TECHNICAL EVALUATION

&

PRELIMINARY DETERMINATION

APPLICANT

City of Jacksonville
Public Works
117 West Duval Street, St. James Building, 4th Floor
Jacksonville, FL 32202

Trail Ridge Landfill
ARMS Facility ID No. 0310358

PROJECT

Draft Permit No. PSD-FL-374C
Project No. 0310358-012-AC
Landfill Gas-to-Energy Project

COUNTY

Duval County, Florida

PERMITTING AUTHORITY

Florida Department of Environmental Protection
Division of Air Resource Management
Office of Permitting and Compliance
2600 Blair Stone Road, MS#5505
Tallahassee, Florida 32399-2400

August 19, 2011

1. GENERAL PROJECT INFORMATION

Facility Description and Location

The existing Trail Ridge Landfill facility is located at 5110 U.S. Highway 301 South in Baldwin, Duval County, Florida. The Trail Ridge Energy, LLC facility is located at the existing Trail Ridge Landfill facility. The Trail Ridge Energy, LLC facility includes six lean-burn spark-ignition reciprocating internal combustion engine (RICE)-generator sets firing landfill gas, is categorized under Standard Industrial Classification (SIC) Code No. 4953, Refuse Systems. The UTM coordinates are Zone 17, 399.873 km East, and 3344.309 km North.

Trail Ridge Landfill is a Class I Municipal Solid Waste (MSW) Landfill consisting of 176 acres. This landfill commenced construction in 1992. Trail Ridge Landfill receives approximately 2,500 - 3,000 tons of waste daily. The site totals 977 acres of land and currently has a 148-acre "footprint" which serves residential and commercial customers.

The nonmethane organic compounds (NMOC) emissions are greater than 50 megagrams per year. Landfill gas (LFG) is directed to an enclosed flare where methane, NMOC and HAPs contained in the gas are destroyed at high temperatures. The facility currently operates two flares – one 5,000 standard cubic feet per minute (scfm) open flare and one 1,600 scfm open flare.

In order to reduce the amount of LFG wasted by flaring, all available LFG from the landfill is supplied to Trail Ridge Energy for use as fuel to power the proposed internal combustion (IC) engine electricity generation plant.

Primary Regulatory Categories

- The facility is not a major source of hazardous air pollutants (HAP).
- The facility has no units subject to the acid rain provisions of the Clean Air Act.
- The facility is a Title V major source of air pollution in accordance with Chapter 213, F.A.C.
- The facility is a major stationary source in accordance with Rule 62-212.400, F.A.C.

Project Description

The City of Jacksonville submitted an application for an air construction permit subject to the preconstruction review requirements of the Prevention of Significant Deterioration (PSD) of Air Quality pursuant to Rule 62-212.400, F.A.C.

The proposed project will add four Caterpillar (CAT) Model G3520C gas IC engines and electricity generators. The four lean-burn IC engines will be connected to individual electricity generators. Each gas IC engine will be connected to a 1,600 kilowatt electricity generator. The plant will have the potential to generate an additional 6.4 megawatts of electricity under base load operating conditions and will be interconnected to the Jacksonville Electric Authority distribution network through a nearby power line.

The LFG fueled IC engines will be housed in a separate building constructed in an area adjacent to the existing building near the LFG collection system header and control system flare. A gas transmission line will be connected to the header of the existing LFG collection system and a dedicated gas blower/compressor is used to draw methane-rich gas (fuel) from the LFG collection system to the electricity generation plant. Ancillary equipment to support the electric generation plant (e.g., fan-cooled radiators, drums for engine radiator coolant and lube oil tanks).

The following existing emissions units will be affected by this project.

ID No.	Description
004-009	Six Caterpillar Model G3520C landfill gas fueled internal combustion engines and electricity generators. Each engine has a power generation rating of 2,233 brake horsepower at 100 percent load. The generator has a power output rating of 1,600 kilowatt. The landfill gas will go through a gas treatment system prior to combustion in the engines.

The following new emissions units will be added by this project.

ID No.	Description
012-015	Four Caterpillar Model G3520C landfill gas fueled internal combustion engines and electricity generators.

Processing Schedule

March 17, 2011 Department received the application for an air pollution construction permit.

April 8, 2011 Department requested additional information.

June 20, 2011 Department received additional information; application complete.

2. APPLICABLE REGULATIONS

State Regulations

This project is subject to the applicable environmental laws specified in Section 403 of the Florida Statutes (F.S.). The Florida Statutes authorize the Department of Environmental Protection to establish rules and regulations regarding air quality as part of the Florida Administrative Code (F.A.C.). This project is subject to the applicable rules and regulations defined in the following Chapters of the F.A.C.: 62-4 (Permitting Requirements); 62-204 (Ambient Air Quality Requirements, PSD Increments, and Federal Regulations Adopted by Reference); 62-210 (Permits Required, Public Notice, Reports, Stack Height Policy, Circumvention, Excess Emissions, and Forms); 62-212 (Preconstruction Review, PSD Review and BACT, 62-213 (Title V Air Operation Permits for Major Sources of Air Pollution); 62-296 (Emission Limiting Standards); and 62-297 (Test Methods and Procedures, Continuous Monitoring Specifications, and Alternate Sampling Procedures). PSD applicability and the preconstruction review requirements of Rule 62-212.400, F.A.C. are discussed in Section 2 of this report. Additional details of the other state regulations are provided in Section 3 of this report.

Federal Regulations

The Environmental Protection Agency (EPA) establishes air quality regulations in Title 40 of the Code of Federal Regulations (CFR). Part 60 identifies New Source Performance Standards (NSPS) for a variety of industrial activities. Part 61 specifies National Emissions Standards for Hazardous Air Pollutant (NESHAP) based on specific pollutants. Part 63 specifies NESHAP provisions based on the Maximum Achievable Control Technology (MACT) for given source categories. Federal regulations are adopted in Rule 62-204.800, F.A.C. Additional details of the applicable federal regulations are provided in Section 3 of this report.

3. PSD APPLICABILITY REVIEW

General PSD Applicability

The Department regulates major stationary sources in accordance with Florida's PSD program pursuant to Rule 62-212.400, F.A.C. PSD preconstruction review is required in areas that are currently in attainment with the state and federal Ambient Air Quality Standards (AAQS) or areas designated as "unclassifiable" for these regulated pollutants. As defined in Rule 62-210.200, F.A.C., a facility is considered a "major stationary source" if it emits or has the potential to emit 5 tons per year of lead, 250 tons per year or more of any PSD pollutant, or

100 tons per year or more of any PSD pollutant and the facility belongs to one of the 28 listed PSD major facility categories. PSD pollutants include: carbon monoxide (CO); nitrogen oxides (NO_X); sulfur dioxide (SO_2); particulate matter (PM); particulate matter with a mean particle diameter of 10 microns or less (PM_{10}); volatile organic compounds (VOC); lead (Pb); Fluorides (Fl); sulfuric acid mist (SAM); hydrogen sulfide (H_2S); total reduced sulfur (TRS), including H_2S; reduced sulfur compounds, including H_2S; municipal waste combustor organics measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans; municipal waste combustor metals measured as particulate matter; municipal waste combustor acid gases measured as SO_2 and hydrogen chloride (HCl); municipal solid waste landfills emissions measured as nonmethane organic compounds (NMOC); and mercury (Hg).

For major stationary sources, PSD applicability is based on emissions thresholds known as the "significant emission rates" as defined in Rule 62-210.200, F.A.C. Emissions of PSD pollutants from the project exceeding these rates are considered "significant" and the Best Available Control Technology (BACT) must be employed to minimize emissions of each PSD pollutant. Although a facility may be "major" for only one PSD pollutant, a project must include BACT controls for any PSD pollutant that exceeds the corresponding significant emission rate. Rule 62-210.200, F.A.C. defines "BACT" as:

> *An emission limitation, including a visible emissions standard, based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account:*
>
> 1. *Energy, environmental and economic impacts, and other costs;*
> 2. *All scientific, engineering, and technical material and other information available to the Department; and*
> 3. *The emission limiting standards or BACT determinations of Florida and any other state; determines is achievable through application of production processes and available methods, systems and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of each such pollutant.*
>
> *If the Department determines that technological or economic limitations on the application of measurement methodology to a particular part of an emissions unit or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice or operation.*
>
> *Each BACT determination shall include applicable test methods or shall provide for determining compliance with the standard(s) by means which achieve equivalent results.*
>
> *In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60, 61, and 63.*

In addition, applicants must provide an Air Quality Analysis that evaluates the predicted air quality impacts resulting from the project for each PSD pollutant.

PSD Applicability for the Project

The project is located in Duval County, which is in an area that is currently in attainment with the state and federal AAQS or otherwise designated as unclassifiable. The facility emits or has the potential to emit 250 tons per year or more of at least one PSD pollutant. Therefore, the facility is a major stationary source and the project is subject to a PSD applicability review. The following table identifies the estimated emissions increases based on the initial application.

Summary of the Applicant's PSD Applicability Analysis

POLLUTANT	POTENTIAL EMISSIONS (TPY) Per Engine	All 4 Engines	PSD SIGNIFICANT EMISSIONS RATE (TPY)	SUBJECT TO PSD REVIEW?
PM	**5.17**	**20.7**	**25**	**N**
PM_{10}[a]	**5.17**	**20.7**	**15**	**Y**
$PM_{2.5}$[a]	**5.17**	**20.7**	**10[b]**	**Y[b]**
SO_2[c]	**4.17**	**16.7**	**40**	**N**
NO_X	**12.9**	**51.7**	**40**	**Y**
CO	**71.2**	**284.6**	**100**	**Y**
VOC	**6.04**	**24.1**	**40**	**N**
HAPS	**0.76**	**3.0**	**25/10**	**N**

Notes:

(a) All front-end PM assumed to also be particulate matter less than 10 microns (PM_{10}) and particulate matter less than 2.5 microns ($PM_{2.5}$).

(b) The Department adopted by reference the federal ambient air quality standard for $PM_{2.5}$, but has not yet promulgated the implementing regulations for PSD preconstruction review (e.g., define $PM_{2.5}$ as a PSD pollutant with a significant emission rate for PSD applicability). The Department is in the process of completing a rulemaking action to implement this remaining piece of the $PM_{2.5}$ program.

(c) The Department will require stack testing to show compliance with the emission limit.

As shown in the table, the project is subject to PSD preconstruction review for emissions of: PM_{10}, $PM_{2.5}$, NO_X and CO in accordance with the provisions of Rule 62-212.400, F.A.C. Therefore, BACT determinations are required for CO, NO_X and PM/PM_{10} emissions. An air quality modeling analysis is required for CO, nitrogen dioxide (NO_2) and PM_{10} emissions.

PROJECT DETAILS

LFG Fuel Requirement/Availability

The Trail Ridge Landfill currently has two existing flares, a 5,000 scfm open flare and a 1,600 scfm open flare, and six gas IC engines. The LFG fuel has a minimum lower heating value (LHV) of 430 Btu/scf (British thermal units per standard cubic foot) and higher heating value (HHV) of 578 Btu/scf, with an average heating value of 472 Btu/scf resulting in approximately 526 scfm of LFG fuel utilization for each engine. The operation of the additional four gas IC engines under base load conditions (100% capacity) will result in average LFG fuel utilization rates of approximately 2,104 scfm and 3.03 million standard cubic feet per day (MMscf/day).

Approximately 6,600 scfm of LFG is currently being controlled by the flaring system, which has a LHV of approximately 443.5 Btu/scf that is expected to be at least 450 Btu/scf at the time full fuel demand is required by the proposed engines. At current waste placement tonnages, the site should be at permitted waste placement capacity in 2015/16. LFG generation estimates predict that a peak gas flow of 5,600 scfm will occur in 2016. An adequate amount of LFG is currently available to fuel the existing 6 engine facility. Historical data indicate that each CAT 3520 uses approximately 520 scfm of LFG, which correlates to 5,200 scfm for the proposed 10

Trail Ridge Energy engines (6 existing and 4 proposed). Landfill gas generation models predict that 5,200 scfm of LFG is expected to be available in approximately 2014. This gas extraction rate is adequate to fuel and power the additional two of the four IC engine/generators proposed for installation at Trail Ridge Energy. It is not known when there will be additional LFG to support the operation of the other two IC engine/generators. The LFG generation model indicates that the Trail Ridge Landfill may produce additional quantities of LFG to support the operation of the proposed four IC engine/generator sets based on permitted capacity and waste placement values, however there are uncertainties in the information calculated with these tools. Therefore, construction activities for the installation and operation of the two IC engine/generator sets will be evaluated at future dates based on the sufficient quantities of additional LFG fuel. The permittee will provide requests for permit extensions should they be determined to be necessary. The permittee has been made aware of the source obligation rule in 62-212.400(12)(a), F.A.C. Authorization to construct shall expire if construction is not commenced within 18 months after receipt of the permit or if construction is discontinued for a period of 18 months. The permittee will be required to submit construction schedule for the four IC engine/generators.

The existing LFG flaring system will be periodically operated during periods of equipment downtime and maintenance, and continually operated when future LFG collection and extraction rates (from new waste placement) exceed the fuel supply requirement of the installed and operated engines.

Treatment of Landfill Gas

The equipment and processes used to treat (dewater, filter and compress) the collected landfill gas prior to its combustion as fuel in the proposed engines consists of the following.

- Landfill gas passes through the suction separator, which is used for moisture knockout and mechanically filters the gas in the initial portion of the treatment system.
- Landfill gas enters the blowers, which supply the compressor. The heat of compression increases the temperature of the gas.
- Landfill gas in excess of the engines design capacity bypasses the treatment system prior to being routed to the flares for destruction.
- Landfill gas is dewatered by cooling the gas in the after-cooler to condense remaining water vapor in the landfill gas.
- Landfill gas passes through a coalescing filter to remove particles down to 1 micron. The cooled and filtered gas is then reheated in the re-heater/economizer to vaporize any remaining moisture before being fired in the engines.

Engine/Generator Specifications (Emission Unit ID Nos. 012-015)

Four identical lean-burn IC engines, CAT Model G3520C gas IC engines will be used to power electricity generators. Each engine will have the following specifications:

1. Is designed to fire low-pressure, lean fuel mixtures and produce low combustion by-product emissions. The engine is equipped with an air-to-fuel ratio controller that monitors engine performance parameters and automatically adjusts the air-to-fuel ratio and ignition timing to maintain efficient fuel combustion, which minimizes air pollutant emissions.
2. Will be fueled exclusively with LFG generated by and received from the Trail Ridge Landfill (natural gas will not be used to fuel the IC engine operations under any conditions).
3. Will fire a maximum of approximately 526 scfm of landfill gas.
4. Has a power generation rating of 2,233 brake horsepower (bhp).
5. Will be connected to a 1,600 kW electricity generator.

6. The maximum fuel consumption rate of each engine is 526 scf per minute or 31,600 scf per hour.
7. The heat content ranges from 476 Btu/scf to 594 Btu/scf on a higher heating value (HHV) basis. The average HHV heat content since Trail Ridge Energy has been in operation is 527 Btu/scf. The LFG fuel heat content on a lower heating value (LHV) basis ranges from 430 Btu/scf to 535 Btu/scf. The average LHV heat content is 472 Btu/scf. Based on a landfill gas heating value of 500 Btu per scf, the heat input rating for each engine is 17.64 million Btu (MMBtu) per hour.

The proposed addition of the four engine/generator sets to the facility will result in a total electricity generation capacity of 16,000 kW (16 MW) with all ten engine/generator sets. Emissions produced by the combustion of LFG fuel in the four gas IC engines will be released into the ambient air through individual stacks connected to the engine exhaust manifolds. A noise muffler will be installed on each engine exhaust stack. The fuel combustion system exhausts and noise mufflers will be located on the roof of the building that houses the engines. The engines will be housed in an enclosed building adjacent to the existing power generating building. Each engine exhaust stack is 23-feet tall.

New Source Performance Standards (NSPS) Provisions

The landfill gas engines and generator sets are subject to applicable NSPS provisions in 40 Code of Federal Regulations (CFR) 60 for Subpart A (General Provisions) and Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines). These regulations establish operating limitations and emissions standards for CO, NO_X and VOC. The vendor, Caterpillar, will not certify the CAT G3520C engines when burning landfill gas as fuel. Therefore, the engines must meet the following emission standards required by 40 CFR 60.4233(e), as defined by Table B of this subpart.

Table B: CAT G3520C Emission Limits

Pollutant	NSPS Subpart JJJJ Emission Standards	Proposed Limits	Regulation
CO	5.0 g/bhp-hr	3.5 g/bhp-hr	Rule 62-212.400(BACT), F.A.C.
NO_X	3.0 g/bhp-hr	0.6 g/bhp-hr	Rule 62-212.400(BACT), F.A.C.
VOC	1.0 g/bhp-hr	0.28 g/bhp-hr (1.38 lb/hour)	Rule 62-212.400(12), F.A.C., Avoids PSD Review

The engines must be tested to demonstrate compliance with these emissions standards. The draft permit will identify NSPS Subpart A and JJJJ in the Appendices.

In addition, the existing landfill gas collection and control system must meet the applicable requirements of the following NSPS provisions: Subpart A (General Provisions) and Subpart WWW (Standards of Performance for Municipal Solid Waste Landfills) in 40 CFR 60. When operating, the CAT G3520C engines will serve as the control device to meet the applicable NSPS Subpart WWW requirements.

National Emission Standards for Hazardous Air Pollutants (NESHAP) Provisions

The reciprocating IC engine National Emission Standards for Hazardous Air Pollutants (RICE NESHAP, 40 CFR Part 63 Subpart ZZZZ) applies to major sources of HAPs that operate RICE rated for 500 bhp or greater. Major is defined as a facility that has the potential to emit in excess of 25 TPY of any combination of HAP compounds or 10 TPY of any single HAP. The individual RICE will have power ratings that exceed 500 bhp. However, the maximum HAP emissions will be limited to less than the major facility thresholds. Therefore, the proposed facility is not subject to the emission limitations and operating limitations but will be subject to the initial notification, reporting and recordkeeping requirement of the subpart applicable NESHAP provisions in 40 CFR 63 for Subpart A (General Provisions) and Subpart ZZZZ (Reciprocating Internal Combustion Engines).

Pursuant to 40 CFR 63.6590, these units comply with NESHAP Subpart ZZZZ by complying with NSPS Subpart JJJJ. The draft permit will identify NESHAP Subpart A and ZZZZ in the Appendices.

Emission Standards

Trail Ridge Energy provided Ocean Energy Corp's monitoring results of the same equipment and the Best Available Control Technology (BACT) analysis, the applicant proposes the following maximum emission rates for the CAT G3520C engines:

- NO_X: 0.60 grams per brake-horsepower hour (g/bhp-hour)
  2.95 lb/hour and 12.9 TPY per engine
  51.7 TPY for all four engines
- CO: 3.3 g/bhp-hour
  17.2 lb/hour and 75.3 TPY per engine
  301.2 TPY for all four engines
- VOC/NMOC: 0.28 g/bhp-hour
  1.38 lb/hour and 6.0 TPY per engine
  24.2 TPY for all four engines
- $PM/PM_{10}/PM_{2.5}$: 0.24 g/bhp-hour
  1.18 lb/hour and 5.17 TPY per engine
  20.7 TPY for all four engines
- SO_2: 164.2 ppmv of H_2S and 526 scfm
  0.95 lb/hour and 4.17 TPY per engine
  16.6 TPY for all four engines

Potential CO, NO_X and $PM/PM_{10}/PM_{2.5}$ emissions were based on the results of BACT analyses. These emissions were estimated using emission factors developed based on operating similar units at Ocean Energy Corp. and CAT G3520C engine/generator specifications. VOC emissions were based on a voluntary limitation that is 90% of the 40 TPY significant emission thresholds listed in Rule 62-210.200(264), F.A.C.

Sulfur dioxide (SO_2) emissions can be produced during the combustion of landfill gas since it contains sulfur-bearing compounds (such as hydrogen sulfide (H_2S)) that are oxidized at normal engine operating temperatures. The H_2S concentration for LFG samples obtained in 2008 and 2009 ranged from 34.1 to 54.1 ppmv. The maximum H_2S concentration results in a calculated SO_2 emission factor of 13.98 lb/MMcf based upon the complete conversion of sulfur to SO_2. Potential SO_2 emissions were estimated based on a maximum H_2S content of the landfill gas of 164.2 ppmv due to potential variability of H_2S in LFG. This limit allows the facility to avoid PSD review with the four proposed engine/generator sets at 16.6 TPY of SO_2 emissions. It is assumed that all the H_2S is converted to SO_2 during combustion of the landfill gas.

Hazardous Air Pollutants

Hazardous Air Pollutants (HAP) as specified in Rule 62-210.200(155), F.A.C are produced during the combustion of landfill gas to be used as fuel by the internal combustion engines since:

1. HAP compounds are present in the gas generated by Trail Ridge Landfill and the fuel combustion process is not 100% complete (ie. a small portion of the HAPs pass through the fuel combustion system).
2. When combusted, chlorinated compounds present in landfill gas can form hydrogen chloride (HCl), which is a regulated HAP.

The emission rate of HCl from each engine/generator set is limited to 5.9 lb/MMscf and 0.90 TPY in the permit to maintain the facility as a minor source of HAP emissions with total HCl emissions limited to 9.0 TPY. The table below shows the actual HCl emissions from stack tests.

Emission Unit	Year	HCl emissions (lb/MMscf) Each Engine	HCl emissions (lb/hr) Each Engine	HCl emissions (TPY) Each Engine	HCl emissions (TPY) Ten Engines
004	2009	0.68	0.02	0.0876	0.876
006	2010	1.4	0.044	0.192	1.92
002	2011	0.97	0.037	0.162	1.62

Other site-specific HAP content analyses have not been performed on the landfill gas generated by Trail Ridge Landfill. Therefore, data developed by EPA in AP-42, Section 2.4 (Table 2.4-1) were used to estimate the total potential HAP content of the landfill gas to be used as fuel. Based on the maximum operating scenarios, the applicant estimates total annual HAP emissions (all ten engines plus flares) to be 7.6 tons per year (TPY) and is well under the 25 TPY thresholds.

Flares (Emission Unit ID Nos. 010-011)

The two existing flares consist of:

Open Flare (EU 010): The 5,000 scfm open, non-assisted flare was installed in 2006. The open flare stack is feet in diameter with a height of feet above ground. The flare is subject to a minimum exit velocity requirement of 18.3 meters per second. The flare is designed for an overall 98% destruction efficiency of total hydrocarbons at a design flow with a landfill gas methane content of 40% to 60%.

Open Flare (EU 011): The 1,600 scfm enclosed flare was installed in 2006. The open flare stack is 9 inches in diameter with a height of 31feet above ground. The flare is subject to a temperature requirement of 1,400° F - 2000° F. At the maximum flow rate of 1,600 scfm, the flare has a maximum hourly design rate of 42.58 MMBtu/hr using a landfill gas heating value of 443.5 BTU/scf. The flare has an estimated destruction and removal efficiency of 98 percent of NMOCs.

The flares will operate under the following scenarios: when the engines are not available because of downtime or maintenance; or when landfill gas is generated in excess of the design fuel requirements of the proposed engines. The landfill gas will not be treated when combusted in the flares.

<u>NSPS Provisions</u>

The existing Trail Ridge Landfill is subject to the following applicable provisions: NSPS Subparts A (General Provisions) and WWW (Standards of Performance for Municipal Solid Waste Landfills) in 40 CFR 60. The existing flares have met the applicable requirements of these subparts. The draft permit will authorize the relocation of these flares, but will not change any currently applicable requirements with regard to these regulations.

<u>NESHAP Provisions</u>

The existing Trail Ridge Landfill is subject to the following applicable NESHAP provisions: Subpart M (Standards for Asbestos) in 40 CFR 61; and Subparts A (General Provisions) and AAAA (National Emission Standards for Hazardous Air Pollutants for Municipal Solid Waste Landfills) in 40 CFR 63. The existing flares have met the applicable requirements of these subparts. The draft permit will authorize the relocation of these flares, but will not change any currently applicable requirements with regard to these regulations.

4. DEPARTMENT REVIEW

Carbon Monoxide – Existing Engines (Emission Unit ID Nos. 004-009)

Emissions data from Caterpillar indicates a not to exceed (NTE) CO emissions limit of 4.13 g/bhp-hr. Annual compliance tests conducted at the facility over the past three years report CO emissions ranging between 2.23 and 2.40 g/bhp-hr. While these CO compliance test results are significantly less than the manufacturers NTE limit, variability in the LFG fuel methane content and engine maintenance cycles will have a significant impact on projected emissions in the future.

The original CO BACT determination was based on the engine design and good combustion practices (including maintenance). The Department is unaware of any new control equipment that would be cost effective. The LFG contains siloxanes, which are silica compounds that form glass-like deposits on the pistons, cylinders, valves, intake manifold and exhaust manifolds of the engine. These deposits degrade the performance of the engine and extensive maintenance is required to restore the combustion equipment to proper operation. As the engine performance degrades, it is difficult to maintain the engine tuned for low CO and NOx emissions.

In support of this concept, the Department found a recent white paper report by the Bay Area Air Quality Management District (BAAQMD) titled, "Revisiting BACT for Lean-Burn Landfill Gas Fired Internal Combustion Engines" from February of 2009. The study discovered that the variability in engine combustion efficiency was not being accounted for since, "… *CO deterioration during the year is not typically detected nor limited*". Existing BACT emissions limits "achieved in practice" were based on once per year compliance tests. Such tests do not account for variability of emissions due to degraded engine performance resulting from siloxane deposits on combustion surfaces. In addition, existing BACT limits were "… *established based on early, limited source test data for digester gas fired engines …*" and as such, are not appropriate for LFG combustion engines. Wastewater digestor gas has higher methane content than LFG meaning that it also has a higher amount of energy per unit volume. The BAAQMD concluded that "… *Our discussions with waste gas engine operators leads us to believe that engines generally perform at their best after overhaul events and that combustion performance tends to deteriorate as siloxane deposits form throughout the combustion surfaces."* The white paper concluded "… *it is apparent that:*

1. *it is normal for CO emissions to increase as the engines are operated, and*
2. *establishment of not to exceed limits based on a nominal rate of CO increase would seem to be a reasonable approach for these engines, and*
3. *additional monitoring is needed to ensure that the engines get needed maintenance in a timely fashion. Engine maintenance events may not have a significant impact on NOx emissions, but for landfill gas engines, regular maintenance is of paramount importance for minimizing CO emissions*." The BAAQMD recommends a NTE emissions limit of 3.6 g/bhp-hr for low-CO biased engines.

The Department also agrees that additional flexibility with CO emissions is necessary to concurrently maintain and tune the engines for low NOx emissions. Therefore, the current CO BACT emission standards for each existing engine/generator set will be revised as follows:

- From 2.75 to 3.5 g/bhp-hr;
- From 13.54 to 17.2 lb/hour; and
- From 59.3 to 75.3 tons/year.

5. BEST AVAILABLE CONTROL TECHNOLOGY (BACT) DETERMINATION

The project to install four landfill gas engines is a physical modification of the facility. As previously described, the project is subject to PSD preconstruction review for CO, NO_X and $PM/PM_{10}/PM_{2.5}$ emissions from the landfill gas engines (Emission Unit ID Nos. 006-011).

General Discussion of Emissions

The CAT G3520C engines are the primary source of CO, NO_X and PM_{10} emissions from this project. Table C summarizes the potential annual emissions produced from the engines.

Table C: Potential Annual Emissions

Pollutant	Tons/Year	
	FOUR PROPOSED CAT G3520C Engines	TEN (PROPOSED AND EXISTING) CAT G3520C Engines
CO	301.2	753
NO_X	51.7	129.2
PM_{10}	20.7	51.7

The applicant reviewed data in EPA's RACT/BACT/LAER Clearinghouse (RBLC) to identify control technology determinations for the operation of reciprocating internal combustion engines firing landfill gas. The following table summarizes this information.

Table D: CO, NO_X and PM BACT Determination for landfill gas fired internal combustion engines.

Facility	Engine Type and Size	Date	Control Method CO/NO_X	Type	g/bhp-hour		
					CO	NO_X	PM_{10}
Sampson County Disposal, LLC (NC)	CAT 3520 2233 HP	09/09/2009	GCP	BACT	2.75	0.5	0.15
Pine Tree Landfill (ME)	LFG-ICE 1359 HP	10/15/2007	---	BACT	2.75	0.65	---
University of New Hampshire (NH)	LFG-ICE 2233 HP	07/25/2007	Combustion Controls	BACT/LAER	2.75	0.5	0.10
Waste Management Midpenn (VA)	CAT 3516 1148 HP	05/29/2007	GCP	BACT	2.7[a]	1.45[a]	1.52[b]
Brevard Energy, LLC (FL)	CAT 3520 2233 HP	06/21/2011	GCP	BACT	3.5	0.6	GCP
Seminole Energy, LLC (FL)	CAT 3520 2146 HP	01/17/2007	GC	BACT	2.75	0.6	0.24
Monmouth County Reclamation Center (NJ)	LFG-ICE 1468 HP	12/12/2006	---	CBC/LAER	2.53	0.53	0.12
Manchester Renewable	CAT	10/06/2006	A/F Controller	BACT/LAER	2.75	0.5	0.20[b]

Facility	Engine Type and Size	Date	Control Method CO/NO_X	Type	g/bhp-hour		
					CO	NO_X	PM_{10}
Power Corp. (NJ)	2233 HP						
Burlington County Resource Recovery (NJ)	Jenbacher 2012 HP	08/03/2006	GCP	CBC/LAER	2.5	0.6	0.16
Trail Ridge Energy, LLC (FL)	CAT 3520 2233 HP	02/24/2006	GC	BACT	2.75	0.6	0.24
Ridgewood Rhode Island Generation (RI)	CAT 3520 2229 HP	01/05/2005	A/F Controller	BACT/LAER	2.75	0.5	0.10
Bio Energy Texas, LLC (TX)	CAT 3520 2172 HP	07/23/2004	Lean Burn Design	BACT	2.8	0.6	0.15
Carlton Farms Landfill (MI)	LFG-ICE 1095 HP	12/23/2003	GCP				
Northwest Regional Landfill (AZ)	LFG-ICE 1410 HP	10/27/2003	Proper Operation & Maintenance	BACT	2.5	0.6	---
Carbon Limestone LFG (OH)	LFG-ICE 1877 HP	04/10/2003	Lean Burn Design	BACT	2.27	1.2	0.097
Chino Basin Desalter Authority (CA)	LFG/DG-ICE 1408 HP	06/18/2002	A/F Controller	BACT	2.5	0.6	0.049
MM San Bernardino Energy (CA)	LFG-ICE 1850 HP	05/16/2002	A/F Controller	BACT	2.5	0.6	---
Reliant Security LFGTE (TX)	Jenbacher 2231 HP	01/31/2002	GCP	BACT	3.0	0.6	0.039
Reliant Energy Galveston Plant (TX)	Jenbacher 2343 HP	01/24/2002	---	CBC	3.0	0.6	0.095

Abbreviations: Horsepower (HP); Landfill Gas (LFG); Internal Combustion Engines (ICE); Case-By-Case (CBC); Good Combustion Practices (GCP); Good Combustion (GC); and Air/Fuel Controller (A/F Controller)

a. Project shows BACT limit for CO as 239 tons/year and NO_X as 128.30 tons/year, conversion done for 8 engines operating 8,760 hours/year.

b. BACT limit for $PM_{2.5}$ also.

The specified CO and NO_X BACT/LAER determinations are applicable to the operation of lean-burn engines with air-to-fuel ratio control. The proposed CAT G3520C engines have a power rating of 2,233 bhp. As shown in the table, for landfill gas engines rated greater than 1,100 bhp and less than 2,400 bhp, the CO BACT ranges from 2.27 to 3.5 g/bhp-hour. The corresponding NO_X BACT/LAER range from approximately 0.5 to 0.6 g/bhp-hour. It is important to note that the low CO BACT determination of 2.27 g/bhp-hour corresponds to a NO_X BACT standard of 1.2 g/bhp-hour.

BACT Emission Limits Proposed by Applicant (per Engine)

Pollutant	Emission Limit	Control Technology
CO	3.3 g/bhp-hr and 17.23 lb/hour	Lean-burn engine with air-to-fuel controller
NO_X	0.6 g/bhp-hr and 2.95 lb/hour	Lean-burn engine with air-to-fuel controller
PM_{10}	0.24 g/bhp-hr and 1.18 lb/hour	Pretreatment of landfill gas and good combustion practices

BACT for CO and NOx

Combustion byproducts are generally controlled by an efficient combustion design, but catalytic technologies are available for reducing these emissions. Since CO and NO_X emissions are related combustion byproducts, these pollutants will be grouped together for convenience of review.

Identification of Control Technologies

The applicant provided the following control technologies:

- *Combustion Design and Air-Fuel Controllers:* The design and operation of the combustion chamber is the primary mechanism in controlling CO emissions. The CAT G3520C engines are designed for high-combustion efficiency to extract the most useful energy from the landfill gas possible, which will minimize CO emissions. Combustion controls include technologies designed to limit the formation of CO and NO_X by controlling the combustion temperature and the mixing of air and fuel in the combustion zone. Combustion controls for NO_X include injection timing retard, pre-ignition chamber combustion, controlling air-to-fuel ratio, or de-rating of the engine. The primary NO_X control is a lean-burn combustion design, which uses approximately 75% more air than needed for complete combustion into the combustion chambers. The weak air-fuel mixture leads to lower combustion temperatures and therefore reduces thermal NO_X formation. The proposed CAT G3520C engines are lean-burn engines equipped with an electronic air-fuel ratio controller that will minimize incomplete combustion and maintain a proper balance between CO and NO_X emissions.
- *Oxidation Catalyst:* In the presence of an oxidation catalyst at a given temperature, excess oxygen in the exhaust reacts with CO to form CO_2. This option includes non-selective catalytic reduction (NSCR). The primary design is a flow through exhaust device that contains a honeycomb structure covered with a layer of chemical catalyst that operates at high temperatures. This layer contains small amounts of precious metal that promote the complete oxidation of pollutants in the exhaust stream. This control device will reduce CO emissions as well as VOC emissions, depending on the type and concentration. Destruction efficiencies for CO and VOC emissions can be greater than 90%.
- *Selective Catalytic Reduction (SCR):* The basic principle of SCR is the injection of ammonia (NH_3) into the exhaust stream prior to a catalyst. In the presence of a catalyst, ammonia and NO_X will be reduced to nitrogen (N_2) and water vapor (H_2O). Several different catalysts are available for use at different exhaust gas temperatures. Such systems can also include an oxidation catalyst for CO reduction. Removal efficiencies may be greater than 90%.
- *Regenerative Selective Catalytic Reduction (RSCR):* Regenerative selective catalytic reduction is a new technology targeted for tail-end applications. RSCR utilizes beds of ceramic media to retain the temperature of the flue gas in the optimum range for the catalytic reaction (approximately 300º F to 400º F), which is a key operating parameter for effective NO_X removal. Such systems are capable of 95% heat recovery, which minimizes operating costs while reducing NOx emissions by 80% to 90% or more. Such systems can also include an oxidation catalyst for CO reduction.

- *Selective Non-Catalytic Reduction (SNCR)*: Selective non-catalytic reduction uses ammonia injection into the high temperature combustion zone or flue gas. This is a post-combustion control technology that reduces NO_X to nitrogen and water vapor. The chemical reaction for this technology is driven by high temperatures (1600ºF to 2100ºF) normally found in combustion sources. Removal efficiencies may be greater than 50% depending on the application.

Discussion of Technically Infeasible Control Options and Ranking of Remaining Options

Landfill gas contains siloxanes, which are a class of compounds that exist in the form of R_2SiO, where R is a hydrogen atom or a hydrocarbon and Si is silicon. Siloxanes are present in certain landfill waste streams such as toiletries, cosmetics and other personal grooming items. When combusted, such compounds produce silica (SiO_2), which can quickly poison a catalyst rendering it ineffective. A separate treatment system to remove SiO_2 would be necessary to avoid the adverse effects of deposits and the rapid decrease in reactivity of the catalyst.

The California Air Resource Board (CARB) has developed and published *Guidance for the Permitting of Electrical Generation Technologies* in July 2002, to assist companies and organizations in the permitting of electrical generating equipment. In this guidance document, CARB:

- Recognizes the benefits of generating electricity from waste gases (landfill and digester gas) and the recovery of useful energy.
- Indicates that waste gases "… contain impurities that, if combusted will likely poison catalyst-based post combustion control systems."
- Determines that additional fuel treatment and post combustion controls have limited success and/or have not been proven to be cost effective in reducing air pollutant emissions from waste combustion applications.

Other state regulatory agencies (e.g., Texas, Rhode Island and New Jersey) have made similar determinations and issued permits that specify BACT for LFG-fueled engines that do not include the use of add-on emission controls because of catalyst poisoning by siloxanes. Such poisoning leads to poor reduction efficiencies and eventually destruction and early replacement of the catalyst. In the preamble to the NSPS for Stationary Spark Ignition Internal Combustion engines and the NESHAP for Reciprocating Internal Combustion Engines, EPA agrees siloxanes will poison the catalyst in add-on control technologies such as SCR, NSCR and oxidation catalysts, which makes the equipment ineffective in a very short period of time.

To employ a catalytic technology would require a siloxane removal system. For a previous project the Department contacted Applied Filter Technology (AFT), which has been active in the biogas-to-energy business since 1996 and has 167 biogas-to-energy systems in operation around the world. For ten years, the AFT siloxane removal systems have primarily been used in conjunction with combustion turbines to achieve guaranteed LFG specifications that are intended to protect the combustion turbines, which operate within close mechanical tolerances. The percentage of siloxane removal required for protecting a combustion turbine is much less than the siloxane removal efficiency required for protecting a catalyst. In addition, AFT does not have any experience in using the siloxane removal system for engines and the protection of the catalyst used in add-on control. It appears that a siloxane removal system that can protect the landfill gas engines as well as the control catalyst is still on the horizon.

In September of 2010, the Trail Ridge Landfill reported a siloxane level of 21 ppm (1.6 micrograms (ug)/Btu), which is higher than the level recommended by the engine manufacturer, Caterpillar (0.60 ug/Btu). This will mean more frequent preventative maintenance as well as major maintenance overhauls. Therefore, add-on control technologies using a catalyst are considered technically infeasible for this project due to premature deactivation by siloxanes. Also, SNCR is not feasible for the landfill gas engines because there is no high-temperature window that will forward this chemical reaction. The remaining control option is combustion design and controls. As previously shown by the applicant, data in the RBLC database (2002 – 2009) supports

the lean-burn combustion design, air-fuel controller and good combustion practices as BACT for landfill gas engines.

Selection of BACT and Rationale

The applicant proposes to use efficient combustion design and air-fuel controllers to establish BACT for CO as 3.3 g/bhp-hour and for NOx as 0.6 g/bhp-hour. As shown in previous Table D summarizing BACT standards posted in the RBLC database, the range of previous CO BACT standards is 2.27 to 3.5 g/bhp-hour and NOx BACT standards is 0.5 to 1.45 g/bhp-hour. The applicant's proposed limits are based on operating similar landfill gas-fired engines and the ambient temperatures by Ocean Energy Corp. Caterpillar LLC states that a nominal CO emission rate from the CAT G3520C engines is 2.5 g/bhp-hour; however, this is only representative of the first 100 hours of operation. Caterpillar LLC also specifies a "not to exceed" limit of 4.13 g CO/bhp-hour at 100% load. The proposed limits are lower than NSPS Subpart JJJJ emissions standards of 5.0 g CO/bhp-hour and 2.0 g NOx/bhp-hour.

For several previous projects using the CAT G3520C engines firing landfill gas, the Department established CO BACT as 2.75 g/bhp-hour and NOx BACT as 0.6 g/bhp-hour, which were based on the applicant's proposals as well as the efficient combustion design and air-fuel controllers. The engines have been installed and are in operation. Other applicants have approved draft permits to increase the CO emissions standards stating that the gradual degradation of the engines will cause higher CO emissions. The Department reconsidered these previous determinations because of the inverse relationship between CO and NOx emissions. In other words, an engine can be tuned to achieve low NOx emissions at the price of higher CO emissions or vice versa. The Department has approved in draft permits BACT for CO as 3.5 g/bhp-hour for Brevard Energy and Medley Landfill.

In 2009, the Bay Air Quality Management District issued a white paper[1] discussing this very issue. Based on actual test data (62 individual tests) for firing landfill gas in three types of spark-ignited reciprocating internal combustion engines (15 total engines), the report indicates the following:

- The engines were annually demonstrating compliance with the CO and NOx standards; however, this appeared to be more of a function of careful preparation of the engine for the annual test rather than the design of the engine.
- The same engine type could be "biased for low NOx emissions" (0.5 g NOx/bhp-hour or less with greater than 2.1 g CO/bhp-hour) or "biased for low CO emissions" (2.1 g CO/bhp-hour or less with greater than 0.5 g NOx/bhp-hour) depending on the air-fuel controller.
- The exhaust from some of the tested engines was periodically monitored throughout the year by hand-held portable probes. This data showed degradation with regard to CO emissions such that many engines were frequently in excess of the CO standard. The report indicates a gradual CO increase of up to 1.5 g/bhp-hour over a year of operation.

The conclusion of the report is that CO and NOx emissions standards should be paired when relying on combustion design and control. As shown below, the Bay Air Quality Management District chose to establish standards based on a low NOx bias or a low CO bias and then allow the CO standard to increase approximately 1.5 g/bhp-hour over a year of operation calling the upper CO standard a "not to exceed (NTE)" limit:

Low NOx Bias:	NOx:	0.5 g/bhp-hour
	CO:	2.5 g/bhp-hour (and NTE 3.9 g/bhp-hour)
Low CO Bias:	NOx:	0.6 g/bhp-hour
	CO:	2.1 g/bhp-hour (and NTE 3.6 g/bhp-hour)

[1] "Revisiting BACT for Lean Burn Landfill Gas Fired Internal Combustion Engines"; Toxics Section, Engineering Division, Bay Air Quality Management District; February 26, 2009.

The applicant's proposed BACT limits of 3.3 g CO/bhp-hour and 0.6 g NOx/bhp-hour appear to be in line with this concept and is based on actual performance of these engines at Ocean Energy Corp. and other facilities. The Department has established a BACT limit of 3.5 g CO/bhp-hour for the same engine/generator sets at other facilities in Florida. Therefore, considering all available information, the Department establishes the following preliminary paired BACT standards for the proposed engines:

CO: 3.5 g/bhp-hour and 17.2 lb/hour (initial and annual EPA Method 10 stack test)
NOx: 0.6 g/bhp-hour and 3.0 lb/hour (initial and annual EPA Method 7E stack test)

This will allow the engines to be tuned for NOx emissions while providing adequate room for reasonable CO emission levels.

BACT for Particulate Matter

Identification of Available Control Technologies

"Smoke" is defined as the collection of airborne solid and liquid particulates and gases emitted as products of incomplete combustion. In AP-42 Section 3.3, EPA identifies two types of smoke that may be emitted from internal combustion engines during stable operations: blue smoke and black smoke, both indicate problems with the engine operation. Blue smoke is emitted when lubricating oil leaks (result from normal wear on piston rings and seals) into the combustion chamber of the engine and is partially burned. Black smoke is agglomerated carbon particles (soot) formed in regions of the combustion mixtures that are oxygen deficient. Black smoke reflects inefficient combustion. Proper maintenance is the most effective method of preventing blue smoke emissions from all types of internal combustion engines, while proper design minimizes black smoke. The applicant identified the following control techniques for reducing and minimizing particulate matter emissions from the engines.

- *Fuel Pre-Treatment (Filtration):* The landfill gas will be pre-treated to remove moisture and condensable impurities as well as filtered to remove particulate matter before combustion.
- *Good Combustion Practices:* The primary options for reducing and minimizing particulate matter emissions from the engines typically include optimizing the design of the combustion chamber, implementing practices that improve the oxidation process to minimize incomplete combustion and proactive maintenance, which are collectively referred to as good combustion practices.
- *Add-On Controls (Filtration):* Wet or dry filtration equipment could be added to capture and filter the exhaust gas to remove particulates.

Identification of Technically Feasible Control Alternatives and Ranking

According to Section 2.4 in AP-42 (Municipal Solid Waste Landfills), data posted in the RBLC database, and other recent permits and permit applications, no add-on controls have been required for reducing particulate matter from engines firing landfill gas. Landfill gas contains siloxanes, which are oxidized to silicon dioxide during combustion. This abrasive substance is also very sticky and can clog add-on controls such as fabric filters making them inoperable in a short period of time. As previously discussed, the technology to remove siloxane from landfill gas for engines is just emerging. In addition, satisfactory pretreatment of the landfill gas makes it cost prohibitive to install add-on particulate controls and/or a siloxane removal system. Therefore, post-combustion add-on control technologies are not considered appropriate for internal combustion engines. Therefore, the combination of fuel pre-treatment combined with good combustion practices is selected as the top control option.

Selection of BACT and Rationale

As shown in previous Table D summarizing BACT standards posted in the RBLC database, the range of previous BACT for particulate matter ranges from 0.039 to 1.52 g/bhp-hour. Florida's most recent BACT determination for a similar landfill gas engine was 0.24 g/bhp-hour based on fuel pretreatment and good

combustion practices. Although initial stack tests for particulate matter emissions from new landfill gas engines have been very low (< 0.1 g/bhp-hour), subsequent tests on the same equipment tend to show higher emission levels with increased engine operating hours. Based on operating experience, Caterpillar, Inc. confirms an increase in particulate matter resulting from normal wear and tear on piston rings and seals. Therefore, the Department establishes the following work practice standards as the preliminary BACT determination for particulate matter from the engines:

- The permittee shall install, operate and maintain a landfill gas pretreatment system to dewater, compress and filter (down to 1 micron) the landfill gas prior to combustion in the engines.
- The permittee shall implement the following good combustion practices to minimize particulate matter emissions: lean-burn combustion design, efficient combustion through the air-fuel controller and preventive and periodic maintenance in accordance with the requirements of NSPS Subpart JJJJ.
- As determined by EPA Method 9, visible emissions from the landfill gas engines shall not exceed 10% opacity.

The above work practice standards should achieve a particulate matter (PM/PM_{10}) emission rate of less than 0.24 g/bhp-hour.

Discussion of $PM_{2.5}$ Emissions

The Department adopted by reference the federal ambient air quality standard for $PM_{2.5}$, but has not yet promulgated the implementing regulations for PSD preconstruction review (e.g., define $PM_{2.5}$ as a PSD pollutant with a significant emission rate for PSD applicability). We are in the process of completing a rulemaking action to implement this remaining piece of the $PM_{2.5}$ program. The draft permit includes the following requirements, which address $PM_{2.5}$ emissions:

- Use of landfill gas as the only fuel;
- Requirement to pre-treat the LFG with filtration down to 1 micron prior to combustion;
- Sampling, analysis and reporting requirements to ensure that the project remains minor with respect to SO_2 emissions, which is a precursor of $PM_{2.5}$ emissions; and
- Establishing a NOx standard of 0.6 g/bhp-hour (another precursor of $PM_{2.5}$ emissions), which is 80% below the applicable 2008 NSPS Subpart JJJJ limitation of 3.0 g/bhp-hour.

Also, regional SO_2 and NOx emissions (precursors of $PM_{2.5}$ emissions) have dramatically decreased in recent years due to regulatory programs such as the Clean Air Interstate Rule (CAIR). For additional details, see the discussion under the "Additional Impacts Analysis" (page 23) in the Air Quality Analysis in Section 6 of this Technical Evaluation and Preliminary Determination. The Department believes that these techniques and limitations effectively minimize $PM_{2.5}$ emissions.

6. OTHER REQUIREMENTS

Based on the PSD applicability analysis, increased emissions of SO_2 (16.6 tons/year) and VOC (24.2 tons/year) are just below the PSD significant emission rates. Emissions of SO_2 may vary greatly depending on the wastes being land filled. Therefore, the draft permit requires semiannual sampling, analysis and reporting to ensure the SO_2 emissions remain minor with respect to this project. The VOC emissions will be a function of the combustion controls and compliance with the CO BACT standard will ensure low VOC emissions. The draft permit specifies the NSPS Subpart JJJJ limit of 1.0 g VOC/bhp-hour as well as a limit of 1.38 lb VOC/hour to avoid PSD preconstruction review.

7. AIR QUALITY IMPACT ANALYSIS

This section provides a general overview of the modeling analyses required for PSD preconstruction review

followed by the specific analyses required for this project.

Overview of the Required Modeling Analyses

Pursuant to Rule 62-212.400, F.A.C., the applicant is required to conduct the following analyses for each PSD significant pollutant:

- A preconstruction ambient air quality analysis,
- A source impact analysis based on EPA-approved models, and
- An additional impact analyses.

Preconstruction Ambient Monitoring Analysis

Generally, the first step is to determine whether the Department will require preconstruction ambient air quality monitoring. Using an EPA-approved air quality model, the applicant must determine the predicted maximum ambient concentrations and compare the results with regulatory thresholds for preconstruction ambient monitoring, known as de minimis air quality levels. The regulations establish de minimis air quality levels for several PSD pollutants as shown in the following table. For ozone, there is no de minimis air quality level because it is not emitted directly. However, since NO_2 and VOC are considered precursors for ozone formation, the applicant may be required to perform an ambient impact analysis (including the gathering of ambient air quality data) for any net increase of 100 tons per year or more of NO_2 or VOC emissions.

If the predicted maximum ambient concentration is less than the corresponding de minimis air quality level, Rule 62-212.400(3)(e), F.A.C. exempts that pollutant from the preconstruction ambient monitoring analysis. If the predicted maximum ambient concentration is more than the corresponding de minimis air quality level (except for non-methane hydrocarbons), the applicant must provide an analysis of representative ambient air concentrations (pre-construction monitoring data) in the area of the project based on continuous air quality monitoring data for each such pollutant with an Ambient Air Quality Standard (AAQS). If no such standard exists, the analysis shall contain such air quality monitoring data as the Department determines is necessary to assess ambient air quality for that pollutant.

PSD Pollutant	De Minimis Air Quality Levels
CO	575 μg/m3, 8-hour average
NO_2	14 μg/m3, annual average;
PM_{10}	10 μg/m3, 24-hour average
SO_2	13 μg/m3, 24-hour average
Pb	0.1 μg/m3, 3-month average
Fl	0.25 μg/m3, 24-hour average
TRS	10 μg/m3, 1-hour average
H_2S	0.2 μg/m3, 1-hour average
RSC	10 μg/m3, 1-hour average
Hg	0.25 μg/m3, 24-hour average

If preconstruction monitoring data is necessary, the Department may require the applicant to collect representative ambient monitoring data in specified locations prior to commencing construction on the project. Alternatively, the Department may allow the requirement for preconstruction monitoring data to be satisfied with data collected from the Department's extensive ambient monitoring network. Preconstruction monitoring data must meet the requirements of Appendix B to 40 CFR 58 during the operation of the monitoring stations. The preconstruction monitoring data will be used to determine the appropriate ambient background concentrations to support any required AAQS analysis.

Finally, after completing the project, the Department may require the applicant to conduct post-construction ambient monitoring to evaluate actual impacts from the project on air quality.

Source Impact Analysis

For each PSD-significant pollutant identified above, the applicant is required to conduct a source impact analysis for affected PSD Class I and Class II areas. This analysis is to determine if emissions from this project will significantly impact levels established for Class I and II areas. Class I areas include protected federal parks and national wilderness areas (NWA) that are under the protection of federal land managers. The table identifies the Class I areas located in Florida or that are within 200 kilometers in nearby states. Class II areas

represent all other areas in the vicinity of the facility open to public access that are not Class I areas.

Class I Area	State	Federal Land Manger
Bradwell Bay NWA	Florida	U.S. Forest Service
Chassahowitzka NWA	Florida	U.S. Fish and Wildlife Service
Everglades National Park	Florida	National Park Service
Okefenokee NWA	Georgia	U.S. Fish and Wildlife Service
St. Marks NWA	Florida	U.S. Fish and Wildlife Service
Wolf Island NWA	Georgia	U.S. Fish and Wildlife Service

The Department is in the process of adopting Significant Emission Rates (SER), Significant Impact Levels (SIL) and AAQS for $PM_{2.5}$. The department extended the applicant's $PM_{2.5}$ results with respect to the federal maximum 24-hour and annual impacts as discussed further below. In conducting this analysis, the applicant conservatively assumed that all PM_{10} is actually $PM_{2.5}$. In addition, the department scaled the SIL for PM_{10} in proportion to the ratio of the respective national AAQS to develop SIL applicable to $PM_{2.5}$. The rationale for the SIL used for $PM_{2.5}$ is as follows:

- The promulgated annual SIL for PM_{10} is 2% of the corresponding state/national AAQS;
- The project-specific annual SIL for $PM_{2.5}$ is also 2% of the corresponding NAAQS;
- The promulgated 24-hour SIL for PM_{10} is 3.3% of the state/national AAQS; and
- The project-specific SIL for $PM_{2.5}$ is also 3.3% of the NAAQS.

The applicant believes this approach encompasses all meaningful $PM_{2.5}$ sources capable of interacting with the project for the purposes of determining impacts with respect to the 24-hour and annual NAAQS for $PM_{2.5}$.

An initial significant impact analysis is conducted using the worst-case emissions scenario for each pollutant and corresponding averaging time. The regulations define separate significant impact levels for Class I and Class II areas for CO, NO_2, Pb, PM_{10} and SO_2. Based on the initial significant impact analysis, no additional modeling is required for any pollutant with a predicted ambient concentration less than the corresponding significant impact level. However, for any pollutant with a predicted ambient concentration exceeding the corresponding significant impact level, the applicant must conduct a full impact analysis. In addition to evaluating impacts caused by the project, a full impact modeling analysis also includes impacts from other nearby major sources (and any potentially-impacting minor sources within the radius of significant impact) as well to determine compliance with:

- The PSD increments and the federal air quality related values (AQRV) for Class I areas.
- The PSD increments and the AAQS for Class II areas.

As previously mentioned, for any net increase of 100 tons per year or more of VOC or NO_2 subject to PSD, the applicant may be required to perform an ambient impact analysis for ozone including the gathering of ambient ozone data.

PSD Class II Area Model

The EPA-approved American Meteorological Society and EPA Regulatory Model (AERMOD) dispersion model is used to evaluate short range impacts from the proposed project and other existing major sources. AERMOD version (09292) was used. In November of 2005, the EPA promulgated AERMOD as the preferred regulatory model for predicting pollutant concentrations within 50 kilometers of a source. The AERMOD model is a replacement for the Industrial Source Complex Short-Term model (ISCST3). The AERMOD model calculates hourly concentrations based on hourly meteorological data. The model can predict pollutant concentrations for annual, 24-hour, 8-hour, 3-hour and 1-hour averaging periods. AERMOD contains two input data processors, AERMET and AERMAP. AERMAP is the terrain processor and AERMET is the meteorological data processor. In addition to the PSD Class II modeling, it is also used to model the predicted impacts for comparison with the de minimis ambient air quality levels when determining preconstruction monitoring requirements.

For evaluating plume behavior within the building wake of structures, the AERMOD model incorporates the Plume Rise Enhancement (PRIME) downwash algorithm developed by the Electric Power Research Institute (EPRI). A series of specific model features recommended by the EPA are referred to as the regulatory options. The applicant used the EPA-recommended regulatory options in each modeling scenario and building downwash effects were evaluated for stacks below the good engineering practice (GEP) stack heights.

The AERMET meteorological data used in the AERMOD model consisted of a concurrent five-year period of hourly surface weather observations from the National Weather Service office located in Jacksonville International Airport and twice-daily upper air soundings from Jacksonville International Airport. The five-year period of meteorological data was from 2001 through 2005. The location of the proposed facility is approximately 40 km southwest of the Jacksonville International Airport. These stations were selected for use in the evaluation because they are the closest primary weather stations to the project area and are most representative of the project site.

Stack Height Considerations

GEP stack height means the greater of 65 meters (213 feet) or the maximum nearby building height plus 1.5 times the building height or width, whichever is less. The calculated GEP stack height for the proposed facility is 11.4 meters (37.5 feet). Therefore, the release height of emissions from the proposed facility are less than GEP height, and have the potential to be influenced by aerodynamic downwash created by buildings that house the equipment. Therefore, building downwash was considered in the modeling analyses, as part of the PRIME downwash algorithm mentioned above.

Additional Impact Analysis

In addition to the above analyses, the applicant must provide an evaluation of impacts to: soils, vegetation, and wildlife; air quality related to general commercial, residential and industrial growth in the area that may result from the project. Additionally, the proposed project will be located 45 km from the closest portion of the nearest PSD Class I area, the Okefenokee NWR. Because the project is less than 50 km from the Class I area, a visibility impairment modeling analysis was required.

PSD Significant Pollutants for the Project

As discussed previously, the proposed project will increase emissions of the following pollutants in excess of the PSD significant emissions rates: CO, PM_{10}, $PM_{2.5}$ and NO_X.

Major Stationary Sources Near the Proposed Trail Ridge Energy

To provide some perspective on the relative scale of the proposed project, the following tables list the largest stationary sources, by pollutant, in and around Duval County. The maximum expected future emissions in TPY from the proposed project are also shown for comparison.

Table 12 - Largest Sources of SO2 (2010) Nearest to the Proposed Trail Ridge Energy Site (TPY)

Owner/Company Name	Site Name	County	Emissions
JEA	Northside/SJRPP	Duval	13,506
Rock Tenn CP, LLC	Fernandina Beach Mill	Nassau	3,983
Cedar Bay Generating Company, LP	Cedar Bay Cogen Facility	Duval	1,833
IFF Chemical Holdings	IFF Chemical Holdings	Duval	1,176
Rayonier Performance Fibers LLC	Sulfite Mill	Nassau	779
Renessenz LLC	Jacksonville Facility	Duval	320
Anchor Glass Container	Jacksonville Plant	Duval	196
EI Dupont De Nemours &Co-TrailRidge	EI Dupont De Nemours &Co-TrailRidge	Clay	124
Trail Ridge Energy (proposed)	**Trail Ridge Landfill**	**Duval**	**17 (proposed)**

Table 13 - Largest Sources of NO_X (2010) Nearest to the Proposed Trail Ridge Energy Site (TPY)

Owner/Company Name	Site Name	County	Emission
JEA	Northside/SJRPP	Duval	9,142
Rayonier Performance Fibers LLC	Sulfite Mill	Nassau	2,256
Rock Tenn CP, LLC	Fernandia Beach Mill	Nassau	2,141
Cedar Bay Generating Co, LP	Cedar Bay Cogen Facility	Duval	1,832
FL Gas Transmission Co	Bradford Co Station #16	Bradford	907
Anchor Glass Container Corp	Jacksonville Plant	Duval	851
Anheuser Busch Inc	Jacksonville Plant	Duval	224
Renessenz LLC	Jacksonville Facility	Duval	107
Trail Ridge Energy (proposed)	**Trail Ridge Landfill**	**Duval**	**52 (proposed)**

Table 14 - Largest Sources of CO (2010) Nearest to the Proposed Trail Ridge Energy Site (TPY)

Owner/Company Name	Site Name	County	Emission
JEA	Northside/SJRPP	Duval	6,633
Rock Tenn CP, LLC	Fernandina Beach Mill	Nassau	1,082
Rayonier Performance Fibers LLC	Rayonier Performance Fibers LLC	Nassau	1,064
Cedar Bay Generating Co	Cedar Bay Cogen Facility	Duval	432
Gerdau Ameristeel	Jacksonville Mill	Duval	357
Trail Ridge Energy (proposed)	**Trail Ridge Landfill**	**Duval**	**285 (proposed)**
JEA	Brandy Branch Facility	Duval	152
Florida Gas Transmission Co	Bradford Co Station #16	Bradford	109

Table 15 - Largest Sources of PM_{10} (2010) Nearest to the Proposed Trail Ridge Energy Site (TPY)

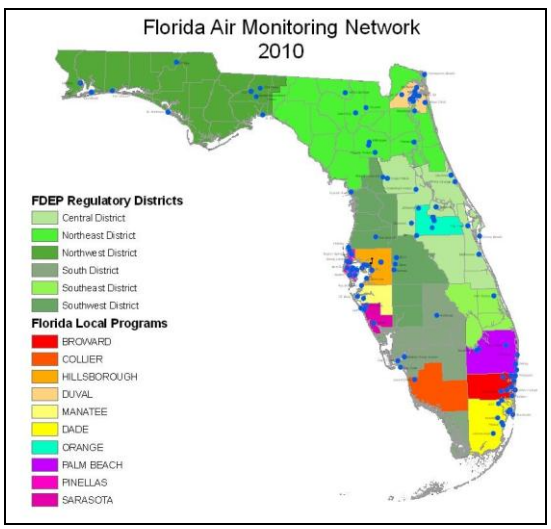
Owner/Company Name	Site Name	County	Emission
JEA	Northside/SJRPP	Duval	378
Rock Tenn CP, LLC	Fernandina Beach Mill	Nassau	352
JEA	Brandy Branch Facility	Duval	127
Rayonier Performance Fibers LLC	Sulfite Mill	Nassau	100
Anchor Glass Container Corporation	Jacksonville Plant	Duval	67
EI Dupoint De Nemours & Co	EI Dupoint De Nemours & Co	Bradford	30
Trail Ridge Energy (proposed)	**Trail Ridge Landfill**	**Duval**	**21 (proposed)**

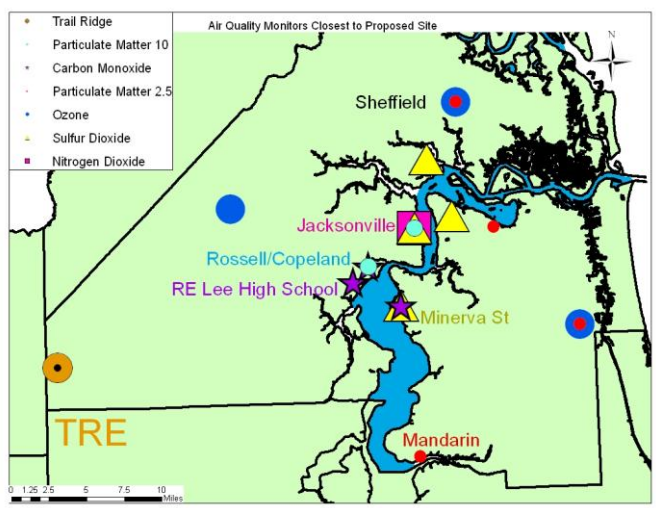
Preconstruction Ambient Monitoring Analysis

Using the AERMOD model, the applicant predicted the following maximum ambient impacts from the project. Proposed SO_2 emissions are less than corresponding PSD significant emission thresholds, but were included in the analysis for informational purposes.

De Minimis Air Quality Levels				
Pollutant	**Averaging Time**	**Maximum Predicted Impact (μg/m^3)**	**De Minimis Concentration (μg/m^3)**	**Greater than De Minimis?**
CO	8-hr	215	575	No
PM_{10}	24-hr	3.3	10	No
$PM_{2.5}$	24-hr	3.3	4	No
SO_2	24-hour	2.7	13	No
NO_X	Annual	0.44	14	No

As shown above, all pollutants are exempt from preconstruction monitoring because the predicted impacts are less than the de minimis levels. Nevertheless, the Department and its partners (local air pollution control programs) maintains an extensive quality-assured ambient monitoring network throughout the state. As the following figures indicate, the ambient air monitoring sites are concentrated in areas of high population density, along the coasts and near major highways in the interior portion of the state.





These monitors are used to estimate the existing air quality in the area of the proposed facility. The following table summarizes CO, PM_{10}, $PM_{2.5}$, SO_2 and NO_X ambient data from 2010 available for existing nearby monitoring locations. The existing monitoring data show no violations of any ambient air quality standards. The Department determines that the data collected from these monitors is representative of the air quality in the vicinity of the project and may be used to satisfy the preconstruction monitoring requirements for $PM_{2.5}$. As necessary, the above ambient concentrations will be used as the ambient background concentrations for any required AAQS analysis, which also includes PM_{10} emissions as will be discussed further.

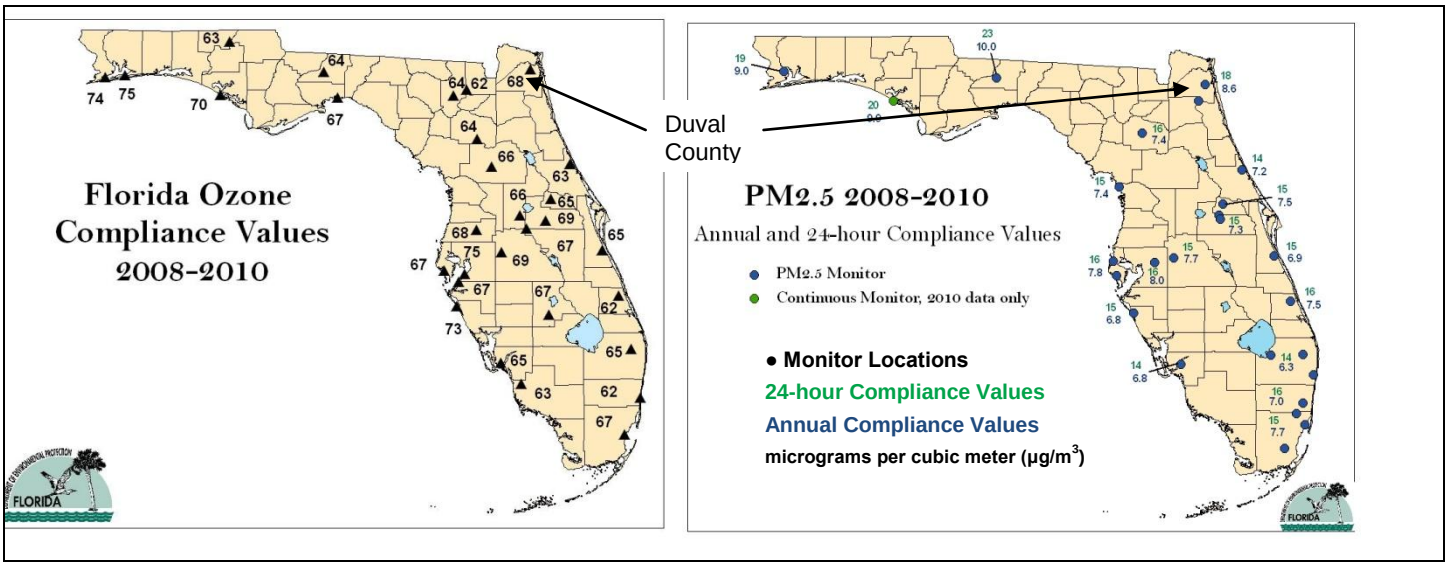
Representative Ambient Concentrations			
Pollutant	**Averaging Time**	**Ambient Concentration**	**Monitor Location**
CO	8-hour	1.2 ppm	R.E Lee High School, Duval County
	1-hour	1.9 ppm	
$PM_{2.5}$	Annual	8.2 (µg/m^3)	Mandarin Rd, Duval County
	24-hour	17.8 (µg/m^3)	
PM_{10}	Annual	63 (µg/m^3)	Rossell/Copeland, Duval County
	24-hour	22 (µg/m^3)	
NO_2	Annual	17.5 (µg/m^3)	Jacksonville, Duval County
	1-hour	77.1 (µg/m^3)	
SO_2	Annual	3.4 (µg/m^3)	Minerva Street, Duval
	24-hour	10.5 (µg/m^3)	
	3-hour	26.2 (µg/m^3)	
	1-hour	44.5 (µg/m^3)	
Ozone	8-hour	0.068 ppm	Sheffield, Duval

Existing Ambient Air Quality – $PM_{2.5}$ and Ozone

Ozone is a key indicator of the overall state of regional air quality. It is not emitted directly from combustion processes. Rather it is formed from VOC and NO_X emitted primarily from regional industrial and transportation sources. VOC is also emitted from fires and vegetation (e.g. isoprene). These two precursors participate in photochemical reactions that occur on an area-wide basis and are highly dependent on meteorological factors.

Ozone limits and measurements are summarized on three year blocks, rolled annually. The reported ozone value was calculated by taking the maximum 8-hour readings recorded each day during the three years. The fourth highest of the recorded maxima were identified for each year and then the average of those three values was reported as the compliance value, and is compared to the standard of 75 parts per billion (ppb).

The Mandarin Road PM monitor, and the Sheffield ozone monitor, both located in Duval County, is closest to and most representative of the ambient air quality at the proposed Trail Ridge Energy project site. The Duval County ozone compliance value is 68 ppb. It is shown in below, which shows the highest compliance values measured in each county where at least one ozone station is located.



Florida Ozone Compliance Values **Figure 22 – Florida $PM_{2.5}$ Compliance Values**

$PM_{2.5}$ (also known as PM_{fine}) is another key indicator of the overall state of regional air quality. Some $PM_{2.5}$ is directly emitted as a product of combustion from transportation and industrial sources as well as fires. Much of it consists of particulate nitrates and sulfates formed through chemical reactions between gaseous precursors

such as SO_2 and NO_X from combustion sources and ammonia (NH_3) naturally present in the air or added by other industrial sources.

$PM_{2.5}$ limits and measurements are summarized on three year blocks, rolled annually. The reported 24-hour compliance value for $PM_{2.5}$ is 18 μg/m^3, shown in Figure 22 above for the Duval site, and was calculated by taking the average 24-hour readings recorded each day during the three years (2008-2010). The value for each year that exceeds 98% of all daily measurements within each given year was identified and then the average of those three numbers was reported as the 24-hour compliance value and compared with the standard of 35 μg/m^3.

The simple average of all $PM_{2.5}$ measurements within each three years (2008-2010) was also calculated and then the mean of the three averages (8.2 μg/m^3) was reported as the annual compliance value and compared with the standard of 15 μg/m^3.

The results indicate that Duval County is in attainment with the applicable ozone and $PM_{2.5}$ AAQS.

$PM_{2.5}$ Precursor Emissions from Power Plants in the Southeastern U.S.

There is a regional effort underway through the CAIR and other regulatory programs to reduce emissions of $PM_{2.5}$ precursors including NO_X (also an ozone precursor) and SO_2. Regional SO_2 emission reductions from existing power plants between 2007 and 2010 are listed below. SO_2 emissions from power plants in Florida were reduced by over 170,000 TPY and regional SO_2 emissions were reduced by over 1.4 million TPY.

The state and regional SO_2 reduction trends will continue as coal-fueled power plants continue to install scrubbers to control SO_2 emissions. Regional NO_X emission reductions from existing power plants between 2007 and 2010 are listed in below.

NO_X emissions from power plants in Florida were reduced by nearly 100,000 TPY and regional NO_X emissions were reduced by nearly 400,000 TPY. The state and regional NO_X reduction trends will continue as coal-fueled power plants operators throughout the southeastern states continue to install SCR systems to control NO_X.

Table 17 - SO_2 Emission Reductions from Power Plants in the Southeast between 2007 and 2010

State	2007 (TPY)	2010 (TPY)	Reduction (TPY)	Reduction (%)
Alabama	447,189	204,197	242,992	54
Florida	317,582	144,552	173,030	54
Georgia	635,484	218,911	416,573	66
Kentucky	379,837	271,514	108,323	29
Mississippi	69,796	54,696	15,100	22
North Carolina	370,826	120,387	250,439	68
South Carolina	172,726	94,656	78,070	45
Tennessee	237,231	118,723	118,508	50
Total	**2,630,671**	**1,227,636**	**1,403,035**	**53**

Table 18 - NO_X Emission Reductions from Power Plants in the Southeast between 2007 and 2010

State	2007 (TPY)	2010 (TPY)	Reduction (TPY)	Reduction (%)
Alabama	122,374	66,049	56,325	46
Florida	184,171	79,493	104,678	57
Georgia	107,471	60,588	46,883	44
Kentucky	174,840	91,979	82,861	47
Mississippi	48,546	29,774	18,772	39

State	2007 (TPY)	2010 (TPY)	Reduction (TPY)	Reduction (%)
North Carolina	59,417	57,305	2,112	4
South Carolina	46,062	28,833	17,229	37
Tennessee	102,886	35,056	67,830	66
Total	**845,767**	**449,077**	**396,690**	**47**

Source Impact Analysis for PSD Class I Areas

Affected PSD Class I Areas

PSD Class I Area	Distance	Receptors
Okefenokee NWR (ONWR)	44 km	500

For PSD Class I areas within 200 kilometers of the facility, the table identifies each affected Class I area as well as the distance to the facility and the number of receptors used in the modeling analysis. For the preliminary significant impact analysis, the highest short-term predicted concentrations will be compared to the significant impact levels.

Results of PSD Class I Significant Impact Analysis

The California Puff (CALPUFF) dispersion model was used to evaluate the pollutant emissions from the proposed project in the Class I Okeefenokee National Wildlife Refuge (ONWR). Meteorological MM4 and MM5 data used in this model was from 2001 to 2003.

CALPUFF is a non-steady state, Lagrangian, long-range transport model that incorporates Gaussian puff dispersion algorithms. This model determines ground-level concentrations of inert gases or small particles emitted into the atmosphere by point, line, area, and volume sources.

The CALPUFF model has the capability to treat time-varying sources, is suitable for modeling domains from tens of meters to hundreds of kilometers, and has mechanisms to handle rough or complex terrain situations. Finally, the CALPUFF model is applicable for inert pollutants as well as pollutants that are subject to linear removal and chemical conversion mechanism.

Significant Impact Analysis for PSD Class I Areas					
Pollutant	**Averaging Time**	**Maximum Predicted Impact (μg/m^3)**	**Significant Impact Level (μg/m^3)**	**Significant Impact?**	**Affected Class I Area**
PM_{10}	Annual	0.003	0.2	NO	ONWR
	24-hour	0.03	0.3	NO	ONWR
NO_2	Annual	0.002	0.1	NO	ONWR
SO_2	Annual	0.001	0.1	NO	ONWR
	24-hr	0.018	0.2	NO	ONWR
	3-hr	0.064	1.0	NO	ONWR

As shown, the maximum predicted impacts are less than the corresponding significant impact levels for each pollutant. Therefore, a full impact analysis for the PSD Class I areas is not required.

Source Impact Analysis for PSD Class II Areas

For the preliminary significant impact analysis, the highest short-term predicted concentrations will be compared to the respective significant impact levels. Since five years of data are available, the highest-second-high (HSH) short-term predicted concentrations will be used for any required AAQS and PSD Class II

increment analysis with regard to short-term averages. However, for annual averages, the highest predicted annual average will be compared with the corresponding annual level.

Results of the Significant Impact Analysis

The following table shows the results of the preliminary PSD Class II significant impact analysis.

Significant Impact Analysis for PSD Class II Areas (Vicinity of Facility)					
Pollutant	**Averaging Time**	**Maximum Predicted Impact (μg/m^3)**	**Significant Impact Level (μg/m^3)**	**Significant Impact?**	**Radius of Significant Impact (km)**
CO	8-hr	209	500	NO	NONE
	1-hr	282	2,000	NO	NONE
PM_{10}	Annual	0.2	1	NO	NONE
	24-hr	3.3	5	NO	NONE
$PM_{2.5}$	Annual	0.2	0.3	NO	NONE
	24-hr	3.3	1.2	YES	2.3
NO_X	Annual	0.44 [a]	1	NO	NONE
	1-hr	18.1 [b]	7.6	YES	8.3
SO_2	Annual	0.2	1	NO	NONE
	24-hr	2.7	5	NO	NONE
	3-hr	6.8	25	NO	NONE
	1-hr	7.4	7.8	NO	NONE

a. Assumes 75% conversion of annual NO_X to NO_2, i.e., the tier 2 modeling approach.

b. Assumes 80% conversion of 1-hour NO_X to NO_2, i.e., the tier 2 modeling approach.

As shown above, the predicted impacts of CO, PM_{10}, and SO_2 are well below the corresponding PSD Class II significant impact level and no further analysis is required. However, the 24-hour $PM_{2.5}$ and the 1-hour predicted impacts of NO_X are greater than the corresponding PSD Class II significant impact levels; therefore, a full impact analysis for these pollutants is required within the applicable significant impact area as defined by the predicted radius of significant impact identified above.

Receptor Grids for Performing PSD Increments and AAQS Analyses

For the Class II analysis of CO, PM_{10}, $PM_{2.5}$, SO_2 and NO_X (annual), a combination of fence line and near-field receptors were chosen for predicting maximum concentrations in the vicinity of the project. The fence line receptors consisted of discrete Cartesian receptors spaced at 100-meter intervals around the already existing facility fence line. The remaining receptor grid consisted of densely spaced Cartesian receptors at 100 meters apart extending to 3.6 kilometers in all directions from the facility.

For the Class II analysis of 1-hour NO_2, the receptor grid was expanded. The fence line receptors consisted of discrete Cartesian receptors spaced at 70-meter intervals around the facility fence line. The remaining receptor grid consisted of densely spaced Cartesian receptors at 70 meters apart extending to 6 kilometers from the facility. From 6 to 10 kilometers, polar receptors with a spacing of 10 degrees and a linear spacing of 500 meters were used from the facility.

PSD Class II Increment Analysis

The PSD increment represents the amount that new sources in an area may increase ambient ground level concentrations of a pollutant from a regulatory baseline concentration. The emission values input into the model

for predicting increment consumption are based on the maximum emissions rates from increment-consuming sources at the facility as well as all other increment-consuming sources in the vicinity of the facility. NO_X does not have an established increment for the 1-hour averaging period, but its multisource-modeling result was included for informational purposes. The following table summarizes the results of the PSD Class II increment analysis.

PSD Class II Increment Analysis				
Pollutant	**Averaging Time**	**Maximum Predicted Impacts (μg/m^3)**	**Allowable Increment (μg/m^3)**	**Greater than PSD Class II Allowable Increment?**
$PM_{2.5}$	24-hour	3.5	4	NO
NO_X	1-hour	34.7	N/A	-

As shown above, the maximum predicted impacts are less than the allowable PSD Class II increments.

AAQS Analysis

For each pollutant subject to an AAQS analysis, the total impact on ambient air quality is obtained by adding an ambient background concentration to the maximum predicted concentration from modeled sources. The ambient background concentration accounts for all sources that are not explicitly modeled.

The sources that are explicitly modeled include the subject facility and nearby sources that are judged to potentially have a significant interaction with the proposed facility. The appropriate calculations for the modeled and background values are different for each pollutant, but generally follow the form for compliance with the AAQS. The North Carolina 20D approach was used to determine which sources are appropriate to be included into the multi-source model. As a result, 5 background sources were included in the NO_X 1-hour background model, and 1 background source was included in the $PM_{2.5}$ model (in which, all potential particulate matter emissions were considered to be $PM_{2.5}$.)

The following table summarizes the results of the AAQS analysis for the affected pollutants. Since no attempt is typically made to subtract out the impacts due to the explicitly modeled sources on these monitored values, there is some amount of double-counting reflected in the total concentration (modeled + background) used to compare with the appropriate AAQS.

AAQS Analysis						
Pollutant	**Averaging Time**	**Modeled Sources (μg/m^3)**	**Ambient Background Concentration (μg/m^3)**	**Total Impact (μg/m^3)**	**AAQS (μg/m^3)**	**Greater than AAQS?**
NO_X	1-hour	34.7	77.1	111.8	189	NO
$PM_{2.5}$	24-hour	3.5	17.5	21.0	35	NO

As shown in this table, impacts from the proposed project are not expected to cause or significantly contribute to a violation of any AAQS.

Additional Impacts Analysis

Impacts on Soils, Vegetation and Wildlife

The effects that air pollutants have on vegetation can be classified into three general categories: acute, chronic and long term. Acute effects are those that result from relatively short exposures (i.e., less than one month) to high concentrations of pollutant emissions. Chronic effects occur when organisms are exposed for months or even years to certain threshold levels of pollutants. Long-term effects include abnormal changes in ecosystems and subtle physiological alterations in organisms. Acute and chronic effects are caused by pollutants acting directly on an organism, and long-term effects can be indirectly caused by secondary agents such as changes in the pH of soil.

The USEPA Air Quality Planning and Standards, Air Strategies and Standards Division, has developed secondary NAAQS for the protection of the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air. The values set for the secondary NAAQS incorporate the protection of ecosystems, which include vegetation and soil.

The maximum ground-level concentrations predicted to occur due to PM_{10}, NO_X and CO emissions as a result of the proposed project are less than the associated secondary NAAQS. The NAAQS are designed to protect both the public health and welfare. As such, this project is not expected to have a harmful impact on soils and vegetation in the PSD Class II area.

Class I Area Impacts - Air Quality Related Values (AQRV)

An air quality related values (AQRV) analysis was also done by the applicant for the Class I area. No significant impacts on this area are expected. Visibility and regional haze analyses using the long-range transport model CALPUFF to assess impacts were done for the Okefenokee NWA PSD Class I area. These analyses showed no significant impact on visibility or regional haze in this area.

Maximum 24-hour CALPUFF Visibility Impairment Predicted from the Proposed Facility at OWNR Class I Area			
Meteorological Year	**Visibility Impairment %**	**Visibility Impairment Criterion %**	**Greater than Visibility Impact Criterion?**
2001	0.76	5	NO
2002	0.81	5	NO
2003	0.86	5	NO
Average	0.81	5	NO

Because the project is located less than 50 km away from the Class 1 area, a VISCREEN plume visibility analysis was also preformed to further analyze visibility impacts at the ONWA. Results are shown in the tables below. VISCREEN is an EPA recommended screening model for calculating the potential visual impact of a plume (including color difference, parameter, and plume contrast against a background) of proposed TRE's emissions from a given vantage point. The applicant used the Level 1 Screening Analysis, which uses the worst-case meteorological conditions possible. VISCREEN assumes all emissions as being emitted from a point source. As shown in the two tables below, this analysis also showed no significant impact on visibility in this area.

VISCREEN Level 1 Analysis: Maximum Visual Impacts *Inside* the OWNR Class 1 Area								
Background	**Theta (°)**	**Azi (°)**	**Distance (Km)**	**Alpha (°)**	**Delta E**		**Contrast**	
					Criteria	**Plume**	**Criteria**	**Plume**
Sky	10	84	43.9	84	2.00	0.141	0.05	0.001
Sky	140	84	43.9	84	2.00	0.048	0.05	-0.001
Terrain	10	84	43.9	84	2.00	0.070	0.05	0.001
Terrain	140	84	43.9	84	2.00	0.013	0.05	0.001

VISCREEN Level 1 Analysis: Maximum Visual Impacts *Outside* the OWNR Class 1 Area								
Background	**Theta (°)**	**Azi (°)**	**Distance (Km)**	**Alpha (°)**	**Delta E**		**Contrast**	
					Criteria	**Plume**	**Criteria**	**Plume**
Sky	10	45	37.3	124	2.00	0.149	0.05	0.001
Sky	140	45	37.3	124	2.00	0.047	0.05	-0.001
Terrain	10	0	1.0	124	2.16	0.151	0.05	0.002
Terrain	140	0	1.0	124	2.00	0.044	0.05	0.002

Air Quality Impacts Related to Growth

The construction and operation of the proposed Trail Ridge Energy facility will not produce significant growth in the Baldwin, Florida area. The proposed facility will interconnect to the JEA distribution network through a nearby power line. This power will supplement or offset power that would otherwise be produced by JEA and does not cause an increase in electricity demand, nor significantly increase emissions from residential and commercial construction and growth.

Conclusion on Air Quality Impacts

As described in this report and based on the required ambient impact analyses, the Department has reasonable assurance that the proposed project will not cause, or significantly contribute to, a violation of any AAQS or PSD increment.

7. PRELIMINARY DETERMINATION

The Department makes a preliminary determination that the proposed project will comply with all applicable state and federal air pollution regulations as conditioned by the Draft Permit. This determination is based on a technical review of the complete application, reasonable assurances provided by the applicant, and the conditions specified in the Draft Permit. Christy DeVore is the project engineer responsible for reviewing the application and drafting the permit changes. Melody Lovin is the meteorologist responsible for reviewing and approving the ambient air quality analyses. Additional details of this analysis may be obtained by contacting the project engineer at the Department's Office of Permitting and Compliance at Mail Station #5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.