

To: Audrey O'Brien, NWR Solid Waste Manager
Columbia Biogas File
Multnomah County

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From: Stephanie Rawson
Solid Waste Compliance Specialist
Northwest Region Solid Waste Program

Subject: Permit Evaluation Report
Solid Waste Disposal Permit #1478
Solid Waste Treatment Facility

Overview

Columbia Biogas, LLC applied for Oregon Department of Environmental Quality permits to operate a solid waste treatment facility. Columbia Biogas will be located at 6849 NE Columbia Boulevard in Portland. Columbia Biogas intends to anaerobically digest commercial and industrial food wastes.

Anaerobic digestion is a controlled and enclosed biological process that breaks down organic matter in the absence of oxygen producing biogas that can generate electricity and heat. Anaerobic digestion produces solid and liquid byproducts which can be utilized as fertilizers or soil amendments.

The operations will occur inside buildings and tanks. Waste will not be processed or stored outside. The operations consist of waste acceptance, pretreatment, digestion, gas combustion and byproduct processing. The receiving and process areas will be emptied of waste and cleaned at the end of each operating day.

The facility will use an odor control system to collect air from the receiving and processing areas and collect exhaust from process equipment and tanks. The collected air will be biologically treated through the use of biofilters.

Background

Columbia Biogas, LLC applied for two DEQ permits, an Air Contaminant Discharge Permit and a Solid Waste Disposal Permit, to establish, operate and maintain a facility processing solid and liquid food waste.

Columbia Biogas intends to accept commercially and industrially generated food waste. Sources of the waste include grocery stores, restaurants, beverage processors, food distributors, bakeries, and breweries. Acceptable waste may include meat, dairy, agricultural crop residues, food-soiled paper, wax-coated cardboard and packaging such as plastic, metal and glass. The facility will not accept yard debris, manure, hazardous waste or ruminant animal tissues. Columbia Biogas does not anticipate accepting food waste from private residences.

Columbia Biogas plans to construct a two-stage "wet" anaerobic digestion facility to convert solid and liquid food waste into useful byproducts such as digested fibers, liquid fertilizer, and

electricity generated from combusted methane gas. The facility includes a receiving and pretreatment building, process equipment and tanks, byproduct processing facilities, odor control system, tire wash, scales, electricity generation equipment and a flare. Columbia Biogas expects facility construction to take nine to twelve months.

Anaerobic digestion is a process where organic waste is broken down by bacteria in a controlled, oxygen free environment. The byproducts of the process include methane rich biogas (which when combusted, can generate electricity) and nutrient rich liquid and digested solids suitable for use as fertilizers. Effective anaerobic digestion requires favorable conditions (temperature, moisture content, oxygen exclusion, and pH) and a steady waste supply.

Columbia Biogas submitted a Solid Waste Treatment Permit application to DEQ on September 7, 2010. The complete application included:

- An Application for a New Solid Waste Disposal Site Permit;
- A Land Use Compatibility Statement (LUCS) issued by the City of Portland on August 6, 2010;
- An Air Contaminant Discharge Permit Application;
- Site characterization information;
- Initial facility location, layout, design and process figures;
- Odor control plan; and
- Draft Operations Plan.

Facility Description

The facility is located at 6849 NE Columbia Boulevard in Portland. The property is owned by Oregon Fresh Farms Real Estate, LLC. The property is bordered by NE Columbia Boulevard to the south and Columbia Slough to the north. The surrounding properties are zoned industrial and include such businesses as an auto body shop, bus yard and fork lift company. The topography of the property is slightly sloped to the north in the direction of the Columbia Slough.

Oregon Fresh Farms formerly used the property for vegetable production, washing and packaging. The only known operation currently on-site is Lucky Farms, a bean sprout production, washing and packaging business. The property is currently occupied by infrastructure consisting of commercial structures, two houses, and fallow agricultural fields.

Five underground storage tanks (USTs), one drywell, and two water wells are known to exist on this property. The five USTs comprise two heating oil, two diesel, and one gasoline. The sizes of the USTs are 1,000 gallons except for one heating oil tank which is 500 gallons. The DEQ UST Programs currently do not have data or information on file for these USTs. The drywell is not rule authorized, registered or permitted by the DEQ Underground Injection Control Program. Columbia Biogas is aware that DEQ regulations apply to the USTs and drywell.

According to Oregon Water Resources Department well logs, two water wells exist on site. Well logs indicate that in 1959 a domestic water well (#1152) was installed and in 1972 an irrigation water well (#1150) was installed. The property is also supplied water by the City of Portland.

The DEQ Site Assessment Program information indicates groundwater contamination exists. The extent of the groundwater contamination is not known due to the lack of data and unconfirmed source(s) of contamination.

Facility construction will include pavement, buildings, tanks, odor control system, and equipment installation. The receiving and pretreatment building will be constructed on concrete slabs. Facility operations will occur inside buildings and on paved surfaces. Several large holding and process tanks will be used for waste processing (buffering, hydrolysis, fermentation, biogas conditioning and byproduct treatment) and storage. Piping with related pumps will move waste between tanks and processes. Engine generators and gas handling equipment will manage biogas produced and facilitate combustion and conversion into electric power.

The facility's electricity generation will support the PacifiCorp distribution system (Killingsworth substation). Columbia Biogas anticipates the facility will produce approximately 5 Megawatts and. The facility is working with PacifiCorp to secure a connection agreement to supply the local substation with the generated electricity.

The facility is designed to prevent releases of methane, reduce and control emissions of air pollutants, and collect and treat odors through biological odor treatment using biofilters. Pipes, tanks, buildings, and process equipment will be constructed using corrosion resistant materials.

Operations

The facility will receive waste Monday through Saturday from 6 a.m. to 4 p.m. Sundays the facility will not accept waste but staff will monitor process flows and conduct necessary maintenance and repair. The facility will not be open to the public.

Columbia Biogas plans to contract with Veolia Water North America to operate and maintain the facility. Veolia Water North America is a provider of water and wastewater services to municipal and industrial customers.

Columbia Biogas anticipates that approximately 60 trucks will enter and leave the facility daily. Trucks will haul in materials for processing and haul out process byproducts. Truck access to the facility will be provided via NE Columbia Boulevard. NE Columbia Boulevard is designed to handle truck traffic, as it has a center turn lane for trucks heading east on Columbia Boulevard towards the facility and is currently identified as a transportation corridor. The close proximity to major traffic corridors including I-205, NE Sandy Boulevard, 82nd Avenue and Killingsworth Street provides access to the facility.

Columbia Biogas categorizes the incoming waste into the following;

- Liquid Waste – primarily grease trap waste from restaurants and liquid waste from food and beverage processors. Little or no contamination, such as paper, plastic or metal, is expected.
- 'Clean' Solid Waste – primarily waste generated from food and beverage processors such as bakeries and breweries. Little or no contamination is expected.
- 'Mixed' Solid Waste – primarily generated by grocery stores, restaurants, and food distributors that may include food-soiled paper, wax-coated cardboard, and biodegradable service ware. Contaminants include packaging such as plastic, metal, and glass which will be removed prior to digestion.

- Containerized Waste – palletized waste or waste in large totes from food processors, grocery stores, restaurants, and food distributors. Contaminants may include plastic, glass, metal and paper products which will be removed prior to digestion.

Receiving

Incoming trucks will be weighed at entry and exit. Waste unloading will occur inside the receiving and pretreatment building. The receiving area has multiple bays for simultaneous unloading of trucks. Haulers are required to contact the facility prior to delivery to obtain preapproval for disposal of waste. Any incoming load without preapproval will be refused.

Haulers with an established acceptance record will be directed to enter into the appropriate receiving bay based on the type of waste. Waste will be unloaded into hopper, tip floor or liquid unloading station then transported to the corresponding pretreatment equipment.

Haulers without an established acceptance record will unload onto the tip floor. Staff will visually inspect the load for prohibited materials, materials that may damage the equipment or hinder the digestion process. Approved loads will be transported to the corresponding pretreatment equipment. Staff will reload unacceptable loads back onto truck and send off-site for proper disposal.

Signage and traffic control devices will direct traffic flow.

Incoming waste except containerized waste will be processed the same day. The facility will store containerized waste in a designated indoor storage area and process on an as-needed basis to balance the feed to the digestion system. Packaging will be removed from the containerized waste and pretreated as necessary prior to the digestion process.

The receiving facilities (hopper, tip floor, liquid unloading station) will be emptied and cleaned at the end of each operating day.

Prior to leaving the receiving and pretreatment building or prior to leaving the facility, trucks will go through a tire wash to prevent track out. Water and materials from the tire wash will collect in a trench and will be pumped to the digestion process for treatment.

Pretreatment

Waste will require one or more pretreatment processes to remove contaminants that may damage equipment or disrupt the digestion process. The pretreatment will also help ensure digested materials are fairly free of contaminants. Pretreatment of waste includes visually inspecting waste to remove contaminants, size reducing, screening out contaminants and removing packing from the waste. Waste pretreatment will occur inside the pretreatment building.

The pretreatment equipment will be emptied and cleaned at the end of each operating day. Recyclable and other residual materials removed from incoming wastes will be collected into containers or dumpsters for proper off-site recycling or disposal.

Anaerobic Digestion

The facility plans to use a two-stage “wet” digestion process operating in sealed tanks on a continuous basis. “Wet” digestion simply means there is more liquid and less solids.

The pretreated waste or substrate will be pumped to the hydrolysis tank. The hydrolysis tank provides both storage and hydrolysis of the substrate. During the hydrolysis stage the waste is broken and dissolved into smaller portions and liquefied. The detention time varies from one to three days at a temperature range of 110° F to 130° F. The liquefied substrate in the hydrolysis tank provides a continuous feed to the fermentation tanks to ensure gas production is relatively constant.

The liquid substrate is pumped from the hydrolysis tank to one of three fermentation tanks. In the fermentation tanks the substrate is stabilized and biogas is produced. The fermentation detention time is approximately 30 days at a temperature range of 110° F to 130° F.

The biogas produced consists primarily of methane and carbon dioxide with concentrations of hydrogen sulfide, other sulfur compounds and moisture. The biogas produced is piped to gas conditioning and storage equipment. The storage of biogas provides an even flow to the engine generators when gas production in the fermentation tanks is variable.

The stabilized substrate or digestate material is pumped from the fermentation tanks to the digestate holding tank. The digestate material is processed to produce additional products including digested fibers, liquid fertilizers and treated process water.

Gas Conditioning and Combustion

Biogas produced in the fermentation tanks contains moisture, hydrogen sulfide and other sulfur compounds. Hydrogen sulfide may damage engine generators and when hydrogen sulfide is burned sulfur dioxide is produced. To protect equipment and minimize emissions, moisture, hydrogen sulfide and sulfur compounds will be removed by gas conditioning equipment. The biogas will process through vessels containing a media to remove the hydrogen sulfide.

The conditioned biogas will be stored in a low pressure membrane dome and will provide an even gas flow to the engine generators when gas production is variable in the fermentation tanks.

Biogas will be combusted in four internal combustion engine generators. Columbia Biogas estimates the engines will operate continuously to produce approximately 5 Megawatts of electricity. The facility plans to interconnect to the PacifiCorp Killingsworth substation per appropriate agreements.

A flare will be constructed primarily as a safety feature. The use of the flare is limited to only when biogas cannot be combusted in the engines (due to maintenance) and safety device in the event of an upset condition.

The engines will also produce heat that will be collected in a hot water circulation system and used for heating the process and administrative buildings. The hot water circulation system cools the engines. A portion of the heat generated by the engines will heat the contents of the process tanks. The remaining heat will supply heat for drying the digested fibers.

Byproduct Processing

The byproducts or digestate materials pumped from the fermentation tanks to the digestate holding tank will be dewatered to separate the liquid and solids. During the dewatering process

the addition of a polymer is used to assist gathering the solids from the liquid. The polymer and digestate material are mixed then pumped to a centrifuge. The centrifuge separates the solids (digested fiber) and liquids (centrate) by spinning the materials.

The digested fiber is conveyed to a hopper or trailer prior to hauling off-site. The digested fiber may be used as a fertilizer, soil amendment or composted.

The centrate resulting from the dewatering process is stored in a buffer tank prior to a multistage filtration (ultra filtration and reverse osmosis). The filtration will concentrate the liquid nutrients and produce treated water. The nutrient rich concentrate will be stored for off-site use as a liquid fertilizer. The treated water may be reused for industrial purposes. The facility will reuse the treated water in facility operations, discharged to City of Portland sanitary sewer under a pretreatment permit, or sent to neighboring facilities for reuse.

The end uses of the digestate materials require DEQ and Oregon Department Agriculture approvals, as appropriate.

Proposed Permit

Under current DEQ solid waste regulations, facilities accepting solid waste and utilizing technologies to convert solid waste to useful products and chemicals (biofuels such as ethanol and oil, and electricity from combusted methane) are considered by to be treatment facilities. Therefore, a Solid Waste Treatment Facility permit is required.

Significant conditions included in the draft permit are summarized below:

- **Permit Administration Section**
 - Information about the permit issuance, disclaimers, DEQ authority, and permit modification
- **Allowable Activities Section**
 - Activities and wastes the permit authorizes and prohibits
- **Operations and Design Section**
 - Operations Plan requirements;
 - Recordkeeping and Reporting;
 - Specific Operating Conditions;
 - Pollution Controls; and
 - Site Development and Design.
- **Site Closure Section**
 - Closure and Financial Assurance requirements
- **Compliance Schedule**
 - Summary of due dates

The draft permit allows the facility to accept and digest food waste from industrial and commercial sources. Other waste may be authorized for acceptance only after the facility submits updated plans, the waste is not hazardous and the waste is not prohibited by the draft permit.

The facility is prohibited from accepting hazardous waste, used oil, infectious waste and asbestos containing waste materials. The facility is required to operate the facility in a manner to prevent impacts to surface water and groundwater, minimize and control odors, dust and litter and to prevent attraction of rodents. The draft permit requires the facility to have procedures in place to

address spills and equipment failures, and implement sampling procedures to ensure digested materials are pathogen free prior to off-site end uses.

Anticipated permits

Permits anticipated for operation and construction of the facility in addition to the DEQ Solid Waste and Air Quality permits include:

- City of Portland Building and Plumbing Permits;
- City of Portland Public Works Permits;
- City of Portland Industrial Pretreatment Permit;
- DEQ National Pollutant Discharge Elimination System (NPDES)-Stormwater-1200C;
- DEQ NPDES Stormwater 1200COLS (administered by City of Portland Industrial Stormwater Program); and
- Metro Solid Waste Franchise.

Potential Environmental Risks

Emissions

Operation of the anaerobic digestion facility will generate emissions of criteria pollutants and hazardous air pollutants.

The air emission sources at the facility include the engine generators, the flare, and tanks storing organic liquids and gases. The tanks used in the anaerobic digestion process will have emergency relief valves that only release air emissions in the event of pressure buildup and will not be ongoing, day-to-day emission sources. All other storage tank vents will be connected to the biofilters used for odor control and will not be emitting organic emissions directly to atmosphere. Odor emissions will be captured and treated. The combustion of biogas in the engine generators and the flare will produce the majority of the air emissions at the facility.

The current design has the biogas being combusted in four internal combustion engines generator sets. The engines will be operated continuously except during maintenance down times. Each engine will be equipped with air pollution control devices.

Biogas coming from the digestion processes will contain hydrogen sulfide and other sulfur compounds. Burning hydrogen sulfide produces sulfur dioxide, one of the criteria pollutants. In order to minimize emissions of sulfur dioxide, the biogas will be conditioned to reduce the concentrations of hydrogen sulfide prior to being burned in the engines or flare. Combustion of biogas also will generate HAPs emissions.

A flare will be primarily a safety feature and only be used to burn biogas when an engine is down. Columbia Biogas will minimize the amount of time the flare is in use. The flare will be sized to combust all of the biogas, if needed in an upset situation. In normal operating conditions it will only combust one-fourth of the biogas flow. The majority of the time the flare will not be operating at all.

For additional information about potential emissions from the facility please see the DEQ Air Contaminant Discharge Permit and Report.

Odors

The Columbia Biogas facility will include an odor control system. Waste delivered to the facility will be received and processed within an enclosed building, process equipment and tanks will be ventilated to biofilters using biological odor treatment.

The trucks are enclosed to minimize odors during hauling. The trucks will be dumped within the receiving and pretreatment building that is ventilated to odor control. Departing trucks will be hosed down following dumping to eliminate track out or residual odors as it leaves the facility.

Incoming waste will be received and processed in an enclosed pretreatment building. Areas in the building will be maintained under a negative pressure to keep odors from escaping and sent to biofilters for odor control.

The reception hall will consist of multiple bays, each dedicated to the receipt of a specific waste type. A truck will back into a bay in the reception hall and the overhead door will enclose the truck in the unloading area. The air in the unloading area will be continuously removed and vented to the air treatment equipment. There will be automated louvers that allow makeup air into the receiving hall when the doors are closed. When the doors open the louvers will close to prevent loss of negative pressure in the hall.

Once the door is closed, the door to the unloading hopper will open. Following unloading the truck will move forward and be washed. The material and water from the washing will be collected in a trench where it is pumped to the process for treatment in the anaerobic digestion process.

The odor control systems will consist of inline ventilators which draw from multiple collection points through ductwork to exterior mounted biofilters. At this point in the project, final design of the odor control systems is not complete. Upon design completion, the system specifications including ductwork, flow rates and biofilter sizes will be provided to DEQ.

Treatment of the collected odorous air will be done using biofilters. Biofilters have been successful in treating odors from organic sources such as waste facilities, wastewater treatment plants, and industrial food and waste processing facilities such as rendering plants.

Biofilters are a biological treatment method that utilizes a media that together with naturally occurring bacteria remove and oxidize odorous compounds present in the air-stream. The odorous air is distributed through a media. A moisture layer is maintained on the media by a combination of humidification of the air going to the biofilter and a surface irrigation system. As the air passes through the media, odorous compounds are adsorbed into the moisture layer. Microorganisms then oxidize the compounds with the byproducts being water and carbon dioxide. Sufficient residence time in the media must be provided to allow the compounds to be adsorbed into the moisture layer on the media.

Stormwater

Stormwater will generate from the impervious surfaces, paved areas and process buildings. The stormwater will be collected and directed to the existing stormwater ponds at the north end of the site. The settled stormwater will be discharged from the existing stormwater outfall to the Columbia Slough. The discharge will occur under a NPDES 1200COLS stormwater permit.

Stormwater will not be impacted by operations, as active operations occur inside buildings and tanks.

A tire wash area will be provided to prevent tracking of materials offsite. The material and water from washing will be collected in a trench where it will be pumped to the process for treatment in the anaerobic digestion process.

Treated process water may be pumped to the City of Portland sanitary sewer system under a pretreatment permit from the city.

Fire Prevention and Explosion Hazard

The facility will be designed to meet the requirements of National Fire Protection Association 820. These guidelines provide the basis for ventilation rates and electrical classifications for solids-handling facilities, biogas-handling systems, and anaerobic digesters. These guidelines specify the classifications of each area for which the electrical equipment and ventilation rates will be designed.

The design will be submitted for approval by the City of Portland fire marshal before construction begins. Fire hydrants, required sprinkler systems, and site access will be provided in accordance with the local fire marshal requirements.

The site has two water wells and access to city supplied water.

The potential explosive hazard of the facility is considered to be minor due to the low volumes of stored biogas and the low pressure maintained in the system. The biogas produced is collected in the head space of the fermentation tanks which is the top 3-4 feet of the tank. The gas is not explosive and will not burn unless oxygen is available. Safety equipment on each tank prevents over pressuring and includes flame-arrester and a fusible link to prevent a flame from entering the digester through the relief valve.

Each tank will have two safety relief valves. Each valve will set at a different pressure. The setting of one valve will be slightly higher than the other to act as a backup in case there is a failure. The piping systems will be designed to collect and drain moisture and include pressure relief and flame-arresters.

Financial Assurance

DEQ is requiring the applicant to secure financial assurance for a “worst-case” closure to ensure the facility is properly closed and the residual waste from the operation of the facility are properly disposed. Financial assurance is a plan for setting aside financial resources or assuring that adequate funds are available to properly close the disposal site.

Since the facility is a treatment facility and the financial assurance requirements are largely written for landfills, DEQ will tailor requirements to fit the facility type. Closure costs will be based on third party packing, transporting, recycling and disposing of the maximum amount of waste expected to be on site at any one time. The cost estimates may also include site cleaning and lab analysis to affirm that the site is clean.

Compliance History

The pending Solid Waste Treatment permit is the first DEQ Solid Waste Disposal Permit for Columbia Biogas. DEQ does not yet have a compliance history with Columbia Biogas.

Public Process

DEQ Solid Waste and Air Quality Programs issued a joint public notice comment period for the permits pending issuance to Columbia Biogas. A public notice with request for written comments was sent to owners of property within one quarter mile of the facility and to other interested parties via the GovDelivery system on Friday October 15, 2010. The notice requests written comments on the draft permit. The comment period closes at 5 p.m. on Monday November 29, 2010. DEQ will respond to comments and may amend the draft permit in response to comments, as appropriate. On Thursday November 18, 2010, DEQ will hold a joint Solid Waste and Air Quality Public Hearing. The purpose of the hearing is to provide citizens an opportunity to ask questions about the draft permits and provide DEQ with comments.

Recommendation

DEQ recommends that this site be approved for a Solid Waste Treatment Permit. DEQ staff will regularly inspect Columbia Biogas to assess compliance with the permit and applicable regulations.