STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR RESOURCES

PRELIMINARY DETERMINATION FOR A MAJOR MODIFICATION OF THE RIDGEWOOD POWER FACILITY

NOVEMBER 2004

NAME OF SOURCE:	Ridgewood Rhode Island Generation, LLC
LOCATION:	65 Shun Pike Johnston, Rhode Island
CONTACT:	John J. Bahrs Ridgewood Power Management 947 Linwood Avenue Ridgewood, New Jersey 07450 (201) 447-9000
APPLICATION PREPARED BY:	GZA GeoEnvironmental, Inc. 380 Harvey Road Manchester, NH 03103 (603) 623-3600
OWNER OF SOURCE:	Ridgewood Rhode Island Generation, LLC

I. Description of the Proposed Project

Ridgewood Rhode Island Generation, LLC (Ridgewood) proposes to install four, landfill gas-fired engine-generator sets at its existing facility in Johnston, RI.

The proposed project will consist of four Caterpillar G3520C engine-generator sets. Each engine-generator set consists of a 2229 HP lean burn, spark ignited internal combustion engine and a 1600 kWe generator. Each engine is equipped with air/fuel ratio controllers and intercoolers. The total landfill gas consumption for the four engines is approximately 2000 scfm.

The existing facility consists of nine Waukesha and two Deutz landfill gas fired engine-generator sets. The Waukesha engine-generator sets each consist of a 2400 HP engine and a 1700 kWe generator. Each Waukesha engine consumes approximately 567 scfm of landfill gas when operating at maximum capacity. The Deutz engine-generator sets each consist of a 1735 HP engine and a 1255 kWe generator. Each Deutz engine consumes approximately 410 scfm of landfill gas when operating at maximum capacity. There is also a 400 HP Detroit Diesel emergency generator at the facility.

The facility is located within the property of the Central Landfill, 65 Shun Pike. The Central Landfill, owned and operated by the Rhode Island Resource Recovery Corporation, is an integrated solid waste management facility located on a site comprising approximately 1100 acres. The primary solid waste management activity at the site is the operation of a municipal solid waste landfill.

A large quantity of landfill gas is generated at the Central Landfill from the anaerobic decomposition of the municipal solid waste. The landfill gas is collected in a number of vertical extraction wells and horizontal collection trenches and then piped to the Ridgewood facility. Flares control any excess landfill gas that is not used by Ridgewood.

The landfill gas is treated prior to combustion. The gas treatment system filters, dewaters and compresses the landfill gas. This gas treatment system meets the requirements of 40 CFR 60, Subpart WWW (40 CFR 60.752(b)(2)(iii)(C)).

Potential Emissions from the Proposed Engines

POLLUTANT	LB/HR/ENGINE	TONS/YR
Nitrogen oxides	2.46	43.0
Carbon monoxide	14.74	258.3
PM-10/Particulates	0.49	8.6
VOC/Nonmethane hydrocarbons	0.76	13.4
Sulfur dioxide	0.63	11.0
		LBS/YR
Benzene	7.5 E-05	2.63
1,4 Dichlorobenzene	1.25 E-04	4.38
Hydrogen chloride	3.74 E-02	1310.5
Hydrogen sulfide	7.53 E-03	262.8
Mercury	5.0 E-06	0.18
Tetrachloroethene	1.25 E-04	4.38

Potential Emissions from the Existing Facility

POLLUTANT	LB/HR/ENGINE		TONS/YR
	WAUKESHA	DEUTZ	
Nitrogen oxides	5.29[1]	2.30	105.1[1]
Carbon monoxide	10.58	9.56	454.5
PM-10/Particulates	1.02	0.38	39.1
VOC/Nonmethane hydrocarbons	2.65	0.62	98.3
Sulfur dioxide	0.70	0.51	28.9
			LBS/YR
Benzene	2.1 E-04	5.0 E-05	15.6
1,4 Dichlorobenzene	3.56 E-04	1.0 E-04	27.0
Hydrogen chloride	4.18 E-02	3.02 E-02	3456.2
Hydrogen sulfide	2.1 E-02	6.05 E-03	1575.8
Mercury	5.56 E-06	5.0 E-06	0.42
Tetrachloroethene	3.22 E-04	1.0 E-04	24.0

[1]Nitrogen oxides emissions are limited to 14,166 lbs per month

The existing facility is classified as a major stationary source under the requirements for major stationary sources in nonattainment areas (Section 9.4 of Air Pollution Control Regulation No. 9) because potential emissions of nitrogen oxides and volatile organic compounds exceed 50 tons per year. The existing facility is also classified as a major stationary source under the requirements for major stationary sources in attainment or unclassifiable areas, also known as the PSD requirements (Section 9.5 of Air Pollution

Control Regulation No. 9) because potential emissions of carbon monoxide exceed 100 tons per year.

The proposed project is considered a major modification because the existing facility is a major stationary source and the net emissions increase of both nitrogen oxides (43.0 tpy) and carbon monoxide (258.3 tpy) exceed the significant thresholds for those pollutants (25 tpy for nitrogen oxides and 100 tpy for carbon monoxide)

II. Requirements for Major Stationary Sources in Nonattainment Areas

The nonattainment area provisions of APC Regulation No. 9 are applicable to the pollutant nitrogen oxides (NO_x). The following is a discussion of the various provisions of Section 9.4 of APC Regulation No. 9 and how the applicant has demonstrated compliance with those provisions.

A. Lowest Achievable Emission Rate (LAER) (Subsection 9.4.2(a))

Subsection 9.4.2 (a)(2) requires that a major modification must meet an emission limitation that is considered the lowest achievable emission rate (LAER). The lowest achievable emission rate will be based on technological factors and can be in the form of a numerical emission standard or a design, operational or equipment standard. It is the responsibility of the applicant to present and defend the technology chosen to represent LAER.

LAER is the most stringent emission limitation derived from either of the following:

> (1) the most stringent emission limitation contained in the implementation plan of any State for such class or category of source; or
>
> (2) the most stringent emission limitation achieved in practice by such class or category of source.

By definition LAER can not be less stringent than any applicable new source performance standard (NSPS).

As part of the review of this permit application, the Office of Air Resources reviewed several recently issued permits by state and local air pollution control agencies for landfill gas-fired engine projects. Table 1 summarizes our findings.

The Office of Air Resources believes that the most stringent emission limitation contained in the implementation plan of any State are control measures adopted in California by the South Coast Air Quality Management District and the Antelope Valley Air Quality Management District. These measures limit NO_x emissions from landfill gas-fired engines greater than 500 HP to 51 ppmvd corrected to 15% O_2 (approximately 0.7 gr/bhp-hr) averaged over 15 consecutive minutes.

The Office of Air Resources believes that the most stringent emission limitation achieved in practice for a landfill gas fired engine is 0.55 gr/bhp-hr for Kiefer Landfill in California.

Table 1
NO_x Emission Limitations for Recently Permitted Projects

FACILITY	ENGINE SIZE	DATE	TYPE	NO_X
Northwest Regional Landfill (AZ)	1410 HP	10/27/03	BACT	0.6 gr/bhp-hr
Bio-Energy, LLC (OH) (Loraine County Landfill)	1877 HP (8)	4/22/03	BACT	1.4 gr/bhp-hr
Bio-Energy, LLC (OH) (Carbon Limestone LFG)	1877 HP (16)	4/10/03	BACT	1.2 gr/bhp-hr
MM San Bernardino Energy (CA)	1850 HP	5/16/02	BACT	0.6 gr/bhp-hr
Northern Tier Landfill (PA)	815 kW	1/29/02	NSPS	2.0 gr/bhp-hr
Reliant Atascocita (TX)	2343 HP (7)	1/24/02	LAER/ BACT	0.6 gr/bhp-hr
Sumpter Energy Associates (MI) (Carleton Farms)	1138 HP (8)	12/20/01	BACT	2.0 gr/bhp-hr
Sumpter Energy Associates (MI) (City Sand)	1138 HP (10)	12/7/01	BACT	2.0 gr/bhp-hr
Sumpter Energy Associates (MI) (Pine Tree Acres)	1138 HP (7)	7/24/01	BACT	2.0 gr/bhp-hr
Bio-Energy (Azusa) LLC (CA)	1850 HP (5)	2/22/00	LAER	0.6 gr/bhp-hr
Kiefer Landfill (CA)	4230 HP (3)	1/18/00	LAER	0.55 gr/bhp-hr
Energy Development, Inc. (CA)	1876 HP	7/13/99	BACT	0.65 gr/bhp-hr
MM Hackensack Energy (NJ)	1340 HP (6)	4/9/98	LAER/ BACT	1.0 gr/bhp-hr
Minnesota Methane Tajiguas (CA)	4314 HP	1/9/98	BACT	0.59 gr/bhp-hr
Monterey Bay Regional Waste Management District (CA)	1274 HP	11/4/96	LAER	1.2 gr/bhp-hr
Manchester Renewable Power (NJ)	800 kW	5/10/95	LAER	1.0 gr/bhp-hr

The California Air Resources Board has issued a guidance document for permitting electrical generation technologies. The document, entitled "Guidance for the Permitting of Electrical Generation Technologies", includes recommendations for Best Available Control Technology (BACT) for engines using waste gas.

In California, BACT is defined as the most stringent limitation or control technique:

1) which has been achieved in practice,
2) is contained in any State Implementation Plan (SIP) approved by the United States Environmental Protection Agency, or
3) any other emission control technique, determined by the Air Pollution Control Officer to be technologically feasible and cost effective.

This definition of BACT is very similar to the definition of LAER contained in APC Regulation No. 9.

The Air Resources Board has recommended a NO_x emission level of 0.6 gr/bhp-hr as representing BACT for engines using waste gas.

The Office of Air Resources believes that LAER for the proposed modification to the Ridgewood facility is a NO_x emission limitation of 0.5 gr/bhp-hr. The applicant proposes to meet this emission limitation by using combustion controls, including lean burn engine technology, air-to-fuel ratio controllers and intercoolers to reduce the combustion air temperature.

B. Compliance Status of Existing Major Stationary Sources (Subsection 9.4.2(b))

Subsection 9.4.2 (b) requires that the applicant certify that all existing major stationary sources owned or operated by the applicant located within the state are in compliance with all applicable state and federal air pollution rules and regulations under the Clean Air Act and federally enforceable compliance schedules.

The applicant, Ridgewood Rhode Island Generation, has provided a certification that all of the facilities owned or operated by Ridgewood Rhode Island Generation or operated under common control with Ridgewood Rhode Island Generation are in compliance with all applicable state and federal air pollution rules and regulations under the Clean Air Act and federally enforceable compliance schedules. The Shun Pike facility is the only facility owned or operated by Ridgewood in Rhode Island.

C. NO_x Emission Offsets (Subsection 9.4.2(c))

Subsection 9.4.2 (c) requires the applicant to provide evidence that the total tonnage of emissions of the nonattainment air pollutant allowed from the proposed new source shall be offset by a greater reduction in the actual emissions of such air pollutant from the same or other sources.

Ridgewood Rhode Island Generation has entered into a purchase agreement for 52 tons of NO_x offsets to satisfy this requirement. These offsets were generated by the MATEP facility in Boston, MA.

Subsection 9.4.2 (d) lists 6 criteria that emission offsets must satisfy. The emission offsets must:

> *(1) be approved by the Director, and be part of a federally enforceable permit, or part of an operating permit issued pursuant to 40 CFR Part 71 or under regulations approved pursuant to 40 CFR Part 70, or made part of the federally approved State Implementation Plan.*

The Massachusett Department of Environmental Protection (MADEP) issued BWP AQ 21 Final Approval (Transmittal No. W005173, MBR 99 NOx-001), to the Medical Area Total Energy Plant (MATEP) facility. This permit limits allowable NO_x emissions from the facility. The voluntary installation of air pollution controls (selective catalytic reduction) is federally enforceable through this permit.

(2) be federally enforceable prior to the issuance of the Major Source Permit

The permits that make the voluntary installation of selective catalytic reduction federally enforceable are currently in effect.

(3) actually occur at the source of the offsets prior to the start-up of the new source

The installation of selective catalytic reduction at the MATEP facility has already occurred.

(4) be at an offset ratio of at least 1.2 to 1 for nitrogen oxides

Potential NO_x emissions from the proposed modification to the Ridgewood facility is 43 tons per year. Ridgewood Rhode Island Generation must purchase 52 tons of offsets. This will be a requirement in any permit issued pursuant to this preliminary determination. The offset ratio is 52/43 = 1.2.

(5) be obtained from a source in the same nonattainment area or in another nonattainment area provide that:

a) The other nonattainment area has an equal or higher nonattainment area classification than the area in which the source is to be located; and

b) Emissions from such other area contribute to a violation of the national ambient air quality standard in the nonattainment area in which the source is to be located.

The MATEP facility is located in an area designated serious nonattainment with respect to the one-hour standard for ozone and moderate nonattainment with respect to the eight-hour standard for ozone. These are the same classifications as the entire state of Rhode Island.

(6) when considered in conjunction with the proposed emissions increase, have a net air quality benefit in the area.

Since the offset ratio is greater than 1:1 there will be a net reduction in NO_x emissions.

Therefore all of the requirements of section 9.4.2(c) & 9.4.2(d) pertaining to emission offsets are satisfied.

D. Alternatives Analysis (Subsection 9.4.2(e))

Subsection 9.4.2 (e) requires the applicant to prepare an analysis of alternative sites, sizes, production processes, and environmental control techniques that demonstrate the benefits of the proposed source significantly outweigh the environmental and social cost imposed as a result of its location, construction or modification.

The applicant has satisfied this requirement with the analysis contained in Section 5.0 of the application.

The alternative site analysis addressed three alternative sites, all located within the Central Landfill. Since the proposed project is to combust landfill gas generated primarily from landfill Phases IV and V, proximity to Phase IV and V was a primary consideration. The chosen site was also closest to sewer lines for the discharge of condensate and the site had the least potential to affect present and future landfill operations.

The applicant evaluated two alternative technologies; (1) the use of dedicated pollution control equipment such as a flare; and (2) the use of a combustion turbine instead of the reciprocating engine. This evaluation concluded that the chosen technology (reciprocating engine) is superior to each of the identified alternatives in terms of cost, environmental impact and reliability.

The project has been sized for four engines based on the current landfill gas projections for Phases IV and V. The alternate size analysis concluded that the modular design of the project would allow for future expansion should the availability of gas make a larger plant economically feasible.

E. NO_x Air Quality Impact (Subsection 9.4.2(f))

Subsection 9.4.2 (f) requires that the applicant demonstrate compliance with the conditions in subsections 9.5.2(b)-(d) and 9.5.3(a)-(c) for the pollutant nitrogen oxides. See section III. B-D of this document for a complete discussion of these requirements.

F. Air Toxics Regulation (Subsection 9.4.2(g))

Subsection 9.4.2(g) requires the applicant to demonstrate that the emissions from the proposed facility will not cause an increase in the ground level ambient concentration at or beyond the property line in excess of that allowed by Air Pollution Control Regulation No.

22 ("Air Toxics") and any Calculated Acceptable Ambient Levels. See section III. E of this document for a complete discussion of these requirements.

G. Health Risks from Proposed Air Pollution Sources (Subsection 9.4.2(h))

Subsection 9.4.2 (h) requires the applicant to conduct any studies required by the Guidelines for Assessing Health Risks from Proposed Air Pollution Sources and meet the criteria therein.

The proposed source does not meet the applicability criteria in this document and therefore is not required to perform this type of study.

H. Applicable Air Pollution Control Regulations (Subsection 9.4.2(i))

Subsection 9.4.2 (i) requires the applicant to demonstrate that the facility will be in compliance with all applicable state and federal air pollution control regulations at the time the source commences operation. See section III. G of this document for a complete discussion of these requirements.

III. Requirements for Major Stationary Sources in Attainment or Unclassifiable Areas

The following is a discussion of the various provisions of Section 9.5 of APC Regulation No. 9 and how the applicant has demonstrated compliance with those provisions.

A. Best Available Control Technology (BACT) (Subsection 9.5.2(a))

Subsection 9.5.2 (a) of APC Regulation No. 9 requires that a stationary source shall apply BACT for each pollutant it would have the potential to emit. Best available control technology is defined as "an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each air pollutant which would be emitted from any proposed stationary source or modification which the Director, on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. 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 state or federal air pollution control rule or regulation. If the Director determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of air emissions standards infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement of best available control technology. Such standard shall to the degree possible set forth the emission reduction achievable by implementation of such design, equipment, work practice or operation and shall provide for compliance by means which achieve equivalent results."

The Office of Air Resources requires the use of the "top down" approach in a BACT analysis. The first step in the "top down" approach is to determine, for the source category being evaluated, the most stringent level of control available. If it can be shown that this level of control is technically or economically infeasible, then the next most stringent level of control is determined and similarly evaluated. Such an evaluation would continue until the level of control under consideration could not be ruled out by any technical, environmental or economic considerations.

The purpose of the BACT analysis is to determine the lowest emission limits that can be met by the source, in light of energy, economic and environmental impacts. The following is an evaluation of the applicant's BACT analysis.

1. Carbon Monoxide (CO)

It is the Office of Air Resources' position that there is no technically feasible, post combustion treatment technology for reducing carbon monoxide emissions from landfill gas-fired engines. Landfill gas contains impurities that, when combusted, have been shown to poison catalyst based post combustion treatment technologies such as an oxidation catalyst. We are not aware of any successful installation of post combustion treatment technologies to landfill gas-fired engines.

Therefore, BACT is represented by combustor design and good combustion practices to minimize CO emissions. There is a direct tradeoff between NO_x emissions and CO emissions. Lowering NO_x emissions increases CO and VOC emissions.

As part of the review of this permit application, the Office of Air Resources reviewed several recently issued permits by state and local air pollution control agencies for landfill gas-fired engine projects. Table 2 summarizes our findings:

Table 2
CO Emission Limitations for Recently Permitted Projects

FACILITY	ENGINE SIZE	DATE	TYPE	CO	NO_X
Northwest Regional Landfill (AZ)	1410 HP	10/27/03	BACT	2.5 gr/bhp-hr	0.6 gr/bhp-hr
Bio-Energy, LLC (OH) (Loraine County Landfill)	1877 HP (8)	4/22/03	BACT	2.4 gr/bhp-hr	1.4 gr/bhp-hr
Bio-Energy, LLC (OH) (Carbon Limestone LFG)	1877 HP (16)	4/10/03	BACT	2.3 gr/bhp-hr	1.2 gr/bhp-hr
MM San Bernardino Energy (CA)	1850 HP	5/16/02	BACT	2.5 gr/bhp-hr	0.6 gr/bhp-hr
Northern Tier Landfill (PA)	815 kW	1/29/02	BACT	3.0 gr/bhp-hr	2.0 gr/bhp-hr
Reliant Atascocita (TX)	2343 HP (7)	1/24/02	BACT	3.0 gr/bhp-hr	0.6 gr/bhp-hr
Sumpter Energy Associates (MI) (Carleton Farms)	1138 HP (8)	12/20/01	BACT	2.9 gr/bhp-hr	2.0 gr/bhp-hr
Sumpter Energy Associates (MI) (City Sand)	1138 HP (10)	12/7/01	BACT	2.9 gr/bhp-hr	2.0 gr/bhp-hr
Sumpter Energy Associates (MI) (Pine Tree Acres)	1138 HP (7)	7/24/01	BACT	2.9 gr/bhp-hr	2.0 gr/bhp-hr
Bio-Energy (Azusa) LLC (CA)	1850 HP (5)	2/22/00	LAER	2.0 gr/bhp-hr	0.6 gr/bhp-hr
Kiefer Landfill (CA)	4230 HP (3)	1/18/00	LAER	2.7 gr/bhp-hr	0.55 gr/bhp-hr
MM Hackensack Energy (NJ)	1340 HP (6)	4/9/98	LAER	2.0 gr/bhp-hr	1.0 gr/bhp-hr
Manchester Renewable Power (NJ)	800 kW	5/10/95	LAER	2.3 gr/bhp-hr	1.0 gr/bhp-hr

Based on vendor guarantees the applicant has proposed that the emission limitation that represents BACT for CO is 3.0 gr/bhp-hr. The lowest NO_x emission limitation, 0.55 gr/bhp-hr, for Kiefer Landfill has a corresponding CO emission limitation of 2.7 gr/bhp-hr. Therefore the proposed CO emission limitation of 3.0 gr/bhp-hr, coupled

with a NO_x emission limitation of *0.5* gr/bhp-hr appears consistent with the reported data.

BACT for carbon monoxide is therefore represented by combustor design and good combustion practices to minimize CO emissions. The emission limit chosen to represent BACT for CO is:

3.0 gr/bhp-hr

2. Sulfur dioxide (SO_2)

Landfill gas can contain a variety of sulfur compounds. The only means of controlling SO_2 emissions from a landfill gas fired engine is to limit the sulfur content of the landfill gas. Post combustion control techniques have not been applied to landfill gas-fired engines. The sulfur content of the landfill gas is variable and beyond the control of the applicant so no emission limit will be set. Monitoring of the landfill gas for sulfur compounds will be required to ensure air quality impacts remain below air quality standards.

3. Particulate Matter less than 10 microns (PM-10)

The Office of Air Resources is not aware of any landfill gas-fired engine installations where flue gas controls are used to reduce particulate emissions. Additionally, the Office of Air Resources believes that the concentration of particulate matter in the flue gases from an engine, during combustion of landfill gas is not sufficient to warrant consideration of flue gas controls as a BACT option. Particulate loading is calculated to be on the order of 0.004 grains/acf. The effectiveness of flue gas controls at this loading would be minimal. Therefore, flue gas controls are not considered a practical option.

BACT for particulate emissions is good combustion practices to minimize particulate emissions. The emission limits chosen to represent BACT for PM-10 emissions is:

0.10 gr/bhp-hr

4. Nonmethane Hydrocarbons (NMHC)

The most stringent control technology identified for reducing NMHC emissions was catalytic oxidation. This is the same technology described previously for control of carbon monoxide emissions. As stated previously, it is the Office of Air Resources' position that there is no technically feasible, post combustion treatment technology for reducing carbon monoxide emissions, and therefore nonmethane hydrocarbon emissions, from landfill gas-fired engines. Landfill gas contains impurities that, when combusted, have been shown to poison catalyst based post combustion

treatment technologies such as an oxidation catalyst. We are not aware of any successful installation of post combustion treatment technologies to landfill gas-fired engines.

Therefore, BACT is represented by combustor design and good combustion practices to minimize NMHC emissions. There is a direct tradeoff between NO_x emissions and NMHC emissions. Lowering NO_x emissions increases CO and NMHC emissions.

As part of the review of this permit application, the Office of Air Resources reviewed several recently issued permits by state and local air pollution control agencies for landfill gas-fired engine projects. Table 3 summarizes our findings:

Table 3
NMOC Emission Limitations for Recently Permitted Projects

FACILITY	ENGINE SIZE	DATE	TYPE	NMOC
Bio-Energy, LLC (OH) (Loraine County Landfill)	1877 HP (8)	4/22/03	NSPS	20 ppmvd @ 3% O_2
Bio-Energy, LLC (OH) (Carbon Limestone LFG)	1877 HP (16)	4/10/03	BACT/ NSPS	20 ppmvd @ 3% O_2
MM San Bernardino Energy (CA)	1850 HP	5/16/02	BACT	0.8 gr/bhp-hr
Northern Tier Landfill (PA)	815 kW	1/29/02	BACT/ NSPS	20 ppmvd @ 3% O_2
Reliant Atascocita (TX)	2343 HP (7)	1/24/02	LAER	0.28 gr/bhp-hr
Sumpter Energy Associates (MI) (City Sand)	1138 HP (10)	12/7/01	NSPS	20 ppmvd @ 3% O_2
Sumpter Energy Associates (MI) (Pine Tree Acres)	1138 HP (7)	7/24/01	BACT/ NSPS	20 ppmvd @ 3% O_2
Bio-Energy (Azusa) LLC (CA)	1850 HP (5)	2/22/00	LAER	0.17 gr/bhp-hr
Energy Development, Inc. (CA)	1876 HP	7/13/99	BACT	0.25 gr/bhp-hr
MM Hackensack Energy (NJ)	1340 HP (6)	4/9/98	NSPS	0.25 gr/bhp-hr
Minnesota Methane Tajiguas (CA)	4314 HP	1/9/98	BACT/ NSPS	20 ppmvd @ 3% O_2
Manchester Renewable Power (NJ)	800 kW	5/10/95	LAER	0.375 gr/bhp-hr

Based on vendor guarantees the applicant has proposed that the emission limitation that represents BACT for NMHC is 20 ppmvd corrected to 3% O_2. This is the emission limit for landfill gas fired engines subject to EPA's New Source Performance Standard (NSPS) for Municipal Solid Waste Landfills (Subpart WWW). Based on the projected flue gas characteristics for this source the 20 ppm limitation corresponds to about 0.16-0.17 gr/bhp-hr. This is consistent with the lowest reported values for recently permitted projects.

BACT for nonmethane hydrocarbons is therefore represented by combustor design and good combustion practices to minimize NMHC emissions. The emission limit chosen to represent BACT for NMHC is the NSPS or:

20 ppmvd corrected to 3% O_2

B. Air Quality Impact Analysis (Subsection 9.5.2(b))

Subsection 9.5.2(b)(1) requires the applicant to demonstrate, by means of air quality modeling, that allowable emissions from the proposed source would not cause or contribute to:

a. air pollution in violation of any national ambient air quality standard; or,

b. any increase in ambient concentrations exceeding the remaining available increment for the specified air contaminant.

The Office of Air Resources' review of the applicant's air quality impact analysis consists of three parts:

1. A review of the modeling methodology used to predict the ambient impacts of the facility;

2. A review of the emission rates used as input to the air quality models to predict the ambient impacts of the facility; and

3. A comparison of the predicted impacts for criteria pollutants to the applicable significant impact levels and a comparison of the predicted impacts for non-criteria pollutants to Acceptable Ambient Levels.

Therefore, the following is a summary of the Office of Air Resources findings with respect to each of these reviews.

1. Modeling Methodology

   a. Discussion of Emission Sources

      The applicant identified 25 emission sources located at either the Ridgewood Power facility or the Central Landfill that have the potential to cause a significant impact on surrounding air quality. The sources consist of 1-6000 cfm ultra low emissions flare, 1-400 scfm flare, 2-2000 scfm flares, 9-Waukesha landfill gas-fired engines, 2-Deutz landfill gas-fired engines, 4-Caterpillar landfill gas-fired engines, a steam boiler located at the Administration Building of the Central Landfill, the leachate treatment plant

and the four sections of the Central Landfill (Phases I, II/III, IV and V). The 2-1300 scfm flares were not included in the modeling because they will only be operated if the ULE flare or the landfill gas-fired engines are not operating. The Rhode Island State Energy Center (RISEC) located adjacent to the landfill was also included in the modeling.

The flares, steam boiler, engines and RISEC turbines were modeled as point sources. Flares were modeled using the default parameters generated by the SCREEN3 model. Fugitive emissions from the four sections of the landfill were modeled as poly-line area sources.

b. Model Selection

The applicant used EPA's Industrial Source Complex Short Term (ISCT3) model and the ISC-PRIME model to predict air impacts from the proposed facility at simple, intermediate and complex terrain.

Criteria pollutants and HCl, which are emitted only from point sources, were modeled using ISC-PRIME. The ISCST3 model was used for modeling air toxics emissions other than HCl because of its capability to model complex area sources (the four sections of the landfill).

c. Meteorology

The meteorological data used by the applicant to predict air impacts are consistent with EPA recommended procedures. The data covered a five-year period from 1989 to 1993. Surface data was collected at T. F. Green Airport and upper air data was collected at Chatham, Mass. These stations are the closest and most representative national weather service stations to the site of the proposed facility.

d. Receptor Locations

The applicant placed receptors at 100-meter intervals along the property boundary of the Central Landfill. Beyond the property line a Cartesian network of receptors was used with 100-meter spacing and extending 1000 meters beyond the Central Landfill property line. The construction of the receptor network and the selection of distances are consistent with procedures specified in EPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W).

e. Model Options

The options chosen by the applicant are consistent with those recommended for regulatory use in EPA's Guideline for Air Quality Models (40 CFR Part 51, Appendix W).

f. Good Engineering Practice (GEP) Stack Height and Building Downwash Parameters

A GEP stack height analysis was conducted for all emission sources modeled as point sources. The stack heights of the 9-Waukesha engines, the 2-Deutz engines and the 2-2000 scfm flares were less than the calculated GEP stack height. Therefore building downwash effects were considered in the modeling for these sources. The applicant's GEP analysis and determination of direction specific building dimensions is consistent with EPA's Guideline for Determination of Good Engineering Practice Stack Height (EPA 450/4-80-023R) and the Building Profile Input Program User's Guide (EPA 454/R-93-038).

g. Cavity Impacts

Refined air quality modeling was conducted using the ISC-PRIME model, which accounts for building cavity impacts.

h. Class I Areas

The nearest Class I area is the Lye Brook Wilderness Area in southern Vermont located approximately 190 km northwest of the facility. The applicant evaluated the impact on this Class I area using EPA's VISCREEN model. The model predicts that visibility will not be impacted by the proposed project.

i. Complex Terrain

The applicant evaluated plume impaction on terrain with elevations higher than the stack elevation using the COMPLEX I screening mode of the ISCT3 model. Area sources were not included in the complex terrain modeling because the COMPLEX I screening model is not intended for use with area sources. The applicant's input parameters are consistent with EPA's Guideline for Air Quality Models (40 CFR Part 51, Appendix W).

j. Background Concentrations

Background air quality data, to represent sources that were not included in the modeling, were based on the highest, second high for short-term concentrations (1-hr, 3-hr, 8-hr or 24-hr) and on the highest annual concentrations measured at any site in Rhode Island for the period 1999-2003.

The modeling methodology used in the permit application is acceptable for predicting impacts of the facility on the surrounding air quality.

2. Emission Rates

a. Criteria Pollutants

The sources of the emission factors for the emission points at Central landfill used to calculate the emission rates for the pollutants NO_x, CO and PM-10 were either permit limitations, EPA's AP-42 "Compilation of Air Pollutant Emission Factors" or vendor supplied information/performance guarantees.

The emission rates for SO_2 for all emission points combusting landfill gas were based on measured sulfur contents of the landfill gas (121.7 ppm). The emission rate for SO_2 for the steam boiler was calculated using an AP-42 emission factor.

Emission rates for the RISEC power plant were obtained from the facility's preconstruction permit application.

b. Air Toxics

Emission rates for all listed toxic air contaminants were calculated based on maximum concentrations observed in samples of the landfill gas collected and analyzed in May 2000.

The Office of Air Resources finds the applicant's emission estimates to be acceptable for use in predicting air quality impacts.

3. Impact Analysis

The criteria pollutants evaluated in the modeling analysis are nitrogen oxides, sulfur dioxide, particulate matter, and carbon monoxide. The maximum predicted impacts due to the proposed modification combined with the other emissions sources at the Central Landfill, Ridgewood Power and RISEC facility when added to background concentrations are below the applicable NAAQS. The maximum predicted impacts

of criteria pollutants due to the facility and the other emission sources are summarized in Table 4 and compared to the NAAQS.

The maximum predicted impacts due to the proposed modification combined with the other new or modified emissions sources at the Central Landfill, Ridgewood Power and RISEC facility are below the applicable PSD increments. The maximum predicted impacts of criteria pollutants due to the facility and the other emission sources are summarized in Table 5 and compared to the PSD increments.

The proposed project is a major modification for the pollutant nitrogen oxides. Subsection 9.5.3(a) of Air Pollution Control Regulation No. 9 limits increment consumption for major modifications to 25% of the remaining annual increment. Table 6 is a summary of the maximum predicted impacts of nitrogen oxides for the proposed facility in comparison to the allowable remaining PSD increment.

The applicant has satisfactorily demonstrated that the proposed facility will not cause or contribute to air pollution in violation of the NAAQS for these pollutants or in excess of the allowable PSD increments for criteria pollutants.

Subsection 9.5.2(b)(2) requires the applicant to prepare an analysis of the ambient air quality in the area that the source would affect for each pollutant for which it would result in a significant net emissions increase. Nitrogen oxides and carbon monoxide are the only pollutants for which there would be a significant net emissions increase. The maximum predicted air quality impacts of these two pollutants, due to the proposed modification alone, are below the threshold levels in subsection 9.5.2(b)(2)d. As a result, no preconstruction ambient monitoring program is deemed to be necessary. The maximum predicted impacts of these two pollutants due to the modification alone are summarized in Table 7 and compared to the threshold levels.

TABLE 4

Summary of Maximum Predicted Impacts of
Criteria Pollutants and Comparison to NAAQS (Fg/m^3)

Pollutant	Averaging Time	Maximum Predicted Impact ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
SO_2	3-hour	80	172	252	1300
	24-hour	26	85	111	365
	Annual	5.43	21	27	80
CO	1-hour	1424	10,409	11,833	40,000
	8-hour	1068	4511	5579	10,000
NO_2	Annual	8.55	46	54	100
PM-10	24-hour	23	91	114	150
	Annual	3.41	39	42	50

TABLE 5

Summary of Maximum Predicted Impacts of
Criteria Pollutants and Comparison to PSD Increments (Fg/m^3)

Pollutant	Averaging Time	Maximum Predicted Impact All Sources ($\mu g/m^3$)	Full PSD Increment ($\mu g/m^3$)
SO_2	3-hour	80	512
	24-hour	26	91
	Annual	5.43	20
NO_2	Annual	8.55	25
PM-10	24-hour	23	30
	Annual	3.41	17

TABLE 6
Maximum Predicted Impacts of Nitrogen Oxides and
Comparison to Allowable Remaining PSD Increments ($\mu g/m^3$)

Pollutant	Averaging Time	Maximum Predicted Impact All Existing Sources ($\mu g/m^3$)	Full PSD Increment ($\mu g/m^3$)	Maximum Predicted Impact from Modification ($\mu g/m^3$)	Allowable Remaining PSD Increment ($\mu g/m^3$)
NO_2	Annual	8.27	25	3.37	4.18

TABLE 7

Summary of Maximum Predicted Impacts of Proposed Modification
and Comparison to Ambient Air Monitoring Threshold Levels (Fg/m^3)

Pollutant	Averaging Time	Maximum Predicted Impact ($\mu g/m^3$)	Threshold Level ($\mu g/m^3$)
CO	8-hour	359	575
NO_2	Annual	3.37	14

C. Additional Impacts Analysis (Subsection 9.5.2(c))

Subsection 9.5.2(c) requires the applicant to provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of the modification and general commercial, residential, industrial and other growth associated with modification. Additionally, this subsection requires the applicant to provide an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial and other growth associated with the modification.

1. Visibility Analysis

The applicant conducted a Level 1 visibility impairment analysis using the VISCREEN program, as specified in the "Workbook for Plume Visual Impact Screening and Analysis" (EPA-450/4-88-015). The results of the VISCREEN program satisfactorily demonstrate that this modification should not cause visibility impairment at the Lye Brook Wilderness Area in Vermont, the nearest Class I area to this facility.

2. Soils and Vegetation Analysis

The applicant has presented an assessment of the impacts on soils and vegetation as a result of emissions from the proposed modification. This assessment compared predicted project impacts with screening levels presented in the 1980 EPA document "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils and Animals" (EPA 450/2-81-078).

This analysis concluded that emissions from the proposed modification will not cause or contribute to air pollution that would adversely impact soils and vegetation in the area.

3. Growth Analysis

The applicant's analysis concluded that there is not expected to be any significant, direct, industrial, commercial or residential growth associated with this modification that would adversely affect air quality in the vicinity of the project. It is not anticipated that any industrial, commercial, or residential growth will occur to support the 20 or so people whom will constitute the peak construction work force or for the additional 3 people that will be employed permanently at this facility.

D. Welfare Impacts (Subsection 9.5.2(d))

Subsection 9.5.2(d) requires the applicant to apply the applicable procedures of the Guidelines for Assessing the Welfare Impacts of Proposed Air Pollution Sources and meet the criteria therein.

The Office of Air Resources "Guidelines for Assessing the Welfare Impacts of Proposed Air Pollution Sources" specifies the procedures to be followed for evaluating a facility's impact on plants, animals and soil. Applicants must apply the procedures and comply with the screening concentrations in A Screening Procedure for the Impacts of Air Pollution on Plants, Soils and Animals (EPA 450/2-81-078, December 12,1980). The applicant has correctly applied the procedure in this assessment and met the criteria therein.

E. Air Toxics Regulation and CAALs (Subsection 9.4.2(g))

Subsection 9.4.2(g) requires the applicant to demonstrate that the emissions from the facility will not cause an increase in the ground level ambient concentration at or beyond the property line in excess of that allowed by Air Pollution Control Regulation No. 22 ("Air Toxics") and any Calculated Acceptable Ambient Levels.

The applicant evaluated 51 compounds that are possible constituents in landfill gas. Thirty-nine of these fifty-one compounds are listed toxic air contaminants in Air Pollution Control Regulation No. 22. Twelve of the thirty-nine compounds that are listed toxic air

contaminants in Air Pollution Control Regulation No. 22 were not detected in the landfill gas sampled and analyzed at Central Landfill.

Potential emissions of the remaining twenty-seven compounds were calculated and compared to the minimum quantities in Table III of Air Pollution Control Regulation No. 22 (see Table 8). Potential emissions of twenty-one of the twenty-seven compounds are less than the Table III minimum quantities and therefore no further analysis is necessary for these compounds.

The maximum predicted impacts of the six remaining compounds, due to the proposed modification combined with the other emissions sources at Ridgewood Power, are below the applicable AALs. The maximum predicted impacts of the six listed toxic air contaminants due to the RPPP facility are summarized in Table 9 and compared to the applicable AALs.

TABLE 8

Potential emissions of listed toxic air contaminants
compared to Table III minimum quantities

Listed toxic air contaminant	CAS Number	Potential emissions (lbs/year)	Table III Minimum Quantity (lbs/year)
Acetone	67641	184	20,000
Benzene	**71432**	**18**	**10**
Carbon Disulfide	75150	71	2000
Carbonyl Sulfide	463581	23	70
Chlorobenzene	108907	14	20,000
Chlorodifluoromethane	75456	44	36,500
Cyclohexane	110827	39	20,000
1,4 Dichlorobenzene	**106467**	**31**	**10**
cis-1,2-Dichloroethene	156592	25	1000
Ethyl benzene	100414	217	3000
Ethyl chloride (Chloroethane)	75003	5	10,000
Ethylidene dichloride (1,1 Dichloroethane)	75343	8	70
Hexane	110543	42	20,000
Hydrogen Chloride	**7647010**	**4768**	**700**
Hydrogen Sulfide	**7783064**	**1839**	**10**
Isopropanol (2-Propanol)	67630	140	1000
Mercury (total)[1]		**0.6**	**0.3**
Methyl Ethyl Ketone	78933	321	4000
Methyl Isobutyl Ketone	108101	37	9000
Methylene Chloride	75092	15	200
Styrene	100425	40	3000
Tetrachloroethylene	**127184**	**28**	**20**
Toluene	108883	729	1000
Trichloroethylene	79016	22	50
Trichlorofluoromethane	75694	27	3000
Vinyl Chloride	75014	18	20
Xylene	1330207	501	1000

[1]treated as methyl mercury since speciated data was not available

TABLE 9

Summary of RPPP's Maximum Predicted Impacts of
Listed Toxic Air Contaminants and Comparison to Acceptable Ambient Levels (Fg/m^3)

Pollutant	Averaging Time	Maximum Predicted Source Impact ($\mu g/m^3$)	Acceptable Ambient Level ($\mu g/m^3$)
1,4 Dichlorobenzene	1-hour	0.109	5000
	24-hour	0.024	800
	Annual	0.003	0.09
Benzene	1-hour	0.064	200
	24-hour	0.014	30
	Annual	0.002	0.1
Hydrogen sulfide	1-hour	6.384	40
	Annual	0.205	10
Tetrachloroethylene	1-hour	0.097	1000
	Annual	0.003	0.2
Mercury	1-hour	0.0004	2
	24-hour	0.00012	0.3
	Annual	0.00002	0.009
Hydrogen Chloride	1-hour	5.619	2000
	Annual	0.144	9

F. Health Risks from Proposed Air Pollution Sources (Subsection 9.5.2(f))

Subsection 9.5.2 (f) requires the applicant to conduct any studies required by the Guidelines for Assessing Health Risks from Proposed Air Pollution Sources and meet the criteria therein.

The proposed source does not meet the applicability criteria in this document and therefore is not required to perform this type of study.

G. Applicable Air Pollution Control Regulations (Subsection 9.5.2(g))

Subsection 9.5.2 (g) requires the applicant to demonstrate that the facility will be in compliance with all applicable state and federal air pollution control regulations at the time the source commences operation. The following is a discussion of the applicable state and federal air pollution control rules and regulations and how compliance with each rule or regulation is addressed:

1. State Air Pollution Control Rules and Regulations

a. APC Regulation No. 1 "Visible Emissions"

This regulation limits visible emissions to less than 20% except for a period or periods aggregating more than three minutes in any one hour. The Office of Air Resources will limit opacity to less than 10% except for a period or periods aggregating more than three minutes in any one hour. The landfill gas fired engines are not expected to create visible emissions and therefore, compliance with this regulation should be assured.

b. APC Regulation No. 7 "Emission of Air Contaminants Detrimental to Person or Property"

The applicant has demonstrated, in the air quality impact analysis, that this facility will not cause or contribute to air pollution in violation of any National Ambient Air Quality Standard.

Additionally, the applicant has demonstrated that emissions from the facility will not adversely impact soils, vegetation, wildlife or human health.

Therefore, based on the foregoing, compliance with this regulation is expected.

c. APC Regulation No. 8 "Sulfur Content of Fuels"

This regulation would limit the sulfur content of the fuel used at this facility to less than 0.55 lbs/million BTU heat release potential.

The sulfur content of the landfill gas used at this facility is on the order of 0.02 lbs/MMBTU. Therefore compliance with the provisions of this regulation would be expected.

d. APC Regulation No. 14 "Recordkeeping and Reporting"

This regulation would require the applicant to maintain certain records and submit this information to the Office of Air Resources as requested. Any recordkeeping or

reporting requirements will be made a part of any permit issued pursuant to this application. See Section E. of the draft permit.

e. APC Regulation No. 17 "Odors"

This regulation states that a source cannot emit an objectionable odor beyond its property line. The landfill gas-fired engines would not be expected to generate odors that would be objectionable beyond the property line. Therefore compliance with this regulation can be expected.

f. APC Regulation No. 22 “Air Toxics”

The air quality modeling conducted by the applicant has demonstrated that the emissions from the facility will not cause an increase in the ground level ambient concentration at or beyond the property line in excess of that allowed by Air Pollution Control Regulation No. 22 ("Air Toxics").

Therefore compliance with this regulation can be expected.

2. Federal Air Pollution Control Rules and Regulations

40 CFR 60, Subpart WWW, “Standards of Performance for Municipal Solid Waste Landfills”

The applicant must comply with the requirements of 40 CFR 60.752(b)(2)(iii)(C). This requires that the landfill gas be treated prior to use in the engines. The landfill gas treatment system in use at this facility filters, de-waters and compresses the landfill gas prior to use in the engines and meets the requirements for a "treatment system" in 40 CFR 60.752(b)(2)(iii)(C). Therefore compliance with the NSPS can be expected.

V. Conclusion

Based on the information supplied by the applicant and the Office of Air Resources' review of the proposed project, the Office of Air Resources believes that the applicant has satisfied all of the applicable provisions of APC Regulation No. 9, Section 9.4 relative to the requirements for issuance of a Major Source Permit for a major modification in a nonattainment area and Section 9.5 relative to the requirements for issuance of a Major Source Permit for a major modification in an attainment area. As such, the Office of Air Resources is proposing approval of the application for a major modification of the Ridgewood Power facility subject to the permit conditions and emission limitations contained in the draft permit.

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