



**PERMIT APPLICATION  
REVIEW SUMMARY**

**New Hampshire Department of Environmental Services  
Air Resources Division  
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<b>Facility:</b>	North Country Environmental Services	<b>Engineer:</b>	Barbara Dorfschmidt
<b>Location:</b>	Bethlehem		
<b>AFS #:</b>	3300990255	<b>Application #:</b>	FY04-0469
		<b>Date:</b>	10/10/13
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**PROJECT DESCRIPTION/APPLICATION HISTORY**

The project incorporates the requirements of Temporary Permits TP-0078 and TP-0125 into an initial Title V Operating Permit. The original Title V application was submitted on June 14, 2004. Prior to that time the capacity of the landfill was below the applicability threshold for the NSPS (40 CFR 60, Subpart WWW); and, therefore a Title V permit was not required. An updated application was submitted on January 7, 2008. Due to changes in ownership and device changes new Temporary Permits needed to be issued before the Title V application could be processed. Another updated Title V application was submitted August 31, 2012.

**CHANGES FROM PREVIOUS PERMIT**

The Title V Operating Permit will contain the same terms and conditions as the Temporary Permits.

**FACILITY/PROCESS DESCRIPTION**

North Country Environmental Services, Inc. (NCES) operates a landfill which is located on a 105.15 acre aggregation of land in Bethlehem, NH. The current landfill units (four lined cells: Stages I, II, III, and IV) occupy approximately 36 acres. Stages I, II, III, and part of the permitted footprint for Stage IV have been constructed and municipal solid waste (MSW) has been placed in each of these landfill units.

An active gas collection system consisting of a network of vertical extraction wells and horizontal gas collection trenches has been installed in the landfill. In addition, landfill gas (LFG) is also collected from several leachate collection pipes and tanks. Centrifugal blowers are used to extract gas from the landfill and deliver the gas to one of two open flares.

**DEVICE DESCRIPTION**

The following table details the permitted devices located at the facility.

<b>Emission Unit Identification</b>				
<b>Emission Unit ID</b>	<b>Area Source or Device Name</b>	<b>Manufacturer Model</b>	<b>Startup Date</b>	<b>Maximum Permitted Capacity Permitted Fuel Type Nominal Maximum Fuel Flow Rate <sup>1</sup></b>
EU01	Landfill (active)	Not applicable	1976	3.51 million Megagrams
EU02	Open Flare	R. I. Baker Company, Inc. RIB – 10” x 30”	2000	52.5 MMBtu/hr 0.105 mmcf/hr of landfill gas
EU03	Open Flare	Parnel Biogas, Inc.	2013	85.5 MMBtu/hr 0.171 mmcf/hr of landfill gas
EU04*	Emergency Generator	Perkins Engine Co. Ltd. PWP-0045MSCINST	2001	0.392 MMBtu/hr 2.86 gal/hr of diesel fuel

\* The emergency generator is below the permitting threshold listed in Env-A 607.01(d). It is listed as an emission unit in the Title V permit because there are Federal regulations that apply to the device.

**LIST OF INSIGNIFICANT ACTIVITIES**

- A space heater located in the facility’s maintenance garage which combusts No. 2 fuel oil and waste oil;
- A space heater in the scale house which combusts kerosene; and
- A flare propane-fired pilot gas system.

<sup>1</sup> Nominal maximum fuel flow rate is based on an assumed HHV of 500 Btu/scf for landfill gas.

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### POLLUTION CONTROL EQUIPMENT

The flares are regulated both as fuel burning devices and as control devices. The LFG is required to be controlled in order to meet the standards under Env-A 1400.

### EMISSION CALCULATIONS

Actual and potential emission estimates are detailed in tables submitted with the permit application dated August 31, 2013. Sample calculations were also submitted as Appendix D of the application. The calculations were reviewed and found to be acceptable. The following describes the basis for the calculations.

The following AP-42 sections were used: Section 2.4, *Municipal Solid Waste Landfills* (updated 11/98); and Section 13.5, *Industrial Flares* (updated 9/91).

#### Landfill Gas Generation Estimates

To assess a range of potential LFG generation rates, Sanborn, Head & Associates, Inc. (Sanborn Head) used EPA's Landfill Gas Emissions Model, Version 3.02 (LandGEM) with historical and projected waste acceptance data and varying input parameters. The analysis evaluated the sensitivity of estimated LFG generation rates to changes in the LandGEM input constants: methane generation rate,  $k$ , and methane generation potential,  $L_0$ .

Eleven sets of LandGEM modeling results were generated based on eleven sets of model parameters. The eleven sets of model parameters were based on AP-42 defaults, published studies, and site-specific LandGEM calibrations performed previously by Sanborn Head. Based on the actual average LFG collection rates during 2001 through 2011 and the various modeled LFG collection rates, Sanborn Head chose a site-specific methane generation potential,  $L_0 = 130 \text{ m}^3/\text{Mg}$ .

During 2013, NCES intends to begin leachate recirculation, which typically results in increased LFG generation rates. Therefore, for LFG generation modeling with no leachate recirculation (prior to 2013), Sanborn Head chose a site-specific value for the methane generation rate constant,  $k = 0.07/\text{yr}$ . For gas generation modeling with leachate recirculation beginning in 2013, two values of  $k$  were used and the median value of projected rates using the two constants was used as the estimated rate. The two values of  $k$  that were used for these estimates were:

1.  $k = 0.16/\text{yr}$ , from the USEPA's September 2006 report on the Outer Loop Landfill in Louisville, Kentucky; and
2.  $k = 0.3/\text{yr}$ , from USEPA's June 2005 report on wet landfills.

The landfill is ultimately projected to be closed and capped by 2018. For the years 2013 to 2018, a weighted average collection efficiency of 86.5% was used, along with the LandGEM projections, to estimate the amount of LFG that will be burned in the flares. After 2018, a collection efficiency of 95% was used.<sup>2</sup> The projection indicates that the LFG collection rate will peak at 2,507 scfm in the year 2018.

#### Primary Pollutants

The primary pollutants generated from the landfill include methane, non-methane organic compounds (NMOCs) and reduced sulfur compounds. As stated above, a portion of this gas is collected and sent to the flare for combustion. The flares are designed to destroy 98% of the NMOCs and methane, as well as to destroy potentially odorous reduced sulfur compounds. The gas that is not collected is assumed to be emitted fugitively across the landfill surface.

#### VOCs

VOC emissions are based on Tier 2 sampling for NMOCs conducted on May 14, 2009. The average Tier 2 test results for NMOCs, as hexane, was 187 ppm. Based on AP-42 guidance (see footnote c of Table 2.4-2), VOC content is approximately 39% of the total NMOCs or 72.9 ppm.

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<sup>2</sup> The collection efficiencies are based on AP-42 guidance which gives the following: for active areas, collection = 75%; for intermediate cover, collection = 85% and for capped areas, collection = 95%. The weighted average number of 86.5% was determined during the permitting of the Baker flare (see air dispersion modeling report dated Sept. 19, 2006).

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*HAPs and RTAPs*

With the exception of hydrogen sulfide (H<sub>2</sub>S) and hydrogen chloride (HCl), AP-42, Table 2.4-1 was used for concentrations of toxic air pollutants in the landfill gas. H<sub>2</sub>S and HCl calculations are discussed in the following section on Secondary Pollutants. H<sub>2</sub>S emission estimates are discussed below along with sulfur dioxide emissions.

Secondary Pollutants

The combustion of LFG in the flares results in the emission of air pollutants that are either created by secondary reactions during the combustion process (i.e. NO<sub>x</sub> and SO<sub>2</sub>), or are the products of incomplete combustion (i.e. CO).

*Particulate Matter*

Emissions of particulate matter are based on factors listed in AP-42 Table 2.4-5. Based on AP-42, most of the particulate matter is less than 2.5 microns in diameter. Hence the total particulate emissions can be used for estimates of PM<sub>10</sub>. The emission factor was converted from units of lb/10<sup>6</sup> dscf methane to lb/MMBtu using the heating value of landfill gas of 500 Btu/scf and assuming the LFG contains 50% methane. The emission factor used is equal to 0.017 lb/MMBtu.

*Carbon Monoxide (CO) and Nitrogen Oxides (NO<sub>x</sub>)*

Emission factors for CO and NO<sub>x</sub> were taken from AP-42 Table 13.5-1. For CO the emission factor is 0.37 lb/MMBtu and NO<sub>x</sub> the emission factor is 0.068 lb/MMBtu.

*Sulfur Dioxide (SO<sub>2</sub>) and Hydrogen Sulfide (H<sub>2</sub>S)*

The estimate of actual SO<sub>2</sub> and H<sub>2</sub>S emissions were based on the average total reduced sulfur (TRS) concentration in LFG from samples collected four times throughout 2011, which was 1089 ppm. Potential emissions were based on a conservative estimate of TRS concentration of 1500 ppm.

*Hydrogen Chloride (HCL)*

Note that the application does not contain an estimate of HCl emissions. HCl emissions would be generated from combustion of chlorinated compounds in the flare. It is assumed that all of the chlorine contained in the landfill gas sent to the flare will be converted to HCl. In the absence of specific analytical data, USEPA suggests using a value of 42 ppmv for the total concentration of chlorinated compounds in landfill gas. Potential emissions are based on the peak landfill gas flow rate of 2,507 scfm and the assumption that 95% of the gas will be combusted in the flare. Using an average molecular weight of 100, the mass flow rate of chlorinated compounds delivered to the flare would be:

$$\frac{(42/1,000,000)(2,507 \text{ cfm} * 0.95)(60 \text{ min/hr})(1 \text{ atm})(100 \text{ lb/lbmol})}{(519.7 \text{ R})(0.7302 \text{ atm} \cdot \text{ft}^3/\text{lbmol} \cdot \text{R})} = 1.58 \text{ lb/hr}$$

Assuming that each chlorinated molecule has two chlorine atoms, the mass flow rate of hydrogen chloride emitted from the flare would be:

$$\frac{(1.58 \text{ lb/hr})(2)(36.46 \text{ lb/lbmol HCl})}{(100 \text{ lb/lbmol})} = 1.15 \text{ lb/hr}$$

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Summary

The following table contains the emission summary of potential emissions from the individual emission units as well as facility-wide totals.

<b>Potential (Unrestricted) Emission Summary (tpy)</b>							
<b>Device/Process</b>	<b>SO<sub>2</sub></b>	<b>NO<sub>x</sub></b>	<b>PM<sub>10</sub></b>	<b>CO</b>	<b>VOCs</b>	<b>H<sub>2</sub>S</b>	<b>HAPs</b>
EU01 – Landfill (86.5% capture efficiency)	--	--	--	--	1.50	12.2	2.50
EU02 – Open Flare	112.6	15.6	3.9	85.1	0.15	1.20	0.25
EU03 – Proposed Flare	183.3	25.5	6.4	138.6	0.20	2.00	0.40
EU04 – Emergency Generator	0.03	0.43	0.03	0.09	0.04	0	0
Garage Space Heaters	1.05	2.61	0.33	0.09	0.05	0	0
Facility Total	297	44.1	10.7	224	1.94	15.4	3.15

The facility has proposed a limit on the amount of gas that will be burned in the flares in order to bring them below the PSD major source threshold for SO<sub>2</sub> of 250 tpy. The facility has proposed an operating limit of 1,000,000 MMBtu/yr of heat input to the two flares, combined. The following table summarizes the potential emissions based on this limit:

<b>Potential (Permitted) Emission Summary (tpy)</b>							
<b>Device/Process</b>	<b>SO<sub>2</sub></b>	<b>NO<sub>x</sub></b>	<b>PM<sub>10</sub></b>	<b>CO</b>	<b>VOCs</b>	<b>H<sub>2</sub>S</b>	<b>HAPs</b>
EU01 – Landfill (85.5% capture efficiency)	--	--	--	--	1.50	12.2	2.50
EU02 and EU03 - Total from Flares	245	34	8	185	0.30	3.00	0.50
EU04 – Emergency Generator	0.03	0.43	0.03	0.09	0.04	0	0
Garage Space Heaters	1.05	2.61	0.33	0.09	0.05	0	0
Facility Total	246	37	8.3	185	1.89	15.2	3.00

The facility is a potential major source of SO<sub>2</sub> and CO for Title V permitting regulations.

**MODELING**

Air dispersion modeling analysis for criteria pollutants and RTAPs was conducted as part of the review for the installation of the Parnel flare. The report was reviewed by DES and summarized in a memo dated Nov. 18, 2012. The source is able to show compliance with all applicable NAAQSs, PSD Increment standards and AALs.

Because the emission limits of the source are above the thresholds listed in Env-A 606.02(c)(5), this source would need to be included in any interactive modeling for the surrounding area. The following table summarizes the pollutants that would need to be included in the interactive modeling based on the criteria of Env-A 606.06(c).

	Achieve Performance Level			Modeling Required?		
	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>
Env-A 606.06(c)	No RACT limits in effect	≤ 0.025 lb/MMBtu	≤ 0.10 lb/MMBtu			
EU02 – Baker Flare	na	0.49 lb/MMBtu	0.017 lb/MMBtu	Y	Y	N
EU03 – Parnel Flare	na	0.49 lb/MMBtu	0.017 lb/MMBtu	Y	Y	N

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**LANDFILL TESTING**

In order to show compliance with Env-A 1400, the facility must operate the collection and control system in accordance with the provisions set forth in an approved Landfill Gas Collection System Enhanced Monitoring Protocol and Standard Operating Procedure (EMP/SOP). Provisions for the following will be maintained in a site specific EMP/SOP approved by the department and changes to the plan must be approved prior to implementation:

- Well monitoring, balancing, and recordkeeping
- Surface scanning and reporting
- LFG Total Reduced Sulfur (TRS) testing and reporting
- LFG flow monitoring

**COMPLIANCE STATUS**

**Emission Testing** – No testing of the flares has been or will be required.

**Inspections** – The source was last inspected on April 2, 2010. Issues were found concerning the annual emissions report and fees. The issues were resolved and all fees are up to date.

**Reports/Fees** – The company has submitted all required annual reports and paid all emission-based fees

**REVIEW OF REGULATIONS**

**State Regulations**

Env-A 600 – *Permitting*

- 607.01(a) – Applicable – The flares are rated > 10 MMBtu/hr.
- 607.01(n) – Applicable – The facility is limiting its potential emissions of SO<sub>2</sub> to avoid PSD regulations.
- 607.01(t) – Applicable – The facility is required to install a collection and control system for compliance with Env-A 1400.
- 609.01(a) – Applicable – The facility is required to obtain a Title V permit because they are a potential major source of CO and SO<sub>2</sub> and because they are subject to Title V permitting under Section 111 of the Clean Air Act.

Env-A 618 – *Additional Requirements in Non-Attainment Areas and the New Hampshire Portion of the Northeast Ozone Transport Region*

- Not Applicable – All emissions are below NSR major source and major modification thresholds.

Env-A 619 – *Prevention of Significant Deterioration of Air Quality Permit Requirements*

- Not Applicable – All emissions are below PSD major source and major modification thresholds.

Env-A 1000 – *Prevention, Abatement, and Control of Open Source Air Pollution*

- 1002 – Applicable – The source shall control the emissions of fugitive dust

Env-A 1200 – *Prevention, Abatement and Control of Stationary Source Air Pollution*

- Not Applicable – Potential emissions of VOCs are less than 50 tpy.

Env-A 1300 – *Nitrogen Oxides Reasonably Available Control Technology*

- Not Applicable – Potential emissions of NO<sub>x</sub> are less than 50 tpy.

Env-A 1400 - *Regulated Toxic Air Pollutants,*

- A collection and control system is required for the landfill to show compliance with AALs for hydrogen sulfide.

Env-A 1600 – *Fuel Specifications*

- Not applicable to landfill gas.

Env-A 2000 – *Fuel Burning Devices*

- 2002.02 – Applicable – Visible emissions limited to 20%
- 2002.08 – Applicable – Total suspended particulate (TSP) emissions limited to 0.30 lb/MMBtu.

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**Federal Regulations**

40 CFR 60, Subpart WWW – *Standards of Performance for Municipal Solid Waste Landfills*

Applicable – The facility has a design capacity exceeding 2.5 million megagrams, making the facility subject to the Title V permit program. The facility must also comply with reporting requirements and the requirement to calculate NMOC emissions on an annual basis.

40 CFR 63, Subpart AAAA – *Municipal Solid Waste Landfills for Facilities without a Bioreactor*

Not Applicable – Requirements for startup, shutdown, and malfunction plan will not apply unless the NMOC generation rises to 50 megagrams per year.

40 CFR 63 Subpart ZZZZ, *National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines*. Applicable - The emergency generator was manufactured prior to June 12, 2006, and the source is considered an area source of HAPs.