



DET NORSKE VERITAS

Verification Report for the Erie County Landfill

Reporting Period:

June 9, 2008 to May 31, 2009

Submitted to the Climate Action Reserve

3 December 2009



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1. INTRODUCTION

Det Norske Veritas Certification, Inc. (DNV) has been contracted by Element Markets, LLC (EM) to verify the emission reductions generated by the Erie County Sanitary Landfill (ECL) project for the period from June 9, 2008 to May 31, 2009. The verification was completed as required in the Climate Action Reserve Verification Program Manual, June 17, 2009. This report contains the findings from the verification and a statement for the verified emission reductions.

1.1 Verification Objective

Verification is the process through which a verification body assesses a project developer's greenhouse gas (GHG) reduction assertions against defined verification criteria and standards that are defined by the Climate Action Reserve (CAR) GHG program. The purpose of verification is to provide an independent third -party review of project data and information being submitted to the Reserve, to ensure that the project is eligible as defined in the relevant project reporting protocols and that the reported emission reductions meet the appropriate materiality threshold.

The Reserve requires third-party verification of all GHG projects, as specified in each project protocol. Climate Reserve Tonnes (CRTs) are issued only after a Verification Report and a Verification Opinion attesting to their accuracy have been submitted by the verifier and accepted by the Reserve. DNV is a verification body under the Reserve and meets additional sector-specific accreditation requirements to which this project is subject.

The objective of this verification was to verify the voluntary emission reductions reported for the ECL for the period from June 9, 2008 to May 31, 2009.

1.2 Scope and Criteria

1.2.1 Scope of the Verification

The scope of the verification includes:

- Ensuring that the project is eligible according to the specific eligibility rules in the general and landfill protocols, and has designed, measured and monitored baseline and project emissions, per the protocol.
- Reviewing the data reported to the Reserve, the project monitoring plan, and record keeping and quantification methodologies, to ensure that the reported GHG reductions are accurate and calculated in line with the general and landfill protocols.

1.2.2 Verification Criteria

According to Reserve, the criteria to be applied during this verification include those contained in the following protocols:

- Landfill Reporting Protocol 2.0¹;
- Landfill Project Verification Protocol 2.0²;
- California Climate Action Registry (CCAR) General Reporting Protocol 3.1³;

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- CCAR General Verification Protocol 3.0⁴, and
- Climate Action Reserve, Verification Program Manual.⁵

1.3 Level of Assurance

During the verification, DNV has focused on providing a reasonable level of assurance that:

- The emission reduction calculation methodology used is appropriate and correctly applied.
- The emission reductions have been accurately monitored, calculated and reported.

2. PROJECT INFORMATION

2.1.1 Project Background

The ECL is a class I municipal sanitary waste landfill located along Hoover Road in Milan, Erie County, Ohio. The landfill began operation in 1986 and is owned by the Erie County Board of Commissioners.⁶

The site includes a permitted disposal area of 60.63 acres on a 116 acre parcel in southern Erie County. The facility consists of eight contiguous landfill cells, with a total permitted volume for waste disposal of 4.0 million cubic meters [5.23 million cubic yards]. As of early 2009, ECL had 1.68 metric tons [1.85 million short tons] of waste in place at the facility. The site is currently receiving an average of about 90,718 metric tons [100,000 short tons] of waste per year.

2.1.2 Project Activities

The ECL project began operation on June 9, 2008; it consists of a voluntary active landfill gas collection and control system to facilitate the destruction of methane contained in the landfill gas, by combustion at an open flare. The voluntary active gas collection system, consists of 17 vertical gas extraction wells, 21 spur wells, 4 connections to leachate cleanout laterals, and connecting gas piping.

The daily operation of the project is undertaken by Erie County Landfill personnel, with support from EM project personnel. EM has exclusive rights and title to any carbon emission reduction credits resulting from this activity.^{7,8,9,10}

3. VERIFICATION ACTIVITIES

DNV has undertaken verification activities and compiled the verification team and tasks based on the complexity of the project developers' GHG emissions reductions and the underlying data supporting them. The verification team and process are summarized below.

Verification Team:

John Warmerdam	Project manager
Weidong Yang	Lead verifier
David DeVooght	Senior internal reviewer
Barbara Toole O'Neil	Technical support
Miguel Rescalvo Santandreu	Corporate reviewer

Duration of verification:

Task	Activities	Completion Date
1	Conflict of Interest form approved by CAR	August 4, 2009
2	Verification kick-off meeting	August 14, 2009
3	Desk review	August 20, 2009
4	Site visit	August 21, 2009
5	Quality assurance review	September 1, 2009
6	Submission of verification report to Project Developer	September 10, 2009
7	Verification opinion uploaded to CAR project site	November 3, 2009

3.1 Desk Review

The documents provided by the project developer, including project design document, emission reductions spreadsheet, monitoring and reporting, calibration, and legal documents^{6,11,12,13,14,15,16}, were assessed. Initial risk areas related to the emission reduction estimates were identified through the document review. The on-site visit agenda was prepared according to items noted during the desk review.

3.2 Site Visit and Data Sampling

On August 2, 2009, DNV performed a site visit at ECL. During the site visit, DNV verified the project facility operation, including the monitoring practices related to the emission reduction estimate, by observation, record review and interview with staff members. Based on the site visit, DNV was able to confirm the actual implementation of the project conforms to the description contained in the project design document⁶

During the site visit, DNV was also able to confirm the emission sources related to the project activity and the risk areas identified during the desk review. A final sampling plan was determined during the site visit, and emission reductions were re-calculated accordingly.

As shown in Table 1, the emissions related to the destruction of landfill gas by the flare (Source A) are the primary emissions related to emission reduction estimates. Therefore, a sampling plan for re-calculating the emission reductions was developed only for Source A.

Table 1: Emission Sources Identified

Emission Sources Identified	Ranked by Magnitude
Emissions related to the destruction of landfill gas by flare (Source A)	1. more than 99% of the emission reductions
Emissions related to the electricity consumed by the project activity (Source B)	2. less than 1% of the emission reductions
Emissions related to the propane consumed by the project activity (Source C)	3. less than 1% of the emission reductions

4. VERIFICATION FINDINGS

4.1 Summary

DNV was able to verify that the GHG emission reductions reported for the ECL project are fairly stated.

Some clarification requests were identified during the verification. Responses were provided by the project developer to the satisfaction of DNV.

4.2 Project Eligibility

The Landfill Reporting Protocol 2.0¹ establishes that a project must satisfy three eligibility rules to meet the definition of a GHG reduction project. DNV verified the ECL project is in conformance with these three eligibility requirements for the reporting period of June 9, 2008 to May 31, 2009.

4.2.2 Eligibility Rule I – Project Location

On August 21, 2009, a qualified DNV lead verifier and a senior reviewer conducted a site visit at the ECL in Milan, Erie County, Ohio. DNV verified that the Erie County Sanitary Landfill is the ECL project seeking registration under the CAR.

4.2.3 Eligibility Rule II – Project Operation Start Date

DNV verified the project's conformance with this eligibility rule, as the project started operation on June 9, 2008, as evidenced by the "Flare Commission Report"¹⁷

4.2.4 Eligibility Rule III – Additionality

The Performance Standard Test

DNV verified the project's conformance with this eligibility rule by meeting option 1 of the performance threshold. This option states that "...if the landfill is not currently collecting and destroying any landfill gas, the project is considered additional." There was only passive landfill gas collection and no destruction of landfill gas at the ECL prior to the start date of the project.

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The Regulatory Test

DNV verified the project's conformance with this eligibility rule as detailed below.

- The Erie County Landfill is subject to the New Source Performance Standard (NSPS) for the control of non-methane organic compounds (NMOC). Based upon the results of the 2008 Tier II Report¹⁸ the Erie County Landfill had a NMOC emission level estimated at 5.5 Mg per year in 2008. This value does not require ECL to capture the landfill gas under the regulation, as the regulatory compliance limit in the regulation is 50 Mg per year.
- The Erie County Landfill is not required to manage its landfill gas under either the Ohio Environmental Protection Agency or local regulations, as confirmed by the Project Developer's Attestation of Regulatory Compliance¹¹, submitted to the Reserve.
- The Erie County Landfill has also met all applicable state and local environmental regulations¹⁶ and has obtained all applicable permits¹⁶

4.3 Monitoring

4.3.1 Monitoring Plan

The monitoring plan is in accordance with the CAR Landfill Reporting Protocol (LRP) 2.0¹ and allows for the accurate measurements of actual emission reductions.

Monitoring Data

All the necessary data needed to estimate emission reductions are included in the monitoring plan, as shown in Table 2. The installation of monitoring meters and the monitoring frequency are in accordance with the CAR LRP 2.0¹.

Table 2: Monitoring Data

Parameter	Measuring Method / Installation Location	Required Frequency
Landfill gas flow	Flow meter * / located in a straight section of pipe upstream from the flare	Continuously
Methane content	Portable methane analyser / located in a straight section of pipe upstream from the flare	Weekly
Flare temperature	Temperature meter / flare skid	Continuously
Electricity consumption	Receipts of supplier / covering all the facility used in the project activities	Monthly

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Propane consumption	Receipts of supplier / covering all consumption used in the project activities	Each purchase
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Note: * Automatically adjusts for temperature and pressure of the gas stream.

QA/QC Procedures

Calibration of the monitoring meters is defined in accordance with requirements contained in the CAR LRP 2.0¹ below:

- The calibration of the landfill gas mass flow meter is conducted quarterly.
- The calibration of the portable methane analyzer is conducted quarterly. In addition, the device will be shipped off location for a factory calibration at least annually, per the manufacturer's recommendations. At ECL, field calibrations are performed approximately weekly.

All the necessary QA/QC procedures to ensure the correct measurement, calculation and reporting of emissions reductions are properly defined. These include:

- Organization and Responsibility, Personnel Competence
- Data Management, Record Keeping, Missing Data & Data Substitution
- Operations and Maintenance
- Environmental Compliance & Violation

4.3.2 Implementation of Monitoring Plan

After reviewing the relevant records^{13,14} interviewing staff members^{19,20,21,22} and observing practices on-site, DNV verified that the monitoring plan was effectively implemented during this verification period, except for the following issue.

The flow meter used to measure the quantity of LFG entering the flare needs to be calibrated quarterly, according to the protocol's requirement. Calibrations for the verification period were performed only on March 31, 2008 and May 9, 2009. However, the project developer has submitted a variance application to the Reserve related to the calibration implementation, and the response from the Reserve approved the variance, "...provided that the verifier confirms the successful calibration asserted for the 5/09/2009 calibration event"²³. DNV verified the flow meter was appropriately calibrated on May 9, 2009¹⁴

4.4 Emission Reduction Estimates

4.4.1 The GHG Assessment Boundary

The GHG assessment boundary for the project includes all emission sources, from the operation of the landfill gas collection system to the ultimate destruction of the landfill gas, as shown in the below table.

Table 3: GHG Sources Associated with the Project

GHG Source	Comments
CH ₄ in the LFG which would have been vented to the atmosphere without the project activities	Calculated as baseline emissions
CO ₂ from combustion of propane by the project activities	Calculated as project emissions
CO ₂ from consumption of electricity by the project activities	Calculated as project emissions

4.4.2 GHG Emission Reduction Calculations

Equations

Equation 5.1 in the CAR LRP 2.0¹ is properly adapted for the emissions reduction calculations of the project, as shown in the table below.

Table 4: Adaptation of Equation 5.1 with Properly Selected Parameter Values

Factor	Explanation	Value	Justification
OX	Factor for the oxidation of methane by soil bacteria	0.10	The landfill is not covered with a synthetic liner as part of the final cover.
DF	Discount factor to account for uncertainties associated with the project monitoring equipment.	0.10	The methane content is not measured continuously.
PRE _{discount}	Adjustment to account for pre-project LFG destruction device	0	No pre-project LFG destruction system was in place prior to project implementation.
EF _{FF}	Fuel-specific emission factor for propane	5.74 kgCO ₂ /gal	CCAR General Reporting Protocol 3.1. Appendix C.3 ⁴ .
EF _{EL}	Carbon emission factor for electricity used	1,537.82 lbCO ₂ /MWh	CCAR General Reporting Protocol 3.1. Appendix C.2 ⁴

Equation 5.2 in the CAR LRP v2.0¹ is properly adapted for the total annual methane emissions destroyed by the project, as described below.

- The methane is destroyed only by flaring;

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- No supplemental natural gas is used in the flare;
- The methane destruction efficiency for the flare is defined as 0.96, since an open flare is used in the project³;

Data Collection, Aggregation, and Calculation

The data collection, aggregation and emission reduction calculations have been planned properly and implemented effectively, as detailed below.

- **Weekly methane content:**
 - ✓ The methane content was planned to be measured once a week. In practice, it is measured more than once a week. The average of the measured readings is used for emission reduction calculations in each week.
 - ✓ The methane content is manually entered into the calculation spreadsheet. The raw data records for the methane content were cross-checked by sampling the data used in the emission reduction calculation spreadsheet, and no errors were found.
- **Weekly LFG cumulative flow:**
 - ✓ The LFG flow-rate is measured continuously, with an automatic recording of the maximum and minimum values within each 2 minute interval. The average of the maximum and the minimum is used to calculate the cumulative LFG flow within each 2 minute interval. The minimum flare temperature within the same 2 minute interval is used to determine if the two-minute cumulative flow measurement can be classified as flared – only when the minimum temperature at the flare is higher than 500°F, is the two-minute cumulative flow added into the total cumulative flow for the day.
 - ✓ The daily cumulative flow is corrected based on Equation 5.4 in the CAR LRP v2.0⁴. The flow-rate meter used in the project measures the flow-rate with automatic pressure and temperature correction, but, the temperature set in the meter is 70°F, while the requirement in Equation 5.4 is 60°F.
 - ✓ Weekly LFG cumulative flow is obtained by adding up the daily LFG cumulative flows within the week.
 - ✓ The raw LFG flow-rate data is copied from the memory card of the flow-rate meter to the emissions calculation spreadsheet. The raw data records were cross-checked by sampling the data used in the emissions reduction calculation spreadsheet, and no errors were found.
- **Weekly methane destruction:**
 - ✓ Weekly methane destruction volume is obtained by weekly methane content multiplied by weekly LFG cumulative flow, with a 5% discount applied for any missing data and subsequent data substitution.

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- ✓ There is no missing data in the verification period. The calculation was checked by sampling, and no errors of material or immaterial nature were found.
- **Emission reductions for year 2008 and 2009 within the verification period:**
 - ✓ The emissions reductions were calculated based on Equation 5.1.
 - ✓ The calculation was checked by sampling, and no errors of material or immaterial nature were found.
 - ✓ The verified emission reductions are shown in Table 5.

Table 5: Emission Reduction Estimates

Period	Emission Reductions (tonnes CO₂e)
6/9/2008 – 12/31/2008	17,081.
1/1/2009 – 5/31/2009	16,162.
Total in the verification period	33,243.



5. VERIFICATION OPINION

Det Norske Veritas Certification, Inc. (DNV) has performed a verification of emission reductions reported for the “Erie County Landfill” managed by Element Markets, LLC for the period from June 9, 2008 to May 31, 2009.

In DNV’s opinion, the GHG emission reductions reported for the project are fairly stated and the project meets all the verification criteria of the Climate Action Reserve.

The GHG emission reductions were calculated correctly, using methods and data contained in the Landfill Reporting Protocol 2.0 and the monitoring plan provided in the project design document.

DNV was able to verify that the emission reductions from the Erie County Landfill managed by Element Markets, LLC for the period from 9 June 9, 2008 to May 31, 2009 amount to 33,243 tCO₂e.

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6. REFERENCES

- 1 Climate Action Reserve Landfill Reporting Protocol, v 2.0, 2009
- 2 Climate Action Reserve Landfill Project Verification Protocol, v. 2.0
- 3 California Climate Action Registry (CCAR) General Reporting Protocol 3.1
- 4 CCAR General Verification Protocol 3.0
- 5 Climate Action Reserve, Verification Program Manual, 17 June 2009.
- 6 Element Markets, Project Design Documents, “Erie County Landfill”, Version 1.0, 31 August 2009.
- 7 Element Markets, Project Developer’s Attestation of Title, 27 March 2009
- 8 Landfill Gas Purchase Agreement between Renewable Energy Services of Ohio, LLC and Erie County, Ohio for the Erie County Landfill, executed December 20, 2007.
- 9 Consent Judgment Entry and Stipulation of Dismissal of All Claims, Renewable Energy Services of Ohio, LLC v. The Board of County Commissioners of Erie County, OH; Case No. 2009-CV-0690, Filed October 9, 2009.
- 10 Signed letter from Erie County Commissioners to Renewal Energy Services of Ohio, LLC (RESO) on October 15, 2009 approving the Verified Emission Reduction Purchase Agreement between Element Markets, LLC and RESO dated October 31, 2008 as amended on April 9, 2009 and August 12, 2009 in accordance with the terms of the Landfill Gas Purchase Agreement between RESO and Erie County dated December 20, 2007.
- 11 Element Markets, Project Developer’s Attestation of Title, 27 March 2009.
- 12 Element Markets, Emission Reductions (spreadsheet), including: CAR Emission Reductions, Raw Data for Calculation.
- 13 Monitoring and Reporting, including: LFG Management Report; Erie County Daily System Notes; Erie County Daily Landfill Observations.
- 14 Calibration Documents, including: ERIE – GEM 2000 Calibrations; ERIE – LFG Spec PM Report; FCI Flow-meter Factory Calibration Record.
- 15 Element Markets, Project Developer’s Attestation of Regulatory Compliance, 15 June 2009.
- 16 Permits: Permit to Construct and Operate Emissions Equipment, Solid Waste Management Permit, Title V Permit, Vertical Expansion Permit, NPDES Permit
- 17 Shaw LFG Specialties, L.L.C., Flare Commission Report for Serial No. 2117, Project No. 131608, 28 June 2008.
- 18 Cornerstone Environmental Group, LLC, Erie County Sanitary Landfill Tier 2 landfill Gas sampling Report, July 2008
- 19 Interview with Steve Petridis, Head of Engineering Services, Element Markets, August 21, 2009
- 20 Interview with Jack Meyers, Sanitary Engineer, Erie County Landfill., August 21, 2009
- 21 Interview with Robert Sennish, Environmental Specialist, Erie County Landfill, August 21, 2009
- 22 Interview with Fred Duppert, Landfill Superintendent, Erie County Landfill, August 21, 2009
- 23 Climate Action Reserve, Variance Approval – Project Name: Erie County Landfill, 25 August 2009.