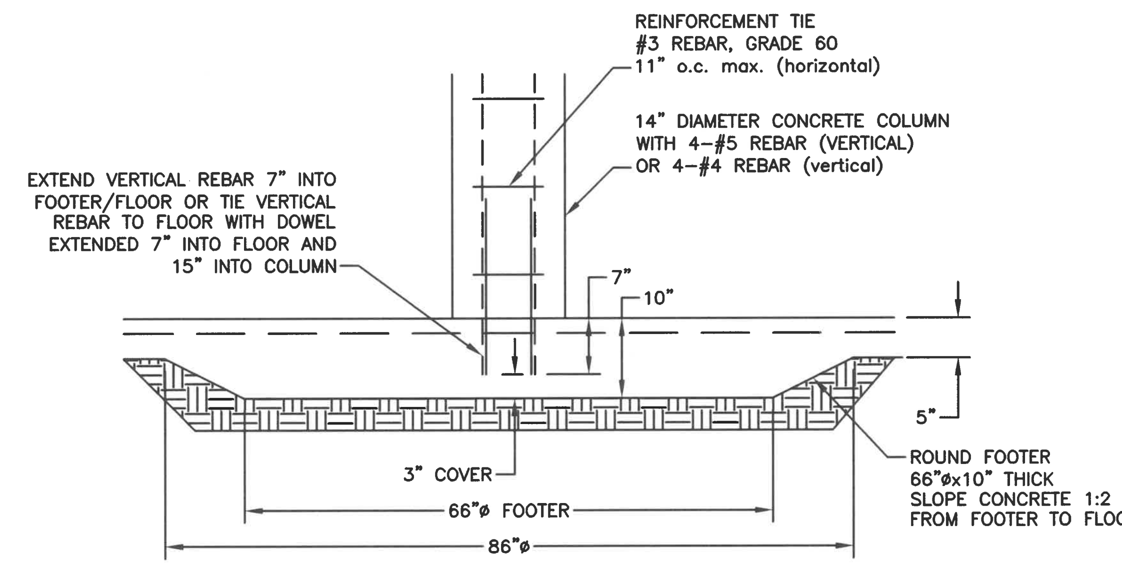
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



COLUMN DETAIL
REINFORCED CONCRETE COLUMN
4-#5 OR 4-#4 REBAR



SQUARE FOOTER DETAIL OPTION



ROUND FOOTER DETAIL OPTION

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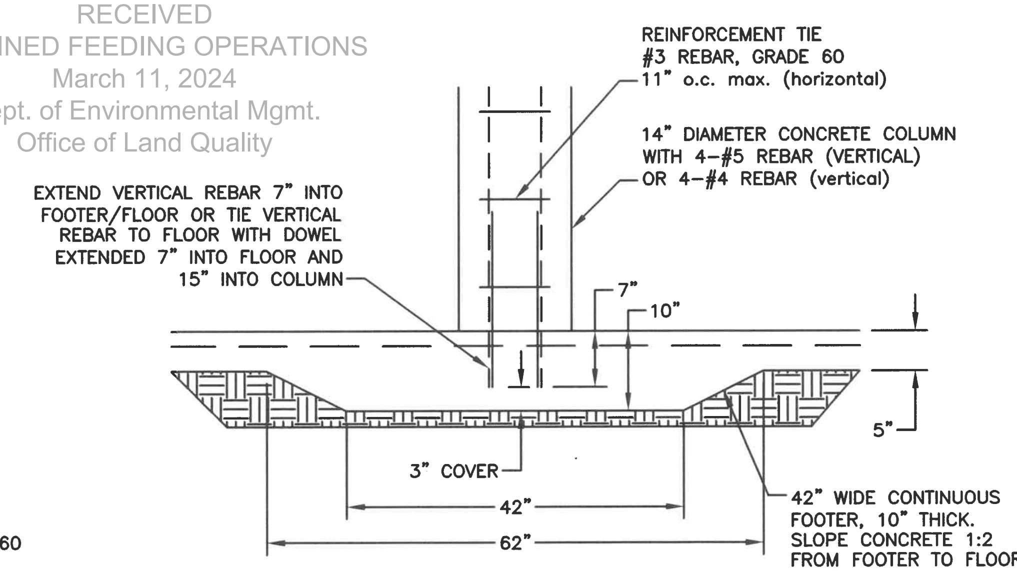
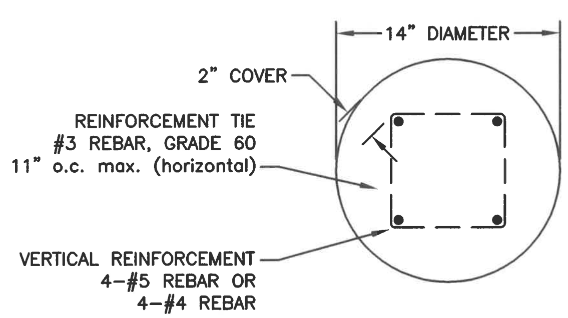
Dept. of Environmental Management
Office of Land Quality

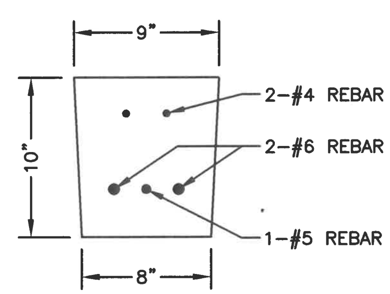
RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality



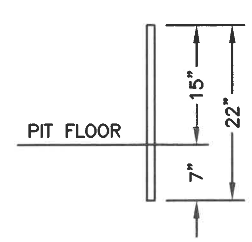
CONTINUOUS FOOTER DETAIL OPTION



14" DIAMETER REINFORCED COLUMN DETAIL
TOP VIEW
4-#5 OR 4-#4 REBAR (vertical)
#3 REBAR TIE (horizontal) 11" o.c.



8"x10"x12' CONCRETE LINTEL
(REBAR GRADE 60)
(5000 PSI CONCRETE)
(HOG SLAT, INC. OR COMPARABLE)



DOWEL DETAIL
#4 OR #5 REBAR, GRADE 60

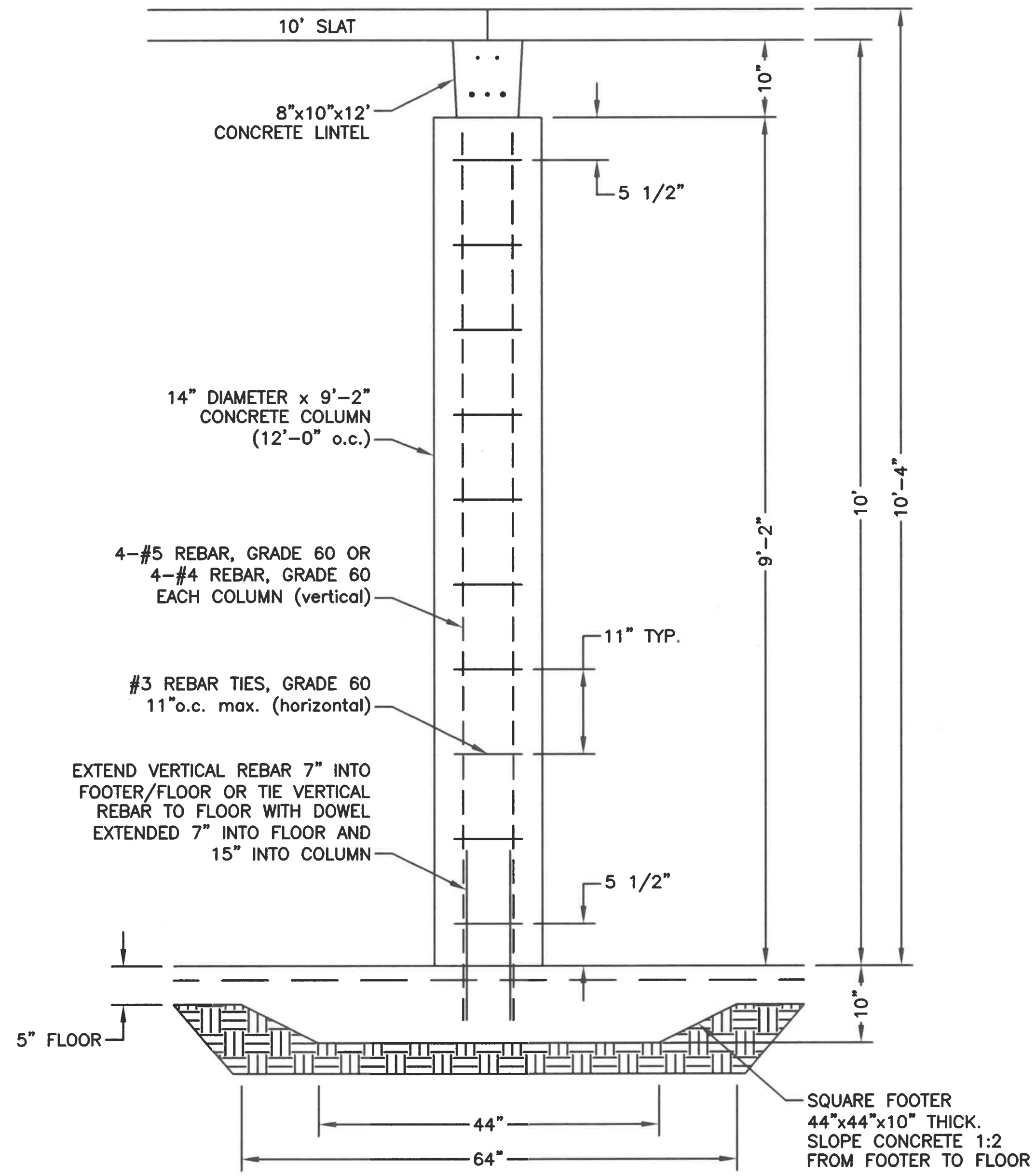
SHEET: 8D of 17D | DRAWING NO: TGP0124-08D

DATE: 02/23/24 | DRAWN BY: MV

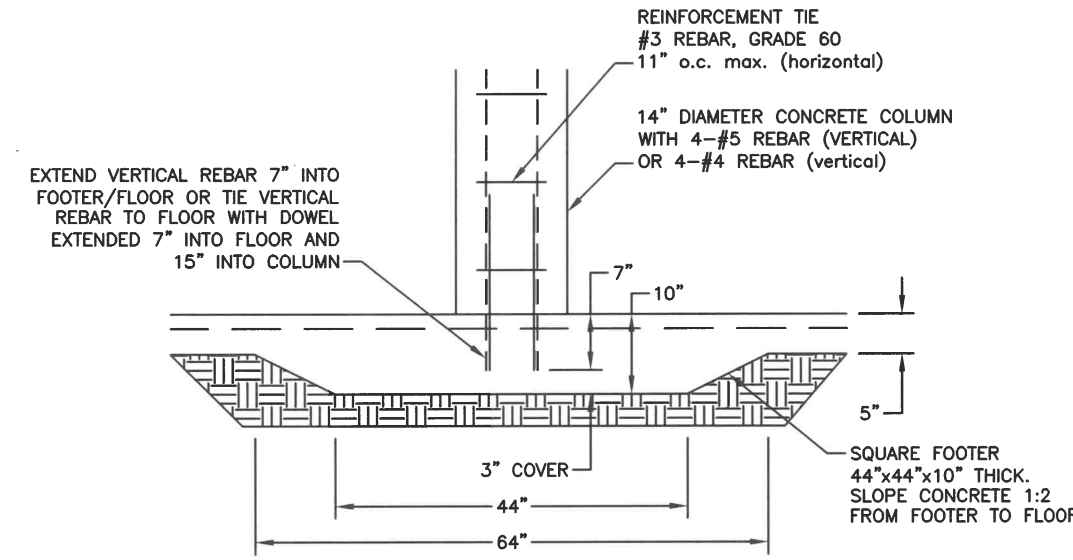
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

COLUMN DETAILS
REINFORCED CONCRETE
14" DIAMETER ROUND
1,500 SOIL BEARING

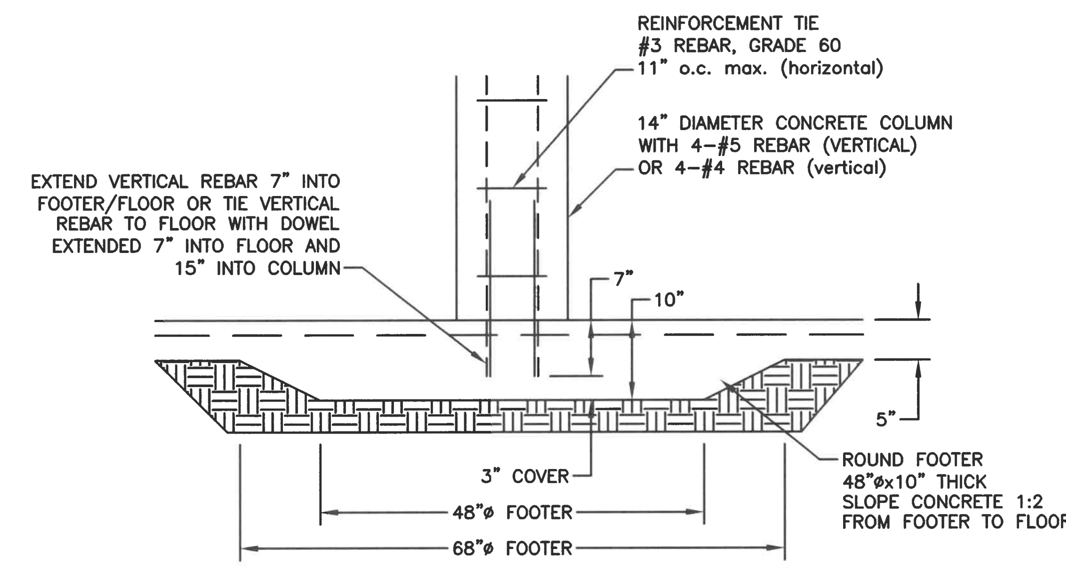
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



COLUMN DETAIL
REINFORCED CONCRETE COLUMN
4-#5 OR 4-#4 REBAR



SQUARE FOOTER DETAIL OPTION



ROUND FOOTER DETAIL OPTION

FINAL APPROVED
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Dept. of Environmental Management
Office of Land Quality

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CONFINED FEEDING OPERATIONS
March 11, 2024
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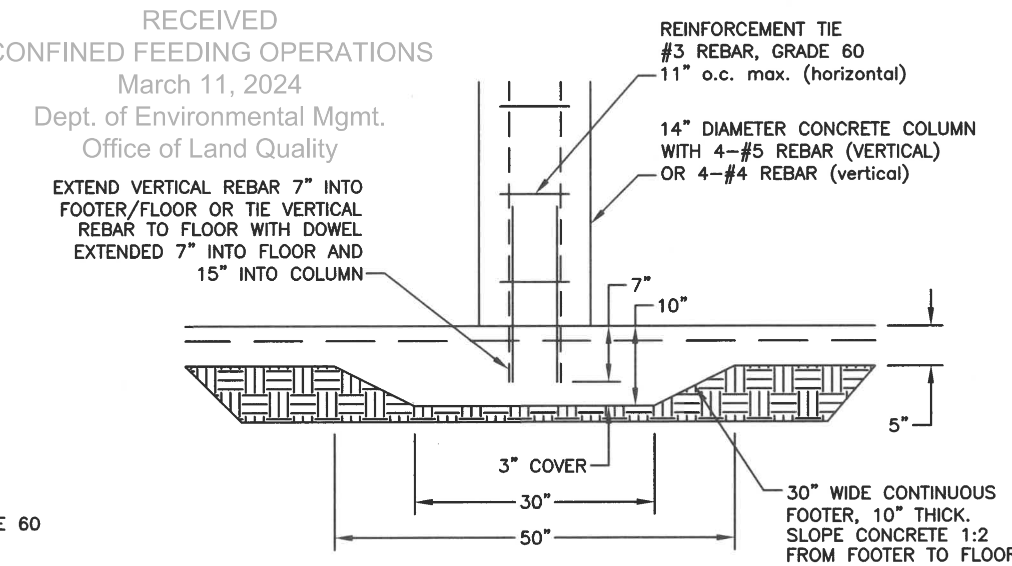
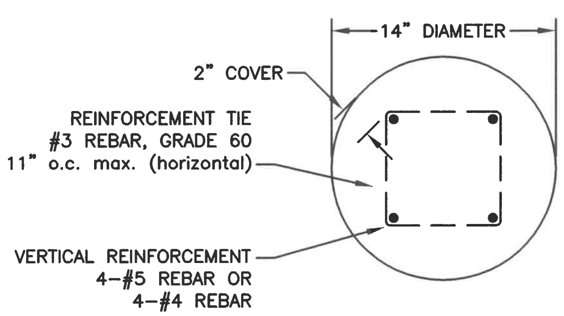
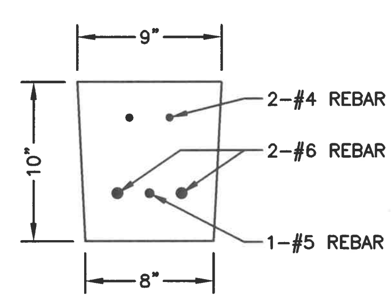
Office of Land Quality



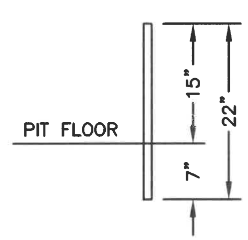
CONTINUOUS FOOTER DETAIL OPTION



14" DIAMETER REINFORCED COLUMN DETAIL
TOP VIEW
4-#5 OR 4-#4 REBAR (vertical)
#3 REBAR TIE (horizontal) 11" o.c.



8"x10"x12' CONCRETE LINTEL
(REBAR GRADE 60)
(5000 PSI CONCRETE)
(HOG SLAT, INC. OR COMPARABLE)



DOWEL DETAIL
#4 OR #5 REBAR, GRADE 60

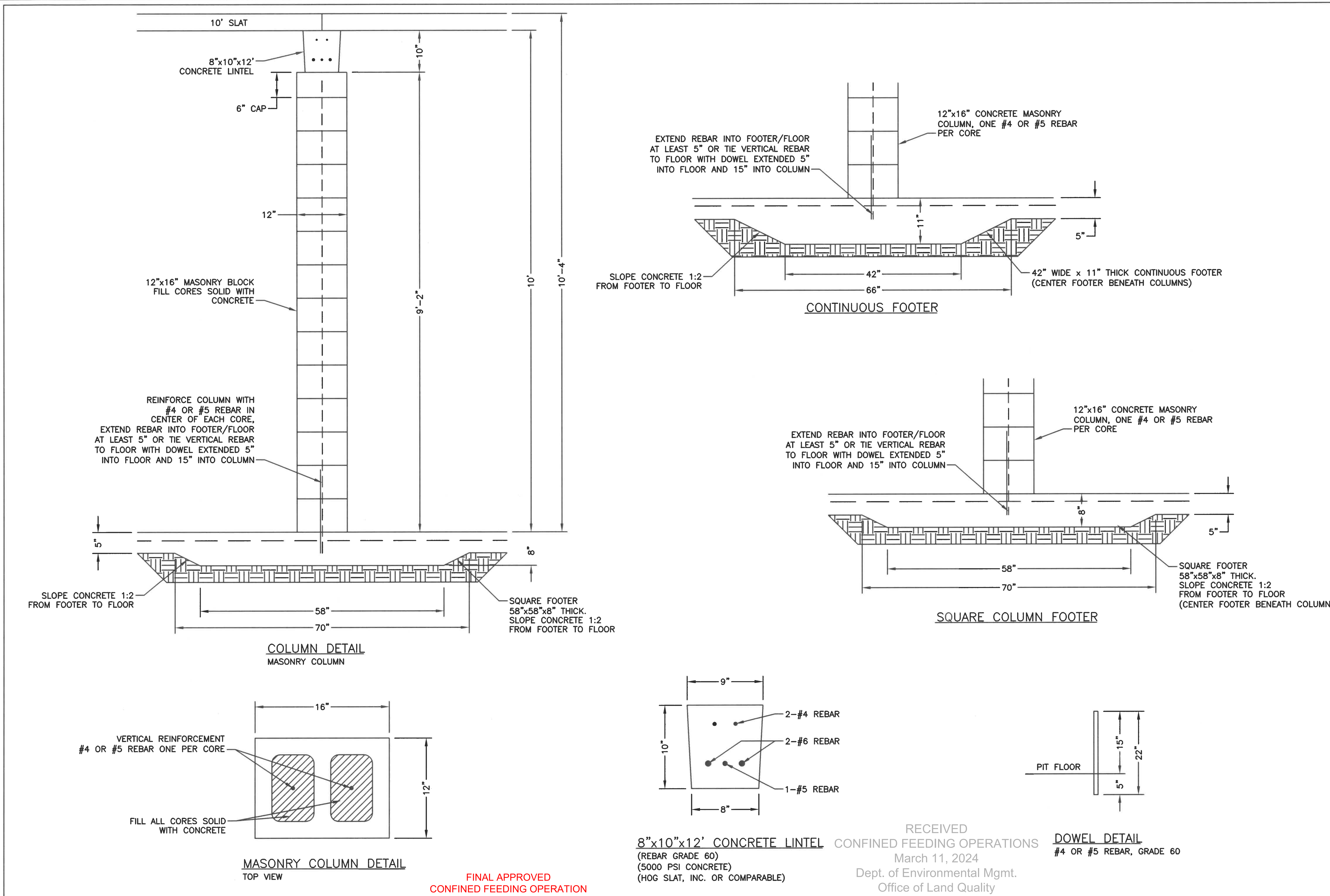
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

COLUMN DETAILS
REINFORCED CONCRETE
14" DIAMETER ROUND
2,000 PSF SOIL BEARING

DATE: 02/23/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

SHEET: 9D of 17D | DRAWING NO: TGP0124-09D



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CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

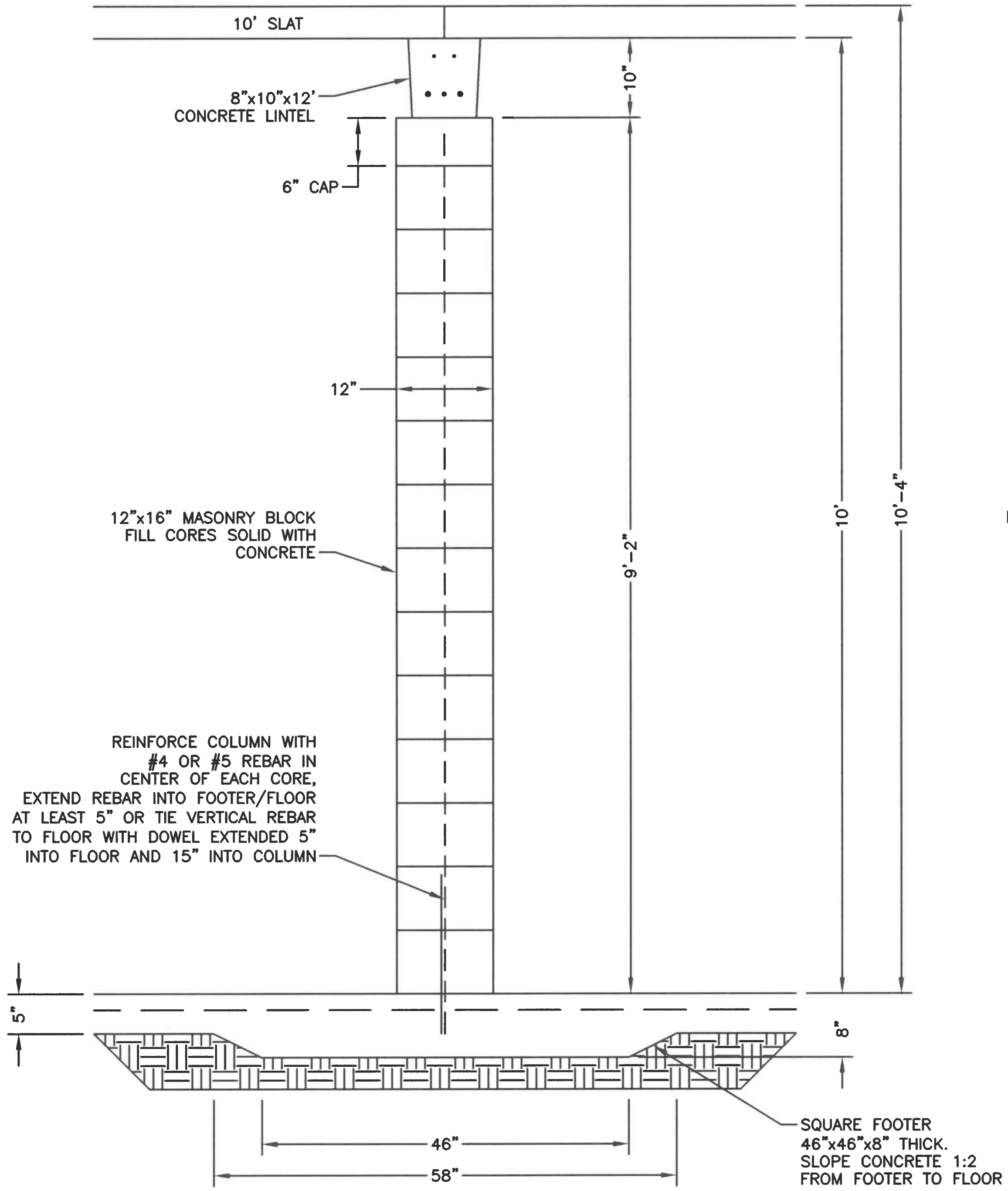
SHEET: 10D of 17D | DRAWING NO: TGP0124– 10D

DATE: 02/23/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

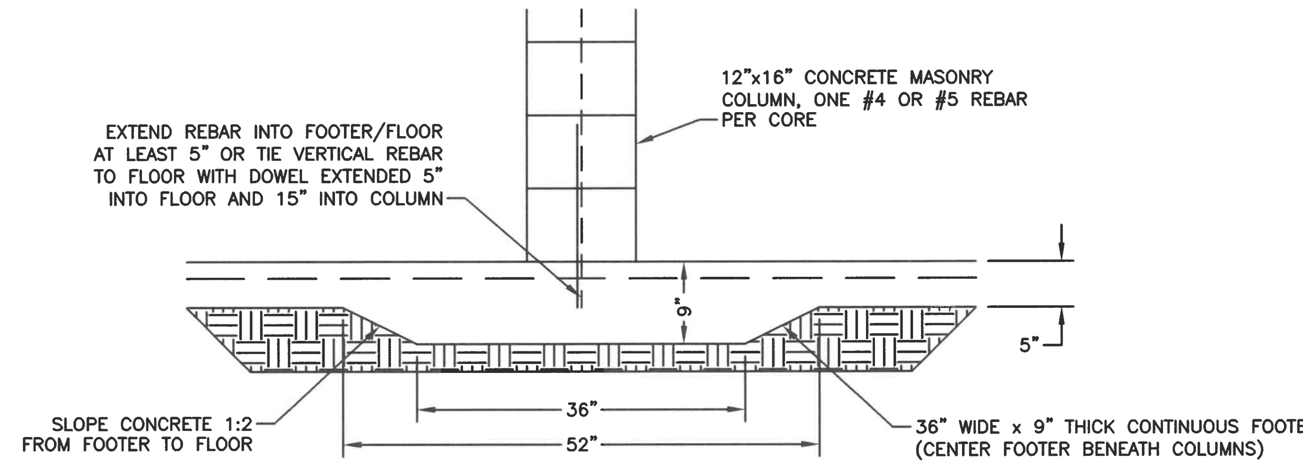
COLUMN DETAILS
MASONRY CONCRETE COLUMN
1,500 PSF SOIL BEARING

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL–#3713

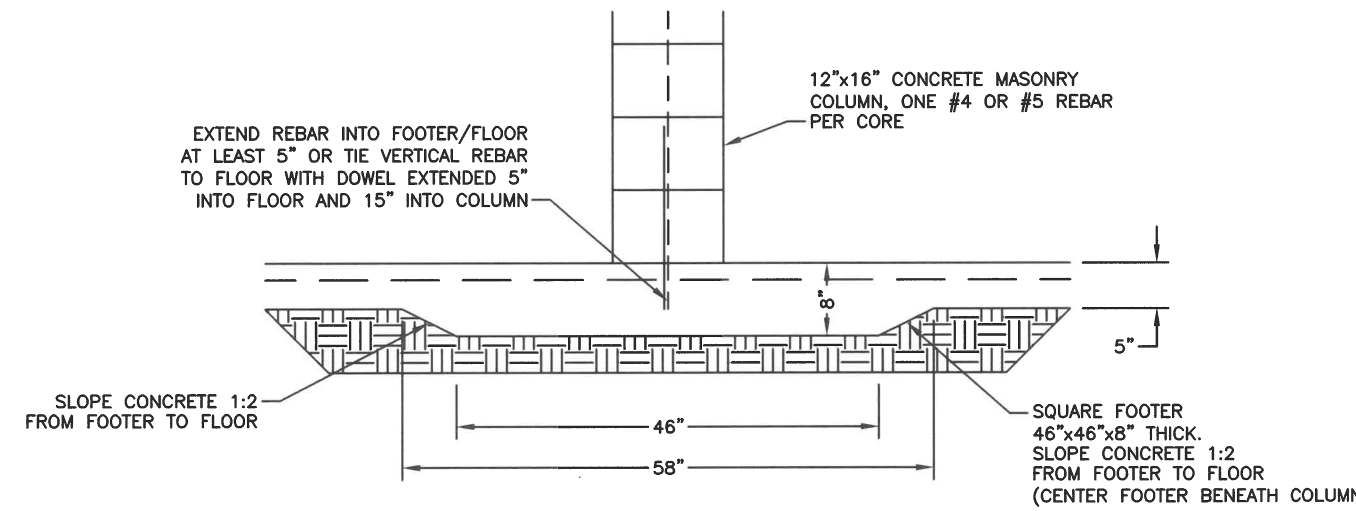


COLUMN DETAIL

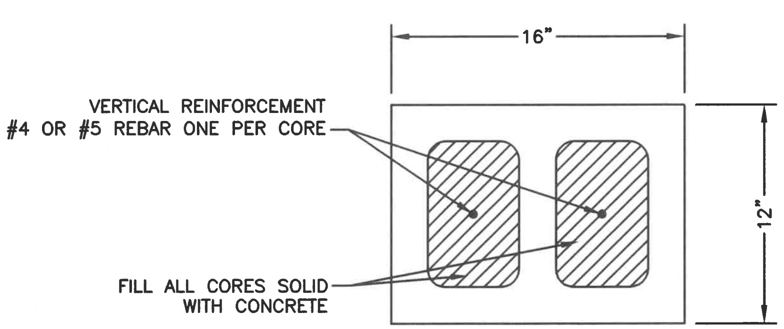
MASONRY COLUMN



CONTINUOUS FOOTER

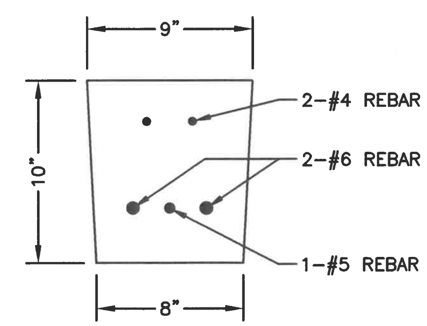


SQUARE COLUMN FOOTER



MASONRY COLUMN DETAIL

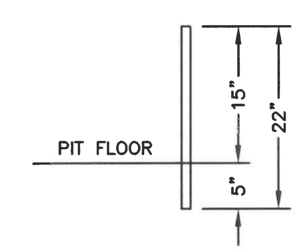
TOP VIEW



8"x10"x12' CONCRETE LINTEL

(REBAR GRADE 60)
(5000 PSI CONCRETE)
(HOG SLAT, INC. OR COMPARABLE)

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality



DOWEL DETAIL

#4 OR #5 REBAR, GRADE 60

FINAL APPROVED
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Dept. of Environmental Management
Office of Land Quality

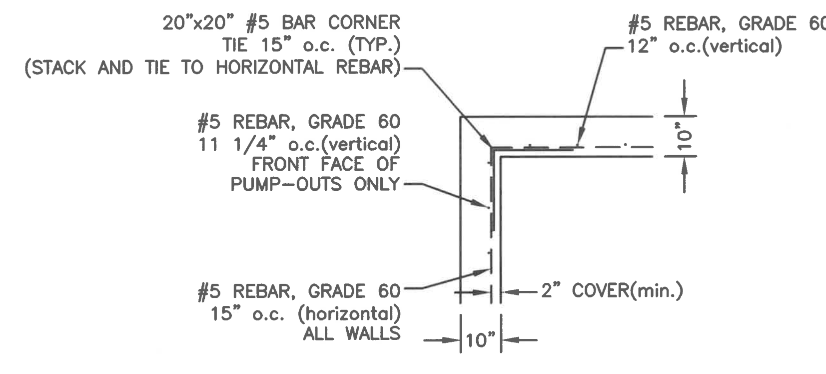
SHEET: 11D of 17D
DRAWING NO: TGP0124-11D

DATE: 02/23/24
DRAWN BY: MV

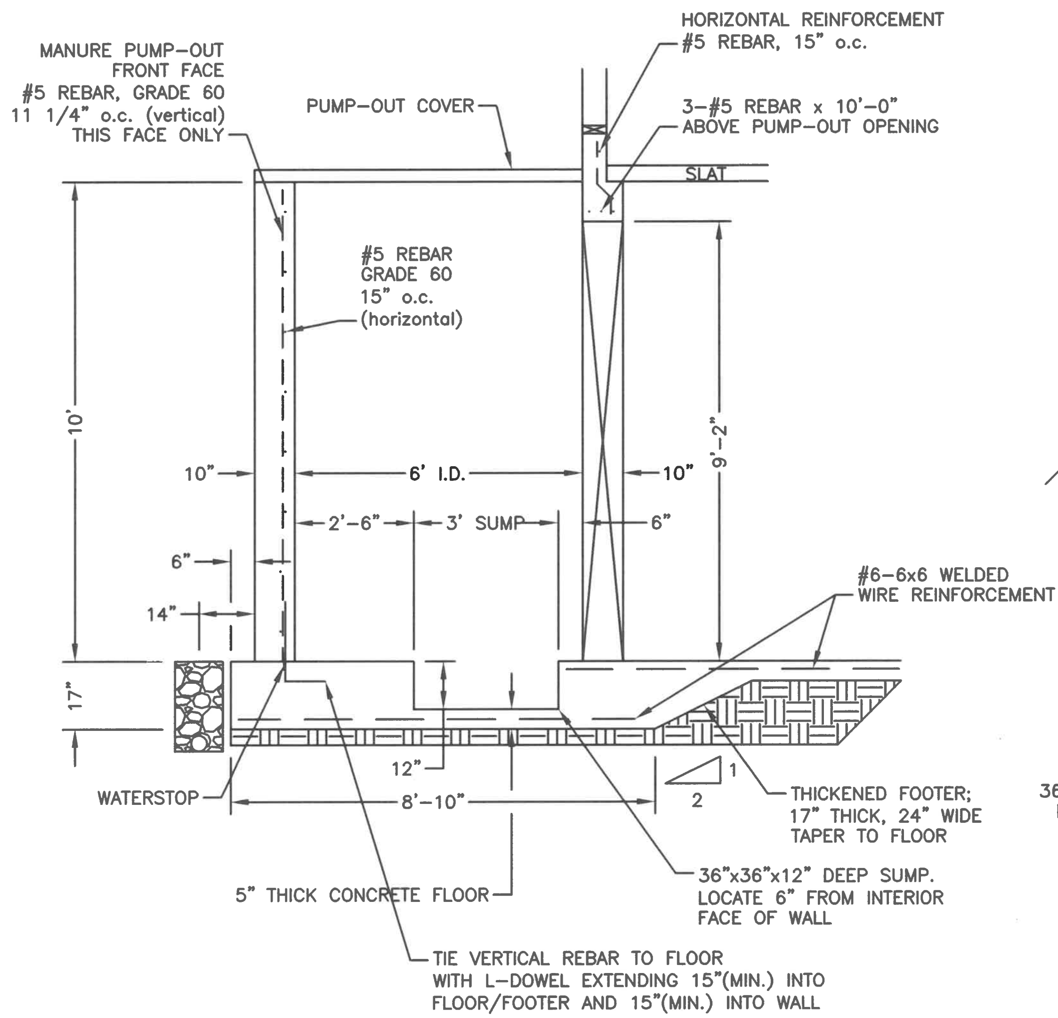
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

COLUMN DETAILS
MASONRY CONCRETE COLUMN
2,000 PSF SOIL BEARING

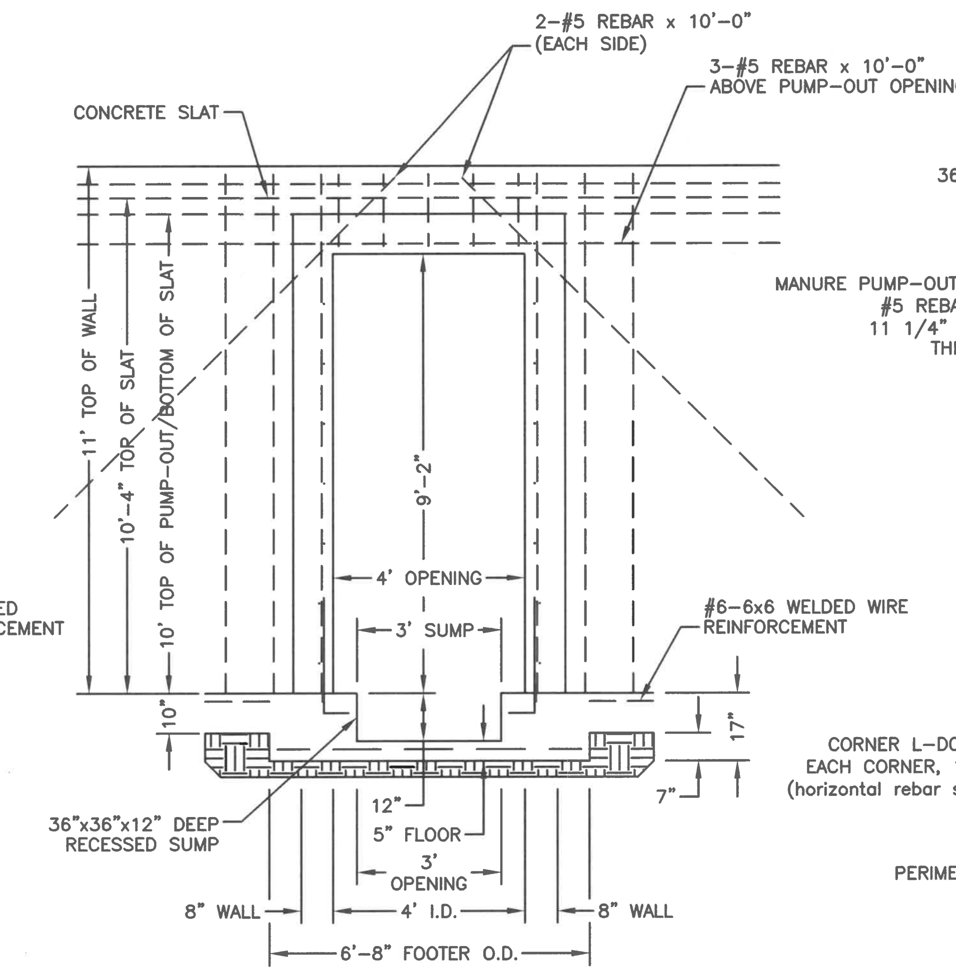
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



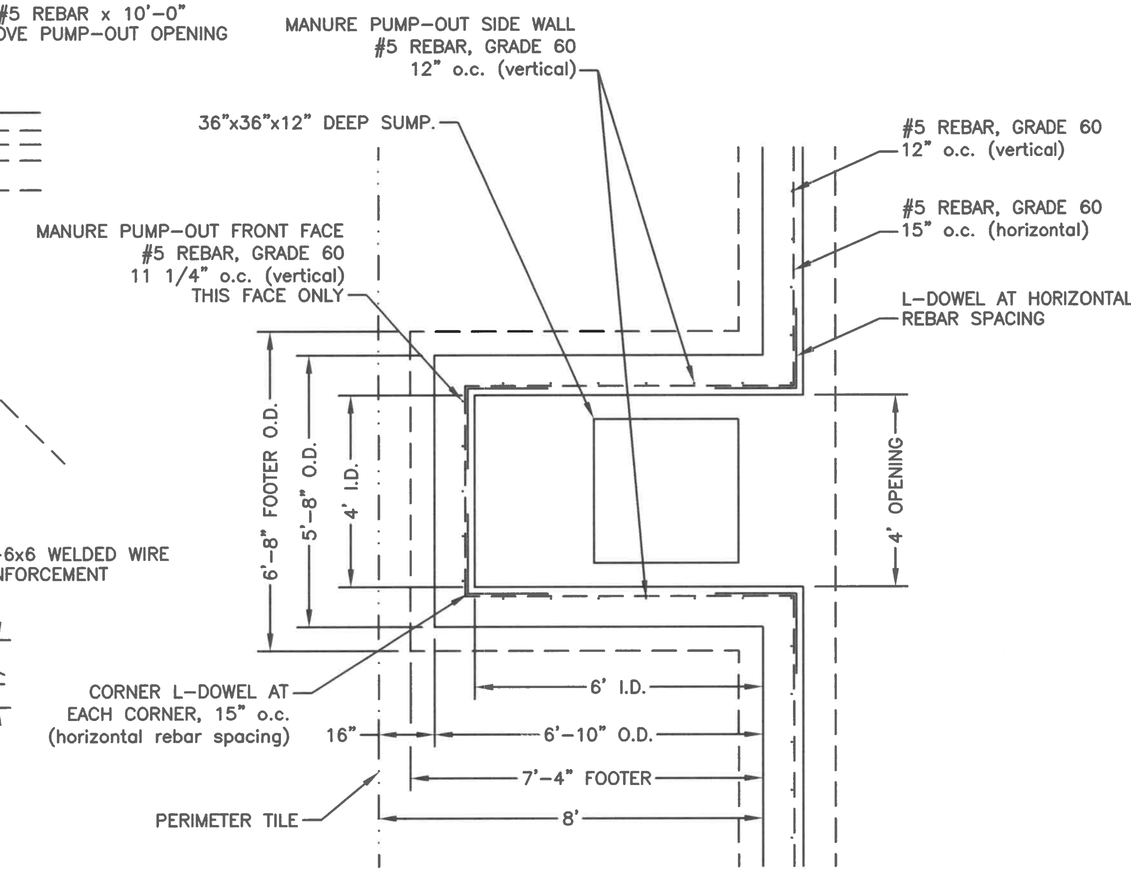
CORNER DETAIL



C/12D MANURE PUMP-OUT SUMP
SECTION



D/12D MANURE PUMP-OUT SUMP
ELEVATION



MANURE PUMP-OUT
PLAN VIEW

MANURE PUMP-OUT DETAILS W/SUMP
SECTION, ELEVATION & PLAN VIEW
4'-0" x 6'-0" I.D.

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Dept. of Environmental Management
Office of Land Quality

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CONFINED FEEDING OPERATIONS
March 11, 2024
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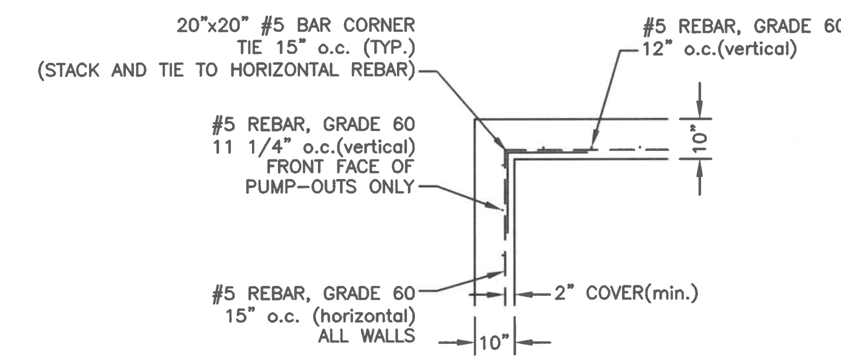
SHEET: 12D of 17D DRAWING NO: TGP0124- 12D

DATE: 02/23/24 DRAWN BY: MV

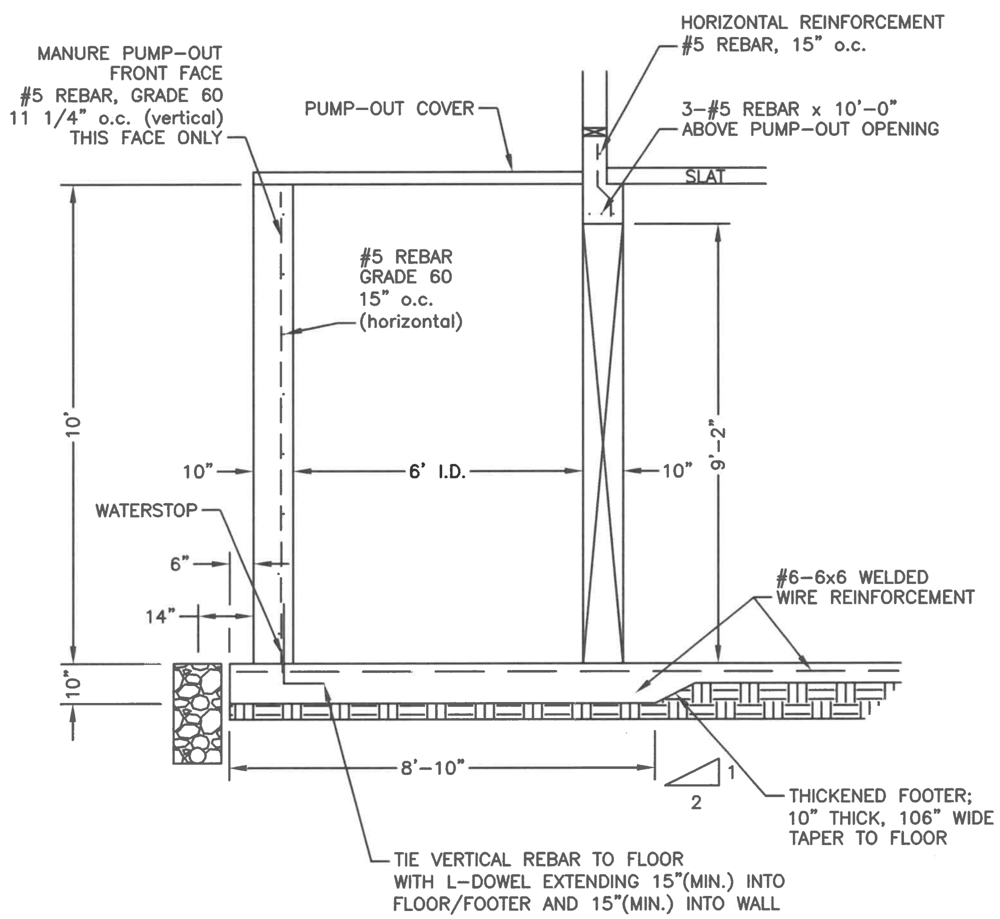
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

MANURE PUMP-OUT
CROSS SECTION, ELEVATION
PLAN VIEW
(SUMP DETAILS)

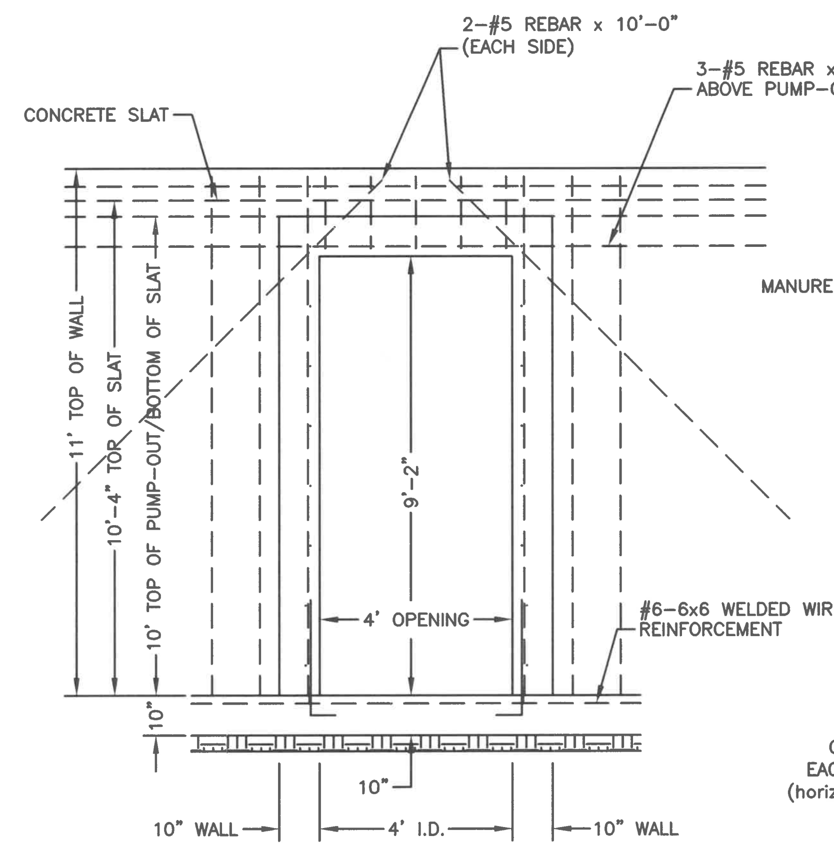
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



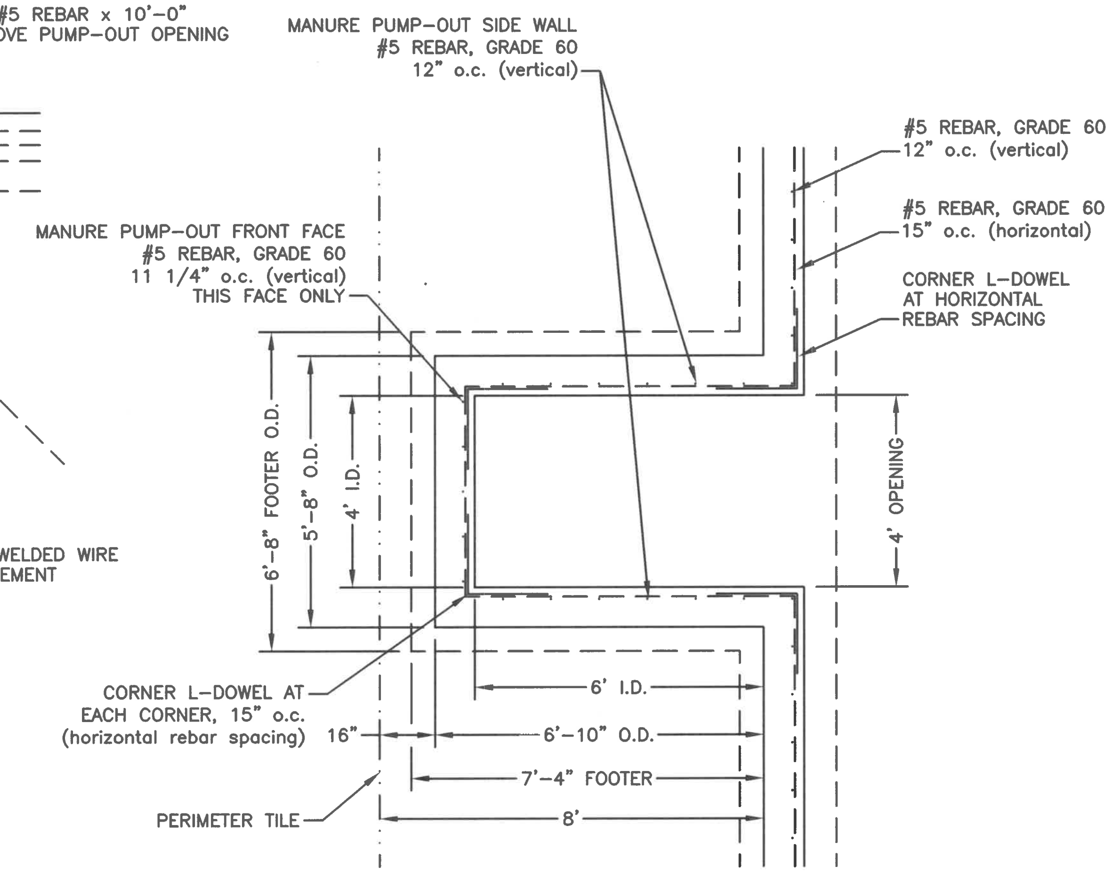
CORNER DETAIL



MANURE PUMP-OUT FLAT FLOOR
SECTION



MANURE PUMP-OUT FLAT FLOOR
ELEVATION



MANURE PUMP-OUT FLAT FLOOR
PLAN VIEW

MANURE PUMP-OUT DETAILS
SECTION, ELEVATION & PLAN VIEW
4'-0" x 6'-0" I.D.

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Dept. of Environmental Management
Office of Land Quality

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CONFINED FEEDING OPERATIONS
March 11, 2024
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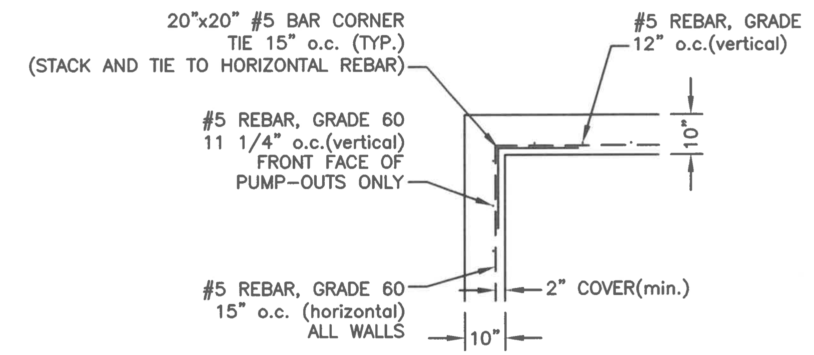
SHEET: 13D of 17D | DRAWING NO: TGP0124- 13D

DATE: 02/23/24 | DRAWN BY: MV

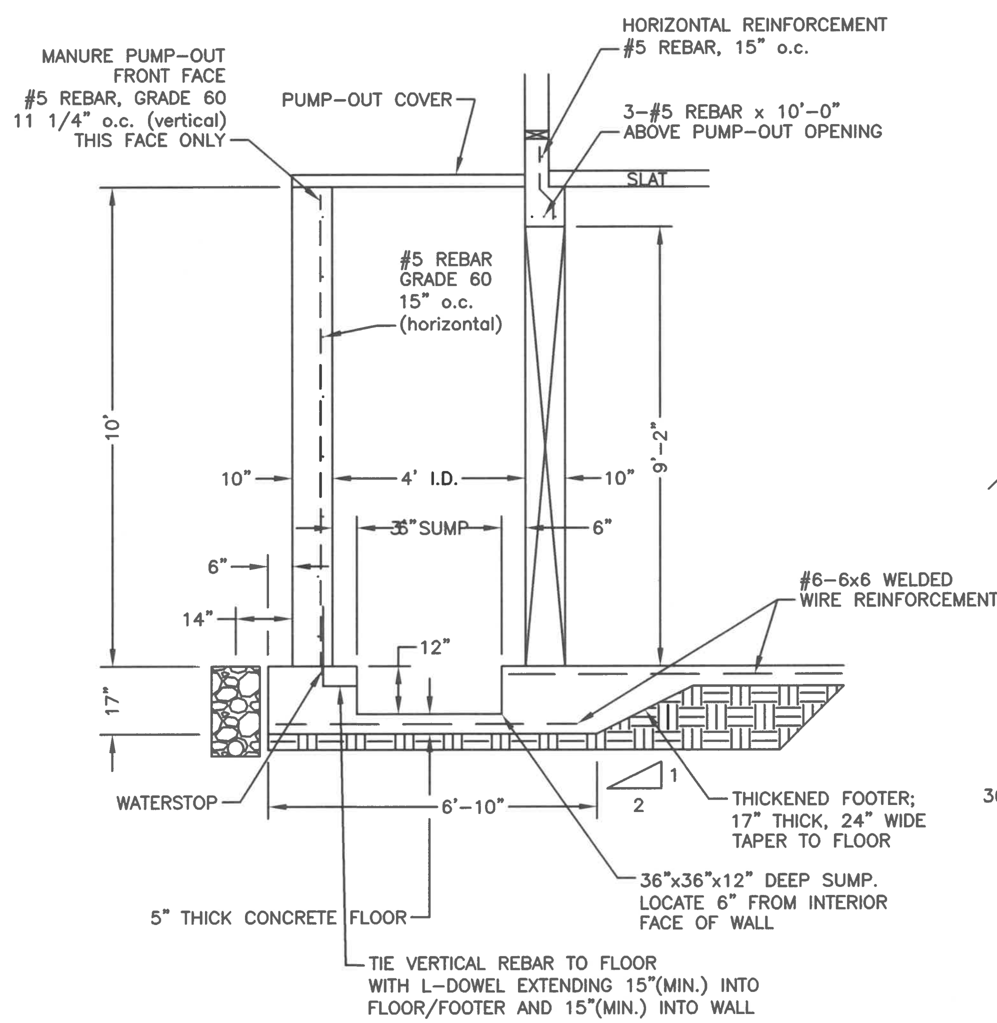
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

MANURE PUMP-OUT
CROSS SECTION, ELEVATION
PLAN VIEW
(FLAT FLOOR DETAILS)

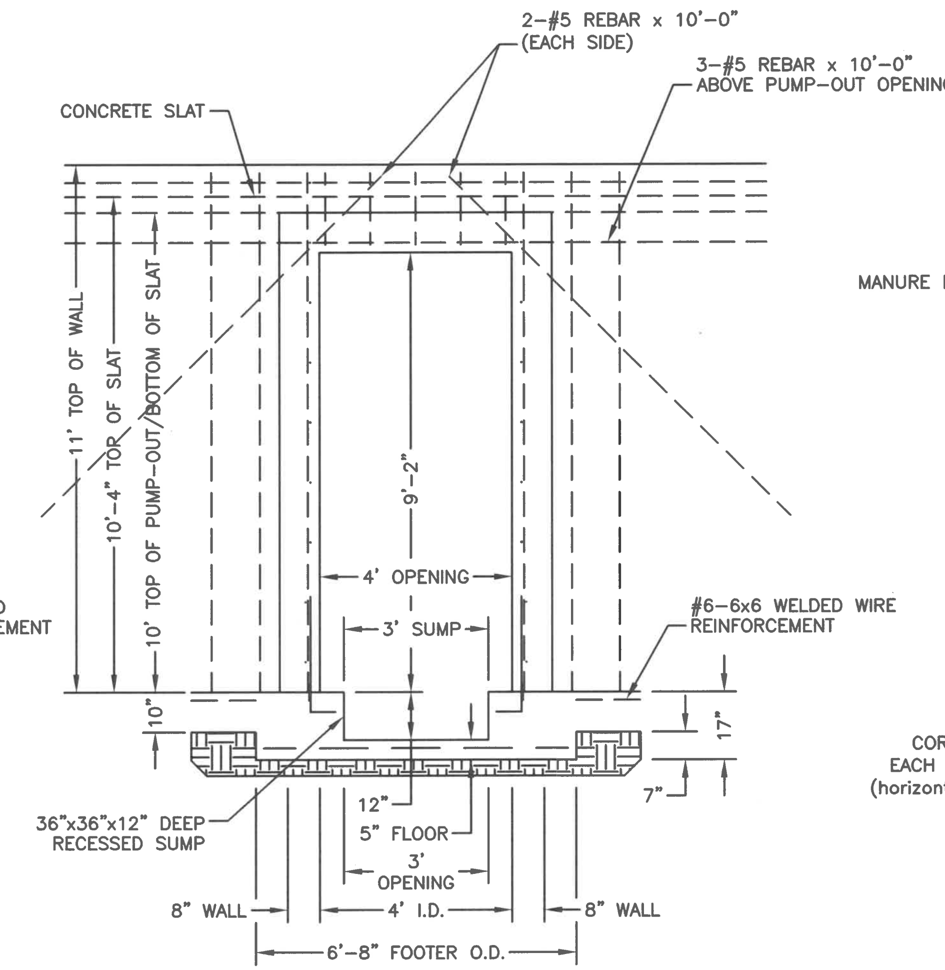
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



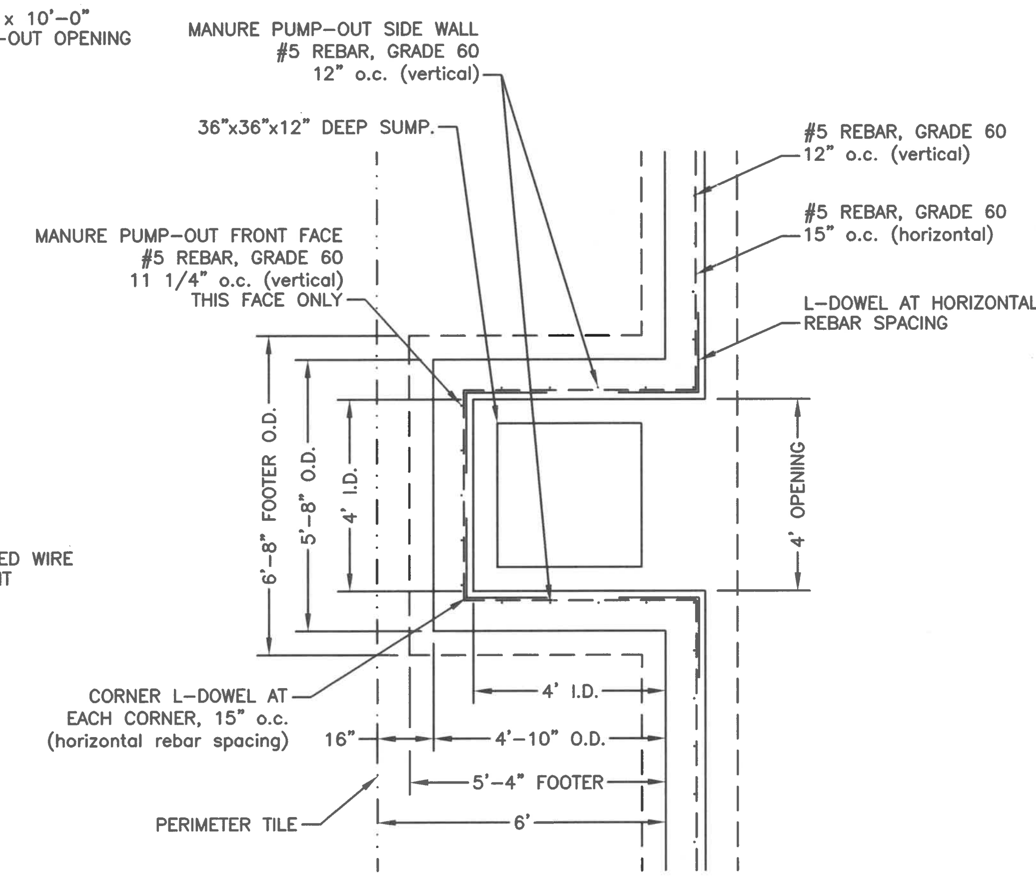
CORNER DETAIL



C
14D
MANURE PUMP-OUT SUMP
SECTION



D
14D
MANURE PUMP-OUT SUMP
ELEVATION



MANURE PUMP-OUT
PLAN VIEW

MANURE PUMP-OUT DETAILS W/SUMP
SECTION, ELEVATION & PLAN VIEW
4'-0" x 4'-0" I.D. (OPTION)

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

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March 11, 2024
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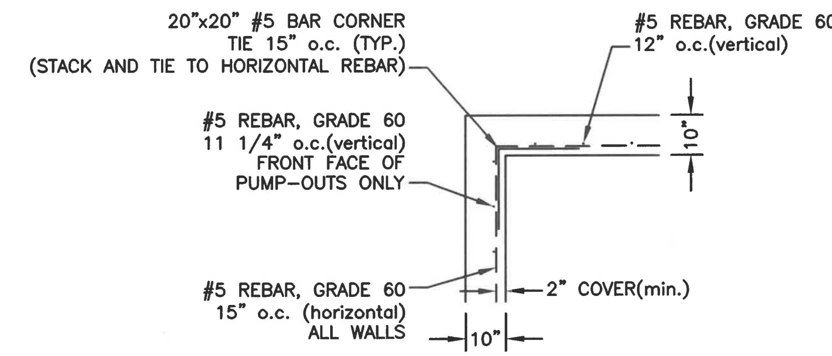
DATE: 02/23/24 | DRAWN BY: MV

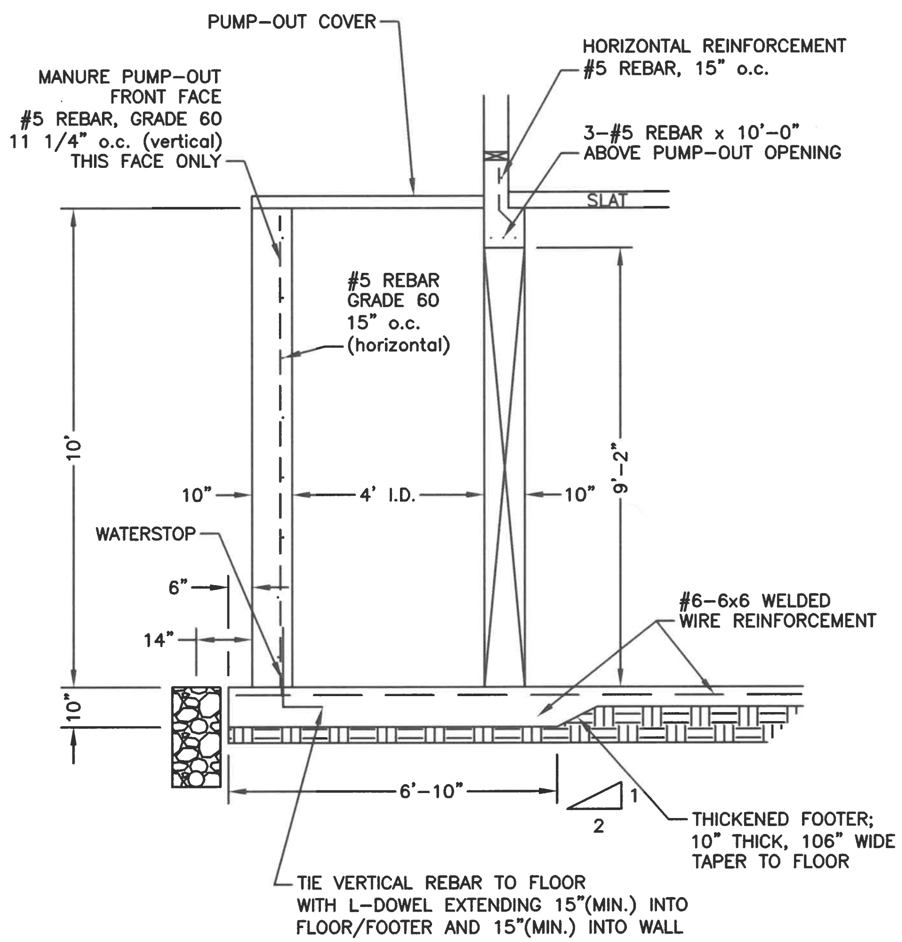
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

MANURE PUMP-OUT
CROSS SECTION, ELEVATION
PLAN VIEW
(SUMP DETAILS)

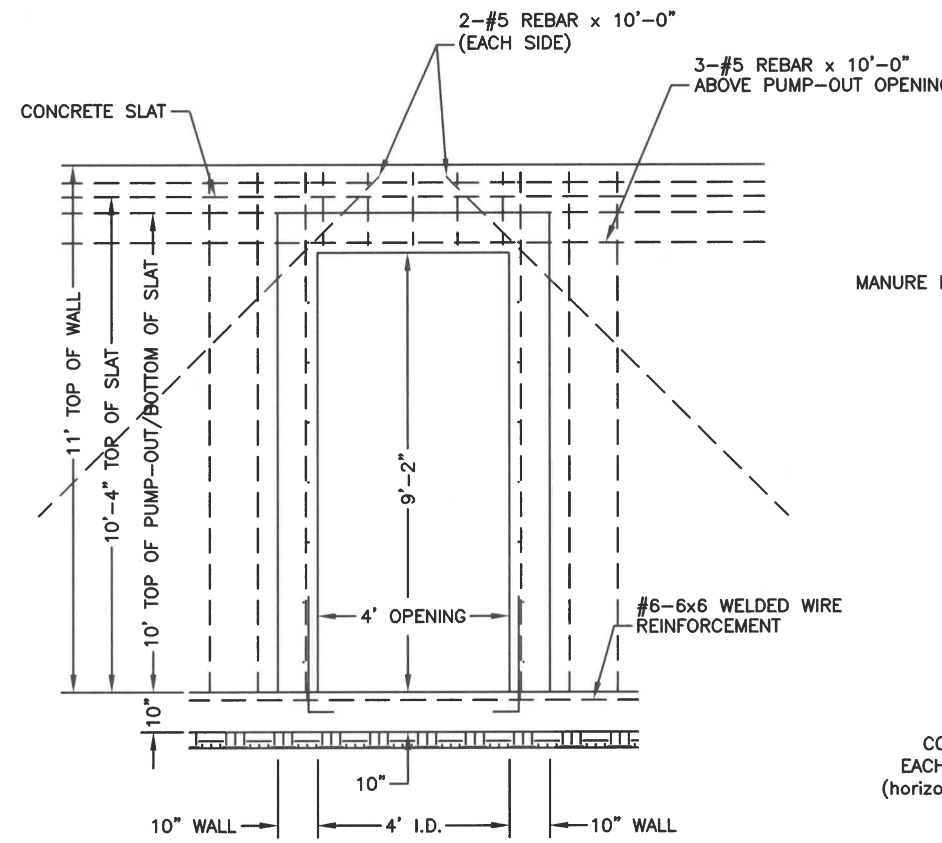
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



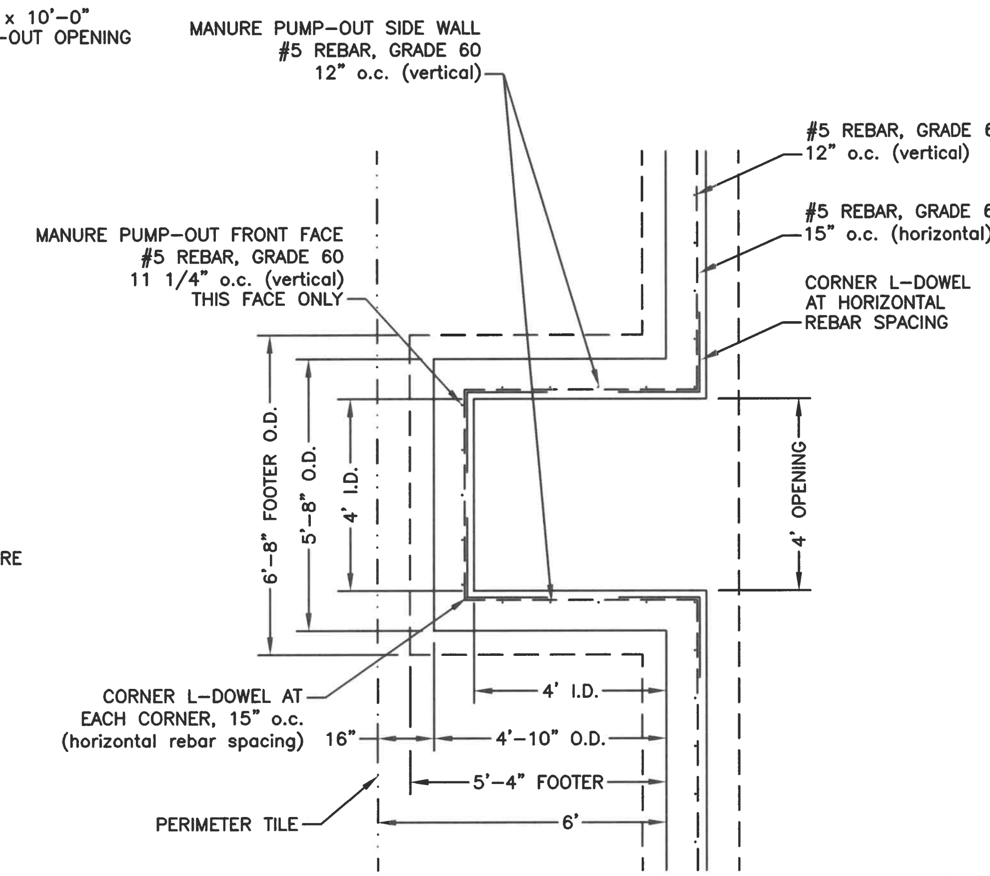
CORNER DETAIL



MANURE PUMP-OUT FLAT FLOOR
SECTION



MANURE PUMP-OUT FLAT FLOOR
ELEVATION



MANURE PUMP-OUT FLAT FLOOR
PLAN VIEW

MANURE PUMP-OUT DETAILS
SECTION, ELEVATION & PLAN VIEW
4'-0" x 4'-0" I.D. (OPTION)

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

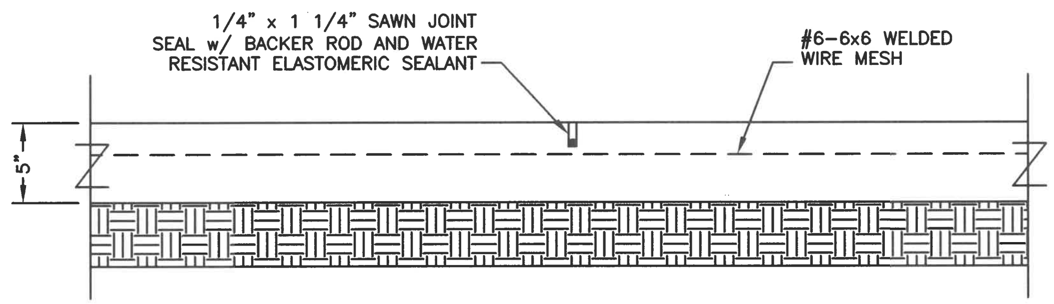
SHEET: 15D of 17D | DRAWING NO: TGP0124- 15D

DATE: 02/23/24 | DRAWN BY: MV

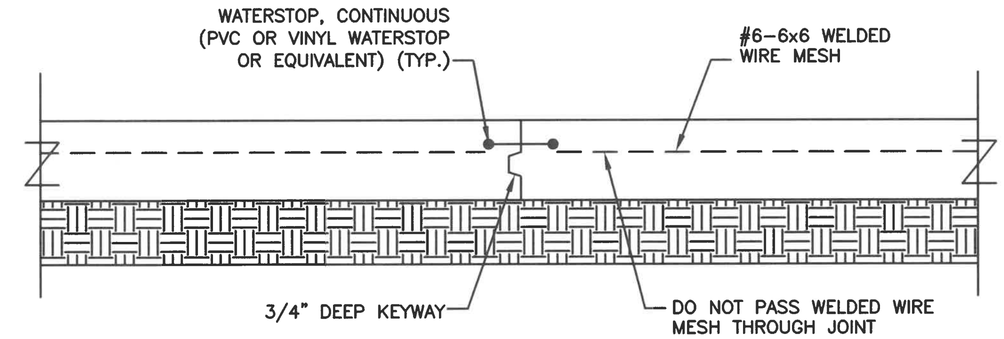
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

MANURE PUMP-OUT
CROSS SECTION, ELEVATION
PLAN VIEW
(FLAT FLOOR DETAILS)

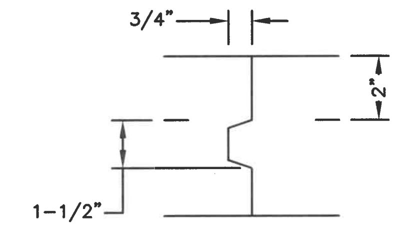
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



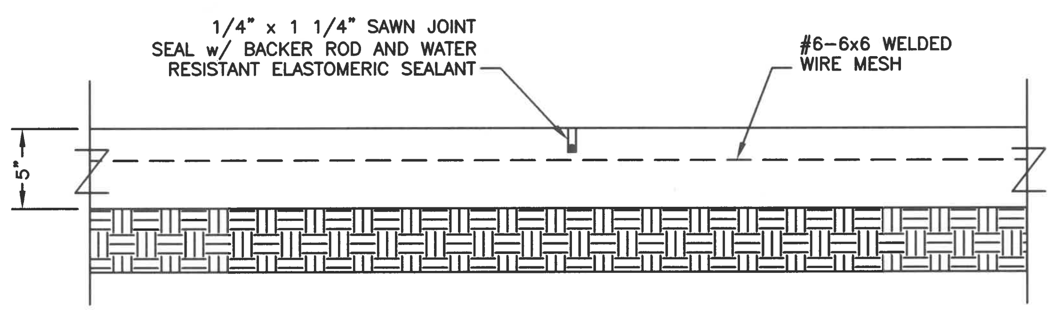
SAWN CONSTRUCTION JOINT WITH #6-6x6 WELDED WIRE MESH
60,000 PSI TENSILE STRENGTH: 42'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 64'-0" SPACING (MAX.)



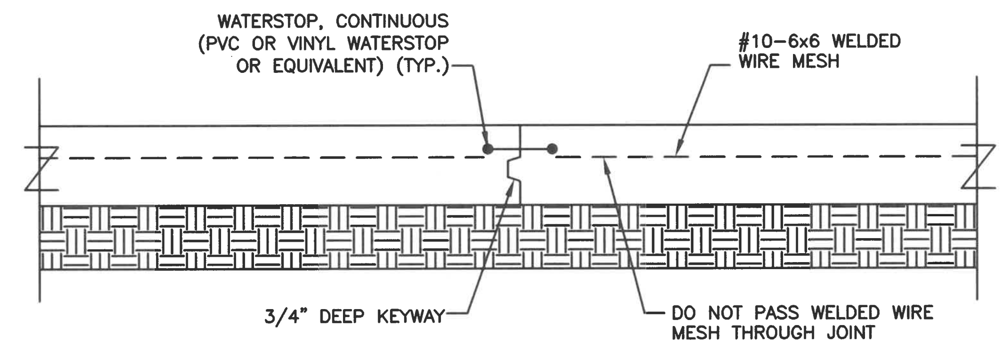
PVC OR VINYL WATERSTOP WITH #6-6x6 WELDED WIRE MESH
60,000 PSI TENSILE STRENGTH: 42'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 64'-0" SPACING (MAX.)



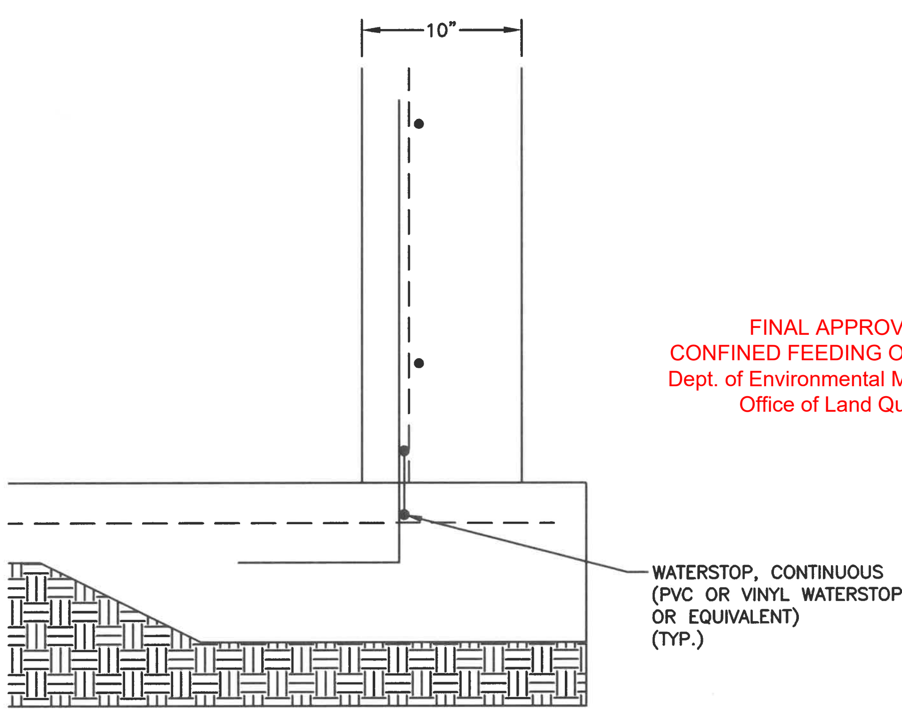
KEYWAY DETAIL



SAWN CONSTRUCTION JOINT WITH #10-6x6 WELDED WIRE MESH
60,000 PSI TENSILE STRENGTH: 20'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 31'-0" SPACING (MAX.)

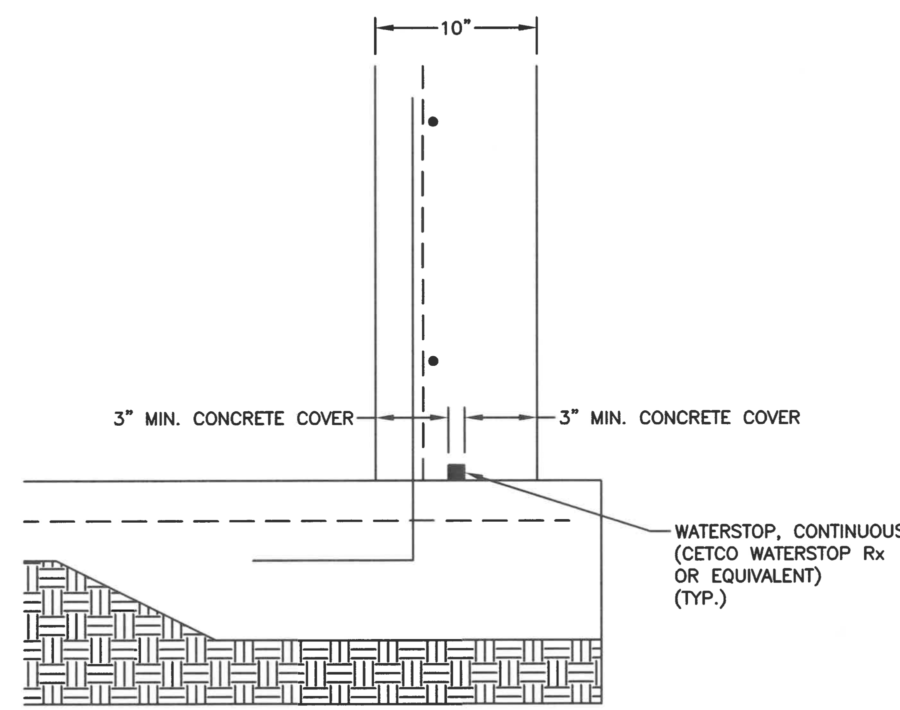


PVC OR VINYL WATERSTOP WITH #10-6x6 WELDED WIRE MESH
60,000 PSI TENSILE STRENGTH: 20'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 31'-0" SPACING (MAX.)



PVC OR VINYL WATERSTOP

FINAL APPROVED
CONFINED FEEDING OPERATION
Dept. of Environmental Management
Office of Land Quality



COLLOIDAL WATERSTOP

WALL FOOTER DETAIL OPTIONS

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

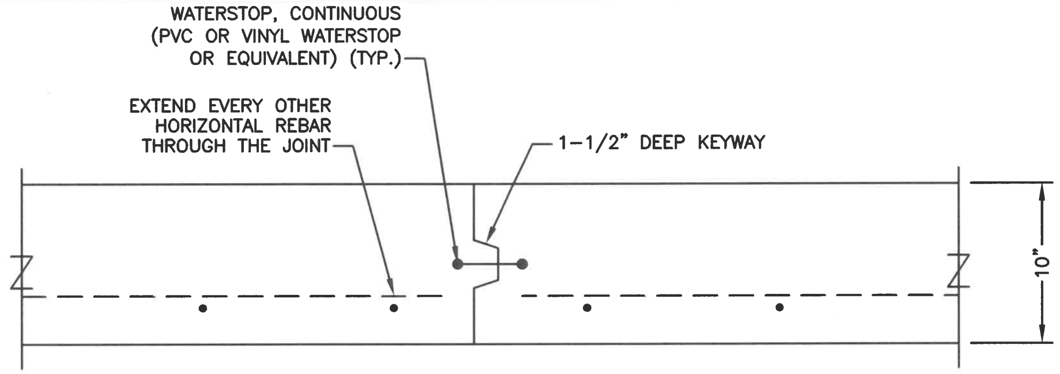
SHEET: 16D of 17D DRAWING NO: TGP0124- 16D

DATE: 02/23/24 DRAWN BY: MV

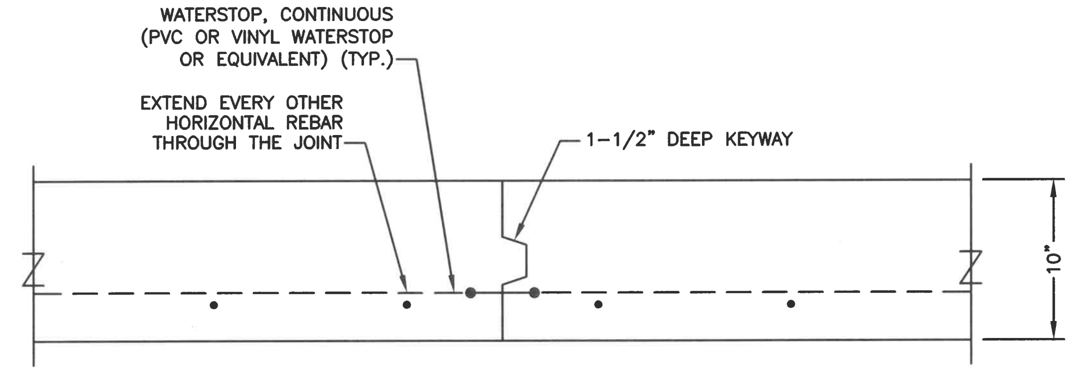
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FLOOR CONTROL JOINTS
WALL/FOOTER WATERSTOP
DETAILS

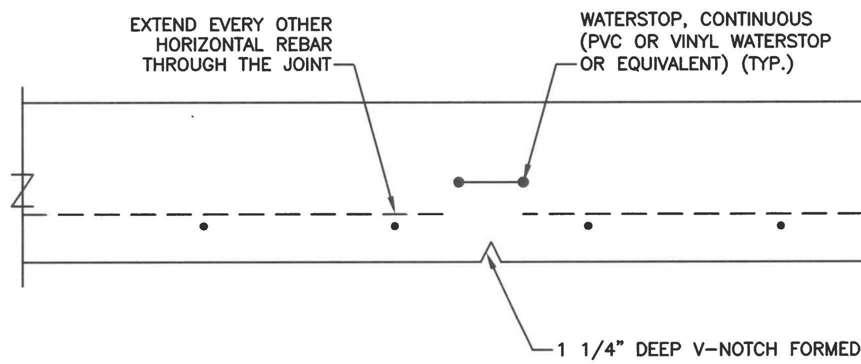
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



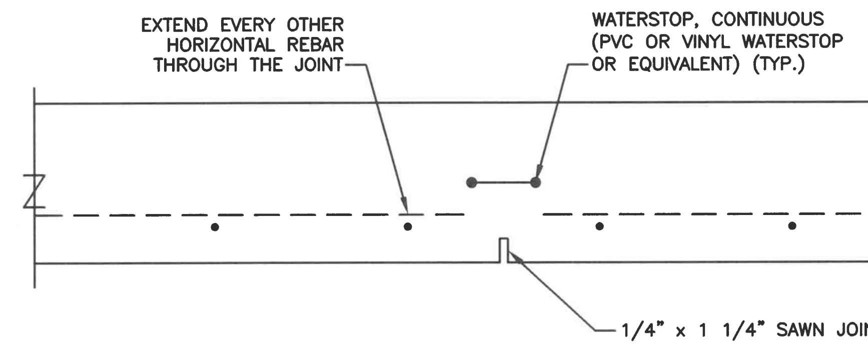
WATERSTOP PLACED IN MIDDLE OF KEYWAY FORM
SPLIT FORM AND PLACE WATERSTOP BETWEEN
TWO HALVES OF FORM



WATERSTOP PLACED OUTSIDE KEYWAY FORM
PLACE WATERSTOP AT LEAST 1-1/2"
FROM WALL



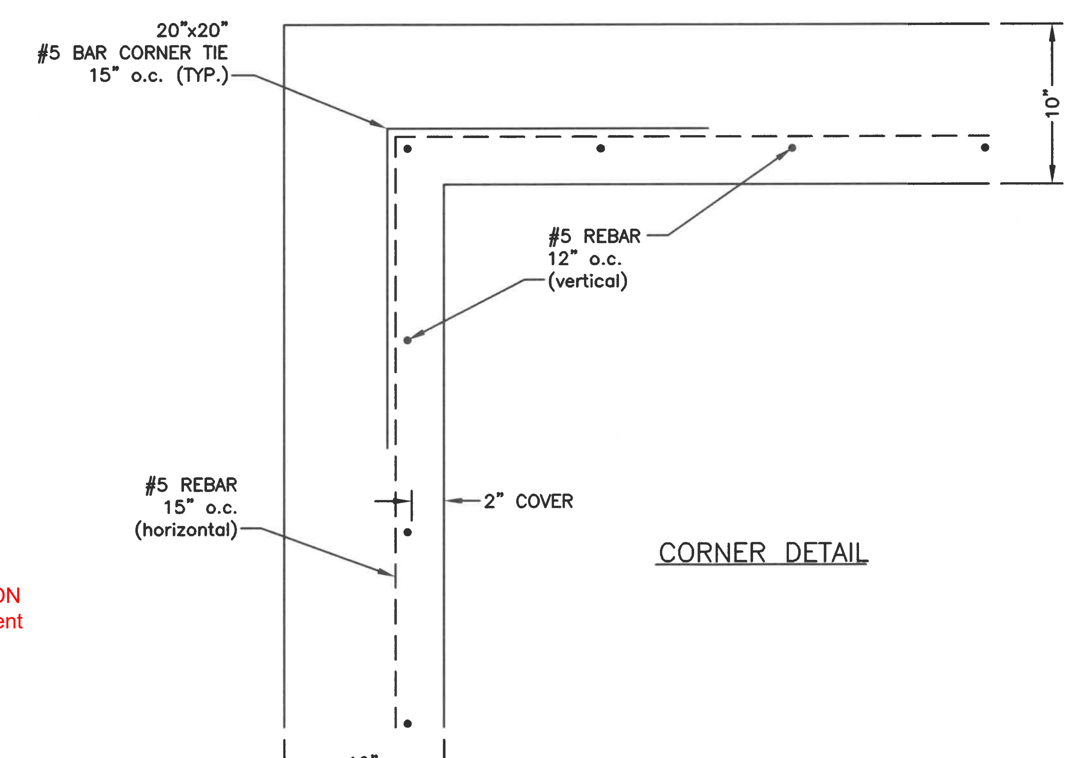
WATERSTOP PLACED IN MIDDLE OF WALL
1-1/4" DEEP x 1-1/4" WIDE 'V'-NOTCH
GROOVE FORMED IN THE WALL



WATERSTOP PLACED IN MIDDLE OF WALL
SAW JOINT IS CUT INTO THE WALL

WALL CONSTRUCTION JOINT OPTIONS

PVC OR VINYL WATERSTOP



CORNER DETAIL

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SHEET: 17D of 17D | DRAWING NO: TGP0124- 17D

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LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

WALL AND JOINT DETAILS
WATERSTOP OPTIONS
CORNER REINFORCEMENT

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

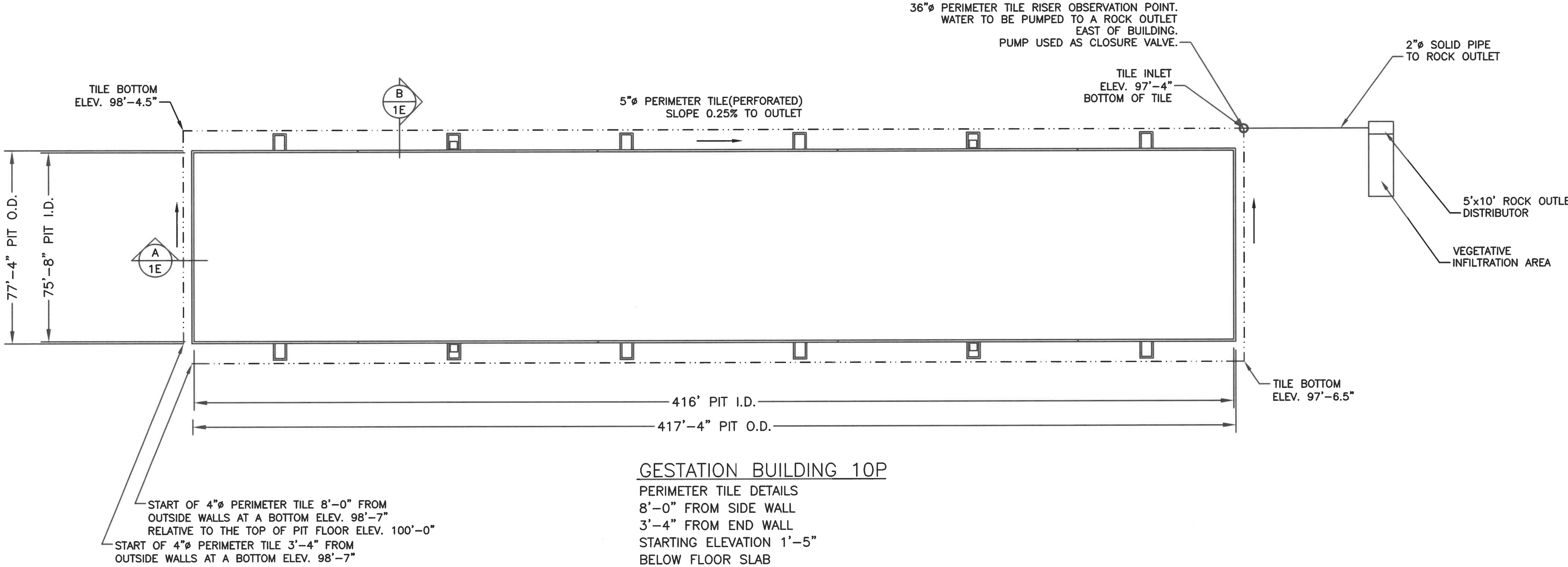
BUILDING DESIGN AND CONSTRUCTION PLANS

BELOW-BUILDING CONCRETE MANURE STORAGE DESIGN PLANS

Seasonal Water Table Management System – Perimeter Tile
10P. South Gestation (Plan Sheets 1E-5E)

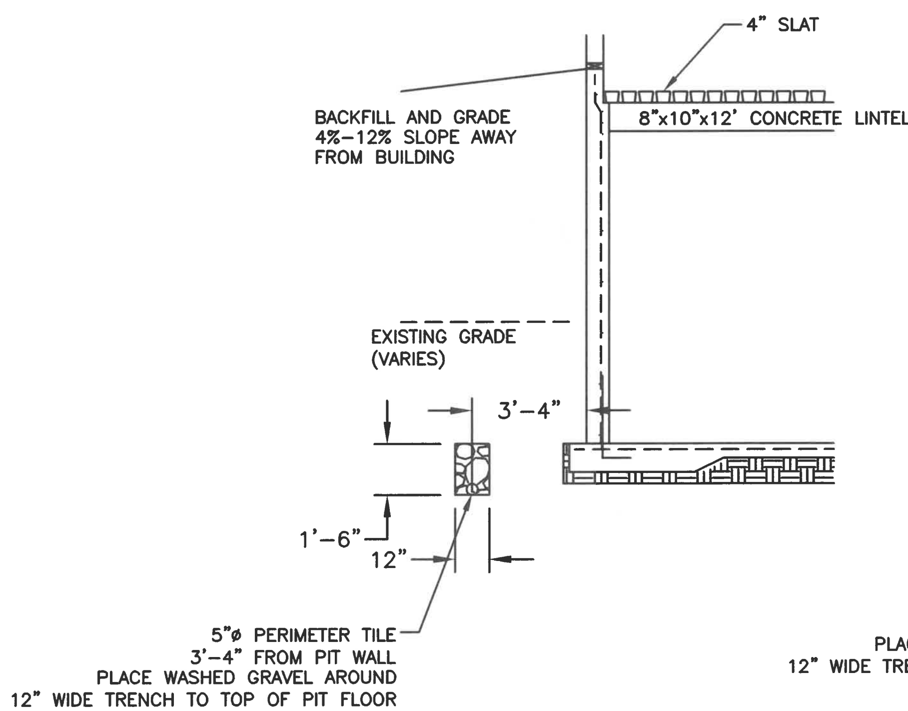
Prepared by:
LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829

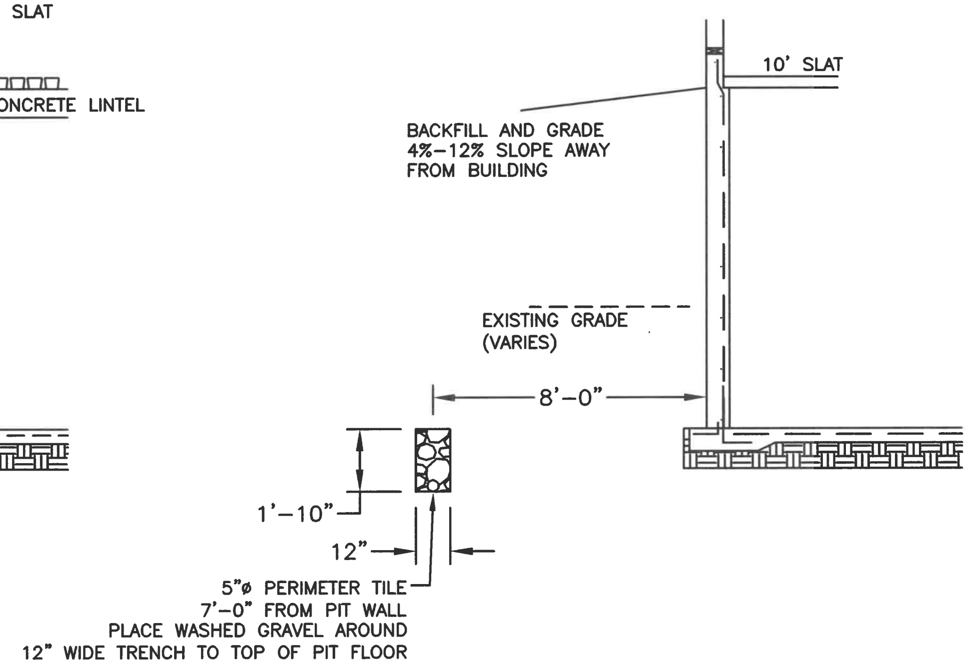


GESTATION BUILDING 10P

PERIMETER TILE DETAILS
8'-0" FROM SIDE WALL
3'-4" FROM END WALL
STARTING ELEVATION 1'-5"
BELOW FLOOR SLAB
SLOPE 0.25% TO OUTLET



A
1E
END WALL DETAIL
CROSS-SECTION A



B
1E
SIDE WALL DETAIL
CROSS-SECTION B

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TOP GRADE PRODUCTION LLC
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KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

PERIMETER TILE DETAILS
PERIMETER TILE LAYOUT
GESTATION BUILDING 10P.
OPTION 1

DATE: 02/23/24 | DRAWN BY: MV

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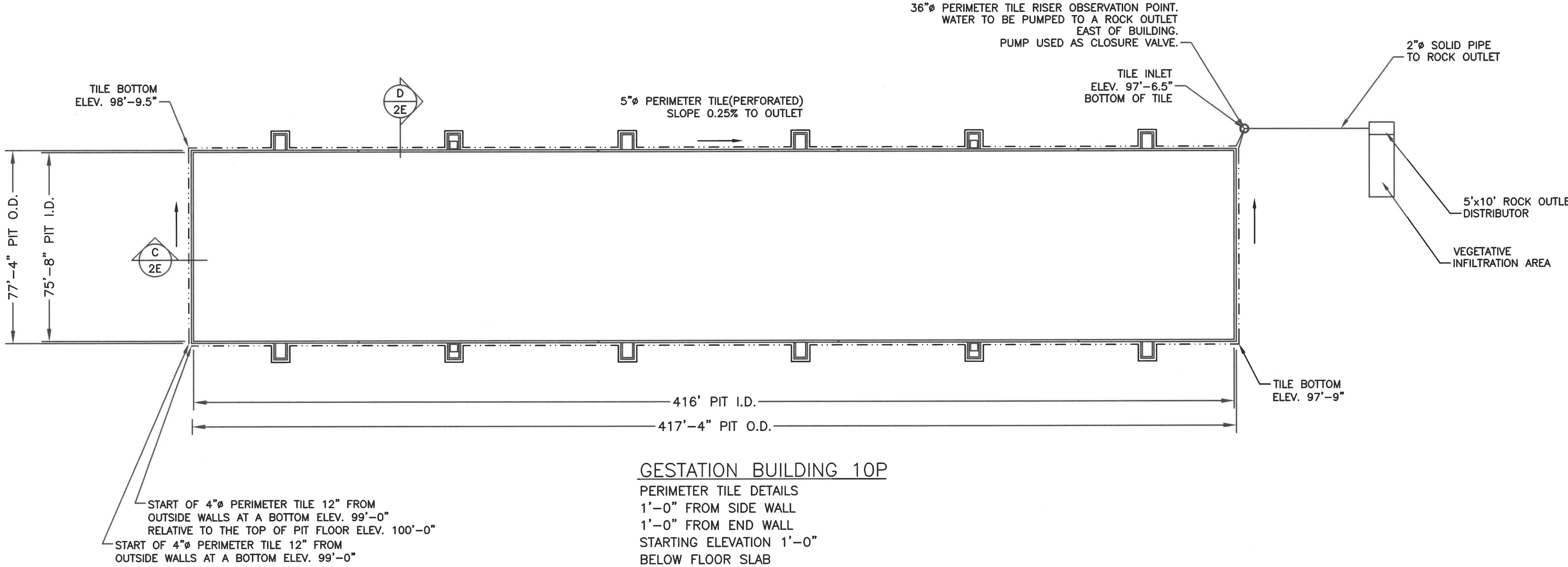
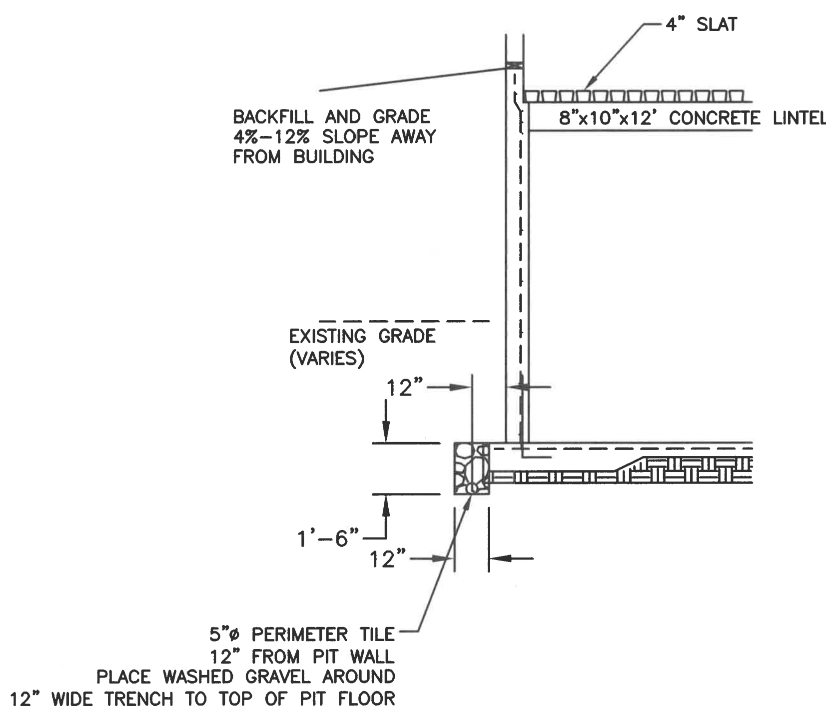
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

SHEET: 1E of 5E | DRAWING NO: TGP0124- 01E

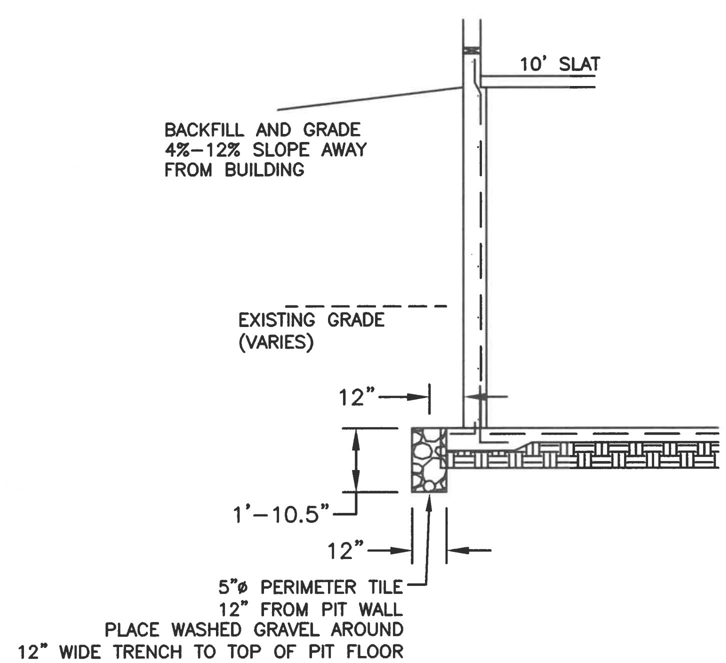


GESTATION BUILDING 10P

PERIMETER TILE DETAILS
1'-0" FROM SIDE WALL
1'-0" FROM END WALL
STARTING ELEVATION 1'-0"
BELOW FLOOR SLAB
SLOPE 0.25% TO OUTLET



C / 2E **END WALL DETAIL**
CROSS-SECTION C



D / 2E **SIDE WALL DETAIL**
CROSS-SECTION D

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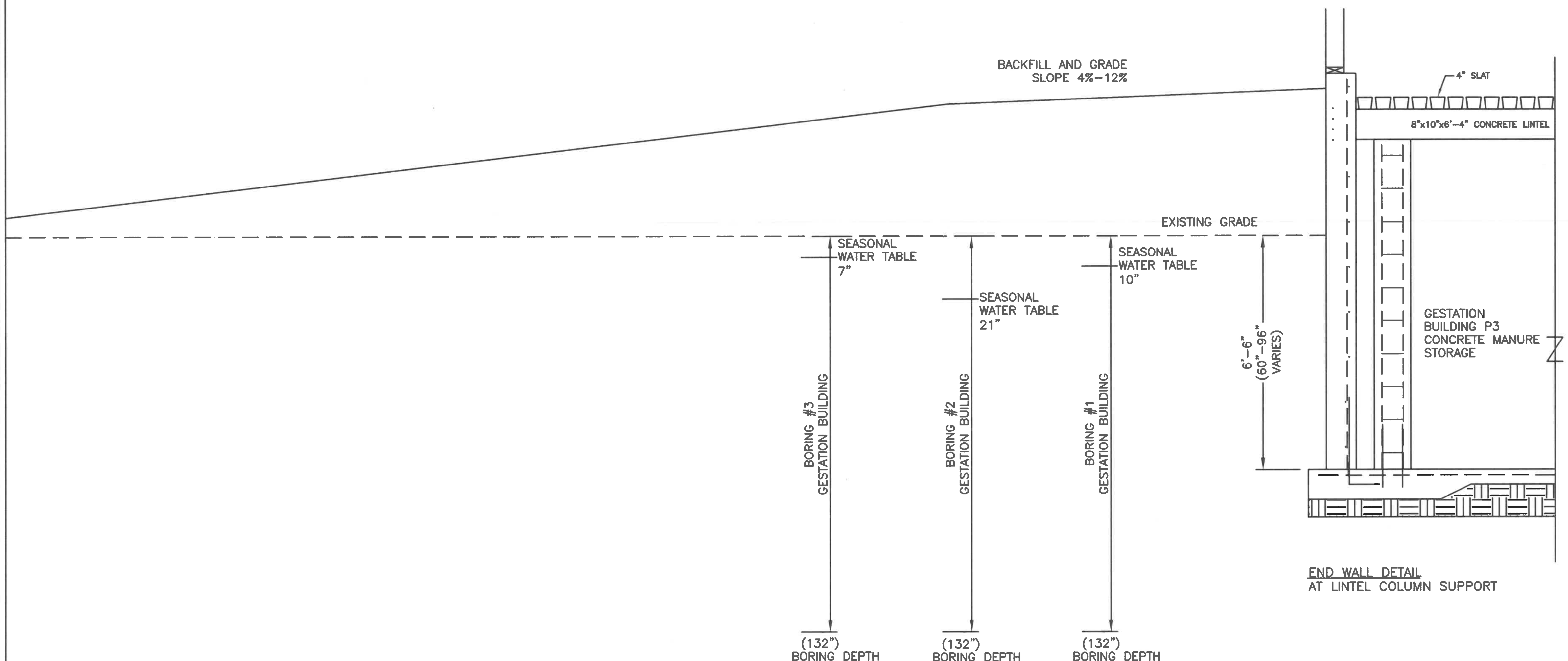
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

PERIMETER TILE DETAILS
PERIMETER TILE LAYOUT
GESTATION BUILDING 10P
OPTION 2

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



SOURCE:
CHESTNUT RIDGE CONSULTING, INC.
JOHN BOWEN
09/28/18

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SEASONAL WATER TABLE DETERMINATION

NOTES: TILE 8'-0" FROM SIDEWALLS AND 3'-4" FROM ENDWALL

1. A 5" DIAMETER PLASTIC PERFORATED CORRUGATED DRAINAGE TILE SHALL BE PLACED AROUND THE FOUNDATION OF THE CONCRETE MANURE STORAGE TANK.
2. PLACE TILE 8'-0" FROM THE SIDEWALL AND 3'-4" FROM THE END WALL.
3. START TILE AT 17" BELOW THE TOP OF PIT FLOOR ELEVATION AND ENTER THE OBSERVATION SUMP AT 32" BELOW THE TOP OF PIT FLOOR.
4. BED OR PLACE WASHED GRANULAR FILL IN A 12" WIDE TRENCH. PLACE AT LEAST 4" OF GRANULAR FILL ON EACH SIDE OF THE TILE AND AT LEAST 6" OF GRANULAR FILL ABOVE THE TILE. FILL THE TRENCH WITH GRANULAR FILL TO THE TOP OF THE PIT FLOOR.
5. SLOPE THE DRAINAGE TILE 0.25% TO THE TILE OBSERVATION SUMP.
6. OUTLET FROM THE TILE OBSERVATION SUMP TO A ROCK OUTLET DISTRIBUTOR AND VEGETATIVE INFILTRATION AREA.
7. WATER FROM TILE OBSERVATION SUMP PUMPED TO ROCK OUTLET DISTRIBUTOR
8. LOCATE THE ROCK OUTLET DISTRIBUTOR AT LEAST 50'-0" FROM THE CONCRETE MANURE STORAGE FOUNDATION.
9. THE ROCK OUTLET DISTRIBUTOR IS LOCATED ON THE ADJACENT PROPERTY. A WAIVER ALLOWING THE LOCATION OF THE ROCK OUTLET DISTRIBUTOR ON THE ADJACENT PROPERTY FROM THE ADJACENT LANDOWNER WAS PROVIDED.

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NOTES: TILE 1'-0" FROM THE SIDEWALLS AND ENDWALLS

1. A 5" DIAMETER PLASTIC PERFORATED CORRUGATED DRAINAGE TILE SHALL BE PLACED AROUND THE FOUNDATION OF THE CONCRETE MANURE STORAGE TANK.
2. PLACE TILE 1'-0" FROM THE SIDEWALL AND 1'-0" FROM THE ENDWALL.
3. START TILE AT 12" BELOW THE TOP OF PIT FLOOR ELEVATION AND ENTER THE OBSERVATION SUMP AT 29.5" BELOW THE TOP OF PIT FLOOR.
4. BED OR PLACE WASHED GRANULAR FILL IN A 12" WIDE TRENCH. PLACE AT LEAST 4" OF GRANULAR FILL ON EACH SIDE OF THE TILE AND AT LEAST 6" OF GRANULAR FILL ABOVE THE TILE. FILL THE TRENCH WITH GRANULAR FILL TO THE TOP OF THE PIT FLOOR.
5. SLOPE THE DRAINAGE TILE 0.25% TO THE TILE OBSERVATION SUMP.
6. OUTLET FROM THE TILE OBSERVATION SUMP TO A ROCK OUTLET DISTRIBUTOR AND VEGETATIVE INFILTRATION AREA.
7. WATER FROM TILE OBSERVATION SUMP PUMPED TO ROCK OUTLET DISTRIBUTOR
8. LOCATE THE ROCK OUTLET DISTRIBUTOR AT LEAST 50'-0" FROM THE CONCRETE MANURE STORAGE FOUNDATION.
9. THE ROCK OUTLET DISTRIBUTOR IS LOCATED ON THE ADJACENT PROPERTY. A WAIVER ALLOWING THE LOCATION OF THE ROCK OUTLET DISTRIBUTOR ON THE ADJACENT PROPERTY FROM THE ADJACENT LANDOWNER WAS PROVIDED.

DRAWING NO: TGP0124- 03E
SHEET: 3E of 5E
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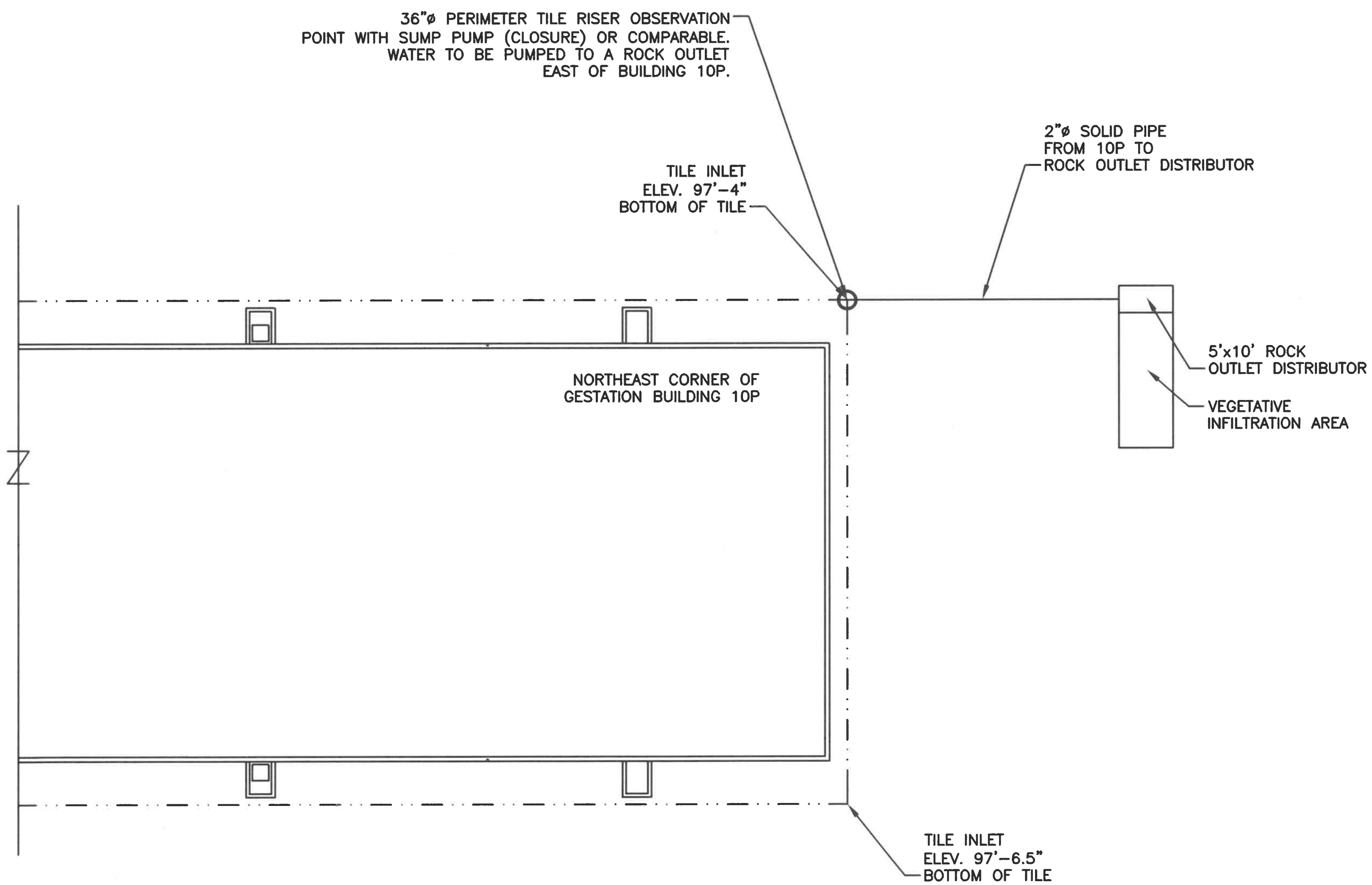
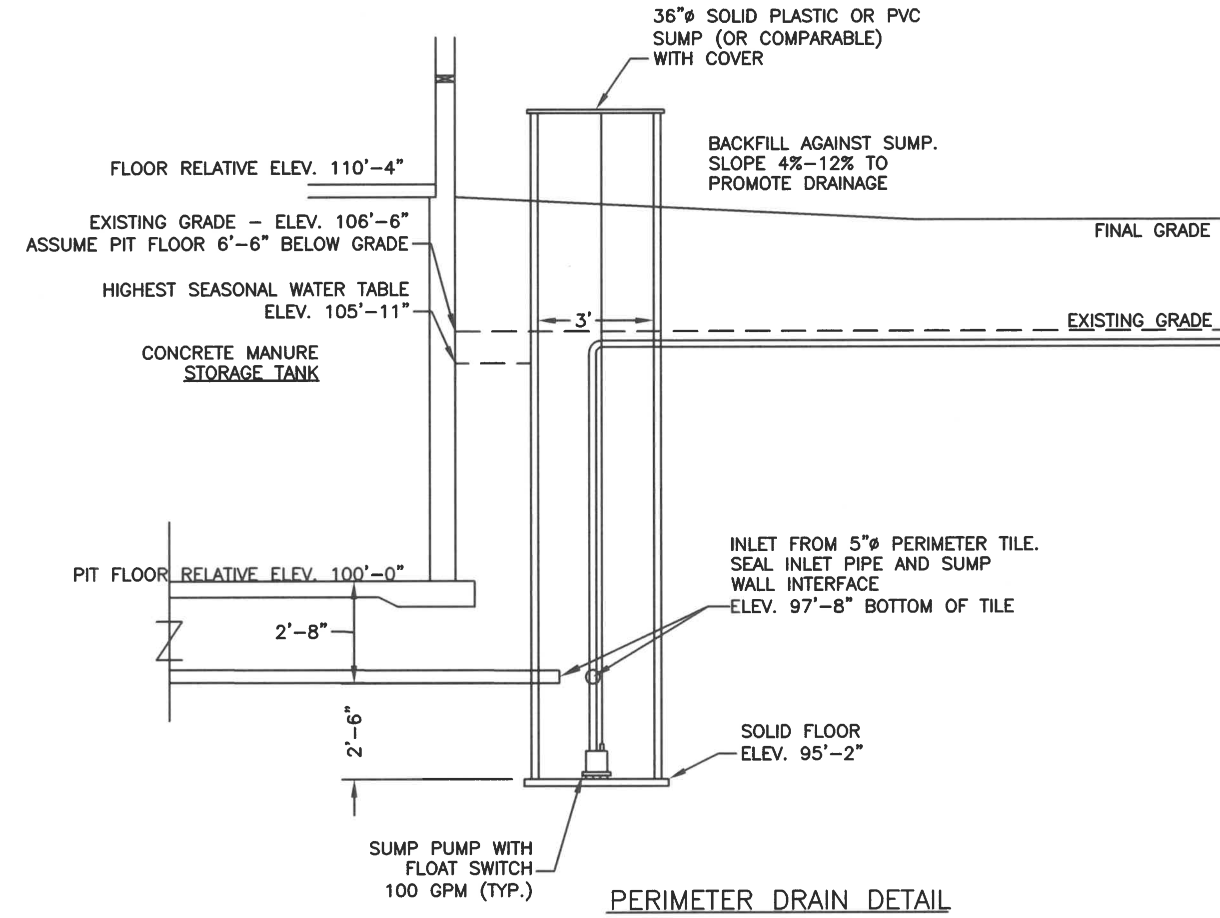
DATE: 02/23/24

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

SEASONAL WATER TABLE MGMT
WATER TABLE DEPTH
PERIMETER TILE SPECIFICATION

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713





PERIMETER DRAIN DETAIL
CROSS-SECTION
VENTED SUMP COVER

NOTE:
1. PROVIDE SUMP PUMP WITH FLOAT SWITCH 100 GPM (TYPICAL)
2. ELECTRICAL SERVICE PROVIDED FROM BUILDING SERVICE TO SUMP PUMP
3. BACK-UP GENERATOR LOCATED ON-SITE IN CASE OF POWER OUTAGE
4. PROVIDE PUMP ELECTRICAL SERVICE DISCONNECT, RECOMMENDED
5. PROVIDE BACK-UP PUMP HOUSED ON-SITE

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TOP GRADE PRODUCTION LLC
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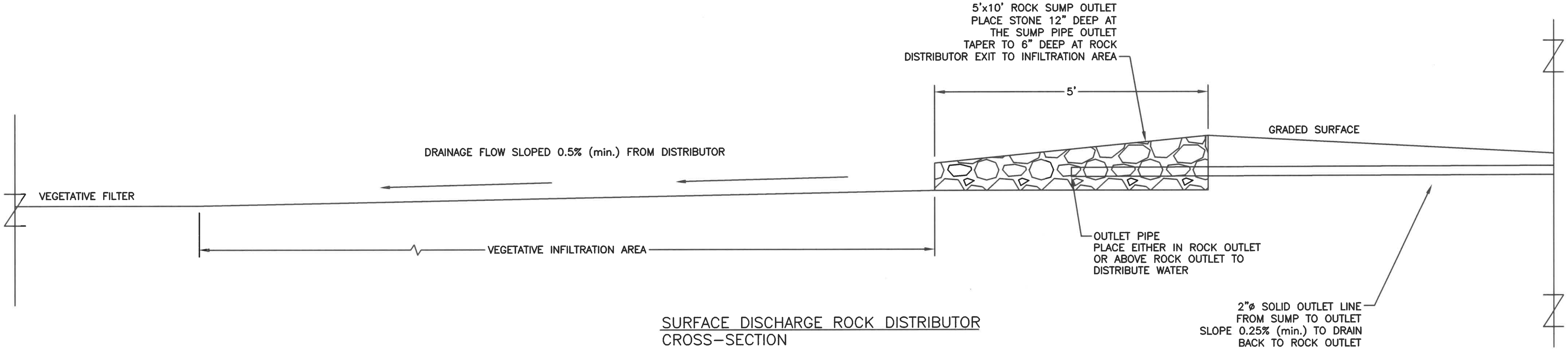
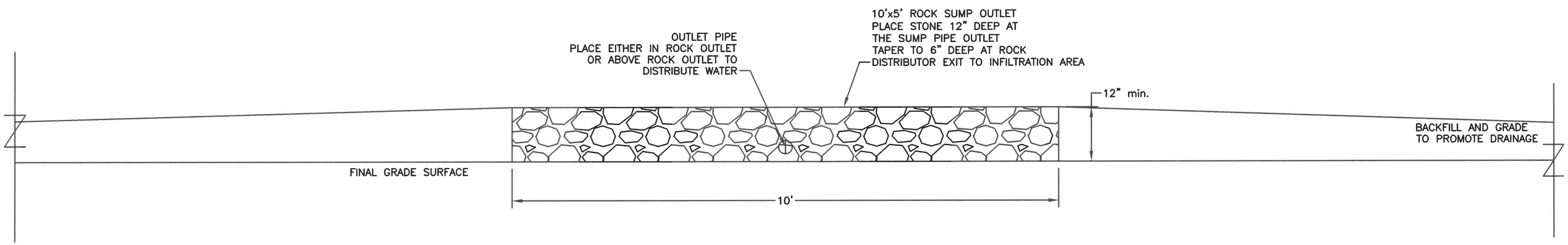
SEASONAL WATER TABLE
SUMP AND DISTRIBUTOR
GESTATION BUILDING

DATE: 02/23/24 | DRAWN BY: MV | SHEET: 4E of 5E | DRAWING NO: TGP0124-04E

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143



SURFACE DISCHARGE ROCK DISTRIBUTOR
CROSS-SECTION



SURFACE DISCHARGE ROCK DISTRIBUTOR
SIDE ELEVATION

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LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

SEASONAL WATER TABLE
ROCK DISTRIBUTOR AND
VEGETATIVE INFILTRATION

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

2024 Confined Feeding Operation Approval Application
Site Preparation and Backfill
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

1. The foundation and subgrade shall have large rocks, organic vegetation, and foreign material removed.
2. The foundation and subgrade shall be smoothly graded and compacted, as necessary, to a uniform density throughout prior to concrete placement. A level and smooth subgrade shall be established to maintain specified floor slab and footer thicknesses.
3. Undisturbed earth foundation surfaces shall be graded to remove surface irregularities. Where fill materials are required to establish the foundation the surface shall be scarified to a depth of not less than 2 inches to allow for adequate bonding between the existing subgrade surface and fill materials.
4. Soil materials used to establish the foundation and subgrade that are acceptable for fill and foundation soils shall consist of the naturally occurring soil materials excavated from the site or designated from a borrow area on the site.
5. Fill and foundation materials used to establish the foundation and subgrade shall not contain large stones, sod, roots, debris, frozen soil, snow or ice, or other perishable materials. Stones larger than 6 inches in diameter shall be removed prior to placement of the fill.
6. Soil materials used for backfill against the concrete manure storage walls shall consist of the naturally occurring soil materials excavated from the site or designated from a borrow area on the site. Acceptable soil materials for backfill shall have a unified soil classification system (USCS) designation of CL, CL-ML, ML, SC, SM-SC, SM, SP, SW, GC, GM, GP, and GW (Table 4. Minimum Lateral Earth Pressure Values, NRCS Code 313.).
7. Soil materials with a unified soil classification system (USCS) designation of OL, MH, CH, and OH shall not be used for backfill against the concrete manure storage walls (Table 4, Minimum Lateral Earth Pressure Values, NRCS Code 313).
8. The naturally occurring soil materials identified within the site based on the on-site soil investigation include soils with a unified soil classification system (USCS) designation of ML, CL, CH, and SM.
9. On-site soils with a unified soil classification system designation (USCS) of ML, CL, and SM are suitable for backfilling against the concrete manure storage walls. These soil materials should be identified and stockpiled for backfilling directly against the concrete manure storage walls.
10. On-site soils with a unified soil classification system designation (USCS) of CH shall not be used for backfill directly against the concrete manure storage walls. These soils material shall be used to establish the necessary site grade away from the building and concrete manure storage walls.
11. According to the on-site soil investigation on-site soils with a unified soil classification system designation of CH are located in the soil profile typically between 20"-41" in the west half of building 8P – East Farrowing and 12"-22" in the east half of building 8P – East Farrowing. According to the on-site soil investigation on-site soil with a unified soil classification system designation of CH are locating in the soil profile typically between 9"-32" in the west half of building 9P – West Farrowing and 25"-46" in the east half of building 9P – West Farrowing.

The farrowing buildings will be constructed mostly on grade after the topsoil is removed. During excavation of the building site topsoil for farrowing buildings (8P & 9P) to establish the subgrade for construction, if CH classification soils are encountered these soils will be identified, removed, and stockpiled separate from the other excavated soil materials. These soils can be used for fill and to establish grade away from the building sidewalls and end walls.

Soil materials excavated from building site that are suitable for backfill will be stockpiled on-site and used for backfilling adjacent to the below-building concrete walls.

12. According to the on-site soil investigation on-site soils with a unified soil classification system designation of CH are located in the soil profile typically between 28”-42” in the east third of building 10P – South Gestation, 10”-41” in the middle third of building 10P – South Gestation, and 18”-48” in the west third of building 10P – South Gestation.

    During excavation of the building site for building 10P – South Gestation between 10”-48” in the soil profile will be evaluated based on the on-site soil investigation to identify CH classification soils and will be removed and stockpiled separate from the other excavated soil materials. These soils can be used for fill and to establish grade away from the building in areas located at least three (3’) feet from the building sidewall and end wall.

    Soil materials excavated from the building site that are either outside of the 10”-48” depth in the soil profile or determined to not be CH classifications soils (ML, CL, SM) are suitable for backfill and shall be stockpiled on-site separate from other excavated soil materials to be used for backfilling adjacent to the below-building concrete walls.

13. Backfill should not be placed upon a frozen surface, nor should snow, ice or frozen materials be incorporated in the fill.
14. Backfilling and compaction of fill adjacent to new concrete walls should not begin in less than 10 days after placement of concrete or until the concrete strength of the concrete walls has been tested to be at least 3,000 psi to protect the structural integrity of the wall during backfilling. Refer to 11, 12, and 13 for specific compaction methods.
15. Backfilling and compaction of fill adjacent to new concrete walls should not begin until slats or floor are in place providing lateral support of the top and bottom of the wall. The timing of backfilling and compaction after the placement of slats and floors is required to ensure that the wall behaves as designed and is consistent with the requirements of the Indiana NRCS Construction Specifications, Concrete Construction, May 2015 (adapted) to protect the walls from potential damage due to backfilling and compaction.
16. Fill materials used for backfill shall be placed against the walls with a bulldozer, skid-steer type loader, or similar earth moving type equipment. Fill materials will be allowed to settle and compact naturally. Fill materials used for backfill will typically be moved and placed against the walls with earth moving equipment two to four times depending on settling and natural compaction of backfill soils.
17. Adjacent to concrete storage tank walls, backfill shall be placed in a manner which will prevent damage to the structures. Manual tamping or compaction can be used to establish a uniform backfill against the building wall.
18. The tracks or tires of heavy earth moving equipment, such as bulldozers, shall not be operated within five (5) feet of the exterior of the concrete walls to prevent vehicle surcharge loads during construction. Light-duty earth moving equipment (i.e. skid-steer type loader) may be operated within five (5) feet of the exterior of the concrete walls to place backfill. Compaction within five (5) of the exterior wall shall not be done with earth moving equipment.

19. Compacting within five (5) feet of a new wall will be either by natural settling and compaction, by means of hand tamping, or by small hand-held tamping or vibrating equipment.
20. Backfill should be graded as needed prior to seeding or installation of other erosion control methods to establish and maintain at least a 4%-12% slope away from the building to promote water movement and drainage away from the building.

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NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

CONCRETE CONSTRUCTION

ADAPTED: August 31, 2017
BY: Livestock Engineering Solutions, Inc.

1. SCOPE

This specification covers concrete construction for reinforced structures, plain concrete for waste storage pond liners, and other slabs.

2A. PREPARATION OF FORMS AND SUBGRADE

Unless otherwise indicated on the construction drawings, concrete shall be placed on a smoothly graded soil or sand subgrade compacted, as necessary, to a uniform density throughout. Plain concrete, where vehicle traffic is expected, shall be placed on a minimum 3 inches of gravel. Over-excavation shall be corrected by a procedure approved by the Engineer or the designated representative.

Concrete shall not be placed until the subgrade, forms and steel reinforcement have been inspected and approved by the Engineer or the designated representative. The Engineer shall be notified far enough in advance to provide time for the inspection.

Prior to placement of concrete, the forms and subgrade shall be free of chips, sawdust, debris, standing water, ice, snow, extraneous oil, mortar or other harmful substances or coatings.

Surfaces against which concrete is to be placed shall be firm and damp. Placement of concrete on mud, dried earth, or uncompacted fill or frozen subgrade will not be permitted. Placement of concrete on plastic is not allowed except where plastic sheeting is required to maintain subgrade integrity. Refer to Section 2B. “Subgrade Stabilization (Precipitation Protection)”.

2B. SUBGRADE STABILIZATION (PRECIPITATION PROTECTION)

The subgrade shall be prepared in accordance with 2A. PREPARATION OF FORMS AND SUBGRADE.

After subgrade preparation is completed in accordance with Section 2A, if a pending precipitation event threatens to impact the stability and integrity of the subgrade, plastic sheets may be used to protect the subgrade and prevent wet, soft, muddy areas in the subgrade when concrete is placed. Prior to placing plastic sheets for subgrade protection, the Engineer shall be notified far enough in advance to allow for the existing and pending conditions to be evaluated and provide an approval.

Plastic sheets shall be prepared and placed directly on the smoothly graded soil or sand subgrade surface. Plastic sheets shall be placed to allow for the plastic to fully cover the footers and maintain the footer dimensions (width, length, thickness)

Plastic sheets should be 0.25 mm to 0.40 m (10 mil to 15 mil) polyethylene sheets. Plastic sheet shall not be overlapped more than six (6”) inches. Plastic sheets shall not be taped or sealed to allow for moisture migration between seams.

Prior to placement of concrete, the plastic sheets shall be sliced or perforated to allow for release of concrete mix water from the concrete to the subgrade during curing. Sliced openings and/or perforations shall be placed uniformly over the surface and the perforated area shall be at least 1% of the surface area to allow adequate opening in the plastic sheets to allow for free water from the concrete to pass through the plastic during concrete curing.

Prior to placement of concrete, standing water shall be removed by pumping, pushing, or screeding to an outlet, sump, subsurface drainage tile or comparable to minimize free water on the surface of the plastic sheets.

In slabs, reinforcement steel supports shall be placed above the plastic sheets.

Concrete placed on plastic sheets should have a water-cement ratio of 0.45 or less to control excess concrete mix water and promote release of bleed water to the surface.

Adjust the time before final concrete finishing allowing adequate time for moisture migration from the concrete mix during curing.

3. FORMS

Forms shall be of wood, plywood, steel or other approved material and shall be mortar tight. The forms and associated false work shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours.

Items to be embedded in the concrete shall be positioned accurately and anchored firmly.

Tolerance on formed concrete is + 3/8 inch. Tolerance on concrete formed in earth is – 1 inch to +6 inches.

4. CONCRETE MIX

Portland cement shall be Type I, IA, II or IIA (Type I with an added air entrainment admixture is preferred). If Type IA or IIA cement is used, additional air entrainment admixture shall be the same type that was used in the cement. Cement that is partially hydrated (hardened), or otherwise damaged, shall not be used. Air entrainment shall be 4 to 7 percent.

Air entraining admixtures shall conform to the requirements of ASTM Specification C 260.

Aggregates shall consist of clean, hard, strong and durable particles that are free of silt, clay or any other material that may affect bonding of the cement paste.

Fine aggregate shall meet the requirements of INDOT fine aggregate number 23. Maximum coarse aggregate size shall be 3/4 inch.

Water shall be clean and free of injurious amounts of oil, salt, acid, alkali, organic matter or other deleterious substances.

Concrete shall have a minimum 28-day compressive strength of 4,000 psi. In lieu of strength tests, a mix containing an acceptable aggregate, 6 bags of cement per cubic yard and no more than 5.5 gallons or 46 pounds of water per bag of cement (including moisture in the aggregate) may be accepted.

The slump of the concrete shall be 3 to 5 inches.

5. MIXING AND PLACING CONCRETE

Concrete shall be uniform and thoroughly mixed when delivered to the job sites.

Concrete shall be discharged into the forms, vibrated and spaded within 90 minutes after the cement has been introduced into the aggregates. When air temperatures are above 85 degrees, this time must be reduced to 45 minutes.

The Inspector may allow a longer time if an approved set retarding admixture is used.

Concrete shall be deposited as close as possible in its final position. It shall not be allowed to drop more than 5 feet in forms and must not be required to flow laterally more than 8 feet.

If concrete must be dropped more than 5 feet, hoppers and chutes, "elephant trunks", etc., shall be used to prevent segregation.

If concrete must be moved laterally more than 8 feet, it shall be moved by shoveling, chutes, conveyors, wheelbarrows or similar equipment. Vibration must not be used to make concrete flow in the forms.

Plasticizing or plasticizing and retarding admixtures used shall conform to ASTM C 494, Types F or G or C 1017 as applicable.

Immediately after placement, concrete shall be consolidated by spading and vibrating, or spading and hand tamping. It shall be worked into corners and angles of the forms and around all reinforcement and embedded items in a manner which prevents segregation or the formation of "honeycomb". Excessive vibration which results in segregation of materials will not be allowed. The vibrator head shall be kept vertical when inserted into the concrete and shall penetrate at least 6" into the previously placed layer.

Slab concrete shall be placed at design thickness in one layer, but walls should be placed in essentially horizontal layers not more than 24 inches high. Successive layers shall be placed and consolidated fast enough to ensure a good bond between layers and to prevent "cold joints".

If the surface of a layer in place will develop its initial set before more concrete is placed on it, a construction joint (of the type shown in the plan) shall be made.

If freshly mixed concrete is to be placed against hardened concrete, the hardened concrete must be clean, sound, fairly level and roughened with some coarse aggregate particles exposed. Any dirt, form oil, wood chips or other foreign material shall be removed.

Concrete surfaces shall be smooth and even. Careful screeding (striking-off) and/or wood or magnesium float finishing are required.

The addition of dry cement or water to the surface of screeded concrete to expedite finishing will not be allowed.

6. REINFORCING STEEL

Reinforcing steel shall be deformed bars manufactured specifically for concrete reinforcement and shall be Grade 60 or higher (more details can be found in ASTM-A-615, A-616 or A-617).

Reinforcing steel shall be free from loose rust, concrete, oil, grease, paint or other deleterious coatings.

Reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete. This shall be accomplished by tying reinforcing steel or special tie bars to the form "snap ties" or by other methods of tying. No welding of either stress steel or temperature and shrinkage steel will be permitted. Reinforcing steel shall not be heated to facilitate bending.

In slabs, steel shall be supported by precast concrete bricks (not clay bricks), corrosion resistant metal chairs or plastic chairs.

The following tolerances will be allowed in the placement of reinforcing bars.

a. Where 1.5 inches clear distance is shown between reinforcing bars and forms, allowable clear distance is 1.125 to 1.5 inches.

b. Where 2 inches clear distance is shown between reinforcing bars and forms, allowable clear distance is 1.625 to 2 inches.

c. Where 3 inches clear distance is shown between reinforcing bars and earth or forms, allowable clear distance is 2.5 to 3 inches. Over excavation backfilled with concrete shall not count toward clear distance.

d. Maximum variation from indicated reinforcing bar spacing: 1/12th of indicated spacing, but no reduction in amount of bars specified.

Unless otherwise indicated on the drawings, splices of reinforcing bars shall provide a lap of not less than 30 diameters of the smaller bar but not less than 12 inches. Bars will not be spliced by welding. Welded wire reinforcement shall be lapped at least one mesh width.

The ends of all stress or temperature and shrinkage bars shall be covered with at least 2 inches of concrete.

7. CURING

Concrete shall be prevented from drying for at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist during this period by covering with moistened canvas, burlap, straw, sand or other approved material, unless they are sprayed with a curing compound or covered with a 4 mil or thicker polyethylene. Forms left in place during the curing period shall be kept wet.

Concrete, except at construction joints, may be coated with a curing compound in lieu of continued application of moisture. The compound shall be sprayed on moist concrete surfaces as soon as free water has disappeared, but shall not be applied to any surface until patching, repairs and finishing of that surface are completed.

Curing compound shall be applied in a uniform layer over all surfaces requiring protection at a rate of not less than 1 gallon per 150 square feet of surface or to manufacturer's recommendation, whichever is greater.

8. FORM REMOVAL AND CONCRETE REPAIR

Forms for structure walls shall not be removed until 24 hours or more after concrete placement. When forms are removed in less than 7 days, the concrete shall be sprayed with a curing compound or be kept wet continuously by methods allowed in Section 7 of this specification.

Forms shall be removed in such a way as to prevent damage to the concrete. Forms shall be removed before walls are backfilled.

Where minor areas of the concrete surface are "honeycombed", damaged or otherwise defective, it shall be removed, the area wetted and then filled with a dry-pack mortar.

Dry-pack mortar shall consist of one part Portland cement and three parts sand, with just enough water to produce a workable consistency.

9. CONCRETING IN COLD WEATHER

Concrete shall not be mixed nor placed when the daily atmospheric low temperature is less than 40 degrees unless alternate concrete mixing and placement practices are provided to prevent the concrete from freezing.

Concrete mixing and placement practices for cold weather concreting shall consist of:

a. Use of warm concrete with temperatures from 55 degrees F to 65 degrees F.

b. Adequate protection from the weather, including the use of artificial heat, to prevent the temperature of the concrete from falling below 50 degrees F for a period of 3 days, and the relative humidity of the air near the concrete from falling below 40 percent.

c. Accelerating or water-reducing and accelerating admixtures shall be noncorrosive and conform to the requirements of ASTM C 494, Types C and E.

d. Chloride accelerators such as calcium chloride may not be used to speed the hardening of concrete.

e. The contractor shall furnish to the Engineer or designated representative for approval, a written plan that shows how the contractor will meet the requirements of this specification. The plan must also show how the requirements of ACI Specification 306 will be met.

10. CONCRETING IN HOT WEATHER

Hot weather precautions should be taken when air temperatures are at or above 85 degrees F.

Concrete temperature shall be less than 90 degrees F during mixing, conveying and placing.

Water-reducing and/or retarding admixtures shall conform to the requirements of ASTM Specification C 494, Types A, B, D, F or G.

11. BACKFILLING NEW CONCRETE WALLS

Heavy equipment may not be operated within five (5) feet of the new concrete wall.

Compaction within five (5) feet of the wall will be by means of hand tamping or small hand-held tamping or vibrating equipment.

Backfilling and compaction of fill adjacent to new concrete walls shall not begin in less than 10 days after placement of the concrete or until the concrete strength at the site has been tested to be at least 3,000 psi. Backfill material shall be the type indicated on the drawings and shall be free of large stones or debris.

12. ADDITIONAL ITEMS WHICH APPLY TO THIS JOB

a. “Section 2 PREPARATION OF FORMS AND SUBGRADE” has been relabeled to “Section 2A. PREPARATION OF FORMS AND SUBGRADE” to distinguish this Section from a new Section “2B. SUBGRADE STABILIZATION (PRECIPITATION PROTECTION)”. [Change to Section 2.]
b. Plans and procedures requiring prior approval shall be submitted to the project Engineer or designated representative in place of the NRCS Engineer or designated representative. [Change to Section 2 and 9.]
c. Notifications for inspections and approvals shall be directed to the project Engineer or designated representative in place of the NRCS Engineer or designated representative. [Change to Section 2.]
d. Placement of concrete on plastic is not allowed except under specific conditions. “Plastic” has been removed from the specification stating the conditions that placement of concrete is not permitted. An exception is added to allow the use of plastic sheets when necessary and with prior approval to protect the integrity and stability of the subgrade due to precipitation events. A reference to a new Section 2B is added. [Change to Section 2.]
e. New Section “2B. SUBGRADE STABILIZATION (PRECIPITATION PROTECTION)” added to provide specifications for the exception that allows the use of plastic sheets to protect the integrity and stability of the subgrade. [New Section 2B]
f. The term “falsework” has been updated to “false work” in Section 3. [Change to Section 3]
g. The term “Overexcavation” has been updated to “Over excavation” in Section 6. [Change to Section 6]
h. The term “Welded wire fabric” has been updated to “Welded wire reinforcement” to be more consistent with concrete reinforcement specifications. [Change to Section 6]
i. The term “facilities” has been updated to “alternate concrete mixing and placement practices” and “concrete mixing and placement practices” to more accurately describe the activity or action referenced in the specification. [Change to Section 9]
j. Chloride accelerators (corrosive) may not be used to speed the hardening of concrete. To be specific a specification stating that chloride accelerators such as calcium chloride may not be used to speed hardening of concrete is added. [Change to Section 9.]
k. Concreting in cold weather plans requiring approval shall be submitted to the project Engineer or designated representative in place of the NRCS. [Change to Section 9.]
l. The distance from a new concrete wall that heavy equipment may not be operated adjacent to is five (5) feet in place of 3 feet. [Change to Section 11.]
m. The distance from a concrete wall that requires compaction be done by means of hand tamping or small hand-held tamping or vibrating equipment is five (5) feet in place of 3 feet. [Change to Section 11.]

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC

2667 E State Road 18

Kokomo, Indiana 46901

CONCRETE MANURE STORAGE DESIGN
SITE SPECIFIC ANALYSIS AND DESIGN

58" x 58" x 10" thick Square Column Footer Design (1,500 psf soil bearing capacity)
12" X 12" Concrete Column
14" Diameter Round Concrete Column

46" x 46" x 10" thick Square Column Footer Design (2,000 psf soil bearing capacity)
12" X 12" Concrete Column
14" Diameter Round Concrete Column

58" x 58" x 8" thick Square Column Footer Design (1,500 psf soil bearing capacity)
12" x 16" Concrete Masonry Column

44" x 44" x 8" thick Square Column Footer Design (2,000 psf soil bearing capacity)
12" x 16" Concrete Masonry Column

44" Wide x 10" Thick Continuous Concrete Footer Design
End wall and Concrete Column Footer
12" X 12" Concrete Column
14" Diameter Round Concrete Column
(1,500 psf, 2,000 psf soil bearing capacity)

End Wall Lateral Support Design

Construction Joint Spacing Floor Reinforcement

Flood Water Design – Buoyancy/Uplift Resistance

Flood Water Design – Concrete Tank Floor Design

Prepared by:

LIVESTOCK ENGINEERING SOLUTIONS, INC.

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2024 Confined Feeding Operation Approval Application

Site Specific Analysis and Design
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Site Specific Analysis and Design:
The provisions of Article 19 Confined Feeding Operations rule (327 IAC 19) **Rule 12 Manure Handling and Storage; Site, Design, and Construction Requirements for Waste Management Systems** specifies the design requirements for manure handling and storage systems. Specifically, 327 IAC 19-12-4 *Storage capacity and design requirements* outlines the design and construction standards required for manure storage facilities. 327 IAC 19-12-4(d) states: "*All liquid manure storage facilities must be constructed according to the Indiana NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016**.*" In addition 327 IAC 19-12-4(e) states: "*In addition to subsection (d), all concrete manure storage facilities must be constructed according to:*

*(1) Indiana NRCS Construction Specification, Concrete Construction, May 2015***; and*
(2) either:
*(A) MWPS-36: Reinforced Concrete Manure Storages, Second Edition, 2005****; or*
*(B) TR-9: Circular Concrete Manure Tanks, March 1998****.*

In accordance with 327 IAC 19-12-4(d) and 327 IAC 19-12-4(e), the design standards presented in NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016 (NRCS Code 313) and MWPS-36: Rectangular Concrete Manure Storages; Second Edition, 2005 (MWPS-36) apply to the design of the proposed rectangular concrete manure storages. The requirements of NRCS Code 313 and MWPS-36 were considered in the design and planned construction of the concrete manure storage structure. Specifically, the manure storage construction is based on the design and construction procedures presented in these design standards, including design and construction data (Table 2-1, MWPS-36), load tables (Table 2-4, MWPS-36; Table 3, NRCS Code 313; Table 4, NRCS Code 313), design tables (Tables 3-1 [adapted], 3-2 [adapted], 3-3, 3-10, 3-11, 3-14, 3-15), design equations (Appendix C), and top of wall beam support (Appendix D).

A site specific analysis and design of the plain square concrete column footings for the 12" x 12" reinforced concrete column, 14" diameter round reinforced concrete column, and 12" x 16" concrete masonry column result in a design different than the values presented in the MWPS-36 design tables. A site specific design for the continuous footer constructed beneath the end wall and end wall column is presented since no information is available in MWPS-36 for a combined footer. The site specific analysis and design is based on the design equations presented in Appendix C, MWPS-36 and ACI 318-11 Building Code Requirements for Structural Concrete.

MWPS-36 also describes the design assumptions and rationale for designing rectangular concrete manure storages. One of the design assumptions for the designs presented in MWPS-36 is that "*Rectangular tank designs assume the walls have full lateral top and bottom support*". Top of wall support is typically provided by tank tops, slats, or a specially designed beam. MWPS-36 states that "*Properly placed gang slats can be used to provide lateral top support for side and end walls.*" It is concluded based on the design information presented in MWPS-36 that specially designed beams may not be required in a totally slatted floor building The specific design requirements for this concrete manure storage will be considered to determine if a top of wall beam is required.

A site specific analysis and design is presented for the square plain concrete column footer designs, end wall and end wall column continuous footer design, end wall lateral support, floor construction joint spacing, farrowing building 8P flood water design for buoyancy/uplift resistance and farrowing building 8P concrete tank floor design to demonstrate that the design is based on MWPS-36: Rectangular Concrete Manure Storages, Second Edition, 2005 in accordance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Site Specific Analysis and Design

58" x 58" x 10" Thick Concrete Column Footer Design
12" x 12" Square Concrete Column
14" Diameter Round Concrete Column
(1,500 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

58" x 58" x 10" thick Square Concrete Column Footer Design:

A concrete footer option is shown on the construction plans depicting a 58" x 58"x 10" thick plain square concrete column footing. The construction plans include a 12" x 12" x 9'-2" reinforced concrete column and a 14" diameter round x 9'-2" reinforced concrete column. The column load (P_u, factored load) for the 12" x 12" x 9'-2" column is 23,183 lb. The column load (P_u, factored load) for the 14" diameter round x 9'-2" column is 23,297 lb. The maximum column load (P_u = 23,297 lb) is used in the design of the square concrete column footer.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for clay, sandy clay, silty clay, clayey silt, silt, and sandy silt soil types (CL, ML, MH, and CH) is 1,500 psf. Table 3-15 "Plain square concrete column footings.", MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005, page 28, provides design information for 10,000 lb, 20,000 lb, 30,000 lb, 40,000 lb, 50,000 lb, and 60,000 lb column loads and 1,500 psf soil bearing. Selecting a plain square concrete column footing size from Table 3-15 indicates that the footing size for a reinforced concrete column load of 23,297 lb (up to a 30,000 pound column load) is 64" x 64" x 14" thick for soil bearing capacity of 1,500 psf. Based on the information presented in Table 3-15 of MWPS-36, the proposed footing size and design depicted on the design plans is not consistent with Table 3-15 of the MWPS-36 design guide.

It is noted that the caption to Table 3-15 "Plain square concrete column footings." States "*Refer to **Appendix C, Design Load Equations** for specific design equation. Concrete strength: 4,000 psi.*" Specifically, this caption refers to Equation C-28 Plain column footing width and Equation C-29 Plain square footing thickness for square columns using 3,000 to 4,000 psi concrete. In accordance with these design equations and the design methods presented in ACI 318-11 "Building Code Requirements for Structural Concrete" the proposed footer design (58" x 58" x 10" thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following site specific design is presented to confirm this conclusion.

Equation C-28. Plain column footing width (adapted)

The description of the design equations for footings in MWPS-36, page 68 states that the equations are based on ACI 318 Chapter 22 and Section 9.3.5 and a modified design approach shown in the 1993 edition of PCA's Simplified Design. Equation C-28 is used to determine the width of a square plain concrete footer. Equation C-28 depicts the axial load in the equation as P_u (factored axial load, ACI 318-11, Chapter 2 – Notation and Definitions). The factored axial load may be a combination of dead load, live load, and snow load. Each loading condition or combination of loads has a different load factor (L_L = 1.6; L_D = 1.2; L_S = 0.5). There are no snow loads in the column or column footer design. The column and column footer design includes dead load and live loads.

Equation C-28, MWPS-36 includes a constant in the denominator of 1.6. It is unclear in the derivation of Equation C-28, MWPS-36 whether the constant, 1.6, represents a live load factor (L_L) to convert P_u

(factored load) to an unfactored load, P. If this is the correct interpretation and the column load is a combination of dead and live loads, it is possible that Equation C-28 may not accurately determine the unfactored load applied to the column and column footer based on the factored load.

ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" An unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. Since the dimensions of the footer are undetermined, the forces due to manure and concrete are represented as a pressure, lbs/in^2, and are subtracted from the allowable soil pressure. In accordance with ACI 318-11; 22.7.2 the based area of the footer is determined using the following equations and relationships.

Incorporating the requirements of ACI 318-11; Section 22.7.2, Equation C-28 is adapted to determine the required base area of footing.

$W_f = \{P_u \div [1.6 \text{ x } (q_a - (65.0 \text{ lb/cu ft x } D_{manure}) - Wt_{footing})]\}^{0.5} \text{ x } 12 \text{ in/ft}$ — Equation C-28

$A_f = P \div [q_a - (\delta_{manure} \text{ x } D_{manure}) - Wt_{footing}]$ — Adapted Equation C-28

P = pig load + slat load + lintel load + column load + equipment load

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36. Table 3-10)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Column load (12" x 12" square reinforced concrete) =
1 ft x 1ft x 9.167 ft x 150 pcf = 1,375 lb (9'-2" column)

Column load (14" diameter round reinforced concrete) =
3.142 x (7" ÷ 12"/ft)^2 x 9.167 ft x 150 pcf = 1,470 lb (9'-2" column)

Use column load (reinforced concrete) = 1,470 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, 1,500 psf

δ_{manure} = density of manure (65.0 lb/ft^3)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

Plain Concrete Footer Base Area, $A_{f(}$ (ACI 318-11; 22.7.2; MWPS-36, Equation C-28, adapted)

Determine footer base area and footer width, A_f & W_f

Reinforced concrete column – 12" x 12" square

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,375 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,375 lb + 1,020 = 16,519 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,375 lb + 1,020 lb) = 23,183 lb

Reinforced concrete column – 14" diameter

$P = (70.0 \text{ psf} \times 10 \text{ ft} \times 12 \text{ ft}) + (38.84 \text{ psf} \times 10 \text{ ft} \times 12 \text{ ft}) + (88.54 \text{ plf} \times 12 \text{ ft}) + 1{,}470 \text{ lb} + (8.5 \text{ psf} \times 10 \text{ ft} \times 12\text{ft})$

$P = 8{,}400 \text{ lb} + 4{,}661 \text{ lb} + 1{,}063 \text{ lb} + 1{,}470 \text{ lb} + 1{,}020 = 16{,}609 \text{ lb}$

$P_u = 1.6 \times 8{,}400 \text{ lb} + 1.2 \times (4{,}661 \text{ lb} + 1{,}063 \text{ lb} + 1{,}470 \text{ lb} + 1{,}020 \text{ lb}) = 23{,}297 \text{ lb}$

Use $P_u = 23{,}297$ lb

$q_s = 1{,}500$ psf (presumptive soil bearing)

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing} = 10 \text{ in} \div 12 \text{ in/ft} \times 150 \text{ pcf} = 125 \text{ psf}$ (assume footing 10" thick)

$A_f = 16{,}609 \text{ lb} \div (1{,}500 \text{ psf} - (65.0 \text{ lb/cu ft} \times 10.0 \text{ ft}) - 125 \text{ psf})$

$A_f = 16{,}609 \text{ lb} \div 725 \text{ psf}$

$A_f = 22.9 \text{ ft}^2 \ (3{,}298 \text{ in}^2)$

Determine width of a square footer:

$W_f = (22.9 \text{ ft}^2)^{0.5} = 4.79 \text{ ft} \ (57.48 \text{ in})$

Required: A 57.5" wide square footer

Use: A 58" x 58" square footer

Equation C-29. Plain square footing thickness for square columns using 3,000 to 4,000 psi concrete

Equation C-29, MWPS-36 is a derived equation to determine footing thickness for a square footer based on the principles of concrete design. Equation C-29 has been developed specifically for square plain concrete footers. For plain (unreinforced) concrete, flexure strength usually controls footer thickness. In accordance with ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11.

It is assumed that Equation C-29 is derived from the flexure strength and calculated moment at the face of the concrete column. Based on the variables presented in Equation C-29, the footer thickness can be determined if the column width, footer width, dead load factor, and factored axial load are known.

For this design, Equation C-29 will be used to estimate the footer thickness based on MWPS-36. The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11. The results of ACI 318-11 design method will be used to determine the footer thickness.

Plain Concrete Footer Thickness Design; MWPS-36; Equation C-29

Determine footer thickness, h; Equation C-29, MWPS-36

$h_f = 0.07 \times (1 - (d_{width} \div W_f) \times (L_D \times P_u)^{0.5} + 2 \text{ inches} >= 8 \text{ inches}$ Equation C-29, MWPS-36

d_{width} = Column width, 12" (12" x12" column); 14" (14" diameter column)

Use d_{width} = 12" (most conservative design)

W_f = Footer width, 58"

L_D = Dead load factor, 1.2

P_u = 23,297 lb (maximum concrete column load)

$h_f = 0.07 \times (1 - (12 \div 58)) \times (1.2 \times 23{,}297)^{0.5} + 2$ inches

$h_f = 0.07 \times (0.793 \times 167.2) + 2$ inches

$h_f = 9.28 + 2 = 11.28$ inches (use a 12.0" thick footer; Equation C-29, MWPS-36)

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

Determine plain rectangular footing thickness

Flexure strength - maximum factored moment at face of column

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f)$

$P_u = 23{,}297$ lb (concrete column)

$A_f = 58" \times 58" = 3{,}364$ in^2

$q_s = 23{,}297$ lb $\div 3{,}364$ in^2

$q_s = 7.0$ psi (1,008 psf)

Determine moment at face of column, M_u

$M_u = q_s \times W_f \times (L_f - L_c)/2 \times (L_f - L_c)/4$

$W_f = 58"$

$L_f = 58"$

$L_c = 12"$ (12" x 12" square column)

$L_c = 14"$ (14" diameter round column)

Moment (12" x 12" square reinforced concrete column) =
$M_u = 7.0$ psi x 58" x [(58"-12") ÷ 2] x [(58"-12") ÷ 4] = 107,387 in-lb (8,949 ft-lb)

Moment (14" diameter round reinforced concrete column) =
$M_u = 7.0$ psi x 58" x [(58"-14") ÷ 2] x [(58"-14") ÷ 4] = 98,252 in-lb (8,187.7 ft-lb)

Use $M_u = 107{,}387$ in-lb

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to factored moment (M_u)

$\varphi M_n \geq M_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

$f'_c = 4{,}000$ psi

$b = W_f = 58"$

$d = h =$ effective depth (h_f - 2)

$M_n = (5 \times 1 \times \sqrt{4{,}000} \times 58" \times h^2) \div 6$

$M_u = 107{,}387$ in-lb

Set $M_n = M_u$

Rearrange to find h^2

$h^2 = (107{,}387 \text{ in-lb} \times 6) \div (5 \times 1 \times \sqrt{4{,}000} \text{ psi} \times 58\text{''})$

$h^2 = (644{,}322) \div (18{,}341.2)$

$h = \sqrt{35.1} = 5.93$

$h_f = h + 2 = 5.93 + 2 = 7.93\text{''}$ [ACI 318-11; 22-7-4 requires a minimum 8" thick footer]

Use a 10" thick footer [an 8" thick footer is allowed]

Beam action shear – critical section located at h from face of column

Use an effective thickness, h = 8" (10" – 2")

$b_w = W_f = 58\text{''}$

$c = W_c = 12\text{''}$ (12" x 12" square column)

$c = W_c = 14\text{''}$ (14" diameter round column)

$L_f = 58\text{''}$

Critical section location (h from face of column):

Critical section (12" x 12" square reinforced concrete column)
(12" ÷ 2) + 8" = 14" from center of column; 15" from edge of footer [(58" ÷ 2) – 14"]

Critical section (14" diameter round reinforced concrete column)
(14" ÷ 2) + 8" = 15" from center of column; 14" from edge of footer [(58" ÷ 2) – 15"]

Critical section location occurs within the footer. Use h = 8"

Calculate shear (V_u) at critical section

$V_u = q_s \times$ tributary area

$q_s = 7.0$ psi

tributary area $= W_f \times [(L_f/2) - (W_c/2) - h]$

Shear (12" x 12" square reinforced concrete column) =
$V_u = 7.0 \text{ psi} \times 58\text{''} \times [58\text{''}/2 - 12\text{''}/2 - 8\text{''}] = 7.0 \text{ psi} \times 58\text{''} \times 15\text{''} = 6{,}090 \text{ lb}$

Shear (14" diameter round reinforced concrete column) =
$V_u = 7.0 \text{ psi} \times 58\text{''} \times [58\text{''}/2 - 14\text{''}/2 - 8\text{''}] = 7.0 \text{ psi} \times 58\text{''} \times 14\text{''} = 5{,}684 \text{ lb}$

Use $V_u = 6{,}090$ lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \times (4/3) \times 1 \times \sqrt{4{,}000} \times 58\text{''} \times 8\text{''} = 23{,}276 \text{ lb}$

23,476 lb > 6,090 lb > 5,684 lb **OKAY**

Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column

Use an effective thickness, h = 8” (10” -2”)

Check punching shear. The critical section is a perimeter (b_o) related to the column length and width and effective depth, h.

W_f = 58”

L_f = 58”

$W_c = L_c$ = 12” (12” x 12” square column)

$W_c = L_c$ = 14” (14” diameter round column)

Critical section location:

Critical section (12” x 12” square reinforced concrete column)
(12” ÷ 2) + (8” ÷ 2) = 10” from center of column; 19” from the edge of the footer [(58” ÷ 2) – 10”]

Critical section (14” diameter round reinforced concrete column)
(14” ÷ 2) + (8” ÷ 2) = 11” from center of column; 18” from the edge of the footer [(58” ÷ 2) – 11”]

Calculate punching shear (V_u) at critical section

$V_u = q_s$ x tributary area

q_s = 7.0 psi

tributary area = W_f x L_f – [(h/2 + W_c + h/2) x (h/2 + L_c + h/2)] = {(W_f x L_f) – [(W_c + h) x (L_c + h)]}

Punching shear (12” x 12” square reinforced concrete column)
V_u = 7.0 psi x {(58” x 58”) - [(12” + 8”) x (12” + 8”)]}

V_u = 7.0 psi x {3,364 in^2 – 400 in^2} = 20,748 lb

Punching shear (14” diameter round reinforced concrete column)
V_u = 7.0 psi x {(58” x 58”) - [(14” + 8”) x (14” + 8”)]}

V_u = 7.0 psi x {3,364 in^2 – 484 in^2} = 20,160 lb

Use V_u = 20,748 in-lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$ and $V_n \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section

b_o = 2 x (W_c + L_c) + (4 x h) = 2 x (12” + 12”) + 4 x 8” = 80”

β = ratio of long-to-short side = 58” ÷ 58” = 1.0

(4/3) + 8/(3 x 1.0) = 4.0; 4.0 > 2.66 Therefore,

$V_n = 2.66 \times \lambda \times \sqrt{f'_c} \times b_o \times h$

φV_n = 0.6 x 2.66 x 1 x √4,000 x 80” x 8” = 64,602 lb

64,602 lb > 20,748 lb > 20,160 lb **OKAY**

Design Check

Required footer base area: A_f= 22.9 ft^2 (3,298 in^2)

Footer width (minimum): $W_f = (22.9 \text{ ft}^2)^{0.5} = 4.79$ ft (57.48 in)

Use 58" x 58" footer

Proposed footer: 3,364 in^2 > 3,298 in^2 **OKAY**

MWPS-36
Footer thickness: $h_f = h + 2 = 9.28 + 2 = 11.28$ **[Estimate]**

ACI 318-11
Flexure analysis:
Footer thickness: $h_f = h + 2 = 5.93 + 2 = 7.93$ **Use 10" thick footer in accordance with ACI 318-11**

Beam action shear:
Footer thickness: h_f = 10"; 23,476 lb > 6,090 lb > 5,684 lb **Use 10" thick footer**

Punching shear (two-way shear action):
Footer thickness: h_f =10"; 64,602 lb > 20,728 lb > 20,160 lb **Use 10" thick footer**

USE: 58" x 58" x 10" square footer (based on ACI 318)

Based on this analysis, a 58" x 58" x 10" thick footer meets or exceeds the design criteria presented in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and ACI 318-11 Building Code Requirements for Structural Concrete. It is noted that the footer thickness determined by the MWPS-36 design equations is 11.28". Based on the ACI 318-11 design standards an 8" thick footer is required and is sufficient to support the factored design load transferred from the column to the footer.

A 10" thick footer is selected for this design based on the analysis to meet or exceed the expected design and service load conditions. Based on this analysis, the proposed footer design (58" x 58" x 10" thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Site Specific Analysis and Design

46" x 46" x 10" Thick Concrete Column Footer Design
12" x 12" Square Concrete Column
14" Diameter Round Concrete Column
(2,000 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

46" x 46" x 10" thick Square Concrete Column Footer Design:

A concrete footer option is shown on the construction plans depicting a 46" x 46"x 10" thick plain square concrete column footing. . The construction plans include a 12" x 12" x 9'-2" reinforced concrete column and a 14" diameter round x 9'-2" reinforced concrete column. The column load (P_u, factored load) for the 12" x 12" x 9'-2" column is 23,183 lb. The column load (P_u, factored load) for the 14" diameter round x 9'-2" column is 23,297 lb. The maximum column load (P_u = 23,297 lb) is used in the design of the square concrete column footer.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for sand, silty sand, clayey sand, silty gravel, clayey gravel soil types (SW, SP, SM, SC, GM, and GC) is 2,000 psf. Table 3-15 "Plain square concrete column footings.", MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005, page 28, provides design information for 10,000 lb, 20,000 lb, 30,000 lb, 40,000 lb, 50,000 lb, and 60,000 lb column loads and 2,000 psf soil bearing. Selecting a plain square concrete column footing size from Table 3-15 indicates that the footing size for a reinforced concrete column load of 23,297 lb (up to a 30,000 pound column load) is 49" x 49" x 13" thick for soil bearing capacity of 2,000 psf. Based on the information presented in Table 3-15 of MWPS-36, the proposed footing size and design depicted on the design plans is not consistent with Table 3-15 of the MWPS-36 design guide.

It is noted that the caption to Table 3-15 "Plain square concrete column footings." States "*Refer to **Appendix C, Design Load Equations** for specific design equation. Concrete strength: 4,000 psi.*" Specifically, this caption refers to Equation C-28 Plain column footing width and Equation C-29 Plain square footing thickness for square columns using 3,000 to 4,000 psi concrete. In accordance with these design equations and the design methods presented in ACI 318-11 "Building Code Requirements for Structural Concrete" the proposed footer design (46" x 46" x 10" thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following site specific design is presented to confirm this conclusion.

Equation C-28. Plain column footing width (adapted)

The description of the design equations for footings in MWPS-36, page 68 states that the equations are based on ACI 318 Chapter 22 and Section 9.3.5 and a modified design approach shown in the 1993 edition of PCA's Simplified Design. Equation C-28 is used to determine the width of a square plain concrete footer. Equation C-28 depicts the axial load in the equation as P_u (factored axial load, ACI 318-11, Chapter 2 – Notation and Definitions). The factored axial load may be a combination of dead load, live load, and snow load. Each loading condition or combination of loads has a different load factor (L_L = 1.6; L_D = 1.2; L_S = 0.5). There are no snow loads in the column or column footer design. The column and column footer design includes dead load and live loads.

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Equation C-28, MWPS-36 includes a constant in the denominator of 1.6. It is unclear in the derivation of Equation C-28, MWPS-36 whether the constant, 1.6, represents a live load factor (L_L) to convert P_u (factored load) to an unfactored load, P. If this is the correct interpretation and the column load is a combination of dead and live loads, it is possible that Equation C-28 may not accurately determine the unfactored load applied to the column and column footer based on the factored load.

ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" An unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. Since the dimensions of the footer are undetermined, the forces due to manure and concrete are represented as a pressure, lbs/in^2, and are subtracted from the allowable soil pressure. In accordance with ACI 318-11; 22.7.2 the based area of the footer is determined using the following equations and relationships.

Incorporating the requirements of ACI 318-11; Section 22.7.2, Equation C-28 is adapted to determine the required base area of footing.

$W_f = \{P_u \div [1.6 \text{ x } (q_a - (65.0 \text{ lb/cu ft x } D_{manure}) - Wt_{footing})]\}^{0.5} \text{ x } 12 \text{ in/ft}$ Equation C-28

$A_f = P \div [q_a - (\delta_{manure} \text{ x } D_{manure}) - Wt_{footing}]$ Adapted Equation C-28

P = pig load + slat load + lintel load + column load + equipment load

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36. Table 3-10)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

1 ft x 1ft x 9.167 ft x 150 pcf = 1,375 lb (9'-2" column)

Column load (14" diameter round reinforced concrete) =
3.142 x (7" ÷ 12"/ft)^2 x 9.167 ft x 150 pcf = 1,470 lb (9'-2" column)

Use column load (reinforced concrete) = 1,470 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, 2,000 psf

δ_{manure} = density of manure (65.0 lb/ft^3)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

Plain Concrete Footer Base Area, $A_{f(}$ (ACI 318-11; 22.7.2; MWPS-36, Equation C-28, adapted)

Determine footer base area and footer width, A_f & W_f

Reinforced concrete column – 12" x 12" square

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,375 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,375 lb + 1,020 = 16,519 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,375 lb + 1,020 lb) = 23,183 lb

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Reinforced concrete column – 14" diameter

$P = (70.0 \text{ psf} \times 10 \text{ ft} \times 12 \text{ ft}) + (38.84 \text{ psf} \times 10 \text{ ft} \times 12 \text{ ft}) + (88.54 \text{ plf} \times 12 \text{ ft}) + 1{,}470 \text{ lb} + (8.5 \text{ psf} \times 10 \text{ ft} \times 12\text{ft})$

$P = 8{,}400 \text{ lb} + 4{,}661 \text{ lb} + 1{,}063 \text{ lb} + 1{,}470 \text{ lb} + 1{,}020 = 16{,}609 \text{ lb}$

$P_u = 1.6 \times 8{,}400 \text{ lb} + 1.2 \times (4{,}661 \text{ lb} + 1{,}063 \text{ lb} + 1{,}470 \text{ lb} + 1{,}020 \text{ lb}) = 23{,}297 \text{ lb}$

Use $P_u = 23{,}297$ lb

$q_s = 2{,}000$ psf (presumptive soil bearing)

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing} = 10 \text{ in} \div 12 \text{ in/ft} \times 150 \text{ pcf} = 125 \text{ psf}$ (assume footing 10" thick)

$A_f = 16{,}609 \text{ lb} \div (2{,}000 \text{ psf} - (65.0 \text{ lb/cu ft} \times 10.0 \text{ ft}) - 125 \text{ psf})$

$A_f = 16{,}609 \text{ lb} \div 1{,}225 \text{ psf}$

$A_f = 13.56 \text{ ft}^2$ ($1{,}953 \text{ in}^2$)

Determine width of a square footer:

$W_f = (13.56 \text{ ft}^2)^{0.5} = 3.69 \text{ ft}$ (44.28 in)

Required: A 44.3" wide square footer

Use: A 46" x 46" square footer

Equation C-29. Plain square footing thickness for square columns using 3,000 to 4,000 psi concrete

Equation C-29, MWPS-36 is a derived equation to determine footing thickness for a square footer based on the principles of concrete design. Equation C-29 has been developed specifically for square plain concrete footers. For plain (unreinforced) concrete, flexure strength usually controls footer thickness. In accordance with ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11.

It is assumed that Equation C-29 is derived from the flexure strength and calculated moment at the face of the concrete column. Based on the variables presented in Equation C-29, the footer thickness can be determined if the column width, footer width, dead load factor, and factored axial load are known.

For this design, Equation C-29 will be used to estimate the footer thickness based on MWPS-36. The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11. The results of ACI 318-11 design method will be used to determine the footer thickness.

Plain Concrete Footer Thickness Design; MWPS-36; Equation C-29

Determine footer thickness, h; Equation C-29, MWPS-36

$h_f = 0.07 \times (1 - (d_{width} \div W_f) \times (L_D \times P_u)^{0.5} + 2 \text{ inches} >= 8 \text{ inches}$ Equation C-29, MWPS-36

d_{width} = Column width, 12" (12" x12" column); 14" (14" diameter column)

Use d_{width} = 12" (most conservative design)

W_f = Footer width, 46"

L_D = Dead load factor, 1.2

P_u = 23,297 lb (concrete column)

$h_f = 0.07 \times (1 - (12 \div 46)) \times (1.2 \times 23{,}297)^{0.5} + 2$ inches

$h_f = 0.07 \times (0.74 \times 167.2) + 2$ inches

$h_f = 8.7 + 2 = 10.7$ inches

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

<u>Determine plain rectangular footing thickness</u>

<u>Flexure strength - maximum factored moment at face of column</u>

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f)$

$P_u = 23{,}297$ lb

$A_f = 46" \times 46" = 2{,}116\ in^2$

$q_s = 23{,}297\ lb \div 2{,}116\ in^2$

$q_s = 11.0$ psi (1,584 psf)

Determine moment at face of column, M_u

$M_u = q_s \times W_f \times (L_f - L_c)/2 \times (L_f - L_c)/4$

$W_f = 46"$

$L_f = 46"$

$L_c = 12"$ (12" x 12" square column)

$L_c = 14"$ (14" diameter round column)

Moment (12" x 12" square reinforced concrete column) =

$M_u = 11.0$ psi x 46" x [(46"-12") ÷ 2] x [(46"-12") ÷ 4] = 73,117 in-lb (6,093 ft-lb)

Moment (14" diameter round reinforced concrete column) =

$M_u = 11.0$ psi x 46" x [(46"-14") ÷ 2] x [(46"-14") ÷ 4] = 64,768 in-lb (5,398 ft-lb)

Use $M_u = 73{,}117$ in-lb

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to factored moment (M_u)

$\varphi M_n \geq M_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

$f'_c = 4{,}000$ psi

$b = W_f = 46"$

$d = h =$ effective depth ($h_f - 2$)

$M_n = (5 \times 1 \times \sqrt{4{,}000} \times 46" \times h^2) \div 6$

$M_u = 73{,}117$ in-lb

Set $M_n = M_u$

Rearrange to find h^2

$h^2 = (73{,}117 \text{ in-lb} \times 6) \div (5 \times 1 \times \sqrt{4{,}000} \text{ psi} \times 46")$

$h^2 = (438{,}702) \div (14{,}547)$

$h = \sqrt{30.2} = 5.5$

$h_f = h + 2 = 5.5 + 2 = 7.5"$ [ACI 318-11; 22-7-4 requires a minimum 8" thick footer]

Use a 10" thick footer [an 8" thick footer is allowed]

Beam action shear – critical section located at h from face of column

Use an effective thickness, h = 8" (10" – 2")

$b_w = W_f = 46"$

$c = W_c = 12"$ (12" x 12" square column)

$c = W_c = 14"$ (14" diameter round column)

$L_f = 46"$

Critical section location (h from face of column):

Critical section (12" x 12" square reinforced concrete column)
(12" ÷ 2) + 8" = 14" from center of column; 9" from edge of footer [(46" ÷ 2) – 14"]

Critical section (14" diameter round reinforced concrete column)
(14" ÷ 2) + 8" = 15" from center of column; 8" from edge of footer [(46" ÷ 2) – 15"]

Critical section location occurs within the footer. Use h = 8"

Calculate shear (V_u) at critical section

$V_u = q_s$ x tributary area

$q_s = 11.0$ psi

tributary area $= W_f \times [(L_f/2) - (W_c/2) - h]$

Shear (12" x 12" square reinforced concrete column) =
$V_u = 11.0 \text{ psi} \times 46" \times [46"/2 - 12"/2 - 8"] = 11.0 \text{ psi} \times 46" \times 9" = 4{,}554$ lb

Shear (14" diameter round reinforced concrete column) =
$V_u = 11.0 \text{ psi} \times 46" \times [46"/2 - 14"/2 - 8"] = 11.0 \text{ psi} \times 46" \times 8" = 4{,}048$ lb

Use $V_u = 4{,}554$ lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \times (4/3) \times 1 \times \sqrt{4{,}000} \times 46" \times 8" = 18{,}620$ lb

18,620 lb > 4,554 lb > 4,048 lb **OKAY**

Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column

Use an effective thickness, h = 8” (10” -2”)

Check punching shear. The critical section is a perimeter (b_o) related to the column length and width and effective depth, h.

W_f = 46”

L_f = 46”

$W_c = L_c$ = 12” (12” x 12” square column)

$W_c = L_c$ = 14” (14” diameter round column)

Critical section location:

Critical section (12” x 12” square reinforced concrete column)
(12” ÷ 2) + (8” ÷ 2) = 10” from center of column; 13” from the edge of the footer [(46” ÷ 2) – 10”]

Critical section (14” diameter round reinforced concrete column)
(14” ÷ 2) + (8” ÷ 2) = 11” from center of column; 12” from the edge of the footer [(46” ÷ 2) – 11”]

Calculate punching shear (V_u) at critical section

$V_u = q_s$ x tributary area

q_s = 11.0 psi

tributary area = W_f x L_f – [(h/2 + W_c + h/2) x (h/2 + L_c + h/2)] = {(W_f x L_f) – [(W_c + h) x (L_c + h)]}

Punching shear (12” x 12” square reinforced concrete column)
V_u = 11.0 psi x {(46” x 46”) - [(12” + 8”) x (12” + 8”)]}

V_u = 11.0 psi x {2,116 in^2 – 400 in^2} = 18,876 lb

Punching shear (14” diameter round reinforced concrete column)
V_u = 11.0 psi x {(46” x 46”) - [(14” + 8”) x (14” + 8”)]}

V_u = 11.0 psi x {2,116 in^2 – 484 in^2} = 17,952 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$ and $V_n \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section

b_o; 12” x 12” square reinforced concrete column
b_o = 2 x (W_c + L_c) + (4 x h) = 2 x (12” + 12”) + 4 x 8” = 80”

b_o; 14” diameter round reinforced concrete column
b_o = 2 x (W_c + L_c) + (4 x h) = 2 x (14” + 14”) + 4 x 8” = 88”

β = ratio of long-to-short side = 46” ÷ 46” = 1.0

(4/3) + 8/(3 x 1.0) = 4.0; 4.0 > 2.66 Therefore,

$V_n = 2.66 \times \lambda \times \sqrt{f'_c} \times b_o \times h$

12” x 12” square reinforced concrete column
$\varphi V_n = 0.6 \times 2.66 \times 1 \times \sqrt{4{,}000} \times 80" \times 8" = 64{,}602$ lb

14” diameter reinforced concrete column
$\varphi V_n = 0.6 \times 2.66 \times 1 \times \sqrt{4{,}000} \times 88" \times 8" = 71{,}062$ lb

71,062 lb > 64,602 lb > 18,876 lb > 17,952 lb **OKAY**

Design Check

Required footer base area: $A_f = 13.84\ ft^2$ (1,993 in^2)

Footer width (minimum): $W_f = (13.84\ ft^2)^{0.5} = 3.72$ ft (44.65 in)

Use 46” x 46” footer

Proposed footer: 2,116 in^2 > 1,993 in^2 **OKAY**

MWPS-36
Footer thickness: $h_f = h + 2 = 8.7 + 2 = 10.7$ **[Estimate]**

ACI 318-11

Flexure analysis:
Footer thickness: $h_f = h + 2 = 5.5 + 2 = 7.5$ in **Use 10” thick footer in accordance with ACI 318-11**

Beam action shear:
Footer thickness: $h_f = 10"$; 18,620 lb > 4,554 lb > 4,048 lb **Use 10” thick footer**

Punching shear (two-way shear action):
Footer thickness: $h_f = 10"$;
71,062 lb > 64,602 lb > 18,876 lb > 17,952 lb **Use 10” thick footer**

USE: 46” x 46” x 10” square footer

Based on this analysis, a 46” x 46” x 10” thick footer meets or exceeds the design criteria presented in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and ACI 318-11 Building Code Requirements for Structural Concrete. It is noted that the footer thickness determined by the MWPS-36 design equations is 10.7”. Based on the ACI 318-11 design standards an 8” thick footer is required and is sufficient to support the factored design load transferred from the column to the footer.

A 10” thick footer is selected for this design based on the analysis to meet or exceed the expected design and service load conditions in accordance with ACI 318-11. Based on this analysis, the proposed footer design (46” x 46” x 10” thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Site Specific Analysis and Design

58" x 58" x 8" Thick Concrete Column Footer Design
12" x 16" Concrete Masonry Column
(1,500 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

58" x 58" x 8" thick Square Concrete Column Footer Design:

A concrete footer option is shown on the construction plans depicting a 58" x 58"x 8" thick plain square concrete column footing. The construction plans include a 12" x 16" x 9'-2" concrete masonry column. The column load (P_u, factored load) for the 12" x 16" x 9'-2" column is 23,450.4 lb.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for clay, sandy clay, silty clay, clayey silt, silt, and sandy silt soil types (CL, ML, MH, and CH) is 1,500 psf. Table 3-15 "Plain square concrete column footings.", MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005, page 28, provides design information to determine the width of a square footer and footer thickness for 10,000 lb, 20,000 lb, 30,000 lb, 40,000 lb, 50,000 lb, and 60,000 lb column loads and 1,500 psf soil bearing capacity. Table 3-15, MWPS-36 provides design information for square columns (i.e. 9 x 9, 10 x 10, 11 x 11, 12 x 12, 14 x 14, and 16 x 16) located in the center of a square footer.

Although, Table 3-15, MWPS-36 is based on square columns, an estimate of the base area (square footer width) for a specific concrete masonry column load can be estimated from Table 3-15. Estimating a plain square concrete column footing width for a 12" x 16" concrete masonry column load of 23,450.4 lb (up to a 30,000 pound column load) from Table 3-15 is 64" x 64" x 14" thick for soil bearing capacity of 1,500 psf. Based on the information presented in Table 3-15 of MWPS-36, the proposed footing size and design depicted on the design plans is not consistent with Table 3-15 of the MWPS-36 design guide.

ACI 318-11 "Building Code Requirements for Structural Concrete" presents a design method for determining the required size and thickness of a plain (unreinforced) concrete footer. ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" According to ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The column dimensions (12" x 16") are used in the calculation of the flexure strength, beam action shear, and punching shear. Since Table 3-15, MWPS-36 is based on a square column, the footer thickness presented in Table 3-15, MWPS-36 is not applicable to determine the required footer thickness. The required footer thickness is determined based on ACI 318-11.

A specific design table for plain (unreinforced) square concrete column footers for rectangular masonry columns was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations presented in Appendix C of MWPS-36, Second Edition and the design methods presented in ACI318-11"Building Code Requirements for Structural Concrete" was conducted.

In accordance with these design equations and the design methods presented in ACI 318-11 "Building Code Requirements for Structural Concrete" the proposed footer design (58" x 58" x 8" thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following design is presented to confirm this conclusion.

Equation C-28. Plain column footing width (adapted)

The description of the design equations for footings in MWPS-36, page 68 states that the equations are based on ACI 318 Chapter 22 and Section 9.3.5 and a modified design approach shown in the 1993 edition of PCA's Simplified Design. Equation C-28 is used to determine the width of a square plain concrete footer. Equation C-28 depicts the axial load in the equation as P_u (factored axial load, ACI 318-11, Chapter 2 – Notation and Definitions). The factored axial load may be a combination of dead load, live load, and snow load. Each loading condition or combination of loads has a different load factor (L_L = 1.6; L_D = 1.2; L_S = 0.5). There are no snow loads in the column or column footer design. The column and column footer design includes dead load and live loads.

Equation C-28, MWPS-36 includes a constant in the denominator of 1.6. It is unclear in the derivation of Equation C-28, MWPS-36 whether the constant, 1.6, represents a live load factor (L_L) to convert P_u (factored load) to an unfactored load, P. If this is the correct interpretation and the column load is a combination of dead and live loads, it is possible that Equation C-28 may not accurately determine the unfactored load applied to the column and column footer based on the factored load.

In accordance with ACI 318-11, Section 22.7.2, an unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. Since the dimensions of the footer are undetermined, the forces due to manure and concrete are represented as a pressure, lbs/in^2, and are subtracted from the allowable soil pressure. In accordance with ACI 318-11; 22.7.2 the based area of the footer is determined using the following equations and relationships.

Incorporating the requirements of ACI 318-11; Section 22.7.2, Equation C-28 is adapted to determine the required base area of footing.

$W_f = \{P_u \div [1.6 \text{ x } (q_a - (65.0 \text{ lb/cu ft x } D_{manure}) - Wt_{footing})]\}^{0.5} \text{ x } 12 \text{ in/ft}$ Equation C-28

$A_f = P \div [q_a - (\delta_{manure} \text{ x } D_{manure}) - Wt_{footing}]$ Adapted Equation C-28

P = pig load + slat load + lintel load + column load + equipment load

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36. Table 3-10)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Column load (9'-2" masonry column with a 3-1/4" concrete cap and 2 #4 or #5 rebar) =

Determine gross area of concrete masonry block, A_{gm}

Actual dimensions of block: 11-5/8" x 15-5/8" with two cores 9-5/8" x 6-5/16"

A_{gm} = 11.625" x 15.625" – 2 x 9.625" x 6.3125"

A_{gm} = 60.125 in^2

Determine gross area of concrete core, A_{gc}

A_{gc} = 2 x 9.625" x 6.3125"

A_{gc} = 121.5 in^2

Determine area of reinforcement steel -- #4 & #5 rebar

Area (#5 rebar) = $(5/8" \div 2)^2 \times \pi = 0.307\ in^2$

2 - #5 rebar = $2 \times 0.307\ in^2 = 0.614\ in^2$

Area (#4 rebar) = $(1/2" \div 2)^2 \times \pi = 0.196\ in^2$

2 - #4 rebar = $2 \times 0.196\ in^2 = 0.392\ in^2$

Determine net area of concrete core, A_{gc}

$A_{gc} = 121.5\ in^2 - .614\ in^2 = 120.886\ in^2$ (#5 rebar)

$A_{gc} = 121.5\ in^2 - .307\ in^2 = 121.193\ in^2$ (#4 rebar)

Column load = $60.125\ in^2 \div 144\ in^2/ft^2 \times 8.89\ ft \times 110\ pcf + 120.886\ in^2 \div 144\ in^2/ft^2 \times 8.89\ ft \times 150\ pcf$
$+ 0.614\ in^2 \times 8.89\ ft \times 12\ in/ft \times 0.284\ lb/in^3 + (11.625\ in \times 15.625\ in \times 3.25\ in) \div 1{,}728\ in^3/ft^3 \times 150\ pcf$
Column load = 408.3 lb + 1,119.5 lb + 18.6 lb + 51.3 lb
Column load = 1,597.7 lb (9'-2" column)
Density of masonry = 110 pcf
Density of concrete = 150 pcf

Use column load (concrete masonry) = 1,598 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, psf

δ_{manure} = density of manure ($65.0\ lb/ft^3$)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

MWPS-36; Plain Concrete Footer Design

Determine footer width, W_f

Masonry concrete column – 12" x 16"

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,598 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,598 lb + 1,020 = 16,742 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,598 lb + 1,020 lb) = 23,450.4 lb

q_s = 1,500 psf (presumptive soil bearing)

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing}$ = 10 in ÷ 12 in/ft x 150 pcf = 125 psf (assume footing 10" thick)

A_f= 16,742 lb ÷ (1,500 psf – (65.0 lb/cu ft x 10.0 ft) – 125 psf)

A_f= 16,742 lb ÷ 725 psf

A_f= 22.32 ft^2 (3,214.5 in^2)

Determine width of a square footer:

$W_f = (22.32\ ft^2)^{0.5} = 4.73$ ft (56.76 in)

Required: A 58" wide square footer

Use: A 58" x 58" square footer

Equation C-29. Plain square footing thickness for square columns using 3,000 to 4,000 psi concrete

Equation C-29, MWPS-36 is a derived equation to determine footing thickness for a square footer and square column based on the principles of concrete design. Equation C-29 has been developed specifically for square columns and is not directly applicable to rectangular concrete masonry columns. For plain (unreinforced) concrete footers, flexure strength usually controls footer thickness. In accordance with ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11.

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

Determine plain square footing thickness

Flexure strength - maximum factored moment at face of column

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f) = (23{,}450.4\ lb) \div (58" \times 58")$

$q_s = 7.0$ psi (1,008 psf)

Determine moment at face of column, M_u

$M_u = q_s \times W_f \times (L_f - L_c)/2 \times (L_f - L_c)/4$

$W_f = 58"$

$L_f = 58"$

$L_c = 12"$ & 16"

Check $L_c = 12"$

$M_u = 7.0\ psi \times 58" \times [(58"-12") \div 2] \times [(58"-12") \div 4]$

$M_u = 107{,}387$ in-lb (8,949 ft-lb) – Moment creates tension in the footer

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to the factored Moment (M_u)

$\varphi M_n \geq M_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

$f'_c = 4{,}000$ psi

$b = W_f = 58"$

$d = h =$ effective depth (h_f - 2)

$M_n = (5 \times 1 \times \sqrt{4,000} \times 58" \times h^2) \div 6$

$M_u = 107,387$ in-lb

Set $M_n = M_u$

Rearrange to find h^2

$h^2 = (107,387 \text{ in-lb} \times 6) \div (5 \times 1 \times \sqrt{4,000} \text{ psi} \times 58")$

$h^2 = (644,322) \div (18,341)$

$h = \sqrt{35.13} = 5.93$

$h_f = h + 2 = 5.93 + 2 = 7.93"$ [ACI 318-11; 22-7-4 requires a minimum 8" thick footer]

Use an 8" thick footer

Check $L_c = 16"$

$M_u = 7.0 \text{ psi} \times 58" \times [(58"-16") \div 2] \times [(58"-16") \div 4]$

$M_u = 89,523$ in-lb (7,461 ft-lb) – Moment creates tension in the footer

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to the factored Moment (M_u)

$\varphi M_n \geq M_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

$f'_c = 4,000$ psi

$b = W_f = 58"$

$d = h =$ effective depth ($h_f - 2$)

$M_n = (5 \times 1 \times \sqrt{4,000} \times 58" \times h^2) \div 6$

$M_u = 89,523$ in-lb

Set $M_n = M_u$

Rearrange to find h^2

$h^2 = (89,523 \text{ in-lb} \times 6) \div (5 \times 1 \times \sqrt{4,000} \text{ psi} \times 58")$

$h^2 = (537,138) \div (18,341)$

$h = \sqrt{29.3} = 5.42$

$h_f = h + 2 = 5.42 + 2 = 7.42"$ Use at least 8" (ACI 318-11; 22.7.4)

Use an 8" thick footer

Beam action shear – critical section located at h from face of column

Use an effective thickness, h = 6”

1. Critical section location: (12” ÷ 2) + 6” = 12” from center of column; 17” from edge of footer
2. Critical section location: (16” ÷ 2) + 6” = 14” from center of column; 15” from edge of footer

Calculate shear (V_u) at critical section

$V_u = q_s$ x b x [(b/2) – (c/2) – h]

q_s = 7.0 psi

b = 58”

c = 12” & 16”

Check c = 12”

V_u = 7.0 psi x 58” x [29” – 6” – 6”] = 6,902 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

V_n = (4/3) x λ x $\sqrt{f'_c}$ x b_w x h (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

φV_n = 0.6 x (4/3) x 1 x √4,000 x 58” x 6” = 17,607 lb

17,607 lb > 6,902 lb **OKAY**

Check c = 16”

V_u = 7.0 psi x 58” x [29” – 8” – 6”] = 6,090 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

V_n = (4/3) x λ x $\sqrt{f'_c}$ x b_w x h (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

φV_n = 0.6 x (4/3) x 1 x √4,000 x 58” x 6” = 17,607 lb

17,607 lb > 6,090 lb **OKAY**

Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column

Use an effective thickness, h = 8”

1. Critical section location: (12” ÷ 2) + (6” ÷ 2) = 9” from center of column; 20” from edge of footer
2. Critical section location: (16” ÷ 2) + (6” ÷ 2) = 11” from center of column; 18” from edge of footer

Calculate punching shear (V_u) at critical section

$V_u = q_s$ x[$b^2 - (c + h)^2$]

q_s = 7.0 psi

$b = 58"$

$c = 12"$ &$16"$

<u>Check c = 12"</u>

$V_u = 7.0 \text{ psi} \times [(58")^2 - (12" + 6")^2] = 20{,}748 \text{ lb}$

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \lambda \times \sqrt{f'_c} \times b_o \times h$ and $V_n \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section = $2 \times [(6/2 + 12 + 6/2) + (6/2 + 16 + 6/2)] = 80"$

β = ratio of long-to-short side = $58" \div 58" = 1$

$(4/3) + 8/(3x1) = 4$; $4 > 2.66$ Therefore,

$V_n = 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

$\varphi V_n = 2.66 \times 0.6 \times` 1 \times \sqrt{4{,}000} \times 80" \times 6" = 48{,}451 \text{ lb}$

48,451 lb > 20,748 lb **OKAY**

<u>Check c = 16"</u>

$V_u = 7.0 \text{ psi} \times [(58")^2 - (16" + 6")^2] = 20{,}160 \text{ lb}$

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \lambda \times \sqrt{f'_c} \times b_o \times h$ and $V_n \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section = $2 \times [(6/2 + 12 + 6/2) + (6/2 + 16 + 6/2)] = 80"$

β = ratio of long-to-short side = $50" \div 50" = 1$

$(4/3) + 8/(3x1) = 4$; $4 > 2.66$ Therefore,

$V_n = 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

$\varphi V_n = 2.66 \times 0.6 \times 1 \times \sqrt{4{,}000} \times 80" \times 6" = 48{,}451 \text{ lb}$

48,451 lb > 20,160 lb **OKAY**

Design Check

Footer base area: A_f= 22.32 ft^2 (3,214.5 in^2)

Footer width (minimum): $W_f = (22.32\ ft^2)^{0.5} = 4.73$ ft (56.76 in)

Use 58" x 58" footer

Proposed footer: 3,364 in^2 > 3,214.5 in^2 **OKAY**

ACI 318-11

Footer thickness: $h_f = h + 2 = 5.93 + 2 = 7.93$ (12" width)	**Use 8" thick footer**	(flexure)
Footer thickness: $h_f = h + 2 = 5.42 + 2 = 7.42$ (16" width)	**Use 8" thick footer**	(flexure)
Footer thickness: h_f = 8"; 17,607 lb > 6,902 lb (12" width)	**Use 8" thick footer**	(beam shear)
Footer thickness: h_f = 8"; 17,607 lb > 6,090 lb (16" width)	**Use 8" thick footer**	(beam shear)
Footer thickness: h_f =8"; 48,451 lb > 20,748 lb (12" width)	**Use 8" thick footer**	(punching shear)
Footer thickness: h_f =8"; 48,451 lb > 20,160 lb (16" width)	**Use 8" thick footer**	(punching shear)

USE: 58" x 58" x 8" square footer

Based on this analysis, a 58"x58"x 8" thick footer meets or exceeds the design criteria presented in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and ACI 318-11 Building Code Requirements for Structural Concrete. Based on the ACI 318-11 design standards an 8" thick footer is required and is sufficient to support the factored design load transferred from the column to the footer.

An 8" thick footer is selected for this design based on the analysis to meet or exceed the expected design and service load conditions. Based on this analysis, the proposed footer design (58" x 58" x 8" thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Site Specific Analysis and Design

46" x 46" x 8" Thick Concrete Column Footer Design
12" x 16" Concrete Masonry Column
(2,000 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

46" x 46" x 8" thick Square Concrete Column Footer Design:

A concrete footer option is shown on the construction plans depicting a 46" x 46"x 8" thick plain square concrete column footing. The construction plans include a 12" x 16" x 9'-2" concrete masonry column. The column load (P_u, factored load) for the 12" x 16" x 9'-2" column is 23,450.4 lb.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for sand, silty sand, clayey sand, silty gravel, clayey gravel soil types (SW, SP, SM, SC, GM, and GC) is 2,000 psf. Table 3-15 "Plain square concrete column footings.", MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005, page 28, provides design information to determine the width of a square footer and footer thickness for 10,000 lb, 20,000 lb, 30,000 lb, 40,000 lb, 50,000 lb, and 60,000 lb column loads and 2,000 psf soil bearing capacity. Table 3-15, MWPS-36 provides design information for square columns (i.e. 9 x 9, 10 x 10, 11 x 11, 12 x 12, 14 x 14, and 16 x 16) located in the center of a square footer.

Although, Table 3-15, MWPS-36 is based on square columns, an estimate of the base area (square footer width) for a specific concrete masonry column load can be estimated from Table 3-15. Estimating a plain square concrete column footing width for a 12" x 16" concrete masonry column load of 23,450.4 lb (up to a 30,000 pound column load) from Table 3-15 is 49" x 49" x 13" thick for soil bearing capacity of 2,000 psf. Based on the information presented in Table 3-15 of MWPS-36, the proposed footing size and design depicted on the design plans is not consistent with Table 3-15 of the MWPS-36 design guide.

ACI 318-11 "Building Code Requirements for Structural Concrete" presents a design method for determining the required size and thickness of a plain (unreinforced) concrete footer. ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" According to ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The column dimensions (12" x 16") are used in the calculation of the flexure strength, beam action shear, and punching shear. Since Table 3-15, MWPS-36 is based on a square column, the footer thickness presented in Table 3-15, MWPS-36 is not applicable to determine the required footer thickness. The required footer thickness is determined based on ACI 318-11.

A specific design table for plain (unreinforced) square concrete column footers for rectangular masonry columns was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations presented in Appendix C of MWPS-36, Second Edition and the design methods presented in ACI318-11"Building Code Requirements for Structural Concrete" was conducted.

In accordance with these design equations and the design methods presented in ACI 318-11 "Building Code Requirements for Structural Concrete" the proposed footer design (46" x 46" x 8" thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following design is presented to confirm this conclusion.

Equation C-28. Plain column footing width (adapted)

The description of the design equations for footings in MWPS-36, page 68 states that the equations are based on ACI 318 Chapter 22 and Section 9.3.5 and a modified design approach shown in the 1993 edition of PCA's Simplified Design. Equation C-28 is used to determine the width of a square plain concrete footer. Equation C-28 depicts the axial load in the equation as P_u (factored axial load, ACI 318-11, Chapter 2 – Notation and Definitions). The factored axial load may be a combination of dead load, live load, and snow load. Each loading condition or combination of loads has a different load factor (L_L = 1.6; L_D = 1.2; L_S = 0.5). There are no snow loads in the column or column footer design. The column and column footer design includes dead load and live loads.

Equation C-28, MWPS-36 includes a constant in the denominator of 1.6. It is unclear in the derivation of Equation C-28, MWPS-36 whether the constant, 1.6, represents a live load factor (L_L) to convert P_u (factored load) to an unfactored load, P. If this is the correct interpretation and the column load is a combination of dead and live loads, it is possible that Equation C-28 may not accurately determine the unfactored load applied to the column and column footer based on the factored load.

In accordance with ACI 318-11, Section 22.7.2, an unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. Since the dimensions of the footer are undetermined, the forces due to manure and concrete are represented as a pressure, lbs/in^2, and are subtracted from the allowable soil pressure. In accordance with ACI 318-11; 22.7.2 the based area of the footer is determined using the following equations and relationships.

Incorporating the requirements of ACI 318-11; Section 22.7.2, Equation C-28 is adapted to determine the required base area of footing.

$W_f = \{P_u \div [1.6 \text{ x } (q_a - (65.0 \text{ lb/cu ft x } D_{manure}) - Wt_{footing})]\}^{0.5} \text{ x } 12 \text{ in/ft}$ Equation C-28

$A_f = P \div [q_a - (\delta_{manure} \text{ x } D_{manure}) - Wt_{footing}]$ Adapted Equation C-28

P = pig load + slat load + lintel load + column load + equipment load

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36. Table 3-10)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Column load (9'-2" masonry column with a 3-1/4" concrete cap and 2 #4 or #5 rebar) =

Determine gross area of concrete masonry block, A_{gm}

Actual dimensions of block: 11-5/8" x 15-5/8" with two cores 9-5/8" x 6-5/16"

A_{gm} = 11.625" x 15.625" – 2 x 9.625" x 6.3125"

A_{gm} = 60.125 in^2

Determine gross area of concrete core, A_{gc}

A_{gc} = 2 x 9.625" x 6.3125"

A_{gc} = 121.5 in^2

Determine area of reinforcement steel -- #4 & #5 rebar

Area (#5 rebar) = $(5/8" \div 2)^2 \times \pi = 0.307\ in^2$

2 - #5 rebar = $2 \times 0.307\ in^2 = 0.614\ in^2$

Area (#4 rebar) = $(1/2" \div 2)^2 \times \pi = 0.196\ in^2$

2 - #4 rebar = $2 \times 0.196\ in^2 = 0.392\ in^2$

Determine net area of concrete core, A_{gc}

$A_{gc} = 121.5\ in^2 - .614\ in^2 = 120.886\ in^2$ (#5 rebar)

$A_{gc} = 121.5\ in^2 - .307\ in^2 = 121.193\ in^2$ (#4 rebar)

Column load = $60.125\ in^2 \div 144\ in^2/ft^2 \times 8.89\ ft \times 110\ pcf + 120.886\ in^2 \div 144\ in^2/ft^2 \times 8.89\ ft \times 150\ pcf + 0.614\ in^2 \times 8.89\ ft \times 12\ in/ft \times 0.284\ lb/in^3 + (11.625\ in \times 15.625\ in \times 3.25\ in) \div 1{,}728\ in^3/ft^3 \times 150\ pcf$
Column load = 408.3 lb + 1,119.5 lb + 18.6 lb + 51.3 lb
Column load = 1,597.7 lb (9'-2" column)
Density of masonry = 110 pcf
Density of concrete = 150 pcf

Use column load (concrete masonry) = 1,598 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, psf

δ_{manure} = density of manure ($65.0\ lb/ft^3$)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

MWPS-36; Plain Concrete Footer Design

Determine footer width, W_f

Masonry concrete column – 12" x 16"

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,598 lb + (8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,598 lb + 1,020 = 16,742 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,598 lb + 1,020 lb) = 23,450.4 lb

q_s = 2,000 psf (presumptive soil bearing)

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing}$ = 10 in ÷ 12 in/ft x 150 pcf = 125 psf (assume footing 10" thick)

A_f= 16,742 lb ÷ (2,000 psf – (65.0 lb/cu ft x 10.0 ft) – 125 psf)

A_f= 16,742 lb ÷ 1,225 psf

A_f= 13.7 ft^2 (1,973 in^2)

Determine width of a square footer:

$W_f = (13.7\ ft^2)^{0.5} = 3.7$ ft (44.4 in)

Required: A 44.4" wide square footer

Use: A 46" x 46" square footer

Equation C-29. Plain square footing thickness for square columns using 3,000 to 4,000 psi concrete

Equation C-29, MWPS-36 is a derived equation to determine footing thickness for a square footer and square column based on the principles of concrete design. Equation C-29 has been developed specifically for square columns and is not directly applicable to rectangular concrete masonry columns. For plain (unreinforced) concrete footers, flexure strength usually controls footer thickness. In accordance with ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11.

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

Determine plain square footing thickness

Flexure strength - maximum factored moment at face of column

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f) = (23{,}450.4\ lb) \div (46" \times 46")$

$q_s = 11.1$ psi (1,599 psf)

Determine moment at face of column, M_u

$M_u = q_s \times W_f \times (L_f - L_c)/2 \times (L_f - L_c)/4$

$W_f = 46"$

$L_f = 46"$

$L_c = 12"$ & $16"$

Check $L_c = 12"$

$M_u = 11.1$ psi x 46" x [(46"-12") ÷ 2] x [(46"-12") ÷ 4]

$M_u = 73{,}782$ in-lb (6,066 ft-lb) – Moment creates tension in the footer

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to the factored Moment (M_u)

$\varphi M_n \geq M_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

$f'_c = 4{,}000$ psi

$b = W_f = 46"$

$d = h =$ effective depth (h_f - 2)

$M_n = (5 \times 1 \times \sqrt{4{,}000} \times 46" \times h^2) \div 6$

$M_u = 73{,}782$ in-lb

Set $M_n = M_u$

Rearrange to find h^2

$h^2 = (73{,}782 \text{ in-lb} \times 6) \div (5 \times 1 \times \sqrt{4{,}000} \text{ psi} \times 46")$

$h^2 = (442{,}692) \div (14{,}547)$

$h = \sqrt{30.5} = 5.52$

$h_f = h + 2 = 5.52 + 2 = 7.52"$ [ACI 318-11; 22-7-4 requires a minimum 8" thick footer]

Use an 8" thick footer

<u>Check $L_c = 16"$</u>

$M_u = 11.1 \text{ psi} \times 46" \times [(46"-16") \div 2] \times [(46"-16") \div 4]$

$M_u = 57{,}443$ in-lb (4,348 ft-lb) – Moment creates tension in the footer

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to the factored Moment (M_u)

$\varphi M_n \geq M_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

$f'_c = 4{,}000$ psi

$b = W_f = 46"$

$d = h =$ effective depth ($h_f - 2$)

$M_n = (5 \times 1 \times \sqrt{4{,}000} \times 46" \times h^2) \div 6$

$M_u = 57{,}443$ in-lb

Set $M_n = M_u$

Rearrange to find h^2

$h^2 = (57{,}443 \text{ in-lb} \times 6) \div (5 \times 1 \times \sqrt{4{,}000} \text{ psi} \times 46")$

$h^2 = (344{,}658) \div (14{,}547)$

$h = \sqrt{23.7} = 4.87$

$h_f = h + 2 = 4.87 + 2 = 6.87"$ Use at least 8" (ACI 318-11; 22.7.4)

Use an 8" thick footer

Beam action shear – critical section located at h from face of column

Use an effective thickness, h = 6”

1. Critical section location: (12” ÷ 2) + 6” = 12” from center of column; 10” from edge of footer
2. Critical section location: (16” ÷ 2) + 6” = 14” from center of column; 8” from edge of footer

Calculate shear (V_u) at critical section

$V_u = q_s \times b \times [(b/2) - (c/2) - h]$

$q_s = 11.1$ psi

b = 46”

c = 12” & 16”

Check c = 12”

$V_u = 11.1$ psi x 46” x [23” – 6” – 6”] = 5,617 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \times (4/3) \times 1 \times \sqrt{4{,}000} \times 46” \times 6” = 13{,}965$ lb

13,965 lb > 5,617 lb **OKAY**

Check c = 16”

$V_u = 11.1$ psi x 46” x [23” – 8” – 6”] = 4,596 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \times (4/3) \times 1 \times \sqrt{4{,}000} \times 46” \times 6” = 13{,}965$ lb

13,965 lb > 4,596 lb **OKAY**

Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column

Use an effective thickness, h = 8”

1. Critical section location: (12” ÷ 2) + (6” ÷ 2) = 9” from center of column; 14” from edge of footer
2. Critical section location: (16” ÷ 2) + (6” ÷ 2) = 11” from center of column; 12” from edge of footer

Calculate punching shear (V_u) at critical section

$V_u = q_s \times [b^2 - (c + h)^2]$

$q_s = 11.1$ psi

$b = 46"$

$c = 12"$ &$16"$

<u>Check c = 12"</u>

$V_u = 11.1$ psi x $[(46")^2 - (12" + 6")^2] = 19{,}892$ lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi\, V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \lambda \times \sqrt{f'_c} \times b_o \times h$ and $V_n \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section = 2 x [(6/2 + 12+ 6/2) + (6/2 + 16 + 6/2)] = 80"

β = ratio of long-to-short side = 46" ÷ 46" = 1

(4/3) + 8/(3x1) = 4; 4 > 2.66 Therefore,

$V_n = 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

$\varphi\, V_n = 2.66 \times 0.6 \times 1 \times \sqrt{4{,}000} \times 80" \times 6" = 48{,}451$ lb

48,451 lb > 19,892 lb **OKAY**

<u>Check c = 16"</u>

$V_u = 11.1$ psi x $[(46")^2 - (16" + 6")^2] = 18{,}116$ lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi\, V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \lambda \times \sqrt{f'_c} \times b_o \times h$ and $V_n \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section = 2 x [(6/2 + 12+ 6/2) + (6/2 + 16 + 6/2)] = 80"

β = ratio of long-to-short side = 46" ÷ 46" = 1

(4/3) + 8/(3x1) = 4; 4 > 2.66 Therefore,

$V_n = 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

$\varphi\, V_n = 2.66 \times 0.6 \times 1 \times \sqrt{4{,}000} \times 80" \times 6" = 48{,}451$ lb

48,451 lb > 18,116 lb **OKAY**

Design Check

Footer base area: $A_f = 13.7\ ft^2$ ($1{,}973\ in^2$)

Footer width (minimum): $W_f = (13.7\ ft^2)^{0.5} = 3.7$ ft (44.4 in)

Use 46" x 46" footer

Proposed footer: $2{,}116\ in^2 > 1{,}973\ in^2$ **OKAY**

ACI 318-11

Footer thickness: $h_f = h + 2 = 5.52 + 2 = 7.52$ (12" width)	**Use 8" thick footer**	(flexure)
Footer thickness: $h_f = h + 2 = 4.87 + 2 = 6.87$ (16" width)	**Use 8" thick footer**	(flexure)
Footer thickness: h_f = 8"; 13,965 lb > 5,617 lb (12" width)	**Use 8" thick footer**	(beam shear)
Footer thickness: h_f = 8"; 13,965 lb > 4,596 lb (16" width)	**Use 8" thick footer**	(beam shear)
Footer thickness: h_f =8"; 48,451 lb > 19,892 lb (12" width)	**Use 8" thick footer**	(punching shear)
Footer thickness: h_f =8"; 48,451 lb > 18,116 lb (16" width)	**Use 8" thick footer**	(punching shear)

USE: 46" x 46" x 8" square footer

Based on this analysis, a 46"x46"x 8" thick footer meets or exceeds the design criteria presented in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and ACI 318-11 Building Code Requirements for Structural Concrete. Based on the ACI 318-11 design standards an 8" thick footer is required and is sufficient to support the factored design load transferred from the column to the footer.

An 8" thick footer is selected for this design based on the analysis to meet or exceed the expected design and service load conditions. Based on this analysis, the proposed footer design (46" x 46" x 8" thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Site Specific Analysis and Design

44" Wide x 10" Thick Continuous Concrete Footer Design
End wall and Concrete Column Footer
(1,500 psf and 2,000 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

44" wide x 10" Continuous Concrete Footer Design:

A 44" wide x 10" thick continuous concrete footer is shown on the construction plans for the combined end wall and concrete column footer.

The construction plans include a 12" x 12" x 9'-2" reinforced concrete column and a 14" diameter round x 9'-2" reinforced concrete column. The construction plans include a 10"thick, 10'-0" tall concrete manure tank wall and a 6" thick, 1'-0" high concrete stem wall. The concrete wall provides support for a 7' high stud frame wall and end wall roof support. A continuous concrete footer is provided for the end wall and concrete column.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for clay, sandy clay, silty clay, clayey silt, silt, and sandy silt soil types (CL, ML, MH, and CH) is 1,500 psf. The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for sand, silty sand, clayey sand, silty gravel, clayey gravel soil types (SW, SP, SM, SC, GM, and GC) is 2,000 psf. A design for a presumptive allowable foundation pressure of 1,500 psf will be used for both a 1,500 psf and 2,000 psf presumptive allowable foundation pressure.

A design table for plain (unreinforced) continuous concrete footers for a column footer was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations and standards presented in ACI 318-11 "Building Code Requirements for Structural Concrete" was conducted.

Based on this analysis and design a 44" wide x 10" thick continuous concrete footer is included in the proposed design drawings. In accordance with these design equations the proposed footer design (44" wide x 10" thick continuous) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following design is presented to confirm this conclusion.

ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" An unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column and wall transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. To confirm the dimensions of the footer, the forces due to the column and wall, manure, and concrete are included in the design confirmation. In accordance with ACI 318-11; 22.7.2 the base area of the footer is determined using the following equations and relationships.

$A_f = P_T \div [q_a - (\delta_{manure} \times D_{manure}) - Wt_{footing}]$ ACI 318-11; 22.7.2

$P_T = P_c + P_B$

P_c = pig load + slat load + lintel load + column load + equipment load [column load on footer]

P_B = building load [building wall load on footer]

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Column load (12" x 12" square reinforced concrete) =
1 ft x 1ft x 9.167 ft x 150 pcf = 1,375 lb (9'-2" column)

Column load (14" diameter round reinforced concrete) =
3.142 x (7" ÷ 12"/ft)^2 x 9.167 ft x 150 pcf = 1,470 lb (9'-2" column)

Use column load (reinforced concrete) = 1,470 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, psf

δ_{manure} = density of manure (65.0 lb/ft^3)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

Plain Concrete Footer Base Area, A_f (ACI 318-11; 22.7.2)

Determine footer base area, A_f

Reinforced concrete column – 12" x 12" square

P_c = (70.0 psf x 10 ft x 6 ft) + (38.84 psf x 10 ft x 6 ft) + (88.54 plf x 6 ft) + 1,375 lb +
(8.5 psf x 10 ft x 6ft)

P_c = 4,200 lb + 2,331 lb + 532 lb + 1,375 lb + 510 = 8,948 lb

Reinforced concrete column – 14" diameter

P_c = (70.0 psf x 10 ft x 6 ft) + (38.84 psf x 10 ft x 6 ft) + (88.54 plf x 6 ft) + 1,470 lb +
(8.5 psf x 10 ft x 6ft)

P_c = 4,200 lb + 2,331 lb + 532 lb + 1,470 lb + 510 = 9,043 lb

Use a column load = 9,043 lb

Column spacing is 10 ft along the end wall.

Column load per foot = 9,043 lb ÷ 10 ft = 905 lb/ft

Building load

Concrete tank wall: 0.833 ft x 10 ft x 150 pcf =	1,249.5 lb/ft (dead load)
Concrete stem wall: 0.5 ft x 1 ft x 150 pcf =	75 lb/ft (dead load)
Stud wall: 7 ft x 10 psf =	70 lb/ft (dead load; assume stud wall load, 10 psf)

Roof load: 3 ft (tributary length; half truss spacing (2') + 1' overhang)
15 psf (roof dead load)
25 psf (roof snow load)]

Roof dead load: 3 ft x 15 psf = 45 lb/ft

Roof snow load: 3 ft x 25 psf = 75 lb/ft

P_B = 1,249.5 lb/ft + 75 lb/ft + 70 lb/ft + 45 lb/ft + 75 lb/ft = 1,514.5 lb/ft

Total load applied to footer; lb/ft

P_T = 905 lb/ft +1,514.5 lb = 2,419.5 lb/ft

Determine required footer area, A_f

q_s = 1,500 psf

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing}$ = 10 in ÷ 12 in/ft x 150 pcf = 125 psf (assume footing 10" thick)

A_f= 2,419.5 lb ÷ (1,500 psf – (65.0 lb/cu ft x 10.0 ft) – 125 psf)

A_f= 2,419.5 lb ÷ 725 psf

A_f= 3.337 ft^2 (480.6 in^2)

Determine the required footer width per foot of wall

Footer length = 1 ft (12 in)

Footer width = 480.6 in^2 ÷ 12 in = 40.1 inch

44" > 40.1" (1,500 psf) **OKAY**

Use 44" continuous footer for 1,500 psf and 2,000 psf soil foundation pressure

Determine plain concrete footing thickness

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

Flexure strength - maximum factored moment at face of column/wall

To determine footing thickness assume that the footer is 44" x 44" square and the column and wall load act as a single load applied as a point load at the column.

Determine plain rectangular footing thickness

Flexure strength - maximum factored moment at face of column

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f)$

P_{u_column} = 1.6 x 4,200 lb + 1.2 x (2,331 lb + 532 lb + 1,470 lb + 510 lb)= 12,532 lb

P_{u_wall} = [1.2 x (1,249.5 lb + 75 lb + 70 lb + 45 lb) +1.6 x (75 lb)] x 44 in ÷ 12 in/ft = 6,774 lb

P_u = 12,532 lb + 6,774 lb = 19,306 lb (axial load applied at the column)

A_f = 44" x 44" = 1,936 in^2 (Note: continuous footer area per column = 5,280 in^2; 44" x 120"; a square footer with a smaller area is used for a more conservative design confirmation)

q_s = 19,306 lb ÷ 1,936 in^2

q_s = 9.97 psi (1,436 psf)

Determine moment at face of column, M_u

$M_u = q_s \times W_f \times (L_f - L_c)/2 \times (L_f - L_c)/4$

$W_f = 44"$

$L_f = 44"$

$L_c = 12"$ (12" x 12" square column)

$L_c = 14"$ (14" diameter round column)

Moment (12" x 12" square reinforced concrete column)

$M_u = 9.97$ psi x 44" x [(44"-12") ÷ 2] x [(44"-12") ÷ 4] = 56,151 in-lb (4,679 ft-lb)

Moment (14" diameter round reinforced concrete column)

$M_u = 9.97$ psi x 44" x [(44"-14") ÷ 2] x [(44"-14") ÷ 4] = 49,352 in-lb (4,113 ft-lb)

Use $M_u = 56{,}151$ in-lb

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to factored moment (M_u)

$\varphi M_n \geq M_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

$f'_c = 4{,}000$ psi

$b = W_f = 44"$

$d = h =$ effective depth (h_f - 2)

$M_n = (5 \times 1 \times \sqrt{4{,}000} \times 44" \times h^2) \div 6$

$M_u = 56{,}151$ in-lb

Set $M_n = M_u$

Rearrange to find h^2

$h^2 = (56{,}151 \text{ in-lb} \times 6) \div (5 \times 1 \times \sqrt{4{,}000} \text{ psi} \times 44")$

$h^2 = (336{,}906) \div (13{,}914)$

$h = \sqrt{24.2} = 4.92$

$h_f = h + 2 = 4.92 + 2 = 6.92"$ [ACI 318-11; 22-7-4 requires a minimum 8" thick footer]

Use a 10" thick footer

Beam action shear – critical section located at h from face of column

Use an effective thickness, h = 8" (10" – 2")

$b_w = W_f$ = 44"

c = W_c = 12" (12" x 12" square column)

c = W_c = 14" (14" diameter round column)

L_f = 44"

Critical section location (h from face of column):

Critical section (12" x 12" square reinforced concrete column)
(12" ÷ 2) + 8" = 14" from center of column; 8" from edge of footer [(44" ÷ 2) – 14"]

Critical section (14" diameter round reinforced concrete column)
(14" ÷ 2) + 8" = 15" from center of column; 7" from edge of footer [(44" ÷ 2) – 15"]

Critical section location occurs within the footer. Use h = 8"

Calculate shear (V_u) at critical section

$V_u = q_s$ x tributary area

q_s = 9.97 psi

tributary area = W_f x [(L_f/2) – (W_c/2) – h]

Shear (12" x 12" square reinforced concrete column) =
V_u = 9.97 psi x 44" x [44"/2 – 12"/2 – 8"] = 9.97 psi x 44" x 8" = 3,510 lb

Shear (14" diameter round reinforced concrete column) =
V_u = 9.97 psi x 44" x [44"/2 – 14"/2 – 8"] = 9.97 psi x 44" x 7" = 3,071 lb

Use V_u = 3,510 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \times (4/3) \times 1 \times \sqrt{4{,}000} \times 44" \times 8"$ = 17,809 lb

17,809 lb > 3,510 lb > 3,071 lb **OKAY**

Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column

Use an effective thickness, h = 8" (10" -2")

Check punching shear. The critical section is a perimeter (b_o) related to the column length and width and effective depth, h.

W_f = 44"

L_f = 44"

$W_c = L_c$ = 12" (12" x 12" square column)

$W_c = L_c$ = 14" (14" diameter round column)

Critical section location:

Critical section (12" x 12" square reinforced concrete column)
(12" ÷ 2) + (8" ÷ 2) = 10" from center of column; 12" from the edge of the footer [(44" ÷ 2) – 10"]

Critical section (14" diameter round reinforced concrete column)
(14" ÷ 2) + (8" ÷ 2) = 11" from center of column; 11" from the edge of the footer [(44" ÷ 2) – 11"]

Calculate punching shear (V_u) at critical section

$V_u = q_s$ x tributary area

$q_s = 9.97$ psi

tributary area = W_f x L_f – [(h/2 + W_c + h/2) x (h/2 + L_c + h/2)] = {(W_f x L_f) – [(W_c + h) x (L_c + h)]}

Punching shear (12" x 12" square reinforced concrete column)
V_u = 9.97 psi x {(44" x 44") - [(12" + 8") x (12" + 8")]}

V_u = 9.97 psi x {1,936 in^2 – 400 in^2} = 15,314 lb

Punching shear (14" diameter round reinforced concrete column)
V_u = 9.97 psi x {(44" x 44") - [(14" + 8") x (14" + 8")]}

V_u = 9.97 psi x {1,936 in^2 – 484 in^2} = 14,477 lb

Use V_u = 15,314 in-lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$ and $V_n \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section

b_o = 2 x (W_c + L_c) + (4 x h) = 2 x (12" + 12") + 4 x 8" = 80"

β = ratio of long-to-short side = 44" ÷ 44" = 1.0

(4/3) + 8/(3 x 1.0) = 4.0; 4.0 > 2.66 Therefore,

$V_n = 2.66 \times \lambda \times \sqrt{f'_c} \times b_o \times h$

φV_n = 0.6 x 2.66 x 1 x √4,000 x 80" x 8" = 64,602 lb

64,602 lb > 15,314 lb > 14,477 lb **OKAY**

Design Check

Required footer base area: A_f= 464.5 in^2

Provided footer base area: A_f= 528 in^2

528 in^2 > 464.5 in^2 **OKAY**

Use a 44" wide continuous footer

ACI 318-11

Flexure analysis:

Footer thickness: $h_f = h + 2 = 4.92 + 2 = 6.92$ **Use 10" thick footer**

Beam action shear:

Footer thickness: h_f = 10"; 17,809 lb > 3,510 lb > 3,071 lb **Use 10" thick footer**

Punching shear (two-way shear action):

Footer thickness: h_f =10"; 64,602 lb > 15,314 lb > 14,477 lb **Use 10" thick footer**

USE: 44" wide x 10" thick continuous footer beneath end wall and first row of columns (based on ACI 318)
Use for soil foundation pressure of 1,500 psf and 2,000 psf

Based on this analysis, a 44" wide x 10" thick footer meets or exceeds the design criteria presented in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and ACI 318-11 Building Code Requirements for Structural Concrete. Based on the ACI 318-11 design standards an 8" thick footer is required and is sufficient to support the factored design load transferred from the column to the footer.

A 10" thick footer is selected for this design based on the analysis to meet or exceed the expected design and service load conditions. Based on this analysis, the proposed footer design (44" wide x 10" thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Site Specific Analysis and Design
End Wall Lateral Support Design
Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Concrete Manure Storage Wall End Wall Lateral Support Design (Top-of-wall beam):

The requirements of 327 IAC 19-12-4(e)(2)(A) state that all concrete manure storage facilities must be constructed according to the design standards presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005 (MWPS-36). MWPS-36 includes the design assumptions and rationale for designing rectangular concrete manure storages. MWPS-36 states on page 14 under the Walls section:

"*Rectangular tank designs assume the walls have full lateral top and bottom support. A wall top support must be provided for tanks without tops or slatted floors. Refer to* ***Wall Top Support*** *for additional design information.*"

MWPS-36 also states on page 16 under the "Wall Top Support" section:

"*Rectangular tank designs assume the walls have full lateral top and bottom support. The bottoms of the walls are supported laterally by the floor and footing. The tops of the tank walls are laterally supported by tank tops, slats, or specially designed beams called wall top beams. Properly placed gang slats can be used to provide lateral top support for side and end walls. Slats typically provide enough lateral support for walls. Additional wall top analysis may be needed for walls under extreme loading conditions. Individual slats placed across the building width most likely will not provide adequate support for the end walls. In this case, a wall top beam will need to be used to provide adequate lateral support for the top of the end wall.*

Top of wall support for the side walls is provided by continuous top of wall contact with the gang slats placed adjacent to the side wall. The gang slats (4' x10', typical) are placed side-by-side across the width of the building providing a continuous support from side-to-side by the gang slats. The gang slats are placed adjacent to and touching each other across the width of the building. Gaps between lines of slats are grouted to maintain continuous contact between gang slats.

Top of wall support for the end walls is provided by the lintel support beams and interior support members of the gang slats. The lintel support beams and gang slats are placed end-to-end across the length of the building. Typically, the spacing between rows of lintels is ten (10') feet and gang slats support members is every five (5) and/or ten (10) feet. Top of wall support design for the end walls has been based on lateral support every ten (10') feet.

The top of wall support for the end walls shown on the construction plans is 4 - #5 rebar, spaced 3.5" on-center located in the top fourteen (14") inches of the wall. The design summary includes an alternate reinforcement schedule using 6 - #4 rebar spaced 2.0" on-center located in the top fourteen (14") inches of the wall. The design tables in Appendix D of MWPS-36 (Table D-1 and Table D-2) provide the recommended number and size of reinforcement steel bars to place in the top 12" of the concrete wall to provide continuous lateral support when support is 10'-0" on-center. The recommended top of wall reinforcement for a ten (10") inch thick, ten (10') foot deep concrete manure storage tank wall for a lateral earth pressure of 100 psf is five (5) #6 rebar or two (2) #8 rebar located in the top twelve (12") inches. Based on the information presented in Table D-1 of MWPS-36, the proposed top of wall support design depicted on the design plans is not consistent with Table D-1 of the MWPS-36 design guide.

The design equations for wall top beams in Appendix C of MWPS-36 are based on a simply supported beam lying on its side (page 67). This design method effectively determines the maximum moment that occurs in the inside face of the wall located at the center of the span between the lintel support beams. Since the top of wall beam is a continuous beam, moments also occur in the outside face of the concrete wall at the interior supports (lintel support beams). The moments at the interior supports (lintel support beams) are less than the moments that occur at the center of the span. The maximum moment at the center of the span is used to determine the required top of wall reinforcement.

To determine the maximum shear and moments along the wall due to soil pressure loads, an analysis and design is completed based on the design equations in MWPS-36, Appendix C. In accordance with these design equations the proposed top of wall design (4-#5 rebar; 6-#4 rebar) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following site specific design is presented to confirm this conclusion.

Top of Wall Support Design

The concrete wall of a rectangular concrete manure storage is designed with full lateral support at the bottom and top. Based on MWPS-36, Appendix C Design Equations, a top of wall support beam is designed using the same design equations for the concrete wall with full lateral support.

Reference Equations (MWPS-36; Appendix C)

Equation C-1. Moment for walls, wall top beams

$M = 0.90 \times A_s \times f_y \times d \times \{1 - [(0.59 \times A_s \times f_y) \div (f'_c \times b \times d)]\}\{1 \text{ ft}/12 \text{ in}\}$

M = moment, ft-lb

A_s = area of steel, in^2

f_y = steel yield strength, lb/in^2

b = width, in

d = distance from extreme compression fiber to centroid of tension reinforcement, in

f'_c = concrete compressive strength, lb/in^2

Equation C-2. Shear for walls, wall top beams

$V = 0.85 \times (2) \times (\sqrt{f'_c}) \times b \times d$

V = shear, lb

b = width, in

d = distance from extreme compression fiber to centroid of tension reinforcement, in

f'_c = concrete compressive strength, lb/in^2

Equation C-7. Largest end shear; linearly increasing or decreasing load on a beam

$V_1 = (w \times L) \div 3$
V_1 = shear, lb
w = linear load, pounds per linear foot
L = length, feet

Equation C-8. Smallest end shear; linearly increasing or decreasing load on beam

$V_2 = (w \times L) \div 6$
V_2 = shear, lb

w = linear load, pounds per linear foot

L = length, feet

Equation C-9. Maximum moment; linearly increasing or decreasing load on beam

$M = (w \times L^2) \div (9 \times \sqrt{3})$

M = moment, ft-lb

w = linear load, pounds per linear foot

L = length, feet

Equation C-10. Shear; uniformly loaded beam

$V = (w \times L) \div 2$

V = shear, lb

w = linear load, pounds per linear foot

L = length, feet

Equation C-11. Maximum moment; uniformly loaded beam

$M = (w \times L^2) \div 8$

M = moment, ft-lb

w = linear load, pounds per linear foot

L = length, feet

Design

Determine w, linearly increasing load on beam (concrete wall)

Equivalent fluid pressure due to soil load = 100 lb/ft^2/ft of depth (NRCS-313; Table 4 – "Minimum Lateral Earth Pressure Values")

Concrete manure storage tank side wall depth = 10'-0"

Soil backfill depth = 10.0 ft (maximum; typically less)

Wall thickness = 10 inches

Beam design width = 14 inches (1.167 ft)

L_L, Load factor = 1.6 (ACI 318-11; 9.2.5)

w = 100 lb/ft^2/ft of depth x 1 ft x 10.0 ft

w = 1,000 lb/ft

w_u = 1,000 lb/ft x 1.6 = 1,600 lb/ft (factored load)

Determine factored shear at top of concrete wall, V_2 (uniform load)

$V_2 = (w \times L) \div 6$ (Equation C-8, MWPS-36)

V_2 = (1,600 lb/ft x 10 ft) ÷ 6 = 2,667 lb

MWPS-36, Appendix C Design (simply supported beam)

Determine shear; uniformly loaded beam, V_u

$V_u = (w_u \times L) \div 2$ (Equation C-10)

w_u = 2,667 lb/ft (factored shear at top of wall due to soil load)

$L = 10$ feet (lintel spacing, beam span)

$V_u = (2{,}667 \text{ lb/ft} \times 10 \text{ ft}) \div 2$

$V_u = 13{,}335$ lb

In accordance with ACI 318-11, 11.1.3.1 sections located less than a distance d from the face of the support shall be permitted to be designed for V_{ud} computed at a distance d from the face of the support.

$V_{ud} = V_u - w_u \times (d + s_w / 2)$

$V_u = 13{,}335$ lb

$w_u = 2{,}667$ lb/ft

s_w = support width = 9.0 inches

c = concrete cover = 1.5 inches

d = 10 inches – 1.5 inches – (5/8" / 2) = 8.1875 inches

$V_{ud} = 13{,}335 \text{ lb} - 2{,}667 \text{ lb/ft} \times (8.1875 + 9 / 2)/12 \text{ in/ft} = 10{,}515$ lb

Determine maximum moment; uniformly loaded beam, M_u

$M_u = (w_u \times L^2) \div 8$ (Equation C-11)

$w_u = 2{,}667$ lb/ft (factored shear at top of wall due to soil load)

$L = 10$ feet (lintel spacing, beam span)

$M_u = [2{,}667 \text{ lb/ft} \times (10)^2] \div 8$

$M_u = 33{,}338$ ft-lb (inside face, maximum moment in length of wall)

ACI 318-11; Allowable Shear and Moment

Determine Allowable Shear and Moment

Check 4 - #5, Grade 60 reinforcement bar in the top 14" of wall and wall thickness 10".

Check 6- #4, Grade 60 reinforcement bar in the top 14" of wall and wall thickness 10".

#5 rebar diameter = 5/8 in (0.625 in)

#4 rebar diameter = 1/2 in (0.5 in)

#5 rebar

$d_{b5} = 0.625$ in

$A_{b5} = 0.307$ in^2

$A_{s4} = 4 \times 0.307 \text{ in}^2 = 1.228 \text{ in}^2$

#4 rebar

$d_{b4} = 0.5$ in

$A_{b4} = 0.196$ in^2

$A_{s6} = 6 \times 0.196 \text{ in}^2 = 1.176 \text{ in}^2$

Allowable Shear

$V_c = 2 \times \sqrt{f'_c} \times b \times d$ (ACI 318-11; 11.2.1.1, Eq 11-3)

Concrete cover = 1.5 in

$b = 14$ in

#5 rebar: $d = [10 \text{ in} - 1.5 \text{ in} - (½ \times 5/8 \text{ in})]$

5 rebar: $d = 8.1875$ in

#4 rebar: $d = [10 \text{ in} - 1.5 \text{ in} - (½ \times 1/2 \text{ in})]$

4 rebar: $d = 8.25$ in

$f'_c = 4{,}000$ psi

#5 rebar: $V_c = 2 \times \sqrt{4{,}000} \times 14 \times 8.1875$

#5 rebar: $V_c = 14{,}499$ lb

#4 rebar: $V_c = 2 \times \sqrt{4{,}000} \times 14 \times 8.25$

#4 rebar: $V_c = 14{,}610$ lb

Check $\varphi V_c > V_u$

$\varphi = 0.75$ (ACI 318-11; 9.3.2.3)

#5 rebar: $\varphi V_c = 0.75 \times 14{,}499 \text{ lb} = 10{,}874$ lb

#4 rebar: $\varphi V_c = 0.75 \times 14{,}610 \text{ lb} = 10{,}957$ lb

Allowable shear = 10,874 lb (#5 rebar)

Allowable shear = 10,957 (#4 rebar)

Allowable Moment - #5 & #4 rebar

$M = 0.90 \times A_s \times f_y \times d \times \{1 - [(0.59 \times A_s \times f_y) \div (f'_c \times b \times d)]\} \times \{1 \text{ ft}/12 \text{ in}\}$

<u>4 - #5 rebar</u>

$A_{s3} = 1.228 \text{ in}^2$

$f_y = 60{,}000$ psi

$b = 14$ in

$d = 8.1875$ in

$f'_c = 4{,}000$ psi

$M = 0.90 \times 1.228 \text{ in}^2 \times 60{,}000 \text{ psi} \times 8.1875 \text{ in} \times \{1-[(0.59 \times 1.228 \text{ in}^2 \times 60{,}000 \text{ psi}) \div (4{,}000 \text{ psi} \times 14 \text{ in} \times 8.1875 \text{ in})]\} \times \{1 \text{ ft}/12 \text{ in}\}$

$M = 542{,}929.5 \text{ psi} \times 0.905 \times \{1 \text{ ft}/12 \text{ in}\}$

$M = 40{,}945$ ft-lb

Allowable moment = 40,945 ft-lb (4-#5 rebar)

<u>6 - #4 rebar</u>

$A_{s6} = 1.176 \text{ in}^2$

$f_y = 60{,}000$ psi

$b = 14$ in

$d = 8.25$ in

$f'_c = 4{,}000$ psi

$M = 0.90 \times 1.176\ in^2 \times 60{,}000\ psi \times 8.25\ in \times \{1-[(0.59 \times 1.176\ in^2 \times 60{,}000\ psi) \div (4{,}000\ psi \times 14\ in \times 8.25\ in)]\} \times \{1\ ft/12\ in\}$

$M = 523{,}908\ psi \times 0.909 \times \{1\ ft/12\ in\}$

$M = 39{,}686$ ft-lb

Allowable moment = 39,686 ft-lb (6-#4 rebar)

Design Check

Maximum Shear

$V_u = 10{,}515$ lb (MWPS-36 design equations, simply supported beam)

Allowable Shear

$V_u = 10{,}874$ lb (#5 rebar)

$V_u = 10{,}957$ lb (#4 rebar)

10,515 lb < 10,874 lb < 10,957 lb **OKAY**

Maximum Moment

$M_u = 33{,}338$ ft-lb (MWPS-36 design equations, simply supported beam, inside face within span)

Use $M_u = 33{,}338$ ft-lb (inside face within span and at interior support (lintel support beams)

Allowable Moment

$M_u = 40{,}945$ ft-lb (4 - #5 rebar)

$M_u = 39{,}686$ ft-lb (6 - #4 rebar)

33,338 ft-lb < 39,686 ft-lb (6-#4 rebar) < 40,945 lb (4-#5 rebar)

Use 4-#5 REBAR or 6-#4 REBAR **OKAY**

In accordance with the most conservative design method (simply-supported beam), 4 - #5 rebar or 6 - #4 rebar are placed in the 10" thick wall in a 14" section of the wall centered on the 8" x 10" support lintel.

A top of wall beam to provide lateral support on the end wall is designed based on a wall support spacing of 10 feet on-center. A soil lateral pressure load at the top of wall due to soil back fill up to 10'-0" high is considered in the design. Four (4)-#5 rebar located in the top fourteen (14") inches of the wall and spaced 3.5" on-center or six (6)-#4 rebar located in the top fourteen (14") inches of the wall and spaced 2.0" on-center is used in accordance with the most conservative design method to provide adequate lateral support in the end wall. The top wall beam and top wall reinforcement have been demonstrated to provide full lateral support at the top of wall for design.

A 14" wide, 10" thick top of wall beam with four (4) #5 rebar, Grade 60 or six (6) #4 rebar, Grade 60 is selected for this design based on the analysis to meet or exceed the expected design and service load conditions. Based on this analysis, the proposed top of wall beam provides adequate lateral support and meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Site Specific Analysis and Design

Construction Joint Spacing
Floor Reinforcement
Farrowing Building, 8P; Farrowing Building, 9P; Gestation Building, 10P
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Floor Construction Joint Spacing (subgrade drag theory):
In accordance with the criteria outlined in Table 3-13, MWPS-36 "Rectangular Concrete Manure Storages", Second Edition, the floor control joint spacing is determined based on subgrade drag theory shown in Design of Slabs on Grade, ACI-360R92 (Reapproved 1997). The subgrade drag equation is used to determine the amount of non-prestressed reinforcement to provide as shrinkage and temperature reinforcement and to control crack width. The amount of prestressed reinforcement is based on allowable reinforcement tensile stress, friction between the concrete and subgrade, distance between floor control joints, and the weight of the concrete floor slab. The subgrade drag equation is:

$A_s = [F \times L \times w] / [2 \times f_s]$

A_s = cross-sectional area in sq. in. of steel per lineal foot
f_s = allowable stress in the reinforcement, psi
F = the friction factor
L = distance in feet between joints
w = dead weight of the slab, psf

The subgrade drag equation can be rearranged to determine the floor control joint spacing, L. The rearranged subgrade drag equation to determine floor control joint spacing, L, is:

$L = [2 \times f_s \times A_s] / [F \times w]$

L = distance in feet between joints
A_s = cross-sectional area in sq. in. of steel per lineal foot
f_s = allowable stress in the reinforcement, psi
F = the friction factor
w = dead weight of the slab, psf

The steel reinforcing in the floor slab is specified in the "Design Summary" of the Confined Feeding Operation Approval Application packet and depicted on the design plans. Welded wire reinforcement is used in Farrowing Building, 9P and Gestation Building, 10P. Rebar reinforcement is used in Farrowing Building, 8P. The welded wire reinforcement specification for the floor slab specifies the following welded wire reinforcement and allowable floor construction joint spacing. The rebar reinforcement specification for the floor slab specifies the following rebar requirement and allowable floor construction joint spacing. The allowable floor construction joint spacing is determined based on the subgrade drag equation.

- 6 x 6, #6 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 64' on center, or
- 6 x 6, #10 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 31'on center, or
- 6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 42' on center, or

- 6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 20'on center
- #3 rebar, Grade 60 (60,000 psi tensile strength) with floor construction joints every 81' on center.

The plan sheets specify 6x6, #10 welded wire reinforcement with a 31' maximum floor construction joint spacing for Farrowing Building, 9P and Gestation Building, 10P. The floor construction joint spacing is based on a welded wire reinforcement tensile strength of 90,000 psi. The specifications include 6x6, #6 welded wire reinforcement and 60,000 psi tensile strength welded wire reinforcement. The plan sheets specify #3 rebar, grade 60 (60,000 psi) with a maximum construction joint spacing for Farrowing Building, 8P. A determination for each combination of welded wire reinforcement and rebar reinforcement is provided.

The floor control joint spacing is determined as follows:

6 x 6, #10 welded wire reinforcement (90,000 psi tensile strength)
$L = ([2 \times f_s \times A_s] / [F \times w]) \times S.F.$

f_s = 90,000 psi
A_s = 0.028 in^2/ft (MWPS-36, Table B-4)
F = 1.95 (soil subgrade, Figure 6.3; Design of Slabs on Grade, ACI 360R-92(97)
w = 5 in floor x 12.5 psf per in of thickness (150 pcf) = 62.5 psf
S.F. = 0.75 (f_s reduction)

L = ([2 x 90,000 psi x 0.028 in^2/ft] / [1.95 x 62.5 psf]) x 0.75
L = 31.0 ft
Use L = 31 ft

6 x 6, #6 welded wire reinforcement (90,000 psi tensile strength)
$L = ([2 \times f_s \times A_s] / [F \times w]) \times S.F.$

f_s = 90,000 psi
A_s = 0.058 in^2/ft (MWPS-36, Table B-4)
F = 1.95 (soil subgrade, Figure 6.3; Design of Slabs on Grade, ACI 360R-92(97)
w = 5 in floor x 12.5 psf per in of thickness (150 pcf) = 62.5 psf
S.F. = 0.75 (f_s reduction)

L = ([2 x 90,000 psi x 0.058 in^2/ft] / [1.95 x 62.5 psf]) x 0.75
L = 64.2 ft
Use L = 64 ft

6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength)
$L = ([2 \times f_s \times A_s] / [F \times w]) \times S.F.$

f_s = 60,000 psi
A_s = 0.028 in^2/ft (MWPS-36, Table B-4)
F = 1.95 (soil subgrade, Figure 6.3; Design of Slabs on Grade, ACI 360R-92(97)
w = 5 in floor x 12.5 psf per in of thickness (150 pcf) = 62.5 psf
S.F. = 0.75 (f_s reduction)

L = ([2 x 60,000 psi x 0.028 in^2/ft] / [1.95 x 62.5 psf]) x 0.75
L = 20.6 ft
Use L = 20 ft

6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength)

$L = ([2 \times f_s \times A_s] / [F \times w]) \times S.F.$

f_s = 60,000 psi

A_s = 0.058 in^2/ft (MWPS-36, Table B-4)

F = 1.95 (soil subgrade, Figure 6.3; Design of Slabs on Grade, ACI 360R-92(97)

w = 5 in floor x 12.5 psf per in of thickness (150 pcf) = 62.5 psf

S.F. = 0.75 (f_s reduction)

$L = ([2 \times 60{,}000 \text{ psi} \times 0.058 \text{ in}^2/\text{ft}] / [1.95 \times 62.5 \text{ psf}]) \times 0.75$

L = 42.8 ft

Use L = 42 ft

#3 rebar reinforcement (60,000 psi tensile strength)

$L = ([2 \times f_s \times A_s] / [F \times w]) \times S.F.$

f_s = 60,000 psi

A_s = 0.1104 in^2/ft

F = 1.95 (soil subgrade, Figure 6.3; Design of Slabs on Grade, ACI 360R-92(97)

w = 5 in floor x 12.5 psf per in of thickness (150 pcf) = 62.5 psf

S.F. = 0.75 (f_s reduction)

$L = ([2 \times 60{,}000 \text{ psi} \times 0.1104 \text{ in}^2/\text{ft}] / [1.95 \times 62.5 \text{ psf}]) \times 0.75$

L = 81.5 ft

Use L = 81 ft

2024 Confined Feeding Operation Approval Renewal and Manure Management Plan Construction Authorization Renewal

Site Specific Analysis and Design

Flood Water Design
Farrowing Building 8P. Concrete Manure Storage Buoyancy/Uplift Resistance
for
Top Grade Production LLC
2667 East State Road 18
Kokomo, Indiana 46901

Concrete Manure Storage Buoyancy/Uplift Resistance Determination:
According to the on-site soil investigation, a seasonal water table exists within the soil profile of the footprint of building 8P. The depth to the seasonal water table below the ground surface according to the on-site soil investigation is:

Building 8P – East Farrowing	
Boring #1 (west boring)	11" below the ground surface
Boring #2 (east boring)	12" below the ground surface

The depth of the foundation and floor of the 8P. farrowing building below-building concrete manure storage will be located approximately on grade after the topsoil is removed (0"-10" below the existing ground surface). A perimeter tile drainage system is not required for building 8P to control the seasonal water table since the seasonal water table identified by the on-site soil investigation is below the below-building concrete manure storage.

According to the DNR Indiana Floodplain Information Portal 2.0, a portion of 8P. farrowing building may be located within the flood fringe of the floodplain. A review of several points within the footprint of building 8P. indicates that the Base Flood Elevation (BFE) is 807.2 feet and 807.3 feet and the approximate ground elevation varies from 807.6 feet to 806.9 feet. The information available from the DNR Indiana Floodplain Information Portal 2.0 confirms that a portion of building 8P. is not located within the floodplain and a portion of building 8P. may be located within the floodplain.

327 IAC 19-12-2(a)(3) states that for waste management systems constructed in a one hundred (100) year flood plain that the waste management system access is at least two (2) feet above the one hundred (100) year flood plain and is designed to be structurally sound without lowering flood waters or the seasonal water table below the bottom of the waste management system. A design of the waste management system is presented to demonstrate that the manure storage is designed to be structurally sound without lowering flood waters below the bottom of the waste management system.

For the design, a Base Flood Elevation (BFE) of 807.3 feet is used. Building 8P. includes a two (2') foot shallow manure collection/storage structure from the top of storage floor to top of the walkway floor. In accordance with 327 IAC 19-12-2(a)(3), the manure storage access (building access door/top of walkway) will be located at 809.3 feet, the bottom of the wall footer (8" thick) will be located at 806.6 feet, and the bottom of the manure storage floor (5" thick) will be located at 806.883 feet. The most conservative design assumes that the potential flood water depth above the base of the foundation and floor is 8".

To demonstrate that the manure storage for building 8P. is sufficiently designed to resist the pressures due to the potential flood waters a design justification is based on a flood water depth of 8" above the base of the floor and foundation.

The potential flood waters could create a buoyancy/uplift force on the concrete manure storage. The buoyancy/uplift force on the concrete floor of the manure storage is equal to the weight of the water displaced by the concrete manure storage, floor, and footers below the flood waters.

To determine the buoyancy/uplift force due to the flood waters adjacent to the concrete manure storage, the following elevations are used.

- Top of manure storage floor elevation – 807.3 feet.
- Bottom of manure storage floor elevation – 806.6 feet.
- Top of wall elevation of the concrete manure storage – 811.3 feet.
- Top of manure storage access – 809.3 feet.
- The Base Flood Elevation (BFE) is 807.3 feet.
- Controlling flood water depth is 0.7 feet (8 inches) above bottom of manure storage floor.

When flood waters exist, the floor and footers will be below the flood waters. The walls of the concrete manure storage will not be below the flood water elevation.

To determine the buoyancy/uplift force on the concrete manure storage, the following information was used.

Footer/floor (outside dimension):	85'-0" x 153'-0"
Manure storage/building (outside dimension):	84'-0" x 152'-0"
Flood waters depth above floor base:	0.7'
Floor thickness:	5"
Footer thickness:	8" (NOTE: For a conservative design it is assumed that the floor and footer thickness is 8")
Calculated floor/footer volume:	9,103.5 ft^3 (85' x 153' x 0.7')
Total volume of displaced water:	9,103.5 ft^3
Density of water:	62.5 lb/cu ft
Total buoyancy/uplift force:	9,103.5 ft^3 x 62.5 lb/cu ft = **568,969 lb**

The buoyancy/uplift force is balanced by the weight of the concrete manure storage. An assessment of the concrete components is conducted to demonstrate that adequate weight and downward force are present to counteract the buoyancy/uplift forces of the potential flood waters. The weight and downward force for the steel reinforcement, equipment, and building components are not included in this assessment to demonstrate adequate resistance to the buoyancy/uplift forces due to potential flood waters.

The following summary of concrete components is presented to demonstrate that adequate weight and downward force exists to counteract the buoyancy/uplift forces.

Concrete Components – calculated volume:

• Floor:	0.416' x 85.0' x 153.0'	5,410 ft^3
• Additional footer:	0.25' x 2.0' x (2 x 85.0' + 2 x 149.0')	234 ft^3
• Footer transition:	0.5 x [0.25' x 0.5' x (2 x 85.0' + 2 x 149.0')	29 ft^3
• Building/storage walls:	0.5' x 4.0' x (2 x 84.0' + 2 x 151.0')	940 ft^3
• Storage divider walls:	0.5' x 1.667' x (16 x 151.0')	2,013 ft^3
• Walkways (lengthwise): 0.333' x (151.0' – 8.0') x (2 x 37.5" + 4 x 27.5" + 3 x 39.5") / 12 in/ft		1,204 ft^3
Walkways (crosswise):	0.333' x 84.0' x (2 x 4.0')	223 ft^3
• TOTAL CONCRETE VOLUME:		10,053 ft^3

Downward Force (weight) Determination

- Concrete density: 150 lb/ft^3
- Concrete volume: 10,053 ft^3
- Concrete weight: 10,053 ft^3 x 150 lb/ft^3 = 1,507,950 lb
- TOTAL DOWNWARD FORCE (WEIGHT): **1,507,950 lb**

DESIGN CHECK:

Total buoyance/uplift force:	568,969 lb
Total concrete downward force (weight):	1,507,950 lb
1,507,950 lb > 568,969 lb	**OKAY**

Conclusion:
The concrete components provide adequate weight/force to counterbalance the buoyancy/uplift force on the concrete manure storage from potential flood waters. It is noted that this analysis and demonstration does not consider the additional weight and downward force provided by the reinforcement, equipment, and building components.

The concrete manure storage is in compliance with 327 IAC 19-12-2(a)(3) requiring that a concrete manure storage be designed to be structurally sound without lowering flood waters below the bottom of the waste management system.

2024 Confined Feeding Operation Approval Renewal and Manure Management Plan Construction Authorization Renewal

Site Specific Analysis and Design

Flood Water Design

Concrete Manure Storage Design – 5" thick floor, 7'-8.5" span (length)

for

Top Grade Production LLC

2667 East State Road 18

Kokomo, Indiana 46901

Concrete Tank Reinforced Concrete Floor Design:
The concrete tank pump-out floor design shown on the construction plans is a 5" thick floor that has a maximum span of 7'-8.5" center-to-center between the walkway support/manure storage divider walls. According to the DNR Indiana Floodplain Information Portal 2.0, a portion of 8P. farrowing building may be located within the flood fringe of the floodplain. A review of several points within the footprint of building 8P. indicates that the Base Flood Elevation (BFE) is 807.2 feet and 807.3 feet and the approximate ground elevation varies from 807.6 feet to 806.9 feet. The information available from the DNR Indiana Floodplain Information Portal 2.0 confirms that a portion of building 8P. is not located within the floodplain and a portion of building 8P. may be located within the floodplain.

327 IAC 19-12-2(a)(3) states that for waste management systems constructed in a one hundred (100) year flood plain that the waste management system access is at least two (2) feet above the one hundred (100) year flood plain and is designed to be structurally sound without lowering flood waters or the seasonal water table below the bottom of the waste management system. In accordance with 327 IAC 19-12-2(a)(3) the manure storage floor is designed to be structurally sound without lowering the potential flood waters below the bottom of the waste management system. The manure storage floor is reinforced to resist the pressure due to potential flood waters near the concrete manure storage.

For the design, a Base Flood Elevation (BFE) of 807.3 feet is used. Building 8P. includes a two (2') foot shallow manure collection/storage structure from the top of storage floor to top of the walkway floor. In accordance with 327 IAC 19-12-2(a)(3), the manure storage access (building access door/top of walkway) will be located at 809.3 feet, the bottom of the wall footer (8" thick) will be located at 806.6 feet, and the bottom of the manure storage floor (5" thick) will be located at 806.883 feet. The most conservative design assumes that the potential flood water depth above the base of the foundation and floor is 8".

To demonstrate that the manure storage for building 8P. is sufficiently designed to resist the pressures due to the potential flood waters a design justification is based on a flood water depth of 8" above the base of the floor and foundation.

The pressure on the concrete floor is equal to the weight of the water displaced by the concrete manure storage, floor, and footers below the flood waters uniformly applied to the surface area of manure storage floor. The floor is reinforced to resist the pressure due to potential flood waters. The following information was used to determine the uniform pressure applied to the concrete floor.

Footer/floor surface area (outside dimension):	85'-0" x 153'-0" =	13,005 ft^2
Flood waters depth above floor base:	0.7'	
Floor thickness:	5"	
Footer thickness:	8" (NOTE: For a conservative design it is assumed that the floor and footer thickness is 8")	
Calculated floor/footer volume:	9,103.5 ft^3 (85' x 153' x 0.7')	
Total volume of displaced water:	9,103.5 ft^3	

Density of water: 62.5 lb/cu ft

Total upward force: 9,103.5 ft^3 x 62.5 lb/cu ft = 568,969 lb

Uniform floor load/pressure: 568,969 lb ÷ 13,005 ft^2 = 43.75 lb/ft^2

Use: **45.0 psf in the floor design.**

The reinforcement steel specified in the design for the concrete manure pump-out annex floor includes #3 rebar 12" on-center across the width of the manure storage collection/storage gutter (7.71' o.c.) (vertical steel, flexure steel) and 11" on-center along the length of the manure storage collection/storage gutter (horizontal, temperature & shrinkage steel).

In accordance with these design equations, the proposed reinforced concrete floor design meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following design is presented to confirm this conclusion.

Design Assumptions:

Floor length between support, L:	7'-8.5"
Floor thickness:	5"
Uniform pressure load:	45 lb/ft^2 uniform load
Steel strength, f_y:	60,000 psi
Concrete strength, f'_c:	4,000 psi
Dead load factor, L_D:	1.6 (soil load; ACI 318-11; 9.2.5(a))
Live load factor, L_L:	1.6 (ACI 318-11; 9.2)
Strength reduction factor, φ:	0.9 (ACI 318-11; 9.3)
Reinforcement steel:	#3 rebar; D = 0.375 in; A_s = 0.1104 in^2

Reinforced Floor Design –Uniform Load

Design Load:

Load, w_v = 45 lb/ft^2

Shear, top of wall, $V_1 = wL / 2$ (Eq. C-10, MWPS-36)
V_1 = 45 lb/ft x 7.71 ft ÷ 2 = 174 lb

Shear, bottom of wall $V_2 = wL / 2$ (Eq. C-10, MWPS-36)
V_2 = 45 lb/ft x 7.71 ft ÷ 2 = 174 lb

Bending moment $M = wL^2 / 8$ (Eq. C-11; MWPS-36)
M = 45 lb/ft x $(7.71\ ft)^2$ ÷ 8 = 335 ft-lb

Determine Total factored loads:

Live load factor, L_L: 1.6 (ACI318-11; 9.2.5(a))

Strength reduction factor, φ: 0.9 (ACI 318-11; 9.3)

Shear: V_1 = 174 lb x 1.6 = 279 lb

V_2 = 174 lb x 1.6 = 279 lb

Bending moment $M_n = M \times L_D \div \varphi$

M_n = 335 ft-lb x 1.6 ÷ 0.9 = 596 ft-lb (design load)

Determine minimum steel requirement – structural slab (ACI 318-11, 10.5.4)
$A_{s\,min} = 0.0018 \times b \times t$

b = 12" (beam width)

t = 5" (floor thickness)

$A_{s\,min} = 0.0018 \times 12" \times 5" = 0.1080\ in^2/ft$

Flexure steel spacing = $0.1104\ in^2 \div 0.1080\ in^2/ft \times 12\ in/ft = 12.27"$

Use 12.0" o.c.

Determine maximum load for reinforcement steel: -- #3 rebar; 12.0" on-center
$M_n = A_s \times f_y \times \{d - [(0.59 \times A_s \times f_y) \div (f'_c \times b)]\}$

(resultant equation when Eq. C-37; Eq. C-9; MWPS-36 and factored load equation are combined)

A_s = steel area, in^2 in beam $\quad A_s = 0.1104\ in^2 \times 12\ in/ft \div 12.0\ in$

$A_s = 0.1104\ in^2$

$f_y = 60{,}000$ psi

d = distance from extreme compression fiber to centroid of tension reinforcement, inches (MWPS-36)

d = 5" (floor thickness) – 1.5" (cover) – 0.375" / 2 (3/8 rebar diameter)

d = 3.3125"

$f'_c = 4{,}000$ psi

b = width, inches (MWPS-36) assumed to be 12" for design

b = 12"

$M_n = 0.1104\ in^2 \times 60{,}000\ psi \times \{3.3125" - [(0.59 \times 0.1104\ in^2 \times 60{,}000\ psi) \div (12" \times 4{,}000\ psi)]\}$

$M_n = 6{,}624\ lb \times \{3.3125" – [3{,}908\ lb \div 48{,}000\ lb/in]\}$

$M_n = 6{,}625\ lb \times \{3.3125" – 0.082"\}$

$M_n = 21{,}402$ in-lb

$M_n = 1{,}783$ ft-lb (allowable load)

1,783 ft-lb (allowable load) > 596 ft-lb (design load) **OKAY**

Determine distribution of flexure reinforcement (ACI 318-11; 10.6)
(Reinforcement steel spacing to control flexure cracking)

s = spacing of reinforcement closest to the tension face

$s = 15 \times (40{,}000 / f_s) – 2.5 \times c_c$ (ACI 318-11; Eq. 10-4)

but not greater than $12 \times (40{,}000 / f_s)$

f_s = calculated stress in reinforcement steel due to unfactored moment

c_c = distance from surface of reinforcement steel to tension face

$f_s = M / (A_s \times d_c)$

Determine f_s

M = unfactored moment =334.4 ft-lb

$A_s = 0.1104\ in^2$

$d_c = d - \beta_1 \times (x/2)$

d = 3.3125"

$\beta_1 = 0.85$

x = neutral axis (distance from compression face) = 0.1911"

d_c = 3.3125" – 0.85 x (0.1911" / 2) = 3.2313 in

f_s = 334.4 ft-lb x 12 in/ft / (0.1104 in^2 x 3.2313 in)

f_s = 11,249 lb/in^2

c_c = 1.5 inch (cover over reinforcement)

Determine s (reinforcement spacing)

s = 15 x (40,000 / 11,249) – 2.5 x 1.5 = 49.6 inch

12 x (40,000 / 11,249) = 42.6 inch

Required spacing, s = 42.6 inch

Provided reinforcement spacing: 12.0 inch

12.0 inch < 42.6 inch **OKAY**

Check Shear:

V_1 = 279 lb

V_2 = 279 lb

Check that V_1 and $V_2 \leq \varphi \times V_c$

$V_c = 2 \times b \times d \times \sqrt{f'_c}$

$V_c = 2 \times 12 \times 3.3125 \times \sqrt{4{,}000}$

V_c = 5,028 lb

$\varphi = 0.85$

$\varphi \times V_c$ = 0.85 x 5,028 lb = 4,273 lb

279 lb = 279 lb < 4,273 lb **OKAY**

Design Check: Reinforced Floor Design – Uniform Load

Flexure design (strength design):	1,783 ft-lb (allowable load) > 596 ft-lb (design load) **OKAY**
Minimum steel design:	0.108 in^2 < 0.1104 in^2 (12.0" o.c. spacing) **OKAY**
Crack control design:	12.0 inch < 42.6 inch **OKAY**
Shear design:	279 lb = 279 lb < 4,273 lb **OKAY**

Use: #3 rebar; 12.0 inch on-center (flexure reinforcement; controlled by minimum steel)

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC

2667 E State Road 18
Kokomo, Indiana 46901

ALTERNATE DESIGN OR COMPLIANCE APPROACH INNOVATIVE TECHNOLOGY

327 IAC 19-5-1 "Alternate design or compliance approach; innovative technology"

327 IAC 19-3-1 "Performance Standards"

12" X 12" Reinforced Concrete Column Design
4 - #5 Vertical Rebar
4 - #4 Vertical Rebar

14" Diameter Round Reinforced Concrete Column Design
4 - #5 Vertical Rebar
4 - #4 Vertical Rebar

12" x 16" Concrete Masonry Column Design

66" Diameter Round x 10" Thick Concrete Column Footer Design (1,500 psf)
12" x 12" Square Concrete Column
14" Diameter Round Concrete Column

50" Diameter Round x 10" Thick Concrete Column Footer Design (2,000 psf)
12" x 12" Square Concrete Column
14" Diameter Round Concrete Column

42" Wide x 11" Thick Continuous Column Footer Design (1,500 psf)
12" x 12" Square Concrete Column
14" Diameter Round Concrete Column

36" Wide x 10" Thick Continuous Column Footer Design (2,000 psf)
12" x 12" Square Concrete Column
14" Diameter Round Concrete Column

42" Wide x 11" Thick Continuous Column Footer Design (1,500 psf)
12" x 16" Concrete Masonry Column

36" Wide x 9" Thick Continuous Column Footer Design (2,000 psf)
12" x 16" Concrete Masonry Column

Concrete Construction Specification
Natural Resource Conservation Service - Concrete Construction
Construction Specification
Adapted

Prepared by:

LIVESTOCK ENGINEERING SOLUTIONS, INC.

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Alternate Design or Compliance Approach:
Confined Feeding Operations rule (327 IAC 19) allows for the use of a design or compliance approach that is not specifically described in the requirements outlined in 327 IAC 19). The requirements for an alternate design or compliance approach request are presented in 327 IAC 19-5-1 "Alternate design or compliance approach; innovative technology." Compliance with the performance standards outlined in 327 IAC 19-3-1 is identified as one of the requirements of an alternate design or compliance approach approval. The requirements of 327 IAC 19-5-1 and 327 IAC 19-3-1 are presented below.

327 IAC 19-5-1 "Alternate design or compliance approach; innovative technology"

Sec. 1. (a) The use of a design or compliance approach other than the requirements specified in this article, or an innovative technology may be proposed by the owner/operator in accordance with the following:

(1) The proposal for the alternative design or compliance approach, or innovative technology must be accompanied by documentation that indicates that the performance standards in 327 IAC 19-3-1 will be met. The alternate design or compliance approach, or innovative technology must comply with all existing environmental rules and laws.
(2) The proposed design or compliance approach, or innovative technology must be incorporated into the approval.

(b) In making a determination on an alternate design or compliance approach, or innovative technology, the commissioner shall consider the applicable criteria that may include the following:

(1) Design specifications that indicate adequate structural integrity
(2) Protective measures that reduce the potential for manure releases and spills
(3) The existence of barriers or surface gradient that directs liquid flow away from features specified for protection
(4) Operational practices that provide additional protection
(5) Threats of adverse impacts to water quality or other specified sensitive areas.
(6) Other criteria related to protection of the environment or human health.

(c) The commissioner shall provide written documentation describing the basis for the approval or denial of the proposed alternate design, compliance approach, or innovative technology

327 IAC 19-3-1 "Performance Standards"

Sec. 1. (a) A CFO shall be managed so as to avoid an unpermitted discharge into waters of the state.
(b) A CFO must be constructed and operated in a manner that minimizes nonpoint source pollution entering waters of the state.
(c) A CFO shall take all reasonable steps to prevent manure releases, spills or the discharge of manure in violation of the approval or this article, including seepage and leakage.
(d) All waste management systems must be designed, constructed, and maintained to minimize leaks and seepage and prevent manure releases or spills, as well as ensure compliance with the water quality standards in 327 IAC 2.
(e) Manure must be staged in such a manner as to:
(1) not threaten or enter waters of the state
(2) prevent:
    (A) runoff;
    (B) manure releases; and
    (C) spills
(f) Manure must be applied in such a manner as to:
(1) not threaten or enter waters of the state
(2) prevent:
    (A) ponding for more than twenty-four (24) hours;
    (B) manure release; and
    (C) spills; and
(3) minimize nutrient leaching beyond the root zone.

2024 Confined Feeding Operation Approval Application
Alternate Design or Compliance Approach (327 IAC 19-5)
12" x 12" Reinforced Concrete Column Design – 9'-2" Column Height
Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Alternate Compliance Approach Request:

The requirements of 327 IAC 19-12-4(d) states:

> "*All liquid manure storage facilities must be constructed according to the Indiana NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016**.*"

The requirements of 327 IAC 19-12-4(e) states:

> "*In addition to subsection (d), all concrete manure storage facilities must be constructed according to:*
> *(1) Indiana NRCS Construction Specification, Concrete Construction, May 2015***; and*
> *(2) either:*
> *(A) MWPS-36: Reinforced Concrete Manure Storages, Second Edition, 2005****; or*
> *(B) TR-9: Circular Concrete Manure Tanks, March 1998****.*

12" x 12" Concrete Column Reinforcement Design:

The 12"x12"x9'-2" high concrete columns shown on the breeding/gestation construction plans specify 4 - #5 vertical rebar tied with #3 rebar every 12" and 4-#4 vertical rebar tied with #3 rebar every 12". Table 3-11 "Reinforced concrete columns.", MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005, page 26, indicates that the vertical reinforcement for a 12"x12" concrete column is 4-#7 vertical rebar. Based on the information presented in Table 3-11 of MWPS-36, the proposed vertical reinforcement for the 12"x12" concrete columns depicted on the design plans is not consistent with the MWPS-36 design guide. Based strictly on Table 3-11 of MWPS-36 the proposed design does not meet the requirements of 327 IAC 19-12-4(e).

It is noted that the caption to Table 3-11 "Reinforced concrete columns." states "*Refer to Appendix C, Design Strength Equations or Maximum Allowable Load Equations for specific design equations.*" Specifically, this caption refers to Equations C-4. Axial loading for square columns with a maximum unsupported column length (ACI 318 Section 10.12.2) and Equation C-5. Axial loading for square columns (ACI 318 Section 10.3.5.2) for the design equations used in Table 3-11. ACI 318 is referenced in MWPS-36: Rectangular Concrete Manure Storages establishing the basis for the column design and standards. The standards for column design are detailed in Chapters 9 and 10 of Building Code Requirements for Structural Concrete (ACI 318-11). In accordance with the design equations and design standards in Appendix C, MWPS-36 and ACI 318-11, the 12"x12"column vertical reinforcement (4-#5 or 4-#4 rebar) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following design is presented to confirm this conclusion.

MWPS-36: Appendix C Equations

Equation C-4. Axial loading for square columns with a maximum unsupported column length (ACI 318 Section 10.12.2) [unsupported length]

$L_{colm} \leq (34)(0.3)b[1\text{ ft}/12\text{ in}]$

b = column width, in

L_{colm} = column length, ft

Equation C-5. Axial loading for square columns (ACI 318 Section 10.3.5.2)

$P_a = \varphi(0.85)[(0.80)\, f'_c\, (A_g - A_{st}) + (f_y\, A_{st})]$

P_a = axial load, lb

φ = strength reduction factor (ACI 318-11; 9.3.2.2)

f'_c = concrete compressive strength, psi

A_g = concrete gross area, in^2

A_{st} = steel area, in^2

f_y = yield strength, psi

ACI 318-11 References

ACI 10.3.6 Design axial strength (page 139)

$\varphi\, P_{n,\,max} = 0.80\, \varphi\, [0.85\, f'_c\, (A_g - A_{st}) + (f_y\, A_{st})]$ (Equation 10-2)

ACI 9.3.2 Strength reduction factor, φ (page 122)

9.3.2.2. – Compression-controlled sections, as defined in 10.3.3:

(a) Members with spiral reinforcement conforming to 10.9.3 ……….. 0.75

(b) Other reinforced members ……………………………………….. 0.65

ACI 10.8. – Design dimensions for compression members

10.8.4. – Limits of section. For a compression member with a cross section larger than required by considerations of loading, it shall be permitted to base the minimum reinforcement and strength on a reduced effective area A_g not less than one-half the total area. This provision shall not apply to special moment frames or special structural walls designed in accordance with Chapter 21.

ACI 10.9. – Limits for reinforcement of compression members

10.9.1. – Area of longitudinal reinforcement, A_{st}, for noncomposite compression members shall be not less than 0.01 A_g or more than 0.08 A_g.

10.9.2. – Minimum number of longitudinal bars in compression members shall be 4 for bars within rectangular or circular ties, 3 for bars within triangular ties, and 6 for bars enclosed by spiral conforming to 10.9.3.

ACI 10.10. – Slenderness effects in compression members

10.10.1. – Slenderness effects shall be permitted to be neglected in the following cases:

(a) for compression members not braced against sideway when

$k\, l_u / r \leq 22$

(b) for compression members braced against side-sway when

$k\, l_u / r \leq 34$

k = effective length factor

l_u = unsupported length, in

r = radius of gyration, 0.3 x b (ACI 318-11; 10.10.1.2)

b = column width, in

Design

Assumptions:

$f'_c = 4{,}000$ psi

$f_y = 60{,}000$ psi

$\varphi = 0.65$ (ACI 318-11; 9.3.2)

12" x 12" x 9'-2" concrete column, and

Vertical reinforcement – 4 - #5 rebar or 4-#4 rebar

Determine design axial load, P_u

$P_u = P_a$ x design load factor (L_D or L_L)

P_a = pig load + slat load + lintel load + equipment load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Equipment load = 8.5 psf

Live load factor, $L_L = 1.6$

Dead load factor, $L_D = 1.2$

P_u = [(70.0 psf x 10 ft x 12 ft) x 1.6] + [(38.84 psf x 10 ft x 12 ft) x 1.2] + [(88.54 plf x 12 ft) x 1.2] + [8.5 psf x 10 ft x 12 ft x 1.2]

P_u = 13,440 lb + 5,593 lb + 1,275 lb + 1,224 lb = 21,932 lb

Determine gross area of concrete, A_g

A_g = 12" x 12" = 144"

Determine area of reinforcement steel -- #5 rebar

Area (#5 rebar) = (5/8" ÷ 2)^2 x π = 0.307 in^2

4 - #5 rebar = 4 x 0.307 in^2 = 1.228 in^2

Determine area of reinforcement steel -- #4 rebar

Area (#4 rebar) = (1/2" ÷ 2)^2 x π = 0.196 in^2

4 - #4 rebar = 4 x 0.196 in^2 = 0.784 in^2

Determine maximum allowable unsupported length, L_{colm}

L_{colm} = (34)(0.3)b[1 ft/12 in] (Equation C-4)

b = 12"

L_{colm} = 34 x 0.3 x 12" x 1 ft/12 in

L_{colm} = 10.2 feet (slenderness effects neglected)

9.167' (9'-2") < 10.2' **OKAY**

Determine slenderness factor, $k\ l_u / r$

$k = 1.0$ (column braced at top and bottom against sideway)

$l_u = 9.167$ ft (110 in)

$b = 12$ in

$r = 0.30 \times 12" = 3.6$ in

$k\ l_u / r = 1.0 \times 110 \text{ in} / (0.30 \times 12 \text{ in}) = 30.6$

$30.6 < 34$ OKAY (ACI 10.10.1)

Slenderness effects can be neglected in design

Determine maximum allowable axial load, $P_{n,\ max}$; (Equation C-5 & ACI 318-11, 10-2)

$P_{n,\ max} = 0.80\ \varphi\ [0.85\ f'_c\ (A_g - A_{st}) + (f_y\ A_{st})]$

$\varphi = 0.65$; strength reduction factor (ACI 318-11; 9.3.2.2)

$f'_c = 4{,}000$ psi; concrete compressive strength, psi

$A_g = 144\ in^2$; concrete gross area, in^2

$A_{st} = 1.228\ in^2$ (#5); steel area, in^2

$A_{st} = 0.784\ in^2$ (#4); steel area, in^2

$f_y = 60{,}000$ psi; yield strength, psi

$P_{n,\ max} = 0.80 \times 0.65 \times [0.85 \times 4{,}000 \times (144 - 1.228) + (60{,}000 \times 1.228)]$

$P_{n,\ max} = 290{,}734$ lb (4 - #5 rebar)

$P_{n,\ max} = 0.80 \times 0.65 \times [0.85 \times 4{,}000 \times (144 - 0.784) + (60{,}000 \times 0.784)]$

$P_{n,\ max} = 277{,}667$ lb (4 - #4 rebar)

Determine ratio of actual load (P_u) and maximum allowable axial load, $P_{n,\ max}$

$P_u / P_{n,\ max} = 21{,}932 \text{ lb} / 290{,}734 \text{ lb} = 0.076$ (4 - #5 rebar)

$P_u / P_{n,\ max} = 21{,}932 \text{ lb} / 277{,}667 \text{ lb} = 0.079$ (4 - #4 rebar)

$0.076 < 0.079 \ll 1.0$; therefore the cross sectional area of the column is significantly larger than required when considering actual loading.

In accordance with ACI 318-11, Chapter 10, Section 10.84 the minimum reinforcement and strength can be based on a reduced effective area A_g not less than one-half the total area.

$A_g = 144"$

$\frac{1}{2} A_g = \frac{1}{2} \times 144\ in^2 = 72\ in^2$

Recalculate maximum allowable axial load, $P_{n,\ max}$

$P_{n,\ max} = 0.80 \times 0.65 \times [0.85 \times 4{,}000 \times (72 - 1.228) + (60{,}000 \times 1.228)]$

$P_{n,\ max} = 163{,}438$ lb (4 - #5 rebar)

$21{,}932 \text{ lb} < 163{,}438 \text{ lb}$ OKAY

$P_{n, max} = 0.80 \times 0.65 \times [0.85 \times 4{,}000 \times (72 - 0.784) + (60{,}000 \times 0.784)]$

$P_{n, max} =$ 150,371 lb (4 - #4 rebar)

21,932 lb < 150,371 lb OKAY

<u>Determine minimum reinforcement of compression members (ACI 318-11, 10-9.1)</u>

$0.01 \times A_g < A_{st} < 0.08 \times A_g$

$A_g = 72$ in^2

$A_{st} = 1.228$ in^2 (4-#5 rebar)

$0.01 \times A_g = 0.72$ in^2

$0.08 \times A_g = 5.76$ in^2

#5 rebar: 0.72 in^2 < 1.228 in^2 < 5.76 in^2 OKAY

$A_{st} = 0.784$ in^2 (4-#4 rebar)

$0.01 \times A_g = 0.72$ in^2

$0.08 \times A_g = 5.76$ in^2

#4 rebar: 0.72 in^2 < 0.784 in^2 < 5.76 in^2 OKAY

<u>Design Confirmation:</u>

<u>Design load</u>

P_u (design axial load) = 21,932 lb

$P_{n, max}$ (max allowable load) = 290,734 lb (4 - #5 rebar) (ACI 318-11, Chapter 10, Section 10.2)

$P_{n, max}$ (max allowable load) = 277,667 lb (4 - #4 rebar) (ACI 318-11, Chapter 10, Section 10.2)

$P_{n, max}$ (max allowable load) = 163,438 lb (4 - #5 rebar) (ACI 318-11, Chapter 10, Section 10.8.4)

$P_{n, max}$ (max allowable load) = 150,371 lb (4 - #4 rebar) (ACI 318-11, Chapter 10, Section 10.8.4)

21,932 lb < 290,734 lb (4-#5 rebar) OKAY

21,932 lb < 163,438 lb (4-#5 rebar) OKAY

21,932 lb < 277,667 lb (4-#4 rebar) OKAY

21,932 lb < 150,371 lb (4-#4 rebar) OKAY

<u>Slenderness factor</u>

30.6 < 34 OKAY

<u>Minimum reinforcement (controls design)</u>

#5 rebar: 0.72 in^2 < 1.228 in^2 < 5.76 in^2 OKAY

#4 rebar: 0.72 in^2 < 0.784 in^2 < 5.76 in^2 OKAY

Based on this analysis, a 12" x 12" x 9'-2" concrete column with 4-#5 vertical rebar tied every 12" with #3 rebar or 4-#4 vertical rebar tied every 12" with #3 rebar meets the design load and design criteria presented in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11).

2024 Confined Feeding Operation Approval Application
Alternate Design or Compliance Approach (327 IAC 19-5)
14" Diameter Reinforced Concrete Column Design – 9'-2" Column Height
(11"x11" Reinforced Concrete Column Design)
Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Alternate Compliance Approach Request:

The requirements of 327 IAC 19-12-4(d) states:

> "*All liquid manure storage facilities must be constructed according to the Indiana NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016**.*"

The requirements of 327 IAC 19-12-4(e) states:

> "*In addition to subsection (d), all concrete manure storage facilities must be constructed according to:*
> *(1) Indiana NRCS Construction Specification, Concrete Construction, May 2015***; and*
> *(2) either:*
> *(A) MWPS-36: Reinforced Concrete Manure Storages, Second Edition, 2005****; or*
> *(B) TR-9: Circular Concrete Manure Tanks, March 1998****.*

<u>14" Diameter Round Concrete Column Reinforcement Design:</u>

The 14" diameter reinforced concrete column shown on the gestation building construction plans specify 4-#5 vertical rebar tied with #3 rebar every 11" and 4-#4 vertical rebar tied with #3 rebar every 11". For design, the equivalent of an 11"x11"reinforced concrete column is used within the 14" diameter concrete column. Table 3-11 "Reinforced concrete columns.", MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005, page 26, indicates that the vertical reinforcement for an 11"x11" concrete column inside a 14" diameter concrete column is 4-#6 vertical rebar. Based on the information presented in Table 3-11 of MWPS-36, the proposed vertical reinforcement for the 14" diameter (11'x11" equivalent) concrete column depicted on the design plans is not consistent with the MWPS-36 design guide. Based strictly on Table 3-11 of MWPS-36 the proposed design does not meet the requirements of 327 IAC 19-12-4(e).

It is noted that the caption to Table 3-11 "Reinforced concrete columns." states "*Refer to Appendix C, Design Strength Equations or Maximum Allowable Load Equations for specific design equations.*" Specifically, this caption refers to Equations C-4. Axial loading for square columns with a maximum unsupported column length (ACI 318 Section 10.12.2) and Equation C-5. Axial loading for square columns (ACI 318 Section 10.3.5.2) for the design equations used in Table 3-11. ACI 318 is referenced in MWPS-36: Rectangular Concrete Manure Storages establishing the basis for the column design and standards. The standards for column design are detailed in Chapters 9 and 10 of Building Code Requirements for Structural Concrete (ACI 318-11). In accordance with the design equations and design standards in Appendix C, MWPS-36 and ACI 318-11, the 14" diameter (11"x11" equivalent) column vertical reinforcement (4-#4 rebar) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following design is presented to confirm this conclusion.

<u>MWPS-36: Appendix C Equations</u>

<u>Equation C-4. Axial loading for square columns with a maximum unsupported column length (ACI 318 Section 10.12.2) [unsupported length]</u>

$L_{colm} \leq (34)(0.3)b[1\ ft/12\ in]$

b = column width, in

L_{colm} = column length, ft

Equation C-5. Axial loading for square columns (ACI 318 Section 10.3.5.2)

$P_a = \varphi(0.85)[(0.80)\, f'_c\, (A_g - A_{st}) + (f_y\, A_{st})]$

P_a = axial load, lb

φ = strength reduction factor (ACI 318-11; 9.3.2.2)

f'_c = concrete compressive strength, psi

A_g = concrete gross area, in^2

A_{st} = steel area, in^2

f_y = yield strength, psi

Equation C-6. Axial loading for round columns with a maximum unsupported column length [unsupported length]

$L_{colm} \leq (34)(0.25)d[1\ ft/12\ in]$

d = column diameter, in

L_{colm} = column length, ft

ACI 318-11 References

ACI 10.3.6 Design axial strength (page 139)

$\varphi P_{n,\,max} = 0.80\, \varphi\, [0.85\, f'_c\, (A_g - A_{st}) + (f_y\, A_{st})]$ (Equation 10-2)

ACI 9.3.2 Strength reduction factor, φ (page 122)

9.3.2.2. – Compression-controlled sections, as defined in 10.3.3:

(a) Members with spiral reinforcement conforming to 10.9.3 ……….. 0.75

(b) Other reinforced members ……………………….………………….. 0.65

ACI 10.8. – Design dimensions for compression members

10.8.4. – Limits of section. For a compression member with a cross section larger than required by considerations of loading, it shall be permitted to base the minimum reinforcement and strength on a reduced effective area A_g not less than one-half the total area. This provision shall not apply to special moment frames or special structural walls designed in accordance with Chapter 21.

ACI 10.9. – Limits for reinforcement of compression members

10.9.1. – Area of longitudinal reinforcement, A_{st}, for noncomposite compression members shall be not less than 0.01 A_g or more than 0.08 A_g.

10.9.2. – Minimum number of longitudinal bars in compression members shall be 4 for bars within rectangular or circular ties, 3 for bars within triangular ties, and 6 for bars enclosed by spiral conforming to 10.9.3.

ACI 10.10. – Slenderness effects in compression members

10.10.1. – Slenderness effects shall be permitted to be neglected in the following cases:

(a) for compression members not braced against sideway when

$k\, l_u / r \leq 22$

(b) for compression members braced against side-sway when

$k\, l_u / r \leq 34$

k = effective length factor

l_u = unsupported length, in

r = radius of gyration, 0.3 x b (ACI 318-11; 10.10.1.2)

b = column width, in

Design

Assumptions:

f'_c = 4,000 psi

f_y = 60,000 psi

φ = 0.65 (ACI 318-11; 9.3.2)

11" x 11" x 9'-2" concrete column, and

Vertical reinforcement – 4 - #5 rebar or 4-#4 rebar

Determine design axial load, P_u

P_u = P_a x design load factor (L_D or L_L)

P_a = pig load + slat load + lintel load + equipment load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Equipment load = 8.5 psf

Live load factor, L_L = 1.6

Dead load factor, L_D = 1.2

P_u = [(70.0 psf x 10 ft x 12 ft) x 1.6] + [(38.84 psf x 10 ft x 12 ft) x 1.2] + [(88.54 plf x 12 ft) x 1.2] + [8.5 psf x 10 ft x 12 ft x 1.2]

P_u = 13,440 lb + 5,593 lb + 1,275 lb + 1,224 lb = 21,932 lb

Determine gross area of concrete, A_g

A_g = 11" x 11" = 121"

Determine area of reinforcement steel -- #5 rebar

Area (#5 rebar) = $(5/8" \div 2)^2 \times \pi = 0.307\ in^2$

4 - #5 rebar = 4 x 0.307 in^2 = 1.228 in^2

Determine area of reinforcement steel -- #4 rebar

Area (#4 rebar) = $(1/2" \div 2)^2 \times \pi = 0.196\ in^2$

4 - #4 rebar = 4 x 0.196 in^2 = 0.784 in^2

Determine maximum allowable unsupported length, L_{colm} (11"x11" square column, effective)

L_{colm} = (34)(0.3)b[1 ft/12 in] (Equation C-4)

b = 11"

L_{colm} = 34 x 0.3 x 11" x 1 ft/12 in

L_{colm} = 9.35 feet (slenderness effects neglected)

9.167' < 9.35' **OKAY**

Determine maximum allowable unsupported length, L_{colm} (14" round column)

L_{colm} = (34)(0.25)d[1 ft/12 in] (Equation C-6)

d = 14"

L_{colm} = 34 x 0.25 x 14" x 1 ft/12 in

L_{colm} = 9.917 feet (slenderness effects neglected)

9.167' < 9.917' **OKAY**

9.167' < 9.35' (square column) < 9.917' (round column) OKAY
Slenderness effects can be neglected based on the square column (effective column) and round column (actual dimension)

Determine slenderness factor, k l_u / r

k = 1.0 (column braced at top and bottom against sideway)

l_u = 9.167 ft (110 in)

b = 11 in

r = 0.30 x 11" = 3.3 in

k l_u / r = 1.0 x 110 in / (0.30 x 11 in) = 33.3

33.3 < 34 OKAY (ACI 10.10.1)

Slenderness effects can be neglected in design

Determine maximum allowable axial load, $P_{n, max}$; (Equation C-5 & ACI 318-11, 10-2)

$P_{n, max} = 0.80\ \varphi\ [0.85\ f'_c\ (A_g - A_{st}) + (f_y\ A_{st})]$

φ = 0.65; strength reduction factor (ACI 318-11; 9.3.2.2)

f'_c = 4,000 psi; concrete compressive strength, psi

A_g = 121 in^2; concrete gross area, in^2

A_{st} = 1.228 in^2 (#5); steel area, in^2

A_{st} = 0.784 in^2 (#4); steel area, in^2

f_y = 60,000 psi; yield strength, psi

$P_{n, max}$ = 0.80 x 0.65 x [0.85 x 4,000 x (121 – 1.228) + (60,000 x 1.228)]

$P_{n, max}$ = 252,241.0 lb (4 - #5 rebar)

$P_{n, max}$ = 0.80 x 0.65 x [0.85 x 4,000 x (121 – 0.784) + (60,000 x 0.784)]

$P_{n,\,max} =$ 237,002.7 lb (4 - #4 rebar)

Determine ratio of actual load (P_u) and maximum allowable axial load, $P_{n,\,max}$

$P_u / P_{n,\,max}$ = 19,228 lb / 252,241 lb = 0.076 (4 - #5 rebar)

$P_u / P_{n,\,max}$ = 19,228 lb / 237,002.7 lb = 0.081 (4 - #4 rebar)

0.076 < 0.081 << 1.0; therefore the cross sectional area of the column is significantly larger than required when considering actual loading.

In accordance with ACI 318-11, Chapter 10, Section 10.84 the minimum reinforcement and strength can be based on a reduced effective area A_g not less than one-half the total area.

A_g = 121"

½ A_g = ½ x 121 in^2 = 60.5 in^2

Recalculate maximum allowable axial load, $P_{n,\,max}$

$P_{n,\,max} =$ 0.80 x 0.65 x [0.85 x 4,000 x (60.5 – 1.228) + (60,000 x 1.228)]

$P_{n,\,max} =$ 143,106.5 lb (4 - #5 rebar)

$P_{n,\,max} =$ 0.80 x 0.65 x [0.85 x 4,000 x (60.5 – 0.784) + (60,000 x 0.784)]

$P_{n,\,max} =$ 130,038.6 lb (4 - #4 rebar)

19,132 lb < 130,038.6 lb < 143,106.5 lb OKAY

Determine minimum reinforcement of compression members (ACI 318-11, 10-9.1)

0.01 x A_g < A_{st} < 0.08 x A_g

A_g = 60.5 in^2

A_{st} = 1.228 in^2 (4-#5 rebar)

0.01 x A_g = 0.605 in^2

0.08 x A_g = 4.84 in^2

#5 rebar: 0.605 in^2 < 0.1.228 in^2 < 4.84 in^2 OKAY

A_{st} = 0.784 in^2 (4-#4 rebar)

0.01 x A_g = 0.605 in^2

0.08 x A_g = 4.84 in^2

#4 rebar: 0.605 in^2 < 0.784 in^2 < 4.84 in^2 OKAY

Design Confirmation:

Design load

P_u (design axial load) = 21,932 lb

$P_{n, max}$ (max allowable load) = 252,241.0 lb (4 - #5 rebar) (ACI 318-11, Chapter 10, Section 10.2)

$P_{n, max}$ (max allowable load) = 237,002.7 lb (4 - #4 rebar) (ACI 318-11, Chapter 10, Section 10.2)

$P_{n, max}$ (max allowable load) = 143,106.5 lb (4 - #5 rebar) (ACI 318-11, Chapter 10, Section 10.8.4)

$P_{n, max}$ (max allowable load) = 130,038.6 lb (4 - #4 rebar) (ACI 318-11, Chapter 10, Section 10.8.4)

21,932 lb < 252,241.0 lb (4-#5 rebar) OKAY

21,932 lb < 237,002.7 lb (4-#4 rebar) OKAY

21,932 lb < 143,106.5 lb (4-#5 rebar) OKAY

21,932 lb < 130,038.6 lb (4-#4 rebar) OKAY

Slenderness factor

33.3 < 34 OKAY

Minimum reinforcement (controls design)

#5 rebar: $0.605\ in^2 < 1.228\ in^2 < 4.84\ in^2$ OKAY

#4 rebar: $0.605\ in^2 < 0.784\ in^2 < 4.84\ in^2$ OKAY

Based on this analysis, a 14" diameter, 9'-2" high (11" x 11" x 9'-2"; equivalent) concrete column with 4-#5 vertical rebar tied every 11" with #3 rebar or 4-#4 vertical rebar tied every 11" with #3 rebar meets the design load and design criteria presented in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11).

2024 Confined Feeding Operation Approval Application
Alternate Design or Compliance Approach (327 IAC 19-5)
12" x 16" Concrete Masonry Column Design
Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Alternate Compliance Approach Request:

The requirements of 327 IAC 19-12-4(d) states:

> "*All liquid manure storage facilities must be constructed to the Indiana NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016**." . . .*"

The requirements of 327 IAC 19-12-4(e) states:

> "*In addition to subsection (d), all concrete manure storage facilities must be constructed according to:*"
> *(1) Indiana NRCS Construction Specification, Concrete Construction, May 2015***; and*
> *(2) either:*
> *(A) MWPS-36: Reinforced Concrete Manure Storages, Second Edition, 2005****; or*
> *(B) TR-9: Circular Concrete Manure Tanks, March 1998****.*

Concrete Masonry Column Design:

The requirements of 327 IAC 19-12-4(e)(1) state that all concrete manure storage facilities must be constructed according to the design standards presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005 (MWPS-36). MWPS-36 includes the design assumptions and rationale for designing rectangular concrete manure storages. MWPS-36 states on page 1 in the Preface that

> "*This handbook reflects the several revisions that ACI 318 has undergone since the first edition of this book in 1994, including a major revision to ACI 318 in 2002 and another revision in 2005. Major changes from the previous edition of MWPS-36 include the following:*
>
> - *Major revisions to all the design tables.*
> - *Expanded discussion of floor design.*
> - *Expanded footing-design tables.*
> - *Expanded discussion of design criteria background.*
> - *More detailed design examples.*
> - *Removal of the section on circular concrete manure storage designs.*
> - *Removal of the section on masonry column designs.*
>
> *The circular concrete manure storage designs were deleted because more detailed designs can be found in Circular Concrete Manure Tanks, TR-9. Masonry columns are rarely used in manure storages and are susceptible to poor construction; therefore, these designs were removed.*"

In the state of Indiana, the statement "*Masonry columns are rarely used in manure storages and are susceptible to poor construction*" presented above is inaccurate. Numerous designs have been approved that include concrete masonry columns and numerous rectangular concrete manure storages have been constructed with concrete masonry columns. These concrete manure storages are still being used and the concrete masonry columns constructed as designed have provided a long service life without failure. The experience of the authors of MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005

(MWPS-36) apparently differs from the construction methods commonly used in Indiana resulting in the included statement and removal of the section on masonry column designs.

Since the section on masonry columns has been removed from MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005 (MWPS-36), a specific reference to design information for masonry columns is not provided in 327 IAC 19. It could be interpreted that since the section on masonry columns has been removed from MWPS-36 masonry columns should not be used in concrete manures storages. It is believed that this would be an inaccurate conclusion. It is noted that the reference to concrete masonry columns in MWPS-36 does not prohibit the use of concrete masonry columns. Specifically, the authors of MWPS-36 in the preparation of the Second Edition decided to remove the section on masonry design from the design guide. In support of their decision, the authors point out that masonry columns are rarely used and that they are susceptible to poor construction. Concrete manure storage construction that includes concrete masonry columns in Indiana does not support these conclusions and should not be prohibited due to the removal of the section on masonry column design from MWPS-36.

A more accurate conclusion would be that masonry columns can be used in concrete manure storages and that approval by the Indiana Department of Environmental Management is required prior to construction. Since there is no information included in MWPS-36 pertaining to concrete masonry columns, construction of a concrete manure storage with concrete masonry columns can be completed in accordance with the requirements of 327 IAC 19-12-4(e) as long as all other concrete components are constructed in accordance with the design standards of MWPS-36.

It is noted that 327 IAC 19-12-4(h) states
"*Waste management systems not specifically listed in this section must be designed and constructed in accordance with the requirements of IC 13-18-10-4(b). The design must be submitted to the department for approval under subsection (a) before construction can commence.*

IC 13-18-10-4(b) states:
Sec. 4. (a) The board may adopt rules under IC 4-22-2 and IC 13-14-9 and the department may adopt policies or statements under IC 13-14-1-11.5 that are necessary for the proper administration of this chapter. The rules, policies, or statements may concern construction, expansion, and operation of confined feeding operations and may include uniform standards for:
(1) construction, expansion, and manure containment that are appropriate for a specific site; and
(2) manure application and handling that are consistent with best management practices:
(A) designed to reduce the potential for manure to be conveyed off a site by runoff or soil erosion; and
(B) that are appropriate for a specific site.
(b) Standards adopted in a rule, policy, or statement under subsection (a) must:
(1) consider confined feeding standards that are consistent with standards found in publications from:
(A) the United States Department of Agriculture;
(B) the Natural Resources Conservation Service of the United States Department of Agriculture;
(C) the Midwest Plan Service; and
(D) postsecondary educational institution extension bulletins; and
(2) be developed through technical review by the department, postsecondary educational institution specialists, and other animal industry specialists.

Based on a review of 327 IAC 19-12-4(h) it is interpreted that the use of concrete masonry columns is allowed if the design is submitted to the department for approval prior to construction. In accordance with the requirements of IC 13-18-10-4(b), an alternative compliance approach presenting the design and requesting approval to use concrete masonry columns in the construction of concrete manure storages is submitted.

Concrete Masonry Column Design

MWPS-36, Concrete Manure Storages Handbook, First Edition, 1994 included a section on Columns (page 16) that presented design information and specifications for unreinforced concrete masonry columns. The designs for concrete masonry columns in MWPS-36, First Edition were presented in Table 16. Consistent with the designs presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005 for columns the designs presented in MWPS-36, Concrete Manure Storages Handbook, First Edition, 1994 are based on design equations presented in Appendix C: Design Equations. The design equations presented in MWPS-36, Concrete Manure Storages Handbook, First Edition, 1994 are the same design equations presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005.

The design strength equations and load equations from MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005 are used in the concrete masonry column design.

MWPS-36: Appendix C Equations

Equation C-4. Axial loading for square columns with a maximum unsupported column length (ACI 318 Section 10.12.2) [unsupported length]

$L_{colm} \leq (34)(0.3)b[1\ ft/12\ in]$

b = column width, in

L_{colm} = column length, ft

Equation C-5. Axial loading for square columns (ACI 318 Section 10.3.5.2)

$P_a = \varphi(0.85)[(0.80)\ f'_c\ (A_g - A_{st}) + (f_y\ A_{st})]$

P_a = axial load, lb

φ = strength reduction factor (ACI 318-11; 9.3.2.2)

f'_c = concrete compressive strength, psi

A_g = concrete gross area, in^2

A_{st} = steel area, in^2

f_y = yield strength, psi

Equation C-24 Axial loading of a reinforced column

$P_a = L_L \times P_u$

P_u = axial load, lb

L_L = load factor, 1.2 or 1.6

ACI 318-11 References

ACI 10.3.6 Design axial strength (page 139)

$\varphi\ P_{n,\ max} = 0.80\ \varphi\ [0.85\ f'_c\ (A_g - A_{st}) + (f_y\ A_{st})]$ (Equation 10-2)

ACI 9.3.2 Strength reduction factor, φ (page 122)

9.3.2.2. – Compression-controlled sections, as defined in 10.3.3:

(a) Members with spiral reinforcement conforming to 10.9.3 ……….. 0.75

(b) Other reinforced members ……………………….………………….. 0.65

10.10. – Slenderness effects in compression members

10.10.1. – Slenderness effects shall be permitted to be neglected in the following cases:

(a) for compression members not braced against sideway when

$k\, l_u / r \leq 22$

(b) for compression members braced against side-sway when

$k\, l_u / r \leq 34$

k = effective length factor

l_u = unsupported length, in

r = radius of gyration, 0.3 x b (ACI 318-11; 10.10.1.2)

b = column width, in

<u>Design</u>

<u>Assumptions:</u>

f'_m = 1,550 psi; masonry compressive strength, psi

f'_c = 4,000 psi; concrete compressive strength, psi

f_y = 60,000 psi

φ = 0.65 (ACI 318-11; 9.3.2)

12 "x 16" x 9'-2" concrete masonry columns with a 3-1/4" thick concrete cap, cores filled with concrete, and one #5 rebar or one #4 rebar per core. For design the concrete cap is assumed to be an extension of the concrete masonry block and concrete cores. No allowance is considered for the higher compressive strength of the concrete cap over the concrete masonry block.

Vertical reinforcement: 2 - #5 rebar, d_5 = 5/8", $A_s = 0.307\ in^2$ or

2 - #4 rebar, d_5 = 1/2", $A_s = 0.196\ in^2$

<u>Determine design axial load, P_u</u>

$P_u = P_a$ x design load factor (L_D or L_L)

P_a = pig load + slat load + lintel load + equipment load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Equipment load = 8.5 psf

Live load factor, L_L = 1.6

Dead load factor, L_D = 1.2

P_u = [(70.0 psf x 10 ft x 12 ft) x 1.6] + [(38.84 psf x 10 ft x 12 ft) x 1.2] + [(88.54 plf x 12 ft) x 1.2] + [8.5 psf x 10' x 12' x 1.2]

P_u = 13,440 lb + 5,593 lb + 1,275 lb + 1,224 lb = 21,532 lb

<u>Determine gross area of concrete masonry block, A_{gm}</u>

Actual dimensions of block: 11-5/8" x 15-5/8" with two cores 9-5/8" x 6-5/16"

A_{gm} = 11.625" x 15.625" – 2 x 9.625" x 6.3125"

A_{gm} = 60.125 in^2

Determine gross area of concrete core, A_{gc}

Actual dimensions of block: 11-5/8" x 15-5/8" with two cores 9-5/8" x 6-5/16"

A_{gc} = 2 x 9.625" x 6.3125"

A_{gc} = 121.5 in^2

Determine area of reinforcement steel -- #4 & #5 rebar

Area (#5 rebar) = $(5/8" \div 2)^2 \times \pi$ = 0.307 in^2

2 - #5 rebar = 2 x 0.307 in^2 = 0.614 in^2

Area (#4 rebar) = $(1/2" \div 2)^2 \times \pi$ = 0.196 in^2

2 - #4 rebar = 2 x 0.196 in^2 = 0.392 in^2

Determine maximum allowable unsupported length, L_{colm}

Use the slenderness criteria for concrete columns to determine the maximum unsupported length.
Critical width = 11-5/8"

L_{colm} = (34)(0.3)b[1 ft/12 in] (Equation C-4)

b = 11-5/8"

L_{colm} = 34 x 0.3 x 11-5/8" x 1 ft/12 in

L_{colm} = 9.88 feet (slenderness effects neglected)

9.167' < 9.88' **OKAY**

Determine maximum allowable axial load, $P_{n,\,max}$; (masonry and concrete core)
(Masonry & Concrete -- Equation C-5 & ACI 318-11, 10-2)

$P_{n,\,max} = P_{nm} + P_{nc}$

$P_{nm} = 0.80\ \varphi\ [0.85\ f'_m\ (A_{gm})]$

$P_{nc} = 0.80\ \varphi\ [0.85\ f'_c\ (A_g - A_{st}) + (f_y\ A_{st})]$

φ = 0.65; strength reduction factor (ACI 318-11; 9.3.2.2)

f'_m = 1,550 psi; masonry compressive strength, psi

f'_c = 4,000 psi; concrete compressive strength, psi

A_{gm} = 60.125 in^2; masonry gross area, in^2

A_{gc} = 121.5 in^2; concrete gross area, in^2

A_{st} = 0.614 in^2 (#5); steel area, in^2

A_{st} = 0.392 in^2 (#4); steel area, in^2

f_y = 60,000 psi; yield strength, psi

P_{nm} = 0.80 x 0.65 x [0.85 x 1,550 x 60.125]

P_{nm} = 41,191.6 lb (12"x16" hollow core masonry block)

Rebar – 2-#5, Grade 60

P_{nc} = 0.80 x 0.65 x [0.85 x 4,000 x (121.5 – 0.614) + (60,000 x 0.614)] (2-#5 rebar)

P_{nc} = 232,883 lb (concrete cores)

$P_{n,\ max}$ = 41,191.6 lb + 232,883 lb

$P_{n,\ max}$ = 274,074.6 lb (concrete masonry column with cores filled and 2-#5 rebar)

Rebar – 2-#4, Grade 60

P_{nc} = 0.80 x 0.65 x [0.85 x 4,000 x (121.5 – 0.392) + (60,000 x 0.392)] (2-#4 rebar)

P_{nc} = 226,349 lb (concrete cores)

$P_{n,\ max}$ = 41,191.6 lb + 226,349 lb

$P_{n,\ max}$ = 267,640.6 lb (concrete masonry column with cores filled and 2-#4 rebar)

Design Confirmation:

Design load

P_u (design axial load) = **21,532 lb**

P_{nm} (hollow core masonry block) = **41,191.6 lb**

P_{nc} (concrete cores with 2-#5 rebar) = **232,883 lb**

P_{nc} (concrete cores with 2-#4 rebar) = **226,349 lb**

$P_{n,\ max}$ (#5 rebar) = **274,074.6 lb (2-#5 rebar)**

$P_{n,\ max}$ (#4 rebar) = **267,640.6 lb (2-#4 rebar)**

21.532 lb < 41,191.6 lb (concrete masonry block only) **OKAY**

21.532 lb < 232,883 lb (concrete core only with #5 rebar) **OKAY**

21.532 lb < 226,349 lb (concrete core only #4 rebar) **OKAY**

21.532 lb < 274,074 lb (complete concrete column, #5 rebar) **OKAY**

21.532 lb < 267,640.6 lb (complete concrete column, #4 rebar) **OKAY**

Based on this analysis, a 12" x 16" x 9'-2" concrete masonry column with a 3-1/4" thick concrete cap, cores filled with concrete, and one #5 rebar per core or one #4 rebar per core meets the design load and design criteria presented in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11).

2024 Confined Feeding Operation Approval Application

Alternate Design or Compliance Approach (327 IAC 19-5)

66" Diameter Round x 10" Thick Concrete Column Footer Design
12" x 12" Square Concrete Column
14" Diameter Round Concrete Column
(1,500 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

66" diameter x 10" thick Round Concrete Column Footer Design:
A concrete footer option is shown on the construction plans depicting a 66" diameter x 10" thick plain round concrete column footing. The construction plans include a 12" x 12" x 9'-2" reinforced concrete column and a 14" diameter round x 9'-2" reinforced concrete column. The column load (P_u, factored load) for the 12" x 12" x 9'-2" column is 23,183 lb. The column load (P_u, factored load) for the 14" diameter round x 9'-2" column is 23,297 lb. The maximum column load (P_u = 23,297 lb) is used in the design of the round concrete column footer.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for clay, sandy clay, silty clay, clayey silt, silt, and sandy silt soil types (CL, ML, MH, and CH) is 1,500 psf. A design table for round concrete column footings was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations and standards presented in ACI 318-11 "Building Code Requirements for Structural Concrete" is conducted.

In accordance with these design equations and the design methods presented in ACI 318-11 "Building Code Requirements for Structural Concrete" the proposed footer design (66" diameter round x 10" thick) meets or exceeds the requirements when the soil bearing capacity is at least 1,500 psf and is in compliance with 327 IAC 19-12-4(e). The following site specific design is presented to confirm this conclusion.

Equation C-28. Plain column footing width (adapted)

ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" An unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. Since the dimensions of the footer are undetermined, the forces due to manure and concrete are represented as a pressure, lbs/in^2, and are subtracted from the allowable soil pressure. In accordance with ACI 318-11; 22.7.2 the based area of the footer is determined using the following equations and relationships.

Incorporating the requirements of ACI 318-11; Section 22.7.2, Equation C-28 is adapted to determine the required base area of footing.

$W_f = \{P_u \div [1.6 \text{ x } (q_a - (65.0 \text{ lb/cu ft x } D_{manure}) - Wt_{footing})]\}^{0.5} \text{ x } 12 \text{ in/ft}$ Equation C-28

$A_f = P \div [q_a - (\delta_{manure} \text{ x } D_{manure}) - Wt_{footing}]$ Adapted Equation C-28

P = pig load + slat load + lintel load + column load + equipment load

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36. Table 3-10)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Column load (12" x 12" square reinforced concrete) =
1 ft x 1ft x 9.167 ft x 150 pcf = 1,375 lb (9'-2" column)

Column load (14" diameter round reinforced concrete) =
3.142 x (7" ÷ 12"/ft)^2 x 9.167 ft x 150 pcf = 1,470 lb (9'-2" column)

Use column load (reinforced concrete) = 1,470 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, psf

δ_{manure} = density of manure (65.0 lb/ft^3)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

Plain Concrete Footer Base Area, $A_{f(}$ (ACI 318-11; 22.7.2)

Determine footer base area and footer diameter, A_f & D_f

Reinforced concrete column – 12" x 12" square

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,375 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,375 lb + 1,020 = 16,519 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,375 lb + 1,020 lb) = 23,183 lb

Reinforced concrete column – 14" diameter

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,470 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,470 lb + 1,020 = 16,609 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,470 lb + 1,020 lb) = 23,297 lb

Use P_u = 23,297 lb

q_s = 1,500 psf

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing}$ = 10 in ÷ 12 in/ft x 150 pcf = 125 psf (assume footing 10" thick)

A_f= 16,609 lb ÷ (1,500 psf – (65.0 lb/cu ft x 10.0 ft) – 125 psf)

A_f= 16,609 lb ÷ 725 psf

A_f= 22.9 ft^2 (3,298 in^2)

Determine the diameter of a round footer:

Area = π x ¼ x D_f^2

D_f = (22.9 ft^2 x 4 ÷ π)$^{0.5}$ = 5.40 ft (64.8 in diameter)

Required: A 66" diameter round footer

Use: A 66" diameter round footer

For plain (unreinforced) concrete footers, flexure strength usually controls footer thickness. In accordance with ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11.

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

Determine plain rectangular footing thickness

Flexure strength - maximum factored moment at face of column

Assume square footer 66" x 66"; maximum moment arm; most conservative)

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f)$

P_u = 23,297 lb

$A_f = \pi \times (66")^2 \div 4 = 3{,}422 \text{ in}^2$

$q_s = 23{,}297 \text{ lb} \div 3{,}422 \text{ in}^2$

q_s = 6.81 psi (981 psf)

Determine moment at face of column, M_u

$M_u = q_s \times W_f \times (L_f - L_c)/2 \times (L_f - L_c)/4$

W_f = 66" (assume width of footer equal diameter of footer; maximum moment arm)

L_f = 66" (assume length of footer equal diameter of footer; maximum moment arm)

L_c = 12" (12" x 12" square column)

L_c = 14" (14" diameter round column)

Moment (12" x 12" square reinforced concrete column)
M_u = 6.81 psi x 66" x [(66"-12") ÷ 2] x [(66"-12") ÷ 4] = 163,829 in-lb (13,653 ft-lb)

Moment (14" diameter round reinforced concrete column)
M_u = 6.81 psi x 66" x [(66"-14") ÷ 2] x [(66"-14") ÷ 4] = 151,918 in-lb (12,660 ft-lb)

Use M_u = 163,829 in-lb

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to factored moment (M_u)

$\varphi M_n \geq M_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

f'_c = 4,000 psi

$b = W_f$ = 66"

$d = h$ = effective depth (h_f - 2)

$M_n = (5 \text{ x } 1 \text{ x } \sqrt{4{,}000} \text{ x } 66\text{"} \text{ x } h^2) \div 6$

$M_u = 163{,}829$ in-lb

Set $M_n = M_u$

Rearrange to find h^2

$h^2 = (163{,}829 \text{ in-lb x } 6) \div (5 \text{ x } 1 \text{ x } \sqrt{4{,}000} \text{ psi x } 66\text{"})$

$h^2 = (982{,}974) \div (20{,}871)$

$h = \sqrt{47.1} = 6.9$

$h_f = h + 2 = 6.9 + 2 = 8.9\text{"}$

Use a 10" thick footer

Beam action shear – critical section located at h from face of column

Use an effective thickness, h = 8" (10" – 2")

$b_w = W_f = 66\text{"}$

$c = W_c = 12\text{"}$ (12" x 12" square column)

$c = W_c = 14\text{"}$ (14" diameter round column)

$L_f = 66\text{"}$

Critical section location (h from face of column):

Critical section (12" x 12" square reinforced concrete column)
(12" ÷ 2) + 8" = 14" from center of column; 19 from edge of footer [(66" ÷ 2) – 14"]

Critical section (14" diameter round reinforced concrete column)
(14" ÷ 2) + 8" = 15" from center of column; 18" from edge of footer [(66" ÷ 2) – 15"]

Critical section location occurs within the footer. Use h = 8"

Calculate shear (V_u) at critical section

$V_u = q_s$ x tributary area

$q_s = 6.81$ psi

tributary area = $W_f \text{ x } [(L_f/2) - (W_c/2) - h]$

Shear (12" x 12" square reinforced concrete column) =
V_u = 6.81 psi x 66" x [66"/2 – 12"/2 – 8"] = 6.81 psi x 66" x 19" = 8,540 lb

Shear (14" diameter round reinforced concrete column) =
V_u = 6.81 psi x 66" x [66"/2 – 14"/2 – 8"] = 6.81 psi x 66" x 18" = 8,091 lb

Use V_u = 8,540 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \text{ x } \lambda \text{ x } \sqrt{f'_c} \text{ x } b_w \text{ x } h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \text{ x } (4/3) \text{ x } 1 \text{ x } \sqrt{4{,}000} \text{ x } 66\text{"} \text{ x } 8\text{"} = 26{,}715$ lb

26,715 lb > 8,540 lb > 8,091 lb **OKAY**

Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column

Use an effective thickness, h = 8” (10” -2”)

Check punching shear. The critical section is a perimeter (b_o) related to the column length and width and effective depth, h.

W_f = 66”

L_f = 66”

$W_c = L_c$ = 12” (12” x 12” square column)

$W_c = L_c$ = 14” (14” diameter round column)

Critical section location:

Critical section (12” x 12” square reinforced concrete column)
(12” ÷ 2) + (8” ÷ 2) = 10” from center of column; 23” from the edge of the footer [(66” ÷ 2) – 10”]

Critical section (14” diameter round reinforced concrete column)
(14” ÷ 2) + (8” ÷ 2) = 11” from center of column; 22” from the edge of the footer [(66” ÷ 2) – 11”]

Calculate punching shear (V_u) at critical section

$V_u = q_s$ x tributary area

q_s = 6.81 psi

tributary area = $W_f \times L_f - [(h/2 + W_c + h/2) \times (h/2 + L_c + h/2)] = \{(W_f \times L_f) - [(W_c + h) \times (L_c + h)]\}$

Punching shear (12” x 12” square reinforced concrete column)
V_u = 6.81 psi x {(66” x 66”) - [(12” + 8”) x (12” + 8”)]}

V_u = 6.81 psi x {4,356 in^2 – 400 in^2} = 26,941 lb

Punching shear (14” diameter round reinforced concrete column)
V_u = 6.81 psi x {(66” x 66”) - [(14” + 8”) x (14” + 8”)]}

V_u = 6.81 psi x {4,356 in^2 – 484 in^2} = 26,369 lb

Use V_u = 26,941 in-lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$ and $V_n \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section

$b_o = 2 \times (W_c + L_c) + (4 \times h)$ = 2 x (12” + 12”) + 4 x 8” = 80”

β = ratio of long-to-short side = 66” ÷ 66” = 1.0

(4/3) + 8/(3 x 1.0) = 4.0; 4.0 > 2.66 Therefore,

$V_n = 2.66 \times \lambda \times \sqrt{f'_c} \times b_o \times h$

$\varphi V_n = 0.6 \times 2.66 \times 1 \times \sqrt{4{,}000} \times 80” \times 8”$ = 64,602 lb

64,602 lb > 26,941 lb > 26,369 lb **OKAY**

Design Check

Required footer base area: $A_f = 22.9\ ft^2$ ($3,298\ in^2$)

Footer diameter (minimum): $D_f = (22.9\ ft^2 \times 4 \div \pi)^{0.5} = 5.40$ ft (64.8 in diameter)

Use 66" diameter round footer

Proposed footer: $3,421\ in^2 > 3,298\ in^2$ **OKAY**

ACI 318-11

Flexure analysis (based on maximum moment arm):

Footer thickness: $h_f = h + 2 = 6.9 + 2 = 8.9$ **Use 10" thick footer**

Beam action shear (based on maximum moment arm):

Footer thickness: h_f = 10"; 26,715 lb > 8,540 lb > 8,091 lb **Use 10" thick footer**

Punching shear (two-way shear action):

Footer thickness: h_f =10"; 64,602 lb > 26,941 lb > 26,369 lb **Use 10" thick footer**

USE: 66" diameter x 10" thick round footer

Based on this analysis, a 66" diameter x 10" thick round footer meets or exceeds the design criteria presented in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and ACI 318-11 Building Code Requirements for Structural Concrete. A 10" thick footer is selected for this design based on the analysis to meet or exceed the expected design and service load conditions. Based on this analysis, the proposed footer design (66" diameter x 10" thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Alternate Design or Compliance Approach (327 IAC 19-5)

50" Diameter Round x 10" Thick Concrete Column Footer Design
12" x 12" Square Concrete Column
14" Diameter Round Concrete Column
(2,000 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

50" diameter x 10" thick Round Concrete Column Footer Design:
A concrete footer option is shown on the construction plans depicting a 50" diameter x 10" thick plain round concrete column footing. The construction plans include a 12" x 12" x 9'-2" reinforced concrete column and a 14" diameter round x 9'-2" reinforced concrete column. The column load (P_u, factored load) for the 12" x 12" x 9'-2" column is 23,183 lb. The column load (P_u, factored load) for the 14" diameter round x 9'-2" column is 23,297 lb. The maximum column load (P_u = 23,297 lb) is used in the design of the round concrete column footer.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for sand, silty sand, clayey sand, silty gravel, clayey gravel soil types (SW, SP, SM, SC, GM, and GC) is 2,000 psf. A design table for round concrete column footings was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations and standards presented in ACI 318-11 "Building Code Requirements for Structural Concrete" is conducted.

In accordance with these design equations and the design methods presented in ACI 318-11 "Building Code Requirements for Structural Concrete" the proposed footer design (50" diameter round x 10" thick) meets or exceeds the requirements when the soil bearing capacity is at least 2,000 psf and is in compliance with 327 IAC 19-12-4(e). The following site specific design is presented to confirm this conclusion.

Equation C-28. Plain column footing width (adapted)

ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" An unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. Since the dimensions of the footer are undetermined, the forces due to manure and concrete are represented as a pressure, lbs/in^2, and are subtracted from the allowable soil pressure. In accordance with ACI 318-11; 22.7.2 the based area of the footer is determined using the following equations and relationships.

Incorporating the requirements of ACI 318-11; Section 22.7.2, the following equation is adapted to determine the required base area of footing.

$W_f = \{P_u \div [1.6 \text{ x } (q_a - (65.0 \text{ lb/cu ft x } D_{manure}) - Wt_{footing})]\}^{0.5} \text{ x } 12 \text{ in/ft}$ Equation C-28

$A_f = P \div [q_a - (\delta_{manure} \text{ x } D_{manure}) - Wt_{footing}]$ Adapted Equation C-28

P = pig load + slat load + lintel load + column load + equipment load

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

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March 11, 2024
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Office of Land Quality

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36. Table 3-10)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Column load (12" x 12" square reinforced concrete) =
1 ft x 1ft x 9.167 ft x 150 pcf = 1,375 lb (9'-2" column)

Column load (14" diameter round reinforced concrete) =
3.142 x (7" ÷ 12"/ft)^2 x 9.167 ft x 150 pcf = 1,470 lb (9'-2" column)

Use column load (reinforced concrete) = 1,470 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, psf

δ_{manure} = density of manure (65.0 lb/ft^3)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

Plain Concrete Footer Base Area, $A_{f(}$ (ACI 318-11; 22.7.2)

<u>Determine footer base area and footer diameter, A_f & D_f</u>

<u>Reinforced concrete column – 12" x 12" square</u>

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,375 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,375 lb + 1,020 = 16,519 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,375 lb + 1,020 lb) = 23,183 lb

<u>Reinforced concrete column – 14" diameter</u>

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,470 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,470 lb + 1,020 = 16,609 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,470 lb + 1,020 lb) = 23,297 lb

Use P_u = 23,297 lb

q_s = 2,000 psf

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing}$ = 10 in ÷ 12 in/ft x 150 pcf = 125 psf (assume footing 10" thick)

A_f= 16,6094 lb ÷ (2,000 psf – (65.0 lb/cu ft x 10.0 ft) – 125 psf)

A_f= 16,609 lb ÷ 1,225 psf

A_f= 13.56 ft^2 (1,953 in^2)

Determine the diameter of a round footer:

Area = π x ¼ x D_f^2

D_f = (13.56 ft^2 x 4 ÷ π)$^{0.5}$ = 4.16 ft (49.92 in diameter)

Required: A 50” diameter round footer

Use: A 50” diameter round footer

For plain (unreinforced) concrete footers, flexure strength usually controls footer thickness. In accordance with ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11.

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

Determine plain rectangular footing thickness

Flexure strength - maximum factored moment at face of column

Assume square footer 50” x 50”; maximum moment arm; most conservative

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f)$

P_u = 23,297 lb

$A_f = \pi$ x (50”)^2 ÷ 4 = 1,964 in^2

q_s = 23,297 lb ÷ 1,964 in^2

q_s = 11.86 psi (1,708 psf)

Determine moment at face of column, M_u

$M_u = q_s$ x W_f x $(L_f - L_c)/2$ x $(L_f - L_c)/4$

W_f = 50” (assume width of footer equal diameter of footer; maximum moment arm)

L_f = 50” (assume length of footer equal diameter of footer; maximum moment arm)

L_c = 12” (12” x 12” square column)

L_c = 14” (14” diameter round column)

Moment (12” x 12” square reinforced concrete column)
M_u = 11.86 psi x 50” x [(50”-12”) ÷ 2] x [(50”-12”) ÷ 4] = 107,036.5 in-lb (8,920 ft-lb)

Moment (14” diameter round reinforced concrete column)
M_u = 11.86 psi x 50” x [(50”-14”) ÷ 2] x [(50”-14”) ÷ 4] = 96,066 in-lb (8,006 ft-lb)

Use M_u = 107,036.5 in-lb

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to factored moment (M_u)

$\varphi M_n \geq M_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

f'_c = 4,000 psi

$b = W_f$ = 50”

$d = h$ = effective depth (h_f - 2)

$M_n = (5 \times 1 \times \sqrt{4{,}000} \times 50" \times h^2) \div 6$

$M_u = 107{,}036.5$ in-lb

Set $M_n = M_u$

Rearrange to find h^2

$h^2 = (107{,}036.5 \text{ in-lb} \times 6) \div (5 \times 1 \times \sqrt{4{,}000} \text{ psi} \times 50")$

$h^2 = (642{,}219) \div (15{,}811.4)$

$h = \sqrt{40.62} = 6.4$

$h_f = h + 2 = 6.4 + 2 = 8.4"$

Use a 10" thick footer

<u>Beam action shear – critical section located at h from face of column</u>

Use an effective thickness, h = 8" (10" – 2")

$b_w = W_f = 50"$

$c = W_c = 12"$ (12" x 12" square column)

$c = W_c = 14"$ (14" diameter round column)

$L_f = 50"$

Critical section location (h from face of column):

Critical section (12" x 12" square reinforced concrete column)
(12" ÷ 2) + 8" = 14" from center of column; 11" from edge of footer [(50" ÷ 2) – 14"]

Critical section (14" diameter round reinforced concrete column)
(14" ÷ 2) + 8" = 15" from center of column; 10" from edge of footer [(50" ÷ 2) – 15"]

Critical section location occurs within the footer. Use h = 8"

Calculate shear (V_u) at critical section

$V_u = q_s$ x tributary area

$q_s = 11.86$ psi

tributary area $= W_f \times [(L_f/2) - (W_c/2) - h]$

Shear (12" x 12" square reinforced concrete column) =
$V_u = 11.86 \text{ psi} \times 50" \times [50"/2 - 12"/2 - 8"] = 11.86 \text{ psi} \times 50" \times 11" = 6{,}523$ lb

Shear (14" diameter round reinforced concrete column) =
$V_u = 11.86 \text{ psi} \times 50" \times [50"/2 - 14"/2 - 8"] = 11.86 \text{ psi} \times 50" \times 10" = 5{,}930$ lb

Use $V_u = 6{,}523$ lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \times (4/3) \times 1 \times \sqrt{4{,}000} \times 50" \times 8" = 20{,}238$ lb

20,238 lb > 6,523 lb > 5,930 lb **OKAY**

Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column

Use an effective thickness, h = 8" (10" -2")

Check punching shear. The critical section is a perimeter (b_o) related to the column length and width and effective depth, h.

W_f = 50"

L_f = 50"

$W_c = L_c$ = 12" (12" x 12" square column)

$W_c = L_c$ = 14" (14" diameter round column)

Critical section location:

Critical section (12" x 12" square reinforced concrete column)
(12" ÷ 2) + (8" ÷ 2) = 10" from center of column; 15" from the edge of the footer [(50" ÷ 2) – 10"]

Critical section (14" diameter round reinforced concrete column)
(14" ÷ 2) + (8" ÷ 2) = 11" from center of column; 14" from the edge of the footer [(50" ÷ 2) – 11"]

Calculate punching shear (V_u) at critical section

$V_u = q_s$ x tributary area

q_s = 11.86 psi

tributary area = W_f x L_f – [(h/2 + W_c + h/2) x (h/2 + L_c + h/2)] = {(W_f x L_f) – [(W_c + h) x (L_c + h)]}

Punching shear (12" x 12" square reinforced concrete column)
V_u = 11.86 psi x {(50" x 50") - [(12" + 8") x (12" + 8")]}

V_u = 11.86 psi x {2,500 in^2 – 400 in^2} = 24,906 lb

Punching shear (14" diameter round reinforced concrete column)
V_u = 11.86 psi x {(50" x 50") - [(14" + 8") x (14" + 8")]}

V_u = 11.86 psi x {2,500 in^2 – 484 in^2} = 23,910 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$ and $V_n \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section

b_o = 2 x (W_c + L_c) + (4 x h) = 2 x (12" + 12") + 4 x 8" = 80"

β = ratio of long-to-short side = 50" ÷ 50" = 1.0

(4/3) + 8/(3 x 1.0) = 4.0; 4.0 > 2.66 Therefore,

$V_n = 2.66 \times \lambda \times \sqrt{f'_c} \times b_o \times h$

φV_n = 0.6 x 2.66 x 1 x $\sqrt{4{,}000}$ x 80" x 8" = 64,602 lb

64,602 lb > 24,906 lb > 23,910 lb **OKAY**

Design Check

Required footer base area: $A_f = 13.29\ ft^2$ ($1{,}914\ in^2$)

Footer diameter (minimum): $D_f = (13.29\ ft^2 \times 4 \div \pi)^{0.5} = 4.12$ ft (49.4 in diameter)

Use 50" diameter round footer

Proposed footer: $1{,}963\ in^2 > 1{,}914\ in^2$ **OKAY**

ACI 318-11

Flexure analysis (based on maximum moment arm):

Footer thickness: $h_f = h + 2 = 6.4 + 2 = 8.4$ **Use 10" thick footer**

Beam action shear (based on maximum moment arm):

Footer thickness: h_f = 10"; 20,238 lb > 6,523 lb > 5,930 lb **Use 10" thick footer**

Punching shear (two-way shear action):

Footer thickness: h_f =10"; 64,602 lb > 24,906 lb > 23,910 lb **Use 10" thick footer**

USE: 50" diameter x 10" thick round footer

Based on this analysis, a 50" diameter x 10" thick round footer meets or exceeds the design criteria presented in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and ACI 318-11 Building Code Requirements for Structural Concrete. Based on the ACI 318-11 design standards an 8" thick footer is required and is sufficient to support the factored design load transferred from the column to the footer.

A 10" thick footer is selected for this design based on the analysis to meet or exceed the expected design and service load conditions. Based on this analysis, the proposed footer design (50" diameter x 10" thick) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Alternate Design or Compliance Approach (327 IAC 19-5)

42" Wide x 11" Thick Continuous Concrete Column Footer Design
12" x 12" Square Concrete Column
14" Diameter Round Concrete Column
(1,500 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

42" wide x 11" Continuous Concrete Column Footer Design:
A concrete footer option is shown on the construction plans depicting a 42" wide x 11" thick plain concrete continuous column footing. The construction plans include a 12" x 12" x 9'-2" reinforced concrete column and a 14" diameter round x 9'-2" reinforced concrete column. The column load (P_u, factored load) for the 12" x 12" x 9'-2" column is 23,183 lb. The column load (P_u, factored load) for the 14" diameter round x 9'-2" column is 23,297 lb. The maximum column load (P_u = 23,297 lb) is used in the design of the continuous concrete column footer.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for clay, sandy clay, silty clay, clayey silt, silt, and sandy silt soil types (CL, ML, MH, and CH) is 1,500 psf. A design table for plain (unreinforced) continuous concrete column footers was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations and standards presented in ACI 318-11 "Building Code Requirements for Structural Concrete" was conducted.

Based on this analysis and design a 42" wide x 11" thick continuous concrete footer is included in the proposed design drawings. In accordance with these design equations the proposed footer design (42" wide x 11" thick continuous) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following design is presented to confirm this conclusion.

Equation C-28. Plain column footing width

The description of the design equations for footings in MWPS-36, page 68 states that the equations are based on ACI 318 Chapter 22 and Section 9.3.5 and a modified design approach shown in the 1993 edition of PCA's Simplified Design. Equation C-28 has been developed specifically for square plain concrete footers and is not directly applicable to a continuous plain concrete footer.

ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" An unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. Since the dimensions of the footer are undetermined, the forces due to manure and concrete are represented as a pressure, lbs/in^2, and are subtracted from the allowable soil pressure. In accordance with ACI 318-11; 22.7.2 the based area of the footer is determined using the following equations and relationships.

$A_f = P \div [q_a - (\delta_{manure} \times D_{manure}) - Wt_{footing}]$ ACI 318-11; 22.7.2

P = pig load + slat load + lintel load + column load + equipment load

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Column load (12" x 12" square reinforced concrete) =
1 ft x 1ft x 9.167 ft x 150 pcf = 1,375 lb (9'-2" column)

Column load (14" diameter round reinforced concrete) =
3.142 x (7" ÷ 12"/ft)^2 x 9.167 ft x 150 pcf = 1,470 lb (9'-2" column)

Use column load (reinforced concrete) = 1,470 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, psf

δ_{manure} = density of manure (65.0 lb/ft^3)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

Plain Concrete Footer Base Area, A_f (ACI 318-11; 22.7.2)

<u>Determine footer base area, A_f</u>

<u>Reinforced concrete column – 12" x 12" square</u>

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,375 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,375 lb + 1,020 = 16,519 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,375 lb + 1,020 lb) = 23,183 lb

<u>Reinforced concrete column – 14" diameter</u>

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,470 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,470 lb + 1,020 = 16,609 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,470 lb + 1,020 lb) = 23,297 lb

Use P_u = 23,297 lb

q_s = 1,500 psf

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing}$ = 11 in ÷ 12 in/ft x 150 pcf = 137.5 psf (assume footing 11" thick)

A_f= 16,609 lb ÷ (1,500 psf – (65.0 lb/cu ft x 10.0 ft) – 137.5 psf)

A_f= 16,609 lb ÷ 712.5 psf

A_f= 23.31 ft^2 (3,357 in^2)

Determine length and width of footer:

W_{fW} = 42" (selected width)

W_{fL} = 3,357 in^2 ÷ 42" = 79.92" (use 80")

Effective Footer Dimensions:

Use: A 42" x 80" rectangular footer

Equation C-29. Plain square footing thickness for square columns using 3,000 to 4,000 psi concrete

Equation C-29, MWPS-36 is a derived equation to determine footing thickness for a square footer based on the principles of concrete design. Equation C-29 has been developed specifically for square plain concrete footers and is not directly applicable to a continuous plain concrete footer. For plain (unreinforced) concrete, flexure strength usually controls footer thickness. In accordance with ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11.

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

Determine plain rectangular footing thickness

Flexure strength - maximum factored moment at face of column

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f)$

$P_u = 23{,}297$ lb

$A_f = 42" \times 80" = 3{,}360\ in^2$

$q_s = 23{,}297\ lb \div 3{,}360\ in^2$

$q_s = 7.0$ psi (1,008 psf)

Determine moment at face of column, M_u

$M_u = q_s \times W_f \times (L_f - L_c)/2 \times (L_f - L_c)/4$

Check moment at face for $W_f = 42"$

$L_f = 80"$

$L_c = 12"$ (12" x 12" square column)

$L_c = 14"$ (14" diameter round column)

Moment (12" x 12" square reinforced concrete column)
$M_u = 7.0\ psi \times 42" \times [(80"-12") \div 2] \times [(80"-12") \div 4]$

$M_u = 169{,}932$ in-lb (14,161 ft-lb) – Moment creates tension in the footer

Moment (14" diameter round reinforced concrete column)
$M_u = 7.0\ psi \times 42" \times [(80"-14") \div 2] \times [(80"-14") \div 4]$

$M_u = 160{,}083$ in-lb (13,340 ft-lb) – Moment creates tension in the footer

Check moment at face for $W_f = 80"$

$L_f = 42"$

$L_c = 12"$ (12" x 12" square column)

$L_c = 14"$ (14" diameter round column)

Moment (12" x 12" square reinforced concrete column)
$M_u = 7.0\ psi \times 80" \times [(42"-12") \div 2] \times [(42"-12") \div 4]$

M_u = 63,000 in-lb (5,250 ft-lb) – Moment creates tension in the footer

Moment (14" diameter round reinforced concrete column)
M_u = 7.0 psi x 80" x [(42"-14") ÷ 2] x [(42"-14") ÷ 4]

M_u = 54,880 in-lb (4,574 ft-lb) – Moment creates tension in the footer

Use M_u = 169,932 in-lb

The moment when W_f = 42" & L_f = 80" controls

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to the factored Moment (M_u)

$\varphi M_n \geq M_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

f'_c = 4,000 psi

$b = W_f$ = 42"

$d = h$ = effective depth (h_f - 2)

$M_n = (5 \times 1 \times \sqrt{4{,}000} \times 42" \times h^2) \div 6$

M_u = 169,932 in-lb

Set $M_n = M_u$

Rearrange to find h^2

h^2 = (169,932 in-lb x 6) ÷ (5 x 1 x $\sqrt{4{,}000}$ psi x 42")

h^2 = (1,019,592) ÷ (13,282)

$h = \sqrt{76.8} = 8.8$

$h_f = h + 2 = 8.8 + 2 = 10.8"$ [ACI 318-11; 22-7-4 requires a minimum 8" thick footer]

Use a 11" thick footer

<u>Beam action shear – critical section located at h from face of column</u>

Use an effective thickness, h = 9"

Check beam action shear when W_f = 42"

$b_w = W_f$ = 42"

$c = W_c$ = 12" (12" x 12" square column)

$c = W_c$ = 14" (14" diameter round column)

L_f = 80"

Critical section location (h from face of column):

Critical section (12” x 12” square reinforced concrete column)
(12” ÷ 2) + 9” = 15” from center of column; 25” from edge of footer [(80” ÷ 2) – 15”]

Critical section (14” diameter round reinforced concrete column)
(14” ÷ 2) + 9” = 16” from center of column; 24” from edge of footer [(80” ÷ 2) – 16”]

Critical section location occurs within the footer. Use h = 9”

Calculate shear (V_u) at critical section

$V_u = q_s$ x tributary area

$q_s = 7.0$ psi

tributary area = W_f x $[(L_f/2) - (W_c/2) - h]$

Shear (12” x 12” square reinforced concrete column) =
V_u = 7.0 psi x 42” x [80”/2 – 12”/2 – 9”] = 7.0 psi x 42” x 25” = 7,350 lb

Shear (14” diameter round reinforced concrete column) =
V_u = 7.0 psi x 42” x [80”/2 – 14”/2 – 9”] = 7.0 psi x 42” x 24” = 7,056 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \times (4/3) \times 1 \times \sqrt{4{,}000} \times 42” \times 9” = 19{,}125$ lb

Check beam action shear when W_f = 80”

$b_w = W_f$ = 80”

$c = W_c$ = 12” (12” x 12” square column)

$c = W_c$ = 14” (14” diameter round column)

L_f = 42”

Critical section location (h from face of column):

Critical section (12” x 12” square reinforced concrete column)
(12” ÷ 2) + 9” = 15” from center of column; 6” from the edge of the footer [(42” ÷ 2) – 15”]

Critical section (14” dimeter round reinforced concrete column)
(14” ÷ 2) + 9” = 16” from center of column; 5” from the edge of the footer [(42” ÷ 2) – 16”]

Critical section location occurs within the footer. Use h = 9”

Calculate shear (V_u) at critical section

$V_u = q_s$ x tributary area

$q_s = 7.0$ psi

tributary area = W_f x $[(L_f/2) - (W_c/2) - h]$

Punching shear (12” x 12” square reinforced concrete column)
V_u = 7.0 psi x 80” x [42”/2 – 12”/2 – 9”] = 3,360 lb

Punching shear (14" diameter round reinforced concrete column)
V_u = 7.0 psi x 80" x [42"/2 – 14"/2 – 9"] = 2,800 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \times (4/3) \times 1 \times \sqrt{4{,}000} \times 80" \times 9" = 36{,}429$ lb

19,125 lb > 7,350 lb > 7,056 lb; (W_f = 42") **OKAY**

36,429 lb > 3,360 lb > 2,800 lb; (W_f = 80") **OKAY**

<u>Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column</u>

Use an effective thickness, h = 9"

Check punching shear. Punching shear is the same in both directions when W_f = 42" and W_f = 80" because the critical section is a perimeter (b_o) related to the column length and width and effective depth, h.

W_f = 42"

L_f = 80"

$W_c = L_c$ = 12" (12" x 12" square column)

$W_c = L_c$ = 14" (14" diameter round column)

Critical section location:

Critical section (12" x 12" square reinforced concrete column)
(12" ÷ 2) + (9" ÷ 2) = 10.5" from center of column;

When W_f = 42", critical section 29.5" from edge of footer [(80" ÷ 2) – 10.5"]

When W_f = 80", critical section 10.5" from edge of footer [(42" ÷ 2) – 10.5"]

Critical section (14" diameter round reinforced concrete column)
(14" ÷ 2) + (9" ÷ 2) = 11.5" from center of column;

When W_f = 42", critical section 28.5" from edge of footer [(80" ÷ 2) – 11.5"]

When W_f = 76", critical section 9.5" from edge of footer [(42" ÷ 2) – 11.5"]

Calculate punching shear (V_u) at critical section

$V_u = q_s$ x tributary area

q_s = 7.0 psi

tributary area = $W_f \times L_f - [(h/2 + W_c + h/2) \times (h/2 + L_c + h/2)] = \{(W_f \times L_f) - [(W_c + h) \times (L_c + h)]\}$

Punching shear (12" x 12" square reinforced concrete column)
V_u = 7.0 psi x {(80" x 42") - [(12" + 9") x (12" + 9")]}

V_u = 7.0 psi x {3,360 in^2 – 441 in^2} = 20,433 lb

Punching shear (14” diameter round reinforced concrete column)
$V_u = 7.0$ psi x {(80” x 42”) - [(14” + 9”) x (14” + 9”)]}

$V_u = 7.0$ psi x {3,360 in^2 – 529 in^2} = 19,817 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section

$b_o = 2 \times (W_c + L_c) + (4 \times h) = 2 \times (12" + 12") + 4 \times 9" = 84"$

β = ratio of long-to-short side = 80” ÷ 42” = 1.91

(4/3) + 8/(3 x 1.91) = 2.73; 2.73 > 2.66 Therefore,

$V_n = 2.66 \times \lambda \times \sqrt{f'_c} \times b_o \times h$

$\varphi V_n = 2.66 \times 0.6 \times 1 \times \sqrt{4{,}000} \times 84" \times 9" = 76{,}310$ lb

76,310 lb > 20,433 lb > 19,817 lb **OKAY**

<u>Design Check</u>

Required footer base area: A_f=23.31 ft^2 (3,357 in^2)

Footer width: W_f = 42”

Footer length: L_f = 79.92”; use 80”

Proposed footer: 3,360 in^2 > 3,357 in^2 **OKAY**

Flexure analysis:

Footer thickness: $h_f = h + 2 = 8.8 + 2 = 10.8$ **Use 11” thick footer**

Beam action shear:

Footer thickness: h_f = 11”; 19,125 lb > 7,350 lb > 7,056 lb; (W_f = 42”) **OKAY**

h_f = 11”; 36,429 lb > 3,360 lb > 2,800 lb; (W_f = 80”) **OKAY**

Use 11” thick footer

Punching shear (two-way shear action):

Footer thickness: h_f =11”; 76,310 lb > 20,433 lb > 19,817 lb **OKAY**

Use 11” thick footer

USE: 42” wide x 11” thick continuous footer

Based on this analysis, a 42” wide x 11” thick continuous footer meets or exceeds the design criteria presented in ACI 318-11 Building Code Requirements for Structural Concrete. Based on the ACI 318-11 design standards a 11.0” thick footer is calculated to support the factored design load transferred from the column to the footer. An 11” thick footer is selected for this design based on the analysis and requirements of ACI 318 to meet or exceed the expected design and service load conditions.

Based on this analysis, the proposed footer design (42” wide x 11” thick, continuous) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Alternate Design or Compliance Approach (327 IAC 19-5)

36" Wide x 10" Thick Continuous Concrete Column Footer Design
12" x 12" Square Concrete Column
14" Diameter Round Concrete Column
(2,000 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

36" wide x 10" Continuous Concrete Column Footer Design:
A concrete footer option is shown on the construction plans depicting a 36" wide x 10" thick plain concrete continuous column footing. The construction plans include a 12" x 12" x 9'-2" reinforced concrete column and a 14" diameter round x 9'-2" reinforced concrete column. The column load (P_u, factored load) for the 12" x 12" x 9'-2" column is 23,183 lb. The column load (P_u, factored load) for the 14" diameter round x 9'-2" column is 23,297 lb. The maximum column load ($P_u = 23{,}297$ lb) is used in the design of the continuous concrete column footer.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for sand, silty sand, clayey sand, silty gravel, clayey gravel soil types (SW, SP, SM, SC, GM, and GC) is 2,000 psf. A design table for round concrete column footings was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations and standards presented in ACI 318-11 "Building Code Requirements for Structural Concrete" is conducted.

Based on this analysis and design a 36" wide x 10" thick continuous concrete footer is included in the proposed design drawings. In accordance with these design equations the proposed footer design (36" wide x 10" thick continuous) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following design is presented to confirm this conclusion.

Equation C-28. Plain column footing width

The description of the design equations for footings in MWPS-36, page 68 states that the equations are based on ACI 318 Chapter 22 and Section 9.3.5 and a modified design approach shown in the 1993 edition of PCA's Simplified Design. Equation C-28 has been developed specifically for square plain concrete footers and is not directly applicable to a continuous plain concrete footer.

ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" An unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. Since the dimensions of the footer are undetermined, the forces due to manure and concrete are represented as a pressure, lbs/in^2, and are subtracted from the allowable soil pressure. In accordance with ACI 318-11; 22.7.2 the based area of the footer is determined using the following equations and relationships.

$A_f = P \div [q_a - (\delta_{manure} \times D_{manure}) - Wt_{footing}]$ ACI 318-11; 22.7.2

P = pig load + slat load + lintel load + column load + equipment load

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

Column load (12" x 12" square reinforced concrete) =
1 ft x 1ft x 9.167 ft x 150 pcf = 1,375 lb (9'-2" column)

Column load (14" diameter round reinforced concrete) =
3.142 x (7" ÷ 12"/ft)^2 x 9.167 ft x 150 pcf = 1,470 lb (9'-2" column)

Use column load (reinforced concrete) = 1,470 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, psf

δ_{manure} = density of manure (65.0 lb/ft^3)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

Plain Concrete Footer Base Area, A_f (ACI 318-11; 22.7.2)

<u>Determine footer base area, A_f</u>

<u>Reinforced concrete column – 12" x 12"</u>

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,375 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,375 lb + 1,020 = 16,519 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,375 lb + 1,020 lb) = 23,183 lb

<u>Reinforced concrete column – 14" diameter</u>

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,470 lb +
(8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,470 lb + 1,020 = 16,609 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,470 lb + 1,020 lb) = 23,297 lb

Use P_u = 23,297 lb

q_s = 2,000 psf (presumptive soil bearing)

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing}$ = 10 in ÷ 12 in/ft x 150 pcf = 125 psf (assume footing 10" thick)

A_f= 16,6094 lb ÷ (2,000 psf – (65.0 lb/cu ft x 10.0 ft) – 125 psf)

A_f= 16,609 lb ÷ 1,225 psf

A_f= 13.56 ft^2 (1,953 in^2)

Determine length and width of footer:

W_{fW} = 36" (selected width)

W_{fL} = 1,953 in^2 ÷ 36" = 54.25" (use 56")

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

Effective Footer Dimensions:

Use: A 36" x 56" rectangular footer

Equation C-29. Plain square footing thickness for square columns using 3,000 to 4,000 psi concrete

Equation C-29, MWPS-36 is a derived equation to determine footing thickness for a square footer based on the principles of concrete design. Equation C-29 has been developed specifically for square plain concrete footers and is not directly applicable to a continuous plain concrete footer. For plain (unreinforced) concrete, flexure strength usually controls footer thickness. In accordance with ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11.

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

Determine plain rectangular footing thickness

Flexure strength - maximum factored moment at face of column

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f)$

$P_u = 23{,}297$ lb

$A_f = 36" \times 56" = 2{,}016\ in^2$

$q_s = 23{,}297\ lb \div 2{,}016\ in^2$

$q_s = 11.56$ psi (1,665 psf)

Determine moment at face of column, M_u

$M_u = q_s \times W_f \times (L_f - L_c)/2 \times (L_f - L_c)/4$

Check moment at face for $W_f = 36"$

$L_f = 56"$

$L_c = 12"$ (12" x 12" square column)

$L_c = 14"$ (14" diameter round column)

Moment (12" x 12" square reinforced concrete column)
$M_u = 11.56\ psi \times 36" \times [(56"-12") \div 2] \times [(56"-12") \div 4]$

$M_u = 100{,}711$ in-lb (7,925 ft-lb) – Moment creates tension in the footer

Moment (14" diameter round reinforced concrete column)
$M_u = 11.56\ psi \times 36" \times [(56"-14") \div 2] \times [(56"-14") \div 4]$

$M_u = 91{,}764$ in-lb (7,647 ft-lb) – Moment creates tension in the footer

Check moment at face for $W_f = 56"$

$L_f = 36"$

$L_c = 12"$ (12" x 12" square column)

$L_c = 14"$ (14" diameter round column)

Moment (12" x 12" square reinforced concrete column)
$M_u = 11.56\ psi \times 56" \times [(36"-12") \div 2] \times [(36"-12") \div 4]$
$M_u = 46{,}610$ in-lb (3,885 ft-lb) – Moment creates tension in the footer

Moment (14” diameter round reinforced concrete column)
M_u = 11.56 psi x 56” x [(36”-14”) ÷ 2] x [(36”-14”) ÷ 4]
M_u = 39,166 in-lb (3,262 ft-lb) – Moment creates tension in the footer

Use M_u = 100,711 in-lb

The moment when W_f = 36” & L_f = 56” controls

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to the factored Moment (M_u)

$\varphi M_n \geq M_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

f'_c = 4,000 psi

b = W_f = 36”

d = h = effective depth (h_f - 2)

M_n = (5 x 1 x √4,000 x 36” x h^2) ÷ 6

M_u = 100,711 in-lb

Set $M_n = M_u$

Rearrange to find h^2

h^2 = (100,711 in-lb x 6) ÷ (5 x 1 x √4,000 psi x 36”)

h^2 = (604,266) ÷ (11,384)

h = √53.1 = 7.3

h_f = h +2 = 7.3 +2 = 9.3”

Use a 10” thick footer

Beam action shear – critical section located at h from face of column

Use an effective thickness, h = 8”

Check beam action shear when W_f = 36”

b_w =W_f = 36”

c = W_c = 12” (12” x 12” square column)

c = W_c = 14” (14” diameter round column)

L_f = 56”

Critical section location (h from face of column):

Critical section (12” x 12” square reinforced concrete column)
(12” ÷ 2) + 8” = 14” from center of column; 14” from edge of footer [(56” ÷ 2) – 14”]

Critical section (14” diameter round reinforced concrete column)
(14” ÷ 2) + 8” = 15” from center of column; 13” from edge of footer [(56” ÷ 2) – 15”]

Critical section location occurs within the footer. Use h = 8"

Calculate shear (V_u) at critical section

$V_u = q_s$ x tributary area

$q_s = 11.56$ psi

tributary area = W_f x $[(L_f/2) - (W_c/2) - h]$

Shear (12" x 12" square reinforced concrete column) =
V_u = 11.56 psi x 36" x [56"/2 – 12"/2 – 8"] = 5,827 lb

Shear (14" diameter round reinforced concrete column) =
V_u = 11.56 psi x 36" x [56"/2 – 14"/2 – 8"] = 5,410 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \times (4/3) \times 1 \times \sqrt{4{,}000} \times 36" \times 8" = 14{,}572$ lb

Check beam action shear when W_f = 56"

$b_w = W_f$ = 56"

$c = W_c$ = 12" (12" x 12" square column)

$c = W_c$ = 14" (14" diameter round column)

L_f = 36"

Critical section location (h from face of column):

Critical section (12" x 12" square reinforced concrete column)
(12" ÷ 2) + 8" = 14" from center of column; 4" from the edge of the footer [(36" ÷ 2) – 14"]

Critical section (14" dimeter round reinforced concrete column)
(14" ÷ 2) + 8" = 15" from center of column; 3" from the edge of the footer [(36" ÷ 2) – 15"]

Critical section location occurs within the footer. Use h = 8"

Calculate shear (V_u) at critical section

$V_u = q_s$ x tributary area

$q_s = 11.56$ psi

tributary area = W_f x $[(L_f/2) - (W_c/2) - h]$

Punching shear (12" x 12" square reinforced concrete column)
V_u = 11.56 psi x 56" x [36"/2 – 12"/2 – 8"] = 2,590 lb

Punching shear (14" diameter round reinforced concrete column)
V_u = 11.56 psi x 56" x [36"/2 – 14"/2 – 8"] = 1,942 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

$\varphi V_n = 0.6 \times (4/3) \times 1 \times \sqrt{4{,}000} \times 54" \times 8" = 21{,}858$ lb

14,572 lb > 5,827 lb > 5,410 lb (W_f = 36") **OKAY**

21,858 lb > 2,590 lb > 1,942 lb; (W_f = 56") **OKAY**

<u>Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column</u>

Use an effective thickness, h = 8"

Check punching shear. Punching shear is the same in both directions when W_f = 30" and W_f = 52" because the critical section is a perimeter (b_o) related to the column length and width and effective depth, h.

W_f = 36"

L_f = 56"

$W_c = L_c$ = 12" (12" x 12" square column)

$W_c = L_c$ = 14" (14" diameter round column)

Critical section location:

Critical section (12" x 12" square reinforced concrete column)
(12" ÷ 2) + (8" ÷ 2) = 10.0" from center of column;

When W_f = 36", critical section 18.0" from edge of footer [(56" ÷ 2) – 10.0"]

When W_f = 56", critical section 8.0" from edge of footer [(36" ÷ 2) – 10.0"]

Critical section (14" diameter round reinforced concrete column)
(14" ÷ 2) + (8" ÷ 2) = 11.0" from center of column;

When W_f = 30", critical section 17.0" from edge of footer [(56" ÷ 2) – 11.0"]
When W_f = 52", critical section 7.0" from edge of footer [(36" ÷ 2) – 11.0"]

Calculate punching shear (V_u) at critical section

$V_u = q_s$ x tributary area

q_s = 11.56 psi

tributary area = $W_f \times L_f - [(h/2 + W_c + h/2) \times (h/2 + L_c + h/2)] = \{(W_f \times L_f) - [(W_c + h) \times (L_c + h)]\}$

Punching shear (12" x 12" square reinforced concrete column)
V_u = 11.56 psi x {(56" x 36") - [(12" + 8") x (12" + 8")]} = 18,681 lb

Punching shear (14" diameter round reinforced concrete column)
V_u = 11.56 psi x {(56" x 36") - [(14" + 8") x (14" + 8")]} = 17,710 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section

$b_o = 2 \times (W_c + L_c) + (4 \times h) = 2 \times (12" + 12") + 4 \times 8" = 80"$

β = ratio of long-to-short side = 56” ÷ 36” = 1.56

$(4/3) + 8/(3 \times 1.56) = 3.05$; $3.05 > 2.66$ Therefore,

$V_n = 2.66 \times \lambda \times \sqrt{f'_c} \times b_o \times h$

$\varphi V_n = 2.66 \times 0.6 \times 1 \times \sqrt{4{,}000} \times 80" \times 8" = 64{,}602$ lb

64,602 lb > 18,681 lb > 17,710 lb **OKAY**

Design Check

Required footer base area: $A_f = 13.56\ ft^2$ ($1{,}953\ in^2$)

Footer width: $W_f = 36"$

Footer length: $L_f = 54.25"$; use 56”

Proposed footer: $2{,}016\ in^2 > 1{,}953\ in^2$ **OKAY**

Flexure analysis:

Footer thickness: $h_f = h + 2 = 7.3 + 2 = 9.3$ **Use 10” thick footer**

Beam action shear:

Footer thickness: $h_f = 10"$; 14,572 lb > 5,827 lb > 5,410 lb; ($W_f = 36"$) **OKAY**

$h_f = 10"$; 21,858 lb > 2,590 lb > 1,942 lb; ($W_f = 56"$) **OKAY**

Use 10” thick footer

Punching shear (two-way shear action):

Footer thickness: $h_f = 10"$; 64,602 lb > 18,681 lb > 17,710 lb **OKAY**

Use 10” thick footer

USE: 36” wide x 10” thick continuous footer

Based on this analysis, a 36” wide x 10” thick continuous footer meets or exceeds the design criteria presented in ACI 318-11 Building Code Requirements for Structural Concrete. Based on the ACI 318-11 design standards a 10.0” thick footer is calculated to support the factored design load transferred from the column to the footer. A 10” thick footer is selected for this design based on the analysis and requirements of ACI 318 to meet or exceed the expected design and service load conditions.

Based on this analysis, the proposed footer design (36” wide x 10” thick, continuous) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Alternate Design or Compliance Approach (327 IAC 19-5)

42" Wide x 11" Thick Continuous Concrete Column Footer Design
12" x 16" Concrete Masonry Column
(1,500 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

42" wide x 11" Continuous Concrete Column Footer Design:
A concrete footer option is shown on the construction plans depicting a 42" wide x 11" thick plain concrete continuous column footing for the 12" x 16" masonry column. The construction plans include a 12" x 16" x 9'-2" concrete masonry column. The column load (P_u, factored load) for the 12" x 16" x 9'-2" column is 23,450.4 lb.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for clay, sandy clay, silty clay, clayey silt, silt, and sandy silt soil types (CL, ML, MH, and CH) is 1,500 psf. A design table for plain (unreinforced) continuous concrete column footers was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations and standards presented in ACI 318-11 "Building Code Requirements for Structural Concrete" was conducted.

Based on this analysis and design a 42" wide x 11" thick continuous concrete footer is included in the proposed design drawings. In accordance with these design equations the proposed footer design (42" wide x 11" thick continuous) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following design is presented to confirm this conclusion.

Equation C-28. Plain column footing width

The description of the design equations for footings in MWPS-36, page 68 states that the equations are based on ACI 318 Chapter 22 and Section 9.3.5 and a modified design approach shown in the 1993 edition of PCA's Simplified Design. Equation C-28 has been developed specifically for square plain concrete footers and is not directly applicable to a continuous plain concrete footer.

ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" An unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. Since the dimensions of the footer are undetermined, the forces due to manure and concrete are represented as a pressure, lbs/in^2, and are subtracted from the allowable soil pressure. In accordance with ACI 318-11; 22.7.2 the based area of the footer is determined using the following equations and relationships.

$A_f = P \div [q_a - (\delta_{manure} \times D_{manure}) - Wt_{footing}]$ ACI 318-11; 22.7.2

P = pig load + slat load + lintel load + column load + equipment load

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

<u>Column load (9'-2" masonry column with a 3-1/4" concrete cap and 2 #4 or #5 rebar) =</u>

<u>Determine gross area of concrete masonry block, A_{gm}</u>

Actual dimensions of block: 11-5/8" x 15-5/8" with two cores 9-5/8" x 6-5/16"

A_{gm} = 11.625" x 15.625" – 2 x 9.625" x 6.3125"

A_{gm} = 60.125 in^2

<u>Determine gross area of concrete core, A_{gc}</u>

A_{gc} = 2 x 9.625" x 6.3125"

A_{gc} = 121.5 in^2

<u>Determine area of reinforcement steel -- #4 & #5 rebar</u>

Area (#5 rebar) = $(5/8" \div 2)^2 \times \pi = 0.307$ in^2

2 - #5 rebar = 2 x 0.307 in^2 = 0.614 in^2

Area (#4 rebar) = $(1/2" \div 2)^2 \times \pi = 0.196$ in^2

2 - #4 rebar = 2 x 0.196 in^2 = 0.392 in^2

<u>Determine net area of concrete core, A_{gc}</u>

A_{gc} = 121.5 in^2 - .614 in^2 = 120.886 in^2 (#5 rebar)

A_{gc} = 121.5 in^2 - .307 in^2 = 121.193 in^2 (#4 rebar)

Column load = 60.125 in^2 ÷ 144 in^2/ft^2 x 8.89 ft x 110 pcf + 120.886 in^2 ÷ 144 in^2/ft^2 x 8.89 ft x 150 pcf + 0.614 in^2 x 8.89 ft x 12 in/ft x 0.284 lb/in^3 + (11.625 in x 15.625 in x 3.25 in) ÷ 1,728 in^3/ft^3 x 150 pcf

Column load = 408.3 lb + 1,119.5 lb + 18.6 lb + 51.3 lb

Column load = 1,597.7 lb (9'-2" column)

Density of masonry = 110 pcf

Density of concrete = 150 pcf

Use column load (concrete masonry) = 1,598 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, psf

δ_{manure} = density of manure (65.0 lb/ft^3)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

Plain Concrete Footer Base Area, A_f (ACI 318-11; 22.7.2)

<u>Determine footer base area, A_f</u>

<u>Masonry concrete column – 12" x 16"</u>

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,598 lb + (8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,598 lb + 1,020 = 16,742 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,598 lb + 1,020 lb) = 23,450.4 lb

q_s = 1,500 psf (presumptive soil bearing, CL, ML, MH, and CH; NRCS Code 313, Table 3)

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing}$ = 11 in ÷ 12 in/ft x 150 pcf = 137.5 psf (assume footing 11" thick)

A_f= 16,742 lb ÷ (1,500 psf – (65.0 lb/cu ft x 10.0 ft) – 137.5 psf)

A_f= 16,742 lb ÷ 712.5 psf

A_f= 23.5 ft^2 (3,384 in^2)

Determine length and width of footer:

W_{fW} = 42" (selected width)

W_{fL} = 3,384 in^2 ÷ 42" = 80.6" (use 82")

Effective Footer Dimensions:

Use: A 42" x 82" rectangular footer

Equation C-29. Plain square footing thickness for square columns using 3,000 to 4,000 psi concrete

Equation C-29, MWPS-36 is a derived equation to determine footing thickness for a square footer based on the principles of concrete design. Equation C-29 has been developed specifically for square plain concrete footers and is not directly applicable to a continuous plain concrete footer. For plain (unreinforced) concrete, flexure strength usually controls footer thickness. In accordance with ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11.

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

Determine plain rectangular footing thickness

Flexure strength - maximum factored moment at face of column

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f)$

P_u = 23,450 lb (concrete masonry column)

A_f = 42" x 82" = 3,444 in^2

q_s = 23,450 lb ÷ 3,444 in^2

q_s = 6.81 psi (981 psf)

Determine moment at face of column, M_u

$M_u = q_s \times W_f \times (L_f - L_c)/2 \times (L_f - L_c)/4$

W_f = 42"

L_f = 82"

L_c = 12" & 16"

Check moment at face for W_f = 42"

L_f = 82"

L_c = 16"

M_u = 6.81 psi x 42” x [(82”-16”) ÷ 2] x [(82”-16”) ÷ 4]

M_u = 155,738 in-lb (12,978 ft-lb) – Moment creates tension in the footer

Check moment at face for W_f = 82”

L_f = 42”

L_c = 12”

M_u = 6.81 psi x 82” x [(42”-12”) ÷ 2] x [(42”-12”) ÷ 4]

M_u = 62,8223 in-lb (5,236 ft-lb) – Moment creates tension in the footer

The moment when L_c = 16”, W_f = 42” & L_f = 82” controls

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to factored Moment (M_u)

$\varphi M_n \geq M_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

M_n = [(5 x λ x $\sqrt{f'_c}$)] x [(b x d^2) ÷ 6] (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

λ = 1

f'_c = 4,000 psi

b = W_f = 42”

d = h = effective depth (h_f - 2)

M_n = (5 x 1 x √4,000 x 42” x h^2) ÷ 6

M_u = 155,738 in-lb

Set M_n = M_u

Rearrange to find h^2

h^2 = (155,738 in-lb x 6) ÷ (5 x 1 x √4,000 psi x 42”)

h^2 = (934,428) ÷ (13,282)

h = √70.4 = 8.39

h_f = h +2 = 8.39 +2 = 10.39” [ACI 318-11; 22-7-4 requires a minimum 8” thick footer]

Use a 11” thick footer

Beam action shear – critical section located at h from face of column

Use an effective thickness, h = 9”

1. Critical section location, W_f = 42”:
   (16” ÷ 2) + 9” = 17” from center of column; 24” from edge of footer [(82” ÷ 2) – 17”]
2. Critical section location, W_f = 82”:
   (12” ÷ 2) + 9” = 15” from center of column; 6” from edge of footer [(42” ÷ 2) – 15”]

Calculate shear (V_u) at critical section

V_u = q_s x tributary area

q_s = 6.81 psi

tributary area = W_f x [(L_f/2) – (W_c/2) – h]

Condition 1: W_f = 42", L_f = 82", W_c = 16"

Condition 2: W_f = 82", L_f = 42", W_c = 12"

<u>Check Condition 1</u>

V_u = 6.81 psi x 42" x [82"/2 – 16"/2 – 9"] = 6,865 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

φV_n = 0.6 x (4/3) x 1 x √4,000 x 42" x 9" = 19,125 lb

19,125 lb > 6,865 lb **OKAY**

<u>Check Condition 2</u>

V_u = 6.81 psi x 82" x [42"/2 – 12"/2 – 9"] = 3,351 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

φV_n = 0.6 x (4/3) x 1 x √4,000 x 82" x 9" = 37,340 lb

37,340 lb > 3,351 lb **OKAY**

Use a 11" thick footer

<u>Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column</u>

Use an effective thickness, h = 9" (11" – 2")

Calculate punching shear (V_u) at critical section

Punching shear is the same in both directions when W_f = 42" and W_f = 82" because the critical section is a perimeter (b_o) related to the column length and width and effective depth, h.

W_f = 42"

L_f = 82"

W_c = 12"

L_c = 16"

V_u = q_s x tributary area

q_s = 6.81 psi

tributary area = W_f x L_f – [(h/2 + W_c + h/2) x (h/2 + L_c + h/2)] = {(W_f x L_f) – [(W_c + h) x (L_c + h)]}

V_u = 6.81 psi x {(82" x 42") - [(12" + 9") x (16" + 9")]} = 19,879 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi\ V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section

$b_o = 2 \times (W_c + L_c) + (4 \times h) = 2 \times (12" + 16") + 4 \times 9" = 92"$

β = ratio of long-to-short side = 82" ÷ 42" = 1.95

$(4/3) + 8/(3 \times 1.95) = 2.70$; $2.70 > 2.66$ Therefore,

$V_n = 2.66 \times \lambda \times \sqrt{f'_c} \times b_o \times h$

$\varphi\ V_n = 2.66 \times 0.6 \times 1 \times \sqrt{4{,}000} \times 92" \times 9" = 83{,}578$ lb

83,578 lb > 19,879 lb **OKAY**

Use a 11" thick footer

<u>Design Check</u>

Required footer base area: A_f= 23.5 ft^2 (3,384 in^2)

Footer width: W_f = 42"

Footer length: L_f = 80.6"; use 82"

Proposed footer: 3,444 in^2 > 3,384 in^2 **OKAY**

Flexure analysis:

Footer thickness: $h_f = h + 2 = 8.39 + 2 = 10.39"$ **Use 11" thick footer**

Beam action shear:

Footer thickness: h_f = 11"; 19,125 lb > 6,865 lb; (W_f = 42") **OKAY**

h_f = 11"; 37,340 lb > 3,351 lb; (W_f = 82") **OKAY**

Use 11" thick footer

Punching shear (two-way shear action):

Footer thickness: h_f =11"; 83,578 lb > 19,879 lb **OKAY**

Use 11" thick footer

USE: 42" wide x 11" thick continuous footer

Based on this analysis, a 42" wide x 11" thick continuous footer meets or exceeds the design criteria presented in ACI 318-11 Building Code Requirements for Structural Concrete. Based on the ACI 318-11 design standards a 11" thick footer is calculated to support the factored design load transferred from the column to the footer. A 11" thick footer is selected for this design based on the analysis and requirements of ACI 318 to meet or exceed the expected design and service load conditions.

Based on this analysis, the proposed footer design (42" wide x 11" thick, continuous) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Alternate Design or Compliance Approach (327 IAC 19-5)

36" Wide x 9" Thick Continuous Concrete Column Footer Design
12" x 16" Concrete Masonry Column
(2,000 psf soil bearing capacity)

Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

<u>36" wide x 9" Continuous Concrete Column Footer Design:</u>
A concrete footer option is shown on the construction plans depicting a 36" wide x 9" thick plain concrete continuous column footing for the 12" x 16" masonry column. The construction plans include a 12" x 16" x 9'-2" concrete masonry column. The column load (P_u, factored load) for the 12" x 16" x 9'-2" column is 23,450.4 lb.

The presumptive allowable foundation pressure (NRCS Code 313, Table 3) for sand, silty sand, clayey sand, silty gravel, clayey gravel soil types (SW, SP, SM, SC, GM, and GC) is 2,000 psf. A design table for plain (unreinforced) continuous column footers for concrete masonry columns was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations and standards presented in in ACI 318-11 "Building Code Requirements for Structural Concrete" was conducted.

Based on this analysis and design a 36" wide x 9" thick continuous concrete footer is included in the proposed design drawings. In accordance with these design equations the proposed footer design (30" wide x 9" thick continuous) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e). The following design is presented to confirm this conclusion.

<u>Equation C-28. Plain column footing width</u>

The description of the design equations for footings in MWPS-36, page 68 states that the equations are based on ACI 318 Chapter 22 and Section 9.3.5 and a modified design approach shown in the 1993 edition of PCA's Simplified Design. Equation C-28 has been developed specifically for square plain concrete footers and is not directly applicable to a continuous plain concrete footer.

ACI 318-11, Section 22.7.2 states "*Base area of footing shall be determined from unfactored forces and moments transmitted by footing to soil and permissible soil pressure selected through principles of soil mechanics.*" An unfactored load (P) should be used to determine the base area of the footing. In addition to the axial load from the column transferred to the footer, the footer and allowable soil pressure must also account for the weight of the manure above the footer and weight of the concrete in the footer. Since the dimensions of the footer are undetermined, the forces due to manure and concrete are represented as a pressure, lbs/in^2, and are subtracted from the allowable soil pressure. In accordance with ACI 318-11; 22.7.2 the based area of the footer is determined using the following equations and relationships.

$A_f = P \div [q_a - (\delta_{manure} \times D_{manure}) - Wt_{footing}]$ ACI 318-11; 22.7.2

P = pig load + slat load + lintel load + column load + equipment load

P_u = factored axial load

Pig load = 70 psf, sows (MWPS-36, Table 2-4) **Use 70 psf**

Slat load = 38.84 psf (1" slot, 5-7/8" wide, 4" deep; adapted from MWPS-36)

Lintel load = (8.5 in x 10 in ÷ 144 sq in/sq ft) x 150 pcf = 88.54 plf

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

Column load (9'-2" masonry column with a 3-1/4" concrete cap and 2 #4 or #5 rebar) =

Determine gross area of concrete masonry block, A_{gm}

Actual dimensions of block: 11-5/8" x 15-5/8" with two cores 9-5/8" x 6-5/16"

A_{gm} = 11.625" x 15.625" – 2 x 9.625" x 6.3125"

A_{gm} = 60.125 in^2

Determine gross area of concrete core, A_{gc}

A_{gc} = 2 x 9.625" x 6.3125"

A_{gc} = 121.5 in^2

Determine area of reinforcement steel -- #4 & #5 rebar

Area (#5 rebar) = $(5/8" \div 2)^2 \times \pi = 0.307$ in^2

2 - #5 rebar = 2 x 0.307 in^2 = 0.614 in^2

Area (#4 rebar) = $(1/2" \div 2)^2 \times \pi = 0.196$ in^2

2 - #4 rebar = 2 x 0.196 in^2 = 0.392 in^2

Determine net area of concrete core, A_{gc}

A_{gc} = 121.5 in^2 - .614 in^2 = 120.886 in^2 (#5 rebar)

A_{gc} = 121.5 in^2 - .307 in^2 = 121.193 in^2 (#4 rebar)

Column load = 60.125 in^2 ÷ 144 in^2/ft^2 x 8.89 ft x 110 pcf + 120.886 in^2 ÷ 144 in^2/ft^2 x 8.89 ft x 150 pcf + 0.614 in^2 x 8.89 ft x 12 in/ft x 0.284 lb/in^3 + (11.625 in x 15.625 in x 3.25 in) ÷ 1,728 in^3/ft^3 x 150 pcf
Column load = 408.3 lb + 1,119.5 lb + 18.6 lb + 51.3 lb
Column load = 1,597.7 lb (9'-2" column)
Density of masonry = 110 pcf
Density of concrete = 150 pcf

Use column load (concrete masonry) = 1,598 lb

Equipment load = 8.5 psf

A_f = Base area of footer, ft^2

q_a = soil bearing capacity, psf

δ_{manure} = density of manure (65.0 lb/ft^3)

D_{manure} = depth of manure, ft

$Wt_{footing}$ = footer thickness

Plain Concrete Footer Base Area, A_f (ACI 318-11; 22.7.2)

Determine footer base area, A_f

Masonry concrete column – 12" x 16"

P = (70.0 psf x 10 ft x 12 ft) + (38.84 psf x 10 ft x 12 ft) + (88.54 plf x 12 ft) + 1,598 lb + (8.5 psf x 10 ft x 12ft)

P = 8,400 lb + 4,661 lb + 1,063 lb + 1,598 lb + 1,020 = 16,742 lb

P_u = 1.6 x 8,400 lb + 1.2 x (4,661 lb + 1,063 lb + 1,598 lb + 1,020 lb) = 23,450.4 lb

q_s = 2,000 psf (presumptive soil bearing)

Manure density = 65.0 pcf

D_{manure} = depth of manure = 10.0 ft (9'-2" column)

$Wt_{footing}$ = 10 in ÷ 12 in/ft x 150 pcf = 125 psf (assume footing 10" thick)

A_f= 16,742 lb ÷ (2,000 psf – (65.0 lb/cu ft x 10.0 ft) – 125 psf)

A_f= 16,742 lb ÷ 1,225 psf

A_f= 13.67 ft^2 (1,969 in^2)

Determine length and width of footer:

W_{fW} = 36" (selected width)

W_{fL} = 1,969 in^2 ÷ 36" = 54.7" (use 56")

Effective Footer Dimensions:

Use: A 36" x 56" rectangular footer

Equation C-29. Plain square footing thickness for square columns using 3,000 to 4,000 psi concrete

Equation C-29, MWPS-36 is a derived equation to determine footing thickness for a square footer based on the principles of concrete design. Equation C-29 has been developed specifically for square plain concrete footers and is not directly applicable to a continuous plain concrete footer. For plain (unreinforced) concrete, flexure strength usually controls footer thickness. In accordance with ACI 318-11, the required footer thickness is based on the flexure strength (moment), beam action shear, and punching shear (two-way action). The footer thickness design will be determined in accordance with the design methods presented in ACI 318-11.

Plain Concrete Footer Thickness Design; ACI 318-11; 22.7.4 – 22.7.6

Determine plain rectangular footing thickness

Flexure strength - maximum factored moment at face of column

Determine soil resistance pressure, q_s

$q_s = P_u \div (A_f)$

P_u = 23,450.4 lb (concrete masonry column)

A_f = 36" x 56" = 2,016 in^2

q_s = 23,450.4 lb ÷ 2,016 in^2

q_s = 11.7 psi (1,685 psf)

Determine moment at face of column, M_u

$M_u = q_s \times W_f \times (L_f - L_c)/2 \times (L_f - L_c)/4$

W_f = 36"

L_f = 56"

L_c = 12" & 16"

Check moment at face for W_f = 36"

L_f = 56"

L_c = 16"

M_u = 11.7 psi x 36" x [(56"-16") ÷ 2] x [(56"-16") ÷ 4]

M_u = 84,240 in-lb (7,020 ft-lb) – Moment creates tension in the footer

Check moment at face for W_f = 56"

L_f = 36"

L_c = 12"

M_u = 11.7 psi x 56" x [(36"-12") ÷ 2] x [(36"-12") ÷ 4]

M_u = 47,175 in-lb (3,932 ft-lb) – Moment creates tension in the footer

The moment when L_c = 16", W_f = 36" & L_f = 56" controls

Determine thickness, h_f

The nominal moment (M_n) with reduction factor must be greater than or equal to factored Moment (M_u)

$\varphi M_n \geq M_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$M_n = [(5 \times \lambda \times \sqrt{f'_c})] \times [(b \times d^2) \div 6]$ (Strength design -- ACI 318-11; 22.5.1; Equation 22-2)

$\lambda = 1$

f'_c = 4,000 psi

$b = W_f$ = 36"

$d = h$ = effective depth (h_f - 2)

M_n = (5 x 1 x √4,000 x 36" x h^2) ÷ 6

M_u = 84,240 in-lb

Set $M_n = M_u$

Rearrange to find h^2

h^2 = (84,240 in-lb x 6) ÷ (5 x 1 x √4,000 psi x 36")

h^2 = (505,440) ÷ (11,384)

$h = \sqrt{44.4} = 6.7$

h_f = h +2 = 6.7 +2 = 8.7" [ACI 318-11; 22-7-4 requires a minimum 8" thick footer]

Use a 9" thick footer

<u>Beam action shear – critical section located at h from face of column</u>

Use an effective thickness, h = 7"

1. Critical section location, W_f = 36":
   (16" ÷ 2) + 7" = 15" from center of column; 13" from edge of footer [(56" ÷ 2) – 15"]
2. Critical section location, W_f = 56":
   (12" ÷ 2) + 7" = 13" from center of column; 5" from edge of footer [(36" ÷ 2) – 13"]

Calculate shear (V_u) at critical section

$V_u = q_s$ x tributary area

q_s = 11.7 psi

tributary area = W_f x [(L_f/2) – (W_c/2) – h]

Condition 1: W_f = 36", L_f = 56", W_c = 16"

Condition 2: W_f = 56", L_f = 36", W_c = 12"

<u>Check Condition 1</u>

V_u = 11.7 psi x 36" x [56"/2 – 16"/2" – 7"] = 5,476 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

φV_n = 0.6 x (4/3) x 1 x √4,000 x 36" x 7" = 12,750 lb

12,750 lb > 5,476 lb **OKAY**

<u>Check Condition 2</u>

V_u = 11.7 psi x 56" x [36"/2" – 12"/2 – 7"] = 3,276 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

φ = 0.6 (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = (4/3) \times \lambda \times \sqrt{f'_c} \times b_w \times h$ (Strength design -- ACI 318-11; 22.5.4; Equation 22-9)

φV_n = 0.6 x (4/3) x 1 x √4,000 x 56" x 7" = 19,834 lb

19,834 lb > 3,267 lb **OKAY**

Use a 9" thick footer

<u>Punching shear (two-way action) – critical section located at one-half effective footing thickness, h, from face of column</u>

Use an effective thickness, h = 7" (9" – 2")

Calculate punching shear (V_u) at critical section

Punching shear is the same in both directions when W_f = 36" and W_f = 54" because the critical section is a perimeter (b_o) related to the column length and width and effective depth, h.

W_f = 36"

L_f = 56"

W_c = 12"

L_c = 16"

$V_u = q_s$ x tributary area

q_s = 11.7 psi

tributary area = W_f x L_f – [(h/2 + W_c + h/2) x (h/2 + L_c + h/2)] = {(W_f x L_f) – [(W_c + h) x (L_c + h)]}

V_u = 11.7 psi x {(56" x 36") - [(12" + 7") x (16" + 7")]} = 18,475 lb

The nominal shear (V_n) with reduction factor must be greater than or equal to the factored shear (V_u)

$\varphi V_n \geq V_u$

$\varphi = 0.6$ (strength reduction factor; ACI 318-11, Section 9.3.5)

$V_n = [(4/3) + (8/3\beta)] \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h \leq 2.66 \times \varphi \times \lambda \times \sqrt{f'_c} \times b_o \times h$

(Strength design -- ACI 318-11; 22.5.4; Equation 22-10)

b_o = perimeter of critical section

$b_o = 2 \times (W_c + L_c) + (4 \times h) = 2 \times (12" + 16") + 4 \times 7" = 84"$

β = ratio of long-to-short side = 56" ÷ 36" = 1.56

$(4/3) + 8/(3 \times 1.56) = 3.05$; $3.05 > 2.66$ Therefore,

$V_n = 2.66 \times \lambda \times \sqrt{f'_c} \times b_o \times h$

$\varphi V_n = 2.66 \times 0.6 \times 1 \times \sqrt{4{,}000} \times 84" \times 7" = 59{,}353$ lb

59,353 lb > 18,475 lb **OKAY**

Use a 9" thick footer

<u>Design Check</u>

Required footer base area: $A_f = 13.67$ ft^2 (1,969 in^2)

Footer width: $W_f = 36"$

Footer length: $L_f = 54.7"$; use 56"

Proposed footer: 2,016 in^2 > 1,969 in^2 **OKAY**

Flexure analysis:

Footer thickness: $h_f = h + 2 = 6.7 + 2 = 8.7"$ **Use 9" thick footer**

Beam action shear:

Footer thickness: $h_f = 9"$; 12,750 lb > 5,476 lb; ($W_f = 36"$) **OKAY**

$h_f = 9"$; 19,834 lb > 3,267 lb; ($W_f = 56"$) **OKAY**

Use 9" thick footer

Punching shear (two-way shear action):

Footer thickness: $h_f = 9"$; 59,353 lb > 18,475 lb **OKAY**

Use 9" thick footer

USE: 36" wide x 9" thick continuous footer

Based on this analysis, a 36" wide x 9" thick continuous footer meets or exceeds the design criteria presented in ACI 318-11 Building Code Requirements for Structural Concrete. Based on the ACI 318-11 design standards a 9.0" thick footer is calculated to support the factored design load transferred from the column to the footer. A 9" thick footer is selected for this design based on the analysis and requirements of ACI 318 to meet or exceed the expected design and service load conditions.

Based on this analysis, the proposed footer design (36" wide x 9" thick, continuous) meets or exceeds the requirements and is in compliance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application
Alternate Design or Compliance Approach (327 IAC 19-5)
Construction Specification - Concrete Construction
Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Alternate Compliance Approach Request:

The requirements of 327 IAC 19-12-4(d) states:

> "*All liquid manure storage facilities must be constructed to the Indiana NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016**. . . .*"

The requirements of 327 IAC 19-12-4(e) states:

> "*In addition to subsection (d), all concrete manure storage facilities must be constructed according to:*
>
> *(1) Indiana NRCS Construction Specification, Concrete Construction, May 2015***; and*
>
> *(2) either:*
>
> *(A) MWPS-36: Rectangular Concrete Manure Storages, Second Edition, 2005****; or*
>
> *(B) TR-9: Circular Concrete Manure Tanks, March 1998****.*

<u>Natural Resource Conservation Service Construction Specification, Concrete Construction, May 2015:</u>

The Confined Feeding Operation Approval application package includes an adapted version of the Natural Resource Conservation Service Construction Specification, Concrete Construction, May 2015 to address project specific details.

The Natural Resource Conservation Service, Construction Specification, Concrete Construction, May 2015 (Specification) was written specifically for concrete construction projects that are completed under the direct supervision of the Natural Resource Conservation Service (NRCS). The Specification includes direct references to NRCS, the NRCS Engineer, and the designated representative [by NRCS] that require the involvement of NRCS in concrete construction projects that are constructed according to the Specification. Direct involvement of NRCS in the construction of the proposed below-building concrete manure storage structure is not NRCS' intent and is not required for this confined feeding operation construction project.

Section 2 of the Specifications states that "Placement of concrete on plastic, mud, dried earth, or uncompacted fill or frozen subgrade will not be permitted." The Specification has been updated to state, "Placement of concrete on mud, dried earth, or uncompacted fill or frozen subgrade will not be permitted." An exception is added to allow the use of plastic sheets when necessary and with prior approval to protect the integrity and stability of the subgrade due to precipitation. Placement of concrete on plastic is not allowed except where plastic sheeting is required to maintain subgrade integrity. Refer to Section 2B. "Subgrade Stabilization Precipitation Protection". This limited exception and Section 2B. have been added allowing the use of plastic sheets to protect a properly prepared subgrade to include prior approval and specific requirements for the limited use of plastic sheets beneath concrete.

Section 9 of the Specifications states that "Accelerating or water-reducing and accelerating admixtures shall be noncorrosive and conform to the requirements of ASTM C 494, Type C and E." Specifically, accelerators such as calcium chloride have not been allowed to be used to speed the hardening of concrete. To make this clear, the Specification has been updated to include the statement, *"Chloride accelerators such as calcium chloride may not be used to speed the hardening of concrete."* has been added.

Section 9 of the Specification refers to "facilities" in describing the required practices associated with concreting in cold weather. The term "facilities" refers to "something (such as a building or large piece of equipment) that is built for a specific purpose [Merriam-Webster]." In many situations, it is not necessary to build something for the purpose of concreting in cold weather. Successful concreting in cold weather more specifically relies on "alternate concrete mixing and placement practices' and "concrete mixing and placement practices" rather than "facilities". The term "facilities" has been replaced.

Section 11of the Specification has specific requirements regarding "Backfilling New Concrete Walls." Specifically, Section 11 states that heavy equipment may not be operated and compaction is to be by means of hand-tamping or small hand-held tamping or vibrating equipment within three (3) feet of the wall. This specification conflicts with the design criteria that no vehicle traffic is allowed or will occur within five (5) feet of the concrete walls. The required separation distance from concrete walls for operating heavy equipment and the required distance from the concrete walls for allowable compaction methods should be consistent with the design criteria.

To more clearly specify the project specific specifications necessary for construction of the concrete manure storage structure, the Specification has been adapted. The direct references to NRCS, the NRCS engineer, and the designated representative have been changed in the Specification to refer to the Engineer and designated representative. In the context of the Specification the reference to the designated representative is interpreted to be the designated representative of the Engineer. The Specification has been adapted to include this change in three places as outlined below.

- 2. PREPARATION OF THE FORMS AND SUBGRADE, paragraph 1: "NRCS Engineer" changed to "Engineer"
- 2. PREPARATION OF THE FORMS AND SUBGRADE, paragraph 2: "NRCS Engineer" changed to "Engineer"
- 9. CONCRETING IN COLD WEATHER, d.: "NRCS " changed to "the Engineer or designated representative" and the subsection reference was changed from "d" to "e".

A new Section 2B. "Subgrade Stabilization" was added to provide specific requirements for the limited use of plastic sheets for protecting and maintaining the stability of a properly prepared subgrade prior to concrete placement. This section specifies the procedures, methods, and practices to be followed when plastic sheets are used.

In support of the use of plastic sheets for the protection of a properly prepared subgrade, vapor retarders and vapor barriers are commonly used in applications where moisture vapor migration through a concrete slab is a problem. The Portland Cement Association (PCA) discusses moisture control and the use of vapor retarders in "Design and Control of Concrete Mixtures-The guide to applications, methods, and materials", 15th edition, Chapter 14 Placing and Finishing Concrete. It is acknowledged and recognized that a suitable subgrade for the placement of concrete is firm and moist. It is recognized that a suitable subgrade should not be wet, soft, muddy, or contain puddles. The stability and integrity of a properly prepared subgrade can be impacted by precipitation events after subgrade preparation and prior concrete placement if appropriate protective measures are not implemented. A compromised subgrade can impair the structural integrity of the concrete slab and delay construction progress.

The use of plastic beneath concrete is not recommended by the NRCS Concrete Construction specification but does provide a practical alternative and preventative control option to protect a properly prepared subgrade and the structural integrity of a concrete slab on grade consistent with the objectives of the Specification. The specification takes into consideration the concreting practices necessary to maintain the concrete integrity and not negatively impact the quality of the cured concrete. The use of plastic sheets (a vapor retarder) provides a positive barrier between the subgrade and accumulation of precipitation to protect and preserve the integrity of the subgrade. It is recognized that a vapor retarder is not a vapor barrier and does not stop 100% of moisture migration consistent with the objective to allow moisture to escape the concrete mix during the curing period. Installation specifications for plastic sheets provide for protection from precipitation events and includes practices to allow for moisture migration during curing and includes provisions that limit the lap between plastic sheets, does not allow for seams to be sealed, and requires that the sheets be perforated or sliced to allow for free water movement from beneath the concrete.

The specification requires that at least 1% perforated area be provided. This is a minimum standard that ensures that sufficient opening is distributed across the surface area to allow water to migrate away from the concrete. In support of this minimum standard, a 12" x 12" square plastic sheet has a surface area of 144 in^2 requiring at least 1.44 in^2 of opening per square foot of surface area. This is a:

- 2.0 inch diameter hole every 17.75 inches,
- 1.35 inch diameter hole every 12 inches,
- 1.0 inch diameter hole approximately every 8.75 inches,
- 0.5 inch diameter hole approximately every 4.5 inches, or
- One 0.25 inch diameter hole approximately every 2.25 inches

Based on this illustration, free water from the concrete during curing must travel a maximum of 18" to reach a 2.0 inch diameter hole and 2.25 inches to reach a 0.25 inch diameter hole. Sufficient opening in addition to the seams between the plastic sheets is available to allow free water to migrate away from the concrete during curing.

The use of a vapor retarder may increase the time needed for excess mix water to escape to the surface, increase the time before final finishing can be conducted due to longer water bleed times, and require that the water-to-cement ratio be reduced to 0.45 to control excess mix water that needs to escape during the curing period. The specifications include provisions that minimize the amount of free water on the surface of the plastic prior to concrete placement, reduce the allowable water-to-cement ratio to control excess concrete mix water that may be released from the surface of the concrete, and adjusts the finishing time to allow for moisture migration from the concrete. These methods are addressed in the construction methods outlined in the Concrete Construction specification to promote and maintain proper concreting practices and structural integrity. The specifications include many concreting practices designed to minimize the amount of free water that migrates from the concrete when a plastic vapor retarder is used and the additional perforations in the plastic provide sufficient opening for water to move away from the concrete and migrate into the soil foundation. All of these practices are included and required to maintain the integrity and quality of the concrete.

The term "facilities" in Section 9 of the Specification was changed to "alternate concrete mixing and placement practices in the first paragraph. Similarly, in the second paragraph of Section 9 "Facilities" was changed to "Concrete mixing and placement practices".

Indiana NRCS has previously specifically prohibited the use of chloride accelerators in Section 9 of the Specification when concreting in cold weather. The Specification states that accelerating or water-reducing and accelerating admixtures shall be noncorrosive. To clearly state that chloride accelerators are prohibited consistent with the intent of the Specification, Section 9.d has been added to state, "Chloride accelerators such as calcium chloride shall not be used to speed the hardening of concrete."

Section 9.d. in the original Specification was changed to Section 9.e.

To be consistent with the concrete wall design criteria specified in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005, *"within 3 feet of the new concrete wall"* and *"within 3 feet of the wall"* was changed to "within five (5) feet of the new concrete wall" and "within five (5) feet of the wall".

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

ALTERNATE DESIGN OR COMPLIANCE APPROACH INNOVATIVE TECHNOLOGY

SUMMARY OF FACTS

ALTERNATE DESIGN OR COMPLIANCE APPROACH JUSTIFICATION

DEMONSTRATION OF COMPLIANCE
327 IAC 19-5-1 "Alternate design or compliance approach; innovative technology"
327 IAC 19-3-1 "Performance Standards"

Prepared by:
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2024 Confined Feeding Operation Approval Application
Alternate Design or Compliance Approach (327 IAC 19-5)
for

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Introduction:
This construction attachment includes alternate design or compliance approach requests and supporting information. Approval of each of the alternate design or compliance approaches is requested. The following information is provided in support of approval of each alternate design or compliance approach.

Facts:

12" x12" Reinforced Concrete Column Design

A reinforced concrete column design utilizing the design equations from Appendix C, MWPS-36: Rectangular Concrete Manure Storages, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11) is presented as part of the alternate design or compliance approach section of this attachment. Based on the design analysis a 12" x 12" x 9'-2" reinforced concrete column with 4-#5 vertical rebar tied every 12" with #3 rebar or 4-#4 vertical rebar tied every 12" with #3 rebar is proposed. The reinforced concrete column design demonstrates compliance with the structural integrity and design standards presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11).

14" Diameter Round Reinforced Concrete Column Design

A reinforced concrete column design utilizing the design equations from Appendix C, MWPS-36: Rectangular Concrete Manure Storages, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11) is presented as part of the alternate design or compliance approach section of this attachment. For design, the equivalent of an 11"x11"reinforced concrete column is used within the 14" diameter concrete column. Based on the design analysis a 14" diameter round x 9'-2" reinforced concrete column with 4-#5 vertical rebar tied every 11" with #3 rebar or 4-#4 vertical rebar tied every 11" with #3 rebar is proposed. The reinforced concrete column design demonstrates compliance with the structural integrity and design standards presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11).

12"x16" Concrete Masonry Column Design

The masonry column design section and design table have been removed from MWPS-36: Rectangular Concrete Manure Storage, Second Edition, 2005. The reason stated in MWPS-36 for this change is based on the assumption that masonry columns are rarely used and are susceptible to poor construction. The use of masonry columns is a practical and structurally sound construction method for concrete manure storages. A modified masonry column construction practice is typically used that includes placing #4 or #5 rebar in each core of the masonry block and filling the cores with concrete. A masonry column design utilizing the design equations from Appendix C, MWPS-36: Rectangular Concrete Manure Storages, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11) is presented as part of the alternate design or compliance approach section of this attachment. In accordance with the requirements of 327 IAC 19-12-4(h) the concrete masonry column design is submitted to the department for approval.

Based on the design analysis a 12" x 16" x 9'-2" concrete masonry column with the cores filled and one #5 rebar or #4 rebar placed in each core design demonstrates compliance with the structural integrity and design standards presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005.

Round Column Footer Design

Plain concrete round column footers are an alternative to the plain concrete square footer designs presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005. A design table for a round plain (unreinforced) column footer for reinforced concrete columns was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations and standards presented in ACI 318-11 "Building Code Requirements for Structural Concrete" was conducted.

A round column footer design utilizing the design equations from Building Code Requirements for Structural Concrete (ACI 318-11) is presented as part of the alternate design or compliance approach section of this attachment. Based on the design analysis a 50" diameter x 10" thick round footer can be used with a 12" x 12" reinforced concrete column and 14" diameter round reinforced concrete column when the presumptive soil bearing capacity is at least 2,000 psf. Based on the design analysis a 66" diameter x 10" thick round footer can be used with a 12" x 12" reinforced concrete column and 14" diameter round reinforced concrete column when the presumptive soil bearing capacity is 1,500 psf. The 50" diameter x 10" thick round footer design and 66" diameter x 10" thick round footer design presented in the alternate design or compliance approach section demonstrates compliance with the structural integrity and design standards presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11).

Continuous Column Footer Design

Continuous column footers are an alternative to the plain concrete square footer designs presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005. A design table for plain (unreinforced) continuous column footers for reinforced concrete columns and concrete masonry columns was not found in MWPS-36. Since a design table was not identified during the design, a project specific design based on the design equations and standards presented in ACI 318-11 "Building Code Requirements for Structural Concrete" was conducted.

A continuous column footer design utilizing the design equations from Building Code Requirements for Structural Concrete (ACI 318-11) is presented as part of the alternate design or compliance approach section of this attachment. Based on the design analysis a 36" wide x 9" thick footer can be used with 12" x 16" concrete masonry columns when the presumptive soil bearing capacity is at least 2,000 psf. Based on the design analysis a 36" wide x 10" thick footer can be used with 12" x 12" reinforced concrete column and 14" diameter round reinforced concrete column when the presumptive soil bearing capacity is at least 2,000 psf. When the presumptive soil bearing capacity is 1,500 psf a 42" wide x 11" thick footer can be used with 12" x 12" square, 14" diameter round, and 12" x 16" concrete masonry columns. The continuous footer designs presented in the alternate design or compliance approach section demonstrate compliance with the structural integrity and design standards presented in MWPS-36, Rectangular Concrete Manure Storages, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11).

Natural Resources Conservation Service Construction Specification, Concrete Construction

The Natural Resource Conservation Service Construction Specification, Concrete Construction, May 2015 was adapted to remove unnecessary or unintentional references and to include specifications and restrictions to address project specific details. Principle changes to the concrete construction specification include clarification of concreting practices during cold weather concreting, allowable distance from concrete walls for operating heavy equipment, and allowable compaction methods. A limited exception allowing the use of plastic has been added to protect and maintain subgrade integrity due to precipitation events. Section "2B. SUBGRADE STABILIZATION (PRECIPITATION PROTECTION)" is added to provide specific construction requirements when plastic sheets are used to cover a prepared subgrade, protect the subgrade, and prevent wet, soft, muddy areas in the subgrade.

None of the changes included in the concrete construction specification alter the structural integrity of the concrete manure storages referenced in the specification. The explanation of the specification changes demonstrates compliance with the structural integrity and design standards.

Justification:

Design Details

A valid design is presented to support the concrete construction plans that include the following building components and options.

- 12" x 12" x 9'-2" reinforced concrete column. This design is completed in accordance with the design information and design equations presented in MWPS-36: Rectangular Concrete Manure Storage, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11).
- 14" diameter round x 9'-2" reinforced concrete column. This design is completed in accordance with the design information and design equations presented in MWPS-36: Rectangular Concrete Manure Storage, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11).
- 12" x 16" x 9'-2" concrete masonry column. This design is completed in accordance with the design information and design equations presented in MWPS-36: Rectangular Concrete Manure Storage, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11).
- 50" diameter x 10" thick round concrete footer and 66" diameter x 10" thick round concrete footer (depending on presumptive soil bearing capacity) for use with a 12" x 12" reinforced concrete column. This design is completed in accordance with the design information and design equations in Building Code Requirements for Structural Concrete (ACI 318-11).
- 36" wide x 10" thick continuous concrete footer and 42" wide x 11" thick continuous concrete footer (depending on presumptive soil bearing capacity) for use with a 12" x 12" reinforced concrete column. This design is completed in accordance with the design information and design equations in Building Code Requirements for Structural Concrete (ACI 318-11).
- 50" diameter x 10" thick round concrete footer and 66" diameter x 10" thick round concrete footer (depending on presumptive soil bearing capacity) for use with a 14" diameter round reinforced concrete column. This design is completed in accordance with the design information and design equations in Building Code Requirements for Structural Concrete (ACI 318-11).
- 36" wide x 10" thick continuous concrete footer and 42" wide x 11" thick continuous concrete footer (depending on presumptive soil bearing capacity) for use with a 14" diameter round reinforced concrete column. This design is completed in accordance with the design information and design equations in Building Code Requirements for Structural Concrete (ACI 318-11).
- 36" wide x 9" thick continuous concrete footer and 42" wide x 11" thick continuous concrete footer (depending on presumptive soil bearing capacity) for use with a 12" x 16" masonry column. This design is completed in accordance with the design information and design equations in Building Code Requirements for Structural Concrete (ACI 318-11).

An adapted concrete construction specification is presented to more clearly identify project specific requirements and details. The adapted specification was prepared in accordance with:

- the design criteria identified in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and American Concrete Institute approved concreting practices,
- the approved concreting practices described in Portland Cement Association's, "Design and Control of Concrete Mixtures-The guide to applications, methods, and materials", 15th edition.

- the installation and utilization of a vapor retardant (10 mil to 15 mil plastic sheets) beneath concrete floor slabs and concreting methods described Chapter 14 Placing and Finishing Concrete in Portland Cement Association's, "Design and Control of Concrete Mixtures-The guide to applications, methods, and materials", 15th edition.

So that the concrete construction plans can be approved as presented Top Grade Production LLC requests that the alternate design or compliance approaches based on the design equations presented in Appendix C of MWPS-36: Rectangular Concrete Manure Storages, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11) be approved in place of design information presented in Design Table included in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005 and in place of design information that is not included in MWPS-36: Rectangular Concrete Manure Storages – Second Edition, 2005.

So that the Construction Specification, Concrete Construction adapted from the Natural Resource Conservation Service Construction Specification, Concrete Construction – May 2015 (adapted August 31, 2017) can be approved as presented Top Grade Production LLC requests that the alternate Construction Specification, Concrete Construction Specification be approved in accordance with 327 IAC 19-5-1 Alternate design or compliance approach; innovative technology in place of the Natural Resource Conservation Service Construction Specification, Concrete Construction, May 2015.

<u>Demonstration of Compliance with Alternate Design or Compliance Approach</u>

The requirements of 327 IAC 19-5-1 outline the details associated with an alternate design or compliance approach; innovative technology and the criteria to be considered in approving an alternate compliance approach. The following information is provided in support of the request for approval of each alternate design or compliance approach request.

5-1(a) The use of alternate compliance approaches has been proposed by Top Grade Production LLC as part of the Confined Feeding Operation approval application

5-1(a)(1) Performance Standards 327 IAC 19-3-1

(a) Top Grade Production LLC's confined feeding operation will be managed to avoid any unpermitted discharges into the waters of the state. The alternate design of the columns and column footers were completed in accordance with the design information and design equations presented in MWPS-36: Rectangular Concrete Manure Storage, Second Edition, 2005 and Building Code Requirements for Structural Concrete (ACI 318-11). The concrete construction specifications were adapted to incorporate updates published by the Indiana Natural Resources Conservation Service and project specific details in accordance with industry standards and construction methods. Approval of the alternative design and compliance approach request does not change Top Grade Production LLC's ability or commitment to managing the proposed confined feeding operation to avoid any unpermitted discharge into the waters of the state.

(b) The proposed production buildings and manure storages at Top Grade Production LLC's AFO have been designed and will be constructed in accordance with the applicable standards specified in the Confined Feeding Rule 327 IAC 19 including Indiana NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016; Midwest Plan Service MWPS-36: Rectangular Concrete Manure Storages, Second Edition, 2005; and Indiana NRCS Construction Specifications, Concrete Construction, May 2015 (adapted). In addition to these standards, the design standards for reinforced concrete presented in ACI 318-11: Building Code Requirements for Structural Concrete, American Concrete Institute (ACI) are used where the design standards referenced in 327 IAC 19 do not include specific design information. The proposed manure storage has been designed and will be constructed to minimize nonpoint source pollution entering waters of the state.

Approval of this alternate design and compliance approach request does not change Top Grade Production LLC's commitment or ability to comply with this requirement.

(c) Top Grade Production LLC's AFO will be operated and managed to prevent manure releases, spills or the discharge of manure in violation of the approval or 327 IAC 19, including seepage and leakage. Top Grade Production LLC has taken all reasonable steps to prevent manure releases, spills or the discharge of manure in violation of the approval or 327 IAC 19, including seepage and leakage. Approval of this alternate design and compliance approach request will not change Top Grade Production LLC's commitment to maintain compliance with the approval, 327 IAC 19, and this performance standard.

(d) All proposed waste management systems located at Top Grade Production LLC's AFO have been designed, will be constructed, and will be maintained to minimize leaks and seepage and prevent manure releases or spills, as well as ensure compliance with the water quality standards in 327 IAC 2. Approval of this alternate design and compliance approach request does not change Top Grade Production LLC's commitment or ability to comply with this requirement.

(e) No manure staging is conducted at Top Grade Production LLC's confined feeding operation. Therefore, Top Grade Production LLC is in compliance with this performance standard.

(f) Land application of manure from Top Grade Production LLC's operation will be conducted in a manner as to not threaten or enter waters of the state, not pond for more than twenty-four (24) hours, result in a manure release, result in a spill, and meet the agronomic rate of application and minimize nutrient leaching beyond the root zone. Approval of this alternate design and compliance approach request does not change Top Grade Production LLC's commitment or ability to comply with this requirement.

5-1(a)(2) Incorporated into approval

In accordance with the requirements of 327 IAC 19-5-1(a)(2), Top Grade Production LLC requests that it be acknowledged and incorporated into the approval that the following alternate design or compliance approaches have been submitted and approved.

- 12" x 12" x 9'-2" Reinforced concrete column with 4 - #5 vertical rebar or 4 - #4 vertical rebar
- 14" diameter round x 9'-2" Reinforced concrete column with 4- #5 vertical rebar or 4 - #4 vertical rebar
- 12" x 16" x 9'-2" Masonry concrete column with one (1) #5 vertical rebar or one (1) #4 vertical rebar placed in each core
- 50" diameter x 10" thick round concrete footer for 12" x 12" reinforced concrete columns
- 66" diameter x 10" thick round concrete footer for 12" x 12" reinforced concrete columns
- 36" wide x 10" thick continuous concrete footer for 12" x 12" reinforced concrete columns
- 42"wide x 11" thick continuous concrete footer for 12" x 12" reinforced concrete columns
- 50" diameter x 10" thick round concrete footer for 14" diameter round reinforced concrete columns
- 66" diameter x 10" thick round concrete footer for 14" diameter round reinforced concrete columns
- 36"wide x 10" thick continuous concrete footer for 14" diameter round reinforced concrete columns

- 42"wide x 11" thick continuous concrete footer for 14" diameter round reinforced concrete columns
- 36"wide x 9" thick continuous concrete footer for 12" x 16" masonry columns
- 42"wide x 11" thick continuous concrete footer for 12" x 16" masonry columns
- Concrete Construction Specifications

5-1(b) Commissioner's determination

5-1(b)(1) The requested alternate concrete column and footer designs demonstrate that the designs meet or exceed the requirements necessary to maintain the structural integrity of the concrete manure storage structure and the components of the structures associated with the columns and footers. The adapted Concrete Construction Specifications are based on site specific details and concrete construction industry standards such that the construction standards meet or exceed the requirements necessary to maintain structural integrity. Approval of this alternate design or compliance approach request does not alter or impact the structural integrity of the concrete manure storages.

5-1(b)(2) Top Grade Production LLC's confined feeding operation will be managed to avoid unpermitted discharges into waters of the state. The proposed manure storage structures will be constructed to minimize nonpoint pollution entering waters of the state. The manure storages have been designed, will be constructed, and will be maintained to minimize any leaks and seepage and prevent manure releases or spills. The columns and column footers have been designed in accordance with the design standards. The adapted Concrete Construction Specifications are based on site specific details and concrete construction industry standards such that the construction standards meet or exceed the requirements necessary to maintain structural integrity, to prevent manure releases, spills or the discharge of manure. Top Grade Production LLC will take all reasonable steps to prevent manure releases, spills or discharges of manure by regularly inspecting manure storages and production areas, land applying manure at agronomic rates, and conducting regular preventive maintenance on all manure storage structures and handling equipment. Approval of this alternate design or compliance approach request does not alter or impact the management of the confined feeding operation and the implementation of management and protective measures to reduce the potential for manure releases and spills.

5-1(b)(3) Top Grade Production LLC's production buildings and manure storages have been located to protect surface water features. The planned construction is located greater than 300 feet from any off-site water wells. The planned construction is located greater than 100 feet from the proposed on-site water well. The planned construction is located within 300 feet of surface water features. A gradient barrier located between the proposed buildings and concrete manure storages can be proposed to establish at least a 300 foot drainage flow path between the production area and surface water features. The gradient barrier should be installed to direct surface drainage away from the surface water feature and establish a surface gradient barrier to comply with the 300 foot setback from surface water requirement of 327 IAC 19-12-3(c). The proposed production building and manure storage meet the protection requirements outlined by the Indiana Department of Environmental Management. Approval of this alternate design or compliance approach request does not alter or change the practices and measures to be installed providing protection of surface water features in close proximity to the concrete manure storage structure.

5-1(b)(4) Top Grade Production LLC will utilize operational practices to minimize and prevent releases or spills of manure from the confined feeding operation. Some practices include regular inspections to identify potential issues, regular preventive maintenance of manure storage structures and handling equipment for proper and uninterrupted operation, and regular soil and manure sampling and testing to determine the agronomic rate of application to meet the crop nutrient requirements, prevent runoff, and minimize leaching below the root zone. Approval of this alternate design or compliance approach does not change the commitment and implementation of operational practices that provide protection of water resources.

5-1(b)(5) The confined feeding operation operated by Top Grade Production LLC does not present a threat of adverse impact to water quality or other sensitive areas. Grading around the buildings is maintained to divert clean storm water drainage away from the buildings and diversions are maintained to direct flow from the buildings away from surface water and other features of concern. The buildings and manure storages have been located and an earthen drainage diversion berm and swale constructed where needed to establish adequate separation distance between the buildings and surface water and other features of concern to manage manure and process wastewater to prevent any negative impacts. Land application methods take into consideration soil test, manure test, crop rotation, and agronomic rate of application to prevent any adverse impact to water resources.

5-1(b)(6) Top Grade Production LLC is not aware of any other requirements or criteria that are required to protect the environment or human health.

Conclusion:

Top Grade Production LLC has demonstrated as part of this alternate design or compliance approach request that the performance standards of 327 IAC 19-3-1 have been met and the criteria for consideration outlined in 327 IAC 19-5-1 have been addressed such that the request for an alternate design or compliance approach to use the alternate design for columns and column footers and an updated concrete construction specification are approvable. Top Grade Production LLC has also demonstrated that no impact or threat to the environment or human health has occurred or will occur as a result of the requested alternate designs or compliance approaches.

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC

2667 E State Road 18

Kokomo, Indiana 46901

SEASONAL WATER TABLE MANAGEMENT

SEASONAL WATER TABLE DETERMINATION

PERIMETER TILE DESIGN

SOILS/SITE EVALUATION REPORT

Chestnut Ridge Consulting, Inc.

John Bowman

Report Date: September 28, 2018

Prepared by:

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2024 Confined Feeding Operation Approval Application

Seasonal Water Table Management
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Seasonal Water Table Determination
The requirements of 327 IAC 19-7-1(c)(6) for concrete manure storages state that an application packet include:

- soil and water table information from test holes,
- the number of test holes must be sufficient to adequately characterize the seasonal water table and soil,
- and test holes for concrete manure storage facilities must be at least two (2) feet below the base of the structure.

The requirements of NRCS Conservation Standard 313 states that:

- a geological exploration shall be conducted for all manure storage facilities.
- the exploration shall be intensive enough to adequately characterize the site.
- a minimum of two holes shall be explored. Additional holes may be necessary based on the site size and complexity.
- the exploration will document the presence or absence of a seasonal water table, and identify the soils using the Unified Classification System.
- soil sampling will follow the National Engineering Manual (NEM) IN531-2.

A review of NRCS NEM IN531 Subpart A and Exhibit A identifies that a soil investigation is to be conducted to document the engineering properties of the soil, to be conducted by an engineer, geologist, and/or soil scientist, to include excavations that are at least two feet below the planned bottom of the concrete manure storage, to include a log of the soil profile from the ground surface to the bottom of the excavation using the Unified Soil Classification System (USCS), to identify the depths where the soil classification changes, to identify the depth of the water table observed in the excavation, to identify the depth of the seasonal water table, and to identify the parent soil material. NRCS NEM IN531 indicates that a minimum of two (2) soil borings for sites up to a ½ acre and one (1) additional soil boring for each additional ½ acre should be conducted.

The IDEM Guidance Manual for Indiana's Confined Feeding Program – December 29, 2014 (IDEM Guidance manual) referencing 327 IAC 19-7-1(c)(6) states the following requirements apply to the soil and water table assessment for manure storages:

- The testing must be conducted by a certified soil scientist, a certified geologist, or an engineer registered in Indiana.
- Soil sampling must follow guidance in the NRCS national engineering manual (NEM) IN531-2.
- The number of test holes varies with the type and size of the storage structure as follows:
    - For liquid manure storage structures, at least 2 holes for a structure up to one-half acre then an additional hole for each additional half acre.
    - For concrete solid manure storage structures, at least 2 holes regardless of size.
- The required depth of test holes varies as follows:
    - At least 2 feet below the base of a concrete manure storage structure
- Documentation that adequately characterizes the soil and water table including soil boring or test hole information required in 327 IAC 19-7-1(c)(6). A soils log identifying the soils using the Unified Soil Classification System and showing the location of the seasonal high water table must be shown on or provided with the plans for the manure storage structure.

The requirements of 327 IAC 19-7-1(c)(6) state "*The number of test holes must be sufficient to adequately characterize the seasonal water table and soil and test holes must be at least two (2) feet below the base of the structure.*" The requirements of NRCS Conservation Standard 313 states that "*A geological exploration shall be conducted for all manure storage facilities. The exploration shall be intensive enough to adequately characterize the site. A minimum of two holes shall be explored.*" Standard 313 also states that "*Soil sampling shall follow guidance in the National Engineering Manual (NEM) IN531-2.*" The National Engineering Manual (NEM) IN531-2 requires that a soil investigation be conducted to document the engineering properties of the soil and identify the depth of the seasonal water table.

An on-site soil investigation was completed by John Bowman, Chestnut Ridge Consulting, Inc. on September 28, 2018. Two (2) soil borings were completed within the footprint of proposed building 8P (East Farrowing), two (2) soil borings were completed within the footprint of proposed building 9P (West Farrowing), and three (3) borings were completed within the footprint of proposed building 10P (South Gestation). A total of five (5) soil borings within the footprint of the proposed buildings were completed to determine the soil characteristics and presence or absence of a seasonal water table. The on-site soil investigation report identifies the soil profile from the ground surface to the bottom of the excavation using the Unified Soil Classification System (USCS) soil classification designation. The soil classifications identified in the soil investigation report for borings representing the proposed buildings include silt loam (ML), clay loam (CL) clay (CH), and sandy loam (SM).

The on-site soil investigation demonstrated that a seasonal water table exists within the footprint of the proposed concrete manure storage structures. The depth to the seasonal water table below the ground surface according to the on-site soil investigation is:

Building 8P – East Farrowing

Boring #1 (west boring)	11" below the ground surface
Boring #2 (east boring)	12" below the ground surface

Building 9P – West Farrowing

Boring #1 (west boring)	12" below the ground surface
Boring #2 (east boring)	12" below the ground surface

Building 10P – South Gestation

Boring #1 (east boring)	10" below the ground surface
Boring #2 (middle boring)	21" below the ground surface
Boring #3 (west boring)	7" below the ground surface

Referring to the on-site soil investigation the soil profile log indicates the following.

Building 8P – East Farrowing

Boring #1 (west boring):

Depth	Texture
0"-11"	silt loam (ML)
11"-20"	clay loam (CL)
20"-31"	clay (CH)
31"-41"	clay (CH)
41"-50"	sandy loam (SM)
50"-132"	sandy loam (SM)

Seasonal water table – 11" below surface

Boring #2 (east boring):

Depth	Texture
0”-12”	silt loam (ML)
12”-22”	clay (CH)
22”-34”	clay loam (CL)
34”-42”	silt loam (ML)
42”-60”	sandy loam (SM)
60”-132”	sandy loam (SM)

Seasonal water table – 12” below surface

Building 9P – West Farrowing
Boring #1 (west boring):

Depth	Texture
0”-9”	clay loam (CL)
9”-22”	clay (CH)
22”-32”	clay (CH)
32”-48”	clay loam (CL)
48”-65”	clay loam (CL)
65”-132”	silt loam (ML)

Seasonal water table – 12” below surface

Boring #2 (east boring):

Depth	Texture
0”-10”	clay loam (CL)
10”-25”	clay loam (CL)
25”-33”	clay (CH)
33”-46”	clay (CH)
46”-70”	clay loam (CL)
70”-100”	silt loam (ML)
100”-132”	sandy loam (SM)

Seasonal water table – 12” below surface

Building 10P – South Gestation
Boring #1 (east boring):

Depth	Texture
0”-10”	silt loam (ML)
10”-18”	silt loam (ML)
18”-28”	clay loam (CL)
28”-42”	clay (CH)
42”-56”	silt loam (ML)
56”-96”	sandy loam (SM)
96”-132”	silt loam (ML)

Seasonal water table – 10” below surface

Boring #2 (middle boring):

Depth	Texture
0”-10”	silt loam (ML)
10”-21”	clay (CH)
21”-31”	clay (CH)
31”-41”	clay (CH)
41”-52”	clay loam (CL)
52”-92”	sandy loam (SM)
92”-132”	silt loam (ML)

Seasonal water table – 21” below surface

Boring #3 (west boring):

Depth	Texture
0”-7”	silt loam (ML)
7”-18”	clay loam (CL)
18”-38”	clay (CH)
38”-48”	clay (CH)
48”-56”	clay loam (CL)
56”-72”	silt loam (ML)
72”-132”	sandy loam (SM)

Seasonal water table – 7” below surface

The information provided by the on-site soil investigation indicates that the soil properties are uniform and that a seasonal water table exists within the footprint of the proposed below-building concrete manure storages. The depth of the foundation and floor of the farrowing buildings (8P & 9P) below-building concrete manure storages will be located approximately on grade after the topsoil is removed (0”-10” below the existing ground surface). The depth of the foundation and floor of the gestation building (10P) will be located approximately 60” – 96” below the existing ground surface.

A perimeter tile drainage system is not required for buildings 8P (East Farrowing) and 9P (West Farrowing) since the seasonal water table identified by the on-site soil investigation is below the proposed below-building concrete manure storage. A perimeter tile drainage system with a tile riser observation point and a collection sump are planned to manage any potential seasonal water table at or below the concrete below-building manure storage for building 10P (South Gestation).

Design Summary _ Building 10P – South Gestation

A perforated perimeter tile drainage system with a tile riser observation point located at the northeast corner of building 10P will be used to collect and direct groundwater away from the building foundation. Groundwater from the tile riser observation sump will be pumped to a surface rock distributor located at least 50 feet from the proposed concrete manure storage. The rock distributor outlet is at least 50 feet from the property boundary in the direction of water flow. Water from the rock distributor will be directed to a grassed infiltration area and is planned to join the natural drainage patterns around the building.

The following details pertain to the seasonal water table management system plans for the below-ground concrete storage structures.

4” Diameter Perforated Drainage Tile (Option 1)

1. Perimeter subsurface drainage tile. A perforated 4”diameter drainage tile is to be placed around the foundation of the concrete manure storage tank.
2. The drainage tile will be installed approximately 96 inches from the side of the concrete manure storage side wall when a 5’-4” x 6’-8” O.D. manure pump out annex is used and approximately 40 inches from the end of the concrete manure storage tank end wall.
3. The drainage tile will be installed approximately 72 inches from the side of the concrete manure storage side wall when a 5’-4” x 4’-8” O.D. manure pump out annex is used and approximately 40 inches from the end of the concrete manure storage tank end wall.
4. The beginning of the perimeter tile will be located approximately 17” below the floor elevation. The perimeter tile slopes 0.25% to the collection sump. The perimeter tile will be installed to drain the seasonal water table to a common collection point. Each segment of the drainage tile will be installed to begin at the opposite corner of the building from the collection sump.

4” Diameter Perforated Drainage Tile (Option 2)

5. Perimeter subsurface drainage tile. A perforated 4”diameter drainage tile is to be placed around the foundation of the concrete manure storage tank.

6. The drainage tile will be installed approximately 12 inches from the sidewall and end wall of the building adjacent to the floor foundation footer. The drainage tile will be placed to follow the contour of the building and manure pump out annex footers.

7. The beginning of the perimeter tile will be located approximately 12" below (99'-0", relative elevation) the top of floor elevation of the manure storage floor slab elevation (100'-0" relative elevation). The perimeter tile slopes 0.25% to the collection sump. The perimeter tile will be installed to drain the seasonal water table to a common collection point. Each segment of the drainage tile will be installed to begin at the opposite corner of the building from the collection sump.

Installation Details

8. The perimeter drainage tile will be backfilled with gravel granular backfill per the plans.

9. The subsurface perimeter tile system is connected to the collection/observation sump.

10. Water collected in the collection/observation sump will be pumped to a rock distributor using a submersible pump.

11. A submersible pump capable of pumping the collected water from the collection sump will be used. A float activated switch will control the pump when water accumulates in the collection sump. A pump capable of pumping at least 100 gpm will be installed in the collection sump.

12. The submersible pump will be used as a shut-off to control water flow from the perimeter tile system and collection/observation sump, as applicable. The pump will be shut off or power disconnected to provide a shut-off in place of a closure or shut-off valve.

13. Electric service to the pump will be provided at the collection sump with a service disconnect or electrical outlet box. Electric service will be directed from the production building.

14. The collection sump and pump will be inspected regularly as part of the site inspections. Pump functionality will be noted as part of the inspection. An inoperable pump will be replaced as needed. A replacement pump will be maintained on-site, as needed, to allow for pump maintenance and/or replacement.

15. The production site includes a back-up generator and power supply. In the case of a power outage, the sump pump power supply will be maintained by the back-up power supply for the production site.

16. Water from the rock distributor is allowed to flow over the surface into a grassed vegetative infiltration area and join the existing drainage patterns.

17. See plans for details.

Perimeter Tile System Design:

In accordance with 327 IAC 19-12-2(a)(5), a perimeter tile system is proposed to lower the seasonal water table below the bottom of the waste management system. Groundwater flows through the soil adjacent to the concrete manure storage and is collected and drained away by the perimeter tile. The perimeter tile collects ground water and transfers the water to the collection/observation sump. A pump is used to pump water from the collection/observation sump to a rock outlet. The rock outlet is used to dissipate the energy in the water and distribute the water in sheet flow to an infiltration area.

Rate of soil water flow, Q:

To determine the required perimeter tile capacity, the rate of soil water flow to the tile is determined. The soil properties determine the rate water flows toward the perimeter tile and the amount of water presented to the tile to be collected and drained away by the perimeter tile. Darcy's law is used to determine the ability of water to flow through the soil to the perimeter tile. The rate of water flow is determined as follows.

$Q = K \times A \times \Delta h \div \Delta L$

Q = rate of water flow (volume per time), gpm/ft of tile

K = hydraulic conductivity, μm/sec

A = cross-sectional area of flow area per foot of tile, ft^2/ft

Δh = hydraulic head, ft

ΔL = distance of hydraulic head change, ft

Determine average tile depth below top of pit floor:

The perimeter tile is installed in two segments. The top of pit floor elevation is assumed to be 100'-0". The starting elevation of the perimeter tile at the point of beginning is 98'-7". The perimeter tile enters the collection/observation sump at an elevation of 97'-4". The average tile depth below the floor is:

d_a = 100'-0" – [(98'-7" + 97'-4") ÷ 2] = 2'-0.5" (24.5)

Assuming the bottom of the pit floor is 96" below the ground surface and the average tile depth below the top of the pit floor is 24.5", the tile is located 115.5" (96" -5" + 24.5") below the ground surface.

Determine hydraulic conductivity, K:

The on-site soil investigation identified the soil properties and presence or absence of a seasonal water table. Three (3) soil borings were completed. The three (3) soil borings indicated a seasonal water table within the depth of the soil boring and profile. The seasonal water table depth below the existing ground surface within the three (3) soil borings is:

- 10" (boring #1, east boring),
- 21" (boring #2, middle boring,
- 7" (boring #3, west boring)

The depth of the bottom of the foundation and floor of the gestation building (10P) will be located approximately 60" to 96" below the existing ground surface. A depth of 96" is used in the analysis. A perimeter tile seasonal water table management system is proposed for the gestation building for the soil properties described by the soil borings.

The seasonal water table management system perimeter tile is designed based on the soil properties described by the representative soil borings within the building footprint and adjacent to and within 50 feet of the building where a seasonal water table exists. Three (3) borings located within the building footprint are evaluated to determine the controlling conditions. There are no other borings within 50 feet of the building.

The on-site soil investigation describes the soil textures within the soil profile of the boring and identifies the depth of the seasonal water table. The information from the on-site soil investigation is summarized below.

Building 10P – South Gestation
Boring #1 (east boring):

Depth	Texture
0"-10"	silt loam (ML)
10"-18"	silt loam (ML)
18"-28"	clay loam (CL)
28"-42"	clay (CH)
42"-56"	silt loam (ML)
56"-96"	sandy loam (SM)
96"-132"	silt loam (ML)

Seasonal water table – 10" below surface

Boring #2 (middle boring):

Depth	Texture
0"-10"	silt loam (ML)
10"-21"	clay (CH)
21"-31"	clay (CH)
31"-41"	clay (CH)
41"-52"	clay loam (CL)
52"-92"	sandy loam (SM)
92"-132"	silt loam (ML)

Seasonal water table – 21" below surface

Boring #3 (west boring):

Depth	Texture
0"-7"	silt loam (ML)
7"-18"	clay loam (CL)
18"-38"	clay (CH)
38"-48"	clay (CH)
48"-56"	clay loam (CL)
56"-72"	silt loam (ML)
72"-132"	sandy loam (SM)

Seasonal water table – 7" below surface

The hydraulic conductivity of the soils is determined based on information available from the Natural Resource Conservation Service (NRCS), "Saturated Hydraulic Conductivity in Relation to Soil Texture". The NRCS information provides a range of saturated hydraulic conductivities in μm/sec for groups of soils by textural class. The values are summarized in the following Table 1. The average soil hydraulic conductivity values for each soil textural classification are used for a representative design. The average hydraulic conductivity values have been converted to ft/min and in/hr for ease of use in the calculations.

Table 1: Saturated Hydraulic Conductivity Summary.

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/office/ssr10/tr/?cid=nrcs144p2_074846

Texture	NRCS µm/sec (min)	NRCS µm/sec (max)	NRCS µm/sec (ave)	NRCS ft/min (ave)	NRCS in/hr (ave)
Coarse sand	141.14	-----	>141.14		
Sand	42.34	141.14	91.740	1.806×10^{-2}	13.003
Loamy sand	42.34	141.14	91.740	1.806×10^{-2}	13.003
Sandy loam	14.11	42.34	28.225	5.556×10^{-3}	4.000
Fine sandy loam	14.11	42.34	28.225	5.566×10^{-3}	4.000
Very fine sandy loam	4.23	14.11	9.170	1.805×10^{-3}	1.300
Loam	4.23	14.11	9.170	1.805×10^{-3}	1.300
Silt loam	4.23	14.11	9.170	1.805×10^{-3}	1.300
Silt	4.23	14.11	9.170	1.805×10^{-3}	1.300
Clay loam	1.41	4.23	2.820	5.551×10^{-4}	0.400
Sandy clay loam	1.41	4.23	2.820	5.551×10^{-4}	0.400
Silty clay loam	1.41	4.23	2.820	5.551×10^{-4}	0.400
Sandy clay	0.42	1.41	0.915	1.801×10^{-4}	0.130
Silty clay	0.42	1.41	0.915	1.801×10^{-4}	0.130
Clay	0.42	1.41	0.915	1.801×10^{-4}	0.130
Cd horizon Natric horizon, fragipan, orstein	0.00	0.42	0.210	4.134×10^{-5}	0.030

The soil texture and saturated hydraulic conductivity (Ksat) for each depth identified in the on-site soil investigation report are summarized below. The soil profile depth is 0" to 132" below the ground surface. The seasonal water table depth for the three (3) soil borings is 10" (boring #1, east boring), 21" (boring #2, middle boring), and 7" (boring #3, west boring) below the ground surface. The average tile depth below the ground surface is 115.5 inches (9.625 ft) assuming the manure storage is 96" below the existing ground surface. A weighted saturated hydraulic conductivity (Ksat) for the saturated soil profile above the perimeter tile for each representative boring where a seasonal water table exists is determined. The saturated soil profile above the perimeter tile is:

- 105.5 inches (10" to 115.5" below the existing ground surface; boring #1, east boring),
- 94.5 inches (21" to 115.5" below the existing ground surface, boring #2, middle boring)
- 108.5" (7" to 115.5" below the existing ground surface; boring #3, west boring)

For the analysis, a seasonal water table depth of 108.5" above the tile (7" below the ground surface) is used. It is noted that the average seasonal water table depth above the tile is approximately 102.83". The on-site soil investigation information was completed to 132" below the ground surface. The available on-site soil information is used to determine the saturated hydraulic conductivity (Ksat) for each soil boring.

The on-site soil information is reported using the USDA Soil Texture Classification System. The saturated hydraulic conductivity (Ksat) is determined using the USDA soil texture classification. The saturated hydraulic conductivity (Ksat) for each soil boring profile is presented in the following summary tables. An average weighted hydraulic conductivity (Ksat) is used in the analysis.

The saturated hydraulic conductivity (Ksat) for each soil boring profile is presented in the following summary tables.

Boring #1 – water table: assumed 7” below ground surface; average tile depth 115.5”

Depth	Texture	Ksat (in/hr)	Depth x Ksat
0”-7”	silt loam (ML)	1.30	-----
7”-10”	silt loam (ML)	1.30	3.90
10”-18”	silt loam (ML)	1.30	10.40
18”-28”	clay loam (CL)	0.40	4.00
28”-42”	clay (CH)	0.13	1.82
42”-56”	silt loam (ML)	1.30	18.20
56”-96”	sandy loam (SM)	4.00	160.00
96”-115.5	silt loam (ML)	1.30	25.35
115.5”-132”	silt loam (ML)	1.30	-----
Total			223.67
Weighted Ksat (in/hr)			**2.062 in/hr**

Boring #2 – water table: assumed 7”below ground surface; average tile depth 115.5”

Depth	Texture	Ksat (in/hr)	Depth x Ksat
0”-7”	silt loam (ML)	1.30	-----
7”-10”	silt loam (ML)	1.30	3.90
10”-21”	clay (CH)	0.13	1.43
21”-31”	clay (CH)	0.13	1.30
31”-41”	clay (CH)	0.13	1.30
41”-52”	clay loam (CL)	0.40	4.40
52”-92”	sandy loam (SM)	4.00	160.00
92”-115.5”	silt loam (ML)	1.30	30.55
115.5”-132”	silt loam (ML)	1.30	-----
Total			202.88
Weighted Ksat (in/hr)			**1.870 in/hr**

Boring #3 – water table: 7” below ground surface; average tile depth 115.5

Depth	Texture	Ksat (in/hr)	Depth x Ksat
0”-7”	silt loam (ML)	1.30	-----
7”-18”	clay loam (CL)	0.40	14.30
18”-38”	clay (CH)	0.13	8.00
38”-48”	clay (CH)	0.13	4.00
48”-56”	clay loam (CL)	0.40	3.20
56”-72”	silt loam (ML)	1.30	20.80
72”-115.5	sandy loam (SM)	4.00	56.55
115.5”-132”	sandy loam (SM)	4.00	-----
Total			106.85
Weighted Ksat (in/hr)			**0.985 in/hr**

Site Average Weighted Ksat (in/hr)	**1.639 in/hr**

Determine cross-sectional flow area, A:

A = W x H

W = 1ft, determine flow area per foot of perimeter tile
H = depth of seasonal water table above perimeter tile, ft
H = tile depth, ave + tank depth below ground surface- water table depth below ground surface
Tile depth below bottom of floor, ave = 19.5 in (1.625 ft)
Water table depth = 7" (0.583 ft; borings #3; most conservative)
Tank depth = 60" to 96"; Use 96" (8 ft)
H = 1.625 ft + 8 ft -0.583 ft = 9.042 ft

A = 1 ft x 9.042 ft = 9.042 ft^2/ft

Determine Δh:

$\Delta h = h_2 - h_1$

h_2 = depth of tile below existing ground surface, ft
h_1 = depth of water table below ground surface, ft

h_2 = 8 ft + 1.625ft = 9.625 ft; depth of tile below existing ground surface, ft
h_1 = 0.583 ft; (7" boring #3) depth of water table below ground surface, ft

Δh = 9.625 ft – 0.583 ft = 9.042 ft; hydraulic head
Use Δh = 9.042 ft; hydraulic head

Determine ΔL:

The distance of hydraulic head change, ΔL, is determined based on the length of the drawdown curve from the perimeter tile to the maximum depth of the seasonal water table above the tile. To determine the distance of hydraulic head change, the ellipse equation (National Engineering Handbook, Section 16 Drainage of Agricultural Land, Chapter 4 Subsurface Drainage) for subsurface drainage tile spacing is evaluated to estimate the distance between the tile and maximum depth of the seasonal water table above the tile.

The ellipse equation is based on the assumption that the streamlines of flow in a gravity system are horizontal and that the velocity of flow is proportional to the hydraulic gradient. The ellipse equation is applicable where ground water flow is largely in a horizontal direction and where soil and subsoil materials are underlain by a barrier at relatively shallow depths which restricts vertical flow and forces water to flow horizontally toward the drain.

For reference the ellipse equation (NEH Section 16 Chapter 4) is as follows.

$S = \sqrt{\{[4 \times K \times (m^2 + 2 \times a \times m)] \div q\}}$

S = drain spacing, ft
K = hydraulic conductivity, in/hr
m = vertical distance, after drawdown, of water table above drain midpoint, ft
m = depth of seasonal water table above the tile, ft
d_d = depth of drain below ground surface, ft
a = depth of barrier (limiting layer) below drain, ft ($a \le d_d$)
c = depth to water table, ft (seasonal water table depth below ground surface)
q = drainage coefficient, in/hr

According to the National Engineering Handbook, Section 16 Drainage of Agricultural Land, Chapter 4 Subsurface Drainage, a barrier at relatively shallow depths is described as twice the depth of the drain or less. It is interpreted that the depth of the barrier (a) below the drain is limited to the depth of the drain below the ground surface. The soil borings were completed to a depth of 96 inches below the ground surface. An impervious barrier was not identified in the on-site soil investigation profile.

Since the site specific information from the on-site soil investigation did not identify or document the depth of a limiting layer, for this analysis the depth to the limiting layer below the perimeter tile is assumed to be the greater of the soil boring depth or two (2) feet below the lowest elevation of the tile not to exceed the depth of the drain below the ground surface. In accordance with the ellipse equation (NEH) the depth to the limiting layer below the tile will not exceed the value of the depth of the tile below the ground surface.

For the perimeter tile design, the distance of hydraulic head change is assumed to be half of the required drain spacing determined by the ellipse equation since the peak of the drawdown curve is typically at the midpoint between drains. The value of ΔL will be set to half of the calculated required drain spacing (½S).

The drainage coefficient (q) is the rate of water removal (volume per unit area) expressed as a vertical depth of water removed in 24 hours. Typically the drainage rate/drainage coefficient (Table 6, ASAE EP480) for mineral soils is 3/8 in/24 hours to ½ in/24 hours (0.015625 in/hr – 0.02083 in/hr). For the perimeter tile design it is assumed that water movement occurs more rapidly through the soil profile. For a conservative design, the drainage coefficient is assumed to be equal to the rate of water removal from a unit area vertical column of soil equal to the depth of the seasonal water table above the drain (m) in 24-hours based on the specific yield of the soil not to exceed the soil specific hydraulic conductivity. Based on this assumption, it is expected that a faster soil water drawdown will occur and the distance of hydraulic head change will be shorter resulting in a more conservative design.

The specific yield for individual soil materials is summarized in Table 2 below. Table 2 is for specific soil materials and does not include a specific yield for each of the USDA soil texture classifications and texture classifications presented in Table 1 Saturated Hydraulic Conductivity. Based on the information presented in Table 2 and the USDA soil texture classifications an equivalent specific yield is determined for each of the soil classifications identified in Table 1. The equivalent specific yield for each soil classification is summarized in Table 3.

Table 2: Specific Yield Summary.

Compilation of Specific Yield for Various Materials, United States Department of The Interior Geological Survey, Denver, Colorado 1963 (Revised 1966); Table: "Specific yields of various materials", page 1a.

Material	Number of determinations	Specific Yield, Maximum, %	Specific Yield, Minimum, %	Specific Yield, Average, %
Clay	15	5	0	2
Silt	16	19	3	8
Sandy clay	12	12	3	7
Fine sand	17	28	10	21
Medium sand	17	32	15	26
Coarse sand	17	35	20	27
Gravelly sand	15	35	20	25
Fine gravel	17	35	21	25
Medium gravel	14	26	13	23
Coarse gravel	14	26	12	22

Table 3: Average Specific Yield Summary – USDA-NRCS Soil Texture Classifications.
For soil materials not included in Table 2, the percent of silt, clay and sand based on the USDA soil texture classification are estimated and used to determine an effective specific yield. For soil materials included in Table 2 the average specific yield is used.

Material	Number of determinations	Specific Yield, Maximum, %	Specific Yield, Minimum, %	Specific Yield, Average, %
Coarse gravel	14	26	12	22.0
Medium gravel	14	26	13	23.0
Fine gravel	17	35	21	25.0
Gravelly sand	15	35	20	25.0
Coarse sand	17	35	20	27.0
Medium sand	17	32	15	26.0
Sand	N/A			21.6
Fine sand	17	28	10	21.0
Loamy sand	N/A			17.6
Sandy loam	N/A			16.5
Fine sandy loam	N/A			13.6
Very fine sandy loam	N/A			13.6
Loam	N/A			10.8
Silt loam	N/A			5.8
Silt	16	19	3	8.0
Clay loam	N/A			9.9
Sandy clay loam	N/A			14.9
Silty clay loam	N/A			5.5
Sandy clay	12	12	3	7.0
Silty clay	N/A			4.9
Clay	15	5	0	2.0

Determine drainage coefficient (q); specific yield determination:
The drainage coefficient (q) is determined based on the specific yield of the soil textures for each depth identified in the on-site soil investigation report. A weighted specific yield for the saturated soil profile above the perimeter tile for each representative boring is determined. The saturated soil profile above the perimeter tile based on the most limiting depth of the seasonal high water table is used. For the gestation building the saturated soil profile above the perimeter tile is 108.5 inches (115.5" – 7.0"). The on-site soil investigation information was completed to 132" below the ground surface. The available on-site soil information is used to determine the specific yield for each soil boring.

The on-site soil information is reported using the USDA Soil Texture Classification System. The specific yield is presented using the USDA Soil Texture Classification. The weighted specific yield for each boring is presented in the following summary tables. An average weighted specific yield is used in the analysis.

Boring #1 – water table: assumed 7" below ground surface; average tile depth 115.5"

Depth	Texture	Specific Yield (%)	Specific yield x Depth
0"-7"	silt loam (ML)	5.80	-----
7"-10"	silt loam (ML)	5.80	17.40
10"-18"	silt loam (ML)	5.80	46.40
18"-28"	clay loam (CL)	9.90	99.00
28"-42"	clay (CH)	2.00	28.00
42"-56"	silt loam (ML)	5.80	81.20
56"-96"	sandy loam (SM)	16.50	660.00
96"-115.5	silt loam (ML)	5.80	113.10
115.5"-132"	silt loam (ML)	5.80	-----
Total			1,045.10
Weighted Specific Yield (%)			**9.64%**

Boring #2 – water table: assumed 7"below ground surface; average tile depth 115.5"

Depth	Texture	Specific Yield (%)	Specific yield x Depth
0"-7"	silt loam (ML)	5.80	-----
7"-10"	silt loam (ML)	5.80	17.40
10"-21"	clay (CH)	2.00	22.00
21"-31"	clay (CH)	2.00	20.00
31"-41"	clay (CH)	2.00	20.00
41"-52"	clay loam (CL)	9.90	108.90
52"-92"	sandy loam (SM)	16.50	660.00
92"-115.5"	silt loam (ML)	5.80	136.30
115.5"-132"	silt loam (ML)	5.80	-----
Total			984.60
Weighted Specific Yield (%)			**9.08%**

Boring #3 – water table: 7" below ground surface; average tile depth 115.5

Depth	Texture	Specific Yield (%)	Specific yield x Depth
0"-7"	silt loam (ML)	5.80	-----
7"-18"	clay loam (CL)	9.90	108.90
18"-38"	clay (CH)	2.00	40.00
38"-48"	clay (CH)	2.00	20.00
48"-56"	clay loam (CL)	9.90	79.20
56"-72"	silt loam (ML)	5.80	92.80
72"-115.5	sandy loam (SM)	16.50	717.75
115.5"-132"	sandy loam (SM)	16.50	-----
Total			1,058.65
Weighted Specific Yield (%)			**9.76%**
Site Average Weighted Specific Yield (%)			**9.50%**

Determine drainage coefficient, q:

Drainage coefficient, q = SY x V x 12 in/ft ÷ 24 hr

Assume a unit area (1 ft^2) to determine the depth (in) of water removed from the soil profile within 24 hours representing the drainage coefficient (q).

V = A x d = 1 ft^2 x 9.042 ft = 9.042 ft^3/ft^2

q = 9.042 ft^3/ft^2 x 12 in/ft x 9.50% ÷ 100 ÷ 24 hr
q = 0.430 in/hr

Compare to hydraulic conductivity, K: K = 1.639 in/hr
0.430 in/hr < 1.639 in/hr

Set q = 0.430 in/hr

Determine spacing (S) – Ellipse equation (NEH Section 16 Chapter 4)

S = √{[4 x K x (m^2 + 2 x a x m)] ÷ q}

S = drain spacing, ft
K = hydraulic conductivity, in/hr
m = vertical distance, after drawdown, of water table above drain midpoint, ft
m = depth of seasonal water table above the tile, ft
d_d = depth of drain below ground surface, ft
a = depth of barrier (limiting layer) below drain, ft (a <= d_d)
NOTE: depth of barrier (limiting layer) below ground surface is assumed to the lesser of the depth of the soil boring or 2 feet below the average tile depth, not to exceed the depth of the tile below the ground surface.
c = depth to water table, ft (seasonal water table depth below ground surface)
q = drainage coefficient, in/hr

K =1.639 in/hr
c = 0.583 ft (7", borings #3)
d_d = 9.625 ft
m = d_d – c = 9.625 ft -0.583 ft = 9.042 ft
(assume that m is equal to the depth of the seasonal water table above the tile; the peak of the drawdown curve between drains is assumed to be at the seasonal water table depth; no additional drawdown is assumed to conservatively estimate the hydraulic head)
a = depth of barrier (limiting layer)
soil boring depth
a = 11.0' – 9.042' = 1.958 ft (soil boring depth)

2 ft below the lowest elevation of tile

Existing ground elevation:	107.583 ft (relative to top of floor, 100.0 ft)
Lowest tile elevation:	97.333 ft
Depth 2 ft below tile elevation:	95.333 ft
Average tile elevation:	97.958 ft

A = 97.958 ft – 95.333 ft = 2.625 ft (lowest tile elevation)

tile depth
a = d_d = 9.625 ft

[2.625 ft > 1.958 ft] < 9.625 ft

Use a = 2.625 ft

a = 2.625 ft

$q = 0.0156$ in/hr (typical drainage coefficient for mineral soils is 3/8 in/24 hr);
$q = 0.430$ in/hr (determine based on soil specific yield and water table depth)

$S = \sqrt{\{[4 \times 1.639 \text{ in/hr} \times ((9.042)^2 \text{ ft}^2 + 2 \times 2.625 \text{ ft} \times 9.042 \text{ ft})] \div 0.430 \text{ in/hr}\}}$

$S = \sqrt{\{[4 \times 1.639 \text{ in/hr} \times 129.23 \text{ ft}^2] \div 0.430 \text{ in/hr}\}}$

$S = \sqrt{1{,}970 \text{ ft}^2} = 44.4$ ft

$\Delta L = ½ \times S$; assume that the change in hydraulic head is half the drain spacing, S, determined by the ellipse equation.

$\Delta L = ½ \times 44.4 \text{ ft} = 22.2$ ft

Use $\Delta L = 22.2$ ft

Determine Q, rate of water flow:

$Q = K \times A \times \Delta h \div \Delta L$

Wean-to-finish Building

$K = 1.639$ in/hr
$A = 9.042$ ft
$\Delta h = 9.042$ ft
$\Delta L = 22.2$ ft

$Q = 1.639 \text{ in/hr} \times \text{ft}/12 \text{ in} \times \text{hr}/60 \text{ min} \times 9.042 \text{ ft}^2/\text{ft} \times 9.042 \text{ ft} \div 22.2 \text{ ft} \times 7.4805 \text{ gallons/ft}^3$
$= 0.0628$ gpm/ft of tile

The rate of water flow into the perimeter tile under saturated conditions is 0.0628 gpm/ft.

The total rate of water flow required to be carried by the perimeter tile is dependent upon the length of perimeter tile between the point of beginning and the outlet to the collection observation sump. The perimeter tile is installed in two sections starting at the opposite corner from the collection observation sump. The length of tile from the point of beginning to the outlet is approximately 514'-4". To determine the total rate of water flow the rate of water flow, Q, is multiplied by the tile length.

Q_T, gpm = Q, gpm/ft x Tile length, ft
Q_T, gpm = 0.0628 gpm/ft x 514.333 ft
$Q_T = 32.3$ gpm (peak flow)

Perimeter tile capacity:

A 5" diameter perforated perimeter tile sloped 0.25% toward the collection/observation sump is used to collect and convey water to the collection/observation sump. Manning's equation for uniform pipe flow is used to determine the perimeter tile capacity. Assume a 5" diameter corrugated drainage tile with corrugated inner walls sloped 0.25%. For this assessment, assume the pipe is running full (100%).

$Q = VA = (1.49 \div n) \times A \times R^{2/3} \times \sqrt{S}$

Q = flow rate, ft^3/sec
V = ft/s
n = Manning's roughness coefficient
A = flow area, ft^2
R = hydraulic radius, ft
S = slope, ft/ft

Manning's roughness coefficient, n

n = 0.018 – 0.025 (corrugated tile, corrugated inner wall)
Use n = 0.021 (corrugated inner wall)

Flow area, A (ft^2)
$A = \pi \times (2.5 \text{ in})^2 \times 1 \text{ ft}^2/144 \text{ in}^2 = 0.1364 \text{ ft}^2$

Wetted perimeter, ft
$P = 2\pi R = 2 \times 3.14159 \times 2.5 \text{ in} \times 1 \text{ ft}/12 \text{ in}$
$P = 1.3090$

Hydraulic radius, R (ft); assume pipe flow is 100%)
R = cross-sectional area / wetted perimeter
$R = 0.1364 \text{ ft}^2 \div 1.309 \text{ ft} = 0.1042$

Pipe slope, S (ft/ft)
$S = 0.25\% = 0.0025$ ft/ft

Determine Q, pipe flow rate, assume pipe flow is 100% and corrugated inner wall:

$$Q = (1.49 \div n) \times A \times R^{2/3} \times \sqrt{S}$$
$$= (1.49 \div 0.021) \times 0.1364 \text{ ft}^2 \times (0.1042)^{2/3} \times \sqrt{.0025}$$
$$= 0.107 \text{ ft}^3/\text{s}$$

$$Q = 0.107 \text{ ft}^3/\text{s} \times 7.4805 \text{ gal/ft}^3 \times 60 \text{ sec/min}$$
$= 48.0$ gpm (corrugated inner wall)

Note: The maximum flowrate occurs when the perimeter tile is running at approximately 93.8% full. A Manning's equation calculator determined that the maximum flow rate is 51.5594 gpm when running 93.8% full.

The 5" diameter perimeter tile (corrugated inner wall) flowrate capacity is 48.0 gallons per minute when flowing at 100%. The maximum peak flowrate of water through the soil profile in proximity of the buildings is 0.0628 gpm/ft of soil width when the soil is saturated. The expected flowrate of water through the soil profile will typically be less. A perforated subsurface drainage tile (514.333 ft x 2 sections) is placed around the below-building concrete manure storage. The peak flowrate of water to be carried by each section of tile is 32.3 gpm. The peak flowrate of the perimeter tile is less than the tile capacity of 48.0 gpm (100% full) and 51.5594 gpm (93.8% full). The 5" diameter perimeter tile, corrugated wall, sloped at 0.25% is adequate to collect and convey the water to the collection observation sump.

Collection/observation sump capacity:
A 36" diameter collection/observation sump is proposed for the buildings. The perimeter tile outfall is located 2'-6" above the bottom of the collection/observation sump floor. Water is collected and accumulated in the collection/observation sump and pumped to a rock outlet. A 75 - 100 gpm sump pump is proposed to pump water from the collection/observation sump to the rock outlet.

The collection/observation sump is to be constructed at least 2'-6" below the inlet to the sump providing water storage capacity in the sump below the inlet pipe. The available water storage capacity is:

36" diameter sump

$V = A \times D$

V = volume, ft^3
A = area, ft^2
D = depth, ft

$$V = \pi \times (18 \text{ in})^2 \times 1 \text{ ft}^2/144 \text{ in}^2 \times 2.5 \text{ ft}$$
$$= 17.6 \text{ ft}^3$$

$$V = 17.6 \text{ ft}^3 \times 7.4805 \text{ gal/ft}^3$$
$= 131$ gallons

The expected peak perimeter tile flowrate is 32.3 gpm. There are two perimeter tile inlets to the collection observation sump. The maximum flowrate into the collection/observation sump is 64.6 gpm. Based on the expected perimeter tile peak flowrate the collection/observation sump will fill in approximately 2 minutes. A 100 gpm sump pump is proposed to remove collected water from the sump. At 100 gpm, the required pump operating time to empty the sump will be approximately 3 minutes and 42 seconds. After the collection/observation sump is emptied, approximately 2 minutes will be required to fill the collection/observation sump to full capacity. At that point the cycle is repeated. The expected cycle time based on these assumptions is approximately 5 minutes and 42 seconds for a 100 gpm pump.

Based on this analysis, the 36-inch diameter collection/observation sump provides adequate water storage capacity between pumping cycles and the sump pump does not have to run continuously during peak flow conditions to adequately remove the water from the collection/observation sump. A 36" diameter collection/observation sump with at least 2'-6" of storage depth is proposed to manage and control the potential seasonal water table.

Rock outlet:
A rock outlet chute (riprap basin/apron) is used to dissipate the energy from water discharged from the outlet pipe to control soil erosion and create sheet flow into a vegetative infiltration area. The rock chute includes a dissipation pool and distribution apron. The rock outlet is based on the design for riprap energy dissipater design for culverts.

Determine the maximum pipe outlet velocity, V (75-100 gpm pump; 2" diameter outlet pipe):

$V_o = Q \div A$

Q = flowrate, ft^3/s

$Q = 100$ gpm x 1 ft^3/7.4805 gallons x 1 min/60 sec

$Q = 0.223\ ft^3/s$

A = pipe outlet area, ft^2

$A = \pi \times (1\ in)^2\ ft^2/144\ in^2$

$A = 0.0218\ ft^2$

$V_o = 0.223\ ft^3/s \div 0.0218\ ft^2 = 10.23$ ft/s (100 gpm pump)

Allowable outlet velocity to control erosion in a vegetative infiltration area is < 4.0 ft/s

Use a rock chute to control the water discharge at the pipe outlet.

Select riprap diameter, D_{50}

Use at least 2" diameter riprap. D_{50} =2" (0.167 ft)

Determine rock outlet dimensions

Flow depth at outlet pipe, y_o: y_o = 2" (0.167 ft)

Equivalent outlet depth, y_e = outlet flow depth, y_o = 2" (0.167 ft)

Riprap dissipater basin depth, h_s – v = 10.23 ft/s

$h_s/y_e = 0.86 \times (D_{50}/y_e)^{-0.55} \times (V_o / \sqrt{(g \times y_e)}) - 1.4$

$h_s/y_e = 0.86 \times (0.167\ ft / 0.167\ ft)^{-0.55} \times (10.23\ ft/s / \sqrt{(32.174\ lb\text{-}ft/lb\text{-}s^2 \times 0.167\ ft)}) - 1.4$

$h_s/y_e = 0.593$

$h_s = 0.593 \times 0.167\ ft = 0.099$ ft (1.2")

Check $h_s / D_{50} > 2.0$ and $D_{50} / y_e > 0.1$

$h_s / D_{50} = 0.0.099 / 0.167 = 0.593 < 2.0$ NO GOOD

Set $h_s / D_{50} = 2.0$

$h_s = 2.0 \times 0.167\ ft = 0.333$ ft (4") Use $h_s = 0.5$ ft (6")

Determine riprap dissipater basin dimensions:

Dissipater rock outlet basin length, $L_s = 10h_s = 10 \times 0.5$ ft = 5 ft

Minimum basin length, $L_s = 3W_o$ [W_o = outlet diameter, 0.167 ft]

$L_s = 3 \times 0.167$ ft = 0.501 ft

Use basin length, $L_s = 5$ ft

Total rock outlet basin length (dissipater basin and exit apron), L_B

$L_B = 15h_s = 15 \times 0.5$ ft = 7.5 ft

Minimum total basin length, $L_B = 4W_o$ [W_o = outlet diameter, 0.167 ft]

$L_B = 4 \times 0.167$ ft = 0.667 ft

Rock outlet basin width, $W_B = W_o + 2 \times (L_B / 3)$

$W_B = 0.167$ ft + 2 x (7.5 ft / 3) = 5.167 ft

Use a 5' wide x 10' long x 6" deep (minimum) rock outlet.

To allow for sufficient water discharge depth and capacity, taper the rock outlet 12" at the pipe outlet to 6" at the rock outlet discharge.

Determine rock outlet basin exit depth, y_B, and exit velocity, V_B:

The exit velocity, V_B, is approximately the critical velocity, V_c, for the water flow exiting the rock outlet. The exit velocity, V_B, can be calculated by determining the critical depth, y_c. The critical depth is equal to the rock outlet basin exit depth, y_B. The following relationship can be used to determine the critical depth, y_c. Once the critical depth (exit depth) is determined the critical velocity (exit velocity) can be determined.

$(Q^2 \times T_c) \div (g \times A_c^3) = 1$

Q = flowrate, ft^3/s

T_c = water surface width, ft

G = gravitational constant, 32.174

A_c = flow area, ft^2

Express A_c and T_c in terms of basin width, W_B, and flow depth, y_c

$A_c = y_c \times (W_B + 2y_c)$

$T_c = W_B + 4y_c$

Solve for Q = 0.223 ft3/s (100 gpm pump)

Rearrange the original equation and solve by iteration for y_c

$(Q^2 \div g) = [y_c \times (W_B + 2y_c)]^3 \div (W_B + 4y_c)$

$(Q^2 \div g) = (0.223\ ft^3/s)^2 \div 32.174 = 0.00169$

$0.00169 = [y_c \times (5 + 2y_c)]^3 \div (5 + 4y_c)$

Solve by iteration:

$y_c = 0.0405$ ft (0.5")

Solve for V_c

$V_c = Q \div A_c$

$Q = 0.223\ ft^3/s$

$A_c = 0.0405$ ft x (5 ft + 2 x 0.0405 ft) = 0.206 ft^2

$V_c = 0.223\ ft^3/s \div 0.206\ ft^2 = 1.08$ ft/s

Allowable velocity = 4 ft/s

1.08 ft/s < 4.0 ft/s OKAY

Design Summary:

- Ground water flowrate (peak) – 0.0628 gpm/ft of length
- Perimeter tile peak flowrate - 32.3 gpm (514.333 ft of tile)
- Perimeter tile capacity – 5" diameter perforated perimeter tile (corrugated inner wall)
  48.0 gpm; 100% flow capacity (corrugated inner wall)
  51.5594 gpm; 93.8% flow capacity (corrugated inner wall)
- Collection/observation sump -- 36" diameter sump with 2'-6" water storage depth
  - Reserve storage capacity: 131 gallons
  - Recharge fill time: 2 minute and 0 seconds
- Sump pump -- 100 gpm pump
  - Sump emptying time: 3 minute and 42 seconds (100 gpm pump)
  - Pump cycle time: approximately 5 minutes and 42 seconds (100 gpm pump)
- Rock outlet -- 5' wide x 10' long x 6" deep (minimum) rock outlet
  - Rock outlet width: 5 feet
  - Rock outlet length: 10 feet
  - Rock outlet thickness: 6 inch (minimum); 12 inch inlet end tapered to 6 inch outlet end
  - Pipe outlet velocity: 10.23 ft/s (100 gpm pump)
  - Riprap (rock) diameter: 2" (minimum)
  - Rock outlet exit depth: 0.5 inch (100 gpm pump)
  - Rock outlet exit velocity: 1.08 ft/s (100 gpm pump)
  - Allowable exit velocity: 4.0 ft/s (grassed infiltration area)

The seasonal water table management system perimeter tile, collection/observation sump, sump pump, outlet pipe, rock distributor, and vegetative infiltration area are sufficient to lower the seasonal water table below the bottom of the waste management system in accordance with 327 IAC 19-12-2(a)(5).

CHESTNUT RIDGE CONSULTING, INC.
JOHN BOWEN
7208 EAST CO. RD. 100 SOUTH
SEYMOUR, IN 47274
(812) 521-0995

TYPE OF ASSISTANCE REQUESTED: Soil and Site Evaluation for a Proposed Hog Buildings

ASSISTANCE REQUESTED BY: Nick Maple, Top Grade
2667 E. St. Rd. 18
Kokomo, IN 46901
765/863-1720

DATE OF ASSISTANCE: September 28, 2018

LOCATION OF SITE: County: Howard
Location: 5508 North Co. Rd. 400 West
Galveston, IN

NUMBER/SIZE OF BUILDINGS: 3 Hog Buildings – 1) Approx. 77 feet x 416 feet
2) Approx. 84 feet x 152 feet
3) Approx. 63 feet x 118 feet

PERSONS PRESENT: John and Michael Bowen (Soil Scientist)

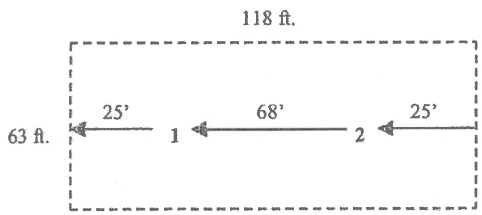
NOTES: Soil borings were taken within the footprint of 3 proposed hog buildings. See soil description forms and diagrams for details. There was no evidence of bedrock to a depth of 11 feet. In addition, there was no evidence of karst topography or karst features at the site. There was no evidence of drainage swales, ponds, creeks, or other water features within 300 feet of the soil borings. A seasonal high water table was present at all of the soil borings.

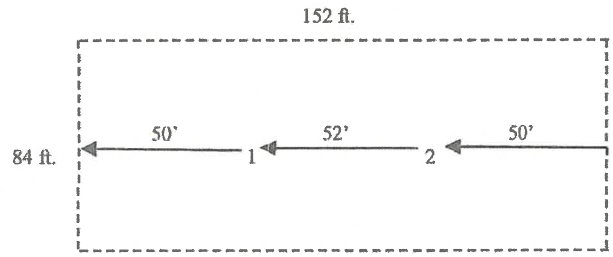
SIGNED/DATE: John Bowen 10/30/18 John F. Bowen, Indiana Registry of Soil Scientists
Registered Professional Soil Scientist, #102

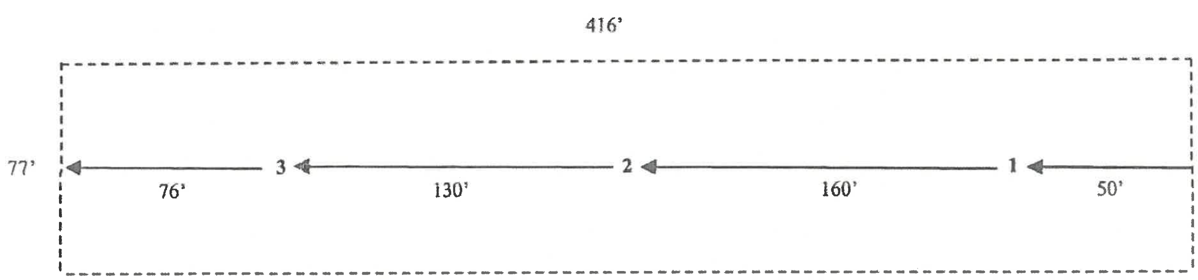
DIAGRAM FOR LOCATION OF SOIL BORINGS

NAME: Top Grade
DATE: 9/28/18

The following diagram is based on a site map provided by Dan Kinker with United Animal Health that shows the location of the proposed buildings.







SOIL AND SITE INFORMATION FOR: Top Grade -- 9/28/18

152 ft. x 84 ft. Building

BORING #1

SLOPE:	1%	LANDSCAPE POSITION:	Upland	LANDUSE:	Idle
ASPECT:	Northeast	LANDFORM:	Till Plain	VEGETATION:	Grass
		SLOPE POSITION:	Flat		

TYPE AND DEPTH TO LIMITING LAYER: Massive, Compact Glacial Till at 50"
DEPTH TO BEDROCK: >132" (11 ft)
DEPTH TO POOR FILTERING LAYER (COARSE SAND AND GRAVEL): None
DEPTH TO SEASONAL HIGH WATER TABLE: 11"
IS KARST TOPOGRAPHY OR KARST FEATURES PRESENT? No
FLOODING? No
PONDING? No
CUT/FILL? No

HOR-ZON	DEPTH (INCH)	UNIFIED SOIL CLASSIFICATION	COLOR MATRIX	COLOR MOTTLES	SOIL STRUCTURE	CONSIST-ENCE	% COARSE FRAG.	EFFER-VESENCE
A	0-11	ML	10YR 3/1	None	Weak-Sbk	Friable	1	None
AB	11-20	CL	10YR 3/1	10YR 5/6	Weak-Sbk	Firm	1	None
Btg1	20-31	CH	10YR 4/1	10YR 5/2, 10YR 4/6	Moderate-Sbk	Very Firm	1	None
Btg2	31-41	CH	10YR 4/2	10YR 5/2, 10YR 5/6	Moderate-Sbk	Very Firm	2	None
Cg	41-50	SM	10YR 4/2	10YR 5/4	Massive	Very Friable	2	None
Cd1	50-132	SM	10YR 5/3	10YR 6/2, 10YR 5/4	Massive-Compact	Very Firm	5	Strong

SOIL AND SITE INFORMATION FOR: Top Grade -- 9/28/18

152 ft. x 84 ft. Building

BORING #2

SLOPE:	1%	LANDSCAPE POSITION:	Upland	LANDUSE:	Idle
ASPECT:	Northeast	LANDFORM:	Till Plain	VEGETATION:	Grass
		SLOPE POSITION:	Flat		

TYPE AND DEPTH TO LIMITING LAYER: Massive, Compact Glacial Till at 60-132"
DEPTH TO BEDROCK: >132" (11 ft)
DEPTH TO POOR FILTERING LAYER (COARSE SAND AND GRAVEL): None
DEPTH TO SEASONAL HIGH WATER TABLE: 12"
IS KARST TOPOGRAPHY OR KARST FEATURES PRESENT? No
FLOODING? No
PONDING? No
CUT/FILL? No

HOR-ZON	DEPTH (INCH)	UNIFIED SOIL CLASSIFICATION	COLOR MATRIX	COLOR MOTTLES	SOIL STRUCTURE	CONSIST-ENCE	% COARSE FRAG.	EFFER-VESENCE
A	0-12	CL	10YR 3/1	None	Weak-Sbk	Firm	0	None
BA	12-22	CH	10YR 3/1	10YR 5/2	Moderate-Sbk	Very Firm	1	None
Btg	22-34	CL	10YR 5/2	10YR 5/6	Moderate-Sbk	Firm	2	None
[illegible]g	34-42	ML	10YR 5/2	10YR 6/2, 10YR 5/6	Weak-Sbk	Friable	3	None
[illegible]	42-60	SM	10YR 5/3	10YR 6/1, 10YR 4/4	Massive	Very Friable	10	None
Cd	60-132	SM	10YR 5/4	10YR 5/3, 10YR 5/6	Massive-Compact	Very Firm	10	Strong

SOIL AND SITE INFORMATION FOR: Top Grade -- 9/28/18

63 ft. x 18 ft. Building

BORING #1

SLOPE:	1%	LANDSCAPE POSITION:	Upland	LANDUSE:	Idle
ASPECT:	West	LANDFORM:	Till Plain	VEGETATION:	Grass
		SLOPE POSITION:	Flat		

TYPE AND DEPTH TO LIMITING LAYER: Massive, Firm Silty Clay Loam at 48-65"
Massive, Compact Glacial Till at 65-132"

DEPTH TO BEDROCK: >132" (11 ft)

DEPTH TO POOR FILTERING LAYER (COARSE SAND AND GRAVEL): None

DEPTH TO SEASONAL HIGH WATER TABLE: 12"

IS KARST TOPOGRAPHY OR KARST FEATURES PRESENT? No

FLOODING? No

PONDING? No

CUT/FILL? No

HOR-ZON	DEPTH (INCH)	UNIFIED SOIL CLASSIFICATION	COLOR MATRIX	COLOR MOTTLES	SOIL STRUCTURE	CONSIST-ENCE	% COARSE FRAG.	EFFER-VESENCE
A	0-9	CL	10YR 3/2	None	Weak-Sbk	Firm	0	None
Btg	9-22	CH	10YR 2/2	10YR 4/6	Moderate-Sbk	Very Firm	1	None
Bt	22-32	CH	10YR 3/2	10YR 5/4	Moderate-Sbk	Firm	2	None
BC	32-48	CL	10YR 5/3	10YR 5/2, 10YR 5/4	Weak-Sbk	Firm	3	None
2C	48-65	CL	10YR 5/2	10YR 6/1, 10YR 5/6	Massive	Firm	10	Strong
2Cd	65-132	ML	10YR 5/4	10YR 5/3, 10YR 5/6	Massive-Compact	Very Firm	10	Strong

SOIL AND SITE INFORMATION FOR: Top Grade -- 9/28/18

63 ft. x 18 ft. Building

BORING #2

SLOPE:	1%	LANDSCAPE POSITION:	Upland	LANDUSE:	Idle
ASPECT:	Northwest	LANDFORM:	Till Plain	VEGETATION:	Grass
		SLOPE POSITION:	Flat		

TYPE AND DEPTH TO LIMITING LAYER: Massive, Firm Clay Loam at 46-70"
Massive, Compact Glacial Till at 70-132"

DEPTH TO BEDROCK: >132" (11 ft)

DEPTH TO POOR FILTERING LAYER (COARSE SAND AND GRAVEL): None

DEPTH TO SEASONAL HIGH WATER TABLE: 12"

IS KARST TOPOGRAPHY OR KARST FEATURES PRESENT? No

FLOODING? No

PONDING? No

CUT/FILL? No

HOR-ZON	DEPTH (INCH)	UNIFIED SOIL CLASSIFICATION	COLOR MATRIX	COLOR MOTTLES	SOIL STRUCTURE	CONSIST-ENCE	% COARSE FRAG.	EFFER-VESENCE
A	0-10	CL	10YR 2/2	None	Weak-Sbk	Firm	2	None
BA	10-25	CL	10YR 2/2	None	Moderate-Sbk	Firm	1	None
Btg	25-33	CH	10YR 5/2	10YR 5/6	Moderate-Sbk	Very Firm	0	None
BCg	33-46	CH	10YR 5/4	10YR 6/2, 10YR 6/6	Weak-Sbk	Firm	0	None
Cg	46-70	CL	10YR 6/1	10YR 6/1, 10YR 5/6	Massive	Firm	2	None
[illegible]1	70-100	ML	10YR 5/4	10YR 6/2, 10YR 5/6	Massive-Compact	Very Firm	5	Strong
Cd2	100-132	SM	10YR 5/4	10YR 5/3, 10YR 5/6	Massive-Compact	Very Firm	5	Strong

SOIL AND SITE INFORMATION FOR: Top Grade -- 9/28/18

'6 ft. x 77 ft. Building

BORING #1

SLOPE: 1%
ASPECT: North
LANDSCAPE POSITION: Upland
LANDFORM: Till Plain
SLOPE POSITION: Toeslope
LANDUSE: Cropland
VEGETATION: Soybeans

TYPE AND DEPTH TO LIMITING LAYER: Massive, Compact Glacial Till at 56-132"
DEPTH TO BEDROCK: >132" (11 ft)
DEPTH TO POOR FILTERING LAYER (COARSE SAND AND GRAVEL): None
DEPTH TO SEASONAL HIGH WATER TABLE: 10"
IS KARST TOPOGRAPHY OR KARST FEATURES PRESENT? No
FLOODING? No
PONDING? No
CUT/FILL? No

HOR-ZON	DEPTH (INCH)	UNIFIED SOIL CLASSIFICATION	COLOR MATRIX	COLOR MOTTLES	SOIL STRUCTURE	CONSIST-ENCE	% COARSE FRAG.	EFFER-VESENCE
Ap	0-10	ML	10YR 3/2	None	Weak-Sbk	Friable	0	None
BE	10-18	ML	10YR 4/2	10YR 5/2	Weak-Sbk	Friable	0	None
Btg1	18-28	CL	10YR 5/2	10YR 5/6	Moderate-Sbk	Firm	0	None
Btg2	28-42	CH	10YR 4/2	10YR 5/2, 10YR 5/6	Moderate-Sbk	Very Firm	2	None
BC	42-56	ML	2.5Y 5/2	10YR 4/6	Weak-Sbk	Friable	2	None
2Cd1	56-96	SM	10YR 5/4	10YR 6/1, 10YR 5/6	Massive-Compact	Very Firm	5	Strong
2Cd2	96-132	ML	10YR 5/4	10YR 5/3, 10YR 5/6	Massive-Compact	Very Firm	5	Strong

OIL AND SITE INFORMATION FOR: Top Grade -- 9/28/18

416 ft. x 77 ft. Building

BORING #2

SLOPE: 2%
ASPECT: North
LANDSCAPE POSITION: Upland
LANDFORM: Till Plain
SLOPE POSITION: Toeslope
LANDUSE: Cropland
VEGETATION: Soybeans

TYPE AND DEPTH TO LIMITING LAYER: Massive, Clay Loam at 41-52"
Massive, Compact Glacial Till at 52-132"
DEPTH TO BEDROCK: >132" (11 ft)
DEPTH TO POOR FILTERING LAYER (COARSE SAND AND GRAVEL): None
DEPTH TO SEASONAL HIGH WATER TABLE: 21"
IS KARST TOPOGRAPHY OR KARST FEATURES PRESENT? No
FLOODING? No
PONDING? No
CUT/FILL? No

FINAL APPROVED
CONFINED FEEDING OPERATION
APR 22 2019
Dept. of Environmental Mgmt.
Office of Land Quality

HOR-ZON	DEPTH (INCH)	UNIFIED SOIL CLASSIFICATION	COLOR MATRIX	COLOR MOTTLES	SOIL STRUCTURE	CONSIST-ENCE	% COARSE FRAG.	EFFER-VESENCE
Ap	0-10	ML	10YR 2/2	None	Weak-Sbk	Friable	0	None
BA	10-21	CH	10YR 2/1	None	Moderate-Sbk	Firm	0	None
Btg1	21-31	CH	10YR 5/2	10YR 4/2, 10YR 5/8	Moderate-Sbk	Very Firm	0	None
Btg2	31-41	CH	10YR 5/1	10YR 5/6	Moderate-Sbk	Very Firm	0	None
Cg	41-52	CL	10YR 6/1	10YR 5/2, 10YR 4/6	Massive	Firm	2	None
J1	52-92	SM	10YR 4/2	10YR 5/6	Massive-Compact	Very Firm	5	Strong
Cd2	92-132	ML	10YR 5/4	10YR 5/3, 10YR 5/6	Massive-Compact	Very Firm	5	Strong

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

SOIL AND SITE INFORMATION FOR: Top Grade -- 9/28/18

416 ft. x 77 ft. Building

BORING #3

SLOPE: 2%

ASPECT: Northwest

LANDSCAPE POSITION: Upland

LANDFORM: Till Plain

SLOPE POSITION: Toeslope

LANDUSE: Cropland

VEGETATION: Soybeans

TYPE AND DEPTH TO LIMITING LAYER: Massive, Compact Glacial Till at 56-132"

DEPTH TO BEDROCK: >132" (11 ft)

DEPTH TO POOR FILTERING LAYER (COARSE SAND AND GRAVEL): None

DEPTH TO SEASONAL HIGH WATER TABLE: 7"

IS KARST TOPOGRAPHY OR KARST FEATURES PRESENT? No

FLOODING? No

PONDING? No

CUT/FILL? No

HOR-ZON	DEPTH (INCH)	UNIFIED SOIL CLASSIFICATION	COLOR MATRIX	COLOR MOTTLES	SOIL STRUCTURE	CONSIST-ENCE	% COARSE FRAG.	EFFER-VESENCE
Ap	0-7	ML	10YR 2/2	None	Weak-Sbk	Friable	0	None
AB	7-18	CL	10YR 2/1	7.5YR 4/6	Weak-Sbk	Firm	0	None
Btg1	18-38	CH	10YR 3/1	7.5YR 4/6	Moderate-Sbk	Very Firm	0	None
Btg2	38-48	CH	10YR 5/1	10YR 4/6	Moderate-Sbk	Very Firm	1	None
BCg	48-56	CL	10YR 6/1	10YR 5/2, 10YR 4/6	Weak-Sbk	Firm	2	None
Cd1	56-72	ML	10YR 4/2	10YR 5/6	Massive-Compact	Very Firm	5	Strong
Cd2	72-132	SM	10YR 5/4	10YR 5/3, 10YR 5/6	Massive-Compact	Very Firm	5	Strong

CFO / CAFO APPLICATION PACKET
SECTION XII - Notification Requirements

Part of State Form 55051 (R5 / 10-22)
Confined Feeding Operation (CFO)
National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation (NPDES CAFO)
Approved by State Board of Accounts, 2022

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

INSTRUCTIONS: THIS SECTION MUST BE FILLED OUT AND MAILINGS MADE TO ALL LISTED PARTIES BY THE APPLICANT FOR APPLICATION TYPES A, B, C, D, AND H THRU N. THIS MUST BE FILLED OUT FOR APPLICATION TYPES E AND F BUT A MAILING DOES NOT HAVE TO BE MADE BY THE APPLICANT. Indiana law requires you to notify certain people of your application submission. Complete Section A to determine what notice requirements apply to your application, if any. Complete the applicable portions of Section B and C as instructed. This form is required and supersedes all previous versions. IDEM will not accept substitutes, altered or previously supplied forms. It is recommended (not required) that you get a certificate of mailing from your local USPS for this mailing.

A. NOTIFICATION REQUIREMENTS

1. Answer all four questions below. If an action is listed to the right of your answer, complete the section(s) listed.
If none of your answers require an action, then no notice is required and the form is complete. If further action is required, read Section 2. and Section 3. below regarding proper notice requirements, materials, and certification.

a). Does the application propose construction of a new confined feeding operation (CFO) or an expansion through construction of an existing CFO?

☐ Yes	**Complete**	**Section B.1. County Executive / County Commissioner List** **Section B.2. One-Half (1/2) Mile List** **Section B.3. Adjoining Land Owner List** **Section B.4. Potentially Affected Parties List**
☒ No		

b). Is the application for an amendment to the CFO approval? For example, does the application propose a change to a permit condition or a change in the type or number of animals that does not involve construction but that will increase manure production or manure containment requirements.

☐ Yes	**Complete**	**Section B.1. County Executive / County Commissioner List** **Section B.3. Adjoining Land Owner List** *Note: Send this information to IDEM. IDEM will use this information to notify county officials and adjoining land owners of the decision on the amendment. You do not have to notify county officials or adjoining land owners of your application as noted in Section 2. below, but you may choose to do so at your option.*
☒ No		

c). Does the operation have a current CFO approval?

☒ Yes		**Notification is not required if application is an Approval Renewal/MMP.**
☐ No	**Complete**	**Section B.1. County Executive / County Commissioner List** **Section B.2. One-Half (1/2) Mile List** **Section B.3. Adjoining Land Owner List** **Section B.4. Potentially Affected Parties List**

d). Is the application for a NPDES CAFO Individual permit coverage, construction, modification, or renewal?

☐ Yes	**Complete**	**Section B.1. County Executive / County Commissioner List** **Section B.3. Adjoining Land Owner List** **Section B.4. Potentially Affected Parties List**
☒ No		

2. The *Notification of Application Submittal* form provided in this packet or an equivalent letter or notice that you develop must:
- a) Be provided, not more than ten (10) working days ***after*** submitting an application, to all individuals listed in Sections B. and C. as directed in Section A. 1.a). A.1. c). or A.1.d). above;
- b) Be sent by mail;
- c) Be in writing;
- d) Include the date on which the application was submitted to IDEM;
- e) Include a brief description of the application, such as permit type, location, animal type(s), animal numbers, numbers and types of barns and storage structures, and methods of manure application; and
- f) Be paid for by you, the applicant.

3. If notification of application submittal is required, you must certify to IDEM the notice was completed in compliance with the requirements of Section 2. listed above. The certification must be included with your application and must contain:
- a) The enclosed *Notification Affidavit* which is completed, signed, and notarized;
- b) The lists generated as directed by all four answers provided in Section A.1.; and
- c) A copy of the notice described Section 2. above.

B. PARTIES NOTIFIED BY APPLICANT

1. County Executive / County Commissioner List
Required when applicable by IC 13-18-10-2(b)(1) and 327 IAC 19-8-7(a)(1)

To complete this section, list the county executive/county commissioners for the county in which the confined feeding operation is to be located or expanded. Attach additional sheets as necessary.

a)	Name	Jack Dodd				
	Mailing address (*number and street*)	Howard County Administration Center, 220 N Main Street				
	City	Kokomo	State	IN	ZIP code	46901
b)	Name	Brad Bray				
	Mailing address (*number and street*)	Howard County Administration Center, 220 N Main Street				
	City	Kokomo	State	IN	ZIP code	46901
c)	Name	Jeff Lipinski				
	Mailing address (*number and street*)	Howard County Administration Center, 220 N Main Street				
	City	Kokomo	State	IN	ZIP code	46901
d)	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
e)	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
f)	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	

2. One-Half (1/2) Mile List
Required when applicable by IC 13-18-10-2(b)(2) and 327 IAC 19-8-7(a)(2)

To complete this section, you must, to the best of your ability, list all known persons described below:

a) Each owner and each occupant of land of which any part of the boundary is one-half (1/2) mile or less from any part of the proposed footprint of either a livestock or poultry production structure, a permanent manure storage structure, or both, on the land on which the confined feeding operation is to be located; and

b) Each owner and each occupant of land of which any part of the boundary is one-half (1/2) mile or less from any part of the proposed footprint of either a livestock or poultry production structure, the expanded area of a livestock or poultry production structure, or both, on the land on which the confined feeding operation is to be expanded.

Attach additional sheets as necessary.

1.	Name	Schultz Farm Inc				
	Mailing address (*number and street*)	3274 W 350 N				
	City	Kokomo	State	IN	ZIP code	46901
2.	Name	Michael G Dyar				
	Mailing address (*number and street*)	1742 Tall Oaks Dr				
	City	Kokomo	State	IN	ZIP code	46901

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

B.	PARTIES NOTIFIED BY APPLICANT *(Continued)*					
2.	**One-Half (1/2) Mile List *(Continued)***					
3.	Name	Terry L & Terri E Holcomb				
	Mailing address *(number and street)*	13742 S 950 E				
	City	Galveston	State	IN	ZIP code	46932
4.	Name	Patti Rose Harris				
	Mailing address *(number and street)*	13475 Elizabeth St.				
	City	Young America	State	IN	ZIP code	46998
5.	Name	Neighbor of Top Grade Production LLC				
	Mailing address *(number and street)*	9409 E Cr 1400 S				
	City	Galveston	State	IN	ZIP code	46932
6.	Name	Brian H & Melody H Jones				
	Mailing address *(number and street)*	9461 E 1400 S				
	City	Galveston	State	IN	ZIP code	46932
7.	Name	Francis M Jr & Patricia Thorpe				
	Mailing address *(number and street)*	13821 S 950 E				
	City	Galveston	State	IN	ZIP code	46932
8.	Name	James & Monica Lytle				
	Mailing address *(number and street)*	13961 S 950 E				
	City	Galveston	State	IN	ZIP code	46932
9.	Name	Luke S & Ashley L Gangloff				
	Mailing address *(number and street)*	1401 Yantis Blvd				
	City	Logansport	State	IN	ZIP code	46947
10.	Name	Melinda Kay Thompson				
	Mailing address *(number and street)*	907 Woodcliff Dr				
	City	Kokomo	State	IN	ZIP code	46901
11.	Name	Mark A Moody				
	Mailing address *(number and street)*	5984 N 400 W				
	City	Galveston	State	IN	ZIP code	46932
12.	Name	Ortman To Ortman LLC				
	Mailing address *(number and street)*	5083 N 300 W				
	City	Kokomo	State	IN	ZIP code	46901
13.	Name	Top Grade Production LLC				
	Mailing address *(number and street)*	2667 E State Road 18				
	City	Kokomo	State	IN	ZIP code	46901
14.	Name	Neighbor of Top Grade Production LLC				
	Mailing address *(number and street)*	5504 N 400 W				
	City	Kokomo	State	IN	ZIP code	46901

II. PARTIES NOTIFIED BY APPLICANT *(Continued)*

B. One-Half (1/2) Mile List *(Continued)*

15.	Name:	Beverly K Austin & Brenda Sue Coffman				
	Mailing Address:	809 W Sycamore St				
	City:	Kokomo	State:	IN	ZIP Code:	46901
16.	Name:	James E & Jane M McDonald; Donald L McDonald; Michael T McDonald; & Mark Ray McDonald				
	Mailing Address:	3295 W 600 N				
	City:	Galveston	State:	IN	ZIP Code:	46932
17.	Name:	Mark R & Karen E McDonald				
	Mailing Address:	3325 W 600 N				
	City:	Galveston	State:	IN	ZIP Code:	46932
18.	Name:	Dennis S & Rita J Long				
	Mailing Address:	3273 W 600 N				
	City:	Galveston	State:	IN	ZIP Code:	46932
19.	Name:	William C & Roma L Chism				
	Mailing Address:	5653 N 300 W				
	City:	Kokomo	State:	IN	ZIP Code:	46901
20.	Name:	Kent A & Isabella F Chism				
	Mailing Address:	3185 W 600 N				
	City:	Galveston	State:	IN	Zip Code:	46932
21.	Name:	John & Karen K Vonderahe				
	Mailing Address:	5491 N 400 W				
	City:	Kokomo	State:	IN	Zip Code:	46901
22.	Name:	Larry E Lanning				
	Mailing Address:	5257 N 400 W				
	City:	Kokomo	State:	IN	Zip Code:	46901
23.	Name:	Gordon Ray & Judy E Moss				
	Mailing Address:	4199 W 500 N				
	City:	Kokomo	State:	IN	Zip Code:	46901
24.	Name:	Samuel C Gray Trust % First Merchants Trust CO				
	Mailing Address:	10333 N Meridian St Ste 350				
	City:	Carmel	State:	IN	Zip Code:	46290
25.	Name:	Norene E Jackson				
	Mailing Address:	3347 N 150 W				
	City:	Kokomo	State:	IN	Zip Code:	46901
26.	Name:	Darrin L & Laura E Martin				
	Mailing Address:	5012 N 400 W				
	City:	Kokomo	State:	IN	Zip Code:	46901

II. PARTIES NOTIFIED BY APPLICANT *(Continued)*

B. One-Half (1/2) Mile List *(Continued)*

27.	Name:	Debra L Mouser				
	Mailing Address:	3758 W 500 N				
	City:	Kokomo	State:	IN	ZIP Code:	46901
28.	Name:	Timothy Wayne Henninger; Terry F Henninger; Kabrina K Potter Trust; Danika D Potter Trust; Misty M Coonfield (Potter) Trust; Robert & Barbara Henninger Family Trust;& Linda D Lauderbaugh Et Al; c/o Linda D Lauderbaugh				
	Mailing Address:	2707 N Dixon Rd				
	City:	Kokomo	State:	IN	ZIP Code:	46901
29.	Name:					
	Mailing Address:					
	City:		State:		ZIP Code:	
30.	Name:					
	Mailing Address:					
	City:		State:		ZIP Code:	
31.	Name:					
	Mailing Address:					
	City:		State:		ZIP Code:	
32.	Name:					
	Mailing Address:					
	City:		State:		Zip Code:	
33.	Name:					
	Mailing Address:					
	City:		State:		Zip Code:	
34.	Name:					
	Mailing Address:					
	City:		State:		Zip Code:	
35.	Name:					
	Mailing Address:					
	City:		State:		Zip Code:	
36.	Name:					
	Mailing Address:					
	City:		State:		Zip Code:	
37.	Name:					
	Mailing Address:					
	City:		State:		Zip Code:	
38.	Name:					
	Mailing Address:					
	City:		State:		Zip Code:	

B. PARTIES NOTIFIED BY APPLICANT *(Continued)*

3. Adjoining Land Owner List
Required when applicable by 327 IAC 15-16-5(a)(4) and 327 IAC 19-7-1(c)(8)

This section may solicit individuals listed in Section B.2. above. It is not necessary to list previously listed individuals more than once. This section is for adjoining property owners to the operation that are outside of the one-half (1/2) mile distance listed above and who were not listed in Section 2. To complete this section, you must, to the best of your ability, list all known persons described below if not already provided in Section 2. above:

a) Each person who owns land that adjoins the land on which the confined feeding operation is to be located; or
b) If a person who owns land that adjoins the land on which the confined feeding operation is to be located does not occupy the land, all occupants of the land.

Attach additional sheets as necessary.

☒ All adjoining land owners and occupants are included in the One-Half (1/2) Mile List. Therefore, this list is blank.

1.	Name					
	Mailing address *(number and street)*					
	City		State		ZIP code	
2.	Name					
	Mailing address *(number and street)*					
	City		State		ZIP code	
3.	Name					
	Mailing address *(number and street)*					
	City		State		ZIP code	
4.	Name					
	Mailing address *(number and street)*					
	City		State		ZIP code	
5.	Name					
	Mailing address *(number and street)*					
	City		State		ZIP code	
6.	Name					
	Mailing address *(number and street)*					
	City		State		ZIP code	
7.	Name					
	Mailing address *(number and street)*					
	City		State		ZIP code	
8.	Name					
	Mailing address *(number and street)*					
	City		State		ZIP code	
9.	Name					
	Mailing address *(number and street)*					
	City		State		ZIP code	
10.	Name					
	Mailing address *(number and street)*					
	City		State		ZIP code	

C. POTENTIALLY AFFECTED PARTIES

Potentially affected parties required when applicable by 327 IAC 19-7-1(c)(8) and 327 IAC 5-3-12 (NPDES).

This section is for additional potentially affected parties you, the applicant, identify which are not required to be listed in Section B.2. It is not necessary to list individuals already included in Section B.2. Attach additional sheets as necessary.

☒ Potentially affected parties are included in the lists in Section B. Therefore, this list is blank.

1.	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
2.	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
3.	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
4.	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
5.	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
6.	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
7.	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
8.	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
9.	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	
10.	Name					
	Mailing address (*number and street*)					
	City		State		ZIP code	

CFO / CAFO APPLICATION PACKET
Notification of Application Submittal

Part of State Form 55051 (R5 / 10-22)
Confined Feeding Operation (CFO)
National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation (NPDES CAFO)
Approved by State Board of Accounts, 2022

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

An application has been submitted to the Indiana Department of Environmental Management (IDEM) for the Confined Feeding Operation (CFO) or Concentrated Animal Feeding Operation (CAFO) that is described below. Indiana law requires an applicant for a CFO or CAFO approval to notify certain people of an application. See IC 13-18-10-2(b) and 327 IAC 19-7-1. This notice has been sent to you by the applicant to satisfy the notice requirement. Please review the information below to learn how to get more information or submit comments about this application. IDEM will notify you of the final decision on the application.

Applicant / Operation name: Top Grade Production LLC

Date application submitted *(required)*: March 11, 2024
(month, day, year)

Operation permit type *(applicable regulations)*

- [x] CFO Approval *(IC 13-18-10 and 327 IAC 19)*
- [ ] NPDES CAFO Individual Permit *(IC 13-18-10 and 327 IAC 15-16)*

Operation Location

Nearest crossroads / address	W 550 N & N 400 W (north of W 550 N; east of N 400 W)
Nearest city / town	Kokomo
County	Howard
Political township	Clay
USGS Section/Township/Range	S4 / T24N / R3E

Brief description of application
(Should include animal type(s), animal numbers, numbers and types of barns and storage structures, and methods of manure application.)

The CFO application is to renew the confined feeding operation approval and construction authorization issued April 22, 2019 to construct three sow production buildings at an existing production site. The site is a breed-to-wean production site with 4,789 sows and 833 sows and litters housed in eight buildings. The buildings include self-contained, below-building concrete manure storages with an earthen storage impoundment. Manure is typically land applied at least one time per year using injection or incorporation.

Questions regarding the location or other aspects of the application should be addressed to

Applicant's name	Top Grade Production LLC; Nicholas T Maple (contact)
Address *(number and street)*	2667 East State Road 18
City / State / ZIP code	Kokomo, Indiana 46901
Telephone number	765-863-1720

If the application meets the requirements in IC 13-18-10, 327 IAC 15-16, and 327 IAC 19, IDEM will approve the application. You may view these laws and regulations on the iga.IN.gov website.
IDEM will accept written public comments for at least thirty-three (33) days following the date the applicant mailed this notice. You can send comments on the application to the address listed at the top of this sheet. You can contact IDEM's Confined Feeding Program staff at (800) 451-6027, ask for Confined Feeding Permits, or (317) 232-4473.

CFO / CAFO APPLICATION PACKET
Notification Affidavit

Part of State Form 55051 (R5 / 10-22)
Confined Feeding Operation (CFO)
National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation (NPDES CAFO)
Approved by State Board of Accounts, 2022

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

INSTRUCTIONS: ***If a notice is required as directed in Section A.1. in Section XII, the Notification Requirements form, the applicant must submit an affidavit to IDEM that certifies the notice requirements listed in Section 2. on the Notification Requirements form were completed. The certification to IDEM must contain this completed Notification Affidavit. This affidavit is required and supersedes all previous versions. IDEM will not accept substitutes, altered, or previously supplied affidavits.***

Nicholas T. Maple, being first duly sworn under oath, deposes and says:

1. I live in Miami County, Indiana, and being of sound mind and over Twenty-one (21) years of age I am competent to give this affidavit.
2. I hold the position of Manager *(Title of Affiant)* for Top Grade Production LLC *(Name of Applicant or Operation)*.
3. I warrant that I have the authority to sign this affidavit on my own behalf, and on behalf of any entity for which I am signing in a representative capacity.
4. As required by IC 13-18-10-2(b), 327 IAC 19-7-1 when applicable, the applicant will mail written notice to all required persons detailed on the Notification Requirements form not more than ten (10) days after submission of the accompanying application on behalf of Top Grade Production LLC *(Name of Applicant or Operation)*.
5. The written notice mailed to all required persons will include a brief description of the application, such as permit type, location, animal type(s), animal numbers, numbers and types of barns and storage structures, and methods of manure application.

Further Affiant Saith Not.

I swear or affirm, under penalty of perjury as specified by IC 35-44.1-2-1 and other penalties specified by IC 13-30-10, IC 13-18-10-1.4, IC 13-18-10-2.2, and IC 13-15-7-1(3), that the statements and representations in this application and the accompanying forms and application materials are true, accurate, and complete.

Applicant signature x Nick T. Maple

Date signed *(mm, dd, yy)* x 3/8/24

State of Indiana County of Miami

Before me, the undersigned, a Notary Public in and for said County and State, personally appeared Nicholas Maple known by me to be the person who executed the foregoing instrument, signed the same and acknowledged to me that he/she did so sign the same, and that his/her free act and deed and that the statements made in the foregoing instrument are true.

IN WITNESS WHEROF, I have set my hand and official seal this 8th day of March, 20 24.

Signature Tracy K. LaPlante

Printed TRACY K. LAPlante

My commission expires *(month, day, year)* February 24, 2029

Residence of Howard County, Indiana

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

TRACY K LAPLANTE
Notary Public, State of Indiana
Howard County
Commission Number NP0731955
My Commission Expires
February 24, 2029

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION CFO APPROVAL RENEWAL/ MANURE MANAGEMENT PLAN/ CONSTRUCTION AUTHORIZATION RENEWAL

327 IAC 19 CONFINED FEEDING OPERATIONS
327 IAC 19-8-2 Approval Renewals

Farm ID #3713

NOTIFICATION REQUIREMENTS ATTACHMENT

Prepared for:

Top Grade Production LLC
2667 East State Road 18
Kokomo, Indiana 46901

NOTIFICATION LETTER PACKET

APPLICANT DEVELOPED NOTIFICATION LETTER:
COUNTY OFFICIALS

APPLICATION DEVELOPED NOTIFICATION LETTER:
LAND OWNERS, RESIDENCES, & TENANTS

SITE LOCATION MAP

IDEM NOTIFICATION OF APPLICATION SUBMITTAL FORM

United States Postal Service
PS Form 3877; Certificate of Mailing

MAILING DATE: March 11, 2024

Prepared by:

LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829

Top Grade Production LLC
Nicholas T Maple
2667 East State Road 18
Kokomo, Indiana 46901
765-863-1720

March 11, 2024

Howard County Commissioner
Howard County Administration Center
220 N Main Street
Kokomo, Indiana 46901

Dear County Commissioner:

Top Grade Production LLC currently owns and operates an existing confined feeding operation at the farm located at 5504 N 400 W, Kokomo, Indiana in Clay Township (Section 4, T24N, R3E). Previously, Top Grade Production LLC submitted a confined feeding operation approval application to the Indiana Department of Environmental Management (IDEM) for approval to make improvements to this farm that included the construction of three new confined feeding buildings. Approval for these improvements was granted by IDEM on April 22, 2019.

Top Grade Production LLC has not been able to complete the planned improvements at the farm. To allow us to continue to make these improvements, we have submitted a Confined Feeding Operation Approval Renewal application to renew the confined feeding operation approval and construction authorization approval for this farm. These are the same improvements that were approved in the original Indiana Department of Environmental Management Confined Feeding Operation Approval. The planned improvements are to construct two new farrowing sow buildings and one breeding & gestation building. A site location map is included for your information.

This confined animal feeding operation is regulated by the Indiana Department of Environmental Management (IDEM). To maintain the Confined Feeding Operation Approval, we are required to submit an approval renewal application to the Indiana Department of Environmental Management for review and approval. Per the IDEM regulations we are notifying the County Commissioners, landowners, residences, and tenants located within one-half mile of the proposed construction and adjoining landowners to the farm. When IDEM completes their review they will notify you by mail of their decision.

An application was submitted to IDEM on about March 11, 2024 for review and approval to renew the confined feeding operation approval and construction approval to complete the construction of the new production buildings. If you have any questions about the IDEM approval process, please feel free to contact IDEM (800-451-6027, extension 2-4473 or 317-232-4473). IDEM will also accept written comments regarding our renewal application (Joseph Goetz, Section Chief, Confined Feeding Program, 100 North Senate Avenue, MC 65-45 IGCN 1101, Indianapolis, Indiana 46204-2251).

If you have any questions, please feel free to contact me (Nicholas Maple at 765-863-1720). I would welcome an opportunity to discuss our plans with you and answer any questions.

Sincerely,

Nicholas T. Maple

Nicholas T. Maple, Top Grade Production LLC

Enclosures

Top Grade Production LLC
Nicholas T. Maple
2667 East State Road 18
Kokomo, Indiana 46901
765-863-1720

March 11, 2024

Land Owner
2667 East State Road 18
Kokomo, Indiana 46901

Dear Land Owner:

I am writing to inform you that Top Grade Production LLC has submitted a confined feeding operation approval application to the Indiana Department of Environmental Management (IDEM) for the existing confined feeding operation located at 5504 N 400 W, Kokomo, Indiana in Clay Township (Section 4, T24N, R3E). Previously, Top Grade Production LLC submitted a confined feeding operation approval application to IDEM for approval to make improvements to this farm. Approval for these improvements was granted by IDEM on April 22, 2019.

Top Grade Production LLC has not been able to complete the planned improvements at the farm. To allow us to continue to make these improvements, we have submitted a Confined Feeding Operation Approval Renewal application to renew the confined feeding operation approval and construction authorization approval for this farm. These are the same improvements that were approved in the original Indiana Department of Environmental Management Confined Feeding Operation Approval. The planned improvements are to construct two new farrowing sow buildings and one breeding & gestation building. A site location map is included for your information.

This confined animal feeding operation is regulated by the Indiana Department of Environmental Management (IDEM). To maintain the Confined Feeding Operation Approval, we are required to submit an approval renewal application to the Indiana Department of Environmental Management for review and approval. Per the IDEM regulations we are notifying the County Commissioners, landowners, residences, and tenants located within one-half mile of the proposed construction and adjoining landowners to the farm. When IDEM completes their review they will notify you by mail of their decision.

An application was submitted to IDEM on about March 11, 2024 for review and approval to renew the confined feeding operation approval and construction approval to complete the construction of the new production buildings. If you have any questions about the IDEM approval process, please feel free to contact IDEM (800-451-6027, extension 2-4473 or 317-232-4473). IDEM will also accept written comments regarding our renewal application (Joseph Goetz, Section Chief, Confined Feeding Program, 100 North Senate Avenue, MC 65-45 IGCN 1101, Indianapolis, Indiana 46204-2251).

If you have any questions, please feel free to contact me (Nicholas Maple at 765-863-1720). I would welcome an opportunity to discuss our plans with you and answer any questions.

Sincerely,

Nicholas T. Maple

Nicholas T. Maple, Top Grade Production LLC

Enclosures


Top Grade Production LLC
Site Location
County Rd 1400 S
County Rd 1400 S
County Rd N 400 W
County Rd 300 W
TOP GRADE PRODUCTION LLC
CONFINED FEEDING OPERATION
Co Rd W 550 N
Co Rd W 550 N
W 500 N
W 500 N
W 500 N
W 500 N
RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality
Google Earth
Image © 2024 Airbus
3000 ft
N

CFO / CAFO APPLICATION PACKET
Notification of Application Submittal

Part of State Form 55051 (R5 / 10-22)
Confined Feeding Operation (CFO)
National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation (NPDES CAFO)
Approved by State Board of Accounts, 2022

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Confined Feeding Section
Office of Land Quality
100 North Senate Avenue
IGCN Rm 1101
Indianapolis, Indiana 46204
(800) 451-6027 request CFO Permits

An application has been submitted to the Indiana Department of Environmental Management (IDEM) for the Confined Feeding Operation (CFO) or Concentrated Animal Feeding Operation (CAFO) that is described below. Indiana law requires an applicant for a CFO or CAFO approval to notify certain people of an application. See IC 13-18-10-2(b) and 327 IAC 19-7-1. This notice has been sent to you by the applicant to satisfy the notice requirement. Please review the information below to learn how to get more information or submit comments about this application. IDEM will notify you of the final decision on the application.

Applicant / Operation name: Top Grade Production LLC

Date application submitted *(required)*: March 11, 2024
(month, day, year)

Operation permit type *(applicable regulations)*

- ☒ CFO Approval *(IC 13-18-10 and 327 IAC 19)*
- ☐ NPDES CAFO Individual Permit *(IC 13-18-10 and 327 IAC 15-16)*

Operation Location

Nearest crossroads / address: W 550 N & N 400 W (north of W 550 N; east of N 400 W)

Nearest city / town: Kokomo

County: Howard

Political township: Clay

USGS Section/Township/Range: S4 / T24N / R3E

Brief description of application
(Should include animal type(s), animal numbers, numbers and types of barns and storage structures, and methods of manure application.)

The CFO application is to renew the confined feeding operation approval and construction authorization issued April 22, 2019 to construct three sow production buildings at an existing production site. The site is a breed-to-wean production site with 4,789 sows and 833 sows and litters housed in eight buildings. The buildings include self-contained, below-building concrete manure storages with an earthen storage impoundment. Manure is typically land applied at least one time per year using injection or incorporation.

Questions regarding the location or other aspects of the application should be addressed to

Applicant's name: Top Grade Production LLC; Nicholas T Maple (contact)

Address *(number and street)*: 2667 East State Road 18

City / State / ZIP code: Kokomo, Indiana 46901

Telephone number: 765-863-1720

If the application meets the requirements in IC 13-18-10, 327 IAC 15-16, and 327 IAC 19, IDEM will approve the application. You may view these laws and regulations on the iga.IN.gov website.
IDEM will accept written public comments for at least thirty-three (33) days following the date the applicant mailed this notice. You can send comments on the application to the address listed at the top of this sheet. You can contact IDEM's Confined Feeding Program staff at (800) 451-6027, ask for Confined Feeding Permits, or (317) 232-4473.

Name and Address of Sender

Top Grade Production LLC
Nicholas T. Maple
2667 East State Road 18
Kokomo, IN 46901

Check type of mail or service:

- ☐ Adult Signature Required
- ☐ Certified Mail
- ☐ COD
- ☐ Delivery Confirmation
- ☐ Express Mail
- ☐ Insured
- ☐ Adult Signature Restricted Delivery
- ☐ Recorded Delivery (International)
- ☐ Registered
- ☐ Return Receipt for Merchandise
- ☐ Signature Confirmation
- ☒ Certificate of Mailing

GREENWOOD P.O. MAR 11 2024

U.S. POSTAGE PAID
GREENWOOD, IN
46142
MAR 11, 24
AMOUNT
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R2304E105810-15

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Article Number	Addressee (Name, Street, City, State, & ZIP Code™)	Postage	Fee	Handling Charge	Actual Value if Registered	Insured Value	Due Sender if COD	ASR Fee	ASRD Fee	DC Fee	SC Fee	SH Fee	RD Fee	RR Fee
1.	Jack Dodd, County Commissioner Howard County Administration Center 220 North Main Street Kokomo, IN 46901													
2.	Brad Bray, County Commissioner Howard County Administration Center 220 North Main Street Kokomo, IN 46901													
3.	Jeff Lipinski, County Commissioner Howard County Administration Center 220 North Main Street Kokomo, IN 46901													
4.	Schultz Farm Inc 3274 W 350 N Kokomo, IN 46901													
5.	Michael G Dyar 1742 Tall Oaks Dr Kokomo, IN 46901													
6.	Terry L & Terri E Holcomb 13742 S 950 E Galveston, IN 46932													
7.	Patti Rose Harris 13475 Elizabeth St. Young America, IN 46998													
8.	Neighbor of Top Grade Production LLC 9409 E Cr 1400 S Galveston, IN 46932													

Total Number of Pieces Listed by Sender	Total Number of Pieces Received at Post Office	Postmaster, Per *(Name of receiving employee)*
8	8	[signature]

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

PS Form **3877**, June 2011 *(Page 1 of 2)* **Complete by Typewriter, Ink, or Ball Point Pen** **See Privacy Act Statement on Reverse**

U.S. POSTAGE PAID
GREENWOOD, IN
46142
MAR 11, 24
AMOUNT
$4.64
R2304E105810-15

UNITED STATES POSTAL SERVICE
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Name and Address of Sender

Top Grade Production LLC
Nicholas T. Maple
2667 East State Road 18
Kokomo, IN 46901

Check type of mail or service:

- ☐ Adult Signature Required
- ☐ Certified Mail
- ☐ COD
- ☐ Delivery Confirmation
- ☐ Express Mail
- ☐ Insured
- ☐ Adult Signature Restricted Delivery
- ☐ Recorded Delivery (International)
- ☐ Registered
- ☐ Return Receipt for Merchandise
- ☐ Signature Confirmation
- ☒ CERTIFICATE OF MAILING

Article Number	Addressee (Name, Street, City, State, & ZIP Code™)	Postage	Fee	Handling Charge	Actual Value if Registered	Insured Value	Due Sender if COD	ASR Fee	ASRD Fee	DC Fee	SC Fee	SH Fee	RD Fee	RR Fee
1.	Brian H & Melody H Jones 9461 E 1400 S Galveston, IN 46932													
2.	Francis M Jr & Patricia Thorpe 13821 S 950 E Galveston, IN 46932													
3.	James & Monica Lytle 13961 S 950 E Galveston, IN 46932													
4.	Luke S & Ashley L Gangloff 1401 Yantis Blvd Logansport, IN 46947													
5.	Melinda Kay Thompson 907 Woodcliff Dr Kokomo, IN 46901													
6.	Mark A Moody 5984 N 400 W Galveston, IN 46932													
7.	Ortman To Ortman LLC 5083 N 300 W Kokomo, IN 46901													
8.	Top Grade Production LLC 2667 E State Road 18 Kokomo, IN 46901													

Total Number of Pieces Listed by Sender	Total Number of Pieces Received at Post Office	Postmaster, Per (Name of receiving employee)
8	8	[signature]

PS Form **3877,** June 2011 *(Page 1 of 2)* **Complete by Typewriter, Ink, or Ball Point Pen** **See Privacy Act Statement on Reverse**

Name and Address of Sender	Check type of mail or service:		U.S. POSTAGE PAID
Top Grade Production LLC Nicholas T. Maple 2667 East State Road 18 Kokomo, IN 46901	☐ Adult Signature Required ☐ Certified Mail ☐ COD ☐ Delivery Confirmation ☐ Express Mail ☐ Insured	☐ Adult Signature Restricted Delivery ☐ Recorded Delivery (International) ☐ Registered ☐ Return Receipt for Merchandise ☐ Signature Confirmation ☒ CERTIFICATE OF MAILING	UNITED STATES POSTAL SERVICE 0000 GREENWOOD, IN 46142 MAR 11, 24 AMOUNT **$4.64** R2304E105810-15

	Article Number	Addressee (Name, Street, City, State, & ZIP Code™)	Postage	Fee	Handling Charge	Actual Value if Registered	Insured Value	Due Sender if COD	ASR Fee	ASRD Fee	DC Fee	SC Fee	SH Fee	RD Fee	RR Fee
1.		Neighbor of Top Grade Production LLC 5504 N 400 W Kokomo 46901													
2.		Beverly K Austin & Brenda Sue Coffman 809 W Sycamore St Kokomo, IN 46901													
3.		James E & Jane M McDonald, Donald L McDonald, Michael T McDonald, & Mark McDonald 3295 W 600 N Galveston, IN 46932													
4.		Mark R & Karen E McDonald 3325 W 600 N Galveston, IN 46932													
5.		Dennis S & Rita J Long 3273 W 600 N Galveston, IN 46932													
6.		William C & Roma L Chism 5653 N 300 W Kokomo, IN 46901													
7.		Kent A & Isabella F Chism 3185 W 600 N Galveston, IN 46932													
8.		John & Karen K Vonderahe 5491 N 400 W Kokomo, IN 46901													

Total Number of Pieces Listed by Sender	Total Number of Pieces Received at Post Office	Postmaster, Per (Name of receiving employee)
8	8	[signature]

 Complete by Typewriter, Ink, or Ball Point Pen **See Privacy Act Statement on Reverse**

GREENWOOD P.O. USPS

Name and Address of Sender

Top Grade Production LLC
Nicholas T. Maple
2667 East State Road 18
Kokomo, IN 46901

Check type of mail or service:

- ☐ Adult Signature Required
- ☐ Certified Mail
- ☐ COD
- ☐ Delivery Confirmation
- ☐ Express Mail
- ☐ Insured
- ☐ Adult Signature Restricted Delivery
- ☐ Recorded Delivery (International)
- ☐ Registered
- ☐ Return Receipt for Merchandise
- ☐ Signature Confirmation
- ☒ CERTIFICATE OF MAILING

Date of Receipt

U.S. POSTAGE PAID
GREENWOOD, IN
46142
MAR 11, 24
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UNITED STATES POSTAL SERVICE
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Article Number	Addressee (Name, Street, City, State, & ZIP Code™)	Postage	Fee	Handling Charge	Actual Value if Registered	Insured Value	Due Sender if COD	ASR Fee	ASRD Fee	DC Fee	SC Fee	SH Fee	RD Fee	RR Fee
1.	Larry E Lanning 5257 N 400 W Kokomo, IN 46901													
2.	Gordon Ray & Judy E Moss 4199 W 500 N Kokomo, IN 46901													
3.	Samuel C Gray Trust % First Merchants Trust CO 10333 N Meridian St Ste 350 Carmel, IN 46290													
4.	Norene E Jackson 3347 N 150 W Kokomo, IN 46901													
5.	Darrin L & Laura E Martin 5012 N 400 W Kokomo, IN 46901													
6.	Debra L Mouser 3758 W 500 N Kokomo, IN 46901													
7.	Linda Lauderbaugh 4199 W 500 N Kokomo, IN 46901													
8.														

Total Number of Pieces Listed by Sender	Total Number of Pieces Received at Post Office	Postmaster, Per (Name of receiving employee)
7	7	[illegible signature]

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

 Complete by Typewriter, Ink, or Ball Point Pen **See Privacy Act Statement on Reverse**

2967 S Honey Creek Road
Greenwood, Indiana 46143
317-535-1829 (voice)
317-535-9806 (fax)

Livestock Engineering Solutions, Inc.

May 13, 2024

Kraig Whitman
Indiana Department of Environmental Management
Office of Land Quality
Confined Feeding Program
100 North Senate Avenue -- IGCN Room 1101
Indianapolis, Indiana 46204-2251

RE: Top Grade Production LLC – Farm ID#3713
CFO Approval Renewal and Construction Authorization Renewal
Notice of Deficiency 1 Response

Dear Mr. Whitman:

On behalf of Top Grade Production LLC, Livestock Engineering Solutions, Inc. submits the following information in response to the Indiana Department of Environmental Management (IDEM) Notice of Deficiency 1 dated May 8, 2024 requesting additional information for the submitted Confined Feeding Operation Approval Renewal and Construction Authorization Renewal Application. The notice includes a Notice of Deficiency 1 enclosure. In response to the Indiana Department of Environmental Management's request for additional information, the following responses and information are provided.

Notice of Deficiency 1 Enclosure: Kraig Whitman

1. DNR Approximate Floodway and Fringe: Thank you for pointing out that based on the recently updated DNR Approximate Floodway and Fringe maps that the approved construction may be located in the DNR Approximate Floodway and Floodplain Fringe.

   A review of the information available from the DNR Indiana Floodplain Information Portal 2.0 identified potential inconsistencies in the DNR Approximate Floodway and Fringe maps and the information provided on the Floodplain Analysis & Regulatory Assessment (FARA) reports. The FARA reports identify an approximate ground elevation and a base flood elevation (BFE). At numerous locations within the DNR Approximate Floodway and Fringe map boundaries, the approximate ground elevation is reported to be above the base flood elevation (BFE) on the FARA report.

   The Indiana DNR, Division of Water was contacted by telephone on about May 2, 2024 to obtain clarification regarding the inconsistencies presented on the FARA reports. The Indiana DNR, Division of Water representative indicated that based on the inquiry a message would be sent to the DNR engineering for review. In addition, the Indiana DNR, Division of Water representative recommended a request be submitted through the DNR Indiana Floodplain Information Portal 2.0 identifying the inconsistencies in the FARA report and request a review of the FARA report and floodway and floodplain fringe information presented on the DNR Indiana Floodplain Information Portal 2.0. A request was submitted on May 10, 2024 to the DNR, Division of Water for each location of the proposed construction. Three requests were submitted. A map showing the proposed construction and examples of the FARA reports generated from the DNR Indiana Floodplain Information Portal 2.0 were included with each request. A copy of the information attachments provided to the DNR, Division of Water are attached.

Each request was acknowledged on May 10, 2024 by the DNR, Division of Water confirming the request had been received and a staff review of the FARA determination generated through the Indiana Floodplain Information Portal would be conducted. The acknowledgement indicated that an initial response should be expected within 5 business days of the request.

Since it is unclear whether the approved construction is located within the DNR Approximate Floodway and Fringe flood hazard zone boundaries a response to this request for additional information cannot be completed. Once a determination is provided by the Indiana DNR, Division of Water regarding the staff review of the FARA determination for the site is received a response cannot be provided. At this time no additional information can be provided.

2. Concrete compressive strength notation – 4,000 psi at 28 days: It is noted that concrete compressive strength requirements are outlined in the Below-Building Concrete Manure Storage Design Plans-Design Summary and the Natural Resource Conservation Service (NRCS) Construction Specification-Concrete Construction (Adapted: August 31, 2017). In accordance with the Indiana Department of Environmental Management's request, plan sheets 2B, 3B, 4B, 2C, 3C, 4C, 1D, 2D, and 3D have been updated to include the following statement.

   NOTE:
   All concrete used on manure tank walls and floors, beams, and columns shall have a minimum 28-day compressive strength of 4,000 psi, unless specifically noted.

3. Plan Sheet 2B of 8B: Thank you for the opportunity to review the details shown on the plan sheets. A review of plan sheet 2B confirms that Detail B-3B faces west and Detail B-3B on plan sheet 3B is correct. It is noted that there are two clean-outs planned on the 8" diameter PVC gravity drain line. The clean-out on the north side of the building was not labeled. A label has been added to plan sheet 2B to identify the clean-out on the north side of the building. Referring to Detail B-3B on plan sheet 3B the cleanout located on the north side of the building is visible and is correctly shown on the right side of the page. The clean-out on the south side of the building is east of the Detail B-3B section line on plan sheet 2B and is not visible on plan sheet 3B when facing west.

   A review of plan sheet 2C confirms that Detail B-3C faces west and Detail B-3C on plan sheet 3C needs to be updated. There are two clean-outs planned on the 8" diameter PVC gravity drain line. The clean-out on the north side of the building was not labeled. A label has been added to plan sheet 3C to identify the clean-out on the north side of the building. Both clean-outs are visible when Detail B-3C section line is facing west. Plan sheet 3C has been updated to identify both of the planned clean-outs in Detail B-3C.

4. USGS Topographic Map: The Indiana Department of Environmental Management states, ". . . a USGS topographic map may need to be submitted . . .". Based on the plot map requirements outlined in Section E of the CFO / CAFO Application Packet Section X, USGS Topographic Maps are not required to be submitted. In response to the Indiana Department of Environmental Management's pending request, a USGS Topographic Map for the confined feeding operation site is submitted.

Thank you for your thoughtful consideration and review of this information. If you have any questions or need further information, please contact Nick Maple, Top Grade Production LLC or Michael Veenhuizen, Livestock Engineering Solutions, Inc.

Sincerely,

Michael A. Veenhuizen

Enclosures
Cc: Nick Maple, Top Grade Production LLC

Attachment: Top Grade Production LLC NE Building Construction

DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19825435068661**

Lat: **40.556319690666804**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.4 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

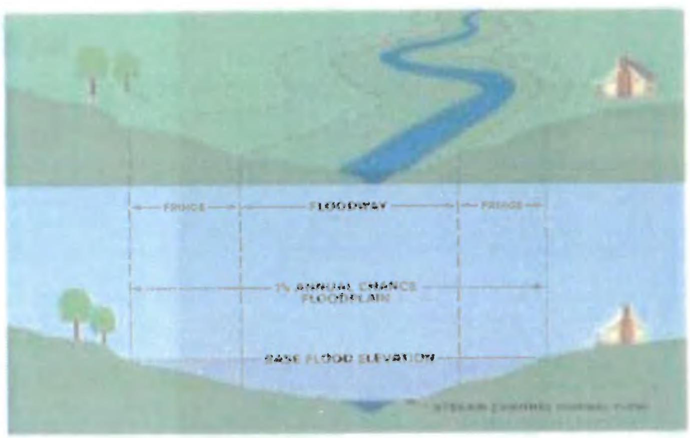
Date Generated: **5/10/2024**

About the Floodplain Analysis and Regulatory Assessment (FARA):

All streams have a floodplain, whether mapped or not. This FARA, and the information provided herein, is designed for sites along streams with a mapped floodplain that delineates the floodway portion of the floodplain; see the image below for a visual guide to the floodplain, floodway, and flood fringe. The information in this document was determined using an automated mapping tool. The DNR has high confidence in the tool, but there are scenarios where the floodplain information provided requires additional review from the DNR.

All streams in DNR jurisdiction (streams that have a drainage area one square mile or greater) are shown by a blue line on the map on page 1. However, a floodplain/floodway may or may not be mapped for every stream. In any of the following scenarios, or if you have more detailed floodplain information, use the link at the bottom of this page to request a staff review of the site. Please note that staff review may take several weeks to complete.

Scenarios that require additional DNR review:
- The base flood elevation on page 1 is not available
- The tool selects the nearest flood elevation point for a stream outside the floodplain associated with the point of interest
- There is not a delineated floodway for the stream nearest your point of interest
- The point of interest is along a stream without a mapped floodplain
- The point of interest is in a mapped floodplain of another stream, but the stream nearest the point of interest does not have a mapped floodplain with a floodway of its own



If DNR review is required, do not use this FARA for your site's determination.
If you have questions about DNR permitting requirements, you can contact DNR, Division of Water toll-free at 1-877-928-3755 and select option 1 to speak to a Technical Services staff member. You can also write to the division at water_inquiry@dnr.IN.gov or use the Indiana Waterways Inquiry Request tool at waterways.IN.gov to submit a permitting determination request to both DNR and the Indiana Department of Environmental Management at once.
We recommend keeping a copy of this FARA for your records as the DNR will not have a copy on file.
IF PERMIT ANSWER IS "See following pages" copy the following line into a web browser to get PDF for answers:
https://countydataharvest.in.gov/DNR/INFIP_Report_Backpgs.pdf

PATH TO SURVEY:

https://survey123.arcgis.com/share/3293526dfdca453e95c19b08fb7bdcfb??
FIELD%3ALAT1=40.556319690666804&FIELD%3ALON1=-86.19825435068661&FIELD%3ADNR_PERMIT=See+following+pages&FIELD%3ALOC
&FIELD%3ASTREAM=MANSON+KINGERY+DITCH&FIELD%3AINIT_DATE=05%2F10%2F2024&FIELD%3ABFE=807.24705

You will need to copy and paste the blue text (PATH TO SURVEY)into a web browser to open the survey you will fill out and submit. If this does not work then send a copy of this FARA to infipinquiry@dnr.IN.gov and describe the reason you are requesting a staff review. Include your name and contact information so that staff can follow-up with you.

Floodplain Analysis & Regulatory Assessment (FARA)

Indiana Department of Natural Resources

Point of Interest
Base Flood Elevation Point
CreateINFIPReport_PointOfInteres

POI

POI
1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway
DNR Approximate Fringe
Not Mapped

Long: -86.19737995054763
Lat: 40.55642158331282

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.6 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

RECEIVED
CONFINED FEEDING OPERATIONS
May 13, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

Date Generated: 5/10/2024

About the Floodplain Analysis and Regulatory Assessment (FARA):

All streams have a floodplain, whether mapped or not. This FARA, and the information provided herein, is designed for sites along streams with a mapped floodplain that delineates the floodway portion of the floodplain; see the image below for a visual guide to the floodplain, floodway, and flood fringe. The information in this document was determined using an automated mapping tool. The DNR has high confidence in the tool, but there are scenarios where the floodplain information provided requires additional review from the DNR.

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- The tool selects the nearest flood elevation point for a stream outside the floodplain associated with the point of interest
- There is not a delineated floodway for the stream nearest your point of interest
- The point of interest is along a stream without a mapped floodplain
- The point of interest is in a mapped floodplain of another stream, but the stream nearest the point of interest does not have a mapped floodplain with a floodway of its own

If DNR review is required, do not use this FARA for your site's determination.
If you have questions about DNR permitting requirements, you can contact DNR, Division of Water toll-free at 1-877-928-3755 and select option 1 to speak to a Technical Services staff member. You can also write to the division at water_inquiry@dnr.IN.gov or use the Indiana Waterways Inquiry Request tool at waterways.IN.gov to submit a permitting determination request to both DNR and the Indiana Department of Environmental Management at once.
We recommend keeping a copy of this FARA for your records as the DNR will not have a copy on file.
IF PERMIT ANSWER IS "See following pages" copy the following line into a web browser to get PDF for answers:
https://countydataharvest.in.gov/DNR/INFIP_Report_Backpgs.pdf

PATH TO SURVEY:

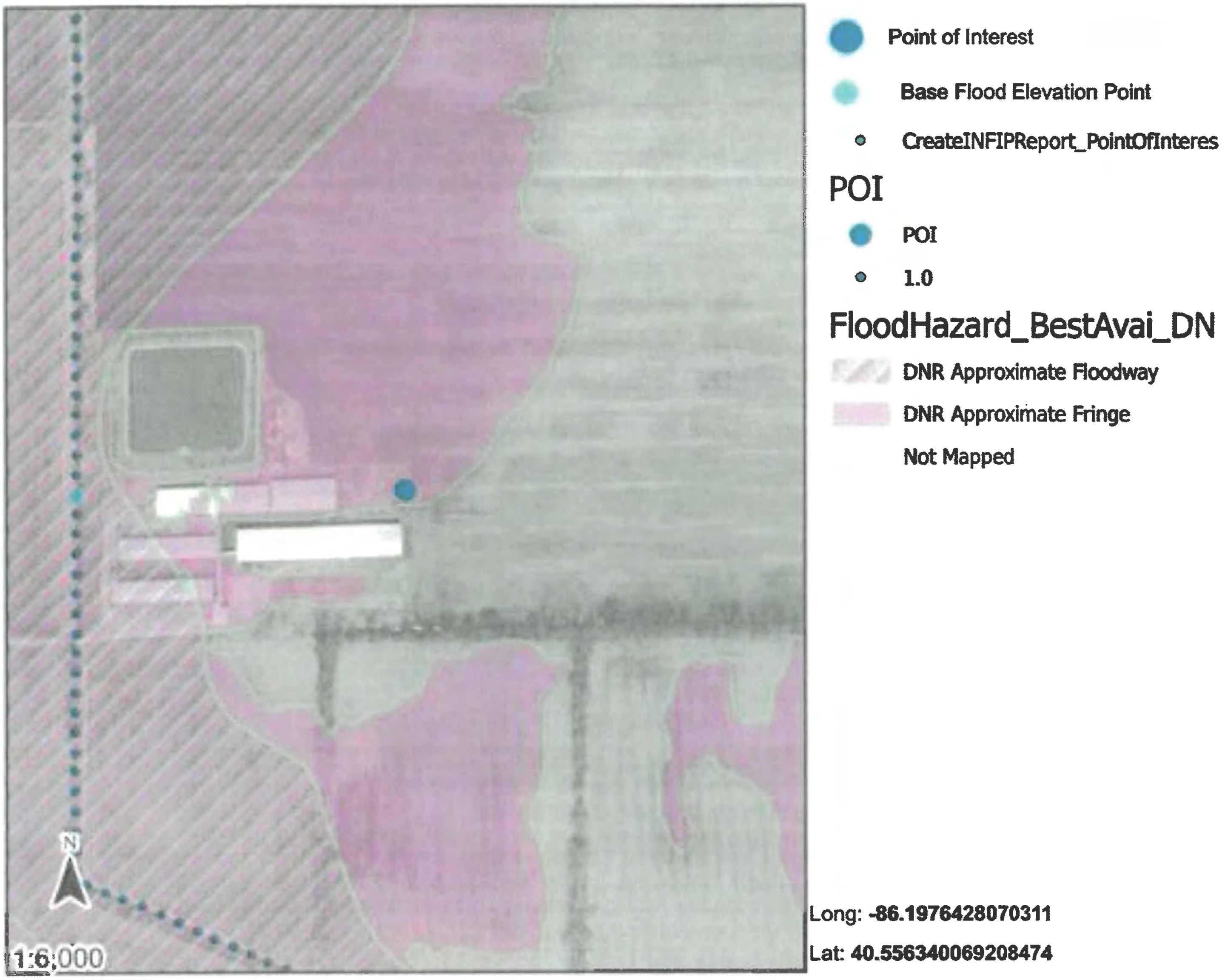
https://survey123.arcgis.com/share/3293526dfdca453e95c19b08fb7bdcfb??FIELD%3ALAT1=40.55642158331282&FIELD%3ALON1=-86.19737995054763&FIELD%3ADNR_PERMIT=See+following+pages&FIELD%3ALOCA&FIELD%3ASTREAM=MANSON+KINGERY+DITCH&FIELD%3AINIT_DATE=05%2F10%2F2024&FIELD%3ABFE=807.21740714

RECEIVED
CONFINED FEEDING OPERATIONS
May 13, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

You will need to copy and paste the blue text (PATH TO SURVEY)into a web browser to open the survey you will fill out and submit. If this does not work then send a copy of this FARA to infipinquiry@dnr.IN.gov and describe the reason you are requesting a staff review. Include your name and contact information so that staff can follow-up with you.

Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)



Long: **-86.1976428070311**
Lat: **40.556340069208474**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.4 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: 5/10/2024

About the Floodplain Analysis and Regulatory Assessment (FARA):

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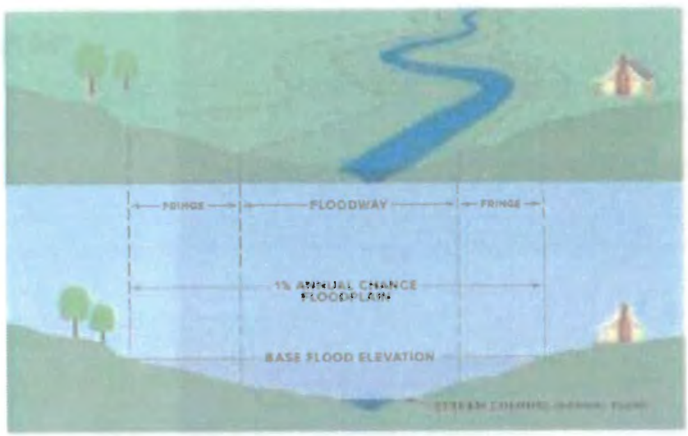

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PATH TO SURVEY:

https://survey123.arcgis.com/share/3293526dfdca453e95c19b08fb7bdcfb??
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DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: -86.19779301073595

Lat: 40.5563726748621

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.3 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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Attachment: Top Grade Production LLC SE Building Construction

DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

1.5

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: -86.19934869196481

Lat: 40.555724634516714

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.8 feet (NAVD88)**

Base Flood Elevation: **807.4 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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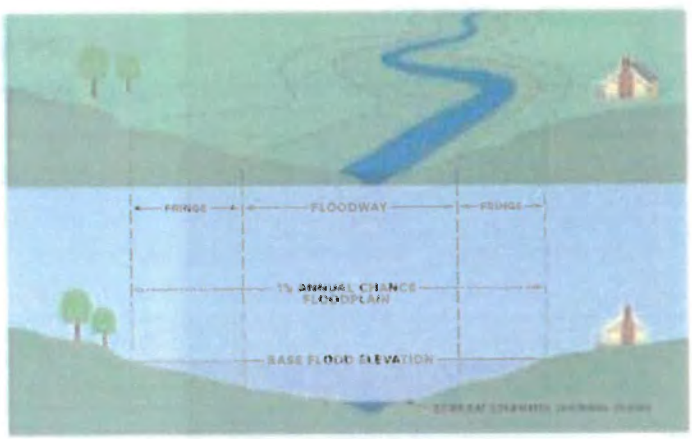

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Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

1.5

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19809341814567**

Lat: **40.55569610429445**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.9 feet (NAVD88)**

Base Flood Elevation: **807.5 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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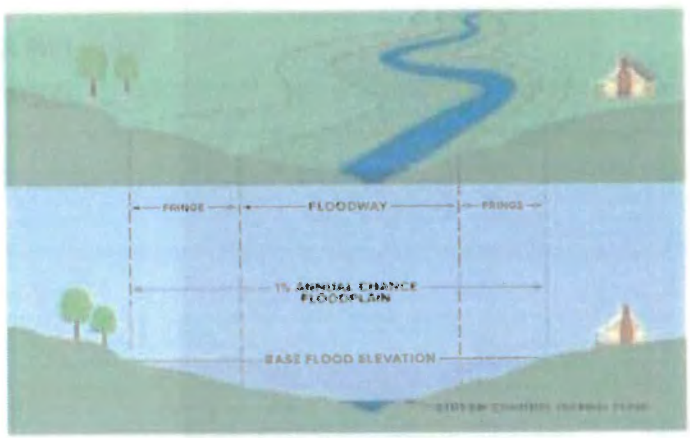

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Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

1.5

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: -86.19900536921085

Lat: 40.555643119563776

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County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.6 feet (NAVD88)**

Base Flood Elevation: **807.5 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

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Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

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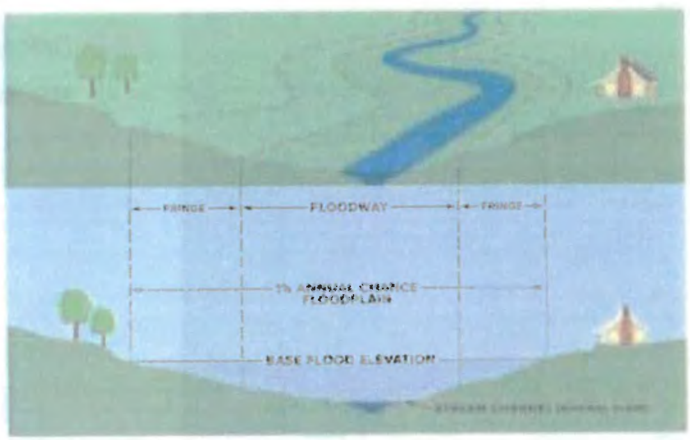

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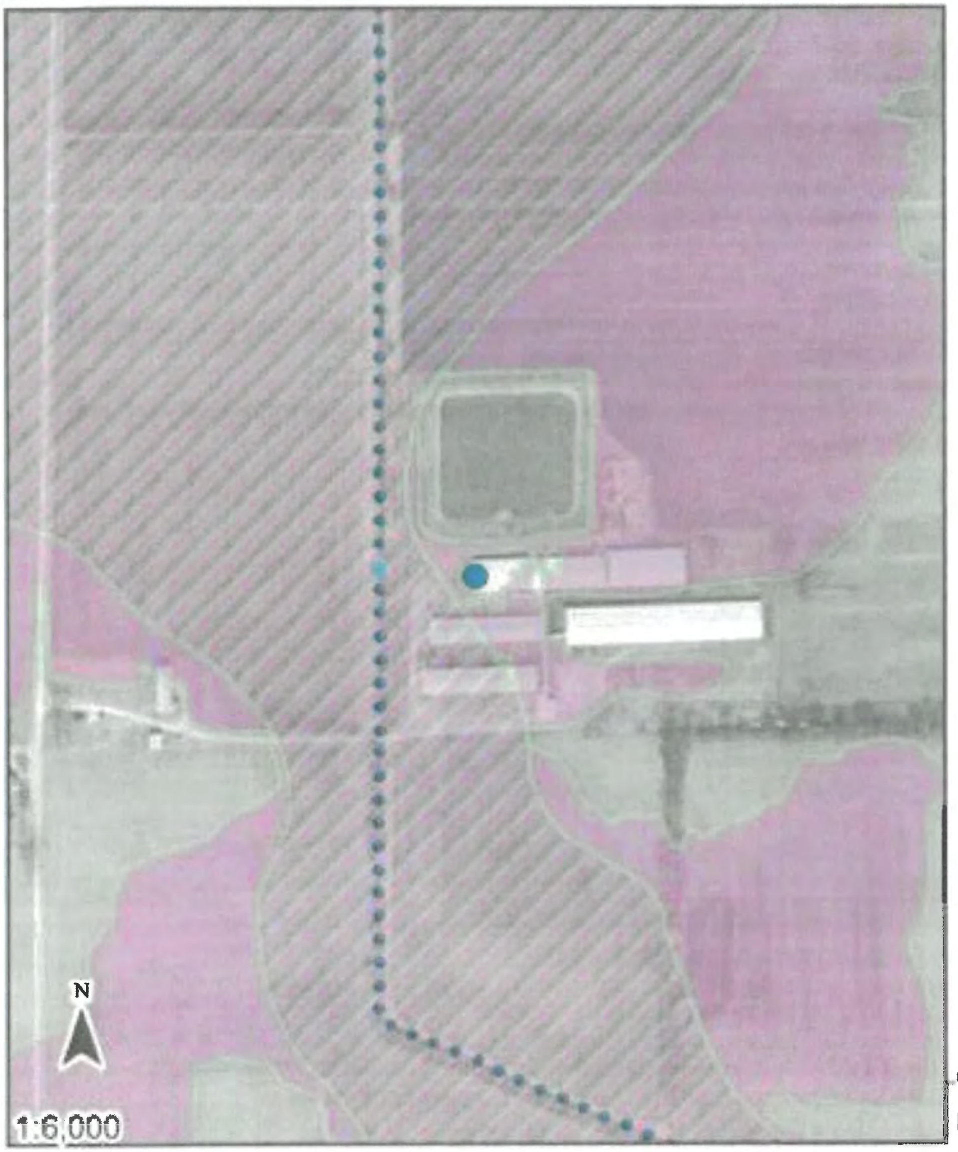
Attachment: Top Grade Production LLC NW Building Construction

DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)



Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19988513376789**

Lat: **40.55625447929201**

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County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.8 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **Not Mapped**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **Contact your local Floodplain Administrator-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

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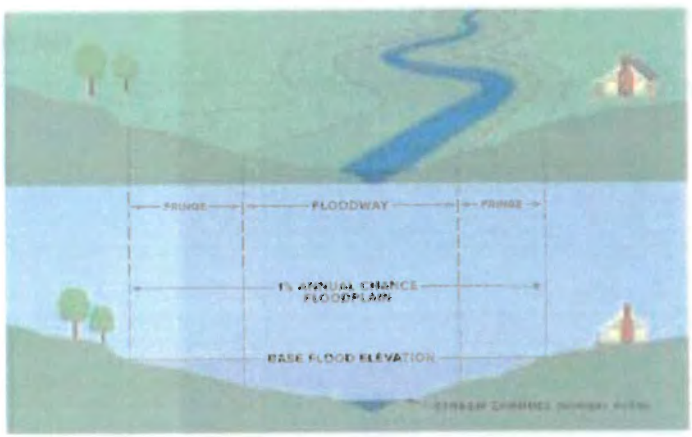

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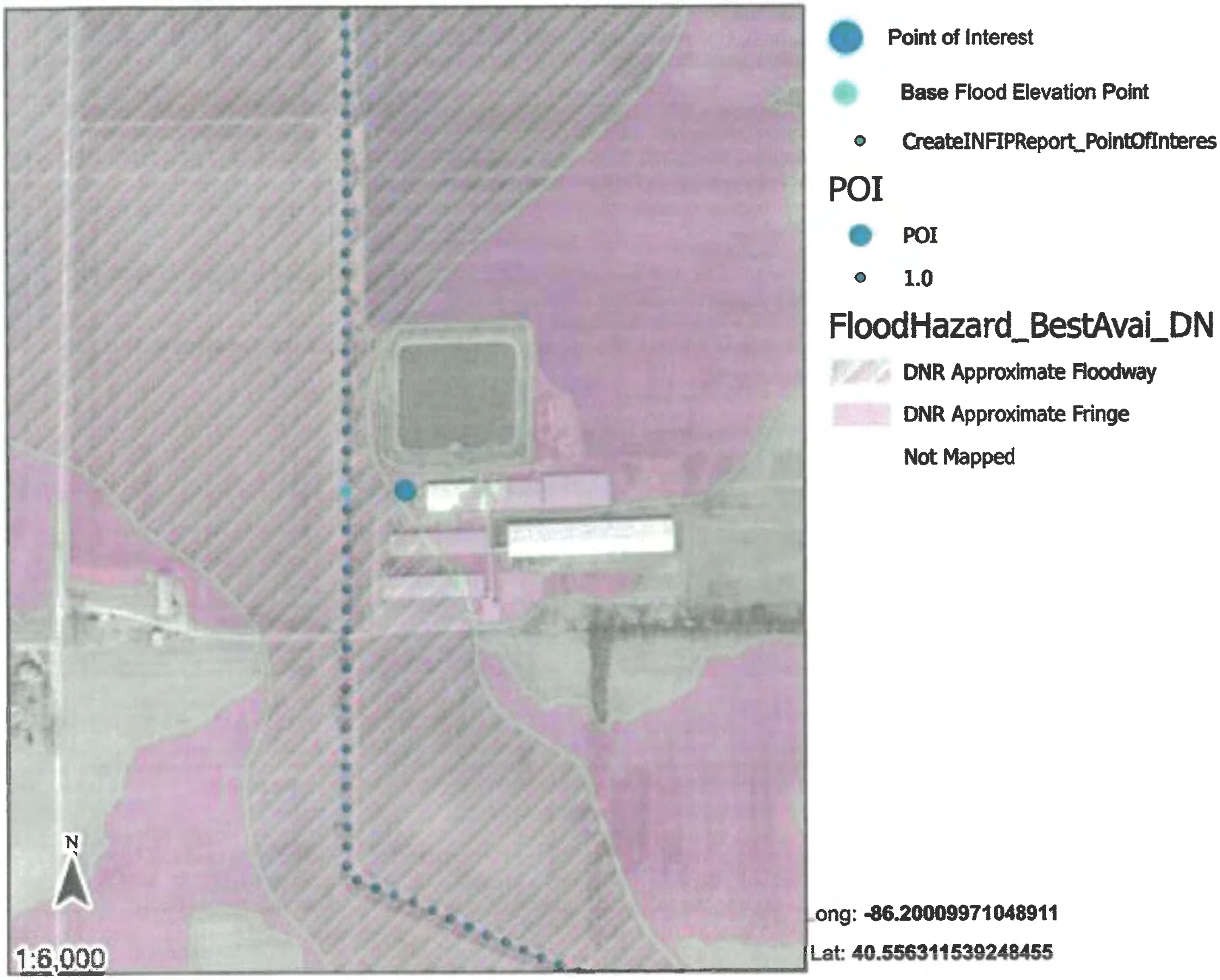

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County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.4 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

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Community Jurisdiction: **Howard County, County proper**

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- The tool selects the nearest flood elevation point for a stream outside the floodplain associated with the point of interest
- There is not a delineated floodway for the stream nearest your point of interest
- The point of interest is along a stream without a mapped floodplain
- The point of interest is in a mapped floodplain of another stream, but the stream nearest the point of interest does not have a mapped floodplain with a floodway of its own

If DNR review is required, do not use this FARA for your site's determination.
If you have questions about DNR permitting requirements, you can contact DNR, Division of Water toll-free at 1-877-928-3755 and select option 1 to speak to a Technical Services staff member. You can also write to the division at water_inquiry@dnr.IN.gov or use the Indiana Waterways Inquiry Request tool at waterways.IN.gov to submit a permitting determination request to both DNR and the Indiana Department of Environmental Management at once.
We recommend keeping a copy of this FARA for your records as the DNR will not have a copy on file.
IF PERMIT ANSWER IS "See following pages" copy the following line into a web browser to get PDF for answers:
https://countydataharvest.in.gov/DNR/INFIP_Report_Backpgs.pdf

PATH TO SURVEY:

https://survey123.arcgis.com/share/3293526dfdca453e95c19b08fb7bdcfb??FIELD%3ALAT1=40.556311539248455&FIELD%3ALON1=-86.20009971048911&FIELD%3ADNR_PERMIT=See+following+pages&FIELD%3ALOCA&FIELD%3ASTREAM=MANSON+KINGERY+DITCH&FIELD%3AINIT_DATE=05%2F10%2F2024&FIELD%3ABFE=807.24705

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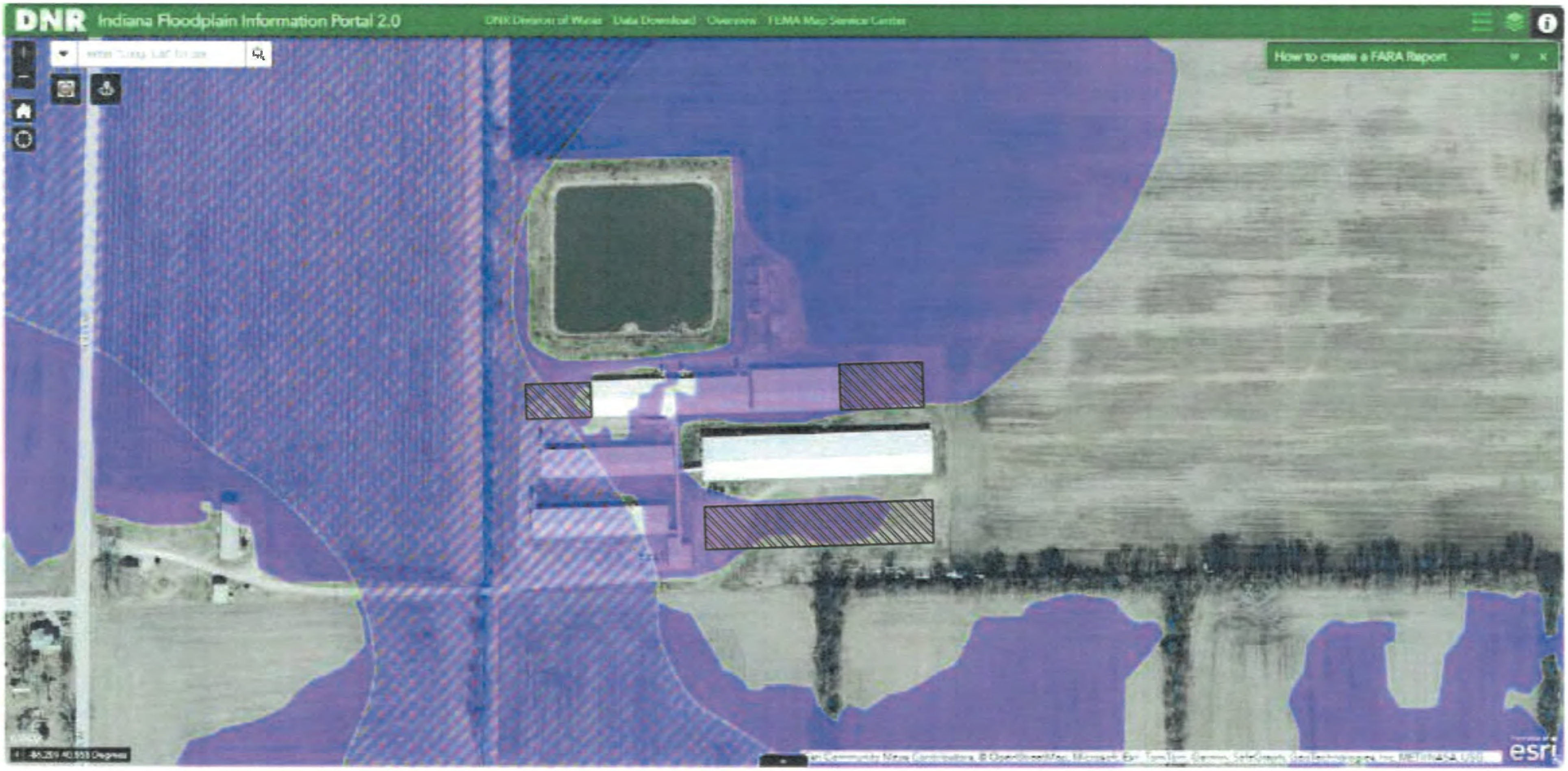
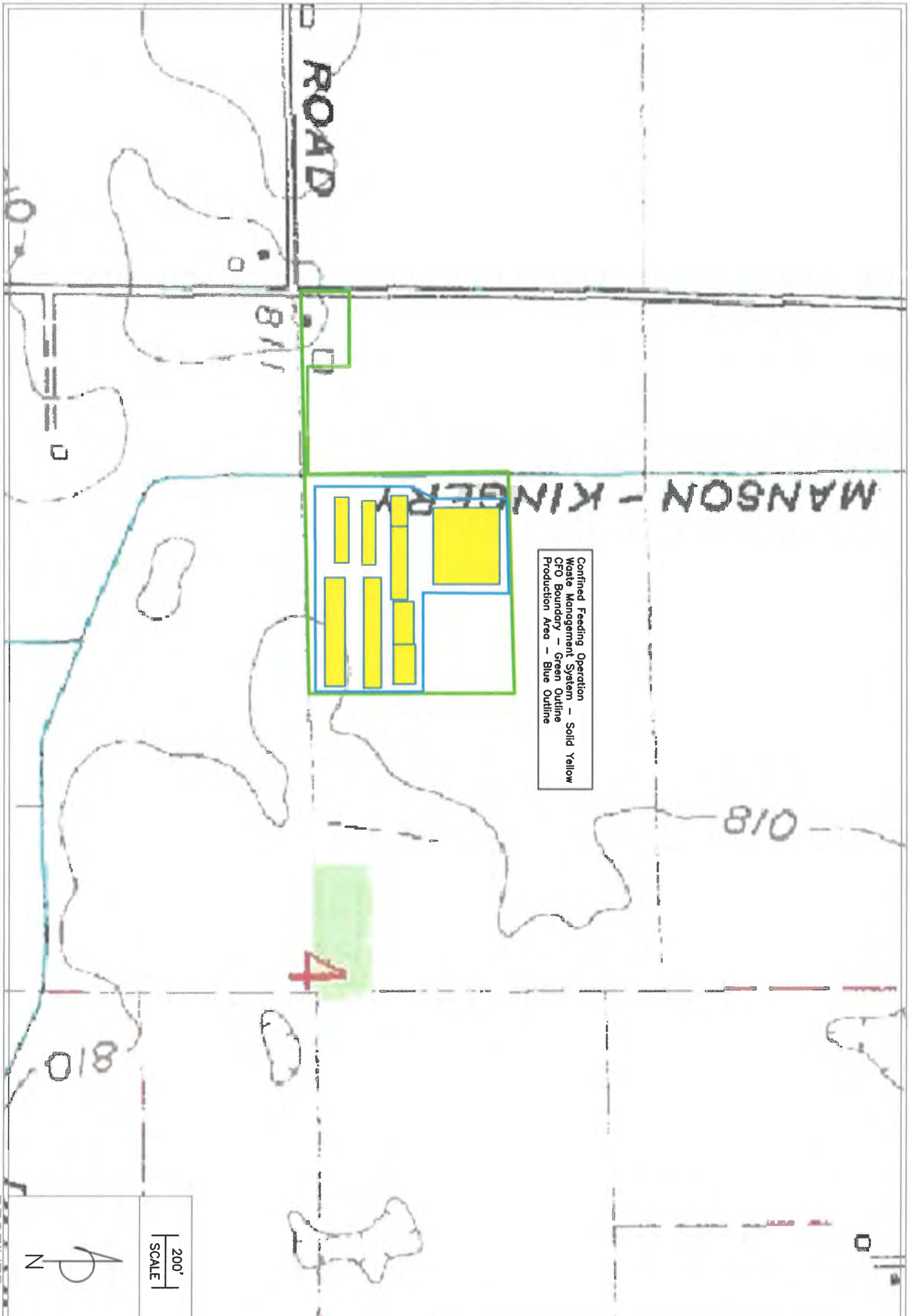
You will need to copy and paste the blue text (PATH TO SURVEY)into a web browser to open the survey you will fill out and submit. If this does not work then send a copy of this FARA to infipinquiry@dnr.IN.gov and describe the reason you are requesting a staff review. Include your name and contact information so that staff can follow-up with you.


DNR
Indiana Floodplain Information Portal 2.0
DNR Division of Water
Data Download
Overview
FEMA Map Service Center
How to create a FARA Report
esri



TOP GRADE PRODUCTION LLC 2667 E. ST. RD 18 KOKOMO, IN 46901 2024 CFO RENEWAL–#3713	USGS TOPOGRAPHIC MAP SITE LOCATION SECTIONS 3 T24N R3E	DATE: 05/10/24 DRAWN BY: MV LIVESTOCK ENGINEERING SOLUTIONS, INC. MICHAEL A. VEENHUIZEN 2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143	SHEET: 1T of 1T DRAWING NO: TGP0224– 01T THE IDEAS, DESIGNS, AND DRAWINGS REPRESENTED HERE ARE THE PROPERTY OF LIVESTOCK ENGINEERING SOLUTIONS, INC. REPRODUCTION OR USE, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF LIVESTOCK ENGINEERING SOLUTIONS, INC. IS PROHIBITED.

2967 S Honey Creek Road
Greenwood, Indiana 46143
317-535-1829 (voice)
317-535-9806 (fax)

Livestock Engineering Solutions, Inc.

June 4, 2024

Kraig Whitman
Indiana Department of Environmental Management
Office of Land Quality
Confined Feeding Program
100 North Senate Avenue -- IGCN Room 1101
Indianapolis, Indiana 46204-2251

RE: Top Grade Production LLC – Farm ID#3713
CFO Approval Renewal and Construction Authorization Renewal
Notice of Deficiency 1 Response Supplement

Dear Mr. Whitman:

On behalf of Top Grade Production LLC, Livestock Engineering Solutions, Inc. submits the following information in response to the Indiana Department of Environmental Management (IDEM) Notice of Deficiency 1 dated May 8, 2024 requesting additional information for the submitted Confined Feeding Operation Approval Renewal and Construction Authorization Renewal Application. The notice includes a Notice of Deficiency 1 enclosure. A response to the Notice of Deficiency 1 enclosure was submitted on May 13, 2024. Additional information has been gathered and prepared to supplement the response to Item 1. DNR Approximate Floodway and Fringe. The following information is provided to complete the response to Item 1.

Notice of Deficiency 1 Enclosure: Kraig Whitman

1. DNR Approximate Floodway and Fringe: It is noted that the recently updated DNR Approximate Floodway and Fringe maps indicate that the approved construction may be located in the DNR Approximate Floodway and Floodplain Fringe.

   Indiana DNR, Division of Water Determination.
   The information available from the DNR Indiana Floodplain Information Portal 2.0 was reviewed and it was identified that the information provided by the DNR Approximate Floodway and Fringe maps and the information provided in the Floodplain Analysis & Regulatory Assessment (FARA) reports is inconsistent and the maps do not accurately identify the approximate floodplain floodway and approximate floodplain fringe boundaries. The inconsistency is shown on the FARA reports which identifies an approximate ground elevation and a base flood elevation (BFE). At numerous locations within the DNR Approximate Floodway and Fringe map boundaries, the approximate ground elevation is reported to be above the base flood elevation (BFE) on the FARA report. This inconsistency would indicate that areas shown on the maps as being in the approximate floodplain floodway and the approximate floodplain fringe are not actually in the floodplain.

   The Indiana DNR, Division of Water was contacted by telephone on about May 2, 2024 to obtain clarification regarding the inconsistencies presented on the FARA reports. The Indiana DNR, Division of Water representative recommended a request be submitted through the DNR Indiana Floodplain Information Portal 2.0 identifying the inconsistencies in the FARA report and request a review of the FARA report and floodway and floodplain fringe

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information presented on the DNR Indiana Floodplain Information Portal 2.0. A request was submitted on May 10, 2024 to the DNR, Division of Water for each location of the proposed construction. Three requests were submitted. A map showing the proposed construction and examples of the FARA reports generated from the DNR Indiana Floodplain Information Portal 2.0 were included with each request. A copy of the information attachments provided to the DNR, Division of Water are attached for reference.

A confirmation that three requests for staff review of the FARA determination generated through the Indiana Floodplain Information Portal were received by email on May 10, 2024 from DNR INFIP_Inquiry. A copy of each confirmation is provided for reference.

A response to the three requests for staff review was received from the Indiana Department of Natural Resources, Division of Water by email on May 15, 2024. The response to each request stated:

> *"Your requested staff review of the FARA determination has been completed. DNR, Division of Water staff has confirmed that the information generated in the FARA determination is accurate according to our best available information and should be used for planning, permitting, and flood risk purposes.*
>
> *If you have additional questions, please contact the Division of Water by replying directly to this email, or by telephone at 1-317-232-4160.*
>
> *Thank you, Indiana Department of Natural Resources."*

A copy of each response is provided for reference.

It was interpreted based on the response from the Indiana DNR, Division of Water that the approximate ground elevations and base flood elevations (BFE) reported on the FARA reports are accurate and correct indicating that the areas identified on these reports where the approximate ground elevation is greater than the base flood elevation (BFE) are not in the floodplain. The Indiana DNR, Division of Water was contacted by telephone on May 15, 2024 to confirm this interpretation and clarify the Indiana DNR, Division of Water determination that the areas identified are not in the floodplain. A voicemail message was left identifying the request for staff review, the May 15, 2024 responses, and the case numbers for the inquiry with a request for DNR to return a call to further discuss the determination responses.

A return telephone call was received from the Indiana DNR, Division of Water on May 15, 2024. The representative from the Indiana DNR, Division of Water confirmed that the determination of the staff review was that the areas identified are not in the floodplain. A written confirmation was requested from the Indiana DNR, Division of Water to document the determination. At the time of this call, the Indiana DNR, Division of Water representative stated that the information on the FARA reports regarding the approximate ground elevation and approximate base flood elevation (BFE) was correct and accurate and provided written confirmation of the determination and that additional written confirmation was not necessary.

In an attempt to receive written confirmation of the Indiana DNR, Division of Water determination that the areas identified are not in the floodplain, the Indiana DNR, Division of Water was contacted by telephone on May 20, 2024. The representative from the Indiana DNR, Division of Water responded that a written confirmation could be provided. An email confirmation from the Technical Services Section of the Indiana Department of Natural Resources, Division of Water was received on May 20, 2024.

The email confirmation stated:

> *"Good afternoon,*
>
> *Thank you for calling us regarding your FARA reports, file numbers 05.10.2024-1, -2, and -3. Based on the locations that you selected, our engineering section in the DNR Division of Water has determined that the three points that you selected are not in the floodplain meaning you are not required to get a floodway permit from our office if you are building at the coordinates that were given to our office.*
>
> *Please reach out to us vis email or this number 317-232-4160 if you have any more questions.*
>
> *Thank you,*
>
> *TSC"*

Based on this email confirmation from the Technical Services Section of the Indiana Department of Natural Resources, Division of Water, it is confirmed that the areas identified in the request for staff review of the FARA determination submitted to the Indiana DNR, Division of Water are not in the floodplain. A copy of the email confirmation is provided for reference.

Building 8P Updates:
The Indiana DNR, Division of Water reviewed information provided within the footprint of Building 8P and confirmed that these points are not located in the floodplain. Additional investigation by Livestock Engineering Solutions, Inc. of the Building 8P area based on information available from the DNR Indiana Floodplain Information Portal 2.0 indicates that a portion of Building 8P is not in the floodplain, as confirmed by the Indiana DNR, Division of Water and FARA demonstration reports, and a portion of Building 8P may be in the floodplain. A review of the information available from the Floodplain Information Portal indicates that the base flood elevation is 807.2 feet and 807.3 feet and the approximate ground elevation varies from 806.9 feet to 807.6 feet. Based on this determination, the Building 8P design has been updated to withstand the hydrostatic pressure due to potential floodwaters.

Building 8P will be constructed to ensure that the lowest access point to the waste management system is two feet above the base flood elevation (BFE). The BFE is 807.2 feet and 807.3 feet in the area of Building 8P. The lowest access point to the waste management system will be constructed at a minimum elevation of 809.3 feet. The required elevations are depicted on the updated design plans.

A justification is provided demonstrating that Building 8P can resist the buoyancy/uplift forces from potential flood waters. The manure storage floor is designed with a reinforced concrete floor to resist the upward hydrostatic pressure from potential flood waters. A site specific design and updated design plans are provided demonstrating that the concrete floor is designed to resist the hydrostatic pressure.

Building 9P Updates:
Building 9P is located partially in the approximate floodway and the approximate floodplain fringe. Information was provided to the Indiana DNR, Division of Water for review to determine if a portion of Building 9P is in the floodplain. The Indiana DNR, Division of Water reviewed information provided within the footprint of Building 9P and confirmed that these points are not located in the floodplain. Additional investigation by Livestock Engineering Solutions, Inc. of the Building 9P area utilizing the DNR Indiana Floodplain Information Portal 2.0 identified the portion of Building 9P that is not within the floodplain

(floodway and fringe). Based on this investigation, it was determined that the boundary of the floodplain (floodway and fringe) is approximately 67 feet from the west end of Building 3E. The FARA determination reports used to make this determination are provided. The base flood elevation (BFE) identified in these reports is 807.2 feet and 807.3 feet. The approximate ground elevations identified in the reports with a BFE of 807.2 feet are 807.3 feet, 807.4 feet, and 807.7 feet. The approximate ground elevations identified in the reports with a BFE of 807.3 feet are 807.4 feet and 807.7 feet.

Since a portion of Building 9P may be located in the floodplain approximate floodway and floodplain approximate fringe, the dimensions have been changed and updated to locate Building 9P outside of the floodplain (floodway and fringe). The length of Building 9P has been changed from 119 feet to 64 feet to locate the constructed building outside of the floodplain. The updated dimensions of Building 9P are 64'-0" x 64'-0" O.D. The operating capacity for Building 9P is changed from 120 sows and litters to 60 sows and litters.

Updated design plans for Building 9P are provided depicting the new building dimensions, manure storage dimensions, and operating capacity. The Confined Feeding Operation Approval Renewal and Manure Management Plan/ Construction Authorization Renewal has been updated to include a facility change documenting the changes to Building 9P.

Building 10P Updates:
The Indiana DNR, Division of Water reviewed information provided within the footprint of Building 10P and confirmed that the area of Building 10P is not located in the floodplain. In addition to the locations submitted to the Indiana DNR, Division of Water for review, Livestock Engineering Solutions, Inc. reviewed additional locations in the area of Building 10P utilizing information available from the DNR Indiana Floodplain Information Portal 2.0. This review confirms the Indiana DNR, Division of Water determination that the area of Building 10P is not located in the floodplain. The FARA determination reports used to make this determination are provided.

Since Building 10P is not located in the floodplain, no changes to the originally submitted design plans for Building 10P are required.

Farmstead Plan Updates:
In accordance with the requirements of 327 IAC 19-7-3(f), the boundaries of the mapped approximate floodplain floodway and approximate floodplain fringe based on information from the DNR Indiana Floodplain Information Portal 2.0 are included on farmstead plan sheet 2A. It is noted that based on the Indiana DNR, Division of Water review of the FARA Determination for this area and additional information from the DNR Indiana Floodplain Information Portal 2.0 that these boundaries are not believed to be accurate and representative of the actual approximate floodplain floodway and approximate floodplain fringe boundaries. The best available information was added to the farmstead plan in accordance with the requirements of 327 IAC 19-7-3(f).

USGS Topographic Map:
The Indiana Department of Environmental Management states Comment 4 in the Notice of Deficiency Enclosure 1, "Depending on the caliber of updates submitted to comply with the floodway and fringe requirements, a USGS topographic map may need to be submitted in addition to the corresponding design plans." Per the Indiana Department of Environmental Management's comment, a USGS Topographic Map for the confined feeding operation site is provided.

A review of the Howard County GIS site (https://beacon.schneidercorp.com) identifies a Storm Water/Surveyor Layer that includes Contour Lines. A copy of the Howard County

GIS site contour line map for the confined feeding site is provided for reference. It is noted that the contour line elevations shown on this map are greater than the contour line elevations shown on the USGS Topographic Map suggesting that the current site elevations may be higher than those depicted on the USGS Topographic Map.

It is noted that the evaluations presented in this summary and response are based on the information available from the DNR Indiana Floodplain Information Portal 2.0 and the USGS Topographic map and Howard County GIS site contour lines map are provided for reference.

Attachments:
In support of the floodplain determination and to update the CFO Approval Renewal and Construction Authorization Renewal application packet the following attachments are included.

- Attachment 1: Information provided to the Indiana DNR, Division of Water as part of the request for staff review of a FARA determination for Building 8P (northeast construction). Labeled "Attachment: Top Grade Production LLC NE Building Construction"
- Attachment 2: Information provided to the Indiana DNR, Division of Water as part of the request for staff review of a FARA determination for Building 9P (northwest construction). Labeled "Attachment: Top Grade Production LLC NW Building Construction"
- Attachment 3: Information provided to the Indiana DNR, Division of Water as part of the request for staff review of a FARA determination for Building 10P (southeast construction). Labeled "Attachment: Top Grade Production LLC SE Building Construction"
- Attachment 4: Confirmation of submittal of a request for staff review of the FARA determination. Three confirmations included.
- Attachment 5: Indiana DNR, Division of Water response to request for staff review of the FARA determination. Three responses included Case No. 05.10.2024-1; Case No. 05.10.2024-2; Case No. 05.10.2024-3.
- Attachment 6: Indiana DNR, Division of Water confirmation that the locations identified in the request for staff review of the FARA determination (Case No. 05.10.2024-1; Case No. 05.10.2024-2; Case No. 05.10.2024-3) are not in the floodplain.
- Attachment 7: FARA determination reports for Building 8P documenting base flood elevation (BFE) and approximate ground elevation showing that a portion of Building 8P is out of the floodplain and a portion of Building 8P may be in the floodplain. Information used to determine that a design for Building 8P is required to resist the hydrostatic pressure due to flood waters.
- Attachment 8: FARA determination reports for Building 9P documenting base flood elevation (BFE) and approximate ground elevation to determine the portion of Building 9P that is not in the floodplain. Information used to determine that the floodplain floodway and fringe boundary is approximately 67 feet from the west edge of existing Building 3E.
- Attachment 9: FARA determination reports for Building 10P documenting base flood elevation (BFE) and approximate ground elevation confirming that Building 10P is not located in the floodplain.

- Attachment 10: CFO Approval Renewal and Construction Authorization Renewal updates.
    - Updated application narrative to include facility change request and updated approval information. (pages 1-10)
    - Updated Farmstead Plan Sheet 2A to include floodplain and updated building dimensions and operating capacity. A copy of the DNR Indiana Floodplain Information Portal 2.0 map for the confined feeding site is added to show the current floodplain floodway and fringe boundaries depicted on Farmstead Plan Sheet 2A. (plan sheet 2A and floodplain map)
    - Updated Construction Attachment Update to include Building 9P dimension changes and Design Summary updates for Building 8P, 9P. and 10P. (pages 73-82)
    - Updated Building 8P and Building 9P design plans and cover pages. (page 81 [duplicate], page 101, plan sheets 1B-8B, and plan sheets 1C-8C)
    - Updated Site Specific Analysis and Design cover page and narrative. (pages 177-180)
    - Updated and new Site Specific Analysis and Design – Construction Joint Spacing, Flood Water Design Buoyancy/Uplift Resistance, Flood Water Design Building 8P Concrete Floor Design (pages 227 – 228; pages 228-A – 228-J)
- Attachment 11: USGS Topographic Map and Beacon Howard County GIS Aerial Contour Map.

Thank you for your thoughtful consideration and review of this information. If you have any questions or need further information, please contact Nick Maple, Top Grade Production LLC or Michael Veenhuizen, Livestock Engineering Solutions, Inc.

Sincerely,

Michael A. Veenhuizen

Enclosures
Cc: Nick Maple, Top Grade Production LLC

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ATTACHMENT 1

FARA Determination – Building 8P

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Attachment: Top Grade Production LLC NE Building Construction

DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19825435068661**

Lat: **40.556319690666804**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.4 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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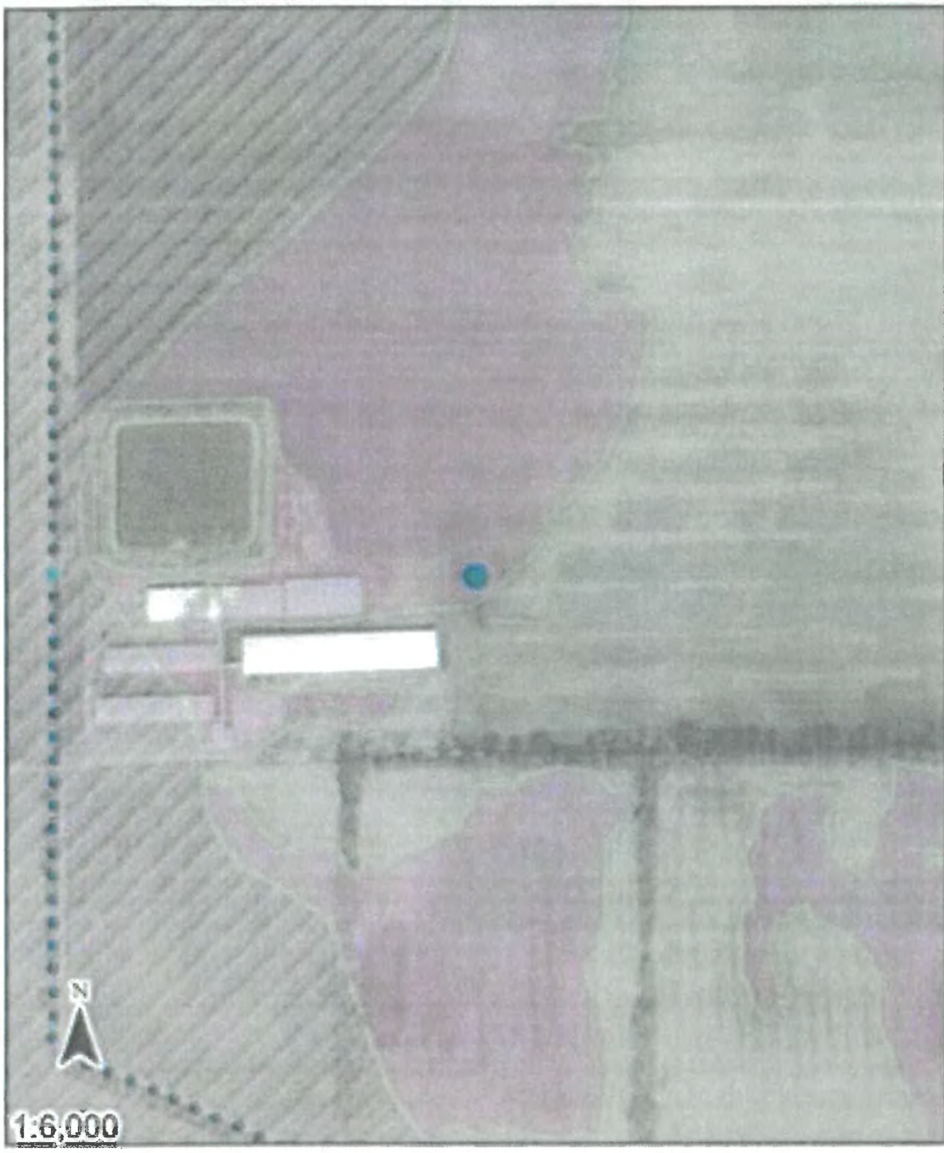
Floodplain Analysis & Regulatory Assessment (FARA)

DNR Indiana Department of Natural Resources



Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: -86.19737995054763

Lat: 40.55642158331282

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.6 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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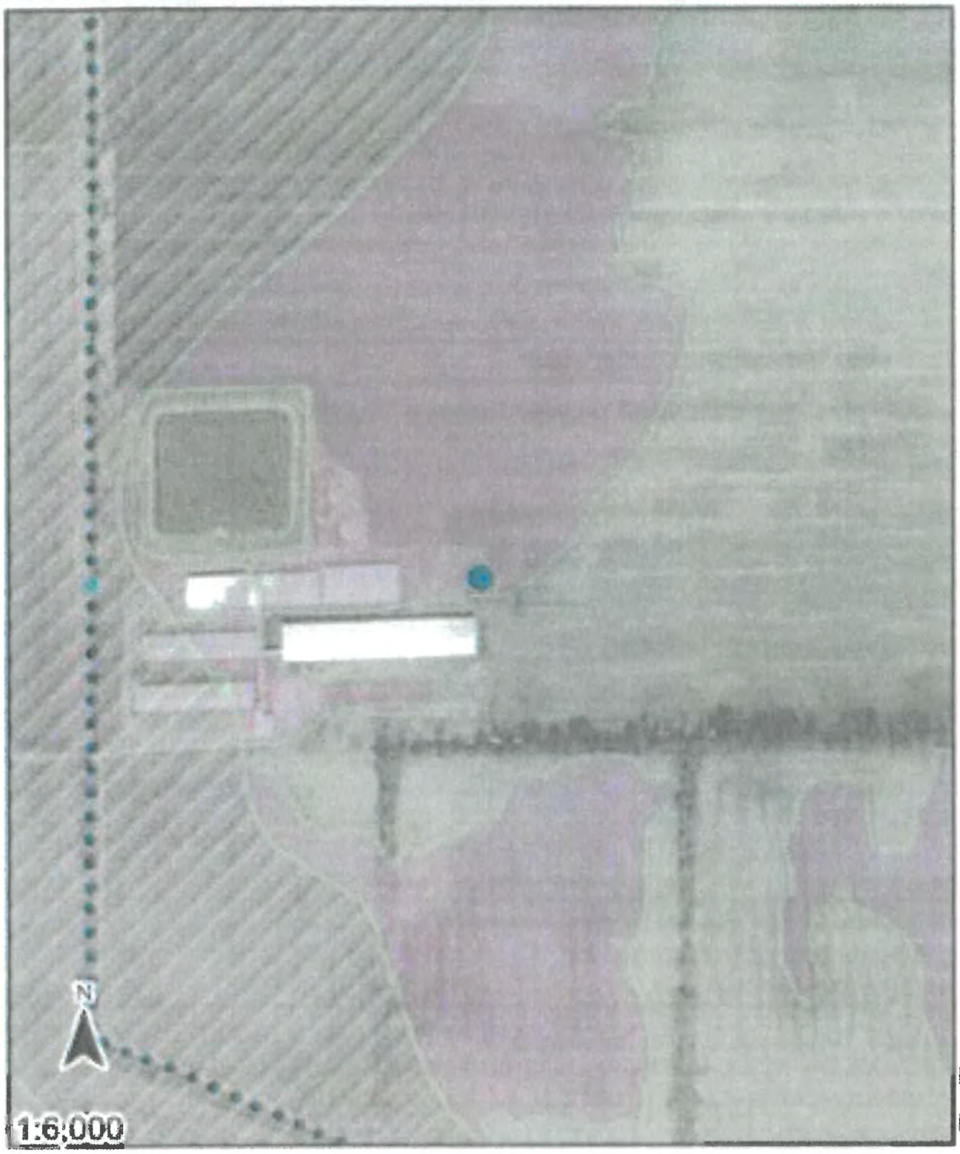
Floodplain Analysis & Regulatory Assessment (FARA)

DNR Indiana Department of Natural Resources



Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: -86.1976428070311

Lat: 40.556340069208474

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.4 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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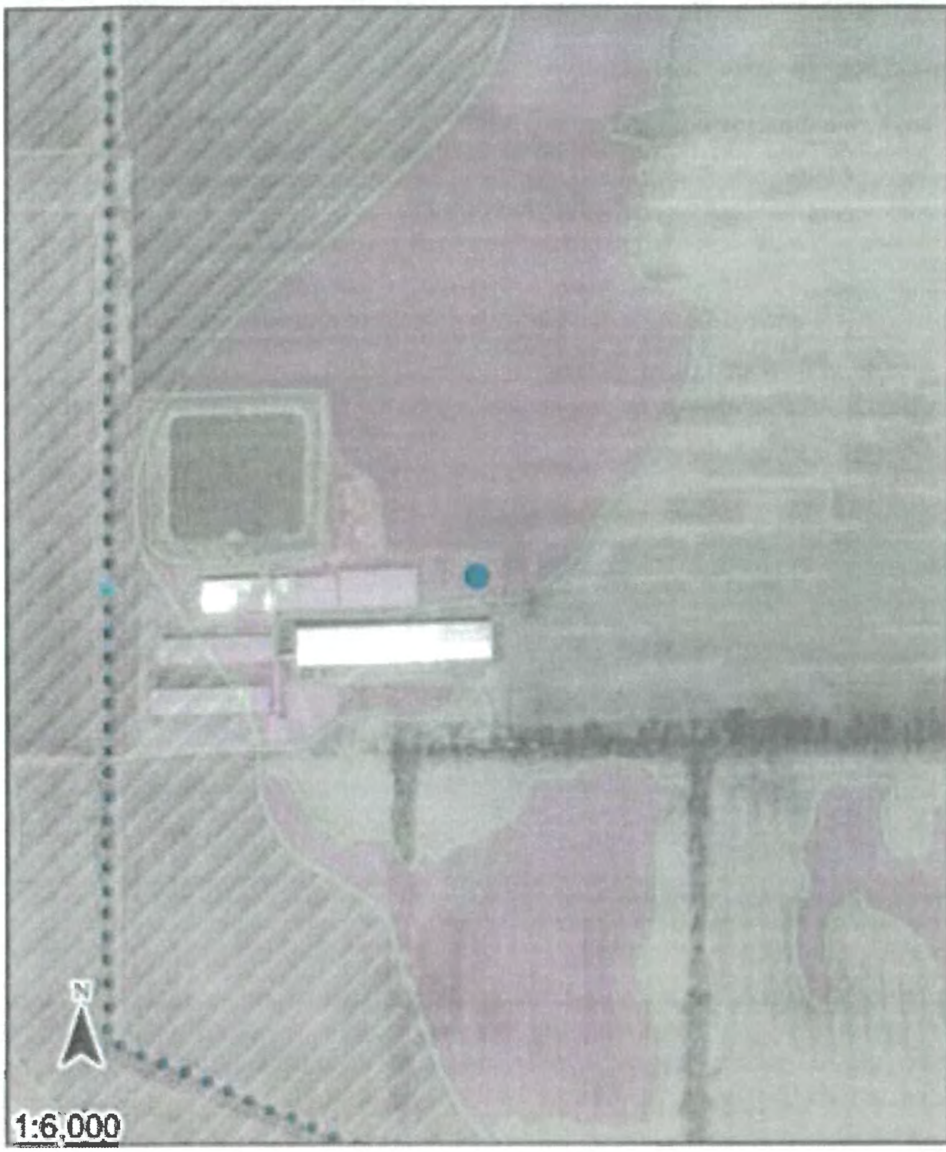
DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)



Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: -86.19779301073595

Lat: 40.5563726748621

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.3 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

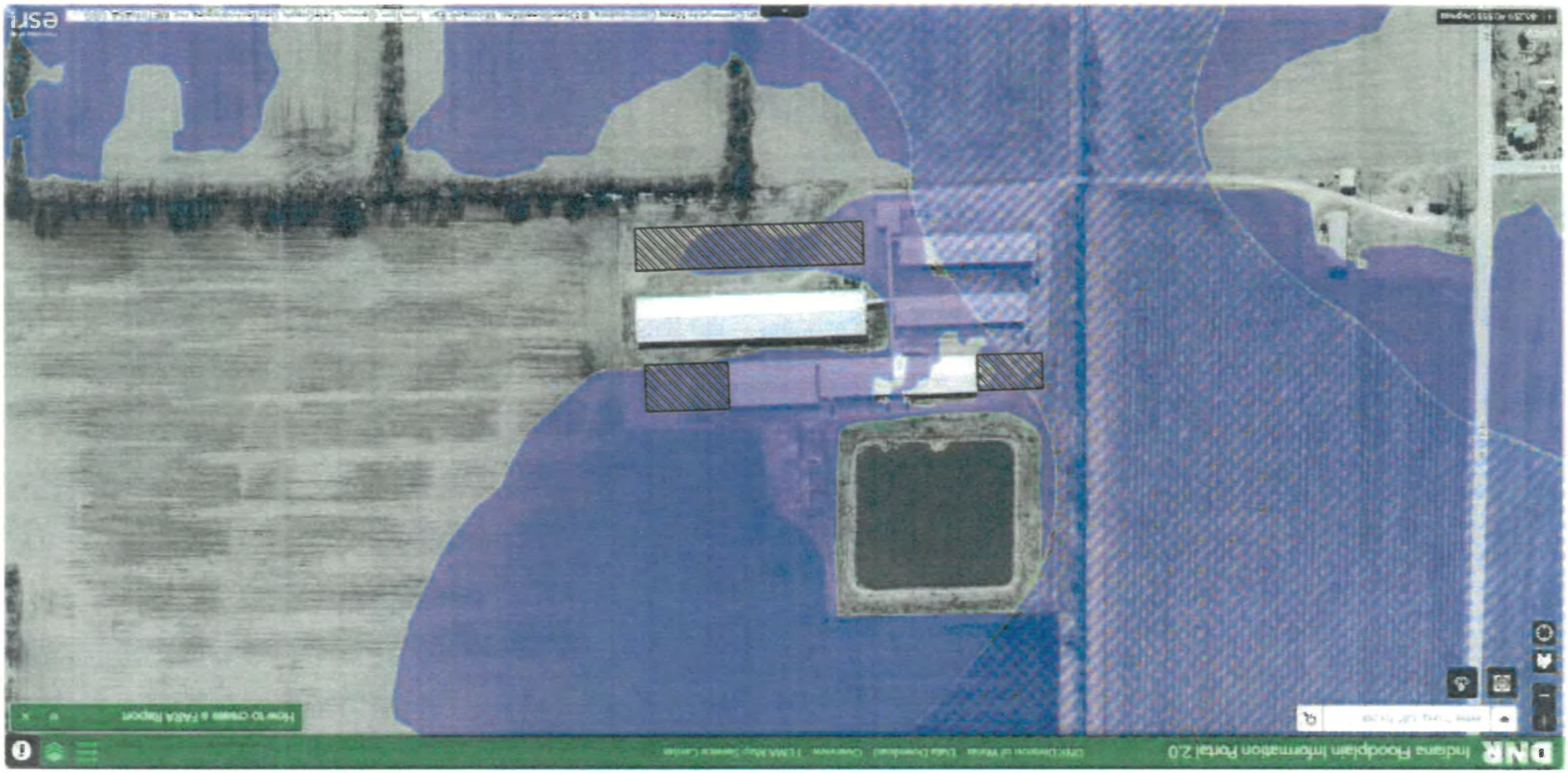
Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: 5/10/2024



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ATTACHMENT 2

FARA Determination – Building 9P

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Attachment: Top Grade Production LLC NW Building Construction

DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19988513376789**

Lat: **40.55625447929201**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.8 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **Not Mapped**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **Contact your local Floodplain Administrator-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

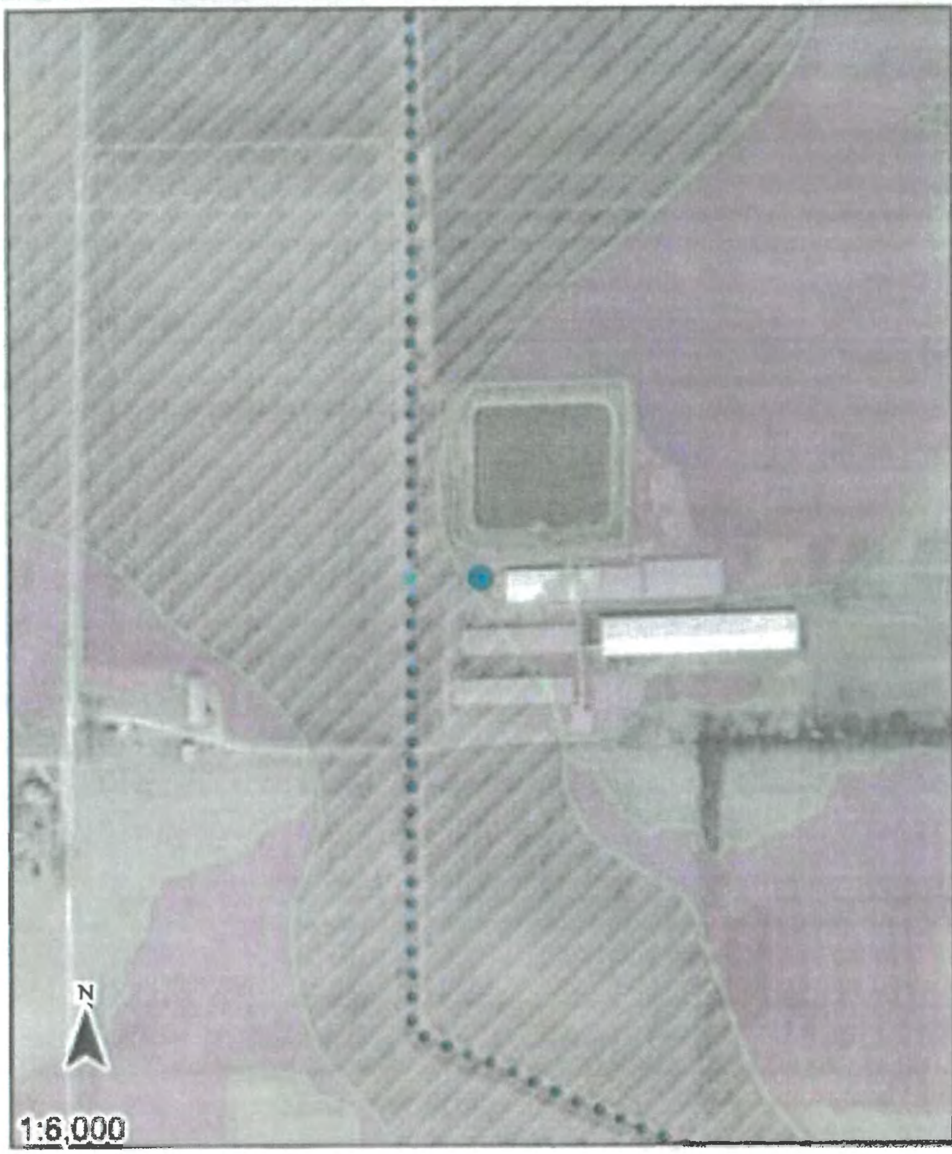
Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: 5/10/2024

Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)



Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.20009971048911**

Lat: **40.556311539248455**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.4 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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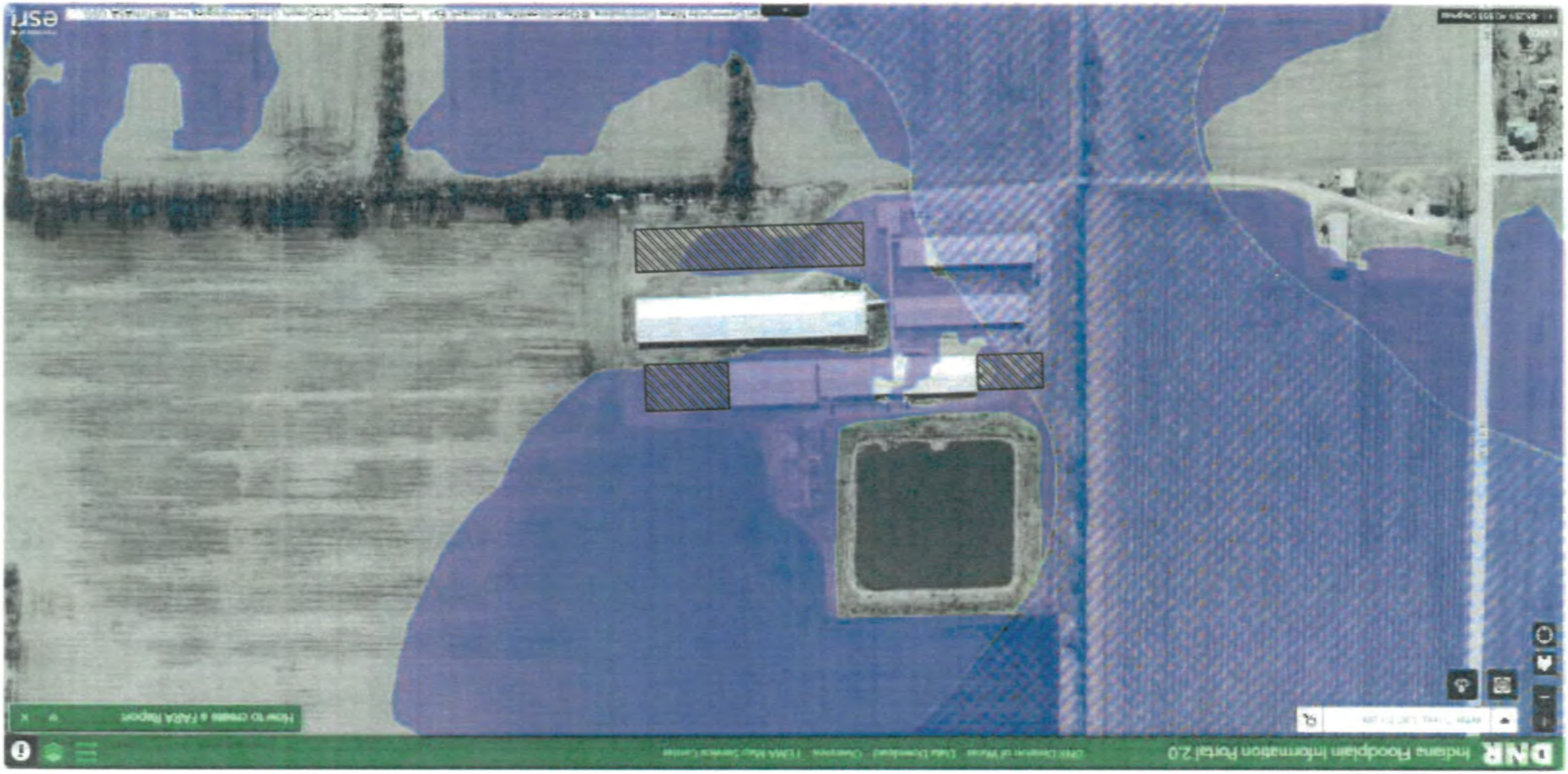

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ATTACHMENT 3

FARA Determination – Building 10P

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Attachment: Top Grade Production LLC SE Building Construction

DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.8 feet (NAVD88)**

Base Flood Elevation: **807.4 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: **5/10/2024**

Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

CreateINFIPReport_PointOfInteres

POI

POI

1.0

1.5

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19809341814567**

Lat: **40.55569610429445**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.9 feet (NAVD88)**

Base Flood Elevation: **807.5 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: **5/10/2024**

DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest
Base Flood Elevation Point
CreateINFIPReport_PointOfInteres

POI

POI
1.0
1.5

FloodHazard_BestAvai_DN

DNR Approximate Floodway
DNR Approximate Fringe
Not Mapped

Long: **-86.19900536921085**
Lat: **40.555643119563776**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.6 feet (NAVD88)**

Base Flood Elevation: **807.5 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

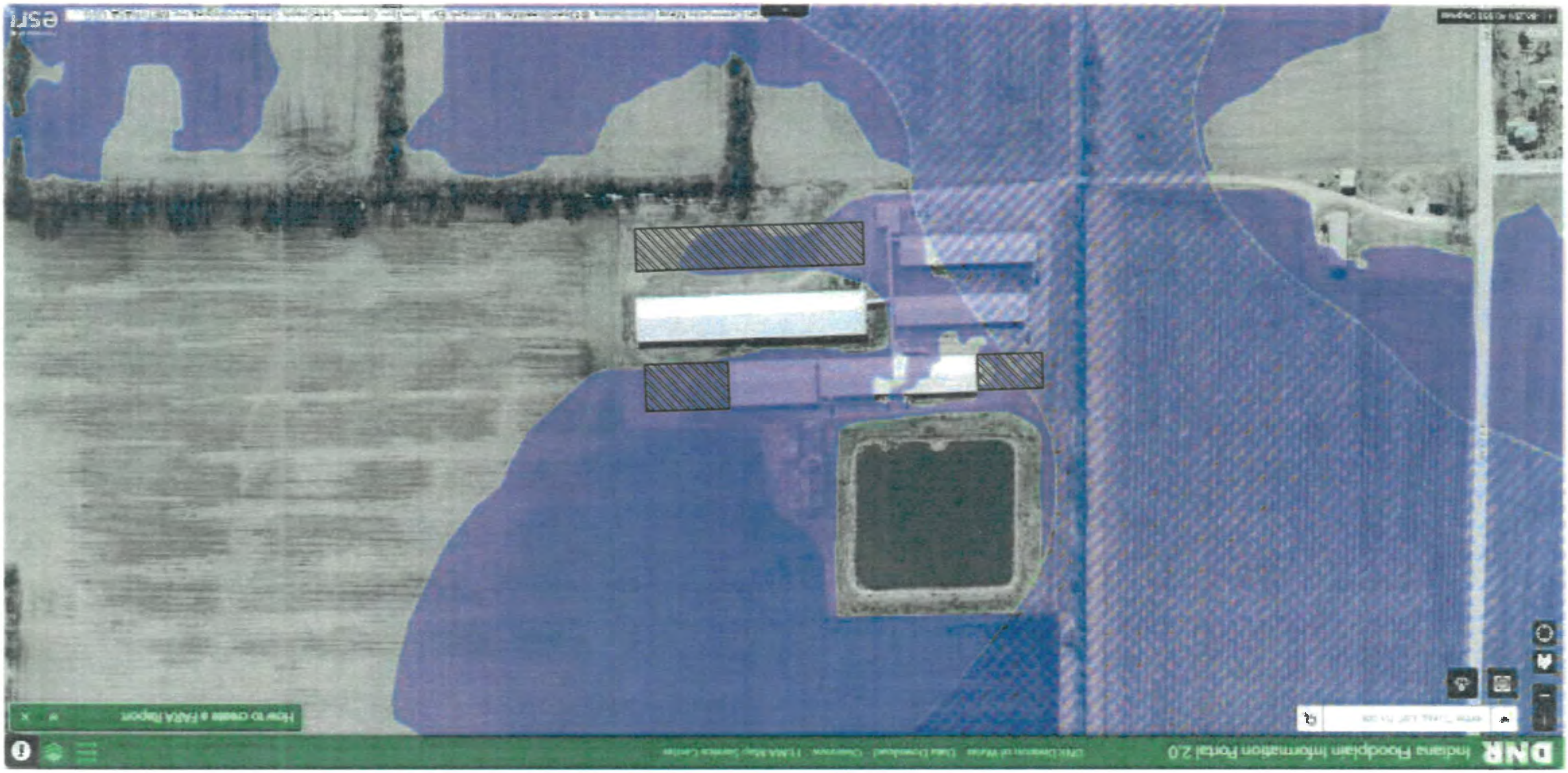
Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: 5/10/2024



RECEIVED
CONFINED FEEDING OPERATIONS
June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

ATTACHMENT 4

DNR Request Submittal Confirmation

Michael Veenhuizen

From: DNR INFIP_Inquiry <INFIP_Inquiry@dnr.IN.gov>
Sent: Friday, May 10, 2024 2:54 PM
To: Michael Veenhuizen
Subject: Review Request

Importance: Low

Thank you for submitting a request for staff review of the FARA determination generated through the Indiana Floodplain Information Portal. The DNR, Division of Water will review the FARA determination as well as any additional information you may have provided. You can expect an initial response within 5 business days of this request.

Thank you

Indiana Department of Natural Resources

Michael Veenhuizen

From: DNR INFIP_Inquiry <INFIP_Inquiry@dnr.IN.gov>
Sent: Friday, May 10, 2024 3:14 PM
To: Michael Veenhuizen
Subject: Review Request

Importance: Low

Thank you for submitting a request for staff review of the FARA determination generated through the Indiana Floodplain Information Portal. The DNR, Division of Water will review the FARA determination as well as any additional information you may have provided. You can expect an initial response within 5 business days of this request.

Thank you

Indiana Department of Natural Resources

Michael Veenhuizen

From: DNR INFIP_Inquiry <INFIP_Inquiry@dnr.IN.gov>
Sent: Friday, May 10, 2024 3:27 PM
To: Michael Veenhuizen
Subject: Review Request

Importance: Low

Thank you for submitting a request for staff review of the FARA determination generated through the Indiana Floodplain Information Portal. The DNR, Division of Water will review the FARA determination as well as any additional information you may have provided. You can expect an initial response within 5 business days of this request.

Thank you

Indiana Department of Natural Resources

ATTACHMENT 5

DNR Staff Review Determination and Response

RECEIVED
CONFINED FEEDING OPERATIONS
June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

Michael Veenhuizen

From: Godoy, Lorena E <LGodoy@dnr.IN.gov>
Sent: Wednesday, May 15, 2024 11:39 AM
To: Michael Veenhuizen; DNR INFIP_Inquiry
Subject: Case No. 05.10.2024-1 Floodplain Analysis and Regulatory Assessment Review Response

Your requested staff review of the FARA determination has been completed. DNR, Division of Water staff has confirmed that the information generated in the FARA determination is accurate according to our best available information and should be used for planning, permitting, and flood risk purposes.
If you have additional questions, please contact the Division of Water by replying directly to this email, or by telephone at 1-317-232-4160.
Thank you, Indiana Department of Natural Resources
www.dnr.in.gov

Lorena Godoy
Hydraulic Engineer
Indiana Department of Natural Resources
Division of Water
402 W Washington St Room W264
Indianapolis, IN 46204
☎ 463-261-6187
✉ lgodoy@dnr.in.gov

** Please let us know about the quality of our service by taking this brief* customer survey.

Michael Veenhuizen

From:	Godoy, Lorena E <LGodoy@dnr.IN.gov>
Sent:	Wednesday, May 15, 2024 11:41 AM
To:	Michael Veenhuizen; DNR INFIP_Inquiry
Subject:	Case No. 05.10.2024-2 Floodplain Analysis and Regulatory Assessment Review Response

Your requested staff review of the FARA determination has been completed. DNR, Division of Water staff has confirmed that the information generated in the FARA determination is accurate according to our best available information and should be used for planning, permitting, and flood risk purposes.

If you have additional questions, please contact the Division of Water by replying directly to this email, or by telephone at 1-317-232-4160.

Thank you, Indiana Department of Natural Resources

www.dnr.in.gov

Lorena Godoy
Hydraulic Engineer
Indiana Department of Natural Resources
Division of Water
402 W Washington St Room W264
Indianapolis, IN 46204
☎ 463-261-6187
✉ lgodoy@dnr.in.gov

**** Please let us know about the quality of our service by taking this brief*** customer survey.

Michael Veenhuizen

From: Godoy, Lorena E <LGodoy@dnr.IN.gov>
Sent: Wednesday, May 15, 2024 11:43 AM
To: Michael Veenhuizen; DNR INFIP_Inquiry
Subject: Case No. 05.10.2024-3 Floodplain Analysis and Regulatory Assessment Review Response

Your requested staff review of the FARA determination has been completed. DNR, Division of Water staff has confirmed that the information generated in the FARA determination is accurate according to our best available information and should be used for planning, permitting, and flood risk purposes.

If you have additional questions, please contact the Division of Water by replying directly to this email, or by telephone at 1-317-232-4160.

Thank you, Indiana Department of Natural Resources

www.dnr.in.gov

Lorena Godoy
Hydraulic Engineer
Indiana Department of Natural Resources
Division of Water
402 W Washington St Room W264
Indianapolis, IN 46204
☎ 463-261-6187
✉ lgodoy@dnr.in.gov

**** Please let us know about the quality of our service by taking this brief*** customer survey.

ATTACHMENT 6

DNR Determination – Locations not in floodplain

RECEIVED
CONFINED FEEDING OPERATIONS
June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

Michael Veenhuizen

From: TechServices, DOW <DOWTechServices@dnr.IN.gov>
Sent: Monday, May 20, 2024 2:30 PM
To: Michael Veenhuizen
Subject: FARA Floodway Inquiry

Good afternoon,

Thank you for calling us regarding your FARA reports, file numbers 05.10.2024-1,-2, and -3. Based on the locations that you selected, our engineering section in the DNR Division of Water has determined that the three points that you selected are not in the floodplain meaning you are not required to get a floodway permit from our office if you are building at the coordinates that were given to our office.

Please reach out to us via email or this number 317-232-4160 if you have any more questions.

Thank you,

TSC

For questions about whether a project needs a permit from the DNR Division of Water and the Indiana Department of Environmental Management's stream and wetland programs, please submit a Waterways Inquiry Request via the online tool at waterways.IN.gov.

You should not construe this to be a local building permit or a waiver of any local building or zoning ordinance. Additionally, this does not relieve you of the responsibility of obtaining permits, approvals, easements, etc. as required by other federal, state, and local agencies.

Thank you for this opportunity to be of assistance. If you have any further questions, please submit them via email to water_inquiry@dnr.IN.gov or call our Technical Services Section at (317) 232-4160 or toll-free at (877) 925-3755 and choose Option 1. Please do not respond directly to this email.

Technical Services Section
Indiana Department of Natural Resources
Division of Water
402 West Washington Street, Room W264
Indianapolis, IN 46204
Phone: (877) 928-3755 Option 1
Email: water_inquiry@dnr.IN.gov
dnr.IN.gov

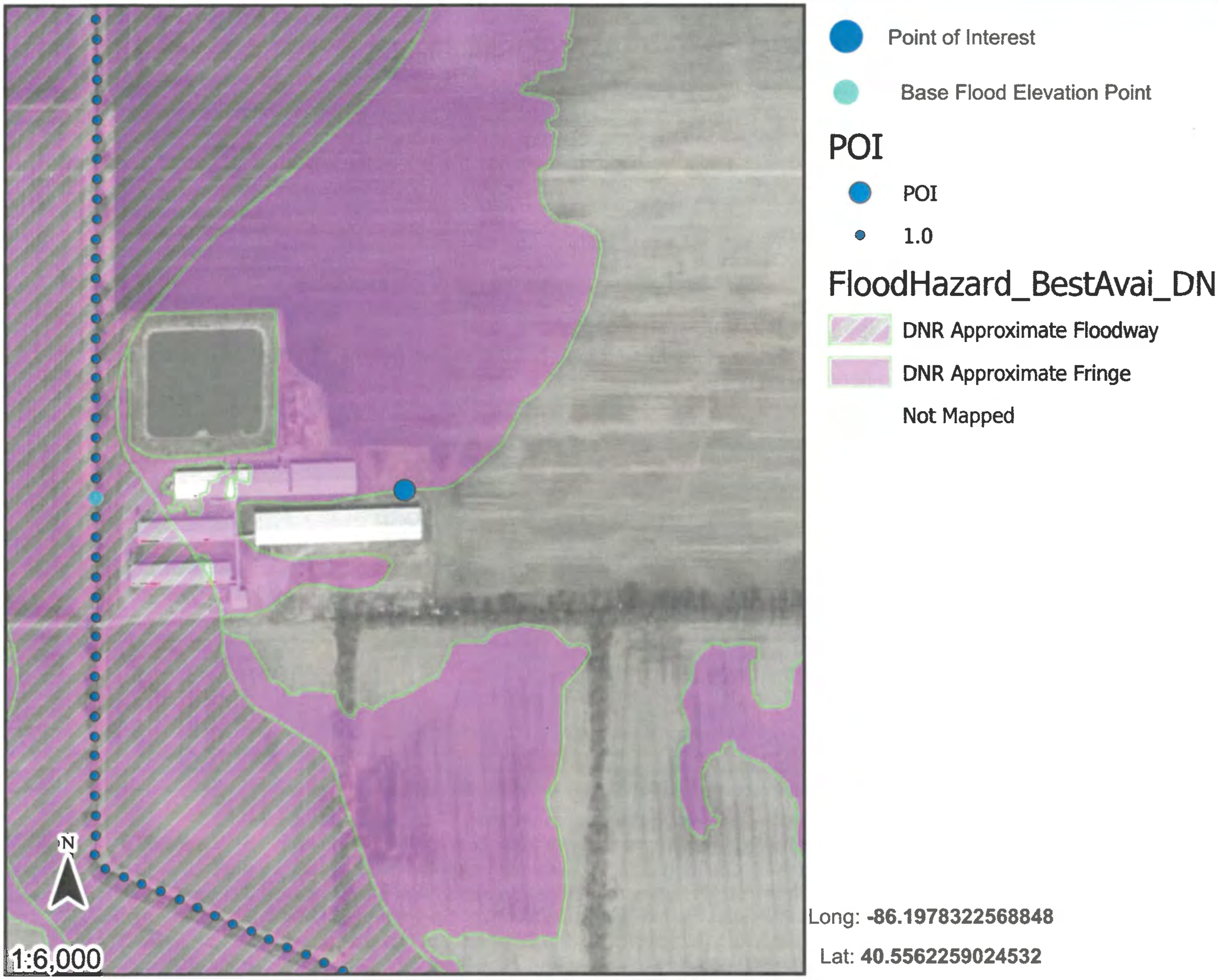
** Please let us know about the quality of our service by taking this brief customer survey.*
(Next Level Survey Link: https://www.surveymonkey.com/r/FLNDLW8)

ATTACHMENT 7

Building 8P FARA Determination Reports

DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)



The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.6 feet (NAVD88)**

Base Flood Elevation: **807.3 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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CONFINED FEEDING OPERATIONS
June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

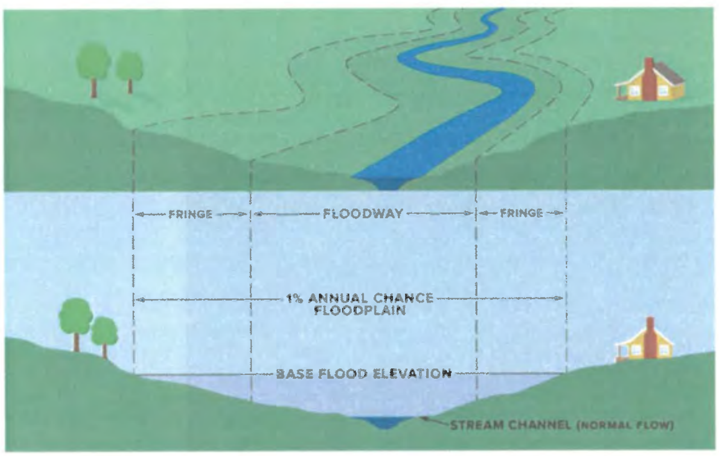
Date Generated: 5/31/2024

About the Floodplain Analysis and Regulatory Assessment (FARA):

All streams have a floodplain, whether mapped or not. This FARA, and the information provided herein, is designed for sites along streams with a mapped floodplain that delineates the floodway portion of the floodplain; see the image below for a visual guide to the floodplain, floodway, and flood fringe. The information in this document was determined using an automated mapping tool. The DNR has high confidence in the tool, but there are scenarios where the floodplain information provided requires additional review from the DNR.

All streams in DNR jurisdiction (streams that have a drainage area one square mile or greater) are shown by a blue line on the map on page 1. However, a floodplain/floodway may or may not be mapped for every stream. In any of the following scenarios, or if you have more detailed floodplain information, use the link at the bottom of this page to request a staff review of the site. Please note that staff review may take several weeks to complete.

Scenarios that require additional DNR review:
• The base flood elevation on page 1 is not available
• The tool selects the nearest flood elevation point for a stream outside the floodplain associated with the point of interest
• There is not a delineated floodway for the stream nearest your point of interest
• The point of interest is along a stream without a mapped floodplain
• The point of interest is in a mapped floodplain of another stream, but the stream nearest the point of interest does not have a mapped floodplain with a floodway of its own



If DNR review is required, do not use this FARA for your site's determination.
If you have questions about DNR permitting requirements, you can contact DNR, Division of Water toll-free at 1-877-928-3755 and select option 1 to speak to a Technical Services staff member. You can also write to the division at water_inquiry@dnr.IN.gov or use the Indiana Waterways Inquiry Request tool at waterways.IN.gov to submit a permitting determination request to both DNR and the Indiana Department of Environmental Management at once.
We recommend keeping a copy of this FARA for your records as the DNR will not have a copy on file.
IF PERMIT ANSWER IS "See following pages" copy the following line into a web browser to get PDF for answers: https://countydataharvest.in.gov/DNR/INFIP_Report_Backpgs.pdf

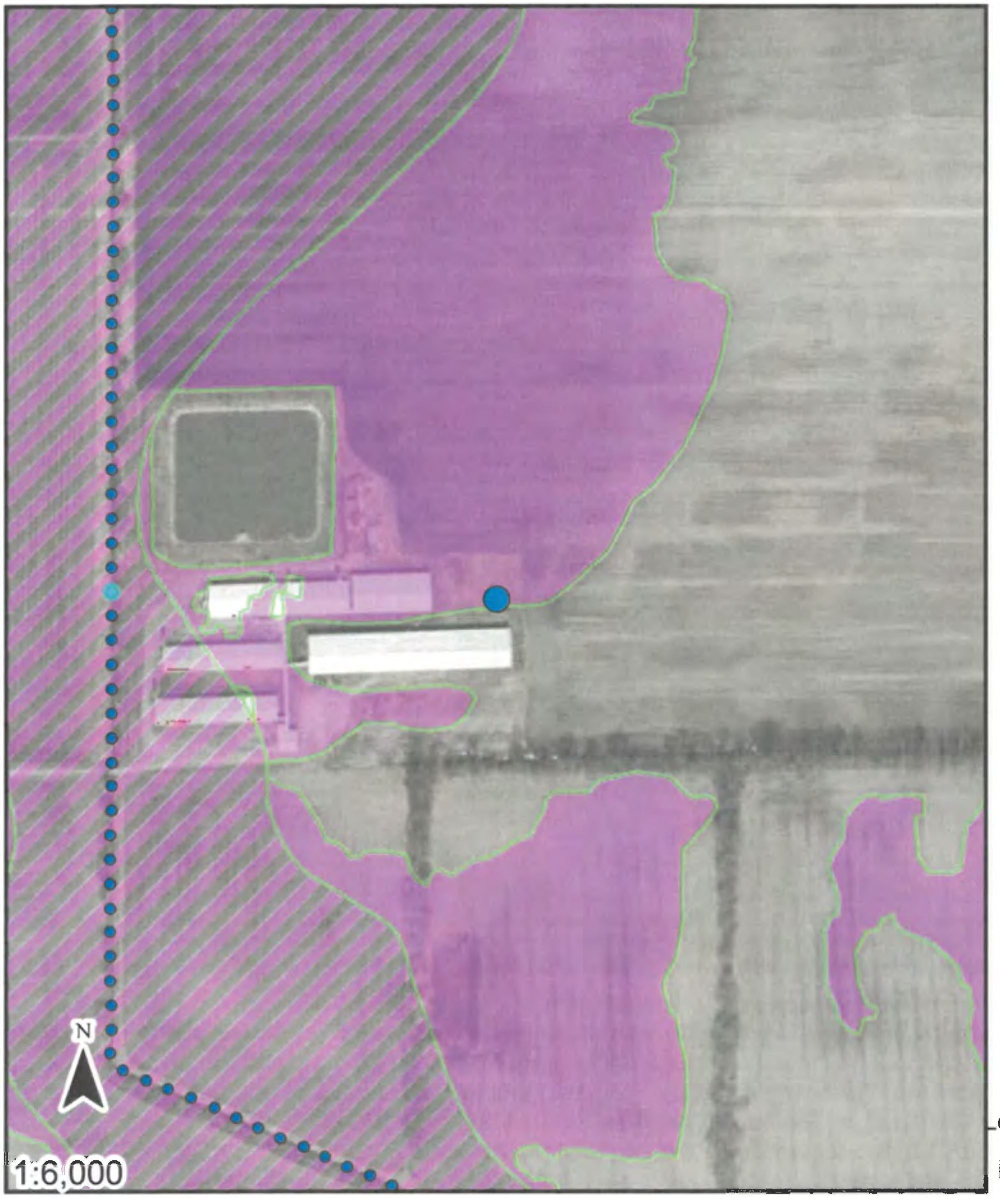
PATH TO SURVEY:

https://survey123.arcgis.com/share/3293526dfdca453e95c19b08fb7bdcfb??FIELD%3ALAT1=40.5562259024532&FIELD%3ALON1=-86.1978322568848&FIELD%3ADNR_PERMIT=See+following+pages&FIELD%3ALOCAL_&FIELD%3ASTREAM=MANSON+KINGERY+DITCH&FIELD%3AINIT_DATE=05%2F31%2F2024&FIELD%3ABFE=807.27669286

You will need to copy and paste the blue text (PATH TO SURVEY)into a web browser to open the survey you will fill out and submit. If this does not work then send a copy of this FARA to infipinquiry@dnr.IN.gov and describe the reason you are requesting a staff review. Include your name and contact information so that staff can follow-up with you.

Floodplain Analysis & Regulatory Assessment (FARA)

Indiana Department of Natural Resources



The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.4 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: 5/31/2024

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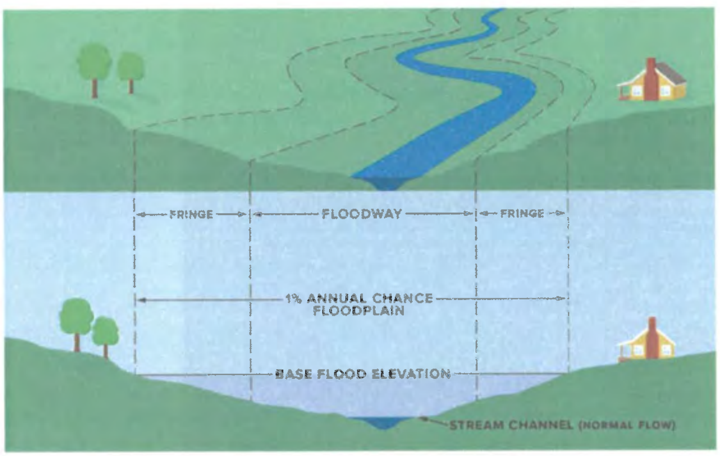

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PATH TO SURVEY:

https://survey123.arcgis.com/share/3293526dfdca453e95c19b08fb7bdcfb??
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&FIELD%3ASTREAM=MANSON+KINGERY+DITCH&FIELD%3AINIT_DATE=05%2F31%2F2024&FIELD%3ABFE=807.24705

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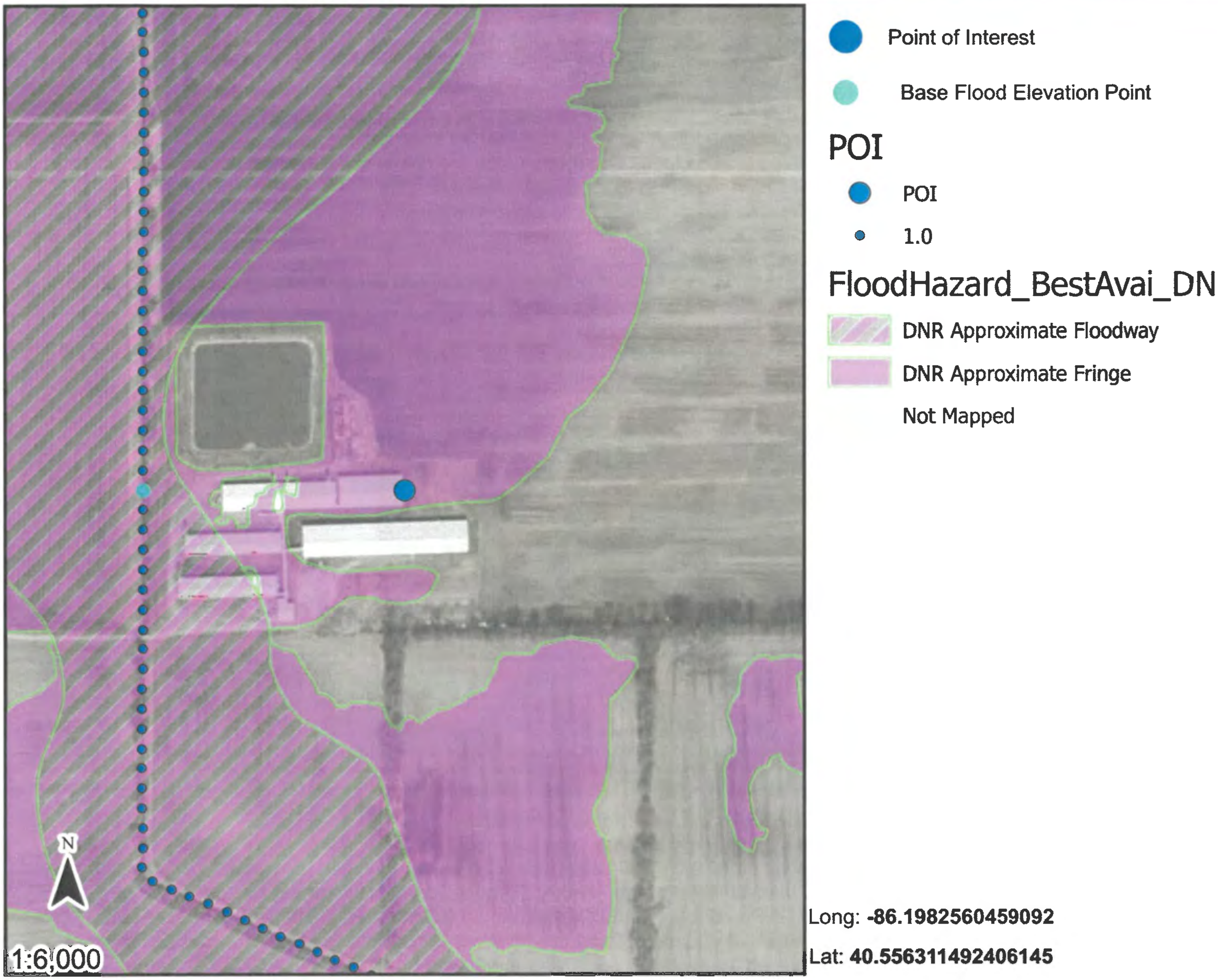
DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)



Long: **-86.1982560459092**
Lat: **40.556311492406145**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.3 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

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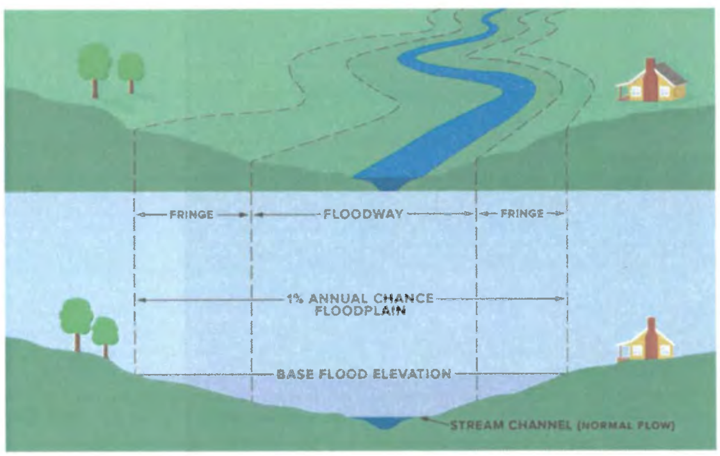

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https://survey123.arcgis.com/share/3293526dfdca453e95c19b08fb7bdcfb??FIELD%3ALAT1=40.556311492406145&FIELD%3ALON1=-86.1982560459092&FIELD%3ADNR_PERMIT=See+following+pages&FIELD%3ALOCA&FIELD%3ASTREAM=MANSON+KINGERY+DITCH&FIELD%3AINIT_DATE=05%2F31%2F2024&FIELD%3ABFE=807.24705

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Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19781079921265**

Lat: **40.55634002236618**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.3 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

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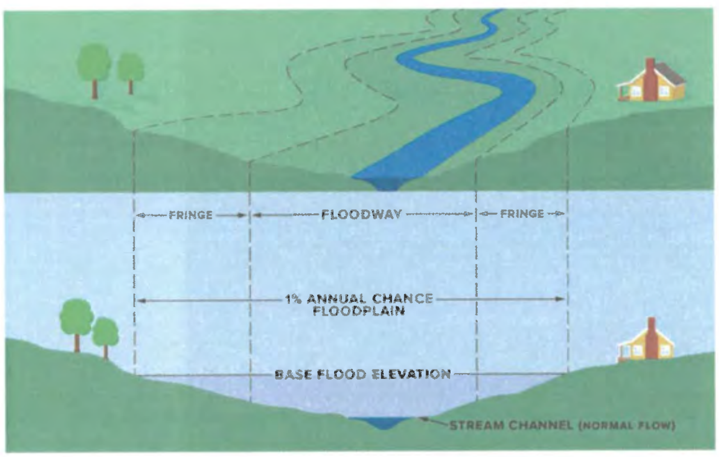

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https://survey123.arcgis.com/share/3293526dfdca453e95c19b08fb7bdcfb??
FIELD%3ALAT1=40.55634002236618&FIELD%3ALON1=-86.19781079921265&FIELD%3ADNR_PERMIT=See+following+pages&FIELD%3ALOCA
&FIELD%3ASTREAM=MANSON+KINGERY+DITCH&FIELD%3AINIT_DATE=05%2F31%2F2024&FIELD%3ABFE=807.24705

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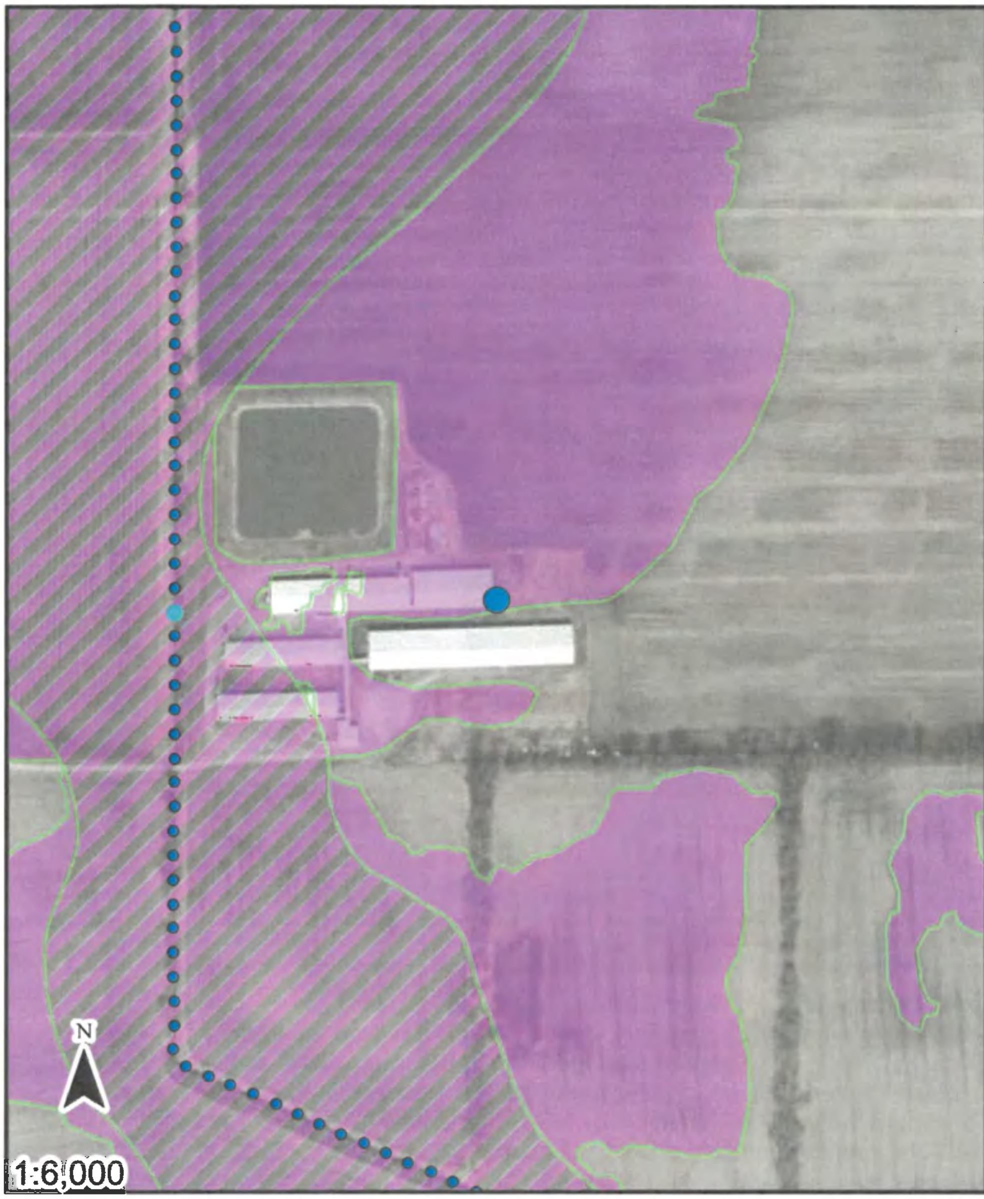
Floodplain Analysis & Regulatory Assessment (FARA)

Indiana Department of Natural Resources



Point of Interest

Base Flood Elevation Point

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19824531707312**

Lat: **40.55624628102331**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.3 feet (NAVD88)**

Base Flood Elevation: **807.3 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: 5/31/2024

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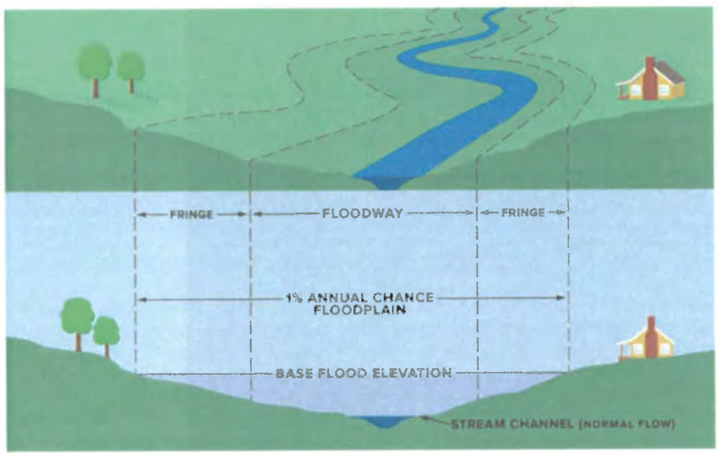

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PATH TO SURVEY:

https://survey123.arcgis.com/share/3293526dfdca453e95c19b08fb7bdcfb??FIELD%3ALAT1=40.55624628102331&FIELD%3ALON1=-86.19824531707312&FIELD%3ADNR_PERMIT=See+following+pages&FIELD%3ALOCA&FIELD%3ASTREAM=MANSON+KINGERY+DITCH&FIELD%3AINIT_DATE=05%2F31%2F2024&FIELD%3ABFE=807.27669286

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Floodplain Analysis & Regulatory Assessment (FARA)

Indiana Department of Natural Resources

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19795027408148**

Lat: **40.55626665958733**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.1 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

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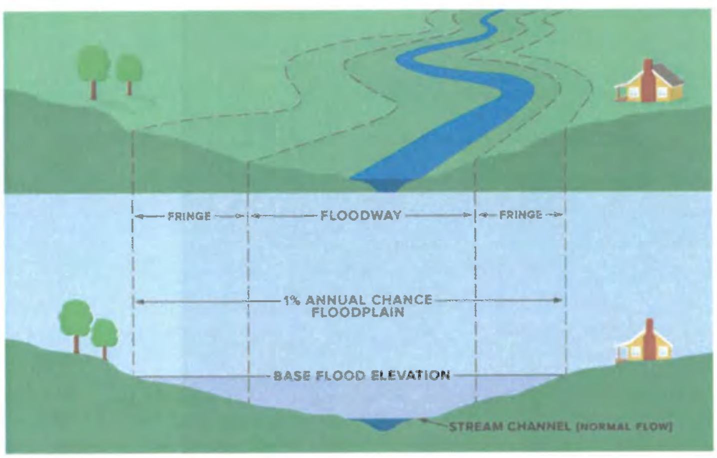

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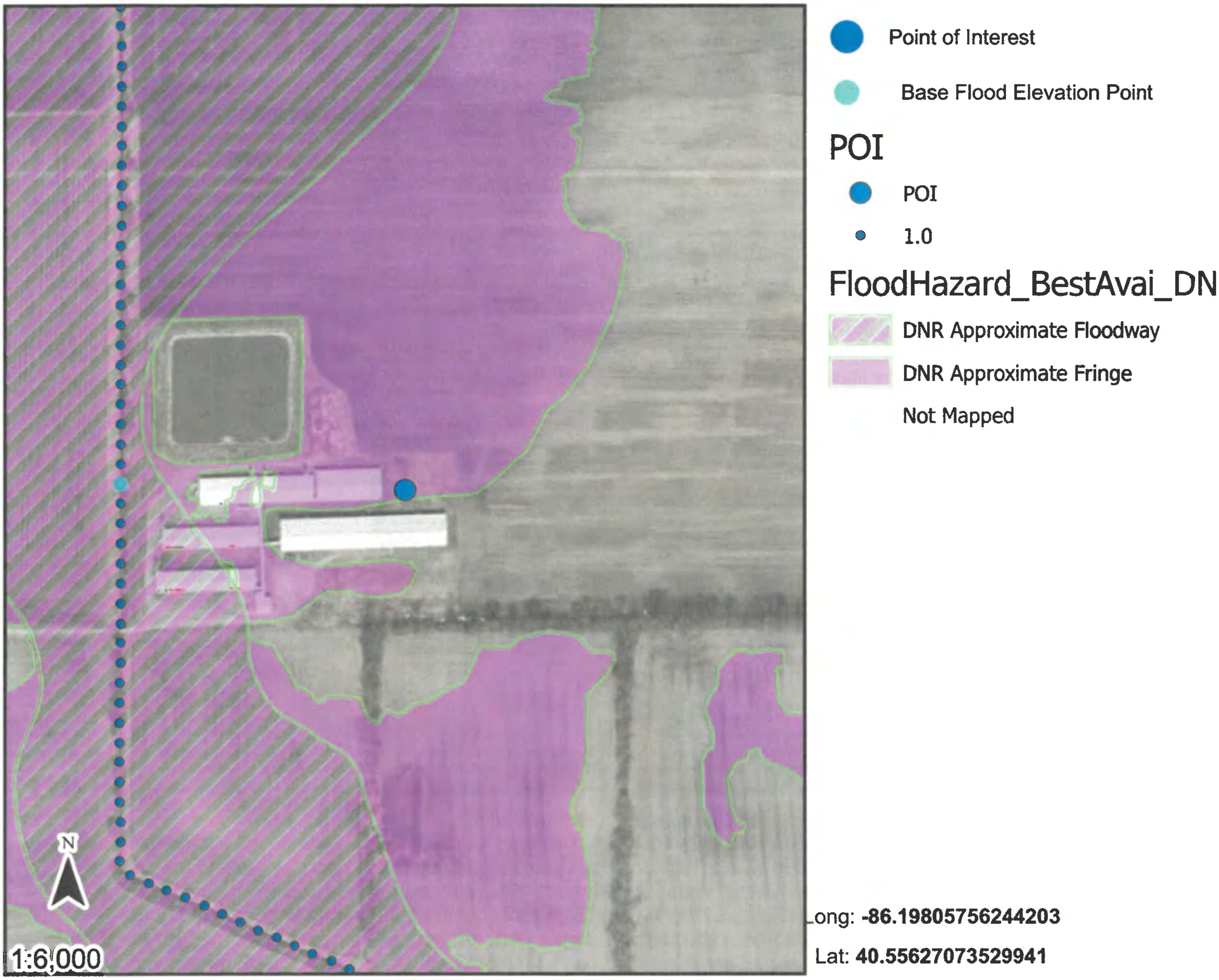
CONFINED FEEDING OPERATIONS
June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

Floodplain Analysis & Regulatory Assessment (FARA)

Indiana Department of Natural Resources



Long: **-86.19805756244203**
Lat: **40.55627073529941**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **806.9 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

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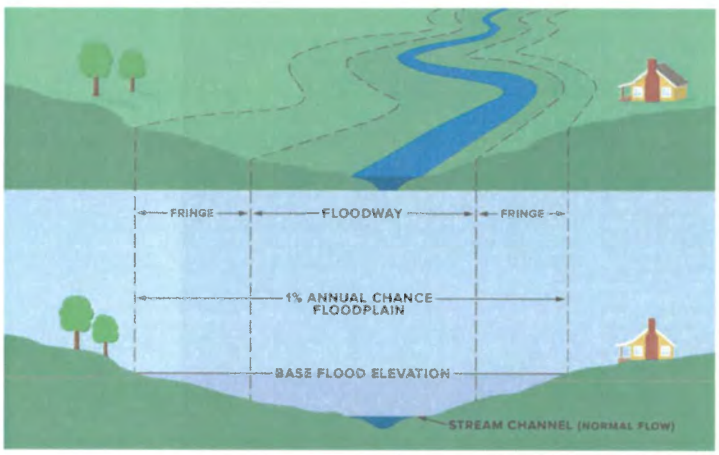

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Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19795027408148**

Lat: **40.556393006545434**

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County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **806.9 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

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US Army Corps of Engineers District: **Louisville**

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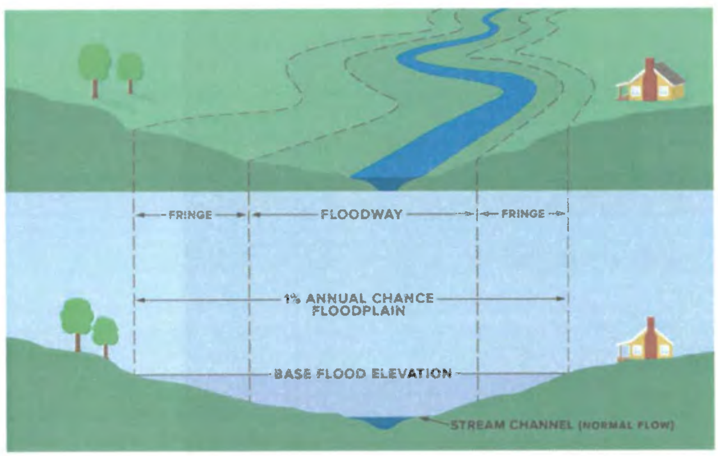

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DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19774642619629**

Lat: **40.55639708224982**

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County: **Howard**

Stream Name: **Manson Kingery Ditch**

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Base Flood Elevation: **807.2 Feet (NAVD88)**

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Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

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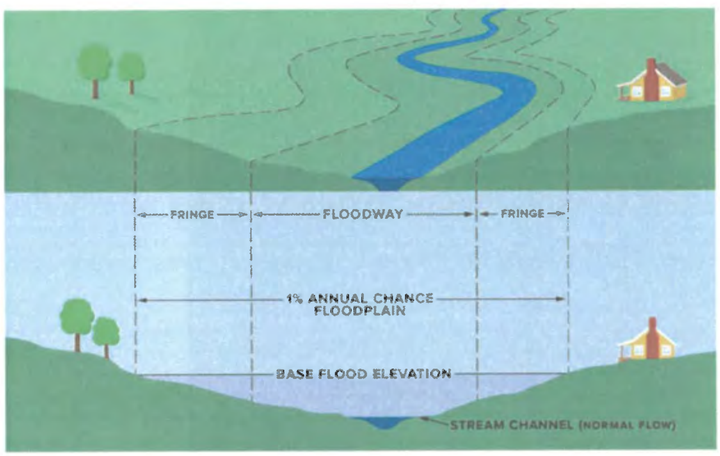

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Floodplain Analysis & Regulatory Assessment (FARA)

Indiana Department of Natural Resources

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19771960410613**

Lat: **40.55640930936139**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.2 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

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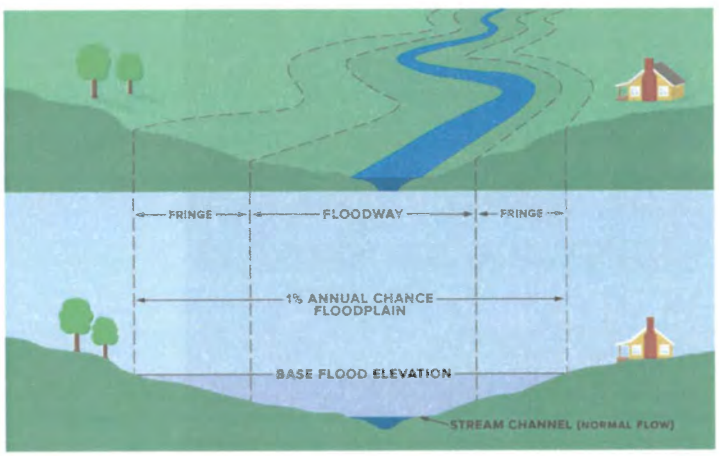

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ATTACHMENT 8

Building 9P FARA Determination Reports

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June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

1.5

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.20016041431003**

Lat: **40.556168842423766**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.4 feet (NAVD88)**

Base Flood Elevation: **807.3 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Floodway**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **yes**

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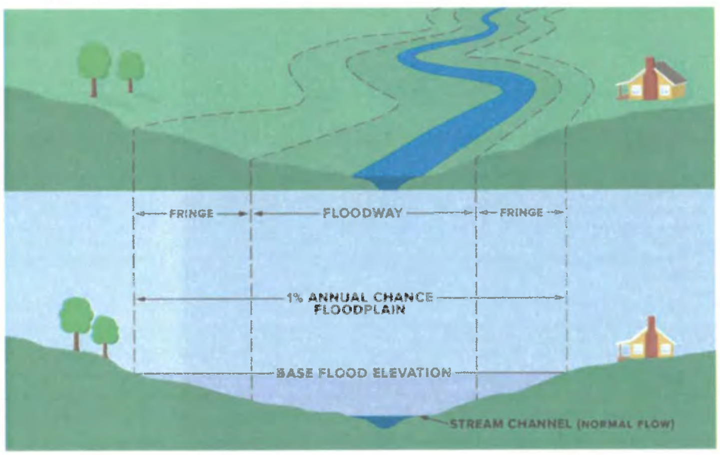

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&FIELD%3ASTREAM=MANSON+KINGERY+DITCH&FIELD%3AINIT_DATE=05%2F31%2F2024&FIELD%3ABFE=807.27669286

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Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.7 feet (NAVD88)**

Base Flood Elevation: **807.3 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Floodway**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **yes**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: 5/31/2024

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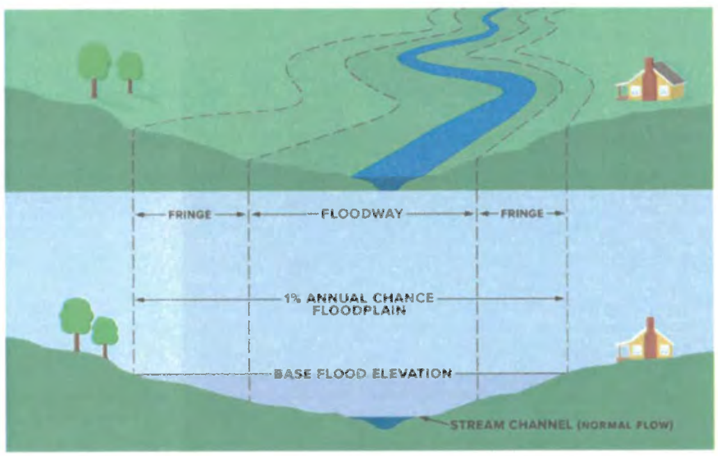

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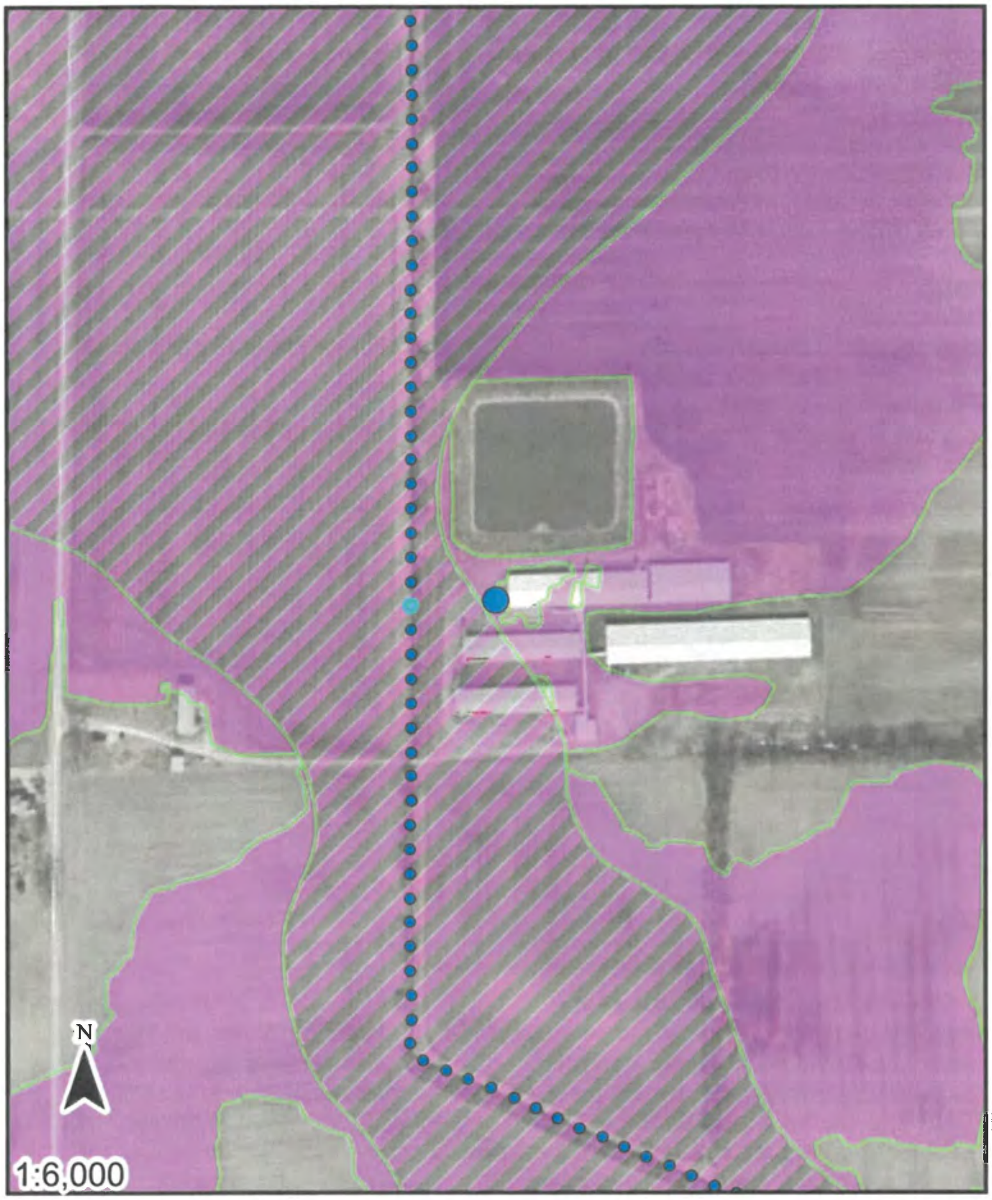

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.2000048461871**

Lat: **40.55620959959258**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.7 feet (NAVD88)**

Base Flood Elevation: **807.3 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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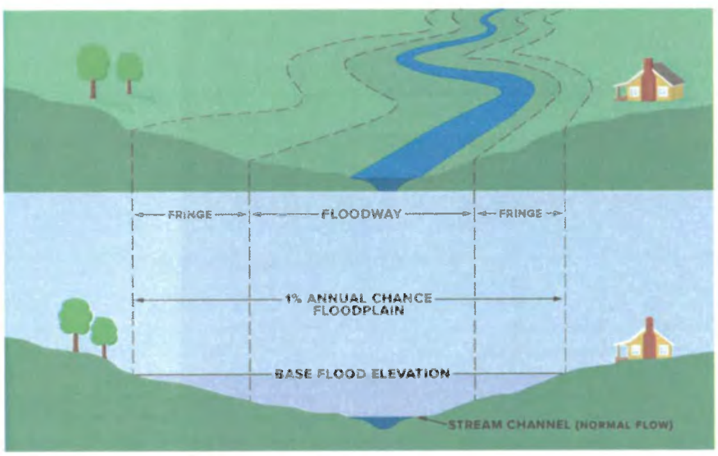

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Floodplain Analysis & Regulatory Assessment (FARA)

Indiana Department of Natural Resources

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.20012822780187**

Lat: **40.556323719533445**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.4 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

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Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

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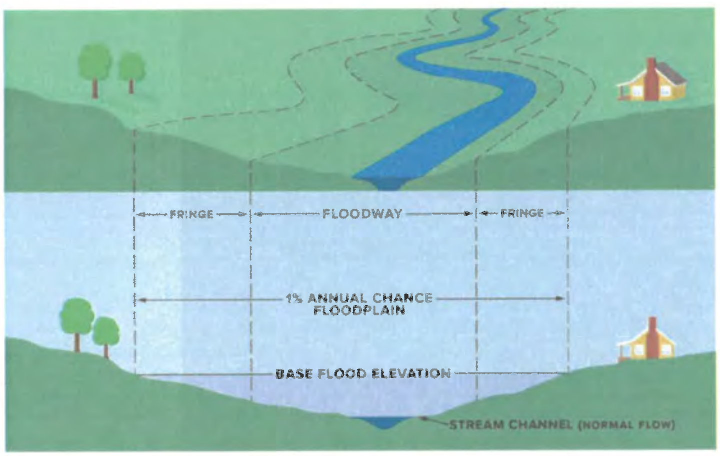

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Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.20013895663787**

Lat: **40.556335946658415**

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County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.3 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

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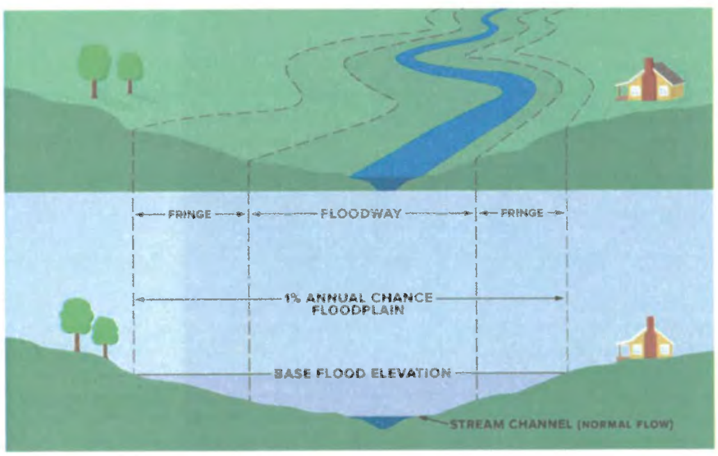

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Floodplain Analysis & Regulatory Assessment (FARA)

Indiana Department of Natural Resources

Long: **-86.20013895663787**

Lat: **40.55628703814504**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.4 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

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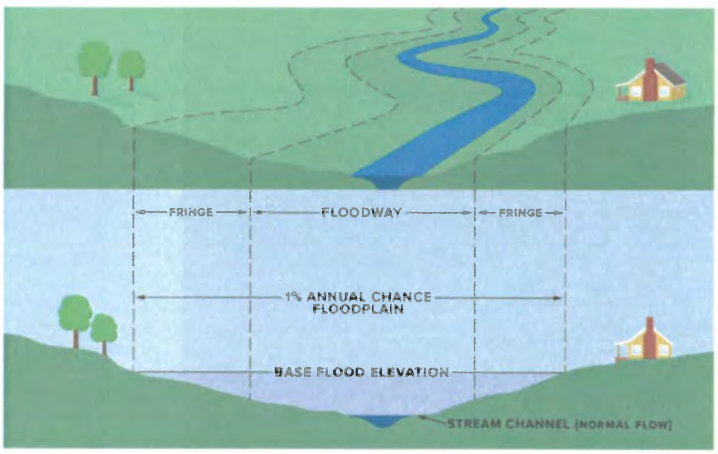

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DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.20006385478544**

Lat: **40.55626665958733**

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County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.7 feet (NAVD88)**

Base Flood Elevation: **807.2 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

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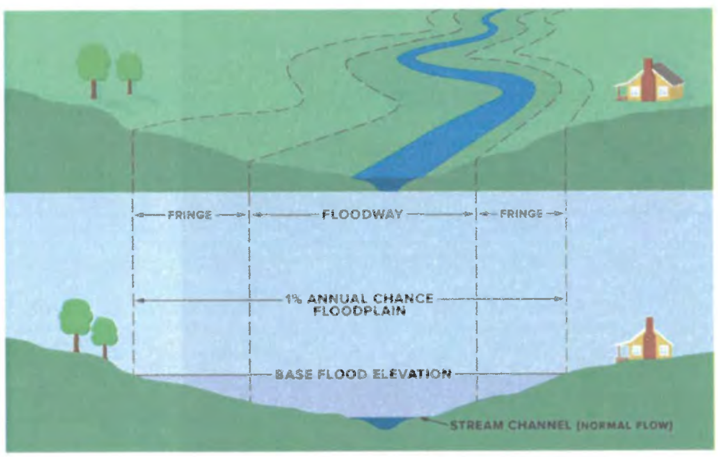

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June 4, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

ATTACHMENT 9

Building 10P FARA Determination Reports

Floodplain Analysis & Regulatory Assessment (FARA)

Indiana Department of Natural Resources

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

1.5

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19913581046619**

Lat: **40.55563492122032**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.6 feet (NAVD88)**

Base Flood Elevation: **807.5 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: 5/31/2024

About the Floodplain Analysis and Regulatory Assessment (FARA):

All streams have a floodplain, whether mapped or not. This FARA, and the information provided herein, is designed for sites along streams with a mapped floodplain that delineates the floodway portion of the floodplain; see the image below for a visual guide to the floodplain, floodway, and flood fringe. The information in this document was determined using an automated mapping tool. The DNR has high confidence in the tool, but there are scenarios where the floodplain information provided requires additional review from the DNR.

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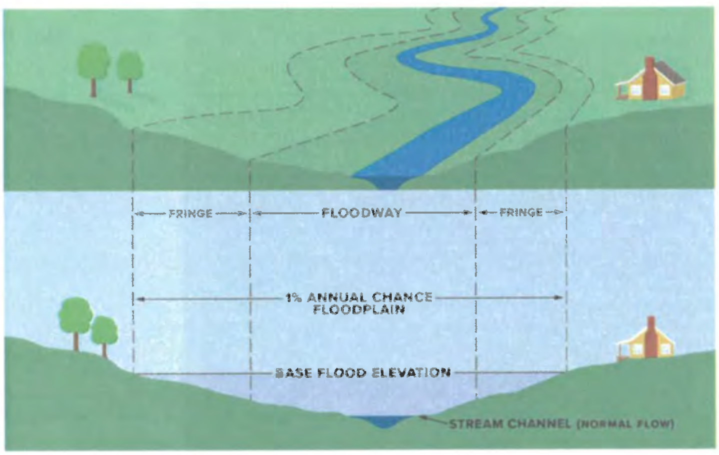

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https://survey123.arcgis.com/share/3293526dfdca453e95c19b08fb7bdcfb??
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&FIELD%3ASTREAM=MANSON+KINGERY+DITCH&FIELD%3AINIT_DATE=05%2F31%2F2024&FIELD%3ABFE=807.51751047

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DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Long: **-86.19899633559741**
Lat: **40.5556716029659**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name: **Manson Kingery Ditch**

Approximate Ground Elevation: **807.6 feet (NAVD88)**

Base Flood Elevation: **807.5 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

Date Generated: 5/31/2024

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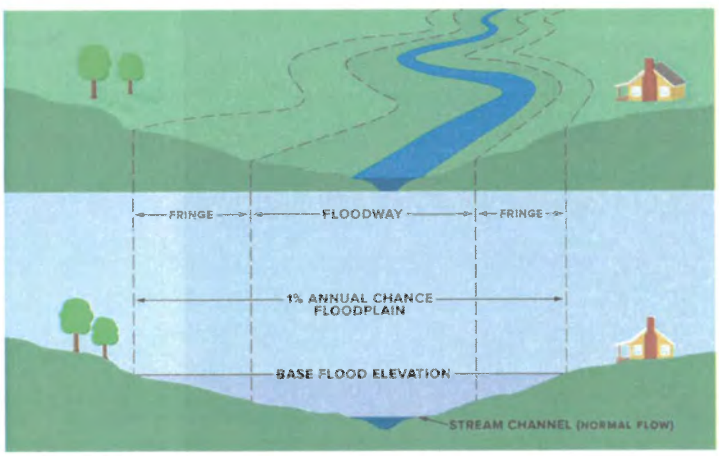

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Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

1.5

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19843843612223**

Lat: **40.55565529997031**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **807.7 feet (NAVD88)**

Base Flood Elevation: **807.5 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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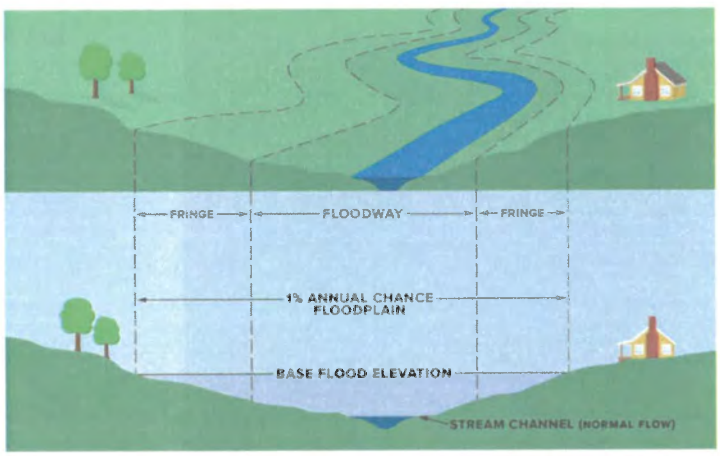

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Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

1.5

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19808974895025**

Lat: **40.55566345146866**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **808.2 feet (NAVD88)**

Base Flood Elevation: **807.5 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **DNR Approximate Fringe**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

Is a local floodplain permit needed for this location? **yes-**

Floodplain Administrator: **Greg Sheline, Director, Howard County Plan Commission**

Community Jurisdiction: **Howard County, County proper**

Phone: **(765) 456-2330**

Email: **gsheline@cityofkokomo.org**

US Army Corps of Engineers District: **Louisville**

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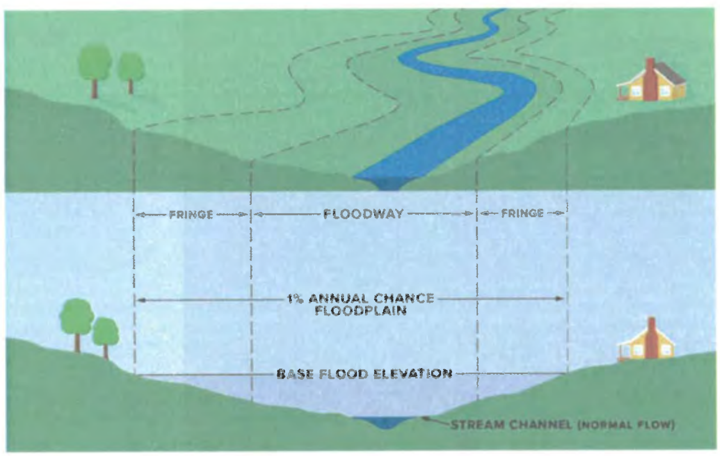

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DNR Indiana Department of Natural Resources

Floodplain Analysis & Regulatory Assessment (FARA)

Point of Interest

Base Flood Elevation Point

POI

POI

1.0

1.5

FloodHazard_BestAvai_DN

DNR Approximate Floodway

DNR Approximate Fringe

Not Mapped

Long: **-86.19767668876186**

Lat: **40.55569198170473**

The information provided below is based on the point of interest shown in the map above.

County: **Howard**

Stream Name:
Manson Kingery Ditch

Approximate Ground Elevation: **808.6 feet (NAVD88)**

Base Flood Elevation: **807.5 Feet (NAVD88)**

Drainage Area: **Not Available**

Best Available Flood Hazard Zone: **Not Mapped**

National Flood Hazard Zone: **Not Mapped**

Is a Flood Control Act permit from the DNR needed for this location? **See following pages**

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Community Jurisdiction: **Howard County, County proper**

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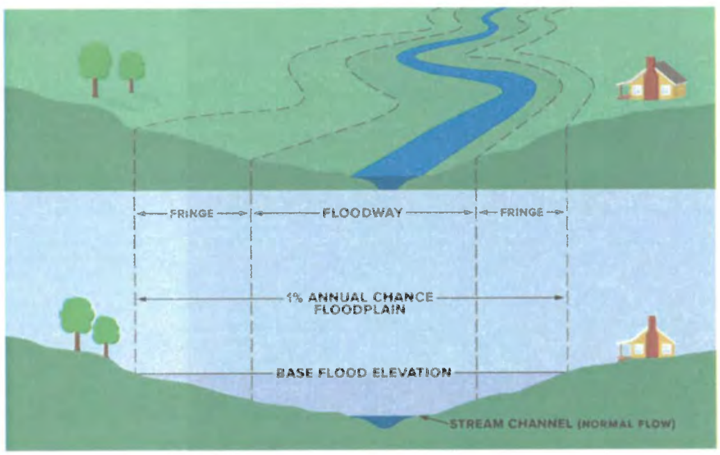

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ATTACHMENT 10

CFO Application Packet Updates

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ATTACHMENT 11

USGS Topographic Map and Howard County GIS Contour Lines

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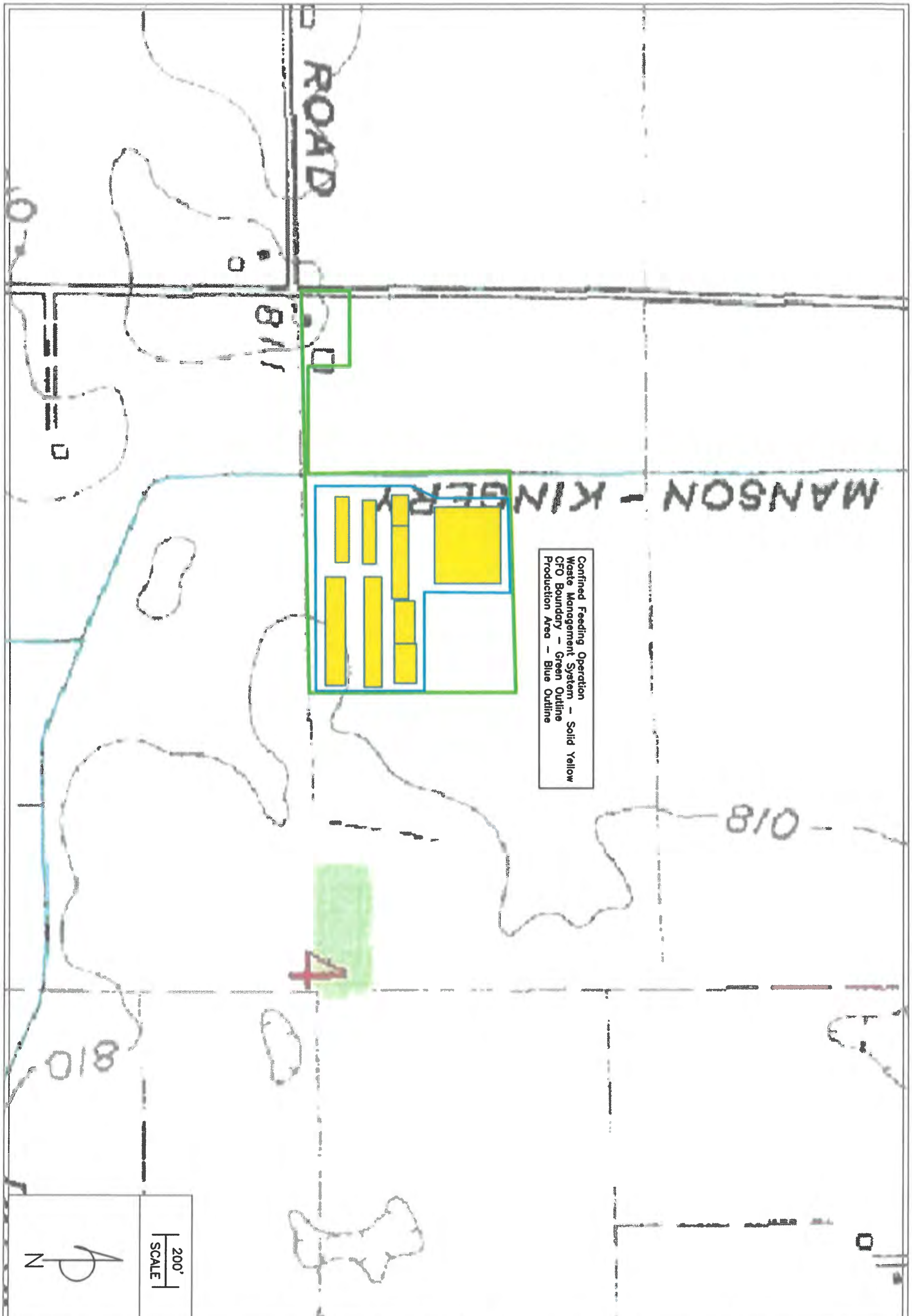

TOP GRADE PRODUCTION LLC 2667 E. ST. RD 18 KOKOMO, IN 46901 2024 CFO RENEWAL–#3713	USGS TOPOGRAPHIC MAP SITE LOCATION SECTIONS 3 T24N R3E	DATE: 05/10/24 DRAWN BY: MV LIVESTOCK ENGINEERING SOLUTIONS, INC. MICHAEL A. VEENHUIZEN 2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143	SHEET: 1T of 1T DRAWING NO: TGP0224– 01T THE IDEAS, DESIGNS, AND DRAWINGS REPRESENTED HERE ARE THE PROPERTY OF LIVESTOCK ENGINEERING SOLUTIONS, INC. REPRODUCTION OR USE, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF LIVESTOCK ENGINEERING SOLUTIONS, INC. IS PROHIBITED.


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N 400W
808
810
812
814
816
121.26'
139'
220.21'
1550.97'
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Office of Land Quality

2967 S Honey Creek Road
Greenwood, Indiana 46143
317-535-1829 (voice)
317-535-9806 (fax)

Livestock Engineering Solutions, Inc.

June 20, 2024

Kraig Whitman
Indiana Department of Environmental Management
Office of Land Quality
Confined Feeding Program
100 North Senate Avenue -- IGCN Room 1101
Indianapolis, Indiana 46204-2251

RE: Top Grade Production LLC – Farm ID#3713
CFO Approval Renewal and Construction Authorization Renewal
Request for Additional Information – E-mail June 17, 2024

Dear Mr. Whitman:

On behalf of Top Grade Production LLC, Livestock Engineering Solutions, Inc. submits the following information in response to the Indiana Department of Environmental Management (IDEM) request for additional information received by e-mail on June 17, 2024 for the submitted Confined Feeding Operation Approval Renewal and Construction Authorization Renewal Application. The request for additional information included four (4) comments. The following information is provided in response to the request.

Request for Additional Information (NOD Response Comments): Kraig Whitman

1. Hydrostatic pressure on the 8" PVC manure piping during floor event:
   Information was previously provided demonstrating that Building 8P is designed to resist the hydrostatic pressure due to potential flood waters. A determination and design for the 8" diameter PVC manure transfer piping located beneath the concrete manure storage floor was not previously provided. Thank you for requesting additional information demonstrating that the 8" diameter PVC manure transfer piping can withstand the hydrostatic pressure due to potential flood waters.

   A site specific design is provided demonstrating that the 8" diameter PVC manure transfer pipe can resist the hydrostatic pressure.

   Site Specific Design:
   The 8" PVC pipe is subject to an inward pressure (collapse pressure) due to the flood condition on the exterior surface of the pipe and an upward pressure on the pipe due to displaced water when the pipe is empty.

   Inward pressure (collapse pressure).
   The inward pressure (collapse pressure) can occur due to two conditions. The first condition assumes the pipe is in a saturated condition and the pressure is due to the hydrostatic pressure of the water. The second condition assumes that the pressure is due to the soil pressure around the pipe and the additional saturated soil conditions around the pipe. The hydrostatic pressure due to water is 62.5 lb/ft^2/foot of depth (density of water). The soil pressure due to flood conditions is 125 lb/ft^2/foot of depth (Table 4. Minimum Lateral Earth Pressure Values, NRCS Code 313 plus additional saturated soil load). Since the soil pressure is greater than

the hydrostatic pressure due to water (125 psf/ft of depth > 62.5 psf/ft of depth) a determination due to soil pressure is presented.

The maximum Base Flood Elevation in this area is 807.3 feet. The top of the concrete pit floor is located at 807.3 feet. The beginning of the 8" diameter PVC pipe is located approximately 21 inches below the top of the concrete pit floor (805.6 feet). The 8" diameter pipe slopes to the outlet pipe 0.25% (4"). The lowest point of the 8" diameter is located approximately 25 inches (805.2 feet) below the top of the concrete pit floor.

Collapse pressure:

Design assumptions:

Base flood elevation:	807.3 feet
8" pipe bottom elevation:	805.2 feet
Hydrostatic pressure due to soil pressure:	125 psf/ft of depth
Collapse pressure Schedule 40 PVC pipe, 8" diameter:	50 psi

Design justification:

Depth of pipe below BFE:	807.3 ft – 805.2 ft =	2.1 ft
Hydrostatic pressure (psf):	2.1 ft x 125 psf/ft =	262.5 psf
Hydrostatic pressure (psi):	262.5 psf ÷ 144 in^2/ft^2 = 1.83 psi	
1.83 psi < 50 psi (collapse pressure)	**Okay**	

Upward pressure:
Upward pressure may occur due to the pressure exerted on the pipe from displaced water when the pipe is empty. The upward pressure is resisted by the weight of the concrete manure storage and soil above the pipe. The downward pressure from the concrete manure storage is approximately 115 psf. The soil density is approximately 83 lb/ft^3 to 87 lb/ft^3 (clay, clay loam). The depth of soil above the 8" PVC pipe beneath the building is approximately 1.6 feet and outside the building is approximately 4.1 feet.

Upward pressure:

Design assumptions:

Top of backfill elevation:	809.3 feet
Bottom of concrete floor elevation:	806.883 feet
Base flood elevation:	807.3 feet
8" pipe top elevation:	805.867
8" pipe bottom elevation:	805.2 feet
Density of water:	62.5 lb/ft^3
Weight of concrete manure storage:	115 lb/ft^2
Density of soil:	83 lb/ft^3 (83-87 lb/ft^3)

Design justification:
Upward pressure due to displace water:

Area of 8" PVC pipe, O.D.:	58.5 in^2

Upward pressure due to water displacement (assume a 12" section [1 foot] of pipe):

$58.5\ in^2 \times 12\ in \div 1{,}728\ in^3/ft^3 \times 62.5\ lb/ft^3 =$ 25.4 lb

Downward pressure:

Building pressure: $115\ lb/ft^2 \times 8\ in \times 12\ in \div 144\ in^2/ft^2 =$ 76.6 lb

Soil pressure below building:

$(806.833\ ft - 805.867\ ft) \times (8\ in \times 12\ in \div 144\ in^2/ft^2) \times 83\ lb/ft^3 = 53.4\ lb$

Total pressure beneath building: 76.6 lb + 53.4 lb = 130.0 lb

Soil pressure outside building:

$(809.3\ ft - 805.867\ ft) \times (8\ in \times 12\ in \div 144\ in^2/ft^2) \times 83\ lb/ft^3 = 189.9\ lb$

25.4 lb < 130.0 lb < 189.9 lb **Okay**

Conclusion:
Based on the design justification, the 8" diameter PVC pipe can withstand the hydrostatic pressure due to potential flood waters, resist the collapse pressure on the pipe due to potential flood waters, and resist the upward pressure on the pipe due to potential flood waters.

The 8" PVC manure transfer pipe is in compliance with 327 IAC 19-12-2(a)(3) requiring that a concrete manure storage be designed to be structurally sound without lowering flood waters below the bottom of the waste management system.

Plan sheet updates: Plan sheets 2B and 3B have been updated to include the beginning and ending elevations of the 8" diameter PVC drain pipe. Updated plan sheets 2B and 3B are included.

2. Building design coordinates:
   The design coordinates for Buildings 8P, 9P, and 10P have been added to farmstead plan sheet 2A and building foundation plan sheets 2B, 2C, and 1D. Updated plan sheets 2a, 2B, 2C, and 1D are included.

3. P1, P2, and P3 references:
   Thank you for noting that the previous CFO Approval and Construction Authorization building ID references (P1, P2, and P3) were not updated to the current building ID references (8P, 9P, and 10P) used in the CFO Approval Renewal and Construction Authorization Renewal. The building ID references have been updated. Pages 6, 7, 8, 9, 75, 167, 168, 308, 309, 310, 313, and 314 are included to update the application packet.

4. Facility Detail Information Table, page 41:
   Thank you for noting that the revised operating capacity for building 9P had not been updated in the Facility Detail Information Table. The current operating capacity has been changed from 120 sows and litters to 60 sows and litters. An updated page 41 is included.

Thank you for your thoughtful consideration and review of this information. If you have any questions or need further information, please contact Nick Maple, Top Grade Production LLC or Michael Veenhuizen, Livestock Engineering Solutions, Inc.

Sincerely,

Michael A. Veenhuizen

Enclosures
Cc: Nick Maple, Top Grade Production LLC

2967 S Honey Creek Road
Greenwood, Indiana 46143
317-535-1829 (voice)
317-535-9806 (fax)

Livestock Engineering Solutions, Inc.

June 28, 2024

Kraig Whitman
Indiana Department of Environmental Management
Office of Land Quality
Confined Feeding Program
100 North Senate Avenue -- IGCN Room 1101
Indianapolis, Indiana 46204-2251

RE: Top Grade Production LLC – Farm ID#3713
CFO Approval Renewal and Construction Authorization Renewal
Building 9P Update

Dear Mr. Whitman:

On behalf of Top Grade Production LLC, Livestock Engineering Solutions, Inc. submits the following information. A recent review identified that the building coordinates for Building 9P were incorrectly transcribed on farmstead plan sheet 2A and plan sheet 2C.

The correct coordinates for Building 9P are:

NW Corner:	40˚ 33' 22.91" N 86˚ 12' 00.60" W
SW Corner:	40˚ 33' 22.25" N 86˚ 12' 00.60" W
NE Corner:	40˚ 33' 22.91" N 86˚ 11' 59.75" W
SE Corner:	40˚ 33' 22.25" N 86˚ 11' 59.75" W

The coordinates have been updated on plan sheets 2A and 2C. Updated copies are included. Please replace the previously submitted plan sheets to update the application packet.

Thank you for your thoughtful consideration and review of this information. If you have any questions or need further information, please contact Nick Maple, Top Grade Production LLC or Michael Veenhuizen, Livestock Engineering Solutions, Inc.

Sincerely,

Michael A. Veenhuizen

Michael A. Veenhuizen

Enclosures
Cc: Nick Maple, Top Grade Production LLC

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June 28, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

THE FOLLOWING PAGES HAVE BEEN REPLACED OR REMOVED FROM THIS APPLICATION

D. FACILITY DETAIL INFORMATION						
Label on Farmstead Plan	**Animal Type**	**Number of Approved Animals**	**Solid or Liquid**	**Date Constructed** *(for existing buildings)*	**Water Uses** *(gallons/unit of time)*	**Brief Description**
9P.	Farrowing (sows & litters)	120 sows & litters	Liquid	Not constructed Originally approved April 22, 2019 Construction authorization renewal requested.	Building wash water 660 gallons Up to 13 times per year **Total Usage:** 8,580 gallons per year	Approved April 22, 2019. Farm ID #3713, AW-6822. Farrowing building (sows and litters) with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding operation structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 64'-0" x 119'-0" O.D. Below-building concrete manure storage: Six (6) shallow manure storages 1) 7'-2.5" x 118'-0" x 2'-0" deep (individual tanks) Total capacity: 10,207 cu ft Available capacity: 5,103 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 99 days

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CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

D. FACILITY DETAIL INFORMATION

Label on Farmstead Plan	Animal Type	Number of Approved Animals	Solid or Liquid	Date Constructed *(for existing buildings)*	Water Uses *(gallons/unit of time)*	Brief Description
9P.	Farrowing (sows & litters)	120 sows & litters	Liquid	Not constructed Originally approved April 22, 2019 Construction authorization renewal requested.	Building wash water 660 gallons Up to 13 times per year **Total Usage:** 8,580 gallons per year	Approved April 22, 2019. Farm ID #3713, AW-6822. Farrowing building (sows and litters) with shallow below-building concrete manure storage. Self-contained manure storage. Not shared with another confined feeding operation structure. Manure drains by gravity to concrete lift station 5E and is pumped to earthen storage impoundment 4E for long-term storage. Total building dimensions: 64'-0" x 64'-0" O.D. Below-building concrete manure storage: Six (6) shallow manure storages 1) 7'-2.5" x 63'-0" x 2'-0" deep (individual tanks) Total capacity: 5,449 cu ft Available capacity: 2,724 cu ft (6" freeboard and 6" residual solids storage) Storage capacity: 106 days

Indiana Department of Environmental Management
2024 Confined Feeding Operation Approval Renewal
and Manure Management Plan
Construction Authorization Renewal
for
Top Grade Production LLC
2667 East State Road 18
Kokomo, Indiana 46901

Introduction:

Attached for your review are a CFO / CAFO Application Packet, State Form 55051 (R5 10-22) and supporting documentation requesting that the Confined Feeding Operation Approval (Farm ID#3713) and Confined Feeding Operation Approval Construction Authorization (AW-6822) issued to Top Grade Production LLC be renewed.

The confined feeding operation is owned and operated by Top Grade Production LLC. Nicholas T Maple is the contact for the confined feeding operation. The animal feeding operation is located in Howard County, Indiana in the Galveston USGS Quadrangle, Section 4, Township 24 North, Range 3 East.

The most recent confined feeding operation approval (Farm ID#3713) and construction authorization (AW#6822) was issued April 22, 2019. The most recent confined feeding operation approval and construction authorization approved the construction of two (2) farrowing (sows and litters) buildings and one (1) breeding and gestation sow building with below-building concrete manure storage.

A request for approval transfer from Top Grade, LLC to Top Grade Production LLC was approved on January 30, 2019.

According to the most recent Confined Feeding Operation Approval with Construction issued by the Indiana Department of Environmental Management, the confined feeding operation is approved for a total capacity of 4,789 breeding and gestation sows and 833 farrowing sows (sows and litters) in eight (8) production buildings with self-contained, below-building concrete storages. The existing confined feeding operation includes a concrete lift station and earthen treatment/storage impoundment. Manure from the buildings is transferred from the concrete lift station to the earthen treatment/storage impoundment for long-term storage.

The construction of the two (2) farrowing buildings (sows and litters) and the one (1) breeding and gestation sow building has not begun or been completed. A request to renew the existing construction authorization (AW-6822) is submitted as a part of the confined feeding operation approval renewal and manure management plan. The approved construction plans are in compliance with the current design requirements outlined in Indiana NRCS FOTG Code 313 – October 2016. However, an interpretation by the Indiana Department of Environmental Management regarding the density of manure value to be used in design calculations requires that the construction plans for the approved below-building concrete manure storage be updated. Updated building plans are submitted in accordance with the requirements of IC 13-18-10-2(d). A written notice has been sent in accordance with the requirements of IC13-18-10-2(b).

No changes to the approved operating capacity, number of confined feeding buildings to be constructed, and location and dimensions of the confined feeding buildings are requested as part of the Confined Feeding Operation Approval Renewal, Manure Management Plan, and Construction Authorization Renewal.

Operating Capacity:

This confined feeding operation is operated as a breed-to-wean pig production site. The current approved operating capacity for this confined feeding operation is 5,622 sows (4,789 breeding and gestation sows and 833 sows and litters (farrowing) housed in eight (8) buildings. The confined feeding operation includes five (5) existing production building and three (3) approved, not yet constructed production

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March 11, 2024
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buildings including two (2) farrowing (sow and litters) buildings and one (1) breeding and gestation sow building with below-building concrete manure storage.

Once the proposed construction is completed, the operating capacity is 5,622 sows housed in eight (8) buildings. Based on the animal categories defined in 40 CFR 122.23(b)(2) and 40 CFR 122.23 (b)(4) this animal feeding operation is defined as a large concentrated animal feeding operation with an operating capacity of 5,622 pigs weighing fifty-five (55) pounds or more.

The production buildings and operating capacities are summarized below.

Table 1: Building Dimension and Operating Capacity

ID	Structure Type	Building Dimensions	Animal Capacity
1E.	Breeding & gestation	49'-0" x 246'-0" (building dimensions) 47'-8" x 244'-8" x 2'-0" deep (storage dimensions)	650 sows
2E.	Breeding & gestation	49'-0" x 246'-0" (building dimensions) 47'-8" x 239'-8" x 2'-0" deep (storage dimensions)	635 sows
3E.	Farrowing (sows & litters)	65'-0" x 289'-4" (building dimensions)	297 sows and litters
4E.	Earthen treatment/storage impoundment	292'-0" x 315'-0" x 15' deep (top of berm)	-----
5E.	Concrete lift station	14'-0" x 14'-0" O.D.	-----
6E.	Breeding & gestation	77'-2" x 417'-2" (building dimensions) 75'-10" x 415'-10" x 7'-8" deep (storage dimensions)	1,752 sows
7E.	Farrowing (sows & litters)	75'-0" x 161'-0" (building dimensions) 16 – 6'-9" x 70'-0" x 2'-0" deep (storage dimensions)	208 sows and litters
8P.	Farrowing (sows & litters)	84'-0" x 152'-0" (building dimensions) 8 – 7'-2.5" x 151'-0" x 2'-0" deep (storage dimensions)	208 sows and litters
9P.	Farrowing (sows & litters)	64'-0" x 119'-0" (building dimensions) 6 – 7'-2.5" x 118'-0" x 2'-0" deep (storage dimensions)	120 sows and litters
10P.	Breeding & gestation	77'-4" x 417'-4" (building dimensions) 75'-8" x 416'-0" x 10'-0" deep (storage dimensions)	1,752 sows
	TOTAL		**833 sows and litters 4,789 breeding/gestation sows**

<u>Land Application Acres:</u>

<u>Required land application acres (minimum):</u>

<u>IDEM Guidance Determination:</u> For manure management planning, this confined feeding operation is operated as a breed-to-wean swine production site. The Indiana Department of Environmental Management (IDEM) Guidance Manual for Indiana's Confined Feeding Program – December 29, 2014 (Guidance Manual) "Manure Application Land Base Estimates" Table (page 52) states that one acre per 13

farrowing (sows & litters) and one (1) acre per 25 breeding/gestation sows per year is required to provide sufficient land application acres to land apply the manure and process wastewater.

The required manure application land requirement is determined as follows.

<u>**Breeding/Gestation – 4,789 sows (1E, 2E, 6E, & 10P)**</u>

Breeding/gestation sows

4,789 sows ÷ 25 sows/acre =	191.6 acres

<u>**Farrowing Building – 833 sows and litters (3E, 7E, 8P, & 9P)**</u>

Sows & litters

833 sows & litters x 13 groups/yr x 25 days/group ÷ 365 days/yr ÷ 13 sows/acre =	57.1 acres
Total land application acres required: (191.6 + 57.1)	**248.7 acres**

<u>Available land application acres:</u>
Liquid manure and process wastewater land application methods utilized are typically injection or single-pass incorporation. When necessary, manure and process wastewater land application methods utilized may include surface application with incorporation and surface application. In the case where surface application of manure and process wastewater is conducted, it is not expected that the annual volume of manure and process wastewater would be land applied using surface application methods. The available land application acres are determined after setbacks are calculated.

The required setbacks for incorporation or single-pass incorporation were calculated based on a setback of:

- 0 feet from property lines and public roads;
- 5 feet from drainage inlets;
- 50 feet from wells;
- 25 feet from sinkholes;
- 25 feet from surface water; and
- 500 feet from public water supply wells & surface intake structures.

When surface application is conducted on land application fields with less than 6% slope the required setbacks used to calculate available acres are:

- 50 feet from property lines and public roads;
- 100 feet from drainage inlets;
- 100 feet from wells;
- 100 feet from sinkholes;
- 100 feet from surface water; and
- 500 feet from public water supply wells & surface intake structures.

If surface application is conducted on land application fields with greater than 6% slope the required setbacks used to calculate available acres are:

- 50 feet from property lines and public roads;
- 200 feet from drainage inlets;
- 200 feet from wells;
- 200 feet from sinkholes;
- 200 feet from surface water; and
- 500 feet from public water supply wells & surface intake structures.

The total number of available land application acres after setbacks are calculated when using injection or single-pass incorporation included in the areas designated for land application is approximately 257.91 acres.

A review of the requirement to submit Land Application Agreements indicates that "Copies of all land application agreements must accompany construction applications (application type A-D, H-K, and L) [identified in Application Checklist of the CFO / CAFO Application Packet]. A CFO Approval Renewal

/ Manure Management Plan is identified as an application type G in the Application Checklist. It is concluded that the Land Application Agreements are not required to be submitted as part of a Confined Feeding Operation Approval Renewal and Construction Authorization Renewal Application packet. It is confirmed that the Land Use Agreements for land application sites included in the original Confined Feeding Operation Approval and Construction Authorization have not changed and are still valid. For reference, the original Land Application Agreement is included.

A review of the original Land Application Agreement indicates that the total land parcel acreage was included as the acres identified in the agreement and may not have included the calculated setbacks. The total number of acres included in the Land Application Agreement is 258.84 acres. The total number of acres owned by Top Grade Production LLC is 4.12 acres. A determination of the calculated setbacks when using injection or single-pass incorporation is summarized below. The calculated setbacks for the land application acres when using injection or single-pass incorporation includes 5.05 acres.

Land Application Agreement Information

Acres					
Total	**Calculated Setback**	**Available**	**Section**	**Township**	**Range**
11.34	0.45	10.89	4	24N	3E
17.00	0.94	16.06	4	24N	3E
20.00	0.00	20.00	4	24N	3E
37.80	1.52	36.28	4	24N	3E
37.69	0.00	37.69	4	24N	3E
39.99	0.76	39.23	3	24N	3E
43.00	0.81	42.19	4	24N	3E
52.02	0.57	51.45	4	24N	3E
258.84	5.05	253.79			

Top Grade Production LLC Information

Acres					
Total	**Calculated Setback**	**Available**	**Section**	**Township**	**Range**
4.12	0.00	4.12	4	24N	3E

The available land application acres after setbacks are calculated is 257.91 acres (253.79 acres [land application agreement] + 4.12 acres [applicant owned]).

Available land application acres are indicated on the USDA-NRCS soil survey map (plot map). Available acres presented on the plot maps are determined based on the setbacks required for liquid injection or single-pass incorporation (liquid or solid). Land application agreements are included and maintained in the operating record for all land application acres not owned by Top Grade Production LLC.

The available land application acres when using incorporation or single-pass incorporation (257.91 acres) exceeds the minimum number of acres required by 327 IAC 19-14-2 (248.7 acres).

Approved Construction (Construction Authorization Renewal):

Design/Construction Plans:
The requirements of 327 IAC 19-12-4(d) state that "*All liquid manure storage facilities must be constructed according to the Indiana NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016***." The requirements of the Indiana NRCS Conservation Practice Standard Code 313; Waste Storage Facility were considered in the design and planned construction of the concrete manure storage structures. The approved construction plans are in compliance with the current design requirements outlined in the Indiana Conservation Practice Standard Code 313: Waste Storage Facility, October 2016. However, a new interpretation by the Indiana Department of Environmental Management regarding the density of manure value to be used in design calculations requires that the design calculations and construction plans for the approved below-building concrete manure storage be updated. Updated design calculations and building plans are submitted in accordance with the requirements of IC13-18-10-2(d).

Updated design calculations for the following building components are provided:

- 58" x 58" x 10" thick concrete column footer – 12" x 12" square and 14" diameter round column (1,500 psf soil bearing capacity)
- 46" x 46" x 10" thick concrete column footer – 12" x 12" column and 14" diameter round column (2,000 psf soil bearing capacity)
- 58" x 58" x 8" thick concrete column footer – 12" x 16" masonry concrete column (1,500 psf soil bearing capacity)
- 46" x 46" x 8" thick square column footer for a 12" x 16" concrete masonry block column. (2,000 psf soil bearing capacity) -- previously 44" x 44" x 8" thick square column footer
- 66" diameter x 10" thick round column footer for a 12" x 12" square and 14" diameter round concrete column. (1,500 psf soil bearing capacity) -- previously 64" diameter x 10" thick round column footer
- 50" diameter x 10" thick round column footer - 12" x 12" square and 14" diameter round concrete column. (2,000 psf soil bearing capacity)
- 42" wide x 11" thick continuous concrete footer – 12" x 12" square and 14" diameter round column (1,500 psf soil bearing capacity)
- 36" wide x 10" thick continuous concrete footer – 12" x 12" square and 14" diameter round column (2,000 psf soil bearing capacity)
- 42" wide x 11" thick continuous concrete footer – 12" x 16" masonry concrete column (1,500 psf soil bearing capacity)
- 36" wide x 9" thick continuous concrete footer – 12" x 16" masonry concrete column (2,000 psf soil bearing capacity)
- 44" wide x 10" thick continuous concrete footer – End wall and concrete column

Some of the planned and proposed construction details for the approved breeding and gestation building construction plans have changed since the original approval. The planned changes include:

- 46" x 46" x 10" thick concrete column footer – 12" x 12" column and 14" diameter round column (2,000 psf soil bearing capacity)
- 66" diameter x 10" thick round column footer for a 12" x 12" square and 14" diameter round concrete column. (1,500 psf soil bearing capacity) -- previously 64" diameter x 10" thick round column footer
- 46" x 46" x 8" thick square column footer for a 12" x 16" concrete masonry block column. (2,000 psf soil bearing capacity) -- previously 44" x 44" x 8" thick square column footer

It is noted that the other proposed footer dimensions do not change due to the change in the design manure density from 62.5 pcf to 65.0 pcf.

A review of the floor construction joint spacing calculations identified a rounding error in the determination of the allowable floor construction joint spacing for 60,000 psi welded wire reinforcement. The updated floor construction joint spacing options include:

- 6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 42' on center, (previously 43')
- 6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 20'on center (previously 21')

A review of the site specific analysis and designs and alternative design or compliance approach designs confirms that no changes are required for the following designs.

- End wall lateral support design
- 12" x 12" reinforced concrete column design
- 14" diameter round reinforced concrete column design
- 12" x 16" concrete masonry column design
- Concrete construction specification

Seasonal Water Table Management (Perimeter Tile):
Since the original Confined Feeding Operation Approval (Farm ID#3713) and Confined Feeding Operation Approval Construction Authorization (AW-6822), a demonstration of the adequacy of the subsurface perimeter tile system seasonal water table management has been added to the requirements of a Confined Feeding Operation Approval Application packet. A perimeter tile system design is provided for building P3 (South Gestation) to determine the size of the perimeter tile and to demonstrate the adequacy of the perimeter tile seasonal water table management system

An on-site soil investigation was completed by John Bowman, Chestnut Ridge Consulting, Inc. on September 28, 2018. Two (2) soil borings were completed within the footprint of proposed building P1 (East Farrowing), two (2) soil borings were completed within the footprint of proposed building P2 (West Farrowing), and three (3) borings were completed within the footprint of proposed building P3 (South Gestation). A total of seven (7) soil borings within the footprint of the proposed buildings were completed to determine the soil characteristics and presence or absence of a seasonal water table. The on-site soil investigation report identifies the soil profile from the ground surface to the bottom of the excavation using the Unified Soil Classification System (USCS) soil classification designation. The soil classifications identified in the soil investigation report for borings representing the proposed buildings include silt loam (ML), clay loam (CL) clay (CH), and sandy loam (SM).

The on-site soil investigation demonstrated that a seasonal water table exists within the footprint of the proposed concrete manure storage structures. The depth to the seasonal water table below the ground surface according to the on-site soil investigation is:

Building P1 – East Farrowing

Boring #1 (west boring)	11" below the ground surface
Boring #2 (east boring)	12" below the ground surface

Building P2 – West Farrowing

Boring #1 (west boring)	12" below the ground surface
Boring #2 (east boring)	12" below the ground surface

Building P3 – South Gestation

Boring #1 (east boring)	10" below the ground surface
Boring #2 (middle boring)	21" below the ground surface
Boring #3 (west boring)	7" below the ground surface

Referring to the on-site soil investigation the soil profile log indicates the following.

Building P1 – East Farrowing
Boring #1 (west boring):

Depth	Texture
0"-11"	silt loam (ML)
11"-20"	clay loam (CL)
20"-31"	clay (CH)
31"-41"	clay (CH)
41"-50"	sandy loam (SM)
50"-132"	sandy loam (SM)

Seasonal water table – 11" below surface

Boring #2 (east boring):

Depth	Texture
0"-12"	silt loam (ML)
12"-22"	clay (CH)
22"-34"	clay loam (CL)
34"-42"	silt loam (ML)
42"-60"	sandy loam (SM)
60"-132"	sandy loam (SM)

Seasonal water table – 12" below surface

Building P2 – West Farrowing

Boring #1 (west boring):

Depth	Texture
0”-9”	clay loam (CL)
9”-22”	clay (CH)
22”-32”	clay (CH)
32”-48”	clay loam (CL)
48”-65”	clay loam (CL)
65”-132”	silt loam (ML)

Seasonal water table – 12” below surface

Boring #2 (east boring):

Depth	Texture
0”-10”	clay loam (CL)
10”-25”	clay loam (CL)
25”-33”	clay (CH)
33”-46”	clay (CH)
46”-70”	clay loam (CL)
70”-100”	silt loam (ML)
100”-132”	sandy loam (SM)

Seasonal water table – 12” below surface

Building P3 – South Gestation

Boring #1 (east boring):

Depth	Texture
0”-10”	silt loam (ML)
10”-18”	silt loam (ML)
18”-28”	clay loam (CL)
28”-42”	clay (CH)
42”-56”	silt loam (ML)
56”-96”	sandy loam (SM)
96”-132”	silt loam (ML)

Seasonal water table – 10” below surface

Boring #2 (middle boring):

Depth	Texture
0”-10”	silt loam (ML)
10”-21”	clay (CH)
21”-31”	clay (CH)
31”-41”	clay (CH)
41”-52”	clay loam (CL)
52”-92”	sandy loam (SM)
92”-132”	silt loam (ML)

Seasonal water table – 21” below surface

Boring #3 (west boring):

Depth	Texture
0”-7”	silt loam (ML)
7”-18”	clay loam (CL)
18”-38”	clay (CH)
38”-48”	clay (CH)
48”-56”	clay loam (CL)
56”-72”	silt loam (ML)
72”-132”	sandy loam (SM)

Seasonal water table – 7” below surface

The information provided by the on-site soil investigation indicates that the soil properties are uniform and that a seasonal water table exists within the footprint of the proposed below-building concrete manure storages. The depth of the foundation and floor of the farrowing buildings (P1 & P2) below-building concrete manure storages will be located approximately on grade after the topsoil is removed (0"-10" below the existing ground surface). The depth of the foundation and floor of the gestation building (P3) will be located approximately 60" – 96" below the existing ground surface.

A perimeter tile drainage system is not required for buildings P1 (East Farrowing) and P2 (West Farrowing) since the seasonal water table identified by the on-site soil investigation is below the proposed below-building concrete manure storage. A perforated perimeter tile drainage system with a tile riser observation point located at the northeast corner of building P3 will be used to collect and direct groundwater away from the building foundation. Groundwater from the tile riser observation sump will be pumped to a surface rock distributor located at least 50 feet from the proposed concrete manure storage. The rock distributor outlet is located on the adjoining property. A waiver letter from the adjoining land owner was provided as part of the original confined feeding operation approval confirming that the adjoining land owner is aware of the planned perimeter tile outfall and has no objection to the location of the perimeter tile outfall. Water from the rock distributor will be directed to a grassed infiltration area and is planned to join the natural drainage patterns around the building and surrounding area.

A perimeter tile system design is provided for building P3 (South Gestation) to determine the size of the perimeter tile and to demonstrate the adequacy of the perimeter tile seasonal water table management system. Based on the assumption that the entire gestation building floor and foundation is at the maximum depth below the existing ground surface (96") and a seasonal water table depth of 7" below the ground surface a 5" diameter corrugated (corrugated inside wall) perimeter tile is required. The building plans and perimeter tile plans have been updated to include a 5" diameter (corrugated inside wall) perimeter tile around the building foundation as part of the perimeter tile seasonal water table management system.

<u>Site Features and Details:</u>

<u>Plot maps (327 IAC 19-7-1(c)(2)):</u>
The specific plot maps, which must be submitted for each application type defined in the "Application Types and Requirements Worksheet" of the CFO / CAFO Application Packet are detailed in Section A. Plot Maps and Section E. Application Type and Required Plot Maps of the CFO / CAFO Application Packet Section X – Plot Maps.

A review of the plot map requirements for a Confined Feeding Operation Approval Renewal Application (CFO / CAFO Application Packet Section X – Plot Maps; E. Application Type and Required Plot Maps) indicates that "1. USDA NRCS Soil Survey Map – The boundaries of all manure application areas. and 2. USDA NRCS Soil Survey Map – The location of the waste management system, boundaries of the confined feeding operation, and boundaries of livestock and poultry production areas." are required to be submitted. A review of CFO / CAFO Application Packet Section X – Plot Maps; E. Application Type and Required Plot Maps indicates that "3. USGS Topographic Maps – The location of the waste management system, the boundaries of the confined feeding operation, boundaries of livestock and poultry production areas, identify any public water supply wells and public water supply surface intake structures within one thousand (1000) feet of the manure storage structures, and boundaries of all manure application areas." are not required as part of a Confined Feeding Operation Approval Renewal Application packet.

Based on the plot map requirements outlined in Section E of the CFO / CAFO Application Packet Section X, USDA NRCS Soil Survey Maps are required to be submitted and USGS Topographic Maps are not required to be submitted. It is confirmed that the land application acres included in the original Confined Feeding Operation Approval and Construction Authorization have not changed. USDA NRCS Soil Survey maps and the current land application agreements are included in the Confined Feeding Operation Approval Renewal and Construction Authorization Renewal application to confirm that there have been no changes to the available land application acres.

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In accordance with 327 IAC 19-7-2, United States Department of Agriculture Natural Resources Conservation Service soil survey maps are included to confirm the location of the existing confined feeding operation (CFO). The plot maps show the location of the waste management systems, boundaries of the CFO property, boundaries of the production areas, boundaries and owners of the manure application areas, and available manure application acres.

Adjacent or contiguous animal feeding operation (327 IAC 19-7-1(c)(11):
The requirements listed in 327 IAC 19-7-1(c)(11) state that a complete application must include "*a statement affirming that AFOs adjacent to or contiguous with the CFO are not under common ownership or control of the applicant.*" It is confirmed that there are no animal feeding operations (AFOs) that exist adjacent to or contiguous with the existing confined feeding operation (CFO) owned and operated by Top Grade Production LLC. The answer to Item A.6 of Section 1. General Information of the CFO / CAFO Application Packet is "No" indicating that there are no AFOs adjacent to or contiguous with the CFO that are under common ownership or control of Top Grade Production LLC. However, because there are no animal feeding operations adjacent to or contiguous with the existing confined feeding operation Top Grade Production LLC. is not able to submit an affirmation statement that is consistent with the requirements of 327 IAC 19-7-1(c)(11).

In place of a statement affirming that AFOs adjacent to or contiguous with the CFO are not under common ownership or control of the applicant, Top Grade Production LLC. affirms that there are no animal feeding operations (AFOs) located adjacent to or contiguous with the existing confined feeding operation (CFO).

Farmstead Plan (327 IAC19-7-1(c)(3):
Farmstead plans are included to confirm the confined feeding operation location and confined feeding operation property boundaries. Farmstead plan sheet 1A is a site location map identifying the location of the confined feeding operation, confined feeding operation property boundaries, and the production area; is legible and drawn to scale; and is submitted on eight and one-half (8-½) inch by eleven (11) inch paper.

Farmstead plan sheet 2A to the best knowledge of Top Grade Production LLC includes all features identified in 327 IAC 19-7-3(a) within 500 feet of the below building concrete manure storages and within the area depicted on the farmstead map, where applicable. Specifically, farmstead plan sheet 2A includes: 1) surface waters of the state; 2) public and private roads; 3) water well locations; 4) production area surface drainage patterns; 5) property boundary lines; 6) outfalls of known subsurface drainage structures including perimeter drain outfalls; 7) drainage inlets including water and sediment control basins; 8) mortality management sites; and 9) residences. No karst features exist within 500 feet of the below-building concrete manure storages.

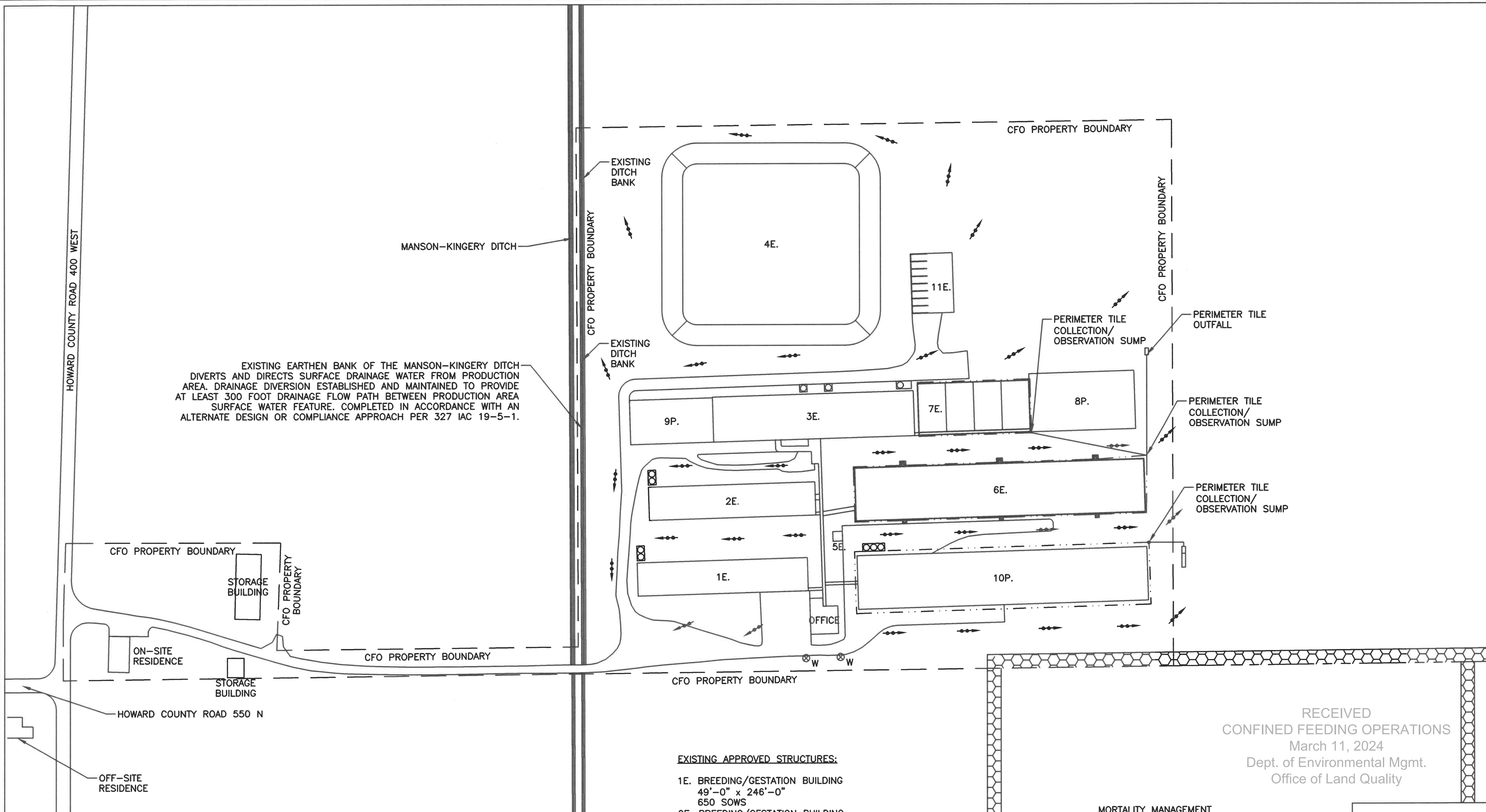
In accordance with 327 IAC 19-7-3(b)-(g), farmstead plan sheet 2A shows the diversion of uncontaminated surface water, includes the number and type of animals, is legible and drawn to scale, shows distances between the waste management system and features of concern within at least 500 feet (as applicable), includes a reference to true north, indicates the presence or absence of a one hundred (100) year flood plain, and is submitted on eleven (11) inch by seventeen (17) inch paper.

Mortality Management (327 IAC 19-7-6):
Mortalities are managed at an existing on-site mortality compost facility. Mortalities are removed from the buildings and delivered to the mortality compost facility to ensure that there will not be a discharge of mortalities or liquids that have come in contact with mortalities to waters of the state and that mortalities will not be disposed of in the manure storage structures.

The mortality compost facility is constructed with a concrete floor to control leaching. The mortality compost facility is constructed and located to control run-on of uncontaminated surface water and to control runoff from the mortality compost facility. The mortality compost facility includes sidewalls to contain compost within the designated area of the compost facility and to control run-on and runoff from the mortality compost facility. The mortality compost facility does not include a roof or cover, precipitation that falls on the compost area is managed to prevent runoff.

The mortality compost facility is operated in accordance with the requirements of IC 15-17-11. The mortality compost facility is constructed to promote and maintain diversion of storm water away from the compost facility to prevent run-on of storm water into the compost facility. The area around the compost facility is graded to create a slope away from the compost floor or base. The mortality compost site has been located to maintain the setback requirements identified in 327 IAC 19-12-3. The location of the on-site mortality compost site is identified on the farmstead plan in accordance with 327 IAC 19-7-3.

Alternate mortality management methods may be used when necessary in accordance with the methods described in 345 IAC 7-7-3.



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EXISTING APPROVED STRUCTURES:

1E. BREEDING/GESTATION BUILDING
49'–0" x 246'–0"
650 SOWS
2E. BREEDING/GESTATION BUILDING
49'–0" x 246'–0"
635 SOWS
3E. FARROWING BUILDING
65'–0" x 289'–4"
297 SOWS & LITTERS
4E. EARTHEN TREATMENT AND STORAGE IMPOUNDMENT
292' x 315' x15' DEEP
5E. CONCRETE LIFT STATION
14' x 14' O.D.
6E. BREEDING/GESTATION BUILDING
77'–2" x 417'–2"
1,752 SOWS
7E. FARROWING BUILDING
75'–0" x 161'–0"
208 SOWS & LITTERS
11E. MORTALITY COMPOST FACILITY

PROPOSED APROVED STRUCTURES:

8P. FARROWING BUILDING
84'–0" x 152'–0"
208 SOWS & LITTERS
9P. FARROWING BUILDING
64'–0" x 119'–0"
120 SOWS & LITTERS
10P. BREEDING/GESTATION BUILDING
77'–4" x 417'–4"
1,752 SOWS

MORTALITY MANAGEMENT

MORTALITIES ARE MANAGED AT AN ON–SITE MORTALITY COMPOST FACILITY.

100'
SCALE

W WELL
DRAINAGE FLOW PATTERN
PERIMETER TILE
CFO PROPERTY BOUNDARY
WOODED AREA

N

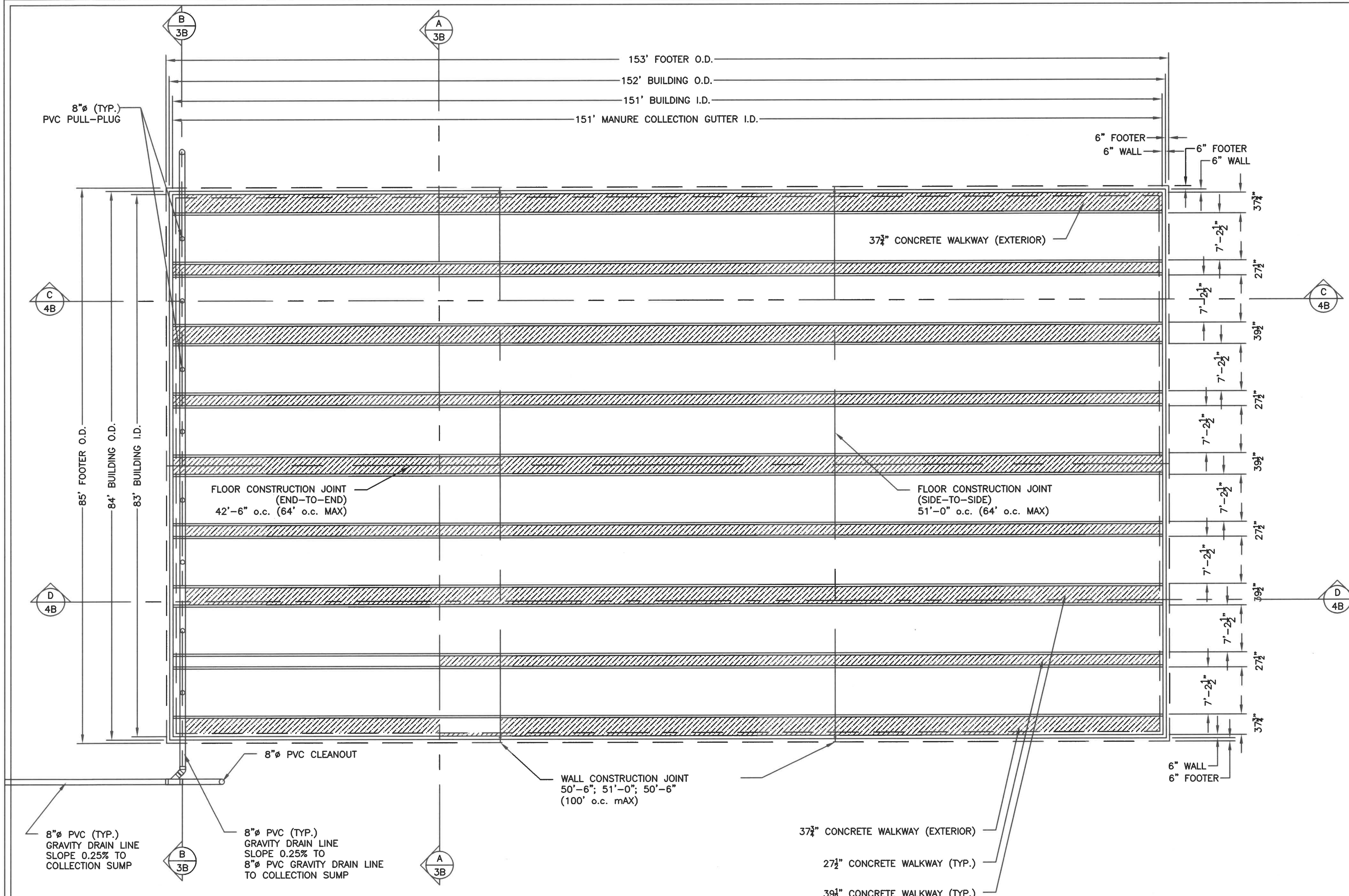
SHEET: 2A of 2A | DRAWING NO: TGP0124– 02A

DATE: 02/21/24 | DRAWN BY: DL

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARMSTEAD PLAN
BUILDING SITE DETAILS
SECTION 4 T24N R3E

TOP GRADE PRODUCTION LLC
2667 EAST STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL–#3713



FARROWING BUILDING
84'-0" x 152'-0" O.D.
8-ROWS; 26 STALLS PER ROW
208 SOWS AND LITTERS

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CONFINED FEEDING OPERATIONS
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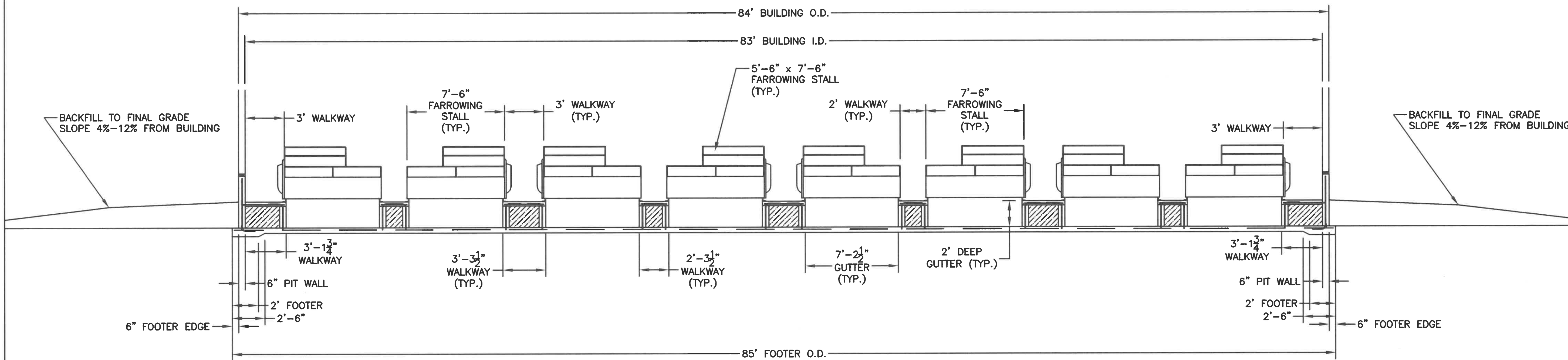
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

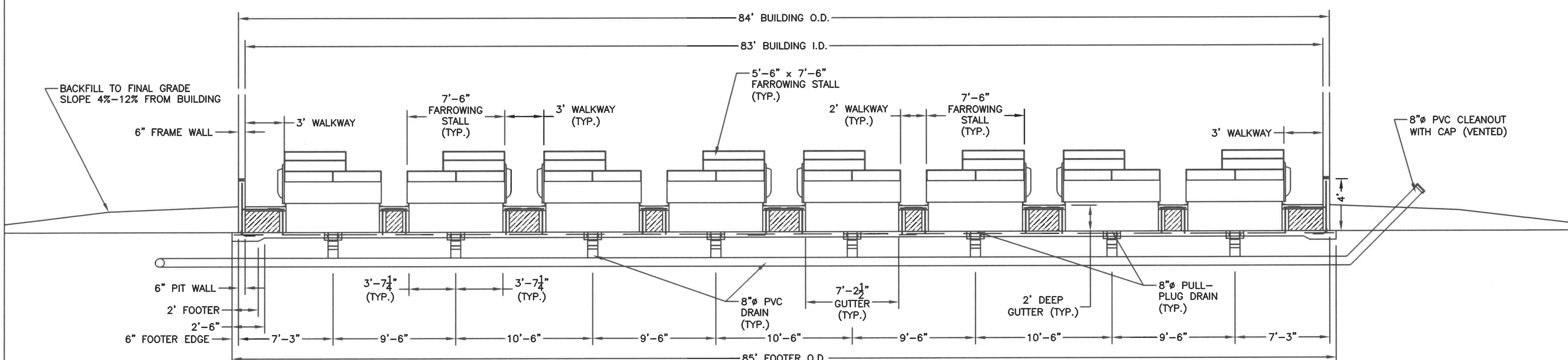
FARROWING BUILDING
FOUNDATION PLAN
BUILDING 8P

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

DATE: 02/23/24 | DRAWN BY: MV | SHEET: 2B of 8B | DRAWING NO: TGP0124- 02B



A / 3B **CONCRETE PIT CROSS-SECTION**
THRU FARROWING STALLS AND COLLECTION GUTTERS



B / 3B **CONCRETE PIT CROSS-SECTION**
THRU PULL PLUG DRAINS AND COLLECTION GUTTERS

DRAWING NO: TGP0124- 03B

SHEET: 3B of 8B

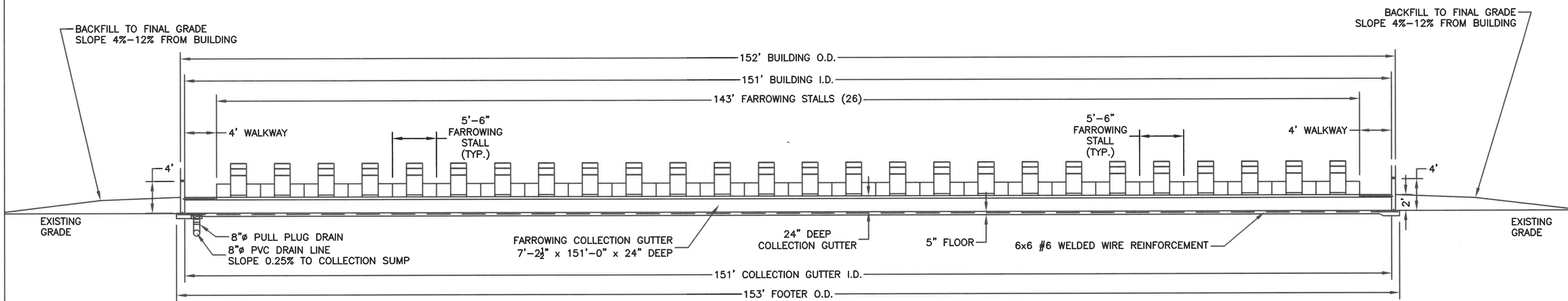
DRAWN BY: MV

DATE: 02/23/24

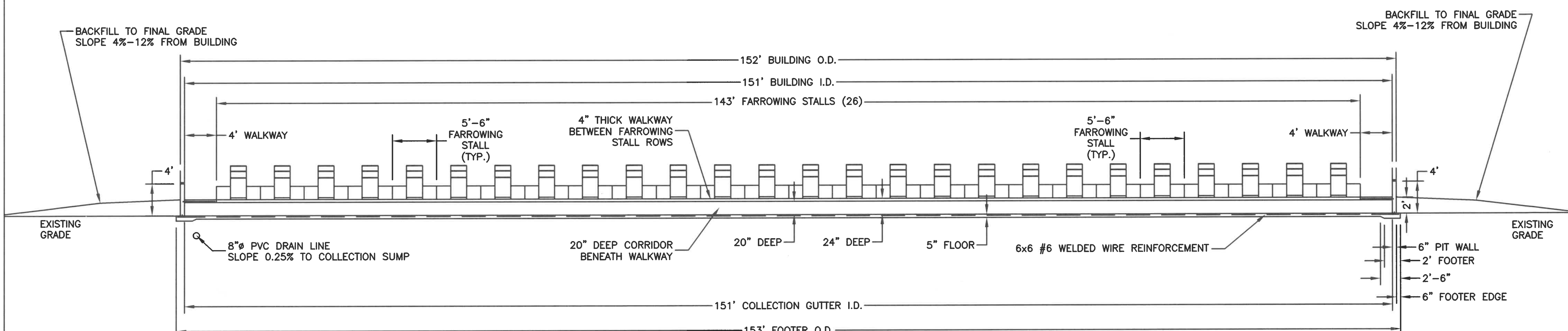
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTION
BUILDING 8P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



C / 4B **CONCRETE PIT CROSS-SECTION**
SIDE ELEVATION THROUGH DRAIN LINE AND COLLECTION GUTTER



D / 4B **CONCRETE PIT CROSS-SECTION**
SIDE ELEVATION THROUGH CONCRETE WALKWAY

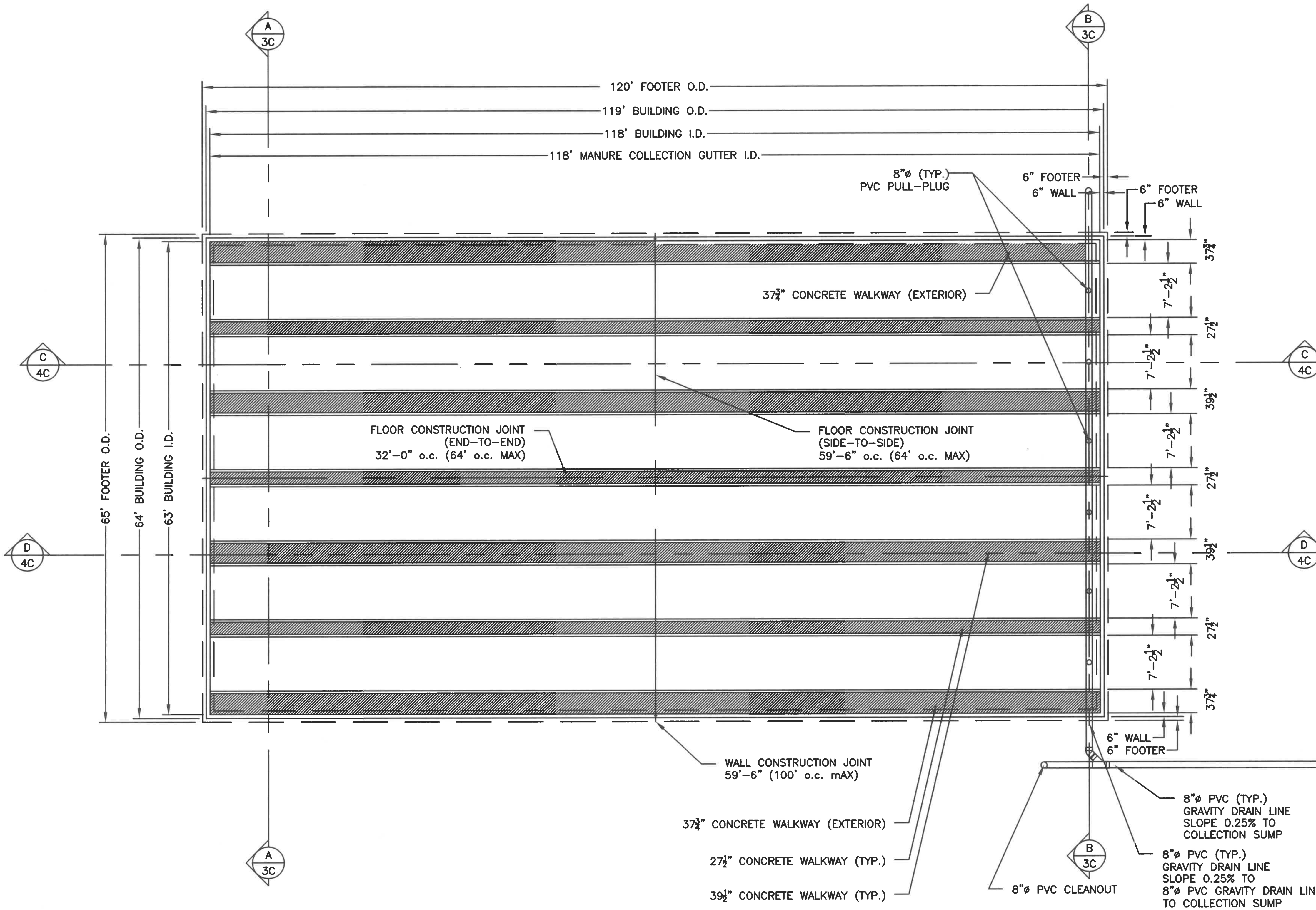
SHEET: 4B of 8B | DRAWING NO: TGP0124-04B

DATE: 02/23/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
SIDE ELEVATION
BUILDING 8P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



FARROWING BUILDING
64'-0" x 119'-0" O.D.
6-ROWS; 20 STALLS PER ROW
120 SOWS AND LITTERS

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

N

SHEET: 2C of 8C
DRAWING NO: TGP0124- 02C

DATE: 02/23/24
DRAWN BY: MV

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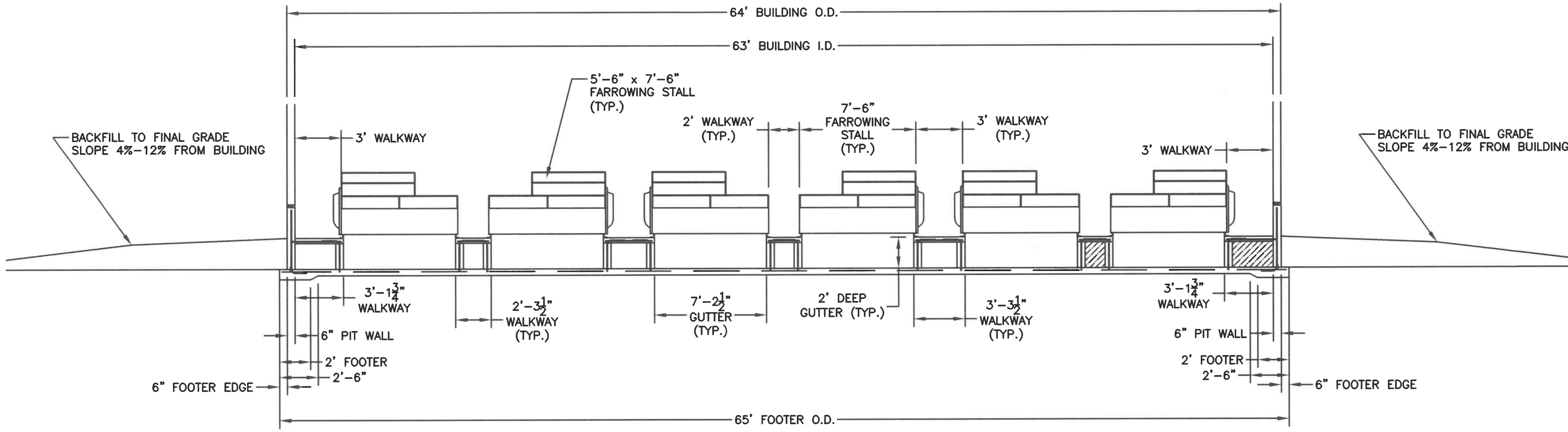
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
FOUNDATION PLAN
BUILDING 9P

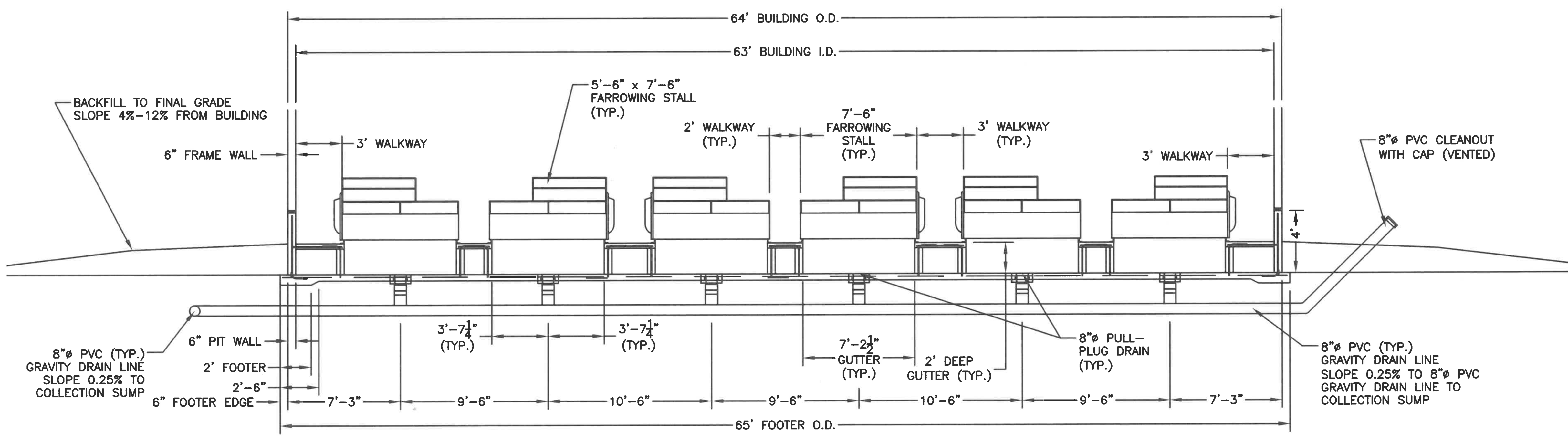
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



A / 3C

CONCRETE PIT CROSS-SECTION

THRU FARROWING STALLS AND COLLECTION GUTTERS



B / 3C

CONCRETE PIT CROSS-SECTION

THRU PULL PLUG DRAINS AND COLLECTION GUTTERS

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March 11, 2024
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Office of Land Quality

SHEET: 3C of 8C | DRAWING NO: TGP0124-03C

DATE: 02/23/24 | DRAWN BY: MV

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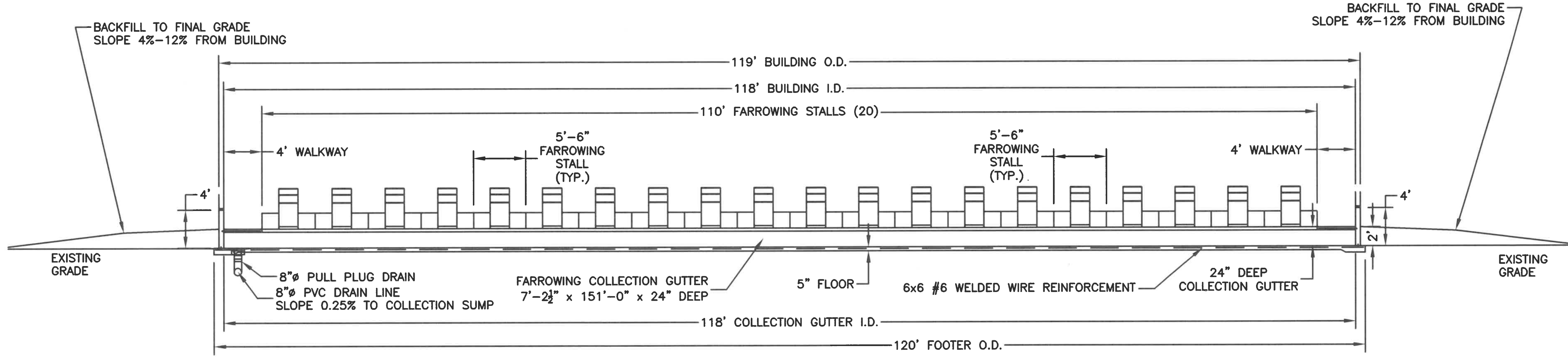
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTION
BUILDING 9P

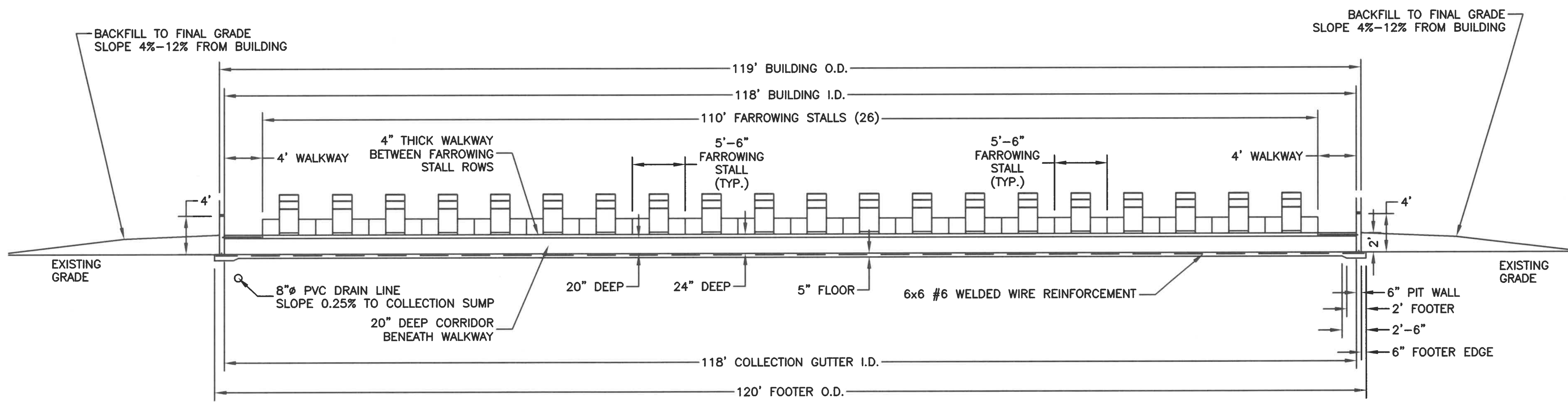
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



C / 4C

CONCRETE PIT CROSS-SECTION

SIDE ELEVATION THROUGH DRAIN LINE AND COLLECTION GUTTER



D / 4C

CONCRETE PIT CROSS-SECTION

SIDE ELEVATION THROUGH CONCRETE WALKWAY

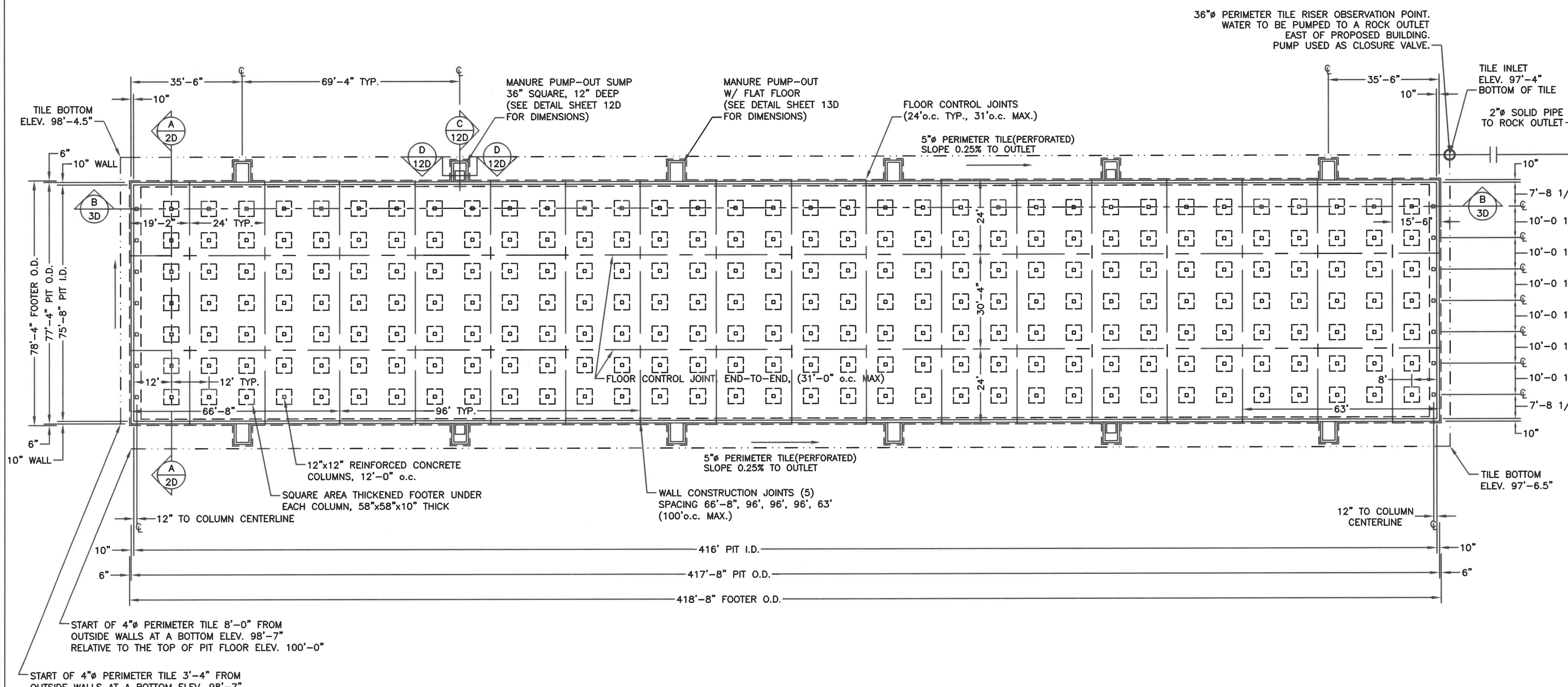
SHEET: 4C of 8C | DRAWING NO: TGP0124- 04C

DATE: 02/23/24 | DRAWN BY: MV

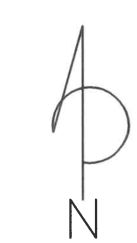
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
SIDE ELEVATION
BUILDING 9P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



GESTATION BUILDING
PLAN VIEW
CONCRETE PIT FOUNDATION



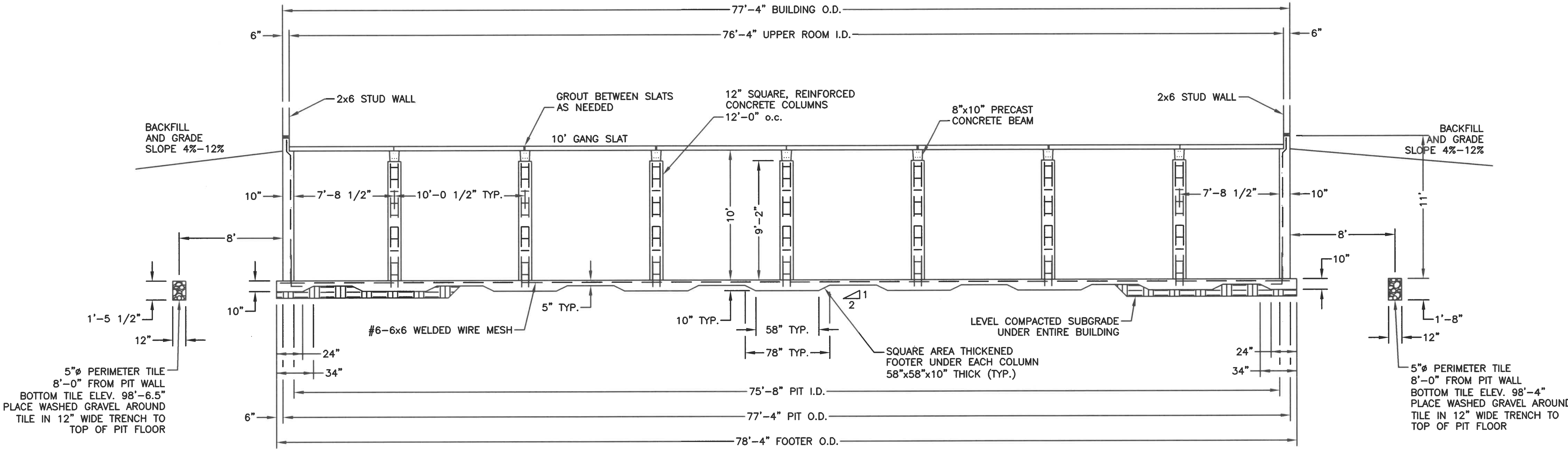
SHEET: 1D of 17D DRAWING NO: TGP0124-01D

DATE: 02/23/24 DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

CONCRETE PIT
FOUNDATION PLAN
BUILDING 10P.

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



A
2D
CONCRETE PIT CROSS-SECTION
ENDVIEW

NOTE:

1. SOLID FLOOR AND SUPPORT BEAMS SHALL MEET A MINIMUM DESIGN LIVE LOAD DUE TO ANIMALS OF 70 POUNDS PER SQUARE FOOT, PSF (UP TO 500 LB SOW) IN THE SOW HOUSING PORTION.
2. SLATS SHALL MEET A MINIMUM DESIGN LIVE LOAD DUE TO ANIMALS OF 170 POUNDS PER LINEAL FOOT, PLF (UP TO 500 LB SOW) IN THE SOW HOUSING PORTION.
3. REINFORCEMENT STEEL FOR TANK WALLS
   10" OUTSIDE WALL: VERTICAL REBAR -- #5, GRADE 60 12" o.c.
   HORIZONTAL REBAR -- #5 GRADE 60, 15" o.c.
   TOP OF WALL 14" BEAM: 4 - #5 GRADE 60, 3.5" O.C.
4. ALTERNATIVE REINFORCEMENT STEEL FOR TANK WALLS:
   10" OUTSIDE WALL: VERTICAL REBAR --#4 GRADE 60, 7.5" O.C.
   HORIZONTAL REBAR -- #4 GRADE 60, 9.75" O.C.
   TOP OF WALL 14" BEAM: 6 - #4 GRADE 60, 2.0" O.C.
5. ACCEPTABLE SOIL MATERIALS FOR BACKFILL SHALL HAVE A UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) DESIGNATION OF CL, CL-ML, ML, SC, SM-SC, SM SP, SW, GC, GM, GP, AND GW.
6. SOIL MATERIALS WITH A UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) DESIGNATION OF OL, MH, CH, AND OH SHALL NOT BE USED FOR BACKFILL DIRECTLY AGAINST THE CONCRETE WALLS.
7. NATURALLY OCCURRING SOIL MATERIALS ON-SITE INCLUDED SOILS WITH A UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) DESIGNATION OF ML, CL, CH, AND SM.
8. ACCEPTABLE BACKFILL MATERIALS SHALL CONSIST OF THE NATURALLY OCCURRING SOILS FROM THE EXCAVATION OR DESIGNATED BORROW AREA. ON-SITE SOILS WITH A CLASSIFICATION OF ML, CL, AND SM ARE SUITABLE FOR BACKFILLING DIRECTLY AGAINST THE CONCRETE MANURE STORAGE WALLS.
9. ON-SITE SOILS WITH A CLASSIFICATION OF CH SHALL NOT BE USED FOR BACKFILL AGAINST THE CONCRETE STORAGE WALLS.
10. LARGE ROCKS, ORGANIC MATERIALS, VEGETATION, DEBRIS, SNOW, ICE AND FOREIGN MATERIALS SHOULD BE REMOVED FROM BACKFILL.
11. BACKFILL ADJACENT TO THE CONCRETE WALLS SHOULD NOT BEGIN:
   A. UNTIL THE SLATS OR FLOOR ARE IN PLACE, AND
   B. IN LESS THAN 10 DAYS AFTER PLACEMENT OF CONCRETE, OR
   C. UNTIL THE CONCRETE STRENGTH IS AT LEAST 3,000 PSI.
12. HEAVY EQUIPMENT SHOULD NOT BE OPERATED WITHIN 5 FEET OF THE CONCRETE WALLS.
13. COMPACTION OF BACKFILL MATERIALS WILL BE BY NATURAL SETTLING AND COMPACTION OR BY MANUAL TAMPING OR HAND COMPACTION EQUIPMENT WITHIN 5 FEET OF THE CONCRETE WALLS.
14. BACKFILL SHOULD BE GRADED TO ESTABLISH AND MAINTAIN AT LEAST A 4%-12% SLOPE AWAY FROM THE BUILDING.

NOTE:

SEE FOR DETAILS:

*SHEET 4D - SIDE WALLS AND FOOTERS
*SHEETS 6D THRU 11D - COLUMNS AND FOOTERS

*INCLUDING DIMENSIONS AND REBAR LOCATION

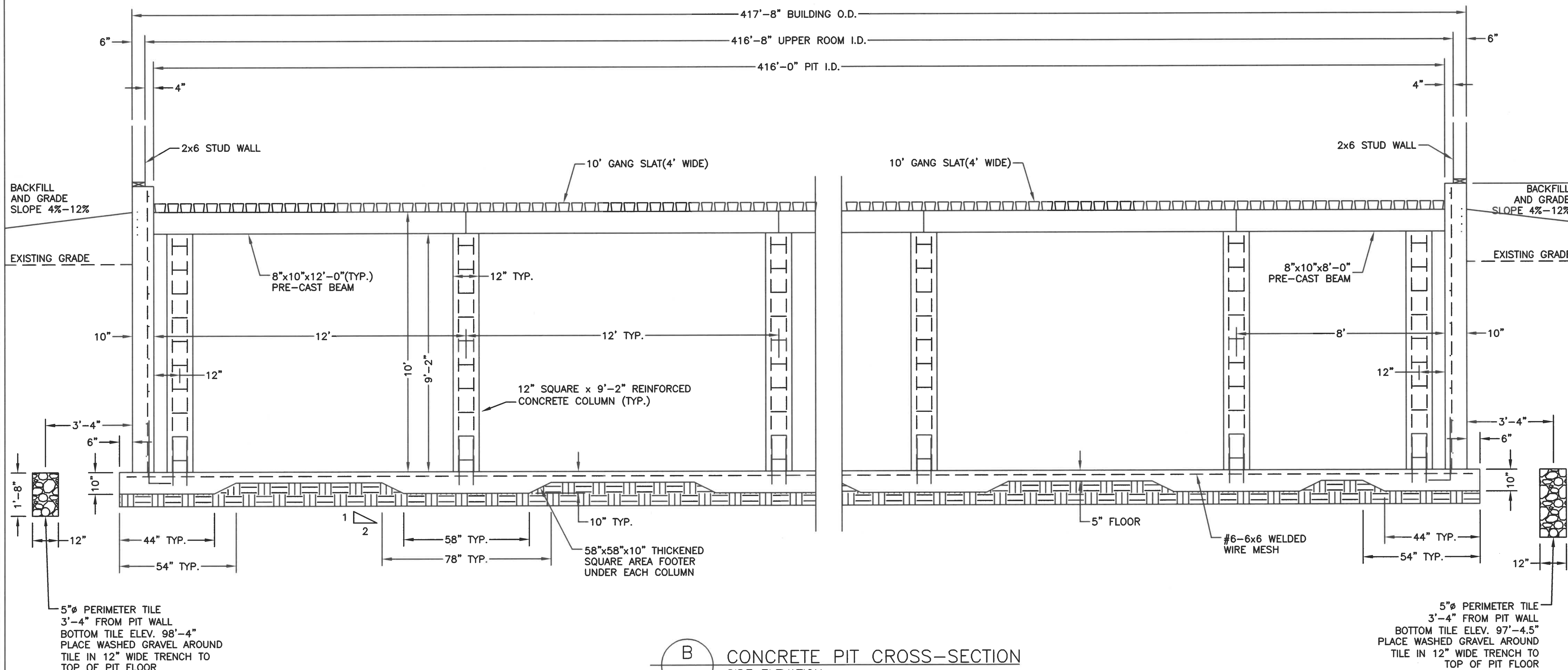
SHEET: 2D of 17D | DRAWING NO: TGP0124- 02D

DATE: 02/23/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

ENDVIEW BUILDING
CROSS-SECTION
SECTION A
BUILDING 10P.

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



B / 3D CONCRETE PIT CROSS-SECTION

SIDE ELEVATION

NOTE:

SEE FOR DETAILS:

*SHEET 5D – END WALLS AND FOOTERS
*SHEETS 6D THRU 11D – COLUMNS AND FOOTERS

*INCLUDING DIMENSIONS AND REBAR LOCATION

SHEET: 3D of 17D | DRAWING NO: TGP0124- 03D

DATE: 02/23/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

SIDE ELEVATION
CROSS-SECTION
SECTION B
BUILDING 10P.

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL RENEWAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

CONSTRUCTION ATTACHMENT UPDATE

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

WASTE MANAGEMENT SYSTEM DRAWINGS
AND
SUPPORTING INFORMATION

DESIGN SUMMARY

SITE PREPARATION AND BACKFILL

CONCRETE DESIGN SPECIFICATION
NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS
CONCRETE CONSTRUCTION
MAY 2015
(ADAPTED TO ADDRESS PROJECT SPECIFIC DETAILS)

CONCRETE MANURE STORAGE DESIGNS
SITE SPECIFIC ANALYSIS AND DESIGN

ALTERNATE DESIGN OR COMPLIANCE APPROACH: 327 IAC 19-5-1 & 327 IAC 19-3-1
ALTERNATE DESIGN OR COMPLIANCE APPROACH ANALYSIS AND DESIGN

SEASONAL WATER TABLE MANAGEMENT

DESIGN AND CONSTRUCTION PLANS
BELOW-BUILDING CONCRETE MANURE STORAGE DESIGN PLANS
EAST FARROWING (P1): 84'-0" x 152'-0" x 2'-0" DEEP (Plan Sheets 1B – 8B)
WEST FARROWING (P2): 64'-0" x 119'-0" x 2'-0" DEEP (Plan Sheets 1C - 8C)
SOUTH GESTATION (P3): 77'-4" x 417'-8" x 10'-0" DEEP (Plan Sheets 1D – 17D)

PERIMETER TILE (SEASONAL WATER TABLE) PLANS
SOUTH GESTATION (P3): (Plan Sheets 1E-5E)

Prepared by:
LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

BUILDING DESIGN AND CONSTRUCTION PLANS

BELOW-BUILDING CONCRETE MANURE STORAGE DESIGN PLANS

8P. East Farrowing: 84'-0" x 152'-0" x 2'-0" deep
Building Plans (Plan Sheets 1B-8B)

9P. West Farrowing: 64'-0" x 119'-0" x 2'-0" deep
Building Plans (Plan Sheets 1C-8C)

10P. South Gestation: 77'-4" x 417'-4" x 10'-0" deep
Building Plans (Plan Sheets 1D-17D)

Seasonal Water Table Management System – Perimeter Tile
10P. South Gestation (Plan Sheets 1E-5E)

Prepared by:
LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

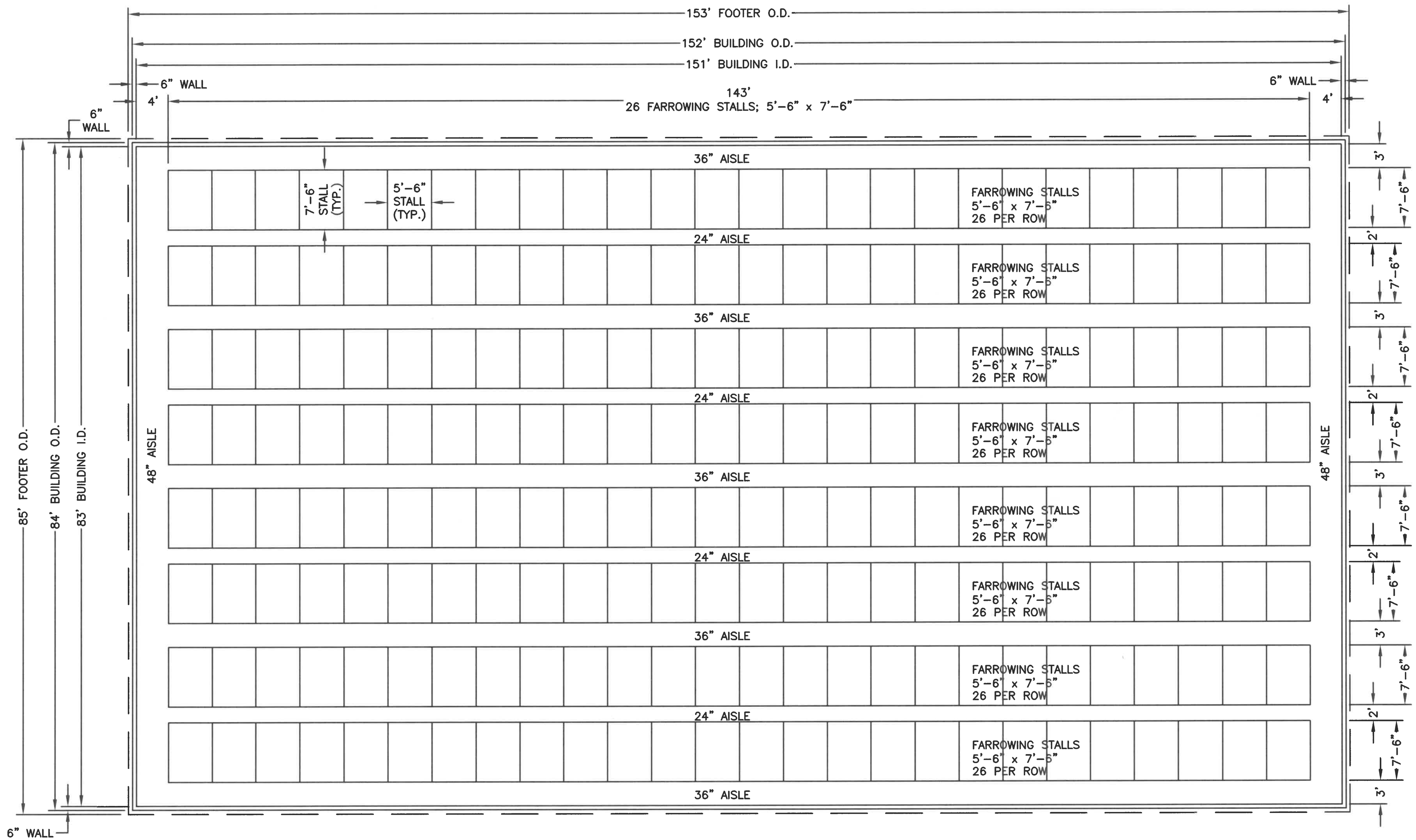
BUILDING DESIGN AND CONSTRUCTION PLANS

BELOW-BUILDING CONCRETE MANURE STORAGE DESIGN PLANS

8P. East Farrowing: 84'-0" x 152'-0" x 2'-0" deep
Building Plans (Plan Sheets 1B-8B)

Prepared by:
LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829



FARROWING BUILDING
84'-0" x 152'-0" O.D.
8-ROWS; 26 STALLS PER ROW
208 SOWS AND LITTERS

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

N

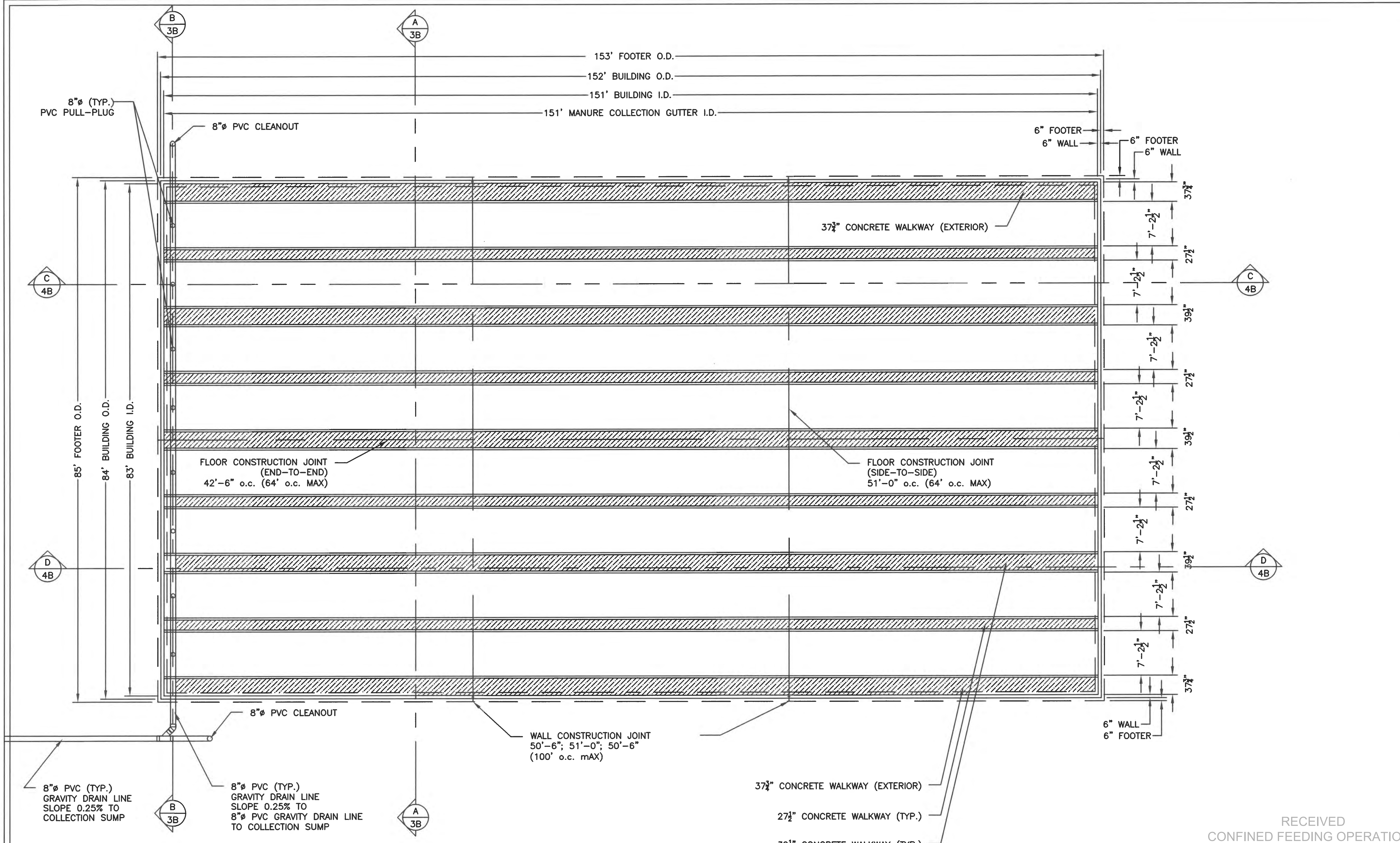
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

FARROWING BUILDING
FLOOR PLAN
BUILDING 8P

DATE: 02/23/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

SHEET: 1B of 8B | DRAWING NO: TGP0124- 01B



FARROWING BUILDING
84'-0" x 152'-0" O.D.
8-ROWS; 26 STALLS PER ROW
208 SOWS AND LITTERS

NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

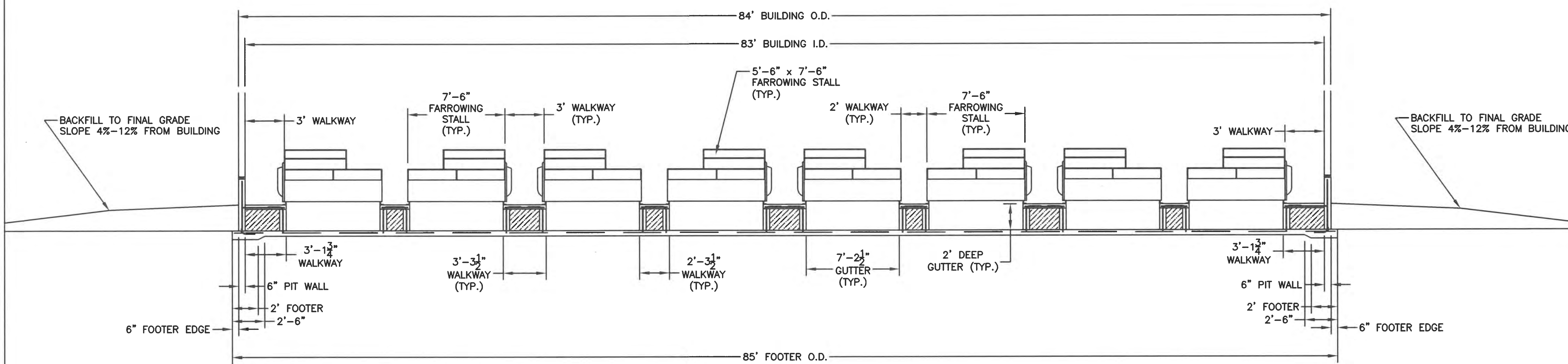
SHEET: 2B of 8B | DRAWING NO: TGP0224- 02B

DATE: 05/10/24 | DRAWN BY: MV

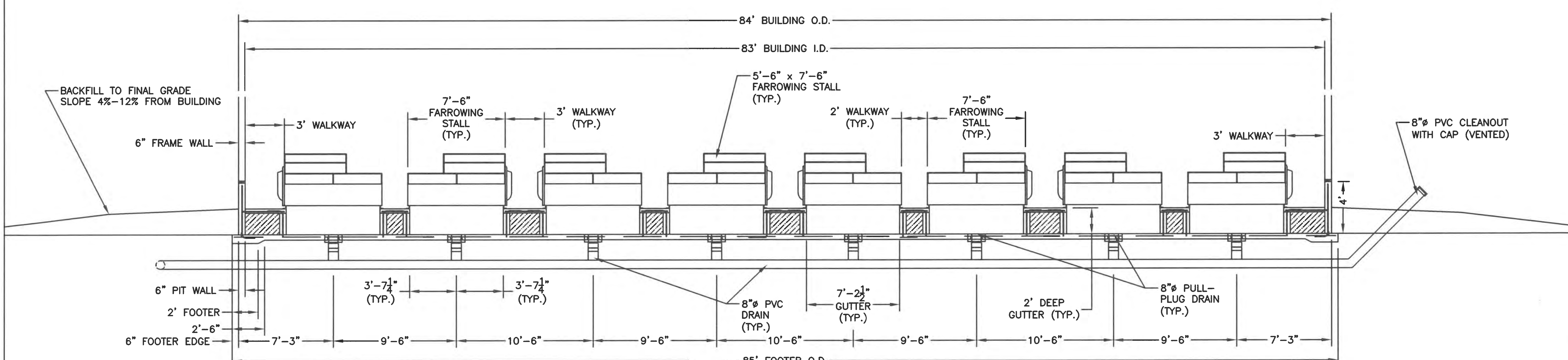
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
FOUNDATION PLAN
BUILDING 8P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



A / 3B CONCRETE PIT CROSS-SECTION
THRU FARROWING STALLS AND COLLECTION GUTTERS



B / 3B CONCRETE PIT CROSS-SECTION
THRU PULL PLUG DRAINS AND COLLECTION GUTTERS

NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

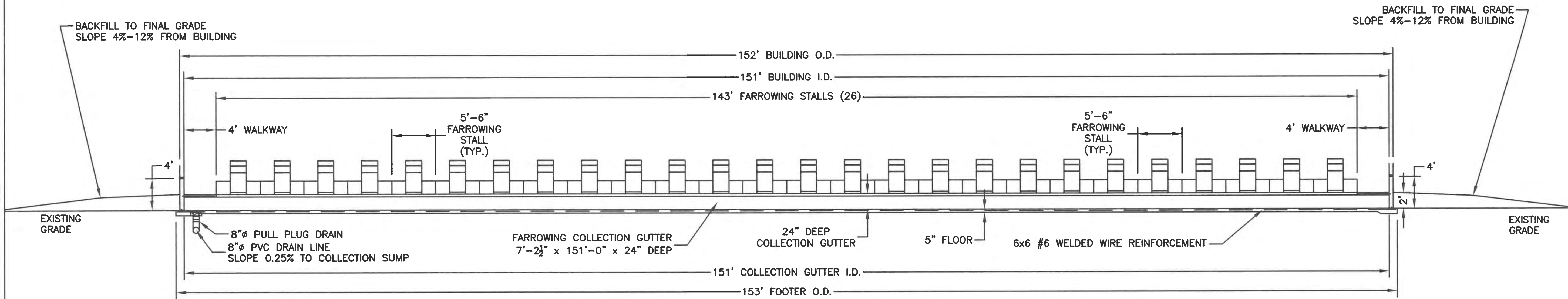
SHEET: 3B of 8B | DRAWING NO: TGP0224-03B

DATE: 05/10/24 | DRAWN BY: MV

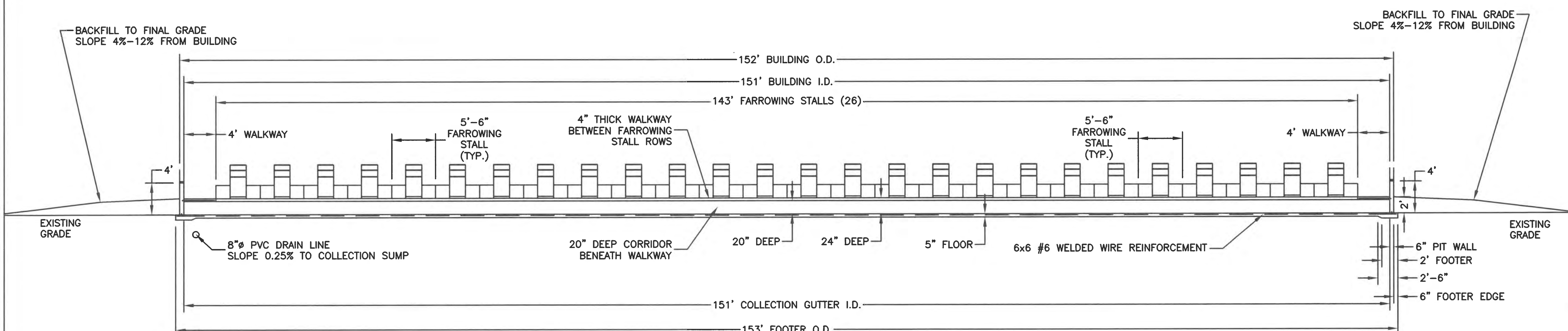
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTION
BUILDING 8P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



C
4B
CONCRETE PIT CROSS-SECTION
SIDE ELEVATION THROUGH DRAIN LINE AND COLLECTION GUTTER



D
4B
CONCRETE PIT CROSS-SECTION
SIDE ELEVATION THROUGH CONCRETE WALKWAY

RECEIVED
CONFINED FEEDING OPERATIONS
May 13, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

DRAWING NO: TGP0224- 04B

SHEET: 4B of 8B

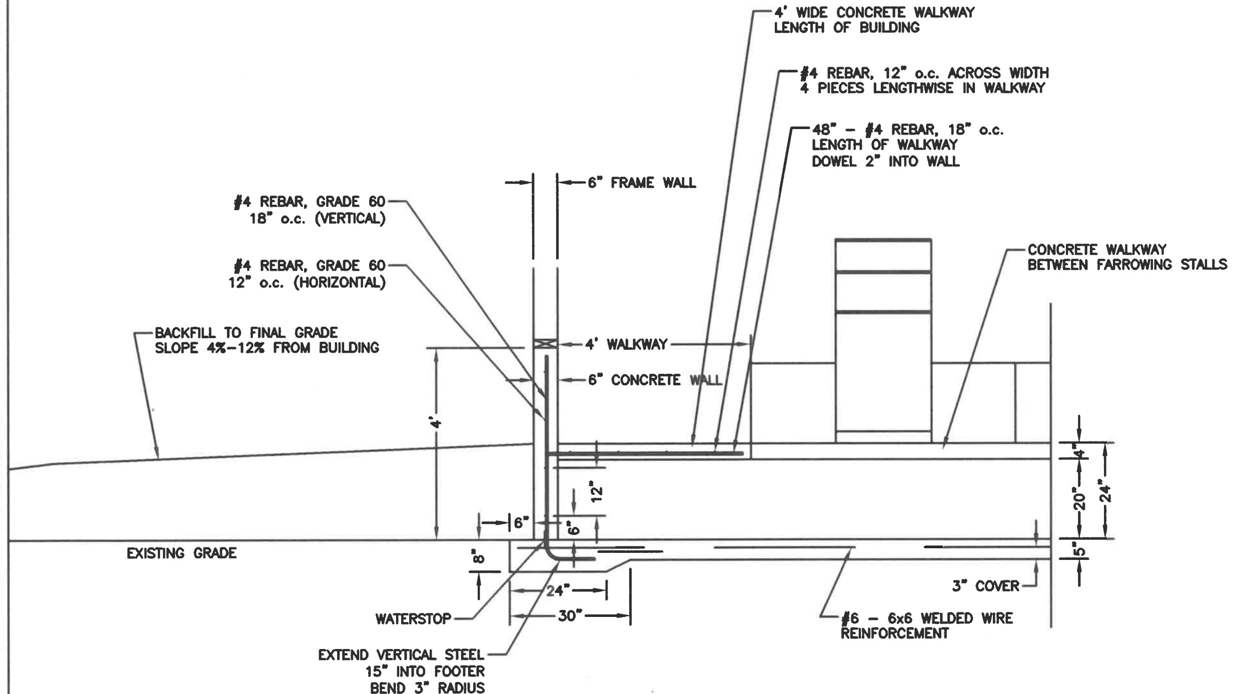
DRAWN BY: MV

DATE: 05/10/24

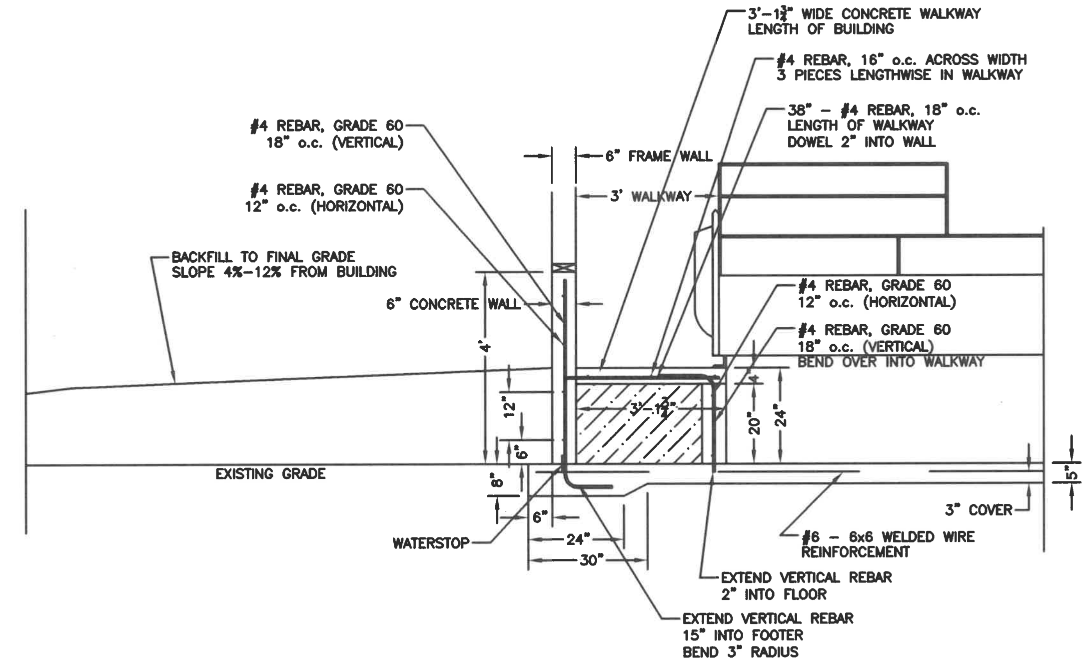
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
SIDE ELEVATION
BUILDING 8P

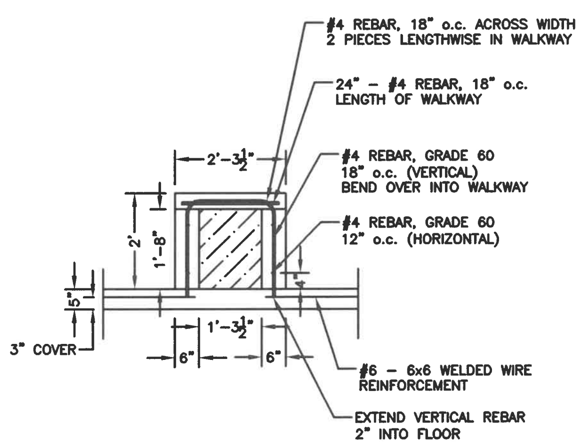
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



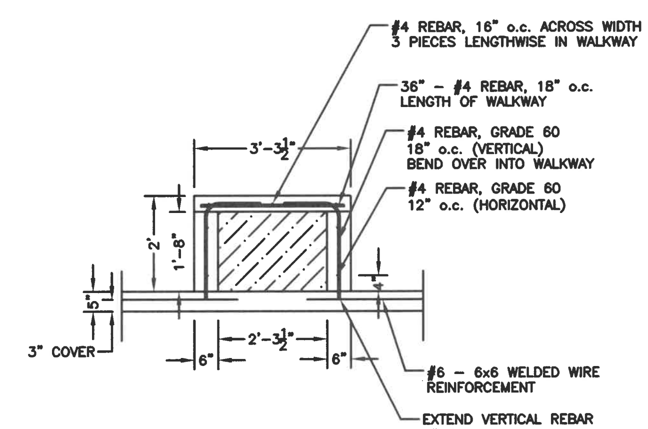
5B CONCRETE PIT END WALL DETAIL
FARROWING COLLECTION GUTTER



5B CONCRETE PIT SIDE WALL DETAIL
FARROWING SIDEWALL



5B CONCRETE WALKWAY DETAIL
2'-3 1/2" CONCRETE WALKWAY (24" NOMINAL)



5B CONCRETE WALKWAY DETAIL
3'-3 1/2" CONCRETE WALKWAY (36" NOMINAL)

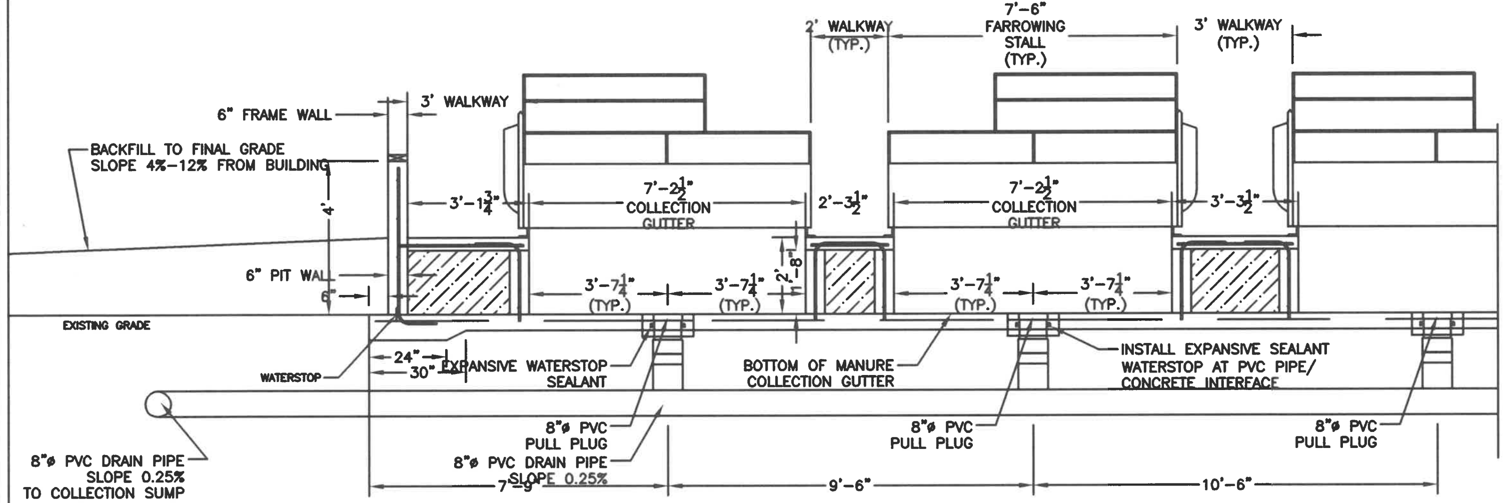
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL–#3713

FARROWING BUILDING
CROSS-SECTIONS
END WALL; SIDEWALL;
WALKWAYS

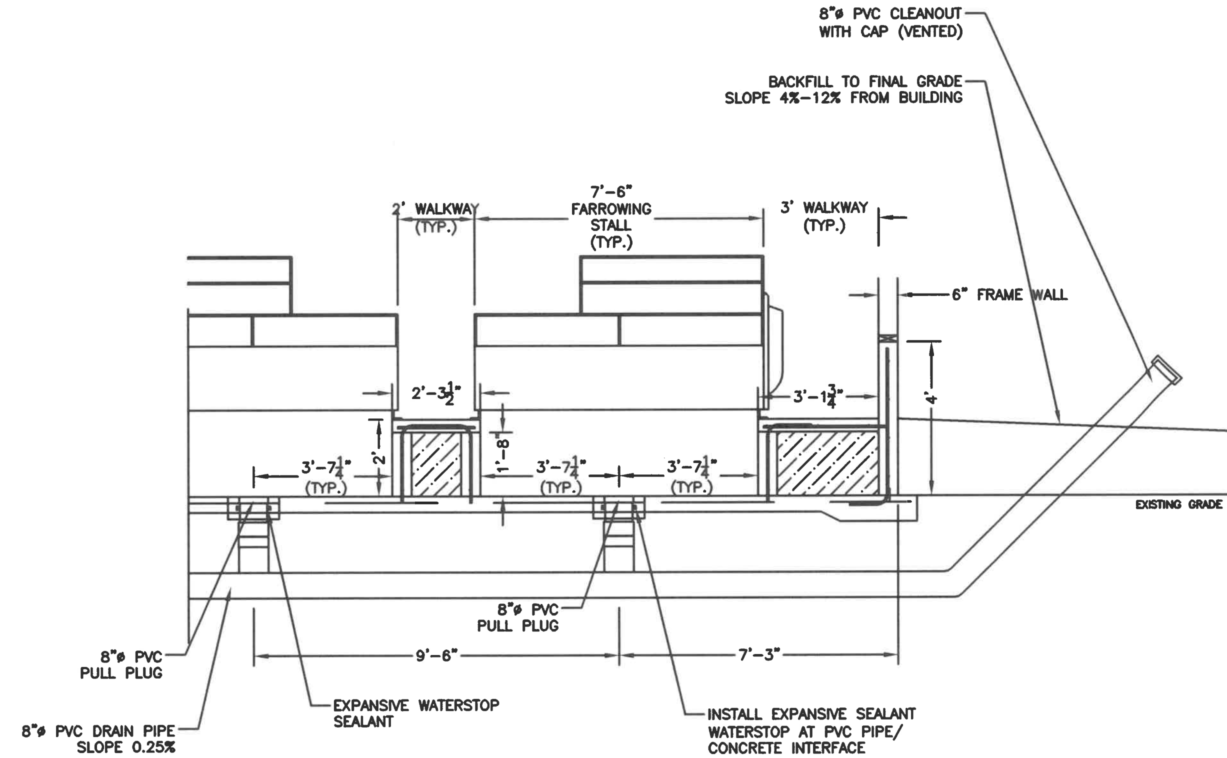
DATE: 02/23/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

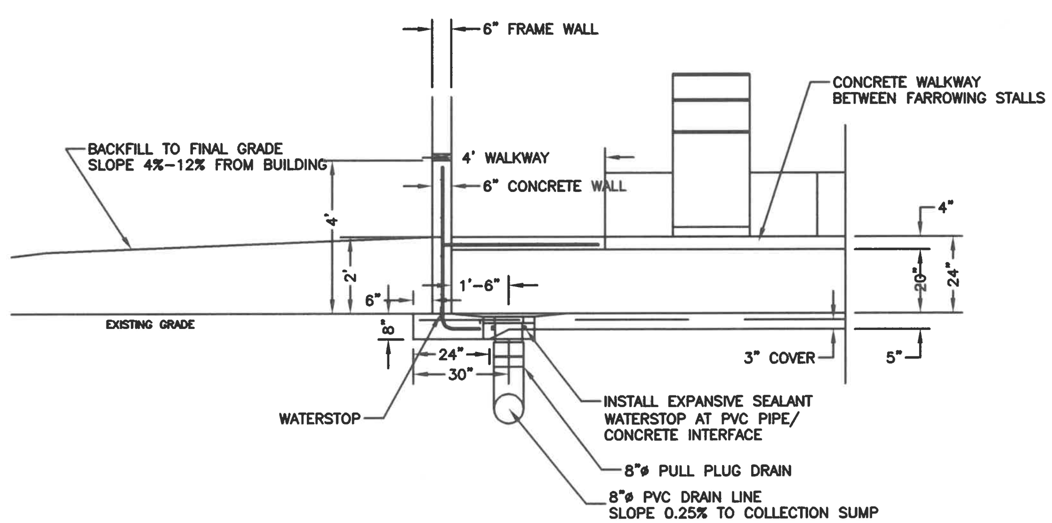
SHEET: 5B of 8B | DRAWING NO: TGP0124– 05B



GRAVITY DRAIN LINE DETAIL
CROSS-SECTION-SOUTH SIDEWALL
6B



GRAVITY DRAIN LINE DETAIL
CROSS-SECTION-NORTH SIDEWALL
6B



GRAVITY DRAIN LINE DETAILCONCRETE PIT END WALL DETAIL
SIDE ELEVATION-END WALL
6B

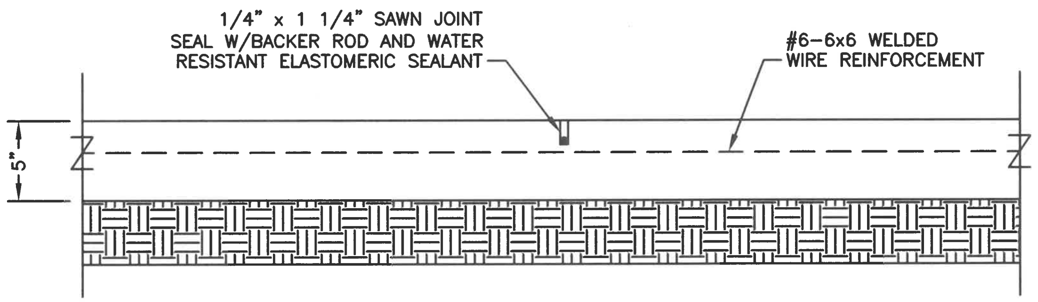
SHEET: 6B of 8B | DRAWING NO: TGP0124-06B

DATE: 02/23/24 | DRAWN BY: MV

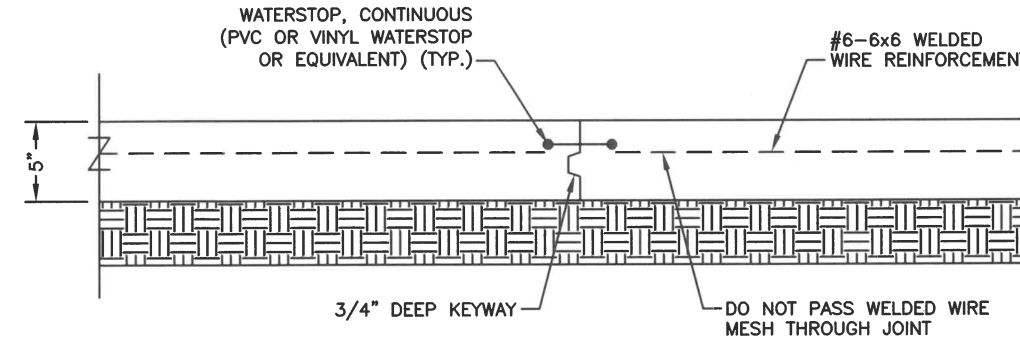
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTION
DRAIN DETAILS

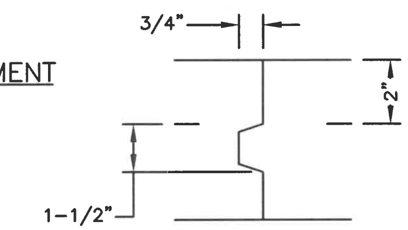
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



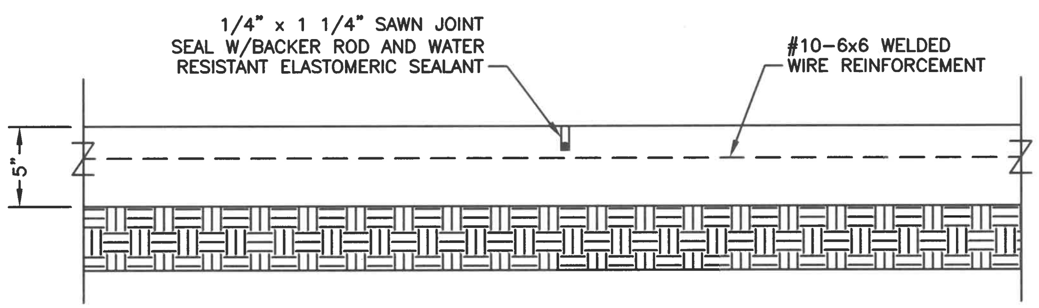
SAWN CONSTRUCTION JOINT WITH #6-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 43'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 64'-0" SPACING (MAX.)



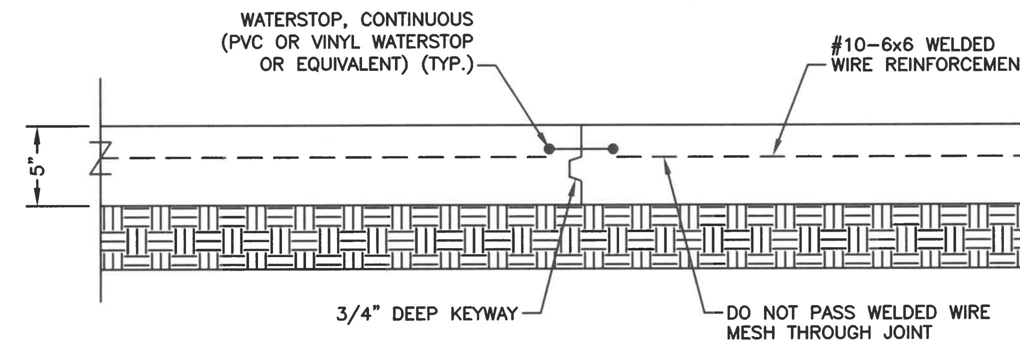
PVC OR VINYL WATERSTOP WITH #6-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 43'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 64'-0" SPACING (MAX.)



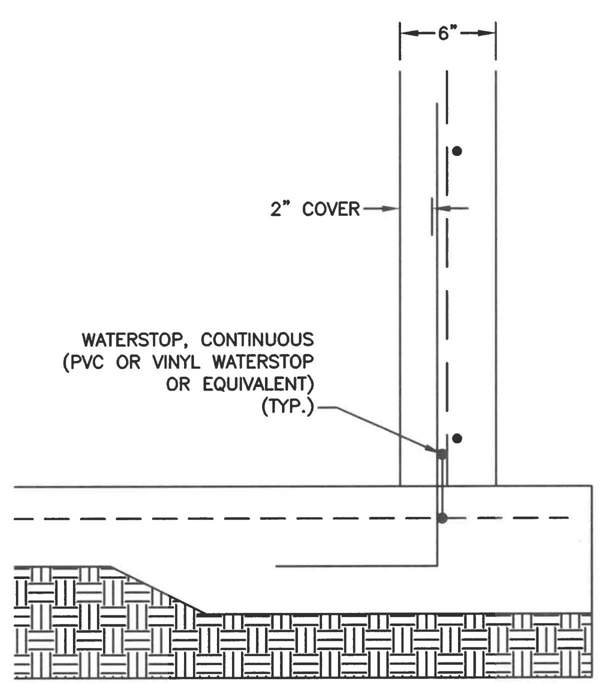
KEYWAY DETAIL



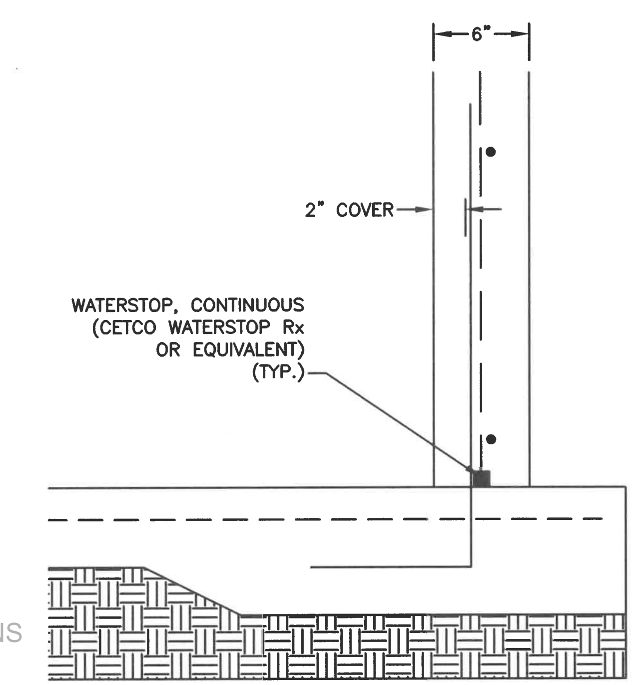
SAWN CONSTRUCTION JOINT WITH #10-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 21'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 31'-0" SPACING (MAX.)



PVC OR VINYL WATERSTOP WITH #10-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 21'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 31'-0" SPACING (MAX.)



PVC OR VINYL WATERSTOP



COLLOIDAL WATERSTOP

WALL FOOTER DETAIL OPTIONS – 6" WALL

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

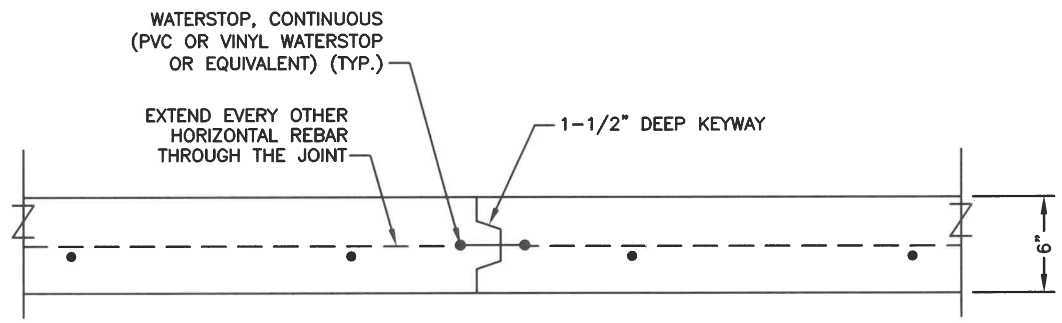
SHEET: 7B of 8B | DRAWING NO: TGP0124- 07B

DATE: 02/23/24 | DRAWN BY: MV

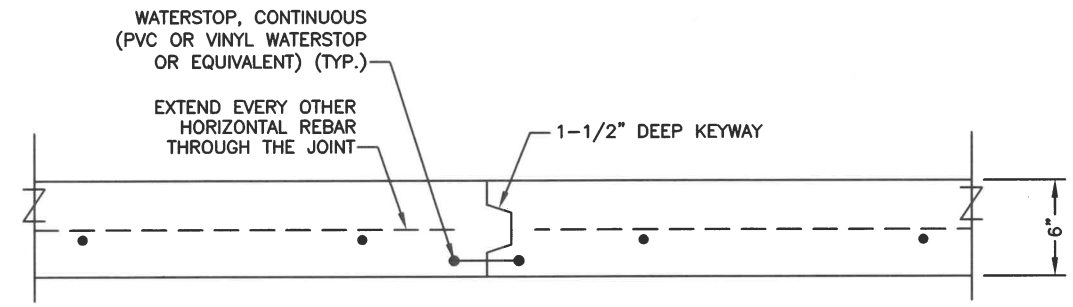
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FLOOR DETAILS, JOINT AND WATERSTOP DETAILS; WALL/FOOTER WATERSTOP

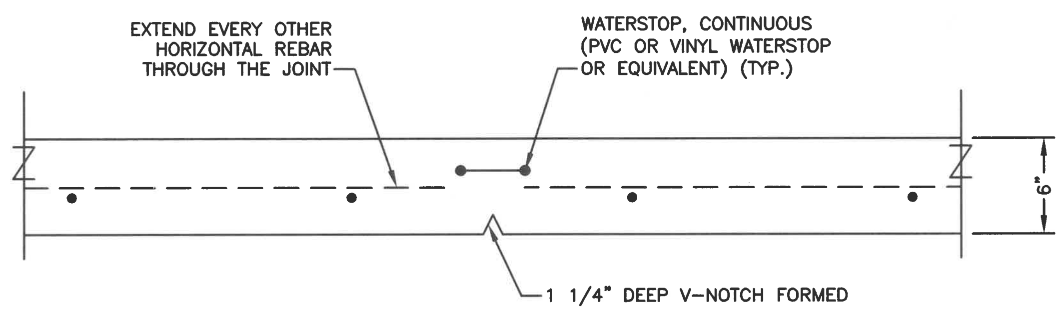
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



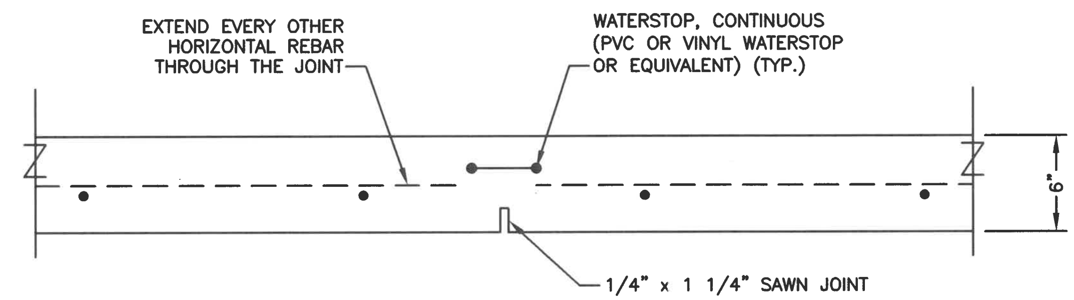
WATERSTOP PLACED IN MIDDLE OF KEYWAY FORM
SPLIT FORM AND PLACE WATERSTOP BETWEEN
TWO HALVES OF FORM



WATERSTOP PLACED OUTSIDE KEYWAY FORM
PLACE WATERSTOP AT LEAST 1-1/2"
FROM WALL

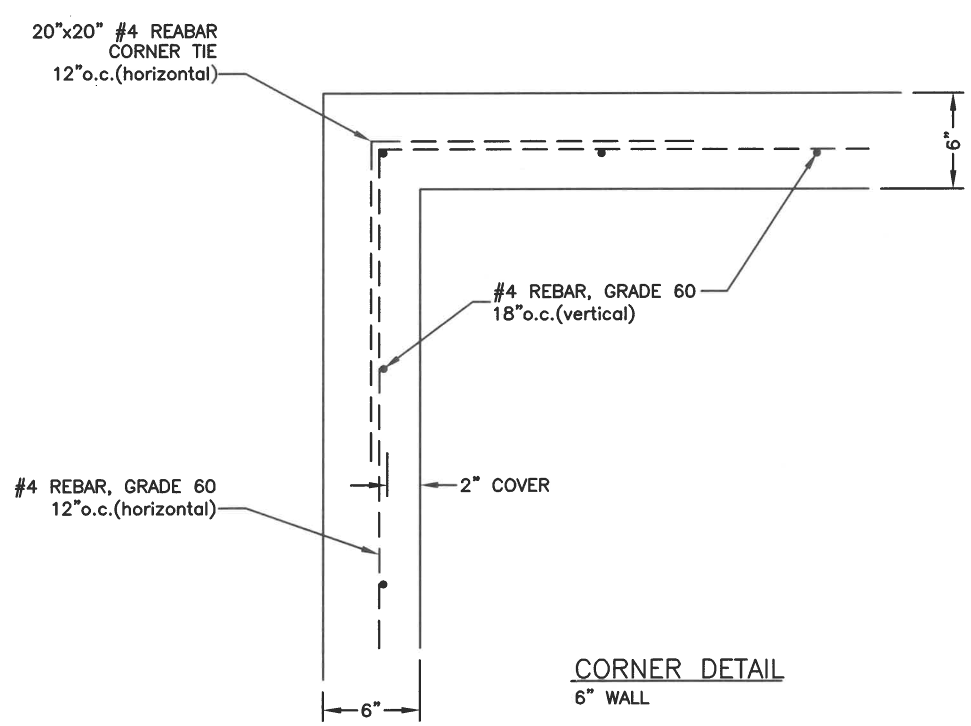


WATERSTOP PLACED IN MIDDLE OF WALL
1-1/4" DEEP x 1-1/4" WIDE 'V'-NOTCH
GROOVE FORMED IN THE WALL



WATERSTOP PLACED IN MIDDLE OF WALL
SAWN JOINT IS CUT INTO THE WALL

WALL CONSTRUCTION JOINT OPTIONS
PVC OR VINYL WATERSTOP



CORNER DETAIL
6" WALL

SHEET: 8B of 8B
DRAWING NO: TGP0124- 08B

DATE: 02/23/24
DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

WALL AND JOINT DETAILS
WATERSTOP OPTIONS
CORNER REINFORCEMENT

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

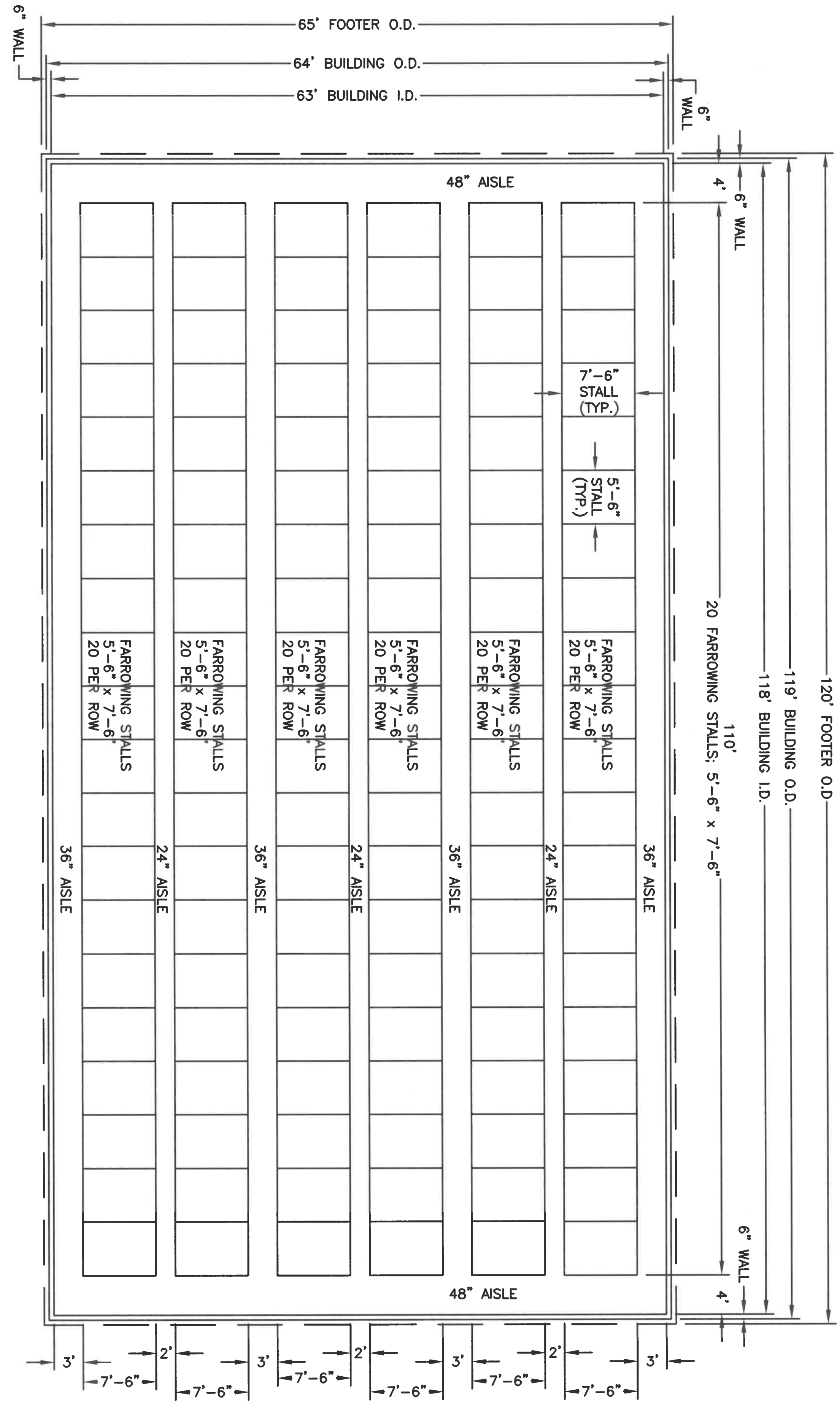
BUILDING DESIGN AND CONSTRUCTION PLANS

BELOW-BUILDING CONCRETE MANURE STORAGE DESIGN PLANS

9P. West Farrowing: 64'-0" x 119'-0" x 2'-0" deep
Building Plans (Plan Sheets 1C-8C)

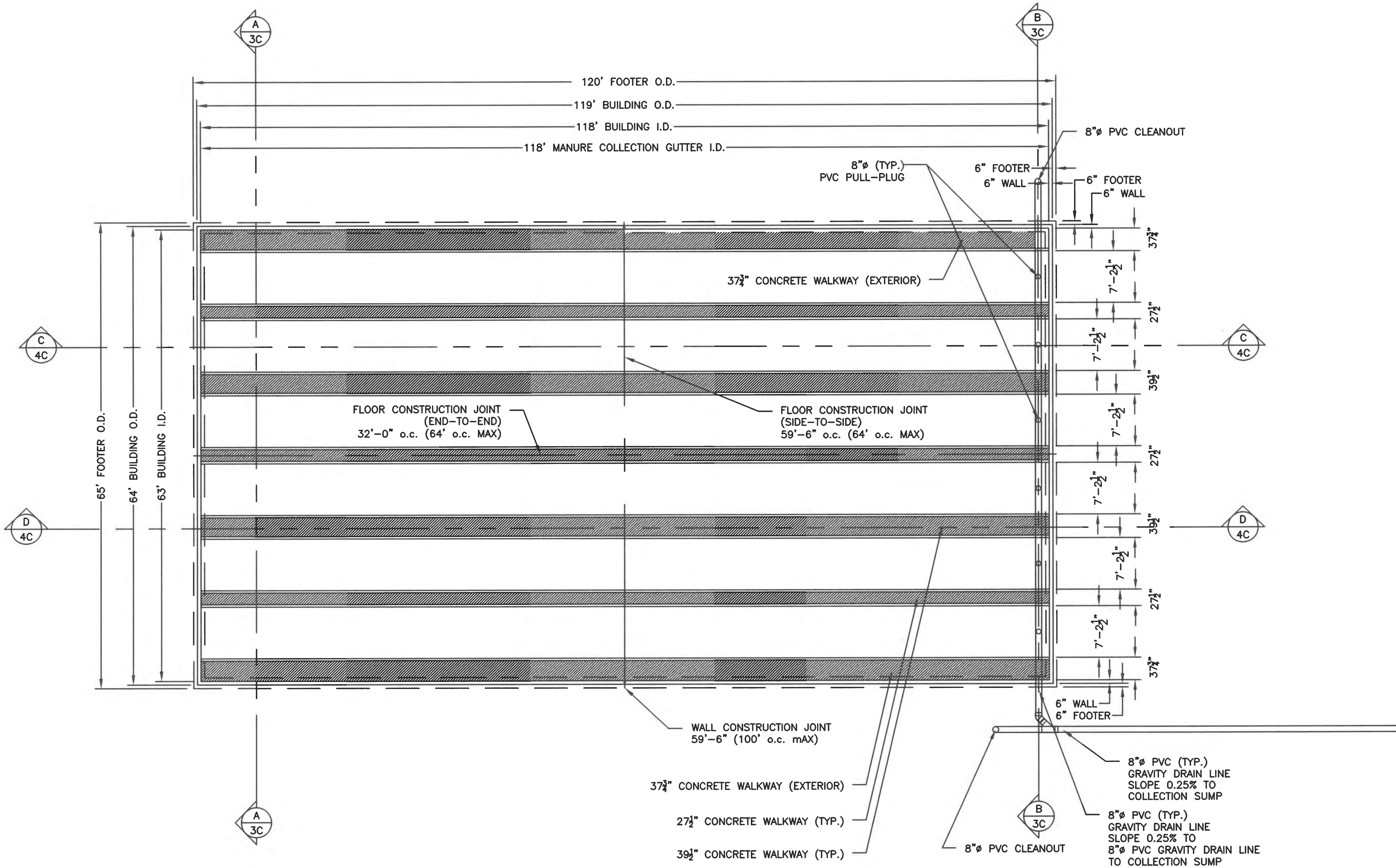
Prepared by:
LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829



FARROWING BUILDING
64'-0" x 119'-0" O.D.
6-ROWS; 20 STALLS PER ROW
120 SOWS AND LITTERS

TOP GRADE PRODUCTION LLC 2667 E STATE ROAD 18 KOKOMO, INDIANA 46901 2024 CFO RENEWAL-#3713	WEST FARROWING BUILDING FLOOR PLAN BUILDING 9P	DATE: 02/23/24 DRAWN BY: MV LIVESTOCK ENGINEERING SOLUTIONS, INC. MICHAEL A. VEENHUIZEN 2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143	SHEET: 1C of 8C DRAWING NO: TGP0124- 01C THE IDEAS, DESIGNS, AND DRAWINGS REPRESENTED HERE ARE THE PROPERTY OF LIVESTOCK ENGINEERING SOLUTIONS, INC. REPRODUCTION OR USE, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF LIVESTOCK ENGINEERING SOLUTIONS, INC. IS PROHIBITED.



FARROWING BUILDING
64'-0" x 119'-0" O.D.
6-ROWS; 20 STALLS PER ROW
120 SOWS AND LITTERS

NOTE:
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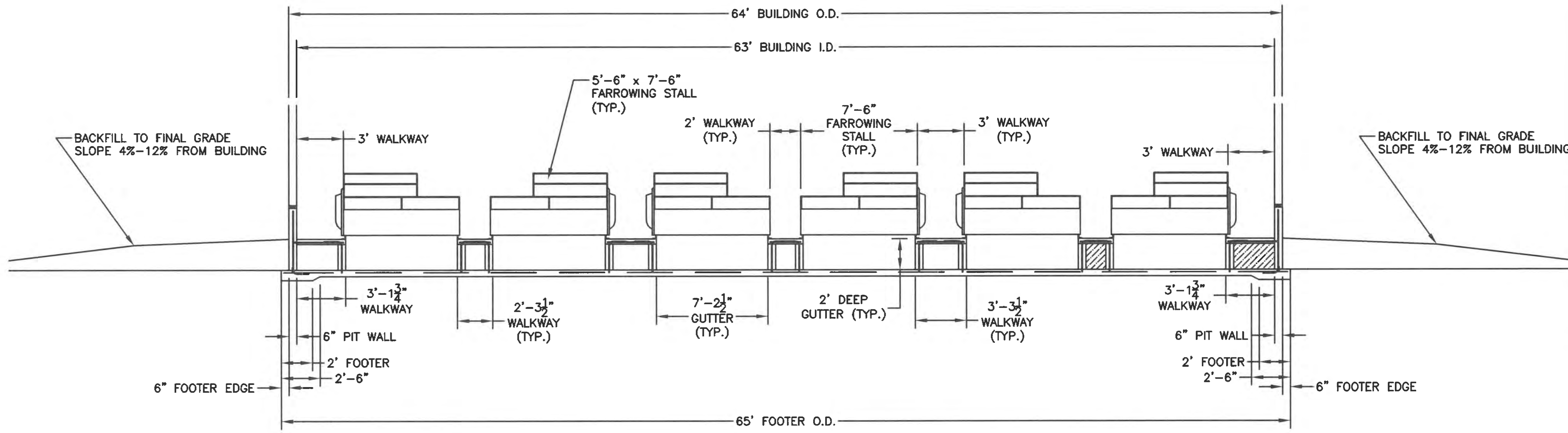
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

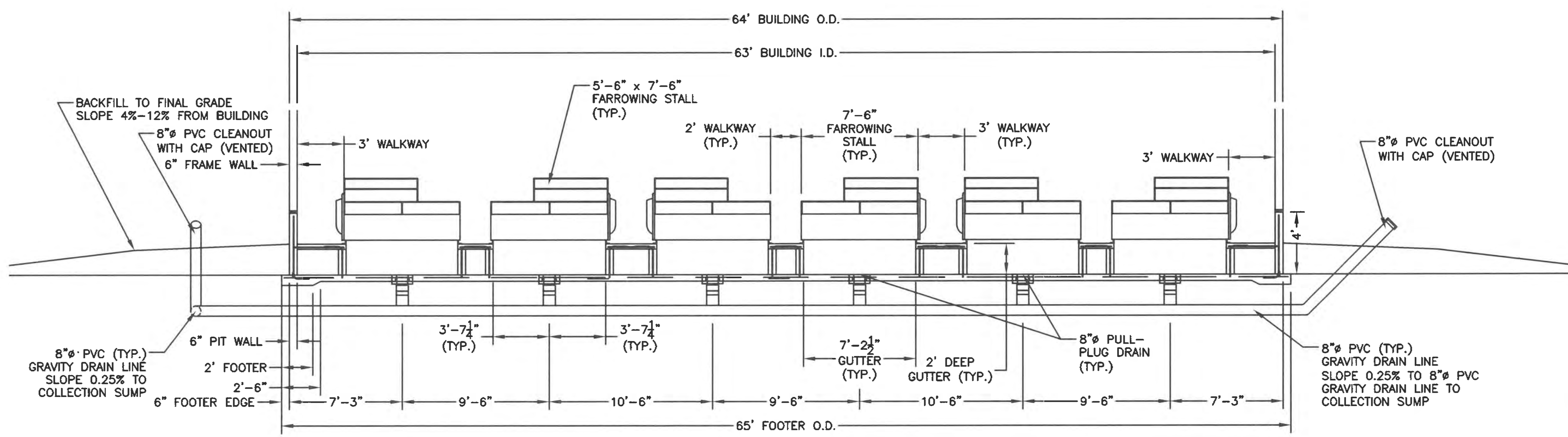
FARROWING BUILDING
FOUNDATION PLAN
BUILDING 9P

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

DATE: 05/10/24 | DRAWN BY: MV | SHEET: 2C of 8C | DRAWING NO: TGP0224- 02C



A / 3C **CONCRETE PIT CROSS-SECTION**
THRU FARROWING STALLS AND COLLECTION GUTTERS



B / 3C **CONCRETE PIT CROSS-SECTION**
THRU PULL PLUG DRAINS AND COLLECTION GUTTERS

NOTE:
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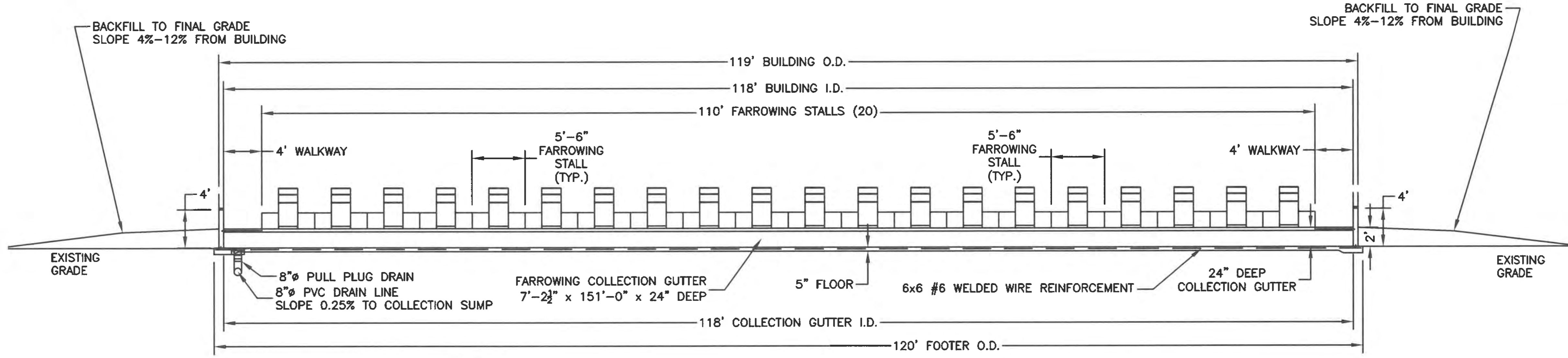
SHEET: 3C of 8C | DRAWING NO: TGP0224- 03C

DATE: 05/10/24 | DRAWN BY: MV

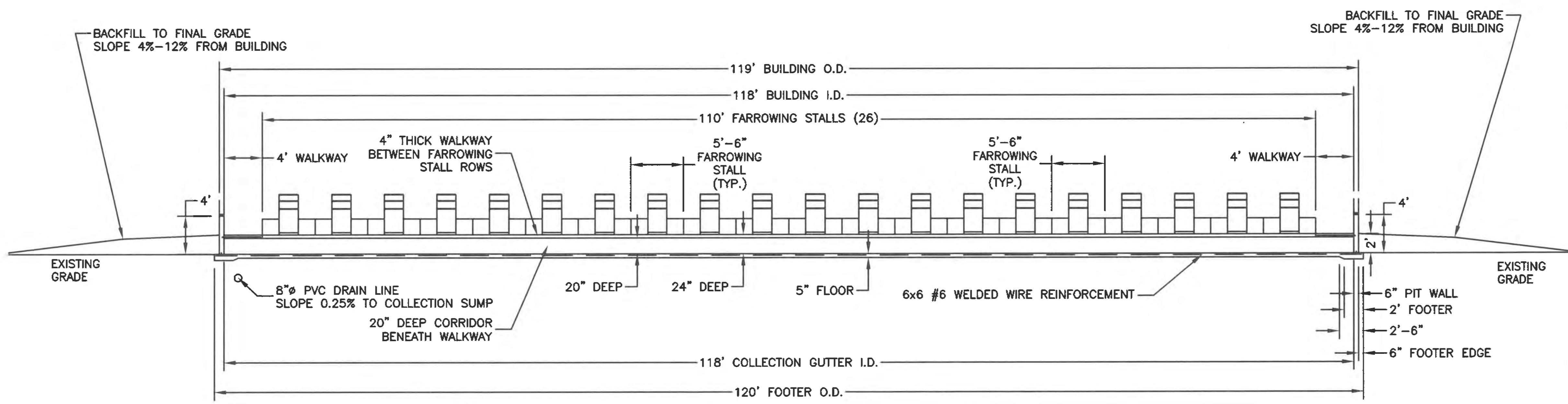
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTION
BUILDING 9P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



C
4C
CONCRETE PIT CROSS-SECTION
SIDE ELEVATION THROUGH DRAIN LINE AND COLLECTION GUTTER



D
4C
CONCRETE PIT CROSS-SECTION
SIDE ELEVATION THROUGH CONCRETE WALKWAY

RECEIVED
CONFINED FEEDING OPERATIONS
May 13, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

NOTE:
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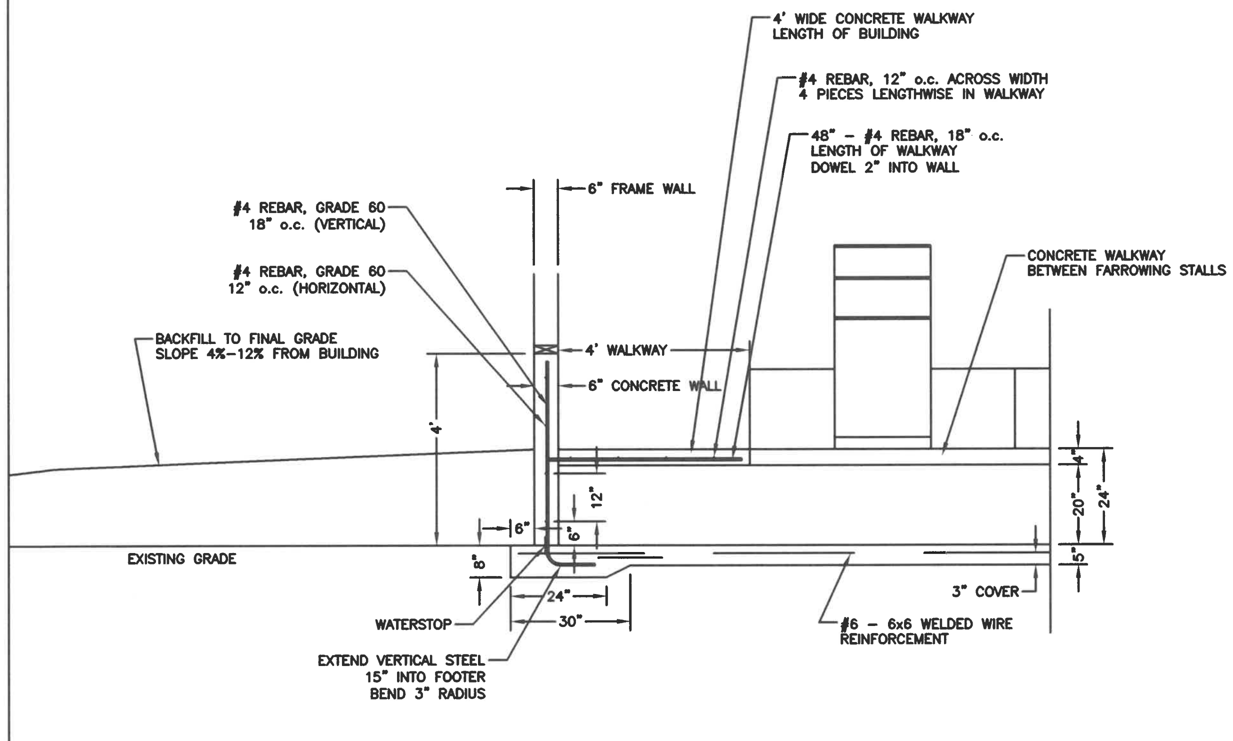
SHEET: 4C of 8C | DRAWING NO: TGP0224- 04C

DATE: 05/10/24 | DRAWN BY: MV

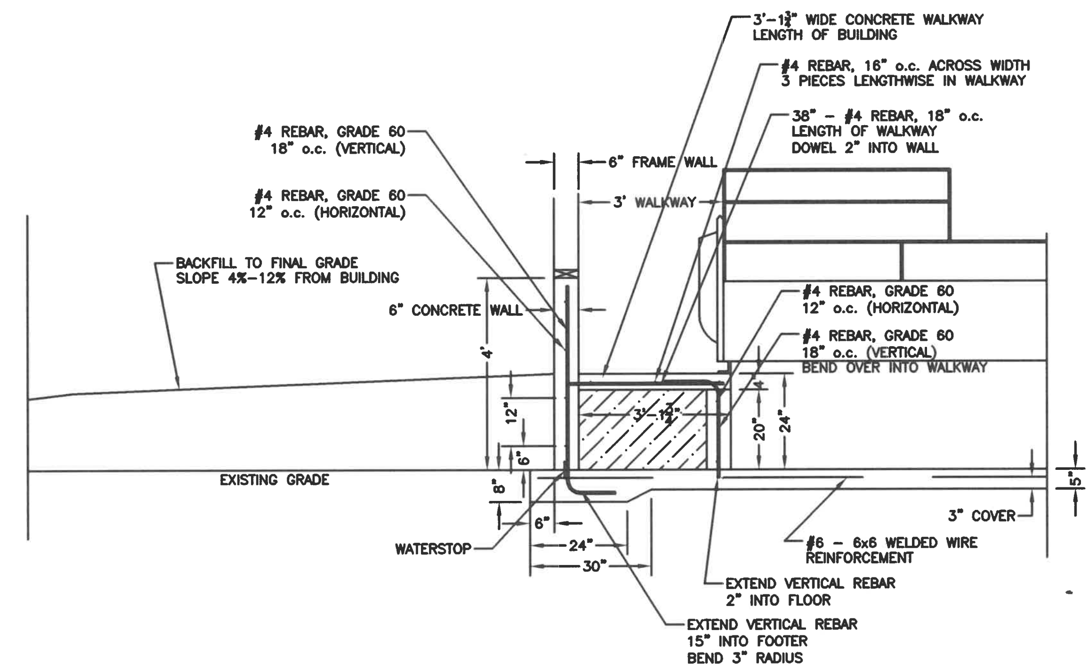
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
SIDE ELEVATION
BUILDING 9P

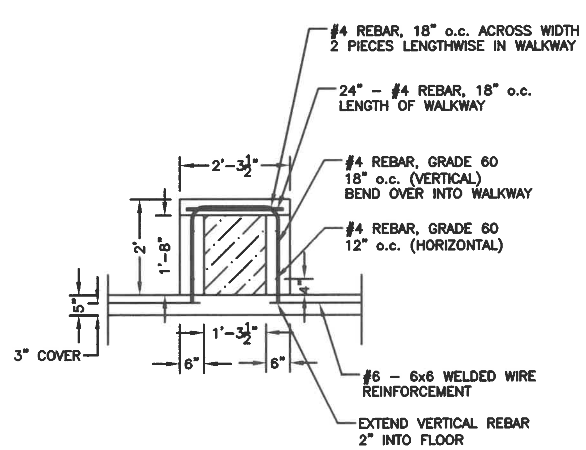
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



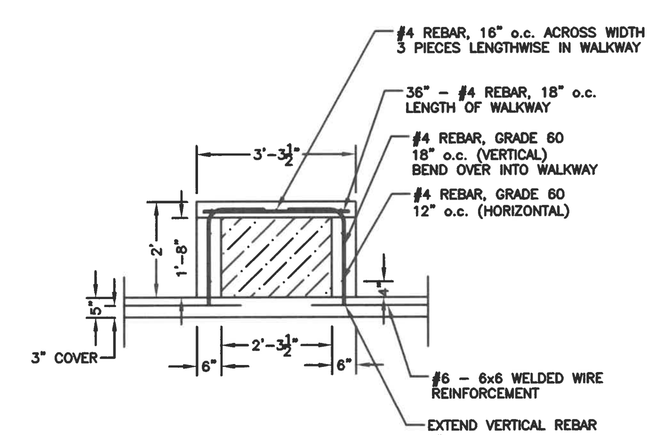
5C CONCRETE PIT END WALL DETAIL
FARROWING COLLECTION GUTTER



5C CONCRETE PIT SIDE WALL DETAIL
FARROWING SIDEWALL



5C CONCRETE WALKWAY DETAIL
2'-3 1/2" CONCRETE WALKWAY (24" NOMINAL)



5C CONCRETE WALKWAY DETAIL
3'-3 1/2" CONCRETE WALKWAY (36" NOMINAL)

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

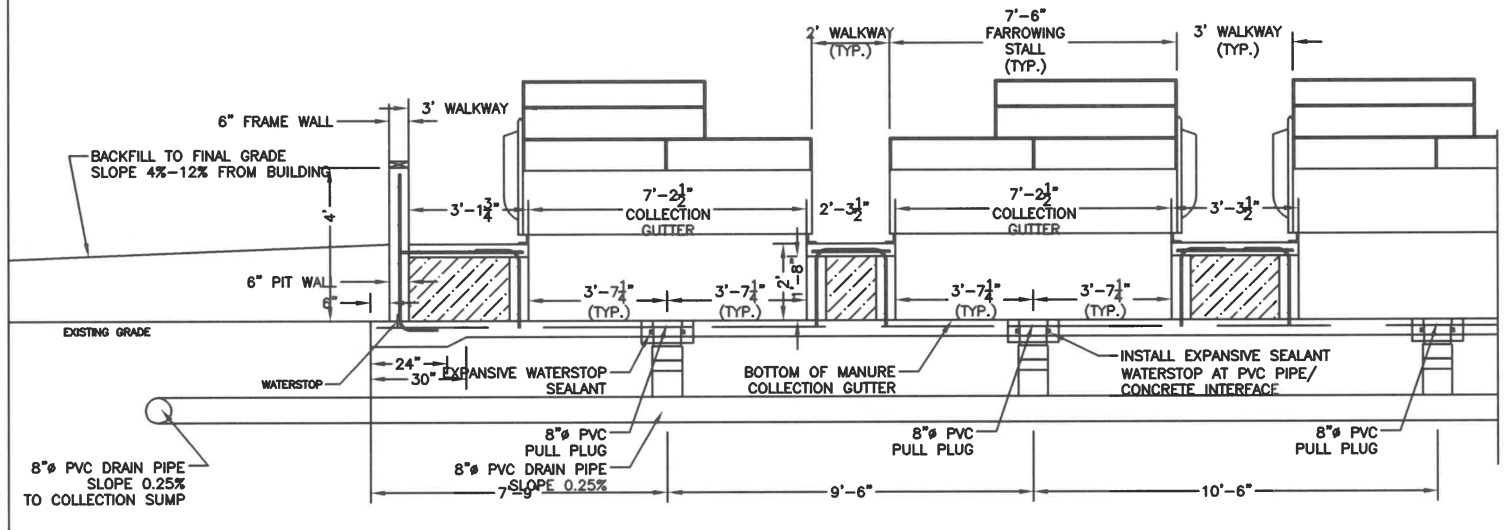
SHEET: 5C of 8C | DRAWING NO: TGP0124- 05C

DATE: 02/23/24 | DRAWN BY: MV

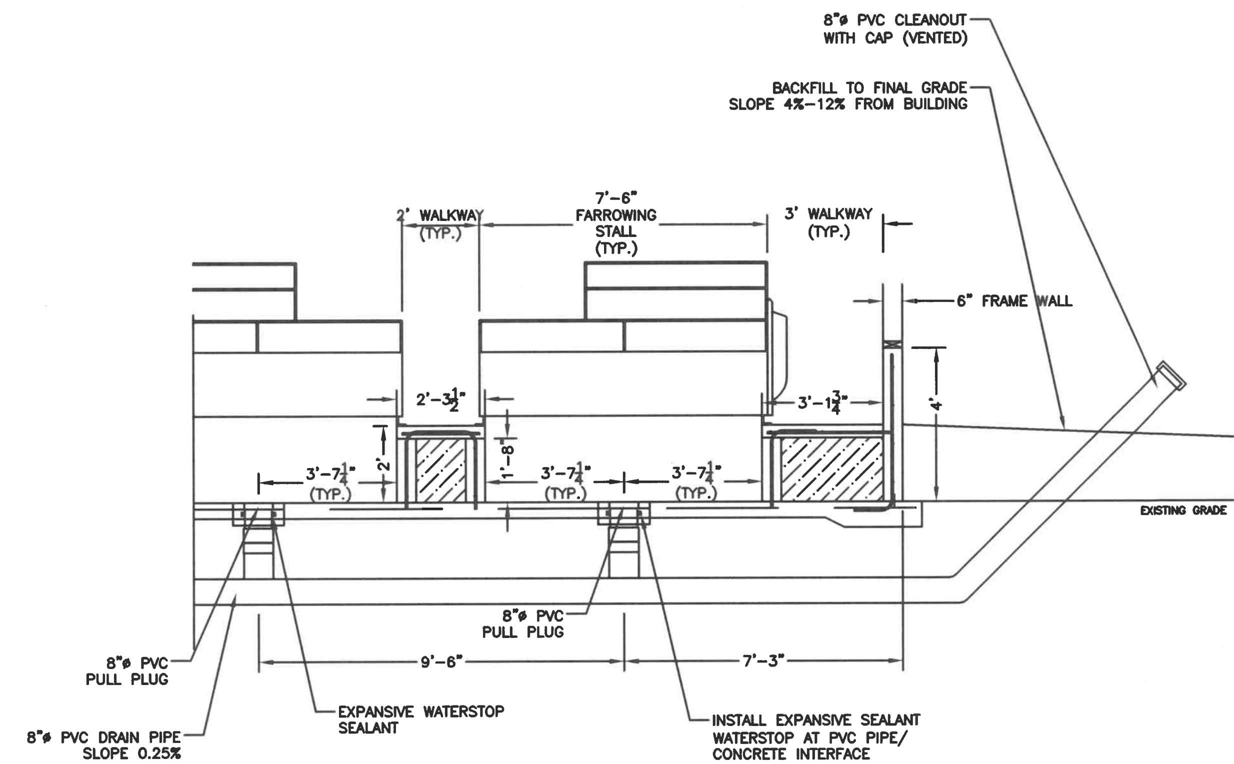
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

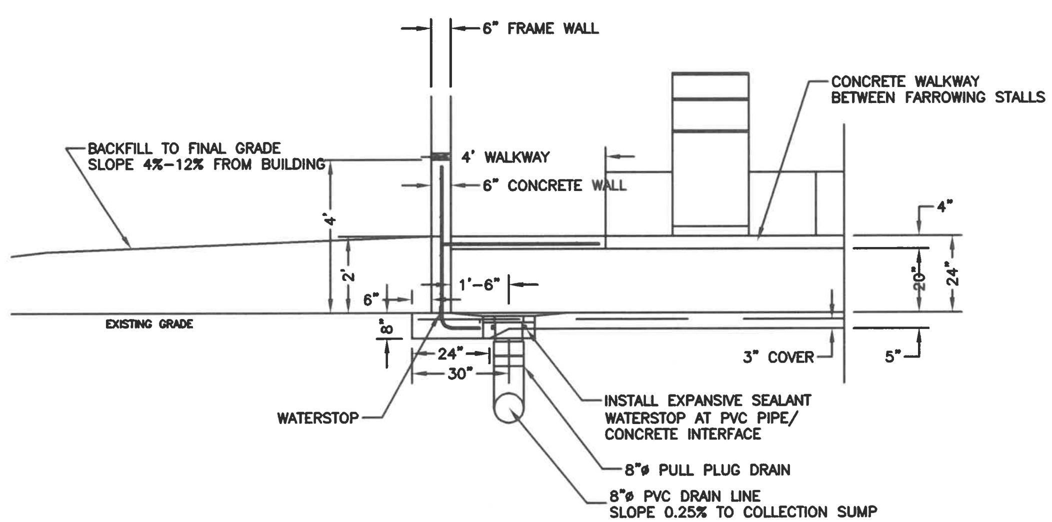
FARROWING BUILDING
CROSS-SECTIONS
END WALL; SIDEWALL;
WALKWAYS



6C GRAVITY DRAIN LINE DETAIL
CROSS-SECTION-SOUTH SIDEWALL



6C GRAVITY DRAIN LINE DETAIL
CROSS-SECTION-NORTH SIDEWALL



6C GRAVITY DRAIN LINE DETAILCONCRETE PIT END WALL DETAIL
SIDE ELEVATION-END WALL

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

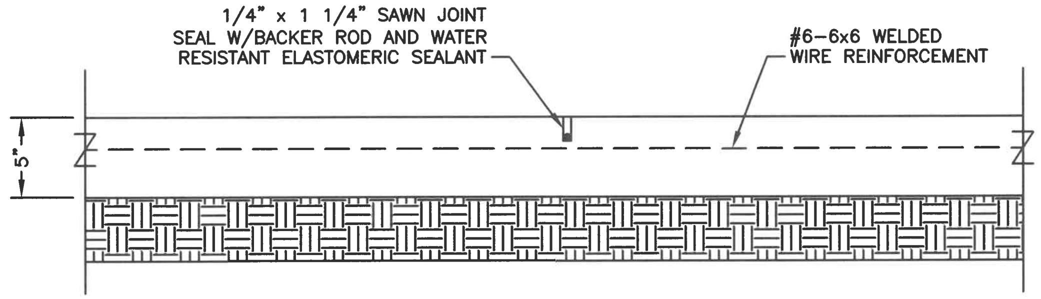
SHEET: 6C of 8C | DRAWING NO: TGP0124-06C

DATE: 02/23/24 | DRAWN BY: MV

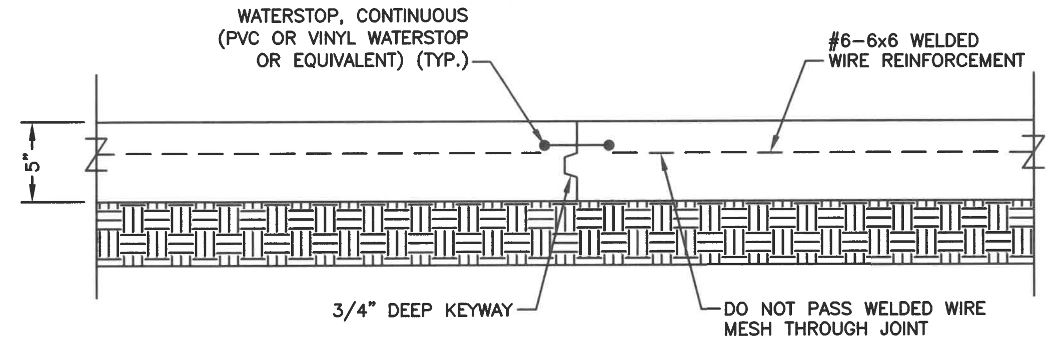
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTION
DRAIN DETAILS

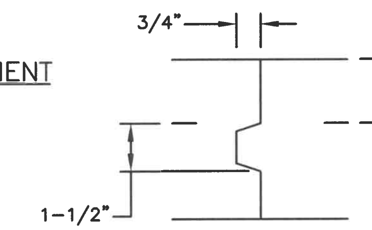
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



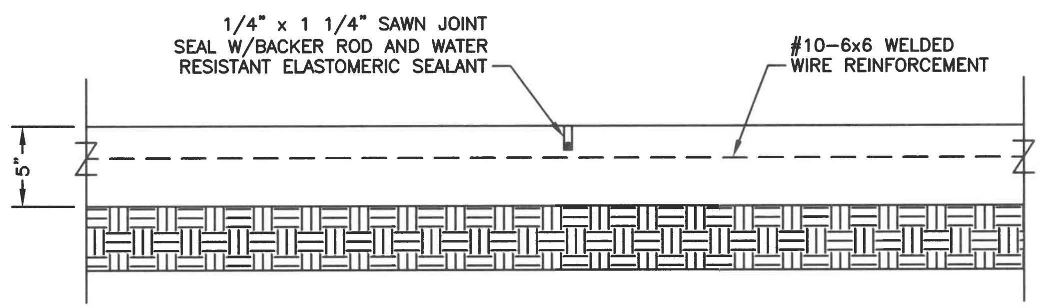
SAWN CONSTRUCTION JOINT WITH #6-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 43'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 64'-0" SPACING (MAX.)



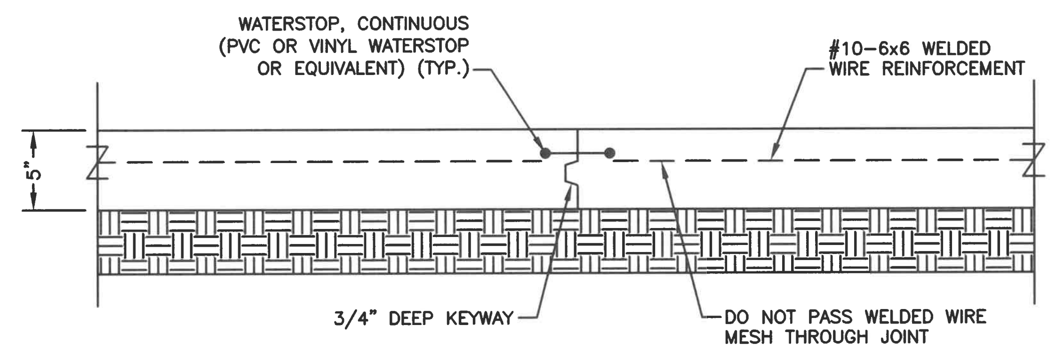
PVC OR VINYL WATERSTOP WITH #6-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 43'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 64'-0" SPACING (MAX.)



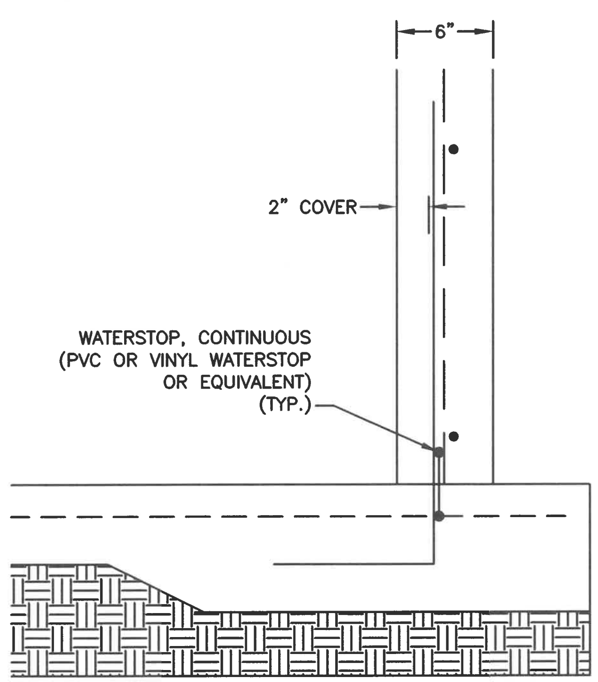
KEYWAY DETAIL



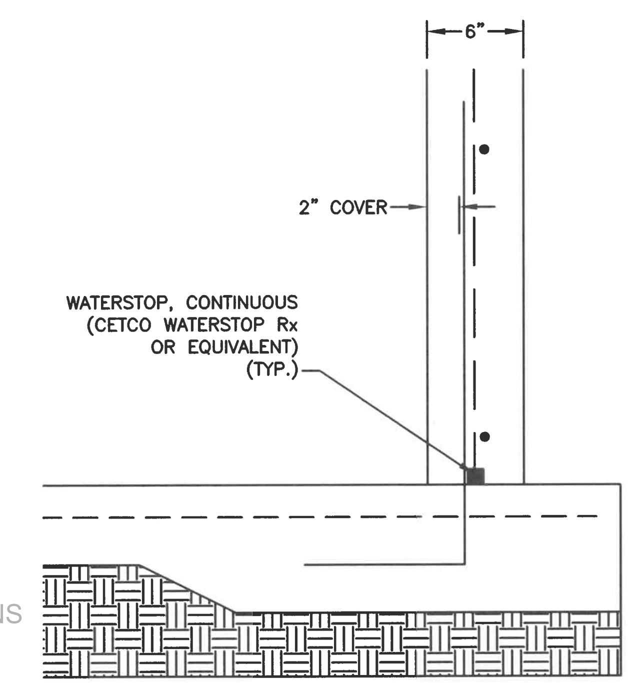
SAWN CONSTRUCTION JOINT WITH #10-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 21'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 31'-0" SPACING (MAX.)



PVC OR VINYL WATERSTOP WITH #10-6x6 WELDED WIRE REINFORCEMENT
60,000 PSI TENSILE STRENGTH: 21'-0" SPACING (MAX.)
90,000 PSI TENSILE STRENGTH: 31'-0" SPACING (MAX.)



PVC OR VINYL WATERSTOP



COLLOIDAL WATERSTOP

WALL FOOTER DETAIL OPTIONS – 6" WALL

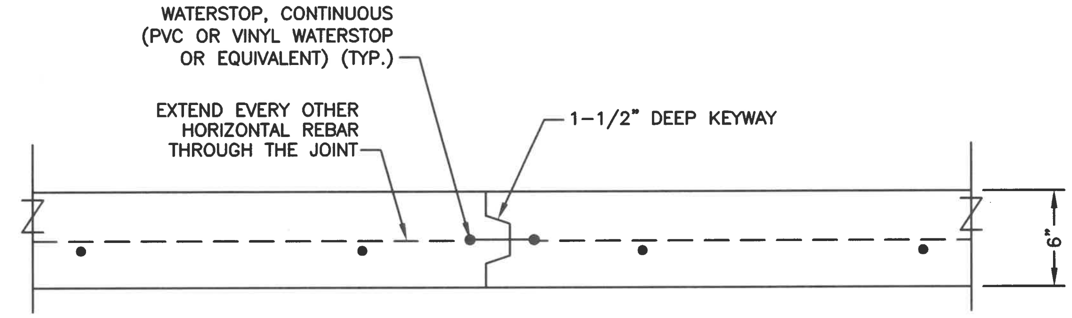
SHEET: 7C of 8C | DRAWING NO: TGP0124- 07C

DATE: 02/23/24 | DRAWN BY: MV

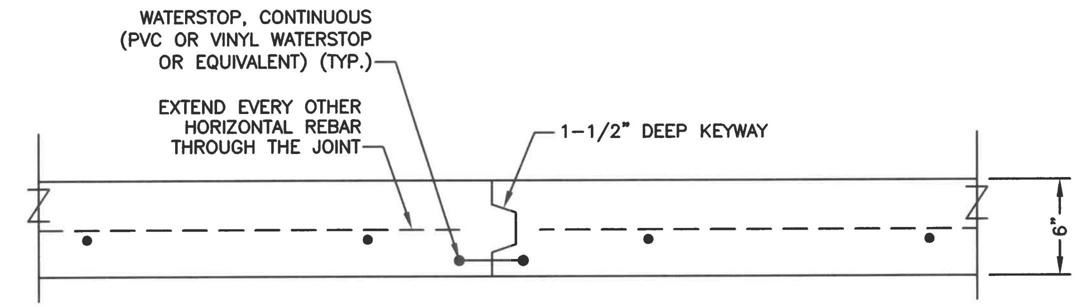
LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FLOOR DETAILS, JOINT AND
WATERSTOP DETAILS;
WALL/FOOTER WATERSTOP

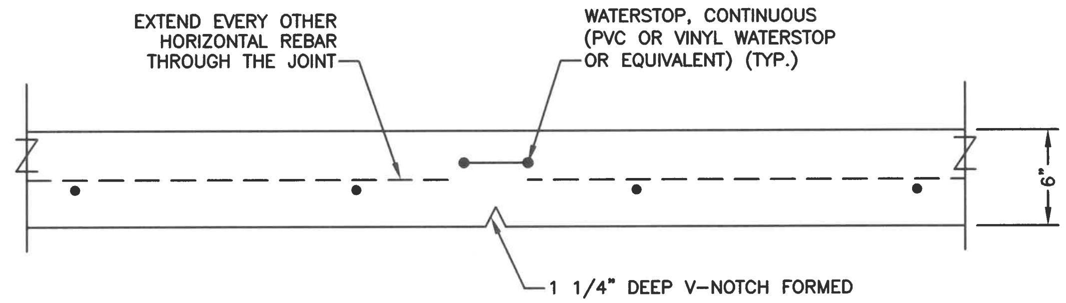
TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



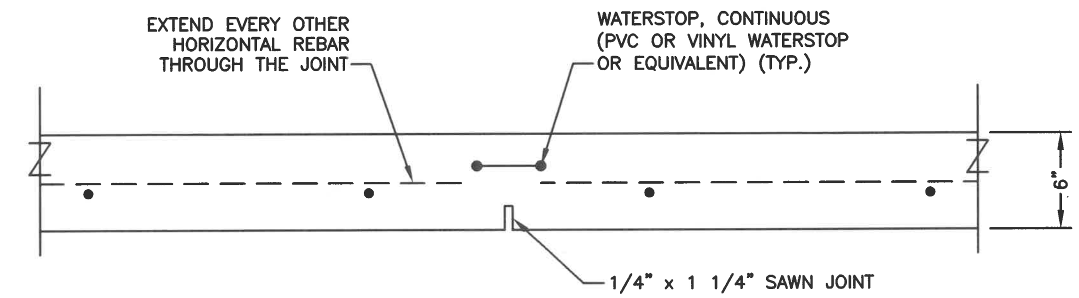
WATERSTOP PLACED IN MIDDLE OF KEYWAY FORM
SPLIT FORM AND PLACE WATERSTOP BETWEEN
TWO HALVES OF FORM



WATERSTOP PLACED OUTSIDE KEYWAY FORM
PLACE WATERSTOP AT LEAST 1-1/2"
FROM WALL

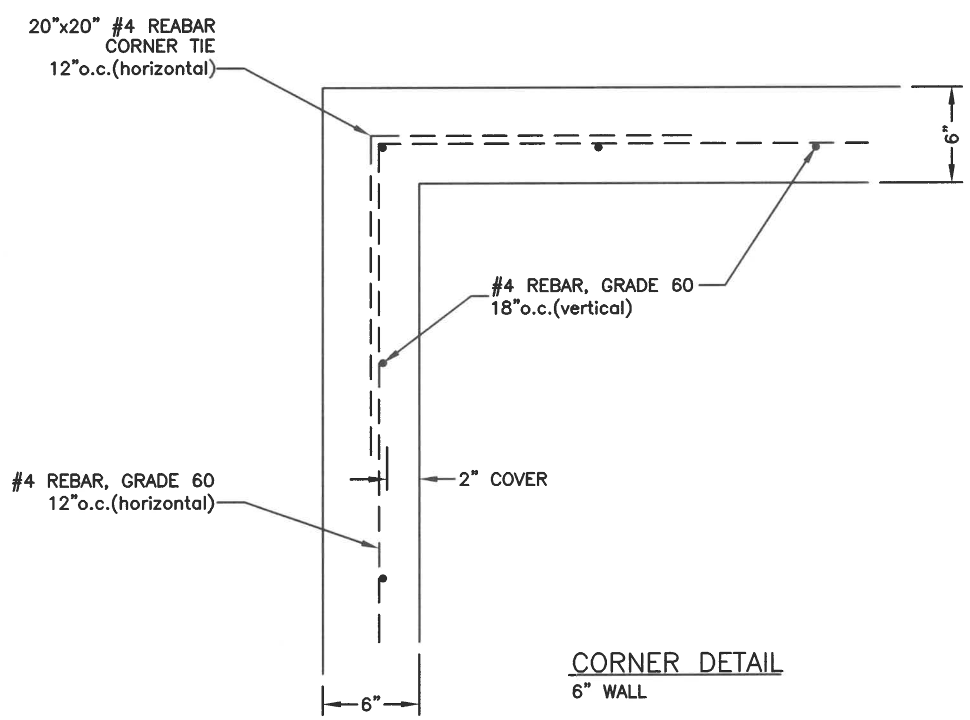


WATERSTOP PLACED IN MIDDLE OF WALL
1-1/4" DEEP x 1-1/4" WIDE 'V'-NOTCH
GROOVE FORMED IN THE WALL



WATERSTOP PLACED IN MIDDLE OF WALL
SAWN JOINT IS CUT INTO THE WALL

WALL CONSTRUCTION JOINT OPTIONS
PVC OR VINYL WATERSTOP



CORNER DETAIL
6" WALL

RECEIVED
CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

WALL AND JOINT DETAILS
WATERSTOP OPTIONS
CORNER REINFORCEMENT

DATE: 02/23/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

SHEET: 8C of 8C | DRAWING NO: TGP0124-08C

2024 Confined Feeding Operation Approval Application
Below-Building Concrete Manure Storage Design Plans
Design Summary
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

The proposed waste treatment control structures for the swine confined feeding operation include below-building concrete storage structures. The following details pertain to all of the below-building concrete manure storage plans.

1. Subgrade preparation. The presumptive bearing capacity of the subgrade soils is 1,500 psf. Large rocks, organic vegetation, or foreign material shall be removed.

   For the design, the presumptive soil bearing capacity of the foundation soils beneath the structure footings was assumed to be 1,500 psf. The soil texture classifications within the soil profile in the area of the proposed concrete manure storage structures are silt loam (ML), clay loam (CL), clay (CH), and sandy loam (SM). Table 3 "Presumptive Allowable Foundation and Lateral Pressure" of the NRCS Conservation Practice Standard, Waste Storage Facility, Code 313 indicates that clay, sandy clay, silty clay, clayey silt, silt, and sandy silt (CL, ML, MH, CH) have a presumptive bearing capacity of 1,500 psf. No on-site investigation was conducted to verify the soil bearing capacity.

2. A design for a presumptive soil bearing capacity of 2,000 psf for the foundation soils beneath the structure footings for Building P3 – South Gestation is included. If the 2,000 psf soil bearing capacity design is used, the soil bearing capacity will be tested by a geotechnical testing company using standard test methods to confirm the soil bearing capacity. Soil bearing capacity testing will be completed prior to commencing construction. If the soil bearing capacity meets or exceeds 2,000 psf, the design details for a soil bearing capacity of 2,000 psf can be used. Soil bearing capacity test results will be submitted to the Indiana Department of Environmental Management confirming the soil bearing capacity and design details used during construction.

3. All concrete work shall conform to the ACI Manual of Concrete Practices, ACI 301.

4. All concrete used on manure tank walls and floors, beams, and columns shall have a minimum 28-day compressive strength of 4,000 psi.

5. Footers formed and placed monolithically with the floor slab shall have a minimum 28-day compressive strength of 4,000 psi. Footers formed and placed independent of the floor slab shall have a minimum 28-day compressive strength of 4,000 psi.

6. Slats shall have a minimum 28-day compressive strength of 4,500 psi.

7. Lintels shall have a minimum 28 day compressive strength of 5,000 psi.

8. Solid floors and support beams shall meet a minimum design live load due to animals of:
   -- 70 pounds per square foot, psf, for sows and boars (up to 500 lbs).
   (adapted from Table 2-4, MWPS-36 Rectangular Concrete Manure Storages, second edition)

9. Slats shall meet a minimum design live load due to animals of:
   -- 170 pounds per lineal foot, plf for sows and boars (up to 500-lb pig).
   (adapted from Table 2-4, MWPS-36 Rectangular Concrete Manure Storages, second edition)

10. Finishes of concrete walls -- standard form finish.

11. All reinforcing steel, as rebar, shall be Grade 60 or higher, deformed bars of new billet steel conforming to ASTM A615, Grade 60.

12. Rebar – Minimum 12" lap on all reinforcing steel. Provide a minimum 19" lap on all #5 rebar, a minimum 15" lap on all #4 rebar, and a minimum 12" lap on reinforcing steel smaller than #4 rebar. Provide a minimum spacing of 3' between laps in rebar.

13. All reinforcing steel, as welded wire reinforcement, shall have a tensile strength (yield strength) of 60,000 psi or higher. Design specifications are based on 60,000 psi and 90,000 psi tensile strength (yield strength). If the welded wire reinforcement tensile strength is less than 90,000 psi, the design requirements for a tensile strength of 60,000 psi shall be used.

14. Welded wire reinforcement – Minimum lap between welded wire reinforcement sheets is at least one mesh width.

15. Welded wire reinforcement shall be placed as sheets rather than rolls.

16. Welded wire reinforcement shall be placed, adequately supported, and sufficiently secured to minimize displacement during concrete placement.

Farrowing building

17. Design loads for the concrete tank sidewalls, concrete tank end walls, and the manure pump out sidewalls (perpendicular to the concrete tank walls) are due to lateral earth pressures. The lateral earth pressure (soil load) was assumed to be 100 psf per foot of depth (NRCS-313; Table 4 – Minimum Lateral Earth Pressure Values"). No vehicle surcharge load is included in the design of the concrete tank sidewalls and concrete tank end walls. No vehicle loads are required since vehicle traffic and activities do not occur within five feet of the walls due to the placement of ventilation fans, feed storage tanks, loadouts, and access doors.

18. The manure storage tanks will be constructed on-grade with backfill, so the design is controlled by soil pressure when the tank is empty. The soil load is due to approximately 2' of backfill. The reinforcement steel spacing requirement for structural integrity exceeds the spacing requirements for temperature and shrinkage steel.

19. Temperature and shrinkage steel controls the reinforcement steel design.

20. Minimum exterior concrete pit wall thickness is 6".

21. Minimum floor thickness is 5".

22. Minimum concrete cover between the earth and rebar and/or welded wire reinforcement in floor slabs in contact with the earth is 3".

23. Minimum concrete cover between the interior surface of the wall and vertical rebar in the walls is 2". Minimum concrete cover between the interior surface of the wall and horizontal rebar in the wall is 1-1/2".

24. Rebar specifications and spacing for the sidewalls and endwalls of the concrete tank are:
    - Vertical reinforcement steel; #4, Grade 60 rebars at 18.0" (max.) on-center spacing or #5, Grade 60 rebars at 18.0" (max.) on-center spacing
    - Horizontal reinforcement steel; #4, Grade 60 rebars at 16" (max.) on-center spacing or #5, Grade 60 rebars at 18.0" (max.) on-center spacing.

25. Rebar specifications and spacing for the interior concrete tank dividing walls are:
    - Vertical reinforcement steel; #4, Grade 60 rebars at 18.0" (max.) on-center spacing or #5, Grade 60 rebars at 18.0" (max.) on-center spacing
    - Horizontal reinforcement steel; #4, Grade 60 rebars at 16" (max.) on-center spacing or #5, Grade 60 rebars at 18" (max.) on-center spacing.

26. Welded wire reinforcement specifications for the floor slabs are:
    - 6 x 6, #6 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 64' on center, or
    - 6 x 6, #10 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 31'on center, or
    - 6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 42' on center, or
    - 6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 20'on center

27. Footings (footers) are designed to carry the bearing load from walls. Wall footers are continuous footers centered under the walls.

    Footers for walls are:
    - 24" wide x 8" thick continuous footers for the 6" outside wall.
    - 16" wide x 8" thick continuous footers for the interior 6" thick manure storage partition walls.

Gestation building

28. Design loads for the concrete tank sidewalls, concrete tank end walls, and the manure pump out sidewalls (perpendicular to the concrete tank walls) are due to lateral earth pressures. The lateral earth pressure (soil load) was assumed to be 100 psf per foot of depth (NRCS-313; Table 4 – Minimum Lateral Earth Pressure Values"). No vehicle surcharge load is included in the design of the concrete tank sidewalls, concrete tank end walls, and manure pump out sidewalls. No vehicle loads are required since vehicle traffic and activities do not occur within five feet of the side walls due to the placement of the manure pump outs and feed bins, within five feet of the end walls due to air intake plenum placement, and within five feet of the manure pump out side walls due to the orientation and placement of the manure pump outs.

29. Design loads for the front face of the manure pump outs are due to lateral earth pressures and vehicle loads. The lateral earth pressure (soil load) was assumed to be 100 psf per foot of depth for the soil pressure (NRCS-313; Table 4 – "Minimum Lateral Earth Pressure Values"). A uniform vehicle surcharge of 200 psf is assumed for the walls subject to vehicle loads within five (5) feet of the wall (MWPS-36, Rectangular Concrete Manure Storages, second edition). The front face of the manure pump out (parallel to the concrete sidewall) is assumed to be subject to a vehicle load and the vehicle surcharge is included in the design.

30. The manure storage tanks will be below ground, so the design is controlled by soil pressure and vehicle surcharge, where applicable, when the tank is empty.

31. Minimum exterior concrete pit wall thickness is 10".

32. Minimum floor thickness is 5".

33. Minimum concrete cover between the earth and rebar and/or welded wire reinforcement in floor slabs in contact with the earth is 3".

34. Minimum concrete cover between the interior surface of the wall and vertical rebar in the walls is 2". Minimum concrete cover between the interior surface of the wall and horizontal rebar in the wall is 1-1/2".

35. Rebar specifications and spacing for the principle sidewalls and endwalls of the concrete tank are:
    - Vertical reinforcement steel; #5, Grade 60 rebars at 12.0" (max.) on-center spacing or #4, Grade 60 rebars at 7.5" (max.) on-center spacing
    - Horizontal reinforcement steel; #5, Grade 60 rebars at 15" on-center spacing or #4, Grade 60 rebars at 9.75" on-center spacing.

36. Rebar specifications and spacing for the manure pumpout sidewalls (perpendicular to the principle concrete tank sidewalls) are:
    - Vertical reinforcement steel; #5, Grade 60 rebars at 12.0" (max.) on-center spacing or #4, Grade 60 rebars at 7.5" (max.) on-center spacing
    - Horizontal reinforcement steel; #5, Grade 60 rebars at 15" on-center spacing or #4, Grade 60 rebars at 9.75" on-center spacing.

37. Rebar specifications and spacing for the manure pumpout front face (parallel to the concrete tank sidewall) to withstand the vehicle surcharge are:
    - Vertical reinforcement steel; #5, Grade 60 rebars at 11.25" on-center spacing or #4, Grade 60 rebars at 7.0" on-center spacing
    - Horizontal reinforcement steel; #5, Grade 60 rebars at 15" on-center spacing or #4, Grade 60 rebars at 9.75" on-center spacing.

38. Welded wire reinforcement specifications for the floor slabs are:
    - 6 x 6, #6 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 64' on center, or
    - 6 x 6, #10 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 31'on center, or
    - 6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 42' on center, or
    - 6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 20'on center

39. Top of the wall support in the sidewalls is provided by the bearing surface of the slats. No additional top of wall reinforcement is necessary to provide top of wall support. A design lateral earth pressure (soil load) of 100 psf per foot of depth (NRCS-313; Table 4 – Minimum Lateral Earth Pressure Values") was assumed to determine the sidewall design. No vehicle traffic occurs within five feet of the sidewalls. Therefore, no vehicle surcharge load is included in the sidewall design.

40. Top of the wall support in the end walls is provided by the lintels and side supports of the gang slats. The lintels are typically spaced ten (10') feet on center. Gang slats are placed against the end wall providing lateral top of wall support. The gang slats are typically ten (10') feet long and have support beam cross members at either five (5') feet or ten (10') feet on center. To be conservative it is assumed that the slat support is ten (10') feet on center.

    A design soil load pressure of 100 psf per foot of depth (NRCS-313; Table 4 – "Minimum Lateral Earth Pressure Values") was assumed to determine adequate end wall lateral top support. No vehicle traffic occurs within five feet of the end walls. Therefore, no vehicle surcharge load is applied in the end wall top of wall beam design. Four (4) #5, Grade 60 rebar spaced 3.5 inches on center or six (6) #4, Grade 60 rebar spaced 2" on-center are placed in the upper 14" of the wall to provided adequate top of wall lateral support. The top of wall beam is centered on the lintel support beam.

41. Columns are spaced 12' on-center. Lintels spanning between columns are 8"x 10"x 12' concrete beams supporting the concrete slats. Support columns for the lintels and concrete slats are either:
    - 12"x12" square columns The 12"x12" square columns are reinforced with 4 - #5 vertical rebars tied with #3 rebar every 12" or 4-#4 vertical rebar tied with #3 rebar every 12". Columns are secured to the floor by extending the reinforcement steel into the floor slab or securing a dowel rebar in the floor slab and tying the reinforcement steel to the dowel rebar.
    - 14" diameter round columns. The 14" diameter round columns are designed as 11"x11" square columns and are reinforced with 4 - #5 vertical rebars tied with #3 rebar every 12" or 4-#4 vertical rebar tied with #3 rebar every 12". Columns are secured to the floor by extending the reinforcement steel into the floor slab or securing a dowel rebar in the floor slab and tying the reinforcement steel to the dowel rebar.
    - 12"x16" masonry concrete columns. The masonry concrete columns are reinforced with a continuous rebar in each core of the block column. The continuous rebar can be either #4 or #5 rebar. Columns are secured to the floor by extending the reinforcement steel into the floor slab or securing a dowel rebar in the floor slab and tying the reinforcement steel to the dowel rebar.
    - See plans for details.

42. Footings (footers) are designed to carry the bearing load from columns and walls. Wall footers are continuous footers centered under the walls. Column footers are square area footers or continuous footers centered under the columns.

    Footers for walls are:
    - 24" wide x 10" thick continuous footers for the 10" outside wall.

    Footers for the columns are:

    <u>Presumptive Soil Bearing Capacity – 1,500 psf</u>
    (NRCS Code 313, Table 3)
    Clay, sandy clay, silty clay, clayey silt, silt, and sandy silt soil types
    (CL, ML, MH, CH)
    - 12" x 12" reinforced concrete columns
        - 58" x 58" x 10" thick square plain concrete footer
        - 66" diameter x 10" thick round plain concrete footer
        - 42" wide x 11" thick continuous plain concrete footer
    - 14" diameter round reinforced concrete columns
        - 58" x 58" x 10" thick square plain concrete footer
        - 66" diameter x 10" thick round plain concrete footer
        - 42" wide x 11" thick continuous plain concrete footer
    - 12" x 16" masonry concrete columns
        - 58" x 58" x 8" thick square plain concrete footer
        - 42" wide x 11" thick continuous plain concrete footer
    - See plans for details.

<u>Presumptive Soil Bearing Capacity – 2,000 psf</u>
(NRCS Code 313, Table 3)
Sand, silty sand, clayey sand, silty gravel, clayey gravel soil types
(SW, SP, SM, SC, GM, GC)

- 12" x 12" reinforced concrete columns
  - 46" x 46" x 10" thick square plain concrete footer
  - 50" diameter x 10" thick round plain concrete footer
  - 36" wide x 10" thick continuous plain concrete footer
- 14" diameter round reinforced concrete columns
  - 46" x 46" x 10" thick square plain concrete footer
  - 50" diameter x 10" thick round plain concrete footer
  - 36" wide x 10" thick continuous plain concrete footer
- 12" x 16" masonry concrete columns
  - 46" x 46" x 8" thick square plain concrete footer
  - 36" wide x 9" thick continuous plain concrete footer
- See plans for details.

Indiana Department of Environmental Management

2024 CONFINED FEEDING OPERATION APPROVAL APPLICATION

327 IAC 19 CONFINED FEEDING OPERATIONS

Prepared for:

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

CONCRETE MANURE STORAGE DESIGN
SITE SPECIFIC ANALYSIS AND DESIGN

58” x 58” x 10” thick Square Column Footer Design (1,500 psf soil bearing capacity)
12” X 12” Concrete Column
14” Diameter Round Concrete Column

46” x 46” x 10” thick Square Column Footer Design (2,000 psf soil bearing capacity)
12” X 12” Concrete Column
14” Diameter Round Concrete Column

58” x 58” x 8” thick Square Column Footer Design (1,500 psf soil bearing capacity)
12” x 16” Concrete Masonry Column

44” x 44” x 8” thick Square Column Footer Design (2,000 psf soil bearing capacity)
12” x 16” Concrete Masonry Column

44” Wide x 10” Thick Continuous Concrete Footer Design
End wall and Concrete Column Footer
12” X 12” Concrete Column
14” Diameter Round Concrete Column
(1,500 psf, 2,000 psf soil bearing capacity)

End Wall Lateral Support Design

Construction Joint Spacing Floor Reinforcement

Prepared by:

LIVESTOCK ENGINEERING SOLUTIONS, INC.

Michael A. Veenhuizen, Ph. D.
2967 S. Honey Creek Road · Greenwood, IN 46143 · (317) 535-1829

2024 Confined Feeding Operation Approval Application

Site Specific Analysis and Design
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Site Specific Analysis and Design:
The provisions of Article 19 Confined Feeding Operations rule (327 IAC 19) **Rule 12 Manure Handling and Storage; Site, Design, and Construction Requirements for Waste Management Systems** specifies the design requirements for manure handling and storage systems. Specifically, 327 IAC 19-12-4 *Storage capacity and design requirements* outlines the design and construction standards required for manure storage facilities. 327 IAC 19-12-4(d) states: "*All liquid manure storage facilities must be constructed according to the Indiana NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016**.*" In addition 327 IAC 19-12-4(e) states: "*In addition to subsection (d), all concrete manure storage facilities must be constructed according to:*

*(1) Indiana NRCS Construction Specification, Concrete Construction, May 2015***; and*
(2) either:
*(A) MWPS-36: Reinforced Concrete Manure Storages, Second Edition, 2005****; or*
*(B) TR-9: Circular Concrete Manure Tanks, March 1998****.*

In accordance with 327 IAC 19-12-4(d) and 327 IAC 19-12-4(e), the design standards presented in NRCS Conservation Practice Standard Code 313: Waste Storage Facility, October 2016 (NRCS Code 313) and MWPS-36: Rectangular Concrete Manure Storages; Second Edition, 2005 (MWPS-36) apply to the design of the proposed rectangular concrete manure storages. The requirements of NRCS Code 313 and MWPS-36 were considered in the design and planned construction of the concrete manure storage structure. Specifically, the manure storage construction is based on the design and construction procedures presented in these design standards, including design and construction data (Table 2-1, MWPS-36), load tables (Table 2-4, MWPS-36; Table 3, NRCS Code 313; Table 4, NRCS Code 313), design tables (Tables 3-1 [adapted], 3-2 [adapted], 3-3, 3-10, 3-11, 3-14, 3-15), design equations (Appendix C), and top of wall beam support (Appendix D).

A site specific analysis and design of the plain square concrete column footings for the 12" x 12" reinforced concrete column, 14" diameter round reinforced concrete column, and 12" x 16" concrete masonry column result in a design different than the values presented in the MWPS-36 design tables. A site specific design for the continuous footer constructed beneath the end wall and end wall column is presented since no information is available in MWPS-36 for a combined footer. The site specific analysis and design is based on the design equations presented in Appendix C, MWPS-36 and ACI 318-11 Building Code Requirements for Structural Concrete.

MWPS-36 also describes the design assumptions and rationale for designing rectangular concrete manure storages. One of the design assumptions for the designs presented in MWPS-36 is that "*Rectangular tank designs assume the walls have full lateral top and bottom support*". Top of wall support is typically provided by tank tops, slats, or a specially designed beam. MWPS-36 states that "*Properly placed gang slats can be used to provide lateral top support for side and end walls.*" It is concluded based on the design information presented in MWPS-36 that specially designed beams may not be required in a totally slatted floor building The specific design requirements for this concrete manure storage will be considered to determine if a top of wall beam is required.

A site specific analysis and design is presented for the square plain concrete column footer designs, end wall and end wall column continuous footer design, end wall lateral support, and floor construction joint spacing to demonstrate that the design is based on MWPS-36: Rectangular Concrete Manure Storages, Second Edition, 2005 in accordance with 327 IAC 19-12-4(e).

2024 Confined Feeding Operation Approval Application

Site Specific Analysis and Design
Construction Joint Spacing
Floor Reinforcement
Gestation Building
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

Floor Construction Joint Spacing (subgrade drag theory):
In accordance with the criteria outlined in Table 3-13, MWPS-36 "Rectangular Concrete Manure Storages", Second Edition, the floor control joint spacing is determined based on subgrade drag theory shown in Design of Slabs on Grade, ACI-360R92 (Reapproved 1997). The subgrade drag equation is used to determine the amount of non-prestressed reinforcement to provide as shrinkage and temperature reinforcement and to control crack width. The amount of prestressed reinforcement is based on allowable reinforcement tensile stress, friction between the concrete and subgrade, distance between floor control joints, and the weight of the concrete floor slab. The subgrade drag equation is:

$A_s = [F \times L \times w] / [2 \times f_s]$

A_s = cross-sectional area in sq. in. of steel per lineal foot
f_s = allowable stress in the reinforcement, psi
F = the friction factor
L = distance in feet between joints
w = dead weight of the slab, psf

The subgrade drag equation can be rearranged to determine the floor control joint spacing, L. The rearranged subgrade drag equation to determine floor control joint spacing, L, is:

$L = [2 \times f_s \times A_s] / [F \times w]$

L = distance in feet between joints
A_s = cross-sectional area in sq. in. of steel per lineal foot
f_s = allowable stress in the reinforcement, psi
F = the friction factor
w = dead weight of the slab, psf

The steel reinforcing in the floor slab is specified in the "Design Summary" of the Confined Feeding Operation Approval Application packet and depicted on the design plans. The welded wire reinforcement specification for the floor slab specifies the following welded wire reinforcement and allowable floor construction joint spacing. The allowable floor construction joint spacing is determined based on the subgrade drag equation.

- 6 x 6, #6 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 64' on center, or
- 6 x 6, #10 welded wire reinforcement (90,000 psi tensile strength) with floor construction joints every 31'on center, or
- 6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 42' on center, or
- 6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 20'on center

The plan sheets specify 6x6, #10 welded wire reinforcement with a 31' maximum floor construction joint spacing. The floor construction joint spacing is based on a welded wire reinforcement tensile strength of 90,000 psi. The specifications include 6x6, #6 welded wire reinforcement and 60,000 psi tensile strength welded wire reinforcement. A determination for each combination of welded wire reinforcement is provided.

The floor control joint spacing is determined as follows:

<u>6 x 6, #10 welded wire reinforcement (90,000 psi tensile strength)</u>
$L = ([2 \times f_s \times A_s] / [F \times w]) \times S.F.$

f_s = 90,000 psi
A_s = 0.028 in^2/ft (MWPS-36, Table B-4)
F = 1.95 (soil subgrade, Figure 6.3; Design of Slabs on Grade, ACI 360R-92(97)
w = 5 in floor x 12.5 psf per in of thickness (150 pcf) = 62.5 psf
S.F. = 0.75 (f_s reduction)

L = ([2 x 90,000 psi x 0.028 in^2/ft] / [1.95 x 62.5 psf]) x 0.75
L = 31.0 ft
Use L = 31 ft

<u>6 x 6, #6 welded wire reinforcement (90,000 psi tensile strength)</u>
$L = ([2 \times f_s \times A_s] / [F \times w]) \times S.F.$

f_s = 90,000 psi
A_s = 0.058 in^2/ft (MWPS-36, Table B-4)
F = 1.95 (soil subgrade, Figure 6.3; Design of Slabs on Grade, ACI 360R-92(97)
w = 5 in floor x 12.5 psf per in of thickness (150 pcf) = 62.5 psf
S.F. = 0.75 (f_s reduction)

L = ([2 x 90,000 psi x 0.058 in^2/ft] / [1.95 x 62.5 psf]) x 0.75
L = 64.2 ft
Use L = 64 ft

<u>6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength)</u>
$L = ([2 \times f_s \times A_s] / [F \times w]) \times S.F.$

f_s = 60,000 psi
A_s = 0.028 in^2/ft (MWPS-36, Table B-4)
F = 1.95 (soil subgrade, Figure 6.3; Design of Slabs on Grade, ACI 360R-92(97)
w = 5 in floor x 12.5 psf per in of thickness (150 pcf) = 62.5 psf
S.F. = 0.75 (f_s reduction)

L = ([2 x 60,000 psi x 0.028 in^2/ft] / [1.95 x 62.5 psf]) x 0.75
L = 20.6 ft
Use L = 20 ft

<u>6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength)</u>
$L = ([2 \times f_s \times A_s] / [F \times w]) \times S.F.$

f_s = 60,000 psi
A_s = 0.058 in^2/ft (MWPS-36, Table B-4)
F = 1.95 (soil subgrade, Figure 6.3; Design of Slabs on Grade, ACI 360R-92(97)
w = 5 in floor x 12.5 psf per in of thickness (150 pcf) = 62.5 psf
S.F. = 0.75 (f_s reduction)

L = ([2 x 60,000 psi x 0.058 in^2/ft] / [1.95 x 62.5 psf]) x 0.75
L = 42.8 ft
Use L = 42 ft

Table 1 (continued): Building Dimension and Operating Capacity

ID	Structure Type	Building Dimensions	Animal Capacity
9P.	Farrowing (sows & litters)	64'-0" x 64'-0" (building dimensions) 6 – 7'-2.5" x 118'-0" x 2'-0" deep (storage dimensions)	60 sows and litters
10P.	Breeding & gestation	77'-4" x 417'-4" (building dimensions) 75'-8" x 416'-0" x 10'-0" deep (storage dimensions)	1,752 sows
	TOTAL		**773 sows and litters** **4,789 breeding/gestation sows**

Land Application Acres:

Required land application acres (minimum):

IDEM Guidance Determination: For manure management planning, this confined feeding operation is operated as a breed-to-wean swine production site. The Indiana Department of Environmental Management (IDEM) Guidance Manual for Indiana's Confined Feeding Program – December 29, 2014 (Guidance Manual) "Manure Application Land Base Estimates" Table (page 52) states that one acre per 13 farrowing (sows & litters) and one (1) acre per 25 breeding/gestation sows per year is required to provide sufficient land application acres to land apply the manure and process wastewater.

The required manure application land requirement is determined as follows.

Breeding/Gestation – 4,789 sows (1E, 2E, 6E, & 10P)

Breeding/gestation sows

4,789 sows ÷ 25 sows/acre = 191.6 acres

Farrowing Building – 833 sows and litters (3E, 7E, 8P, & 9P)

Sows & litters

833 sows & litters x 13 groups/yr x 25 days/group ÷ 365 days/yr ÷ 13 sows/acre = 57.1 acres

Total land application acres required: (191.6 + 57.1) 248.7 acres

Available land application acres:

Liquid manure and process wastewater land application methods utilized are typically injection or single-pass incorporation. When necessary, manure and process wastewater land application methods utilized may include surface application with incorporation and surface application. In the case where surface application of manure and process wastewater is conducted, it is not expected that the annual volume of manure and process wastewater would be land applied using surface application methods. The available land application acres are determined after setbacks are calculated.

The required setbacks for incorporation or single-pass incorporation were calculated based on a setback of:

- 0 feet from property lines and public roads;
- 5 feet from drainage inlets;
- 50 feet from wells;
- 25 feet from sinkholes;
- 25 feet from surface water; and
- 500 feet from public water supply wells & surface intake structures.

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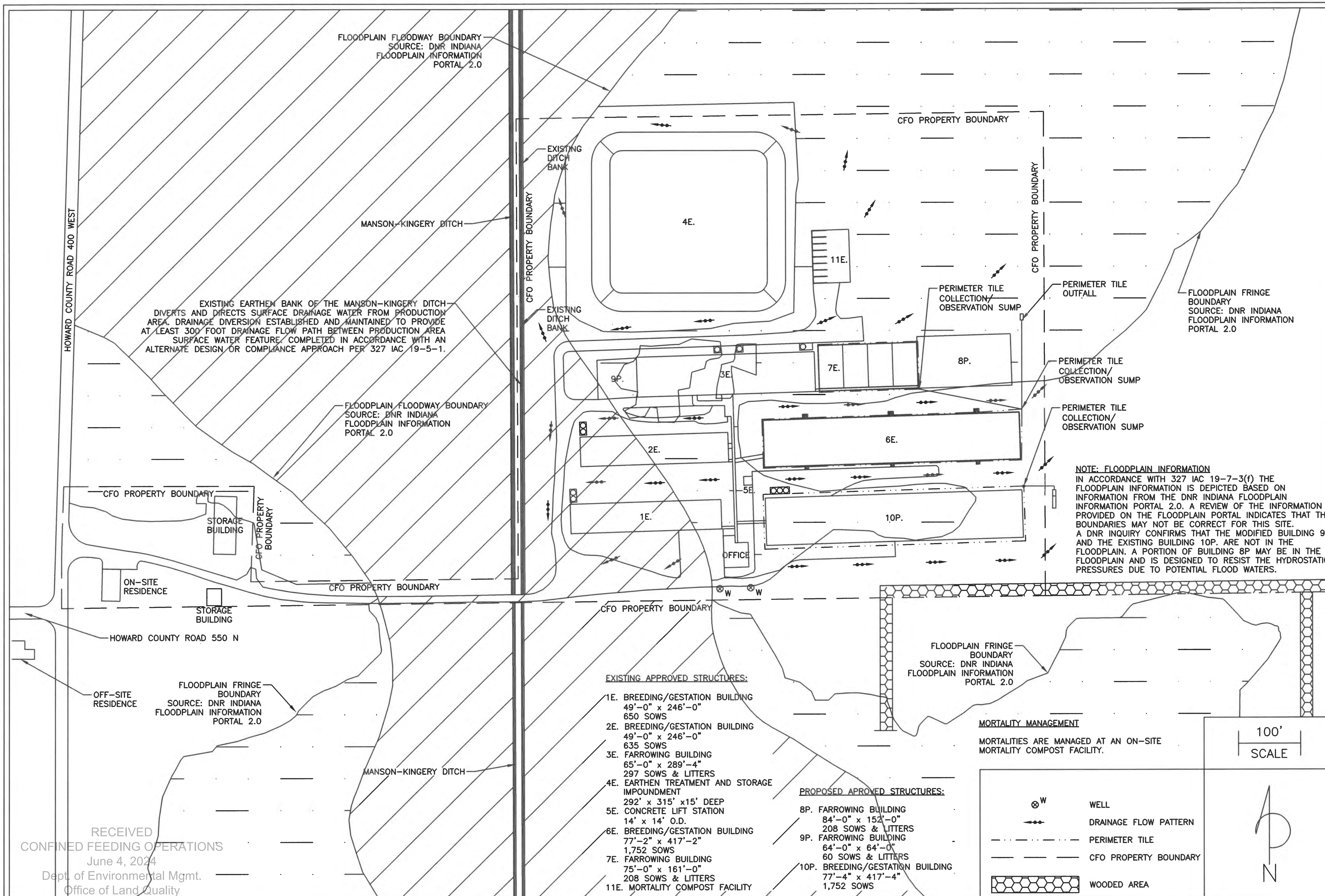

SHEET: 2A of 2A | DRAWING NO: TGP0324-02A

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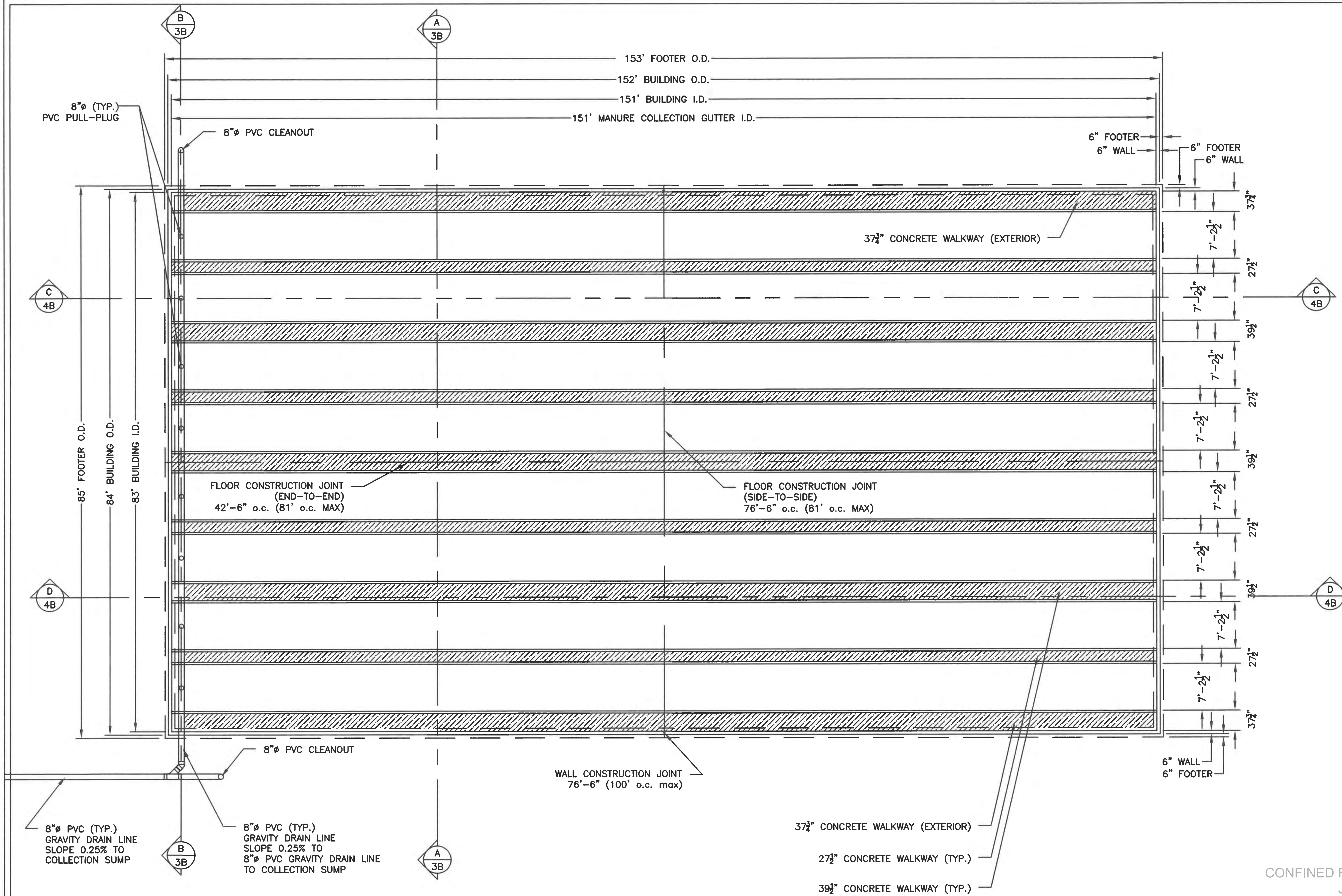
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARMSTEAD PLAN
BUILDING SITE DETAILS
SECTION 4 T24N R3E

TOP GRADE PRODUCTION LLC
2667 EAST STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



FARROWING BUILDING
84'-0" x 152'-0" O.D.
8-ROWS; 26 STALLS PER ROW
208 SOWS AND LITTERS

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Office of Land Quality

NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

FARROWING BUILDING
FOUNDATION PLAN
BUILDING 8P

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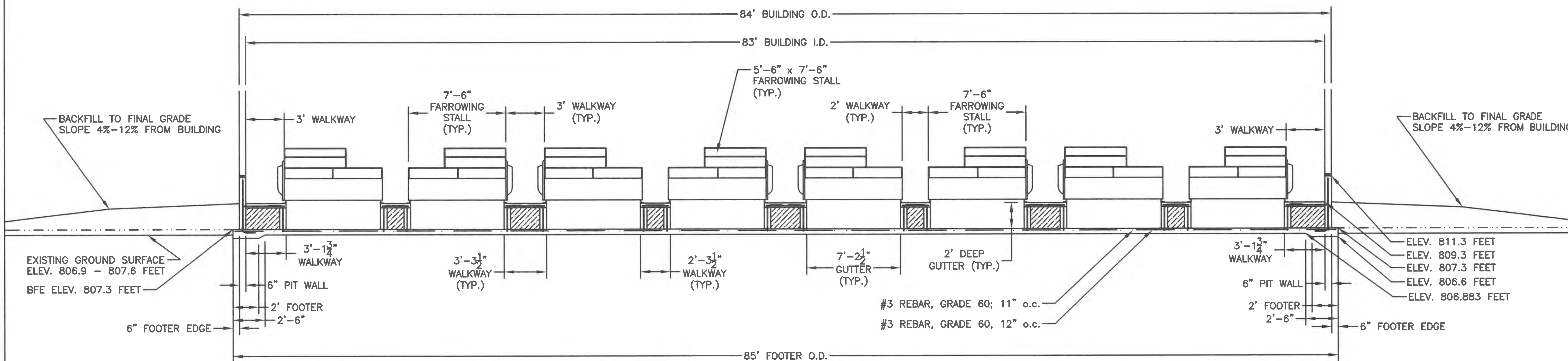
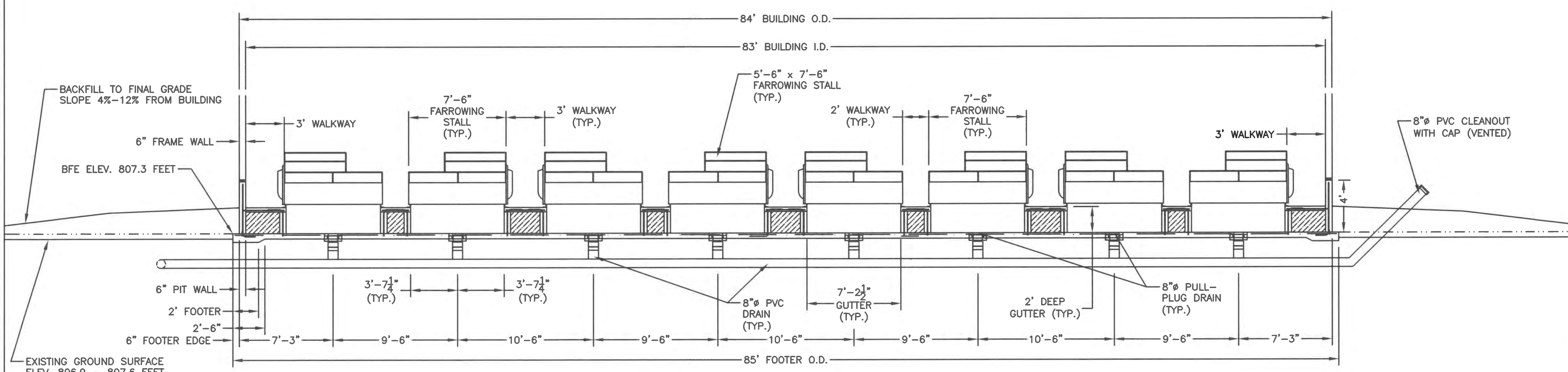
SHEET: 2B of 8B | DRAWING NO: TGP0324-02B



A/3B CONCRETE PIT CROSS-SECTION
THRU FARROWING STALLS AND COLLECTION GUTTERS



B/3B CONCRETE PIT CROSS-SECTION
THRU PULL PLUG DRAINS AND COLLECTION GUTTERS

NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

SHEET: 3B of 8B | DRAWING NO: TGP0324-03B

DATE: 06/03/24 | DRAWN BY: MV

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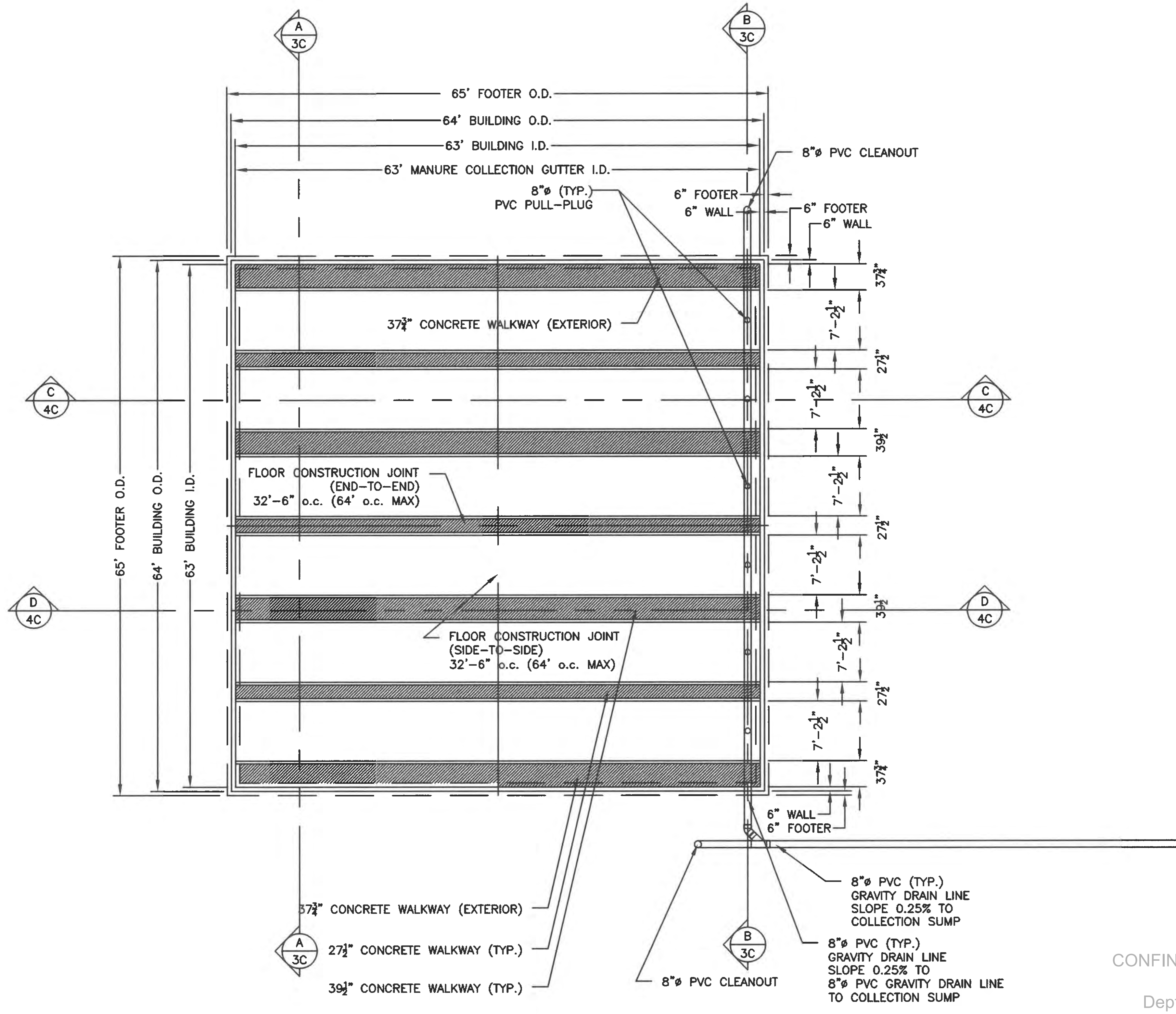
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
CROSS-SECTION
BUILDING 8P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713



FARROWING BUILDING
64'-0" x 64'-0" O.D.
6-ROWS; 10 STALLS PER ROW
60 SOWS AND LITTERS

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NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

FARROWING BUILDING
FOUNDATION PLAN
BUILDING 9P

DATE: 06/03/24 | DRAWN BY: MV

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MICHAEL A. VEENHUIZEN
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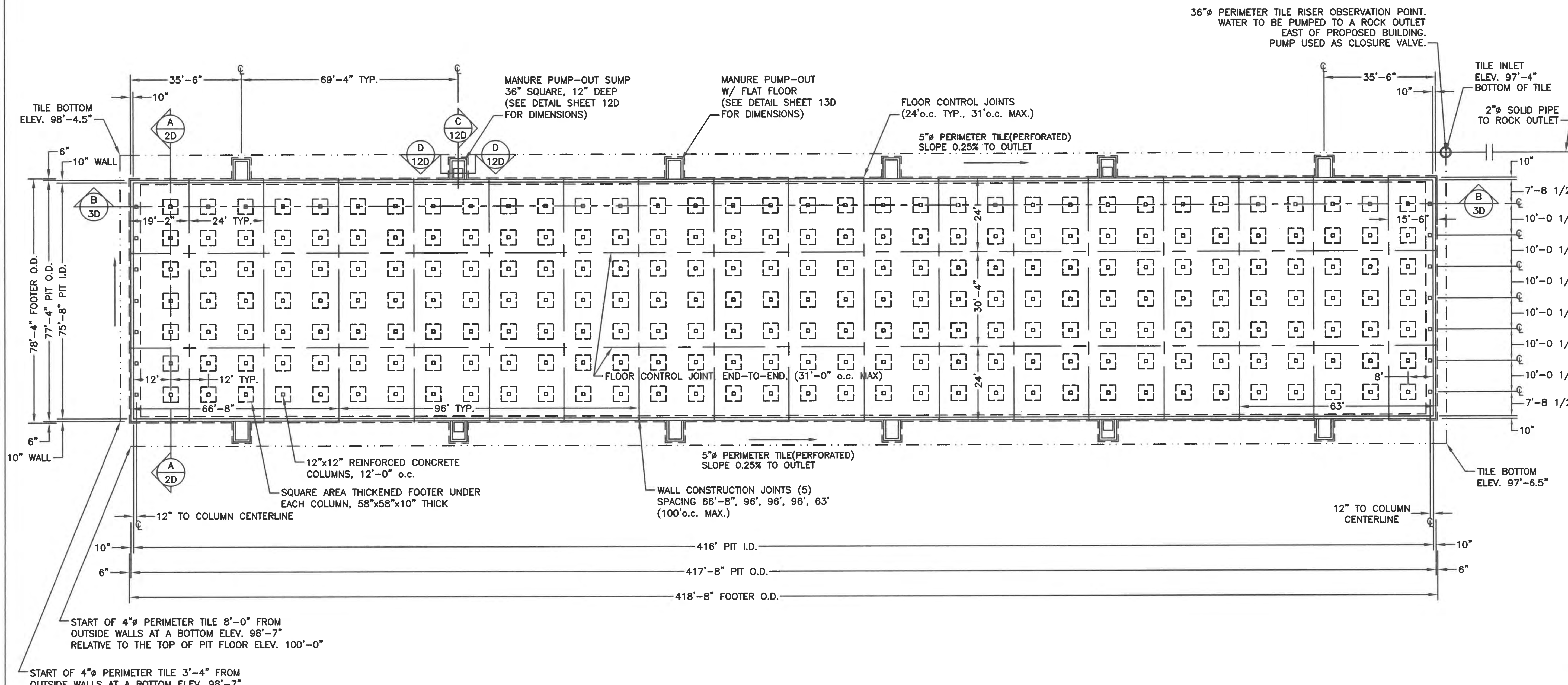
SHEET: 2C of 8C | DRAWING NO: TGP0324- 02C



GESTATION BUILDING
PLAN VIEW
CONCRETE PIT FOUNDATION

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NOTE:
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SHEET: 1D of 17D | DRAWING NO: TGP0224- 01D

DATE: 05/10/24 | DRAWN BY: MV

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MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

CONCRETE PIT
FOUNDATION PLAN
BUILDING 10P.

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

Some of the planned and proposed construction details for the approved breeding and gestation building construction plans have changed since the original approval. The planned changes include:

- 46" x 46" x 10" thick concrete column footer – 12" x 12" column and 14" diameter round column (2,000 psf soil bearing capacity)
- 66" diameter x 10" thick round column footer for a 12" x 12" square and 14" diameter round concrete column. (1,500 psf soil bearing capacity) -- previously 64" diameter x 10" thick round column footer
- 46" x 46" x 8" thick square column footer for a 12" x 16" concrete masonry block column. (2,000 psf soil bearing capacity) -- previously 44" x 44" x 8" thick square column footer

It is noted that the other proposed footer dimensions do not change due to the change in the design manure density from 62.5 pcf to 65.0 pcf.

A review of the floor construction joint spacing calculations identified a rounding error in the determination of the allowable floor construction joint spacing for 60,000 psi welded wire reinforcement. The updated floor construction joint spacing options include:

- 6 x 6, #6 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 42' on center, (previously 43')
- 6 x 6, #10 welded wire reinforcement (60,000 psi tensile strength) with floor construction joints every 20'on center (previously 21')

A review of the site specific analysis and designs and alternative design or compliance approach designs confirms that no changes are required for the following designs.

- End wall lateral support design
- 12" x 12" reinforced concrete column design
- 14" diameter round reinforced concrete column design
- 12" x 16" concrete masonry column design
- Concrete construction specification

Seasonal Water Table Management (Perimeter Tile):
Since the original Confined Feeding Operation Approval (Farm ID#3713) and Confined Feeding Operation Approval Construction Authorization (AW-6822), a demonstration of the adequacy of the subsurface perimeter tile system seasonal water table management has been added to the requirements of a Confined Feeding Operation Approval Application packet. A perimeter tile system design is provided for building P3 (South Gestation) to determine the size of the perimeter tile and to demonstrate the adequacy of the perimeter tile seasonal water table management system

An on-site soil investigation was completed by John Bowman, Chestnut Ridge Consulting, Inc. on September 28, 2018. Two (2) soil borings were completed within the footprint of proposed building P1 (East Farrowing), two (2) soil borings were completed within the footprint of proposed building P2 (West Farrowing), and three (3) borings were completed within the footprint of proposed building P3 (South Gestation). A total of seven (7) soil borings within the footprint of the proposed buildings were completed to determine the soil characteristics and presence or absence of a seasonal water table. The on-site soil investigation report identifies the soil profile from the ground surface to the bottom of the excavation using the Unified Soil Classification System (USCS) soil classification designation. The soil classifications identified in the soil investigation report for borings representing the proposed buildings include silt loam (ML), clay loam (CL) clay (CH), and sandy loam (SM).

The on-site soil investigation demonstrated that a seasonal water table exists within the footprint of the proposed concrete manure storage structures. The depth to the seasonal water table below the ground surface according to the on-site soil investigation is:

Building P1 – East Farrowing

Boring #1 (west boring)	11" below the ground surface
Boring #2 (east boring)	12" below the ground surface

Building P2 – West Farrowing

Boring #1 (west boring)	12" below the ground surface
Boring #2 (east boring)	12" below the ground surface

Building P3 – South Gestation

Boring #1 (east boring)	10" below the ground surface
Boring #2 (middle boring)	21" below the ground surface
Boring #3 (west boring)	7" below the ground surface

Referring to the on-site soil investigation the soil profile log indicates the following.

Building P1 – East Farrowing

Boring #1 (west boring):

Depth	Texture
0"-11"	silt loam (ML)
11"-20"	clay loam (CL)
20"-31"	clay (CH)
31"-41"	clay (CH)
41"-50"	sandy loam (SM)
50"-132"	sandy loam (SM)

Seasonal water table – 11" below surface

Boring #2 (east boring):

Depth	Texture
0"-12"	silt loam (ML)
12"-22"	clay (CH)
22"-34"	clay loam (CL)
34"-42"	silt loam (ML)
42"-60"	sandy loam (SM)
60"-132"	sandy loam (SM)

Seasonal water table – 12" below surface

Building P2 – West Farrowing

Boring #1 (west boring):

Depth	Texture
0"-9"	clay loam (CL)
9"-22"	clay (CH)
22"-32"	clay (CH)
32"-48"	clay loam (CL)
48"-65"	clay loam (CL)
65"-132"	silt loam (ML)

Seasonal water table – 12" below surface

Boring #2 (east boring):

Depth	Texture
0"-10"	clay loam (CL)
10"-25"	clay loam (CL)
25"-33"	clay (CH)
33"-46"	clay (CH)
46"-70"	clay loam (CL)
70"-100"	silt loam (ML)
100"-132"	sandy loam (SM)

Seasonal water table – 12" below surface

Building P3 – South Gestation
Boring #1 (east boring):

Depth	Texture
0"-10"	silt loam (ML)
10"-18"	silt loam (ML)
18"-28"	clay loam (CL)
28"-42"	clay (CH)
42"-56"	silt loam (ML)
56"-96"	sandy loam (SM)
96"-132"	silt loam (ML)

Seasonal water table – 10" below surface

Boring #2 (middle boring):

Depth	Texture
0"-10"	silt loam (ML)
10"-21"	clay (CH)
21"-31"	clay (CH)
31"-41"	clay (CH)
41"-52"	clay loam (CL)
52"-92"	sandy loam (SM)
92"-132"	silt loam (ML)

Seasonal water table – 21" below surface

Boring #3 (west boring):

Depth	Texture
0"-7"	silt loam (ML)
7"-18"	clay loam (CL)
18"-38"	clay (CH)
38"-48"	clay (CH)
48"-56"	clay loam (CL)
56"-72"	silt loam (ML)
72"-132"	sandy loam (SM)

Seasonal water table – 7" below surface

The information provided by the on-site soil investigation indicates that the soil properties are uniform and that a seasonal water table exists within the footprint of the proposed below-building concrete manure storages. The depth of the foundation and floor of the farrowing buildings (P1 & P2) below-building concrete manure storages will be located approximately on grade after the topsoil is removed (0"-10" below the existing ground surface). The depth of the foundation and floor of the gestation building (P3) will be located approximately 60" – 96" below the existing ground surface.

A perimeter tile drainage system is not required for buildings P1 (East Farrowing) and P2 (West Farrowing) since the seasonal water table identified by the on-site soil investigation is below the proposed below-building concrete manure storage. A perforated perimeter tile drainage system with a tile riser observation point located at the northeast corner of building P3 will be used to collect and direct groundwater away from the building foundation. Groundwater from the tile riser observation sump will be pumped to a surface rock distributor located at least 50 feet from the proposed concrete manure storage. The rock distributor outlet is located on the adjoining property. A waiver letter from the adjoining land owner was provided as part of the original confined feeding operation approval confirming that the adjoining land owner is aware of the planned perimeter tile outfall and has no objection to the location of the perimeter tile outfall. Water from the rock distributor will be directed to a grassed infiltration area and is planned to join the natural drainage patterns around the building and surrounding area.

A perimeter tile system design is provided for building P3 (South Gestation) to determine the size of the perimeter tile and to demonstrate the adequacy of the perimeter tile seasonal water table management system. Based on the assumption that the entire gestation building floor and foundation is at the maximum depth below the existing ground surface (96") and a seasonal water table depth of 7" below the ground surface a 5" diameter corrugated (corrugated inside wall) perimeter tile is required. The building plans and perimeter tile plans have been updated to include a 5" diameter (corrugated inside wall) perimeter tile around the building foundation as part of the perimeter tile seasonal water table management system.

Site Features and Details:

Plot maps (327 IAC 19-7-1(c)(2)):
The specific plot maps, which must be submitted for each application type defined in the "Application Types and Requirements Worksheet" of the CFO / CAFO Application Packet are detailed in Section A. Plot Maps and Section E. Application Type and Required Plot Maps of the CFO / CAFO Application Packet Section X – Plot Maps.

A review of the plot map requirements for a Confined Feeding Operation Approval Renewal Application (CFO / CAFO Application Packet Section X – Plot Maps; E. Application Type and Required Plot Maps) indicates that "1. USDA NRCS Soil Survey Map – The boundaries of all manure application areas. and 2. USDA NRCS Soil Survey Map – The location of the waste management system, boundaries of the confined feeding operation, and boundaries of livestock and poultry production areas." are required to be submitted. A review of CFO / CAFO Application Packet Section X – Plot Maps; E. Application Type and Required Plot Maps indicates that "3. USGS Topographic Maps – The location of the waste management system, the boundaries of the confined feeding operation, boundaries of livestock and poultry production areas, identify any public water supply wells and public water supply surface intake structures within one thousand (1000) feet of the manure storage structures, and boundaries of all manure application areas." are not required as part of a Confined Feeding Operation Approval Renewal Application packet.

Based on the plot map requirements outlined in Section E of the CFO / CAFO Application Packet Section X, USDA NRCS Soil Survey Maps are required to be submitted and USGS Topographic Maps are not required to be submitted. It is confirmed that the land application acres included in the original Confined Feeding Operation Approval and Construction Authorization have not changed. USDA NRCS Soil Survey maps and the current land application agreements are included in the Confined Feeding Operation Approval Renewal and Construction Authorization Renewal application to confirm that there have been no changes to the available land application acres.

In accordance with 327 IAC 19-7-2, United States Department of Agriculture Natural Resources Conservation Service soil survey maps are included to confirm the location of the existing confined feeding operation (CFO). The plot maps show the location of the waste management systems, boundaries of the CFO property, boundaries of the production areas, boundaries and owners of the manure application areas, and available manure application acres.

Adjacent or contiguous animal feeding operation (327 IAC 19-7-1(c)(11):
The requirements listed in 327 IAC 19-7-1(c)(11) state that a complete application must include "*a statement affirming that AFOs adjacent to or contiguous with the CFO are not under common ownership or control of the applicant.*" It is confirmed that there are no animal feeding operations (AFOs) that

2024 Confined Feeding Operation Approval Application
Site Preparation and Backfill
for
Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

1. The foundation and subgrade shall have large rocks, organic vegetation, and foreign material removed.
2. The foundation and subgrade shall be smoothly graded and compacted, as necessary, to a uniform density throughout prior to concrete placement. A level and smooth subgrade shall be established to maintain specified floor slab and footer thicknesses.
3. Undisturbed earth foundation surfaces shall be graded to remove surface irregularities. Where fill materials are required to establish the foundation the surface shall be scarified to a depth of not less than 2 inches to allow for adequate bonding between the existing subgrade surface and fill materials.
4. Soil materials used to establish the foundation and subgrade that are acceptable for fill and foundation soils shall consist of the naturally occurring soil materials excavated from the site or designated from a borrow area on the site.
5. Fill and foundation materials used to establish the foundation and subgrade shall not contain large stones, sod, roots, debris, frozen soil, snow or ice, or other perishable materials. Stones larger than 6 inches in diameter shall be removed prior to placement of the fill.
6. Soil materials used for backfill against the concrete manure storage walls shall consist of the naturally occurring soil materials excavated from the site or designated from a borrow area on the site. Acceptable soil materials for backfill shall have a unified soil classification system (USCS) designation of CL, CL-ML, ML, SC, SM-SC, SM, SP, SW, GC, GM, GP, and GW (Table 4. Minimum Lateral Earth Pressure Values, NRCS Code 313.).
7. Soil materials with a unified soil classification system (USCS) designation of OL, MH, CH, and OH shall not be used for backfill against the concrete manure storage walls (Table 4, Minimum Lateral Earth Pressure Values, NRCS Code 313).
8. The naturally occurring soil materials identified within the site based on the on-site soil investigation include soils with a unified soil classification system (USCS) designation of ML, CL, CH, and SM.
9. On-site soils with a unified soil classification system designation (USCS) of ML, CL, and SM are suitable for backfilling against the concrete manure storage walls. These soil materials should be identified and stockpiled for backfilling directly against the concrete manure storage walls.
10. On-site soils with a unified soil classification system designation (USCS) of CH shall not be used for backfill directly against the concrete manure storage walls. These soils material shall be used to establish the necessary site grade away from the building and concrete manure storage walls.
11. According to the on-site soil investigation on-site soils with a unified soil classification system designation of CH are located in the soil profile typically between 20"-41" in the west half of building P1 – East Farrowing and 12"-22" in the east half of building P1 – East Farrowing. According to the on-site soil investigation on-site soil with a unified soil classification system designation of CH are locating in the soil profile typically between 9"-32" in the west half of building P2 – West Farrowing and 25"-46" in the east half of building P2 – West Farrowing.

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The farrowing buildings will be constructed mostly on grade after the topsoil is removed. During excavation of the building site topsoil for farrowing buildings (P1 & P2) to establish the subgrade for construction, if CH classification soils are encountered these soils will be identified, removed, and stockpiled separate from the other excavated soil materials. These soils can be used for fill and to establish grade away from the building sidewalls and end walls.

Soil materials excavated from building site that are suitable for backfill will be stockpiled on-site and used for backfilling adjacent to the below-building concrete walls.

12. According to the on-site soil investigation on-site soils with a unified soil classification system designation of CH are located in the soil profile typically between 28"-42" in the east third of building P3 – South Gestation, 10"-41" in the middle third of building P3 – South Gestation, and 18"-48" in the west third of building P3 – South Gestation.

    During excavation of the building site for building P3 – South Gestation between 10"-48" in the soil profile will be evaluated based on the on-site soil investigation to identify CH classification soils and will be removed and stockpiled separate from the other excavated soil materials. These soils can be used for fill and to establish grade away from the building in areas located at least three (3') feet from the building sidewall and end wall.

    Soil materials excavated from the building site that are either outside of the 10"-48" depth in the soil profile or determined to not be CH classifications soils (ML, CL, SM) are suitable for backfill and shall be stockpiled on-site separate from other excavated soil materials to be used for backfilling adjacent to the below-building concrete walls.

13. Backfill should not be placed upon a frozen surface, nor should snow, ice or frozen materials be incorporated in the fill.
14. Backfilling and compaction of fill adjacent to new concrete walls should not begin in less than 10 days after placement of concrete or until the concrete strength of the concrete walls has been tested to be at least 3,000 psi to protect the structural integrity of the wall during backfilling. Refer to 11, 12, and 13 for specific compaction methods.
15. Backfilling and compaction of fill adjacent to new concrete walls should not begin until slats or floor are in place providing lateral support of the top and bottom of the wall. The timing of backfilling and compaction after the placement of slats and floors is required to ensure that the wall behaves as designed and is consistent with the requirements of the Indiana NRCS Construction Specifications, Concrete Construction, May 2015 (adapted) to protect the walls from potential damage due to backfilling and compaction.
16. Fill materials used for backfill shall be placed against the walls with a bulldozer, skid-steer type loader, or similar earth moving type equipment. Fill materials will be allowed to settle and compact naturally. Fill materials used for backfill will typically be moved and placed against the walls with earth moving equipment two to four times depending on settling and natural compaction of backfill soils.
17. Adjacent to concrete storage tank walls, backfill shall be placed in a manner which will prevent damage to the structures. Manual tamping or compaction can be used to establish a uniform backfill against the building wall.
18. The tracks or tires of heavy earth moving equipment, such as bulldozers, shall not be operated within five (5) feet of the exterior of the concrete walls to prevent vehicle surcharge loads during construction. Light-duty earth moving equipment (i.e. skid-steer type loader) may be operated within five (5) feet of the exterior of the concrete walls to place backfill. Compaction within five (5) of the exterior wall shall not be done with earth moving equipment.

2024 Confined Feeding Operation Approval Application
Below-Building Concrete Manure Storage Design Plans
Design Summary

for

Top Grade Production LLC
2667 E State Road 18
Kokomo, Indiana 46901

The proposed waste treatment control structures for the swine confined feeding operation include below-building concrete storage structures. The following details pertain to all of the below-building concrete manure storage plans.

1. Subgrade preparation. The presumptive bearing capacity of the subgrade soils is 1,500 psf. Large rocks, organic vegetation, or foreign material shall be removed.

   For the design, the presumptive soil bearing capacity of the foundation soils beneath the structure footings was assumed to be 1,500 psf. The soil texture classifications within the soil profile in the area of the proposed concrete manure storage structures are silt loam (ML), clay loam (CL), clay (CH), and sandy loam (SM). Table 3 "Presumptive Allowable Foundation and Lateral Pressure" of the NRCS Conservation Practice Standard, Waste Storage Facility, Code 313 indicates that clay, sandy clay, silty clay, clayey silt, silt, and sandy silt (CL, ML, MH, CH) have a presumptive bearing capacity of 1,500 psf. No on-site investigation was conducted to verify the soil bearing capacity.

2. A design for a presumptive soil bearing capacity of 2,000 psf for the foundation soils beneath the structure footings for Building P3 – South Gestation is included. If the 2,000 psf soil bearing capacity design is used, the soil bearing capacity will be tested by a geotechnical testing company using standard test methods to confirm the soil bearing capacity. Soil bearing capacity testing will be completed prior to commencing construction. If the soil bearing capacity meets or exceeds 2,000 psf, the design details for a soil bearing capacity of 2,000 psf can be used. Soil bearing capacity test results will be submitted to the Indiana Department of Environmental Management confirming the soil bearing capacity and design details used during construction.

3. All concrete work shall conform to the ACI Manual of Concrete Practices, ACI 301.

4. All concrete used on manure tank walls and floors, beams, and columns shall have a minimum 28-day compressive strength of 4,000 psi.

5. Footers formed and placed monolithically with the floor slab shall have a minimum 28-day compressive strength of 4,000 psi. Footers formed and placed independent of the floor slab shall have a minimum 28-day compressive strength of 4,000 psi.

6. Slats shall have a minimum 28-day compressive strength of 4,500 psi.

7. Lintels shall have a minimum 28 day compressive strength of 5,000 psi.

8. Solid floors and support beams shall meet a minimum design live load due to animals of:
   -- 70 pounds per square foot, psf, for sows and boars (up to 500 lbs).
   (adapted from Table 2-4, MWPS-36 Rectangular Concrete Manure Storages, second edition)

9. Slats shall meet a minimum design live load due to animals of:
   -- 170 pounds per lineal foot, plf for sows and boars (up to 500-lb pig).
   (adapted from Table 2-4, MWPS-36 Rectangular Concrete Manure Storages, second edition)

10. Finishes of concrete walls -- standard form finish.

The requirements of 327 IAC 19-7-1(c)(6) state "*The number of test holes must be sufficient to adequately characterize the seasonal water table and soil and test holes must be at least two (2) feet below the base of the structure.*" The requirements of NRCS Conservation Standard 313 states that "*A geological exploration shall be conducted for all manure storage facilities. The exploration shall be intensive enough to adequately characterize the site. A minimum of two holes shall be explored.*" Standard 313 also states that "*Soil sampling shall follow guidance in the National Engineering Manual (NEM) IN531-2.*" The National Engineering Manual (NEM) IN531-2 requires that a soil investigation be conducted to document the engineering properties of the soil and identify the depth of the seasonal water table.

An on-site soil investigation was completed by John Bowman, Chestnut Ridge Consulting, Inc. on September 28, 2018. Two (2) soil borings were completed within the footprint of proposed building P1 (East Farrowing), two (2) soil borings were completed within the footprint of proposed building P2 (West Farrowing), and three (3) borings were completed within the footprint of proposed building P3 (South Gestation). A total of five (5) soil borings within the footprint of the proposed buildings were completed to determine the soil characteristics and presence or absence of a seasonal water table. The on-site soil investigation report identifies the soil profile from the ground surface to the bottom of the excavation using the Unified Soil Classification System (USCS) soil classification designation. The soil classifications identified in the soil investigation report for borings representing the proposed buildings include silt loam (ML), clay loam (CL) clay (CH), and sandy loam (SM).

The on-site soil investigation demonstrated that a seasonal water table exists within the footprint of the proposed concrete manure storage structures. The depth to the seasonal water table below the ground surface according to the on-site soil investigation is:

Building P1 – East Farrowing

Boring #1 (west boring)	11" below the ground surface
Boring #2 (east boring)	12" below the ground surface

Building P2 – West Farrowing

Boring #1 (west boring)	12" below the ground surface
Boring #2 (east boring)	12" below the ground surface

Building P3 – South Gestation

Boring #1 (east boring)	10" below the ground surface
Boring #2 (middle boring)	21" below the ground surface
Boring #3 (west boring)	7" below the ground surface

Referring to the on-site soil investigation the soil profile log indicates the following.

Building P1 – East Farrowing
Boring #1 (west boring):

Depth	Texture
0"-11"	silt loam (ML)
11"-20"	clay loam (CL)
20"-31"	clay (CH)
31"-41"	clay (CH)
41"-50"	sandy loam (SM)
50"-132"	sandy loam (SM)

Seasonal water table – 11" below surface

Boring #2 (east boring):

Depth	Texture
0"-12"	silt loam (ML)
12"-22"	clay (CH)
22"-34"	clay loam (CL)
34"-42"	silt loam (ML)
42"-60"	sandy loam (SM)
60"-132"	sandy loam (SM)

Seasonal water table – 12" below surface

Building P2 – West Farrowing

Boring #1 (west boring):

Depth	Texture
0"-9"	clay loam (CL)
9"-22"	clay (CH)
22"-32"	clay (CH)
32"-48"	clay loam (CL)
48"-65"	clay loam (CL)
65"-132"	silt loam (ML)

Seasonal water table – 12" below surface

Boring #2 (east boring):

Depth	Texture
0"-10"	clay loam (CL)
10"-25"	clay loam (CL)
25"-33"	clay (CH)
33"-46"	clay (CH)
46"-70"	clay loam (CL)
70"-100"	silt loam (ML)
100"-132"	sandy loam (SM)

Seasonal water table – 12" below surface

Building P3 – South Gestation

Boring #1 (east boring):

Depth	Texture
0"-10"	silt loam (ML)
10"-18"	silt loam (ML)
18"-28"	clay loam (CL)
28"-42"	clay (CH)
42"-56"	silt loam (ML)
56"-96"	sandy loam (SM)
96"-132"	silt loam (ML)

Seasonal water table – 10" below surface

Boring #2 (middle boring):

Depth	Texture
0"-10"	silt loam (ML)
10"-21"	clay (CH)
21"-31"	clay (CH)
31"-41"	clay (CH)
41"-52"	clay loam (CL)
52"-92"	sandy loam (SM)
92"-132"	silt loam (ML)

Seasonal water table – 21" below surface

Boring #3 (west boring):

Depth	Texture
0"-7"	silt loam (ML)
7"-18"	clay loam (CL)
18"-38"	clay (CH)
38"-48"	clay (CH)
48"-56"	clay loam (CL)
56"-72"	silt loam (ML)
72"-132"	sandy loam (SM)

Seasonal water table – 7" below surface

The information provided by the on-site soil investigation indicates that the soil properties are uniform and that a seasonal water table exists within the footprint of the proposed below-building concrete manure storages. The depth of the foundation and floor of the farrowing buildings (P1 & P2) below-building concrete manure storages will be located approximately on grade after the topsoil is removed (0"-10" below the existing ground surface). The depth of the foundation and floor of the gestation building (P3) will be located approximately 60" – 96" below the existing ground surface.

A perimeter tile drainage system is not required for buildings P1 (East Farrowing) and P2 (West Farrowing) since the seasonal water table identified by the on-site soil investigation is below the proposed below-building concrete manure storage. A perimeter tile drainage system with a tile riser observation point and a collection sump are planned to manage any potential seasonal water table at or below the concrete below-building manure storage for building P3 (South Gestation).

Design Summary _ Building 10P – South Gestation

A perforated perimeter tile drainage system with a tile riser observation point located at the northeast corner of building P3 will be used to collect and direct groundwater away from the building foundation. Groundwater from the tile riser observation sump will be pumped to a surface rock distributor located at least 50 feet from the proposed concrete manure storage. The rock distributor outlet is at least 50 feet from the property boundary in the direction of water flow. Water from the rock distributor will be directed to a grassed infiltration area and is planned to join the natural drainage patterns around the building.

The following details pertain to the seasonal water table management system plans for the below-ground concrete storage structures.

<u>4" Diameter Perforated Drainage Tile (Option 1)</u>

1. Perimeter subsurface drainage tile. A perforated 4"diameter drainage tile is to be placed around the foundation of the concrete manure storage tank.
2. The drainage tile will be installed approximately 96 inches from the side of the concrete manure storage side wall when a 5'-4" x 6'-8" O.D. manure pump out annex is used and approximately 40 inches from the end of the concrete manure storage tank end wall.
3. The drainage tile will be installed approximately 72 inches from the side of the concrete manure storage side wall when a 5'-4" x 4'-8" O.D. manure pump out annex is used and approximately 40 inches from the end of the concrete manure storage tank end wall.
4. The beginning of the perimeter tile will be located approximately 17" below the floor elevation. The perimeter tile slopes 0.25% to the collection sump. The perimeter tile will be installed to drain the seasonal water table to a common collection point. Each segment of the drainage tile will be installed to begin at the opposite corner of the building from the collection sump.

<u>4" Diameter Perforated Drainage Tile (Option 2)</u>

5. Perimeter subsurface drainage tile. A perforated 4"diameter drainage tile is to be placed around the foundation of the concrete manure storage tank.

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CONFINED FEEDING OPERATIONS
March 11, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

Perimeter Tile System Design:

In accordance with 327 IAC 19-12-2(a)(5), a perimeter tile system is proposed to lower the seasonal water table below the bottom of the waste management system. Groundwater flows through the soil adjacent to the concrete manure storage and is collected and drained away by the perimeter tile. The perimeter tile collects ground water and transfers the water to the collection/observation sump. A pump is used to pump water from the collection/observation sump to a rock outlet. The rock outlet is used to dissipate the energy in the water and distribute the water in sheet flow to an infiltration area.

Rate of soil water flow, Q:
To determine the required perimeter tile capacity, the rate of soil water flow to the tile is determined. The soil properties determine the rate water flows toward the perimeter tile and the amount of water presented to the tile to be collected and drained away by the perimeter tile. Darcy's law is used to determine the ability of water to flow through the soil to the perimeter tile. The rate of water flow is determined as follows.

$Q = K \times A \times \Delta h \div \Delta L$

Q = rate of water flow (volume per time), gpm/ft of tile

K = hydraulic conductivity, μm/sec

A = cross-sectional area of flow area per foot of tile, ft^2/ft

Δh = hydraulic head, ft

ΔL = distance of hydraulic head change, ft

Determine average tile depth below top of pit floor:

The perimeter tile is installed in two segments. The top of pit floor elevation is assumed to be 100'-0". The starting elevation of the perimeter tile at the point of beginning is 98'-7". The perimeter tile enters the collection/observation sump at an elevation of 97'-4". The average tile depth below the floor is:

d_a = 100'-0" – [(98'-7" + 97'-4") ÷ 2] = 2'-0.5" (24.5)

Assuming the bottom of the pit floor is 96" below the ground surface and the average tile depth below the top of the pit floor is 24.5", the tile is located 115.5" (96" -5" + 24.5") below the ground surface.

Determine hydraulic conductivity, K:

The on-site soil investigation identified the soil properties and presence or absence of a seasonal water table. Three (3) soil borings were completed. The three (3) soil borings indicated a seasonal water table within the depth of the soil boring and profile. The seasonal water table depth below the existing ground surface within the three (3) soil borings is:

- 10" (boring #1, east boring),
- 21" (boring #2, middle boring,
- 7" (boring #3, west boring)

The depth of the bottom of the foundation and floor of the gestation building (P3) will be located approximately 60" to 96" below the existing ground surface. A depth of 96" is used in the analysis. A perimeter tile seasonal water table management system is proposed for the gestation building for the soil properties described by the soil borings.

The seasonal water table management system perimeter tile is designed based on the soil properties described by the representative soil borings within the building footprint and adjacent to and within 50 feet of the building where a seasonal water table exists. Three (3) borings located within the building footprint are evaluated to determine the controlling conditions. There are no other borings within 50 feet of the building.

The on-site soil investigation describes the soil textures within the soil profile of the boring and identifies the depth of the seasonal water table. The information from the on-site soil investigation is summarized below.

Building P3 – South Gestation
Boring #1 (east boring):

Depth	Texture
0"-10"	silt loam (ML)
10"-18"	silt loam (ML)
18"-28"	clay loam (CL)
28"-42"	clay (CH)
42"-56"	silt loam (ML)
56"-96"	sandy loam (SM)
96"-132"	silt loam (ML)

Seasonal water table – 10" below surface

Boring #2 (middle boring):

Depth	Texture
0"-10"	silt loam (ML)
10"-21"	clay (CH)
21"-31"	clay (CH)
31"-41"	clay (CH)
41"-52"	clay loam (CL)
52"-92"	sandy loam (SM)
92"-132"	silt loam (ML)

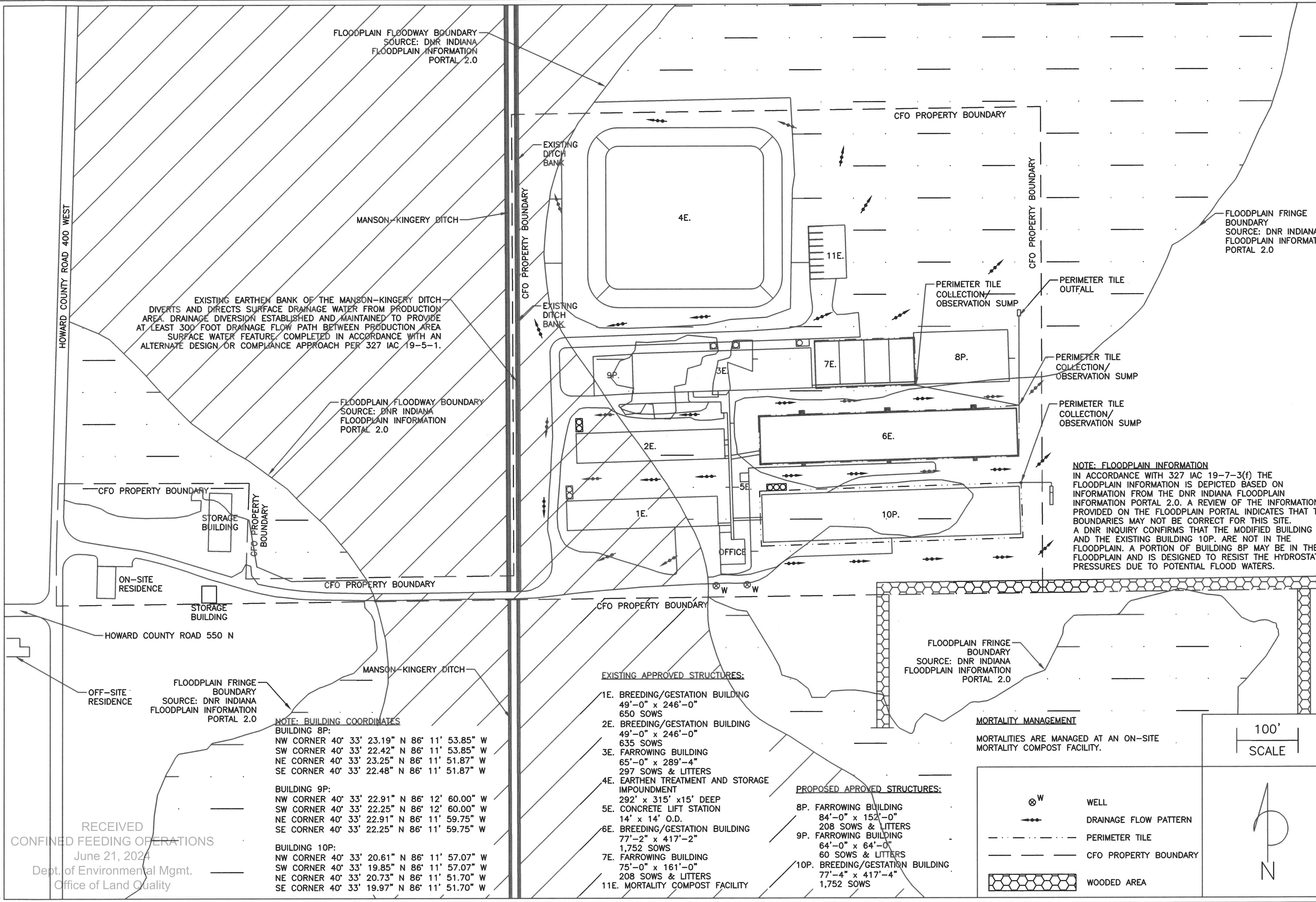
Seasonal water table – 21" below surface

Boring #3 (west boring):

Depth	Texture
0"-7"	silt loam (ML)
7"-18"	clay loam (CL)
18"-38"	clay (CH)
38"-48"	clay (CH)
48"-56"	clay loam (CL)
56"-72"	silt loam (ML)
72"-132"	sandy loam (SM)

Seasonal water table – 7" below surface

The hydraulic conductivity of the soils is determined based on information available from the Natural Resource Conservation Service (NRCS), "Saturated Hydraulic Conductivity in Relation to Soil Texture". The NRCS information provides a range of saturated hydraulic conductivities in µm/sec for groups of soils by textural class. The values are summarized in the following Table 1. The average soil hydraulic conductivity values for each soil textural classification are used for a representative design. The average hydraulic conductivity values have been converted to ft/min and in/hr for ease of use in the calculations.



NOTE: FLOODPLAIN INFORMATION

IN ACCORDANCE WITH 327 IAC 19-7-3(f) THE FLOODPLAIN INFORMATION IS DEPICTED BASED ON INFORMATION FROM THE DNR INDIANA FLOODPLAIN INFORMATION PORTAL 2.0. A REVIEW OF THE INFORMATION PROVIDED ON THE FLOODPLAIN PORTAL INDICATES THAT THE BOUNDARIES MAY NOT BE CORRECT FOR THIS SITE. A DNR INQUIRY CONFIRMS THAT THE MODIFIED BUILDING 9P. AND THE EXISTING BUILDING 10P. ARE NOT IN THE FLOODPLAIN. A PORTION OF BUILDING 8P MAY BE IN THE FLOODPLAIN AND IS DESIGNED TO RESIST THE HYDROSTATIC PRESSURES DUE TO POTENTIAL FLOOD WATERS.

NOTE: BUILDING COORDINATES

BUILDING 8P:
NW CORNER 40° 33' 23.19" N 86° 11' 53.85" W
SW CORNER 40° 33' 22.42" N 86° 11' 53.85" W
NE CORNER 40° 33' 23.25" N 86° 11' 51.87" W
SE CORNER 40° 33' 22.48" N 86° 11' 51.87" W

BUILDING 9P:
NW CORNER 40° 33' 22.91" N 86° 12' 60.00" W
SW CORNER 40° 33' 22.25" N 86° 12' 60.00" W
NE CORNER 40° 33' 22.91" N 86° 11' 59.75" W
SE CORNER 40° 33' 22.25" N 86° 11' 59.75" W

BUILDING 10P:
NW CORNER 40° 33' 20.61" N 86° 11' 57.07" W
SW CORNER 40° 33' 19.85" N 86° 11' 57.07" W
NE CORNER 40° 33' 20.73" N 86° 11' 51.70" W
SE CORNER 40° 33' 19.97" N 86° 11' 51.70" W

EXISTING APPROVED STRUCTURES:

1E. BREEDING/GESTATION BUILDING
49'-0" x 246'-0"
650 SOWS
2E. BREEDING/GESTATION BUILDING
49'-0" x 246'-0"
635 SOWS
3E. FARROWING BUILDING
65'-0" x 289'-4"
297 SOWS & LITTERS
4E. EARTHEN TREATMENT AND STORAGE IMPOUNDMENT
292' x 315' x15' DEEP
5E. CONCRETE LIFT STATION
14' x 14' O.D.
6E. BREEDING/GESTATION BUILDING
77'-2" x 417'-2"
1,752 SOWS
7E. FARROWING BUILDING
75'-0" x 161'-0"
208 SOWS & LITTERS
11E. MORTALITY COMPOST FACILITY

PROPOSED APROVED STRUCTURES:

8P. FARROWING BUILDING
84'-0" x 152'-0"
208 SOWS & LITTERS
9P. FARROWING BUILDING
64'-0" x 64'-0"
60 SOWS & LITTERS
10P. BREEDING/GESTATION BUILDING
77'-4" x 417'-4"
1,752 SOWS

MORTALITY MANAGEMENT

MORTALITIES ARE MANAGED AT AN ON-SITE MORTALITY COMPOST FACILITY.

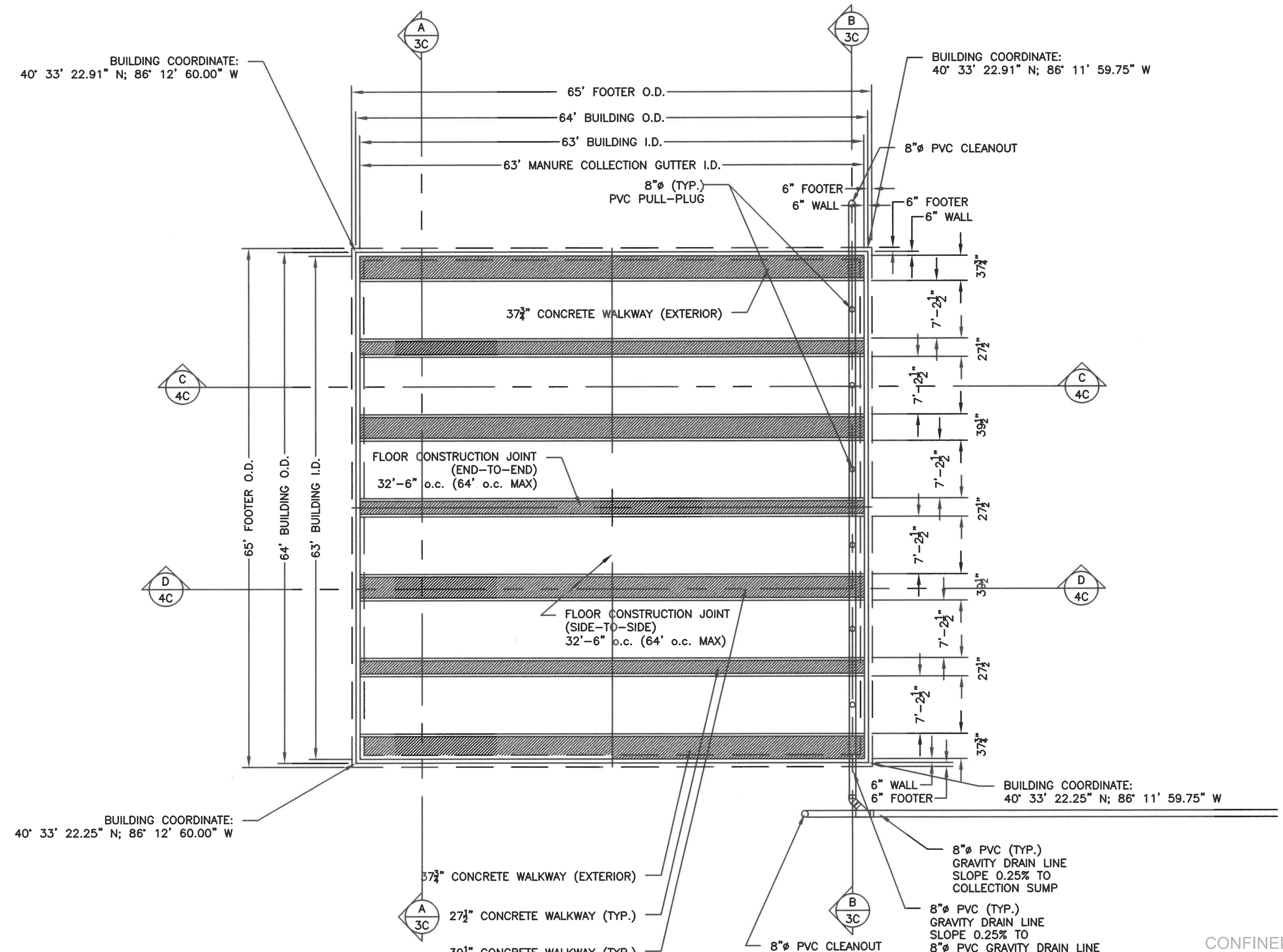
W	WELL
	DRAINAGE FLOW PATTERN
	PERIMETER TILE
	CFO PROPERTY BOUNDARY
	WOODED AREA

TOP GRADE PRODUCTION LLC
2667 EAST STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713

FARMSTEAD PLAN
BUILDING SITE DETAILS
SECTION 4 T24N R3E

DATE: 06/03/24 | DRAWN BY: MV | SHEET: 2A of 2A | DRAWING NO: TGP0324-02A

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143



FARROWING BUILDING
64'-0" x 64'-0" O.D.
6-ROWS; 10 STALLS PER ROW
60 SOWS AND LITTERS

RECEIVED
CONFINED FEEDING OPERATIONS
June 21, 2024
Dept. of Environmental Mgmt.
Office of Land Quality

NOTE:
ALL CONCRETE USED ON MANURE TANK WALLS AND FLOORS, BEAMS, AND COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFICALLY NOTED.

DRAWING NO: TGP0424- 02C

SHEET: 2C of 8C

DATE: 06/20/24 | DRAWN BY: MV

LIVESTOCK ENGINEERING SOLUTIONS, INC.
MICHAEL A. VEENHUIZEN
2967 S. HONEY CREEK ROAD, GREENWOOD, IN 46143

FARROWING BUILDING
FOUNDATION PLAN
BUILDING 9P

TOP GRADE PRODUCTION LLC
2667 E STATE ROAD 18
KOKOMO, INDIANA 46901
2024 CFO RENEWAL-#3713