REQUEST FOR PROPOSAL

Landfill Gas-to-Energy Development Project for the Blackburn Landfill and Resource Recovery Facility Newton, North Carolina

RFP NO. 21-1001

catawba county
MAKING. LIVING. BETTER.

Date of Issue:	**Monday, August 3, 2020**
Proposal Due Date:	**Friday, September 11, 2020**
Proposal Due Time:	**4:00 PM ET**

Issued for:
Catawba County Utilities & Engineering
Solid Waste Division
25 Government Drive
Newton, North Carolina 28658
(828) 465-8261

Issued by:
Catawba County Purchasing Manager
25 Government Drive
Newton, North Carolina 28658
(828) 465-8224

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Catawba County Utilities & Engineering
Solid Waste Division

Landfill Gas-to-Energy Development Project for the Blackburn Landfill and Resource Recovery Facility Newton, North Carolina

Issue Date: Monday, August 3, 2020

Title: Landfill Gas-to-Energy Development Project for the Blackburn Landfill and Resource Recovery Facility

Issuing Agency & Address: Catawba County Purchasing Manager
25 Government Drive
Newton, NC 28658
(828) 465-8224

Location of Work: Blackburn Landfill and Resource Recovery Facility
4017 Rocky Ford Road, Newton, NC 28658

Proposed Term of Contract: Twenty (20) Years

Contact Person: Tina Wright, Catawba County Purchasing Department
email: tinawright@catawbacountync.gov
phone: (828) 465-8224

Proposal packages must be labeled: Proposal for Landfill Gas-to-Energy Development Project for the Blackburn Landfill

Virtual Pre-Proposal Conference: A non-mandatory virtual pre-proposal conference will be conducted on **Wednesday, August 12, 2020 at 10:00 AM ET**. Requests to be invited to virtual pre-proposal conference must be submitted by **Monday, August 10, 2020 by 5:00 PM ET** to the above contact person.

Proposals are due before Friday, September 11, 2020 at 4:00 PM ET to the Catawba County Purchasing Department. Proposals will be date stamped and recorded as they are received. Proposals received after this date and time will not be considered and will be returned to the Company unopened.

The County requests two (2) paper copies and one (1) electronic copy of the Proposal from each Company.

NOTICE TO COMPANIES FOR LANDFILL GAS DEVELOPMENT SERVICES

Catawba County (County) is the owner and operator of the Blackburn Landfill and Resource Recovery Facility (Blackburn Landfill), a permitted municipal solid waste (MSW) landfill under North Carolina Solid Waste Permit No. 1803-MSWLF-1997 and Title V Operating Permit No. 08533T10. The Blackburn Landfill is located at 4017 Rocky Ford Road in Newton, North Carolina.

The County is also the owner and operator of an existing landfill gas-to-energy (LFGE) project at the Blackburn Landfill that consists of an electrical generation facility (power plant) which utilizes the landfill gas (LFG) as fuel for engine generators (gensets) and produces renewable (green) electrical power that is sold to Duke Energy. The 15-year term of the Power Purchase Agreement has expired and the three Jenbacher engine gensets each have (or will soon have) over 60,000 hours of service. Accordingly, the County intends to discontinue operation of this power plant due to the age of the existing engine gensets.

The County has elected to issue this Request for Proposal (RFP) to solicit proposals from qualified Companies to develop an LFGE project and related facilities for commercial and beneficial use of the LFG collected at the Blackburn Landfill and to make payments to the County in exchange for receiving LFG. The County shall consider Proposals outlining technically and financially feasible beneficial uses of the LFG, including electrical power generation, direct-use by industrial users as medium-BTU fuel, production of renewable natural gas (RNG), or other suitable beneficial utilization technologies.

For the purposes of this RFP, the scope of work requested by the County includes, but is not limited to, planning, permitting, financing, design, construction, operation, maintenance, and environmental monitoring services for facilities associated with the beneficial use of landfill gas. In addition, the scope of work includes marketing, sale and distribution of the full market value of the LFG, including all forms of energy and environmental attributes, tax credits, and tax incentives.

Sealed proposals will be submitted to the Catawba County Purchasing Department **before Friday, September 11, 2020 at 4:00 PM ET** for furnishing LFGE project development services for LFG collected at the Blackburn Landfill. Proposals submitted after this date and time will not be considered. The County reserves the right to postpone or discontinue future phases of this procurement contingent on responses to the RFP or for any other reason.

VIRTUAL PRE-PROPOSAL CONFERENCE

A non-mandatory virtual pre-proposal conference will be conducted on **Wednesday, August 12, 2020 at 10:00 AM ET**. Requests to be invited to the virtual pre-proposal conference must be submitted by **Monday, August 10, 2020 by 5:00 PM ET** to the above contact person.

SMALL GROUP SITE VISITS

Interested parties may contact the County for a small group site visit during the **Week of August 17th**. Requests must be submitted by **Thursday, August 13, 2020 by 5:00 PM ET** to the above contact person.

RFP QUESTIONS

Written questions must be emailed to tinawright@catawbacountync.gov by **Wednesday, August 26, 2020 at 5:00 PM ET**. The Company should enter "RFP #21-1001 – Questions" as the subject for the email. Questions received prior to the submission deadline date, the County's response, and any additional terms deemed necessary by the County will be posted in the form of an addendum to the Catawba County website, https://www.catawbacountync.gov/county-services/purchasing/bid-notices/ and will become an Addendum to this RFP. No information, instruction or advice provided orally or informally by any County personnel, whether made in response to a question or otherwise in connection with this RFP, will be considered authoritative or binding. The Company may only rely on written material contained in an Addendum to this RFP.

SUBMISSION OF PROPOSALS

The Proposals, including all required forms, must be submitted with one (1) original, one (1) copy, and one (1) electronic copy on flash drive. The sealed envelope containing the Proposal must be marked on the exterior "Proposal for Landfill Gas-to-Energy Development Project for the Blackburn Landfill", along with the name and address of the Company.

When responding to this RFP, please follow all instructions carefully. Please submit proposal contents according to the outline specified. Failure to follow these instructions may be considered a non-responsive submission and may result in immediate elimination from further consideration. The Proposal should be sent to the address indicated in the table below.

Mailing address for delivery of Proposal via US Postal Service	**Office Address of delivery by any other method (hand delivery, overnight, or any other carrier)**
RFP Number: 21-1001 Catawba County Government Center Attn: Purchasing Department Post Office Box 389 Newton, North Carolina 28658	RFP Number: 21-1001 Catawba County Government Center Attn: Purchasing Department 25 Government Drive Newton, North Carolina 28658

IMPORTANT NOTE: All Proposals shall be physically delivered to the office address listed above on or before the submission deadline referenced in the RFP Schedule below in order to be considered timely, regardless of the method of delivery. **This is an absolute requirement.** All risk of late arrival due to unanticipated delay—whether delivered by hand, U.S. Postal Service, courier or other delivery service is entirely on the Company(s). It is the sole responsibility of the Company to have the Proposal physically in this Office by the specified time of opening. No facsimile or e-mail submissions will be accepted.

If applicable, any addendum to this RFP, will be placed on the County's website at the following location: https://www.catawbacountync.gov/county-services/purchasing/bid-notices/

RFP SCHEDULE AND PROCUREMENT PROCESS

The *intended* schedule for this RFP and the proposed procurement process for development of a Landfill Gas-to-Energy project at the Blackburn Landfill is presented below. Catawba County will make every effort to adhere to this proposed schedule.

1. Issuance of Request for Proposals – **Monday, August 3, 2020**
2. Request to Attend Non-Mandatory Virtual Pre-Proposal Conference – **Monday, August 10, 2020 by 5:00 PM ET**
3. Non-Mandatory Virtual Pre-Proposal Conference – **Wednesday, August 12, 2020 at 10:00 AM ET**
4. Request for Small Group Site Visits – **Thursday, August 13, 2020 by 5:00 PM ET.**
5. Small Group Site Visits – **Week of August 17 at request and by appointment only**
6. Last Day for Receipt of Questions on RFP – **Wednesday, August 26, 2020 at 5:00 PM ET**
7. Last Day the County will issue written responses to questions – **Wednesday, September 2, 2020 at 5:00 PM ET**
8. Proposals Due – **Friday, September 11, 2020 at 4:00 PM ET**
9. Selection Committee to present recommendation to Catawba County's Utilities & Engineering Director – **TBD**
10. Complete Final Contract Negotiations with Selected Respondent – **TBD**
11. Present Final Contract to Board of Commissioners for approval – **TBD**
12. Issue Notice to Proceed for Landfill Gas-to-Energy Project Development – **TBD**

Once the Proposals have been reviewed, the County reserves the right to shortlist Companies, request that the Companies conduct a presentation and be interviewed by the Selection Committee.

The RFP includes the following sections:

- SECTION 1 – GENERAL INFORMATION
- SECTION 2 – SCOPE OF SERVICES
- SECTION 3 – SUBMITTAL REQUIREMENTS
- SECTION 4 – SELECTION PROCESS
- SECTION 5 – FORECAST OF LANDFILL GAS RESERVES
- FORM A – PROPOSAL SUBMITTAL FORM
- FORM B – PROPOSAL CERTIFICATION AND NON-COLLUSION AFFIDAVIT
- FORM C – LANDFILL GAS PAYMENT FORM

SECTION 1 – GENERAL INFORMATION

RFP OBJECTIVE

The objective of this RFP is to solicit Proposals for the development of an LFGE project at the Blackburn Landfill. Catawba County, as the owner and operator of the Blackburn Landfill and the existing power plant that currently utilizes the LFG, intends to discontinue operation of the existing power plant (due to the age of the existing engine gensets) and to enter into a contract with the successful respondent, herein referred to as "the Company" including the following general provisions:

- Conveying the LFG, associated environmental attributes, and tax credits to the Company for an initial term of 20 years including:
    - The LFG produced, collected by the County-owned LFG collection system, and made available;
    - The environmental attributes including greenhouse gas credits associated with destruction of the methane, any environmental attributes associated with the generation of electricity (Renewable Energy Credits and/or greenhouse gas credits for offsetting other forms of electrical generation), any Renewable Identification Number (RIN) assigned to a batch of biofuel for the purpose of tracking its production, use, and trading as required by the United States Environmental Protection Agency's Renewable Fuel Standard (RFS), and any other environmental attributes existing or yet to be conceived; and
    - Applicable tax credits and tax incentives associated with LFGE and Greenhouse Gas Emissions Reduction projects.
- The County expects to be compensated for: 1) conveying the LFG to the Company at a determined point of delivery; 2) environmental attributes; and, 3) the beneficial use of the LFG. While the specific contract terms contained in a contract resulting out of a negotiations phase following this RFP process will ultimately define frequency of compensation, the County desires to receive such compensation on a monthly basis. However, for purposes of presenting the financial aspects of the proposed LFGE Project, the Landfill Gas Payment Form included in this RFP is formatted to request an annual value for compensation to the County.

Proposals that present technically and financially-feasible alternatives to the approach and specifics contained in this RFP will be accepted and considered. Several circumstances that the Company should make note of when considering development of an LFGE Project at the Blackburn Landfill are as follows:

- The County will be responsible for the permitting, design, construction, operation, and financing of the LFG Collection and Control System and intends to operate the existing and future LFG Collection System in a manner that prioritizes compliance with applicable regulations;
- The County intends to operate the existing and future LFG collection system in a manner that prioritizes regulatory compliance and odor mitigation and will continue to establish operational practices and protocols that minimize the potential for fugitive LFG emissions that may result

in regulatory non-compliance and/or contribute to potential odors at the Blackburn Landfill and within surrounding communities. While environmental compliance and odor control is the Landfill's primary goal, it should be recognized that the County has over 20 years of experience in successfully optimizing LFG collection and effectively achieving multiple objectives that include energy recovery, regulatory compliance, and odor abatement and control; and

- The County does not exert control of the composition or quantities of waste that are delivered to the Blackburn Landfill and, thus, cannot warranty or guarantee the quantity or quality of the LFG recovered at the Blackburn Landfill.

RIGHTS OF THE COUNTY

All responses, inquiries, or correspondence relating to this RFP will become the property of the County when received and will become subject to all appropriate public disclosure laws of North Carolina.

COST INCURRED BY THE COMPANY

Any cost incurred by the Company in preparing or submitting a Proposal in response to this RFP shall be the Company's sole responsibility.

RIGHTS OF THE SELECTION COMMITTEE

This RFP constitutes an invitation to submit Proposals to the County. This RFP does not obligate the County to procure or contract for any of the scopes of services set forth in this RFP. All responses, inquiries, or correspondence relating to this RFP will become the property of the County when received and will become subject to all appropriate public disclosure laws of North Carolina. The County and the Selection Committee reserve and hold at its sole discretion, various rights and options, including without limitation, the following:

a) Waive any minor informalities in the RFP

b) Prepare and issue addenda to the RFP prior to the receipt of the Proposals that may expand, restrict, or cancel any portion or all work described in this RFP

c) Receive questions and provide answers as it deems appropriate

d) Reject any and all Proposals

e) Change the date for receipt of Proposals or any deadlines and dates specified in this RFP

f) Conduct investigations with respect to information provided, seek clarification and request additional information

g) Contact References

h) If applicable, provide a facility visit as referenced in a Proposal

i) Interview (or not) any or all of the Companies for purposes of discussing information in the Proposals

j) Cancel this procurement process with or without substitution of another RFP

PROPOSALS TO REMAIN OPEN

All Proposals will remain open for 180 days beyond the Proposal date. The County may, at its sole discretion, release any Proposals and return the Proposal Security prior to that date.

GENERAL CONDITIONS FOR INSURANCE, INDEMNIFICATION, AND PERFORMANCE GUARANTEES

Any potential contract resulting out of a negotiations phase following this RFP process will include specific contract terms pertaining to site use, financing, operations, compensation, ownership, security, insurance, indemnification, warranties, performance guarantees, designation of responsibilities, and other appropriate provisions. It is anticipated that such contract will contain terms and conditions which reflect the unique nature of an LFGE Project to be developed by the Company. The Company should outline any specific terms and conditions they want the County to consider in their Proposal. The County reserves the right to include terms and conditions specific to an LFGE Project in any potential contract.

DEFINITIONS

The following terms used herein are defined below for the purposes of this RFP.

Landfill Gas Contract. The legal contract between Catawba County and the Company that includes sale of LFG to the Company at the point of delivery, the construction, operation and maintenance of the LFGE Facilities by the Company and includes payment to the County for the LFG.

Landfill Gas Collection and Control Facilities. The network of LFG collection and control system equipment appurtenances including, but not limited to, gas collection wells, horizontal collectors, leachate cleanout connections, collection header and lateral piping, interconnecting pipes, valves, dewatering liquid and condensate management features, monitoring and measuring equipment, blowers and other equipment associated with the Gas Handling System and Gas Compression System, glycol chiller, filters, and other equipment associated with the Gas Dehydration System, LFG utility flare, telemetry and controls, and other related equipment that has been, or will be, planned, permitted, designed and installed by the County and used in the extraction and collection of LFG at the Blackburn Landfill.

Landfill Gas Point of Delivery. The location between the County-owned LFG Collection Facilities and the Project Facilities where LFG collected and measured by the County's Collection Facilities is transferred and sold to the Company.

Project Facilities. The infrastructure, system components, and controls that are furnished, constructed, maintained, and managed by the Company and in agreement with the County for purposes of operating and maintaining an LFGE Project to beneficially utilize the LFG for energy recovery, monetization of environmental attributes, and monetization of tax credits and tax incentives. Project Facilities may or may not be located within the County's property that is leased to the Company, as applicable.

Project. The overall planning, permitting, financing, design, construction, operation, maintenance, and environmental monitoring services associated with the facilities installed for the beneficial use of LFG. In addition, the Project includes marketing, sale and distribution of the full market value of the LFG, including all environmental attributes, tax credits, and tax incentives.

Project Site. The area of land owned by the County, whereby the County shall grant usage to the Company for purposes of operating LFGE Facilities per the Contract. The area of land may include easements, rights-of-way, or land leases.

The Company. The entity that enters into a contract with the County to complete the scope of services for an LFGE Project using LFG generated from any or all portions of the Blackburn Landfill. The County agrees to sell LFG generated from the waste disposal units of the Blackburn Landfill to, or to participate in some revenue-sharing arrangement with, the Company as described in the Landfill Gas Contract. The Company is responsible for completing the scope of work outlined in the contract.

SECTION 2 – SCOPE OF SERVICES

GENERAL

For the purposes of this RFP, the scope of services requested by the County includes, but is not limited to, planning, permitting, financing, design, construction, operation, maintenance, and environmental monitoring services for facilities associated with the beneficial use of LFG. In addition, the scope of services includes marketing, sale and distribution of the full market value of the LFG, including all forms of energy, environmental attributes, tax credits, and tax incentives.

In exchange for granting a Company the right to receive the LFG at the Blackburn Landfill for commercial energy production purposes, the Company must agree to make payments to the County based on metered quantities/measured quality of gas delivered and/or based on some mutually agreed upon revenue-sharing arrangement.

Term of Contract. The initial term of the Contract shall be for twenty (20) years, and the County shall have the option to extend the Term for one (1), five (5) year period.

RIGHTS AND RESPONSIBILITIES OF CATAWBA COUNTY

The rights and responsibilities of the County are:

Landfill Gas Collection Facilities. The County will continue to exercise responsibility to plan, permit, design, finance, construct, install, operate, and maintain all existing and future Landfill Gas Collection Facilities over the Unit 1 through Unit 12 waste disposal units.

Licenses and Permits. The County will make application for, obtain, and maintain all applicable licenses and permits required for the construction and operation of the Landfill Gas Collection Facilities.

Review of Permit Applications and Construction Documents. At all times, the County, in its role as landfill owner and partner with the Company, reserves the right to review permit applications prepared by the Company prior to the permit applications being submitted to the regulatory agencies. The Company will be solely responsible for obtaining necessary environmental permits and maintaining compliance with those permits for the Company's facility. In addition, at all times, the County, in its role as landfill owner and partner with the Company, reserves the right to review construction documents prepared by the Company prior to the Company soliciting for construction or equipment bids. The County, in its role as landfill owner and partner with the Company, will complete its review of permit applications and construction documents within 30 working days of receipt, and will notify the Company in writing of any comments, concerns, problems, or perceived non-compliance with applicable law, environmental compliance requirements, or landfill operations. The conditions of this "courtesy" review are separate and unrelated from any reviews of permit applications or construction documents in which the County is serving in the role as the regulatory agency.

Access and Property Lease. The specific contract terms contained in a contract resulting out of a negotiations phase following this RFP process will ultimately define granted access to the Project Site for the purposes of enabling the Company to complete its responsibilities. Similarly, any lease of property to the Company for the Company's facilities will be stipulated in the contract.

Landfill Gas Metering and Billing. The County will install LFG meters at a designated delivery point to monitor the quality and quantity of LFG delivered to the Company from the County's Landfill Gas Collection Facilities. The County will assume all responsibility for installing, maintaining and calibrating the LFG meters. In addition, the County will be responsible for reading the LFG meters and preparing invoices for submittal to the Company, in accordance with the provisions of a contract resulting out of a negotiations phase following this RFP process. Alternatively, the County may consider provisions in which the Company is responsible for certain duties related to metering, recordkeeping, and billing.

Landfill Operations. The County cannot guarantee the quantities or composition of the future waste to be disposed of at the active Blackburn Landfill. The County will not operate the Landfill in a manner that could unnecessarily or unreasonably diminish the quality and quantity of LFG generated from the Blackburn Landfill to the extent practicable. In addition, the County will make reasonable efforts to perform its operations at the Blackburn Landfill such that it will not unreasonably interfere with the operations of the LFGE Project Facility.

Landfill Gas Collection and Control Facilities Operations. The County will be responsible for the operations, maintenance, monitoring, and reporting associated with the Landfill Gas Collection and Control Facilities, as defined in the Definitions section of this RFP. The County may contract with a third-party to perform such duties, and such third-party may be the Company. If the County contracts with the Company for operations of the Landfill Gas Collection and Control Facilities, specific provisions governing the duties will be negotiated at a future date. The Company will be responsible for operations, maintenance, monitoring, and reporting associated with infrastructure and controls related to the Project Facilities, as defined in the Definitions section of this RFP.

Landfill Gas Delivery Point. In the LFG Contract, the County and the Company will designate a LFG Delivery Point anticipated to be a marked location within the piping downstream of the County-owned blower unit that is a component in the Gas Handling System.

Future Projects. If, in the County's sole discretion, the County observes a significant flow of LFG generated from the Blackburn Landfill being directed to the flare for an extended duration, the County reserves the right to initiate one, or more, LFG projects to use the excess LFG for a more advantageous use than flaring.

Right to Terminate Contract. At all times, the County retains the right to terminate the LFG contract with the Company for failure to perform as required. Default of the Company may include, but is not limited to, (a) failure to operate and maintain the Project Facilities in full compliance with all applicable law and environmental compliance requirements; (b) operating the Project Facilities in a manner that creates a non-compliance event for the County's landfill facilities, (c) operating the Project Facilities in a manner that creates a nuisance condition, (d) failure to make timely and full payments to the County for the LFG, and (e) failure to operate the Project Facilities in a manner that maximizes the beneficial use of the LFG.

If the Company utilizes less than 50 percent of LFG quantities (or other value stipulated in a contract resulting out of a negotiations phase following this RFP process) made available by the County, as measured on a 12-month rolling average, the County retains the right to either sell excess LFG to another entity (excess to be defined as the average quantity of LFG not utilized over the 12-month period), or if revised terms cannot be negotiated with the Company, terminate the contract. For the initial year after commencement of Project Facilities operations, the calculation of the 12-month rolling average of LFG quantities shall supplement the data recorded by the Company's LFG meters with historic data recorded by the County's measuring and monitoring equipment.

Right of First Refusal. If, at any time, the Company receives a bona fide offer ("Offer") to sell the Project Facilities to a third party purchaser, and the Company decides to sell the Project Facilities pursuant to such Offer, the County retains the first right to purchase the Project Facilities before the Company may sell the Project to a third party purchaser. The Company must provide the County a notice ("Offer Notice") of the Offer within ten (10) business days after Company receives it. The Offer Notice must include the pricing and the purchase terms included in the Offer.

Upon receiving the Offer Notice from the Company, the County will solicit proposals from independent appraisers to estimate the value of the assets offered for sale by the Company. The County will select an independent appraiser that is mutually agreeable to the Company and the County. If Company and County cannot agree on an appraiser, Company and County will each select an appraiser and the two appraisers will select the appraiser who will do the independent appraisal. Upon completion of the appraisal, the County may elect to purchase the Company's Project Facilities at the value estimated by the independent appraiser.

If, within fifteen (15) business days after receiving estimated value from the independent appraiser, the County does not provide to the Company notice of County's intent to purchase the Project Facilities ("Intent to Purchase Notice") at the value estimated by the independent appraiser, then the Company may proceed with the sale of the Project Facilities to the third party purchaser. If the County provides the Company a timely Intent to Purchase Notice, the County shall have the sole and absolute right to purchase the Project Facilities at the value determined by the independent appraiser.

RIGHTS AND RESPONSIBILITIES OF THE COMPANY

The rights and responsibilities of the Company include, but are not limited to the following:

Landfill Gas Marketing and Sales. The Company assumes all responsibility for the marketing and sale of LFG, including all forms of energy, environmental attributes, tax credits and tax incentives. The Company must also assume all responsibility for developing, negotiating and executing agreements with other parties for LFG sales, electrical power sales, steam sales, renewable natural gas sales, and any other beneficial uses that provide a revenue source to the Company.

Customer Service. The Company shall assume all responsibility for providing customer service to LFG customers including, but not limited to, emergency response for equipment failures, power outages, LFG quantity and quality, monthly meter reading and billing, and service requests for equipment.

Monthly Payments for Gas. On a monthly basis, the County will submit an invoice to the Company for LFG quantities delivered to the Company during the previous month or reflecting some mutually agreed upon revenue-sharing arrangement. The Company must make payment to the County within 30 days of the invoice.

Financing. The Company is solely responsible for the financing of all of the planning, permitting, design, construction, operations, maintenance, repair, replacement, rehabilitation and environmental compliance monitoring and reporting associated with the LFGE Project that consist of infrastructure separate from the County's existing and future Landfill Gas Collection Facilities, including the blower/flare station. The Company will not be compensated by the County for any work related to the Project Facilities. It is understood that payments to the County by the Company for the quantity of LFG or in accordance with some mutually agreed upon revenue-sharing arrangement, will be paid from the compensation received by the Company through a variety of sources. The compensation to be received by the Company for the Project Facilities may include, but will not be limited to, the sale of

LFG, renewable natural gas, steam, electricity, carbon credits, tax credits, renewable identification numbers, and other material and marketable features of LFG. The Company may not encumber or otherwise pledge or grant a security interest in the LFGE Facilities.

Use of Licensed Professionals. The Company is required to undertake, perform and complete all required planning, permitting, design and construction of Project Facilities using professional engineers and construction contractors licensed to practice in North Carolina.

Staffing. The Company is required to staff the Project Facilities with qualified personnel who meet the licensing and certification requirements of the State. The Company must manage, administer, coordinate and schedule in an orderly manner all work done by Company's officers, employees, and Subcontractors. Company, Company's officers, employees, and Subcontractors must perform every act or service required in a skillful and competent manner in accordance with the highest standards of the LFG utilization industry. The Company must furnish evidence of the skill and qualifications of its officers, employees, Subcontractors and agents on the request of the County. The Company must take appropriate action with respect to any employee of the Company or any Subcontractor engaging in unlawful, unruly or objectionable conduct.

Resident Landfill Gas-to-Energy Superintendent. The Company must appoint a Resident Landfill Gas-to-Energy Superintendent who is trained, experienced and proficient in the management and operation of LFGE Facilities, and whose sole employment responsibility is managing the Company's Project Facilities at the Blackburn Landfill. The primary residence of the Resident Landfill Gas-to-Energy Superintendent must be within a one hundred (100) mile radius of the County's landfill facilities. The Superintendent must be the Company's point-of-contact for the Facility responsible for coordination with the County.

Landfill Gas-to-Energy Facilities. The Company shall, at its sole expense, purchase, design, modify, install, permit, construct, expand, operate and maintain (including preventative and routine maintenance and replacement of worn equipment) the LFGE Facilities, which considered to be a component of the Project Facilities for purposes of this RFP, all in accordance with applicable laws and environmental compliance requirements, and as may be necessary to effectively use landfill gas onsite or offsite for renewable natural gas production, steam production, electrical power production or and any other beneficial uses that provide a revenue source to the Company.

Landfill Gas-to-Energy Facilities Operations. The Company will be responsible for the operations, maintenance, monitoring, and reporting associated with the LFGE Facilities. The Company shall not operate the LFGE Facilities in a manner that interferes with the County's operations of the Blackburn Landfill.

Telemetry and Remote Monitoring & Control System for Landfill Gas Collection and Control Facilities. The Company will be responsible for procuring and installing equipment and controls that enable remote monitoring and control of the LFG collection and control system, which will remain the responsibility of the County to own and operate. The exact specifications and features of the telemetry and remote monitoring & control hardware equipment and software programs will be as specified by the County and will become the property of the County upon installation and demonstration of proper functional testing. The exact location and configuration for this equipment will be as specified by the County, but certain components will require connection to the existing Gas Handling System, Gas Compression System, and Gas Dehydration System. In general, the telemetry and remote monitoring & control system capabilities are expected to enable the County operational personnel to monitor LFG system operational status and parameters from mobile devices, receive customized text message and

email based alarm notifications, automatic recording of pertinent LFG system operational data, and automatic upload of LFG system operational data to designated servers. It is anticipated that certain operational parameters related to the Landfill Gas-to-Energy Facilities Operations will be available to be monitored and recorded using this system.

Landfill Gas Pipelines. The Company shall, at its sole expense, purchase, design, install, permit, construct, operate and maintain (including preventative and routine maintenance and replacement of worn materials) landfill gas pipelines from the specified Landfill Gas Delivery Point, all in accordance with applicable laws and environmental compliance requirements, and as may be necessary to transport the LFG to onsite or offsite facilities for renewable natural gas production, steam production, electrical power production or and any other beneficial uses. Any interconnect requirements (including LFG quality) with existing natural gas pipelines is the sole responsibility of the Company.

Renewable Natural Gas or Steam Production Facilities. If, in the Company's sole and reasonable discretion, the Company determines that there is sufficient LFG to warrant it, the Company shall, at its sole expense, purchase, design, modify, install, permit, construct, expand, operate and maintain (including preventative and routine maintenance and replacement of worn equipment) renewable natural gas or steam production facilities onsite or offsite, all in accordance with applicable law and environmental compliance requirements.

Power Production Facilities. If, in the Company's sole and reasonable discretion, the Company determines that there is sufficient LFG to warrant it, the Company may, at its sole expense, purchase, design, modify, install, permit, construct, expand, operate and maintain (including preventative and routine maintenance and replacement of worn equipment) power production facilities onsite or offsite, all in accordance with applicable law and environmental compliance requirements. Any interconnect requirements with the existing electrical power distribution grid is the sole responsibility of the Company. Any upgrades, expansions, or alterations to the existing grid required by the electrical utility are the responsibility of the Company. The County executed a Purchased Power Agreement, dated June 16, 1997, with Duke Energy governing the existing power plant, which can be made available to the Company as background information, upon request. The County may consider provisions in which the Company offers compensation to utilize the existing County-owned interconnect equipment. Specifications or documentation regarding the existing interconnect equipment will need to be obtained from Duke Energy.

Existing County-Owned Power Production Facilities. Consistent with State law and County Code, the Company is responsible for addressing disposition of the existing County-owned power production facilities, and specifically the three existing Jenbacher engine gensets. This could involve decommissioning and removal of the engine gensets and conveying revenues associated with sale of this used surplus equipment to the County or it could involve other higher and more beneficial use.

Environmental Compliance Requirements. The Company shall be responsible for operating all Project Facilities in a manner to at all times maintain compliance with all applicable law and environmental compliance requirements. In addition, the Company shall assume all responsibilities for environmental compliance monitoring and reporting to appropriate federal, state and local agencies. Environmental compliance requirements shall include, but shall not be limited to, the Clean Air Act; the federal Water Pollution Control Act; the Safe Drinking Water Act; the Toxic Substances Control Act; the Comprehensive Environmental Response, Compensation and Liability Act, as amended by the Superfund Amendments and Reauthorization Act of 1986; the Resource Conservation and Recovery Act, as amended by the Solid and Hazardous Waste Amendments of 1984; the Occupational Safety

and Health Act; the Hazardous Materials Transportation Act; the Oil Pollution Act of 1990; and any similar federal, state or local statutes and regulations.

Fines, Penalties and Remediation. If at any time the Company fails to comply with any applicable law or environmental compliance requirements, the Company shall, without limiting any other remedy available to the County upon such an occurrence: (1) immediately correct such failure and resume compliance with applicable law or environmental compliance requirements (2) bear all loss-and-expense of the Company and the County resulting there from; (3) pay any resulting damages, fines, assessments, levies, impositions, penalties or other charges; (4) make all capital modifications and changes in operating and management practices which are necessary to assure that the failure of compliance with applicable law or environmental compliance requirements will not recur; and (5) comply with any corrective action plan filed with or mandated by any federal, state or local agency in order to remedy a failure of the Company to comply with applicable law or environmental compliance requirements. The specific contract terms contained in an agreement resulting out of a negotiations phase following this RFP process will ultimately define the manner in which potential loss of revenue to the County associated with failure of the Company to comply will be addressed.

No Nuisance. The Company shall at all times operate and maintain the Project Facilities in a good, environmentally sound, reliable, safe, neat, clean and substantially litter-free manner so as to not create any odor, litter, noise, or other adverse environmental effects constituting, with respect to each of the foregoing, a nuisance condition under applicable law or environmental compliance requirement. Should any such nuisance condition occur, the Company shall expeditiously remedy the condition, make all changes in operating and management practices necessary to prevent a recurrence of the nuisance condition, and indemnify and hold harmless the County from any loss-and-expense relating thereto. The Company shall be responsible for the permitting, design, construction, operation, and monitoring of any odor abatement system or noise attenuation features at the Project Facilities that the County deems necessary to maintain good relations with the surrounding communities.

Documents Storage at Site. At all times, the Company must maintain at the County's Landfill Office, clean reproducible record copies of all construction drawings, specifications, operations and maintenance manuals, manufacturer maintenance and inspection recommendations for equipment, logic diagrams for instrumentation and control systems, graphic or written instructions, interpretations and clarifications, and all other documents related to the planning, permitting, design and construction of the Project Facilities. These documents must be provided to the County for reference, copying and use, and a complete set must be delivered to the County upon completion of the Project Facilities.

Design Reviews. All construction drawings, plans, construction specifications, equipment specifications, site plans, construction schedules, startup and operational procedures, and permit applications must be reviewed by and approved by the County, in its role as landfill owner and partner with the Company, prior to implementation or application. County approval will not be unreasonably withheld. The conditions of this "courtesy" review are separate and unrelated from any reviews of permit applications or construction documents in which the County is serving in the role as the regulatory agency.

Other Clarifications, Agreements and Statements. The Company acknowledges that additional certifications, agreements, and statements may be required in the contract. The Company's execution of Affirmative Action, Non-Discrimination Agreements and Drug-Free Workplace Certifications, and other Federal, State, and local governmental requirements may be required in the contract.

SECTION 3 – SUBMITTAL REQUIREMENTS

ORGANIZATION OF PROPOSAL

The Company must submit 2 paper copies of the Proposal along with an electronic copy of the Proposal in the form of a PDF file. Proposals must be submitted on 8.5- x 11-inch paper, double-sided print, with dividers for each section. Using labeled dividers, the Proposal must be segregated into the following sections:

Letter of Interest. The Proposal must identify all companies proposed for the team, including the organizational and contractual relationship between the companies and briefly describe the scope of work to be assigned to each company or group, including staff to be assigned.

Proposal Submittal Form. The Proposal must include a completed, signed copy of Form A – Proposal Submittal Form included in this RFP.

Proposal Sections. The Proposal must contain the following sections:

Table of Contents

1. Parent Company Confirmation
2. Qualifications and Experience
3. Proposed LFGE Project Description, Approach, and Scope of Services Assumptions
4. Capital Improvement Plan
5. Permits and Documentation Requirements
6. Landfill Gas Payment Form (Form C)
7. Other Elements of Proposed Project
8. Notice of Violations and Actions
9. Proposal Certification and Non-Collusion Affidavit (Form B)
10. Proposal Security

Addenda. The Proposal must contain an acknowledgement of receipt of Addenda, if any are posted by the County.

1. Parent Company Confirmation

The County is seeking guaranteed long-term LFG beneficial use options. A Company wholly or partially owned by another corporation or other entity must submit a Parent Company Confirmation to certify that any potential contract with the Company resulting from this RFP process will be co-signed by the Company's parent company. A Company who does not fall into this category must note that in the Proposal.

2. Qualifications and Experience

Each Company must provide documentation to demonstrate credibility, qualification, experience, financial stability, and capability of successfully executing the LFGE Development Project per their Proposal. The specific nature of the documentation is at the discretion of each Company. For example, a Company may opt to submit a project profile as well as contact information of the landfill owner(s) for

currently operating Landfill Gas-to-Energy Facilities, where the Company served as the developer of the beneficial utilization and energy recovery project and currently serves as either the owner or operator of the Landfill Gas-to-Energy Facilities. As another example, a Company may opt to submit information regarding their experience and expertise with biogas, alternative fuels, renewable energy, or similar related endeavors. To demonstrate qualifications, the Company should provide sufficient information for existing facilities (if applicable) to make evident that they are in operation and communicate whether they are of similar size and scale (approximately 1,000 scfm or greater) as the Blackburn Landfill. To demonstrate experience, the Company should identify the role that the Company and/or select individuals served for any previous projects. The Company should provide a reference that includes name, project location and contact information (name, title, address, telephone number). The documentation should include the Company's financial statement or a Federal Identification Number to enable the County to assess the Company's financial background.

Where possible, experience with North Carolina landfills, biogas, alternative fuels, and/or renewable energy should be highlighted in the documentation presented. In preparing information for this section, the text shall clearly distinguish and state which entity actually performed the work for which they are claiming experience. Where it is the experience of a parent, affiliate, subsidiary or subcontractor that is listed as a relevant qualification, this fact shall be explicitly noted and the relationship linking the experience to this project shall be described.

Resumes shall also be provided for the anticipated personnel needed to design, build, operate and maintain the Project Facilities.

3. Proposed LFGE Project Description, Approach, and Scope of Services Assumptions

Proposals must provide a Project Description and Approach that describes the intended process(es) for developing an LFGE Project at the Blackburn Landfill. The Proposal must describe the approach to the planning, permitting, design, construction, and operation of the Project Facilities and associated infrastructure to assure the County's functional, aesthetic, and quality control requirements related to all aspects of the County's ownership, solid waste management facility operations, and monitoring of the Blackburn Landfill will be satisfactorily addressed by the Company.

The intent of this RFP is to receive and evaluate revenue potential for potential long-term LFG beneficial use options at the Blackburn Landfill. It is important for the Company to note that Section 2 of this RFP (Scope of Services), in many instances, provides general information regarding the expectation and requirements of the County with regard to LFGE Facilities, rather than specific contract terms and specifications. In instances where the Company finds the Scope of Services language insufficient to represent the Company's proposed activities, or to reasonably estimate the Landfill Gas Payments to be made to the County, each Company should list their major assumptions.

By submitting a Proposal, the Company warrants that they have read, fully understand, and comprehend all of the terms and conditions within this RFP, especially those specified in Section 2 – Scope of Services. The Company further warrants that the unit price quotes offered to the County in the Landfill Gas Payment Form presented in this RFP are based on a full and clear understanding of the Scope of Services and the work required to plan, permit, design, build, finance, operate, maintain, and conduct environmental compliance monitoring and reporting for the Project Facilities.

Where a Company takes exception to a specific term or condition of the Scope of Services, the Company must clearly identify and describe the proposed modification to the Scope of Services, and

define the revenue impact, if any, to the County. If a proposed modification to the Scope of Services increase the revenue potential for the County, then the Company must clearly describe and quantify the nature and scope of the revenue increase for the County.

4. Capital Improvement Plan

Each Company must provide a proposed 20-year Capital Improvement Plan (CIP) for constructing the Project Facilities, infrastructure, and controls based on the LFG production estimates for the Blackburn Landfill. The Plan should describe substantial additions or modifications to the LFG facilities that would potentially occur during the timeframe of a future 5-year contract extension (total of 25-year CIP), in the event the County elected to invoke the optional contract term extension. The CIP will be developed in a manner that illustrates the Company's plan for constructing or expanding LFGE Project Facilities over time as landfill gas production increases, as well as the plan for decommissioning and removal of LFGE Project Facilities over time as LFG production decreases after landfill closure (and upon ultimate cessation of LFGE Project operations). The CIP should be developed to clearly demonstrate the Bidders approach to maximize the utilization of the LFG for the financial benefit of the County and minimize use of the LFG flare. The Company must include a Project Schedule with specific information of expansion plans as part of this section.

By submitting a Proposal, the Company warrants that Landfill Gas Payment Form, and the payments to be made to the County, accurately reflect all capital, operations, maintenance, administration and financing costs associated with Company's Capital Improvement Plan.

5. Permits and Documentation Requirements

Corresponding to the proposed CIP, each Company must provide a listing of all the environmental permits, land development permits, site plan approval requirements, and environmental documentation requirements associated with each task and phase of the LFGE project implementation and development of associated infrastructure and facilities identified in the Company's CIP. In addition, each Company shall provide information regarding the review and approval requirements of the North Carolina Utilities Commission and/or other regulatory bodies having jurisdiction over any aspect of the Project associated with the specific LFG beneficial use projects outlined within the Proposal.

6. Landfill Gas Payment Form

The Scope of Services associated with this RFP (Section 2) includes, but is not limited to, planning, permitting, financing, design, construction, operation, maintenance, and environmental monitoring services for facilities associated with the beneficial use of LFG. In addition, the Scope of Services includes marketing, sale and distribution of the full market value of the LFG, including all forms of energy, environmental attributes, tax credits, and tax incentives.

In exchange for delivering LFG collected from the Blackburn Landfill to a Company for commercial energy recovery purposes, Company must agree to make payments to the County based either on metered quantities and measured quality of LFG delivered and/or based on some mutually agreed upon revenue-sharing arrangement.

Each Company's proposed schedule of payments to be paid to the County must be submitted using the Landfill Gas Payment Form included within this RFP as Form C. The Company may modify this Form as appropriate to best communicate the payment structure or revenue-sharing arrangement that is being proposed.

Each Proposer must provide unit price rates and total annual payments to the County for each year listed in the Landfill Gas Payment Form based on the landfill gas production estimates stated for each year. For the purposes of this RFP, the Company should provide unit price rates with the understanding that any eventual contract will include payment terms based either on LFG quality and quantity as measured at metering stations installed, maintained and calibrated by the County or based on some mutually agreed upon revenue-sharing arrangement.

7. Other Elements of Proposed Project

The Company may present technically and financially beneficial uses of the LFG including, but not limited to, electrical power generation, direct-use by industrial users as medium-BTU fuel, or production of renewable natural gas (RNG). Company's may present other elements of the proposed project, such as recommendations for modifying the scope of services, using innovative technologies, or implementing creative analytical tools and approaches to maximize the use of the LFG and the revenue potential for both the Company and the County.

8. Notice of Violations and Compliance Actions

Company must include a list of all Notice of Violations (NOVs), Compliance Actions, and/or litigations claims related to any LFGE Project Facilities owned and/or operated by the Company or its' affiliated companies from January 1, 2016 to March 31, 2020. The list must include a description of the NOVs, Compliance Actions, and/or litigation claims, the date received, the name of regulatory agency, the facility name and location, and the resolution. In addition, NOVs, Compliance Actions, and/or litigation claims information must be provided for parent companies with which the Company is associated in the event the Company is a wholly or partially owned by another corporation or other entity.

9. Proposal Certification and Non-Collusion Affidavit

The Company must include an appropriately completed and signed Proposal Certification and Non-Collusion Affidavit (Form B).

10. Proposal Security

A bond or certified check ("Proposal Security") in the amount of **$30,000** must accompany each Proposal. Proposal Security must be made payable, without condition, to Catawba County. The County reserves the right to retain proposal security of all reasonable proposals until 180 days after proposals are due. Proposal Security for proposals deemed unreasonable will be returned. If the Company withdraws its Proposal, fails to negotiate in good faith with the County, or if after the County and the Company agree on terms of a contract, the Company fails to sign a contract and provides the necessary bonds within 30 days after a copy of the contract has been presented, the entire amount of Proposal Security shall be forfeited to the County.

SELECTION PROCESS

The County will appoint a Selection Committee comprised of appropriate staff representing certain departments, and may include external consultants. The process for the Project will likely involve three stages:

Stage I: Qualifications Proposal

The stage commences with the establishment of a Selection Committee with its members having been appointed by Catawba County's Utilities & Engineering Director. A Request for Proposals is placed on the County's website. Upon receipt of the Proposals, Selection Committee members review and select ("short-list") for further consideration those Companies which appear to be best able to provide services for the Project.

Stage II: Interviews (if necessary)

Separate interview sessions may be scheduled with the "short-listed" Companies to permit Selection Committee members to further evaluate each Company's qualifications and Proposal. Recommendations are forwarded to the Utilities and Engineering Director for approval.

Stage III: Contract Negotiations

Company and County will negotiate a contract. In the event negotiations of the specific contract terms, conditions and fees prove unsuccessful, another Company will be chosen. Any contract is subject to approval by the Catawba County Board of Commissioners.

Evaluation Criteria

A Company will be selected for further consideration based on the following:

1. Qualifications, expertise and past performance on similar projects related to development, construction, and operation of LFGE Facilities.
2. Project implementation and delivery methodology including characteristics of beneficial utilization of LFG, technical approach to design and construction of Project Facilities and associated energy recovery infrastructure, integration of controls and coordination with County-owned LFG system infrastructure, and overall understanding of the scope of work and achievement of the County's objectives.
3. Capital Improvement Plan and Financial Package.
4. Project permitting requirements, involvement of external parties, and Project Implementation Schedule.
5. References.
6. Other factors that may be appropriate for the LFGE Project.

SECTION 4 – FORECAST OF LANDFILL GAS RESERVES

BLACKBURN LANDFILL BACKGROUND, WASTE DISPOSAL RATES, AND DESIGN CAPACITY

The Blackburn Landfill and Resource Recovery Facility is located off Rocky Ford Road, near the City of Newton, North Carolina. The Landfill is owned and operated by Catawba County (County) and the landfill facility boundary comprises an area of approximately 568 acres. The Facility also includes the following additional active waste management operations: a vegetative and wood waste mulching and grinding treatment and processing facility, a small Type-1 composting facility, a mobile home reclamation operation, scrap tire collection operation, a white goods collection area, and a covered paint storage and electronics recycling area. Ancillary facilities include a landfill office, two scale houses, a vehicle maintenance shop, equipment storage building, leachate storage tanks, the LFGE power plant, and a Bio-Diesel Production Facility, which is leased to Blue Ridge Biofuels. Additionally, a drop-off location for residential waste and recycling along with the Crop Processing Facility is located on the north side of Rocky Ford Road.

According to the Permit-To-Construct (PTC) Application, prepared by CDM Smith, dated April 2018, the existing and future waste disposal units are:

- MSW Landfill Unit 1: The Landfill commenced waste placement operations in MSW Landfill Unit 1, which has a waste footprint area of 60 acres, in January 1981 and waste filling operations continued until December 1997. The Unit 1 waste disposal area has received a final cap and is equipped with an active LFG collection system comprised of approximately 91 vertical LFG extraction wells.

- MSW Landfill Unit 2: MSW Landfill Unit 2 is comprised of three subareas: Phase 1, which has a waste footprint area of 22 acres, commenced waste placement operations in December 1997; Phase 2, Stage 1, which has a waste footprint area of 16 acres, commenced waste placement operations in December 2001; and Phase 2, Stage 2, which has a waste footprint area of 14 acres commenced waste placement operations in April 2004. The Unit 2 waste disposal area is equipped with an active LFG collection system comprised of approximately 37 vertical LFG extraction wells.

- MSW Landfill Unit 3 Phase 1: This waste disposal unit, which has a waste footprint area of 22 acres, commenced waste placement operations in May 2009 and is projected to continue to receive waste until March 2021. The LFG collection system was expanded into this area in December 2019 with the installation of approximately 5 horizontal LFG extraction wells.

- MSW Landfill Unit 3 Phase 2: This proposed future waste disposal unit, which is located north of Unit 3 Phase 1, will comprise a waste footprint area of 18.5 acres. The Phase 2 cell is currently under construction and is anticipated to commence waste placement operations around September 2020.

- Future MSW Landfill Units 4 through 12: These proposed future waste disposal units will be positioned east of Unit 3 and extend southward. While Units 4 through 12 will comprise a waste footprint area of approximately 212 acres, only Units 1 through 4 have received or will receive waste during the initial 20-year term of the Contract.

- **C&D Landfill Unit 1:** This construction and demolition (C&D) waste disposal unit is closed and there are no LFG collection system components in this cell.

- **C&D Landfill Unit 2 Phases 1 and 2:** This C&D waste disposal unit has a waste footprint area of 23.4 acres. There are no LFG collection system components in this cell. Current C&D disposal is on-going in Unit 2 Phase 2.

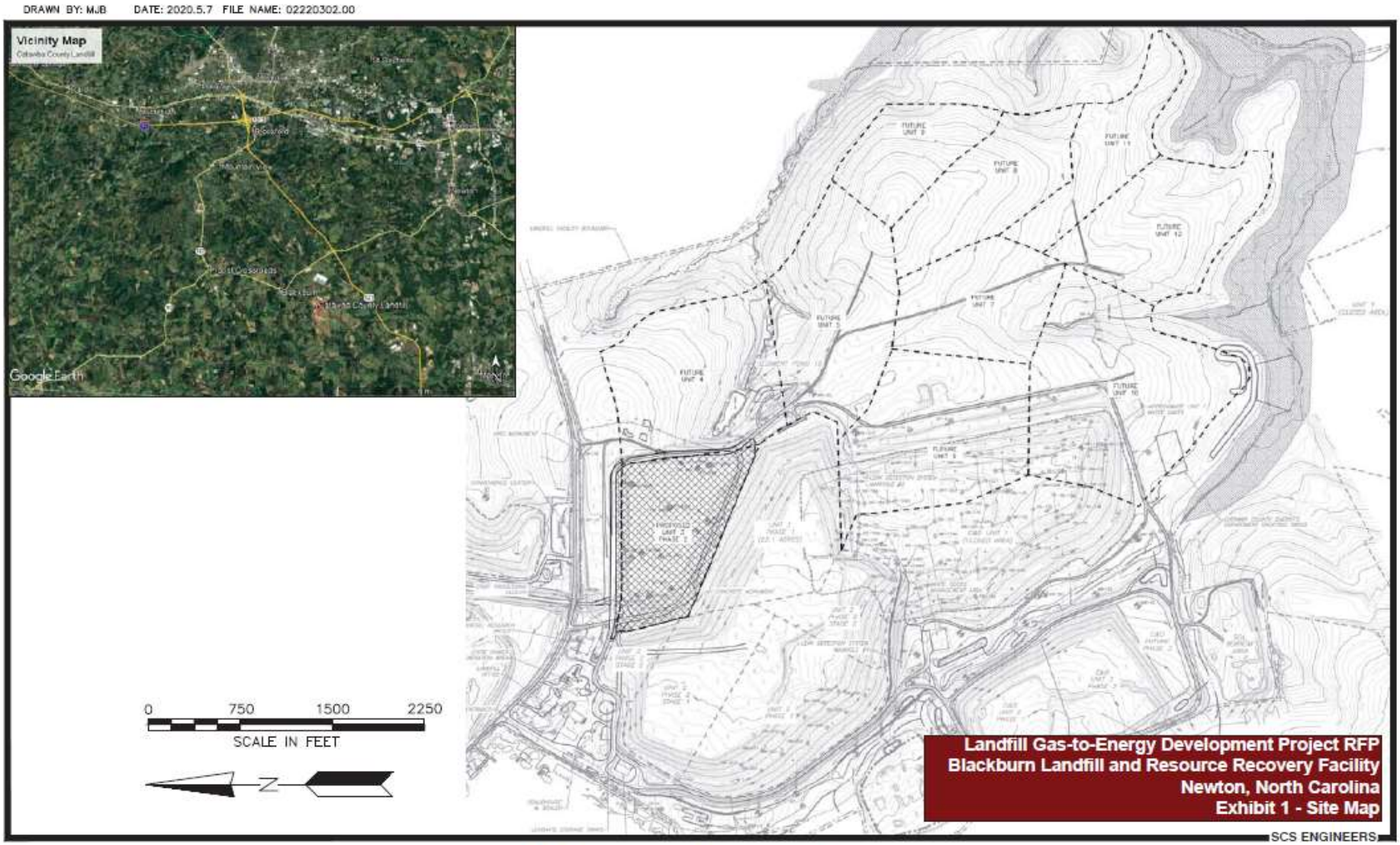
The orientation and layout of these existing and future waste disposal limits are presented in **Exhibit 1**.

Based on records cited in the document titled "Landfill Gas Beneficial Use Feasibility Study", prepared by CEG Engineering, PLLC and dated January 2019, as well as scale house data provided by the County, the Landfill has placed approximately 4.8 million tons of waste in the existing MSW Landfill waste disposal units (Unit 1, Unit 2, and Unit 3 Phase 1) between January 1981 and July 2019. The Landfill Gas Beneficial Use Feasibility Study dated January 2019 is provided as **Appendix A**. The total airspace capacity of the proposed future MSW Landfill waste disposal units (Unit 3 Phase 2 through Unit 12) that is available for waste and daily cover material is approximately 38.5 million cubic yards. The PTC Application cites an anticipated Airspace Utilization Factor of 0.64 tons per cubic yard for purposes of estimating life expectancy. Thus, these future cells are expected to be capable of receiving approximately 24.6 million tons of waste and daily cover material. The PTC Application includes assumptions and calculations that yield an estimated site life of 85 years for the future MSW Landfill waste disposal units.

The existing MSW Landfill accepts residential, commercial, municipal, and industrial waste generated within Catawba County. Nonhazardous industrial sludge is accepted and the County is permitted to co-dispose of wastewater treatment sludge. Yard waste and C&D waste delivered to the Facility are managed in the Type 1 composting facility and C&D landfill, respectively. The PTC Application cited the waste acceptance quantities for disposal in the MSW Landfill to be approximately 11,300 tons per month. However, the waste acceptance rates increased to around 155,000 tons per year during the past two fiscal years. Annual waste disposal rates for the MSW Landfill during the past seven fiscal years (July 1 through June 30) are provided below:

- FY2012-2013 – 117,787 tons
- FY2013-2014 – 120,579 tons
- FY2014-2015 – 123,307 tons
- FY2015-2016 – 133,842 tons
- FY2016-2017 – 139,635 tons
- FY2017-2018 – 153,198 tons
- FY2018-2019 – 157,312 tons

Exhibit 1. Site Map



CATAWBA COUNTY LANDFILL EXHIBIT 1

Although the County has not conducted a waste characterization study on the waste materials delivered to the Facility for disposal in the MSW Landfill to measure or identify specific weight-based composition, the origin (generator) of each load is categorized as either "residential", "municipal", "commercial", or "industrial". Based on the past 14 years of waste acceptance data, the average portion of the total waste placed in the MSW Landfill for each of these categories is as follows:

- Residential – 23 percent
- Municipal – 17 percent
- Commercial – 40 percent
- Industrial – 20 percent

The following is additional pertinent program information relating to potential LFG impacts:

- Unit 2 Phase 2 of the C&D Landfill has an estimated 4 to 5 years of remaining life. Once full, C&D waste will be disposed of in the MSW landfill. Accordingly, waste composition disposed in the MSW Landfill will likely change in the future.

- County does not have a food waste diversion/organics management program nor does it anticipate such program in the foreseeable future. The organic fraction of the current waste stream is not anticipated to change in the near future related to organics diversion.

- The County currently does not have active waste disposal competition. The future waste tonnages are anticipated to be committed and the County is in a perceived low risk competitive market.

- County will be initiating partial closure projects for the Landfill in the future, which may increase LFG flowrates. The time frame for these partial landfill closures has not been determined.

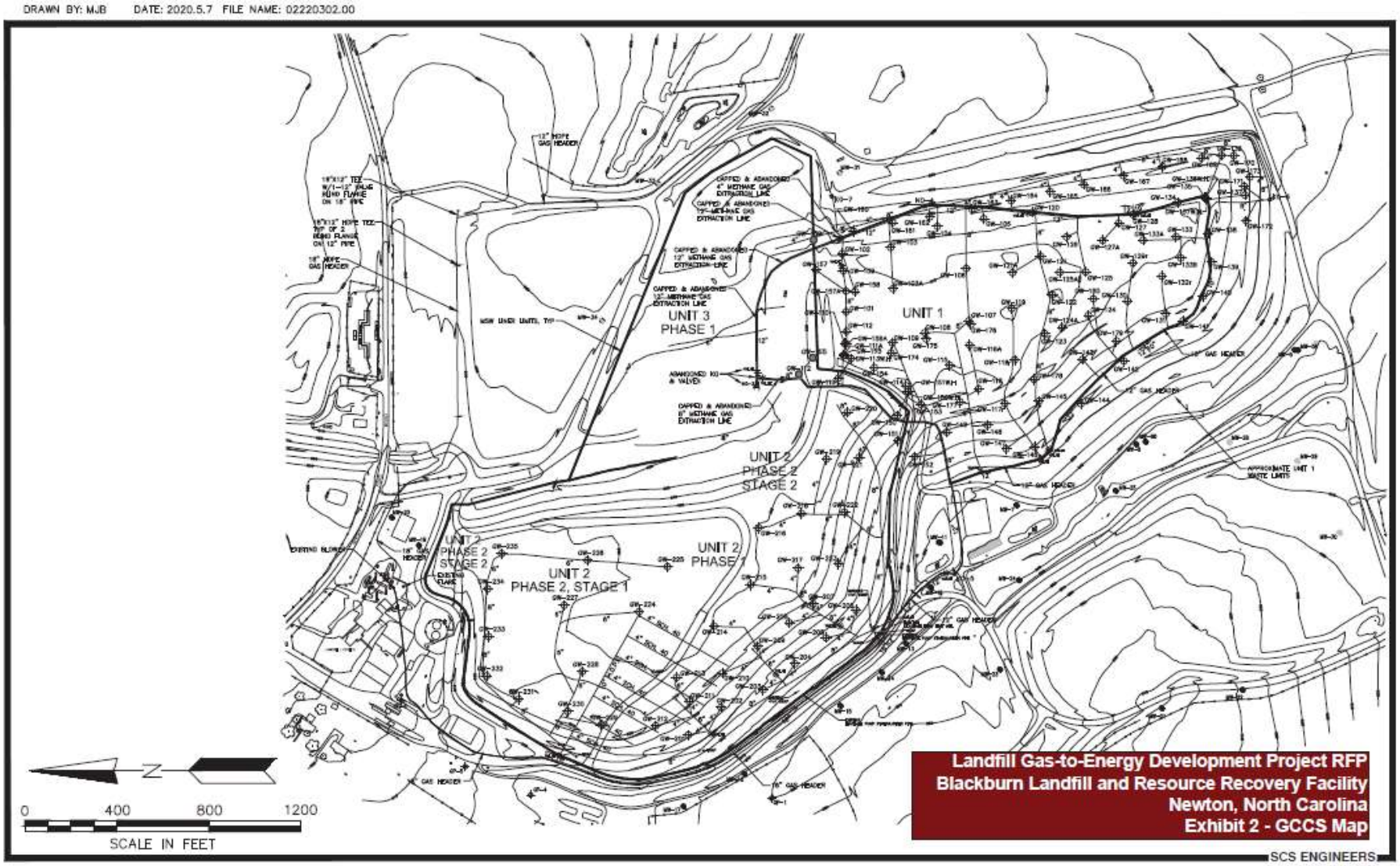
EXISTING AND PLANNED LFG COLLECTION SYSTEM

As discussed in Section 2 above, the Landfill Gas Collection and Control Facilities maintained by the County are defined as a system of equipment and appurtenances for purposes of collection and control of LFG produced by the landfill. The current LFG collection system (see Exhibit 2) includes a total of 133 LFG extraction components, including:

- 91 vertical LFG extraction wells in Unit 1
- 37 vertical LFG extraction wells in Unit 2
- 5 horizontal collectors in Unit 3

The array of vertical collection wells are connected to 4-inch and 8-inch diameter HDPE lateral piping connected to 12-inch diameter HDPE header pipes at the perimeter of each unit. The header expands to an 18-inch diameter HDPE header at the northern perimeter of the landfill and a 16-inch diameter HDPE header on the southern perimeter of the landfill. Both headers are connected to the LFG blower/flare station located on the western side of Unit 2. The collection system also includes lateral and header isolation valves.

Exhibit 2. GCCS Map



CATAWBA COUNTY LANDFILL EXHIBIT 2

Along with LFG collection, a condensate management system includes condensate piping installed in parallel to the header systems. Collected LFG condensate flows by gravity into the perimeter leachate collection system where it is pumped to the holding tank on the west side of the landfill.

Vacuum is applied to the LFG collection system via a centrifugal blower powered by an electric motor equipped with a variable frequency drive as part of the Gas Handling System. The LFG blower obtains electrical power directly from the existing power plant (i.e., through parasitic load) when the power plant is operational and the electrical power supply for the blower unit is provided by the utility when the power plant is non-operational (but the County incurs demand charges). The current LFG peak collection rate is approximately 1,000 scfm, and the existing blower has a maximum rated capacity of 1,600 scfm. The Gas Handling System delivers the LFG either to the LFG utility flare or to the Gas Compression System/Gas Dehydration System.

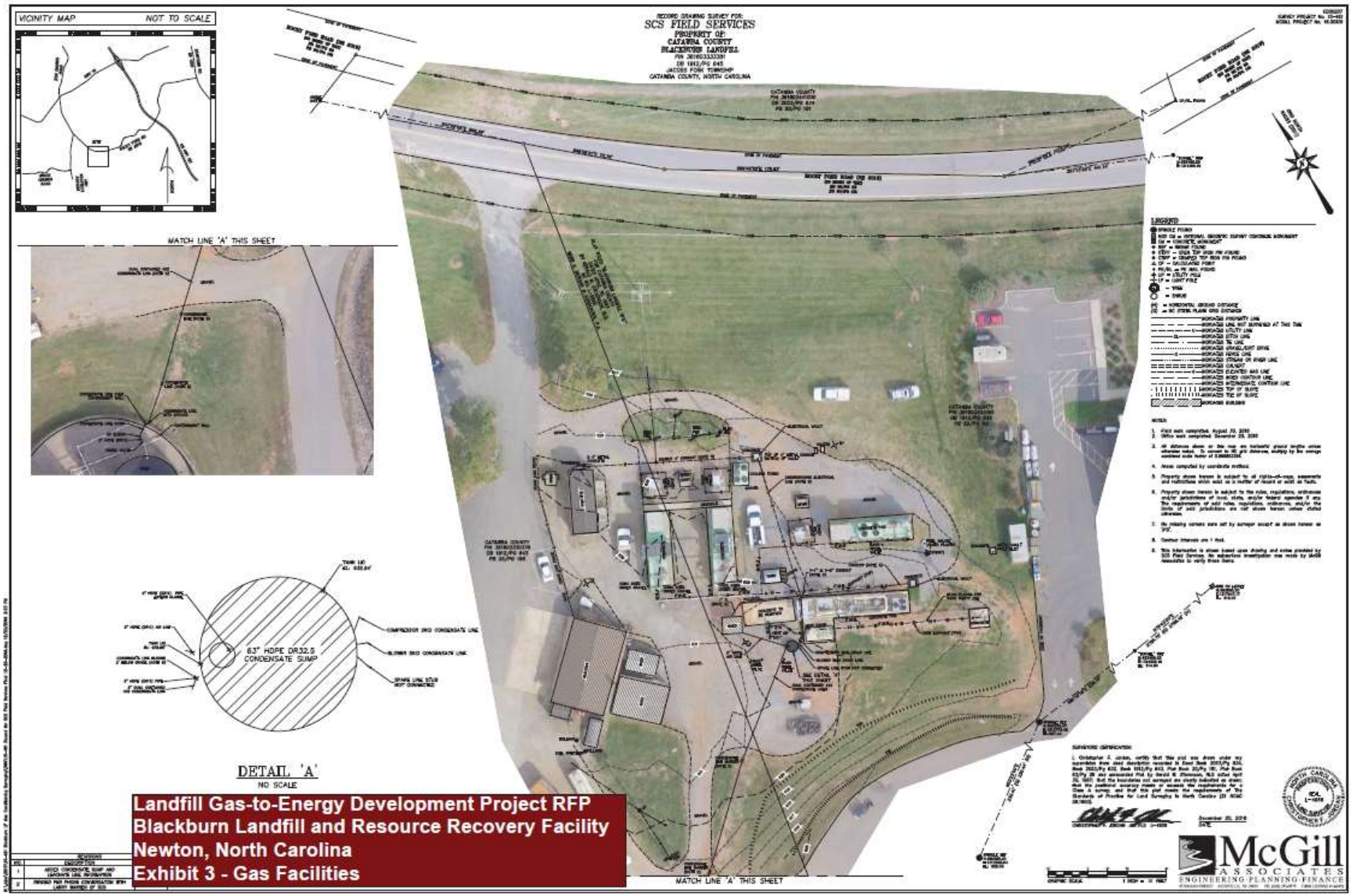
The existing LFG treatment system is comprised of the Gas Compression System, which consists of a centrifugal blower powered by an electric motor equipped with a variable frequency drive, and the Gas Dehydration System, which includes a series of heat exchangers, a glycol chiller, and various moisture removal vessels. The blower on the Gas Compression System has a maximum rated capacity of 1,600 scfm. The Gas Handling System, Gas Compression System, and Gas Dehydration System equipment were installed in 2016.

The LFG conveyed to the utility flare, which is rated for 1,600 scfm, is not routed through the Gas Compression System/Gas Dehydration System.

Exhibit 3 depicts the gas facilities.

The design capacity for the future MSW Landfill units is anticipated to reach approximately 26.4 million tons of waste before its final waste acceptance in 2075. The County plans to expand the active LFG collection and control system as necessary. The County plans for the future system to follow the current practices of continuous improvement to the current wellfield through operations and maintenance and expansions of the system footprint with the intent of achieving a larger percentage of well density over the landfill footprint. The existing LFG collection system includes blind flange tees within the landfill units and at the blower station to facilitate system expansion inside existing and future units.

Exhibit 3. Gas Facilities



REGULATORY STATUS

Currently, the Blackburn Landfill is equipped with an active landfill gas (LFG) collection and control system within Unit 1, Unit 2, and Unit 3 Phase 1 areas. The control devices consist of the 1,600-cfm utility flare as well as the treatment system that processes the LFG prior to delivery to the three engine gensets at the power plant.

The Blackburn Landfill is subject to the New Source Performance Standards (NSPS) for municipal solid waste landfills under 40 CFR 60 Subpart XXX, and other provisions of the Clean Air Act, and the Blackburn Landfill has been issued a Title V Air Operating Permit (No. 08533T10). Since the annual emissions rate of non-methane organic compounds (NMOCs) is greater than the regulatory applicability threshold that requires installation and operation of a mandatory LFG collection and control system, the existing active LFG system is considered mandatory with respect to the Clean Air Act provisions.

Furthermore, the County believes the existing gas compression, filtering, and de-watering equipment serves as a gas treatment system in accordance with 40 CFR §60.752(b)(2)(iii)(C). However, with the possible decommissioning of the existing power plant, the proposed Project Facilities associated with development of a new LFGE project may need to incorporate certain equipment that constitutes a treatment system under the NSPS regulations.

The County plans to continue conducting design and installation of the expansion of the active LFG collection and control system in accordance with the regulatory requirements to achieve various other objectives, such as odor mitigation and abatement, as well as to allow for the sale and beneficial use of the LFG for energy recovery purposes. The County continues to coordinate with the North Carolina Department of Environmental Quality (NCDEQ) regarding regulatory permitting and compliance requirements.

The County's primary goals are to operate the LFG collection and control system in a manner that prioritizes compliance with the applicable Clean Air Act and Solid Waste regulations, as well as to accomplish odor mitigation, abatement, and control and to provide for beneficial use of the LFG via energy recovery. The LFG System operations include the control of LFG emissions from the site via the active LFG collection and control system, which currently includes the utility flare and the power plant. The County's goal is to operate the LFG Collection Facilities in a manner to balance the objectives of regulatory compliance, operation of the LFGE Project Facilities, and to reduce nuisance odors to the surrounding community. Therefore, at times, it may be the County's goal to extract landfill gas in a manner that produces the greatest wellfield zone-of-influence. The County may not be able to operate the LFG Collection Facilities with the goal of producing higher quality (i.e., high methane, low oxygen) gas in a manner that would most likely reduce the volume of landfill gas recovered.

LANDFILL GAS RECOVERY MODELING

The County previously commissioned a LFGE feasibility study, prepared by CEG Engineering, titled "Landfill Gas Beneficial Use Feasibility Study", dated January 2019, which included an analysis of the expected LFG recovery potential from the Blackburn Landfill. The LFG recovery projections presented in this study are included in this RFP as **Appendix A**. In support of this RFP, another LFG model was developed based on the following input parameters:

- Refuse Filling History and Projections: Historical refuse disposal rates for 1981 through 2004 were obtained from the CEG Study and tons for Fiscal Year 2005/2006 through 2018/2019 were provided by the County (and based on scale house waste receipts) were input for 2005 through 2018. The annual waste acceptance for 2019 was assumed to be the average for the prior two fiscal years. Future waste disposal quantities in the MSW Landfill are assumed to escalate at a constant rate of 1 percent annually and exclude the introduction of C&D waste material, which is expected to occur in approximately 4 to 5 years when the Unit 2 Phase 2 C&D Landfill will achieve full capacity. The mass-based design capacity is expected to be approximately 5 million tons for the existing MSW Landfill units and 26.4 million tons of waste for the future MSW Landfill units.

- LFG Decay Rate Constant (k): A k value of 0.07/year was selected based on: SCS historical experience with other landfill sites throughout North Carolina, the average annual precipitation of 46 inches at the landfill (https://www.usclimatedata.com/climate/hickory/north-carolina/united-states/usnc0312), no leachate recirculation, and model calibration to the actual LFG flow rates measured during 2017 to 2020.

- Ultimate Methane Recovery Potential (L_0): An L_0 value of 2,883 cubic feet (ft3)/ton was selected based on the reported waste composition, relative distribution of waste generators (industrial, commercial, municipal, and residential), and calibrated to the actual LFG flow rates from 2017 to 2020.

- System Coverage: LFG collection system coverage prior to 2015 was assumed to be 75 percent. For 2015 through 2020, collection system coverage was assigned values that were back-calculated based on actual LFG recovery as a percentage of modeled recovery potential. Based on LFG system expansion and improvements in December 2019, the system coverage in 2020 is believed to be 70 percent and future system coverage is assumed to increase by 5 percent every 5 years, until achieving 85 percent in 2035. These future system coverage values assume that the County's practices of improving the current wellfield, routine expansions of the existing collection system, installation of replacement wells and re-drills, maintaining dedicated dewatering pumps in a select portion of the wellfield, and routine operations and maintenance of the LFG system will continue.

The LFG recovery projections developed for this RFP are presented in **Exhibit 4**. A graph depicting the LFG recovery projections are shown in **Exhibit 5**. Based on the modeling results, LFG recovery from the existing and planned systems is projected to increase from an average of 996 standard cubic feet per minute (scfm) in 2020 to 1,143 scfm in 2025 and to 1,297 scfm in 2030. Since waste placement operations are expected to continue throughout the term of the LFGE Contract, the model anticipates a maximum recovery rate during the proposed 20-year term of the LFGE Contract of 1,544 scfm in 2040. These values are within the range cited by the CEG Engineering Feasibility Study, as presented in **Appendix A.**

LANDFILL GAS FORECAST DISCLAIMER

The LFG recovery estimates are normalized to cubic feet per minute at 50 percent methane content. The heat rate represented by the LFG fuel reserves in units of MMBtu/hr is calculated using the heat value of methane equal to 1,012 Btu/cf.

The County offers no guarantee of minimum gas quantities available or minimal methane content of LFG generated from the Blackburn Landfill. This data is provided in this RFP for the purposes of providing information upon which bidders may submit proposals for the services requested.

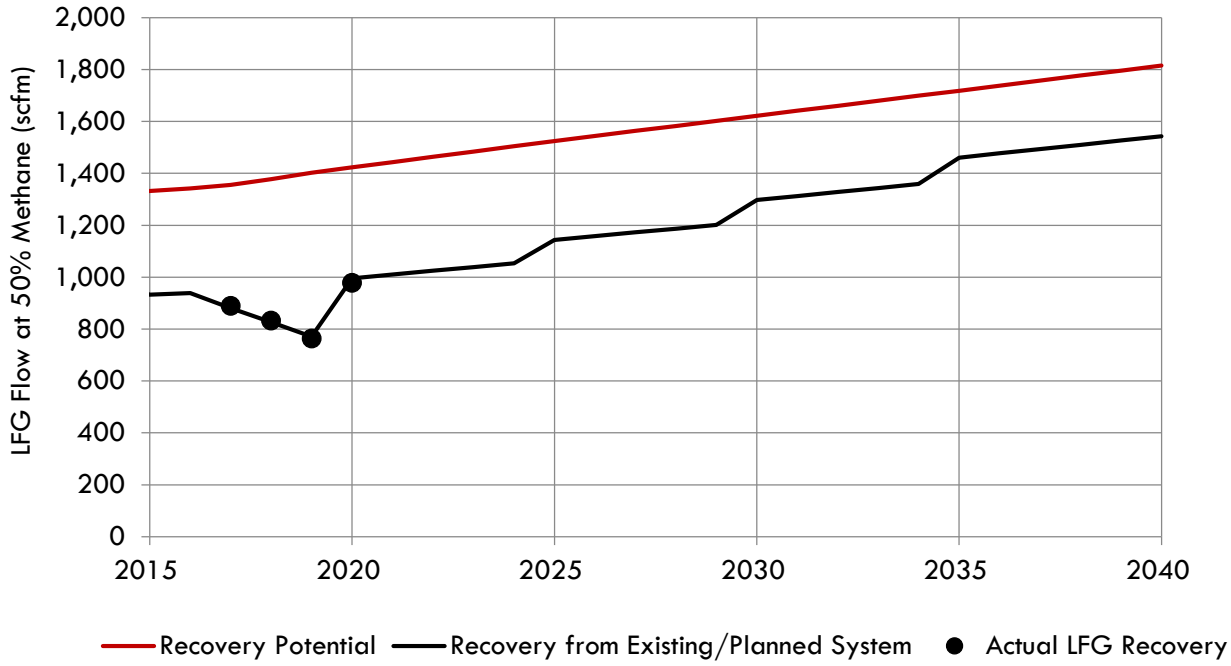
The LFG recovery forecasts presented in this RFP have been prepared in accordance with the care and skill generally exercised by LFG professionals, under similar circumstances, in this or similar localities. No other warranty, express or implied, is made as to the professional opinions presented herein. Changes in the landfill property use and conditions (for example, variations in rainfall, water levels, landfill operations, waste composition, final cover systems, or other factors) may affect future gas recovery at the landfill.

Exhibit 4. Landfill Gas Recovery Projections Table

Year	Annual Total Waste Disposal	Total Waste In-Place	LFG Recovery Potential			LFG System Coverage	LFG Recovery from Existing Planned System		
	(tons/yr)	(tons)	(scfm)	(mmcf/day)	(mmBtu/Yr)	(%)	(scfm)	(mmcf/day)	(mmBtu/Yr)
1981	48,100	48,100	0	0	0	0%	0	0	0
1982	49,600	97,700	36	0.05	9,540	0%	0	0	0
1983	51,100	148,800	70	0.10	18,733	0%	0	0	0
1984	52,600	201,400	104	0.15	27,601	0%	0	0	0
1985	54,200	255,600	136	0.20	36,168	0%	0	0	0
1986	55,800	311,400	167	0.24	44,472	0%	0	0	0
1987	57,500	368,900	198	0.28	52,533	0%	0	0	0
1988	59,200	428,100	227	0.33	60,386	0%	0	0	0
1989	61,000	489,100	256	0.37	68,045	0%	0	0	0
1990	64,300	553,400	284	0.41	75,543	0%	0	0	0
1991	131,200	684,600	313	0.45	83,189	0%	0	0	0
1992	129,950	814,550	389	0.56	103,587	0%	0	0	0
1993	136,460	951,010	460	0.66	122,357	0%	0	0	0
1994	144,450	1,095,460	531	0.76	141,150	0%	0	0	0
1995	148,850	1,244,310	603	0.87	160,257	0%	0	0	0
1996	159,490	1,403,800	673	0.97	178,945	0%	0	0	0
1997	156,450	1,560,250	746	1.07	198,480	75%	560	0.81	148,860
1998	166,100	1,726,350	813	1.17	216,091	75%	609	0.88	162,069
1999	167,780	1,894,130	881	1.27	234,426	75%	661	0.95	175,820
2000	178,300	2,072,430	947	1.36	251,854	75%	710	1.02	188,891
2001	169,450	2,241,880	1,016	1.46	270,191	75%	762	1.10	202,643
2002	163,430	2,405,310	1,074	1.55	285,532	75%	805	1.16	214,149
2003	163,530	2,568,840	1,123	1.62	298,643	75%	842	1.21	223,982
2004	167,590	2,736,430	1,169	1.68	310,887	75%	877	1.26	233,165
2005	167,988	2,904,418	1,215	1.75	323,108	75%	911	1.31	242,331
2006	166,845	3,071,263	1,258	1.81	334,582	75%	944	1.36	250,937
2007	151,007	3,222,270	1,297	1.87	345,054	75%	973	1.40	258,790
2008	132,853	3,355,123	1,322	1.90	351,676	75%	992	1.43	263,757
2009	122,938	3,478,061	1,332	1.92	354,250	75%	999	1.44	265,688
2010	123,149	3,601,210	1,334	1.92	354,684	75%	1,000	1.44	266,013
2011	117,329	3,718,539	1,335	1.92	355,130	75%	1,001	1.44	266,347
2012	117,787	3,836,326	1,333	1.92	354,392	75%	999	1.44	265,794
2013	120,579	3,956,906	1,330	1.92	353,794	75%	998	1.44	265,346
2014	123,307	4,080,213	1,330	1.92	353,791	75%	998	1.44	265,343
2015	133,842	4,214,055	1,332	1.92	354,329	70%	933	1.34	248,030
2016	139,635	4,353,690	1,342	1.93	356,919	70%	939	1.35	249,844
2017	153,198	4,506,888	1,355	1.95	360,484	65%	881	1.27	234,315
2018	157,312	4,664,200	1,378	1.98	366,498	60%	827	1.19	219,899
2019	155,000	4,819,200	1,402	2.02	372,921	55%	771	1.11	205,107
2020	156,600	4,975,800	1,423	2.05	378,452	70%	996	1.43	264,916
2021	158,200	5,134,000	1,444	2.08	383,926	70%	1,011	1.46	268,748
2022	159,800	5,293,800	1,464	2.11	389,347	70%	1,025	1.48	272,543
2023	161,400	5,455,200	1,484	2.14	394,719	70%	1,039	1.50	276,303
2024	163,000	5,618,200	1,504	2.17	400,045	70%	1,053	1.52	280,031
2025	164,600	5,782,800	1,524	2.19	405,328	75%	1,143	1.65	303,996
2026	166,200	5,949,000	1,544	2.22	410,572	75%	1,158	1.67	307,929
2027	167,900	6,116,900	1,563	2.25	415,778	75%	1,173	1.69	311,833
2028	169,600	6,286,500	1,583	2.28	420,969	75%	1,187	1.71	315,727
2029	171,300	6,457,800	1,602	2.31	426,147	75%	1,202	1.73	319,610
2030	173,000	6,630,800	1,622	2.34	431,312	80%	1,297	1.87	345,050
2031	174,700	6,805,500	1,641	2.36	436,465	80%	1,313	1.89	349,172
2032	176,400	6,981,900	1,660	2.39	441,607	80%	1,328	1.91	353,285
2033	178,200	7,160,100	1,680	2.42	446,738	80%	1,344	1.94	357,390
2034	180,000	7,340,100	1,699	2.45	451,879	80%	1,359	1.96	361,503
2035	181,800	7,521,900	1,718	2.47	457,030	85%	1,461	2.10	388,475
2036	183,600	7,705,500	1,738	2.50	462,189	85%	1,477	2.13	392,861
2037	185,400	7,890,900	1,757	2.53	467,357	85%	1,494	2.15	397,254
2038	187,300	8,078,200	1,777	2.56	472,533	85%	1,510	2.17	401,653
2039	189,200	8,267,400	1,796	2.59	477,735	85%	1,527	2.20	406,075
2040	191,100	8,458,500	1,816	2.61	482,962	85%	1,544	2.22	410,518

	MSW	C&D
Methane Content of LFG adjusted to:	50%	50%
Selected Decay Rate Constant (k):	0.070	0.028
Selected Ultimate Methane Recovery Rate (Lo):	2,883 cu ft/ton	2,280 cu ft/ton

Exhibit 5. Landfill Gas Recovery Projections Chart



MEASURED LANDFILL GAS COLLECTION RATE

The County measures real-time flow of LFG collected at the blower station and the quantities of LFG routed to the flare in comparison to the power plant. LFG collection prior to December 2019 included only the Unit 1 and Unit 2 cells. Gas collection from Unit 3 Phase 1 began in January 2020 and likely accounts for some of the recent increased LFG flowrates. The average LFG collection quantities (normalized to 50 percent methane) measured from March 2017 through March 2020 are presented below in **Exhibit 6**.

MEASURED LANDFILL GAS METHANE CONTENT

The County currently measures real-time methane content (% CH_4) of the landfill gas collected at the blower station via a methane analyzer. Based on available data measured over the last 36 months, the average monthly methane concentration of the landfill gas ranges from 50.6% to 55.8%, with an average of 54.1%. The average monthly methane concentrations measured from March 2017 through March 2020 are presented in **Exhibit 7**.

MEASURED LANDFILL GAS COMPOSITION

LFG samples were obtained on March 4, 2020 from the main LFG header pipe conveying the LFG from the wellfield to the blower/flare station and gas processing/compression system. Samples were collected upstream as well as downstream of the moisture removal and treatment system (condensate knockout and glycol chiller). Prior to collecting gas samples, field personnel measured and recorded concentrations of Methane (CH_4), Carbon Dioxide (CO_2), Oxygen (O_2), and balance (assumed to be Nitrogen (N_2)). The concentration of Hydrogen Sulfide (H_2S) was measured using a field meter and colorimetric tubes. A sample at the upstream port and a sample at the downstream port were obtained using standard sampling protocol and transmitted to AtmAA Laboratory for analysis to measure the following concentrations of constituents:

- TO-15 Component Analysis to determine concentrations of Toxic Air Pollutants and Hazardous Air Pollutants (TAPs/HAPs);
- EPA Method 3C to determine the concentrations of permanent gases including carbon dioxide (CO_2), methane (CH_4), oxygen (O_2), and nitrogen (N_2);
- Hydrogen Sulfide Analysis (SCAQMD 307-91 or ASTM D5504); and,
- Siloxane Compounds Analysis (GC/MS per TO-14 or other suitable method).

A copy of the laboratory analytical report from AtmAA is presented in **Appendix B**.

Exhibit 6. Average Landfill Gas Collection Rate – Blower Station Data

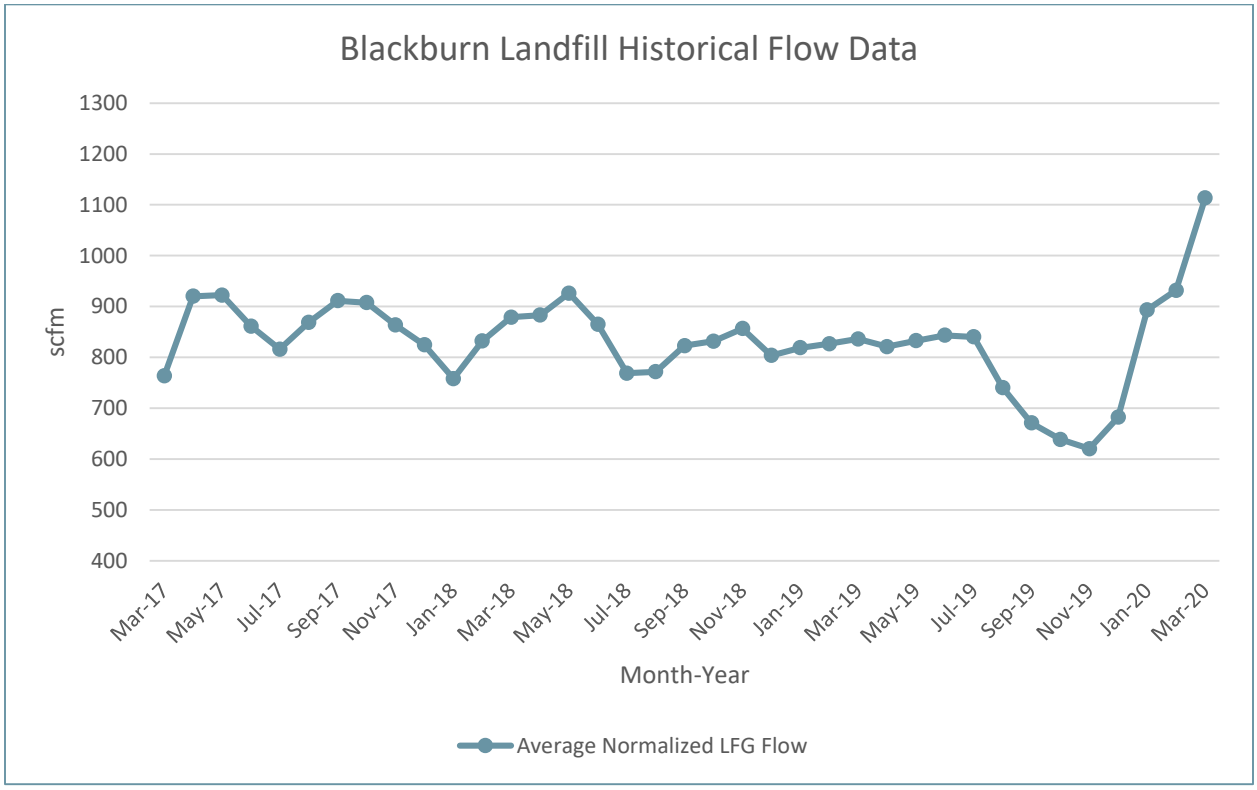
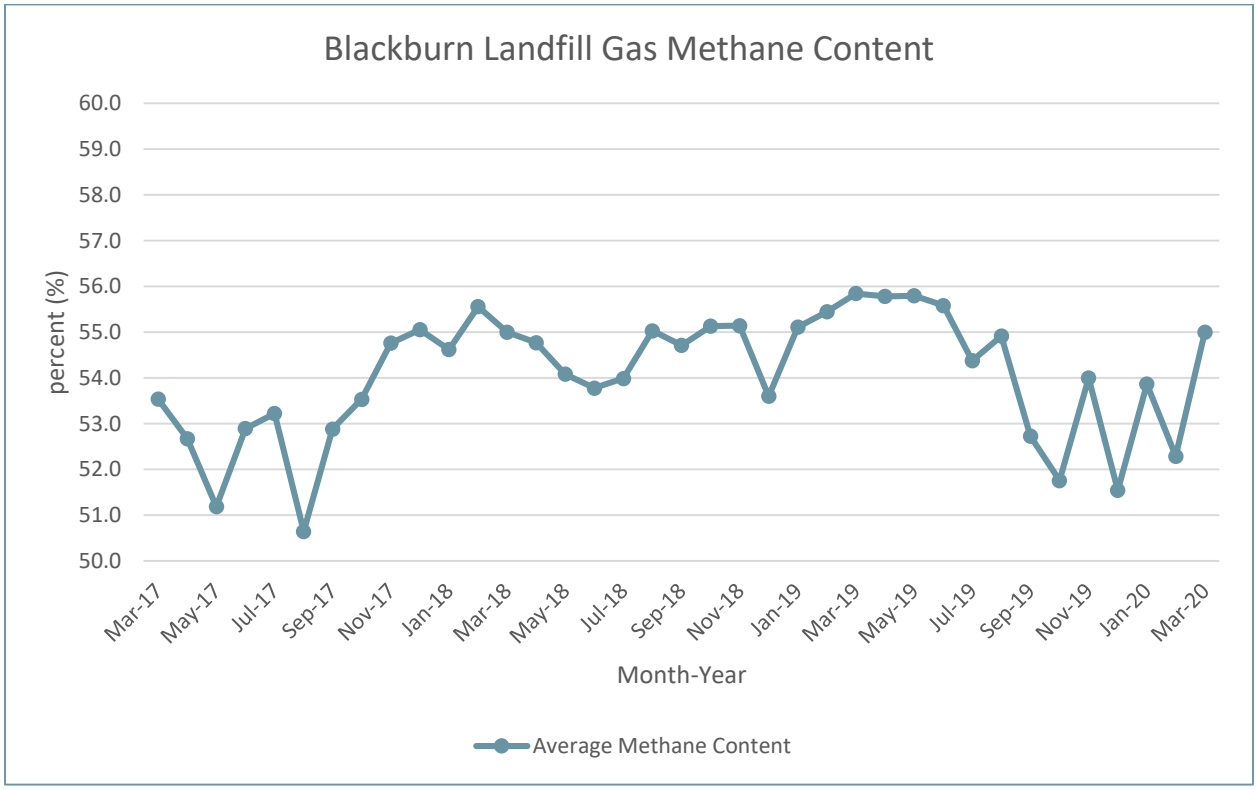


Exhibit 7. Average Methane Concentration of Landfill Gas – Blower Station Data



ADDITIONAL INFORMATION

- The existing LFGE building may be repurposed for the Company's use. The Company must indicate planned use and how intensive the Company's use will be. The building currently serves as County staff offices' and houses gas skid control. The extent of space sharing with the County will depend on what use is proposed by the Company.

- The closest available water source is a City of Newton waterline along Rocky Ford Road.

- The County does not have a current power purchase agreement.

FORM A – PROPOSAL SUBMITTAL FORM

Landfill Gas-to-Energy Development Project for the Blackburn Landfill and Resource Recovery Facility Newton, North Carolina

In compliance with this Request for Proposals, which includes the attached Exhibits referenced herein, and subject to all the terms and conditions set forth herein, the undersigned offers and agrees to furnish the services described in the RFP cited above and submit this signed proposal which includes this completed and signed page, and other data as required by the RFP. It is understood that this proposal and the scope of services may be modified, by mutual agreement in subsequent negotiations.

Name and Address of Company:

_____	Date: _____
_____	By: (sign in ink) _____
_____	By: (print name) _____
_____	Title: _____
_____	Phone: _____
FEI/FIN #: _____	Email: _____

FORM B – PROPOSAL CERTIFICATION AND NON-COLLUSION AFFIDAVIT

State of _____

County of _____

_____ being first duly sworn, deposes and says that:

a. I am the _____, (Owner, Partner, Officer, Representative or Agent) of _____ the Company that has submitted the attached Proposal;
b. I have carefully read and examined the Request for Proposals dated **Monday, August 3, 2020,** as prepared by the County and understand the terms and provisions thereof;
c. I am fully informed regarding the preparation and contents of the attached Proposal;
d. The attached Proposal is genuine and is not a collusive or sham Proposal;
e. I affirm that the attached Proposal has been independently arrived at without collusion with any other bidder or with any competitor or potential competitor;
f. I understand that all proposals shall remain open for **180** calendar days after the actual date of the Proposal opening;
g. I understand and agree that any project arising out of a successful Proposal will be subject to the County's Equal Employment Opportunity, Anti-Discrimination, and Affirmative Action Programs.

My below signature certifies that the Proposal as submitted complies with all Terms and Conditions as set forth in the Request for Proposal for Landfill Gas-to-Energy Development Project involving beneficial use of landfill gas generated at the Blackburn Landfill and Resource Recovery Facility, Newton, North Carolina. My signature also certifies that by submitting a Proposal in response to this Request for Proposal, the Company represents that in the preparation and submission of this proposal, said Company did not, either directly or indirectly, enter into any combination or arrangement with any person, firm or corporation or enter into any agreement, participate in any collusion, or otherwise take any action in the restraint of free, competitive bidding in violation of the Sherman Act (15 U.S.C. section 1) and/or County, State and Federal laws, codes, rules and regulations.

I hereby certify that I am authorized to sign as a Representative for the Company:

NAME OF COMPANY: _____

ADDRESS: _____

_____

FEDERAL TAX ID #: _____

TELEPHONE: _____

EMAIL: _____

SUBMITTED this_____day of_____, 2020

_____
(Name of Company)

_____
(Signature of authorized representative)

_____
(SEAL)

_____
(SEAL)(Title)

_____
(Business Address)

_____
(City, State & Zip Code)

(Note: If the Company is a corporation, indicate State of incorporation under signature, affix corporate seal, and give below the names and residential addresses of its president, treasurer, and general manager; if a partnership, give the full names and residential addresses of all partners; and if an individual, give residential address if different from business address. Also include registration with North Carolina Secretary of State showing authority to operate as a business in North Carolina.)

FORM C – LANDFILL GAS PAYMENT FORM

FORM C - LANDFILL GAS PAYMENT FORM

Blackburn Landfill and Resource Recovery Facility - Newton, North Carolina

Year	Projected LFG Recovery Potential (scfm)	Anticipated LFG to be USED by Project (scfm)	Anticipated Excess LFG NOT USED by Project (scfm)	Proposed Compensation to County on LFG Unit Basis ($/MMBTU)	Proposed Compensation to County on Other Unit Basis (specify)	Projected Annual Compensation to County Attributed to Power Sales ($)[1]	Projected Annual Compensation to County Attributed to RECs ($)[1]	Projected Annual Compensation to County Attributed to Gas Sales ($)[1]	Projected Annual Compensation to County Attributed to RINs ($)[1]	Projected Annual Compensation to County Attributed to Other Sources ($)[1]	Projected Total Annual Compensation to County ($)[2]
2021	1,011										
2022	1,025										
2023	1,039										
2024	1,053										
2025	1,143										
2026	1,158										
2027	1,173										
2028	1,187										
2029	1,202										
2030	1,297										
2031	1,313										
2032	1,328										
2033	1,344										
2034	1,359										
2035	1,461										
2036	1,477										
2037	1,494										
2038	1,510										
2039	1,527										
2040	1,544										
Total for 20-Year Term											

1. Projected Annual Compensation to County Attributed to various LFGE project elements may or may not be applicable depending on nature of LFGE project.
2. Projected Total Annual Compensation to County should equal the sum of values for compensation attributed to various LFGE project elements.

Description of Other Sources or alternative compensation structures:

Appendix A

cornerstone PLLC

Building lifetime relationships with our clients and employees.

Landfill Gas Beneficial Use Feasibility Study

Catawba County

Blackburn Landfill, Newton, North Carolina

January 2019

Prepared for:
Catawba County
25 Government Drive
Newton, NC 28658

7820 NE Holman Street, Suite B-6
Portland, OR 97218
(877) 633-5520

REPORT CERTIFICATION

Landfill Gas Beneficial Use Feasibility Study

Catawba County

Blackburn Landfill
Newton, NC

The material and data in this report were prepared under the supervision and direction of the undersigned.

CEG Engineering, PLLC

Michael S. Michels, P.E.
Executive Vice President

Paul Stout
Regional Vice President

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1 INTRODUCTION

The Blackburn Landfill (Landfill) is owned and operated by Catawba County (County) and is located at 4017 Rocky Ford Road, Newton, North Carolina. The Landfill's existing infrastructure includes a landfill gas (LFG) collection and control system (GCCS) installed for the collection and destruction of LFG. The LFG is destroyed via flare and an existing beneficial use project consisting of three internal combustion (IC) engines to generate electricity. The rate of payment for the generated electricity has steadily dropped during recent years and coupled with the rising operations and maintenance (O&M) costs of the aging engines, feasibility of the continued operation of the IC engines has come into question. Therefore, the County is exploring the feasibility of beneficially utilizing the collected LFG by other methods. The County has contracted CEG Engineering, PLLC (CEG) to conduct a LFG Beneficial Use Feasibility Study (Feasibility Study). This Feasibility Study estimates the quality and quantity of LFG available for use as a fuel source, reviews LFG beneficial use alternatives, and provides a summary of potential LFG utilization options and incentives that may be available to the County. This Feasibility Study presents a high-level analysis of potential beneficial use projects and end-users, based on feedback from potential end-users and CEG's experience with similar projects. Conceptual drawings have not been completed nor have quotes for construction or equipment been procured. The intention of the high-level analysis is for the County to gain a general sense of profitability of each scenario and develop a short list of projects that may warrant further consideration.

2 EXECUTIVE SUMMARY

CEG has conducted this general evaluation of the Landfill for the purpose of determining the potential options for an LFG beneficial use project, particularly focusing on an LFG to renewable natural gas (RNG) project. This Feasibility Study assesses the future LFG generation and composition, evaluates options for utilizing the LFG in a beneficial use project, and identifies and evaluates parties that may be interested in developing a beneficial use project.

As part of this Feasibility Study, LFG generation modeling was prepared to estimate the quantity of LFG available for use. CEG compared the model to actual LFG collection observed at the Landfill and developed a potential range of future LFG collection. By applying a low LFG collection efficiency rate of 60 percent and high LFG collection efficiency rate of 80 percent, a projection of potential fuel availability was created. Results are discussed in detail in Section 4 of this Feasibility Study. The projected LFG collection rates are based on anticipated future waste intake rates, waste characteristics, waste moisture content (none of which we have control over), and existing LFG flow and composition data provided by the County.

CEG applied the projected rates of LFG collection to currently available utilization technologies, incorporating the quality of LFG historically extracted based on field monitoring and laboratory analysis, and the proximity of potential commercial customers. With this, CEG conducted preliminary budgetary estimates to conduct a high-level analysis of various LFG beneficial use projects at the site. This analysis is meant to eliminate options from further consideration, and/or develop a short-list of options that warrant further analysis.

This Feasibility Study focuses on the implementation of a LFG to RNG project. One of the utilization alternatives is to install a LFG processing facility that will process the collected LFG and create pipeline quality RNG, often referred to as a high-British Thermal Unit (BTU) facility. The RNG can then be delivered to a local high-volume natural gas pipeline and used down-stream at a compressed natural gas (CNG) fueling station. LFG would be dewatered, compressed, conditioned, and delivered to the natural gas pipeline via a dedicated new pipeline from the Landfill or via virtual pipeline using tube trailers. CEG interviewed several developers in the area with existing and potential pipeline injection projects. Various incentives and financial options may exist for the County. The exact disbursement of these incentives between the biogas supplier, processer, pipeline, CNG station operator, and CNG vehicle owner will need to be further explored via project development and contracting.

The high-BTU project may be viable due to the revenues generated from federal and other incentives for conversion of biogas to RNG for use in vehicles. A high-BTU project could

also be implemented due to the interest expressed by developers that have existing pipeline injection projects in the area. However, this project would be dependent on costs of the pipeline, including permitting, right of ways, and reaching agreements with the local utilities for an interconnection. Additional challenges such as utility transmission, pipeline capacity to accommodate the RNG and interconnection requirements such as gas quality testing, pressure, and metering, will need to be considered in future studies or design for this option. Should the LFG quality be proved at the higher quality, LFG to RNG conversion currently has several incentives which would make the option financially attractive. A contract with a CNG fuel user would need to be completed to show that the RNG is used as CNG vehicle fuel. This is necessary for the incentives associated with the production and use of RNG as a vehicle fuel (i.e. RINs). The payback could be less than five years for a project of this nature, depending upon the project structure and financing assumed.

Additionally, high-BTU projects such as a LFG to pipeline project are highly dependent on the LFG quality from the GCCS. Removal of the oxygen and nitrogen (i.e.: air) within LFG that results from the slight overpull on a GCCS to control surface emissions, is extremely difficult and expensive. If the concentration of oxygen and nitrogen within the LFG coming from the GCCS is too high, the cost of removal can become prohibitive. For a high-BTU to pipeline facility, nitrogen up to approximately eight to ten percent can be accommodated for a project of sufficient size.

It should be noted, that the requirement for RNG quality going directly to trucks is much less than that going into a utility pipeline. Thus, if the created RNG could be delivered directly to a fueling station, as opposed to going into the utility pipeline, this option's financial outlook increases significantly. This would involve processing LFG to RNG and conveying it directly to vehicles via a new CNG fueling station to be developed as part of the project. There are several fueling stations near the Landfill, but based on CEG's review, none appear to offer CNG fuel as an option at this time. There is potential with these fuel station owners that a teaming arrangement could be developed where direct use of RNG could be an option in their future. The RNG could be conveyed to these fueling stations via dedicated pipeline, or virtual pipeline, i.e. use of CNG tube trailers and trucking the CNG tube trailers to the CNG stations for dispensing. A small LFG to RNG facility could create RNG that meets the lower fueling standards required for use in a local CNG station. This project would benefit from the incentives for direct (i.e.: without natural gas pipeline injection) RNG utilization in vehicles.

CEG interviewed potential end users and developers that may be interested in the LFG to RNG project. Based on conversations between CEG and these potential end users, Blue Ridge Biofuels, Loves/Trillium, and Evensol have the highest level of interest in the project and potential contracting options that may be financially attractive to the County. They all have existing facilities in the area and have interest in developing their portfolios by teaming with the County to bring the project to fruition. Multiple scenarios exist for the

County's involvement in the project. The County could potentially own the LFG conditioning equipment, pipeline, and/or tube trailers, or the County could simply sell the fuel (raw LFG) to one of the developers at an agreed upon rate and negotiate the distribution of available incentives.

3 FACILITY DESCRIPTION

The Landfill has been operating since 1980 and accepts only Municipal Solid Waste (MSW). The Landfill is permitted to accept a total capacity of 15,000,000 metric tons. If the Landfill maintains its current intake rates, it is expected to reach capacity in 2075. At the end of 2018, the site had received approximately 4.9 million tons of solid waste, per waste intake information provided by the County.

The Landfill operates under Title V Air Quality Permit No. 08533T10 issued by the North Carolina Department of Environmental Quality (NCDEQ) Division of Air Quality (DAQ). The GCCS is subject to New Source Performance Standards (NSPS) for Municipal Solid Waste Landfills, Title 40 of the Code of Federal Regulations (CFR), Part 60 (40 CFR 60), Subpart WWW, and is also subject to the requirements of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Municipal Solid Waste Landfills as provided in 40 CFR 63 Subpart AAAA.

4 LFG MODELLING AND FIELD TESTING

4.1 Field Testing

Laboratory and field sampling of the County's LFG were performed by others in 2012 and 2015. The laboratory results are summarized in Table 4.1 below with the full laboratory analysis reports included as Appendix A.

The LFG composition of the samples was varied between 51 and 57 percent methane, 39 and 41 percent carbon dioxide (CO_2), zero to one percent oxygen (O_2), and two to nine percent balance gas (likely nitrogen). H_2S was relatively low for LFG at 5.04 to 8.46 parts per million by volume (ppmv).

All gas chemistry tests were quite old (year 2012 to 2015) so future studies should include obtaining recent sample and more laboratory testing for these items plus siloxane.

Table 4.1 - Field Sampling Summary

Date	1/27/2015	1/27/2015	2/6/2015	2/6/2015	1/27/2015	3/14/2012
Testing Method	GEM2000	GEM2000	GEM2000	GEM2000	ASTM D1946	ASTM D1946
Methane (%)	55.5	55.5	56.6	56.6	51.54	52.8
Carbon Dioxide (%)	40.8	40.6	40.5	40.6	38.55	39.5
Oxygen (%)	0.6	0.5	0.4	0.4	1.0	0.8
Balance (%)	3.1	3.4	2.5	2.4	8.91	6.9
Testing Method					**ASTM D6228**	**ASTM D6228**
Hydrogen Sulfide (ppm)					5.04	8.46

4.2 LFG Modeling

CEG has evaluated the LFG generation potential for the Landfill utilizing the United States Environmental Protection Agency (USEPA) Landfill Gas Emissions Model (LandGEM) v3.02. The model projections were used to predict the potential range of LFG generation and collection from the GCCS at the Landfill. LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in MSW landfills.

Characteristics of the Landfill that are considered when preparing the LandGEM include annual waste intake rates; waste characteristics such as the types of material accepted and moisture content; annual precipitation and reuse/recirculation of leachate that would

increase liquids within the landfill. For annual waste intake rates, the evaluation utilized available historical waste intake rates for years 1980 to 2014 from the "2015 Catawba GHG Report" (GHG Report) prepared by CDM Smith, dated April 18, 2016; and waste intake rates for 2015 to 2017 were provided in an email dated November 20, 2018 from Catawba County titled "Catawba County Tonnage Email." The landfill capacity is 15,000,000 metric tons, per the GHG Report. For remaining capacity after the historical waste intake values from 1980 to 2017, the yearly waste intake was assumed to be received at a constant rate (no increase applied to the yearly intake) with 184,285 metric tons received per year until closure in 2075.

Assumed low and high collection efficiencies were applied to the LFG generation projections to estimate potential low and high LFG collection rates. These projections provide a bracketing of potential LFG collection rates, from an estimated current collection efficiency of 60 percent to a higher collection efficiency that could potentially be achieved through future GCCS improvements at the Landfill at 80 percent.

At a collection efficiency of 60 percent, the model estimates LFG collection for 2018 as approximately 793 standard cubic feet per minute (scfm), close to the current collection rate of approximately 780 scfm provided by the site on December 5, 2018. The low LFG collection scenario is assumed to be the current conditions at the Landfill since improvements can be made to increase collection efficiency. Per a phone conversation with CDM Smith on November 15, 2018, improvements to the Landfill's GCCS are currently being implemented. Many wells in the Unit 1 area of the Landfill are either completely watered in or silted in, greatly reducing the collection of LFG from this portion of the Landfill. CDM Smith is currently working to install a dewatering system in this area to improve LFG collection efficiency.

The high LFG collection scenario assumes that improvements have been made to the Landfill to increase the collection efficiency. The high collection efficiency is assumed as 80 percent, which is considered industry standard for a well-tuned and maintained wellfield. At an 80 percent collection efficiency, the model estimates an LFG collection rate in 2018 of approximately 1,057 scfm and a peak LFG collection rate of approximately 1,894 scfm in the year 2076.

Table 4.2 provides a projection of potential LFG generation and collection, based upon the projection and applying a low and high collection rate for the GCCS. The LandGEM model results are included in Appendix B. These values are shown for planning purposes and are highly dependent upon future waste intake rates, waste characteristics, moisture content, and construction sequencing.

Table 4.2 – Projected LFG Generation and Extraction Rates 2018 and 2076

Year	LandGEM Projection (scfm)	Low Collection Efficiency-60% (scfm)	High Collection Efficiency-80% (scfm)
2018 (current)	1,321	793	1,057
2076 (peak year)	2,367	1,420	1,894

5 ASSESSMENT OF OPTIONS FOR LFG TO BENEFICIAL USE

5.1 General Classification of LFG Utilization Projects

LFG utilization projects can generally be classified into one of three categories, relative to project economics, the application of technology, and the availability of resources. These project classifications are generally considered as:

- Small Projects (less than 500 scfm): These projects are generally suited to the application of small IC engines or microturbines (often for on-site direct usage), RNG fuel production, or small medium/high BTU direct fire applications (boilers, evaporators, etc.);
- Medium Projects (500 scfm to 2,000 scfm): Projects of this magnitude could involve staged applications of small IC engines or RNG fuel production, however they also lend themselves to a wider range of medium/high BTU direct fire applications, electrical generation through larger IC engines or turbines, and the production of RNG for pipeline transport; and
- Large Projects (more than 2,000 scfm): Projects of this magnitude generally include electrical generation through larger IC engines or turbines, combined-cycle generating facilities, and the production of RNG for pipeline transport.

Note that all flow values are normalized to a common basis of 50 percent methane by volume. This is standard practice in the LFG industry in order to provide relative comparisons of data sets from fuel streams that may have differing methane contents.

LFG beneficial use projects in the US, numbering in the hundreds, utilize LFG as fuel in a variety of ways, including the following:

- Electrical Generation;
- Medium BTU Applications;
- Production of alternative fuels by converting LFG to a high-BTU fuel suitable for pipeline injection; and
- Production of alternative fuels by converting LFG to RNG suitable for direct use in vehicles.

The CEG team has explored gas conditioning options that have the potential to bring positive economic and socio-economic results to the Landfill and reached out to potential end users, which are discussed below.

5.2 Low Feasibility Options

5.2.1 Electrical Generation

Utilizing LFG to generate electricity for export to the power grid has long been a mainstay of LFG beneficial use. Traditionally, these projects were developed because of the relative ease of transport, both on-site and off-site, via the existing electrical grid infrastructure and the use of LFG-to-electric projects to fulfill the requirements of State-mandated renewable portfolio standards for the electrical utilities (mandated minimums of renewable electrical generation in the utilities portfolio). Prices for these projects were largely predicated on wholesale prices and fluctuated substantially based upon the regional "supply" and "need" for renewable power.

There are few incentives in the current market for renewable electric, due to the influx of solar and wind energy projects. In most states, including North Carolina, the utilities are no longer offering enough value in their recent power purchase agreements to make the development of LFG-to-electric projects economically viable.

5.2.2 Medium BTU Applications

Medium BTU applications generally consist of projects where the BTU content of the original biogas is not concentrated. Medium BTU applications that use minimally-processed biogas as a replacement for oil, coal, natural gas, etc. is an application that has been widely developed for LFG beneficial use. For relevant projects, this type of LFG beneficial use application is very appropriate – the fuel price is lower than that of natural gas, however, the processing costs are substantially lower, and the overall delivery process is simpler than observed in many other beneficial use applications.

However, these projects typically require a large consumer of natural gas end-user in relatively close proximity to the landfill. Although some medium BTU pipelines exceed 20 miles in length, the majority are well within a ten-mile radius of a landfill. Unfortunately, there do not appear to be likely candidates near the Landfill to make the development of a medium BTU project economically viable.

Based on the results of the high-level analysis of electrical generation and medium BTU projects, CEG focused efforts on LFG to RNG beneficial use projects. With the growing advancements in technology and high incentives for the production of RNG fuel for vehicles these projects are proving to be economically viable. The results of our high-level analysis are presented in the subsequent sections.

5.3 High BTU Pipeline Injection

Gas utilities have strict quality guidelines for injected gas. Nitrogen and oxygen levels in the LFG must be extremely low, or expensive additional conditioning systems would be required to remove these inert gases. Although this type of development has traditionally been the province of projects with large gas flow rates (generally more than 5,000 scfm), since 2012 the largest development reported is approximately 3,500 scfm, with smaller systems capable of operating at as low as 100 scfm have been successfully implemented. This reflects the relative efficiency and flexibility of the conditioning equipment currently being utilized and its capacity for producing fuel cost-effectively.

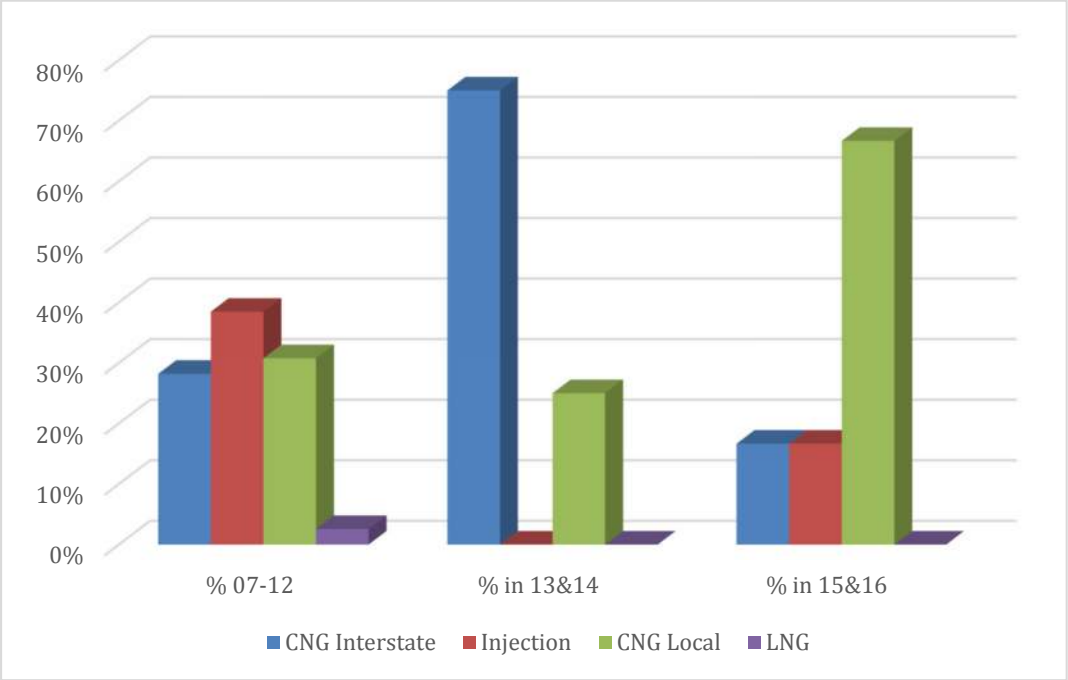
The majority of the fuel sources used for RNG applications are landfills – approximately 40 percent in 2015 - 2016, down from approximately 80 percent in 2013 - 2014. The balance of the fuel is derived from anaerobic digester and wastewater treatment plant facilities.

Within the umbrella of RNG development are four sub-sets of development:

- CNG Interstate;
- CNG Local;
- Liquefied Natural Gas (LNG); and
- RNG pipeline Injection.

Through 2012, the development of CNG for Interstate transport, CNG for local usage, and RNG injection into pipelines were developed at comparable rates, with relatively few LNG projects developed. From 2013 - 2014 there was a spike in interstate CNG projects, however, in 2015 - 2016 local applications of CNG fuel were the predominant development – approximately 60 percent of projects, as shown in Figure 5.1 below (Reference: United States Department of Energy Alternative Fuels Data Center). The predominance of local CNG fueling projects is likely due to the relatively low cost of natural gas – approximately $2.90 per million BTU (MMBTU), down from approximately $4.30/MMBTU in 2014 and more than $8/MMBTU in 2008 (Reference: Henry Hub Spot Index, 2017). The combination of low natural gas pricing and the improvement of heavy-use natural gas engines, suitable for refuse collection vehicles and freight transport, are additional drivers in the development of local CNG fueling projects.

Figure 5.1 - RNG Applications



The processes required for production of high-BTU gas from LFG are substantially more involved and, as a result, more expensive than those needed to prepare medium-BTU gas. The process involves the compression of LFG collected from the wellfield to a pressure dictated by the beneficial end use technology selected. Following compression, the LFG is processed to remove moisture, CO_2, and trace contaminants such as H_2S, siloxane, and condensed organics.

The processes required for production of high-BTU gas are adversely impacted by the oxygen and nitrogen that are typically present in LFG collection systems installed for compliance purposes. LFG collection systems designed for compliance are operated at relatively high vacuum levels in order to minimize emissions of LFG to the atmosphere. As a result, compliance systems inherently draw some amount of atmospheric air containing oxygen and nitrogen into the LFG stream. Collection systems designed specifically for high quality gas collection are operated at lower vacuum, or limit collection to deeper areas of the landfill, in order to avoid drawing air into the system.

Pipeline RNG projects generally require a greater level of processing than do vehicle fuel projects, due to the requirements of the end-use. Vehicle fuel RNG can be processed to a minimum of approximately 94 percent methane, while pipeline injection of RNG requires processing to a minimum of approximately 98 percent methane with lower limits of oxygen, nitrogen, carbon dioxide, siloxanes, and sulfur. For example, to meet Piedmont Natural Gas pipeline injection standards, in addition to the methane content percentage,

oxygen content of the injected gas must be below 0.2 percent and nitrogen below two percent. Each utility has its own particular gas quality requirements for pipeline injection. Piedmont Natural Gas Company, Inc. requirements are relatively standard as compared to the requirements seen nationwide, with California injection requirements being much more difficult to meet and the Midwest requirements typically easier to achieve.

Table 5.2 – Production of High-BTU Gas to Pipeline Injection

	1,000 scfm System
Minimum Methane Quality	50%
LFG Flow (scfm)	1,000
Fuel Production (GGE per Day)	6,000
Nitrogen Rejection Unit	$4,700,000
Gas Conditioning Equipment	$3,100,000
Pipeline Installation to high-volume natural gas pipeline interconnection	$2,000,000 - $3,000,000
Design and Permitting	$900,000
Construction	$2,600,000
Annual H_2S, Siloxane Media Replacement	$90,000
Annual Maintenance	$250,000
Annual Electricity Consumption	$1,200,000
Annual RIN Revenue[2]	$3,000,000

(1) All prices are budgetary estimates.
(2) RIN Revenue Based on current RIN value of $1.90. One RIN = 77,000 BTU. 1 GGE = 111,200 BTU. Therefore, 1 GGE = $2.74 in RIN revenue. *RINs shown are half of the total potential amount. This was done to account for distribution of RINs to the CNG fueling station developer for RNG fueling end use.*
(3) Design and permitting assumed to be ten percent of capital cost.
(4) Construction assumed to be 30 percent of capital cost.

The budgetary estimate presented in Table 5.2 does not take into account incentives from LCFS from California that could significantly impact the project budget.

With the LFG quality information available at this time, it would be a fair assessment to conclude that per the laboratory sample from 2015, at 51.5 percent methane with relatively low nitrogen and minimal oxygen, the LFG quality at the Landfill is likely sufficient for high-BTU projects.

5.3.1 LFG to Vehicle Fuel

RNG vehicle fuel facilities as shown in Figure 5.3, utilize biogas from a range of anaerobic decomposition processes, including LFG, to produce a replacement fuel for conventional CNG vehicle fuel. These facilities are generally scaled in increments from 100 scfm to 800 scfm, producing approximately 500 gasoline gallons equivalent (GGE) to 4,000 GGE of fuel per day respectively. With a relatively small footprint, RNG vehicle fuel facilities provide an effective use of small biogas streams and fit well into both Renewable Fuel and Low Carbon Fuel development programs.

Figure 5.3 - RNG Vehicle Fuel Production and Fueling Facility

In order to produce vehicle-quality RNG, a gas conditioning system is required to remove moisture, H_2S, particulates, siloxanes, and CO_2. The Society of Automotive Engineers sets the minimum quality requirements of CNG vehicle fuel in their SAE-J1616 standard. Currently, based on the data available at this time, the Landfill's LFG quality would be able to meet the standards and not require a nitrogen rejection unit (NRU) to reduce nitrogen to acceptable levels. NRUs are typically cost prohibitive unless paired with much higher LFG flows, approximately 2,000 scfm or more.

Currently, there are no active or public CNG stations in operation within 50 miles of the Landfill. Utilizing a gas conditioning system and fueling station located at the Landfill to fill mobile storage trailers and haul these trailers to one of the two CNG stations located over 50 miles west of the site is not feasible. However, a partnership with a CNG fueling

station developer to construct a CNG fueling station nearby would provide a relatively close location for transport of RNG. In addition, an existing fueling station nearby may be interested in expanding and installing a CNG fueling post that the Landfill could supply with a dedicated pipeline. There are five truck fueling stations nearby. Developing a relationship with one of the stations to provide CNG would allow the Landfill to supply RNG to that station, or potentially multiple stations through transport by tube trailer or dedicated pipeline. This option would allow the Landfill to produce a lower grade RNG that would allow RNG fueling incentives to be applied for.

Table 5.3 outlines two hypothetical LFG to vehicle fuel scenarios for a fueling station to be installed on-site. The scenarios do not include budgetary costs for pipeline installation, or the permitting, design, or modification of existing facilities to accommodate the fueling station.

Table 5.3 – Vehicle Fuel Production Cost Estimate

	200 scfm System	400 scfm System
Minimum Methane Quality	50%	50%
LFG Flow (scfm)	200	400
Fuel Production (GGE per Day)	800	1,600
Gas Conditioning Equipment	$900,000	$1,400,000
Fueling Station Equipment	$500,000	$650,000
Annual H_2S, Siloxane Media Replacement	$60,000	$120,000
Design and Permitting	$150,000	$220,000
Construction	$500,000	$650,000
Annual Maintenance	$40,000	$55,000
Annual Electricity Consumption	$225,000	$400,000
Annual RIN Revenue[2]	$1,500,000	$3,000,000
Annual Fuel Cost Offset[3]	$415,000	$830,000

(1) All prices are budgetary estimates.
(2) RIN Revenue Based on current RIN value of $1.90. One RIN = 77,000 BTU. 1 GGE = 111,200 BTU. Therefore, 1 GGE = $2.74 in RIN revenue.
(3) Based on $1.95/Gasoline Gallon Equivalent minus road tax in North Carolina ($0.351) and Federal Tax ($0.184).
(4) Design assumed to be ten percent of capital cost.
(5) Construction assumed to be 30 percent of capital cost.

It is important to note, that the above project scenarios require CNG vehicles to utilize the RNG in order to monetize the RINs and other incentives. As such, it is key to find sufficient CNG vehicles to utilize the RNG created. CNG hauling trucks to be purchased by the

County in the future would be ideal as this would greatly facilitate reaching an agreement and would not require sharing of any RINs or other incentives.

The above options utilize a budgetary estimate for a basic CNG fueling station at the Landfill, as would be the case if existing vehicles arriving at the Landfill converted to CNG engines and fueled at the Landfill. No budgetary costs are included for conversion of vehicles to CNG or sharing of RINs value with the CNG vehicle fleet owner. As such, these budgetary costs should be reexamined once a final approach for LFG to RNG for vehicles is established.

5.3.2 Additional Market Forces

Numerous forces in today's market are driving biogas to energy projects toward high-BTU systems. The market forces are proving that high-BTU projects, once requiring a minimum of 3,000 scfm inlet to be economically feasible, are now economically feasible at rates as low as 100 scfm of raw inlet biogas.

Abundant Natural Gas. Fracking of shale in the US has resulted in abundant amounts of natural gas, selling recently in October 2018, at $3.28/MMBTU on the Henry Hub. For biogas to high-BTU projects that sell RNG into the natural gas pipeline, several survey respondents reported that their projects are not meeting financial goals set for them because the natural gas price is currently so low.

Transport of RNG Using the Natural Gas Grid. Selling RNG into the natural gas pipeline infrastructure for general use is less financially viable. However, injecting RNG into the pipeline, paying a transport fee, and selling the RNG to a vehicle fueling station owner is proving economically viable. The transport of RNG is supported by the American Gas Association and wheeling fees are very reasonably priced.

Gasoline and Diesel versus CNG/LNG. In recent years, vehicle fueling in the US with CNG and LNG has become a large sector of the fuel industry. CNG/LNG fueling stations are now located along most major interstate highways, with more being built every month. The trend toward the use of CNG or LNG by truckers and owners of heavy duty vehicles has occurred largely because the cost for CNG/LNG is about 65 percent less than diesel, and their vehicles experience less internal wear and tear when using CNG/LNG.

Hundreds of large fleet owners and thousands of small vehicles have made the switch to CNG or LNG fuel. More vehicle conversions to CNG/LNG are occurring all the time resulting in substantial cost reductions and greenhouse gas (GHG) emission reductions, with CNG conversions applicable to residential and relatively "short haul" or local vehicles such as service or collection vehicles and LNG conversions used for "long haul" trucking applications.

Incentives. Incentives for LFG utilization projects come and go (one-time grants or incentives to multi-year tax credits or market incentives) and vary based on how the LFG is utilized (electricity, pipeline, vehicle fuel). A summary of incentives can be found in Section 6 below.

6 ASSESSMENT OF ADDITIONAL FINANCIAL INCENTIVES

Incentives for LFG utilization projects come and go (one-time grants or incentives to multi-year tax credits or market incentives) and vary based on how the LFG is utilized (electricity, pipeline, vehicle fuel). The following incentives apply specifically to LFG utilization projects.

6.1.1 Renewable Fuel Standard

As a result of emission reductions when CNG, LNG, and ethanol are used in vehicles, the US federal government has established the Renewable Fuel Standard (RFS) and Renewable Identification Number (RIN) program, which requires US oil refineries to meet renewable fuel goals. If they cannot meet the goals themselves, they are required to purchase the RINs. The price paid for RINs varies. A 2014 amendment to the RFS created a cellulosic biofuel (D-3) RIN, which is currently trading at about $3.50 per RIN ($5.05 per GGE). D-3 RINs are applicable to landfill, wastewater treatment plant, and agricultural digester biogas.

RINs are available for RNG that is used to fuel vehicles or injected into the interstate pipeline system. As with any federal program, RINs are subject to annual establishment of a quantity to be purchased by fuel producers which make the value of the RINs somewhat uncertain. However, currently, most developers are developing RNG to vehicle projects due to the current high value of RINs. The RIN regulations are fairly consistent through 2022 but wording in the regulation increases uncertainty after 2022.

6.1.2 California Low Carbon Fuel Standard

This incentive is only available if the County's LFG is sent by pipeline into California and a contract with a trucker in California is signed. California Air Resources Board (CARB) created a Low Carbon Fuel Standard (LCFS) credit program to reduce GHG emissions by incentivizing the use of alternative fuels in vehicles. The LCFS program is available to facilities outside the state of California that produce low carbon intensity fuel that is transported to and dispensed in California for fueling vehicles. The value of the LCFS credit is volatile, but results in a revenue incentive for RNG to vehicle fuel projects. The price per credit has fluctuated between a low of $22 per credit as a monthly average at the program's inception in January 2013, to a current value of approximately $184 per credit as a monthly average. This average includes all RNG sources, and it should be noted that LFG based RNG will likely be priced on the low end of the selling range ($115 per credit).

The County could participate in the LCFS program and generate credits by providing RNG to an existing natural gas pipeline that is part of the larger interstate pipeline system that travels through California. Locating an interstate pipeline in the vicinity will be the major

challenge with this approach. If found, a fuel pathway application would need to be submitted to CARB to establish a specific carbon intensity for the CNG produced at the Landfill and its transport to fueling vehicles in California. As with the CFP, a contract with a California CNG fueling station developer will need to be provided to CARB as proof that the RNG produced at the landfill is fueling vehicles in California, offsetting what would otherwise have been diesel with a renewable lower carbon intensity fuel.

A specific carbon intensity and fuel pathway would need to be calculated using the California-modified Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (CA-GREET) model and then approved by CARB. A relatively high carbon intensity value, as compared to biofuels generated from other sources, could be expected. Therefore, finding an owner of a truck fleet that is willing to purchase the LFG to RNG will be difficult due to the competition lower carbon intensity fuels, which provide more financial incentives to the fleet owners. With the difficulties of obtaining a CNG purchaser and finding a fuel pathway from North Carolina to California, it is not recommended to include LCFS credits in the economic analysis of a potential project at the Landfill.

7 POTENTIAL END USERS

CEG contacted a variety of potential end users to discuss scenarios and interest in a LFG to RNG project. The discussions were high-level and focused on developing a short-list of potential end users to be further evaluated. The discussions covered the quality of gas that the potential end user would likely be interested in taking, scenarios of involvement, and the timeframe of project execution. Table 7.1 outlines the results of these calls and a brief summary of the three potential end users CEG is recommending for further evaluation has been included below in the subsequent sections. Detailed logs of all the interviews have been included as an attachment to this Feasibility Study.

Table 7.1 – Potential End User Summary

Potential End Users Contacted	Level of Interest	Quality Desired	End Use
Loves/ Trillium	High	CNG/Pipeline	CNG fueling station if there is a demand or would get involved with pipeline injection.
Evensol	High	Pipeline Quality	Injection into pipeline in conjunction with project starting in 2019.
Blue Ridge Biofuels, LLC	High	TBD	TBD - Requested approval to perform feasibility study and an option to purchase the gas.
Clean Energy Fuels	Moderate	RNG/ Pipeline Quality	Partner with NG Advantage to inject RNG into a pipeline at nearby facility.
ReNew Petra	Moderate	RNG	Tube trailer to Mount Air Landfill or pipeline injection.
Republic Services	Moderate	Raw LFG	Potential interest with RNG developer, Evensol, at the Caldwell County Landfill.
Piedmont Natural Gas Company, Inc.	Low	Pipeline Quality	Does not have a need for gas currently.
Apple, Inc.	Low	TBD	Obtain LCFS credits if low level of interest from other groups

7.1 Love's/Trillium

Trillium indicated they have a Love's truck stop nearby, but they do not typically install CNG fueling stations unless there is a direct need within the area. They stated that if there is a need within the area, perhaps the nearby Target Distribution Center, they would

consider installing a CNG filling station at the truck stop. However, they are not aware of a demand for CNG but stated they could have their business development team provide additional research and determine any nearby demands.

Overall, Trillium is interested in the project and would be open to pipeline injection or other options, regardless of whether it is feasible to construct a CNG fueling station at the Love's Truck Stop. They would be interested in any combination of involvement, including design, build, own, and operate as a whole, or provide assistance in role the County desired. Trillium stated that if a Request for Proposal was prepared, they would likely submit a response.

7.2 Evensol

Evensol has two existing LFG to RNG projects operating for Republic that deliver RNG to a Piedmont pipeline location. They also have a third project at the Caldwell County Landfill in North Carolina that is beginning construction during the first quarter of 2019. The project consists of a gas conditioning facility, generating pipeline quality RNG to be injected into a Piedmont pipeline location. The RNG will be transported from the landfill to the injection location via virtual pipeline. The gas condition facility is expected to intake approximately 2,750 scfm of landfill gas. Originally, Piedmont would not allow the injection of this quantity of gas into their pipeline, as they did not have a demand for this high of a quantity in the area. However, Piedmont has now identified a location within their transmission system where they will allow the injection. Evensol purchased the property around this injection location and will be constructing the decant equipment and injection point to complete the virtual pipeline. This injection location is approximately 18 miles from the Blackburn Landfill, and therefore, it is likely the RNG from the Blackburn Landfill could also be injected at this location.

Overall, Evensol has high interest in working with the County to move forward with the potential project at the Blackburn Landfill. It would be convenient for timing purposes if an agreement could be reached in the coming months, as the Foothills project is moving forward in early 2019. Evensol stated they are open to developing, constructing, and operating the entire project or any portion of the project the County prefers. They also indicated that they would be able to decommission the existing landfill gas to energy facility, if the County so desired. If the County wanted to let Evensol own and operate the full project, they estimated royalties to the County between $300,000-$500,000 per year, based on RIN pricing and overall profits.

7.3 Blue Ridge Biofuels

Blue Ridge Biofuels, LLC (Blue Ridge) has a biodiesel plant adjacent to the electrical generation facility at Blackburn Landfill, operational for approximately five years. Blue Ridge currently utilizes the waste heat off the jackets of the existing generators for use in its

nearby plant. Blue Ridge expressed initial interest to the County for purchasing the heating value (BTUs) from Catawba to use for creating process heat at its plant. Currently, they are more interested in the potential RFS and LCFS credits that could be available through vehicle fuel or interstate pipeline injection. Blue Ridge has submitted a Letter of Intent, dated May 2, 2018, to the County expressing their interest in developing a project with the County.

Blue Ridge currently has connections with entities that are interested in developing or already sell CNG for vehicle use. They are aware of a location that has a demand for approximately 2,000 diesel gallon equivalents (DGE) of CNG. Their next steps would be to conduct an internal feasibility study to evaluate options for transporting the fuel, either via pipeline or tube trailer, depending on the economics. Blue Ridge would consider the costs and benefits of purchasing the raw gas from Catawba and conditioning the LFG itself, then assessing how to efficiently transport and market the fuel. Per the Letter of Intent, Blue Ridge proposes an anticipated target price to purchase LFG at $2.00 per dekatherm plus five percent of profits earned from the sale of the conditioned biogas.

8 SUMMARY OF FINDINGS

CEG has conducted an evaluation of the Landfill for the purpose of determining the potential options for an LFG beneficial use project, particularly focusing on an LFG to RNG project. This Feasibility Study assesses the future LFG generation and composition, evaluates options for utilizing the LFG in a beneficial use project, and identifies and evaluates parties that may be interested in developing a beneficial use project.

LFG generation modeling was prepared to estimate the quality and quantity of LFG available for use. CEG compared the model to actual LFG collection observed at the Landfill and developed a potential range of future LFG collection. By applying a low LFG collection efficiency rate of 60 percent and high LFG collection efficiency rate of 80 percent, a projection of potential fuel availability was created. The projected rates are based on the waste intake rates, waste characteristics, waste moisture content, and existing LFG flow and composition data provided by the County.

CEG interviewed potential end users and developers that may be interested in the LFG to RNG project. Based on conversations between CEG and these potential end users, Blue Ridge Biofuels, Loves/Trillium, and Evensol have the highest level of interest in the project and potential contracting options that may be financially attractive to the County. They all have existing facilities in the area and have interest in developing their portfolios by teaming with the County to bring the project to fruition. Based on the discussions with the parties listed herein, CEG believes if the County elected to move forward with a LFG to RNG project, there would be end-users interested in responding to a Request for Proposal or negotiating directly with the County. Multiple scenarios may exist for the County's involvement in the potential project. The County could potentially own the LFG conditioning equipment, pipeline, and/or tube trailers, or the County could simply sell the LFG to one of the developers at an agreed upon royalty payment, which may or may not be variable depending on the negotiation of the distribution of available incentives.

Based on the findings of this Feasibility Study, CEG believes the County should consider moving forward with the next steps in determining if a LFG to RNG project is desirable, as it is possible that a LFG to RNG project may be profitable. The County may want to pursue in-depth conversations with the potential end users and develop detailed and more accurate economic pro-forma for a few of the options discussed herein. This approach may allow the County to assess what role is desirable in the potential project (i.e. would the County prefer to own/operate or simply provide LFG rights to a developer and negotiate a royalty payment). The County could also seek discussions with even more potential end users. Another option would be for the County to move forward with a Request for Proposal from potential project developers and/or end users. CEG is available to provide assistance in further developing detailed economic pro-formas, seeking out even more potential end users, or could also assist the County in drafting a Request for Proposal.

LIMITATIONS

The work product included in the attached was undertaken in full conformity with generally accepted professional consulting principles and practices and to the fullest extent as allowed by law we expressly disclaim all warranties, express or implied, including warranties of merchantability or fitness for a particular purpose. The work product was completed in full conformity with the contract with our client and this document is solely for the use and reliance of our client (unless previously agreed upon that a third party could rely on the work product) and any reliance on this work product by an unapproved outside party is at such party's risk.

The work product herein (including opinions, conclusions, suggestions, etc.) was prepared based on the situations and circumstances as found at the time, location, scope and goal of our performance and thus should be relied upon and used by our client recognizing these considerations and limitations. CEG shall not be liable for the consequences of any change in environmental standards, practices, or regulations following the completion of our work and there is no warrant to the veracity of information provided by third parties, or the partial utilization of this work product.

APPENDIX A
LABORATORY TEST RESULTS

REIC
RESEARCH ENVIRONMENTAL & INDUSTRIAL CONSULTANTS INC
Post Office Box 286 Beaver WV 25813 800 999 0105
304 255 2500 304 255 2572(fax)
website www reiclabs com
Improving the environment, one client at a time

April 12, 2012

Mr Rodney Hamby
Catawba County
P O Box 389
Newton, NC 28658

RE Landfill Gas Analysis, Blackburn Landfill

Mr Hamby,

Attached please find enclosed results of analysis of the landfill gas at Blackburn Landfill REI Consultants, Inc (REIC) conducted gas sampling on March 14, 2012 Gas analysis was conducted by REIC, Data Analysis Technologies of Plain City, Ohio (sulfur analysis), and Columbia Analytical Services of Simi Valley, California (siloxanes analysis) The gas sample was collected from a port located directly downstream of the blower and upstream of the chiller unit

Please let me know if you have any questions or if I can be of further assistance

Sincerely,
REI Consultants, Inc

Michael Hofe, PE

Environmental Monitoring Dept
(304) 255-2500 Office
(304) 890-2018 Cell
mhofe@reiclabs com

Attachment

Landfill Gas Analysis

Site **Blackburn Landfill** **Sample Date** **03/14/2012**

Gas Stream Profile

Parameter	Result (vol %)
Methane	52 8
Carbon Dioxide	39 5
Oxygen	0 8
Carbon Monoxide	<0 02
Ethane	<0 002
Ethene	<0 02
Acetylene	<0 02
Balance	6 9

Gas Stream Physical Properties

Parameter	Result
Temperature	80 4 °F
Relative Humidity	41 3%

Sulfur Compounds

Parameter	Result (ppmv)
Hydrogen Sulfide	8 46
Carbonyl Sulfide	<0 02
Sulfur Dioxide	<0 03
Methyl Mercaptan	0 190
Ethyl Mercaptan	<0 03
Dimethyl Sulfide	0 38
Carbon Disulfide	0 119
t-Butyl Mercaptan	0 0433
n-Propyl Mercaptan	<0 03
Isobutyl Mercaptan	<0 03
n-Butyl Mercaptan	<0 05
Dimethyl Disulfide	<0 01

Landfill Gas Analysis

Site **Blackburn Landfill** **Sample Date** **03/14/2012**

Halogenated Volatile Organic Compounds (VOCs)

Parameter	Result (mg/m^3*)
1,1,1,2-Tetrachloroethane	<0 03
1 1 1-Trichloroethane	<0 03
1,1,2,2-Tetrachloroethane	<0 03
1,1,2-Trichloroethane	<0 03
1,1-Dichloroethane	<0 03
1 1-Dichloroethene	<0 03
1 1-Dichloropropene	<0 03
1,2,3-Trichlorobenzene	<0 03
1,2,3-Trichloropropane	<0 03
1,2 4-Trichlorobenzene	<0 03
1,2-Dibromo-3-chloropropane	<0 03
1,2-Dibromoethane	<0 03
1 2 Dichlorobenzene	<0 03
1 2-Dichloroethane	<0 03
1 2-Dichloropropane	<0 03
1 3-Dichlorobenzene	<0 03
1 3-Dichloropropane	<0 03
1 4-Dichlorobenzene	0 86
2,2-Dichloropropane	<0 03
2-Chlorotoluene	<0 03
4-Chlorotoluene	<0 03
Bromobenzene	<0 03
Bromochloromethane	<0 03
Bromodichloromethane	<0 03
Bromoform	<0 03
Bromomethane	<0 03
Carbon tetrachloride	<0 03
Chlorobenzene	0 19
Chloroethane	<0 03
Chloroform	<0 03
Chloromethane	<0 03
cis-1,2-Dichloroethene	<0 03
cis-1 3-Dichloropropene	<0 03
Dibromochloromethane	<0 03
Dibromomethane	<0 03
Dichlorodifluoromethane	<0 03
Hexachlorobutadiene	<0 03
Methylene chloride	<0 03
Tetrachloroethene	3 3
trans-1,2-Dichloroethene	<0 03
trans-1 3-Dichloropropene	<0 03
Trichloroethene	0 53
Trichlorofluoromethane	<0 03
Vinyl chloride	<0 03

* expressed as parameter at gas conditions

Landfill Gas Analysis

Site **Blackburn Landfill** **Sample Date** **03/14/2012**

Silicon Compounds

Parameter	Result (mg/m^3 as Silicon*)
Trimethylsilanol	3 1
Hexamethyldisiloxane (L_2)	1 6
Hexamethylcyclotrisiloxane (D_3)	0 27
Octamethyltrisiloxane (L_3)	0 063
Octamethylcyclotetrasiloxane (D_4)	1 4
Decamethyltetrasiloxane (L_4)	<0 016
Decamethylcyclopentasiloxane (D_5)	0 40
Dodecamethylpentasiloxane (L_5)	<0 017
Dodecamethylcyclohexasiloxane (D_6)	0 16

* expressed at gas conditions

Sampling and Analysis Methods

Parameter	Sampling Method	Analysis Method
Major Constituent Gases (Methane Carbon Dioxide Oxygen)	Direct Reading Instrument (GEM 2000)	Direct Read
Minor Constituent Gases (Carbon Monoxide Ethane Ethene, Acetylene)	Tedlar Bag (grab)	GC-TCD
Temperature	Direct Reading Instrument (Dickson TH300)	Direct Read
Relative Humidity	Direct Reading Instrument (Dickson TH300)	Direct Read
Sulfur Compounds	Tedlar Bag (grab)	GC-FPD
VOCs	Charcoal Tube	GC/MS
Silicon Compounds	Sorbent Tube	GC/MS

REIC
RESEARCH ENVIRONMENTAL & INDUSTRIAL CONSULTANTS, INC.
Post Office Box 286 • Beaver, WV 25813 • 800.999.0105
304.255.2500 • 304.255.2572(fax)
website: www.reiclabs.com
Improving the environment, one client at a time...

February 18, 2015

Mr. Barry Edwards, PE
Catawba County
P.O. Box 389
Newton, NC 28658

RE: Landfill Gas Analysis, Blackburn Landfill

Mr. Edwards;

Attached please find results of analysis of landfill gas samples collected by REI Consultants, Inc. (REIC) at Blackburn Landfill on January 27 and February 6, 2015. Gas analysis was conducted by REIC and by Data Analysis Technologies of Plain City, Ohio. The gas samples were collected from ports located downstream of the blower and upstream of the engines.

In addition to the attached laboratory analyses, REIC recorded measurements from Catawba County's LANDTEC GEM2000 landfill gas analyzer during both sampling events. These readings were as follows:

Date and Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Balance (%)
1/27/15 1124	55.5	40.8	0.6	3.1
1/27/15 1227	55.5	40.6	0.5	3.4
2/6/15 0939	56.6	40.5	0.4	2.5
2/6/15 1137	56.6	40.6	0.4	2.4

Note that the January 27, 2015 sample analysis results differ slightly from the field readings. The variation is likely due to the introduction of a small amount of air contamination to the gas sample during the collection, transport, handling, and analysis processes.

During the February 6, 2015 event, REIC performed measurements of temperature, relative humidity, and dewpoint using a Dickson TH300 direct reading instrument. Measurements were collected within an insulated chamber fed by a sampling port from the landfill gas pipeline. A summary of these measurements is as follows:

REIC
RESEARCH ENVIRONMENTAL & INDUSTRIAL CONSULTANTS, INC.
Post Office Box 286 • Beaver, WV 25813 • 800.999.0105
304.255.2500 • 304.255.2572(fax)
website: www.reiclabs.com
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Date and Time	Temperature (°F)	Relative Humidity (%)	Dew Point (°F)
2/6/15 0955	46.5	80.0	40.8
2/6/15 1017	51.5	63.7	39.4
2/6/15 1030	52.5	58.7	37.8
2/6/15 1121	50.5	59.3	36.7
2/6/15 1130	52.4	60.3	39.0
2/6/15 1137	49.6	60.1	36.1

The above readings indicate an average humidity ratio of 0.007 lb water per lb dry gas, or approximately 500 lb water per MMscf (60 °F, 1 atm).

If you have any questions or if I can be of further assistance, please feel free to contact me at (304) 255-2500 or mhofe@reiclabs.com.

Sincerely,

Michael Hofe, PE
REI Consultants, Inc.

cc: Rodney Hamby, Catawba County
Jack Chandler, Catawba County

Attachments (2)

ATTACHMENT 1

Data Analysis Technologies Laboratory Report
1/27/2015 Sample

DAT Reports®

Data Analysis Technologies, Inc.
7715 Corporate Blvd.
Plain City, OH 43064
800-733-8644

Sample Analysis Certificate

Client:	REI Consultants, Inc.	Date:	2/10/2015
Address:	225 Airport Industrial Park Road	DAT Project ID:	0115029
	Beaver, WV 25813	Date Received:	1/30/2015

Attn: Mike Hofe
Client Project: Blackburn
Analysis: Multiple

The following samples were received on 1/30/2015:

DAT Sample ID	Client Sample ID	Date Sampled	Matrix
0115029-1	Blackburn Air Samples	1/27/2015	Gas
0115029-2	Blackburn Sorbent Tube Sample	1/27/2015	Solid
0115029-3	Blackburn Sorbent Tube Blank		Solid

Results: See attached summary.

QC: Met the criteria for the method.

Reviewed and approved for release by:

Ronald K. Mitchum, Ph.D.
President, DAT

DAT Reports®

Data Summary

ASTM D1946 / Permanent Gases

Client:	REIC
Client Project:	Blackburn
DAT Project:	0115029
Date Sampled:	1/27/2015
Date Received:	1/30/2015
Date Analyzed:	1/30/3015
Analyst:	CSM

Client Sample ID:	DAT Sample ID:	Analyte:	*Sample MDL, % by volume*	Result, % by volume	Q
Blackburn	0115029- 1	Hydrogen	*0.12*	ND	
		Oxygen	*0.002*	1.00	
		Nitrogen	*0.005*	8.91	
		Carbon monoxide	*0.0019*	ND	
		Methane	*0.0007*	51.54	
		Carbon dioxide	*0.0012*	38.55	
		Ethylene	*0.0012*	ND	
		Ethane	*0.0012*	ND	

Results have been normalized to 100%.
ND = Not detected at the detection limit shown.
J = Value below lowest calibrator.
D = Value obtained from a dilution.

DAT Reports®

Data Summary
GPA 2286

Client: REIC
Client Project: Blackburn
DAT Project: 0115029
Date Sampled: 1/27/2015
Date Received: 1/30/2015
Date Analyzed: 2/6/2015
Analyst: SM

Client Sample ID	DAT Sample ID	Analyte	Detector	Normalized Result, % (vol)	Q	PQL %
Blackburn	0115029- 1	Hydrogen	TCD	ND		1.00000
		Oxygen	TCD	1.0		0.10000
		Nitrogen	TCD	8.9		0.10000
		Carbon Monoxide	TCD	ND		0.10000
		Methane	TCD	51.535		0.10000
		Carbon Dioxide	TCD	38.5		0.10000
		Ethane	TCD	ND		0.10000
		Propane	FID	0.0021		0.00005
		n-Butane	FID	0.00047		0.00005
		Other C4	FID	0.0005		0.00005
		Isopentane	FID	ND		0.00005
		n-Pentane	FID	0.000322		0.00005
		Other C5	FID	0.001		0.00005
		n-Hexane	FID	0.000081		0.00005
		Other C6	FID	0.00063		0.00005
		n-Heptane	FID	0.0001		0.00005
		Other C7	FID	0.00094		0.00005
		Octane	FID	ND		0.00005
		Other C8+	FID	0.0045		0.00005

ND = Not detected in the sample.
D = Value measured from a dilution.

DAT Reports®

ASTM D-6228 / Sulfur Compounds

Client: REIC
Client Project: Blackburn
DAT Project: 0115029
Date Sampled: 1/27/2015
Date Received: 1/30/2015
Date Analyzed: 1/30/2015
Analyst: sm

Client Sample ID: Blackburn
DAT Sample ID: 0115029-1

Analyte:	*Sample MDL, ppm*	Result, ppm	Q
Hydrogen Sulfide	*0.07000*	5.04	
Carbonyl Sulfide	*0.00040*	ND	
Methyl Mercaptan	*0.07000*	0.333	
Ethyl Mercaptan	*0.00060*	0.0113	
Dimethyl Sulfide	*0.02000*	0.379	
Carbon Disulfide	*0.00080*	ND	
n-Propyl Mercaptan	*0.00060*	0.0250	
Ethyl Methyl Sulfide	*0.00060*	0.0162	
Isobutyl Mercaptan	*0.00060*	0.00424	
n-Butyl Mercaptan	*0.00100*	ND	
Dimethyl Disulfide	*0.00016*	0.00744	

ND = Not detected at the detection limit shown.
D = Value calculated from a dilution.
J = Value below lowest calibrator.
B = Trace of this compound was found in the blank.

TO-15 Data Summary

Misc Info	**BlackBurn Air Sample**
Sample Name	**0115029-1 200mL 100x**
Date Acquired	**02/ 6/15 13:53**
Method File	**T015021**
Data File Path	**C:\HPCHEM\1\DATA\0115029B**
Data File Name	**02061401.D**
Sample Multiplier	**100**
Process factor =	**1**

Name	Amount	PQL (ppb)	Q	ug/m3	DL ug/m3
Dichlorodifluoromethane	175.95	20		870.11	98.9
Chloromethane	22.16	20		45.76	41.3
1,2-dichlorotetrafluoroethane	31.02	20		216.83	139.8
Vinyl_chloride	1045.71	20		2673.09	51.1
1,3-Butadiene	ND	20			44.2
Bromomethane	ND	20			77.7
Ethyl Chloride	187.60	20		495.04	52.8
Acetonitrile	3384.25	20		5681.94	33.6
Acrolein	ND	20			45.9
Acetone	2318.11	20		5506.58	47.5
Trichlorofluoromethane	13.62	20		76.54	112.4
Pentane	2210.56	20		6523.17	59.0
Acrylonitrile	ND	20			43.4
1,1-Dichloroethene	8.69	20		34.48	79.3
Methylene Chloride	1097.05	20		3811.20	69.5
Carbon disulfide	57.90	20		180.32	62.3
1,1,2-Trichlorotrifluoroethane	ND	20			153.3
1,1-Dichloroethane	31.19	20		126.23	80.9
Methyl t-butyl ether	ND	20			72.1
Hexane	403.83	20		1423.38	70.5
cis-1,2-Dichloroethene	167.57	20		664.39	79.3
Chloroform	5.18	20		25.30	97.7
Ethane, 1,2-dichloro-	65.73	20		266.02	80.9
1,1,1-Trichloroethane	ND	20			109.1
Benzene	525.98	20		1680.54	63.9
Carbon Tetrachloride	ND	20			125.8
2-Nitropropane	ND	20			72.9
1,2-Dichloropropane	ND	20			92.4
2,2,4-Trimethylpentane	126.97	20		593.22	93.4
Trichloroethylene	79.43	20		426.50	107.4
Methyl isobutyl ketone	ND	20			81.9
cis-1,3-Dichloropropene	ND	20			90.8
trans-1,3-Dichloropropene	ND	20			90.8

Name	ppb	PQL (ppb)	Q	ug/m3	DL ug/m3
1,1,2-Trichloroethane	13.10	20		71.47	109.1
Toluene	4021.44	20		15156.47	75.4
1,2-Dibromoethane	ND	20			153.7
Tetrachloroethylene	47.25	20		320.47	135.6
Chlorobenzene	ND	20			92.1
Ethylbenzene	508.75	20		2209.15	86.8
m/p-Xylene	178.07	20		773.24	86.8
Styrene	51.07	20		217.58	85.2
1,1,2,2-Tetrachloroethane	ND	20			137.3
o-Xylene	68.93	20		299.34	86.8
Cumene	1.62	20	J	7.97	98.3
1,3,5-Trimethylbenzene	ND	20			98.3
1,2,4-Trimethylbenzene,	11.10	20		95.44	171.9
1,3-Dichlorobenzene	ND	20			120.3
1,4-Dichlorobenzene	ND	20			120.3
1,2-Dichlorobenzene	ND	20			120.3
Nitrobenzene	ND	20			100.7
1,2,4-Trichlorobenzene	ND	20			148.4
Naphthalene	ND	20			104.8
Hexachloro-1,3-butadiene	ND	20			213.3
TVOC				50471.76	

Surrogate %R	**%R**
4-bromofluorobenzene	101.62

D=Results obtained from dilution.
J= Below the lowest calibration point (PQL)
E= Exceeds the highest calibration point
B= Found in the blank and not valid for dilution values

Tentatively Identified Compound (LSC) summary

Operator ID: CSM Date Acquired: 6 Feb 15 1:53 pm
Data File: C:\HPCHEM\1\DATA\0115029B\02061401.D
Name: 0115029-1 200mL 100x
Misc: BlackBurn Air Sample
Method: C:\HPCHEM\1\METHODS\T1582602.M
Title: TO-15 8260 IS
Library Searched: C:\DATABASE\NBS75K.L

TIC Top Hit name	EstConc ppmv
Ethane, 1,1-difluoro	0.345
Propene	0.261
Propane	0.848
1-Propene, 2-methyl-	0.456
Butane	0.756
unknown hydrocarbon	0.192
Butane, 2-methyl-	2.929
Pentane, 2-methyl-	0.278
2-Butanone	0.292
Furan, tetrahydro-	0.264
Cyclopentane, methyl	0.319
Hexane, 3-methyl-	0.344
Heptane	0.474
Cyclohexane, methyl-	0.253
Heptane, 3-methyl-	0.248
Cyclohexane, 1,3-dimethyl	0.385
Octane	0.366
Heptane, 2,4-dimethyl	0.195
Nonane	0.332
Octane, 2,6-dimethyl	0.316
unknown hydrocarbon	0.348
.alpha.-Pinene	2.999
unknown hydrocarbon	0.815
unknown hydrocarbon	0.243
unknown hydrocarbon	0.349
unknown hydrocarbon	0.491
unknown hydrocarbon	0.314
unknown hydrocarbon	0.554

Siloxanes

Trimethyl silanol (MOH)	1.367
Cyclotetrasiloxane, hexamethyl (D3)	ND
Cyclotetrasiloxane, octamethyl (D4)	0.396
Cyclopentasiloxane, decamethyl (D5)	ND
Disiloxane, hexamethyl (L2,MM)	0.268
Trisiloxane, octamethyl (L3, MDM)	ND

Data Summary Table
Method NIOSH 7903 - Inorganic Acids

Client: REIC
Client Project: Blackburn
DAT Project: 0115029
Date Sampled: 1/27/2015
Date Received: 1/30/2015
Date Prepped: 2/6/2015
Date Analyzed: 2/6/2015
Sampled Liters: 22
Analyst: JK

Client ID:	DAT ID:	Analyte:	*MDL, ug*	Sample Total, ug	*MDL, ugL*	Sample , ug/L	Q
Blackburn	0115029- 2	Hydrogen Fluoride	*0.30*	ND	*0.0136*	ND	
Blackburn	0115029- 2	Hydrogen Cluoride	*0.40*	ND	*0.0182*	ND	
Blackburn	0115029- 2	Hydrogen Bromide	*0.20*	ND	*0.00909*	ND	
Blackburn	0115029- 2	Hydrogen Iodide	*0.20*	ND	*0.00909*	ND	
Field Blank	0115029- FB	Hydrogen Fluoride	*0.30*	ND	*0.0136*	ND	
Field Blank	0115029- FB	Hydrogen Cluoride	*0.40*	ND	*0.0182*	ND	
Field Blank	0115029- FB	Hydrogen Bromide	*0.20*	ND	*0.00909*	ND	
Field Blank	0115029- FB	Hydrogen Iodide	*0.20*	ND	*0.00909*	ND	

ND = Not detected at the reporting limit shown.
D = Value calculated from a dilution.
J = Result less than that of the low standard.

CHAIN OF CUSTODY RECORD

v10-0114 | REIC use ONLY | CLIENT ID _____ DATE _____ SHEET 1 of 1

REIC
Research Environmental & Industrial Consultants, Inc.
MAIN LABORATORY & CORPORATE HEADQUARTERS:
P.O. Box 286 • 225 Industrial Park Rd, Beaver, WV 25813
800-999-0105 • 304-255-2500 • www.reiclabs.com

MID-OHIO VALLEY Service Center: 101 17th Street, Ashland, KY 41101, 606-393-5027
SHENANDOAH Service Center: 1557 Commerce Rd., Ste 201, Verona, VA 24482, 540-248-0183
ROANOKE Service Center: 3029-C Peters Creek Rd, Roanoke, VA 24019, 540-777-1276
MORGANTOWN Service Center: 16 Commerce Drive, Westover, WV 26501, 304-241-5861

Client: REIC Laboratory — PO # _____
Contact Person: Mike Hofe — Phone: (304) 255-2500
Address: PO Box 286 — City: Beaver — State: WV — Zip: 25813
Billing Address (if different): Same
City _____ State _____ Zip _____
Site ID & State: Blackburn/NC — Project ID: Landfill Gas — Sampler: MH

SAMPLE LOG & ANALYSIS REQUEST

TURNAROUND TIME

(•) NORMAL

RUSH TURNAROUND*

( ) 5 DAY ( ) 3 DAY ( ) 2 DAY ( ) 1 DAY

*Rush work needs prior laboratory approval and will incur additional charges

ANALYSIS & METHOD REQUESTED:
- D1945 Permanent Gases*
- TO-15 VOCs
- D6228 Sulfur Compounds (w/concentrator)
- Siloxanes
- NIOSH 7903 Fluoride, Chloride, Bromide, Iodide**

SAMPLE ID	No. & Type of Containers	Sampling Date/Time	Matrix	Sample Comp/Grab	TO-15 a	TO-15 b	D6228 a	D6228 b	NIOSH 7903 a	NIOSH 7903 b	NIOSH 7903 c	NIOSH 7903 d	NIOSH 7903 e
Blackburn	4 bags	1/27/15 1120	Air	Grab	X	X	X	X					
Blackburn	1 tube**	1/27/15 1228	Air	Comp					X				
			Choose	Choose									
			Choose	Choose									
			Choose	Choose									
			Choose	Choose									
			Choose	Choose									
			Choose	Choose									
			Choose	Choose									

ENTER PRESERVATIVE CODE(S):

0 None	6 Sodium Hydroxide
1 Hydrochloric Acid	7 Ascorbic Acid
2 Nitric Acid	8 Sodium Bisulfate/Methanol
3 Sulfuric Acid	9 Ammonium Chloride
4 Sodium Thiosulfate	10 _____*
5 Sodium Hydroxide/ Sodium Arsenite	11 _____*

* (Use blanks for preservatives not listed.)

COMMENTS:

*Field Readings:
CH4 55.5%
CO2 40.8%
O2 0.6%
**Sample volume 22 L

All analytical requests are subject to REIC's Standard Terms and Conditions.

Temperature at arrival: 17 °C | ICED? Y___ N X

Containers provided by: [ ] REIC [ ] Client

1 Relinquished by (signature)	1/28/15 Date/Time 0900	2 Relinquished by (signature)	Date/Time	3 Relinquished by (signature)	Date/Time
Received by (signature)	1-30-15 Date/Time 1150	Received by (signature)	Date/Time	Received by (signature)	Date/Time

DAT Project #0115029

DAT SAMPLE RECEIVING

7715 Corporate Blvd. Plain City,OH 43064.

Project Number: 0115029

Date Received:	1/30/2015	**Carrier:**	UPS
Client Name:	REI Consultants	**Analysis:**	Multiple
Tracking number:	1Z26X7130361804853	**Package Temp:**	17 C amb.
Custody Seals ?	No	**COC:**	☑ check if COC from client

Sample Information

Client ID	Laboratory ID	Date	Matrix:	Container	Comment
Blackburn Air Samples	0115029-1A/B/C/D	1/27/2015	Gas	1L Tedlar Bag	
Blackburn Sorbent Tube Sample	0115029-2	1/27/2015	Solid	Sorbent Tube	
Blackburn Sorbent Tube Blank	0115029-3		Solid	Sorbent Tube	Not on Chain of Custody

AA

Laboratory Receiving Initials

0115029

1/30/2015 12:04:53 PM

DAT Labs Inc.
Sample Receipt Report

Client/Number: REI Consultants / 11098

Custodian Initial: AA Date: 1-30-2015

Secondary Review: Initials: Date:

The client has been contacted.

_____ Yes _____ No

Upon receipt of samples, check if any of the following discrepancies have been noted.

	Discrepancy Type	*Specify applicable client ID or "all"*
	COC and samples do not match	
	No unique sample identifications	
	Samples received outside of the required temp criteria. **Receipt Temp:** 17 C	
	No preservation type was noted **Correction Factor:** C	
	No date of collection stated **Corrected Temp:** C	
	No time of collection stated	
	The sample collector was not named	
	Sample containers were not appropriate	
	Sample labels were destroyed or unreadable	
	Samples were received outside of holding time	
	There was not enough sample to perform the requested analysis.	
	Samples showed sign of damage or contamination.	
	Aqueous samples for volatile analysis: Headspace? Y N	If Yes, list sample ID(s) in details:

Details: _____

Sample pH for nonvolatile aqueous samples and presence or absence of headspace (Y or N) for VOA aqueous samples shall be recorded at time of sample log-in.
Under no circumstances shall VOA vials be opened at time of sample receipt.

Other Discrepancies:

Sample ID	**Discrepancy**

Container Return

Yes / No

Price:

Size:

Return Spl wt:

[X] ***Upon receipt, the samples met all of DAT's acceptance criteria.*** ***DAT Project #*** Q115029

Effective 05/03/11

DATFRM1049 Revision 5


SAMPLE CUSTODY
(800) 999-0105
REI CONSULTANTS
225 INDUSTRIAL PARK RD
BEAVER WV 25813
1 LBS
1 OF 1
DWT: 10,7,10
SHIP TO:
RON MITCHEM
DATA ANALYSIS TECHNOLOGIES INC
7715 CORPORATE BLVD
PLAIN CITY OH 43064-9212
OH 432 9-30
UPS GROUND
TRACKING #: 1Z 26X 713 03 6180 4853
BILLING: P/P
REF 1:DA
17.0.31
LP2844 60 0A 01/2015
Thanks for your business
REIC
Research Environmental & Industrial Consultants, Inc
1.800.999.0105

ATTACHMENT 2

REIC Laboratory Report
2/6/2015 Sample

REI Consultants, Inc.
PO Box 286
Beaver, WV 25813
TEL: (304) 255-2500
Website: www.reiclabs.com

Improving the environment, one client at a time...

3029-C Peters Creek Road
Roanoke, VA 24019
TEL: 540.777.1276

101 17th Street
Ashland, KY 41101
TEL: 606.393.5027

1557 Commerce Road, Suite 201
Verona, VA 24482
TEL: 540.248.0183

16 Commerce Drive
Westover, WV 26501
TEL: 304.241.5861

Wednesday, February 18, 2015

Mr. Rodney Hamby
COUNTY OF CATAWBA
P O BOX 389
NEWTON, NC 28658

TEL: (828) 465-8200
FAX: (828) 465-8392

RE: LANDFILL GAS

Work Order #: 1502860

Dear Mr. Rodney Hamby:

REI Consultants, Inc. received 2 sample(s) on 2/9/2015 for the analyses presented in the following report.

Sincerely,

Michelle Ellison

Michelle Ellison

REI Consultants, Inc. - Case Narrative

WO#: 1502860

Date Reported: 2/18/2015

Client: COUNTY OF CATAWBA

Project: LANDFILL GAS

The analytical results presented in this report were produced using documented laboratory SOPs that incorporate appropriate quality control procedures as described in the applicable methods. Verification of required sample preservation (as required) is recorded on associated laboratory logs. Any deviation from compliance or method modification is identified within the body of this report by a qualifier footnote which is defined at the bottom of this page.

All sample results for solid samples are reported on an "as-received" wet weight basis unless otherwise noted.

Results reported for sums of individual parameters, such as TTHM and HAA5, may vary slightly from the sum of the individual parameter results, due to rounding of individual results, as required by EPA.

The test results in this report meet all NELAP (and/or VELAP) requirements for parameters except as noted in this report.

Please note if the sample collection time is not provided on the Chain of Custody, the default recording will be 0:00:00. This may cause some tests to be apparently analyzed out of hold.

All tests performed by REIC Service Centers are designated by an annotation on the test code. All other tests were performed by REIC's Main Laboratory in Beaver, WV.

DEFINITIONS:
MCL: Maximum Contaminant Level
MDL: Method Detection Limit; The lowest concentration of analyte that can be detected by the method in the applicable matrix.
Mg/Kg or mg/L: Units of part per million (PPM) - milligram per Kilogram (weight/weight) or milligram per Liter (weight/volume).
NA: Not Applicable
ND: Not Detected at the PQL or MDL
PQL: Practical Quantitation Limit; The lowest verified limit to which data is quantified without qualifications. Analyte concentrations below PQL are reported either as ND or as a number with a "J" qualifier.
Qual: Qualifier that applies to the analyte reported.
TIC: Tentatively Identified Compound, Estimated Concentration denoted by "J" qualifier.
Ug/Kg or ug/L: Units of part per billion (PPB) - microgram per kilogram (weight/weight) or microgram per liter (weight/volume).

QUALIFIERS:
X: Reported value exceeds required MCL
B: Analyte detected in the associated Method Blank at a concentration > 1/2 the PQL
E: Analyte concentration reported that exceeds the upper calibration standard. Greater uncertainty is associated with this result and data should be consider estimated.
H: Holding time for preparation or analysis has been exceeded.
J: Analyte concentration is reported, and is less than the PQL and greater than or equal to the MDL. The result reported is an estimate.
S: % REC (% recovery) exceeds control limits

CERTIFICATIONS:
Beaver, WV: WVDHHR 00412CM, WVDEP 060, VADCLS 00281, KYDEP 90039, TNDEQ TN02926, NCDWQ 466, PADEP 68-00839, VADCLS (VELAP) 460148
Bioassay (Beaver, WV): WVDEP 060, VADCLS(VELAP) 460148, PADEP 68-00839
Roanoke, VA: VADCLS(VELAP) 460150
Verona, VA: VADCLS(VELAP) 460151
Ashland, KY: KYDEP 00094, WVDEP 389
Morgantown, WV: WVDHHR 003112M, WVDEP 387

REI Consultants, Inc. - Analytical Report

WO#: 1502860

Date Reported: 2/18/2015

Client:	COUNTY OF CATAWBA	**Collection Date:**	2/6/2015 11:33:00 AM
Project:	LANDFILL GAS	**Date Received:**	2/9/2015
Lab ID:	1502860-01A	**Matrix:**	Air
Client Sample ID:	BLACKBURN FILTER	**Site ID:**	BLACKBURN/NC

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
TOTAL PARTICULATES			**Method: NIOSH 0500**				**Analyst: MH**	
Particulates, Total	ND	0	0.42	NA		mg/m³	2/18/2015 10:27 AM	
ELEMENTS BY ICP			**Method: NIOSH 7300M**				**Analyst: JD**	
Arsenic	ND	0.680	6.80	NA		ppbv	2/12/2015 10:21 AM	
Barium	ND	0.0900	1.86	NA		ppbv	2/12/2015 10:21 AM	
Cadmium	ND	0.0200	0.450	NA		ppbv	2/12/2015 10:21 AM	
Chromium	ND	0.240	4.90	NA		ppbv	2/12/2015 10:21 AM	
Iron	2.17	0.460	4.56	NA	J	ppbv	2/12/2015 10:21 AM	
Lead	ND	0.250	2.46	NA		ppbv	2/12/2015 10:21 AM	
Potassium	9.41	3.26	32.6	NA	J	ppbv	2/12/2015 10:21 AM	
Selenium	ND	0.640	6.45	NA		ppbv	2/12/2015 10:21 AM	
Sodium	14.4	5.54	111	NA	J	ppbv	2/12/2015 10:21 AM	
Tin	ND	0.430	2.15	NA		ppbv	2/12/2015 11:33 AM	
Vanadium	ND	0.250	5.00	NA		ppbv	2/12/2015 10:21 AM	
Zinc	13.8	0.190	1.95	NA		ppbv	2/12/2015 10:21 AM	

REI Consultants, Inc. - Analytical Report

WO#: 1502860

Date Reported: 2/18/2015

Client:	COUNTY OF CATAWBA	**Collection Date:**	2/6/2015 11:33:00 AM
Project:	LANDFILL GAS	**Date Received:**	2/9/2015
Lab ID:	1502860-02A	**Matrix:**	Air
Client Sample ID:	BLACKBURN TUBE	**Site ID:**	BLACKBURN/NC

Analysis	Result	MDL	PQL	MCL	Qual	Units	Date Analyzed	NELAP
MERCURY, Total SW7417B			**Method: SW7471B (2/07)**				**Analyst: CR**	
Mercury	0.016	0.012	0.119	NA	J	ppbv	2/12/2015 11:55 AM	

CHAIN OF CUSTODY RECORD

v10-0114 REIC use ONLY CLIENT ID CAT002 DATE _____ SHEET 1 of 1

REIC
Research Environmental & Industrial Consultants, Inc.
MAIN LABORATORY & CORPORATE HEADQUARTERS:
P.O. Box 286 • 225 Industrial Park Rd, Beaver, WV 25813
800-999-0105 • 304-255-2500 • www.reiclabs.com

MID-OHIO VALLEY Service Center
101 17th Street
Ashland, KY 41101
606-393-5027

SHENANDOAH Service Center
1557 Commerce Rd., Ste 201
Verona, VA 24482
540-248-0183

ROANOKE Service Center
3029-C Peters Creek Rd
Roanoke, VA 24019
540-777-1276

MORGANTOWN Service Center
16 Commerce Drive
Westover, WV 26501
304-241-5861

Client: Catawba County PO # _____
Contact Person Rodney Hamby Phone (304) 255-2500
Address PO Box 389 City Newton State NC Zip 28658
Billing Address (if different) Same
City _____ State _____ Zip _____
Site ID & State Blackburn/NC Project ID Landfill Gas Sampler MH

SAMPLE LOG & ANALYSIS REQUEST

TURNAROUND TIME: (•) NORMAL
RUSH TURNAROUND*: ( ) 5 DAY ( ) 3 DAY ( ) 2 DAY ( ) 1 DAY
*Rush work needs prior laboratory approval and will incur additional charges

ANALYSIS & METHOD REQUESTED: 6010_S As, Ba, Cd, Cr, Fe, Pb, K, Se, Na, Sn, V, Zn *; HG_T_S *

SAMPLE ID	No. & Type of Containers	Sampling Date/Time	Matrix	Sample Comp/Grab	*0	*0							
Blackburn	1 filter	2/6/15 1133	Air	Comp	X								
Blackburn	1 tube	2/6/15 1133	Air	Comp		X							
			Choose	Choose									
			Choose	Choose									
			Choose	Choose									
			Choose	Choose									
			Choose	Choose									
			Choose	Choose									
			Choose	Choose									

ENTER PRESERVATIVE CODE(S):
0 None
1 Hydrochloric Acid
2 Nitric Acid
3 Sulfuric Acid
4 Sodium Thiosulfate
5 Sodium Hydroxide/ Sodium Arsenite
6 Sodium Hydroxide
7 Ascorbic Acid
8 Sodium Bisulfate/Methanol
9 Ammonium Chloride
10 _____ *
11 _____ *
* (Use blanks for preservatives not listed.)

COMMENTS:
* See Ivan prior to digestion

All analytical requests are subject to REIC's Standard Terms and Conditions.

Temperature at arrival: 20.0 °C ICED? Y___ N X

Containers provided by: [X] REIC [ ] Client

1 Relinquished by (signature)	Date/Time	2 Relinquished by (signature)	Date/Time	3 Relinquished by (signature)	Date/Time
Blake Hill	2/9/15 0930				
Received by (signature)	Date/Time 2-9-15 9:50	Received by (signature)	Date/Time	Received by (signature)	Date/Time

APPENDIX B
LANDGEM MODEL

COMPUTATION SHEET

PROJECT TITLE:	Blackburn Sanitary Landfill	PROJECT NO:	180694
DESCRIPTION:	Landfill Gas Modeling Projections	SHEET:	1
		OF:	4
PREPARED BY:	DK	CHECKED BY:	JAB
DATE:	11/21/2018	DATE:	12/4/2018

Given:

Landfill gas generation projections have been made utilizing the USEPA's Landfill Gas Emission Model (LandGEM) V3.02. LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of land filled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on USEPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_0 \left[\frac{M_i}{10} \right] (e^{-kt_{ij}})$$

Where:

Q_{CH4} = annual methane generation in the year of the calculation ($m^3/year$)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate ($year^{-1}$)

L_o = potential methane generation capacity (m^3/Mg)

M_i = mass of waste accepted in the i^{th} year (Mg)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate.

Site Conditions:

An estimate of landfill gas (LFG) generation rates for Blackburn Sanitary Landfill was prepared under the following conditions:

1. USEPA LandGEM Model Version 3.02 for LFG generation rates.
2. The model assumes a closure year of 2075 and a final capacity of 15,000,000 tons per "2015 GHG Report" prepared by CDM Smith. Waste in-place values from 1980 through 2014 from CDM Smith Report. 2015 to 2017 waste in-place values provided by Catawba County in an email dated November 20, 2018. Waste in-place from 2018 through closure were remaining capacity equally divided per year with no increase in yearly tonnage assumed.
3. The landfill has about 46 inches of precipitation annually, therefore, a k value of 0.04 was representing a conventional (non-arid) landfill was selected based on the annual precipitation values from NOAA.
4. The conventional methane generation capacity value of L_o = 100 m^3/Mg was used in the model.
5. Two separate LandGEM models were prepared since the operational time surpassed the 80 year limit. In both cases, the input parameters were kept the same. The LFG was projected to 30-years past closure.
6. The 2018 LFG generation rate is estimated as 1,321 scfm. The peak LFG generation rate is estimated to be 2,367 scfm in 2076.

COMPUTATION SHEET

PROJECT TITLE:	Blackburn Sanitary Landfill	PROJECT NO:	180694
DESCRIPTION:	Landfill Gas Modeling Projections	SHEET:	2
		OF:	4
PREPARED BY:	DK	CHECKED BY:	JAB
DATE:	11/21/2018	DATE:	12/4/2018

Year	Total Degradable Intake Rates (metric tons/year)	Total Waste In-Place (metric tons)	Flow Rates from 1980-2059 waste in place tonnages (scfm)	Flow Rates from 2060 waste in place tonnages (scfm)	Total LFG Flow Rate (scfm)	
1980	42,366	0	0		0	
1981	43,636	42,366	22		22	
1982	44,996	86,002	45		45	
1983	46,357	130,998	67		67	
1984	47,718	177,355	88		88	
1985	49,169	225,073	110		110	
1986	50,621	274,242	132		132	
1987	52,163	324,863	153		153	
1988	53,705	377,026	175		175	
1989	55,338	430,731	196		196	
1990	58,332	486,069	218		218	
1991	119,024	544,401	240		240	
1992	117,887	663,425	294		294	
1993	123,794	781,312	344		344	
1994	131,043	905,106	396		396	
1995	135,036	1,036,149	450		450	
1996	144,688	1,171,185	503		503	
1997	141,930	1,315,873	560		560	
1998	150,688	1,457,803	613		613	
1999	152,208	1,608,491	669		669	
2000	161,756	1,760,699	723		723	
2001	153,727	1,922,455	780		780	
2002	148,263	2,076,182	830		830	
2003	148,349	2,224,445	876		876	
2004	152,031	2,372,794	920		920	
2005	152,539	2,524,825	964		964	
2006	150,005	2,677,364	1,007		1,007	
2007	146,258	2,827,369	1,047		1,047	
2008	130,608	2,973,627	1,083		1,083	
2009	127,006	3,104,235	1,109		1,109	
2010	132,763	3,231,241	1,133		1,133	
2011	129,925	3,364,004	1,159		1,159	
2012	130,907	3,493,929	1,182		1,182	
2013	137,139	3,624,836	1,205		1,205	
2014	133,683	3,761,975	1,230		1,230	
2015	142,288	3,895,658	1,252		1,252	
2016	133,910	4,037,946	1,278		1,278	
2017	139,638	4,171,856	1,299		1,299	
2018	184,285	4,311,494	1,321		1,321	
2019	184,285	4,495,779	1,367		1,367	
2020	184,285	4,680,064	1,411		1,411	
2021	184,285	4,864,349	1,453		1,453	
2022	184,285	5,048,634	1,493		1,493	
2023	184,285	5,232,919	1,532		1,532	
2024	184,285	5,417,204	1,569		1,569	
2025	184,285	5,601,489	1,605		1,605	
2026	184,285	5,785,774	1,639		1,639	
2027	184,285	5,970,059	1,672		1,672	
2028	184,285	6,154,344	1,704		1,704	
2029	184,285	6,338,629	1,734		1,734	
2030	184,285	6,522,914	1,764		1,764	
2031	184,285	6,707,199	1,792		1,792	
2032	184,285	6,891,484	1,819		1,819	
2033	184,285	7,075,769	1,845		1,845	
2034	184,285	7,260,054	1,870		1,870	
2035	184,285	7,444,339	1,894		1,894	

COMPUTATION SHEET

PROJECT TITLE:	Blackburn Sanitary Landfill	PROJECT NO:	180694
DESCRIPTION:	Landfill Gas Modeling Projections	SHEET:	3
		OF:	4
PREPARED BY:	DK	CHECKED BY:	JAB
DATE:	11/21/2018	DATE:	12/4/2018

Year	Total Degradable Intake Rates (metric tons/year)	Total Waste In-Place (metric tons)	Flow Rates from 1980-2059 waste in place tonnages (scfm)	Flow Rates from 2060 waste in place tonnages (scfm)	Total LFG Flow Rate (scfm)	
2036	184,285	7,628,624	1,917		1,917	
2037	184,285	7,812,909	1,939		1,939	
2038	184,285	7,997,194	1,960		1,960	
2039	184,285	8,181,479	1,981		1,981	
2040	184,285	8,365,764	2,000		2,000	
2041	184,285	8,550,049	2,019		2,019	
2042	184,285	8,734,334	2,037		2,037	
2043	184,285	8,918,619	2,055		2,055	
2044	184,285	9,102,904	2,071		2,071	
2045	184,285	9,287,189	2,087		2,087	
2046	184,285	9,471,474	2,103		2,103	
2047	184,285	9,655,759	2,118		2,118	
2048	184,285	9,840,044	2,132		2,132	
2049	184,285	10,024,329	2,146		2,146	
2050	184,285	10,208,614	2,159		2,159	
2051	184,285	10,392,899	2,172		2,172	
2052	184,285	10,577,184	2,184		2,184	
2053	184,285	10,761,469	2,195		2,195	
2054	184,285	10,945,754	2,207		2,207	
2055	184,285	11,130,039	2,217		2,217	
2056	184,285	11,314,324	2,228		2,228	
2057	184,285	11,498,609	2,238		2,238	
2058	184,285	11,682,894	2,247		2,247	
2059	184,285	11,867,179	2,256		2,256	
2060	184,285	12,051,464	2,265	0	2,265	
2061	184,285	12,235,749	2,176	97	2,274	
2062	184,285	12,420,034	2,091	191	2,282	
2063	184,285	12,604,319	2,009	281	2,290	
2064	184,285	12,788,604	1,930	367	2,297	
2065	184,285	12,972,889	1,855	450	2,304	
2066	184,285	13,157,174	1,782	529	2,311	
2067	184,285	13,341,459	1,712	606	2,318	
2068	184,285	13,525,744	1,645	680	2,324	
2069	184,285	13,710,029	1,580	750	2,331	
2070	184,285	13,894,314	1,518	818	2,336	
2071	184,285	14,078,599	1,459	883	2,342	
2072	184,285	14,262,884	1,402	946	2,348	
2073	184,285	14,447,169	1,347	1,006	2,353	
2074	184,285	14,631,454	1,294	1,064	2,358	
2075	184,261	14,815,739	1,243	1,120	2,363	
2076	0	15,000,000	1,194	1,173	2,367	
2077	0	15,000,000	1,148	1,127	2,275	
2078	0	15,000,000	1,103	1,083	2,185	
2079	0	15,000,000	1,059	1,040	2,100	
2080	0	15,000,000	1,018	1,000	2,017	
2081	0	15,000,000	978	960	1,938	
2082	0	15,000,000	940	923	1,862	
2083	0	15,000,000	903	886	1,789	
2084	0	15,000,000	867	852	1,719	
2085	0	15,000,000	833	818	1,652	

COMPUTATION SHEET

PROJECT TITLE:	Blackburn Sanitary Landfill	PROJECT NO:	180694
DESCRIPTION:	Landfill Gas Modeling Projections	SHEET:	4
		OF:	4
PREPARED BY:	DK	CHECKED BY:	JAB
DATE:	11/21/2018	DATE:	12/4/2018

Year	Total Degradable Intake Rates (metric tons/year)	Total Waste In-Place (metric tons)	Flow Rates from 1980-2059 waste in place tonnages (scfm)	Flow Rates from 2060 waste in place tonnages (scfm)	Total LFG Flow Rate (scfm)	
2086	0	15,000,000	801	786	1,587	
2087	0	15,000,000	769	755	1,525	
2088	0	15,000,000	739	726	1,465	
2089	0	15,000,000	710	697	1,407	
2090	0	15,000,000	682	670	1,352	
2091	0	15,000,000	656	644	1,299	
2092	0	15,000,000	630	618	1,248	
2093	0	15,000,000	605	594	1,199	
2094	0	15,000,000	581	571	1,152	
2095	0	15,000,000	559	549	1,107	
2096	0	15,000,000	537	527	1,064	
2097	0	15,000,000	516	506	1,022	
2098	0	15,000,000	495	487	982	
2099	0	15,000,000	476	467	943	
2100	0	15,000,000	457	449	906	
2101	0	15,000,000	439	432	871	
2102	0	15,000,000	422	415	837	
2103	0	15,000,000	406	398	804	
2104	0	15,000,000	390	383	772	
2105	0	15,000,000	374	368	742	

APPENDIX C
CALL LOG SUMMARIES

cornerstone PLLC

7600 Dublin Boulevard, Suite 200, Dublin, CA 94568
T 877.633.5520 | F 877.845.1456 | W www.cornerstoneeg.com

Memorandum

Date and Time:	November 7, 2018; 11:05
Cornerstone Personnel:	Paul Stout
Potential User Company:	Republic
Potential User Contact:	Don Phelps
Contact Title:	Republic GM

General Summary of the Call:

CEG Engineering, PLLC (CEG) gave a brief synopsis of the current scope and project with Catawba County. Currently, Republic Services, Inc. (Republic) operates 47 routes out of their hauling yard at 4062 Section House Road in Hickory, NC. These routes do not all go to Catawba County.

Each truck uses about 4.5 to 5.0 DGE per hour and runs about 10-hour days. Thus, 2,000 to 2,500 DGE are used daily. They pay bulk for Diesel at about $2.45 per DGE.

Republic operates the landfill north of Catawba County, NC, Caldwell County. At that site, there is a third party installing a gas collection and control system (GCCS) and a renewable natural gas (RNG) to pipeline project. Don Phelps of Republic did not know the third party when asked. He did say that CEG should reach out to someone at corporate for the identity of the third party, and what it might take to get Republic to convert to RNG from Diesel. This is not a decision that he can make alone.

The franchise agreement with Catawba is believed to be good for another 13 years or so.

CEG contacted Brian Martz on November 14, 2018. Please see call log dated November 14, 2018 for details.

cornerstone PLLC

7600 Dublin Boulevard, Suite 200, Dublin, CA 94568
T 877.633.5520 | F 877.845.1456 | W www.cornerstoneeg.com

Memorandum

Date and Time:	November 13, 2018 – 8:30 PM PST
Cornerstone Personnel:	Paul Stout, Gavin Casson
Potential User Company:	Republic Services
Potential User Contact:	Brian Martz
Contact Title:	Director of Renewable Energy Development

General Summary of the Call:

CEG Engineering, PLLC (CEG) called Brian Martz of Republic Services (Republic) as a follow up to a call that Paul Stout of CEG had with Don Phelps of Republic. Don directed CEG to Bryan as Don cannot make the decision to convert a fleet of trucks to compressed natural gas (CNG). See the call log with Don Phelps dated November 7, 2018 for additional details.

Brian oversees the national renewable natural gas (RNG) and solar development for Republic. Brian mentioned that Caldwell County, NC is currently installing a gas collection and control system (GCCS) and planning to build a renewable natural gas (RNG) project at the site. There may be interest (similar to Surry County Landfill) in taking RNG for their project. Brian suggested that he would discuss with this RNG developer as to their interest to take landfill gas (LFG) from Catawba County, and if interested, would put CEG in touch with the developer.

In regard to Republic converting the fleet being used in Catawba County, Brian stated there were significant efforts in capital reinvestment that would need to take place. Several factors including, size of the fleet, future in the area, etc. He noted that it would be highly unlikely that they would consider converting the fleet. However, he will reach out to others in the NC area to discuss this with them before providing a final answer. If there is interest, he will forward contact information along.

Brian did suggest that he felt we would have little trouble finding a party in the near term that would pick up the RNG via tube trailer, and that any conversion of Republic trucks would take longer than that, and probably not be a high probability for our consideration for the RNG.

Based on the highly unlikely assessment by Brian, CEG does not believe this requires further follow up.

7600 Dublin Boulevard, Suite 200, Dublin, CA 94568
T 877.633.5520 | F 877.845.1456 | W www.cornerstoneeg.com

Memorandum

Date and Time:	November 19, 2018 - 11:30 AM PST
Cornerstone Personnel:	Gavin Casson, Jessica Bernardini, Alex Newell
Potential User Company:	ReNew Petra
Potential User Contact:	Wayne Marshall, Tim Holder
Contact Title:	Managing Director

General Summary of the Call:

CEG Engineering, PLLC, (CEG) gave a brief synopsis of the proposed project with Catawba County. ReNew Petra owns and operates a landfill gas to energy (LFGTE) facility at the Mount Airy Landfill in Surry County. They have 15 years remaining on a 20-year contract with a fixed price for the electric generated with an escalator in the contract. They currently operate at 1100 kW of a 1600 kW system and are looking for ways to meet the full capacity of the system. The vision for this project would be to partially clean the landfill gas (LFG) (moisture and particulate removal at a minimum) and transport via tube trailer to the Mount Airy Project for use in the LFGTE facility. The major hurdle would be reducing the volume enough to lessen the transportation costs to a point that the project is profitable. Currently, there is only particulate and moisture removal at the Mount Airy Landfill, no CO2 removal, which operates at approximately 500 million British thermal units (MMBtu).

ReNew Petra have also been involved in the dialogue with Piedmont regarding pipeline injection from pig farms, dairy farms, etc. Therefore, ReNew Petra is interested and open to ideas for ways to use RNG and inject into a pipeline but have not pursued any projects at this point. Wayne of ReNew Petra also took part in the fuel cell study at Apple (Wayne did not use Apple by name, but it was clear what project he was mentioning). ReNew Petra has also discussed compressed natural gas (CNG) filling stations with some groups in the mid-west but the challenge is finding the volume to justify the upfront costs.

Overall, ReNew Petra is interested in participating in this project as it develops and would like to be a part of the process if they can find a way for it to be economically profitable.

ReNew Petra did not give a specific price point, but more of a general guideline that the RINs, price of natural gas, and/or any LCFS benefits from a pipeline injection would need to balance the costs.

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Memorandum

Date and Time:	November 19, 2018 - 2:30 PM PST
Cornerstone Personnel:	Paul Stout, Gavin Casson, Alex Newell
Potential User Company:	Pilot Station (Clean Energy)
Potential User Contact:	Sean Wine
Contact Title:	Director of Strategic Development & Operations

General Summary of the Call:

CEG Engineering, PLLC (CEG) provided an introduction and synopsis of the proposed project and current scope with Catawba County. Pilot Station (Pilot) is partnered with Clean Energy and are open and always looking to take more renewable natural gas (RNG) into their supply and build their portfolio. Currently, Clean Energy has several places with existing infrastructure in North Carolina where they could inject the RNG. They have users that would take the RNG but would require the RNG to be cleaned to pipeline specifications.

Clean Energy is not interested in development of a compressed natural gas fueling station project. They do not foresee an immediate need for a new CNG fueling station. However, they do anticipate growth in this sector, but it is at least 18-24 months out. They do not have any current use for tube trailers at any existing CNG fueling stations.

However, Clean Energy would be interested in taking the RNG for an existing pipeline injection site. The view for this project would most likely be to work with NG Advantage. They own the majority share of NG Advantage. NG Advantage would provide the transport of the RNG from the landfill to the existing pipeline injection infrastructure. NG Advantage would only provide a rate for the transportation. They would not collect any RINs or other incentives. These incentives would be split between Clean Energy and the County in an approximate 25% (Clean Energy)/75% (County) split. Essentially, the County would clean the landfill gas (LFG) to pipeline quality and sell to Clean Energy who would take ownership at the injection point with NG Advantage providing the virtual pipeline.

Clean Energy did note that they have not seen a successful tube trailer/virtual pipeline project yet. However, they provided a contact at NG Advantage.

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Memorandum

Date and Time:	November 27, 2018 – 8:00 AM PST
Cornerstone Personnel:	Bill Bloomenkranz, Gavin Casson, Alex Newell
Potential User Company:	Piedmont Natural Gas, Division of Duke Energy
Potential User Contact:	David Nester
Contact Title:	Director of Compressed Natural Gas

General Summary of the Call:

CEG Engineering, PLLC (CEG) gave a brief rundown of potential project, existing site infrastructure, and evaluation of other options. Potential direct injection sites have already identified in previous feasibility studies. There is a nearby potential injection location but is located on a transmission line that is not always in use. Another potential injection location is farther from the site and may not be financially feasible for a physical connection via pipeline.

The North Carolina Utilities Commission is running a pilot program to establish renewable natural gas (RNG) injection standards. The draft version of these standards can be found in Docket G9698, which will be emailed to Cornerstone from David Nester of Piedmont Natural Gas. The standards are still in development and the tariff is not set yet.

It was noted that for an injection location to be approved, an interconnection application would be required for submission to Duke/Piedmont. They do not allow injection into distribution lines, only transmission lines. Additionally, a transmission line may not be approved if the particular line does not have consistent flow.

Appendix F of the docket will have information regarding the gas quality requirements.

Duke/Piedmont does not have an existing need for the gas. Therefore, they are not currently purchasing gas from alternative gas sources. The need to purchase additional gas is largely dependent on existing utility customers. Therefore, CEG will need to find an end user that is an existing Duke/Piedmont costumer that is willing to purchase the gas from

the landfill. Duke/Piedmont does not have the ability to transfer gas interstate and gain LCFS credits at this time.

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Memorandum

Date and Time:	November 27, 2018 - 3:00 PM PST
Cornerstone Personnel:	Gavin Casson
Potential User Company:	NG Advantage
Potential User Contact:	Greg Morse
Contact Title:	Senior Director

General Summary of the Call:

CEG Engineering, PLLC (CEG) had a discussion with Greg Morse of NG Advantage (NGA) in regards to the possibilities of a mobile pipeline. CEG was referred to this company from Sean Wine at Clean Energy (see call summary on November 19, 2018). Clean Energy is the majority shareholder of NG Advantage, but the companies operate independently of each other. However, they often team up on projects to provide the best solution for their prospective clients. NGA primarily operates in the northeast but have explored projects in North Carolina. However, none of these projects have come to fruition.

The typical set up for a mobile pipeline project to be successful includes compression equipment at the gas conditioning location, at least two tube trailers for transport of gas from the conditioning location to the injection location, and decompressing equipment at the injection location. The compression equipment at the gas conditioning location where trailers will be loaded typically requires between 4,200 – 5,000 pounds per square inch (psi). These are typically slow fill processes, therefore, at least two tube trailers are required. One tube trailer remains connected to the gas conditioning and compression equipment at all times while the other trailer is used for transport to the injection location. Decompression equipment requirements vary based on the injection location. Average costs of decompression and injection equipment is approximately $400,000.

Tube trailers typically require pipeline quality gas to adhere to the manufacturer warranty requirements. Hauling lesser quality gas will void the warranty of the trailer. However, Greg indicated that vehicle standards would likely be acceptable as long as this was

negotiated with the manufacturer up front. The likelihood of being able to haul raw landfill gas is not favorable and would be difficult regardless of the warranty conditions but based more on the chemical degradation of the trailer liners being exposed to low quality gas.

Often, the owner will purchase the tube trailers and all equipment up front and contract NGA to operate and maintain the equipment. There are many sizes and models available. On average, the tube trailers costs are approximately $100,000 per 100 thousand cubic feet (MCF) capacity. For example, a 350 MCF trailer is approximately $350,000. The cost of operation ranges between $2-$3 per MCF hauled.

It was noted during the conversation that a shorter trip is not necessarily more beneficial from an economic standpoint. A two to four hour round trip is typically ideal assuming that there is enough gas to fill one to two trailers per day. Reasoning is that it takes two to four hours to offload the fuel (depending on size of truck and the decompression requirements) so a shorter trip is not necessarily beneficial as the driver's salary for the full day must be accounted.

NGA is transport only and does not negotiate contracts based on RINs or other incentives. However, it was noted during the conversation that Transco pipeline is near the Blackburn Landfill and may be a viable option for an injection point that would allow the County to take advantage of the California incentives. Greg indicated that the Transco standards are stringent but have been established so they are known up front. The in-state standards with Duke Energy/Piedmont are still in deliberations.

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Memorandum

Date and Time:	November 28, 2018 @ 2:00 PM PST
Cornerstone Personnel:	Jessica Bernardini, Paul Stout, Gavin Casson, Alex Newell
Potential User Company:	Blue Ridge Biofuels, LLC
Potential User Contact:	Woody Eaton (Blue Ridge) and Brad Pleima (Eco Engineers)
Contact Title:	Owner

General Summary of the Call:

CEG Engineering, PLLC (CEG) provided an introduction and synopsis of the proposed project and current scope with Catawba County. Blue Ridge Biofuels, LLC (Blue Ridge) has a biodiesel plant adjacent to the electrical generation facility at Blackburn Landfill. The biodiesel plant has been operational for approximately five years and Blue Ridge currently utilizes the waste heat off the jackets of the existing generators for use in its nearby plant. Initially, Blue Ridge's interest was in purchasing the heating value (BTUs) from Catawba to create process heat at its plant. Currently, they are more interested in the potential RFS and LCFS credits that could be available through vehicle fuel or interstate pipeline injection. Overall, Blue Ridge Biofuels remains interested in a potential partnership with Catawba.

EcoEngineers was also on the call as the consulting engineer for Blue Ridge. EcoEngineers has experience with similar projects in Iowa where utilities do not have physical interstate connections to easily allow for LCFS credits from California to be received. Landfills typically have an intensity of 30-50 carbon intensity (CI). EcoEngineers noted that if solar or wind technologies are on-site that would help decrease CI and create a project that would be easier to get into the California market.

Blue Ridge currently has connections with entities that are interested in developing or already selling CNG for vehicle use. They are aware of a location that has a demand for approximately 2,000 diesel gallon equivalents (DGE) of CNG. Their next steps would be to conduct an internal feasibility study to evaluate options for transporting the fuel, either via pipeline or tube trailer, depending on the economics. Blue Ridge would consider the costs

and benefits of purchasing the raw gas from Catawba and conditioning the LFG itself, then assess how to efficiently transport and market the fuel. If it was to proceed with the feasibility study, Blue Ridge would like an option to purchase the gas prior to commencing work on the study.

Blue Ridge submitted a Letter of Intent to Catawba County. In the Letter of Intent, Blue Ridge is proposing $2 per decatherm (1 decatherm~1 MMBTU) and 5% of profits shared. Profits would include environmental incentives as revenue (i.e. LCFS/RIN credits). For reference, the site currently operates between 900-1200 scfm at approximately 500 BTU/cf, which is roughly equivalent to 5,000 DGE per day (128,400 BTU/DGE).

Blue Ridge has no current contracts with entities that it does business with that would limit the potential deal to produce CNG.

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Memorandum

Date and Time:	December 11, 2018 @ 2:30 PM PST
Cornerstone Personnel:	Paul Stout and Gavin Casson
Potential User Company:	Environmental Energy Solutions (Evensol)
Potential User Contact:	David Wentworth
Contact Title:	Managing Manager

General Summary of the Call:

CEG Engineering, PLLC (CEG) provided an introduction and synopsis of the proposed project and current scope with Catawba County. Environmental Energy Solutions (Evensol) provided a summary of their current projects in the area. Evensol has two existing landfill gas (LFG) to renewable natural gas (RNG) projects operating for Republic that deliver RNG to a Piedmont pipeline location. They also have a third project that is to begin construction during the first quarter of 2019. They are advancing RNG projects at all three of these sites.

Evensol has a project at the Foothill's Landfill (aka. Caldwell County) in North Carolina that will be moving forward in the first quarter of 2019. The project consists of a gas conditioning facility that generates pipeline quality RNG to be injected into a Piedmont pipeline location. The RNG will be transported from the landfill to the injection location via virtual pipeline. The gas condition facility is expected to intake approximately 2,750 standard cubic feet per minute (scfm) of landfill gas. Originally, Piedmont would not allow an injection of this quantity of gas into their pipeline, as they did not have a demand for this high of a quantity in the area. However, Piedmont has now identified a location within their transmission system where they will allow the injection. Evensol purchased the property around this injection location and will be constructing the decant equipment and injection point to complete the virtual pipeline. This injection location is approximately 18 miles from the Blackburn Landfill, and therefore, it is likely the RNG from the Blackburn Landfill could also be injected at this location.

We discussed the possibilities of injection locations closer to the Blackburn Landfill where a physical pipeline may be feasible. Looking at the area at the intersection of Highway 10 and Robinson Road, Evensol agreed this could be a potential injection point. They indicated they would explore this as an option and would likely be preferred to the virtual pipeline if the costs were acceptable. Evensol has a good relationship with Piedmont and would work with them to determine if this location or any alternate locations are suitable for the project.

Overall, Evensol has high interest in working with the County to move forward with the potential project at the Blackburn Landfill. It would be convenient for timing purposes if an agreement could be reached in the coming months, as the Foothills project is moving forward in early 2019. David stated that they would be willing to be involved on many combinations of levels. They are open to developing, constructing, and operating the entire project or any portion of the project the County prefers. David also indicated that they would be able to decommission the existing landfill gas to energy facility, if the County so desired.

We briefly discussed estimated costs and revenue. David indicated if the County wanted to own the gas conditioning equipment, he estimated $20M to get to startup. At that point, Evensol would purchase the RNG and use in one of their projects. If the County wanted to let Evensol own and operate the full project, he estimated royalties to the County between $300,000-$500,000 per year, based on RIN pricing and overall profits. David indicated LCFS credits are not typically granted and he does not consider them when evaluating the feasibility of a project.

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Memorandum

Date and Time:	December 12, 2018 @ 10:30 AM PST
Cornerstone Personnel:	Paul Stout and Gavin Casson
Potential User Company:	Trillium
Potential User Contact:	Charles Love
Contact Title:	Renewable Energy Acquisition

General Summary of the Call:

CEG Engineering, PLLC (CEG) gave an introduction and synopsis of the proposed project and current scope with Catawba County and asked about the nearby Love's truck stop and potential for installing a clean natural gas (CNG) fueling station at that location. Trillium indicated they have a Love's truck stop nearby, but they do not typically install CNG fueling stations unless there is a direct need within the area. They also stated that if there is a need within the area, perhaps the nearby Target Distribution Center, they would consider installing a CNG filling station at the truck stop. They were not aware of a demand for CNG but stated their business development team could provide additional research and determine any nearby demands.

Overall, Charles is interested in the project and would be open to pipeline injection or other options, regardless of it is feasible to construct a CNG fueling station at the Love's Truck Stop. He would be interested in any combination of involvement, including design, build, own, and operate as a whole, or provide assistance in role the County desired. Charles stated that if an RFP was available, he would likely submit a response.

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LABORATORY ANALYSIS REPORT

Permanent Gases and Total Gaseous Non- Methane Organics (TGNMO)
Analysis in SUMMA Canister Sample

Report Date: March 16, 2020
Client: SCS Engineers
Project Location: Catawba County / Newton, NC
Project No.: 02220302.00 T3
Date Received: March 5, 2020
Date Analyzed: March 13, 2020

ANALYSIS DESCRIPTION

Permanent gases were measured by thermal conductivity detection/gas chromatography (TCD/GC), EPA Method 3C.

AtmAA Lab No.:	20650-2	20650-4
Sample I.D.:	PRE-1	POST-1
Components	*(Concentration in %,v)*	
Nitrogen	9.03	6.68
Oxygen	0.87	0.48
Methane	50.7	52.6
Carbon dioxide	38.8	40.2

The reported oxygen concentration includes any argon present in the sample. Calibration is based on a standard atmosphere containing 20.95% oxygen and 0.93% argon.
The accuracy of permanent gas analysis by TCD/GC is +/- 2%, actual results are reported.

Brian W. Fung
Laboratory Director

QUALITY ASSURANCE SUMMARY
(Repeat Analyses)

Project Location: Catawba County / Newton, NC
Date Received: March 5, 2020
Date Analyzed: March 13, 2020

Components	Sample ID	Repeat Analysis Run #1	Repeat Analysis Run #2	Mean Conc.	% Diff. From Mean
		(Concentration in %,v)			
Nitrogen	PRE-1	9.10	8.95	9.03	0.83
	POST-1	6.73	6.63	6.68	0.75
Oxygen	PRE-1	0.91	0.83	0.87	4.6
	POST-1	0.47	0.48	0.48	1.1
Methane	PRE-1	50.6	50.7	50.7	0.10
	POST-1	52.6	52.5	52.6	0.10
Carbon dioxide	PRE-1	38.8	38.7	38.8	0.13
	POST-1	40.2	40.2	40.2	0.00

Two SUMMA canister samples, laboratory numbers 20650-(2 & 4), were analyzed for permanent gases. Agreement between repeat analyses is a measure of precision and is shown above in the column "% Difference from Mean". The average % difference from mean for 4 repeat measurements from two SUMMA canister samples is 0.94%.

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LABORATORY ANALYSIS REPORT

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TO-15 Component Analysis in SUMMA Canister Sample, by GC/MS Method EPA TO-15

Report Date: March 16, 2020
Client: SCS Engineers
Project Location: Catawba County / Newton, NC
Project No.: 02220302.00 T3
Date Received: March 5, 2020
Date Analyzed: March 6-11, 2020

AtmAA Lab No.:	20650-2	20650-4
Sample ID:	PRE-1	POST-1
Components	*(Concentations in ppbv)*	
Freon 12	267	330
Chloromethane	97.1	117
Freon 114	<60	<60
Vinyl Chloride	1400	1425
1,3-Butadiene	<100	<100
Bromomethane	<100	<100
Chloroethane	606	439
Acetone	19300	31350
Freon 11	87.7	77.5
Isopropyl Alcohol	37350	47450
1,1-Dichloroethene	<100	<100
Methylene Chloride	722	890
3-Chloro-1-Propene	<100	<100
Carbon Disulfide	221	275
Freon 113	<60	<60
trans-1,2-Dichloroethene	<100	<100
1,1-Dichloroethane	<100	<100
MTBE	<100	<100
2-Butanone	14300	15150
Vinyl Acetate	<100	<100
cis-1,2-Dichloroethene	808	1040
n-Hexane	2305	2730
Chloroform	<80	<80
Ethyl Acetate	7480	7110
Tetrahydrofuran	8495	5255
1,2-Dichloroethane	731	960
1,1,1-Trichloroethane	<80	<80
Benzene	1200	1715
Carbon Tetrachloride	<100	<100
Cyclohexane	<100	<100
1,2-Dichloropropane	<100	<100
Bromodichloromethane	<100	<100
Trichloroethene	626	920
1,4-Dioxane	<100	<100
2,2,4-Trimethyl Pentane	<100	<100
n-Heptane	<100	<100
cis-1,3-Dichloropropene	<100	<100
4-Methyl-2-pentanone	1116	1430
trans-1,3-Dichloropropene	<100	<100
1,1-2-Trichloroethane	<100	<100
Toluene	20500	33950
2-Hexanone	<100	<100
Dibromochloromethane	<100	<100
1,2-Dibromomethane	<80	<80
Tetrachloroethene	505	881
Chlorobenzene	<100	<100
Ethylbenzene	5715	10400
m,p-Xylene	5995	11050
Bromoform	<80	<80
Styrene	2365	4525
1,1,2,2-Tetrachloroethane	<100	<100
o-Xylene	1550	2750
Benzyl Chloride	<100	<100
4-Ethyl Toluene	379	1080
1,3,5-Trimethyl Benzene	130	354
1,2,4-Trimethyl Benzene	290	871
1,3-Dichlorobenzene	<80	<80
1,4-Dichlorobenzene	<80	204
1,2-Dichlorobenzene	<80	<80
1,2,4-Trichlorobenzene	<150	<150
Hexachlorobutadiene	<100	<100

Brian W. Fung
Laboratory Director

QUALITY ASSURANCE SUMMARY
(Repeat Analyses)

Project Location: Catawba County / Newton, NC
Date Received: March 5, 2020
Date Analyzed: March 6-11, 2020

Components	Sample ID	Repeat Analysis Run #1	Repeat Analysis Run #2	Mean Conc.	% Diff. From Mean
		(Concentration in ppbv)			
Freon-12	PRE-1	292	241	267	9.6
	POST-1	308	351	330	6.5
Chloromethane	PRE-1	103	91.2	97.1	6.1
	POST-1	117	116	117	0.43
Freon 114	PRE-1	<60	<60	---	---
	POST-1	<60	<60	---	---
Vinyl Chloride	PRE-1	1440	1360	1400	2.9
	POST-1	1360	1490	1425	4.6
1,3-Butadiene	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
Bromomethane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
Chloroethane	PRE-1	622	590	606	2.6
	POST-1	420	457	439	4.2
Acetone	PRE-1	19900	18700	19300	3.1
	POST-1	30800	31900	31350	1.8
Freon 11	PRE-1	87.6	87.7	87.7	0.06
	POST-1	76.1	78.8	77.5	1.7
Isopropyl Alcohol	PRE-1	39600	35100	37350	6.0
	POST-1	47000	47900	47450	0.95
1,1-Dichloroethene	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
Methylene Chloride	PRE-1	775	668	722	7.4
	POST-1	865	914	890	2.8
3-Chloro-1-Propene	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
Carbon Disulfide	PRE-1	251	191	221	14
	POST-1	276	273	275	0.55
Freon 113	PRE-1	<60	<60	---	---
	POST-1	<60	<60	---	---
trans-1,2-Dichloroethene	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---

QUALITY ASSURANCE SUMMARY
(Repeat Analyses)
(continued)

Components	Sample ID	Repeat Analysis Run #1	Repeat Analysis Run #2	Mean Conc.	% Diff. From Mean
		(Concentration in ppbv)			
1,1-Dichloroethane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
MTBE	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
2-Butanone	PRE-1	15600	13000	14300	9.1
	POST-1	15000	15300	15150	0.99
Vinyl Acetate	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
cis-1,2-Dichloroethene	PRE-1	817	799	808	1.1
	POST-1	1020	1060	1040	1.9
n-Hexane	PRE-1	2430	2180	2305	5.4
	POST-1	2650	2810	2730	2.9
Chloroform	PRE-1	<80	<80	---	---
	POST-1	<80	<80	---	---
Ethyl Acetate	PRE-1	7520	7440	7480	0.53
	POST-1	7360	6860	7110	3.5
Tetrahydrofuran	PRE-1	9100	7890	8495	7.1
	POST-1	6060	4450	5255	15
1,2-Dichloroethane	PRE-1	777	684	731	6.4
	POST-1	944	976	960	1.7
1,1,1-Trichloroethane	PRE-1	<80	<80	---	---
	POST-1	<80	<80	---	---
Benzene	PRE-1	1280	1120	1200	6.7
	POST-1	1710	1720	1715	0.29
Carbon Tetrachloride	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
Cyclohexane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
1,2-Dichloropropane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
Bromodichloromethane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---

QUALITY ASSURANCE SUMMARY
(Repeat Analyses)
(continued)

Components	Sample ID	Repeat Analysis Run #1	Repeat Analysis Run #2	Mean Conc.	% Diff. From Mean
		(Concentration in ppbv)			
Trichloroethene	PRE-1	641	610	626	2.5
	POST-1	917	923	920	0.33
1,4-Dioxane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
2,2,4-Trimethyl Pentane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
n-Heptane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
cis-1,3-Dichloropropene	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
4-Methyl-2-pentanone	PRE-1	1280	952	1116	15
	POST-1	1460	1400	1430	2.1
trans-1,3-Dichloropropene	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
1,1-2-Trichloroethane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
Toluene	PRE-1	21200	19800	20500	3.4
	POST-1	32900	35000	33950	3.1
2-Hexanone	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
Dibromochloromethane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
1,2-Dibromomethane	PRE-1	<80	<80	---	---
	POST-1	<80	<80	---	---
Tetrachloroethene	PRE-1	519	491	505	2.8
	POST-1	879	883	881	0.23
Chlorobenzene	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
Ethylbenzene	PRE-1	5850	5580	5715	2.4
	POST-1	10400	10400	10400	0.00
m,p-Xylene	PRE-1	6180	5810	5995	3.1
	POST-1	11200	10900	11050	1.4
Bromoform	PRE-1	<80	<80	---	---
	POST-1	<80	<80	---	---

QUALITY ASSURANCE SUMMARY

(Repeat Analyses)

(continued)

Components	Sample ID	Repeat Analysis Run #1	Repeat Analysis Run #2	Mean Conc.	% Diff. From Mean
		(Concentration in ppbv)			
Styrene	PRE-1	2510	2220	2365	6.1
	POST-1	4610	4440	4525	1.9
1,1,2,2-Tetrachloroethane	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
o-Xylene	PRE-1	1620	1480	1550	4.5
	POST-1	2800	2700	2750	1.8
Benzyl Chloride	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---
4-Ethyl Toluene	PRE-1	377	380	379	0.40
	POST-1	1120	1040	1080	3.7
1,3,5-Trimethyl Benzene	PRE-1	149	111	130	15
	POST-1	362	346	354	2.3
1,2,4-Trimethyl Benzene	PRE-1	340	240	290	17
	POST-1	891	850	871	2.4
1,3-Dichlorobenzene	PRE-1	<80	<80	---	---
	POST-1	<80	<80	---	---
1,4-Dichlorobenzene	PRE-1	<80	<80	---	---
	POST-1	211	197	204	3.4
1,2-Dichlorobenzene	PRE-1	<80	<80	---	---
	POST-1	<80	<80	---	---
1,2,4-Trichlorobenzene	PRE-1	<150	<150	---	---
	POST-1	<150	<150	---	---
Hexachlorobutadiene	PRE-1	<100	<100	---	---
	POST-1	<100	<100	---	---

Two SUMMA canister samples, laboratory number 20650-(2 & 4), were analyzed for TO-15 components by GC/MS. Agreement between repeat analyses is a measure of precision and is shown above in the column "% Difference from Mean". The average % difference from mean for 55 repeat measurements from two SUMMA canister samples is 4.2%.

AtmAA Inc.
23917 Craftsman Rd., Calabasas, CA 91302 • (818) 223-3277 • FAX (818) 223-8250
environmental consultants
laboratory services
atmaa.com

LABORATORY ANALYSIS REPORT

Hydrogen Sulfide Analysis in Silco Canister Sample

Report Date: March 16, 2020
Client: SCS Engineers
Project Location: Catawba County / Newton, NC
Project No.: 02220302.00 T3
Date Received: March 5, 2020
Date Analyzed: March 5, 2020

ANALYSIS DESCRIPTION

Hydrogen sulfide was measured by gas chromatography with sulfur chemiluminescence detector (SCD), SCAQMD 307.91

AtmAA Lab No.:	20650-2	20650-4
Sample I.D.:	PRE-1	POST-1
Components	*(Concentration in ppmv)*	
Hydrogen sulfide	9.05	9.98

Brian W. Fung
Laboratory Director

QUALITY ASSURANCE SUMMARY
(Repeat Analyses)

Project Location: Catawba County / Newton, NC
Date Received: March 5, 2020
Date Analyzed: March 5, 2020

Components	Sample ID	Repeat Analysis Run #1	Repeat Analysis Run #2	Mean Conc.	% Diff. From Mean
		(Concentration in ppmv)			
Hydrogen sulfide	PRE-1	8.89	9.21	9.05	1.8
	POST-1	9.96	10.0	9.98	0.20

Two Silco canister samples, laboratory numbers 20650-(2 & 4), were analyzed for hydrogen sulfide. Agreement between repeat analyses is a measure of precision and is shown above in the column "% Difference from Mean". The average % difference from mean for 2 repeat measurements from two Silco canister samples is 0.98%.

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LABORATORY ANALYSIS REPORT

Siloxane Compounds Analysis in Silco Canister Sample

Report Date: March 16, 2020
Client: SCS Engineers
Project Location: Catawba County / Newton, NC
Project No.: 02220302.00 T3
Date Received: March 5, 2020
Date Analyzed: March 11, 2020

ANALYSIS DESCRIPTION

Volatile silicon components are measured by GC/Mass Spec. in the selected ion monitor mode, TO-14 method. Siloxane coumpounds are calibrated with a standard mixture provided by Scott Specialty Gases.

AtmAA Lab No.:	20650-2	20650-4
Sample I.D.:	PRE-1	POST-1
Components	*(Concentration in ppmv)*	
Hexamethyldisiloxane	0.237	0.246
Hexamethylcyclotrisiloxane	0.090	0.103
Octamethyltrisiloxane	<0.090	<0.090
Octamethylcyclotetrasiloxane	0.353	0.494
Decamethyltetrasiloxane	<0.100	<0.100
Decamethylcyclopentasiloxane	<0.100	<0.100
total:	0.679	0.842

Brian W. Fung
Laboratory Director

QUALITY ASSURANCE SUMMARY
(Repeat Analyses)

Project Location: Catawba County / Newton, NC
Date Received: March 5, 2020
Date Analyzed: March 11, 2020

Components	Sample ID	Repeat Analysis Run #1	Repeat Analysis Run #2	Mean Conc.	% Diff. From Mean
		(Concentration in ppmv)			
Hexamethyldisiloxane	PRE-1	0.239	0.234	0.237	1.1
	POST-1	0.240	0.251	0.246	2.2
Hexamethylcyclotrisiloxane	PRE-1	0.091	0.088	0.090	1.7
	POST-1	0.104	0.101	0.103	1.5
Octamethyltrisiloxane	PRE-1	<0.090	<0.090	---	---
	POST-1	<0.090	<0.090	---	---
Octamethylcyclotetrasiloxane	PRE-1	0.366	0.340	0.353	3.7
	POST-1	0.512	0.476	0.494	3.6
Decamethyltetrasiloxane	PRE-1	<0.100	<0.100	---	---
	POST-1	<0.100	<0.100	---	---
Decamethylcyclopentasiloxane	PRE-1	<0.100	<0.100	---	---
	POST-1	<0.100	<0.100	---	---

Two Silco canister samples, laboratory numbers 20650-(2 & 4), were analyzed for siloxane compounds. Agreement between repeat analyses is a measure of precision and is shown above in the column "% Difference from Mean". The average difference from mean for 6 repeat measurements from two Silco canister samples is 2.3%.

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
CATAWBA COUNTY	NEWTON, NC
Project No.	**Field Logbook No.**
~~0220~~ 0220302.00 T3	
Sampler: (Signature)	**Chain of Custody Tape No.**
DW Walker	

Sample No./ Identification	Type of Sample	AtmAA Lab Number	Sampling Date	Sampling Time	SILOXANE	H2S	TO-15				Special Remarks
											20650
PRE-1	LFG/AIR	29054	3/4	0924	X	X	X				STD TAT -2 #418
PRE-2	"	00183	"	0958	X	X	X				-3 #183
POST-1	"	27862	"	1026	X	X	X				-4 #407
POST-2	"	27869	"	1054	X	X	X				-5 #401

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
DW Walker	3/4/20	1200			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time
			Michael Lau	3/5/20	09:20

Company Info:	Send Report to:	Analytical Laboratory
Company: SCS ENGINEERS	Company:	AtmAA Inc.
Street Address:	Street Address:	23917 Craftsman Rd.
City/State/Zip: CHARLOTTE, NC	City/State/Zip:	Calabasas, CA 91302
Telephone No.: 336-262-2379	Project Manager: DAVID WALKER	TEL: (818) 223-3277
Fax No.:	Email Address: DWALKER@SCSENGINEERS.com	FAX: (818) 223-8250