PROPERTY TAX INCENTIVE APPLICATION FOR

THARALSDON ETHANOL

(Ryan Aasheim)

SUGGESTED MOTION:

Move to participate in the request for a Payment In Lieu of Taxes (PILOT) in the City of Casselton submitted by Theraldson Ethanol to construct a new facility for up to a ten-year period.

OR

Move to **NOT** participate in the request for a Payment In Lieu of Taxes (PILOT) in the City of Casselton submitted by Theraldson Ethanol to construct a new facility for up to a ten-year period.

CASS COUNTY GOVERNMENT

Equalization Department

Box 2806
211 Ninth Street South
Fargo, ND 58103

Telephone: 701-241-5616
Fax: 701-241-5729
assessor@casscountynd.gov

MEMO

To: Cass County Commission

From: Paul Fracassi, Director of Equalization

Date: November 8th, 2021

Subject: Tharaldson Ethanol Plant – PILOT

Dear Commissioners,

I have reviewed the information supplied by Tharaldson Ethanol regarding their application for Payments in Lieu of Taxes for 10 years at an annual amount of $100 per year. The main purpose of my review was to develop a realistic understanding of what the valuation will be after completion. I reached out to facility managers and Mr. Aasheim to help assist with this question, but they were not able to develop a conclusion as of my writing of this memo.

The application shows that new construction costs total $23,825,875 with an additional $32,318,875 in machinery in equipment. Typically, facilities of this nature do not reach a value for taxation purposes equal to or above their construction costs. This is often the result of state guidelines which determine what components are valued as real versus personal property.

While it is difficult to determine the value prior to completion, I would estimate the new construction would be valued around $5-7 million dollars. This estimate is based on a review of the plans that were provided with the application. Below is an estimated tax projection:

Market Value (Est):	$5,000,000	$7,000,000
Taxable Value:	$250,000	$350,000
Consolidated Mill:	195.77	195.77
Estimated Taxes:	$48,942.50	$68,519.50

The current value of the facility is $66,479,500 and the 2021 taxes are estimated to total $650,734.59.

Sincerely,

Paul Fracassi

Paul Fracassi
Director of Equalization

Application For Property Tax Incentives For New or Expanding Businesses

N.D.C.C. Chapter 40-57.1

Project Operator's Application To Cass
City or County

File with the City Auditor for a project located within a city; County Auditor for locations outside of city limits.

A representative of each affected school district and township is included as a non-voting member in the negotiations and deliberation of this application.

This application is a public record

Identification Of Project Operator

1. Name of project operator of new or expanding business: Tharaldson Ethanol
2. Address of project: 3549 153rd Ave SE
   City: Casselton County: Cass
3. Mailing address of project operator: 3549 153rd Ave SE
   City: Casselton State: ND Zip: 58012
4. Type of ownership of project
   - ☐ Partnership
   - ☐ Subchapter S corporation
   - ☐ Individual proprietorship
   - ☐ Corporation
   - ☐ Cooperative
   - ☑ Limited liability company
5. Federal Identification No. or Social Security No.: 20-5803864
6. North Dakota Sales and Use Tax Permit No.: 20-5803864-01
7. If a corporation, specify the state and date of incorporation:
8. Name and title of individual to contact: Corey Aanenson, EH&S Manager or Kari Deery, Controller
   Mailing address: 3549 153rd Ave SE
   City, State, Zip: Casselton, ND, 58012 Phone No.: 701-347-4000

Project Operator's Application For Tax Incentives

9. Indicate the tax incentives applied for and terms. Be specific.

   ☐ **Property Tax Exemption**
   - _____ Number of years
   - _____ Percent of exemption

   ☑ **Payments In Lieu of Taxes**
   - 2023 Beginning year 2033 Ending year
   - $100 Amount of annual payments (attach schedule if payments will vary)

10. Which of the following would better describe the project for which this application is being made:
    - ☑ New business project
    - ☐ Expansion of a existing business project

24734
(Rev. 2/14)

Description of Project Property

11. Legal description of project real property

~~TOWNSHIP 140 N, RANGE 52 W, Section 33. Two story insulated metal siding Processing Building , Protein Dryer, MCC~~ Room, pipe/ duct/ conveyor supports, and Protein Storage and Loadout of Two (2) 1,200 ton silos or three (3) 700 ton silos with load out facilities for both truck and rail car.

12. Will the project property be owned or leased by the project operator? ☑ Owned ☐ Leased

If the answer to 12 is leased, will the benefit of any incentive granted accrue to the project operator?
☐ Yes ☐ No

If the property will be leased, attach a copy of the lease or other agreement establishing the project operator's benefits.

13. Will the project be located in a new structure or an existing facility? ☑ New construction ☐ Existing facility

If existing facility, when was it constructed? _____

If new construction, complete the following:

a. Estimated date of commencement of construction of the project covered by this application November 2021

b. Description of project to be constructed including size, type and quality of construction
High Protein Project (Fluid Quip Technologies) - Two story insulated metal siding Processing Building (approximately 144ft L x 70ft W x 50ft H) with standing seam insulated metal decking roof, a bridge crane. For details, reference the pdf document labeled as "MSC Design Base Document Tharaldson".

c. Projected number of construction employees during the project construction 150 Contract Employees

14. Approximate date of commencement of this project's operations November 2022

15. Estimated market value of the property used for this project:

a. Land ..... $ _____

b. Existing buildings and structures for which an exemption is claimed ..... $ _____

c. Newly constructed buildings and structures when completed ..... $ 23,825,875

d. Total ..... $ 23,825,875

e. Machinery and equipment ..... $ 32,318,875

16. Estimate taxable valuation of the property eligible for exemption by multiplying the market values by 5 percent:

a. Land (not eligible) .....

b. Eligible existing buildings and structures ..... $ _____

c. Newly constructed buildings and structures when completed ..... $ 1,191,293.75

d. Total taxable valuation of property eligible for exemption (Add lines b and c) ..... $ 1,191,293.75

e. Enter the consolidated mill rate for the appropriate taxing district ..... .19577 0.27

f. Annual amount of the tax exemption (Line d multiplied by line e) ..... 233,219.57 $ 326,807.61

Description of Project Business

Note: "project" means a newly established business or the expansion portion of an existing business. Do not include any established part of an existing business.

17. Type of business to be engaged in: ☑ Ag processing ☐ Manufacturing ☐ Retailing ☐ Wholesaling ☐ Warehousing ☐ Services

18. Describe in detail the activities to be engaged in by the project operator, including a description of any products to be manufactured, produced, assembled or stored (attach additional sheets if necessary).

Fluid Quip Technologies' MSC protein technology will be implemented to improve flexibility and profitability by producing higher-value proteins and corn oil in a sustainable manner that will trade at a value substantially higher than DDGS. The target for this project is to generate a nominal rate of 3.5 lb/bu of protein product at 7-8% moisture and 1.1 lb/bu of corn oil. For details, please reference the pdf document labeled "MSC Design Base Document Tharaldson".

19. Indicate the type of machinery and equipment that will be installed

Wet Scrubber, Fluid Quip MZSA Paddle Screens, Pressure Screens, Clarifier Centrifuges, Centrifuges, Alfa Laval Protein Decanters, DXP Pumps, JT Cullen Tanks, Proquip Agitators, BCI Drag Conveyors, and Engineering Screw Conveyors. Please see the pdf document labeled as "MSC Design Base Document Tharaldson" for details.

20. For the project only, indicate the projected annual revenue, expense, and net income (before tax) from either the new business or the expansion itself for each year of the requested exemption.

Year *(12 mo. periods)*	New/Expansion Project only Year 1	New/Expansion Project only Year 2	New/Expansion Project only Year 3	New/Expansion Project only Year 4	New/Expansion Project only Year 5
Annual revenue	43,200,000	43,200,000	43,200,000	43,200,000	43,200,000
Annual expense	8,000,000	8,600,000	8,600,000	8,600,000	8,600,000
Net income	34,500,000	34,600,000	34,600,000	34,600,000	34,600,000

21. Projected number and salary of persons to be employed by the project for the first five years:

Current positions & positions added the initial year of project

# Current Positions		New Positions Under $13.00	New Positions $13.01-$15.00	New Positions $15.01-$20.00	New Positions $20.01-$28.00	New Positions $28.01-$35.00	New Positions Over $35.00
					13	1	1

Year		(Before project)	Year 1	Year 2	Year 3	Year 4	Year 5
No. of Employees	(1)	0	13	15	15	15	15
	(2)						
Estimated payroll	(1)	0	975,000	1,001,4[illegible]	1,028,4[illegible]	1,056,2[illegible]	1,084,7[illegible]
	(2)						

(1) - full time
(2) - part time

Previous Business Activity

22. Is the project operator succeeding someone else in this or a similar business? ☐ Yes ☑ No

23. Has the project operator conducted this business at this or any other location either in or outside of the state?

☐ Yes ☑ No

24. Has the project operator or any officers of the project received any prior property tax incentives? ☑ Yes ☐ No

If the answer to 22, 23, or 24 is yes, give details including locations, dates, and name of former business (attach additional sheets if necessary).

~~Tharaldson Ethanol has received tax exemption for the build of the original facility, 2008 to 2018, for first 10 years.~~

Business Competition

25. Is any similar business being conducted by other operators in the municipality? ☐ Yes ☑ No

If YES, give name and location of competing business or businesses

Percentage of Gross Revenue Received Where Underlying Business Has ANY Local Competition %

Property Tax Liability Disclosure Statement

26. Does the project operator own real property in North Dakota which has delinquent property tax levied against it? ☐ Yes ☑ No

27. Does the project operator own a greater than 50% interest in a business that has delinquent property tax levied against any of its North Dakota real property? ☐ Yes ☑ No

If the answer to 26 or 27 is Yes, list and explain

Use Only When Reapplying

28. The project operator is reapplying for property tax incentives for the following reason(s):

☐ To present additional facts or circumstances which were not presented at the time of the original application

☐ To request continuation of the present property tax incentives because the project has:

- ☐ moved to a new location
- ☐ had a change in project operation or additional capital investment of more than twenty percent
- ☐ had a change in project operators

☐ To request an additional annual exemption for the year of _____ on structures owned by a governmental entity and leased to the project operator. (See N.D.C.C. § 40-57.1-04.1)

Notice to Competitors of Hearing

Prior to the hearing, the applicant must present to the governing body of the county or city a copy of the affidavit of publication giving notice to competitors unless the municipality has otherwise determined there are no competitors.

I, Corey Aakenson, do hereby certify that the answers to the above questions and all of the information contained in this application, including attachments hereto, are true and correct to the best of my knowledge and belief and that ~~no relevant fact~~ pertaining to the ownership or operation of the project has been omitted.

Signature	Title	Date
Corey Aakenson	EH&S Manager	10-20-21

PRIVACY ACT NOTIFICATION

In compliance with the Privacy Act of 1974, disclosure of a social security number or Federal Employer Identification Number (FEIN) on this form is required under N.D.C.C. §§ 40-57.1-03, 40-57.1-07, and 57-01-15, and will be used for tax reporting, identification, and administration of North Dakota tax laws. Disclosure is mandatory. Failure to provide the social security number or FEIN may delay or prevent the processing of this form.

Certification of Governing Body (To be completed by the Auditor of the City or County)

The municipality shall, after granting any property tax incentives, certify the findings to the State Tax Commissioner and Director of Tax Equalization by submitting a copy of the project operator's application with the attachments. The governing body, on the _____ day of _____, 20____, granted the following:

☐ **Property Tax Exemption**

_____ Number of years

_____ Percent of exemption

☐ **Payments in lieu of taxes**

_____ Beginning year _____ Ending year

_____ Amount of annual payments (Attach schedule if payments will vary)

_____
Auditor

DESIGN BASIS DOCUMENT

FOR

INTEGRATION OF MSC™ PROCESS INTO THE THARALDSON ETHANOL FACILITY

WITH A PROCESSING CAPACITY FOR A

160 MMGPY FUEL GRADE ETHANOL

FOR

THARALDSON ETHANOL

By

FLUID QUIP TECHNOLOGIES

Note:

Contents

1.0 Production Capacity

The facility will be designed to process #2 Yellow Dent Corn with the following characteristics from historical corn analysis for the plant:

Corn Composition			
	Wet basis %	lb/bu	Dry basis
Corn Weight, lb/bu		56.00	47.49
Starch	61.93%	34.68	73.02%
Fat	3.22%	1.80	3.80%
Protein	6.90%	3.86	8.13%
Ash	1.31%	0.73	1.55%
Sugar	1.31%	0.73	1.55%
Fiber	10.14%	5.68	11.96%
Water	15.19%	8.51	
TOTAL	**100.0%**	**56.00**	**100.0%**

The facility will process the following volume of corn:

Corn, Bu/day: 157,505 bu/day

The major components and targeted co-product yields are:

Ethanol anhydrous (UnDenatured): 2.92 gal/bu
52% as is protein product: 3.50 lb/bu
Total oil: 1.1 lb/bu
DDGS: 9.23 lb/bu

2.0 Products

Ethanol

Ethanol production volume will be unchanged as a result of the MSC™ project. MSC™ is being designed to support 160 million gallons per year nameplate with a maximum production of 180 million gallons per year of ethanol production.

52% Protein (Still Pro 50™)

The MSC™ project is planned to be designed to implement equipment to generate a high-grade protein product from whole stillage that will trade at a value substantially higher than DDGS. The target for this project is to generate a nominal rate of 3.5 lb/bu of protein product at 7-8% moisture.

DDGS

The amount of DDGS produced will decrease as protein is being removed from whole stillage. The new DDGS stream from the DDGS dryers will have pro-fat close to 28% when the 52% protein product is at design yield. The future estimated DDGS and today's DDG/ Modified yields are calculated as:

	DDG/Modified Today			DDGS New		
	lb/bu	Percent	% on DMB	lb/bu	Percent	% on DMB
Protein	4.04	27.88%	31.39%	2.21	21.16%	23.77%
Oil	1.01	6.99%	7.87%	0.68	6.55%	7.36%
Other	7.81	53.93%	60.73%	6.40	61.29%	68.86%
Water	1.62	11.20%		1.15	11.00%	
Total Yield	14.48	100.00%	100.00%	10.44	100.00%	100.00%
Pro/Fat	5.05	34.87%	39.27%	2.89	27.71%	31.14%
DMB totals	12.86			9.29		

Corn Oil

The backend of the ethanol production process is expected to yield approximately 1.1 lb/bu of oil with the implementation of the MSC™ technology. No accommodation for additional de-oiling or storage of final oil product is planned as part of the detailed engineering deliverables. The use of emulsion breakers may still be required to get higher oil yields.

The MSC™ process will enable more corn oil to be recovered as follows (provided down streams system (i.e. syrup oil decanter) can fully capture the additional free oil generated with the MSC system.):

	Oil Today		Oil New	
	lb/bu	Percent	lb/bu	Percent
Protein	0.00	0.00%	0.00	0.00%
Oil	0.79	99.00%	1.09	99.00%
Other	0.00	0.00%	0.00	0.00%
Water	0.01	1.00%	0.01	1.00%
Total Yield	0.80	100.00%	1.10	100.00%

3.0 Major Capital Assumptions

The following are assumptions made during the conceptual phase of the project and have a large impact on the capital cost of the project. They are listed in no particular order as follows:

a. The maximum protein production is dictated by the size of the protein dryer selected. The current size of the dryer is based on a nominal evaporation rate of 56,000lb/hr of water assuming a 680°F dryer hot air temperature. The process is being designed to incorporate one (1) dryer. Product will be dried to 6-10% moisture. A wet scrubber will be installed to reduce the particulate load of the dryer exhaust vapors prior to the existing RTOs.

b. Facility is designed to run 355 days per year.

c. Facility should be able to turn down to about 50% of its normal operational capacity to handle running reduced rate and for start-up.

d. A new process building will be added to house the new MSC™ process that will be about 144ft L x 70ft W x 50 ft H. This MSC building will house the major "wet" MSC equipment (Pressure Screen, MZSA, Clarifier, Protein Decanter, Tanks and associated pumps).

e. The process is being designed to incorporate FQT's Patented MSC™ protein separation process.

f. The process is being designed to incorporate five (5) Fluid Quip MZSA paddle screens.

g. The process is being designed to incorporate five (5) FQ3000 fiber centrifuges.

h. The process is being designed to incorporate five (5) Fluid Quip clarifier centrifuges, FQC-950T-E.

i. The process is being designed to incorporate sixteen (16) Fluid Quip pressure screen tri-boxes, FQ PS-Triple.

j. The process is being designed to incorporate seven (7) new Alfa Laval SG3-805 decanters for protein dewatering.

k. The process is being designed to incorporate four (4) trough-bottom tanks with 12ft diameter trough and 12ft internal height split with solid baffles into eight (8) compartments.

    - (1) 50 ft length (Clarifier Overflow Tank, Pressure Screen Feed, Acid Wash)
    - (1) 50 ft length (Clarifier Feed, Fiber Dewatering Feed)
    - (1) 50 ft length (Filtration Feed)
    - (1) 50 ft length (Dilute Stillage Backset, Protein Decanter Feed Tank)

l. The process tanks will be designed with a total of nine (9) agitators.

m. The process is being designed to incorporate ten (10) centrifugal pumps, and one (1) sump pump.

n. The 52% protein will be removed post distillation from the whole stillage stream.

o. Protein dewatering will produce a 25-30% solids protein cake prior to drying.

p. The process is designed to use flash drying. Dryers will each be in a standalone structure (approx. 56ft W x 65ft L x 150ft H).

q. The protein dryers bleed-off exhaust stream will route to Dryers existing RTOs after passing through a scrubber to remove solid particulates.

r. Product from flash dryer will be cooled by a pneumatic cooling tube and collected in a filter baghouse receiver.

s. Product from cooling system will be mechanically conveyed to the storage silos.

t. The system will have two (2) storage silos holding about 1200 Tons per silo or three (3) 700 Tons (about 7 days of planned production) of material. The storage silos are adjacent to the truck loadout facility.

u. New protein loadout is being designed and constructed to load into bulk trucks as well as rail cars.

v. For the truck loadout, the protein product will be conveyed from the silos through a bucket elevator and then through gravity magnets and then into the truck loadout drag conveyor.

w. For rail loadout, the protein product will be conveyed from the silos through a bucket elevator and then through gravity magnets and then into the rail loadout drag conveyor. The wet processing equipment generally will be 304SS stainless steel unless noted otherwise.

x. Process water is designed to be used as seal water for all pumps.

y. Existing steam boiler is adequate to provide steam for new MSC™ building.

z. MSC steam users will be an indirect Cookwater Heater (~15MMBtu/hr) and direct steam injection for Acid Wash Heating (Maximum ~2MMBtu/hr) that will operate when needed.

aa. Existing natural gas header after main pressure reduction station is expected to be adequate to provide gas to new dryers.

bb. New DDGS product from the MSC™ process will be fed to existing dryers.

cc. Off-spec Protein Product will be diverted via conveyers to Dryer 2's DDGS cooler and transferred to the DDGS barn.

dd. A new MCC room will be added to the MSC™ Building to house new electrical gear for the MSC™ equipment.

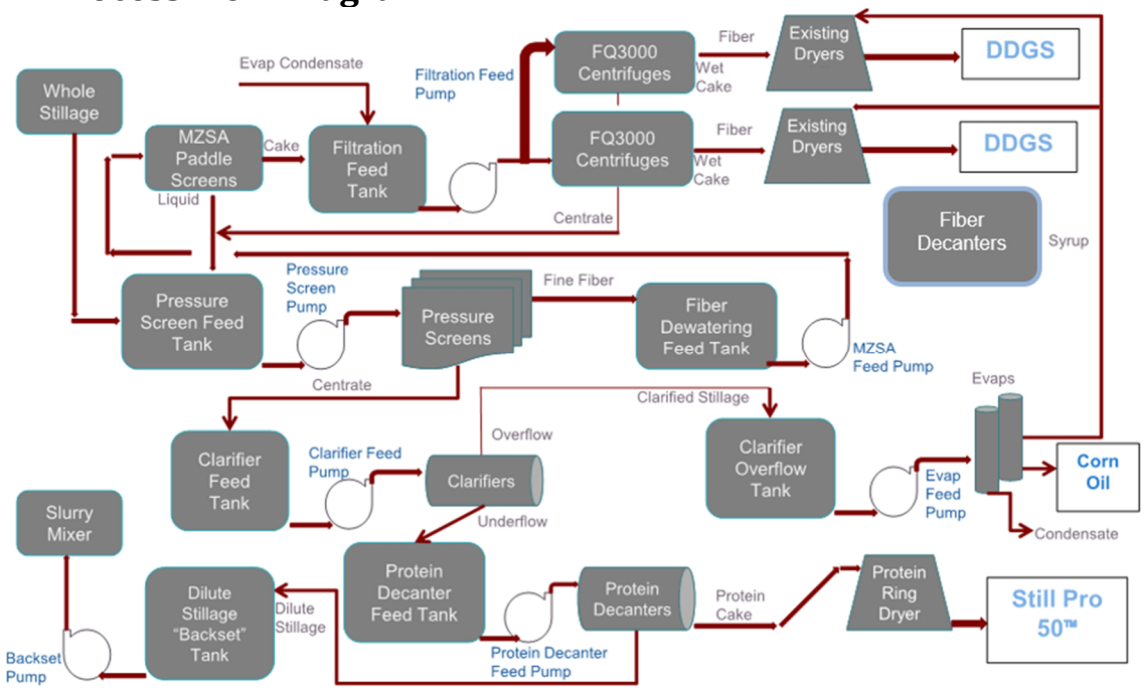
ee. The existing fire loop will provide fire protection in the dryer structure with duct deluge nozzles.

ff. FQT to determine if existing air compressors/ dryers are adequate to provide the required flowrate.

gg. There are no unidentified underground commodities. Ground penetrating radar scan has confirmed this.

hh. There are no adverse soil conditions within the project construction area. Soil borings and geotechnical report have been completed. Pilings and Foundations will be built according to the boring and geotechnical findings.

4.0 Process Flow Diagram



5.0 Project Description

5.1. Process Building

A new process building to house the MSC™ process will be installed south of the existing wet pad. The new building will be approximately 144ft L x 70ft W x 50ft H and will house FQT equipment, protein decanters, tanks, pumps, and agitators (main process equipment is described in detail in section 5.18). The building will also have control room and simple lab area.

The building will include two stories. The first floor will contain all process tanks and pumps, the motor control center (MCC), and an area for the Dryer quench steam and deluge water isolation valves. The second floor will contain the MSC processing equipment and a control room.

A bridge crane will be installed above the 2nd floor equipment to allow for maintenance access. A separate (exterior) stair tower will also provide egress from the 2nd floor structure to the ground level. The walls will be insulated metal siding and roof will be standing seam insulated metal decking. The building will be designed with a ventilation system to maintain +10F above ambient using wall fans and wall louvers. All floors or platforms will be in increments of 7". Stairs will be 7" rise, 11" run where permissible and per code. Building will be designed with an

interior pipe rack that will be supplied in structural steel package. All elevated floor slabs will slope to a trench drain and then to a 1st floor sump.
An additional exit door will be located on the second floor that will connect to the dryer structure via a walk bridge.

Approximate Relative Building Elevations:
First Floor Elevation – 0'-0"
Second floor elevation – ~26'-0"
Roof line elevation – ~50' 0"
Roof slope – 1" per ft
All curbs 7" tall x 6" wide
Floor slope – will vary depending on location of sump

First floor will contain a trench drain (~18" wide) and sump (~5'x5'x5') for floor drainage. First floor will contain a perimeter curbing 7" in height. The process sump will discharge any floor collection back to either the fiber slurry tank or the existing beer well.

Second floor is designed with a trench drain that will discharge into the first-floor sump. Second floor will contain perimeter curbing 7" in height. All door landings will be 7" tall x 3 ft square.

The first floor will have 2 personnel access doors, as well as two 10 ft electric rollup doors. In addition, there is one 20 ft electric rollup door at the second-floor laydown area.

One air receiver tank will be installed on the first floor and tied into the plant air system.

Due to the proximity of the MSC building to the existing Ethanol storage, the south and east sides of the building will have additional fire protection. This will be provided through increased fire rated materials of construction or additional sprinkler systems.

5.2. Protein Dryer

The protein decanter cake will be conveyed to the dryer paddle mixer via a series of drag conveyors.

One (1) 56,000 lb/hr, 680°F (nominal evaporation rate and dryer inlet temperature with a max capacity of 56,000 lb/hr) adiabatic ring dryer will be installed. The dryers will include a double paddle mixer, dryer in-feed screw, disintegrator, drying column, drying ring, recycle manifold and chute, high efficiency cyclones, cyclone inlet header, cyclone exhaust collection header, cyclone airlocks, 2 recycle screws, 1 recycle airlock, 1 product screw, 2 product airlocks, hammermill, main fan, combustion air fan, exhaust booster fan, miscellaneous dampers, start-up stack and

vapor exhaust to Dryer's RTO system. The dryers will be purchased with a mass flow burner control management system and an ultra-low NOX burner.

The dryer layout, main equipment, ductwork, burner, burner gas train and burner management system along with process engineering will be purchased from dryer manufacturer. Dryer instrumentation, feed and discharge conveyors, hammermill, structural engineering, electrical engineering and civil engineering by FQT.

The dryer structure is designed to be galvanized steel and will be stick framed. There will be approximately 8 working platforms that will be framed and will utilize bar grating. All platforms will be equipped with handrail and toe boards. Each level will be accessible by stairs between levels.

The dryer will be equipped with deflagration panels for the 52% protein material K_{st} and P_{max}. Design values are Kst = 146 bar-m/s and Pmax = 8.4 barg. The dryer will be equipped with a steam snuffing system for fire protection and a secondary protection water deluge system. Water deluge shall be from the existing firewater loop. The water deluge system is to be a dry manually activated system.

The dryer product will discharge to a hammermill for consistent particle size distribution. The milled product will discharge to a negative pressure pneumatic conveying system for cooling. Ambient air will be utilized for transport/cooling air. A screen/filter will be installed on the intake to eliminate foreign particles from the product stream. Product is to be cooled to no higher than 115°F. A moisture reduction of 0.5% in the product is assumed in the cooling duct. The pickup velocity shall be approx. 5500 FPM. The product and transport air will be collected via dust collector. All cloth filter baghouse receivers shall be designed with a 6.0 ACFM:1.0 SF air to cloth ratio, the air will be discharged to atmosphere. This discharge point will be a new emission point.

The dryer will be unclassified except for 5 ft around all venting and manways will be classified as Class II, Division 2, Group G.

Dryer Design Basis:
Total Evaporation Rate – 56,000 lb/hr nominal
Protein Feed Rate from Decanters – 76,747 lb/hr
Protein Product Rate – 23,519 lb/hr
Feed Moisture from Decanters – 70-75% moisture
Paddle Mixer Moisture – 30-38% Moisture
Disintegrator Feed Moisture – 18-25% Moisture
Final Product Moisture – 6-8% moisture
Protein Feed Temperature – 160°F
Protein Product Temperature – 180°F
Dryer Exhaust Temperature – 230°F
Product Bulk Density – 30lb/cf (45lb/cf for equipment motor sizing)
Overall Recycle Rate – 17 lb Recycle : 1 lb dry product

The Dryer manufacturer will provide a standalone PLC to control the burner management system (BMS) and combustion control system (CCS) for the dryer. The PLC will be provided as a subcontract through the dryer supplier. The PLC will include all BMS control logic and combustion control logic with air/gas lead/lag control for mass flow. The initial firing curves will be set by the burner manufacturer after the dryer is installed. The PLC will include hardware burner interlocks per the appropriate NFPA code and connections to the plant DCS via the standard communication protocol to report the status of all instruments. The site DCS will be used for startup/shutdown of all motors and for general interlocks. The PLC will only be used for burner safety interlocks and coordination of air and gas control valves.

Vapors from the Protein Dryer will be taken to the existing RTO. To reduce solids carryover from the dryer to the RTO, FQT will install a scrubber to control the carryover from the dryer. FQT will assess the RTO, scrubber, and dryer systems to confirm that the overall system is appropriately sized for the vapor volume that will be delivered from the new ring dryer.

5.3. MCC Room

A new MCC room will be installed adjacent to the MSC™ building footprint to provide electrical power for all equipment in the building and dryer. The MCC room will have a standalone ventilation and cooling unit. MCC will be masonry CMU wall and concrete roof with metal decking. MCC room will have 8ft x 6ft double doors to access the interior of building. The MCC room will house the switchgear and circuit breakers necessary to power the MSC process equipment.

A new MCC room will also be installed at the new truck storage and loadout facility. In addition, an MCC room will be located at the new rail loadout facility. These rooms will house the switchgear and breakers required to power the loadout equipment.

5.4. Protein Storage and Loadout

Two (2) 1,200 ton silos or three (3) 700 ton silos will be installed to allow for about ~7.0 days of product storage. The silos will be built using bolted steel construction. The silo will not be equipped with a Laidig style reclaimer but will be designed to allow for a future installation, if required. The tank steel will be enamel painted on the interior and exterior.

The silos are designed to reclaim the product at a rate of 100 Ton/hr.

The silos will be designed for center fill. A top mounted level transmitter will be used for level detection.

The protein product will transfer directly to the silo. The silo will be aspirated to a common filter baghouse receiver. This discharge point will be a new emission point.

This aspiration design is different then what is depicted on the emissions PFD, which was submitted for permitting. The submitted emissions PFD shows silo, truck and rail all having their own aspiration system. This was done to allow for maximum flexibility in potential design changes during detailed engineering without effecting the permitting process.

The silos will discharge to a drag conveyor which will feed a bucket elevator, the bucket elevator will feed a drag conveyor that will gravity discharge and be diverted to either truck or rail loadout then through magnets at each location.

The silos will have side wall blast panels designed based on the deflagration values provided above in Section 5.2.

Loadout facilities will be provided for both bulk truck and rail car.

Bulk Truck Loadout:

From the transfer drag conveyor a discharge chute will feed an industrial magnet for metal removal.

The product will discharge into the bulk truck through a retractable dust hood. A certified truck scale will be installed for measuring the truck weight during loading. The dust hood will be aspirated to a standalone filter baghouse. This discharge point will be a new emission point.

FQT will request a typical truck / trailer length to use for loadout design. Based on design throughput, trucks will be loaded in ~ 30 minutes and an average of 12 trucks per day will be required. Each standard truckload holds 20 tons of product.

Due to the proximity of the truck loadout to the existing Ethanol storage, the west side of the building will have additional fire protection. This will be provided through increased fire rated materials of construction or additional sprinkler systems.

Rail Loadout:

The loadout design will be similar to that of bulk truck loading. The final design will provide specific details necessary to accommodate the loading of rail cars. FQT will request a typical rail car configuration to use for loadout design. The rail loadout facility will be located near the existing rails along the east side of the site adjacent to the truck loadout. The protein product will be conveyed via drag

conveyors from the silos to the rail loadout facility using a common drag that also feeds the truck loadout. The standard rail cars hold 100 tons of product each. A standard rail car will be loaded in approximately 1-1.25 hours.

5.5. Pipe/ Duct/ Conveyor Supports

Piping, ducting, and conveyors between the MSC™ building and existing plant facilities will supported by new racks. The conveyors between the MSC ™ Building and the dryers will be supported by a new bridge, including a walkway. The dryers exhaust duct is routed to the existing RTO and will be supported as necessary. The loadout blow line will be supported on a new pipe rack from the dryer structure to the Loadout building.

5.6. Electrical Design

Process Building
Non-rated – General Duty

Protein Dryer
Non-rated with exception of 5 ft radius around any vent or nozzle will be Class II, Division II, Group G, any device penetration the dryer surface will be rated Class II, Division I, Group G.

A 5 ft radius around natural gas vents will be rated Class I Div 2 group D.

Silo / Loadout
Loadout Building and Silo Skirt – Class II, Division I, Group G
Within Silo – Class II, Division I, Group G
Above and outside silo – non-rated with the exception of 5 ft radius around any vent or nozzle will be Class II, Division II, Group G.

Electrical Supply

Electrical Switch Gear – Manufacturer and short circuit current rating to match existing, networked with standardized communication protocol.

MCC's – Manufacturer and short circuit current rating to match existing, networked with standardized communication protocol.

VFD's – Manufacturer to match existing
Equipment – Constant Torque
Pumps – Variable Torque
Features

- Ramp up starts
- Ramp down stops
- Catch speed of motor during restarts

Motors

Mfg.- Toshiba / TECO recommended
<500hp – 480V/3phase/60Hz, s.f – 1.15, TEFC, Premium Efficiency
>500hp – 4160V/3phase/60Hz, s.f – 1.15 (if available), TEFC, Premium Efficiency (WEG or TECO)
VFD motors – to contain grounding bushings, all motors controlled by a VFD will be VFD rated and have a 1.15SF.

Lighting

45- ft candles inside buildings
15 ft candles perimeter lighting
45 ft candles in MCC rooms
All lighting to be LED, 277V, 3phase, 60 Hz
Lighting panels shall be circuit breakers

Heat Trace – Follow plant guidelines to install heat trace for freeze protection on process and utility piping. A new heat trace panel will be installed at the dryer structure, all other heat trace will use existing panels. All piping outside of buildings are to be insulated and heat traced except for steam and condensate.

5.7. Control System Architecture

FQT will design a process control system (PCS) to control the MSC, Dryer and Loadout areas. To control the process, control rooms will be located in both the MSC ™ and Loadout Buildings. Field instrumentation will be wired to Remote I/O panels distributed throughout the process area with communications to the Main Processor located in the MSC ™ electrical room. To incorporate the new PCS into the existing control system architecture, a new fiber optic communication cable will be installed from the MSC ™ electrical room to the existing Energy Center.

5.8. Utilities

5.8.1. Steam

Steam will be fed from the existing plant steam header.

The new Ring Dryer will contain a snuffing steam line. The steam will be routed to the cyclones and ductwork. Steam to the hot box will also be used to maintain

an oxygen level inside the dryers below deflagration limits during dryer startup and shutdown.

The dryers will be supplied with a quench water system that will inject water into the dryers through nozzles installed in the air mix box. The quench water system will provide a drying load for the dryers to maintain a stable temperature during dryer feed upsets. The quench water system will use tower water for operation.

Steam Pressure Available – 110 psig
Condensate returned – all MSC™ and Dryer building traps

5.8.2. Plant Air

Air Design Basis – 100psig, -40F dew point.

Air supply shall be from the existing plant air system. A new air receiver tank will be installed in the MSC ™ Building.

5.8.3. Flush Water

All flushing water shall be from the existing plant methanation water system or similar water source used in the plant today. A new line shall tie into the existing flush water header and shall be routed to the new MSC™ building. The line size will match or exceed the current flush water header size.

5.8.4. Process Water

All process water shall be provided from the existing process water system. A new line will tie into the existing process water header and be routed to the new MSC™ building. Process water will be used for hose stations and emergency flush water on centrifuges. Process water will also be used for seal water makeup.

5.8.5 Natural Gas

All natural gas shall be from the existing natural gas system. A new distribution line shall be routed from the existing natural gas header to the new ring dryer. All added natural gas piping will be above grade. The gas line will be sized to supply gas to the new ring dryer. Design gas usage for each dryer will be ~73,000 SCFH. Natural Gas supply pressure is 40 psig.

5.8.6 Fire Water

A new fire water line will be routed from the existing fire main header into the dryer structure where a dry pipe system will be installed to provide fire water to the dryers. The existing fire main header is maintained at 160 psig. Manual isolation valves will be installed with tamper switches with communication to the DCS.

5.8.7. Roadway/ paving improvements:

Roadway improvements may be necessary on the truck route to provide adequate turn radius and access to the loadout area. The existing gravel road will be paved appropriately to allow for truck access to the new truck loadout.

5.8.8. Relocation of underground utilities:

A ground penetrating radar (GPR) survey will be performed to identify existing underground commodities. This information will be used as appropriate in detailed design development and construction activities. The existing natural gas line and storm sewer will have to be relocated to provide appropriate space for the new MSC ™ and dryer buildings.

5.9. Structural Design Basis

5.9.1 Codes and Standards:

International Building Code 2019

ASCE 7-10 Standard: “Minimum Design Loads for Buildings and Other Structures”.

American Institute of Steel Construction (AISC): “Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design” and referenced codes and standards.

American Concrete Institute: ACI 318 – “Building Code Requirements for Structural Concrete”

5.9.2 Design Loads:

Occupancy Category II

Dead Loads

Structure dead loads based on volume and weight density of the structural material.

Piping and electrical wiring loads 10 psf on the roof horizontal projected area.

Weights of mechanical and electrical equipment according to mechanical and electrical layouts and vendor drawings.

Live Loads

Uniformly distributed live loads on the horizontal projected area:

Operating floors	125 psf
Platforms walkways	100 psf
Stairs	100 psf
Roof live load	20 psf

Wind Load

Design wind speed = 115 mph

Snow Load

Ground snow load = 35 psf

Earthquake Load

Design seismic ground motion characteristics S_s = 0.0586; S_1 = 0.0212

5.10. Foundations

Soil borings will be performed, and a geotechnical report developed. Foundation designs will be based on results of the geotechnical report and the site-specific geotechnical data.

5.11. Elevated Slabs

Elevated Slabs – 3000 psi
Minimum 9in coverage over metal decking
3” composite metal decking, galvanized
12” total thickness including the deck
Curbing 7” height, 6” width
Bent Plate used around perimeter

5.12. Structural Steel

50 ksi steel strength
Hot Dipped Galvanized –Dryer Structure and Loadout Structure
Girts – C Channel with sag rods

5.13. Masonry

8” CMU units
Filled units where rebar present
Foam filled courses when insulation is needed.

5.14. Piping

Piping specifications for the following piping to be released in design engineering:

C1- Category D Fluid Systems - Cooling Water, Potable Water, Chilled Water
C2 - Normal Fluid Systems – Saturated Steam
C4 - Steam & Condensate, Boiler Feed Water
C5- Duct
C7- Natural Gas, Propane
C8 - Firewater (Aboveground)
C10 - Pressure Water Piping
G1 - Category D Fluid Systems – Compressed Air, Water
S1 - Category D Fluid Systems – Aqueous Process Solutions, Fiber Process Mixtures
S3- Category D Fluid Systems – Cook Water, Process Condensate, Thin Stillage, Evaporator Liquid Streams, Syrup
S4 - CIP, Sulfuric Acid Wash, Caustic Solutions
S5 – Duct, Process Aspiration, Process Vent
S6 - Duct, Dryer Exhaust, Dryer Process

5.15. Pipe Supports

Piping support specifications to be released in design engineering.

5.16. Insulation

FQT to follow current plant specification on insulation standard.

5.17. Major Equipment

MZSA Paddle Screens

- Fluid Quip – Supplier
- Cake Discharge to be supplied with Overflow door and bracket for proximity switch
- Centrate collection hopper to be a single discharge design
- Screen flush to be hard piped with automated valves for flushing from DCS
- Feed piping to be close fit (minimize dead legs)
    - Flush piping to be installed for all piping that can be isolated with minimum distance to isolation
- Screen sizing is assumed to be 300 micron in both front and back sections (to be confirmed before purchase)
- MZSA shall be isolated from all piping with a flexible connection
- 100HP Motor to be connected to VFD for paddle speed control
- MZSA must be installed directly above the Filtration Feed Tank
- Cake chutes must have a minimum 60° slope from horizontal
- Centrate piping is designed to be gravity flow.

Pressure Screens

- Fluid Quip - Supplier
- Feed shall be provided to each row of pressure screens. The feed headers of each pressure screen are in a row and will be connected with field fit pipe.
- Feed headers will be installed above the center aisle between screen boxes for straight tube connections between feed header and pressure screen nozzle.
- Each screen box (bi-screen or tri-screen) will have one automated valve installed on the outside nozzle of a screen box. The automated nozzle will be utilized for level control of the Pressure Screen Feed Tank.
- Pressure screen feed is designed at 85 psi at the nozzle exit.
- A drip tray shall be installed under the front and back doors to minimize spills to the building floor.
- Screen Sizing is assumed to be 250-micron (to be confirmed before purchase)
- Pressure Screens to be installed directly above Fiber Dewatering Feed tank
- Cake chutes must have a minimum 60° slope from horizontal
- Centrate piping is to be designed to be gravity flow with maximum 60% fill. Centrate and Cake Piping is used to aspirate the screen box.

Clarifier Centrifuges

- Fluid Quip - Supplier
- Clarifiers must be installed with vibration monitoring and interlock at the following levels:
    - 0.75 in/sec for 5 sec (HIHI) Initiate Shutdown
- Clarifiers are assumed to be installed with Size 32 nozzles (to be confirmed before purchase)
- 300HP C-face motor to be connected to VFD for speed control
- Standalone PLCs with HMI are to be installed to monitor vibration, bearing temperature, and control the lube oil system.
- Centrifuge feed, CIP, and flush water must pass through a 1500-micron rotary strainer before entering centrifuge.
- Emergency flush water (Process Water) must be piped after strainer and designed to supply a minimum of 400 gal to each centrifuge in an emergency shutdown.
- Centrifuge must be isolated from all piping with flexible connections.
- Feed and Overflow piping must be designed to disconnect for bowl removal.
- Overflow piping is designed for gravity flow.

Fiber Centrifuges

- Fluid Quip – Supplier
- Model: FQ3000
- Feed piping to be close fit (minimize dead legs)
    - Flush piping to be installed for all piping that can be isolated with minimum distance to isolation
- Centrifuges must be installed with vibration monitoring and interlock at the following levels:
    - 1.1 in/sec for 5 sec (HI) Initiate Flush
    - 1.7 in/sec for 5 sec (HIHI) Initiate Shutdown
- Centrifuge must be isolated from all piping with flexible connections.
- Centrate collection hopper to be a single discharge design
- Centrate collection hopper and centrate header to be designed with continuous centrate flush to minimize buildup
- Centrate header to be designed to be gravity flow.
- Centrate header to be aspirated on top of header pipe after the last centrifuge. Aspiration to be routed vertically to minimum elevation equal to the centerline of the centrifuge before routing to the aspiration header to minimize backflow into aspiration header.
- Centrifuge collection drag conveyor to have an aspiration take-off adjacent to at least one centrifuge.

Protein Decanters

- Alfa Laval – Supplier
- SG3-805 model
- ~65% collection efficiency on insoluble

- ~10% capture efficiency on solubles
- Design Cake to be 70-75% moisture
- With standalone PLC with HMI communicating to DCS via ethernet
- Starter/VFD by vendor, disconnect by owner
- Standard capacity is 45 ton/day of dried product per SG3-805
- Centrate piping is to be designed to be gravity flow with maximum 60% fill.
- Centrate header to be aspirated on top of header pipe after the last decanter. Aspiration to be routed vertically to minimum elevation equal to the centerline of the decanter before routing to the aspiration header to minimize backflow into aspiration header.
- Decanter collection drag conveyor to have an aspiration take-off adjacent to at least one centrifuge.
- Minimum 750CFM aspiration per Protein Decanter
- Feed Piping is preferred to be routed from below the Decanter to facilitate removal of the feed tube.

Pumps

- Manufacturer – DXP
- Open impellers where fiber is present
- Recessed Vane for slurries
- Reducer on pump inlet is to be eccentric FOT typical. (Exception: highly viscous streams such as fiber slurry and blowdown must be FOB)
- External Seal Pots – API plan 53 provided by AES (Exception: Single mechanical product seals allowed on pumps containing no solids)
- Motors – TEFC, 1.15 sf, VFD rated, vendor to provide Teco or Toshiba motor
- Impellers – 316L SS
- Casing – 316L SS
- Seals – SEPCO Dual Cartridge Mechanical Seal
- Coupling – Rex Omega Series
- OSHA guarding
- CS pump bases
- Pump Isolation valves shall be accessible and located within eyesight of the pump.
- Tank growth must be considered on pump suction piping. Flexible connections must be provided.

Tanks

- Manufacturer – JT Cullen
- 304 SS, Mill finish
- Design, 212F, -6”w.c. to 10” w.c.
- API 650 design basis where applicable
- 24” dia side manways
- 20” dia top manways
- Internal overflow piped to floor with gooseneck vapor seal
- All tanks tied into vent system

- All top process inlets to be field installed with pipe flanged connections
- Process inlet nozzles are allowed in the side wall above the overflow pipe.
- Roof stiffeners on agitated tanks to support agitator loading
- Side wall stiffeners must be a sliding design to compensate for varying growth rates from hot tank wall to cool tank stiffener.
- Tank roof to be accessible for maintenance. Cable to be installed in building structure for fall protection on tank roof. Handrail and toeboard is not to be installed.
- Trough Bottom, Full internal baffle to separate individual tank sections unless otherwise stated.
- Flat roof
- Insulated over 130F

Agitators

- Manufacturer- Proquip
- 3 blade hydrofoil blades, located as close to tank bottom as feasible.
- Motors – TEFC, SF – 1.15, VFD rated
- Agitators controlled by VFD, motor s.f. – 1.15
- Steady bearing mounted to tank bottom required on all agitators
- All agitators must be able to be installed through top or side manway
- Gear box removal without removing shaft from vessel
- Speed ~125 rpm.

Drag Conveyors

- General: limited to 25 degree rise and 100 ft/min speed
- Manufacturer – BCI or similar
- 304 SS casings for wet product, CS for dry products on wear surfaces
- 316 SS chains for wet product, CS for dry products
- Max speed – 100 ft/min at design conditions (Wet Protein Cake design for 50 ft/min)
- Motors – SF – 1.15
- Inclines – max 25 degree where spacing allows
- 10 ft sections
- Take-up on tail end
- Belt driven drives
- All drags tied into vent system
- Try to match existing chain and sizing if possible for spare redundancy
- Minimum 18” paddle spacing on Wet Protein
- Add UHMW at wear points to minimize wear to divider plates
- UHMW Paddles
- Install “ramps” before all wet protein discharges to clean paddles
- Installation of torque arm must be considered on approval drawings.

Screw Conveyors

- Manufacturer – Conveyor Engineering or similar
- 304 SS troughs and covers
- Lid with shroud around screw must be installed on Protein Dryer conveyors to minimize mold growth.
- 304SS screw
- CS shaft with SS cladding
- Motors – SF – 1.15
- Direct drives where possible
- Trough Loading – 45% typical , use CEMA recommendations
- Max speed – 75 rpm at design conditions
- All screws tied into vent system
- Try to match existing screw sizing if possible for spare redundancy
- Drill and tap tail shaft for speed switch installation.

Wall /Roof Fans

- Greenheck - supplier
- Belt driven
- Mounted in wall girts
- Electrically adjustable louvers
- Design based on 95F ambient temp in summer months, must dissipate motor and process heat loads
- Wall/Roof fans to have actuated isolation louvers for winter conditions
- Fans are to be reversible
- Design Louvers for 0.05 “wc pressure drop.

MCC Room HVAC

- Stand alone external split system units
- Integral DX coils and main fan
- Stand alone PLC controller
- Freeze protection coils
- Cooling only, no reheat coils
- 73F, 45% RH summer design conditions

Dust Collectors

- Manufacturer – Schenck
- Medium-Pressure Reverse Air Baghouse Dust Collector
- All Welded - # 10 Ga. Carbon Steel, Heavy Duty Construction Reinforced for -30” W.C.
- External Seam Welds Continuous
- Internal Product Contact Seam Welds Continuous (Ground Smooth - Where Accessible)
- Exterior and Clean Air Plenum Interior Surfaces Primed and Finish Painted.
- Plenum Roof Cone Formed for Rain Run-Off

- Domed Rupture Style Explosion Vents
- Design for 6:1 air to cloth ratio
- Rotating pulse arm is preferred over timed solenoids.

Airlocks

- Designed and Documented to Comply with NFPA Standards, NFPA 69
- Design conditions @ 50% Pocket Fill
- Design for < 20 rpm
- Cast Iron Housing and End Plates
- Packing Gland Shaft Seals
- Outboard Sealed Shaft Bearings
- 8-Vane, Open End, 304 Stainless Steel Rotor with:
  - Adjustable Rotor Tips
  - Shaft Drilled & Tapped for Speed Switch
- 15 RPM Rotor Speed max

Fans (excluding Protein Dryer Main Fan)

- Twin Cities or similar - Supplier
- Centrifugal Fans
- AMCA 'A' Spark Proof Fan Blade
- Drain with Plug
- Flanged Inlet
- Inlet Vane Damper (if necessary)
- Flanged Outlet
- Flush Bolted Cleanout Door
- Belt Guard
- Shaft and Bearing Guard
- EPDM Inlet Flex Connector
- EPDM Outlet Flex Connector

PD Blowers

- Blower Roots Ram Style or similar
- Adjustable Motor Mount
- Premium Belt Drive (Low Overhung Load)
- Belt Guard
- Table Top Style Base
- Intake Filter/Silencer
- Discharge Silencer Chamber Stoddard Type 6
- Flexible Joints between Silencers and Blower
- Discharge Check Valve
- Weighted Relief Valve
- Design criteria for the blowline will be minimum 5000 FPM pickup velocity, max 7.0 psi pressure drop, ~6.0 SCF/lb product.

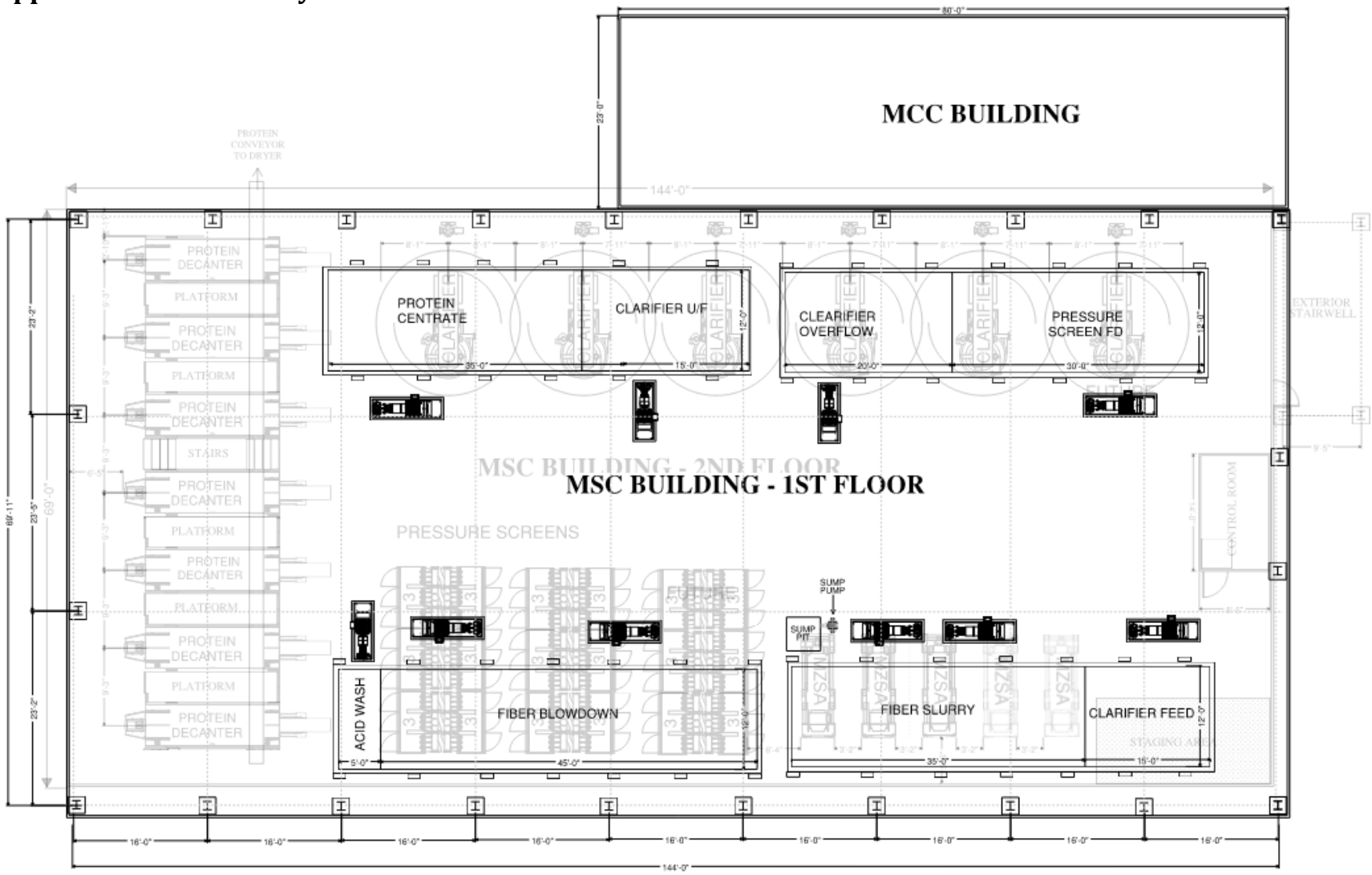
6.0 Project Exclusions

The following scopes of work are not included in the approved project:

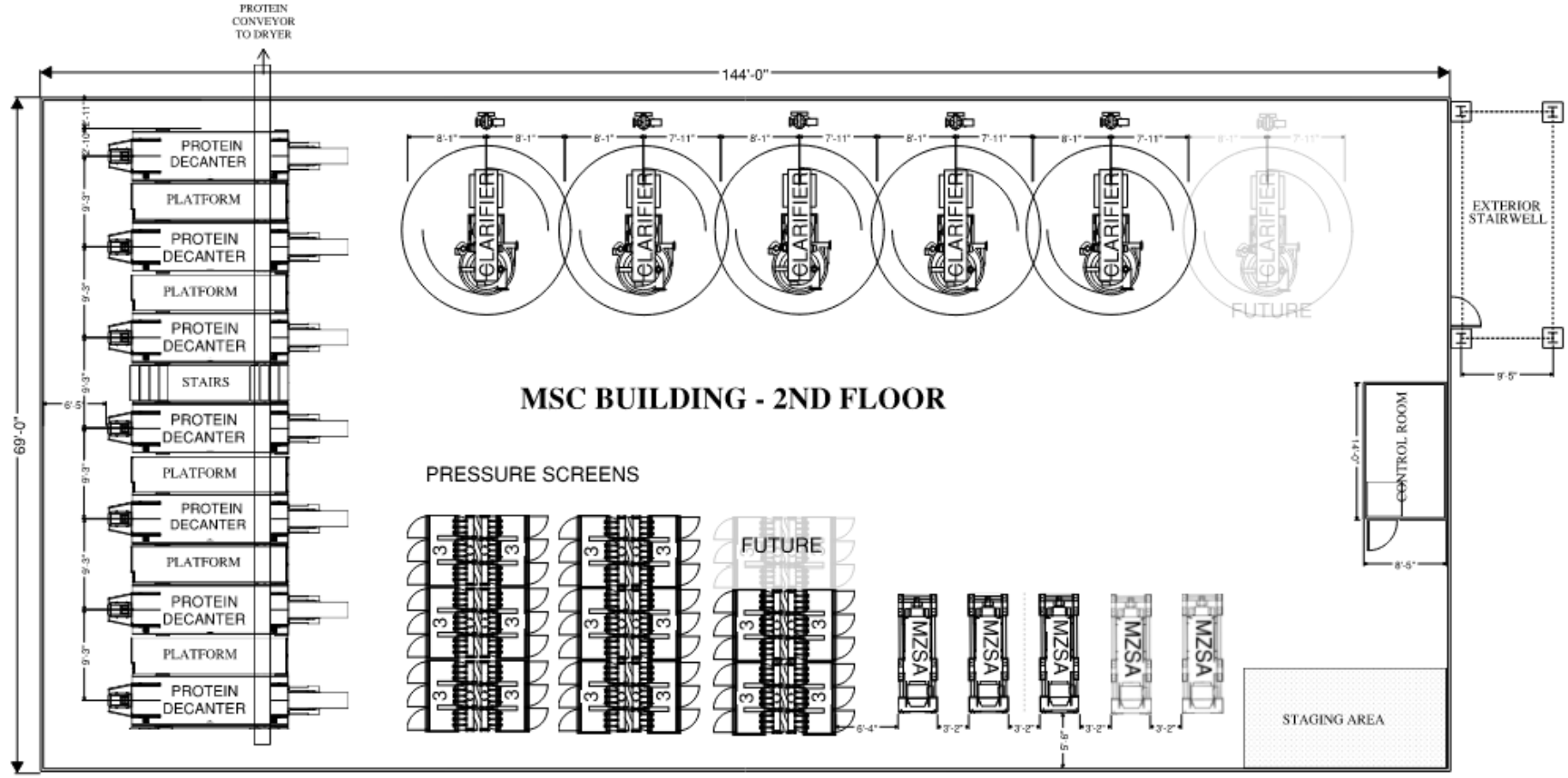
- One protein dryer in scope; no changes will be made to existing DDGS dryers.
- Plant personnel are responsible for working with the local electric utility to ensure adequate electrical power is provided to the site, with capacity for the MSC™ addition. Any changes to utility substations, supply transformers, and transmission lines to the site are not in scope.
- Additional lab space/ break area is the plant's responsibility; FQT has no scope of work.
- Any required storm sewer work will be the responsibility of plant personnel and is outside FQT's scope of work.
- No new restroom facilities will be included.
- Duct bridges will not include personnel walkways; access to inspection hatches will be via lift.
- Existing corn oil storage will not be modified for this process and is assumed to be of adequate size to hold the planned additional oil production volume.

Appendix A: Site Plan

Appendix B: 1st Floor Layout

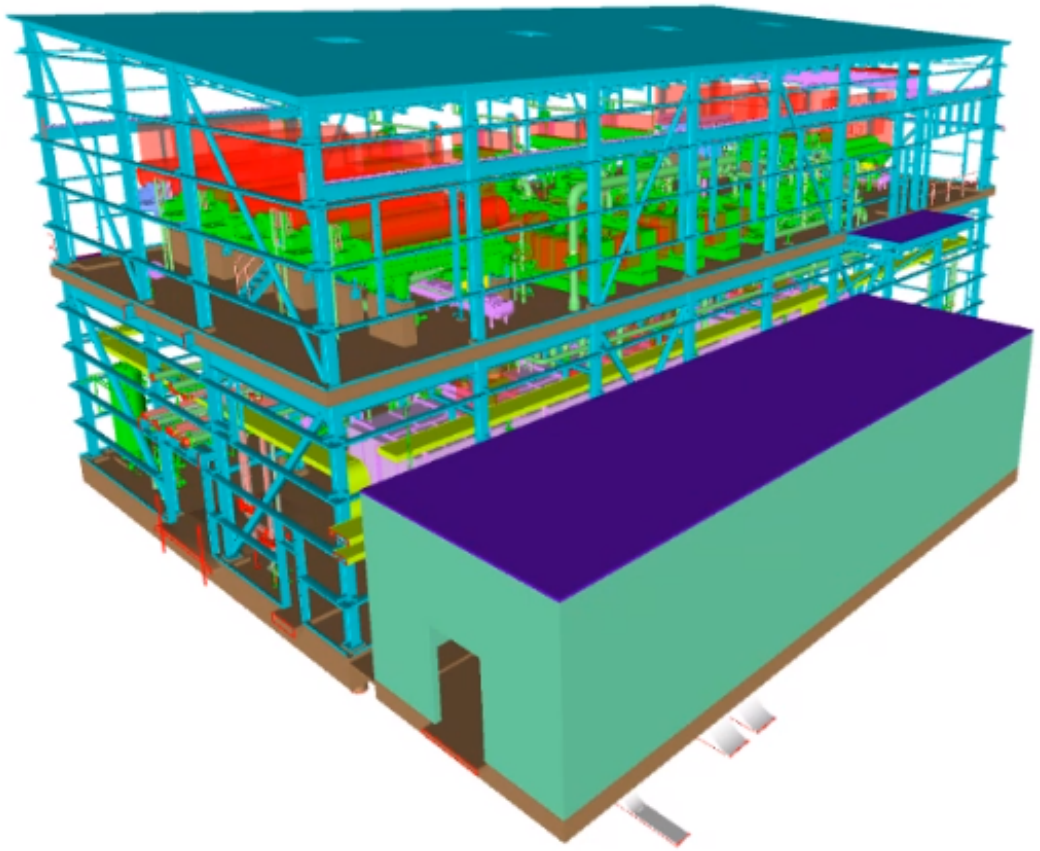


Appendix C: 2nd Floor Layout

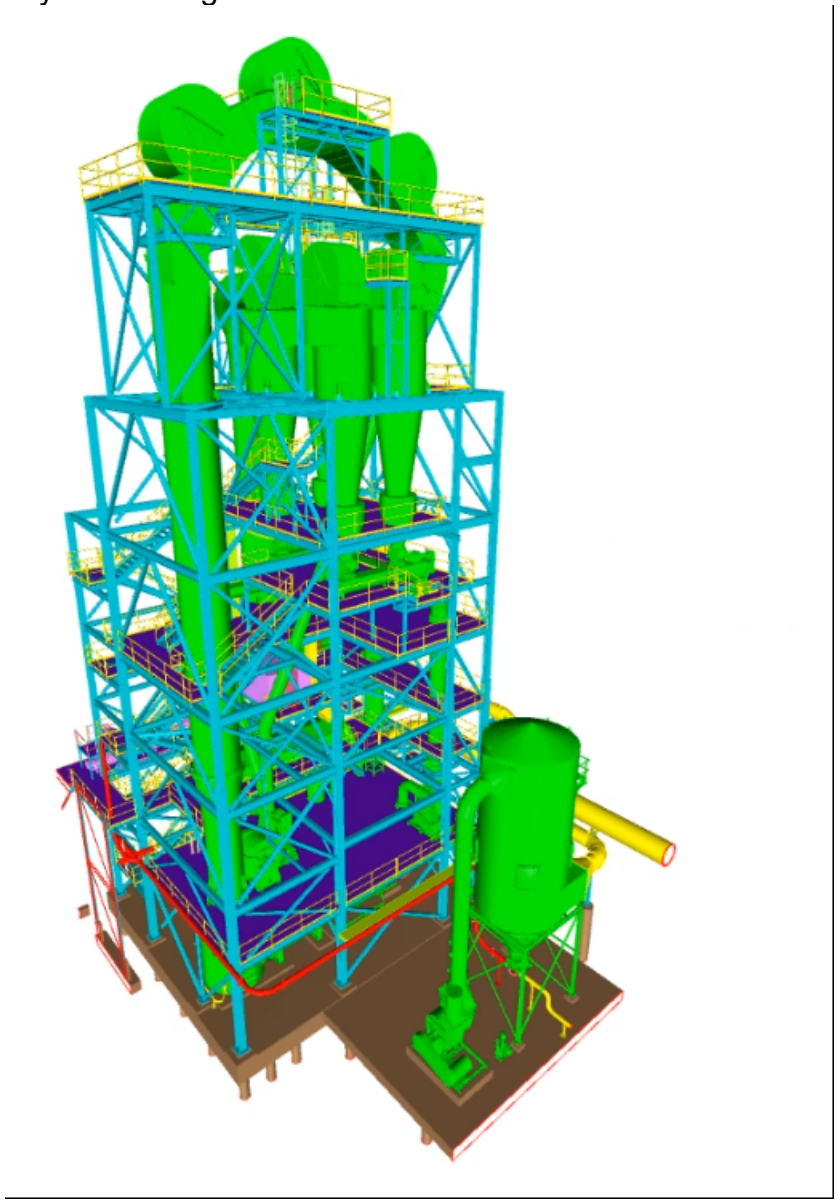


Appendix D: 3D Models

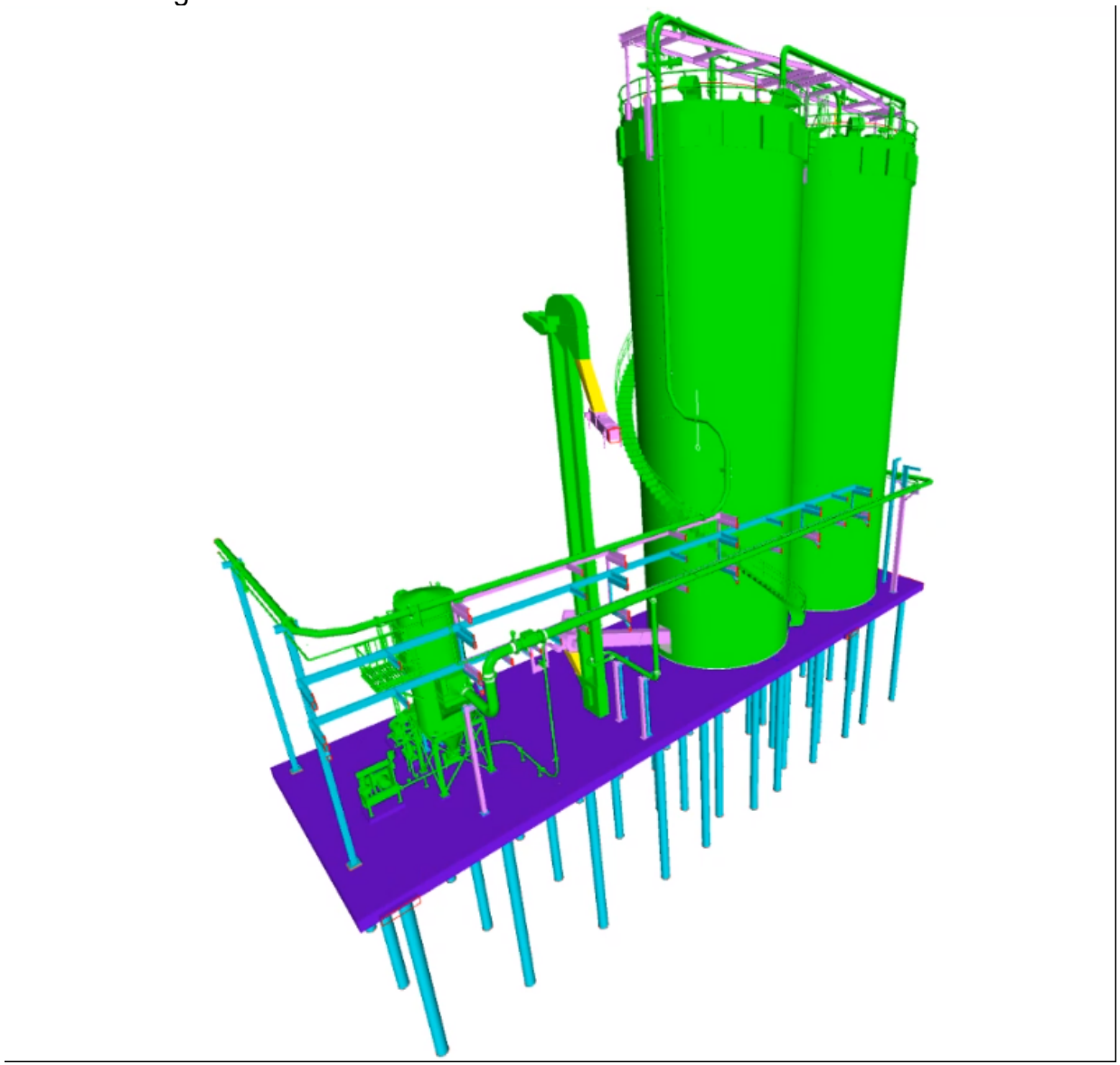
MSC:



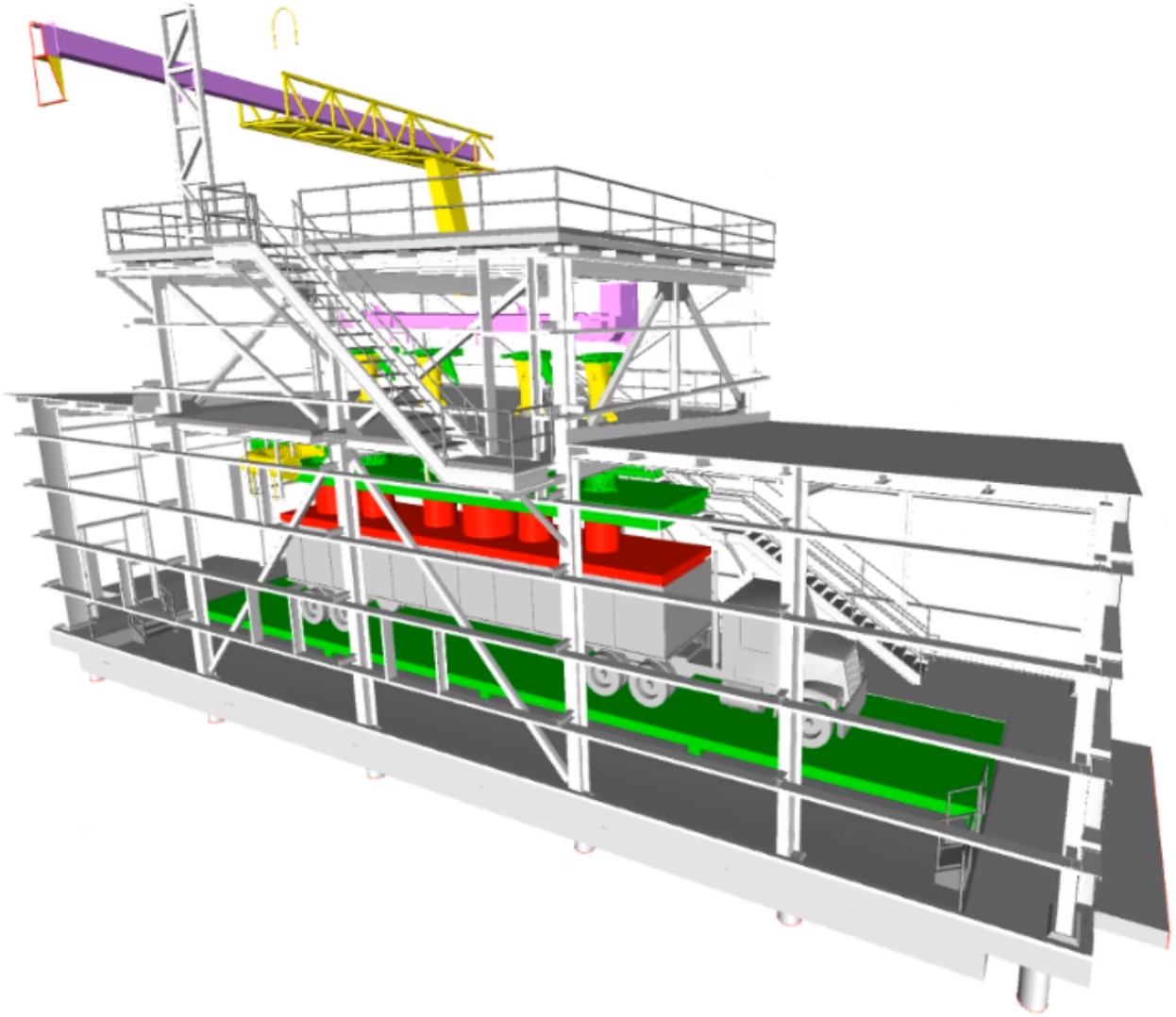
Dryer / Cooling:



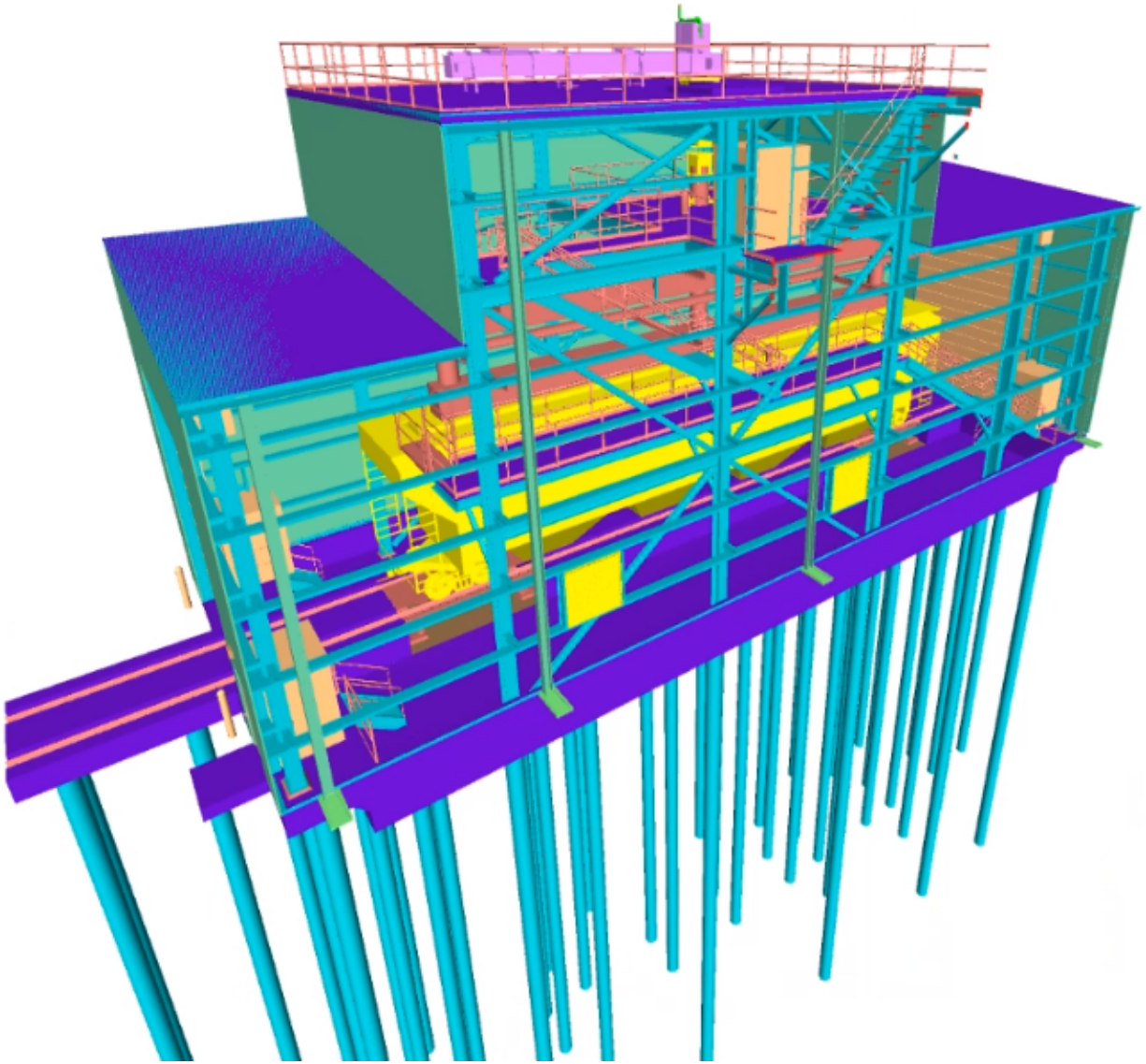
Protein Storage:



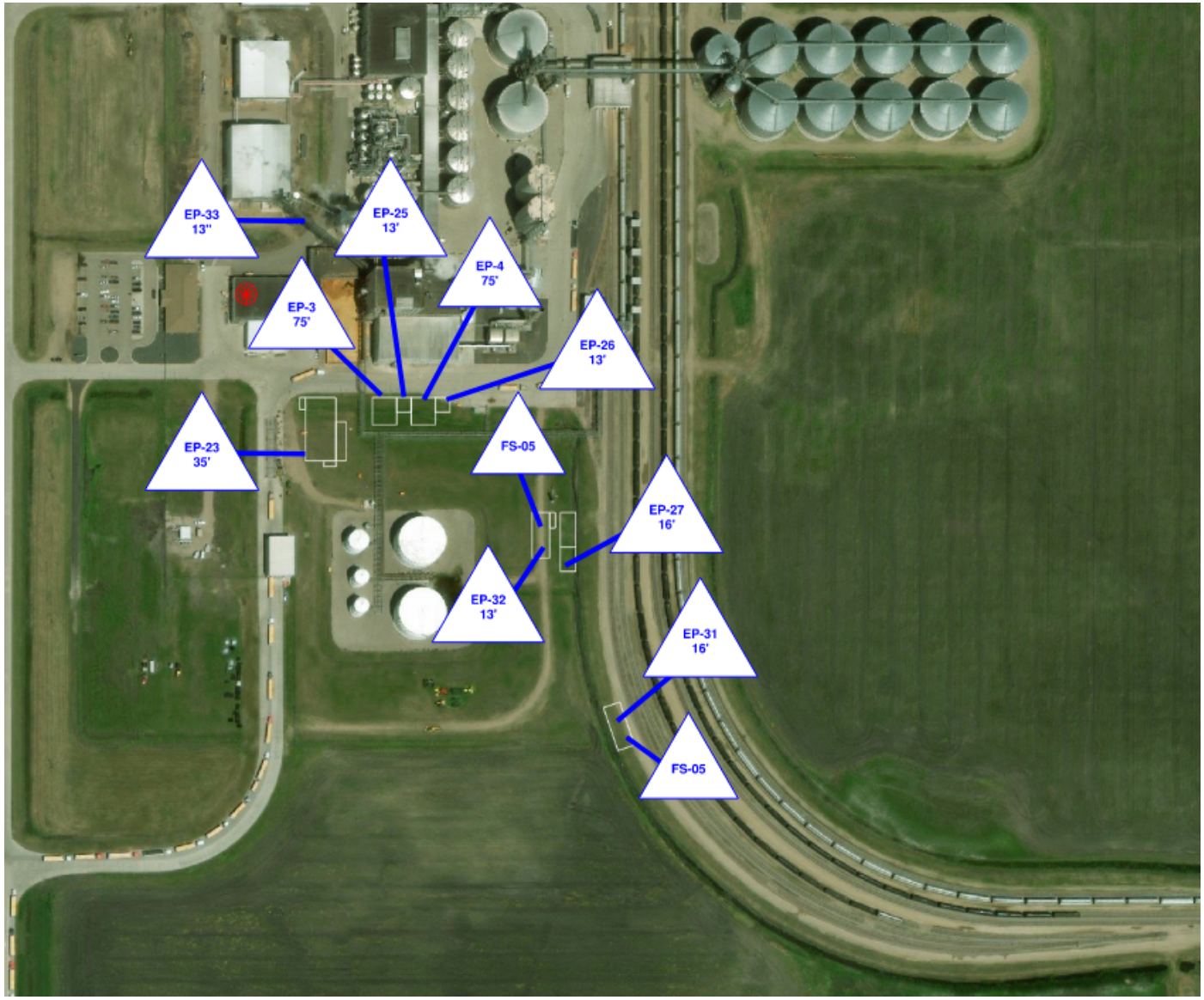
Truck Loadout:



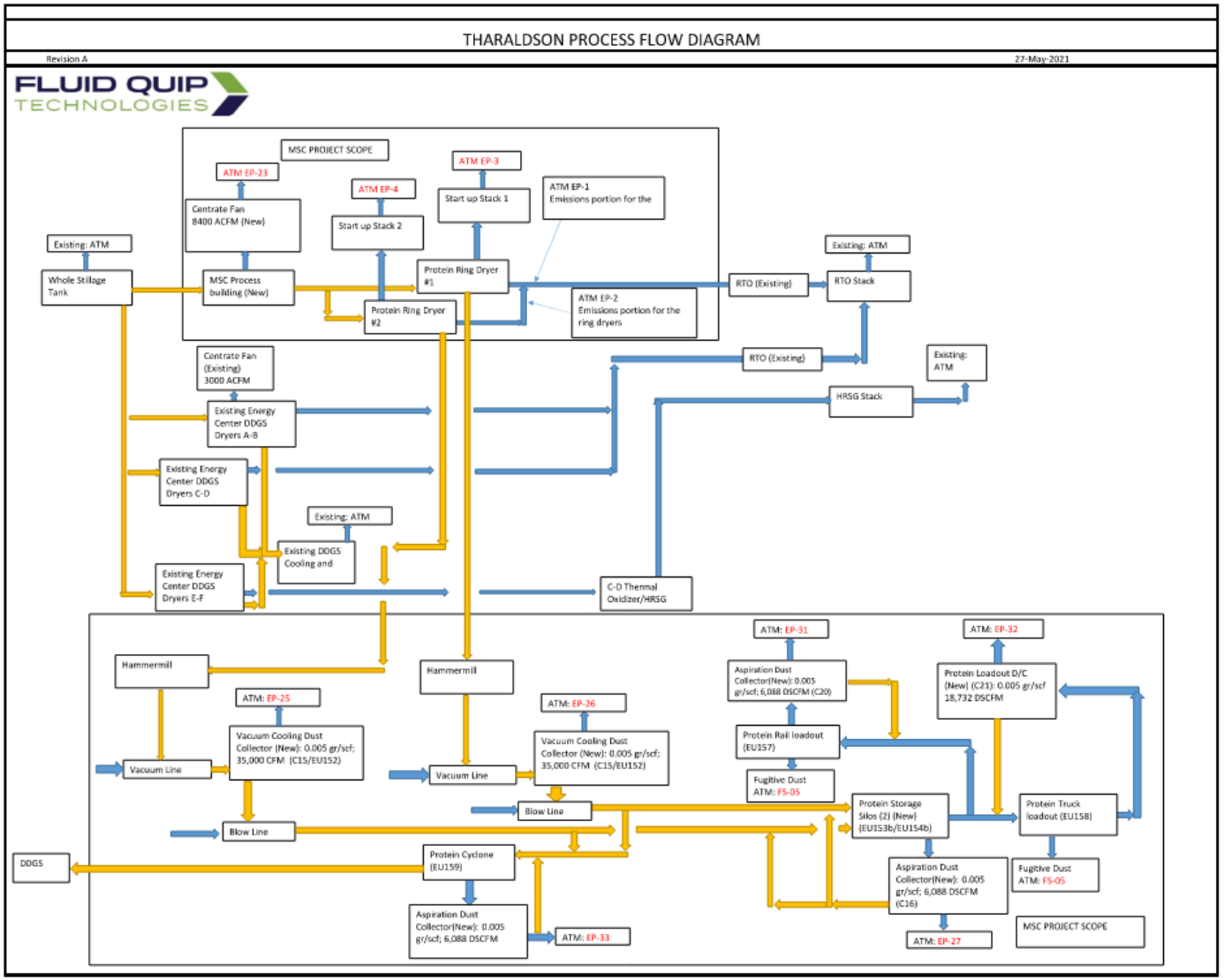
Rail Loadout:



Appendix E: Site Plan with Emission Sources



Appendix F: Emission Process Flow Diagram and Summary Tables



EP-23 MSC Centrate Fan

Vent Fan Max Flow Rate	8,400	ACFM
Vent Temperature	185.0	°F
Humidity Ratio	0.8200	lb water / lb dry air
Water	10,893	lbs/hr
Air	13,284	lbs/hr
Total Exhaust Flow	24,177	lbs/hr
Vent Volumetric Airflow	6,772	SCFM
Vent Volumetric Airflow	2,947	dscfm
Operation hours	8,760	h/y

Emissions	Concentration ppmvd	Uncontrolled lb/h	Abated lb/h	Emisson Rate lb/y	Emisson Rate Tons/y	Destruction Efficiency % (assumed)	EPA Method #	
NOx	0	0.00	0.00	0	0.00	0.0	7	
CO	0	0.0	0.00	0	0.00	0.0	10	
SO2	0	0.00	0.00	0	0.00	0.0	6	
VOC (as carbon)	150.0	0.83	0.83	7,236	3.62	0.0	25A	As Carbon
HAPS								
Acetaldehyde	3.43	0.07	0.07	607	0.30	0.0	18	
Formaldehyde	0.56	0.01	0.01	68	0.03	0.0	18	
Methanol	0.29	0.00	0.00	37	0.02	0.0	18	
Acrolein	0.13	0.00	0.00	29	0.01	0.0	18	

Emissions	Concentration gr/dscf	Uncontrolled lb/h	Abated lb/h	Emisson Rate lb/y	Emisson Rate Tons/y	Destruction Efficiency %	EPA Method #
Particulate - Dry	0.00	0.00	0.00	0	0.00	0.0	
Particulate - Dry + 202	0.00	0.00	0.00	0	0.00	0.0	
Particulate - Dry + 202*	0.00	0.00	0.00	0	0.00	0.0	

Stack Height, ft	35
Stack Diameter, in	14.0

EP-3 - Dryer Startup Stack

Description		
Burner Maximum Firing Rate	46.0	MMBTU/hr
Maximum operation hr/yr	250	hrs/yr
Stack Height, ft	75	Ft
Stack Diameter, ft	3.5	Ft

PM/PM 10 Emissions

Emission Source	Firing Rate		Emission Factor (lb/MMBTU)	Hours of Operation (hrs/yr)	PM Emissions (lbs/hr)	Controlled PM Emissions (tons/yr)
PM	46.0		0.007	250	0.343	**0.04**
PM10	46.0		0.007	250	0.343	**0.04**
PM2.5	46.0		0.007	250	0.343	**0.04**
CO	46.0		0.053	250	2.452	**0.31**
NOx	46.0		0.044	250	2.001	**0.25**
SO2	46.0		0.001	250	0.027	**0.00**
VOC	46.0		0.005	250	0.248	**0.03**

Notes
Emission factors are for natural gas combustion only with no dryer feec
Stack will have a horizontal discharge

EP- 4 - Dryer Startup Stack

Description		
Burner Maximum Firing Rate	46.0	MMBTU/hr
Maximum operation hr/yr	250	hrs/yr
Stack Height, ft	75	Ft
Stack Diameter, ft	3.5	Ft

PM/PM 10 Emissions

Emission Source	Firing Rate		Emission Factor (lb/MMBTU)	Hours of Operation (hrs/yr)	PM Emissions (lbs/hr)	Controlled PM Emissions (tons/yr)
PM	46.0		0.007	250	0.343	**0.04**
PM10	46.0		0.007	250	0.343	**0.04**
PM2.5	46.0		0.007	250	0.343	**0.04**
CO	46.0		0.053	250	2.452	**0.31**
NOx	46.0		0.044	250	2.001	**0.25**
SO2	46.0		0.001	250	0.027	**0.00**
VOC	46.0		0.005	250	0.248	**0.03**

Notes
Emission factors are for natural gas combustion only with no dryer feed
Stack will have a horizontal discharge

EP-25 Protein Cooling Baghouse

Fan Max Flow Rate	35,000	ACFM
Fan Air Temperature	120.0	°F
Humidity Ratio	0.0189	lb water / lb dry air
Water	2,507	lbs/hr
Air	132,660	lbs/hr
Total Exhaust Flow	135,167	lbs/hr
Vent Volumetric Airflow	31,379	SCFM
Vent Volumetric Airflow	29,426	dscfm
Operation hours	8,760	h/y

Emissions	Concentration ppmvd	Uncontrolled lb/h	Abated lb/h	Emisson Rate lb/y	Emisson Rate Tons/y	Destruction Efficiency % (assumed)	EPA Method #	
VOC (as carbon)	34.0	1.87	1.87	16,379	8.19	0.0	25A	As Carbon
HAPS								
Acetaldehyde	1.00	0.20	0.20	1,766	0.88	0.0	18	
Formaldehyde	0.40	0.05	0.05	482	0.24	0.0	18	
Methanol	0.40	0.06	0.06	514	0.26	0.0	18	
Acrolein	0.10	0.03	0.03	225	0.11	0.0	18	

Emissions	Concentration gr/scf	Uncontrolled lb/h	Abated lb/h	Emisson Rate lb/y	Emisson Rate Tons/y	Destruction Efficiency %	EPA Method #
Particulate - Dry	0.005	1.26	1.26	11,047	5.52	0.0	

Notes
- All PM exhausting from baghouse is presumed to be PM10

Opacity	0%
Stack Height, ft	13
Stack Diameter, in	30.0

EP-26 Protein Cooling Baghouse

Fan Max Flow Rate	35,000	ACFM
Fan Air Temperature	120.0	°F
Humidity Ratio	0.0189	lb water / lb dry air
Water	2,507	lbs/hr
Air	132,660	lbs/hr
Total Exhaust Flow	135,167	lbs/hr
Vent Volumetric Airflow	31,379	SCFM
Vent Volumetric Airflow	29,426	dscfm
Operation hours	8,760	h/y

Emissions	Concentration ppmvd	Uncontrolled lb/h	Abated lb/h	Emisson Rate lb/y	Tons/y	Destruction Efficiency % (assumed)	EPA Method #	
VOC (as carbon)	34.0	1.87	1.87	16,379	8.19	0.0	25A	As Carbon
HAPS								
Acetaldehyde	1.00	0.20	0.20	1,766	0.88	0.0	18	
Formaldehyde	0.40	0.05	0.05	482	0.24	0.0	18	
Methanol	0.40	0.06	0.06	514	0.26	0.0	18	
Acrolein	0.10	0.03	0.03	225	0.11	0.0	18	

Emissions	Concentration gr/scf	Uncontrolled lb/h	Abated lb/h	Emisson Rate lb/y	Tons/y	Destruction Efficiency %	EPA Method #
Particulate - Dry	0.005	1.26	1.26	11,047	5.52	0.0	

Notes
- All PM exhausting from baghouse is presumed to be PM10

Opacity	0%
Stack Height, ft	13
Stack Diameter, in	30.0

EP-27 Protein Silos Aspiration Dust Collector

Fan Max Flow Rate	13,000	ACFM
Fan Air Temperature	100.0	°F
Humidity Ratio	0.0120	lb water / lb dry air
Water	659	lbs/hr
Air	54,891	lbs/hr
Total Exhaust Flow	55,550	lbs/hr
Vent Volumetric Airflow	12,071	SCFM
Vent Volumetric Airflow	12,176	dscfm
Operation hours	8,760	h/y

Emissions	Concentration gr/scf	Uncontrolled lb/h	Abated lb/h	Emisson Rate lb/y	Emisson Rate Tons/y	Destruction Efficiency %	EPA Method #
Particulate - Dry	0.005	0.52	0.52	4,571	2.29	0.0	

Notes
- All PM exhausting from baghouse is presumed to be PM10

Opacity	0%
Stack Height, ft	10
Stack Diameter, in	16.0

EP-31 Protein Rail Aspiration Dust Collector		
Fan Max Flow Rate	6,500	ACFM
Fan Air Temperature	100.0	°F
Humidity Ratio	0.0120	lb water / lb dry air
Water	329	lbs/hr
Air	27,445	lbs/hr
Total Exhaust Flow	27,775	lbs/hr
Vent Volumetric Airflow	6,036	SCFM
Vent Volumetric Airflow	6,088	dscfm
Operation hours	8,760	h/y

Emissions	Concentration gr/scf	Uncontrolled lb/h	Abated lb/h	Emisson Rate lb/y	Tons/y	Destruction Efficiency %	EPA Method #
Particulate - Dry	0.005	0.26	0.26	2,286	1.14	0.0	

Notes
- All PM exhausting from baghouse is presumed to be PM10

Opacity	0%
Stack Height, ft	10
Stack Diameter, in	16.0

EP-32 Protein Loadout Dust Collector		
Fan Max Flow Rate	20,000	ACFM
Fan Air Temperature	100.0	°F
Humidity Ratio	0.0120	lb water / lb dry air
Water	1,013	lbs/hr
Air	84,448	lbs/hr
Total Exhaust Flow	85,461	lbs/hr
Vent Volumetric Airflow	18,571	SCFM
Vent Volumetric Airflow	18,732	dscfm
Operation hours	8,760	h/y

Emissions	Concentration gr/scf	Uncontrolled lb/h	Abated lb/h	Emisson Rate lb/y	Emisson Rate Tons/y	Destruction Efficiency %	EPA Method #
Particulate - Dry	0.005	0.80	0.80	7,032	3.52	0.0	

Notes
- All PM exhausting from baghouse is presumed to be PM10

Opacity	0%
Stack Height, ft	13
Stack Diameter, in	24.0

EP-58 - Protein Loadout Emissions / Fugitive Emissions

Capture Efficiency - 95%

PM Emissions

Emission Source	Throughput (tpy)	Emission Factor (lb/ton)	Potential uncontrolled PM (tpy)	PM Emissions (tons/yr)
Protein Loadout	88,750	0.035	1.5531	0.078
Fugitive Handling/Storage	88,750	0.061	2.7069	0.135
			Total	**0.21**

PM-10 Emissions

Emission Source	Throughput (tpy)	Emission Factor (lb/ton)	Potential uncontrolled PM (tpy)	PM 10 Emissions (tons/yr)
Protein Loadout	88,750	0.008	0.3461	0.017
Fugitive Handling/Storage	88,750	0.034	1.5088	0.075
			Total	**0.09**

EP-33 Protein OffSpec Aspiration Dust Collector		
Fan Max Flow Rate	13,000	ACFM
Fan Air Temperature	100.0	°F
Humidity Ratio	0.0120	lb water / lb dry air
Water	659	lbs/hr
Air	54,891	lbs/hr
Total Exhaust Flow	55,550	lbs/hr
Vent Volumetric Airflow	12,071	SCFM
Vent Volumetric Airflow	12,176	dscfm
Operation hours	8,760	h/y

Emissions	Concentration gr/scf	Uncontrolled lb/h	Abated lb/h	Emisson Rate lb/y	Tons/y	Destruction Efficiency %	EPA Method #
Particulate - Dry	0.005	0.52	0.52	4,571	2.29	0.0	

Notes
- All PM exhausting from baghouse is presumed to be PM10

Opacity	0%
Stack Height, ft	10
Stack Diameter, in	16.0