2011 Updated Facility Design Prevention of Significant Deterioration Air Quality Construction Permit Application Source ID No. 1890231

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Prepared For

Abengoa Bioenergy Biomass of Kansas, LLC
Hugoton, Kansas

WLA Project No. 165-009

May 2011

Revision No. 0

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Section 1.0
PSD Air Quality Construction Permit Application Summary

1.1 Current Proposed Project

Abengoa Bioenergy Biomass of Kansas, LLC (ABBK) intends to build and operate a biomass-to-ethanol and biomass-to-energy production facility. The proposed facility will employ two different biomass processes to produce fuel ethanol, lignin-rich stillage and stillage syrup, soil amendment ash, and power. These two processes include the following:

- Biomass-to-Ethanol: Enzymatic Hydrolysis Ethanol Production Process (EH Plant), 30 Million Gallon Per Year Anhydrous Ethanol Capacity; and
- Biomass-to-Power: Cogeneration Process (CoGen Plant), 22 Megawatt Capacity.

1.2 Permitting History

A PSD air quality construction permit application was originally submitted to the Kansas Department of Health and Environment (KDHE) in July 2008. The very nature of "first-of-its-kind" cellulosic ethanol technology, and turbulent economic conditions, contributed to project scope and design changes that resulted in revisions to the application several times since the July 2008 submission. A 2011 redesign of the project was required to satisfy U.S. Department of Energy (DOE) partnership criteria and the February 21, 2011 National Emission Standards for Industrial, Commercial, and Institutional Boilers and Process Heaters standards.

1.3 Regulated Project Emissions

The proposed facility will generate emissions of several regulated air pollutants, including particulate matter (PM; a.k.a. total suspendable particulate (TSP), generally defined as PM_{30}), particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}), particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$), nitrogen oxides (NOx), sulfur oxides (SOx), carbon monoxide (CO), volatile organic compounds (VOC), hazardous air pollutants (HAPs), and greenhouse gases (GHGs).

The KDHE continues to categorize the proposed facility as a "chemical process plant", one of the 27 "Federally designated fugitive emissions sources" (i.e. source categories). As defined in Kansas Administrative Regulations Chapter 28, Title 19, Section 200(kk)(3)

(K.A.R. 28-19-200(kk)(3)), a major source shall include a major stationary source of air pollutants that *"directly emits or has the potential-to-emit 100 tons per year or more of any air pollutant, including any major source of fugitive emissions of any such pollutant from a Federally designated fugitive emissions source"*. Therefore, the 100 tons per year (ton/yr) major stationary source threshold for criteria pollutants applies to the EH Plant.

According to K.A.R. 28-19-17, *Prevention of Significant Deterioration*, K.A.R. 28-19-200, *General Provisions; Definitions*, and K.A.R. 28-19-300, *Construction Permits and Approvals; Applicability*, the proposed facility is required to obtain a PSD air quality construction permit due to the following:

- The potential to emit (PTE) for the proposed facility equals or exceeds either 25 ton/yr of particulate matter (PM) or 15 ton/yr of PM_{10}; 40 ton/yr of sulfur dioxide (SO_2) or sulfur trioxide (SO_3) or a combination thereof; 100 ton/yr of carbon monoxide (CO); 40 ton/yr of volatile organic compounds (VOC); and 40 ton/yr of oxides of nitrogen (NOx);
- The facility belongs to the following source categories:
    1) Chemical process plant with a Standard Industrial Code (SIC) 2869; and
    2) Fossil fuel boilers totaling more than 250,000,000 Btu/hr with a SIC 4911.
- The facility is a major source of the criteria pollutants: PM/PM_{10}, SO_2, CO, and NOx.

The proposed facility will be a sythetic minor source for HAPs under K.A.R. 28-19-750, *Hazardous Air Pollutants; Maximum Achievable Control Technology*. Emissions will be controlled to below the major source thresholds defined in Title 40, Code of Federal Regulations, Part 63, Section 63.2 (40 CFR §63.2), *"Major source means any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit considering controls, in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants"*. The control of emissions will be through the implementation of either Maximum Achievable Control Technology (MACT) or Generally Available Control Technology (GACT) that will be federally enforceable on all HAP emitting sources. The MACT/GACT analysis will detail the control technologies proposed and the methods that will be used to demonstrate compliance.

Table 1-1 summarizes the maximum PTE for the proposed facility.

Table 1–1
Summary of Emissions for Abengoa Bioenergy Biomass of Kansas, LLC

Pollutant	Uncontrolled Facility-Wide Emissions (ton/yr)	Controlled Facility-Wide Emissions (ton/yr)	PSD Significant Emission Rate (ton/yr)	PSD Review Required
PM	18,044.6	130.5	25	Yes
PM_{10}	16,070.5	118.6	15	Yes
$PM_{2.5}$	13,560.9	81.2	15	No
NO_x	1,665.8	916.5	40	Yes
SO_2	5,830.5	483.4	40	Yes
H_2SO_4 (SAM)	355.79	3.56	7	No
CO	519.5	519.5	100	Yes
VOC	1,242.5	29.0	40	No
Lead	0.11	0.11	0.6	No
Hydrogen Fluoride (HF)	0.66	0.01	3	No
Single HAP (HCl)	569.5	5.7	N/A	No
Total HAPs	615.7	20.1	N/A	No
CO_2e	590,299	590,299	N/A	No

Because the proposed facility meets the current K.A.R. definition for major source for criteria pollutants, K.A.R. 28-19-350, *Prevention of Significant Deterioration of Air Quality*, is applicable. The PSD regulations are designed to ensure that the air quality in existing attainment areas does not significantly deteriorate or exceed the National Ambient Air Quality Standards (NAAQS), while providing a margin for future industrial and commercial growth. The primary provisions of PSD regulations require that new major stationary sources, like the proposed facility, be reviewed prior to construction to ensure compliance with the applicable NAAQS and PSD increments, as well as apply BACT to minimize the emissions of air pollutants. Additional impacts analyses are also required under 40 CFR §52.21(o), and must describe air quality and related impacts due to associated growth and construction, as well as potential impacts of atmospheric emissions on soils, vegetation and visibility impairment.

1.4 Report Organization

The potential for ambient air quality impacts is acknowledged and the proposed facility will be evaluated under the PSD program, 40 CFR Parts 51 and 52 to determine best available control technologies, allowable emissions, and impact on residential and industrial growth, soils and vegetation, and visibility. This report is a technical support document for the 2011 updated facility design PSD air quality construction permit application. This report contains a KDHE Air Quality Notification of Construction

Application; Process/Equipment Description forms; a detailed project description; a regulatory applicability analysis; PTE calculations; and process flow diagrams and figures.

This report has been organized such that each required PSD construction permit application component is provided in either a section of this report or attached as an appendix. A summary of the contents of each section and appendix of this report are provided herein. Also, additional deliverables to be provided to KDHE subsequent to this report in support of the PSD construction permit application have also described in this section.

1.4.1 Sections

1.4.1.1 *Section 2.0: Facility Operations / Project Description*

A detailed process description has been prepared and is included in Section 2.0. The process description is site-specific and includes all proposed operations.

1.4.1.2 *Section 3.0: Regulatory Applicability Analysis*

Section 3.0 includes a discussion for some of the applicable and non-applicable State and Federal regulations. There are numerous administrative regulations (e.g., permit posting, fees, etc.) or other statewide regulations (e.g. open burning, odor) that apply to the proposed facility, but these are not summarized in this report.

1.4.2 Appendices

1.4.2.1 *Appendix A: KDHE Air Quality Notification of Construction Application*

A Notification of Construction Application form has been included in Appendix A.

1.4.2.2 *Appendix B: Process/Equipment Description Forms*

KDHE process/equipment forms have been completed and included in Appendix B. It should be noted that for ABBK to meet the proposed construction and operating schedule, the permit application must be filed as soon as possible. As the proposed project is still in the development stage, certain project components have not been finalized, and certain project components may still undergo minor revisions in an effort to refine

and improve production efficiency. Therefore, the proposed project presented in this application is based on the current facility design as of April 2011. Modifications and/or revisions to the proposed facility will be discussed with KDHE upon finalization of the modification and/or revision, and the appropriate forms and permitting procedures will be completed by ABBK at that time to ensure compliance with all applicable State and Federal regulations.

1.4.2.3 *Appendix C: Potential to Emit Calculations*

Emissions were calculated for both point sources and fugitive sources at the proposed facility. Potential emissions of criteria pollutants, HAPs and GHGs were estimated using a combination of vendor guarantees, process design data, emission factors from U.S. Environmental Protection Agency's (EPA) Compilation of Air Pollutant Emission Factors, 5th Edition, Volume 1 (AP-42), EPA emissions databases, EPA protocol and guidance documents, California Climate Action Registry's (CCAR) General Reporting Protocol, and EPA's TANKS version 4.09D (10/05). Detailed emission calculations are presented in Appendix C. Potential emission calculations include both uncontrolled and controlled scenarios.

1.4.2.4 *Appendix D: Diagrams and Figures*

Process flow diagrams and figures pertinent to the facility's permit application are included in Appendix D.

1.4.3 Additional Deliverables

1.4.3.1 *Air Quality Impact Assessment*

The primary provisions of PSD regulations require that new major stationary sources, like the proposed facility, be reviewed prior to construction to ensure compliance with the applicable NAAQS and PSD increments. Additional impacts analyses are also required by 40 CFR §52.21(o), and must describe air quality and related impacts due to associated growth and construction, as well as potential impacts of atmospheric emissions on soils, vegetation, and visibility impairment.

The results of the AQIA and additional impacts analyses for the proposed facility will be provided under separate cover.

1.4.3.2 *Best Available Control Technology Analysis*

Under the PSD program, newly constructed and modified major sources in attainment areas, must implement BACT. The proposed facility is located in an area designated as an attainment or unclassified area, as defined in 40 CFR §52.21. A detailed BACT analysis for each individual new affected emission unit and pollutant emitting activity with a significant emissions increase will be performed and provided under separate cover. The determination of the final BACT is made by KDHE, and is federally enforceable.

1.4.3.3 *Maximum Achievable Control Technology and Generally Available Control Technology Analysis*

The national emission standards for hazardous air pollutants (NESHAPs) apply to both major sources in specifically regulated industrial source categories and area sources of certain types of emissions. The proposed facility is subject to certain NESHAPs listed in 40 CFR Part 63 and will voluntarily comply with other NESHAPs to reduce facility-wide HAP emissions below major source thresholds. A detailed NESHAPs applicability review and MACT/GACT analysis for each new affected emission unit and pollutant emitting activity will be performed and provided under separate cover. The MACT standards set forth in applicable NESHAPs are federally enforceable as are the emission reductions to below major source thresholds.

Section 2.0
Facility Operations / Project Description

2.1 Biomass Feedstock Receiving, Grinding and Storage

The enzymatic hydrolysis ethanol manufacturing plant will utilize cellulosic feedstocks (e.g. biomass) including agricultural resides such as wheat straw, milo (sorghum) stubble, and corn stover; as well as energy crops such as switchgrass; and opportunity feedstocks that are locally available. The cogeneration plant will utilize the same cellulosic feedstocks used in the enzymatic hydrolysis ethanol manufacturing plant, as well as enzymatic hydrolysis residuals (including lignin-rich stillage cake and thin stillage syrup), particles collected during biomass grinding, non-condensable gases (NCG) vent streams, and wastewater treatment sludge and biogas, as they are available. Natural gas will be used during start-up periods as required per manufacturer recommendations, as well as during periods when there is a reduction or failure in the solid fuel feedrate.

Agricultural residues and energy crops will be delivered in bale form primarily on flatbed / module / custom trucks. The baled biomass will either be unloaded directly onto conveyors supplying the grinding lines or unloaded at the biomass overnight staging area or biomass storage field. The biomass overnight staging area is utilized during the night shift and is located immediately adjacent to the biomass grinding lines to reduce traffic traveling in the biomass storage field. The biomass storage field is a 10-acre storage area onsite to ensure process continuity in case of a short-term disruption of biomass delivery from off-site locations.

The biomass overnight staging area and biomass storage field are constantly active as bales are brought onsite and stored as well as retrieved for use in the process during the night shift or during delivery disruptions.

Biomass consists of 3-ft x 4-ft x 8-ft bales weighing approximately 1,000 to 1,500 pounds, which are unloaded directly from the flatbed / module / custom trucks which may be equipped with either tilt or walking beds. A typical 52-ft long flatbed trailer can hold 36 1,000- to 1,500-pound bales or one module bale. The 1,000- to 1,500 -pound bales will be stacked three high (9-ft), two wide (8-ft) and 6 long (48-ft), with a shipping weight of approximately 18 tons per truckload. The baled biomass material is scheduled to be

delivered in regular intervals to the proposed facility by 52-ft flatbed trailers during a typical daily 12-hour daylight window.

Receiving operations at the grinding lines will consist of receiving the biomass bales by truck and unloading the bales at the conveyors to support a "nearly just in time" operational process. Grinding of the biomass is required for both biofuel and bioenergy production. Grinding is a mechanical process that reduces the biomass into useable sizes for feedstock to the ethanol production process and the biomass-fired boiler. The grinders are to be housed within the Biomass Handling Building, where all de-stringing, cleaning, and grinding takes place. The agricultural residues and energy crops grinding lines are designed to process a combined maximum 79.2 wet tons per hour (wet ton/hr).

The grinding process begins with retrieved bales delivered to single process infeed conveyor line consisting of a "pan style" chain conveyor capable of moving two bales, side by side. Transfer tables and bale destackers segregate bales to two grinding lines. Each grinding line is equipped with an automatic bale de-stringer, rotochopper grinder (with discharge conveyor and conveyor magnets), and dust hood on the infeed. The grinding activities and associated transfer points are controlled by a dust collector. Ground biomass is conveyed to one of two air classifier live-bottom surge bins with dust collector. Ground biomass is air classified to remove rocks and other large debris. The air classifier live-bottom surge bins and associated transfer points are controlled by dust collectors.

Positive displacement blowers pneumatically transfer the classified ground biomass to either the EH Plant weigh belt or biomass-fired boiler metering bins. There are four to eight metering bins associated with the cogeneration plant. The boiler feed conveyors transferring solid fuel to the metering bins are controlled by a dust collector.

A positive pressure fines collection and transfer system for the biomass bale handling and grinding operations consists of a floor sweep system with input shredders that deliver the floor sweepings to grinding lines via a vacuum conveyor. The floor sweep system is controlled by a dust collector.

Positive displacement blowers pneumatically transfer biomass grinding and cleaning fines to the biomass boiler as fuel. String, rock, metal, and/or dirt will be shipped off-site exclusively by trucks via roll-off dumpsters.

2.1.1 Specific Equipment

Specific equipment for these operations include the following:

- One process infeed conveyor line consisting of a "pan style" chain conveyor designed for storing approximately 36 wet tons.
- One transfer table.
- One singulating conveyor / bale destacker.
- Two biomass grinding lines each equipped with a scale for rate and process infeed, automatic bale de-stringer, rotochopper grinder, dust hood on infeed and discharge conveyor and discharge conveyor magnets for tramp metals. Biomass grinding lines #1 and #2 will be ventilated to a 143,900 cfm dust collector (DC-11110).
- A floor sweep system to collect the sweepings to send to the biomass boiler via a vacuum conveyor, clean-up cyclone with dust collector (DC-11120), and pneumatic conveyor.
- Two (2) air classifier live-bottom surge bins (T-11130 and T-11230) with 20 minutes of retention time. Each air classifier surge bin will be equipped with a rotary valve vent with a maximum 35 cfm exhaust potential that will only be in use when the biomass is being fed from the bin. Rotary valve vents will be ducted into the air classifier cyclones (CY-11160 and CY-11260) dust collectors (DC-11170 and DC-11270) as necessary.
- Two enzymatic hydrolysis air classifier cyclones (CY-11160 and CY-11260) ventilated to dust collectors (DC-11170 and DC-11270).
- One paved temporary baled biomass overnight staging area with a maximum storage capacity of 950 wet tons.
- One 10-acre unpaved baled biomass storage field.
- Several elevated biomass boiler live-bottom metering bins. Each bin will be equipped with one slide gate isolation valve and one air swept feed chute. Biomass boiler metering bins are open to the boiler during combustion and cannot be controlled under negative pressure by a baghouse; however, the conveyors transferring soild fuel to the metering bins will be ventilated to one common dust collector (DC-11711).
- One bottoms ash load-out system and one acid wash solids load-out system consisting of material drops into roll-off dumpsters for offsite disposal.

2.2 Enzymatic Hydrolysis Ethanol Manufacturing Plant

Nominal production for the enzymatic hydrolysis ethanol production process is 23,300,000-gallons per year (23.3MMgpy) anhydrous ethanol. For permitting purposes, the enzymatic hydrolysis ethanol production process is based on a 20% increase in plant efficiency and a production schedule of 365 days per year, which results in a maximum annual anhydrous ethanol production of 30 MMgpy (rounded). The anhydrous ethanol is denatured prior to shipment off-site, resulting in a denatured nominal production rate of 23.8 MMgpy, and a denatured maximum production rate of 31.6 MMgpy.

Ethanol will be produced using nominally 930 dry tons/day of biomass feedstock. Once ground, the biomass feedstock is conveyed to the Biomass Pretreatment Building. The feedstock is treated with sulfuric acid, steam, enzymes and genetically modified organisms (enzymatic hydrolysis) to simultaneously break down the tougher cellulose and ferment the recovered sugars resulting in "beer." At the conclusion of the co-fermentation process, the beer is between 4 and 5 percent ethanol. Beer is then pumped to the distillation area for purification. Distillation removes the majority of the water and residual solids from the ethanol. Distillation also destroys all living organisms, including genetically modified organisms. Soluble and insoluble solids will be recovered from the bottom of the distillation column for further processing. The insoluble solids are separated from the soluble solids and dewatered to produce lignin-rich stillage cake. Lignin-rich stillage cake is conveyed to the biomass-fired boiler as a solid fuel. The soluble solids stream, referred to as distiller's biomass thin stillage is evaporated to concentrate the soluble solids into syrup. The syrup is pumped to the biomass boiler as fuel. The evaporator condensate is routed directly to wastewater treatment . Nominally 320.6 dry ton/day enzymatic hydrolysis lignin-rich stillage cake and 209.5 dry ton/day syrup will be co-produced as a by-product of the enzymatic hydrolysis ethanol production process.

The enzymatic hydrolysis production process consists of pre-treatment and digestion (Area 12000); liquefaction, yeast propagation, saccharification and co-fermentation (Area 16000); ethanol recovery (i.e. distillation) (Area 18000); and stillage processing (Area 19000). Associated pollution control equipment include:

- The CO_2 generated from the biomass co-fermentation process (Area 16000) will be routed through the enzymatic hydrolysis fermentation CO_2 scrubber (S-18185). The scrubber will be a packed bed, impingement scrubbing tower, designed to

clean 4,100 cfm of gas and support a scrubbing liquid flow rate of 50 gpm. The rated control efficiency will be equal to or greater than 99 percent.

- The CO_2 generated from the biomass ethanol recovery process (Area 18000) will be routed through the enzymatic hydrolysis distillation vent scrubber (S-18180). The scrubber will be a packed bed, impingement scrubbing tower, designed to clean 90 cfm of gas. The distillation vent scrubber vent feeds into the enzymatic hydrolysis fermentation CO_2 scrubber (S-18185) for further control efficiency.
- The non-condensables generated in areas 12000, 16000, and 19000 from the biomass process vents will be routed to either the biomass-fired boiler or flare for destruction.

2.3 Cooling Water Tower

A three cell cooling tower (EP-04001) with a total water circulation rate of 2,592,000 gallons per hour will be employed. The cooling water tower will be equipped with a drift (mist) eliminator.

2.4 Organic Liquid and Chemical Storage Tanks and Piping, Pumps and Valves

2.4.1 Enzymatic Hydrolysis Ethanol Manufacturing Plant Specific Equipment

Specific equipment required for process operations include the following:

- Two shift process tanks (T-02107 and T-02108), each having a working capacity of 41,000 gallons for the purpose of storing anhydrous ethanol. Each tank will be equipped with an interior floating roof and seal system.
- Two product storage tanks (T-02102 and T-02112), each having a working capacity of 500,000 gallons for the purpose of storing denatured ethanol. The tanks will be equipped with an interior floating roof and seal system that meets the applicable requirements of 40 CFR Part 60, Subpart Kb.
- One denaturant tank (T-02105), having a capacity of 22,500 gallons for the purpose of storing denaturant (natural gasoline). The tank will be equipped with an interior floating roof and seal system that meets the applicable requirements of 40 CFR Part 60, Subpart Kb.
- Piping, pumps and valves will be utilized for transport of organic liquid to and from the ethanol storage tank yard. There will be approximately 5 pumps and 24 valves in light liquid service, 4 pumps and 28 valves in heavy liquid service, 22 valves in gas/vapor service, 7 pressure relief valves, 6 sample valves and 199 connectors. All piping, pumps and valves will be

constructed, operated and maintained in accordance with the applicable requirements of 40 CFR Part 60, Subpart VVa.

2.4.2 Chemical Storage Vessels Specific Equipment

Specific equipment required for process and support operations include the following:

- One 94% sulfuric acid tank (T-01911), having a working capacity of 22,500 gallons. The tank will be equipped with seal system and dessicant filter (F-01911).
- One nutrient tank (T-01930), having a working capacity of 9,000 gallons.
- One Anhydrous Ammonia Vessel (V-01910), having a working capacity of 14,400 gallons.
- One 19% aqua ammonia tank (T-01915) having a working capacity of 7,920 gallons.
- One media liquid tank (T-01912) having a working capacity of 28,800 gallons.
- One cellulase tank (T-01940), having a working capacity of 50,400 gallons.
- Piping, pumps and valves will be utilized for transport of chemicals from the chemical storage tank yard. There wil be approximately 17 pumps, two heaters, 2 coolers, 4 filters/strainers, 3 mixers/agitators, and various valves and connectors.

2.5 Ethanol Loadout

The ethanol loadout operations will employ one truck and one railcar loading terminal for the purpose of transferring denatured ethanol to trucks and railcar for shipment off-site. Truck and railcar loading will be equipped with a vapor collection system that is routed to either the biomass-fired boiler or flare for destruction of collected load-out vapors.

2.6 Cogeneration Plant

The cogeneration plant will employ one water-cooled vibrating grate (stoker) boiler. The boiler will be capable of producing 325,000 pounds per hour of 920 pound-force per square inch gauge (psig) /750 °F steam. The high pressure steam supplies a single condensing-extraction steam turbine generator nominally rated at 22 Megawatts of

electricity (MWe). Electrical power will be supplied to the facility. Power sales to the grid are not foreseen at this time.

Enzymatic hydrolysis process steam is extracted from the turbine at a lower pressure from extraction ports. Boiler feedwater preheater steam and deaeration steam is also extracted from the turbine from extraction ports. Exhaust steam is condensed under vacuum against cooling water in the cooling water tower. The stoker boiler's maximum design heat input is 500 million British thermal units per hour (MMBtu/hr). The stoker boiler is capable of burning a combination of raw biomass (consisting of corn stover, wheat straw, milo (sorghum) stubble, corn stover, switchgrass, and other opportunity feedstocks that are available), enzymatic hydrolysis residuals (including lignin-rich stillage cake and thin stillage syrup), particles collected during biomass grinding, NCG vent streams, wastewater treatment sludge and biogas. Natural gas will be used during start-up periods as required per manufacturer recommendations. The stoker boiler will also be capable of firing on natural gas during normal operations as needed at a limited capacity, as well as firing on a combination of natural gas, liquid fuel (i.e. enzymatic hydrolysis thin stillage syrup) and biogas in the event of a solid fuel failure. The cogeneration process will utilize up to 812 dry tons/day of fuel feedstock.

2.6.1 Specific Equipment

Specific equipment for these operations includes the following:

- One water-cooled vibrating grate (stoker) boiler (BL-20001) rated at 500 MMBtu/hr maximum design heat input, burning solid biomass as the primary fuel. Natural gas will be used during startup periods, as required per manufactur recommendations, and in the event of a solid fuel failure. Wastewater treatment biogas will be used as a supplemental gaseous fuel. The emissions from the boiler will be ventilated to the boiler stack (EP-20001) for emissions control. The emissions from the stoker boiler will be controlled as follows:
  - NOx emissions will be controlled with the installation of a Selective Non-Catalytic Reduction (SNCR) system.
  - SOx emissions will be controlled with a Spray Dry Absorber (SDA) utilizing hydrated lime.
  - CO and VOC emissions will be controlled using of good combustion practices (GCP).

- The filterable $PM/PM_{10}/PM_{2.5}$ emissions will be controlled by a pulse jet fabric filter baghouse.
- The condensable $PM_{2.5}$ emissions will be controlled with the SDA and baghouse equipment listed above for SOx and PM control and through balancing the ammonia slip associated with the SNCR system to avoid visible plume conditions.
- The particulate HAP emissions, including metals, sulfuric acid mist, hydrochloric acid (HCl) and hydrofluoric acid (HF) will be controlled with the SDA and baghouse equipment listed above for SOx and PM control.
- The total organic HAP emissions, dioxins and furans will be controlled using good combustion practices similar for CO and VOC.

- Exhaust steam from the condensing-extracting steam turbines in the cogeneration plant will be condensed under vacuum against cooling water in the cooling water tower (EP-04001).

2.7 Cogeneration Materials Handling

The cogeneration plant's materials handling will consist of a hydrated lime handling and injection system, a boiler bottoms ash collection system, and a boiler fly ash collection system. The biomass-fired stoker boiler is capable of producing approximately 29,646 dry ton/yr of fly ash and 35,942 wet ton/yr bottoms ash when operated at the maximum feed rate continuously. The bottoms ash (including non-condensables) collected from the boilers will include the used bed media and will be landfilled. The collected fly ash will be conveyed to the fly ash storage silo for rail or truck loadout. Fly ash will be used as soil amendment.

2.7.1 Specific Equipment

Specific equipment for these operations includes the following:

- The hydrated lime injection system includes one hydrated lime storage silo (T-20512), pneumatic truck off-load system and handling conveyors. The emissions from the hydrated lime handling conveyors will be ventilated to a dust collectors (DC-20512).

- The boiler bottoms ash collection system includes a bottoms ash roll-off box (T-20514) and conveyors. The emissions from the bottoms ash collection system will be ventilated to a dust collector (DC-20514).
- The boiler fly ash collection system includes ash handling pneumatic conveyors, one interim storage silo (T-02710) with a combined truck/rail load-out system. The emissions from the boiler fly ash collection and conveying system will be ventilated to one of two dust collectors (DC-20510 or DC-20520). The fly ash storage silo will be ventilated to a dust collector (DC-2710).
- One fly ash load-out silo spout (EP-02711) ventilated to a dust collector (DC-02711).

2.8 Lignin Cake Storage

Wet lignin-rich stillage cake, produced from the enzymatic hydrolysis ethanol manufacturing process will be burned as solid biomass boiler fuel. A covered concrete pad storage area will be constructed to divert lignin-rich stillage cake away for the biomass-fired stoker boiler during process upsets and to provide some additional storage. The lignin-rich stillage cake storage needs are based on a pad sized for 4 hours of storage.

2.9 Flaring

A single flare will be utilized at the facility for emissions control of vapor recovery during product loadout, as well as for back-up destruction of biogas and NCG process vent flow normally combusted in the biomass-fired stoker boiler. The flare will be limited to 3,960 hours per year.

2.9.1 Specific Equipment

One flare (EP-09001) with maximum design heat input rate of 51 MMBtu/hr for the purpose of an emergency and start-up, shutdown and maintenance (SSM) of the biomass boiler, where biogas and NCG process vents are normally combusted.

2.10 Emergency Equipment

The facility will be equipped with an emergency firewater pump. The firewater pump will be limited to operational testing of 100 hours per year.

2.10.1 Specific Equipment

Specific equipment for this operation includes the following:

- One diesel engine (EP-06001), rated at 460 maximum brake horsepower, burning diesel fuel for the purpose of providing power to the emergency firewater pump.

2.11 Plant Roads

Maintenance will be performed on all roads on plant property, as necessary, to ensure that the structural integrity of the roads is preserved and that fugitive emissions of PM and PM_{10} from all roads on plant property are minimized. In-plant haul roads (EP-01000) will be paved. Biomass laydown roads (EP-01050) will be unpaved. Best management practices (BMPs) will be used to ensure there are no visible emissions beyond the property boundary. BMPs such as limiting vehicle speeds, use of wind fences or other wind breaks, water spray/road washing, chemical stabilization, and sweeping will be employed as necessary.

Section 3.0
Regulatory Applicability Analysis

3.1 Current Kansas Air Quality Regulations

The Kansas Air Quality Regulations (K.A.R.) that were reviewed for the purpose of the permit application are discussed below. Table 3-1 summarizes the Kansas Air Quality Regulations that were reviewed for the applicability of each regulation.

Table 3–1
Reviewed Kansas Air Quality Regulations

K.A.R.	Title	Applicability Determination
K.A.R. 28-19-20	Particulate Matter Emissions Limitations	Applicable
K.A.R. 28-19-23	Hydrocarbon Emissions Stationary Sources	Applicable
K.A.R. 28-19-30 & K.A.R. 28-19-31	General Provisions & Emission Limitations	Not Applicable
K.A.R. 28-19-77	Chemical Processing Facilities that Operate Alcohol Plants or Liquid Detergent Plants	Not Applicable
K.A.R. 28-19-300	Construction Permits and Approvals; Applicability	Applicable
K.A.R. 28-19-302	Construction Permits and Approvals; Additional Provisions; Construction Permits	Not Applicable
K.A.R. 28-19-304	Construction Permits and Approvals; Fees	Applicable
K.A.R. 28-19-350	Prevention of Significant Deterioration of Air Quality	Applicable
K.A.R. 28-19-500	Operating Permits; Applicability	Applicable
K.A.R. 28-19-650	Emissions Opacity Limits	Applicable
K.A.R. 28-19-720	New Source Performance Standards	Applicable
K.A.R. 28-19-735	National Emission Standards for Hazardous Air Pollutants	Not Applicable
K.A.R. 28-19-750	Maximum Achievable Control Technology Regulations	Not Applicable

3.1.1 K.A.R. 28-19-20 – Particulate Matter Emissions Limitations

This standard establishes a particulate matter (PM) emission limit based upon the processing throughput (i.e. process weight rate) of the processing equipment or device(s) which emit PM. This standard does not apply to emission units where more stringent New Source Performance Standards (NSPS, 40 CFR Part 60) apply, to indirect heating sources per K.A.R. 28-19-20(a), to sources whose emissions do not pass through a stack (i.e. fugitive sources), or to emission units that at maximum design capacity have a potential to emit less than one-half (0.5) pounds per hour of PM. Exempt emission units at the facility include those units listed in Table 3-2.

Table 3–2
Emission Units Exempt from Process Weight Rate Standard

Emission Point No.	Source	Applicability Determination
Enzymatic Hydrolysis Plant		
EP-11120	Floor Sweep System DC	<0.5 lb/hr Emission Rate
EP-11110FUG	Crop Receiving, Grinding and Conveying	Fugitive Source
EP-18185	EH Fermentation CO_2 Scrubber	<0.5 lb/hr Emission Rate
Utilities		
EP-04001	Cooling Water Tower	<0.5 lb/hr Emission Rate
EP-20001	Biomass-Fired Stoker Boiler #1	Indirect Heat; Solid Fuel
EP-20514	Boiler Bottoms Ash Handling DC #1	<0.5 lb/hr Emission Rate
EP-20510	Boiler Fly Ash Handling DC #1	<0.5 lb/hr Emission Rate
EP-20520	Boiler Fly Ash Handling DC #2	<0.5 lb/hr Emission Rate
EP-20512	Lime Handling DC #1	<0.5 lb/hr Emission Rate
EP-09001	Flare	<0.5 lb/hr Emission Rate
EP-06001 (EMG)	Firewater Pump Engine	<0.5 lb/hr Emission Rate

The PM emission limits based on process weight are presented in Table P-1 of K.A.R. 28-19-20 and the following equation:

For process weight rates up to and equal to 30 ton/hr (60,000 lb/hr), $E = 4.10\ P^{0.67}$

For process weight rates in excess of 30 ton/hr (60,000 lb/hr), $E = 55.0\ P^{0.11} - 40$

Where:

E = rate of emission in lb/hr

P = process weight rate in tons/hr

The maximum allowable emission rates for each regulated source at the proposed facility are summarized in Table 3-3.

Table 3–3
Maximum Allowable Particulate Emission Rates

Emission Point No.	Source	Potential PM Emissions (lb/hr)	Process Weight (P) (tons/hr)	Maximum Allowable Emission Rate (E) (lb/hr)	Complies with Limit? (Yes/No)
Enzymatic Hydrolysis Plant					
EP-11110	Bale Grinder DC	4.93	79.2	48.97	Yes
EP-11170	Classifier Cyclone # 1 DC	0.74	27.4	37.68	Yes
EP-11270	Classifier Cyclone # 2 DC	0.74	27.4	37.68	Yes
EP-11711	Boiler Feed System DC	0.74	27.4	37.68	Yes
EP-02710	Bulk Fly Ash Load-Out Silo	0.96	7.06	15.19	Yes
EP-02711	Bulk Fly Ash Load-Out Silo Spout	0.96	7.06	15.19	Yes

3.1.2 K.A.R. 28-19-23 – Hydrocarbon Emissions Stationary Sources

This standard applies to any stationary tank reservoir or other container of more than 40,000 gallons capacity, which contains any gasoline or any petroleum distillate having a vapor pressure of 3.0 pounds per square inch, absolute, or greater under actual storage conditions unless such tank, reservoir, or other container is a pressure tank capable of maintaining working pressures sufficient to prevent vapor or gas loss to the atmosphere. Tanks subject to this standard must be equipped with a floating roof, such as a pontoon type, double deck-type roof or internal floating cover; or a vapor recovery system.

Each on-site storage tank that contains gasoline, or is blended with gasoline, will be built to code on-site and will utilize the internal floating roof design, in accordance with NSPS Subpart Kb, *Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Modification, Reconstruction, or Modification Commenced After July 23, 1984* (40 CFR §§60.110b through 60.117b). The relevant requirements for the storage tanks are contained in 40 CFR §60.112b, which requires a fixed roof in combination with an internal floating roof. The ethanol production process tanks (shift tanks) are not subject to Subpart Kb based on the definition of "storage vessel"; however, these tanks will also be fitted with control technology similar to the storage tanks to reduce product loss and thereby increase production efficiency. The tanks will be installed with internal pontoon floating roofs with fixed tank roofs. The floating roofs will have metallic shoe seals and low profile secondary seals.

Truck and railcar loading will be equipped with a vapor collection system that is routed to either the biomass-fired stoker boiler or flare for destruction of collected load-out vapors. The flare will meet the control device requirements of 40 CFR Part 60, Subpart A, Standards of Performance for New Stationary Sources – General Provisions, 40 CFR §60.18c through §60.18f.

Based on the planned use of internal floating roofs for on-site storage tanks and vapor recovery during loadout, the proposed facility is expected to be in compliance with this regulation.

3.1.3 K.A.R. 28-19-30 – General Provisions & K.A.R. 28-19-31 – Emission Limitations

This standard applies to installations in which fuel is burned for the primary purpose of producing steam, hot water, or hot air or other indirect heating of liquids, gases, or solids and, in the course of doing so, the products of combustion do not come into direct contact with process materials.

Exempt emission units at the facility include those units listed in Table 3-4. These exempt units include those which utilize direct combustion or are subject to more stringent NSPS regulations.

Table 3–4
Emission Units Exempt From General Provisions

Emission Point No.	Source	Applicability Determination
Utilities		
EP-20001	Biomass-Fired Stoker Boiler #1	NSPS, Subpart Db
EP-09001	Flare	Direct Combustion
EP-06001 (EMG)	Firewater Pump Engine	Direct Combustion

There are no indirect heating sources at the proposed facility subject to this standard; therefore, this standard is not applicable.

3.1.4 K.A.R. 28-19-77 – Chemical Processing Facilities that Operate Alcohol Plants or Liquid Detergent Plants

This standard applies to any facility that uses, produces or stores ethanol or methanol; has a VOC emission rate of 100 ton/yr or greater; and is located in an

area which has been identified as not meeting the National Ambient Air Quality Standard (NAAQS) for Ozone. The proposed facility is located within an area designated as attainment or unclassified; therefore this standard is not applicable.

3.1.5 K.A.R. 28-19-300 – Construction Permits and Approvals; Applicability

A construction permit is required for this facility because the PTE of the proposed project has an uncontrolled net increase in emissions equal to or greater than the thresholds listed in K.A.R. 28-19-300(a)(1)(A) through (F) for PM/PM_{10}/$PM_{2.5}$, NOx, SOx, CO, and VOC; and because the facility is an affected source as defined in K.A.R. 28-19-200(dd)(20). The emission thresholds are summarized in Table 3-5 below.

Table 3–5
Construction Permit Emissions Thresholds

Pollutant	Threshold
PM	25 tpy
PM_{10}	15 tpy
NOx	40 tpy
SOx	40 tpy
CO	100 tpy
VOC	40 tpy

Because the facility exceeds at least one of the above construction permit thresholds, the facility must obtain a construction permit prior to commencing construction.

3.1.6 K.A.R. 28-19-302 – Construction Permits and Approvals; Additional Provisions; Construction Permits

This standard allows for facilities that would otherwise be required to submit an application for the construction of a new source to request a federally enforceable operational restriction be included in the construction permit which reduces the PTE of the facility, thereby reducing the requirements the facility must meet.

The facility is requesting to limit its individual HAP emissions to not more than 9.9 tons per year and total HAP emissions to not more than 24.9 tons per year based on a 12-month rolling average. This HAP limit will establish the facility as a synthetic minor for the purposes of 40 CFR Part 63.

3.1.7 K.A.R. 28-19-304 – Construction Permits and Approvals; Fees

The facility has submitted a $5,500.00 fee in accordance with this standard. The maximum construction application fee of $4,000.00 was submitted due to the capital cost of the project totaling more than $8,000,000. An additional $1,500.00 was also submitted due the proposed project also being a PSD source.

3.1.8 K.A.R. 28-19-350 – Prevention of Significant Deterioration of Air Quality

The requirements of this regulation apply to the facility, as it meets the definition in 40 CFR Part 52, *Prevention of Significant Deterioration of Air Quality* (40 CFR §52.21) for a major stationary source and is located in an area of the state designated as attainment or unclassified area.

3.1.9 K.A.R. 28-19-500 – Operating Permits; Applicability

The facility is required to obtain a Class I Operating Permit for the criteria pollutants, PM/PM_{10}, NOx, SOx, and CO.

3.1.10 K.A.R. 28-19-650 – Emissions Opacity Limits

This standard limits opacity from all equipment at the facility to 20%. This standard does not apply to those sources that do not emit visible air contaminants or emission units, that are subject to other K.A.R. regulations, or that are subject to more stringent NSPS regulations. Table 3-6 lists those sources subject to this opacity limit, as well as those sources subject to other K.A.R. regulations or more stringent NSPS opacity limits.

Table 3–6
Emission Units with Opacity Limits

Emission Point No.	Source Description	Limiting Standard	Opacity Limit (%)
Haul Roads			
EP-01000FUG	Paved Plant Roads	K.A.R. 28-19-650	20
EP-01050FUG	Biomass Laydown Roads	K.A.R. 28-19-650	20
Enzymatic Hydrolysis Plant			
EP-11120	Floor Sweep System DC	K.A.R. 28-19-650	20
EP-11110	Bale Grinder DC	K.A.R. 28-19-650	20
EP-11170	Classifier Cyclone # 1 DC	K.A.R. 28-19-650	20
EP-11270	Classifier Cyclone # 2 DC	K.A.R. 28-19-650	20

Table 3–6
Emission Units with Opacity Limits

Emission Point No.	Source Description	Limiting Standard	Opacity Limit (%)
EP-11711	Boiler Feed System DC	K.A.R. 28-19-650	20
EP-11110FUG	Crop Receiving, Grinding and Conveying	K.A.R. 28-19-650	20
EP-18185	EH Fermentation CO2 Scrubber	K.A.R. 28-19-650	20
Utilities			
EP-02710	Bulk Fly Ash Load-Out Silo	K.A.R. 28-19-650	20
EP-02711	Bulk Fly Ash Load-Out Silo Spout	K.A.R. 28-19-650	20
EP-04001	Cooling Water Tower	K.A.R. 28-19-650	20
EP-20001	Biomass-Fired Stoker Boiler #1	Area MACT Subpart 6J	10
EP-20514	Boiler Bottoms Ash Handling DC #1	K.A.R. 28-19-650	20
EP-20510	Boiler Fly Ash Handling DC #1	K.A.R. 28-19-650	20
EP-20520	Boiler Fly Ash Handling DC #2	K.A.R. 28-19-650	20
EP-20512	Lime Handling DC #1	K.A.R. 28-19-650	20
EP-09001	Flare	NSPS, Subpart A	0
EP-06001 (EMG)	Firewater Pump Engine	K.A.R. 28-19-650	20

All of the equipment controlled by fabric filter baghouse dust collection systems will comply with this standard, as the equipment is maintained under negative pressure and a BACT limit for visible emissions of 0% opacity, which is the most stringent limit and includes both filterable and condensable particulate matter, has been proposed. The cooling water tower (EP-04001) will be equipped with drift eliminators to control drift to 0.0005%; therefore, it is expected that these units will comply with this standard.

40 CFR Part 63, Subpart JJJJJJ, *National Emission Standard for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers*, limits particulate emissions controlled by a fabric filter (baghouse) to less than or equal to 10% opacity (daily block average).

The flare will not emit visible emissions (0% opacity) in accordance with NSPS, Subpart A, *General Provisions* (40 CFR §60.18).

Fugitive emission sources such as the haul roads will comply with this standard through the implementation of a Fugitive Dust Control Plan.

3.1.11 K.A.R. 28-19-720 – New Source Performance Standards

New Source Performance Standards are Federal standards (40 CRF Part 60) that Kansas has adopted by reference, with the exception of 40 CFR §§60.4, 60.9, 60.10, 60.16 and subpart HHHH. There are multiple NSPS that apply to the facility. These standards are discussed in detail in Section 3.2.

3.1.12 K.A.R. 28-19-735 – National Emission Standards for Hazardous Air Pollutants

National Emission Standards for Hazardous Air Pollutants regulations are Federal standards (40 CFR Part 61) that Kansas has adopted by reference, with the exception of 40 CFR §§61.04, 61.16, 61.17, and subparts H, I and K. There are no NESHAPs in 40 CFR Part 61 that apply to the facility.

3.1.13 K.A.R. 28-19-750 – Maximum Achievable Control Technology Regulations

Maximum Achievable Control Technology regulations are Federal NESHAP standards for Source Categories (40 CFR Part 63) that Kansas has adopted by reference, with the exception of 40 CFR §§63.12, 63.13, 63.13, 63.40 through 63.44 and subpart E.

As discussed previously, the facility is requesting to limit its individual HAP emissions to not more than 9.9 tons per year and total HAP emissions to not more than 24.9 tons per year based on a 12-month rolling average. Therefore, the proposed facility is subject to certain NESHAPs listed in 40 CFR Part 63 and will voluntarily comply with other NESHAPs to reduce facility-wide HAP emissions below major source thresholds. A detailed NESHAPs applicability review and MACT/GACT analysis for each new affected emission unit and pollutant emitting activity will be performed and provided under separate cover. The MACT standards set forth in applicable NESHAPs are federally enforceable as are the emission reductions to below major source thresholds.

3.2 Federal Standards of Performance for New Stationary Sources

The Federal Standards of Performance for New Stationary Sources (a.k.a. New Source Performance Standards, NSPS) regulations that were reviewed for the purpose of the permit application are discussed below. Table 3-7 summarizes the NSPS regulations that were reviewed and the applicability of each regulation.

Table 3–7
Reviewed NSPS Regulations

40 CFR Part 60	Standards of Performance for…	Affected Sources
Subpart D	Fossil-Fuel-Fired Steam Generators for Which Construction Is Commenced After August 17, 1971	Not Applicable
Subpart Da	Electric Utility Steam Generating Units for Which Construction Is Commenced After September 18, 1978	Not Applicable
Subpart Db	Industrial-Commercial-Institutional Steam Generating Units for Which Construction, or Modification Commenced After June 19, 1984	EP-20001
Subpart Dc	Small Industrial-Commercial-Institutional Steam Generating Units for Which Construction, Reconstruction, or Modification Commenced After June 9, 1989	Not Applicable
Subpart K	Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After June 11, 1973, and Prior to May 19, 1978	Not Applicable
Subpart Ka	Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and Prior to July 23, 1984	Not Applicable
Subpart Kb	Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced after July 23, 1984	EP-02102 EP-02112 EP-02105
Subpart VV	Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry (SOCMI) for which Construction, Reconstruction, or Modification Commenced After January 5, 1981, and on or Before November 7, 2006	Not Applicable
Subpart VVa	Equipment Leaks of VOC in the SOCMI for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006	EP-02000
Subpart GGG	Equipment Leaks of VOC in Petroleum Refineries	Not Applicable
Subpart III	VOC Emissions From the SOCMI Air Oxidation Unit Processes	Not Applicable
Subpart NNN	VOC Emissions From the SOCMI Distillation Operations	Not Applicable
Subpart RRR	VOC Emissions From SOCMI Reactor Processes	Not Applicable
Subpart IIII	Compression Ignition Internal Combustion Engines	EP-06001

3.2.1 40 CFR Part 60 Subpart D – Standards of Performance for Fossil-Fuel-Fired Steam Generators for Which Construction Is Commenced After August 17, 1971

The affected facilities to which the provisions of this subpart apply are fossil fuel-fired or fossil fuel and wood residue-fired steam generating unit of more than 73 megawatts heat input rate (250 MMBtu/hr). 40 CFR §60.40b(j) specifically exempts any affected facility meeting the applicability requirements under 40 CFR §60.40b(a) and commencing construction, modification, or reconstruction after June 19, 1986 from this subpart.

3.2.2 40 CFR Part 60 Subpart Da – Standards of Performance for Electric Utility Steam Generating Units for Which Construction Is Commenced After September 18, 1978

The affected facility to which this subpart applies is each electric utility steam generating unit that is capable of combusting more than 73 megawatts (250 MMBtu/hr) heat input of fossil fuel (either alone or in combination with any other fuel); and for which construction or modification is commenced after September 18, 1978.

An "electric utility steam-generating unit" is defined in 40 CFR §60.41Da as any steam electric generating unit that is constructed for the purpose of supplying more than one-third of its potential electric output capacity and more than 25 MWe net-electrical output to any utility power distribution system for sale. The proposed cogeneration plant will consist of a single steam driven electricity-producing turbine with a nominal gross power production rate of 22 MWe. Electrical power will be supplied to the facility. The projected electricity output is as follows:

- Nominal gross power production = 22 MWe;
- Power net to grid = 0 - 2 MWe;
- Power to enzymatic hydrolysis and cogeneration processes = 20 MWe.

The proposed electricity-producing turbine generator will not be capable of supplying more than one-third of its potential electric output capacity to the grid; therefore, this subpart does not apply to the proposed biomass-fired stoker boiler (BL-20001).

3.2.3 40 CFR Part 60 Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units

The affected facility to which this subpart applies is each steam generating unit that is capable of combusting more than 29 megawatts (100 MMBtu/hr) heat input of fossil fuel (either alone or in combination with any other fuel); and for which construction or modification is commenced after June 19, 1984. This facility will have a biomass-fired stoker boiler (BL-200001) with a heat input of 500 MMBtu/hr. The boiler is subject to this NSPS.

3.2.3.1 *SO_2 NSPS Limit*

40 CFR §60.42b(k) limits SO_2 emissions to 0.20 lb/MMBtu, or 8 percent (0.08) of the potential SO_2 emission rate (i.e. a 92% reduction) and 1.2 lb/MMBtu. The SO_2 emission rate during the worst-case fuel blend with the implementation of BACT is 0.21 lb/MMBtu, which is based on a 92% reduction of the maximum potential SO_2 emission rate. Therefore, the boiler is expected to be in compliance with Subpart Db SO_2 limits when firing a combination of raw biomass (consisting of corn stover, wheat straw, milo (sorghum) stubble, corn stover, switchgrass, and other opportunity feedstocks that are available), enzymatic hydrolysis residuals (including lignin-rich stillage cake and thin stillage syrup), particles collected during biomass grinding, NCG vent streams, wastewater treatment sludge and biogas.

Natural gas will be used during start-up periods as required per manufacturer recommendations. The biomass-fired stoker boiler will also be capable of firing on natural gas during normal operations as needed and during periods of malfunction and maintenance of control devices at a limited capacity. The SO_2 emission rate during SSM when only natural gas is combusted is 0.0006 lb/MMBtu.

The biomass-fired stoker boiler will also be capable of firing on a combination of natural gas, liquid fuel (i.e. enzymatic hydrolysis thin stillage syrup) and biogas in the event of a solid fuel failure. The SO_2 emission rate when there is a solid fuel failure event with the implementation of BACT is 0.21 lb/MMBtu, which is based on a 92% reduction of the maximum potential SO_2 emission rate.

3.2.3.2 *PM NSPS Limit*

The biomass-fired stoker boiler is exempt from §60.43b and is subject to the more stringent limit established in 40 CFR Part 63, Subpart JJJJJJ, *National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers*. This limit is discussed in detail in the MACT/GACT analysis, to be provided under separate cover.

The PM emission rate (including filterable and condensable fractions) during the worst-case fuel blend with the implementation of BACT is 0.015 lb/MMBtu filterable PM, which incorporates a 99.8% reduction of the maximum potential filterable PM emission rate.

Natural gas will be used during start-up periods as required per manufacturer recommendations. The biomass-fired stoker boiler will also be capable of firing on natural gas during normal operations as needed and during periods of malfunction and maintenance of control devices at a limited capacity. The PM emission rate during SSM when only natural gas is combusted is 0.0075 lb/MMBtu.

The biomass-fired stoker boiler will also be capable of firing on a combination of natural gas, liquid fuel (i.e. enzymatic hydrolysis thin stillage syrup) and biogas in the event of a solid fuel failure. The filterable PM emission rate when there is a solid fuel failure event with the implementation of BACT is 0.0.014 lb/MMBtu.

ABBK will comply with the fabric filter control requirements specified in 40 CFR Part 63, Subpart JJJJJJ, Table 3, *Operating Limits for Boilers with Emission Limits.*

3.2.3.3 *NOx NSPS Limit*

ABBK is requesting to limit the annual capacity factor for natural gas to 10% or less; therefore, the NOx standard in this subpart does not apply to the proposed biomass-fired stoker boiler (BL-20001).

Performance testing, compliance determination and record keeping will be performed in accordance to this rule.

3.2.4 40 CFR Part 60 Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

This subpart applies to steam generating units with a design heat input rate greater than 10 MMBtu/hr but less than 100 MMBtu/hr that are constructed, reconstructed or modified after June 9, 1989.

There are no steam generating unit at the proposed facility that have a heat input greater than 10 MMBtu/hr but less than 100 MMBtu/hr; therefore, this subpart is not applicable.

3.2.5 40 CFR Part 60 Subpart K – Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After June 11, 1973, and Prior to May 19, 1978

This subpart is not applicable to the proposed facility, as the petroleum liquid storage vessels were not constructed or modified between June 11, 1973 and May 19, 1978.

3.2.6 40 CFR Part 60 Subpart Ka – Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and Prior to July 23, 1984

This subpart is not applicable to the proposed facility, as the petroleum liquid storage vessels were not constructed or modified between May 18, 1978 and July 23, 1984.

3.2.7 40 CFR Part 60 Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced after July 23, 1984

This subpart applies to affected facilities containing a storage vessel with a capacity greater than or equal to 40 cubic meters (approximately 10,600 gallons) that is used to store volatile organic liquids (VOLs) for which construction, reconstruction, or modification is commenced after July 23, 1984. The applicable requirements depend on the size of the vessel and the maximum true vapor pressure (in kilopascals, kPa) of the VOL.

This standard applies to the following storage tanks:

- 500,000-gallon denatured ethanol tanks (T-02102 and T-02112), 7 kPa maximum true vapor pressure; and
- 22,500-gallon denaturant (gasoline) tank (T-02105), 42 kPa maximum true vapor pressure.

The relevant requirements for the proposed tanks are contained in 40 CFR §60.112b, which requires a fixed roof in combination with an internal floating roof. The tanks will be installed with internal pontoon floating roofs with fixed tank roofs. The floating roofs will have metallic shoe seals and low profile secondary seals. The testing, reporting and monitoring provisions of 40 CFR §§60.113b, 60.115b and 60.116b will be met as applicable.

Other storage tanks at the facility that are not subject to this subpart include the emergency firewater pump diesel fuel storage tank and the process tanks specifically excluded based the definition of "storage vessel". The firewater pump diesel engine will not have a stand-alone storage tank. The 41,000-gallon shift tanks (T-02107 and T-02108) are process tanks as defined in 40 CFR §60.111b.

3.2.8 40 CFR Part 60 Subpart VV – Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for which Construction, Reconstruction, or Modification Commenced After January 5, 1981, and on or Before November 7, 2006

This subpart is not applicable to the proposed facility, as the facility was not constructed or modified after January 5, 1981, and on or before November 7, 2006.

3.2.9 40 CFR Part 60 Subpart VVa – Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemical Manufacturing Industry

The provisions of this subpart apply to new affected facilities in the synthetic organic chemicals manufacturing industry (SOCMI). Synthetic organic chemical manufacturing industry (SOCMI) is defined as any facility that manufactures any chemical listed in 40 CFR §60.489a. Ethanol (CAS No. 64-17-5) is so listed in 40 CFR §60.489a, and thus Subpart VV applies to the proposed facility. This subpart is associated with 40 CFR Part 60 Subpart NNN and RRR, but NNN and RRR are based on how the chemical is produced (biomass versus synthetic), while this subpart is based just on the chemicals produced.

Affected equipment at the facility include: light liquid valves, light liquid pumps, gas valves, control valves, flanges, transmitters, and manholes (EP-02000). The requirements of this subpart include monitoring of components, both visually and

with the aid of a portable organic vapor detection instrument, to detect leaks beyond certain thresholds. Leaks detected that exceed the applicable thresholds must be repaired in specific timeframes. Reporting and recordkeeping will be performed in accordance with 40 CFR §§60.486a and 60.487a.

3.2.10 40 CFR Part 60 Subpart GGG – Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries

The provisions of this subpart apply to affected facilities in petroleum refineries. The proposed facility is not a petroleum refinery; therefore, this subpart is not applicable.

3.2.11 40 CFR Part 60 Subpart III – Standards of Performance for Volatile Organic Compound (VOC) Emissions from the SOCMI Air Oxidation Unit Processes

The provisions of this subpart apply to each affected facility that produces any of the chemicals listed in §60.617 as a product, co-product, by-product, or intermediate. The proposed facility produces ethanol (e.g. ethyl alcohol), which is not a chemical listed in §60.617; therefore, this subpart is not applicable.

3.2.12 40 CFR Part 60 Subpart NNN – Standards of Performance for VOC Emissions From the SOCMI Distillation Operations

The provisions of this subpart apply to each affected facility that is part of a process unit that produces any of the chemicals listed in 40 CFR §60.667 as a product, co-product, by-product, or intermediate through a distillation process. Although ethanol is listed in §60.667, this subpart does not apply to the distillation operation, per an EPA Region VII decision. The EPA has stated that Subpart NNN does not apply to ethanol derived from biomass. Subpart NNN applies to synthetic (chemical reaction of petroleum refining products) processes used to produce organic chemicals (including ethanol).

3.2.13 40 CFR Part 60 Subpart RRR – Standards of Performance for VOC Emissions From SOCMI Reactor Processes

The provisions of this subpart apply to each affected facility that is part of a process unit that produces any of the chemicals listed in 40 CFR §60.707 as a product, co-product, by-product, or intermediate in a process reactor. Although

ethanol is listed in 40 CFR §60.707, this subpart does not apply to the fermentation tanks, per an EPA Region VII decision. The EPA has stated that Subpart RRR does not apply to ethanol derived from biomass. Subpart RRR applies to synthetic (chemical reaction of petroleum refining products) processes used to produce organic chemicals (including ethanol).

3.2.14 40 CFR Part 60 Subpart IIII – Standards of Performance Compression Ignition Internal Combustion Engines

The provisions of this subpart apply to new stationary compression ignition (CI) internal combustion engines (ICE) manufactured after July 1, 2006. This rule applies to the emergency firewater pump engine (EP-06001).

The firewater pump engine will be limited to operating 100 hr/yr to comply with §60.4211(e). Since the requirements to meet the emissions standards actually fall on the engine manufacturer, the facility is only required to meet operational limits, including fuel requirements. The proposed ICE at the facility will be installed, operated and maintained in accordance with the specifications and instructions provided by the engine manufacturer. The engine purchased will be certified to meet the applicable emission standard for the model year and maximum engine power of the engine selected and will have a non-resettable hour meter. According to this subpart, owners and operators of emergency engines are not required to submit initial notifications. However, records of hours of operation in emergency and non-emergency service are required.

Appendix A

KDHE Air Quality Notification of Construction Application

Kansas Department of Health and Environment
Bureau of Air and Radiation
Phone (785) 296-1570 Fax (785) 291-3953

Notification of Construction or Modification

(K.A.R. 28-19-300 Construction permits and approvals; applicability)

Check one: [X] **Applying for a Permit under K.A.R. 28-19-300(a)** [ ] **Applying for an Approval under K.A.R. 28-19-300(b)***

1) Source ID Number: 1890231

2) Mailing Information:
   Company Name: Abengoa Bioenergy Biomass of Kansas, LLC
   Address: 16150 Main Circle Drive, Suite 300
   City, State, Zip: Chesterfield, Missouri 63017

3) Source Location:
   Street Address: N/A
   City, County, State, Zip: Hugoton, Kansas 67951
   Section, Township, Range: Section 18, Township 33S, Range 37W
   ~~Latitude & Longitude Coordinates:~~ UTM: 288420.00 Easting, 4117545.00 Northing

4) NAICSC/SIC Code (Primary): 325193/2869

5) Primary Product Produced at the Source: Fuel-Grade Ethanol

6) Would this modification require a change in the current operating permit for your facility? [ ] Yes [x] No

   If no, please explain: New Construction

7) Is a permit fee being submitted? [x] Yes [ ] No

   If yes, please include the facility's federal employee identification number (FEIN #) 20-5181119

8) Person to Contact at the Site: Robert Wildgen Phone: (636) 728-4515
   Title: Project Development Manager, Abengoa Bioenergy Biomass of Kansas
   Email: Robert.Wildgen@bioenergy.abengoa.com Fax: (636) 536-4502

9) Person to Contact Concerning Permit: Stephanie Salter, PE Phone: (402) 475-8588
   Title: Environmental Project Manager, WLA Consulting, Inc.
   Email: Stephanie.Salter@WLA-consulting.com Fax: (402) 477-1956

Please read before signing:

Reporting forms provided may not adequately describe some processes. Modify the forms if necessary. Include a written description of the activity being proposed, a description of where the air emissions are generated and exhausted and how they are controlled. A simple diagram showing the proposed activity addressed in this notification which produces air pollutants at the facility (process flow diagrams, plotplan, etc.) with emission points labeled must be submitted with reporting forms. Information that, if made public, would divulge methods or processes entitled to protection as trade secrets may be held confidential. See the reverse side of this page for the procedure to request information be held confidential. A copy of the Kansas Air Quality Statutes and Regulations will be provided upon request.

Name and Title: Robert Wildgen, Project Development Manager

Address: 16150 Main Circle Drive, Suite 300 Chesterfield, MO 63017

Signature: _____ Date: 5/3/11 Phone: (636) 728-4515

* If you do not know whether to apply for a permit or an approval, follow approval application procedures.

Procedures For Requesting Information To Be Held Confidential

An applicant may request that information submitted to the Department, other than emission data or information in any air quality permit or approval, be treated as confidential if the information would divulge methods or processes entitled to protection as trade secrets.

A request to designate information within the Department's air quality files as confidential must include:

(1) An uncensored copy of the document clearly marked as confidential;

(2) A copy of the document, or copies if more than one is required to be filed with the Department, with the confidential information masked;

(3) Specification of the type of information to be held as confidential (i.e., product formulations, process rates);

(4) Specification and justification of the reason the information is qualified by statute to be treated as confidential (competitive advantage, company developed secret formulation, trade secret); and

(5) A reference at each place in the document or documents where information is masked referring to the specification of the type of information masked and the specification and justification the information is qualified by statute to be treated as confidential.

ONLY THE CONFIDENTIAL INFORMATION ON ANY DOCUMENT MAY BE MASKED. ALL INFORMATION ON ANY DOCUMENT WHICH IS NOT CONFIDENTIAL MUST REMAIN LEGIBLE.

The information will be treated as confidential until the secretary has acted upon the request and the owner or operator has had the opportunity to exhaust any available remedies if the secretary determines the information is not confidential.

Complete this and all reporting forms and submit to:

Kansas Department of Health and Environment
Bureau of Air and Radiation
1000 SW Jackson, Suite 310
Topeka, KS 66612-1366
(785) 296-1570

Sources located in Wyandotte County should obtain forms from, and submit forms to:

Unified Government of Wyandotte County
Department of Air Quality
619 Ann Avenue
Kansas City, KS 66101
(913) 573-6700

CALCULATING THE CONSTRUCTION PERMIT APPLICATION FEE

[These requirements are found at K.A.R. 28-19-304(b).]

Calculate the construction permit application fee as follows:

Estimated capital cost of the proposed activity for which the application is made, including the total cost of equipment and services to be capitalized.	**Line 1**	$ >8,000,000
Multiply by .05% (.0005)		x .0005
Total	**Line 2**	$ 4,000

If Line 2 is less than $100, enter $100 on Line 3.
If Line 2 is greater than $4,000, enter $4,000 on Line 3.

Otherwise, copy Line 2 to Line 3.

Construction permit application fee. **Line 3** $ 4,000 + 1500 (PSD) Minimum fee is $100

Certifier of Capital Cost

Robert A. Wildgen
(Print)

(Signature)

5/3/11
Date

K.A.R. 28-19-350 is a complex regulation pertaining to prevention of significant deterioration (PSD). An additional fee of $1,500 will be required if a PSD review is necessary. If you believe the proposed activity in this Notification of Construction or Modification will be subject to the requirements of K.A.R. 28-19-350, contact the Department for further evaluation.

For purposes of construction permit or approval applications, the following are not considered modifications:

1. Routine maintenance or parts replacement.
2. An increase or decrease in operating hours or production rates if:
   a. production rate increases do not exceed the originally approved design capacity of the stationary source or emissions unit; and
   b. the increased potential-to-emit resulting from the change in operating hours or production rates do not exceed any emission or operating limitations imposed as a permit condition.

Appendix B

Process/Equipment Description Forms

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

EQUIPMENT IN VOC SERVICE

(Pumps, Compressors, Pressure Relief Devices, Sampling Connection Systems Open Ended Valves or Lines, Valves, Flanges, & Other Connectors)

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Normal Operating Schedule: 8,760 hrs/yr

4) Process Unit In Which Equipment Is To Be Located: Located throughout proposed biorefinery.

5) Design Processing Capacity of the Process Unit: Total production capacity is 30.0 MMgal/yr anhydrous ethanol.

6) Equipment (Include only that equipment which is in VOC service as defined in 40 CFR Part 60.481. Gas/vapor service, light liquid service, and heavy liquid service are also defined in 40 CFR 60.481):

Equipment Name	Quantity in Gas/Vapor Service	Quantity in Light Liquid Service	Quantity in Heavy Liquid Service
Pumps		5	4
Compressors			
Pressure Relief Devices	7		
Sampling Connection Systems	199		
Open Ended Valves or Lines	6		
Valves	22	24	28
Flanges			
Other Connectors			

7) NSPS Applicability (40 CFR Part 60)
Subpart VV - Standards of Performance for Equipment Leaks of VOC in the Organic Chemicals Manufacturing Industry
Subpart GGG - Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries
Subpart KKK - Standards of Performance for Equipment Leaks of VOC From Onshore Natural Gas Processing Plants

-What is the date of construction or modification of the facility ? July 2011
-Does the facility in question have the capacity to produce more than 1,000 Mg/yr?
Yes ☐; No ☑

EQUIPMENT IN VOC SERVICE

(Pumps, Compressors, Pressure Relief Devices, Sampling Connection Systems Open Ended Valves or Lines, Valves, Flanges, & Other Connectors)

(cont.)

-Does the facility in question produce heavy liquid chemicals only from heavy liquid feed or raw materials as defined in 40 CFR 60.481? Yes [ ]; No [✓]

-Does the facility in question produce beverage alcohol? Yes [ ]; No [✓]

-Does the facility in question have any equipment in VOC service? Yes [✓]; No [ ]

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

TANK LOADING/UNLOADING TERMINALS

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Emission Unit Identification: Storage Tanks T-02102, T-02105, T-02107, T-02108, and T-02112

4) Normal Operating Schedule: 3,960 hrs/yr

5) Products Loaded and Amounts (Attach MSDS for each product):

Product Name	Average Amount Transferred (gal/hr)
Loading: Denatured Ethanol	15,000 Avg; 30,000 MAX
Unloading: Denaturant (Gasoline)	7,500 Avg; 30,000 MAX

6) Filling Method:
Top-Splash Fill: _____ Top-Submerged Fill: _____ Bottom Loading: X
Other (Describe): _____

7) For emission control equipment, use the appropriate CONTROL EQUIPMENT form and duplicate as needed. Be sure to indicate the emission unit that the control equipment is affecting.

8) NSPS Applicability (40 CFR Part 60)
Subpart XX - Standards of Performance for Bulk Gasoline Terminals
-Does the facility operate one or more loading racks at a bulk gasoline terminal which deliver liquid product into gasoline tank trucks? Yes ☐; No ☑
-Did construction, modification, or reconstruction commence after December 17, 1980?
Yes ☑; No ☐

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

INDIRECT HEATING UNIT (BOILER)

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Emission Unit Identification: Biomass-Fired Stoker Boiler #1, EP-20001

4) Manufacturer: UNK Model No.: UNK

5) Maximum design heat-input rate: 500 MM BTU/hr
   Heat-release Rate: _____ BTU/hr/cu. ft. of furnace volume
   Annual load factor: _____
   Heater design: Cyclone _____; Underfeed stoker _____; Spreader stoker X_____;
   Pulverized (dry-tangential or normal/wet)_____; Other (specify) _____
   Normal Operating Schedule: 8,760 hours/year
   Date of latest modification: NA, New Source

6) Primary Fuel Type:
   Natural Gas ____ Oil ____Coal ____ Other (specify) Blended Biomass
   Secondary Fuel Type:
   Natural Gas X____ Oil ____ Coal ____ Other (specify) _____

7) If other fuel is waste liquid:
   What is the source of the waste? NA
   Will the waste be pretreated to remove any of the contaminants? Yes ____; No ____ If yes, describe method of pretreatment:

   _____

   _____

   If waste liquid is used in combination with fuel oil:
   Specify the volume percent of waste liquid:_____ %
   Specify the anticipated annual operating hours during which the fuel and waste combination will be used: _____ hrs.
   Fill in the data below for the fuel oil.

Include the chemical and physical characteristics of the waste liquid. Also, include any source emissions test data that is available from testing similar facilities that have disposed of this type liquid waste.

INDIRECT HEATING UNIT (BOILER)
(cont.)

8) Fuel Specific Data: (if other is specified, give appropriate data)

Natural Gas:

Heating value: 1,020 BTU/cu. ft.

(If fuel gas is used, also specify %Sulfur: 0.00)

Coal:

Fuel Parameters: %Sulfur: _____ % Ash: _____

Heating value: _____ BTU/lb.

Fuel Oil:

Fuel Parameters: %Sulfur: ____ Grade: _____

Heating value: _____ BTU/gal.

Density: _____ lb./gal.

Solids Fuel:

Fuel Parameters: %Sulfur = 0.86 to 0.98

%Ash = 12.98 to 13.53

Heating Value = 7,331 to 7,388 BTU/dry lbs

9) Air Emissions Control Technology: NOx X SOx X CO ____ Particulate X

If yes, breakdown of Control Technology: See BACT Analysis.

10) Soot blowing (if applicable): frequency: _____ duration: _____

11) Has boiler been derated because of:

Fuel change _____ Equip. limitations _____ Regulatory compliance _____

12) Emissions discharge to atmosphere 160 ft. above grade through stack or duct 10 ft. diameter at 300 ° F temperature, with 264,000 cfm flow rate and 56.02 fps velocity.

13) For emission control equipment, use the appropriate CONTROL EQUIPMENT form and duplicate as needed. Be sure to indicate the emission unit that the control equipment is affecting

14) Did construction, modification, or reconstruction commence after August 17, 1971 and on or before September 18, 1978 and does the indirect heating unit have a maximum design heat-input capacity to combust more than 250 million BTU/hour? Yes ☐; No ☑

If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart D.

15) Did construction, modification, or reconstruction commence after September 18, 1978 and does the indirect heating unit have a maximum design heat-input capacity to combust more than 250 million BTU/hour? Yes ☑; No ☐ Subject to Db

If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart Da.

16) Did construction, modification, or reconstruction commence after June 19, 1984 and does the indirect heating unit have a maximum design heat-input capacity to combust more than 100 million BTU/hour but less than 250 million BTU/hour? Yes ☐; No ☑ Subject to Db

If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart Db.

INDIRECT HEATING UNIT (BOILER)
(cont.)

17) Did construction, modification, or reconstruction commence after June 9, 1989 and does the indirect heating unit have a maximum design heat-input capacity to combust 10 million or more BTU/hour but less than 100 million BTU/hour? Yes _____; No ✓
If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart Dc.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

STATIONARY INTERNAL COMBUSTION ENGINES

1) Source ID Number : 1890231
Firewater Pump Engine (Emergency), EP-06001

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Type of Engine: Turbine_____ ; Reciprocating X_____ ; Other_____

4) Engine Manufacturer : TBD
Model No.: TBD
Date of Manufacture: 2010 or later
Serial No.: TBD

5) Use of Engine: Electric power generation ___ ; Compressor ___ ; Pump X___ ; Other - describe_____

6) Maximum Brake horsepower at continuous rating: 460 BHP
Normal operating engine speed: TBD RPM
Rated Brake Horsepower at normal operating RPM: TBD BHP
or
Maximum Generator Nameplate Capacity: 343.02 kW
Maximum design heat input rate: 3,220,000 BTU/hr

7) Operating schedule: 100 hrs per year

8) Date of Installation: NA, New Source
Date of Last modification: _____

TURBINES

9) Type of Gas Turbine: Simple cycle _____ ; Co-generation _____ ; Regenerative _____ ; Combined cycle_____

10) Fuel data for all the different types of fuel to be used :
a) Fuel Type _____ ; Sulfur content % by weight _____ ;
Lower heating value _____ BTU per cu ft; **or** _____ BTU per lb; **or** _____ BTU per gallon
b) Fuel Type _____ ; Sulfur content % by weight _____ ;
Lower heating value _____ BTU per cu ft; **or** _____ BTU per lb; **or** _____ BTU per gallon
c) Fuel Type _____ ; Sulfur content % by weight _____ ;
Lower heating value _____ BTU per cu ft; **or** _____ BTU per lb; **or** _____ BTU per gallon

STATIONARY INTERNAL COMBUSTION ENGINES
(cont.)

11) Heat recovery unit or steam generator unit installed? Yes _____; No _____
Supplementary fired ? Yes _____ ; No _____ If yes, type of fuel used: _____
Capacity of the burner _____ gals per hr
Fuel heating value _____ BTU per cu ft or gal
Sulfur content of fuel by weight _____ %; Please attach complete supplementary fuel oil/distillate analysis.

12) Emission control system(s) used: Water injection_____ ; Steam injection_____ ;
Selective Catalytic reduction with Water injection _____ ; Selective catalytic reduction _____ ;
Describe Selective Catalytic emission reduction control installed:_____
Manufacturer's name:_____ Model No.: _____

POLLUTANT	MANUFACTURER'S REDUCTION EFFICIENCY %

13) Did construction, modification, or reconstruction commence after October 3, 1977? Yes_____; No _____
If yes, this facility may be subject to NSPS, 40 CFR 60, Subpart GG.

RECIPROCATING ENGINES

14) Engine design details:
Number of cylinders TBD
Aspiration: Normal _____ ; Turbo charged _____
Ignition: Spark _____ ; Compression _____
Design class 2 cycle lean burn _____ ; 4 cycle lean burn _____ ; 4 cycle rich burn _____

15) 2 or 4 cycle lean burn with combustion modification, increased air/fuel ratio and intercooling ? TBD
Yes_____; No_____
If yes, attach the guaranteed performance of the conversion supplier **or** the actual monitored performance, and the engine operating conditions for the guarantee of performance.

16) Type of integral emission control: Selective Catalytic Reduction _____ ;
Non Selective Catalytic Reduction _____ ; Combustion Reduction _____(Describe)_____; None X

17) Fuel(s): Gasoline _____ ; Diesel X ; Natural Gas _____ ; Dual fuel _____

STATIONARY INTERNAL COMBUSTION ENGINES
(cont.)

18) Fuel Heating Value: Gasoline _____ BTU per gal; Diesel 137,030 _____ BTU per gal;
Natural Gas _____ BTU per cu ft ; Dual fuel mix _ ____ % diesel _____ % natural gas
Sulfur content of diesel by weight 0.0015 % _____

APPLICABLE TO ALL STATIONARY INTERNAL COMBUSTION ENGINES

19) Enclose available engine manufacturer's emissions data.

20) For emission control equipment, use the appropriate CONTROL EQUIPMENT form and duplicate as needed. Be sure to indicate the emission unit that the control equipment is affecting.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

LIQUID STORAGE TANKS/VESSELS

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Emission Unit Identification and Number: Enzymatic Hydrolysis Ethanol Product Storage Tank #1, T-02102

4) Type of Tank:
   1. External Floating Roof (E) _____
   2. Internal Floating Roof (I) X
   3. Horizontal Fixed Roof (H) _____
   4. Vertical Fixed Roof (V) _____
   5. Domed External Floating Roof (D) _____

5) Complete the following table:

Measurement, Physical State, etc.	External	Internal	Horizontal	Vertical	Domed External
Shell height (ft)					
Diameter (ft)		48.5			
Shell length (ft)					
Maximum liquid height (ft)					
Average liquid height (ft)					
Working volume / tank volume (gal)		500,000			
Turnovers per year		31.58			
Net throughput (gal/yr)					
Tank heated (yes/no)					
Tank underground (yes/no)					
Self-supported roof? (yes/no)		Yes			
Number of columns		0			
Column diameter (ft)		NA			
Shell color/shade		White			
Shell condition (good/poor)		Good			
Shell paint condition (good/poor)		Good			
Roof color/shade		White			
Roof paint condition (good/poor)		Good			

LIQUID STORAGE TANKS/VESSELS
(cont.)

Measurement, Physical State, etc.	External	Internal	Horizontal	Vertical	Domed External
Roof type (cone, dome, pontoon, doubledeck)					
Roof height (ft)					
Dome roof radius (ft)					
Cone roof slope (ft/ft)					
Tank construction (welded, riveted)					
Primary seal (vapor-mounted, liquid-mounted, mechanical shoe)		Vapor mounted			
Secondary seal (weather shield, rim-mounted, none)		None			
Fitting category (typical, controlled, detail)					
Vacuum setting (psig)					
Pressure setting (psig)					
Deck type (bolted, welded)		Welded			
If bolted, deck construction					
If bolted, deck seam length (ft)					
Deck fitting (typical, controlled, detail)		Typical			
Chemical category of liquid (crude oil, petroleum distillate, organic liquid)		Organic liquid			
Single or multiple component mixture		Multiple			
Chemical name		Ethyl alcohol & Gasoline			
CAS number		64-17-5 & NA			
Vapor pressure of tank if different than ambient (psig)					
Temperature of tank if different than ambient (^{o}F)					

LIQUID STORAGE TANKS/VESSELS
(cont.)

6) Tank shape: cylindrical __X__ spherical _____ other, describe _____

7) Tank material: steel __X__ fiberglass _____ other, describe _____

8) If tank is fixed roof, check the type of vapor recovery system:

Liquid absorption _____ Vapor compression _____ Carbon absorption _____
None_____ Other, describe _____

9) Tank filling source: pipeline _____ railcar _____ truck _____ other, specify __Process piping__

10) Type of filling: submerged __X__ splash _____

11) Maximum rate at which tank can be emptied __500__gpm filled __220__gpm

Is this storage vessel subject to any of the following NSPS (40 CFR 60) subparts?

12) (Subpart K - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 151,416 liters (40,000 gallons) but not exceeding 246,052 liters (65,000 gallons), and commenced construction or modification after March 8, 1974 and prior to May 19, 1978?
Yes ____ No ____ Exempt __X__

13) (Subpart K - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 246,052 liters (65,000 gallons) and commenced construction or modification after June 11, 1973 and prior to May 19, 1978?
Yes ____ No ____ Exempt __X__

14) (Subpart Ka - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 151,416 liters (40,000 gallons) and for which construction commenced after May 18, 1978 and prior to July 23, 1984?
Yes ____ No ____ Exempt __X__

15) (Subpart Kb - Volatile Organic Liquid Storage Vessels) Does the storage vessel have a capacity greater than or equal to 75 m^3 (19,813 gallons) and is used to store volatile organic liquids in which construction, reconstruction, or modification commenced after July 23, 1984?
Yes __X__ No ____ Exempt _____

16) (Subpart XX - Bulk Gasoline Terminals) Does the facility have a bulk gasoline terminal site?
Yes ____ No __X__
Have the loading racks at the bulk gasoline terminal been constructed or modified after December 17, 1980?
Yes ____ No __X__ Exempt ____

LIQUID STORAGE TANKS/VESSELS
(cont.)

17) (Subpart UU – Asphalt Processing and Asphalt Roofing Manufacturing) Is the tank an asphalt storage facility at a petroleum refinery or an asphalt roofing plant; or a mineral storage tank at an asphalt roofing plant; and did the equipment commence construction or modification after November 18, 1980?

Yes _____ No _____ Exempt __X_____

Is the equipment an asphalt storage tank or blowing still at an asphalt processing plant, petroleum refinery, or asphalt roofing plant; and
does the asphalt storage tank or blowing still process and/or store asphalt used for roofing only or for roofing and other purposes; and
did the equipment commence construction or modification after November 18, 1980?

Yes _____ No _____ Exempt __X_____

Is the equipment an asphalt storage tank or blowing still at an asphalt processing plant, petroleum refinery, or asphalt roofing plant; and
does the asphalt storage tank or blowing still process and/or store only nonroofing asphalts; and
did the equipment commence construction or modification after May 26, 1981?

Yes _____ No _____ Exempt __X_____

18) Reason for any exemptions:_____
_____
_____
_____

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

LIQUID STORAGE TANKS/VESSELS

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Emission Unit Identification and Number: Enzymatic Hydrolysis Denaturant Storage Tank, T-02105

4) Type of Tank:
   1. External Floating Roof (E) _____
   2. Internal Floating Roof (I) X
   3. Horizontal Fixed Roof (H) _____
   4. Vertical Fixed Roof (V) _____
   5. Domed External Floating Roof (D) _____

5) Complete the following table:

Measurement, Physical State, etc.	External	Internal	Horizontal	Vertical	Domed External
Shell height (ft)					
Diameter (ft)		16.5			
Shell length (ft)					
Maximum liquid height (ft)					
Average liquid height (ft)					
Working volume / tank volume (gal)		22,500			
Turnovers per year		70.22			
Net throughput (gal/yr)					
Tank heated (yes/no)					
Tank underground (yes/no)					
Self-supported roof? (yes/no)		Yes			
Number of columns		0			
Column diameter (ft)		NA			
Shell color/shade		White			
Shell condition (good/poor)		Good			
Shell paint condition (good/poor)		Good			
Roof color/shade		White			
Roof paint condition (good/poor)		Good			

LIQUID STORAGE TANKS/VESSELS
(cont.)

Measurement, Physical State, etc.	External	Internal	Horizontal	Vertical	Domed External
Roof type (cone, dome, pontoon, doubledeck)					
Roof height (ft)					
Dome roof radius (ft)					
Cone roof slope (ft/ft)					
Tank construction (welded, riveted)					
Primary seal (vapor-mounted, liquid-mounted, mechanical shoe)		Vapor mounted			
Secondary seal (weather shield, rim-mounted, none)		None			
Fitting category (typical, controlled, detail)					
Vacuum setting (psig)					
Pressure setting (psig)					
Deck type (bolted, welded)		Welded			
If bolted, deck construction					
If bolted, deck seam length (ft)					
Deck fitting (typical, controlled, detail)		Typical			
Chemical category of liquid (crude oil, petroleum distillate, organic liquid)		Petro Distillates			
Single or multiple component mixture		Single			
Chemical name		Gasoline			
CAS number		NA			
Vapor pressure of tank if different than ambient (psig)					
Temperature of tank if different than ambient (^{o}F)					

LIQUID STORAGE TANKS/VESSELS
(cont.)

6) Tank shape: cylindrical __X___ spherical _____other, describe _____

7) Tank material: steel _X____ fiberglass _____ other, describe _____

8) If tank is fixed roof, check the type of vapor recovery system:

Liquid absorption _____ Vapor compression _____ Carbon absorption _____
None_____ Other, describe _____

9) Tank filling source: pipeline _____ railcar _____ truck _X____ other, specify _____

10) Type of filling: submerged _X____ splash _____

11) Maximum rate at which tank can be emptied __500___gpm filled _500____gpm

Is this storage vessel subject to any of the following NSPS (40 CFR 60) subparts?

12) (Subpart K - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 151,416 liters (40,000 gallons) but not exceeding 246,052 liters (65,000 gallons), and commenced construction or modification after March 8, 1974 and prior to May 19, 1978?
Yes ____ No _X__ Exempt _____

13) (Subpart K - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 246,052 liters (65,000 gallons) and commenced construction or modification after June 11, 1973 and prior to May 19, 1978?
Yes ____ No _X__ Exempt _____

14) (Subpart Ka - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 151,416 liters (40,000 gallons) and for which construction commenced after May 18, 1978 and prior to July 23, 1984?
Yes ____ No _X__ Exempt _____

15) (Subpart Kb - Volatile Organic Liquid Storage Vessels) Does the storage vessel have a capacity greater than or equal to 75 m^3 (19,813 gallons) and is used to store volatile organic liquids in which construction, reconstruction, or modification commenced after July 23, 1984?
Yes _X__ No ____ Exempt _____

16) (Subpart XX - Bulk Gasoline Terminals) Does the facility have a bulk gasoline terminal site?
Yes ____ No __X_
Have the loading racks at the bulk gasoline terminal been constructed or modified after December 17, 1980?
Yes ____ No _X__ Exempt ____

LIQUID STORAGE TANKS/VESSELS
(cont.)

17) (Subpart UU – Asphalt Processing and Asphalt Roofing Manufacturing) Is the tank an asphalt storage facility at a petroleum refinery or an asphalt roofing plant; or a mineral storage tank at an asphalt roofing plant; and did the equipment commence construction or modification after November 18, 1980?

Yes _____ No ___X___ Exempt _____

Is the equipment an asphalt storage tank or blowing still at an asphalt processing plant, petroleum refinery, or asphalt roofing plant; and
does the asphalt storage tank or blowing still process and/or store asphalt used for roofing only or for roofing and other purposes; and
did the equipment commence construction or modification after November 18, 1980?

Yes _____ No ___X___ Exempt _____

Is the equipment an asphalt storage tank or blowing still at an asphalt processing plant, petroleum refinery, or asphalt roofing plant; and
does the asphalt storage tank or blowing still process and/or store only nonroofing asphalts; and
did the equipment commence construction or modification after May 26, 1981?

Yes _____ No ___X___ Exempt _____

18) Reason for any exemptions:_____
_____
_____
_____

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

LIQUID STORAGE TANKS/VESSELS

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Emission Unit Identification and Number: Enzymatic Hydrolysis Product Shift Tanks #1 and #2, T-02107 & T-02108

4) Type of Tank:
   1. External Floating Roof (E) _____
   2. Internal Floating Roof (I) X
   3. Horizontal Fixed Roof (H) _____
   4. Vertical Fixed Roof (V) _____
   5. Domed External Floating Roof (D) _____

5) Complete the following table:

Measurement, Physical State, etc.	External	Internal	Horizontal	Vertical	Domed External
Shell height (ft)					
Diameter (ft)		20			
Shell length (ft)					
Maximum liquid height (ft)					
Average liquid height (ft)					
Working volume / tank volume (gal)		41,000 EACH			
Turnovers per year		365.85 PER TANK			
Net throughput (gal/yr)					
Tank heated (yes/no)					
Tank underground (yes/no)					
Self-supported roof? (yes/no)		Yes			
Number of columns		0			
Column diameter (ft)		NA			
Shell color/shade		White			
Shell condition (good/poor)		Good			
Shell paint condition (good/poor)		Good			
Roof color/shade		White			
Roof paint condition (good/poor)		Good			

LIQUID STORAGE TANKS/VESSELS
(cont.)

Measurement, Physical State, etc.	External	Internal	Horizontal	Vertical	Domed External
Roof type (cone, dome, pontoon, doubledeck)					
Roof height (ft)					
Dome roof radius (ft)					
Cone roof slope (ft/ft)					
Tank construction (welded, riveted)					
Primary seal (vapor-mounted, liquid-mounted, mechanical shoe)		Vapor mounted			
Secondary seal (weather shield, rim-mounted, none)		None			
Fitting category (typical, controlled, detail)					
Vacuum setting (psig)					
Pressure setting (psig)					
Deck type (bolted, welded)		Welded			
If bolted, deck construction					
If bolted, deck seam length (ft)					
Deck fitting (typical, controlled, detail)		Typical			
Chemical category of liquid (crude oil, petroleum distillate, organic liquid)		Organic liquid			
Single or multiple component mixture		Single			
Chemical name		Ethyl alcohol			
CAS number		64-17-5			
Vapor pressure of tank if different than ambient (psig)					
Temperature of tank if different than ambient (^{o}F)					

LIQUID STORAGE TANKS/VESSELS
(cont.)

6) Tank shape: cylindrical __X___ spherical _____other, describe _____

7) Tank material: steel _X____ fiberglass _____ other, describe _____

8) If tank is fixed roof, check the type of vapor recovery system:

Liquid absorption _____ Vapor compression _____ Carbon absorption _____
None_____ Other, describe _____

9) Tank filling source: pipeline _____ railcar _____ truck _____ other, specify _Process piping_

10) Type of filling: submerged _X____ splash _____

11) Maximum rate at which tank can be emptied __220___gpm filled _220____gpm

Is this storage vessel subject to any of the following NSPS (40 CFR 60) subparts?

12) (Subpart K - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 151,416 liters (40,000 gallons) but not exceeding 246,052 liters (65,000 gallons), and commenced construction or modification after March 8, 1974 and prior to May 19, 1978?
Yes ____ No ____ Exempt _X___

13) (Subpart K - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 246,052 liters (65,000 gallons) and commenced construction or modification after June 11, 1973 and prior to May 19, 1978?
Yes ____ No ____ Exempt _X___

14) (Subpart Ka - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 151,416 liters (40,000 gallons) and for which construction commenced after May 18, 1978 and prior to July 23, 1984?
Yes ____ No ____ Exempt _X___

15) (Subpart Kb - Volatile Organic Liquid Storage Vessels) Does the storage vessel have a capacity greater than or equal to 75 m^3 (19,813 gallons) and is used to store volatile organic liquids in which construction, reconstruction, or modification commenced after July 23, 1984?
Yes ____ No ____ Exempt _X___

16) (Subpart XX - Bulk Gasoline Terminals) Does the facility have a bulk gasoline terminal site?
Yes ____ No _X__
Have the loading racks at the bulk gasoline terminal been constructed or modified after December 17, 1980?
Yes ____ No _X__ Exempt ____

LIQUID STORAGE TANKS/VESSELS
(cont.)

17) (Subpart UU – Asphalt Processing and Asphalt Roofing Manufacturing) Is the tank an asphalt storage facility at a petroleum refinery or an asphalt roofing plant; or a mineral storage tank at an asphalt roofing plant; and did the equipment commence construction or modification after November 18, 1980?

Yes _____ No _____ Exempt __X_____

Is the equipment an asphalt storage tank or blowing still at an asphalt processing plant, petroleum refinery, or asphalt roofing plant; and
does the asphalt storage tank or blowing still process and/or store asphalt used for roofing only or for roofing and other purposes; and
did the equipment commence construction or modification after November 18, 1980?

Yes _____ No _____ Exempt __X_____

Is the equipment an asphalt storage tank or blowing still at an asphalt processing plant, petroleum refinery, or asphalt roofing plant; and
does the asphalt storage tank or blowing still process and/or store only nonroofing asphalts; and
did the equipment commence construction or modification after May 26, 1981?

Yes _____ No _____ Exempt __X_____

18) Reason for any exemptions: The ethanol production process tanks (shift tanks) are not subject to Subpart Kb based on the definition of "storage vessel"

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

LIQUID STORAGE TANKS/VESSELS

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Emission Unit Identification and Number: Enzymatic Hydrolysis Ethanol Product Storage Tank #2, T-02112

4) Type of Tank:
   1. External Floating Roof (E) _____
   2. Internal Floating Roof (I) X
   3. Horizontal Fixed Roof (H) _____
   4. Vertical Fixed Roof (V) _____
   5. Domed External Floating Roof (D) _____

5) Complete the following table:

Measurement, Physical State, etc.	External	Internal	Horizontal	Vertical	Domed External
Shell height (ft)					
Diameter (ft)		48.5			
Shell length (ft)					
Maximum liquid height (ft)					
Average liquid height (ft)					
Working volume / tank volume (gal)		500,000			
Turnovers per year		31.58			
Net throughput (gal/yr)					
Tank heated (yes/no)					
Tank underground (yes/no)					
Self-supported roof? (yes/no)		Yes			
Number of columns		0			
Column diameter (ft)		NA			
Shell color/shade		White			
Shell condition (good/poor)		Good			
Shell paint condition (good/poor)		Good			
Roof color/shade		White			
Roof paint condition (good/poor)		Good			

LIQUID STORAGE TANKS/VESSELS
(cont.)

Measurement, Physical State, etc.	External	Internal	Horizontal	Vertical	Domed External
Roof type (cone, dome, pontoon, doubledeck)					
Roof height (ft)					
Dome roof radius (ft)					
Cone roof slope (ft/ft)					
Tank construction (welded, riveted)					
Primary seal (vapor-mounted, liquid-mounted, mechanical shoe)		Vapor mounted			
Secondary seal (weather shield, rim-mounted, none)		None			
Fitting category (typical, controlled, detail)					
Vacuum setting (psig)					
Pressure setting (psig)					
Deck type (bolted, welded)		Welded			
If bolted, deck construction					
If bolted, deck seam length (ft)					
Deck fitting (typical, controlled, detail)		Typical			
Chemical category of liquid (crude oil, petroleum distillate, organic liquid)		Organic liquid			
Single or multiple component mixture		Multiple			
Chemical name		Ethyl alcohol & Gasoline			
CAS number		64-17-5 & NA			
Vapor pressure of tank if different than ambient (psig)					
Temperature of tank if different than ambient (^{o}F)					

LIQUID STORAGE TANKS/VESSELS
(cont.)

6) Tank shape: cylindrical __X__ spherical _____ other, describe _____

7) Tank material: steel __X__ fiberglass _____ other, describe _____

8) If tank is fixed roof, check the type of vapor recovery system:

Liquid absorption _____ Vapor compression _____ Carbon absorption _____
None_____ Other, describe _____

9) Tank filling source: pipeline _____ railcar _____ truck _____ other, specify __Process piping__

10) Type of filling: submerged __X__ splash _____

11) Maximum rate at which tank can be emptied __500__gpm filled __220__gpm

Is this storage vessel subject to any of the following NSPS (40 CFR 60) subparts?

12) (Subpart K - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 151,416 liters (40,000 gallons) but not exceeding 246,052 liters (65,000 gallons), and commenced construction or modification after March 8, 1974 and prior to May 19, 1978?
Yes ____ No ____ Exempt __X__

13) (Subpart K - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 246,052 liters (65,000 gallons) and commenced construction or modification after June 11, 1973 and prior to May 19, 1978?
Yes ____ No ____ Exempt __X__

14) (Subpart Ka - Petroleum Liquid Storage Vessels) Does the storage vessel have a capacity greater than 151,416 liters (40,000 gallons) and for which construction commenced after May 18, 1978 and prior to July 23, 1984?
Yes ____ No ____ Exempt __X__

15) (Subpart Kb - Volatile Organic Liquid Storage Vessels) Does the storage vessel have a capacity greater than or equal to 75 m^3 (19,813 gallons) and is used to store volatile organic liquids in which construction, reconstruction, or modification commenced after July 23, 1984?
Yes __X__ No ____ Exempt _____

16) (Subpart XX - Bulk Gasoline Terminals) Does the facility have a bulk gasoline terminal site?
Yes ____ No __X__
Have the loading racks at the bulk gasoline terminal been constructed or modified after December 17, 1980?
Yes ____ No __X__ Exempt ____

LIQUID STORAGE TANKS/VESSELS
(cont.)

17) (Subpart UU – Asphalt Processing and Asphalt Roofing Manufacturing) Is the tank an asphalt storage facility at a petroleum refinery or an asphalt roofing plant; or a mineral storage tank at an asphalt roofing plant; and did the equipment commence construction or modification after November 18, 1980?

Yes _____ No _____ Exempt __X_____

Is the equipment an asphalt storage tank or blowing still at an asphalt processing plant, petroleum refinery, or asphalt roofing plant; and
does the asphalt storage tank or blowing still process and/or store asphalt used for roofing only or for roofing and other purposes; and
did the equipment commence construction or modification after November 18, 1980?

Yes _____ No _____ Exempt __X_____

Is the equipment an asphalt storage tank or blowing still at an asphalt processing plant, petroleum refinery, or asphalt roofing plant; and
does the asphalt storage tank or blowing still process and/or store only nonroofing asphalts; and
did the equipment commence construction or modification after May 26, 1981?

Yes _____ No _____ Exempt __X_____

18) Reason for any exemptions:_____
_____
_____
_____

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

RAW MATERIAL HANDLING AND STORAGE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Storage: Number and capacity of vessel

Tank I.D.	Diameter (feet)	Height (feet)	Capacity (tons)	Throughput (tons/yr)	Material Stored
T-01911	13	26	174.26	8,751.85	Sulfuric Acid (94%)
T-01930	12	12	45.045	1,501.5	Nutrient Tank
T-01912	16	22	160.992	9,335.3	Media Liquid Tank
T-01915	10	15	30.3732	2,031	Enzymatic Hydrolysis Aqueous Ammonia
T-01940	21	21	210.168	9,924.6	Cellulase Tank

4) Material received by: truck X ; rail X ; other _____
Describe method of unloading material from truck, rail or other:
Materials will be received on a regular schedule and handled in a manner consistent with industry standards and with the highest regard for human health and environment.

Conveyor System:

5) Emission Unit Identification: NA

6) What is the capacity of the conveyor: _____ tons/hr
Type: _____

7) If pneumatic conveying system is used, complete the following information:
Type of system: Positive _____ ; Negative _____ ; Combination _____

8) Normal Operating Schedule: _____ hours/year

9) Briefly describe methods used to minimize particulate emissions at transfer points (if control equipment is used, use the appropriate CONTROL EQUIPMENT form):_____

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

RAW MATERIAL HANDLING AND STORAGE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Storage: Number and capacity of vessel

Tank I.D.	Diameter (feet)	Height (feet)	Capacity (tons)	Throughput (tons/yr)	Material Stored
V-01910	TBD	TBD	14,400 gal	TBD	Anydrous Ammonia

4) Material received by: truck X ; rail X ; other _____
Describe method of unloading material from truck, rail or other:
Materials will be received on a regular schedule and handled in a manner consistent with industry standards and with the highest regard for human health and environment.

Conveyor System:

5) Emission Unit Identification: NA

6) What is the capacity of the conveyor: _____ tons/hr
Type: _____

7) If pneumatic conveying system is used, complete the following information:
Type of system: Positive _____ ; Negative _____ ; Combination _____

8) Normal Operating Schedule: _____ hours/year

9) Briefly describe methods used to minimize particulate emissions at transfer points (if control equipment is used, use the appropriate CONTROL EQUIPMENT form):_____

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

INDUSTRIAL PROCESS COOLING TOWERS

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Emission Unit Identification: Cooling Water Tower, EP-04001

4) Normal Operating Schedule: 8,760 hrs/yr

5) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD

6) Is the cooling tower a major source of HAPs? Yes_____; No X
   Is the cooling tower an integral part of a major source of HAPs? Yes_____; No X

7) Total dissolved solids fraction in the circulating water: 1,575 ppm

8) Cooling tower type: Induced Draft X Natural Draft_____

9) Does the cooling tower operate with chromium-based water treatment chemicals? Yes _____; No X

10) Date of installation or modification (whichever is later): NA, New Source

11) Total drift loss: 0.001 % of circulation rate

12) Water circulation rate: 43,200 gpm

13) Does the cooling tower have a mist eliminator? Yes X; No_____

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Bulk Fly Ash Load-out Silo; EP-02710

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Bulk Fly Ash Load-Out Silo
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: >99% %
   Capture Efficiency: 100% %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient ^{o}F

11) Gas Flow: 28,100 cfm at Ambient ^{o}F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 36 IN diameter at Ambient°F temperature, with 28,100 cfm flow rate and 66.26 fps velocity.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Bulk Fly Ash Load-out Silo Spout; EP-02711

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Bulk Fly Ash Load-Out Silo Spout
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: >99% %
   Capture Efficiency: 100% %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient °F

11) Gas Flow: 28,100 cfm at Ambient°F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 36 IN diameter at Ambient°F temperature, with 28,100 cfm flow rate and 66.26 fps velocity.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Bale Grinder Dust Collector, EP-11110

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Bale Grinding Line #1 and #2, EP-11110
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: >99% %
   Capture Efficiency: 100% %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient °F

11) Gas Flow: 143,900 cfm at Ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 84 IN diameter at Ambient ^oF temperature, with 143,900 cfm flow rate and 62.32 fps velocity.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Floor Sweep System Dust Collector, EP-11120

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Floor Sweep System Dust Collector, EP-11120
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: >99% %
   Capture Efficiency: 100% %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient °F

11) Gas Flow: 7,800 cfm at Ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 24 IN diameter at Ambient ^oF temperature, with 7,800 cfm flow rate and 41.38 fps velocity.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Classifier Cyclone #1 Dust Collector, EP-11170

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Classifier Live-Bottom Surge Bin #1, T-11130
   b. Air Classifier #1
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: >99% %
   Capture Efficiency: 100% %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient °F

11) Gas Flow: 21,600 cfm at Ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 36 IN diameter at Ambient ^oF temperature, with 21,600 cfm flow rate and 50.93 fps velocity.

Kansas Department of Health and Environment
Division of Environment
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FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Classifier Cyclone #2 Dust Collector, EP-11270

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Classifier Live-Bottom Surge Bin #2, T-11230
   b. Air Classifier #2
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: >99% %
   Capture Efficiency: 100% %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient °F

11) Gas Flow: 21,600 cfm at Ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 36 IN diameter at Ambient ^oF temperature, with 21,600 cfm flow rate and 50.93 fps velocity.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Boiler Metering Bins Dust Collector, EP-11711

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Boiler Metering Bins
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: > 99 %
   Capture Efficiency: 100 %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient °F

11) Gas Flow: 21,600 cfm at Ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 36 IN diameter at Ambient ^oF temperature, with 21,600 cfm flow rate and 50.93 fps velocity.

Kansas Department of Health and Environment
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Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Boiler Fly Ash Handling Dust Collector #1; EP-20510

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Boiler Fly Ash Handling System
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: >99% %
   Capture Efficiency: 100% %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient °F

11) Gas Flow: 14,050 cfm at Ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 30 IN diameter at Ambient ^oF temperature, with 14,050 cfm flow rate and 47.70 fps velocity.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Lime Handling Dust Collector #1; EP-20512

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Lime Handling System
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: >99% %
   Capture Efficiency: 100% %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient °F

11) Gas Flow: 2,000 cfm at Ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 12 IN diameter at Ambient ^oF temperature, with 2,000 cfm flow rate and 42.44 fps velocity.

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Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Boiler Bottoms Ash Handling Dust Collector #1; EP-20514

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Boiler Bottoms Ash Handling System
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: >99% %
   Capture Efficiency: 100% %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient °F

11) Gas Flow: 28,100 cfm at Ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 36 IN diameter at Ambient ^oF temperature, with 28,100 cfm flow rate and 66.26 fps velocity.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

FABRIC FILTER/BAGHOUSE

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Fabric Filter/Baghouse identification number or designation: Boiler Fly Ash Handling Dust Collector #2; EP-20520

4) What emission unit(s) or source(s)of emissions is(are) vented to the fabric filter/baghouse?
   a. Boiler Fly Ash Handling System
   b. _____
   c. _____
   d. _____

5) Description of particulate collected: PM/PM10/PM2.5

6) Manufacturer: TBD
   Date of Manufacture: TBD
   Model No.: TBD
   Rated Control Efficiency: >99% %
   Capture Efficiency: 100% %
   Date of Installation: NA, New Source

7) Bag Fabric Type: TBD

8) Number of Bags: TBD

9) Air to Cloth Ratio: TBD Volume of gas (in actual cubic feet per minute) flowing through the dust collector's inlet duct divided by the total square feet of cloth area in the bag filters.
   Cloth Weight: TBD oz.
   Kind of Cloth: TBD

10) Temperature of gas filtered: Ambient °F

11) Gas Flow: 14,050 cfm at Ambient °F

12) If blower used, complete the following:
   Rotor Dia.: TBD ft
   Speed: TBD rpm
   Power: TBD BHP

FABRIC FILTER/BAGHOUSE
(cont.)

13) Have the filter bags in this filter/baghouse been replaced? NA, New Source
If yes, are the replacement bags the same as, or the equivalent of, the bags supplied by the filter manufacturer as original equipment?

14) Bag Cleaning Method (e.g. shake, pressure jet, etc.) TBD

15) Nominal Pressure Drop: TBD inches of H_2O

16) Is there a device provided to measure pressure drop across the fabric filter/baghouse? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

17) Emission discharge to atmosphere TBD ft. above grade through stack or duct 30 IN diameter at Ambient ^oF temperature, with 14,050 cfm flow rate and 47.70 fps velocity.

Kansas Department of Health and Environment
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FLARES/TAILGAS INCINERATOR

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Flares/Tailgas Incinerator identification number or designation: Flare, EP-09001

4) What emission unit(s) or source(s) of emissions is(are) vented to the flare/tailgas incinerator?
   a. Wastewater Treatment Plant in the event of SSM at boiler
   b. Product Loadout
   c. EH Process vents in the event of SSM at boiler
   d. _____

5) Description of pollutant(s) collected: Blended gas with varying components. See PTE in permit application.

6) Manufacturer: TBD Model No.: TBD
   Type of flare: Ground _____ Elevated X
   If flare, mixing method: Steam injected _____ Compressed air _____ Fuel gas X
   Other, specify _____
   Type (if incinerator): _____
   Date of Manufacture: _____ Date of Modification: _____
   Maximum designed heat rate: _____Btu/hr

7) Normal Operating Schedule: 3,960 hrs/yr 8,760 (Pilot)

8) Gas stream composition including either volume% or mole% (be sure to indicate which):

COMPONENT	MOLE % OR VOLUME % (circle one)
See PTE in permit application for detailed gas stream composition.	

FLARES/TAILGAS INCINERATOR
(cont.)

9) (If units are inappropriate to the fuel that you use, be sure to indicate the correct units):
Type of primary fuel: Blended Gas
Heat Value of pilot gas: 83.53 Btu/ft^3
Maximum Consumption: 100 ft^3/hr
Type of secondary fuel: Natural Gas (Pilot)
Heat value: 1,020 Btu/ft^3
Max. Consumption: 100 ft^3/hr

10) Gas Temperature TBD °F; Height of Flare TBD ft; Diameter TBD ft; Residence time TBD sec

11) If flare is equipped with sound suppressor, please describe TBD

12) Over-all sulfur recovery efficiency: NA %

13) % SO_2 by volume discharged to atmosphere: _____% 9.31 lb/hr max when flaring during SSM.

14) If flares are used, give the appropriate number of flares
in existence _____
normal operation _____
for emergencies 1

15) For flares in existence, what is their orientation? series _____ parallel _____

16) Emissions discharged to the atmosphere TBD ft above grade through a stack or duct TBD ft in diameter at TBD °F temperature at TBD ft^3/min and TBD ft/sec velocity.

17) If other emission control equipment is employed, use the appropriate CONTROL EQUIPMENT form and duplicate as needed. Be sure to indicate the emission unit that the control equipment is affecting.

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SCRUBBER

1) Source ID Number: 1890231

2) Company/Source Name: Abengoa Bioenergy Biomass of Kansas

3) Scrubber identification number or designation: Enzymatic Hydrolysis Fermentation CO2 Scrubber EP-18185

4) What emission unit(s) or source(s)of emissions is(are) vented to the scrubber?
   a. Saccharification and Fermentation Area 16000
   b. Alcohol Recovery Area 18000
   c. _____
   d. _____

5) Description of particulate collected: NA

6) Type of Scrubber: Impingement Scrubbing Tower X; Spray Tower_____; Venturi _____;
   Self-Induced Spray Scrubber_____; Wet Centrifugal _____; Wet Dynamic _____;
   Other _____

7) If an Impingement Scrubbing Tower, indicate type: Target Plate_____; Packed Bed X;
   Other_____

8) If a Spray Tower Scrubber, complete the following:
   Arrangement and number of nozzles: _____

9) If a Venturi Scrubber, indicate integral mist injection eliminator used?_____

10) If a Wet Centrifugal Scrubber, indicate type: Impingement_____; Cyclone_____; Combination_____;
    Other _____

11) Manufacturer: Vogelbusch
    Date of Manufacture: TBD
    Model No.: TBD
    Rated Control Efficiency: 99 %
    Capture Efficiency: 100 %
    Date of Installation: NA, New Source

12) Volume of gas cleaned: 4,100 cfm

SCRUBBER
(cont.)

13) Temperature of gas cleaned: TBD °F

14) Scrubbing-Liquid Flow Rate: TBD gpm or gallons/1000 cubic feet of gas
Indicate type of solution used in scrubber, if other than water: _____
If water, indicate pH: UNK

15) Inlet Velocity to scrubber: TBD feet per seconds

16) Nominal Pressure Drop: 3.5 inches of H_2O

17) Is there a device provided to measure pressure drop across the scrubber? Yes
If yes, specify device: A device will be installed, however one has not yet been specified.

18) Emission discharge to atmosphere 67 ft. above grade through stack or duct 16 IN diameter at 67 °F temperature, with 4,100 cfm flow rate and 48.94 fps velocity.

Appendix C

Potential to Emit Calculations

Abengoa Bioenergy Biomass of Kansas, LLC Biorefinery Facility Hugoton, Kansas	Rev. 5

Facility Design Assumptions and Engineering Specifications

Production Schedule	Qty	Units	Notes
Nominal Production Schedule	350	days/yr	15 days per year planned shutdown
Hours per Day of Operation	24	hr/day	
Hours per Year of Operation	8,400	hr/yr	
Maximum Production Schedule - Permit	365	days/yr	
Hours per Day of Operation	24	hr/day	
Hours per Year of Operation	8,760	hr/yr	

Production Rate	Qty	Units	Notes
Nominal Biomass Anhydrous ETOH Production	23.27	MMgpy	Nominal production is based on 46.17 gpm anhydrous ethanol produced from cellulosic feedstocks on a 350 day annual production schedule (Stream 18044, PFD Rev 0). The targeted cellulosic feedstocks include: wheat straw, milo (sorghum) stubble, corn stover, switchgrass, and opportunity feedstocks that are locally available.
Enzymatic Hydrolysis Plant	66,486	gal/day	
	2,770	gal/hr	
TOTAL Nominal Biomass Denatured Ethanol Production	23.80	MMgpy	
Enzymatic Hydrolysis Plant	68,009	gal/day	
	2,833	gal/hr	
PERMITTED FACILITY NAMEPLATE Maximum Anhydrous Ethanol Productio	30.00	MMgpy	For permitting purposes, the biomass ethanol production is based on a 20% increase in plant efficiency and a production schedule of 365 days per year results in a permitted facility nameplate maximum annual anhydrous ethanol production of 29.13 MMgpy (rounded up to 30 MMgpy).
Enzymatic Hydrolysis Plant	82,200	gal/day	
	3,425	gal/hr	
TOTAL Maximum Biomass Denatured Ethanol Production	31.58	MMgpy	
Enzymatic Hydrolysis Plant	86,526	gal/day	
	3,605	gal/hr	
Anhydrous Ethanol Density	6.62	lb/gal	Perry's Chemical Handbook Table 3-110
Anhydrous Ethanol Weight	99,300	ton/yr	
Ethanol (Denatured) Density	6.60	lb/gal	
Ethanol (Denatured) Weight	104,214	ton/yr	
Ethanol HAPs			HAP emission rate based on engineering estimate.
Acetaldehyde	200	ppmw	
Methanol	200	ppmw	
Acrolein	20	ppmw	
Formaldehyde	100	ppmw	

Denaturant Usage	Qty	Units	Notes
Nominal Denaturant (Gasoline) % of Total	2.24%	by volume	Nominal Denaturant usage in 25MMGPY PFD Rev 0 is 2.24%v/v of anhydrous ethanol production.
	1.51%	by weight	
Maximum Denaturant (Gasoline) % of Total - Permit	5.00%	by volume	ASTM D 4806 - 07a specification limits denaturant to minimum 1.96% v/v and maximum 5.0%v/v for gasoline.
	4.30%	by weight	
Nominal Denaturant (Gasoline) Usage	0.53	MMgpy	
	1,523.0	gal/day	
	63.0	gal/hr	
Maximum Denaturant (Gasoline) Usage - Permit	1.58	MMgpy	
	4,326	gal/day	
	180	gal/hr	
Denaturant (Gasoline) Density	5.67	lb/gal	25 MMGPY PFD Rev 0 denaturant density
Nominal Denaturant (Gasoline) Weight	1,503	ton/yr	
Maximum Denaturant (Gasoline) Weight	4,479	ton/yr	

Off-Spec Product	Qty	Units	Notes
% Off-Spec Produced per Year	5%		
Max. Off-Spec Produced	1.5	MMgpy	

Biomass Receiving - Crop Resides or Energy Crops	Qty	Units	Notes
Conversion Factor	2,204.6	lb/T	
Crop Residues or Energy Crops % Moisture	15%		
Nominal Crop Residues or Energy Crops Onsite Delivery Rate	1,190	wet T/day	Crop Residues or Energy Crops receiving and short term intermediate bale storage based on nominal daily feed rate usage (100% Crop Residues or Energy Crops), and a truck delivery rate of 12 hr/day, rounded.
	1,312	wet ton/day	
	2,624,235	wet lb/day	
	109	wet ton/hr	
	174,949	wet lb/hr	
Maximum Crop Residues or Energy Crops Onsite Delivery Rate - Permit	1,724	wet T/day	Based on two biomass grinders with 33 wet ton/hr capacity each + 20% design margin, rounded.
	1,900	wet ton/day	
	3,800,000	wet lb/day	
	158	wet ton/hr	
	158,333	wet lb/hr	

Facility Design Assumptions and Engineering Specifications

Nominal Biomass Feed Rates	Qty	Units	Notes
Nominal to Maximum Feed Rate Ratio Factor	1.20		For permitting purposes, a 20% design margin has been incorporated in to the feed rate calculations.
Nominal Raw Biomass to Enzymatic Hydrolysis Process Raw Crop Residues or Energy Crops	844 295,292 930.0 325,500 651,000,000 1,860,000 77,500	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Based on 25 MMGPY PFD Rev 0 stream 12000 & 12100; 930.0 dry ton/day to EH with 7.7wt% ash.
Nominal Enzymatic Hydrolysis Process Residuals Generated	531 186,002 585.8 205,030 410,060,000 1,171,600 48,817	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Based on 25 MMGPY PFD Rev 0; includes stillage cake; adjusted stillage syrup; adjusted WWTP Sludge; adjusted WWTP Biogas.
Nominal Raw Crop Residues or Energy Crops to Biomass-Fired Boilers Raw Crop Residues or Energy Crops	168 58,836 185.3 64,855 129,710,000 370,600 15,442	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Crop Residues or Energy Crops feed rate is based on the balance needed after EH Process Residuals are added to the boilers to produce the required steam.
TOTAL Nominal Fuel Feed Rate to Biomass-Fired Boilers Raw Crop Residues or Energy Crops plus EH Process Residua	700 244,838 771.1 269,885 539,770,000 1,542,200 64,258	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Based on 25 MMGPY PFD Rev 0; includes stillage cake; adjusted stillage syrup; adjusted WWTP Sludge; adjusted WWTP Biogas, Corn Stover, Corn Stover Fines.

Maximum Biomass Feed Rates	Qty	Units	Notes
Maximum Crop Residues or Energy Crops to Enzymatic Hydrolysis Process - Raw Crop Residues or Energy Crops	1,012 369,536 1,116 407,340 814,680,000 2,232,000 93,000	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Nominal EH Process feed rate + 20% design margin, rounded.
Maximum Enzymatic Hydrolysis Solid Residuals Generated - Permit	638 232,781 703 256,595 513,190,000 1,406,000 58,583	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	EH Process Residuals feed rate + 20% design margin, rounded.
Maximum Raw Crop Residues or Energy Crops to Biomass-Fired Boilers - Pe Raw Crop Residues or Energy Crops	453 165,232 499 182,135 364,270,000 998,000 41,583	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Process design requires the boiler start-up on crop residues and NG only. Two grinder operation limits fresh crop residue (w/o crop residue fines) less crop residues to EH + 20% design margin = 500 dry ton/day to boiler with EH in operation, rounded.
Maximum Fuel Feed Rate to Biomass-Fired Boilers - Permit Raw Crop Residues or Energy Crops plus EH Process Residua	737 268,874 812 296,380 592,760,000 1,624,000 67,667	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Based on maximum heat release from the worst-case boiler fuel calculations presented on the EP-20001 Biomass-Fired Boiler sheets, rounded.

Facility Design Assumptions and Engineering Specifications

Lignin-Rich Stillage and Syrup Production	Qty	Units	Notes
Maximum Lignin-Rich Stillage Production	349 127,384 384.7 140,416 280,831,000 769,400 32,058	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Based on 25 MMGPY Rev 0 PFD plus 20% safety margin. Lignin makes up approximately 43.4%wt of dry lignin-rich stillage cake.
Distiller's Biomass Thin Stillage Syrup Production	228 83,245 251.4 91,761 183,522,000 502,800 20,950	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Adjusted syrup rate from 25 MMGPY Rev 0 PFD to account for increased WWTP COD, plus 20% design margin. Distiller's biomass thin stillage is evaporated and the syrup combusted in the boilers.
Maximum WWTP Anaerobic Sludge Production	3.3 1,192 3.6 1,314 2,628,000 7,200 300	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Adjusted WWTP sludge rate from 25 MMGPY Rev 0 PFD to account for increased WWTP COD, plus 20% design margin.
Maximum WWTP Anaerobic Biogas Production	57 20,927 63.2 23,068 46,136,000 126,400 5,267	dry T/day dry T/yr dry ton/day dry ton/yr dry lb/yr dry lb/day dry lb/hr	Adjusted WWTP Biogas rate from 25 MMGPY Rev 0 PFD to account for increased WWTP COD, plus 20% design margin.

Biomass Yard Data - Crop Residues or Energy Crops	Qty	Units	Notes
Crop Residues or Energy Crops Laydown Capacity	4.33	days	Crop Residues or Energy Crop laydown capacity based on a 10 acre laydown site.
Total Laydown Capacity	5,681	wet T	

Fly Ash Production - Bulk	Qty	Units	Notes
Percent Fly Ash Stored for Offsite Shipment	100%		All fly ash delivered to fly ash silo dry.
Fly Ash Production Rate	6,769 162,445 59,292,571 29,646	lb/hr lb/day lb/yr ton/yr	Assumes 10% of maximum boiler fuel feed rate (includes lime and reaction products). Based on 365 days per year. Corn stover to EH assumed to contain 7.7wt% ash dry basis and corn stover direct to boiler contains 18wt% ash.
Fly Ash Loadout Rate By Truck	24.75 50 99,000	ton/truck ton/hr lb/hr	Ash loadout worst-case assumes all bulk fly ash loaded into trucks. Fly ash will typically be shipped by rail.

Bottoms Ash Production - Bulk	Qty	Units	Notes
Percent Bottoms Ash Stored for Offsite Shipment	100%		All bottoms ash delivered to bottoms ash roll-off boxes wet (20% moisture).
Bottoms Ash Production Rate Non-Combustibles Included	6,769 162,445 59,292,571 29,646	lb/hr lb/day lb/yr ton/yr	Assumes 10% of maximum boiler fuel feed rate (includes non-combustibles). Based on 365 days per year. Corn stover to EH assumed to contain 7.7wt% ash dry basis and corn stover direct to boiler contains 18wt% ash.
Bottoms Ash Loadout Rate By Truck	24.75 50 99,000	ton/truck ton/hr lb/hr	Bottoms ash loadout worst-case assumes all bottoms ash loaded into trucks.

Bulk Fly Ash Storage Data - Typical	Qty	Units	Notes
Bulk Fly Ash Storage Capacity	10	days	To account for rail logistics.
Total Fly Ash Storage	812	dry ton	
Fly Ash Density	45	lb/ft^3	Estimated fly ash bulk density.
Number of Bins	1	Bin	
Fly Ash Storage Volume	36,099	ft	
Total Size Required	812 36,099	ton/Bin ft^3/Bin	
Bin Diameter	40	ft	
Bin Height	55	ft	Elevated Storage Silos.

Facility Design Assumptions and Engineering Specifications

Misc Chemical / Supply Usage	Qty	Units	Notes
Maximum Sulfuric Acid (94%) Usage	2,000	lb/hr	25 MMGPY Rev 0 Strm 1991 + 20% design margin for EH Plant. Based on 365 days per year.
	48,010	lb/day	
	17,523,504	lb/yr	
Delivery Capacity (By Truck)	49,500	lb	
Maximum Anhydrous Ammonia Usage at EH	522	lb/hr	25 MMGPY Rev 0 PFD (Strm 1918E - 1944) + 20% design margin for EH Plant. EPI Boiler Proposal (Strm 1944) + overdesign for Boilers. Based on 365 days per year.
Maximum Anhydrous Ammonia Usage at Boilers	150	lb/hr	
	16,128	lb/day	
	5,886,720	lb/yr	
Delivery Capacity (By Truck)	49,500	lb	
Maximum Magnesium Hydroxide Usage (For Wastewater Treatment)	395	lb/hr	ABBK estimate + 20% design margin. Assumes tanker truck delivery twice every 10 days and a density of 12 lb/gal. Based on 365 days per year.
	9,468	lb/day	
	3,456,000	lb/yr	
Delivery Capacity (By Truck)	49,500	lb	
Maximum Urea Usage (For Wastewater Treatment)	18	lb/hr	ABBK estimate + 20% design margin. Assumes approximate 350 gallon urea tote delivered once every 7 days and a density of 9.5 lb/gal. Based on 365 days per year.
	422	lb/day	
	153,900	lb/yr	
Delivery Capacity (By Truck)	5,000	lb	
Miscellaneous Chemical Usage (For Wastewater Treatment)	1	lb/hr	ABBK estimate of macronutrients, micronutrients, defoamer. polymer, hypochlorite in totes (only as required) - delivery once a month (assuming a maximum of 500 lbs per month) + 20% overdesign. Based on 365 days per year.
	20	lb/day	
	7,200	lb/yr	
Delivery Capacity (By Truck)	5,000	lb	
Maximum Hydrated Lime Usage	4,288	lb/hr	Vendor estimate + 20% design margin. Based on 365 days per year.
	102,923	lb/day	
	37,566,734	lb/yr	
Delivery Capacity (By Truck)	49,500	lb	
Diesel Usage	1,508	lb/hr	Based on 365 days per year.
	36,198	lb/day	
	13,212,409	lb/yr	
Delivery Capacity (By Truck)	49,500	lb	
Maximum Media Liquid Usage	2,137	lb/hr	25 MMGPY Rev 0 PFD Strm 1910 + 20% design margin for EH Plant. Based on 365 days per year.
	51,293	lb/day	
	18,721,872	lb/yr	
Delivery Capacity (By Truck)	49,500	lb	
Maximum Nutrient Usage	342	lb/hr	25 MMGPY Rev 0 PFD Strm 1930 + 20% design margin for EH Plant. Based on 365 days per year.
	8,208	lb/day	
	2,995,920	lb/yr	
Delivery Capacity (By Truck)	49,500	lb	
Antifoam Usage	1	lb/hr	ABBK estimate of antifoam delivered on totes once a month (assuming a maximum 500 lbs per month) = 20% overdesign. Based on 365 days per year.
	20	lb/day	
	7,200	lb/yr	
Delivery Capacity (By Truck)	5,000	lb	
Maximum Cellulase Usage	4,538	lb/hr	25 MMGPY Rev 0 PFD Strm 1981 + 20% design margin for EH Plant. Based on 365 days per year.
	108,922	lb/day	
	39,756,384	lb/yr	
Delivery Capacity (By Truck)	49,500	lb	
Maximum Fly Ash Production From Boiler, Dry	6,769	lb/hr	Assumes 10% of maximum boiler fuel feed rate (includes lime and reaction products). Based on 365 days per year. Corn stover to EH assumed to contain 7.7wt% ash dry basis and corn stover direct to boiler contains 18wt% ash.
	162,445	lb/day	
	59,292,571	lb/yr	
Shipment Capacity (By Truck)	49,500	lb	
Maximum Bottoms Ash Production From Boiler, Wet	8,461	lb/hr	Assumes 10% of maximum boiler fuel feed rate (includes non-combustibles). Based on 365 days per year. Corn stover to EH assumed to contain 7.7wt% ash dry basis and corn stover direct to boiler contains 18wt% ash.
Non-Combustibles Included	203,057	lb/day	
Shipped at 20% moisture (by weight)	74,115,714	lb/yr	
Shipment Capacity (By Truck Via Roll-Off)	49,500	lb	
Acid Wash Solids Production, Wet	8,206	lb/hr	Based on approximately 7.5% of maximum crop residues or energy crops to enzymatic hydrolysis process. Shipped at 10 to 25% moisture. Neutralized with aqua ammonia. Based on 365 days per year.
Includes Sand, Dirt and Other Debris From Ground Biomass	196,941	lb/day	
	71,883,529	lb/yr	
Shipment Capacity (By Truck Via Roll-Off)	49,500	lb	
Hazardous & Municipal Wastes	22	lb/hr	Waste Management Plan.
	526	lb/day	
	192,146	lb/yr	
Shipment Capacity (By Truck Via Roll-Off)	22,000	lb	
Total Annual Chemical / Supply Usage	344,771,804	lb/yr	
	172,386	ton/yr	

Facility Design Assumptions and Engineering Specifications

EH Ethanol Product Storage Tank #1	Qty	Units	Notes
Tank ID	T-02102		
Conversion Factor	7.48	gal/ft^3	
Storage Capacity	500,000	gal	EDS T-2102 Working Tank Capacity
	66,845	ft^3	
Throughput	15.79	MMgpy	Denatured ethanol storage to be divided between two (2) tanks.
	43,263.00	gal/day	
	1,802.50	gal/hr	
Storage Capacity	11.56	days	
	277.37	hours	
Turnovers	31.58	times/yr	
Tank Diameter	48.5	ft	
Area of Deck	1,847	ft^2	
Tank Height	41	ft	

EH Ethanol Product Storage Tank #2	Qty	Units	Notes
Tank ID	T-02112		
Conversion Factor	7.48	gal/ft^3	
Storage Capacity	500,000	gal	EDS T-2112 Working Tank Capacity
	66,845	ft^3	
Throughput	15.79	MMgpy	Denatured ethanol storage to be divided between two (2) tanks.
	43,263.00	gal/day	
	1,802.50	gal/hr	
Storage Capacity	11.56	days	
	277.37	hours	
Turnovers	31.58	times/yr	
Tank Diameter	48.5	ft	
Area of Deck	1,847	ft^2	
Tank Height	41	ft	

EH Denaturant (Gasoline) Storage Tank	Qty	Units	Notes
Tank ID	T-02105		
Conversion Factor	7.48	gal/ft^3	
Storage Capacity	22,500	gal	EDS T-02105 Working Tank Capacity
	3,008	ft^3	
Throughput	1.58	MMgpy	
	4,326.00	gal/day	
	180.00	gal/hr	
Storage Capacity	5.20	days	
	124.83	hours	
Turnovers	70.22	times/yr	
Tank Diameter	16.5	ft	
Area of Deck	214	ft^2	
Tank Height	16	ft	

EH Product Shift Storage Tank #1	Qty	Units	Notes
Tank ID	T-02107		
Conversion Factor	7.48	gal/ft^3	
Storage Capacity	41,000	gal	EDS T-0210X Working Tank Capacity
	5,481	ft^3	
Throughput	15.00	MMgpy	
Storage Capacity	1.00	days	
	24	hours	
Turnovers	366	times/yr	
Tank Diameter	20	ft	
Area of Deck	314	ft^2	
Tank Height	20	ft	

EH Product Shift Storage Tank #2	Qty	Units	Notes
Tank ID	T-02108		
Conversion Factor	7.48	gal/ft^3	
Storage Capacity	41,000	gal	EDS T-0210X Working Tank Capacity
	5,481	ft^3	
Throughput	15.00	MMgpy	
Storage Capacity	1.00	days	
	24	hours	
Turnovers	366	times/yr	
Tank Diameter	20	ft	
Area of Deck	314	ft^2	
Tank Height	20	ft	

Facility Design Assumptions and Engineering Specifications

Sulfuric Acid Storage Tank	Qty	Units	Notes
Tank ID	T-01911		
Conversion Factor	15.49	lb/gal	
	7.48	gal/ft^3	
Storage Capacity	22,500	gal	EDS T-01911 Working Tank Capacity
	3,008	ft^3	
Throughput	1.13	MMgpy	
Storage Capacity	0.03	days	
	0.73	hours	
Turnovers	50	times/yr	
Tank Diameter	13	ft	
Area of Deck	133	ft^2	
Tank Height	26	ft	

Nutrient Tank	Qty	Units	Notes
Tank ID	T-01930		
Conversion Factor	10.01	lb/gal	
	7.48	gal/ft^3	
Storage Capacity	9,000	gal	EDS T-01930 Working Tank Capacity
	1,203	ft^3	
Throughput	0.30	MMgpy	
Storage Capacity	10.98	days	
	263.42	hours	
Turnovers	33	times/yr	
Tank Diameter	12	ft	
Area of Deck	113	ft^2	
Tank Height	12	ft	

EH Plant Aqua Ammonia Tank	Qty	Units	Notes
Tank ID	T-01915		
Conversion Factor	7.67	lb/gal	PFD Rev 0
	7.48	gal/ft^3	
Storage Capacity	7,920	gal	EDS T-01915 Working Tank Capacity
	1,059	ft^3	
Throughput	0.60	MMgpy	
Storage Capacity	4.85	days	
	116.37	hours	
Turnovers	76	times/yr	
Tank Diameter	10	ft	
Area of Deck	79	ft^2	
Tank Height	15	ft	

Media Liquid Tank	Qty	Units	Notes
Tank ID	T-01912		
Conversion Factor	11.18	lb/gal	PFD Rev 0
	7.48	gal/ft^3	
Storage Capacity	28,800	gal	EDS T-01912 Working Tank Capacity
	3,850	ft^3	
Throughput	1.67	MMgpy	
Storage Capacity	6.28	days	
	150.66	hours	
Turnovers	58	times/yr	
Tank Diameter	16	ft	
Area of Deck	189	ft^2	
Tank Height	22	ft	

Cellulase Tank	Qty	Units	Notes
Tank ID	T-01940		
Conversion Factor	8.34	lb/gal	PFD Rev 0
	7.48	gal/ft^3	
Storage Capacity	50,400	gal	EDS T-01940 Working Tank Capacity
	6,738	ft^3	
Throughput	2.38	MMgpy	
Storage Capacity	3.86	days	
	92.62	hours	
Turnovers	47	times/yr	
Tank Diameter	21	ft	
Area of Deck	346	ft^2	
Tank Height	21	ft	

Facility Design Assumptions and Engineering Specifications

Receiving and Product Loadout by Truck	Qty	Units	Notes
Received by Truck			
Biomass - Crop Residues or Energy Crops	100%		
Denaturant (Gasoline)	100%		
Chemicals/Supplies	Various		
Shipped by Truck			
Bulk Fly Ash	100%		
Non-combustibles (Bottoms Ash, Metal, etc.)	100%		
Spent Acid Wash Sand	100%		
Ethanol (Denatured)	50%		
Received by Rail			
Biomass - Crop Residues or Energy Crops	0%		
Denaturant (Gasoline)	0%		
Shipped by Rail			
Ethanol (Denatured)	50%		
Bulk Fly Ash	0%		
Truck Fluid Capacity (Ethanol/Denaturant/Chemicals/Ash)	7,500	gal/truck	
	49,500	lb/truck	
Small Truck Weight (Assumed Always Loaded)	5,000	lb/truck	
Truck Dry Capacity (Biomass)	36,000	lb/truck	
Truck Dry Capacity (Wastes/Materials)	22,000	lb/truck	
Rail Car Capacity (Ethanol/Denaturant/Ash/Chemicals)	190,000	lb/car	

Shipping and Receiving Schedule	Qty	Units	Notes
Daily	12	hr/day	"Worst Case Scenario" for hourly and daily haul road emissions assumes shipping and receiving will occur 6:00 AM to 6:00 PM only.
Annual	330	days	
Total Shipping and Receiving Hours	3,960	hr/yr	
All Receiving and Shipping Roads	PAVED		

Abengoa Bioenergy Biomass of Kansas, LLC
Biorefinery Facility
Hugoton, Kansas

Rev. 5

Operations Data

Plant Capacity:	Denatured Ethanol:	31.58 MMgpy	**Biomass:**	589,475 ton/yr
	Anhydrous Ethanol:	30 MMgpy		

Operations:	365 day/yr
	8760 hr/yr

UNCONTROLLED Potential to Emit Summary (TPY)

Emission Point No.	Emission Unit(s)	PM	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOC	Single HAP	Total HAPs	Direct $CO_2 + CO_2e$
HAUL ROADS											
EP-01000FUG	Paved Plant Roads	7.51	1.50	0.37	--	--	--	--	--	--	--
EP-01050FUG	Biomass Laydown Roads	9.56	2.44	0.24	--	--	--	--	--	--	--
ENZYMATIC HYDROLYSIS PLANT											
EP-11120	Floor Sweep System DC	--	--	--	--	--	--	--	--	--	--
EP-11110	Bale Grinder DC	--	--	--	--	--	--	--	--	--	--
EP-11170	Classifier Cyclone # 1 DC	--	--	--	--	--	--	--	--	--	--
EP-11270	Classifier Cyclone # 2 DC	--	--	--	--	--	--	--	--	--	--
EP-11711	Boiler Feed System DC	--	--	--	--	--	--	--	--	--	--
EP-11110FUG	Crop Receiving, Grinding and Conveying	349.57	94.74	15.89	--	--	--	--	--	--	--
EP-18185	EH Fermentation CO2 Scrubber	0.44	0.44	0.44	5.83	--	--	1,186.54	4.68	6.89	88,356.94
EP-19001FUG	Lignin-Rich Stillage Storage	--	--	--	--	--	--	1.29	0.03	0.06	--

UNCONTROLLED Potential to Emit Summary (TPY)											
Emission Point No.	**Emission Unit(s)**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**SO_2**	**CO**	**VOC**	**Single HAP**	**Total HAPs**	**Direct $CO_2 + CO_2e$**
ETHANOL STORAGE AND PIPING											
EP-02000	Fugitive Leaks	--	--	--	--	--	--	7.65	0.00	0.00	0.01
T-02107	EH Product Shift Tank #1	--	--	--	--	--	--	0.15	0.00	0.00	--
T-02108	EH Product Shift Tank #2	--	--	--	--	--	--	0.15	0.00	0.00	--
T-02102	EH Ethanol Product Storage Tank #1	--	--	--	--	--	--	0.22	0.00	0.00	--
T-02112	EH Ethanol Product Storage Tank #2	--	--	--	--	--	--	0.22	0.00	0.00	--
T-02105	EH Denaturant Storage Tank	--	--	--	--	--	--	1.27	0.01	0.01	--
EP-02100	Vapor Recovery System	--	--	--	--	--	--	7.51	0.12	0.13	--
EP-02100FUG	Loading Losses	--	--	--	--	--	--	--	--	--	--
UTILITIES											
EP-02710	Bulk Fly Ash Load-Out Silo	421.98	421.98	421.98	--	--	--	--	--	--	--
EP-02711	Bulk Fly Ash Load-Out Silo Spout	421.98	421.98	421.98		--	--	--	--	--	--
EP-04001	Cooling Water Tower	0.74	0.52	0.31	--	--	--	--	--	--	--
EP-20001	Biomass-Fired Stoker Boiler #1	15,958.77	14,252.90	12,262.70	1,652.92	5,811.99	481.99	37.24	569.50	608.56	481,652
EP-20514	Boiler Bottoms Ash Handling DC #1	421.98	421.98	210.99	--	--	--	--	--	--	--
EP-20510	Boiler Fly Ash Handling DC #1	210.99	210.99	105.50	--	--	--	--	--	--	--
EP-20520	Boiler Fly Ash Handling DC #2	210.99	210.99	105.50	--	--	--	--	--	--	--
EP-20512	Lime Handling DC #1	30.03	30.03	15.02	--	--	--	--	--	--	--
EP-09001	Flare	0.00	0.00	0.00	6.92	18.43	37.47	0.27	0.00	0.00	20,166
EP-06001 (EMG)	Firewater Pump Engine	0.00	0.00	0.00	0.13	0.05	0.03	0.00	0.00	0.00	119
EP-08000	High Voltage Circuit Breakers Fugitive Leaks	--	--	--	--	--	--	--	--	--	4.9
Total Plantwide		**18,044.6**	**16,070.5**	**13,560.9**	**1,665.8**	**5,830.5**	**519.5**	**1,242.5**	**569.5**	**615.7**	**590,299**

Abengoa Bioenergy Biomass of Kansas, LLC
Biorefinery Facility
Hugoton, Kansas

Rev. 5

Operations Data

Plant Capacity:	Denatured Ethanol:	31.58 MMgpy	**Biomass:**	589,475 ton/yr
	Anhydrous Ethanol:	30 MMgpy		

Operations:	365 day/yr
	8760 hr/yr

CONTROLLED Potential to Emit Summary (TPY)

Emission Point No.	Emission Unit(s)	PM	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOC	Single HAP	Total HAPs	Direct $CO_2 + CO_2e$
HAUL ROADS											
EP-01000FUG	Paved Plant Roads	7.51	1.50	0.37	--	--	--	--	--	--	--
EP-01050FUG	Biomass Laydown Roads	2.87	0.73	0.07	--	--	--	--	--	--	--
ENZYMATIC HYDROLYSIS PLANT											
EP-11120	Floor Sweep System DC	1.17	1.17	0.20	--	--	--	--	--	--	--
EP-11110	Bale Grinder DC	21.61	21.61	3.67	--	--	--	--	--	--	--
EP-11170	Classifier Cyclone # 1 DC	3.24	3.24	0.55	--	--	--	--	--	--	--
EP-11270	Classifier Cyclone # 2 DC	3.24	3.24	0.55	--	--	--	--	--	--	--
EP-11711	Boiler Feed System DC	3.24	3.24	0.55	--	--	--	--	--	--	--
EP-11110FUG	Crop Receiving, Grinding and Conveying	0.16	0.07	0.01	--	--	--	--	--	--	--
EP-18185	EH Fermentation CO2 Scrubber	0.44	0.44	0.44	0.29	--	--	11.87	1.40	1.62	88,356.94
EP-19001FUG	Lignin-Rich Stillage Storage	--	--	--	--	--	--	1.29	0.03	0.06	--

CONTROLLED Potential to Emit Summary (TPY)

Emission Point No.	Emission Unit(s)	PM	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOC	Single HAP	Total HAPs	Direct $CO_2 + CO_2e$
ETHANOL STORAGE AND PIPING											
EP-02000	Fugitive Leaks	--	--	--	--	--	--	1.69	0.00	0.00	0.01
T-02107	EH Product Shift Tank #1	--	--	--	--	--	--	0.15	0.00	0.00	--
T-02108	EH Product Shift Tank #2	--	--	--	--	--	--	0.15	0.00	0.00	--
T-02102	EH Ethanol Product Storage Tank #1	--	--	--	--	--	--	0.22	0.00	0.00	--
T-02112	EH Ethanol Product Storage Tank #2	--	--	--	--	--	--	0.22	0.00	0.00	--
T-02105	EH Denaturant Storage Tank	--	--	--	--	--	--	1.27	0.01	0.01	--
EP-02100	Vapor Recovery System	--	--	--	--	--	--	Emitted Through Flare, EP-09001			--
EP-02100FUG	Loading Losses	--	--	--	--	--	--	0.75	0.01	0.01	--
UTILITIES											
EP-02710	Bulk Fly Ash Load-Out Silo	4.22	4.22	4.22	--	--	--	--	--	--	--
EP-02711	Bulk Fly Ash Load-Out Silo Spout	4.22	4.22	4.22	--	--	--	--	--	--	--
EP-04001	Cooling Water Tower	0.74	0.52	0.31	--	--	--	--	--	--	--
EP-20001	Biomass-Fired Stoker Boiler #1	69.08	65.67	61.69	909.10	464.96	481.99	11.17	5.70	18.41	481,652
EP-20514	Boiler Bottoms Ash Handling DC #1	4.22	4.22	2.11	--	--	--	--	--	--	--
EP-20510	Boiler Fly Ash Handling DC #1	2.11	2.11	1.05	--	--	--	--	--	--	--
EP-20520	Boiler Fly Ash Handling DC #2	2.11	2.11	1.05	--	--	--	--	--	--	--
EP-20512	Lime Handling DC #1	0.30	0.30	0.15	--	--	--	--	--	--	--
EP-09001	Flare	0.003	0.003	0.003	6.92	18.43	37.47	0.27	0.00	0.00	20,166
EP-06001 (EMG)	Firewater Pump Engine	0.004	0.004	0.004	0.13	0.05	0.03	0.00	0.00	0.00	119
EP-08000	High Voltage Circuit Breakers Fugitive Leaks	--	--	--	--	--	--	--	--	--	4.9
Total Plantwide		**130.5**	**118.6**	**81.2**	**916.5**	**483.4**	**519.5**	**29.0**	**5.7**	**20.1**	**590,299**

Abengoa Bioenergy Biomass of Kansas, LLC
Biorefinery Facility
Hugoton, Kansas

Rev. 5

UNCONTROLLED HAPs Summary (TPY)

CAS No.	HAP Chemicals	EP-02000 Fugitive Leaks	T-02107 EH Product Shift Tank #1	T-02108 EH Product Shift Tank #2	T-02102 EH Ethanol Product Storage Tank #1	T-02112 EH Ethanol Product Storage Tank #2	T-02105 EH Denaturant Storage Tank	EP-02100 Vapor Recovery System	EP-02100FUG Loading Losses
75-07-0	Acetaldehyde	1.53E-03	3.01E-05	3.01E-05	3.26E-05	3.26E-05	--	--	6.73E-04
107-02-8	Acrolein	1.53E-04	3.01E-06	3.01E-06	3.26E-06	3.26E-06	--	--	6.73E-05
71-43-2	Benzene	--	--	--	1.31E-04	1.31E-04	3.17E-03	--	1.06E-04
7782-50-5	Chlorine	--	--	--	--	--	--	--	--
75-15-0	Carbon disulfide	--	--	--	1.05E-06	1.05E-06	2.53E-05	--	4.69E-05
9882-8	Cumene	--	--	--	5.25E-06	5.25E-06	1.27E-04	--	2.35E-04
95-50-1	Dichlorobenzene	--	--	--	--	--	--	--	--
75-09-2	Dichloromethane	--	--	--	--	--	--	--	--
100-41-4	Ethylbenzene	--	--	--	2.63E-06	2.63E-06	6.34E-05	--	1.17E-04
206-44-0	Fluoranthene	--	--	--	--	--	--	--	--
86-73-7	Fluorene	--	--	--	--	--	--	--	--
50-00-0	Formaldehyde	7.65E-04	1.51E-05	1.51E-05	1.63E-05	1.63E-05	--	--	3.36E-04
110-54-3	Hexane	--	--	--	--	--	--	--	1.17E-01
7647-01-0	Hydrogen chloride	--	--	--	--	--	--	--	--
7664-39-3	Hydrogen fluoride	--	--	--	--	--	--	--	--
67-56-1	Methanol	1.53E-03	3.01E-05	3.01E-05	3.26E-05	3.26E-05	--	--	6.73E-04
91-20-3	Naphthalene	--	--	--	--	--	--	--	--
85-01-8	Phenanathrene	--	--	--	--	--	--	--	--
115-07-1	Propylene	--	--	--	--	--	--	--	--
129-00-0	Pyrene	--	--	--	--	--	--	--	--
100-42-5	Styrene	--	--	--	--	--	--	--	--
108-88-3	Toluene	--	--	--	2.63E-04	2.63E-04	6.34E-03	--	1.17E-02
1330-20-7	Xylene	--	--	--	2.63E-05	2.63E-05	6.34E-04	--	1.17E-03
7440-36-0	Antimony	--	--	--	--	--	--	--	--
7440-38-2	Arsenic	--	--	--	--	--	--	--	--
7440-41-7	Beryllium	--	--	--	--	--	--	--	--
7440-43-9	Cadmium	--	--	--	--	--	--	--	--
7440-47-3	Chromium	--	--	--	--	--	--	--	--
7440-48-4	Cobalt	--	--	--	--	--	--	--	--
7439-92-1	Lead	--	--	--	--	--	--	--	--
7439-96-5	Manganese	--	--	--	--	--	--	--	--
7439-97-6	Mercury	--	--	--	--	--	--	--	--
7440-02-0	Nickel	--	--	--	--	--	--	--	--
7782-49-2	Selenium	--	--	--	--	--	--	--	--
	Other HAPs	--	--	--	--	--	--	--	--
Total HAPs Per Unit		**3.98E-03**	**7.84E-05**	**7.84E-05**	**5.14E-04**	**5.14E-04**	**1.04E-02**	**0.00E+00**	**1.32E-01**

UNCONTROLLED HAPs Summary (TPY)

CAS No.	HAP Chemicals	EP-20001 Biomass-Fired Stoker Boiler #1	EP-18185 EH Fermentation CO2 Scrubber	EP-19001FUG Lignin-Rich Stillage Storage	EP-09001 Flare	EP-06001 (EMG) Firewater Pump Engine	Maximum Single HAP
75-07-0	Acetaldehyde	1.82E+00	4.68E+00	1.73E-02	--	1.23E-04	6.52
107-02-8	Acrolein	8.76E+00	9.99E-01	2.61E-03	--	--	9.76
71-43-2	Benzene	9.20E+00	--	--	9.20E-07	1.50E-04	9.20
7782-50-5	Chlorine	0.00E+00	--	--	--	--	0.00
75-15-0	Carbon disulfide	--	--	--	--	--	0.00
9882-8	Cumene	--	--	--	--	--	0.00
95-50-1	Dichlorobenzene	--	--	--	5.26E-07	--	0.00
75-09-2	Dichloromethane	6.35E-01	--	--	--	--	0.64
100-41-4	Ethylbenzene	6.79E-02	--	--	--	--	0.07
206-44-0	Fluoranthene	3.50E-03	--	--	1.31E-09	--	0.00
86-73-7	Fluorene	7.45E-03	--	--	1.23E-09	--	0.01
50-00-0	Formaldehyde	9.64E+00	--	3.46E-02	3.29E-05	1.90E-04	9.67
110-54-3	Hexane	--	--	--	7.88E-04	--	0.12
7647-01-0	Hydrogen chloride	5.70E+02	--	--	--	--	569.50
7664-39-3	Hydrogen fluoride	6.57E-01	--	--	--	--	0.66
67-56-1	Methanol	--	1.21E+00	6.93E-03	--	--	1.22
91-20-3	Naphthalene	2.12E-01	--	--	2.67E-07	1.37E-05	0.21
85-01-8	Phenanathrene	1.53E-02	--	--	7.45E-09	--	0.02
115-07-1	Propylene	--	--	--	--	4.15E-04	0.00
129-00-0	Pyrene	8.10E-03	--	--	2.19E-09	--	0.01
100-42-5	Styrene	4.16E+00	--	--	1.49E-06	6.58E-05	4.16
108-88-3	Toluene	2.02E+00	--	--	--	--	2.03
1330-20-7	Xylene	5.48E-02	--	--	--	4.59E-05	0.06
7440-36-0	Antimony	3.46E-03	--	--	--	--	0.00
7440-38-2	Arsenic	3.46E-02	--	--	8.76E-08	--	0.03
7440-41-7	Beryllium	2.56E-02	--	--	--	--	0.03
7440-43-9	Cadmium	5.73E-05	--	--	4.82E-07	--	0.00
7440-47-3	Chromium	5.73E-04	--	--	6.13E-07	--	0.00
7440-48-4	Cobalt	1.77E-04	--	--	3.68E-08	--	0.00
7439-92-1	Lead	1.05E-01	--	--	2.19E-07	--	0.11
7439-96-5	Manganese	1.96E-02	--	--	1.66E-07	--	0.02
7439-97-6	Mercury	1.91E-05	--	--	1.14E-07	--	0.00
7440-02-0	Nickel	1.15E-03	--	--	9.20E-07	--	0.00
7782-49-2	Selenium	7.17E-05	--	--	--	--	0.00
	Other HAPs	1.62E+00	--	--	1.05E-08	--	1.62
Total HAPs Per Unit		**608.56**	**6.89**	**0.06**	**8.27E-04**	**1.00E-03**	**569.50**
Total Plantwide HAPs							**615.66**

Abengoa Bioenergy Biomass of Kansas, LLC
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CONTROLLED HAPs Summary (TPY)

CAS No.	HAP Chemicals	EP-02000 Fugitive Leaks	T-02107 EH Product Shift Tank #1	T-02108 EH Product Shift Tank #2	T-02102 EH Ethanol Product Storage Tank #1	T-02112 EH Ethanol Product Storage Tank #2	T-02105 EH Denaturant Storage Tank	EP-02100 Vapor Recovery System	EP-02100FUG Loading Losses
75-07-0	Acetaldehyde	3.37E-04	3.01E-05	3.01E-05	3.26E-05	3.26E-05	--	Emitted Through Flare, EP-09001	1.03E-04
107-02-8	Acrolein	3.37E-05	3.01E-06	3.01E-06	3.26E-06	3.26E-06	--		1.03E-05
71-43-2	Benzene	--	--	--	1.31E-04	1.31E-04	3.17E-03		5.86E-04
7782-50-5	Chlorine	--	--	--	--	--	--		--
75-15-0	Carbon disulfide	--	--	--	1.05E-06	1.05E-06	2.53E-05		4.69E-06
9882-8	Cumene	--	--	--	5.25E-06	5.25E-06	1.27E-04		2.35E-05
95-50-1	Dichlorobenzene	--	--	--	--	--	--		--
75-09-2	Dichloromethane	--	--	--	--	--	--		--
100-41-4	Ethylbenzene	--	--	--	2.63E-06	2.63E-06	6.34E-05		1.17E-05
206-44-0	Fluoranthene	--	--	--	--	--	--		--
86-73-7	Fluorene	--	--	--	--	--	--		--
50-00-0	Formaldehyde	1.69E-04	1.51E-05	1.51E-05	1.63E-05	1.63E-05	--		5.16E-05
110-54-3	Hexane	--	--	--	--	--	--		1.17E-02
7647-01-0	Hydrogen chloride	--	--	--	--	--	--		--
7664-39-3	Hydrogen fluoride	--	--	--	--	--	--		--
67-56-1	Methanol	3.37E-04	3.01E-05	3.01E-05	3.26E-05	3.26E-05	--		1.03E-04
91-20-3	Naphthalene	--	--	--	--	--	--		--
85-01-8	Phenanathrene	--	--	--	--	--	--		--
115-07-1	Propylene	--	--	--	--	--	--		--
129-00-0	Pyrene	--	--	--	--	--	--		--
100-42-5	Styrene	--	--	--	--	--	--		--
108-88-3	Toluene	--	--	--	2.63E-04	2.63E-04	6.34E-03		1.17E-03
1330-20-7	Xylene	--	--	--	2.63E-05	2.63E-05	6.34E-04		1.17E-04
7440-36-0	Antimony	--	--	--	--	--	--		--
7440-38-2	Arsenic	--	--	--	--	--	--		--
7440-41-7	Beryllium	--	--	--	--	--	--		--
7440-43-9	Cadmium	--	--	--	--	--	--		--
7440-47-3	Chromium	--	--	--	--	--	--		--
7440-48-4	Cobalt	--	--	--	--	--	--		--
7439-92-1	Lead	--	--	--	--	--	--		--
7439-96-5	Manganese	--	--	--	--	--	--		--
7439-97-6	Mercury	--	--	--	--	--	--		--
7440-02-0	Nickel	--	--	--	--	--	--		--
7782-49-2	Selenium	--	--	--	--	--	--		--
	Other HAPs	--	--	--	--	--	--		--
Total HAPs Per Unit		**8.77E-04**	**7.84E-05**	**7.84E-05**	**5.14E-04**	**5.14E-04**	**1.04E-02**	**--**	**1.39E-02**

CONTROLLED HAPs Summary (TPY)

CAS No.	HAP Chemicals	EP-20001 Biomass-Fired Stoker Boiler #1	EP-18185 EH Fermentation CO2 Scrubber	EP-19001FUG Lignin-Rich Stillage Storage	EP-09001 Flare	EP-06001 (EMG) Firewater Pump Engine	Maximum Single HAP
75-07-0	Acetaldehyde	5.45E-01	1.40E+00	1.73E-02	--	1.23E-04	1.96
107-02-8	Acrolein	2.63E+00	1.00E-01	2.61E-03	--	--	2.73
71-43-2	Benzene	2.76E+00	--	--	9.20E-07	1.50E-04	2.76
7782-50-5	Chlorine	0.00E+00	--	--	--		0.00
75-15-0	Carbon disulfide	--	--	--	--	--	0.00
9882-8	Cumene	--	--	--	--	--	0.00
95-50-1	Dichlorobenzene	--	--	--	5.26E-07	--	0.00
75-09-2	Dichloromethane	6.35E-01	--	--	--	--	0.64
100-41-4	Ethylbenzene	6.79E-02	--	--	--	--	0.07
206-44-0	Fluoranthene	3.50E-03	--	--	1.31E-09	--	0.00
86-73-7	Fluorene	7.45E-03	--	--	1.23E-09	--	0.01
50-00-0	Formaldehyde	2.89E+00	--	3.46E-02	3.29E-05	1.90E-04	2.93
110-54-3	Hexane	--	--	--	7.88E-04	--	0.01
7647-01-0	Hydrogen chloride	5.70E+00	--	--	--	--	5.70
7664-39-3	Hydrogen fluoride	6.57E-03	--	--	--	--	0.01
67-56-1	Methanol	--	1.20E-01	6.93E-03	--	--	0.13
91-20-3	Naphthalene	6.37E-02	--	--	2.67E-07	1.37E-05	0.06
85-01-8	Phenanathrene	1.53E-02	--	--	7.45E-09	--	0.02
115-07-1	Propylene	--	--	--	--	4.15E-04	0.00
129-00-0	Pyrene	8.10E-03	--	--	2.19E-09	--	0.01
100-42-5	Styrene	1.25E+00	--	--	--	--	1.25
108-88-3	Toluene	6.05E-01	--	--	1.49E-06	6.58E-05	0.61
1330-20-7	Xylene	5.48E-02	--	--	--	4.59E-05	0.06
7440-36-0	Antimony	3.46E-03	--	--	--	--	0.00
7440-38-2	Arsenic	3.46E-02	--	--	8.76E-08	--	0.03
7440-41-7	Beryllium	2.56E-02	--	--	--	--	0.03
7440-43-9	Cadmium	5.73E-05	--	--	4.82E-07	--	0.00
7440-47-3	Chromium	5.73E-04	--	--	6.13E-07	--	0.00
7440-48-4	Cobalt	1.77E-04	--	--	3.68E-08	--	0.00
7439-92-1	Lead	1.05E-01	--	--	2.19E-07	--	0.11
7439-96-5	Manganese	1.96E-02	--	--	1.66E-07	--	0.02
7439-97-6	Mercury	1.91E-05	--	--	1.14E-07	--	0.00
7440-02-0	Nickel	1.15E-03	--	--	9.20E-07	--	0.00
7782-49-2	Selenium	7.17E-05	--	--	--	--	0.00
	Other HAPs	9.81E-01	--	--	--	--	0.98
Total HAPs Per Unit		**18.41**	**1.62**	**0.06**	**8.27E-04**	**1.00E-03**	**5.70**
Total Plantwide HAPs							**20.12**

Abengoa Bioenergy Biomass of Kansas, LLC Biorefinery Facility Hugoton, Kansas	Rev. 5

Direct GHG Summary (TPY)

Pollutants	EP-18185 EH Fermentation CO2 Scrubber	EP-02000 Fugitive Leaks	EP-20001 Biomass-Fired Stoker Boiler #1	EP-09001 Flare	EP-06001 (EMG) Firewater Pump Engine	EP-08000 High Voltage Circuit Breakers Fugitive Leaks
CO_2	88,356.9	0.0065	472,118	20,166	119.3	0
CH_4	0	0	155	0.005	0.004	0
CH_4 => CO_2 Equivalent (1)	0	0	3,246	0.10	0.07	0
N_2O	0	0	20	0.0001	0.0002	0
N_2O => CO_2 Equivalent (1)	0	0	6,288	0.03	0.07	0
SF_6	0	0	0	0	0	0.00021
SF_6 => CO_2 Equivalent (1)	0	0	0	0	0	4.9
Total CO_2 + CO_2e	**88,357**	**0.0065**	**481,652**	**20,166**	**119.4**	**4.9**

(1) To incorporate and evaluate non-CO_2 gases, the mass estimates of these gases were converted to their CO_2 equivalent (CO_2e). To calculate the CO_2 equivalent, the mass of the non-CO_2 gas is multiplied by the non-CO_2 gas's Global Warming Potential (GWP), see note 2 below. The GWPs for CH_4, N_2O and SF_6 are 21, 310 and 23,900, respectively, as obtained from 40 CFR Part 98 Table A-1 of the Greenhouse Gas Reporting Program (GHGRP).

(2) Global Warming Potentials (GWPs) were developed by the Intergovernmental Panel on Climate Change (IPCC) to quantify the globally averaged relative radiative forcing effects of a given GHG, using CO_2 as the reference gas. In 1996, the IPCC published a set of GWPs for the most commonly measured greenhouse gases in its Second Assessment Report (SAR). In 2001, the IPCC published its Third Assessment Report (TAR), which adjusted the GWPs to reflect new information on atmospheric lifetimes and an improved calculation of the radiative forcing of CO_2. However, SAR GWPs are still used by international convention and the U.S. to maintain the value of the CO_2 "currency". To maintain consistency with international practice, the California Climate Action Registry requires participants to use GWPs from the SAR when determining de minimis emissions, establishing baselines, and making baseline adjustments.

EP-01000
Paved Plant Roads

Basis: AP-42 Section 13.2.1 Paved Haul Roads, Final Section, January 2011.

Emission Factor Equation: **E=[k(sL^0.91)(W^1.02)]*[1-(P/4*365)]** Equation 13.2.1-2

where:
E = particulate emission factor (pounds per vehicle mile traveled, lb/VMT)
k = particle size multiplier, lb/VMT
sL = road surface silt loading (g/m^2)
W = mean vehicle weight of the vehicles traveling the road (tons)
P = number of "wet" days with at least 0.254 mm (0.01-in) of precipitation during the averaging period

		PM_{30}	PM_{10}	$PM_{2.5}$	Unit	Notes
Particle Size Multipliers for Paved Road Equation	k	0.011	0.0022	0.00054	lb/VMT	Table 13.2.1-1
Road Surface Silt Loading	sL	2.00	2.00	2.00	g/m^2	Proposed Limit Based on Annual Sample Average*
Average Weight of Vehicles	W	24.98	24.98	24.98	tons	Average weight, see calculation below
Mean Days > 0.01-in precipitation	P	75	75	75	days	1971-2000 Average Annual Precipitation

*Table 13.2.1-3, *Typical Silt Content and Loading Values for Paved Roads at Industrial Facilities*, indicates that the silt loading for corn wet mills is 0.05 to 2.9 g/m^2. Also, the test data from each of the four test slowly moving and stop and go programs produced 14 slowly moving and 8 stop and go PM_{10} emission factors and indicated that "in all but one of the 22 cases, the AP-42 emission factor overestimated the measured PM_{10} value", and "that there was no significant difference between 'slowly moving' and 'stop-and-go' results on average." Of the four test programs, only one is representative of the proposed ABBK operating scenario. The Cargill's Blair, Nebraska facility had a lower mean vehicle weight value of 27 tons (ABBK's mean vehicle weight is 22 tons), and the surface silt loading was 0.05 g/m^2, based on stringent fugitive dust control (ABBK proposes to also maintain stringent dust control). The Cargill's Blair, Nebraska facility measured PM_{10} emission factors of 0.0036 and 0.0066 lb/VMT for slowly moving and low speed traffic. Because ABBK will enforce a strict speed limit of 15 mph and because the trucks will be required to weigh in/out and maneuver through the facility (i.e. facility traffic is not representative of the majority of the tests conducted during the development of the AP-42 emission factor equation which involved freely flowing vehicles traveling at constant speed on relatively level roads), a proposed road surface silt loading average of 2.0 g/m^2 is assumed conservative and appropriate.

Emission Factors:

			Emission Factors		
ID	Source Description	Daily Ops (hr/day)	PM_{30} (lb/VMT)	PM_{10} (lb/VMT)	$PM_{2.5}$ (lb/VMT)
EP-01000	Paved Plant Roads	12	0.522	0.1045	0.0256

$PM/PM_{10}/PM_{2.5}$ Emissions:

		PM_{30}			PM_{10}			$PM_{2.5}$		
ID	Source Description	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)
EP-01000	Paved Plant Roads	3.98	47.73	7.51	0.80	9.55	1.50	0.20	2.34	0.37
Total		**3.98**	**47.73**	**7.51**	**0.80**	**9.55**	**1.50**	**0.20**	**2.34**	**0.37**

EP-01000
Paved Plant Roads

Average Weight of Vehicles:							
Material Loaded/Unloaded	miles LOADED Per Year	% miles LOADED Per	miles EMPTY Per Year	% miles EMPTY Per Year	miles TOTAL Per Year	LOADED weight	EMPTY weight
Ethanol (Denatured)	825.65	2.87%	729.92	2.54%	1,555.57	40	15
Denaturant (Gasoline)	73.13	0.25%	82.72	0.29%	155.85	40	15
Biomass Delivery	12,477.82	43.42%	9,340.12	32.50%	21,817.94	33	15
Boiler Fly Ash (By-product)	601.27	2.09%	410.68	1.43%	1,011.95	30.25	5.5
New Acid Wash Sand	856.81	2.98%	408.55	1.42%	1,265.36	30.25	5.5
Spent Acid Wash Sand	352.24	1.23%	470.57	1.64%	822.82	30.25	5.5
Misc. Chemicals & Supplies	990.56	3.45%	1,120.47	3.90%	2,111.02	40	15
Facility-wide	**16,177.48**		**12,563.03**		**28,740.50**		

W = [(% of Miles LOADED) x (LOADED Weight)] + [(% of Miles EMPTY) x (EMPTY Weight)]

W = **24.98 tons**

Annual VMT Calculations:	Load Size		Annual Volume		Average % by Truck	Annual Volume by Truck		Trips / Year	Annual VMT
Ethanol (Denatured)	24.75	tons	104,214	ton/yr	50%	52,107	ton/yr	2,106	1,555.57
Denaturant (Gasoline)	24.75	tons	1,503	ton/yr	100%	1,503	ton/yr	211	155.85
Biomass Delivery	18	tons	693,500	wet ton/yr	100%	693,500	wet ton/yr	38,528	21,817.94
Fly Ash (By-product)	25	tons	29,646	ton/yr	100%	29,646	ton/yr	1,198	1,011.95
Bottoms Ash (By-product)	24.75		37,058	ton/yr	100%	37,058	ton/yr	1,498	1,265.36
Acid Wash Solids	24.75	tons	35,942	ton/yr	100%	35,942	ton/yr	1,453	822.82
Misc. Chemicals & Supplies	25	tons	69,740	ton/yr	100%	69,740	ton/yr	2,858	2,111.02
Facility-wide			**971,603**	**ton/yr**				**47,852**	**28,740.50**

Daily VMT Calculations:	Load Size		Daily Volume		Average Daily % by Truck	Daily Volume by Truck		Trips / Day	Daily VMT
Ethanol (Denatured)	24.75	tons	316	ton/day	50%	158	ton/day	7	5.17
Denaturant (Gasoline)	24.75	tons	74	ton/day	100%	74	ton/day	3	2.22
Biomass Delivery	18	tons	1,900	wet ton/day	100%	1,900	wet ton/day	106	60.03
Fly Ash (By-product)	24.75	tons	162	ton/day	100%	162	ton/day	7	5.91
Bottoms Ash (By-product)	24.75		203	ton/day	100%	203	ton/day	9	7.60
Acid Wash Solids	24.75	tons	197	ton/day	100%	197	ton/day	8	4.53
Misc. Chemicals & Supplies	24.7	tons	191	ton/day	100%	191	ton/day	8	5.91
Facility-wide			**3,044**	**ton/day**				**148**	**91.37**

EP-01000
Paved Plant Roads

Supporting Calculations:

Ethanol (Denatured)

** Denatured ethanol will primarily be shipped offsite by rail; however a conservative estimate of 50% shipped by truck is included as a worst-case scenario.

Ethanol (Denatured) Production - Annual	31.58	MMgal/yr
	104,214.00	ton/yr
Ethanol (Denatured) Shipped - Daily	95,696.97	gal/day
	315.80	ton/day
% Shipped by Truck	50%	
Ethanol (Denatured) Density	6.60	lb/gal
Truck Capacity	7,500	gal
	24.75	tons
Estimated Truck Trips	2,106	trips/yr
	7	trips/day

Truck Travel on Plant Roads	2,070	feet per trip LOADED	825.65	miles LOADED	From Plot Plan	ABBK GD-0000-D-0001_PLANT
	1,830	feet per trip EMPTY	729.92	miles EMPTY	From Plot Plan	ABBK GD-0000-D-0001_PLANT
			1,555.57	**miles TOTAL**		

Denaturant (Gasoline)

Denaturant (Gasoline) Usage - Annual	1.58	MMgal/yr
	1,503.00	ton/yr
Denaturant (Gasoline) Received - Daily	22,500.00	gal/day
	74.25	ton/day
% Shipped by Truck	100%	
Denaturant (Gasoline) Density	5.67	lb/gal
Truck Capacity	7,500	gal
	24.75	tons
Estimated Truck Trips	211	trips/yr
	3	trips/day

Truck Travel on Plant Roads	1,830	feet per trip LOADED	73.13	miles LOADED	From Plot Plan	ABBK GD-0000-D-0001_PLANT
	2,070	feet per trip EMPTY	82.72	miles EMPTY	From Plot Plan	ABBK GD-0000-D-0001_PLANT
			155.85	**miles TOTAL**		

Biomass Delivery (Agricultural Residues/Energy Crops)

Biomass Receiving - Annual	693,500	wet ton/yr
Biomass Receiving - Daily	1,900	wet ton/day
% Received by Truck	100%	
Truck Capacity	18	tons
Estimated Truck Trips	38,528	trips/yr
	106	trips/day

Truck Travel on Plant Roads	1,710	feet per trip LOADED	12,477.82	miles LOADED	From Plot Plan	ABBK GD-0000-D-0001_PLANT
	1,280	feet per trip EMPTY	9,340.12	miles EMPTY	From Plot Plan	ABBK GD-0000-D-0001_PLANT
			21,817.94	**miles TOTAL**		

EP-01000
Paved Plant Roads

Fly Ash (By-product) Shipped Offsite

Fly Ash Production - Annual	29,646	ton/yr	
Maximum Fly Ash Shipping - Daily	162	ton/day	*Assumes not more than 2 days storage shipped by truck in any single day.
% Shipped by Truck	100%		
Truck Capacity	25	tons	
Estimated Truck Trips	1,198	trips/yr	
	7	trips/day	

Truck Travel on Plant Roads	2,650	feet per trip LOADED	601.27	miles LOADED	From Plot Plan	ABBK GD-0000-D-0001_PLANT
	1,810	feet per trip EMPTY	410.68	miles EMPTY	From Plot Plan	ABBK GD-0000-D-0001_PLANT
			1,011.95	**miles TOTAL**		

Bottoms Ash (By-product) Shipped Offsite

Bottoms Ash Production - Annual	37,058	ton/yr	
Maximum Bottoms Ash Shipping - Daily	203	ton/day	*Assumes not more than 2 days storage shipped by truck in any single day.
% Shipped by Truck	100%		
Truck Capacity	24.75	tons	
Estimated Truck Trips	1,498	trips/yr	
	9	trips/day	

Truck Travel on Plant Roads	3,020	feet per trip LOADED	856.81	miles LOADED	From Plot Plan	ABBK GD-0000-D-0001_PLANT
	1,440	feet per trip EMPTY	408.55	miles EMPTY	From Plot Plan	ABBK GD-0000-D-0001_PLANT
			1,265.36	**miles TOTAL**		

Acid Wash Solids (Waste) Shipped Offsite

Acid Wash Sand (Wet) Production - Annual	35,942	ton/yr	
Maximum Acid Wash Sand (Wet) Shipping - Daily	197	ton/day	*Assumes not more than 2 days storage shipped by truck in any single day.
% Shipped by Truck	100%		
Truck Capacity	24.75	tons	
Estimated Truck Trips	1,453	trips/yr	
	8	trips/day	

Truck Travel on Plant Roads	1,280	feet per trip LOADED	352.24	miles LOADED	From Plot Plan	ABBK GD-0000-D-0001_PLANT
	1,710	feet per trip EMPTY	470.57	miles EMPTY	From Plot Plan	ABBK GD-0000-D-0001_PLANT
			822.82	**miles TOTAL**		

EP-01000
Paved Plant Roads

Misc. Chemicals, Enzymes & Supplies

**The weighted average of the trucks was estimated.

Chemicals Received - Annual	69,739.99	ton/yr
% Shipped by Truck	100%	
Truck Capacity**	24.70	tons
Estimated Truck Trips	2,858	trips/yr
	239	trips/mo
	8	trips/day

Truck Travel on Plant Roads	1,830	feet per trip LOADED	990.56	miles LOADED	From Plot Plan	ABBK GD-0000-D-0001_PLANT
	2,070	feet per trip EMPTY	1,120.47	miles EMPTY	From Plot Plan	ABBK GD-0000-D-0001_PLANT
			2,111.02	**miles TOTAL**		

Misc. Chemicals & Enzymes Used	Usage (lb/day)	Usage (lb/yr)	Truck Capacity (lb/truck)	Truck Trips (trips/yr)
Chemicals				
Maximum Sulfuric Acid (94%) Usage	48,010	17,523,504	49,500	355
Maximum Anhydrous Ammonia Usage	16,128	5,886,720	49,500	119
Maximum Magnesium Hydroxide Usage (For Wastewater Treatment)	9,468	3,456,000	49,500	70
Maximum Urea Usage (For Wastewater Treatment)	422	153,900	5,000	31
Miscellaneous Chemical Usage (For Wastewater Treatment)	20	7,200	5,000	2
Maximum Hydrated Lime Usage	102,923	37,566,734	49,500	759
Diesel Usage	36,198	13,212,409	49,500	267
Maximum Media Liquid Usage	51,293	18,721,872	49,500	379
Maximum Nutrient Usage	8,208	2,995,920	49,500	61
Antifoam Usage	20	7,200	5,000	2
Enzymes				
Maximum Cellulase Usage	108,922	39,756,384	49,500	804
Wastes				
Hazardous & Municipal Wastes	526	192,146	22,000	9
	Total Annual Lbs	139,479,989		2,858
	Total Annual Tons	69,740		

EP-01050
Biomass Laydown Roads

Basis: AP-42 Section 13.2.2 Unpaved Haul Roads, Final Section, November 2006.

Emission Factor Equation: **E=[k(s/12)^a(W/3)^b]*[(365-P)/365]** Equation 13.2.2-1a

where:
E = particulate emission factor (pounds per vehicle mile traveled, lb/VMT)
k, a, b = dimensionless constants
s = surface material silt content (%)
W = mean vehicle weight of the vehicles traveling the road (tons)
P = number of "wet" days with at least 0.254 mm (0.01-in) of precipitation during the averaging period

		PM_{30}	PM_{10}	$PM_{2.5}$	Unit	Notes
Particle Size Multipliers for Paved Road Equation	k	4.9	1.5	0.15		Table 13.2.2-2
	a	0.7	0.9	0.9		Table 13.2.2-2
	b	0.45	0.45	0.45		Table 13.2.2-2
Mean Silt Content	s	4.8	4.8	4.8	%	Utah DEQ March 10, 2008 Memo
Average Weight of Vehicles	W	24.28	24.28	24.28	tons	Average weight, see calculation below
Mean Days > 0.01-in precipitation	P	85	85	85	days	1971-2000 Average Annual Precipitation
Chemical Suppressant and Watering	CE	70	70	70	%	Utah DEQ March 10, 2008 Memo

Emission Factors:

			Uncontrolled Emission Factors			Controlled Emission Factors		
ID	Source Description	Daily Ops (hr/day)	PM_{30} (lb/VMT)	PM_{10} (lb/VMT)	$PM_{2.5}$ (lb/VMT)	PM_{30} (lb/VMT)	PM_{10} (lb/VMT)	$PM_{2.5}$ (lb/VMT)
EP-01050	Biomass Laydown Roads	12	5.072	1.293	0.129	1.521	0.388	0.039

Uncontrolled $PM/PM_{10}/PM_{2.5}$ Emissions:

		PM_{30}			PM_{10}			$PM_{2.5}$		
ID	Source Description	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)
EP-01050	Biomass Laydown Roads	4.48	53.82	9.56	1.14	13.72	2.44	0.11	1.37	0.24
Total		**4.48**	**53.82**	**9.56**	**1.14**	**13.72**	**2.44**	**0.11**	**1.37**	**0.24**

Controlled $PM/PM_{10}/PM_{2.5}$ Emissions:

		PM_{30}			PM_{10}			$PM_{2.5}$		
ID	Source Description	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)	(lb/hr)	(lb/day)	(ton/yr)
EP-01050	Biomass Laydown Roads	1.35	16.15	2.87	0.34	4.11	0.73	0.03	0.41	0.07
Total		**1.35**	**16.15**	**2.87**	**0.34**	**4.11**	**0.73**	**0.03**	**0.41**	**0.07**

EP-01050
Biomass Laydown Roads

Average Weight of Vehicles:							
Material Loaded/Unloaded	miles LOADED Per Year	% miles LOADED Per Year	miles EMPTY Per Year	% miles EMPTY Per Year	miles TOTAL Per Year	LOADED weight	EMPTY weight
Biomass Storage Field	265.13	7.03%	148.97	3.95%	414.10	33	15
Biomass Staging Area	1,678.30	44.51%	1,678.30	44.51%	3,356.61	33	15
Facility-wide	**1,943.44**		**1,827.27**		**3,770.71**		

W = [(% of Miles LOADED) x (LOADED Weight)] + [(% of Miles EMPTY) x (EMPTY Weight)]
W = **24.28 tons**

Annual VMT Calculations:	Load Size	Annual Volume	% by Truck	Annual Volume by Truck	Trips / Year	Annual VMT
Biomass Storage Field	18 tons	16,235 ton/yr	100%	16,235 ton/yr	902	414.10
Biomass Staging Area	18 tons	346,750 ton/yr	100%	346,750 ton/yr	38,528	3,356.61
Facility-wide		**362,985 ton/yr**			**39,430**	**3,770.71**

Daily VMT Calculations:	Load Size	Daily Volume	% by Truck	Daily Volume by Truck	Trips / Day	Daily VMT
Biomass Storage Field	18 tons	44 ton/day	100%	44 ton/day	3	1.38
Biomass Staging Area	18 tons	1,900 ton/day	100%	1,900 ton/day	106	9.23
Facility-wide		**1,944 ton/day**			**109**	**10.61**

EP-01050
Biomass Laydown Roads

Supporting Calculations:

Biomass Storage Field

**Biomass storage field assumed to cycle once per three months. Biomass bale delivery to storage field includes only traffic on unpaved storage haul roads.
**Biomass storage field is used for emergency purposes only. The field will only be active to the extent required to cycle bales through to maintain feedstock quality.

Biomass Storage Field - Annual	16,235	ton/yr
Biomass Storage Field - Daily	44	ton/day
% Received by Truck	100%	
Truck Capacity	18	tons
Estimated Truck Trips	902	trips/yr
	3	trips/day
	1	trips/hr
	60	min/truck

Truck Travel on Plant Roads	1552	feet per trip LOADED	265.13	miles LOADED
	872	feet per trip EMPTY	148.97	miles EMPTY
			414.10	**miles TOTAL**

Biomass Overnight Staging Area

**Biomass staging area is constantly active as bales are brought onsite and stored as well as retrieved for use in the process during the night shift.
**Travel to and from biomass staging area to the facility entrance is included with the paved plant roads, EP-01000.

Biomass Staging Area - Annual	346,750	ton/yr	Includes biomass to be delivered to the grinders during the night shift.
Biomass Staging Area - Daily	1,900	ton/day	Biomass delivered to maximum grinder capacity for 12 hr/24 hr period.
% Received by Truck	100%		
Truck Capacity	18	tons	
Estimated Truck Trips	38,528	trips/yr	
	106	trips/day	
	9	trips/hr	
	6.67	min/truck	

Truck Travel on Plant Roads	230	feet per trip LOADED	1,678.30	miles LOADED
	230	feet per trip EMPTY	1,678.30	miles EMPTY
			3,356.61	**miles TOTAL**

EP-02000
Equipment Leaks

Basis: Leak Rates and VOC control from Protocol for Leak Emission Rates, EPA-453/R-95-017, November 1995.
Leak Rate (SOCMI average) multiplied by number of components.
Component count based on estimate for similar sized ethanol facilities.
HAP composition is the same in all VOC emissions for source identified.
Composition of HAPs is based on an engineering estimate.

Ethanol HAPs:			
	Acetaldehyde	200	ppmw
	Methanol	200	ppmw
	Acrolein	20	ppmw
	Formaldehyde	100	ppmw

Component Count Criteria:
Streams with less than 1% VOC content (by water weight) are assumed negligible and are not counted.
Streams with less than 20% VOC (Vapor Pressure >0.3 kPa at 20 °C) content (by water weight) are defined as "Heavy Liquids".
Components in vacuum service are not inventoried and not to be inspected due to leak free nature.
All other streams are "Light Liquid" or "Gas/Vapor".

VOC Emissions:

		Fermentation		Distillation					Storage	
Plant Area:		Pre-Fermenter	Beer Well	Beer Preheater	Stripper	Rectifier	Molecular Sieve Purge	Molecular Sieve	Finished Product	Total Plant
%VOC in Product at Area		2%	2%	1%	50%	93%	75%	100%	100%	
%CO_2 in Product Area		1%	88%	88%	5%	1%	1%	0%	0%	
Equipment	Leak Rate (kg/hr/source)									
Valves:										
Gas	0.00597	0.0001194	0.0001194	0.0000597	0.002985	0.0055521	0.0044775	0.00597	0.00597	
	Count	3	2	0	3	6	2	5	1	22
	VOC Emissions	0.0003582	0.0002388	0	0.008955	0.0333126	0.008955	0.02985	0.00597	0.088
	CO_2 Emissions	0.0001791	0.0105072	0	0.0008955	0.0003582	0.0001194	0	0	0.012
Light Liquid	0.00403	0.0000806	0.0000806	0.0000403	0.002015	0.0037479	0.0030225	0.00403	0.00403	
	Count	0	0	0	6	4	2	6	6	24
	VOC Emissions	0	0	0	0.01209	0.0149916	0.006045	0.02418	0.02418	0.081
	CO_2 Emissions	0	0	0	0.001209	0.0001612	0.0000806	0	0	0.001
Heavy Liquid	0.00023	0.0000046	0.0000046	0.0000023	0.000115	0.0002139	0.0001725	0.00023	0.00023	
	Count	14	9	5	0	0	0	0	0	28
	VOC Emissions	0.0000644	0.0000414	0.0000115	0	0	0	0	0	0.000
	CO_2 Emissions	0.0000322	0.0018216	0.001012	0	0	0	0	0	0.003
Pumps:										
Light Liquid	0.0199	0.000398	0.000398	0.000199	0.00995	0.018507	0.014925	0.0199	0.0199	
	Count	0	0	0	1	1	1	1	1	5
	VOC Emissions	0	0	0	0.00995	0.018507	0.014925	0.0199	0.0199	0.083
	CO_2 Emissions	0	0	0	0.000995	0.000199	0.000199	0	0	0.001
Heavy Liquid	0.00862	0.0001724	0.0001724	0.0000862	0.00431	0.0080166	0.006465	0.00862	0.00862	
	Count	2	2	0	0	0	0	0	0	4
	VOC Emissions	0.0003448	0.0003448	0	0	0	0	0	0	0.001
	CO_2 Emissions	0.0001724	0.0151712	0	0	0	0	0	0	0.015
Other:										
Relief Valves	0.104	0.00208	0.00208	0.00104	0.052	0.09672	0.078	0.104	0.104	
	Count	1	1	1	1	1	1	1	0	7
	VOC Emissions	0.00208	0.00208	0.00104	0.052	0.09672	0.078	0.104	0	0.336
	CO_2 Emissions	0.00104	0.09152	0.09152	0.0052	0.00104	0.00104	0	0	0.191
Connectors	0.00183	0.0000366	0.0000366	0.0000183	0.000915	0.0017019	0.0013725	0.00183	0.00183	
	Count	49	32	13	24	26	9	29	17	199
	VOC Emissions	0.0017934	0.0011712	0.0002379	0.02196	0.0442494	0.0123525	0.05307	0.03111	0.166
	CO_2 Emissions	0.0008967	0.0515328	0.0209352	0.002196	0.0004758	0.0001647	0	0	0.000
Sample Valves	0.015	0.0003	0.0003	0.00015	0.0075	0.01395	0.01125	0.015	0.015	
	Count	1	1	1	1	1	0	0	1	6
	VOC Emissions	0.0003	0.0003	0.00015	0.0075	0.01395	0	0	0.015	0.037
	CO_2 Emissions	0.00015	0.0132	0.0132	0.00075	0.00015	0	0	0	0.027

EP-02000
Equipment Leaks

Pollutant	Unit	Total Plant
Uncontrolled VOC Total	**kg/hr**	**0.79**
	lb/hr	**1.75**
	ton/yr	**7.65**
Uncontrolled CO_2 Total	**kg/hr**	**0.25**
	lb/hr	**0.56**
	ton/yr	**0.006**

Equipment	LDAR Control [1, 2] (% Eff.)	Emissions
Valves:		
Gas	0.87	0.011
Light Liquid	0.84	0.013
Heavy Liquid	0.84	0.000
Pumps:		
Light Liquid	0.69	0.026
Heavy Liquid	0.69	0.000
Other:		
Relief Valves	0.87	0.044
Connectors	0.55	0.075
Sample Valves	0.84	0.006
Controlled VOC Total	**kg/hr**	**0.17**
	lb/hr	**0.39**
	ton/yr	**1.69**

(1) Control effectiveness for Valves and Pumps obtained with monthly monitoring 10,000 ppmv leak definition, as presented in Table 5-2. Heavy Liquid Valves and Pumps control efficiencies assumed equivalent to the Light Liquid Valves and Pumps.

(2) Control effectiveness for Connectors were estimated based on Equations 1 through 4, in Section 5 and an occurrence rate of 1%. The calculations demonstrating how the LDAR control was estimated are included on the following page. Control effectiveness for Sample Valves (Sampling Connections) were assumed equivalent to Light Liquid Valves.

Uncontrolled HAPs Emissions:

ID	Source Description	VOC Emissions (ton/yr)	Acetaldehyde (ton/yr)	Methanol (ton/yr)	Acrolein (ton/yr)	Formaldehyde (ton/yr)	
EP-02000	Equipment Leaks	7.649	0.0015	0.0015	0.0002	0.0008	**Total**
Total			**0.0015**	**0.0015**	**0.0002**	**0.0008**	**0.0040**

Controlled HAPs Emissions:

ID	Source Description	VOC Emissions (ton/yr)	Acetaldehyde (ton/yr)	Methanol (ton/yr)	Acrolein (ton/yr)	Formaldehyde (ton/yr)	
EP-02000	Equipment Leaks	1.687	0.0003	0.0003	0.0000	0.0002	**Total**
Total			**0.0003**	**0.0003**	**0.0000**	**0.0002**	**0.0009**

EP-02000
Equipment Leaks

SOCMI Connectors LDAR Control Calculation

Initial Leak Rate =
ILR = 0.00183 From Figure 5-4 - SOCMI Connector Average Leak Rate vs. Fraction Leaking at Several Leak Definitions (Includes 10,000 ppmv leak definition)
Precise Value Obtained from EPA-453/R-95-017, Table 2-1, Page 2-12.

Table 5-4 Equations Relating Average Leak Rate to Fraction Leaking at SOCMI Units

Connector with 10,000 ppmv leak definition: ALR = (0.11 x LKFRACT) + 8.1E-05

Zi = LKFRACT
0.00183 = (0.11 x LKFRACT) + 8.1E-05

LKFRACT = 0.0159
Z1 = 0.0159

Yi = Zi - (FR x Zi) + (FR x Zi x R) (EPA-453/R-95-017, Page 5-56)
Zi+1 = Oc x (1-Yi) + Yi
Oc = 1.0%

Y1 =	0.0023055
Z1 =	0.0159
R =	0.1
FR =	0.95
Y2 =	0.001780955
Z2 =	0.012282445
R2 =	0.1
FR2 =	0.95
Y3 =	0.001705656
Z3 =	0.011763145
R3 =	0.1
FR3 =	0.95
Y4 =	0.001694847
Z4 =	0.011688599
R4 =	0.1
FR4 =	0.95
Y5 =	0.001693295
Z5 =	0.011677898
R5 =	0.1
FR5 =	0.95
Y6 =	0.001693073
Z6 =	0.011676362
R6 =	0.1
FR6 =	0.95
Y7 =	0.001693041
Z7 =	0.011676142
R7 =	0.1
FR7 =	0.95
Y8 =	0.001693073 = After LDAR monitoring (%)
Z8 =	0.011676362 = Prior to LDAR monitoring (%)
R8 =	0.1
FR8 =	0.95

Avg LDAR monitor = 0.006684717

From Table 5-4 Gas Valve Eqn: **FLR = 0.00081632**

Eff = (ILR-FLR) / ILR x 100 (EPA-453/R-95-017, Page 5-57)
Where:
Eff = Control Effectiveness (Percent)
FLR = Final Leak Rate (kg/hr/source) **FLR = 0.00081632**
ILR = Initial Leak Rate (kg/hr/source) **ILR = 0.00183**
Eff = (0.00183-0.000816) / 0.00183 x 100 = 55 % Conservative LDAR Control Effectiveness

AREA 02100
Product Process and Storage Tanks

Vendor: TBD

Product Process and Storage Tank Specifications

Criteria: Internal pontoon floating roof with fixed tank roof.
Floating roof to have metallic shoe seal and low profile secondary seal.
Vapor seal and sleeve all penetrations of floating roof.

HAP Weight Fraction of VOC:

Material	Pollutant	ppmw	%wt	Mass Fraction
Anhydrous Ethanol	Acetaldehyde	200	-	0.0002
Anhydrous Ethanol	Methanol	200	-	0.0002
Anhydrous Ethanol	Acrolein	20	-	0.00002
Anhydrous Ethanol	Formaldehyde	100	-	0.0001
Natural Gasoline (Denaturant)	Benzene	-	0.25	0.0025
Natural Gasoline (Denaturant)	Carbon disulfide	-	0.002	0.00002
Natural Gasoline (Denaturant)	Cumene	-	0.01	0.0001
Natural Gasoline (Denaturant)	Ethylbenzene	-	0.005	0.00005
Natural Gasoline (Denaturant)	n-Hexane	-	5	0.05
Natural Gasoline (Denaturant)	Toluene	-	0.5	0.005
Natural Gasoline (Denaturant)	Xylene	-	0.05	0.0005

ID	Source Description	Tank Capacity (gals)	Tank Dimensions				Maximum Throughput (gals/yr)	Tank Paint Color
			Diameter		Height			
			(ft)	(m)	(ft)	(m)		
T-02107	EH Product Shift Tank #1	41,000	20	6.10	20	6.10	15,000,000	White
T-02108	EH Product Shift Tank #2	41,000	20	6.10	20	6.10	15,000,000	White
T-02102	EH Ethanol Product Storage Tank #1	500,000	48.5	14.78	41	12.50	15,790,000	White
T-02112	EH Ethanol Product Storage Tank #2	500,000	48.5	14.78	41	12.50	15,790,000	White
T-02105	EH Denaturant Storage Tank	22,500	16.5	5.03	16	4.88	1,580,000	White

AREA 02100
Product Process and Storage Tanks

Product Process and Storage Tank Emissions

Basis: TANKS, version 4.09D, October 2005.
Denatured ethanol storage tanks contain a maximum 5.0% gasoline (denaturant) by volume, per ASTM fuel specifications
HAP composition is the same in all VOC emissions for source identified.

VOC Emissions:

ID	Source Description	Rim Seal Loss (lb/yr)	Withdrawal Loss (lb/yr)	Deck Fitting Loss (lb/yr)	Deck Seam Loss (lb/yr)	Emission Rate VOC, Tanks 4.09 (lb/yr)	Amount of VOC from Ethanol (lb/yr)	Amount of VOC from Denaturant (lb/yr)
T-02107	EH Product Shift Tank #1	70.44	161.95	69.08	0	301.47	301.47	-
T-02108	EH Product Shift Tank #2	70.44	161.95	69.08	0	301.47	301.47	-
T-02102	EH Ethanol Product Storage Tank #1	232.93	69.5	128.17	0	430.60	325.60	105.00
T-02112	EH Ethanol Product Storage Tank #2	232.93	69.5	128.17	0	430.60	325.60	105.00
T-02105	EH Denaturant Storage Tank	1149.64	18.06	1,366.46	0	2,534.16	-	2,534.16
Total						**3,998.30**	**1254.14**	**2744.16**

Etoh HAPs Emissions:

ID	Source Description	Acetaldehyde (lb/yr)	Acetaldehyde (ton/yr)	Methanol (lb/yr)	Methanol (ton/yr)	Acrolein (lb/yr)	Acrolein (ton/yr)	Formaldehyde (lb/yr)	Formaldehyde (ton/yr)
T-02107	EH Product Shift Tank #1	6.03E-02	3.01E-05	6.03E-02	3.01E-05	6.03E-03	3.01E-06	3.01E-02	1.51E-05
T-02108	EH Product Shift Tank #2	6.03E-02	3.01E-05	6.03E-02	3.01E-05	6.03E-03	3.01E-06	3.01E-02	1.51E-05
T-02102	EH Ethanol Product Storage Tank #1	6.51E-02	3.26E-05	6.51E-02	3.26E-05	6.51E-03	3.26E-06	3.26E-02	1.63E-05
T-02112	EH Ethanol Product Storage Tank #2	6.51E-02	3.26E-05	6.51E-02	3.26E-05	6.51E-03	3.26E-06	3.26E-02	1.63E-05
Total	**3.26E-04**	**2.51E-01**	**1.25E-04**	**2.51E-01**	**1.25E-04**	**2.51E-02**	**1.25E-05**	**1.25E-01**	**6.27E-05**

Gasoline HAPs Emissions:

ID	Source Description	Pollutant	Mass Fraction	VOC (lb/yr)	HAPs (lb/yr)	HAPs (ton/yr)
T-02102	EH Ethanol Product Storage Tank #1	Benzene	0.0025	105.00	2.63E-01	1.31E-04
		Carbon disulfide	0.00002	105.00	2.10E-03	1.05E-06
		Cumene	0.0001	105.00	1.05E-02	5.25E-06
		Ethylbenzene	0.00005	105.00	5.25E-03	2.63E-06
		n-Hexane	0.05	105.00	5.25E+00	2.63E-03
		Toluene	0.005	105.00	5.25E-01	2.63E-04
		Xylene	0.0005	105.00	5.25E-02	2.63E-05
T-02112	EH Ethanol Product Storage Tank #2	Benzene	0.0025	105.00	2.63E-01	1.31E-04
		Carbon disulfide	0.00002	105.00	2.10E-03	1.05E-06
		Cumene	0.0001	105.00	1.05E-02	5.25E-06
		Ethylbenzene	0.00005	105.00	5.25E-03	2.63E-06
		n-Hexane	0.05	105.00	5.25E+00	2.63E-03
		Toluene	0.005	105.00	5.25E-01	2.63E-04
		Xylene	0.0005	105.00	5.25E-02	2.63E-05
T-02105	EH Denaturant Storage Tank	Benzene	0.0025	2,534.16	6.34E+00	3.17E-03
		Carbon disulfide	0.00002	2,534.16	5.07E-02	2.53E-05
		Cumene	0.0001	2,534.16	2.53E-01	1.27E-04
		Ethylbenzene	0.00005	2,534.16	1.27E-01	6.34E-05
		n-Hexane	0.05	2,534.16	1.27E+02	6.34E-02
		Toluene	0.005	2,534.16	1.27E+01	6.34E-03
		Xylene	0.0005	2,534.16	1.27E+00	6.34E-04
Total					**159.63**	**7.98E-02**

AREA 02100
Product Process and Storage Tanks

Corrosion Inhibitor

Vendor recommended adding DCI-11 to the oxygenate (gasoline) so that a concentration of 6-12 mg/L is provided in the finished gasoline/oxygenate blend.

Max. Denatured Ethanol Production - Permit	31.58	MMgpy
	2.08E+08	lb/yr
Midpoint of Recommended Concentration	9	mg/L
	7.51E-05	lb/gal
Density of Product	7.84	lb/gal
Required Product	2,371.94	lb/yr
	303	gal/yr
DCI-11 HAPs Composition:		
Methanol (67-56-1)	25%	
	592.99	lb/yr
Xylene (1330-20-7)	10%	
	237.19	lb/yr
Ethylbenzene (100-41-4)	1%	
	23.72	lb/yr
Percent of Total Liquid Weight:		
Methanol (67-56-1)	0.000285%	
Xylene (1330-20-7)	0.000114%	
Ethylbenzene (100-41-4)	0.000011%	

Due to the very small amount of corrosion inhibitor added to the denatured ethanol, the tank emissions are unchanged.

EP-02100
Vapor Recovery System and Loading Losses

Loading Losses

Basis: AP-42 Section 5.2 Transportation and Marketing of Petroleum Liquids, Final Section, January 1995.
California Climate Action Registry (CCAR) General Reporting Protocol, Version 2.2, March 2007.
Tanker trucks receiving denatured ethanol previously carried natural gasoline.
All rail cars assumed dedicated to denatured ethanol transportation.
Emissions controlled by vapor recovery to flare, EP-09001. Emissions guaranteed controlled to at least 0.0835 lb/1000 gallons loaded; or approximately 98.2% destruction efficiency, rounded to 98%.

Criteria:

Annual Anhydrous Ethanol Loading Rate	30,000,000	gal/yr
Annual Gasoline (Denaturant) Loadout	1,580,000	gal/yr
Annual Ethanol (Denatured) Loadout	31,580,000	gal/yr
Receiving Schedule	3,960	hr/yr
% Loadout by Truck	50%	
% Loadout by Rail	50%	

HAP Weight Fraction of VOC:

Material	Pollutant	ppmw	%wt	Mass Fraction
Anhydrous Ethanol	Acetaldehyde	200	-	0.0002
Anhydrous Ethanol	Methanol	200	-	0.0002
Anhydrous Ethanol	Acrolein	20	-	0.00002
Anhydrous Ethanol	Formaldehyde	100	-	0.0001
Natural Gasoline (Denaturant)	Benzene	-	0.25	0.0025
Natural Gasoline (Denaturant)	Carbon disulfide	-	0.002	0.00002
Natural Gasoline (Denaturant)	Cumene	-	0.01	0.0001
Natural Gasoline (Denaturant)	Ethylbenzene	-	0.005	0.00005
Natural Gasoline (Denaturant)	n-Hexane	-	5	0.05
Natural Gasoline (Denaturant)	Toluene	-	0.5	0.005
Natural Gasoline (Denaturant)	Xylene	-	0.05	0.0005

Emission Factor Equation: $\mathbf{L_L = [12.46(SPM)/T]*X}$ Equation 5.2-1

where:
L_L = loading loss, pounds per 1000 gallons (lb/1000 gal) of liquid loaded
S = saturation factor
P = true vapor pressure of liquid loaded per square inch absolute (psia)
M = molecular weight of vapors (pounds per pound-mole, lb/lb-mole)
T = temperature on bulk liquid loaded (deg R)
X = Liquid Mole Fraction

$X = (D*V/ML)/[(D_{ethanol}*V_{ethanol}/ML_{ethanol})+(D_{denaturant}*V_{denaturant}/ML_{denaturant})]$

where:
D = Density
V = Loading rate
ML = Liquid molecular weight

EP-02100 Vapor Recovery System and Loading Losses					
		Tanker Truck	Rail Car	Unit	Notes
Saturation Factor, Submerged Loading	S				Table 5.2-1
$S_{normal\ dedicated,\ submerged\ loading}$		0.6	-		
$S_{clean\ cargo,\ submerged\ loading}$		0.5	0.5		
True Vapor Pressure	P				Average vapor pressure from Tanks 4.09
Ethanol		0.599	0.599	psia	
Denaturant		6.60	6.60	psia	
Gasoline (RVP-13)		6.60	6.60	psia	
Molecular Weight of Vapors	M				From Tanks 4.09
Ethanol		46	46	lb/lb-mole	
Denaturant		62	62	lb/lb-mole	
Gasoline (RVP-13)		62	62	lb/lb-mole	
Temperature of Bulk Liquid	T				From Tanks 4.09, average ambient
Ethanol		514.87	514.87	deg R	temperature for Dodge City, KS
Denaturant		514.87	514.87	deg R	
Gasoline (RVP-13)		514.87	514.87	deg R	
Liquid Molecular Weight	ML				
Ethanol		46	46		
Denaturant		92	92		
Gasoline (RVP-13)		92	92		
Density	D				
Ethanol		6.6	6.6	lb/gal	
Denaturant		5.7	5.7	lb/gal	
Gasoline (RVP-13)		5.7	5.7	lb/gal	
Liquid Mole Fraction					
Ethanol		0.98	0.98		
Denaturant		0.02	0.02		
Collection Efficiency		90%	90%	%	Vendor
Destruction Efficiency		98%	98%	%	Vendor
Overall Reduction Efficiency		88.2%	88.2%	%	ColEff x DisEff

Emission Factors:	Truck Loadout Uncontrolled Emission Factor (lbs VOC/Mgal)	Railcar Loadout Uncontrolled Emission Factor (lbs VOC/Mgal)
$EF_{gasoline}$	0.990	N/A
$EF_{ethanol}$	0.327	0.327
$EF_{denaturant}$	0.099	0.099
EF_{VOC}	1.416	0.426

$EF_{gasoline}$ emission factors assumes $S = S_{normal} - S_{clean\ cargo}$ and do not use the Liquid Mole Fraction (X) in the equations.

VOC Emissions:

		Uncontrolled VOC		EP-02100 Controlled VOC (Emitted through Flare, EP-09001)		EP-02100 Fugitive VOC	
Material	Loadout Method	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)
Ethanol	Tanker Truck - Shipping	5,163.33	2.58	92.94	0.05	516.33	0.26
Denaturant	Tanker Truck - Shipping	1,563.21	0.78	28.14	0.01	156.32	0.08
Ethanol	Rail Car - Shipping	5,163.33	2.58	92.94	0.05	516.33	0.26
Denaturant	Rail Car - Shipping	1,563.21	0.78	28.14	0.01	156.32	0.08
Gasoline	Tanker Truck - Receiving	1,564.20	0.78	28.16	0.01	156.42	0.08
Total		**15,017.28**	**7.51**	**270.31**	**0.14**	**1,501.73**	**0.75**

EP-02100
Vapor Recovery System and Loading Losses

EP-02100 Etoh Uncontrolled HAPs Emissions:

Material	Loadout Method	VOC (ton/yr)	Acetaldehyde (ton/yr)	Methanol (ton/yr)	Acrolein (ton/yr)	Formaldehyde (ton/yr)
Ethanol	Tanker Truck	2.58	5.16E-04	5.16E-04	5.16E-05	2.58E-04
Ethanol	Rail Car	0.78	1.56E-04	1.56E-04	1.56E-05	7.82E-05
Total			**6.73E-04**	**6.73E-04**	**6.73E-05**	**3.36E-04**

EP-02100 Etoh Controlled HAPs Emissions (Emitted through Flare, EP-09001):

Material	Loadout Method	VOC (ton/yr)	Acetaldehyde (ton/yr)	Methanol (ton/yr)	Acrolein (ton/yr)	Formaldehyde (ton/yr)
Ethanol	Tanker Truck	0.05	9.29E-06	9.29E-06	9.29E-07	4.65E-06
Ethanol	Rail Car	0.05	9.29E-06	9.29E-06	9.29E-07	4.65E-06
Total			**1.86E-05**	**1.86E-05**	**1.86E-06**	**9.29E-06**

EP-02100 Etoh Fugitive HAPs Emissions:

Material	Loadout Method	VOC (ton/yr)	Acetaldehyde (ton/yr)	Methanol (ton/yr)	Acrolein (ton/yr)	Formaldehyde (ton/yr)
Ethanol	Tanker Truck	0.26	5.16E-05	5.16E-05	5.16E-06	2.58E-05
Ethanol	Rail Car	0.26	5.16E-05	5.16E-05	5.16E-06	2.58E-05
Total			**1.03E-04**	**1.03E-04**	**1.03E-05**	**5.16E-05**

Denaturant & Gasoline HAPs Emissions:

				VOC			HAPs		
Material	Loadout Method	Pollutant	Mass Fraction	EP-02100 Uncontrolled (ton/yr)	EP-02100 Controlled (Emitted through Flare, EP-09001) (ton/yr)	EP-02100 Fugitive (ton/yr)	EP-02100 Uncontrolled (ton/yr)	EP-02100 Controlled (Emitted through Flare, EP-09001) (ton/yr)	EP-02100 Fugitive (ton/yr)
Denaturant	Tanker Truck	Benzene	0.0025	0.78	0.01	0.08	1.95E-03	3.52E-05	1.95E-04
		Carbon disulfide	0.00002	0.78	0.01	0.08	1.56E-05	2.81E-07	1.56E-06
		Cumene	0.0001	0.78	0.01	0.08	7.82E-05	1.41E-06	7.82E-06
		Ethylbenzene	0.00005	0.78	0.01	0.08	3.91E-05	7.03E-07	3.91E-06
		n-Hexane	0.05	0.78	0.01	0.08	3.91E-02	7.03E-04	3.91E-03
		Toluene	0.005	0.78	0.01	0.08	3.91E-03	7.03E-05	3.91E-04
		Xylene	0.0005	0.78	0.01	0.08	3.91E-04	7.03E-06	3.91E-05
Denaturant	Rail Car	Benzene	0.0025	0.78	0.01	0.08	1.95E-03	3.52E-05	1.95E-04
		Carbon disulfide	0.00002	0.78	0.01	0.08	1.56E-05	2.81E-07	1.56E-06
		Cumene	0.0001	0.78	0.01	0.08	7.82E-05	1.41E-06	7.82E-06
		Ethylbenzene	0.00005	0.78	0.01	0.08	3.91E-05	7.03E-07	3.91E-06
		n-Hexane	0.05	0.78	0.01	0.08	3.91E-02	7.03E-04	3.91E-03
		Toluene	0.005	0.78	0.01	0.08	3.91E-03	7.03E-05	3.91E-04
		Xylene	0.0005	0.78	0.01	0.08	3.91E-04	7.03E-06	3.91E-05
Gasoline	Tanker Truck	Benzene	0.0025	0.78	0.01	0.08	1.96E-03	3.52E-05	1.96E-04
		Carbon disulfide	0.00002	0.78	0.01	0.08	1.56E-05	2.82E-07	1.56E-06
		Cumene	0.0001	0.78	0.01	0.08	7.82E-05	1.41E-06	7.82E-06
		Ethylbenzene	0.00005	0.78	0.01	0.08	3.91E-05	7.04E-07	3.91E-06
		n-Hexane	0.05	0.78	0.01	0.08	3.91E-02	7.04E-04	3.91E-03
		Toluene	0.005	0.78	0.01	0.08	3.91E-03	7.04E-05	3.91E-04
		Xylene	0.0005	0.78	0.01	0.08	3.91E-04	7.04E-06	3.91E-05
Total							**1.36E-01**	**2.46E-03**	**1.36E-02**

AREA 02700
Fly Ash Handling

Criteria Pollutants

Basis: Bulk Fly Ash will be typically shipped offsite either by trucks or rail cars that are loaded from the elevated Fly Ash Load-Out Silo (EP-02710) or an elevated conveyor system connected to the silo. For the purposes of calculating PTE, all load-out was assumed to be by truck. The trucks will be filled using the Fly Ash Load-Out Spout (EP-02711).

Load-out of fly ash be based on a closed vent system that vents back into the ash silo or to the bulk fly ash load-out spout and all load-out activities will occur within an enclosure for control of fugitive dust.

Uncontrolled emissions represent potential-to-emit in the absence of controls.

Criteria:

Fly Ash Production Rate	6,769	lb/hr
Fly Ash Production Rate	29,646	ton/yr
Annual Operations	8,760	hr/yr
Natural Gas Heat Value	1,020	BTU/scf

Emission Factor Equation: **$PM/PM_{10}/PM_{2.5}$ Emissions (lb/hr) = (cfm) x (gr/dscf) x (60 min/hr) / (gr/lb)**

BACT Emission Factor	0.004	gr/dscf	All PM is assumed to be less than 2.5 micrometers in diameter.
Conversion Factor	7,000	gr/lb	
Conversion Factor	60	min/hr	

Source Details:

ID	Emission Source	Stack Flow Rate (cfm)	Stack Diameter (in)	Release Height (ft)	Stack Area (ft^2)	Gas Velocity (ft/s)	Gas Velocity (m/s)	Gas Exit Temperature (deg F)	Gas Exit Temperature (deg K)
EP-02710	Bulk Fly Ash Load-Out Silo	28,100	36	TBD	7.07	66.26	20.19	Ambient	Ambient
EP-02711	Bulk Fly Ash Load-Out Silo Spout	28,100	36	TBD	7.07	66.26	20.19	Ambient	Ambient

$PM/PM_{10}/PM_{2.5}$ Emissions:

ID	Emission Source	PM (lb/hr)	PM (ton/yr)	PM_{10} (lb/hr)	PM_{10} (ton/yr)	$PM_{2.5}$ (lb/hr)	$PM_{2.5}$ (ton/yr)
EP-02710	Bulk Fly Ash Load-Out Silo	0.96	4.22	0.96	4.22	0.96	4.22
EP-02711	Bulk Fly Ash Load-Out Silo Spout	0.96	4.22	0.96	4.22	0.96	4.22

EP-04001
Cooling Water Tower (CWT)

Basis: AP-42, Section 13.4 Wet Cooling Towers, Final Section, January 1995.
Circulation rate, total dissolved solids and drift losses is based on 25 MMGPY Rev 0 PFD, and Wigen Preliminary Water Balance with CWT operating at five cycles.
PM_{10} and $PM_{2.5}$ emissions estimated to be 70% and 42% (respectively) of total PM emissions based on Appendix A to Particulate Matter (PM) 2.5 Significance Thresholds and Calculation Methodology published by the South Coast Air Quality Management District.

Emission Factor Equation:

$PM/PM_{10}/PM_{2.5}$ Emissions (lb/hr) = (Circulation Rate) x (TDS / 1,000,000) x (Drift Loss) x (Water Density)

Criteria:

Drift Rate	0.0005%		
Number of Cells	3		
Cooling Tower Water Density	8.31	lb/gal	
TDS	1,575	ppm	5 cycles of concentration (includes ± 5% variance)
Circulation Rate	43,200	gpm	Includes a 20% safety margin
Circulation Rate	2,592,000	gal/hr	
Annual Operations	8,760	hr/yr	

Source Details:

ID	Emission Source	Stack Flow Rate (cfm)	Stack Diameter (in)	Release Height (ft)	Stack Area (ft^2)	Gas Velocity (ft/s)	Gas Velocity (m/s)	Gas Exit Temperature (deg F)	Gas Exit Temperature (deg K)
EP-04001	Cooling Water Tower								
EP04001A	Cell 1	1,258,000	396	44	855.30	24.51	7.47	72	295
EP04001B	Cell 2	1,258,000	396	44	855.30	24.51	7.47	73	296
EP04001C	Cell 3	1,258,000	396	44	855.30	24.51	7.47	74	296

$PM/PM_{10}/PM_{2.5}$ Emissions:

ID	Emission Source	PM (lb/hr)	PM (ton/yr)	PM_{10} (lb/hr)	PM_{10} (ton/yr)	$PM_{2.5}$ (lb/hr)	$PM_{2.5}$ (ton/yr)
EP-04001	Cooling Water Tower	0.17	0.74	0.12	0.52	0.07	0.31
Total		**0.17**	**0.74**	**0.12**	**0.52**	**0.07**	**0.31**

EP-20001
Biomass-Fired Stoker Boiler

Fuel Configuration

Basis:

AP-42 Section 1.6 Wood Residue Combustion in Boilers, Final Section, September 2003.
The biomass-fired boiler system consists of one (1) water-cooled vibrating grate (stoker) boiler.
Gaseous fuel will be supplied to the biomass-fired stoker boiler system from the wastewater treatment system to optimize the energy available from the biogas.
ABNT Cogeneration Model used to determine blended fuel rate, composition and HHV. Final engineering of the biomass-fired stoker boiler system has not been completed.
California Climate Action Registry (CCAR) General Reporting Protocol, Version 3.1, January 2009.
The fuel moisture contents can vary from 5 to 75 wt% depending of residue type and storage operations.

The typical feed rate volumes differ from the nominal WORST CASE to the nominal TYPICAL scenario due to the actual boiler design basis constant being based on the plant's steam demand requirements. For the fuel balance, a constant amount of steam is generated, which requires a constant energy demand. The energy demand is supplied by the fuel lower heating value after the fuel moisture has been evaporated. The higher heating value energy input does not remain constant because the different fuel scenarios create different blended fuel compositions.

In addition to firing biomass and biogas, the biomass-fired stoker boiler will be capable of firing on natural gas during normal operations as needed, as well as firing on a combination of natural gas, liquid fuel (i.e. EH stillage syrup) and biogas in the event of a solid fuel failure. "Start-up" emissions are based on the combustion of natural gas only, without any add-on control devices. All other firing scenarios will only be possible when the add-on control devices are operational.
Boiler limited to less than 10% natural gas annual capacity.

Criteria:

Number of Solids-Fired Boilers	1		
Total Area 20000 Heat Input - Permit	500	MMBtu/hr	Based on Maximum WORST CASE fuel blend. Includes 20% factor of safety applied to NOMINAL EH Residuals.
Annual Operations	8,760	hr/yr	

Source Details:

		Stack Flow Rate	Stack Diameter	Release Height	Stack Area	Gas Velocity		Gas Exit Temperature	
ID	Emission Source	(cfm)	(in)	(ft)	(ft^2)	(ft/s)	(m/s)	(deg F)	(deg K)
EP-20001	Biomass-Fired Stoker Boiler #1	264,000	120	160	78.54	56.02	17.07	300	422

EP-20001
Biomass-Fired Stoker Boiler

Combined Fuels Specifications:	Nominal TYPICAL Fuel Blend					
Fuel Component (Dry Basis)	EH Lignin-Rich Stillage (wt%)	EH Thin Stillage Syrup (wt%)	Corn Stover (wt%)	Biogas (wt%)	WWTP Sludge (wt%)	Blended Biomass (wt%)
Carbon	48.16	34.98	40.74	46.46	48.05	42.68
Hydrogen	6.28	6.12	5.48	9.97	6.88	6.30
Oxygen	25.04	47.39	35.34	43.49	35.31	34.89
Nitrogen	1.77	1.98	0.40	0.00	7.43	1.40
Sulfur	0.33	2.62	0.04	0.08	0.02	0.86
Ash	18.07	6.39	17.79	0.00	2.30	13.53
Chlorine	0.35	0.52	0.21	0.00	0.01	0.34
Total wt%	100.0	100.0	100.0	100.0	100.0	100.0
Moisture	54.4%	50.0%	15.0%	4.1%	80.0%	45.3%
Feed Rate (dry ton/day)	320.6	209.5	185.3	52.7	3.0	771.10
Feed Rate (wet lb/hr)	58,579	34,917	18,167	4,579	1,250	117,492

Combined Fuels Energy:	Nominal TYPICAL Fuel Blend					
HHV (Btu/dry lb)	7,880	6,250	6,920	9,631	9,225	7,331.35
HHV (MMBtu/dry ton)	15.76	12.50	13.84	19.26	18.45	14.66
Energy (MMBtu/hr)	210.53	109.11	106.86	42.30	2.31	471.10

Combined Fuels Specifications:	Maximum WORST CASE Fuel Blend					
Fuel Component (Dry Basis)	EH Lignin-Rich Stillage (wt%)	EH Thin Stillage Syrup (wt%)	Corn Stover (wt%)	Biogas (wt%)	WWTP Sludge (wt%)	Blended Biomass (wt%)
Carbon	48.16	34.98	40.74	46.46	48.05	42.95
Hydrogen	6.28	6.12	5.48	9.97	6.88	6.41
Oxygen	25.04	47.39	35.34	43.49	35.31	34.83
Nitrogen	1.77	1.98	0.40	0.00	7.43	1.54
Sulfur	0.33	2.62	0.04	0.08	0.02	0.98
Ash	18.12	6.46	17.76	0.00	2.30	12.98
Chlorine	0.30	0.45	0.24	0.00	0.01	0.31
Total wt%	100.0	100.0	100.0	100.0	100.0	100.0
Moisture	54.4%	50.0%	15.0%	4.1%	80.0%	47.8%
Feed Rate (dry ton/day)	384.7	251.4	109.3	63.2	3.6	812.23
Feed Rate (wet lb/hr)	70,291	41,900	10,718	5,495	1,250	129,655

Combined Fuels Energy:	Maximum WORST CASE Fuel Blend					
HHV (Btu/dry lb)	7,880	6,250	6,920	9,631	9,225	7,388.47
HHV (MMBtu/dry ton)	15.76	12.50	13.84	19.26	18.45	14.78
Energy (MMBtu/hr)	252.62	130.94	63.05	50.72	2.77	500.09

EP-20001
Biomass-Fired Stoker Boiler

Combined Fuels Specifications:	Solid Fuel Failure Fuel Blend [Liquid (i.e. EH Stillage Syrup) and Gaseous Fuels Only]						
Fuel Component (Dry Basis)	EH Lignin-Rich Stillage (wt%)	EH Thin Stillage Syrup (wt%)	Corn Stover (wt%)	Natural Gas (wt%)	Biogas (wt%)	WWTP Sludge (wt%)	Blended Biomass (wt%)
Carbon	48.16	34.98	40.74	64.84	46.46	48.05	45.90
Hydrogen	6.28	6.12	5.48	20.85	9.97	6.88	11.25
Oxygen	25.04	47.39	35.34	1.41	43.49	35.31	32.49
Nitrogen	1.77	1.98	0.40	12.90	0.00	7.43	5.12
Sulfur	0.33	2.62	0.04	0.00	0.08	0.02	1.45
Ash	18.07	6.39	17.79	0.00	0.00	2.30	3.51
Chlorine	0.35	0.52	0.21	0.00	0.00	0.01	0.29
Total wt%	100.0	100.0	100.0	100.0	100.0	100.0	100.00
Moisture	54.4%	50.0%	15.0%	0.001%	4.1%	80.0%	36.8%
Fee Rate (dry ton/day)	0.0	209.5	0.0	119.1	52.7	0.0	381
Feed Rate (wet lb/hr)	0	34,917	0	9,925	4,579	1,250	50,671

Combined Fuels Energy:	Solid Fuel Failure Fuel Blend [Liquid (i.e. EH Stillage Syrup) and Gaseous Fuels Only]						
HHV (Btu/dry lb)	5,550	6,250	6,920	20,160	9,631	9,225	11,062.12
HHV (MMBtu/dry ton)	11.10	12.50	13.84	40.32	19.26	18.45	22.12
Energy (MMBtu/hr)	0.00	109.11	0.00	200.09	42.30	0.00	351.50

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Process Vents Flow:

Fuel Components		12024 Digester Vent Gas (lb/hr)	16023 Propagator Vent (lb/hr)	16012 Saccharification Vent (lb/hr)	19026 Stillage Handling Vent (lb/hr)	2133 Ethanol Loadout Vent (lb/hr)	1916 + 1919 Ammonia Tank Vent (lb/hr)	Combined Process Vents (lb/hr)	Component HHV (Btu/lb)	Carbon (lb-mol/hr)
Oxygen	O_2	407	7,171	17	69	2	0.10	7,666.10	--	--
Nitrogen	N_2	1,341	26,119	61	231	12	0.30	27,764.30	--	--
Hydrogen Sulfide	H_2S	0.07	0.04	0.03	0.008	0.002	4.30E-04	0.15	7,100	--
Nitrogen Dioxide	NO_2	0.40	0.10	0.10	0.04	1.50E-04	4.60E-04	0.64		
Ammonia	NH_3	0	0	0	0	0	0.03	0.03	9,668	--
Methane	CH_4	0.003	0	0.01	0	0	1.20E-04	0.01	23,879	0.00
Ethane	C_2H_6	0	0	0	0	0	0	0.00	22,320	--
Ethanol	C_2H_5OH	0.04	0	0	0.001	3	0	3.04	13,161	1.30E-01
Acetic Acid	$C_2H_4O_2$	13	1	0.02	0	0	0	14.02	6,558	4.67E-01
Furfural	$C_5H_4O_2$	8	0.1	0.005	0.02	8.10E-04	0	8.13	--	4.23E-01
Tars / Fusel Oils	$C_{10}H_8$	0	0	0	0	0.60	0	0.63	--	--
Carbon Dioxide	CO_2	1	1,139	10	0.7	7.50E-05	0.3	1,151.00	--	26.15
Water/Inerts	H_2O/Inerts	1,101	1,272	6	121	0.03	0.02	2,500.05	--	--
	Total (lb-mol/hr)	2,872	35,702	94	422	18	1	39,108.10	--	27.17

Process Vents Energy:	12024 Digester Vent Gas	16023 Propagator Vent	16012 Saccharification Vent	19026 Stillage Handling Vent	2133 Ethanol Loadout Vent	1916 + 1919 Ammonia Tank Vent	Combined Process Vents
HHV (Btu/lb)	30.07	0.19	6.19	0.17	2,239.80	394.08	3.42
Volumetric Flow (lb-mol/hr)	2,871.51	35,702.24	94.17	421.79	17.63	0.75	39,108.10
Energy (MMBtu/hr)	0.09	0.01	0.00	0.00	0.04	0.00	0.13

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Biomass-Fired Stoker Boiler Emissions (Nominal TYPICAL Fuel Blend)

Emission Factors: Nominal TYPICAL Fuel Blend		Combined Fuels	Process Vents	Total		
Criteria Pollutants		(lb/dry ton)	(lb/hr)	(lb/hr)	(lb/MMBtu)	Notes:
NOx		10.12	0.64	325.79	0.70	Predicted NOx for similar fuel combustion for stoker from vendor proposal (approximately 11% fuel N conversion to NOx). Staged combustion to minimize thermal NOx.
SO_2		34.40	0.301	1,105.54	2.35	Predicted SOx for similar fuel combustion for stoker from vendor testing (100% fuel S conversion to SOx).
H_2SO_4 (SAM)		--		67.68	0.14	Based on 4% SO_2 conversion to SO_3 and 100% conversion SO_3 to H_2SO_4.
CO		3.23	Negligible	103.62	0.22	Note 1. Predicted CO for similar fuel combustion for stoker from vendor proposal. Modern combustion practices, staged combustion, fuel/air mixing, large firebox/residence time.
VOC		0.25	Negligible	8.01	0.017	Table 1.6-3, 70% control efficiency for use of modern stoker boiler based on performance test data from similar fuel combustion for stoker.
PM	Filterable	--		3,569.43	7.58	Table 1.6-1 Filterable PM from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
PM_{10}	Filterable	--		3,186.99	6.77	Table 1.6-1 Filterable PM_{10} from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
$PM_{2.5}$	Filterable	--		2,740.81	5.82	Table 1.6-1 Filterable $PM_{2.5}$ from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
PM	Condensible	--		8.01	0.017	Table 1.6-1 Condensible PM from wood residue combustion, bark and wet wood.
PM_{10}	Condensible	--		8.01	0.017	Table 1.6-1 Condensible PM from wood residue combustion, bark and wet wood.
$PM_{2.5}$	Condensible	--		8.01	0.017	Table 1.6-1 Condensible PM from wood residue combustion, bark and wet wood.
Lead		0.0007	Negligible	0.02	4.80E-05	Table 1.6-4
NH_3		--		6.03	0.0128	Note 2 - Predicted 25 ppmv NH_3 slip. Includes NH_3 from gaseous fuel source.
GHG Pollutants						
Natural Gas CO_2		3,130	1,195.93	101,755.94	216.00	Boiler fuel criteria engineering calculations - 100% conversion fuel carbon to CO_2.
CH_4		--		33.24	0.071	CCAR Table C.8 (0.032 kg CH_4/MMBtu). Methane is a combustible boiler fuel.
N_2O		--		4.36	0.009	CCAR Table C.8 (0.0042 kg N_2O/MMBtu).

(1) Emission factors for CO in parts per million (ppm) converted to lb/MMBtu as follows:

EF (lb/MMBtu) = (ppm) x (k) x (F) x (20.9/(20.9-%O_2))

where:

CO =	260	ppm	Vendor Proposal
%O_2 =	3	%	
k =	unit conversion, (2.59E-09 x Molecular Weight (M)) lb/dscf = 1 ppm		
k (for CO) =	7.25E-08	(lb/scf)/ppm	
F =	9939.40	dscf/MMBtu	Based on stoichiometric flow
Molecular weight of CO =	28.01		

(2) Emission factors for NH_3 in parts per million (ppm) converted to lb/MMBtu as follows:

EF (lb/MMBtu) = (ppm) x (k) x (F) x (20.9/(20.9-%O_2))

where:

NH_3 =	25	ppm	Vendor Proposal
%O_2 =	3	%	
k =	unit conversion, (2.59E-09 x Molecular Weight (M)) lb/dscf = 1 ppm		
k (for NH_3) =	4.41077E-08	(lb/scf)/ppm	
F =	9939.40	dscf/MMBtu	Based on stoichiometric flow
Molecular weight of NH_3 =	17.03		

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Emissions: **Nominal TYPICAL Fuel Blend**		Control Efficiency	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled		EP-20001 Biomass-Fired Stoker Boiler Controlled		BACT
Criteria Pollutants		(%)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/MMBtu)
NOx		45%	325.79	1,426.95	179.18	784.82	0.380
SO_2		92%	1,105.54	4,842.28	88.44	387.38	0.188
H_2SO_4 (SAM)		99%	67.68	296.43	0.68	2.96	0.001
CO		0%	103.62	453.87	103.62	453.87	0.220
VOC		70%	8.01	35.07	2.40	10.52	0.005
PM	Filterable	99.8%	3,569.43	15,634.11	7.14	31.27	0.015
PM_{10}	Filterable	99.8%	3,186.99	13,959.02	6.37	27.92	0.014
$PM_{2.5}$	Filterable	99.8%	2,740.81	12,004.76	5.48	24.01	0.012
PM	Condensible	0%	8.01	35.08	8.01	35.08	0.017
PM_{10}	Condensible	0%	8.01	35.08	8.01	35.08	0.017
$PM_{2.5}$	Condensible	0%	8.01	35.08	8.01	35.08	0.017
Lead		0%	0.02	0.10	0.02	0.10	--
NH_3		0%	--	--	6.40	28.04	--
GHG Pollutants							
CO_2		0%	101,756	445,691	101,756	445,691	--
CH_4		0%	33.24	145.59	33.24	145.59	--
N_2O		0%	4.36	19.11	4.36	19.11	--

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Biomass-Fired Stoker Boiler Emissions (Maximum WORST CASE Fuel Blend)

Emission Factors: Maximum WORST CASE Fuel Blend		Combined Fuels	Process Vents	Total		
Criteria Pollutants		(lb/dry ton)	(lb/hr)	(lb/hr)	(lb/MMBtu)	Notes:
NOx		11.13	0.64	377.38	0.76	Predicted NOx for similar fuel combustion for stoker from vendor proposal (approximately 11% fuel N conversion to NOx). Staged combustion to minimize thermal NOx.
SO_2		39.20	0.301	1326.94	2.65	Predicted SOx for similar fuel combustion for stoker from vendor testing (100% fuel S conversion to SOx).
H_2SO_4 (SAM)		--		81.23	0.16	Based on 4% SO_2 conversion to SO_3 and 100% conversion SO_3 to H_2SO_4.
CO		3.25	Negligible	110.04	0.22	Note 1. Predicted CO for similar fuel combustion for stoker from vendor proposal. Modern combustion practices, staged combustion, fuel/air mixing, large firebox/residence time.
VOC		0.25	Negligible	8.50	0.017	Table 1.6-3, 70% control efficiency for use of modern stoker boiler based on performance test data from similar fuel combustion for stoker.
PM	Filterable	--		3,635.05	7.27	Table 1.6-1 Filterable PM from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
PM_{10}	Filterable	--		3,245.58	6.49	Table 1.6-1 Filterable PM_{10} from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
$PM_{2.5}$	Filterable	--		2,791.20	5.58	Table 1.6-1 Filterable $PM_{2.5}$ from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
PM	Condensible	--		8.50	0.017	Table 1.6-1 Condensible PM from wood residue combustion, bark and wet wood.
PM_{10}	Condensible	--		8.50	0.017	Table 1.6-1 Condensible PM from wood residue combustion, bark and wet wood.
$PM_{2.5}$	Condensible	--		8.50	0.017	Table 1.6-1 Condensible PM from wood residue combustion, bark and wet wood.
Lead		0.0007	Negligible	0.02	4.80E-05	Table 1.6-4
NH_3		--		6.43	0.0129	Note 2 - Predicted 25 ppmv NH_3 slip. Includes NH_3 from gaseous fuel source.
GHG Pollutants						
CO_2		3,150	1,195.93	107,789.44	215.54	Boiler fuel criteria engineering calculations - 100% conversion fuel carbon to CO_2.
CH_4		--		35.29	0.071	CCAR Table C.8 (0.032 kg CH_4/MMBtu). Methane is a combustible boiler fuel.
N_2O		--		4.63	0.009	CCAR Table C.8 (0.0042 kg N_2O/MMBtu).

(1) Emission factors for CO in parts per million (ppm) converted to lb/MMBtu as follows:

EF (lb/MMBtu) = (ppm) x (k) x (F) x (20.9/(20.9-%O_2))

where:

CO =	260	ppm	Vendor Proposal
%O_2 =	3	%	
k =	unit conversion, (2.59E-09 x Molecular Weight (M)) lb/dscf = 1 ppm		
k (for CO) =	7.25E-08	(lb/scf)/ppm	
F =	9988.31	dscf/MMBtu	Based on stoichiometric flow
Molecular weight of CO =	28.01		

(2) Emission factors for NH_3 in parts per million (ppm) converted to lb/MMBtu as follows:

EF (lb/MMBtu) = (ppm) x (k) x (F) x (20.9/(20.9-%O_2))

where:

NH_3 =	25	ppm	Vendor Proposal
%O_2 =	3	%	
k =	unit conversion, (2.59E-09 x Molecular Weight (M)) lb/dscf = 1 ppm		
k (for NH_3) =	4.41077E-08	(lb/scf)/ppm	
F =	9988.31	dscf/MMBtu	Based on stoichiometric flow
Molecular weight of NH_3 =	17.03		

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Emissions: **Maximum WORST CASE Fuel Blend**		Control Efficiency	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled		EP-20001 Biomass-Fired Stoker Boiler Controlled		BACT
Criteria Pollutants		(%)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/MMBtu)
NOx		45%	377.38	1,652.92	207.56	909.10	0.415
SO_2		92%	1,326.94	5,811.99	106.16	464.96	0.212
H_2SO_4 (SAM)		99%	81.23	355.79	0.81	3.56	0.002
CO		0%	110.04	481.99	110.04	481.99	0.220
VOC		70%	8.50	37.24	2.55	11.17	0.005
PM	Filterable	99.8%	3,635.05	15,921.54	7.27	31.84	0.015
PM_{10}	Filterable	99.8%	3,245.58	14,215.66	6.49	28.43	0.013
$PM_{2.5}$	Filterable	99.8%	2,791.20	12,225.47	5.58	24.45	0.011
PM	Condensible	0%	8.50	37.24	8.50	37.24	0.017
PM_{10}	Condensible	0%	8.50	37.24	8.50	37.24	0.017
$PM_{2.5}$	Condensible	0%	8.50	37.24	8.50	37.24	0.017
Lead		0%	0.02	0.11	0.02	0.11	--
NH_3		0%	--	--	0.00	0.00	--
GHG Pollutants							
CO_2		0%	107,789	472,118	107,789	472,118	--
CH_4		0%	35.29	154.55	35.29	154.55	--
N_2O		0%	4.63	20.29	4.63	20.29	--

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Biomass-Fired Stoker Boiler Emissions (Solid Fuel Failure Fuel Blend)

Emission Factors: Solid Fuel Failure Fuel Blend [Liquid (i.e. EH Stillage Syrup) and Gaseous Fuels Only]		Combined Fuels (Excluding	Process Vents	Total			
Criteria Pollutants		(lb/dry ton)	(lb/hr)	(lb/hr)	(lb/MMBtu)	Notes:	
NOx		11.42	0.64	190.10	0.55	Predicted NOx for similar fuel combustion for stoker from vendor proposal (approximately 11% fuel N conversion to NOx) with use of low NOx technology. Staged combustion to minimize thermal NOx. Natural gas added into emission factor based on LNB emission rate.	
SO_2		58.00	0.301	921.78	2.62	Predicted SOx for similar fuel combustion for stoker from vendor testing (100% fuel S conversion to SOx).	
H_2SO_4 (SAM)		--		56.43	0.16	Based on 4% SO_2 conversion to SO_3 and 100% conversion SO_3 to H_2SO_4.	
CO		4.20	Negligible	66.78	0.190	Note 1. Predicted CO for similar fuel combustion for stoker from vendor proposal. Modern combustion practices, staged combustion, fuel/air mixing, large firebox/residence time.	
VOC		0.38	Negligible	5.98	0.017	Table 1.6-3, 70% control efficiency for use of modern stoker boiler based on performance test data from similar fuel combustion for stoker.	
PM	Filterable	--		690.91	1.97	Table 1.6-1	Filterable PM from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
PM_{10}	Filterable	--		616.88	1.76	Table 1.6-1	Filterable PM_{10} from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
$PM_{2.5}$	Filterable	--		530.52	1.51	Table 1.6-1	Filterable $PM_{2.5}$ from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
PM	Condensible	--		5.98	0.017	Table 1.6-1	Condensible PM from wood residue combustion, bark and wet wood.
PM_{10}	Condensible	--		5.98	0.017	Table 1.6-1	Condensible PM from wood residue combustion, bark and wet wood.
$PM_{2.5}$	Condensible	--		5.98	0.017	Table 1.6-1	Condensible PM from wood residue combustion, bark and wet wood.
Lead		0.0011	Negligible	0.02	4.80E-05	Table 1.6-4	
NH_3		--		4.00	0.0114	Note 2 - Predicted 25 ppmv NH_3 slip. Includes NH_3 from gaseous fuel source.	
GHG Pollutants							
CO_2		3,366	1,195.93	54,673.26	155.54	Boiler fuel criteria engineering calculations - 100% conversion fuel carbon to CO_2.	
CH_4		--		24.80	0.071	CCAR Table C.8 (0.032 kg CH_4/MMBtu). Methane is a combustible boiler fuel.	
N_2O		--		3.26	0.009	CCAR Table C.8 (0.0042 kg N_2O/MMBtu).	

(1) Emission factors for CO in parts per million (ppm) converted to lb/MMBtu as follows:

EF (lb/MMBtu) = (ppm) x (k) x (F) x (20.9/(20.9-%O_2))

where:

CO =	260	ppm	Vendor Proposal
%O_2 =	3	%	
k =	unit conversion, (2.59E-09 x Molecular Weight (M)) lb/dscf = 1 ppm		
k (for CO) =	7.25E-08	(lb/scf)/ppm	
F =	8838.72	dscf/MMBtu	Based on stoichiometric flow
Molecular weight of CO =	28		

(2) Emission factors for NH_3 in parts per million (ppm) converted to lb/MMBtu as follows:

EF (lb/MMBtu) = (ppm) x (k) x (F) x (20.9/(20.9-%O_2))

where:

NH_3 =	25	ppm	Vendor Proposal
%O_2 =	3	%	
k =	unit conversion, (2.59E-09 x Molecular Weight (M)) lb/dscf = 1 ppm		
k (for NH_3) =	4.41077E-08	(lb/scf)/ppm	
F =	8838.72	dscf/MMBtu	Based on stoichiometric flow
Molecular weight of NH_3 =	17.03		

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Emissions: Solid Fuel Failure Fuel Blend [Liquid (i.e. EH Stillage Syrup) and Gaseous Fuels Only]		Control Efficiency	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled		EP-20001 Biomass-Fired Stoker Boiler Controlled		BACT
Criteria Pollutants		(%)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/MMBtu)
NOx		45%	190.10	832.63	104.55	457.94	0.297
SO_2		92%	921.78	4,037.38	73.74	322.99	0.210
H_2SO_4 (SAM)		99%	56.43	247.16	0.56	2.47	0.002
CO		0%	66.78	292.52	66.78	292.52	0.190
VOC		70%	5.98	26.17	1.79	7.85	0.005
PM	Filterable	99.3%	690.91	3,026.17	4.84	21.18	0.014
PM_{10}	Filterable	99.3%	616.88	2,701.94	4.32	18.91	0.012
$PM_{2.5}$	Filterable	99.3%	530.52	2,323.66	3.71	16.27	0.011
PM	Condensible	0%	5.98	26.17	5.98	26.17	0.017
PM_{10}	Condensible	0%	5.98	26.17	5.98	26.17	0.017
$PM_{2.5}$	Condensible	0%	5.98	26.17	5.98	26.17	0.017
Lead		0%	0.02	0.07	0.02	0.07	--
NH_3		0%	--	--	5.69	24.93	--
GHG Pollutants							
CO_2		0%	54,673	239,469	54,673	239,469	--
CH_4		0%	24.80	108.63	24.80	108.63	--
N_2O		0%	3.26	14.26	3.26	14.26	--

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HAPs Emissions from Combustion in Area 20000 (Maximum WORST CASE Fuel Blend)

Basis: AP-42 Section 1.6 Wood Residue Combustion in Boilers, Final Section, September 2003.

Speciated HAP emission factors typically based on the "Average Emission Factor" for dutch oven, stoker and fluidized bed combustion boilers as provided in AP-42 unless otherwise noted.

Control of acetaldehyde, acrolein, benzene, formaldehyde, naphthalene, styrene and toluene assumed 70% reduction for modern staged combustion stoker and good combustion practices (based on performance test data from similar fuel combustion for stoker). Particulate HAPs (metals) AP-42 emission factors are for boilers with no controls or with particulate matter controls; therefore, no additional control for the baghouse was applied.

Hydrogen chloride emission factor based on the worst case assumptions that 100% of fuel chlorine becomes hydrogen chloride and control efficiency obtained from vendor specifications. A factor of safety of 1.5 has been applied to the emission factor to account for variability in the fuel chlorine concentrations.

Hydrogen fluoride emissions based on the data contained in the Speciated metal HAP emission factors obtained from the EPA's Emissions Database for Boilers and Process Heaters Containing Stack Test, CEM, & Fuel Analysis Data Reported Under ICR No. 2286.01 and ICR No. 2286.03 (Version 6).mdb dated February 2011. Values for biomass stoker or sloped grate boilers assumed similar to the proposed biomass-fired stoker boiler. Value based on the maximum concentration reported when biomass was 90% of the fuel combusted or greater. This value is slightly higher than the overall test average of all HF emissions for biomass stoker or sloped grate boilers reported.

Control options of hydrogen chloride and hydrogen fluoride are essentially the same as for other acid gases and particulate matter emissions. The proposed control for acid gases and particulate matter are BACT, which will provide a consistently achievable 99% control efficiency for hydrogen chloride and hydrogen fluoride emissions.

Total Hexachlorodibenzo-p-dioxins (HxCDDs) emission factor adjusted in accordance with North Carolina Department of Environment and Natural Resources, Division of Air Quality, June 11, 2008 Memorandum: Emission Factors for Wood-Fired Industrial Boilers for 1,2,3,6,7,8-HxCDD.

Only factors for pollutants noted as HAPs as defined by Section 112(b) of the Clean Air Act listed.

Criteria:

Annual Operations	8,760	hr/yr
Boiler Heat Input	500	MMBtu/hr

Pollutant	Emission Factor (lb/MMBtu)	Control Efficiency (%)	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled (lb/hr)	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled (ton/yr)	EP-20001 Biomass-Fired Stoker Boiler Controlled (lb/hr)	EP-20001 Biomass-Fired Stoker Boiler Controlled (ton/yr)	Controlled Emission Rate (lb/MMBtu)
Total HAPs	--	--	**138.62**	**607.17**	**4.18**	**18.30**	--
Acetaldehyde	8.30E-04	70%	0.42	1.82	0.12	0.55	2.49E-04
Acrolein	4.00E-03	70%	2.00	8.76	0.60	2.63	1.20E-03
Benzene	4.20E-03	70%	2.10	9.20	0.63	2.76	1.26E-03
Formaldehyde	4.40E-03	70%	2.20	9.64	0.66	2.89	1.32E-03
Naphthalene	9.70E-05	70%	0.05	0.21	0.01	0.06	2.91E-05
Styrene	1.90E-03	70%	0.95	4.16	0.29	1.25	5.70E-04
Toluene	9.20E-04	70%	0.46	2.02	0.14	0.60	2.76E-04
Chlorine	Assumes 100% fuel chlorine becomes hydrogen chloride for worst-case scenario.						
Hydrogen chloride	2.60E-01	99%	130.02	569.50	1.30	5.70	0.003
Hydrogen fluoride	3.00E-04	99%	0.15	0.66	0.00	0.01	3.00E-06

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Pollutant	Emission Factor (lb/MMBtu)	Control Efficiency (%)	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled (lb/hr)	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled (ton/yr)	EP-20001 Biomass-Fired Stoker Boiler Controlled (lb/hr)	EP-20001 Biomass-Fired Stoker Boiler Controlled (ton/yr)	Notes
Metals:			0.02	0.09	0.02	0.09	
Antimony	1.58E-06	0%	7.90E-04	3.46E-03	7.90E-04	3.46E-03	Note 1
Arsenic	1.58E-05	0%	7.90E-03	3.46E-02	7.90E-03	3.46E-02	Note 1
Beryllium	1.17E-05	0%	5.85E-03	2.56E-02	5.85E-03	2.56E-02	Note 1
Cadmium	2.62E-08	0%	1.31E-05	5.73E-05	1.31E-05	5.73E-05	Note 2
Chromium, total	2.62E-07	0%	1.31E-04	5.73E-04	1.31E-04	5.73E-04	Note 3
Chromium, hexavalent	5.24E-08	0%	2.62E-05	1.15E-04	2.62E-05	1.15E-04	Note 3
Cobalt	8.07E-08	0%	4.04E-05	1.77E-04	4.04E-05	1.77E-04	Note 4
Manganese	8.94E-06	0%	4.47E-03	1.96E-02	4.47E-03	1.96E-02	Note 5
Mercury	8.73E-09	0%	4.36E-06	1.91E-05	4.36E-06	1.91E-05	Note 6
Nickel	5.24E-07	0%	2.62E-04	1.15E-03	2.62E-04	1.15E-03	Note 7
Selenium	3.27E-08	0%	1.64E-05	7.17E-05	1.64E-05	7.17E-05	Note 8

(1) Speciated metal HAP emission factors obtained from the EPA's Emissions Database for Boilers and Process Heaters Containing Stack Test, CEM, & Fuel Analysis Data Reported Under ICR No. 2286.01 and ICR No. 2286.03 (Version 6).mdb dated February 2011. Values for biomass stoker or sloped grate boilers assumed similar to the proposed biomass-fired stoker boiler. Non detect values included in the average.

(2) Based on trace metal analysis of corn stover = 0.12 mg/L Cd concentrated in cake/syrup + 100% safety margin.

(3) Based on trace metal analysis of corn stover = 1.2 mg/L Cr concentrated in cake/syrup + 100% safety margin. Hexavalent chromium assumed to be approximately 20% of total chromium.

(4) Based on trace metal analysis of corn stover = 0.37mg/L Co concentrated in cake/syrup + 100% safety margin.

(5) Based on trace metal analysis of corn stover = 41 mg/L Mn concentrated in cake/syrup + 100% safety margin.

(6) Based on trace metal analysis of corn stover = 0.04 mg/L Hg concentrated in cake/syrup + 100% safety margin.

(7) Based on trace metal analysis of corn stover = 2.4 mg/L Ni concentrated in cake/syrup + 100% safety margin

(8) Based on trace metal analysis of corn stover = 1.5 mg/L Se concentrated in cake/syrup + 100% safety margin

Pollutant	Emission Factor (lb/MMBtu)	Control Efficiency (%)	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled (lb/hr)	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled (ton/yr)	EP-20001 Biomass-Fired Stoker Boiler Controlled (lb/hr)	EP-20001 Biomass-Fired Stoker Boiler Controlled (ton/yr)
Minor HAPs:			0.39	1.71	0.39	1.71
Acetophenone	3.20E-09	0%	1.60E-06	7.01E-06	1.60E-06	7.01E-06
Benzoic acid (chloramben)	4.70E-08	0%	2.35E-05	1.03E-04	2.35E-05	1.03E-04
bis(2-Ethylhexyl)phthalate (DEHP)	4.70E-08	0%	2.35E-05	1.03E-04	2.35E-05	1.03E-04
Bromomethane (methl bromide)	1.50E-05	0%	7.50E-03	3.29E-02	7.50E-03	3.29E-02
Carbon tetrachloride	4.50E-05	0%	2.25E-02	9.86E-02	2.25E-02	9.86E-02
Chlorobenzene	3.30E-05	0%	1.65E-02	7.23E-02	1.65E-02	7.23E-02
Chloroform	2.80E-05	0%	1.40E-02	6.13E-02	1.40E-02	6.13E-02
Chloromethane (methyl chloride)	2.30E-05	0%	1.15E-02	5.04E-02	1.15E-02	5.04E-02
1,2-Dichloroethane (ethylene dichloride)	2.90E-05	0%	1.45E-02	6.35E-02	1.45E-02	6.35E-02
1,2-Dichloropropane (propylene dichloride)	3.30E-05	0%	1.65E-02	7.23E-02	1.65E-02	7.23E-02
2,4-Dinitrophenol	1.80E-07	0%	9.00E-05	3.94E-04	9.00E-05	3.94E-04
Dichloromethane (methylene chloride)	2.90E-04	0%	1.45E-01	6.35E-01	1.45E-01	6.35E-01
Ethylbenzene	3.10E-05	0%	1.55E-02	6.79E-02	1.55E-02	6.79E-02
Pentachlorophenol	5.10E-08	0%	2.55E-05	1.12E-04	2.55E-05	1.12E-04
4-Nitrophenol	1.10E-07	0%	5.50E-05	2.41E-04	5.50E-05	2.41E-04
Phenol	5.10E-05	0%	2.55E-02	1.12E-01	2.55E-02	1.12E-01
Propionaldehyde	6.10E-05	0%	3.05E-02	1.34E-01	3.05E-02	1.34E-01
Tetrachloroethene	3.80E-05	0%	1.90E-02	8.32E-02	1.90E-02	8.32E-02
1,1,1-Trichloroethane (methyl chloroform)	3.10E-05	0%	1.55E-02	6.79E-02	1.55E-02	6.79E-02
Trichloroethene	3.00E-05	0%	1.50E-02	6.57E-02	1.50E-02	6.57E-02
2,4,6-Trichlorophenol	2.20E-08	0%	1.10E-05	4.82E-05	1.10E-05	4.82E-05
Vinyl chloride	1.80E-05	0%	9.00E-03	3.94E-02	9.00E-03	3.94E-02
o-Xylene	2.50E-05	0%	1.25E-02	5.48E-02	1.25E-02	5.48E-02

EP-20001
Biomass-Fired Stoker Boiler

Pollutant	Emission Factor (lb/MMBtu)	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled (lb/hr)	(ton/yr)	EP-20001 Biomass-Fired Stoker Boiler Controlled (lb/hr)	(ton/yr)
Polychlorinated biphenyls:		3.96E-06	1.74E-05	3.96E-06	1.74E-05
Decachlorobiphenyl	2.70E-10	1.35E-07	5.91E-07	1.35E-07	5.91E-07
Dichlorobiphenyl	7.40E-10	3.70E-07	1.62E-06	3.70E-07	1.62E-06
Heptachlorobiphenyl	6.60E-11	3.30E-08	1.45E-07	3.30E-08	1.45E-07
Hexachlorobiphenyl	5.50E-10	2.75E-07	1.20E-06	2.75E-07	1.20E-06
Pentachlorobiphenyl	1.20E-09	6.00E-07	2.63E-06	6.00E-07	2.63E-06
Trichlorobiphenyl	2.60E-09	1.30E-06	5.70E-06	1.30E-06	5.70E-06
Tetrachlorobiphenyl	2.50E-09	1.25E-06	5.48E-06	1.25E-06	5.48E-06

Pollutant	Emission Factor (lb/MMBtu)	EP-20001 Biomass-Fired Stoker Boiler Uncontrolled (lb/hr)	(ton/yr)	EP-20001 Biomass-Fired Stoker Boiler Controlled (lb/hr)	(ton/yr)
Polycyclic Organic Matter:		1.40E-02	6.13E-02	1.40E-02	6.13E-02
Benzo(a)anthracene	6.50E-08	3.25E-05	1.42E-04	3.25E-05	1.42E-04
Benzo(a)pyrene	2.60E-06	1.30E-03	5.70E-03	1.30E-03	5.70E-03
Benzo(b)fluoranthene	1.00E-07	5.00E-05	2.19E-04	5.00E-05	2.19E-04
Benzo(e)pyrene	2.60E-09	1.30E-06	5.70E-06	1.30E-06	5.70E-06
Benzo(g,h,i)perylene	9.30E-08	4.65E-05	2.04E-04	4.65E-05	2.04E-04
Benzo(j,k)fluoranthene	1.60E-07	8.00E-05	3.50E-04	8.00E-05	3.50E-04
Benzo(k)fluoranthene	3.60E-08	1.80E-05	7.89E-05	1.80E-05	7.89E-05
Chrysene	3.80E-08	1.90E-05	8.32E-05	1.90E-05	8.32E-05
Dibenzo(a,h)anthracene	9.10E-09	4.55E-06	1.99E-05	4.55E-06	1.99E-05
Indeno(1,2,3,c,d)pyrene	8.70E-08	4.35E-05	1.91E-04	4.35E-05	1.91E-04
Acenaphthene	9.10E-07	4.55E-04	1.99E-03	4.55E-04	1.99E-03
Fluorene	3.40E-06	1.70E-03	7.45E-03	1.70E-03	7.45E-03
Anthracene	3.00E-06	1.50E-03	6.57E-03	1.50E-03	6.57E-03
Phenanthrene	7.00E-06	3.50E-03	1.53E-02	3.50E-03	1.53E-02
Fluoranthene	1.60E-06	8.00E-04	3.50E-03	8.00E-04	3.50E-03
Pyrene	3.70E-06	1.85E-03	8.10E-03	1.85E-03	8.10E-03
Perylene	5.20E-10	2.60E-07	1.14E-06	2.60E-07	1.14E-06
Acenaphthylene	5.00E-06	2.50E-03	1.10E-02	2.50E-03	1.10E-02
2-Methylnaphthalene	1.60E-07	8.00E-05	3.50E-04	8.00E-05	3.50E-04
2-Chloronaphthalene	2.40E-09	1.20E-06	5.26E-06	1.20E-06	5.26E-06

Pollutant	Emission Factor (lb/MMBtu)	Toxic Equivalency Factor (TEF)	Toxic Equivalents (TEQ) EP-20001 Biomass-Fired Stoker Boiler Uncontrolled (lb/hr)	(ton/yr)	Toxic Equivalents (TEQ) EP-20001 Biomass-Fired Stoker Boiler Controlled (lb/hr)	(ton/yr)
Dibenzo furans:			4.19E-08	1.83E-07	4.19E-08	1.83E-07
Heptachlorodibenzo-p-furans	2.40E-10	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexachlorodibenzo-p-furans	2.80E-10	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Octachlorodibenzo-p-furans	8.80E-11	0.001	4.40E-11	1.93E-10	4.40E-11	1.93E-10
Pentachlorodibenzo-p-furans	4.20E-10	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3,7,8-Tetrachlorodibenzo-p-furans	9.00E-11	0.1	4.50E-09	1.97E-08	4.50E-09	1.97E-08
Tetrachlorodibenzo-p-furans	7.50E-10	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dioxins:						
Heptachlorodibenzo-p-dioxins	2.00E-09	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexachlorodibenzo-p-dioxins	3.19E-11	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Octachlorodibenzo-p-dioxins	6.60E-08	0.001	3.30E-08	1.45E-07	3.30E-08	1.45E-07
Pentachlorodibenzo-p-dioxins	1.50E-09	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3,7,8-Tetrachlorodibenzo-p-dioxins	8.60E-12	1.0	4.30E-09	1.88E-08	4.30E-09	1.88E-08
Tetrachlorodibenzo-p-dioxins	4.70E-10	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

EP-20001
Biomass-Fired Stoker Boiler During Start-Up and at Reduced Loads

Fuel Configuration

Basis: Emissions from biomass combustion presented for a stoker boiler during normal operations are still applicable.

In addition to firing biomass and biogas, the biomass-fired stoker boiler will be capable of firing on natural gas during normal operations as needed, as well as firing on a combination of natural gas, liquid fuel (i.e. EH stillage syrup) and biogas in the event of a solid fuel failure. "Start-up" emissions are based on the combustion of natural gas only, without any add-on control devices. All other firing scenarios will only be possible when the add-on control devices are operational.

Biomass-fired stoker boiler start-up based on the use of natural gas to heat the boiler to 400 ^{o}C (approximately 4 hours). The spray dry absorber (SDA) scrubber and SNCR are started when the appropriate operating temperature is achieved. No fuels other than natural gas will be combusted until the SDA scrubber is operational. The SNCR will be fully functional at greater than 30% load. The baghouse utilized for PM control will be in service at all times.

Gaseous fuel to be supplied to the biomass-fired stoker boiler from the wastewater treatment system will not be feed to the boiler system during SSM.

AP-42 Section 1.4 Natural Gas Combustion, Final Section, July 1998.

California Climate Action Registry (CCAR) General Reporting Protocol, Version 3.1, January 2009.

Criteria:

Number of Solids-Fired Boilers	1		
Total Area 20000 Heat Input - Permit	500	MMBtu/hr	
Maximum Heat Input Per Boiler When Fully Operational	500	MMBtu/hr	
Heat Input During Initial Start-up	61	MMBtu/hr	Natural gas used for start-up.
30% of Nominal Heat Input When Fully Operational	141	MMBtu/hr	Approximately 30% Load of Nominal Design (Baghouse and SDA Scrubber Operational, no SNCR).
50% of Nominal Heat Input When Fully Operational	236	MMBtu/hr	Approximately 50% Load of Nominal Design (Baghouse and SDA Scrubber Operational, SNCR).
75% of Nominal Heat Input When Fully Operational	353	MMBtu/hr	Approximately 75% Load of Nominal Design (Baghouse, Scrubber and SNCR Operational).
100% of Nominal Heat Input When Fully Operational	471	MMBtu/hr	100% Load of Nominal Design, Approximately 83.5% Load of Boiler Nameplate.
Annual Operations	8,760	hr/yr	

Source Details:

	Stack Flow Rate	Stack Diameter	Release Height	Stack Area	Gas Velocity		Gas Exit Temperature	
Percent Load	(cfm)	(in)	(ft)	(ft^2)	(ft/s)	(m/s)	(deg F)	(deg K)
30% Reduced Load	66,000	120	160	78.54	14.01	4.27	250	394
50% Reduced Load	110,000	120	160	78.54	23.34	7.11	280	411
75% of Nominal Design Load	165,000	120	160	78.54	35.01	10.67	300	422
100% of Nominal Design Load	220,000	120	160	78.54	46.69	14.23	300	422
120% of Nominal Design Load	264,000	120	160	78.54	56.02	17.07	300	422

EP-20001
Biomass-Fired Stoker Boiler During Start-Up and at Reduced Loads

Biomass-Fired Boiler Emissions (Maximum WORST CASE Fuel Blend)

Emission Factors: (Maximum WORST CASE Fuel Blend)		Combined Fuels	Process Vents	Total		Notes:	
Criteria Pollutants		(lb/dry ton)	(lb/hr)	(lb/hr)	(lb/MMBtu)		
NOx		11.13	0.64	377.38	0.76	Predicted NOx for similar fuel combustion for stoker from vendor proposal (approximately 11% fuel N conversion to NOx). Staged combustion to minimize thermal NOx.	
SO_2		39.20	0.301	1326.94	2.65	Predicted SOx for similar fuel combustion for stoker from vendor testing (100% fuel S conversion to SOx).	
CO		3.25	Negligible	110.04	0.22	Note 1. Predicted CO for similar fuel combustion for stoker from vendor proposal. Modern combustion practices, staged combustion, fuel/air mixing, large firebox/residence time.	
VOC		0.25	Negligible	8.50	0.017	fuel combustion for stoker.	
PM	Filterable	--		3,635.05	7.27	Table 1.6-1	Filterable PM from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
PM_{10}	Filterable	--		3,245.58	6.49	Table 1.6-1	Filterable PM_{10} from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
$PM_{2.5}$	Filterable	--		2,791.20	5.58	Table 1.6-1	Filterable $PM_{2.5}$ from wood residue combustion, bark and wet wood. Adjusted to account for increased ash content of fuel blend.
PM	Condensible	--		8.50	0.017	Table 1.6-1	Condensible PM from wood residue combustion, bark and wet wood.
PM_{10}	Condensible	--		8.50	0.017	Table 1.6-1	Condensible PM from wood residue combustion, bark and wet wood.
$PM_{2.5}$	Condensible	--		8.50	0.017	Table 1.6-1	Condensible PM from wood residue combustion, bark and wet wood.
Lead		0.0007	Negligible	0.02	4.80E-05	Table 1.6-4	
NH_3		--		6.43	0.0129	Note 2 - Predicted 25 ppmv NH_3 slip. Includes NH_3 from gaseous fuel source.	
GHG Pollutants							
CO_2		3,150	1,195.93	107,789.44	215.54	Boiler fuel criteria engineering calculations - 100% conversion fuel carbon to CO_2.	
CH_4		--		35.29	0.071	CCAR Table C.8 (0.032 kg CH_4/MMBtu). Methane is a combustible boiler fuel.	
N_2O		--		4.63	0.009	CCAR Table C.8 (0.0042 kg N_2O/MMBtu).	

EP-20001
Biomass-Fired Stoker Boiler During Start-Up and at Reduced Loads

Natural Gas Emission Factors:					
Criteria Pollutants	EF	Unit	EF	Unit	Notes:
NOx	190	lb/MMscf	0.04	lb/MMBtu	Note 1 - Maximum BACT Low-NOx Burner (LNB) = 0.04 MMBtu/hr (or 30 ppm @ 3% Oxygen)
SO_2	0.6	lb/MMscf	5.88E-04	lb/MMBtu	Table 1.4-2
CO	84	lb/MMscf	0.04	lb/MMBtu	Note 1 - Maximum BACT for CO with Good Combustion Practices = 0.04 MMBtu/hr (or 50 ppm @ 3% Oxygen)
VOC	5.5	lb/MMscf	5.39E-03	lb/MMBtu	Table 1.4-2
$PM/PM_{10}/PM_{2.5}$ Filterable	1.9	lb/MMscf	1.86E-03	lb/MMBtu	Table 1.4-2 All PM is assumed to be less than 1.0 micrometer in diameter.
$PM/PM_{10}/PM_{2.5}$ Condensible	5.7	lb/MMscf	5.59E-03	lb/MMBtu	Table 1.4-2 All PM is assumed to be less than 1.0 micrometer in diameter.
Lead	0.0005	lb/MMscf	4.90E-07	lb/MMBtu	Table 1.4-2
GHG Pollutants					
Natural Gas CO_2	119,337.25	lb/MMscf	117.00	lb/MMBtu	CCAR Table C.7 (53.06 kg CO_2/MMBtu, 100% Oxidization)
CH_4	2.2491	lb/MMscf	0.002205	lb/MMBtu	CCAR Table C.8 (0.001 kg CH_4/MMBtu)
N_2O	0.22491	lb/MMscf	0.0002205	lb/MMBtu	CCAR Table C.8 (0.0001 kg N_2O/MMBtu)

(1) Vendor emission factors for natural gas NO_x and CO emissions in parts per million (ppm) converted to lb/MMBtu as follows:

NOx EF (lb/MMBtu) = (ppm) x (k) x (F) x (20.9-(20.9-%O_2))

Where:

NO_x =	30	ppm
CO =	50	ppm
$\%O_2$ =	3	%
k =	unit conversion, (2.59E-09 x M) lb/dscf = 1 ppm	
k (for NO_2) =	1.19E-07	(lb/scf)/ppm
k (for CO) =	7.25E-08	(lb/scf)/ppm
F =	8710	dscf/MMBtu
Molecular weight of NO_x as NO_2 =	46	
Molecular weight of CO =	28	

EP-20001
Biomass-Fired Stoker Boiler During Start-Up and at Reduced Loads

Emissions: Worst Case Emissions During Start-up and at Reduced Loads		Control Efficiency	Fully Operational Biomass-Fired Stoker Boiler Controlled	**Boiler During Initial Start-up Burning Natural Gas Only**	**Boiler Operating at 30% Reduced Nominal Load (Baghouse and Scrubber Operational, no SNCR)**	**Boiler Operating at 50% Reduced Nominal Load (Baghouse and Scrubber and SNCR Operational)**	**Boiler Operating at 75% Reduced Nominal Load (Baghouse, Scrubber and SNCR Operational)**	**Boiler Operating at 100% Nominal Load (Baghouse, Scrubber and SNCR Operational)**
Criteria Pollutants		(%)	(lb/hr)	**(lb/hr)**	**(lb/hr)**	**(lb/hr)**	**(lb/hr)**	**(lb/hr)**
NOx		45%	207.56	**2.44**	**107.39**	**98.44**	**147.66**	**196.88**
SO_2		92%	106.16	**0.04**	**29.99**	**49.99**	**74.99**	**99.98**
CO		0%	110.04	**2.44**	**31.09**	**51.81**	**77.72**	**103.62**
VOC		70%	2.55	**0.33**	**2.40**	**1.20**	**1.80**	**2.40**
PM	Filterable	99.8%	7.27	**0.11**	**2.05**	**3.42**	**5.14**	**6.85**
PM_{10}	Filterable	99.8%	6.49	**0.11**	**1.83**	**3.06**	**4.59**	**6.11**
$PM_{2.5}$	Filterable	99.8%	5.58	**0.11**	**1.58**	**2.63**	**3.94**	**5.26**
PM	Condensible	0%	8.50	**0.34**	**2.40**	**4.00**	**6.01**	**8.01**
PM_{10}	Condensible	0%	8.50	**0.34**	**2.40**	**4.00**	**6.01**	**8.01**
$PM_{2.5}$	Condensible	0%	8.50	**0.34**	**2.40**	**4.00**	**6.01**	**8.01**
Lead		0%	0.02	**0.00**	**0.007**	**0.011**	**0.017**	**0.023**
NH_3		0%	--	**--**	**--**	**3.03**	**4.54**	**6.06**
GHG Pollutants								
Natural Gas CO_2		0%	107,789	**0.13**	**16,532**	**50,760**	**76,140**	**101,519**
CH_4		0%	35.29	**0.01**	**0.31**	**16.62**	**24.93**	**33.23**
N_2O		0%	4.63	**0.00**	**0.03**	**2.18**	**3.27**	**4.36**

EP-20001
Biomass-Fired FBC Boiler During Start-Up and at Reduced Loads

HAPs Emissions from Combustion in Area 20000

Basis: Emissions from biomass combustion presented for FBC boilers during normal operations are still applicable.
Biomass-fired stoker boiler start-up based on the use of natural gas to heat the boiler to 400 °C (approximately 4 hours). The spray dry absorber (SDA) scrubber and SNCR are started when the appropriate operating temperature is achieved. No fuels other than natural gas will be combusted until the SDA scrubber is operational. The SNCR will be fully functional at greater than 30% load.
The baghouse utilized for PM control will be in service at all times.
Gaseous fuel to be supplied to the biomass-fired stoker boiler from the wastewater treatment system will not be feed to the boiler system during SSM.
AP-42 Section 1.4 Natural Gas Combustion, Final Section, July 1998.

Criteria:

Number of Solids-Fired Boilers	1	
Total Area 20000 Heat Input - Permit	500	MMBtu/hr
Maximum Heat Input Per Boiler When Fully Operational	500	MMBtu/hr
Heat Input During Initial Start-up	141	MMBtu/hr
50% of Nominal Heat Input When Fully Operational	236	MMBtu/hr
75% of Nominal Heat Input When Fully Operational	353	MMBtu/hr
100% of Nominal Heat Input When Fully Operational	471	MMBtu/hr
Annual Operations	8,760	hr/yr

Pollutant	Biomass Emission Factor (lb/MMBtu)	Natural Gas Emission Factor (lb/MMBtu)	Control Efficiency (%)	Fully Operational Biomass-Fired FBC Boiler **Controlled** (lb/hr)	Boiler During Initial Start-up Burning Natural Gas Only at 30% Nominal Load for up to 10 Hours (lb/hr)	Boiler Operating at 50% Reduced Nominal Load (Baghouse and Scrubber Operational, no SNCR) (lb/hr)	Boiler Operating at 75% Reduced Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)	Boiler Operating at 100% Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)
Total HAPs	--	--	--	**4.18**	**0.26**	**1.97**	**2.95**	**3.93**
Acetaldehyde	8.30E-04	0	70%	0.12	0	5.86E-02	0.088	0.117
Acrolein	4.00E-03	0	70%	0.60	0	2.83E-01	0.424	0.565
Benzene	4.20E-03	2.06E-06	70%	0.63	2.91E-04	2.97E-01	0.445	0.593
Formaldehyde	4.40E-03	7.35E-05	70%	0.66	1.04E-02	3.11E-01	0.466	0.622
Hexane	0	1.76E-03	0%	0.01	2.49E-01	0.00E+00	0.000	0.000
Naphthalene	9.70E-05	5.95E-08	70%	0.29	8.41E-06	6.85E-03	0.010	0.014
Styrene	1.90E-03	0	70%	0.14	0	1.34E-01	0.201	0.268
Toluene	9.20E-04	3.33E-06	70%	0.00	4.71E-04	6.50E-02	0.097	0.130
Chlorine	Assumes 100% fuel chlorine becomes hydrogen chloride for worst-case scenario.							
Hydrogen chloride	2.60E-01	0	99%	1.30	0	6.12E-01	0.918	1.225
Hydrogen flouride	6.50E-08	0	99%	0.00	0	1.53E-07	2.30E-07	3.06E-07

EP-20001
Biomass-Fired FBC Boiler During Start-Up and at Reduced Loads

Pollutant	Biomass Emission Factor (lb/MMBtu)	Natural Gas Emission Factor (lb/MMBtu)	Control Efficiency (%)	Fully Operational Biomass-Fired FBC Boiler **Controlled** (lb/hr)	Boiler During Initial Start-up Burning Natural Gas Only at 30% Nominal Load for up to 10 Hours (lb/hr)	Boiler Operating at 50% Reduced Nominal Load (Baghouse and Scrubber Operational, no SNCR) (lb/hr)	Boiler Operating at 75% Reduced Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)	Boiler Operating at 100% Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)
Metals:				0.02	5.71E-04	9.19E-03	1.38E-02	1.84E-02
Antimony	1.58E-06	0	0%	7.90E-04	0	3.72E-04	5.58E-04	7.44E-04
Arsenic	1.58E-05	1.96E-07	0%	7.90E-03	2.77E-05	3.72E-03	5.58E-03	7.44E-03
Beryllium	1.17E-05	0	0%	5.85E-03	0	2.76E-03	4.13E-03	5.51E-03
Cadmium	2.62E-08	1.08E-06	0%	1.31E-05	1.52E-04	6.17E-06	9.25E-06	1.23E-05
Chromium, total	2.62E-07	0	0%	1.31E-04	0	6.17E-05	9.25E-05	1.23E-04
Chromium, hexavalent	5.24E-08	0	0%	2.62E-05	0	1.23E-05	1.85E-05	2.47E-05
Cobalt	8.07E-08	8.24E-08	0%	4.04E-05	1.16E-05	1.90E-05	2.85E-05	3.80E-05
Manganese	8.94E-06	3.73E-07	0%	4.47E-03	5.26E-05	2.11E-03	3.16E-03	4.21E-03
Mercury	8.73E-09	2.55E-07	0%	4.36E-06	3.60E-05	2.06E-06	3.08E-06	4.11E-06
Nickel	5.24E-07	2.06E-06	0%	2.62E-04	2.91E-04	1.23E-04	1.85E-04	2.47E-04
Selenium	3.27E-08	0	0%	1.64E-05	0	7.71E-06	1.16E-05	1.54E-05

EP-20001
Biomass-Fired FBC Boiler During Start-Up and at Reduced Loads

Pollutant	Biomass Emission Factor (lb/MMBtu)	Natural Gas Emission Factor (lb/MMBtu)	Control Efficiency (%)	Fully Operational Biomass-Fired FBC Boiler **Controlled** (lb/hr)	Boiler During Initial Start-up Burning Natural Gas Only at 30% Nominal Load for up to 10 Hours (lb/hr)	Boiler Operating at 50% Reduced Nominal Load (Baghouse and Scrubber Operational, no SNCR) (lb/hr)	Boiler Operating at 75% Reduced Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)	Boiler Operating at 100% Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)
Minor HAPs:				3.91E-01	0.00E+00	1.84E-01	2.76E-01	3.68E-01
Acetophenone	3.20E-09	0	0%	1.60E-06	0	7.54E-07	1.13E-06	1.51E-06
Benzoic acid (chloramben)	4.70E-08	0	0%	2.35E-05	0	1.11E-05	1.66E-05	2.21E-05
bis(2-Ethylhexyl)phthalate (DEHP)	4.70E-08	0	0%	2.35E-05	0	1.11E-05	1.66E-05	2.21E-05
Bromomethane (methl bromide)	1.50E-05	0	0%	7.50E-03	0	3.53E-03	5.30E-03	7.07E-03
Carbon tetrachloride	4.50E-05	0	0%	2.25E-02	0	1.06E-02	1.59E-02	2.12E-02
Chlorobenzene	3.30E-05	0	0%	1.65E-02	0	7.77E-03	1.17E-02	1.55E-02
Chloroform	2.80E-05	0	0%	1.40E-02	0	6.59E-03	9.89E-03	1.32E-02
Chloromethane (methyl chloride)	2.30E-05	0	0%	1.15E-02	0	5.42E-03	8.12E-03	1.08E-02
Dichlorobenzene	0	1.18E-06	0%	0	1.66E-04	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloroethane (ethylene dichloride)	2.90E-05	0	0%	1.45E-02	0	6.83E-03	1.02E-02	1.37E-02
1,2-Dichloropropane (propylene dichloride)	3.30E-05	0	0%	1.65E-02	0	7.77E-03	1.17E-02	1.55E-02
2,4-Dinitrophenol	1.80E-07	0	0%	9.00E-05	0	4.24E-05	6.36E-05	8.48E-05
Dichloromethane (methylene chloride)	2.90E-04	0	0%	1.45E-01	0	6.83E-02	1.02E-01	1.37E-01
Ethylbenzene	3.10E-05	0	0%	1.55E-02	0	7.30E-03	1.10E-02	1.46E-02
Pentachlorophenol	5.10E-08	0	0%	2.55E-05	0	1.20E-05	1.80E-05	2.40E-05
4-Nitrophenol	1.10E-07	0	0%	5.50E-05	0	2.59E-05	3.89E-05	5.18E-05
Phenol	5.10E-05	0	0%	2.55E-02	0	1.20E-02	1.80E-02	2.40E-02
Propionaldehyde	6.10E-05	0	0%	3.05E-02	0	1.44E-02	2.15E-02	2.87E-02
Tetrachloroethene	3.80E-05	0	0%	1.90E-02	0	8.95E-03	1.34E-02	1.79E-02
1,1,1-Trichloroethane (methyl chloroform)	3.10E-05	0	0%	1.55E-02	0	7.30E-03	1.10E-02	1.46E-02
Trichloroethene	3.00E-05	0	0%	1.50E-02	0	7.07E-03	1.06E-02	1.41E-02
2,4,6-Trichlorophenol	2.20E-08	0	0%	1.10E-05	0	5.18E-06	7.77E-06	1.04E-05
Vinyl chloride	1.80E-05	0	0%	9.00E-03	0	4.24E-03	6.36E-03	8.48E-03
o-Xylene	2.50E-05	0	0%	1.25E-02	0	5.89E-03	8.83E-03	1.18E-02

EP-20001
Biomass-Fired FBC Boiler During Start-Up and at Reduced Loads

Pollutant	Biomass Emission Factor (lb/MMBtu)	Fully Operational Biomass-Fired FBC Boiler **Controlled** (lb/hr)	Boiler During Initial Start-up Burning Natural Gas Only at 30% Nominal Load for up to 10 Hours (lb/hr)	Boiler Operating at 50% Reduced Nominal Load (Baghouse and Scrubber Operational, no SNCR) (lb/hr)	Boiler Operating at 75% Reduced Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)	Boiler Operating at 100% Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)
Polychlorinated biphenyls:		3.96E-06	0	1.87E-06	2.80E-06	3.73E-06
Decachlorobiphenyl	2.70E-10	1.35E-07	0	6.36E-08	9.54E-08	1.27E-07
Dichlorobiphenyl	7.40E-10	3.70E-07	0	1.74E-07	2.61E-07	3.49E-07
Heptachlorobiphenyl	6.60E-11	3.30E-08	0	1.55E-08	2.33E-08	3.11E-08
Hexachlorobiphenyl	5.50E-10	2.75E-07	0	1.30E-07	1.94E-07	2.59E-07
Pentachlorobiphenyl	1.20E-09	6.00E-07	0	2.83E-07	4.24E-07	5.65E-07
Trichlorobiphenyl	2.60E-09	1.30E-06	0	6.12E-07	9.18E-07	1.22E-06
Tetrachlorobiphenyl	2.50E-09	1.25E-06	0	5.89E-07	8.83E-07	1.18E-06

Pollutant	Biomass Emission Factor (lb/MMBtu)	Natural Gas Emission Factor (lb/MMBtu)	Fully Operational Biomass-Fired FBC Boiler **Controlled** (lb/hr)	Boiler During Initial Start-up Burning Natural Gas Only at 30% Nominal Load for up to 10 Hours (lb/hr)	Boiler Operating at 50% Reduced Nominal Load (Baghouse and Scrubber Operational, no SNCR) (lb/hr)	Boiler Operating at 75% Reduced Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)	Boiler Operating at 100% Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)
Polycyclic Organic Matter:			1.40E-02	7.18E-06	6.59E-03	9.88E-03	1.32E-02
Benzo(a)anthracene	6.50E-08	0	3.25E-05	0	1.53E-05	2.30E-05	3.06E-05
Benzo(a)pyrene	2.60E-06	0	1.30E-03	0	6.12E-04	9.18E-04	1.22E-03
Benzo(b)fluoranthene	1.00E-07	0	5.00E-05	0	2.36E-05	3.53E-05	4.71E-05
Benzo(e)pyrene	2.60E-09	0	1.30E-06	0	6.12E-07	9.18E-07	1.22E-06
Benzo(g,h,i)perylene	9.30E-08	0	4.65E-05	0	2.19E-05	3.29E-05	4.38E-05
Benzo(j,k)fluoranthene	1.60E-07	0	8.00E-05	0	3.77E-05	5.65E-05	7.54E-05
Benzo(k)fluoranthene	3.60E-08	0	1.80E-05	0	8.48E-06	1.27E-05	1.70E-05
Chrysene	3.80E-08	0	1.90E-05	0	8.95E-06	1.34E-05	1.79E-05
Dibenzo(a,h)anthracene	9.10E-09	0	4.55E-06	0	2.14E-06	3.21E-06	4.29E-06
Indeno(1,2,3,c,d)pyrene	8.70E-08	0	4.35E-05	0	2.05E-05	3.07E-05	4.10E-05
Acenaphthene	9.10E-07	0	4.55E-04	0	2.14E-04	3.21E-04	4.29E-04
Fluorene	3.40E-06	2.75E-09	1.70E-03	3.88E-07	8.01E-04	1.20E-03	1.60E-03
Anthracene	3.00E-06	0	1.50E-03	0	7.07E-04	1.06E-03	1.41E-03
Phenanthrene	7.00E-06	1.67E-08	3.50E-03	2.36E-06	1.65E-03	2.47E-03	3.30E-03
Fluoranthene	1.60E-06	2.94E-09	8.00E-04	4.16E-07	3.77E-04	5.65E-04	7.54E-04
Pyrene	3.70E-06	4.90E-09	1.85E-03	6.93E-07	8.71E-04	1.31E-03	1.74E-03
Perylene	5.20E-10	0	2.60E-07	0	1.22E-07	1.84E-07	2.45E-07
Acenaphthylene	5.00E-06	0	2.50E-03	0	1.18E-03	1.77E-03	2.36E-03
2-Methylnaphthalene	1.60E-07	2.35E-08	8.00E-05	3.32E-06	3.77E-05	5.65E-05	7.54E-05
2-Chloronaphthalene	2.40E-09	0	1.20E-06	0	5.65E-07	8.48E-07	1.13E-06

EP-20001
Biomass-Fired FBC Boiler During Start-Up and at Reduced Loads

Pollutant	Biomass Emission Factor (lb/MMBtu)	Toxic Equivalency Factor (TEF)	TEQ Fully Operational Biomass-Fired FBC Boiler **Controlled** (lb/hr)	TEQ Boiler During Initial Start-up Burning Natural Gas Only at 30% Nominal Load for up to 10 Hours (lb/hr)	TEQ Boiler Operating at 50% Reduced Nominal Load (Baghouse and Scrubber Operational, no SNCR) (lb/hr)	TEQ Boiler Operating at 75% Reduced Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)	TEQ Boiler Operating at 100% Nominal Load (Baghouse, Scrubber and SNCR Operational) (lb/hr)
Dibenzo furans:			4.19E-08	0	1.97E-08	2.96E-08	3.94E-08
Heptachlorodibenzo-p-furans	2.40E-10	0	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00
Hexachlorodibenzo-p-furans	2.80E-10	0	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00
Octachlorodibenzo-p-furans	8.80E-11	0.001	4.40E-11	0	2.07E-11	3.11E-11	4.14E-11
Pentachlorodibenzo-p-furans	4.20E-10	0	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00
2,3,7,8-Tetrachlorodibenzo-p-furans	9.00E-11	0.1	4.50E-09	0	2.12E-09	3.18E-09	4.24E-09
Tetrachlorodibenzo-p-furans	7.50E-10	0	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00
Dioxins:							
Heptachlorodibenzo-p-dioxins	2.00E-09	0	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00
Hexachlorodibenzo-p-dioxins	3.19E-11	0	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00
Octachlorodibenzo-p-dioxins	6.60E-08	0.001	3.30E-08	0	1.55E-08	2.33E-08	3.11E-08
Pentachlorodibenzo-p-dioxins	1.50E-09	0	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00
2,3,7,8-Tetrachlorodibenzo-p-dioxins	8.60E-12	1.0	4.30E-09	0	2.03E-09	3.04E-09	4.05E-09
Tetrachlorodibenzo-p-dioxins	4.70E-10	0	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00

EP-06001
Firewater Pump Engine (Emergency)

Basis: AP-42 Section 3.3 Gasoline and Diesel Industrial Engines, Final Section, October 1996.

New Source Performance Standard (NSPS) Subpart IIII (Tier 3 standards from 40 CFR 89.112 Table 1, 450<kW<560). For emergency engines with maximum engine power greater than 50 horsepower (hp) the manufacturer must certify, pursuant to 40 CFR 60.4202(a)(2), that the engine meets the standards for new non-road compression ignition engines for the same model year and maximum power listed in 40 CFR 89.112. It is assumed that the model to be chosen for this facility will be a 2010 or newer model and will meet the Tier 3 standards.
California Climate Action Registry (CCAR) General Reporting Protocol, Version 3.1, January 2009.

Emergency firewater pump engine assumed to be a 460 Hp diesel engine. This size engine falls into the NSPS emission standards 450<kW<560 range.
Equipment for emergency purposes only.
Ultra low sulfur diesel (ULSD) with no more than 15 ppm will be combusted in the engine.
The firewater pump will be limited to operational testing of 100 hr/yr to comply with the proposed rule, 40 CFR Part 60 Subpart IIII – Standards of Performance Compression Ignition Internal Combustion Engines. This rule does not regulate hours of operations during an emergency.
Fuel consumption GHG BACT limit includes a 5% variability to allow for selection of similar engine with lowest overall EPA Tier 3 emissions.

Criteria:

Normal Annual Operations	100	hrs/yr
Maximum Emergency Operations	500	hrs/yr
Weekly Operations	115.38	min/wk
Brake Specific Fuel Consumption	7,000	Btu/Hp-hr
Diesel Heating Value	19,300	Btu/lb
Density of Diesel	7.1	lb/gal
Fuel Consumption	21.32	gal/hr
Unit Size Rating	460	Hp
Unit Size Rating	343.02	kW
Unit Size Rating	3,220,000	Btu/hr

Source Details:

		Stack Flow Rate	Stack Diameter	Release Height	Stack Area	Gas Velocity		Gas Exit Temperature	
ID	Emission Source	(cfm)	(in)	(ft)	(ft^2)	(ft/s)	(m/s)	(deg F)	(deg K)
EP-06001	Firewater Pump	1,750	6	60	0.20	148.54	45.27	770	683

EP-06001 Firewater Pump Engine (Emergency)

Emission Factors:			
Criteria Pollutants	EF	Unit	Notes:
NOx	2.57	g/Hp-hr	EPA Tier 3 Standard
SO_2	0.93	g/Hp-hr	Table 3.3-1
CO	0.67	g/Hp-hr	EPA Tier 3 Standard
VOC	0.09	g/Hp-hr	EPA Tier 3 Standard
$PM/PM_{10}/PM_{2.5}$	0.08	g/Hp-hr	EPA Tier 3 Standard
GHG Pollutants			
Diesel CO_2	22.38	lb/gal	CCAR Table C.7 (10.15 kg CO_2/gallon, 100% Oxidization)
CH_4	0.0033	lb/gal	CCAR Table C.9 (0.0015 kg CH_4/gallon)
N_2O	0.0002	lb/gal	CCAR Table C.9 (0.0001 kg N_2O/gallon)

Emissions:	Normal Operations		Emergency
Criteria Pollutants	(lb/hr)	(ton/yr)	(ton/yr)
NOx	2.61	0.13	0.65
SO_2	0.94	0.05	0.24
CO	0.68	0.03	0.17
VOC	0.09	0.00	0.02
$PM/PM_{10}/PM_{2.5}$	0.08	0.00	0.02
GHG Pollutants			
Diesel CO_2	477.05	23.85	119.26
CH_4	7.05E-02	3.52E-03	1.76E-02
N_2O	4.70E-03	2.35E-04	1.17E-03

EP-06001
Firewater Pump Engine (Emergency)

HAPs from Diesel Combustion

Basis: AP-42 Section 3.3 Gasoline and Diesel Industrial Engines, Final Section, October 1996.
HAPs emission from diesel combustion in the Firewater Pump.
Only factors for pollutants noted as HAPs as defined by Section 112(b) of the Clean Air Act listed.
AP-42 factors marked as "less than" are omitted as emissions from such pollutants are negligible.

Criteria:

Annual Operations	100	hrs/yr
Weekly Operations	115.38	min/wk
Unit Size Rating	460	Hp

Pollutant	Emission Factor [1] (lb/hp-hr)	Emissions (lb/hr)	Emissions (ton/yr)
Benzene	6.53E-06	3.00E-03	1.50E-04
Toluene	2.86E-06	1.32E-03	6.58E-05
Xylenes	2.00E-06	9.18E-04	4.59E-05
Propylene	1.81E-05	8.31E-03	4.15E-04
Formaldehyde	8.26E-06	3.80E-03	1.90E-04
Acetaldehyde	5.37E-06	2.47E-03	1.23E-04
Naphthalene	5.94E-07	2.73E-04	1.37E-05
Total			**1.00E-03**

(1) Table 3.3-2. Emission factor converted from lb/MMBtu to lb/hp-hr using a conversion factor of 7,000 Btu/hp-hr.

EP-09001
Flare

Flare Configuration

Basis:
AP-42 Section 1.4 Natural Gas Combustion, Final Section, July 1998.
AP-42 Section 13.5 Industrial Flares, Final Section, September 1991.
California Climate Action Registry (CCAR) General Reporting Protocol, Version 3.1, January 2009.
Pilot heat input based on typical size.
Flare will be equipped with an electric igniter.
Flare will not operate more than 3960 hours per year.
HAP emissions from flaring are presented with the product loadout emissions, EP-02100.
Heating values obtained from Fuel Flue Gases, American Gas Association, 1941. Gasoline heating values assumed equivalent to Xylene.

Total Flared VOC Emission Calculations from Denatured Ethanol Loadout:

Loadout Type/Material	Product Code	Emissions From Loading Losses (tons/yr)
50% Truck / 50% Rail Loadout		
Truck Loadout - Receiving		
Gasoline	GA	0.704
Truck Loadout - Shipping		
Ethanol	ET	2.323
Denaturant	DE	0.703
Rail Loadout - Shipping		
Ethanol	ET	2.323
Denaturant	DE	0.703

Gaseous Fuel Specifications:

Fuel Component		Molecular Weight	Combined Process Vents Flow (lb/hr)	Biogas Flow (lb/hr)	Product Loadout Vapors (lb/hr)	Flare Flow (lb-mol/hr)	Flare Flow (mole fraction)	Component HHV (Btu/scf)	Component LHV (Btu/scf)
Oxygen	O_2	32.00	7,666.10	-	-	239.57	1.49E-01	0	0
Nitrogen	N_2	28.01	27,764.30	-	-	991.11	6.15E-01	0	0
Hydrogen Sulfide	H_2S	34.08	0.15	4.80	-	0.15	9.01E-05	647	596
Nitrogen Dioxide	NO_2	46.01	0.64	-	-	0.014	8.64E-06	0	0
Ammonia	NH_3	17.03	0.030	-	-	0.002	1.09E-06	441	365
Methane	CH_4	16.04	0.013	2,119.20	-	132.10	8.19E-02	1,013	913
Ethane	C_2H_6	30.07	-	-	-	-	-	1,792	1,641
Ethanol	C_2H_5OH	46.07	3.04	-	2.35	0.12	7.25E-05	1,600	1,451
Gasoline & Denaturant	C_8H_{18}	92.00	-	-	1.07	0.012	7.19E-06	5,230	4,980
Acetic Acid	$C_2H_4O_2$	60.05	14.02	-	-	0.23	1.45E-04	1,050	975
Furfural	$C_5H_4O_2$	96.09	8.13	-	-	0.085	5.25E-05	2,650	2,605
Tars / Fusel Oils	$C_{10}H_8$	128.17	0.63	-	-	0.005	3.03E-06	5,854	5,654
Carbon Dioxide	CO_2	44.01	1,151.00	3,138.00	-	97.46	6.05E-02	0	0
Water/Inerts	H_2O/Inerts	18.02	2,500.05	224.40	-	151.23	9.38E-02	0	0
	Total		39,108.10	5,486.40	3.41	1,612.08	1.00		
	Gas HHV (Btu/scf)						83.53		
	Gas LHV (Btu/scf)						75.30		

Energy Usage:

Gas Volumetric Flow (lb-mol/hr)	1,612.08
Gas Volumetric Flow (MMscf/hr)	0.6118
Energy (MMBtu/hr)	51.10

EP-09001 Flare

Fuel Component		Combustion Reaction	Combustion Stoichiometric Calculations	
			CO_2	SO_2
Hydrogen Sulfide	H_2S	$2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$	-	1
Methane	CH_4	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$	1	-
Ethanol	C_2H_5OH	$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$	2	-
Gasoline & Denaturant	C_8H_{18}	$C_8H_{18} + 12.5O_2 \rightarrow 8CO_2 + 9H_2O$	8	-
Acetic Acid	$C_2H_4O_2$	$C_2H_4O_3 + 2O_2 \rightarrow 2CO_2 + 2H_2O$	2	-
Furfural	$C_5H_4O_2$	$C_5H_4O_2 + 5O_2 \rightarrow 5CO_2 + 2H_2O$	5	
Tars / Fusel Oils	$C_{10}H_8$	$C_{10}H_8 + 12O_2 \rightarrow 10CO_2 + 4H_2O$	10	
Carbon Dioxide	CO_2	N/A	1	

Combustion Exhaust	Value	Units	Notes/Equations:
Flare SO_2	15.21	lb/MMscf	[Gas Flowlb-mol/hr * [(S (Component * Component Ratio to SO_2) * 100%) * SO_2 MW]
Assumes 100% Conversion H_2S to SO_2	0.18	lb/MMBtu	Gas $Flow_{MMscf/hr}$ [OR] Gas $Flow_{MMBtu/hr}$
Flare CO_2	16,605.32	lb/MMscf	[Gas Flowlb-mol/hr * [(C (Component * Component Ratio to CO_2)) + (CO_2 Component)] * CO_2 MW]
Assumes 100% Conversion C to CO_2	198.80	lb/MMBtu	Gas $Flow_{MMscf/hr}$ [OR] Gas $Flow_{MMBtu/hr}$

Natural Gas Pilot Emission Factors:			
Criteria Pollutants	EF	Unit	Notes:
NOx	100	lb/MMscf	Table 1.4-1 Small Boilers, Uncontrolled
SO_2	0.6	lb/MMscf	Table 1.4-2
CO	84	lb/MMscf	Table 1.4-1 Small Boilers, Uncontrolled
VOC	5.5	lb/MMscf	Table 1.4-2
$PM/PM_{10}/PM_{2.5}$	7.6	lb/MMscf	Table 1.4-2 All PM is assumed to be less than 1.0 micrometer in diameter.
Lead	0.0005	lb/MMscf	Table 1.4-2
GHG Pollutants			
Natural Gas CO_2	119,337.25	lb/MMscf	CCAR Table C.7 (53.06 kg CO_2/MMBtu, 100% Oxidization)
CH_4	11.25	lb/MMscf	CCAR Table C.8 (0.005 kg CH_4/MMBtu)
N_2O	0.22	lb/MMscf	CCAR Table C.8 (0.0001 kg N_2O/MMBtu)

Flaring Emission Factors:			
Criteria Pollutants	EF	Unit	Notes:
NOx	0.068	lb/MMBtu	Table 13.5-1 Thermal NOx emissions from combustion.
SO_2	0.1821	lb/MMBtu	Boiler Fuel Criteria Engineering Calculations. Based on 100% conversion fuel sulfur to SO_2.
CO	0.37	lb/MMBtu	Table 13.5-1 Product of incomplete combustion.
VOC	0.14	lb/hr	From Controlled Product Loadout (EP-02100)
GHG Pollutants			
Flaring CO_2	198.80	lb/MMBtu	Boiler Fuel Criteria Engineering Calculations.

Criteria:

Flare Size	51.10	MMBtu/hr
Heating Value	83.53	Btu/scf
Pilot Fuel Gas	100	scf/hr
Flare Annual Operations	3,960	hr/yr
Pilot Annual Operations	8,760	hr/yr

Emissions:	Pilot Emissions		Flaring Emissions		Total Emissions	
Criteria Pollutants	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)
NOx	1.00E-02	4.38E-02	3.47	6.88	3.48	6.92
SO_2	6.00E-05	2.63E-04	9.31	18.43	9.31	18.43
CO	8.40E-03	3.68E-02	18.91	37.44	18.92	37.47
VOC	5.50E-04	2.41E-03	0.14	0.27	1.36E-01	2.70E-01
$PM/PM_{10}/PM_{2.5}$	7.60E-04	3.33E-03	0	0	7.60E-04	3.33E-03
Lead	5.00E-08	2.19E-07	0	0	5.00E-08	2.19E-07
GHG Pollutants						
CO_2	11.93	52.27	10,158.34	20,113.51	10,170.27	20,165.78
CH_4	1.12E-03	4.93E-03	0	0	1.12E-03	4.93E-03
N_2O	2.25E-05	9.85E-05	0	0	2.25E-05	9.85E-05

EP-09001
Flare

HAPs from Natural Gas Combustion

Basis: AP-42 Section 1.4 Natural Gas Combustion, Final Section, July 1998.
HAPs emission from Natural Gas Combustion in the Flare and Pilot.
Only factors for pollutants noted as HAPs as defined by Section 112(b) of the Clean Air Act listed.
AP-42 factors marked as "less than" are omitted as emissions from such pollutants are negligible.

Criteria:

Pilot Fuel Gas	100	scf/hr
Annual Operations	8,760	hr/yr

Pollutant	Emission Factor [1] (lb/10^6 scf)	Emissions (lb/hr)	(lb/yr)	(ton/yr)
2-Methylnaphthalene	0.000024	2.40E-09	2.10E-05	1.05E-08
Benzene	0.0021	2.10E-07	1.84E-03	9.20E-07
Dichlorobenzene	0.0012	1.20E-07	1.05E-03	5.26E-07
Fluoranthene	0.000003	3.00E-10	2.63E-06	1.31E-09
Fluorene	0.0000028	2.80E-10	2.45E-06	1.23E-09
Formaldehyde	0.075	7.50E-06	6.57E-02	3.29E-05
Hexane	1.8	1.80E-04	1.58E+00	7.88E-04
Naphthalene	0.00061	6.10E-08	5.34E-04	2.67E-07
Phenanathrene	0.000017	1.70E-09	1.49E-05	7.45E-09
Pyrene	0.000005	5.00E-10	4.38E-06	2.19E-09
Toluene	0.0034	3.40E-07	2.98E-03	1.49E-06
Arsenic	0.0002	2.00E-08	1.75E-04	8.76E-08
Cadmium	0.0011	1.10E-07	9.64E-04	4.82E-07
Chromium	0.0014	1.40E-07	1.23E-03	6.13E-07
Cobalt	0.000084	8.40E-09	7.36E-05	3.68E-08
Manganese	0.00038	3.80E-08	3.33E-04	1.66E-07
Mercury	0.00026	2.60E-08	2.28E-04	1.14E-07
Nickel	0.0021	2.10E-07	1.84E-03	9.20E-07
Total		**1.89E-04**	**1.65E+00**	**8.27E-04**

(1) Tables 1.4-3 and Table 1.4-4

AREA 11000
Biomass Grinding, Handling and Storage Baghouse Emissions

Biomass Grinding, Handling and Storage Baghouse Emissions

Basis: AP-42 Section 9.9.1, Grain Elevators and Processes, Final Section, April 2003.
Emission factors for grinding operations assumed equivalent to grain cleaning.
Emission factors for grain shipping used as a appropriate estimate for emissions from grinded biomass shipping.
AP-42 Section 9.9.1 states that, recent research on dust emissions from grain handling operations have indicated that the fraction of dust particles equal to or less than 10 micrometers in aerodynamic diameter (PM_{10}) averages approximately 25 percent of total PM, and the fraction of dust particles less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$) averages about 17 percent of PM_{10}. Controlled emissions from the baghouses assumed all PM was less than 10 micrometers.

$PM_{2.5}$ Emission Factor (lb/ton) = [(Wt. % < $PM_{2.5}$) x PM Emission Factor]

The ground biomass grinding, transfer and handling system is a completely closed system designed with high velocity pickup of grains; therefore capture efficiency is assumed 100%.
Uncontrolled emissions represent potential-to-emit in the absence of controls.
Straight grain delivery trucks are not typically used in bulk grain transfer operations; however, these trucks are assumed to most similar to the truck type that will be used for biomass delivery.
Acid wash solids from biomass cleaning will be shipped offsite exclusively by trucks via roll-off dumpsters. Acid wash solids shipped at 10% to 25% moisture (by weight), therefore, fugitive emissions are considered

Criteria:

Crop Residues or Energy Crops Grinding Design Rate	3,801,600	wet lb/day
Crop Residues or Energy Crops Grinding Capacity	79.20	wet ton/hr
Maximum Crop Residues or Energy Crops to Enzymatic Hydrolysis Process - Permit	54.71	wet ton/hr
Maximum Raw Crop Residues or Energy Crops to Biomass-Fired Boilers - Permit	24.46	wet ton/hr
Maximum Crop Residues or Energy Crops Feed Rate	1,615	dry ton/day
Maximum Hours of Operations	8,760	hr/yr
% Loadout by Straight Truck	100%	

Emission Factor Equation: **PM/PM_{10} Emissions (lb/hr) = (cfm) x (gr/dscf) x (60 min/hr) / (gr/lb)**

BACT Emission Factor	0.004	gr/dscf	All PM is assumed to be less than 10 micrometers in diameter.
Conversion Factor	7,000	gr/lb	
Conversion Factor	60	min/hr	
$PM_{2.5}$ Percent	17%		

AREA 11000
Biomass Grinding, Handling and Storage Baghouse Emissions

Source Details:

ID	Emission Source	Stack Flow Rate (cfm)	Stack Diameter (in)	Release Height (ft)	Stack Area (ft^2)	Gas Velocity (ft/s)	Gas Velocity (m/s)	Gas Exit Temperature (deg F)	Gas Exit Temperature (deg K)
EP-11120	Floor Sweep System DC	7,800	24	TBD	3.14	41.38	12.61	Ambient	Ambient
EP-11110	Bale Grinder DC	143,900	84	TBD	38.48	62.32	18.99	Ambient	Ambient
EP-11170	Classifier Cyclone # 1 DC	21,600	36	TBD	7.07	50.93	15.52	Ambient	Ambient
EP-11270	Classifier Cyclone # 2 DC	21,600	36	TBD	7.07	50.93	15.52	Ambient	Ambient
EP-11711	Boiler Feed System DC	21,600	36	TBD	7.07	50.93	15.52	Ambient	Ambient

$PM/PM_{10}/PM_{2.5}$ Emissions:

ID	Emission Source	System Design Feed Rate (wet ton/hr)	PM (lb/hr)	PM (ton/yr)	PM_{10} (lb/hr)	PM_{10} (ton/yr)	$PM_{2.5}$ (lb/hr)	$PM_{2.5}$ (ton/yr)
EP-11120	Floor Sweep System DC	1.14	0.27	1.17	0.27	1.17	0.05	0.20
EP-11110	Bale Grinder DC	79.2	4.93	21.61	4.93	21.61	0.84	3.67
EP-11170	Classifier Cyclone # 1 DC	27.4	0.74	3.24	0.74	3.24	0.13	0.55
EP-11270	Classifier Cyclone # 2 DC	27.4	0.74	3.24	0.74	3.24	0.13	0.55
EP-11711	Boiler Feed System DC	24.5	0.74	3.24	0.74	3.24	0.13	0.55
Total			**7.42**	**32.51**	**7.42**	**32.51**	**1.26**	**5.53**

Combined Biomass Grinding, Handling and Storage Fugitive Emissions

PM Emissions:

ID	Emission Source	Uncontrolled Emissions (lb/hr)	Uncontrolled Emissions (ton/yr)	Fugitive Emissions (lb/hr)	Fugitive Emissions (ton/yr)
EP-11110FUG	Crop Receiving, Grinding and Conveying	79.88	349.57	0.07	0.16
Total		**79.88**	**349.57**	**0.07**	**0.16**

PM_{10} Emissions:

ID	Emission Source	Uncontrolled Emissions (lb/hr)	Uncontrolled Emissions (ton/yr)	Fugitive Emissions (lb/hr)	Fugitive Emissions (ton/yr)
EP-11110FUG	Crop Receiving, Grinding and Conveying	21.66	94.74	0.034	0.075
Total		**21.66**	**94.74**	**0.034**	**0.075**

$PM_{2.5}$ Emissions:

ID	Emission Source	Uncontrolled Emissions (lb/hr)	Uncontrolled Emissions (ton/yr)	Fugitive Emissions (lb/hr)	Fugitive Emissions (ton/yr)
EP-11110FUG	Crop Receiving, Grinding and Conveying	3.63	15.89	0.005	0.011
Total		**3.63**	**15.89**	**0.005**	**0.011**

AREA 11000
Biomass Grinding, Handling and Storage Baghouse Emissions

Crop Residues and Energy Crops Receiving, Grinding and Conveying Emissions

Basis: AP-42 Section 9.9.1, Grain Elevators and Processes, Final Section, April 2003.
AP-42 Section 13.2.1, Aggregate Handling and Storage Piles, November 2006.
AP-42 Section 9.9.1 states that, recent research on dust emissions from grain handling operations have indicated that the fraction of dust particles equal to or less than 10 micrometers in aerodynamic diameter (PM_{10}) averages approximately 25 percent of total PM, and the fraction of dust particles less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$) averages about 17 percent of PM_{10}.
The ground crop residues and energy crops transfer and handling system is a closed system designed with high velocity pickup of grains; therefore capture efficiency is assumed 100%.
Crop residues will be received exclusively by trucks that will unload (dump) the material uncontrolled into the grinding lines. The particulate emissions generated from the dumping of material from the trucks to the grinding lines was assumed equivalent to the particulate emissions generated by the drop operation for aggregate handling and storage piles. The bound biomass bales will typically not be a source of suspended $PM/PM_{10}/PM_{2.5}$ emissions until grinded; however, for the purposes of the PTE calculations, worst-case fugitive emissions have been estimated using AP-42 Section 13.2.1.
Crop residues bales are handled in an open structure with roof.
Uncontrolled emissions represent potential-to-emit in the absence of controls.

Criteria:

Crop Residues or Energy Crops Grinding Capacity	79.2	wet ton/hr
Maximum Crop Residues or Energy Crops Onsite Delivery Rate - Permit	158	wet ton/hr
Crop Residues or Energy Crops Annual Usage	693,500	wet ton/yr
% Loadout by Straight Truck	100%	

Emission Factor Equation: **E=k(0.0032)*[((U/5)^1.3)/((M/2)^1.4)]** Equation 13.2.4-1

where:
E = particulate emission factor (pounds per ton, lb/ton)
k = particle size multiplier (dimensionless)
U = mean wind speed (miles per hour, mph)
M = material moisture content

		PM_{30}	PM_{10}	$PM_{2.5}$	Unit	Notes
Particle Size Multipliers	k	0.74	0.35	0.053		AP-42 13.2.4
Mean Wind Speed	U	12.3	12.3	12.3	mph	Dodge City, Kansas Met Station Data
Material Moisture Content	M	15	15	15	%	Engineering Estimate

Emission Factors:	PM_{30}	PM_{10}	$PM_{2.5}$	Unit	Notes
Emission Factor for Headhouse and Grain Handling	6.10E-02	3.40E-02	5.80E-03	lb/ton	Table 9.9.1-1
Emission Factor for Grain Cleaning w/Cyclone	7.50E-02	1.90E-02	3.20E-03	lb/ton	Table 9.9.1-1
Emission Factor for Grain Cleaning (Uncontrolled Emission Factor Back-Calculated Using a 85.0% Control Efficiency for Cyclones	5.00E-01	1.27E-01	2.10E-02	lb/ton	Table 9.9.1-1
Emission Factor for Grain Milling (Hammermilling)	6.70E-02	1.68E-02	2.85E-03	lb/ton	Table 9.9.1-2
Emission Factor for Grain Milling (Uncontrolled Emission Factor Back-Calculated Using a 85.0% Control Efficiency for Cyclones	4.47E-01	1.12E-01	1.90E-02	lb/ton	Table 9.9.1-1
Emission Factor for Crop Residues Receiving Operations (Drop Operations)	4.54E-04	2.15E-04	3.26E-05	lb/ton	Equation 13.2.4-1

AREA 11000
Biomass Grinding, Handling and Storage Baghouse Emissions

PM Emissions:

		Throughput		Emission Factor	Uncontrolled PM		Capture Efficiency	Fugitive Emissions	
ID	Emission Source	(wet ton/hr)	(wet ton/yr)	(lb/ton)	(lb/hr)	(ton/yr)	(%)	(lb/hr)	(ton/yr)
EP-11110FUG	Headhouse and Crop Residues/Energy Crops Handling	79.2	693,500	6.10E-02	4.83	21.15	100%	0	0
EP-11110FUG	Crop Residues Cleaning (Uncontrolled)	79.2	693,500	5.00E-01	39.60	173.38	100%	0	0
EP-11110FUG	Crop Residues Grinding (Uncontrolled)	79.2	693,500	4.47E-01	35.38	154.88	100%	0	0
Subtotal					**79.81**	**349.41**		**0**	**0**
EP-11110FUG	Crop Residues Receiving via Truck	158	693,500	4.54E-04	0.072	0.16	0%	0.07	0.16
Subtotal					**0.07**	**0.16**		**0.07**	**0.16**
Total					**79.88**	**349.57**		**0.07**	**0.16**

PM_{10} Emissions:

		Throughput		Emission Factor	Uncontrolled PM_{10}		Capture Efficiency	Fugitive Emissions	
ID	Emission Source	(wet ton/hr)	(wet ton/yr)	(lb/ton)	(lb/hr)	(ton/yr)	(%)	(lb/hr)	(ton/yr)
EP-11110FUG	Headhouse and Crop Residues/Energy Crops Handling	79.2	693,500	3.40E-02	2.69	11.79	100%	0	0
EP-11110FUG	Crop Residues Cleaning (Uncontrolled)	79.2	693,500	1.27E-01	10.06	44.04	100%	0	0
EP-11110FUG	Crop Residues Grinding (Uncontrolled)	79.2	693,500	1.12E-01	8.87	38.84	100%	0	0
Subtotal					**21.62**	**94.66**		**0**	**0**
EP-11110FUG	Crop Residues Receiving via Truck	158	693,500	2.15E-04	0.034	0.075	0%	0.03	0.07
Subtotal					**0.03**	**0.075**		**0.03**	**0.07**
Total					**21.66**	**94.74**		**0.03**	**0.07**

$PM_{2.5}$ Emissions:

		Throughput		Emission Factor	Uncontrolled $PM_{2.5}$		Capture Efficiency	Fugitive Emissions	
ID	Emission Source	(wet ton/hr)	(wet ton/yr)	(lb/ton)	(lb/hr)	(ton/yr)	(%)	(lb/hr)	(ton/yr)
EP-11110FUG	Headhouse and Crop Residues/Energy Crops Handling	79.2	693,500	5.80E-03	0.46	2.01	100%	0	0
EP-11110FUG	Crop Residues Cleaning (Uncontrolled)	79.2	693,500	2.10E-02	1.66	7.28	100%	0	0
EP-11110FUG	Crop Residues Grinding (Uncontrolled)	79.2	693,500	1.90E-02	1.50	6.59	100%	0	0
Subtotal					**3.63**	**15.88**		**0**	**0**
EP-11110FUG	Crop Residues Receiving via Truck	158	693,500	3.26E-05	0.01	0.01	0%	0.01	0.01
Subtotal					**0.01**	**0.01**		**0.01**	**0.01**
Total					**3.63**	**15.89**		**0.01**	**0.01**

EP-18185
Enzymatic Hydrolysis Fermentation CO_2 Scrubber

Vendor: Vogelbusch

Basis: Vogelbusch Equipment Datasheet and Scrubber Calculations (EP-18185). A safety margin of 20% was applied.
Acetaldehyde includes trace Formaldehyde.

Parts per million by volume dry (ppmvd) calculations were performed using the average molecular weight of the vent gas to calculate total molar flow rate, and using the molecular weight of the hazardous air pollutant (HAP) to calculate its molar flow rate. The total controlled HAP ppmvd is based on the weighted average of the total HAP molecular weight. The ppmvd calculation equation used was:
ppmvd = [(Emission Rate, lb/hr) / (Molecular Weight of Component, lb-lb-mol)] / [(Total Dry Exhaust Rate, lb/hr) / (Average Molecular Weight of Vent Gas, lb/lb-mol)] * 1,000,000

The permit limit for HAP emissions from the EH Fermentation CO_2 Scrubber to establish the facility as a synthetic minor is requested to be set at the 40 CFR Part 63, Subpart FFFF – National Emission Standard for HAPs for Miscellaneous Organic Chemical Manufacturing (MON) level of $\leq$20 ppmvd total organic HAP based on an average of the concentration throughout the fermentation batch cycle.

VOM Composition:

Uncontrolled VOM Emissions	270.90	lb/hr		
Ethanol	267.28	lb/hr	% Ethanol	98.66%
Acetaldehyde	1.068	lb/hr	% Acetaldehyde	0.39%
Methanol	0.276	lb/hr	% Methanol	0.10%
Acrolein	0.228	lb/hr	% Acrolein	0.08%
Other VOM	2.05	lb/hr	% Other VOM	0.76%

Other Pollutants of Concern:

Nitrogen Dioxide	NO_2	1.33	lb/hr

Molecular Weights:

Average of Vent Gas	41.1	lb/lb-mol
Average VOC/TOC	45.99	lb/lb-mol
Ethanol	46	lb/lb-mol
Acetaldehyde	44	lb/lb-mol
Methanol	32	lb/lb-mol
Acrolein	56	lb/lb-mol

Criteria:

Biomass Feed Rate	1,012.43	dry T/day
Biomass Feed Rate	1,116.00	dry ton/day
EH Anhydrous ETOH Production	3,425	gal/hr
EH Anhydrous ETOH Production	30	MMgpy
Hours of Operations	8,760	hr/year

Control Equipment: Wet Scrubber with Packing
Auxiliary Material: Water and Chemical Agents

Source Details:

ID	Emission Source	Stack Flow Rate (cfm)	Stack Diameter (in)	Release Height (ft)	Stack Area (ft^2)	Gas Velocity (ft/s)	Gas Velocity (m/s)	Gas Exit Temperature (deg F)	Gas Exit Temperature (deg K)
EP-18185	EH Fermentation CO_2 Scrubber	4,100	16	67	1.40	48.94	14.92	67	292

Emission Factors:

Pollutant	Composition of VOM	EF	Unit	Removal Efficiency	Notes
NOx	N/A	1.33	lb/hr	95%	Includes 20% design margin
VOC (VOM assumed VOC)	100%	270.90	lb/hr	99%	Efficiency of total VOM removal
$PM/PM_{10}/PM_{2.5}$	N/A	0.10	lb/hr	0%	Worst-case condensible particulate matter
HAPs					
Acetaldehyde	0.39%	1.068	lb/hr	70%	% Removal Efficiency
Methanol	0.10%	0.276	lb/hr	90%	% Removal Efficiency
Acrolein	0.08%	0.228	lb/hr	90%	% Removal Efficiency
CO_2	--	5.89	lb/gal	N/A	Includes 20% design margin

EP-18185
Enzymatic Hydrolysis Fermentation CO_2 Scrubber

Emission Factors:	Control Efficiency	EP-18185 EH Fermentation CO_2 Scrubber Uncontrolled		EP-18185 EH Fermentation CO_2 Scrubber Controlled		
Criteria Pollutants	(%)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(ppmv)
NOx	95%	1.33	5.83	0.07	0.29	-
VOC (VOM assumed VOC)	99.5%	271	1,187	2.71	11.87	124
$PM/PM_{10}/PM_{2.5}$	0%	0.10	0.44	0.10	0.44	-

HAPs Emissions:							
		Uncontrolled HAPs		Controlled HAPs			
Pollutant		(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(ppmv)	(CE %)
Acetaldehyde		1.07	4.68	0.32	1.40	15.40	70.00%
Methanol		0.28	1.21	0.03	0.12	1.90	90.00%
Acrolein		0.23	1.00	0.02	0.10	0.90	90.00%
Total		**1.57**	**6.89**	**0.37**	**1.62**	**17.90**	**76.41%**

CO_2 Emissions:			
		Uncaptured CO_2	
ID	Source Description	(lb/hr)	(ton/yr)
EP-18185	EH Fermentation CO_2 Scrubber	20,173	88,357
Total		**20,173**	**88,357**

EP-19001
Lignin-Rich Stillage Storage

Lignin-Rich Stillage Storage

Basis: Emissions calculated for lignin-rich stillage storage assumed equivalent to wet distiller's grain emission rates from starch ethanol production. November 2004 stack test at the Diversified Energy Co. (DENCO) ethanol facility located in Morris, Minnesota.

Lignin-rich storage will only be utilized in the event of a process upset. Typically, lignin stillage is conveyed continuously to the Biomass-Fired Boiler System.

Criteria:

Lignin-Rich Stillage Percent Moisture	55%	by weight	
Lignin-Rich Stillage Handling Rate	71,241	wet lb/hr	
Lignin-Rich Stillage Handling Rate	35.62	wet ton/hr	
Annual Lignin-Rich Stillage Pile Storage Needs	7,409	wet ton/yr	Based on a pad sized for 4 hours of storage and assuming pad usage not more than once per week.
Annual Operations	8,760	hr/yr	

Emission Factors:			
Pollutant	EF	Unit	Notes:
VOC	0.0083	lb/ton Stillage, Wet	DENCO EF
HAPs			
Acetaldehyde	1.11E-04	lb/ton Stillage, Wet	DENCO EF
Methanol	4.44E-05	lb/ton Stillage, Wet	DENCO EF
Acrolein	1.67E-05	lb/ton Stillage, Wet	DENCO EF
Formaldehyde	2.22E-04	lb/ton Stillage, Wet	DENCO EF

Emissions:	Emissions		
Pollutant	(lb/hr)	(ton/yr)	Notes:
VOC	0.30	1.29	Note 1
HAPs			
Acetaldehyde	3.95E-03	1.73E-02	Note 1
Methanol	1.58E-03	6.93E-03	Note 1
Acrolein	5.95E-04	2.61E-03	Note 1
Formaldehyde	7.91E-03	3.46E-02	Note 1
Total VOC	**0.30**	**1.29**	
Total HAPs	**0.01**	**0.06**	

(1) Lignin-rich stillage pile assumed to be utilized 24 hr/day, 365 day/yr, as needed.

AREA 20000
Materials and Chemical Handling

Materials and Chemical Handling

Basis: BACT emission factor used to calculate emissions from vents associated with ash and hydrated lime handling.
Ash may either settle out in the boiler (bottoms ash) or be carried with the flue gas (fly ash). For the purposes of estimating potential emissions, the fraction of dust particles equal to or less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$) was assumed not greater than 50 percent of PM_{10}. Controlled emissions from the baghouses assumed all PM was less than 10 micrometers.
Uncontrolled emissions represent potential-to-emit in the absence of controls.
The transfer, handling and storage systems are completely closed systems designed with high velocity pickup of grains; therefore capture efficiency is assumed 100%.
Bottoms ash shipped at a minimum 20% moisture (by weight), therefore, fugitive emissions are considered negligible.

Criteria:

Maximum Hours of Operations	8,760	hr/yr

Emission Factor Equation: **$PM/PM_{10}/PM_{2.5}$ Emissions (lb/hr) = (cfm) x (gr/dscf) x (60 min/hr) / (gr/lb)**

BACT Emission Factor	0.004	gr/dscf	All PM is assumed to be less than 10 micrometers in diameter.
Conversion Factor	7,000	gr/lb	
Conversion Factor	60	min/hr	
$PM_{2.5}$ Percent	50%		

Source Details:

ID	Emission Source	Stack Flow Rate (cfm)	Stack Diameter (in)	Release Height (ft)	Stack Area (ft^2)	Gas Velocity (ft/s)	Gas Velocity (m/s)	Gas Exit Temperature (deg F)	Gas Exit Temperature (deg K)
EP-20514	Boiler Bottoms Ash Handling DC #1	28,100	36	TBD	7.07	66.26	20.19	Ambient	Ambient
EP-20510	Boiler Fly Ash Handling DC #1	14,050	30	TBD	4.91	47.70	14.54	Ambient	Ambient
EP-20520	Boiler Fly Ash Handling DC #2	14,050	30	TBD	4.91	47.70	14.54	Ambient	Ambient
EP-20512	Lime Handling DC #1	2,000	12	TBD	0.79	42.44	12.94	Ambient	Ambient

$PM/PM_{10}/PM_{2.5}$ Emissions:

ID	Emission Source	PM (lb/hr)	PM (ton/yr)	PM_{10} (lb/hr)	PM_{10} (ton/yr)	$PM_{2.5}$ (lb/hr)	$PM_{2.5}$ (ton/yr)	Notes:
EP-20514	Boiler Bottoms Ash Handling DC #1	0.96	4.22	0.96	4.22	0.48	2.11	Note 1
EP-20510	Boiler Fly Ash Handling DC #1	0.48	2.11	0.48	2.11	0.24	1.05	Note 1
EP-20520	Boiler Fly Ash Handling DC #2	0.48	2.11	0.48	2.11	0.24	1.05	Note 1
EP-20512	Lime Handling DC #1	0.07	0.30	0.07	0.30	0.03	0.15	Note 1
Total		**2.00**	**8.74**	**2.00**	**8.74**	**1.00**	**4.37**	

(1) Equipment assumed to operate 24 hr/day, 365 day/yr.

EP-08000
High Voltage Circuit Breaker Equipment Leaks

Basis: Leak Rates based on state-of-the-art enclosed-pressure SF_6 circuit breaker with leak detection.

Criteria:

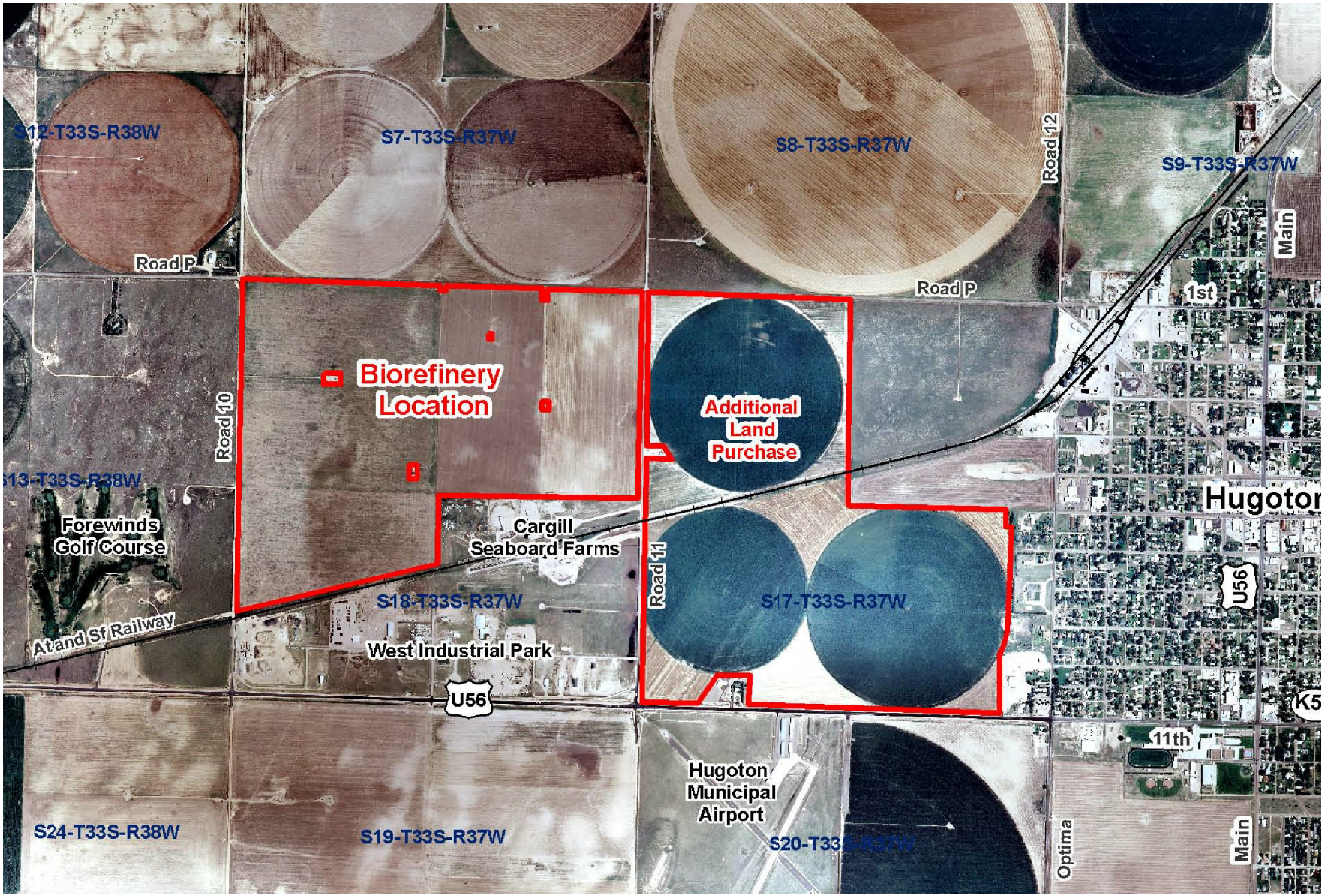
Number of High Voltage Circuit Breakers	1	
Circuit Breaker Rating	125	kV
Circuit Breaker SF_6 Capacity	82	lbs

GHG Emissions:

Equipment	BACT Control	SF_6 Emissions	
	(% by Weight)	(lb/yr)	(ton/yr)
HV Circuit Breaker #1	99.5%	0.41	0.0002

Appendix D

Diagrams and Figures



WLA Consulting, Inc.

FILE: 165001FIG1-1(1)

DATE:	12/29/09
SCALE:	NOT TO SCALE
PROJ. NO.:	165-001
DRAWN:	JAS
CHECKED:	SES
	FIGURE 1-1

GENERAL FACILITY LOCATION
ABENGOA BIOENERGY BIOMASS OF KANSAS, LLC
HUGOTON, KANSAS

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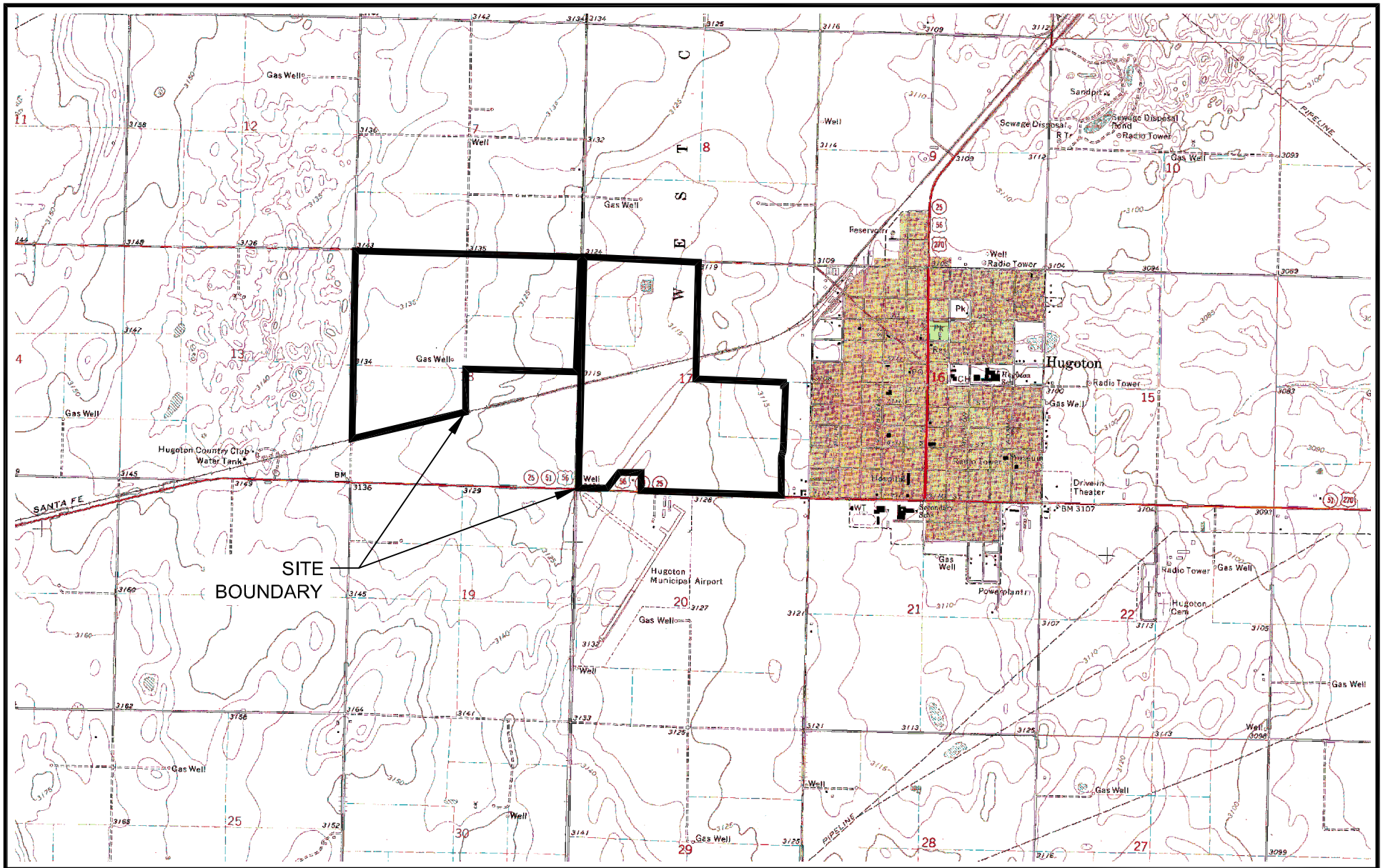


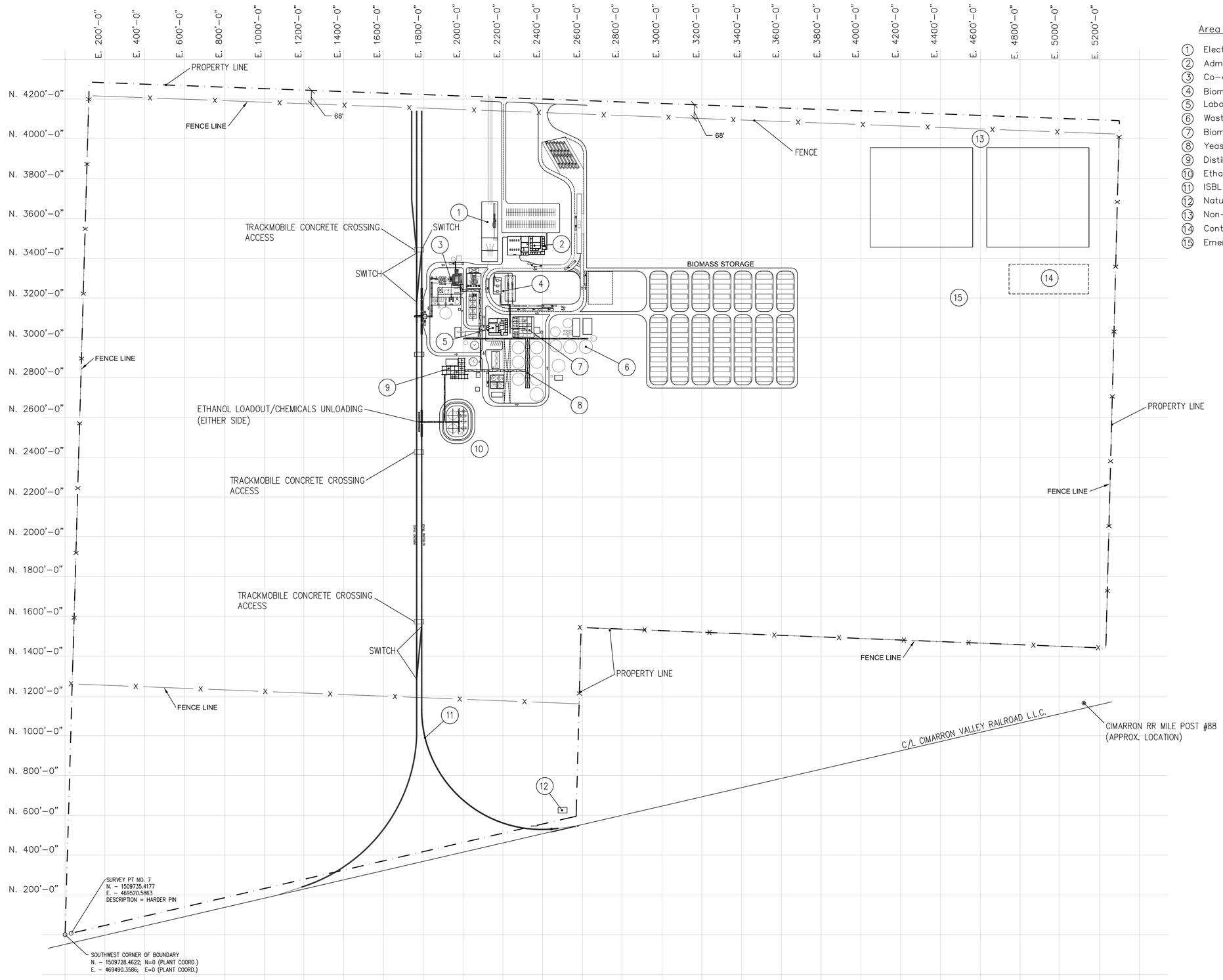
Consulting, Inc.

FILE: 165001FIG1-2(0)

DATE: 12/29/09	
SCALE: NOT TO SCALE	
PROJ. NO.: 165-001	
DRAWN: JAS	
CHECKED: SES	
FIGURE 1-2	

REGIONAL TOPOGRAPHY
ABENGOA BIOENERGY BIOMASS OF KANSAS, LLC
HUGOTON, KANSAS

R:_Drawings\165-001 ABHK - Air Constr Permit\165001FIG1-2(0).dwg, 11 X 8.5, 12/29/2009 10:18:15 AM



Area Legend:

1. Electric Substation
2. Administration Building
3. Co-generation Plant
4. Biomass Receiving/Handling
5. Laboratory & Control Room
6. Waste Water Treatment
7. Biomass Pretreatment
8. Yeast Propogation & Fermentation
9. Distillation & Ethanol Dehydration
10. Ethanol Storage & Loadout
11. ISBL Trail Spur
12. Natural Gas Metering, Let Down Station & Tie-In
13. Non-Contact Water Retention Ponds
14. Contact Water Retention Ponds
15. Emergency Ponds

N

0 250' 500'

Ford, Bacon & Davis
A Limited Liability Company

REVISION TRACKING		
DATE	DESCRIPTION	REVISION
12/29/2009	ORIGINAL DRAWINGS	0
04/26/2011	SAMPLING PROTOCOL REVISION	1
05/16/2011	REVISION	2

ABENGOA BIOENERGY BIOMASS OF KANSAS, LLC
HUGOTON, KANSAS

REVISED FACILITY LAYOUT

PROJECT NUMBER: 165-009
DESIGNED: FBD
DRAWN: JAS
CHECKED: SES

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LINCOLN, NE 68508
TEL (402) 475-8588
FAX (402) 477-1956
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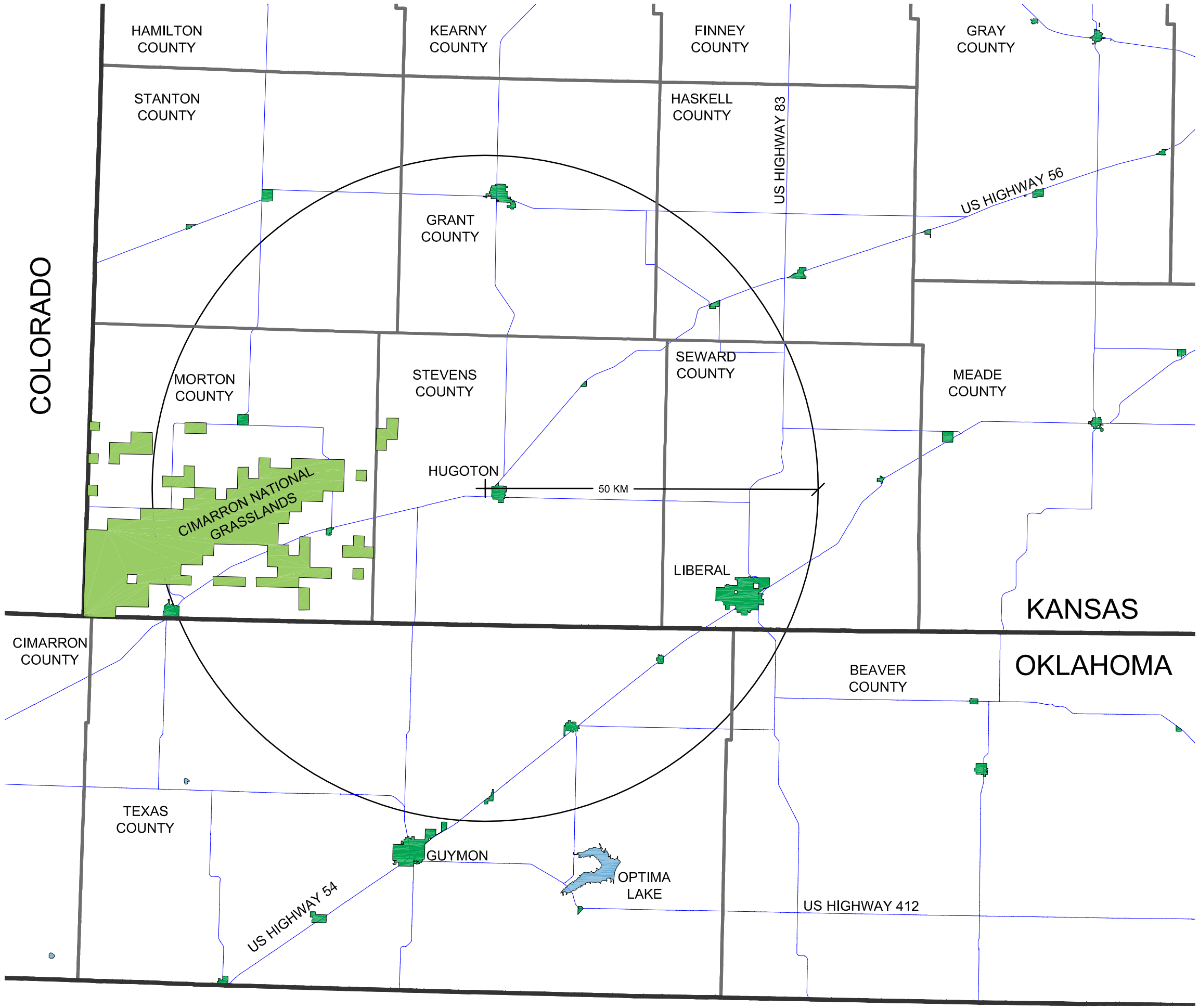
DRAWING NUMBER FIG 1-3

FILE: 165009FIG1-3(1)



REVISION TRACKING		
DATE	DESCRIPTION	REVISION
12/29/09	ORIGINAL DRAWINGS	0

ABENGOA BIOENERGY BIOMASS OF KANSAS, LLC
HUGOTON, KANSAS

MAXIMUM AREA OF INFLUENCE

PROJECT NUMBER: 165-001
DESIGNED: DAJ
DRAWN: JAS
CHECKED: SES

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DRAWING NUMBER FIG 1-4

FILE: 165001FIG1-4(0)

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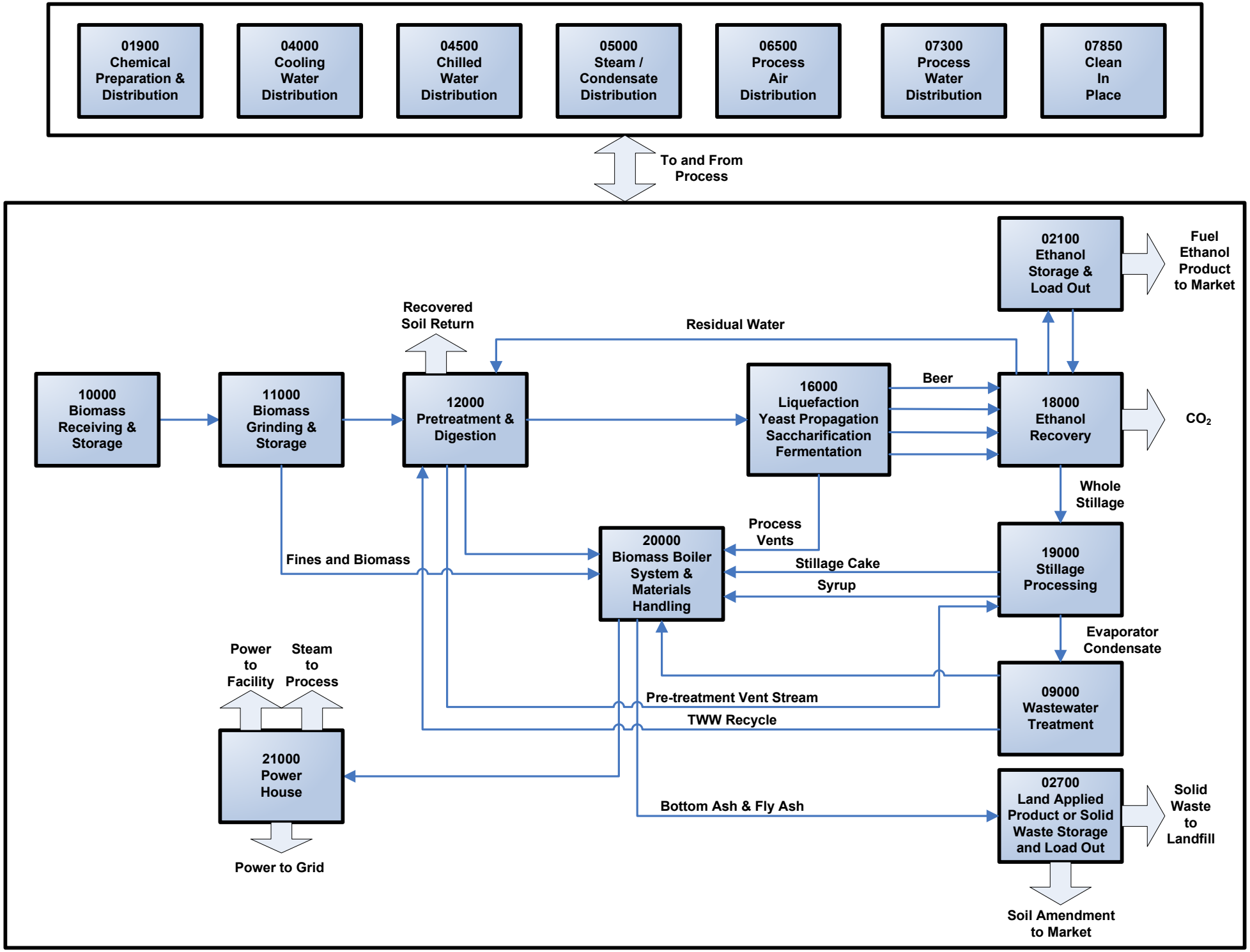
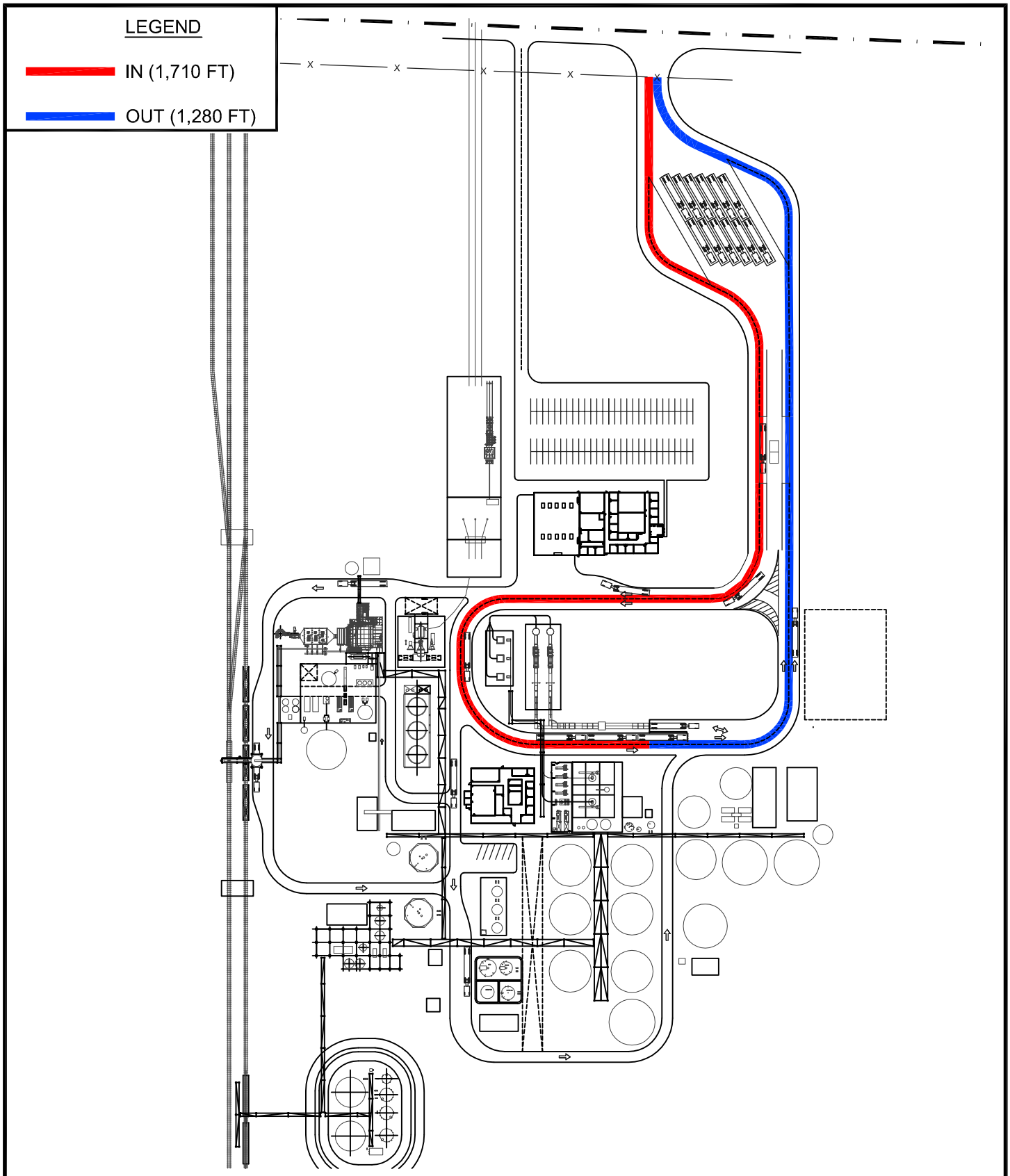


FIGURE 1-5 SIMPLIFIED PROCESS FLOW DIAGRAM



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FILE:165009FIG1-6(0)

DATE: 05/05/2011

SCALE: 1" = 200'

PROJ. NO.: 165-009

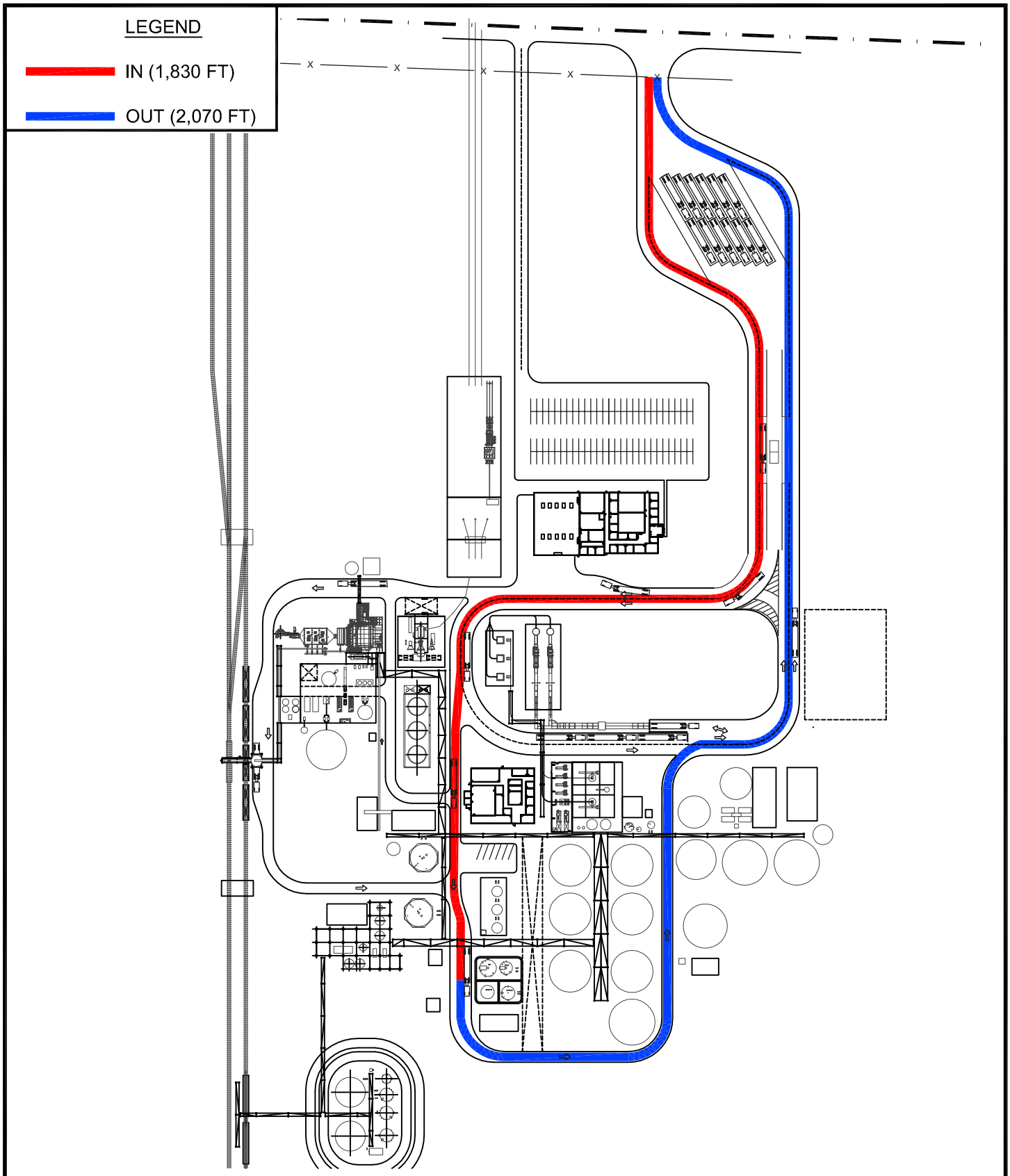
DRAWN: JAS

CHECKED: SES

FIGURE 1-6

BIOMASS DELIVERY &
ACID WASH SOILDS LOADOUT HAUL ROAD
ABENGOA BIOENERGY BIOMASS OF KANSAS
HUGOTON, KANSAS

R:_Drawings\165-009 Air CS Permit DOE\dwg\165009FIG1-6(0).dwg, FIG1-6, 5/16/2011 10:55:49 AM



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FILE:165009FIG1-6(0)

DATE: 05/05/2011

SCALE: 1" = 200'

PROJ. NO.: 165-009

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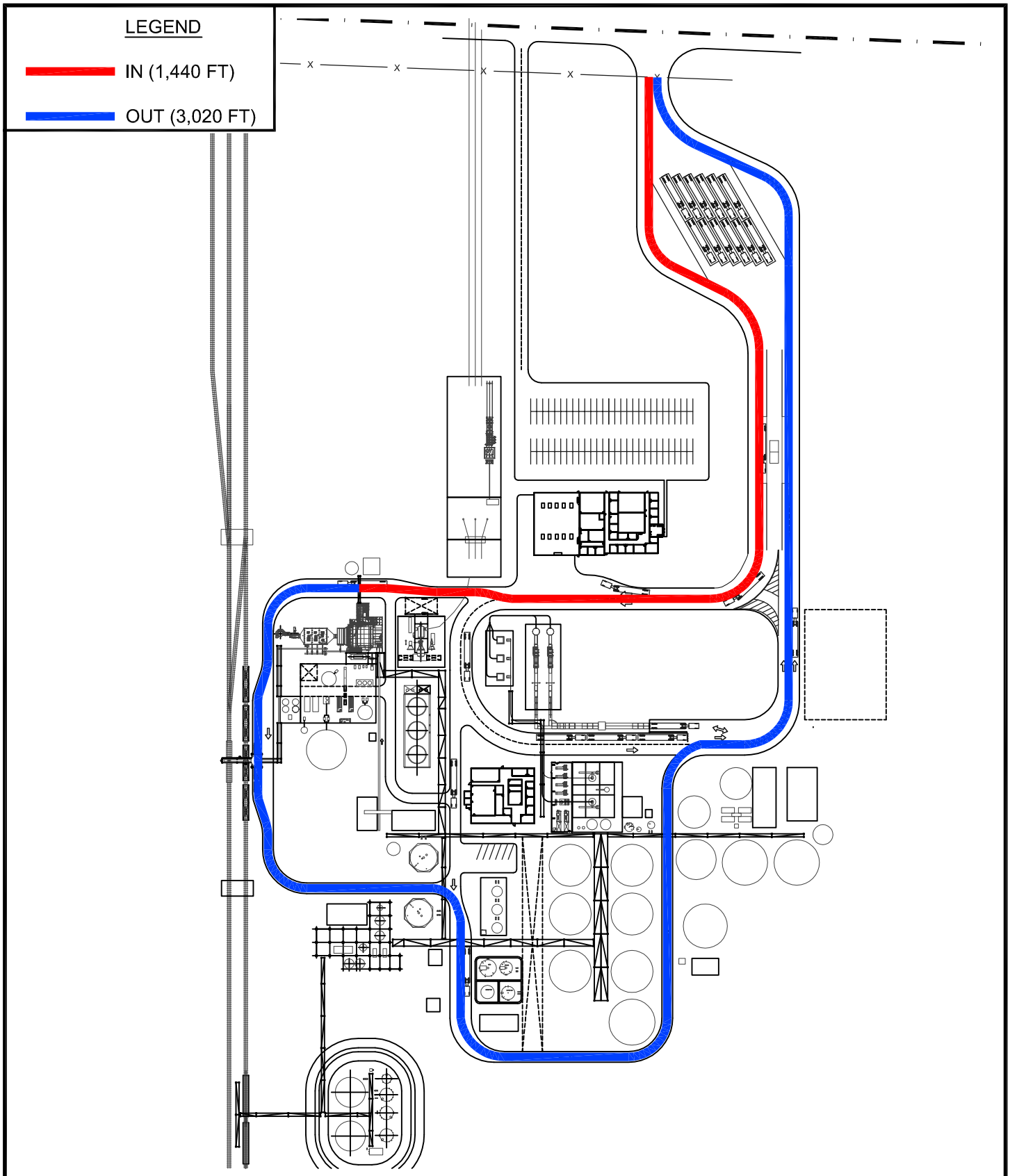
CHECKED: SES

FIGURE 1-7

ETHANOL LOADOUT HAUL ROAD
ABENGOA BIOENERGY BIOMASS OF KANSAS
HUGOTON, KANSAS

R:_Drawings\165-009 Air CS Permit DOE\dwg\165009FIG1-6(0).dwg, FIG1-7, 5/16/2011 10:56:01 AM



WLA Consulting, Inc.

FILE:165009FIG1-6(0)

DATE: 05/05/2011

SCALE: 1" = 200'

PROJ. NO.: 165-009

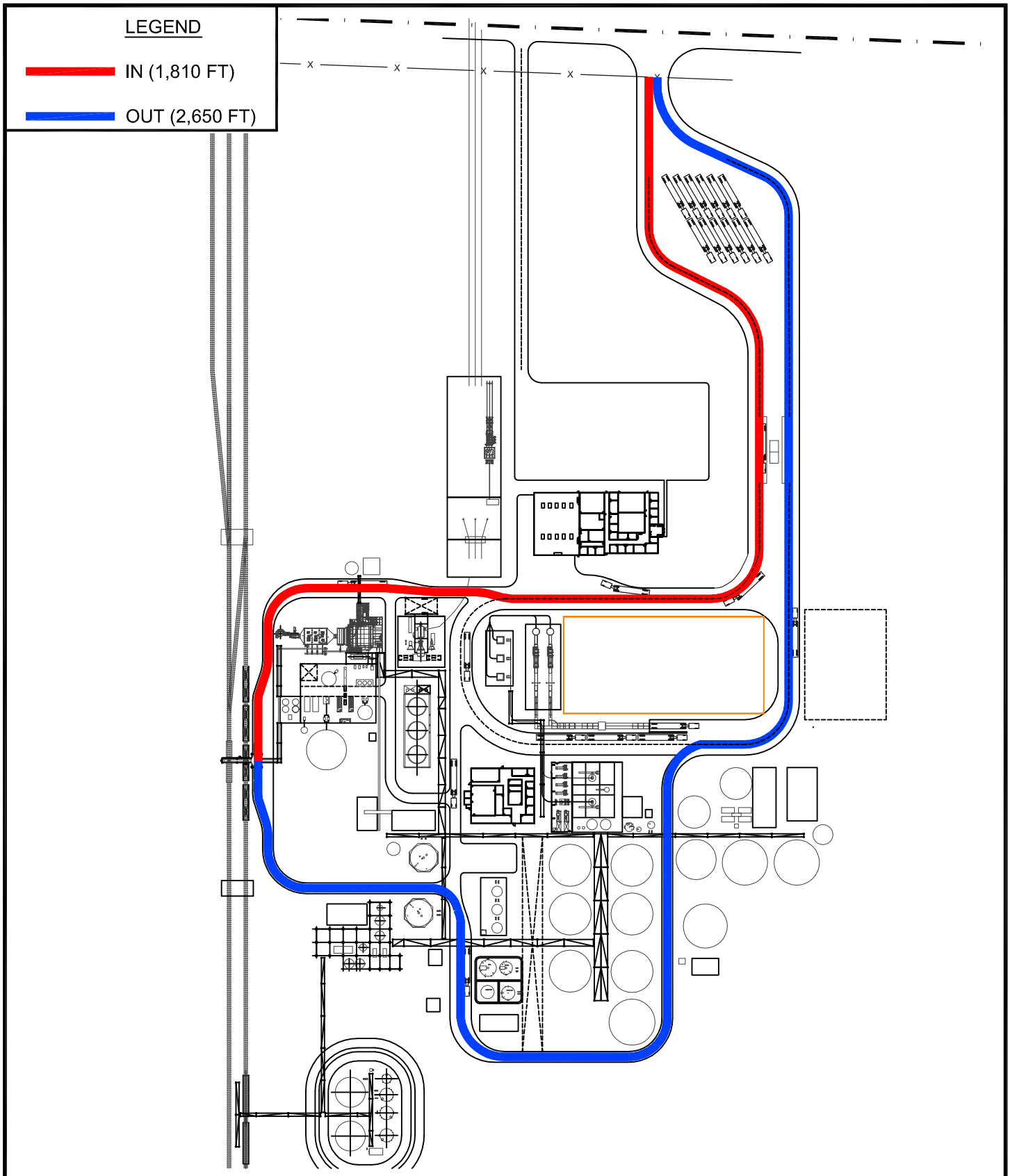
DRAWN: JAS

CHECKED: SES

FIGURE 1-8

BOTTOMS ASH LOADOUT HAUL ROAD
ABENGOA BIOENERGY BIOMASS OF KANSAS
HUGOTON, KANSAS

R:_Drawings\165-009 Air CS Permit DOE\dwg\165009FIG1-6(0).dwg, FIG1-8, 5/16/2011 10:56:20 AM



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FILE:165009FIG1-6(0)

DATE: 05/05/2011

SCALE: 1" = 200'

PROJ. NO.: 165-009

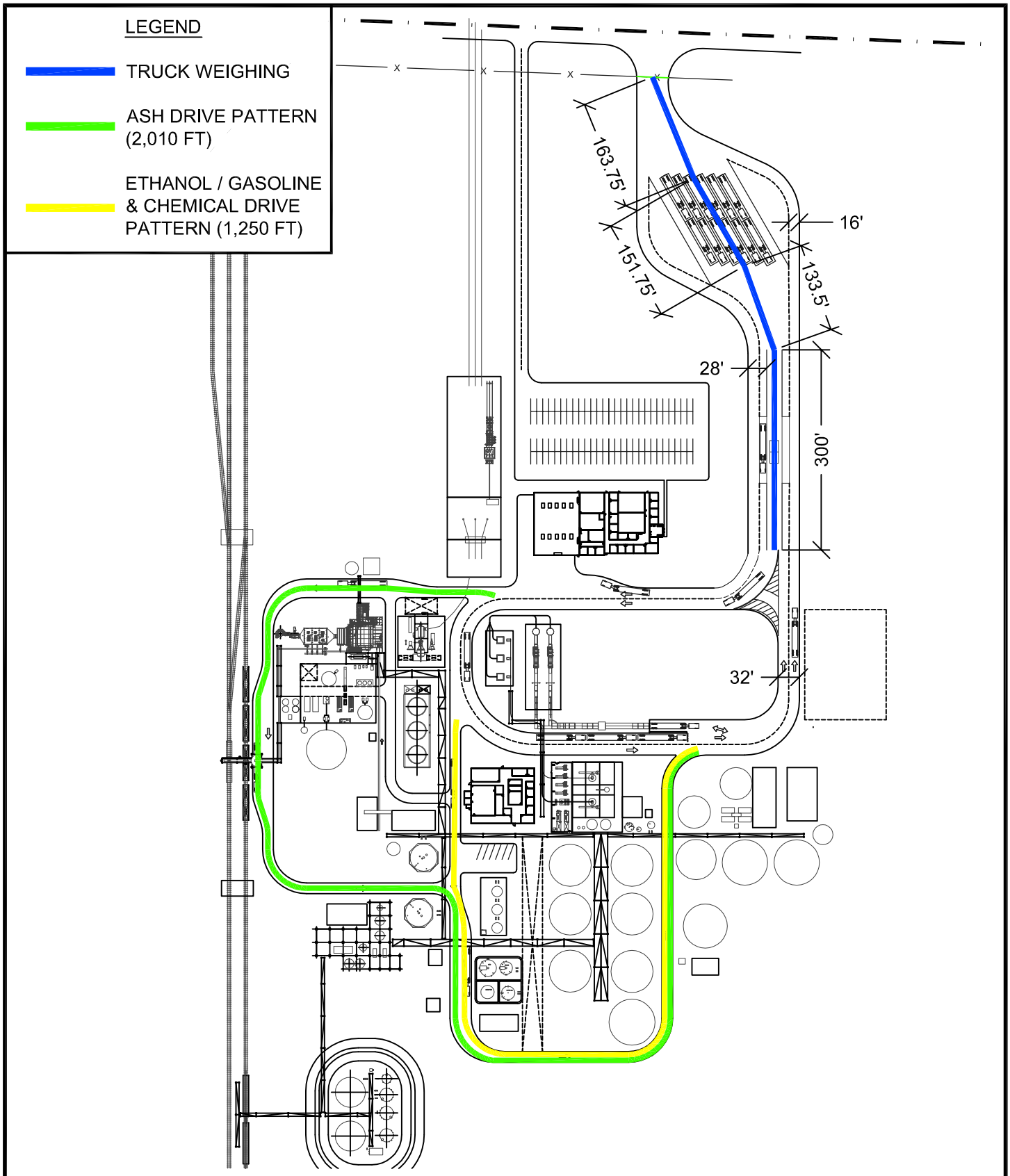
DRAWN: JAS

CHECKED: SES

FIGURE 1-9

ASH LOADOUT HAUL ROAD
ABENGOA BIOENERGY BIOMASS OF KANSAS
HUGOTON, KANSAS

R:_Drawings\165-009 Air CS Permit DOE\dwg\165009FIG1-6(0).dwg, FIG1-9, 5/16/2011 11:22:10 AM



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FILE:165009FIG1-6(0)

DATE: 05/05/2011	HAUL ROAD MODELING LENGTHS FOR DISTRIBUTION CALCULATIONS ABENGOA BIOENERGY BIOMASS OF KANSAS HUGOTON, KANSAS
SCALE: 1" = 200'	
PROJ. NO.: 165-009	
DRAWN: JAS	
CHECKED: SES	
FIGURE 1-10	

R:_Drawings\165-009 Air CS Permit DOE\dwg\165009FIG1-6(0).dwg, FIG1-10, 5/16/2011 11:22:28 AM