

NEW SOURCE REVIEW AIR CONSTRUCTION PERMIT APPLICATION

For the:

**NEW RIVER CLEAN ENERGY FACILITY
RALEIGH COUNTY, WEST VIRGINIA**

Prepared For:

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

On Behalf Of:



SEVEN ISLANDS ENVIRONMENTAL SOLUTIONS, LLC

6205 Peachtree Dunwoody Road
Atlanta, GA 30328
(678) 645-0634

Prepared By:



CARLSON ENVIRONMENTAL CONSULTANTS, PC

305 South Main Street
Monroe, North Carolina 28112
(704) 283-9765

February 22, 2016



CARLSON ENVIRONMENTAL CONSULTANTS, PC

LANDFILL GAS AND SOLID WASTE SPECIALISTS

February 22, 2016

Ms. Bev McKeone
NSR Program Manager
Division of Air Quality Permitting Section
West Virginia Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

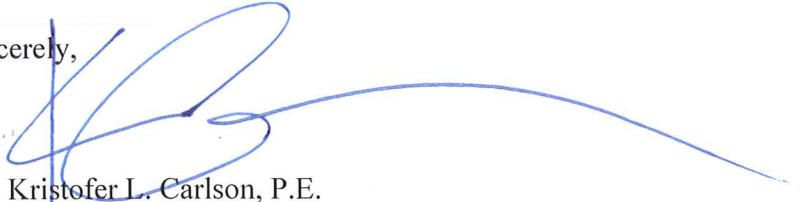
Subject: New Source Review Air Construction Permit Application
New River Clean Energy Facility
Raleigh County, West Virginia

Dear Ms. McKeone:

On behalf of Seven Islands Environmental Solutions, LLC (SIES), Carlson Environmental Consultants, PC (CEC) is submitting to the West Virginia Department of Environmental Protection (WVDEP) this New Source Review (NSR) Air Construction Permit Application (Application) for the proposed new New River Clean Energy Facility (New River Facility) located in Raleigh County near Beckley, WV. The New River Facility will be located on land leased from the Raleigh County Solid Waste Authority (Authority) (Permit No. R30-08100155-2013) and will utilize collected landfill gas (LFG) from the Authority as fuel. The New River Facility will be owned and operated by SIES and this Application seeks to obtain a separate Air Permit for the construction and operation of the New River Facility.

This Application contains the appropriate WVDEP forms, emissions calculations and modeling, site plan and site location map, flow diagram, electronic copies of the Application, a \$1,000 check for the Application Fee and a certification from the facility Responsible Official. SIES reserves the right to review the draft NSR Permit and to make corrections and updates at that time, as needed, before issuance of the final permit. Please feel free to call Mr. Robert Fairey (SIES) at (678) 645-0634 or the undersigned at (704) 283-9765 if you have any questions concerning this Application.

Sincerely,



Mr. Kristofer L. Carlson, P.E.
President
Carlson Environmental Consultants, PC

cc: Mr. Robert Fairey, SIES

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SECTION A - EXECUTIVE SUMMARY

PURPOSE OF APPLICATION

Seven Islands Environmental Solutions (SIES) is preparing to construct a renewable energy facility (to be known as the New River Clean Energy Facility) utilizing landfill gas (LFG) collected from the existing Raleigh County Sanitary Landfill (Landfill) which holds existing Title V Permit No. R30-08100155-2013. The renewable energy facility will be physically located within the property boundary of the Landfill on land leased from the Raleigh County Solid Waste Authority (Authority). The renewable energy facility will be owned and operated by SIES.

Therefore, SIES is submitting this New Source Review (NSR) Air Construction Permit Application (Application) to the West Virginia Department of Environmental Protection (WVDEP) to obtain approval to construct and operate the renewable energy facility.

FACILITY DESCRIPTION

The New River Clean Energy Facility will consist of two (2) LFG-fueled engine generators that will combust collected LFG from the Landfill and generate electricity for off-site sale to the power grid. Except for insignificant emissions sources, including small drums for oil and fluid storage and other engine maintenance supplies, the only air emissions sources from the SIES facility will be the engine generators.

The Landfill has an existing LFG collection and control system which currently routes all collected LFG to one (1) 1,200 SCFM open flare for combustion. After construction of the landfill gas-to-energy (LFGTE) facility, the primary operating scenario will be to route all collected gas to the SIES engine generators and have the open flare serve as a back-up control device. No modifications will be made to the Landfill LFG collection system or the open flare as part of the SIES construction with the exception of additional piping to connect the LFG collection system to the LFGTE plant.

PERMIT HISTORY

No previous air permits have been obtained or applied for by SIES for the renewable energy facility. The Landfill currently holds Title V Permit No. R30-08100155-2013. No changes to the Landfill's permit are proposed under this Application.

SIES has applied for the following additional permits as part of this project:

- Siting Certificate Application – West Virginia Public Service Corporation

AIR EMISSION SOURCES

The facility's primary emission sources are the two (2) Caterpillar G3520C 2,233 horsepower engines, which have been listed in this Application as ES-1 and ES-2.

TABLE A. SIGNIFICANT EMISSIONS UNITS

| Emission Source ID | Emission Unit Description |
|---------------------------|--|
| ES-1 | One (1) Engine Genset – Caterpillar G3520C |
| ES-2 | One (1) Engine Genset – Caterpillar G3520C |

POTENTIAL AND ACTUAL AIR EMISSIONS

In order to limit the carbon monoxide (CO) emissions to less than 100 tons per year, the operation of the two gensets will be limited to 15,260 hours per year (combined) at 100% load capacity. This equates to one genset operating for 8,760 hours and one genset operating at 6,500 hours (or any other combination up to the 15,260 hours) at 100% load or higher operating hours at a reduced load. The Landfill is currently recovering approximately 550 SCFM of LFG for use in the gensets, which is sufficient to operate one (1) genset at 100% load. The second genset will be used initially as a back-up device and the gensets will be used interchangeably. As additional LFG is made available to recovery (over a period of many years), both gensets will begin to operate concurrently. Excess LFG that cannot be utilized by the gensets (or at times when both gensets are inoperable) will be combusted in the LFG open flare currently permitted by the Landfill under Air Permit No. R30-08100155-2013.

Potential site emissions are presented in Table B below. Unlimited emissions assume both engines operating at 100% load at 8,760 hours per year each (i.e., 17,520 hours combined). Limited emissions assume both engines operating at 100% load at a combined 15,260 hours.

TABLE B. MAXIMUM POTENTIAL EMISSIONS (TONS/YR)

| ID | Description | VOC | HAP | CO | SO_x | NO_x | PM | PM₁₀ | PM_{2.5} | Anthropogenic CO_{2e} | Biogenic CO_{2e} |
|-----------------------------------|-------------------------------------|--------------|-------------|---------------|-----------------------|-----------------------|-------------|------------------------|-------------------------|--------------------------------------|---------------------------------|
| ES-1 | One (1) Engine - Caterpillar G3520C | 18.96 | 0.30 | 53.88 | 0.98 | 10.77 | 2.38 | 2.38 | 2.38 | 55.5 | 14,374 |
| ES-2 | One (1) Engine - Caterpillar G3520C | 18.96 | 0.30 | 53.88 | 0.98 | 10.77 | 2.38 | 2.38 | 2.38 | 55.5 | 14,374 |
| Facility Total (Unlimited) | | 37.92 | 0.60 | 107.76 | 1.96 | 21.54 | 4.76 | 4.76 | 4.76 | 111 | 28,748 |
| Facility Total (Limited) | | 33.03 | 0.52 | 93.84 | 1.71 | 18.76 | 4.15 | 4.15 | 4.15 | 111 | 27,822 |

Notes:

- Not Applicable
- 1. See the attached emissions calculations and modeling for additional information.
- 2. Insignificant sources are not included in Table B.

For the purposes of this application, potential and actual emissions are considered to be the same since the Landfill will continue to increase LFG collection and the goal will be to maximize the operation of the engine gensets for power production.

COMPLIANCE PLAN AND SCHEDULE

The renewable energy facility is new. Therefore, a Compliance Plan and Compliance Schedule are not required.

CONTROL DEVICES

The renewable energy facility engine generators do not have control devices. The engine generators will act as the primary control device(s) for the Landfill's collected LFG. As such, WVDEQ Control Device forms were not included in this Application under Attachment M.

CONFIDENTIAL DATA

No parts of this Application are being considered confidential. As such, WVDEQ Business Confidential forms were not included in this Application under Attachment Q.

APPLICATION FEE

An application fee of \$1,000 has been included with this Application per WVDEQ Air Permit Application Instructions for NSR 45CSR13 applications. If additional fees are needed, please contact SIES.

SECTION B

WVDEQ NSR AIR CONSTRUCTION PERMIT APPLICATION FORMS



WEST VIRGINIA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY

601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
www.dep.wv.gov/daq

**APPLICATION FOR NSR PERMIT
AND
TITLE V PERMIT REVISION
(OPTIONAL)**

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

- ☒ **CONSTRUCTION** ☐ **MODIFICATION** ☐ **RELOCATION**
☐ **CLASS I ADMINISTRATIVE UPDATE** ☐ **TEMPORARY**
☐ **CLASS II ADMINISTRATIVE UPDATE** ☐ **AFTER-THE-FACT**

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

- ☐ **ADMINISTRATIVE AMENDMENT** ☐ **MINOR MODIFICATION**
☐ **SIGNIFICANT MODIFICATION**

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant (as registered with the WV Secretary of State's Office):

SEVEN ISLANDS ENVIRONMENTAL SOLUTIONS, LLC

2. Federal Employer ID No. (**FEIN**):

47-3963320

3. Name of facility (if different from above):

NEW RIVER CLEAN ENERGY FACILITY

4. The applicant is the:

☐ **OWNER** ☐ **OPERATOR** ☒ **BOTH**

5A. Applicant's mailing address:

6205 PEACHTREE DUNWOODY ROAD, ATLANTA, GA 30328

5B. Facility's present physical address:

200 FERNANDEZ DRIVE, BECKLEY, WV 25801

6. **West Virginia Business Registration.** Is the applicant a resident of the State of West Virginia? ☐ **YES** ☒ **NO**

- If **YES**, provide a copy of the **Certificate of Incorporation/Organization/Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A**.
- If **NO**, provide a copy of the **Certificate of Authority/Authority of L.L.C./Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A**. **SEE ATTACHED COA IN ATTACHMENT A**

7. If applicant is a subsidiary corporation, please provide the name of parent corporation: **COX CORPORATE SERVICES, INC.**

8. Does the applicant own, lease, have an option to buy or otherwise have control of the *proposed site*? ☒ **YES** ☐ **NO**

- If **YES**, please explain: **SEIS WILL LEASE PROPERTY FROM THE RALEIGH COUNTY SOLID WASTE AUTHORITY FOR THIS PROJECT.**
- If **NO**, you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.):

Renewable Energy Generation Facility – landfill gas fueled electric generators

10. North American Industry Classification System (**NAICS**) code for the facility:

221118 – OTHER ELECTRIC POWER GENERATION

11A. DAQ Plant ID No. (for existing facilities only):

–

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

- 12A. For **Modifications, Administrative Updates** or **Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;
- For **Construction** or **Relocation permits**, please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B**.

Directions to SEIS FACILITY from Route 19

- Take the North Beckley Exit off Route 19. Last exit before the toll plaza.
- At the bottom of the ramp, at the light, turn left onto Robert C. Byrd Drive.
- Turn left onto Ragland Road.
- Go approximately 1 1/2 miles out Ragland Road.
- Follow the signs to Landfill/Recycling entrance via Fernandez Drive.
- The SEIS Facility is located approximately 0.25 miles from the entrance and beside the Landfill blower/flare station and maintenance shop.

| | | |
|--|--|--------------------------------|
| 12.B. New site address (if applicable): NEW RIVER CLEAN ENERGY FACILITY 200 FERNANDEZ DRIVE, BECKLEY, WV 25801 | 12C. Nearest city or town: BECKLEY | 12D. County: RALEIGH |
| 12.E. UTM Northing (KM): N4186.39 | 12F. UTM Easting (KM): E485.50 | 12G. UTM Zone: 17 |

13. Briefly describe the proposed change(s) at the facility:
Installation of a new landfill gas renewable energy facility consisting of two (2) engine gensets.

| | |
|--|---|
| 14A. Provide the date of anticipated installation or change: 06/01/2016 – If this is an After-The-Fact permit application, provide the date upon which the proposed change did happen: / / | 14B. Date of anticipated Start-Up if a permit is granted: 10/01/2016 |
|--|---|

- 14C. Provide a **Schedule** of the planned **Installation** of/**Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved). **SEE ATTACHED**

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:
Hours Per Day **24** Days Per Week **7** Weeks Per Year **52**

16. Is demolition or physical renovation at an existing facility involved? ☐ **YES** ☒ **NO**

17. **Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18. **Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process (*if known*). A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance (*if known*). Provide this information as **Attachment D**. **SEE ATTACHED**

Section II. Additional attachments and supporting documents.

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13). **SEE ATTACHED**

20. Include a **Table of Contents** as the first page of your application package. **SEE ATTACHED**

21. Provide a **Plot Plan**, e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as **Attachment E** (Refer to **Plot Plan Guidance**) .

- Indicate the location of the nearest occupied structure (e.g. church, school, business, residence). **SEE ATTACHED**

22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F**. **SEE ATTACHED**

23. Provide a **Process Description** as **Attachment G. SEE ATTACHED**
 – Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).
All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H.**
 – For chemical processes, provide a MSDS for each compound emitted to the air. **SEE ATTACHED**

25. Fill out the **Emission Units Table** and provide it as **Attachment I. SEE ATTACHED**

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J. SEE ATTACHED**

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K. SEE ATTACHED**

28. Check all applicable **Emissions Unit Data Sheets** listed below:

| | | |
|--|--|--|
| <input type="checkbox"/> Bulk Liquid Transfer Operations | <input type="checkbox"/> Haul Road Emissions | <input type="checkbox"/> Quarry |
| <input type="checkbox"/> Chemical Processes | <input type="checkbox"/> Hot Mix Asphalt Plant | <input type="checkbox"/> Solid Materials Sizing, Handling and Storage Facilities |
| <input type="checkbox"/> Concrete Batch Plant | <input type="checkbox"/> Incinerator | <input type="checkbox"/> Storage Tanks |
| <input type="checkbox"/> Grey Iron and Steel Foundry | <input type="checkbox"/> Indirect Heat Exchanger | |

☒ General Emission Unit, specify **Engine Gensets**

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L.**

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

| | | |
|---|---|--|
| <input type="checkbox"/> Absorption Systems | <input type="checkbox"/> Baghouse | <input type="checkbox"/> Flare |
| <input type="checkbox"/> Adsorption Systems | <input type="checkbox"/> Condenser | <input type="checkbox"/> Mechanical Collector |
| <input type="checkbox"/> Afterburner | <input type="checkbox"/> Electrostatic Precipitator | <input type="checkbox"/> Wet Collecting System |

☐ Other Collectors, specify

NOT APPLICABLE – ENGINE GENSETS DO NOT HAVE CONTROL DEVICES

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M.**

30. Provide all **Supporting Emissions Calculations** as **Attachment N**, or attach the calculations directly to the forms listed in Items 28 through 31. **SEE ATTACHED**

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O.**
 ➤ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and **Example Legal Advertisement** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?
☐ YES ☒ NO
 ➤ If **YES**, identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's **"Precautionary Notice – Claims of Confidentiality"** guidance found in the **General Instructions** as **Attachment Q.**

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

| | |
|---|---|
| <input checked="" type="checkbox"/> Authority of Corporation or Other Business Entity | <input type="checkbox"/> Authority of Partnership |
| <input type="checkbox"/> Authority of Governmental Agency | <input type="checkbox"/> Authority of Limited Partnership |

Submit completed and signed **Authority Form** as **Attachment R. SEE ATTACHED**

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned ☒ **Responsible Official** / ☐ **Authorized Representative**, hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE _____

(Please use blue ink)

DATE: _____

(Please use blue ink)

35B. Printed name of signee: **ROBERT FAIREY**

35C. Title: **VICE PRESIDENT**

35D. E-mail: **ROBERT.FAIREY@7IES.COM**

36E. Phone: **678-645-0634**

36F. FAX: **NA**

36A. Printed name of contact person (if different from above):

36B. Title:

36C. E-mail:

36D. Phone:

36E. FAX:

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

- | | |
|--|--|
| <input checked="" type="checkbox"/> Attachment A: Business Certificate | <input checked="" type="checkbox"/> Attachment K: Fugitive Emissions Data Summary Sheet |
| <input checked="" type="checkbox"/> Attachment B: Map(s) | <input checked="" type="checkbox"/> Attachment L: Emissions Unit Data Sheet(s) |
| <input checked="" type="checkbox"/> Attachment C: Installation and Start Up Schedule | <input type="checkbox"/> Attachment M: Air Pollution Control Device Sheet(s) |
| <input checked="" type="checkbox"/> Attachment D: Regulatory Discussion | <input checked="" type="checkbox"/> Attachment N: Supporting Emissions Calculations |
| <input checked="" type="checkbox"/> Attachment E: Plot Plan | <input checked="" type="checkbox"/> Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans |
| <input checked="" type="checkbox"/> Attachment F: Detailed Process Flow Diagram(s) | <input checked="" type="checkbox"/> Attachment P: Public Notice |
| <input checked="" type="checkbox"/> Attachment G: Process Description | <input type="checkbox"/> Attachment Q: Business Confidential Claims |
| <input checked="" type="checkbox"/> Attachment H: Material Safety Data Sheets (MSDS) | <input checked="" type="checkbox"/> Attachment R: Authority Forms |
| <input checked="" type="checkbox"/> Attachment I: Emission Units Table | <input type="checkbox"/> Attachment S: Title V Permit Revision Information |
| <input checked="" type="checkbox"/> Attachment J: Emission Points Data Summary Sheet | <input checked="" type="checkbox"/> Application Fee |

Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.

FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:

- ☐ Forward 1 copy of the application to the Title V Permitting Group and:
- ☐ For Title V Administrative Amendments:
- ☐ NSR permit writer should notify Title V permit writer of draft permit,
- ☐ For Title V Minor Modifications:
- ☐ Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,
- ☐ NSR permit writer should notify Title V permit writer of draft permit.
- ☐ For Title V Significant Modifications processed in parallel with NSR Permit revision:
- ☐ NSR permit writer should notify a Title V permit writer of draft permit,
- ☐ Public notice should reference both 45CSR13 and Title V permits,
- ☐ EPA has 45 day review period of a draft permit.

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

ATTACHMENT A
BUSINESS CERTIFICATE

State of West Virginia



Certificate

*I, Natalie E. Tennant, Secretary of State of the
State of West Virginia, hereby certify that*

SEVEN ISLANDS ENVIRONMENTAL SOLUTIONS, LLC

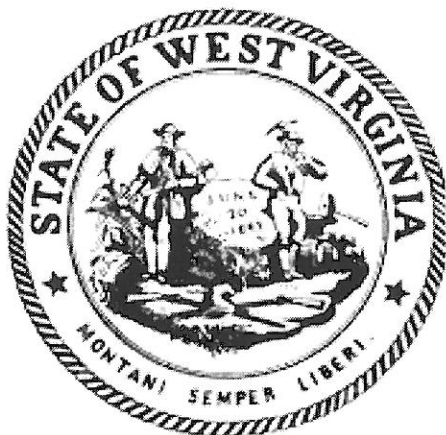
Control Number: 9AC8K

a limited liability company, organized under the laws of the State of Delaware
has filed its "Application for Certificate of Authority" in my office according to the provisions
of West Virginia Code §31B-10-1002. I hereby declare the organization to be registered as a
foreign limited liability company from its effective date of November 12, 2015, until a
certificate of cancellation is filed with our office.

Therefore, I hereby issue this

CERTIFICATE OF AUTHORITY OF A FOREIGN LIMITED LIABILITY COMPANY

to the limited liability company authorizing it to transact business in West Virginia



*Given under my hand and the
Great Seal of the State of
West Virginia on this day of
November 12, 2015*

Natalie E. Tennant

Secretary of State

FILED

NOV 12 2015

Natalie E. Tennant
West Virginia Secretary of State
1900 Kanawha Blvd. East
Bldg. 1, Suite 157-K
Charleston, WV 25305

IN THE OFFICE OF
WV SECRETARY OF STATE



Penney Barker, Manager
Business & Licensing Division
Tel: (304)558-8000
Fax: (304)558-8381
Website: www.wvsos.com
E-mail: business@wvsos.com

FILE ONE ORIGINAL
(Two if you want a filed stamped
copy returned to you.)

WEST VIRGINIA APPLICATION FOR
CERTIFICATE OF AUTHORITY OF
LIMITED LIABILITY COMPANY

Office Hours: Monday - Friday
8:30 a.m. - 5:00 p.m. EST

FILING FEE: \$150

* Fee Waived for Veteran-owned organization

Control # 9AC81K

*** The undersigned, having authority to transact business on behalf of a foreign (out-of-state) registered entity, agrees to ***
comply with the requirements of West Virginia Code §31B-10-1002 to apply for Certificate of Authority.

1. The name of the limited liability company as registered in its home state is: Seven Islands Environmental Solutions, LLC

and the State or Country of organization is: Delaware

☒ CHECK HERE to indicate you have obtained and submitted with this application a CERTIFICATE OF EXISTENCE (GOOD STANDING), dated during the current tax year, from your home state of original formation as required to process your application. The certificate may be obtained by contacting the Secretary of State's Office in the home state of original formation.

2. The business name to be used in West Virginia will be: [The name must contain one of the required terms such as "limited liability company" or abbreviations such as "LLC" or "PLLC." See instructions for complete list of acceptable terms and requirements for use of Trade Name.]

☒ Home State name as listed in Section 1. above, if available in West Virginia
(If name is not available, check DBA Name box below and follow special instructions in Section 2. attached.)

☐ DBA Name _____

(See special instructions in Section 2. regarding the Letter of Resolution attached to this application. [Click here](#) to see a sample Letter of Resolution.)

3. The company will be a: [See instructions for limitations on professions which may form P.L.L.C. in WV. All members must have WV professional license. See (*) note at the right.]

☒ regular LLC

☐ Professional LLC* for the profession of: _____

* In most cases, a Letter of Authorization/Approval from the appropriate State Licensing Board is required to process the application. See attached instructions.

4. The address of the principal office of the company will be:

Street: 6205 Peachtree Dunwoody Road

City: Atlanta State: GA Zip Code: 30328

County: Dekalb

Street: _____

City: _____ State: _____ Zip Code: _____

Street: _____

City: _____ State: _____ Zip Code: _____

County: _____

Located in the County of (required): _____

The mailing address of the above location, if different, will be:

5. The address of the initial designated (physical) office of the company in West Virginia, if any, will be:

Located in the County of: _____

WEST VIRGINIA APPLICATION FOR CERTIFICATE OF AUTHORITY OF LIMITED LIABILITY COMPANY

Page 2

5. (Continued from previous page....)

The mailing address of the above location, if different, will be:

Street: _____
City: _____ State: _____ Zip Code: _____

6. Agent of Process:
may be sent, if any, will be:

Name: Corporation Service Company
Street: 209 West Washington Street
City: Charleston State: WV Zip Code: 25302

7. E-mail address where business correspondence may be received: _____

8. Website address of the business, if any (ex: yourdomainname.com): _____

9. Do you own or operate more than one business in West Virginia? ☐ Yes * Answer a. and b. below. ☒ No ☐ Decline to answer

If "Yes"... a. How many businesses? _____ b. Located in how many West Virginia counties? _____

10. The company is: ☒ an AT-WILL company, conducting business for an indefinite period.
☐ a TERM company, conducting business for the term of _____ years.

11. The company is: ☒ MEMBER-MANAGED [List the names and addresses of all members below.]
☐ MANAGER-MANAGED [List the names and addresses of all managers below.]

List the name(s) and address(es) of the Member(s)/Manager(s) of the company (required; attach additional pages if necessary):

| Name | No. & Street Address | City | State | Zip Code |
|------------------------------|------------------------------|---------|-------|----------|
| Cox Corporate Services, Inc. | 6205 Peachtree Dunwoody Road | Atlanta | GA | 30328 |

12. All or specified members of a limited liability company are liable in their capacity as members for all or specified debts, obligations or liabilities of the company (required): ☒ No - All debts, obligations and liabilities are those of the company.
☐ Yes - Those persons who are liable in their capacity as members for all debts, obligations or liability of the company have consented in writing to the adoption of the provision or to be bound by the provision.

13. The purpose(s) for which this limited liability company is formed is as follows:
[Describe the type(s) of business activity which will be conducted, for example, "real estate," "construction of residential and commercial buildings," "commercial painting," "professional practice of law" (see Section 2. for acceptable "professional" business activities). Purpose may conclude with words "...including the transaction of any or all lawful business for which corporations may be incorporated in West Virginia."]

Environmental tech company

14. Is the business a Scrap Metal Dealer?

☐ Yes [If "Yes," you must complete the Scrap Metal Dealer Registration Form (Form SMD-1) and proceed to Section 15.]
☒ No [Proceed to Section 15.]

WEST VIRGINIA APPLICATION FOR CERTIFICATE OF AUTHORITY OF LIMITED LIABILITY COMPANY

Page 3

15. Other provisions which may be set forth in the operating agreement or matters not inconsistent with law:
[See instructions for further information; use extra pages if necessary.]

16. The number of pages attached and included in these Articles is: _____

17. The requested effective date is:

[Requested date *may not be earlier than filing nor later than 90 days after filing in our office.*]

☒ the date and time of filing in the Secretary of State's Office.

☐ the following date _____ and time _____

18. Is the organization a "veteran-owned" organization?

Effective JULY 1, 2015, to meet the requirements for a "veteran-owned" organization, the entity filing the registration must meet the following criteria per West Virginia Code §59-1-2a:

1. A "veteran" must be honorably discharged or under honorable conditions, and
2. A "veteran-owned business" means a business that meets one of the following criteria:
 - o Is at least fifty-one percent (51%) unconditionally owned by one or more veterans; or
 - o In the case of a publicly owned business, at least fifty-one percent (51%) of the stock is unconditionally owned by one or more veterans.

☐ Yes (If "Yes," attach Form DD214)

☒ No

☐ CHECK BOX indicating you have attached Veteran Affairs Form DD214

You may obtain a copy
of your Veterans Affairs
Form DD214 by
contacting:

National Personnel Records Center
Military Personnel Records
1 Archives Drive
St. Louis, MO 63138
Toll free: 1-86-NARA-NARA or 1-866-272-6272
Phone: 314-801-0800
www.archives.gov/veterans/military-service-records

Per WV Code §59-1-2(i) effective July 1, 2015, the registration fee is waived for entities that meet the requirements as a "veteran-owned" organization. See attached instructions to determine if the organization qualifies for this waiver. In addition, a "veteran-owned" entity will have four (4) consecutive years of Annual Report fees waived AFTER the organization's initial formation [see WV Code §59-1-2a(m)].

19. Contact and Signature Information* (See below Important Legal Notice Regarding Signature):

a. Contact person to reach in case there is a problem with filing: Barbara Williamson

Phone: 678-645-0841

b. Print or type name of signer: Charles N. Bowen

Title/Capacity of signer: Assistant Secretary

c. Signature: Charles N. Bowen

Date: 11/11/2015

*Important Legal Notice Regarding Signature: Per West Virginia Code §31B-2-209. Liability for false statement in filed record. If a record authorized or required to be filed under this chapter contains a false statement, one who suffers loss by reliance on the statement may recover damages for the loss from a person who signed the record or caused another to sign it on the person's behalf and knew the statement to be false at the time the record was signed.

Important Note: This form is a public document. Please do NOT provide any personal identifiable information on this form such as social security number, bank account numbers, credit card numbers, tax identification or driver's license numbers.

Reset Form

Print Form

Delaware

The First State

Page 1

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY "SEVEN ISLANDS ENVIRONMENTAL SOLUTIONS, LLC" IS DULY FORMED UNDER THE LAWS OF THE STATE OF DELAWARE AND IS IN GOOD STANDING AND HAS A LEGAL EXISTENCE SO FAR AS THE RECORDS OF THIS OFFICE SHOW, AS OF THE ELEVENTH DAY OF NOVEMBER, A.D. 2015.

AND I DO HEREBY FURTHER CERTIFY THAT THE SAID "SEVEN ISLANDS ENVIRONMENTAL SOLUTIONS, LLC" WAS FORMED ON THE SIXTH DAY OF MAY, A.D. 2015.

AND I DO HEREBY FURTHER CERTIFY THAT THE ANNUAL TAXES HAVE BEEN PAID TO DATE.



5742144 8300

SR# 20150877719

You may verify this certificate online at corp.delaware.gov/authver.shtml

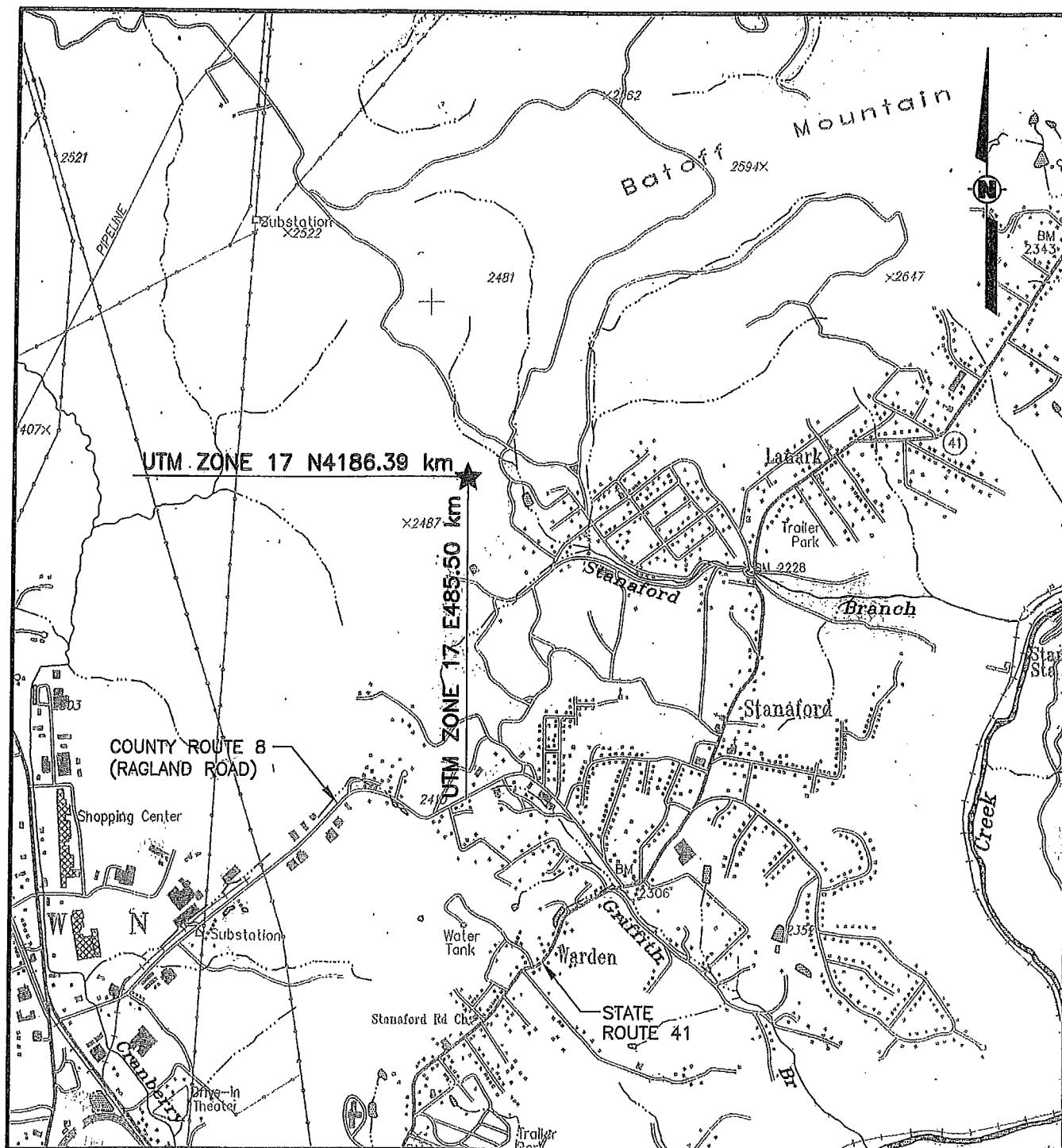
A handwritten signature in black ink, appearing to read "JBULLOCK", is written over a horizontal line. Below the line, the text "Jeffrey W. Bullock, Secretary of State" is printed in a small font.

Authentication: 10403452

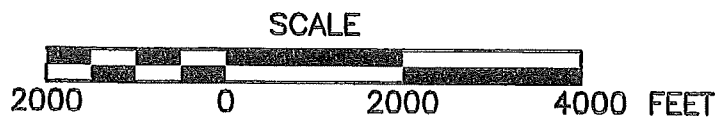
Date: 11-11-15

ATTACHMENT B

MAPS



REFERENCE:
 TOPOGRAPHIC 7.5 MIN.
 QUADRANGLE OF BECKLEY
 W.Va. 1969 (PHOTO REVISED 1989)



ATTACHMENT C
INSTALLATION AND START-UP SCHEDULE

SCHEDULE

The following schedule is estimated based on Seven Island's Environmental Solutions projections, permit issuance, electrical interconnections, equipment availability, weather, and other factors.

February 2016 – All permit applications submitted

March 2016 – Site work begins

June 2016 – Engine equipment arrives at the site and installation begins

October 2016 – Engine start-up and testing

November 2016 – Electrical power production begins and full operation

ATTACHMENT D
REGULATORY DISCUSSION

REGULATORY APPLICABILITY SUMMARY

- 1) 40 CFR 60, Subpart A – Standards of Performance for New Stationary Sources-General Provisions

The facility is considered to be a new stationary source under 40 CFR 60 Subpart A and is subject to the applicable conditions listed under Section 60.1 through 60.18.

- 2) 40 CFR 60 Subpart JJJJ - Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

SIES plans to install two (2) Caterpillar Internal Combustion Engines (Model No. G3520C). The specifications which determine the engine's subjectivity to the NSPS include spark ignition, engine power, displacement, use of landfill gas as fuel, and date of manufacture. The engine must meet emissions standards contained in Subpart JJJJ as applicable based on the unit specifications. The engine is subject to specified maintenance, testing, reporting and recordkeeping requirements in order to demonstrate compliance with 40 CFR 60 Subpart JJJJ, as applicable.

- 3) 40 CFR 60 Subpart WWW - Standards of Performance for Municipal Solid Waste Landfills

The Landfill is subject to the NSPS as listed under 40 CFR 60 Subpart WWW in applicable Sections 60.750 through Section 60.759; however, the landfill does not have non-methane organic compound (NMOC) emissions exceeding 50 MG at this time and therefore the LFG collection and control system is voluntary. The SIES LFGTE facility will not be subject to the requirements of Subpart WWW since the Authority will install a LFG treatment system prior to sale of LFG to SIES. A treatment system has been installed to process landfill gas before entering the engine generators. The treatment system will meet the requirements of the NSPS 40 CFR 60.752(b)(2)(iii)(c) (Treatment Rule) for treating collected landfill gas prior to combustion. In detailing options for controlling landfill gas emissions, the Treatment Rule states *"Route the collected gas to a treatment system that processes the collected gas for subsequent sale or use."* Therefore, the two (2) engines are not subject to the requirements of 40 CFR 60 Subpart WWW. The treatment system itself will produce no air pollutant emissions, therefore is not required to be included in the SIES or Landfill air permit as regulated equipment.

- 4) 40 CFR 63, Subpart A – National Emission Standards for Hazardous Air Pollutants for Source Categories-General Provisions

The LFGTE engines have the potential to emit HAPs, therefore the facility is subject to 40 CFR 63, Subpart A. The applicable provisions are in Sections 63.1 through 63.16.

- 5) 40 CFR 63, Subpart AAAA – National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills

The facility is subject to 40 CFR 63, Subpart AAAA as listed in Sections 63.1930 through 63.1990.

- 6) 40 CFR 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

The two (2) internal combustion engines are subject to 40 CFR 63, Subpart ZZZZ under applicable provisions in Sections 63.6580 through 63.6675 due to being located at the Landfill, which is considered an area source for hazardous air pollutants.

Greenhouse Gas (GHG) Emissions

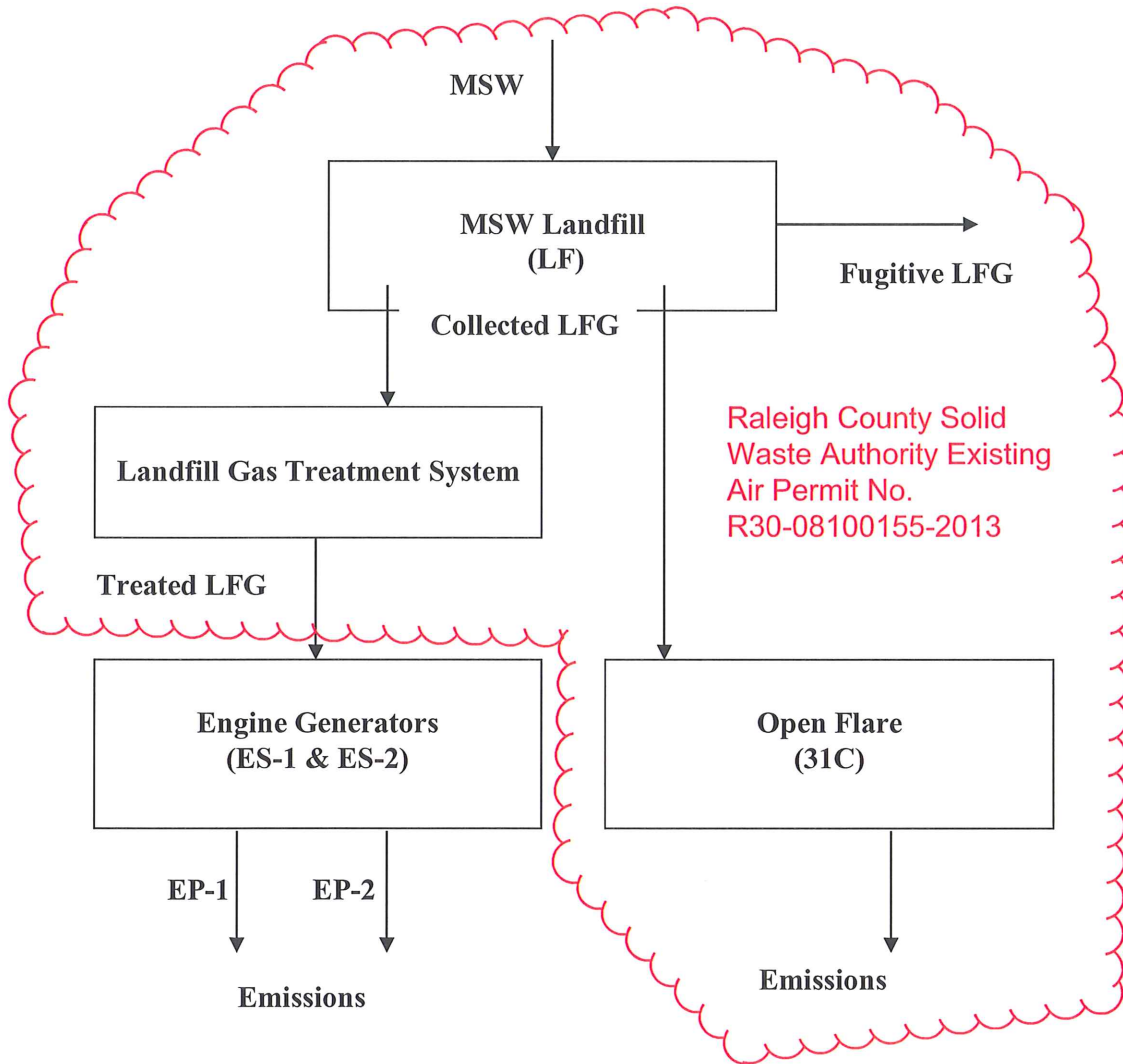
Based on the recent U.S. Supreme Court case, UARG v. EPA, 134 S. Ct. 2427 (2014), greenhouse gas emissions do not trigger major source status for either the Title V or PSD air permitting programs; however, the GHG emissions have been calculated and are included in the Application.

ATTACHMENT E

PLOT PLAN

ATTACHMENT F
PROCESS FLOW DIAGRAM

FLOW DIAGRAM



Note: Insignificant sources and activities are not shown on these flow diagrams.

ATTACHMENT G
PROCESS DESCRIPTION

PROCESS DESCRIPTION

Seven Islands Environmental Solutions, LLC (SIES) is proposing to install two (2) Caterpillar Model G3520c engine/generators to combust landfill gas captured from the landfill gas collection and control system at the Raleigh County Solid Waste Authority Landfill and to generate electricity (“green power”). The project will be operated under the name “New River Clean Energy Facility”. The proposed project includes routing gas from the existing LFG blower/treatment system, where an existing LFG open flare is used to combust collected LFG, to the new engine/generator plant. SIES will lease land from the Authority to construct a building to house the engine gensets. Each engine will have an individual exhaust stack. Additional infrastructure will include electrical equipment and minor engine maintenance equipment.

Once installed, the primary combustion device for the Landfill’s collected LFG will be the SIES engine generators with the Landfill’s existing 1,200 SCFM LFG open flare serving as a back-up control device. The Landfill has a finite amount of available landfill gas to utilize and this project will reduce the amount of LFG being combusted in the Authority’s open flare and will move this combustion to the engines where beneficial electricity will be produced. No modifications will be made to the Authority’s existing equipment or air permit.

ATTACHMENT H

MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet (MSDS)

Section I

Product Name: MSW Landfill Gas Company Name: _____
Product Code: LFG-001 Emergency Telephone Number: _____
Chemical Name and Synonyms: LFG, Biogas Information Telephone Number: _____
Landfill Name: _____ Landfill Telephone Number: _____
Address: _____
City: _____ State: _____ Zip Code: _____

Section II – Hazardous Ingredients

| | % (VOL) | TLV | PEL | Units |
|--|------------|------|------|-------|
| Methane (Methyl Hydride) CAS# 74-82-8 | 40 – 65 | A* | NE | NA |
| Carbon Dioxide CAS# 124-38-9 | 35 – 50 | 5000 | 5000 | PPM |
| Nitrogen CAS# 7727-37-9 | 0 – 25 | A* | NE | NA |
| Oxygen CAS# 7782-44-7 | 0 – 6 | NE | NE | NA |
| Ethane (Methyl Methane) CAS# 74-84-0 | <1 | A* | NE | NA |
| Hydrogen Sulfide (Sulfuretted Hydrogen) CAS# 7783-06-4 | <1 | 10 | 20** | PPM |

* Classified as a "Simple Asphyxiant"

** Ceiling Concentration

Landfill Gas may also contain trace quantities (<0.1%) of various gases not listed above. Absolute concentrations vary by site and with time.

Section III – Physical Data

Boiling Point (°F): < -50 Specific Gravity (Water = 1): NA
Vapor Pressure (mm Hg): NE Percent Volatile by Volume (%): 100
Vapor Density (Air = 1): 0.89 – 1.09 pH: NA
Solubility in Water: Appreciable Evaporation Rate: NA
Appearance and Odor: Colorless Gas; Characteristic Odor, H₂S has a "rotten egg" odor

Section IV – Fire and Explosion Hazard Data

Flash Point (°F): < 0 Flammable Limits (% as Methane): LEL: 5 UEL: 15
Extinguishing Media: Carbon Dioxide or Dry Chemical
Special Fire Fighting Procedures: Use water spray or fog to cool fire-exposed containers.

Unusual Fire & Explosion Hazards:

May reignite explosively if fire is extinguished before stopping leak.

Section V – Health Hazards

Simple Asphyxiants

Most of the gases that comprise Landfill Gas can create an asphyxiation hazard when present at typical Landfill Gas concentrations because these gases reduce the concentration of oxygen inhaled. Depending on the concentration of the Landfill Gas in the air that is inhaled symptoms may include nausea, headache, accelerated heartbeat, intermittent respiration, rapid fatigue, poor muscular coordination, vomiting, spasmodic breathing, convulsive movements, unconsciousness, or death in minutes.

Methane

Simple asphyxiant – effects similar to above.

Carbon Dioxide

Simple asphyxiant – effects similar to above. Lower concentrations may cause dizziness, mental depression, visual disturbances, or shaking.

Nitrogen

Simple asphyxiant – effects similar to above. In severe cases abnormally low blood pressure, apnea, and cardiac arrest develop. Various disturbances including mood disturbances, numbness of the extremities, sleepiness, mental confusion, and memory loss may occur. Prolonged or severe hypoxia results in unconsciousness. Prolonged asphyxia may produce CNS injury. Cerebral edema with brainstem herniation may occur.

Oxygen

Atmospheres with oxygen concentrations below 19.5 percent can have adverse physiological effects, fatigue, faster and deep breathing, dizziness, buzzing in the ears, or rapid heartbeat. Atmospheres with less than 16 percent oxygen can become life threatening, loss of consciousness with prolonged exposure, convulsive movements, or death.

Ethane

Simple asphyxiant – effects similar to above. In addition, ethane can be an irritant at high concentrations and may be a depressant of the central nervous system.

Hydrogen Sulfide

Inhalation of hydrogen sulfide may result in upper airway irritation at concentrations above 5 PPM. Low-level exposure can cause eye pain and redness, dizziness, nausea, and headache. Exposure to 50 PPM or higher may cause pulmonary edema or bronchitis. Exposure to 300 PPM is immediately dangerous to life and health. Exposure to high levels of hydrogen sulfide may cause convulsions, respiratory arrest, permanent brain damage, heart failure, or immediate death. In addition, cardiac effects including bradycardia, myocarditis, and conduction defects have been reported. Amnesia, delirium and hallucinations may also occur after exposure to high levels.

Skin Contact: May result in irritation, severe pain, itching, and erythema.

Eye Contact: At concentrations above 50 PPM can cause conjunctivitis with pain and vision disturbance. Erosion of the cornea may occur with very high exposures but this is usually reversible.

Chronic Effects: Repeated exposures to the mixture may reduce the threshold of exposure at which symptoms occur. Neurologic effects such as headache and insomnia have been reported.

Emergency First Aid Procedures

Inhalation: Remove to fresh air. Perform cardio-pulmonary resuscitation (CPR) if patient is not breathing or if there is no pulse. Administer oxygen if possible by trained personnel. Seek medical attention if patient is/has been unconscious or experiences difficulty in breathing.

Skin contact: After removing contaminated clothing, wash affected area thoroughly with soap and water. Seek medical attention if irritation develops or persists.

Eye contact: Flush eyes and eyelids thoroughly under gently running water for at least 15 minutes. Seek medical attention if irritation develops or persists.

Ingestion: NA (Is a gas at room temperature, making ingestion unlikely).

Section VI – Reactivity Data

Stability: Normally stable. Avoid heat, sparks and open flame.

Incompatible Materials: Oxidizers

Hazardous Decomposition Products: Combustion may produce carbon monoxide, carbon dioxide, ethylene, and acetylene.

Section VII – Spill or Leak Procedures

Procedures: Evacuate immediate area.

Remove all ignition sources and stop leak if you can do so from a safe area without risk.

If possible, provide explosion-proof ventilation from a safe area.

Do not approach the area of the leak unless testing shows that the oxygen concentration is greater than 19.5%, the methane concentration is less than 10% of the LEL, and the concentrations of the indicated compounds are less than their respective TLV/PEL. Do not rely on sense of smell for hydrogen sulfide release.

Wear a NIOSH/MSHA approved self-contained breathing apparatus (SCBA) and other protective equipment if entering an unknown atmosphere or where testing shows that the oxygen concentration is less than 19.5% or the concentrations of the indicated compounds are greater than their respective TLV/PEL. Place SCBA in positive pressure mode if the hydrogen sulfide concentration exceeds 300 PPM or the concentration is unknown. Do not rely on sense of smell for hydrogen sulfide release.

Use only non-sparking tools and intrinsically safe or explosion-proof (Class I, Div. I, Group D) equipment in areas where the methane concentration is unknown or greater than 10% of the LEL.

Test atmosphere periodically in the area of the leak and adjust use of PPE as detailed above until the leak is repaired and the area is determined by testing to be safe. Do not rely on sense of smell for hydrogen sulfide release.

Waste disposal Method: Burn through a flare stack or vent in accordance with Federal, State and Local regulations.

Section VIII – Special Protection Information

Respiratory: Test atmosphere periodically. Wear a NIOSH/MSHA approved self-contained breathing apparatus (SCBA) and other protective equipment where concentrations exceed the TLV/PEL for the indicated compounds, when the oxygen concentration is below 19.5%, or when working in unknown atmospheres. Place SCBA in positive pressure mode if the hydrogen sulfide concentration exceeds 300 PPM or the concentration is unknown. Do not rely on sense of smell for hydrogen sulfide release.

Eyewear: Avoid direct contact with eyes. Wear protective eyewear.

Clothing / Gloves: Avoid direct physical contact. Wear protective gloves and clothing to prevent skin exposure.

Tools / Equipment: Use only non-sparking tools and intrinsically safe or explosion-proof (Class I, Div. I, Group D) equipment in areas where the methane concentration is unknown or greater than 10% of the LEL.

Ventilation: Use adequate ventilation to maintain oxygen concentration above 19.5%, methane concentration less than 10% of the LEL, and other exposures to below TLV/PEL exposure limits. Supervisory or Health/Safety personnel should address specific needs.

Section IX – Special Precautions

Toxic and flammable, do not breathe Landfill Gas. Bond and ground all lines and equipment used with gas to prevent static sparks. Keep away from heat, sparks, and flames. Use only in well ventilated area. Do not smoke where Landfill Gas is used or stored. Test atmosphere periodically for oxygen, methane, carbon dioxide, and hydrogen sulfide. Do not rely on sense of smell for detecting hydrogen sulfide release. A 19.5% oxygen concentration in air is the minimum recommended for working without special breathing equipment. This product does not contain any carcinogens (at 0.1% concentration or greater) as defined by IARC, NTP or OSHA.

The information contained herein has been developed based upon current available scientific data. New information may be developed from time to time which may render the conclusions of this report obsolete. Therefore, no warranty is extended as to the applicability of this information to the user's intended purpose or for the consequences of its use or misuse.

ATTACHMENT I
EMISSION UNIT TABLE

Attachment I

Emission Units Table

(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

[illegible]

¹ For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S,... or other appropriate designation.

² For Emission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation.

³ New, modification, removal

⁴ For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

ATTACHMENT J

EMISSION POINTS DATA SUMMARY SHEET

Attachment J

EMISSION POINTS DATA SUMMARY SHEET

| Table 1: Emissions Data | | | | | | | | | | | | | | | |
|---|----------------------------------|---|-------------|--|-------------|---|-----|--|---|--------|---|--------|---|-------------------------------|--|
| Emission Point ID No. <i>(Must match Emission Units Table & Plot Plan)</i> | Emission Point Type ¹ | Emission Unit Vented Through This Point <i>(Must match Emission Units Table & Plot Plan)</i> | | Air Pollution Control Device <i>(Must match Emission Units Table & Plot Plan)</i> | | Vent Time for Emission Unit <i>(chemical processes only)</i> | | All Regulated Pollutants - Chemical Name/CAS ³ <i>(Speciate VOCs & HAPS)</i> | Maximum Potential Uncontrolled Emissions ⁴ | | Maximum Potential Controlled Emissions ⁵ | | Emission Form or Phase <i>(At exit conditions, Solid, Liquid or Gas/Vapor)</i> | Est. Method Used ⁶ | Emission Concentration ⁷ (ppmv or mg/m ⁴) |
| | | | | | | | | | lb/hr | ton/yr | lb/hr | ton/yr | | | |
| ID No. | Source | ID No. | Device Type | Short Term ² | Max (hr/yr) | | | | | | | | | | |
| EP-1 | Horz. Stack | ES-1 | Gen 1 | C-1 | Engine | N/A | N/A | See attached Calculations | | | | Gas | EE and Vendor Factors | See Attached Calculations | |
| EP-2 | Horz. Stack | ES-2 | Gen 2 | C-2 | Engine | N/A | N/A | See attached Calculations | | | | Gas | EE and Vendor Factors | See Attached Calculations | |

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

¹ Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

² Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

³ List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. **DO NOT LIST** H₂, H₂O, N₂, O₂, and Noble Gases.

⁴ Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

⁵ Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

⁶ Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

⁷ Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m³) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO₂, use units of ppmv (See 45CSR10).

Attachment J

EMISSION POINTS DATA SUMMARY SHEET

[illegible]

**** INFORMATION OBTAINED FROM CATERPILLAR SPECIFICATIONS**

¹ Give at operating conditions. Include inerts.

² Release height of emissions above ground level.

ATTACHMENT K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

| APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS |
|---|
| 1.) Will there be haul road activities? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET. |
| 2.) Will there be Storage Piles? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET. |
| 3.) Will there be Liquid Loading/Unloading Operations? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET. |
| 4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET. |
| 5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET. |
| 6.) Will there be General Clean-up VOC Operations? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET. |
| 7.) Will there be any other activities that generate fugitive emissions? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form. |
| If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary." |

| FUGITIVE EMISSIONS SUMMARY | All Regulated Pollutants - Chemical Name/CAS ¹ | Maximum Potential Uncontrolled Emissions ² | | Maximum Potential Controlled Emissions ³ | | Est. Method Used ⁴ |
|---|--|--|--------|--|--------|-------------------------------------|
| | | lb/hr | ton/yr | lb/hr | ton/yr | |
| Haul Road/Road Dust Emissions Paved Haul Roads | NOT APPLICABLE | | | | | |
| Unpaved Haul Roads | | | | | | |
| Storage Pile Emissions | | | | | | |
| Loading/Unloading Operations | | | | | | |
| Wastewater Treatment Evaporation & Operations | | | | | | |
| Equipment Leaks | | Does not apply | | Does not apply | | |
| General Clean-up VOC Emissions | | | | | | |
| Other | | | | | | |

¹ List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. DO NOT LIST H₂, H₂O, N₂, O₂, and Noble Gases.

² Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

³ Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

⁴ Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

ATTACHMENT L
EMISSION UNIT DATA SHEET

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): ES-1

| |
|--|
| <p>1. Name or type and model of proposed affected source:</p> <p>CATERPILLAR G3520C ENGINE GENSET</p> |
| <p>2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.</p> |
| <p>3. Name(s) and maximum amount of proposed process material(s) charged per hour:</p> <p>LANDFILL GAS - 6,509 BTU/BHP-HR @ 500 BTU/SCF GAS, PER CAT SPECIFICATIONS</p> |
| <p>4. Name(s) and maximum amount of proposed material(s) produced per hour:</p> <p>ELECTRICITY - 1,600 KW, PER CAT SPECIFICATIONS</p> |
| <p>5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:</p> <p>COMBUSTION OF LANDFILL GAS IN ENGINE GENERATOR</p> |

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

LANDFILL GAS - 473 SCFM AT 500 BTU LANDFILL GAS, PER CAT SPECIFICATIONS

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

LANDFILL GAS - SEE ATTACHED CALCULATIONS FOR ESTIMATED COMPOSITION.
ASSUMED: 50% METHANE, 40% CARBON DIOXIDE, 9% NITROGEN, 1% OXYGEN WITH TRACE AMOUNTS OF WATER VAPOR, VOCs, SULFURS, AND HAPS.
MAXIMUM SULFUR EXPECTED = 46.9 PPMV

(c) Theoretical combustion air requirement (ACF/unit of fuel):

4512 CFM @ 77 °F and 14.7 psia.

(d) Percent excess air: 40%

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

LANDFILL GAS ENGINE - 6,509 BTU/BHP-HR, PER CAT SPECIFICATIONS

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

COAL WILL NOT BE USED

(g) Proposed maximum design heat input: 14.2 × 10⁶ BTU/hr.

7. Projected operating schedule:

| | | | | | |
|-----------|----|-----------|---|------------|----|
| Hours/Day | 24 | Days/Week | 7 | Weeks/Year | 52 |
|-----------|----|-----------|---|------------|----|

| | | | |
|--|-------|--------|------------|
| 8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used: | | | |
| @ | 1,000 | °F and | 15 psia |
| a. NO _x | 2.46 | lb/hr | grains/ACF |
| b. SO ₂ | 0.22 | lb/hr | grains/ACF |
| c. CO | 12.30 | lb/hr | grains/ACF |
| d. PM ₁₀ | 0.54 | lb/hr | grains/ACF |
| e. Hydrocarbons | 0.07 | lb/hr | grains/ACF |
| f. VOCs | 4.33 | lb/hr | grains/ACF |
| g. Pb | 0 | lb/hr | grains/ACF |
| h. Specify other(s) | | | |
| SEE ATTACHED CALCS | | lb/hr | grains/ACF |
| | | lb/hr | grains/ACF |
| | | lb/hr | grains/ACF |
| | | lb/hr | grains/ACF |

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING

1. ENGINE HOUR METER
2. INLET GAS FLOW METER

RECORDKEEPING

1. ENGINE HOURS
2. INLET GAS FLOW
3. MAINTENANCE

REPORTING

STANDARD AIR COMPLIANCE REPORTING

TESTING

ENGINE WILL BE CERTIFIED FROM
MANUFACTURER

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

SEE CATERPILLAR G3520C ENGINE SPECIFICATIONS AND MAINTENANCE PROCEDURES

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): ES-2

| |
|--|
| <p>1. Name or type and model of proposed affected source:</p> <p>CATERPILLAR G3520C ENGINE GENSET</p> |
| <p>2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.</p> |
| <p>3. Name(s) and maximum amount of proposed process material(s) charged per hour:</p> <p>LANDFILL GAS - 6,509 BTU/BHP-HR @ 500 BTU/SCF GAS, PER CAT SPECIFICATIONS</p> |
| <p>4. Name(s) and maximum amount of proposed material(s) produced per hour:</p> <p>ELECTRICITY - 1,600 KW, PER CAT SPECIFICATIONS</p> |
| <p>5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:</p> <p>COMBUSTION OF LANDFILL GAS IN ENGINE GENERATOR</p> |

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

| | | | | | |
|--|----|-----------|--------|---------------------------|-------|
| 6. Combustion Data (if applicable): | | | | | |
| (a) Type and amount in appropriate units of fuel(s) to be burned: | | | | | |
| LANDFILL GAS - 473 SCFM AT 500 BTU LANDFILL GAS, PER CAT SPECIFICATIONS | | | | | |
| (b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash: | | | | | |
| LANDFILL GAS - SEE ATTACHED CALCULATIONS FOR ESTIMATED COMPOSITION. ASSUMED: 50% METHANE, 40% CARBON DIOXIDE, 9% NITROGEN, 1% OXYGEN WITH TRACE AMOUNTS OF WATER VAPOR, VOCS, SULFURS, AND HAPS. MAXIMUM SULFUR EXPECTED = 46.9 PPMV | | | | | |
| (c) Theoretical combustion air requirement (ACF/unit of fuel): | | | | | |
| 4512 CFM | @ | 77 | °F and | 14.7 | psia. |
| (d) Percent excess air: 40% | | | | | |
| (e) Type and BTU/hr of burners and all other firing equipment planned to be used: | | | | | |
| LANDFILL GAS ENGINE - 6,509 BTU/BHP-HR, PER CAT SPECIFICATIONS | | | | | |
| (f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired: | | | | | |
| COAL WILL NOT BE USED | | | | | |
| (g) Proposed maximum design heat input: | | | | | |
| | | | 14.2 | × 10 ⁶ BTU/hr. | |
| 7. Projected operating schedule: | | | | | |
| Hours/Day | 24 | Days/Week | 7 | Weeks/Year | 52 |

LANDFILL GAS - 473 SCFM AT 500 BTU LANDFILL GAS, PER CAT SPECIFICATIONS

LANDFILL GAS - SEE ATTACHED CALCULATIONS FOR ESTIMATED COMPOSITION.
 ASSUMED: 50% METHANE, 40% CARBON DIOXIDE, 9% NITROGEN, 1% OXYGEN WITH TRACE
 AMOUNTS OF WATER VAPOR, VOCs, SULFURS, AND HAPS.
 MAXIMUM SULFUR EXPECTED = 46.9 PPMV

4512 CFM @ 77 °F and 14.7 psia.

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

LANDFILL GAS ENGINE - 6,509 BTU/BHP-HR, PER CAT SPECIFICATIONS

COAL WILL NOT BE USED

(g) Proposed maximum design heat input: 14.2 $\times 10^6$ BTU/hr.

| | | | | | |
|-----------|----|-----------|---|------------|----|
| Hours/Day | 24 | Days/Week | 7 | Weeks/Year | 52 |
|-----------|----|-----------|---|------------|----|

| | | | |
|--|-------|--------|------------|
| 8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used: | | | |
| @ | 1,000 | °F and | 15 psia |
| a. NO _x | 2.46 | lb/hr | grains/ACF |
| b. SO ₂ | 0.22 | lb/hr | grains/ACF |
| c. CO | 12.30 | lb/hr | grains/ACF |
| d. PM ₁₀ | 0.54 | lb/hr | grains/ACF |
| e. Hydrocarbons | 0.07 | lb/hr | grains/ACF |
| f. VOCs | 4.33 | lb/hr | grains/ACF |
| g. Pb | 0 | lb/hr | grains/ACF |
| h. Specify other(s) | | | |
| SEE ATTACHED CALCS | | lb/hr | grains/ACF |
| | | lb/hr | grains/ACF |
| | | lb/hr | grains/ACF |
| | | lb/hr | grains/ACF |

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING

1. ENGINE HOUR METER
2. INLET GAS FLOW METER

RECORDKEEPING

1. ENGINE HOURS
2. INLET GAS FLOW
3. MAINTENANCE

REPORTING

STANDARD AIR COMPLIANCE REPORTING

TESTING

ENGINE WILL BE CERTIFIED FROM
MANUFACTURER

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty
SEE CATERPILLAR G3520C ENGINE SPECIFICATIONS AND MAINTENANCE PROCEDURES

ATTACHMENT N
SUPPORTING EMISSIONS CALCULATIONS

**TABLE 1. FACILITY MAXIMUM POTENTIAL EMISSION RATE SUMMARY
(tons/yr)**

| Source I.D. # | Emission Source | VOCs | HAPs | NO _x | CO | SO _x | PM | PM ₁₀ | PM _{2.5} |
|-------------------------------|--|--------------|-------------|-----------------|---------------|-----------------|-------------|------------------|-------------------|
| ES-1 | Engine Genset Generator – 2,233 HP | 18.96 | 0.30 | 10.77 | 53.88 | 0.98 | 2.38 | 2.38 | 2.38 |
| ES-2 | Engine Genset Generator – 2,233 HP | 18.96 | 0.30 | 10.77 | 53.88 | 0.98 | 2.38 | 2.38 | 2.38 |
| Total: (Unlimited) | | 37.92 | 0.60 | 21.54 | 107.76 | 1.96 | 4.76 | 4.76 | 4.76 |
| Total: (Limited) | | 33.03 | 0.52 | 18.76 | 93.84 | 1.71 | 4.15 | 4.15 | 4.15 |

NOTES

- 1 Emission factors for NO_x, CO and VOC were provided by engine manufacturer (Caterpillar). CO emission factor is nominal and represents a new engine during the first 100 hours of engine operation.
- 2 The emission factor for SO₂ is from AP-42 Section 2.4.
- 3 The emission factor for PM₁₀ is from AP-42 Section 3.1 Table 3.4-3. Per AP-42 Section 3.1, PM and PM-2.5 emissions are assumed to be equivalent to PM-10 emissions.
- 4 HAP and TAP emissions were estimated based on AP-42 recommended HAP and TAP concentrations in LFG and a destruction efficiency of 98 percent.
- 5 The Unlimited operation equates to both gensets at 100% load capacity at 8,760 hours per year for each genset. Full operation with no restrictions on the operation.
- 6 The Limited operation equates to the gensets at 100% load capacity and being voluntarily limited to 15,260 hours per year (combined). This equates to one genset at 100% load capacity at 8,760 hours per year and one genset at 100% load capacity at 6,500 hours per year or some combination up to the 15,260 hours at 100% load capacity.

LFG ENGINE GENSET EMISSIONS

GENERAL

The following pages detail the assumptions and calculations that were used to determine emissions for two (2) planned 2,233 HP Caterpillar Model G3520C landfill gas (LFG) engine generators (gensets) at the Seven Islands Environmental Solutions facility. The genset emissions were calculated based on a combination of emission factors provided by the genset manufacturer (Caterpillar) and emission factors provided in U.S. EPA's "Compilation of Air Pollutant Emission Factors" (AP-42) Volume I, 5th Edition, Section 2.4 as updated November 1998. Table 2 summarizes the emission factors used.

In order to limit facility emissions to less than 100 tons per year of carbon monoxide (CO), the combined engine operation will be voluntarily limited. The available landfill gas from the Landfill is approximately 550 SCFM at this time which is sufficient to operate only one (1) genset at a time. Therefore, the second genset will primarily be used as back-up unit until such time as the available LFG flows increase. This is not expected for several years.

TABLE 2. MAXIMUM POTENTIAL LFG GENSET EMISSIONS

| Pollutant | Emission Factor | Potential Genset Emissions (1 Engine Max) (tpy) | Potential Genset Emissions (1 Engine Limit) (tpy) |
|-------------------|--|--|--|
| NO _x | 0.5 g/bhp-hr ⁽¹⁾ | 10.77 | 7.99 |
| CO | 2.5 g/bhp-hr ⁽¹⁾ | 53.88 | 39.96 |
| SO ₂ | 46.9 ppmv TRS in LFG ⁽²⁾ | 0.98 | 0.73 |
| PM ₁₀ | 0.0023 lb /hr-CH ₄ ⁽³⁾ | 2.38 | 1.77 |
| PM _{2.5} | 0.0023 lb /hr-CH ₄ ⁽³⁾ | 2.38 | 1.77 |
| PM | 0.0023 lb /hr-CH ₄ ⁽³⁾ | 2.38 | 1.77 |
| VOC | 0.88 g/bhp-hr ⁽¹⁾ | 18.96 | 14.07 |
| HAPs | 98 percent DRE ⁽⁴⁾ | 0.30 | 0.22 |

NOTES

- 1 Emission factors for NO_x, CO and VOC were provided by engine manufacturer (Caterpillar). CO emission factor is nominal and represents a new engine during the first 100 hours of engine operation.
- 2 The emission factor for SO₂ is from AP-42 Section 2.4.
- 3 The emission factor for PM₁₀ is from AP-42 Section 3.1 Table 3.4-3. Per AP-42, PM and PM-2.5 emissions are assumed to be equivalent to PM-10 emissions.
- 4 HAP and TAP emissions were estimated based on AP-42 recommended HAP and TAP concentrations in LFG and a destruction efficiency of 98 percent.
- 5 Potential genset emissions (1 engine max) refers to the maximum potential emissions of one genset operating at 100% load capacity for 8,760 hours per year.
- 6 Potential genset emissions (1 engine limited) refers to the potential emissions of one genset operating at 100% load capacity for 6,500 hours per year.

EMISSIONS CALCULATIONS

The maximum horsepower for each 1.6 MW CAT 3520C engine is approximately 2,233 BHP at about 473 SCFM of fuel (landfill gas) assuming 500 BTUs per SCF of LFG. The potential emissions calculations assume each genset may individually operate at maximum capacity for 8,760 hours per year.

The one (1) engine generator operating data is presented in Table 3.

TABLE 3. ENGINE OPERATING DATA (1-ENGINE MAXIMUM)

| | |
|---|----------------------------|
| Maximum engine power | 2,233 BHP |
| Maximum LFG firing rate | 473 SCFM ⁽¹⁾ |
| Maximum hours of operation | 8,760 hours |
| Average Btu content of LFG ⁽²⁾ | 500 Btu/scf ⁽²⁾ |

¹ Standard cubic feet per minute (scfm).

² The Higher Heating Value of LFG based on methane content of 50 percent is approximately 500 British Thermal Units (Btu) per standard cubic foot (scf) of gas.

³ The engine data shown above is the maximum available per engine.

In order to limit the maximum potential emissions of CO from the facility to less than 100 tons per year, the operation of the two (2) gensets will be voluntarily limited to no greater than 15,260 combined hours per year at maximum engine load and gas flow. The facility will have non-resettable hour meters on each engine and will record the operation hours of each engine to demonstrate compliance with this limitation. The facility will also have flow meters on each engine and data loggers to record the amount of flow being used by each engine. The engine hours and engine flow will be used to confirm compliance with the air permit.

The two (2) engine generator limited operating data is presented in Table 4.

TABLE 4. ENGINE OPERATING DATA (2-ENGINE LIMITED)

| | |
|---|----------------------------|
| Maximum engine power | 4,466 BHP |
| Maximum LFG firing rate | 946 SCFM ⁽¹⁾ |
| Maximum hours of operation | 15,260 hours |
| Average Btu content of LFG ⁽²⁾ | 500 Btu/scf ⁽²⁾ |

¹ Standard cubic feet per minute (scfm).

² The Higher Heating Value of LFG based on methane content of 50 percent is approximately 500 British Thermal Units (Btu) per standard cubic foot (scf) of gas.

³ The engine data shown above is the voluntary limited amounts for two (2) engines.

ONE (1) GENSET EMISSIONS – MAXIMUM POTENTIAL

Maximum potential engine genset emissions for one genset operating at maximum capacity and flow are calculated below for nitrogen oxides, carbon monoxide, particulate matter, hazardous air pollutants, volatile organic compounds, sulfur dioxide, hydrochloric acid, methane and nitrous dioxide.

Nitrogen Oxide (NO_x) Emissions

$$\left(0.5 \frac{g \text{ NO}_x}{bhp-hr}\right) \left(2,233 \frac{bhp}{engine}\right) \left(8,760 \frac{hr}{1 \text{ yr}}\right) \left(1.0 \frac{lb}{454 \text{ g}}\right) \left(1.0 \frac{ton}{2,000 \text{ lbs.}}\right)$$

= 10.77 tpy NO_x

Carbon Monoxide (CO) Emissions

$$\left(2.5 \frac{g \text{ CO}}{bhp-hr}\right) \left(2,233 \frac{bhp}{engine}\right) \left(8,760 \frac{hr}{1 \text{ yr}}\right) \left(1.0 \frac{lb}{454 \text{ g}}\right) \left(1.0 \frac{ton}{2,000 \text{ lbs.}}\right)$$

= 53.88 tpy CO

Particulate Matter (PM) Emissions

$$\left(0.0023 \frac{lb \text{ PM-10}}{hr-cfm \text{ methane}}\right) \left(473 \frac{ft^3 \text{ LFG}}{\text{min}}\right) \left(8,760 \frac{hr}{1 \text{ yr}}\right) \left(\frac{0.5 \text{ cfm methane}}{1.0 \text{ cfm LFG}}\right) \left(1.0 \frac{ton}{2,000 \text{ lbs.}}\right)$$

= 2.38 tpy PM-10

Please note that per AP-42 Section 3.1, PM and PM-2.5 emissions are assumed to be equivalent to PM-10 emissions.

Sulfur Dioxide (SO₂) Emissions

The emissions of sulfur oxides, particularly sulfur dioxide (SO₂), from the genset are dependent on the inlet concentration of sulfur-bearing compounds in the LFG. The calculation of the estimated SO₂ emissions from the genset is based on the assumption that all of the total reduced sulfur (TRS) in the LFG is oxidized to SO₂. Since site specific data for the TRS concentration in the LFG delivered to the device was not available, SO₂ emissions from the genset were estimated based on the published mean concentration of TRS in LFG samples. AP-42 Section 2.4 (revised November 1998) lists concentrations of various compounds in uncontrolled LFG. This section reports that the mean concentration of TRS in LFG is 46.9 ppmv.

Molar Flow Rate of LFG to the Genset

At a volumetric flow rate of 473 scfm, the molar flow rate of LFG into the genset can be

calculated as shown below. For this calculation, natural gas processing standards of 60° F (520° Rankine (R)) and 1 atmosphere have been used.

$$(473 \text{ scfm}) \left(\frac{60 \text{ min}}{\text{hr}} \right) \left(\frac{1 \text{ atm}}{\left(\frac{0.7302 \text{ atm ft}^3}{\text{lbmole R}} \right) (520^\circ \text{ R})} \right)$$

$$= 74.74 \text{ lbmole fuel/hour}$$

Molecular weight of Sulfur (S) = 32.06 lb/lbmole

$$\left(\frac{46.9 \text{ lbmole } H_2S}{10^6 \text{ lbmole fuel}} \right) \left(\frac{74.74 \text{ lbmole fuel}}{\text{hr}} \right) \left(\frac{32.06 \text{ lb } SO_2}{\text{lbmole } H_2S} \right) \left(\frac{2 \text{ lb } SO_2}{\text{lb S}} \right) \left(\frac{1 \text{ ton}}{2,000 \text{ lb}} \right) \left(\frac{8,760 \text{ hours}}{\text{yr}} \right)$$

$$= 0.98 \text{ tpy } SO_2$$

Volatile Organic Compound (VOC) Emissions

$$\left(0.88 \frac{\text{g VOC}}{\text{bhp-hr}} \right) \left(2,233 \frac{\text{bhp}}{\text{engine}} \right) \left(8,760 \frac{\text{hr}}{1 \text{ yr}} \right) \left(1.0 \frac{\text{lb}}{454 \text{ g}} \right) \left(1.0 \frac{\text{ton}}{2,000 \text{ lbs.}} \right)$$

$$= 18.96 \text{ tpy VOC}$$

Hazardous and Toxic Air Pollutant (HAP) Emissions

Emissions of uncombusted hazardous air pollutant (HAP) and toxic air pollutant (TAP) emissions are based on the inlet concentration of HAPs and TAPs to the genset and the destruction efficiency. Individual HAP/TAP quantities in the inlet LFG were estimated using concentrations listed in AP-42 Table 2.4-1 and equation (3) and (4) in Section 2.4. Table 4 (attached) summarizes the inlet HAP/TAP concentrations to the gensets; this table shows that the estimated total maximum potential quantity of HAPs and TAPs delivered to each genset will be about **2.56 tons** while the uncombusted HAPs and TAPs emitted from each genset is about **0.30 tons**. The destruction efficiency of the genset was based on typical efficiencies for halogenated and non-halogenated compounds for IC Engines as shown in AP-42 Section 2.4.

ONE (1) GENSET EMISSIONS – LIMITED OPERATION

Potential engine genset emissions for one genset operating at maximum power and flow but under reduced operating hours (i.e., 6,500 hours per year) are calculated below for nitrogen oxides, carbon monoxide, particulate matter, hazardous air pollutants, volatile organic compounds, sulfur dioxide, hydrochloric acid, methane and nitrous dioxide.

Nitrogen Oxide (NO_x) Emissions

$$\left(0.5 \frac{g \text{ NO}_x}{bhp-hr}\right) \left(2,233 \frac{bhp}{engine}\right) \left(6,500 \frac{hr}{1 \text{ yr}}\right) \left(1.0 \frac{lb}{454 \text{ g}}\right) \left(1.0 \frac{ton}{2,000 \text{ lbs.}}\right)$$

$$= 7.99 \text{ tpy NO}_x$$

Carbon Monoxide (CO) Emissions

$$\left(2.5 \frac{g \text{ CO}}{bhp-hr}\right) \left(2,233 \frac{bhp}{engine}\right) \left(6,500 \frac{hr}{1 \text{ yr}}\right) \left(1.0 \frac{lb}{454 \text{ g}}\right) \left(1.0 \frac{ton}{2,000 \text{ lbs.}}\right)$$

$$= 39.96 \text{ tpy CO}$$

Particulate Matter (PM) Emissions

$$\left(0.0023 \frac{lb \text{ PM-10}}{hr-cfm \text{ methane}}\right) \left(473 \frac{ft^3 \text{ LFG}}{\text{min}}\right) \left(6,500 \frac{hr}{1 \text{ yr}}\right) \left(\frac{0.5 \text{ cfm methane}}{1.0 \text{ cfm LFG}}\right) \left(1.0 \frac{ton}{2,000 \text{ lbs.}}\right)$$

$$= 1.77 \text{ tpy PM-10}$$

Please note that per AP-42 Section 3.1, PM and PM-2.5 emissions are assumed to be equivalent to PM-10 emissions.

Sulfur Dioxide (SO₂) Emissions

The emissions of sulfur oxides, particularly sulfur dioxide (SO₂), from the genset are dependent on the inlet concentration of sulfur-bearing compounds in the LFG. The calculation of the estimated SO₂ emissions from the genset is based on the assumption that all of the total reduced sulfur (TRS) in the LFG is oxidized to SO₂. Since site specific data for the TRS concentration in the LFG delivered to the device was not available, SO₂ emissions from the genset were estimated based on the published mean concentration of TRS in LFG samples. AP-42 Section 2.4 (revised November 1998) lists concentrations of various compounds in uncontrolled LFG. This section reports that the mean concentration of TRS in LFG is 46.9 ppmv.

Molar Flow Rate of LFG to the Genset

At a volumetric flow rate of 473 scfm, the molar flow rate of LFG into the genset can be calculated as shown below. For this calculation, natural gas processing standards of 60° F (520° Rankine (R)) and 1 atmosphere have been used.

$$(473 \text{ scfm}) \left(\frac{60 \text{ min}}{\text{hr}} \right) \left(\frac{1 \text{ atm}}{\left(\frac{0.7302 \text{ atm ft}^3}{\text{lbmole R}} \right) (520^\circ \text{ R})} \right)$$

$$= 74.74 \text{ lbmole fuel/hour}$$

Molecular weight of Sulfur (S) = 32.06 lb/lbmole

$$\left(\frac{46.9 \text{ lbmole } H_2S}{10^6 \text{ lbmole fuel}} \right) \left(\frac{74.74 \text{ lbmole fuel}}{\text{hr}} \right) \left(\frac{32.06 \text{ lb } SO_2}{\text{lbmole } H_2S} \right) \left(\frac{2 \text{ lb } SO_2}{\text{lb S}} \right) \left(\frac{1 \text{ ton}}{2,000 \text{ lb}} \right) \left(\frac{6,500 \text{ hours}}{\text{yr}} \right)$$

$$= 0.73 \text{ tpy } SO_2$$

Volatile Organic Compound (VOC) Emissions

$$\left(0.88 \frac{\text{g VOC}}{\text{bhp} - \text{hr}} \right) \left(2,233 \frac{\text{bhp}}{\text{engine}} \right) \left(6,500 \frac{\text{hr}}{1 \text{ yr}} \right) \left(1.0 \frac{\text{lb}}{454 \text{ g}} \right) \left(1.0 \frac{\text{ton}}{2,000 \text{ lbs.}} \right)$$

$$= 14.07 \text{ tpy VOC}$$

Hazardous and Toxic Air Pollutant (HAP) Emissions

Emissions of uncombusted hazardous air pollutant (HAP) and toxic air pollutant (TAP) emissions are based on the inlet concentration of HAPs and TAPs to the genset and the destruction efficiency. Individual HAP/TAP quantities in the inlet LFG were estimated using concentrations listed in AP-42 Table 2.4-1 and equation (3) and (4) in Section 2.4. Table 4 (attached) summarizes the inlet HAP/TAP concentrations to the gensets; this table shows that the estimated total maximum potential quantity of HAPs and TAPs delivered to each genset will be about **1.90 tons** while the uncombusted HAPs and TAPs emitted from each genset is about **0.223 tons**. The destruction efficiency of the genset was based on typical efficiencies for halogenated and non-halogenated compounds for IC Engines as shown in AP-42 Section 2.4.

TABLE 5. PROJECTED HAP/TAP GENERATION AND EMISSION RATES - ENGINE GENERATOR MAXIMUM
Seven Islands Environmental Solutions LFGTE Facility

Total Methane Generation (m3/yr) = 3,519,909
 LFG Collection Efficiency (%) = 100.0%
 Landfill Gas Temperature (C) = 25.0
 Halogenated Destruction Eff. (%) = 93.0%
 Non-Halogenated Destruction Eff. (%) = 86.1%

| Year | LFG (cfm) | HAP/TAP EMISSIONS (tpy) | |
|------------|-----------|-------------------------|------------------|
| | | Delivered to Engine | Engine Emissions |
| Engine Max | 473 | 2.56 | 0.30 |

| Pollutant | HAP/TAP CAS No. | HAP/TAP Molecular Wt. (g/gmol) | HAP/TAP Concentration (ppmv) | HAP/TAP Volumetric Emission Rate (m^3/yr) | HAP/TAP Delivered to Engine (kg/yr) (tpy) | | Engine HAP/TAP Emissions (tpy) | Engine HAP/TAP Emissions (lb/yr) | Engine HAP/TAP Emissions (lb/day) | Engine HAP/TAP Emissions (lb/hr) |
|---|-----------------|--------------------------------|------------------------------|---|---|-------|--------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| 1,1,1-trichloroethane ^{TAP, HAP} | 71-55-6 | 133.42 | 0.168 | 1.076 | 5.873 | 0.006 | 0.000 | 0.905 | 0.002 | 0.000 |
| 1,1,2,2-tetrachloroethane ^{TAP, HAP} | 79-34-5 | 167.85 | 0.005 | 0.032 | 0.220 | 0.000 | 0.000 | 0.034 | 0.000 | 0.000 |
| 1,1-dichloroethane ^{HAP} | 75-34-3 | 98.95 | 0.741 | 4.747 | 19.211 | 0.021 | 0.001 | 2.962 | 0.008 | 0.000 |
| 1,1-dichloroethene ^{HAP} | 75-35-4 | 96.94 | 0.092 | 0.589 | 2.337 | 0.003 | 0.000 | 0.360 | 0.001 | 0.000 |
| 1,2-dichloroethane ^{TAP, HAP} | 107-06-2 | 98.96 | 0.120 | 0.769 | 3.111 | 0.003 | 0.000 | 0.480 | 0.001 | 0.000 |
| 1,2-dichloropropane ^{HAP} | 78-87-5 | 112.98 | 0.023 | 0.147 | 0.681 | 0.001 | 0.000 | 0.105 | 0.000 | 0.000 |
| acrylonitrile ^{TAP, HAP} | 107-13-1 | 53.06 | 0.036 | 0.231 | 0.500 | 0.001 | 0.000 | 0.153 | 0.000 | 0.000 |
| benzene ^{TAP, HAP} | 71-43-2 | 78.11 | 0.972 | 6.227 | 19.892 | 0.022 | 0.003 | 6.090 | 0.017 | 0.001 |
| carbon disulfide ^{TAP, HAP} | 75-15-0 | 76.13 | 0.221 | 1.416 | 4.408 | 0.005 | 0.001 | 1.350 | 0.004 | 0.000 |
| carbon tetrachloride ^{TAP, HAP} | 56-23-5 | 153.84 | 0.004 | 0.026 | 0.161 | 0.000 | 0.000 | 0.025 | 0.000 | 0.000 |
| carbonyl sulfide ^{HAP} | 463-58-1 | 60.07 | 0.183 | 1.172 | 2.880 | 0.003 | 0.000 | 0.882 | 0.002 | 0.000 |
| chlorobenzene ^{TAP, HAP} | 108-90-7 | 112.56 | 0.227 | 1.454 | 6.694 | 0.007 | 0.001 | 1.032 | 0.003 | 0.000 |
| chloroethane ^{HAP} | 75-00-3 | 64.52 | 0.448 | 2.870 | 7.573 | 0.008 | 0.001 | 1.168 | 0.003 | 0.000 |
| chloroform ^{TAP, HAP} | 67-66-3 | 119.39 | 0.010 | 0.064 | 0.313 | 0.000 | 0.000 | 0.048 | 0.000 | 0.000 |
| chloromethane ^{HAP} | 74-87-3 | 50.49 | 0.136 | 0.871 | 1.799 | 0.002 | 0.000 | 0.277 | 0.001 | 0.000 |
| dichlorobenzene ^{TAP, HAP} | 95-50-1 | 147.00 | 1.448 | 9.276 | 55.769 | 0.061 | 0.004 | 8.599 | 0.024 | 0.001 |
| dichlorodifluoromethane ^{TAP} | 75-71-8 | 120.91 | 0.964 | 6.176 | 30.538 | 0.034 | 0.002 | 4.709 | 0.013 | 0.001 |
| dichlorofluoromethane ^{TAP} | 75-43-4 | 102.92 | 2.620 | 16.784 | 70.649 | 0.078 | 0.005 | 10.893 | 0.030 | 0.001 |
| dichloromethane ^{TAP, HAP} | 75-09-2 | 84.94 | 3.395 | 21.749 | 75.554 | 0.083 | 0.006 | 11.649 | 0.032 | 0.001 |
| ethyl mercaptan ^{TAP} | 75-08-1 | 62.13 | 0.226 | 1.448 | 3.679 | 0.004 | 0.000 | 0.567 | 0.002 | 0.000 |
| ethylbenzene ^{HAP} | 100-41-4 | 106.16 | 6.789 | 43.492 | 188.832 | 0.208 | 0.029 | 57.814 | 0.158 | 0.007 |
| ethylene dibromide ^{TAP, HAP} | 106-93-4 | 187.88 | 0.005 | 0.032 | 0.246 | 0.000 | 0.000 | 0.038 | 0.000 | 0.000 |
| hexane ^{TAP, HAP} | 110-54-3 | 86.18 | 2.063 | 13.216 | 46.582 | 0.051 | 0.007 | 14.262 | 0.039 | 0.002 |
| hydrogen sulfide ^{TAP} | 7783-06-04 | 34.08 | 35.500 | 227.421 | 316.983 | 0.349 | 0.024 | 48.874 | 0.134 | 0.006 |
| mercury and compounds ^{HAP} | 743-99-76 | 200.61 | 0.000 | 0.002 | 0.015 | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 |
| methyl ethyl ketone ^{TAP, HAP} | 78-93-3 | 72.11 | 12.694 | 81.321 | 239.829 | 0.264 | 0.037 | 73.428 | 0.201 | 0.008 |
| methyl isobutyl ketone ^{TAP, HAP} | 108-10-1 | 100.16 | 0.750 | 4.805 | 19.682 | 0.022 | 0.003 | 6.026 | 0.017 | 0.001 |
| methyl mercaptan ^{TAP} | 74-93-1 | 48.11 | 2.490 | 15.952 | 31.386 | 0.035 | 0.002 | 4.839 | 0.013 | 0.001 |
| perchloroethylene ^{TAP, HAP} | 127-18-4 | 165.83 | 1.193 | 7.643 | 51.834 | 0.057 | 0.004 | 7.992 | 0.022 | 0.001 |
| toluene ^{TAP, HAP} | 108-88-3 | 92.13 | 25.405 | 162.750 | 613.237 | 0.675 | 0.094 | 187.753 | 0.514 | 0.021 |
| trichloroethylene ^{TAP, HAP} | 79-01-6 | 131.38 | 0.681 | 4.363 | 23.441 | 0.026 | 0.002 | 3.614 | 0.010 | 0.000 |
| vinyl chloride ^{TAP, HAP} | 75-01-4 | 62.50 | 1.077 | 6.900 | 17.636 | 0.019 | 0.001 | 2.719 | 0.007 | 0.000 |
| xylenes ^{TAP, HAP} | 1330-20-7 | 106.16 | 16.582 | 106.228 | 461.218 | 0.508 | 0.071 | 141.210 | 0.387 | 0.016 |
| Total HAPs Only | | --- | --- | --- | 1869.528 | 2.059 | 0.265 | 530.980 | 1.455 | 0.061 |
| Total TAPs Only | | --- | --- | --- | 1511.175 | 1.664 | 0.203 | 405.631 | 1.111 | 0.046 |
| Total HAPs/TAPs | | --- | --- | --- | 2322.765 | 2.558 | 0.300 | 600.863 | 1.646 | 0.069 |

- Notes:
- Pollutant concentrations used to compute the estimated emissions are from the Waste Industry Air Coalition and the EPA's AP-42 Section 2.4 Table 2.4-1 and Table 2.4-2.
 - ^{TAP} denotes compounds that are classified as toxic air pollutants per AP-42 and CAA Section 112.
 - ^{HAP} denotes compounds that are classified as hazardous air pollutants per AP-42 and CAA Section 112.
 - The compounds listed above were compiled from AP-42 (revised Nov. 1998) and CAA Section 112.
 - The landfill gas temperature was obtained from AP-42 Section 2.4.
 - The AP-42 Section 2.4 default for internal combustion engine destruction efficiency was assumed.

TABLE 6. PROJECTED HAP/TAP GENERATION AND EMISSION RATES - ENGINE GENERATOR LIMITED
Seven Islands Environmental Solutions LFGTE Facility

Total Methane Generation (m3/yr) = 2,611,805 * The hours are limited to 6,500 hours per year in this calculation
 LFG Collection Efficiency (%) = 100.0%
 Landfill Gas Temperature (C)= 25.0
 Halogenated Destruction Eff. (%)= 93.0%
 Non-Halogenated Destruction Eff. (%)= 86.1%

| HAP/TAP EMISSIONS (tpy) | | | |
|-------------------------|-----------|---------------------|------------------|
| Year | LFG (cfm) | Delivered to Engine | Engine Emissions |
| Engine Max | 473 | 1.90 | 0.22 |

| Pollutant | HAP/TAP CAS No. | HAP/TAP Molecular Wt. (g/gmol) | HAP/TAP Concentration (ppmv) | HAP/TAP Volumetric Emission Rate (m^3/yr) | HAP/TAP Delivered to Engine (kg/yr) (tpy) | | Engine HAP/TAP Emissions (tpy) | Engine HAP/TAP Emissions (lb/yr) | Engine HAP/TAP Emissions (lb/day) | Engine HAP/TAP Emissions (lb/hr) |
|---|-----------------|--------------------------------|------------------------------|---|---|-------|--------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| 1,1,1-trichloroethane ^{TAP, HAP} | 71-55-6 | 133.42 | 0.168 | 0.799 | 4.358 | 0.005 | 0.000 | 0.672 | 0.002 | 0.000 |
| 1,1,2,2-tetrachloroethane ^{TAP, HAP} | 79-34-5 | 167.85 | 0.005 | 0.024 | 0.163 | 0.000 | 0.000 | 0.025 | 0.000 | 0.000 |
| 1,1-dichloroethane ^{HAP} | 75-34-3 | 98.95 | 0.741 | 3.522 | 14.254 | 0.016 | 0.001 | 2.198 | 0.006 | 0.000 |
| 1,1-dichloroethene ^{HAP} | 75-35-4 | 96.94 | 0.092 | 0.437 | 1.734 | 0.002 | 0.000 | 0.267 | 0.001 | 0.000 |
| 1,2-dichloroethane ^{TAP, HAP} | 107-06-2 | 98.96 | 0.120 | 0.570 | 2.309 | 0.003 | 0.000 | 0.356 | 0.001 | 0.000 |
| 1,2-dichloropropane ^{HAP} | 78-87-5 | 112.98 | 0.023 | 0.109 | 0.505 | 0.001 | 0.000 | 0.078 | 0.000 | 0.000 |
| acrylonitrile ^{TAP, HAP} | 107-13-1 | 53.06 | 0.036 | 0.171 | 0.371 | 0.000 | 0.000 | 0.114 | 0.000 | 0.000 |
| benzene ^{TAP, HAP} | 71-43-2 | 78.11 | 0.972 | 4.620 | 14.760 | 0.016 | 0.002 | 4.519 | 0.012 | 0.001 |
| carbon disulfide ^{TAP, HAP} | 75-15-0 | 76.13 | 0.221 | 1.051 | 3.271 | 0.004 | 0.001 | 1.001 | 0.003 | 0.000 |
| carbon tetrachloride ^{TAP, HAP} | 56-23-5 | 153.84 | 0.004 | 0.019 | 0.120 | 0.000 | 0.000 | 0.018 | 0.000 | 0.000 |
| carbonyl sulfide ^{HAP} | 463-58-1 | 60.07 | 0.183 | 0.870 | 2.137 | 0.002 | 0.000 | 0.654 | 0.002 | 0.000 |
| chlorobenzene ^{TAP, HAP} | 108-90-7 | 112.56 | 0.227 | 1.079 | 4.967 | 0.005 | 0.000 | 0.766 | 0.002 | 0.000 |
| chloroethane ^{HAP} | 75-00-3 | 64.52 | 0.448 | 2.130 | 5.619 | 0.006 | 0.000 | 0.866 | 0.002 | 0.000 |
| chloroform ^{TAP, HAP} | 67-66-3 | 119.39 | 0.010 | 0.048 | 0.232 | 0.000 | 0.000 | 0.036 | 0.000 | 0.000 |
| chloromethane ^{HAP} | 74-87-3 | 50.49 | 0.136 | 0.646 | 1.335 | 0.001 | 0.000 | 0.206 | 0.001 | 0.000 |
| dichlorobenzene ^{TAP, HAP} | 95-50-1 | 147.00 | 1.448 | 6.883 | 41.381 | 0.046 | 0.003 | 6.380 | 0.017 | 0.001 |
| dichlorodifluoromethane ^{TAP} | 75-71-8 | 120.91 | 0.964 | 4.582 | 22.660 | 0.025 | 0.002 | 3.494 | 0.010 | 0.000 |
| dichlorofluoromethane ^{TAP} | 75-43-4 | 102.92 | 2.620 | 12.454 | 52.423 | 0.058 | 0.004 | 8.083 | 0.022 | 0.001 |
| dichloromethane ^{TAP, HAP} | 75-09-2 | 84.94 | 3.395 | 16.138 | 56.062 | 0.062 | 0.004 | 8.644 | 0.024 | 0.001 |
| ethyl mercaptan ^{TAP} | 75-08-1 | 62.13 | 0.226 | 1.074 | 2.730 | 0.003 | 0.000 | 0.421 | 0.001 | 0.000 |
| ethylbenzene ^{HAP} | 100-41-4 | 106.16 | 6.789 | 32.271 | 140.115 | 0.154 | 0.021 | 42.899 | 0.118 | 0.005 |
| ethylene dibromide ^{TAP, HAP} | 106-93-4 | 187.88 | 0.005 | 0.024 | 0.183 | 0.000 | 0.000 | 0.028 | 0.000 | 0.000 |
| hexane ^{TAP, HAP} | 110-54-3 | 86.18 | 2.063 | 9.806 | 34.564 | 0.038 | 0.005 | 10.582 | 0.029 | 0.001 |
| hydrogen sulfide ^{TAP} | 7783-06-04 | 34.08 | 35.500 | 168.749 | 235.204 | 0.259 | 0.018 | 36.265 | 0.099 | 0.004 |
| mercury and compounds ^{HAP} | 743-99-76 | 200.61 | 0.000 | 0.001 | 0.011 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 |
| methyl ethyl ketone ^{TAP, HAP} | 78-93-3 | 72.11 | 12.694 | 60.341 | 177.955 | 0.196 | 0.027 | 54.484 | 0.149 | 0.006 |
| methyl isobutyl ketone ^{TAP, HAP} | 108-10-1 | 100.16 | 0.750 | 3.565 | 14.604 | 0.016 | 0.002 | 4.471 | 0.012 | 0.001 |
| methyl mercaptan ^{TAP} | 74-93-1 | 48.11 | 2.490 | 11.836 | 23.289 | 0.026 | 0.002 | 3.591 | 0.010 | 0.000 |
| perchloroethylene ^{TAP, HAP} | 127-18-4 | 165.83 | 1.193 | 5.671 | 38.461 | 0.042 | 0.003 | 5.930 | 0.016 | 0.001 |
| toluene ^{TAP, HAP} | 108-88-3 | 92.13 | 25.405 | 120.762 | 455.027 | 0.501 | 0.070 | 139.315 | 0.382 | 0.016 |
| trichloroethylene ^{TAP, HAP} | 79-01-6 | 131.38 | 0.681 | 3.237 | 17.394 | 0.019 | 0.001 | 2.682 | 0.007 | 0.000 |
| vinyl chloride ^{TAP, HAP} | 75-01-4 | 62.50 | 1.077 | 5.120 | 13.086 | 0.014 | 0.001 | 2.018 | 0.006 | 0.000 |
| xylenes ^{TAP, HAP} | 1330-20-7 | 106.16 | 16.582 | 78.822 | 342.228 | 0.377 | 0.052 | 104.779 | 0.287 | 0.012 |
| Total HAPs Only | | --- | --- | --- | 1387.207 | 1.528 | 0.197 | 393.992 | 1.079 | 0.045 |
| Total TAPs Only | | --- | --- | --- | 1121.306 | 1.235 | 0.150 | 300.982 | 0.825 | 0.034 |
| Total HAPs/TAPs | | --- | --- | --- | 1723.513 | 1.898 | 0.223 | 445.846 | 1.221 | 0.051 |

- Notes:
1. Pollutant concentrations used to compute the estimated emissions are from the Waste Industry Air Coalition and the EPA's AP-42 Section 2.4 Table 2.4-1 and Table 2.4-2.
 2. ^{TAP} denotes compounds that are classified as toxic air pollutants per AP-42 and CAA Section 112.
 3. ^{HAP} denotes compounds that are classified as hazardous air pollutants per AP-42 and CAA Section 112.
 4. The compounds listed above were compiled from AP-42 (revised Nov. 1998) and CAA Section 112.
 5. The landfill gas temperature was obtained from AP-42 Section 2.4.
 6. The AP-42 Section 2.4 default for internal combustion engine destruction efficiency was assumed.

| | | | |
|--|----------------|------------------------------|--|
| ENGINE SPEED: | 1200 | FUEL: | LOW ENERGY (1.43 CH ₄ :CO ₂ RATIO) |
| COMPRESSION RATIO: | 11.3:1 | FUEL SYSTEM: | CAT LOW PRESSURE |
| AFTERCOOLER - STAGE 1 MAX. INLET (°F): | 218 | | WITH AIR FUEL RATIO CONTROL |
| AFTERCOOLER - STAGE 2 MAX. INLET (°F): | 130 | FUEL PRESS. RANGE (PSIG): | 1.5 - 5.0 |
| JACKET WATER - MAX. OUTLET (°F): | 230 | MIN. METHANE NUMBER: | 135 |
| COOLING SYSTEM: | JW+1AC, OC+2AC | RATED ALTITUDE (FT): | 1378 |
| IGNITION SYSTEM: | ADEM3 | AT AIR TO TURBO. TEMP. (°F): | 77 |
| SPARK PLUG TYPE: | J-GAP | NOx EMISSION LEVEL: | 0.5 g/bhp-hr |
| EXHAUST MANIFOLD: | DRY | FUEL LHV (BTU/SCF): | 456 |
| COMBUSTION: | LOW EMISSION | APPLICATION: | GENSET |

| RATING AND EFFICIENCY | | NOTES | LOAD | 100% | 75% | 50% |
|-----------------------|---------------|-------|------|------|------|------|
| ENGINE POWER | (WITHOUT FAN) | (1) | BHP | 2233 | 1675 | 1116 |
| GENERATOR POWER | (WITHOUT FAN) | (2) | EKW | 1600 | 1200 | 800 |
| ENGINE EFFICIENCY | (ISO 3046/1) | (3) | % | 40.1 | 38.6 | 36.1 |
| ENGINE EFFICIENCY | (NOMINAL) | (3) | % | 39.1 | 37.7 | 35.2 |
| THERMAL EFFICIENCY | (NOMINAL) | (4) | % | 41.3 | 40.6 | 42.2 |
| TOTAL EFFICIENCY | (NOMINAL) | (5) | % | 80.4 | 78.3 | 77.4 |

| ENGINE DATA | | | | | | |
|----------------------------------|----------------------|------|--------------|-------|-------|-------|
| FUEL CONSUMPTION | (ISO 3046/1) | (6) | BTU/bhp-hr | 6354 | 6592 | 7047 |
| FUEL CONSUMPTION | (NOMINAL) | (6) | BTU/bhp-hr | 6509 | 6753 | 7219 |
| AIR FLOW (77 °F, 14.7 psi) | | (7) | SCFM | 4512 | 3415 | 2286 |
| AIR FLOW | | (7) | lb/hr | 20006 | 15141 | 10136 |
| COMPRESSOR OUT PRESSURE | | | in. HG (abs) | 105.8 | 80.8 | 55.5 |
| COMPRESSOR OUT TEMPERATURE | | | °F | 375 | 306 | 220 |
| AFTERCOOLER AIR OUT TEMPERATURE | | | °F | 142 | 138 | 135 |
| INLET MAN. PRESSURE | | (8) | in. HG (abs) | 94.4 | 71.5 | 48.9 |
| INLET MAN. TEMPERATURE | (MEASURED IN PLENUM) | (9) | °F | 142 | 138 | 135 |
| TIMING | | (10) | °BTDC | 27 | 27 | 27 |
| EXHAUST STACK TEMPERATURE | | (11) | °F | 898 | 943 | 984 |
| EXHAUST GAS FLOW (@ stack temp.) | | (12) | CFM | 12476 | 9780 | 6770 |
| EXHAUST MASS FLOW | | (12) | lb/hr | 22318 | 16940 | 11418 |

| EMISSIONS DATA | | | | | | |
|----------------------------------|--|------|----------|------|------|------|
| NOx (as NO ₂) | | (13) | g/bhp-hr | 0.5 | 0.5 | 0.5 |
| NTE CO | | (14) | g/bhp-hr | 4.13 | 4.25 | 4.4 |
| NOMINAL CO | | (15) | g/bhp-hr | 2.5 | 2.5 | 2.5 |
| THC (molecular weight of 15.84) | | (14) | g/bhp-hr | 5.84 | 6.49 | 7.51 |
| NMHC (molecular weight of 15.84) | | (14) | g/bhp-hr | 0.88 | 0.98 | 1.13 |
| EXHAUST O ₂ | | (16) | % DRY | 9.0 | 8.8 | 8.6 |
| LAMBDA | | (16) | | 1.71 | 1.67 | 1.57 |

| HEAT BALANCE DATA | | | | | | |
|--|--|------|---------|--------|--------|--------|
| LHV INPUT | | (17) | BTU/min | 242216 | 188451 | 134313 |
| HEAT REJECTION TO JACKET | | (18) | BTU/min | 28738 | 23806 | 21929 |
| HEAT REJECTION TO ATMOSPHERE | | (19) | BTU/min | 7210 | 6034 | 4857 |
| HEAT REJECTION TO LUBE OIL | | (20) | BTU/min | 10108 | 9524 | 8917 |
| HEAT REJECTION TO EXHAUST (LHV to 77°F) | | (21) | BTU/min | 76779 | 65253 | 45101 |
| HEAT REJECTION TO EXHAUST (LHV to 350°F) | | (21) | BTU/min | 57574 | 47602 | 34587 |
| HEAT REJECTION TO A/C - STAGE 1 | | (22) | BTU/min | 13823 | 5157 | 102 |
| HEAT REJECTION TO A/C - STAGE 2 | | (23) | BTU/min | 8895 | 5684 | 4086 |

CONDITIONS AND DEFINITIONS

ENGINE RATING OBTAINED AND PRESENTED IN ACCORDANCE WITH ISO 3046/1. DATA REPRESENTS CONDITIONS OF 77°F, 29.6 IN HG BAROMETRIC PRESSURE, 30% RELATIVE HUMIDITY, 10 IN H₂O AIR FILTER RESTRICTION, AND 20 IN H₂O EXHAUST STACK PRESSURE. ENGINE EFFICIENCY AND FUEL CONSUMPTION SPECIFICALLY NOTED AS ISO 3046/1 ARE REPRESENTED WITH 5 IN H₂O AIR FILTER RESTRICTION AND 0 IN H₂O EXHAUST STACK PRESSURE. CONSULT ALTITUDE CURVES FOR APPLICATIONS ABOVE MAXIMUM RATED ALTITUDE AND/OR TEMPERATURE. NO OVERLOAD PERMITTED AT RATING SHOWN.

EMISSION LEVELS ARE BASED ON THE ENGINE OPERATING AT STEADY STATE CONDITIONS AND ADJUSTED TO THE SPECIFIED NOx LEVEL AT 100% LOAD. EMISSION TOLERANCES SPECIFIED ARE DEPENDENT UPON FUEL QUALITY. METHANE NUMBER CANNOT VARY MORE THAN ± 3. PUBLISHED PART LOAD DATA IS WITH AIR FUEL RATIO CONTROL.

ENGINE RATING IS WITH 2 ENGINE DRIVEN WATER PUMPS. PUMP POWER IS NOT INCLUDED IN HEAT BALANCE DATA.

FOR NOTES INFORMATION CONSULT PAGE THREE.

FUEL USAGE GUIDE

| CAT METHANE NUMBER | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
|--------------------|----|----|----|----|----|----|-----|-----|------|------|------|------|
| IGNITION TIMING | - | - | - | - | - | - | - | - | 24 | 26 | 28 | 30 |
| DERATION FACTOR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.00 | 1.00 | 1.00 | 1.00 |

ALTITUDE DERATION FACTORS

| | | | | | | | | | | | | | | | |
|---------------------------------|-----|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|--|
| AIR TO TURBO (°F) | 130 | 0.96 | 0.93 | 0.89 | 0.86 | 0.83 | 0.79 | 0.76 | 0.74 | 0.71 | 0.68 | 0.65 | 0.63 | 0.60 | |
| | 120 | 0.98 | 0.94 | 0.91 | 0.87 | 0.84 | 0.81 | 0.78 | 0.75 | 0.72 | 0.69 | 0.66 | 0.64 | 0.61 | |
| | 110 | 0.99 | 0.96 | 0.92 | 0.89 | 0.86 | 0.82 | 0.79 | 0.76 | 0.73 | 0.70 | 0.68 | 0.65 | 0.62 | |
| | 100 | 1.00 | 0.97 | 0.94 | 0.90 | 0.87 | 0.84 | 0.81 | 0.77 | 0.74 | 0.72 | 0.69 | 0.66 | 0.63 | |
| | 90 | 1.00 | 0.99 | 0.96 | 0.92 | 0.89 | 0.85 | 0.82 | 0.79 | 0.76 | 0.73 | 0.70 | 0.67 | 0.65 | |
| | 80 | 1.00 | 1.00 | 0.97 | 0.94 | 0.90 | 0.87 | 0.84 | 0.80 | 0.77 | 0.74 | 0.71 | 0.68 | 0.66 | |
| | 70 | 1.00 | 1.00 | 0.99 | 0.96 | 0.92 | 0.89 | 0.85 | 0.82 | 0.79 | 0.76 | 0.73 | 0.70 | 0.67 | |
| | 60 | 1.00 | 1.00 | 1.00 | 0.97 | 0.94 | 0.90 | 0.87 | 0.83 | 0.80 | 0.77 | 0.74 | 0.71 | 0.68 | |
| | 50 | 1.00 | 1.00 | 1.00 | 0.99 | 0.96 | 0.92 | 0.88 | 0.85 | 0.82 | 0.79 | 0.76 | 0.73 | 0.70 | |
| | | 0 | 1000 | 2000 | 3000 | 4000 | 5000 | 6000 | 7000 | 8000 | 9000 | 10000 | 11000 | 12000 | |
| ALTITUDE (FEET ABOVE SEA LEVEL) | | | | | | | | | | | | | | | |

AFTERCOOLER HEAT REJECTION FACTORS

| AIR TO TURBO (°F) | 130 | 1.33 | 1.37 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | |
|---------------------------------|-----|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|--|
| | 120 | 1.26 | 1.31 | 1.33 | 1.33 | 1.33 | 1.33 | 1.33 | 1.33 | 1.33 | 1.33 | 1.33 | 1.33 | 1.33 | |
| | 110 | 1.19 | 1.24 | 1.26 | 1.26 | 1.26 | 1.26 | 1.26 | 1.26 | 1.26 | 1.26 | 1.26 | 1.26 | 1.26 | |
| | 100 | 1.13 | 1.17 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | |
| | 90 | 1.06 | 1.11 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | |
| | 80 | 1.00 | 1.04 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | |
| | 70 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| | 60 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| | 50 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| | | 0 | 1000 | 2000 | 3000 | 4000 | 5000 | 6000 | 7000 | 8000 | 9000 | 10000 | 11000 | 12000 | |
| ALTITUDE (FEET ABOVE SEA LEVEL) | | | | | | | | | | | | | | | |

FREE FIELD MECHANICAL & EXHAUST NOISE

| 100% Load Data | | | dB(A) | (dB) | | | | | | | | |
|-------------------------------------|---------------------------------|------|-------|-------|--------|--------|--------|-------|-------|-------|-------|--|
| Free Field Mechanical | DISTANCE FROM THE ENGINE (FEET) | 3.2 | 108.5 | 51.5 | 78.7 | 88.2 | 92.9 | 99.9 | 97.3 | 93.2 | 99.2 | |
| | | 22.9 | 91.6 | 34.6 | 59.0 | 68.1 | 74.0 | 83.0 | 79.4 | 75.1 | 85.2 | |
| | | 49.2 | 85.0 | 28.0 | 55.2 | 64.7 | 69.4 | 76.4 | 73.8 | 69.7 | 75.7 | |
| Free Field Exhaust | DISTANCE FROM THE ENGINE (FEET) | 4.9 | 106.1 | 67.5 | 86.5 | 96.0 | 88.5 | 88.7 | 90.1 | 95.6 | 92.7 | |
| | | 22.9 | 92.7 | 54.1 | 73.1 | 82.6 | 75.1 | 75.3 | 76.7 | 82.2 | 79.3 | |
| | | 49.2 | 86.1 | 47.5 | 66.5 | 76.0 | 68.5 | 68.7 | 70.1 | 75.6 | 72.7 | |
| Overall SPL | | | | 63 Hz | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | 8 kHz | |
| Octave Band Center Frequency (OBCF) | | | | | | | | | | | | |

FUEL USAGE GUIDE:

This table shows the derate factor required for a given fuel. Note that deration occurs as the methane number decreases. Methane number is a scale to measure detonation characteristics of various fuels. The methane number of a fuel is determined by using the Caterpillar Methane Number Calculation program.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various air inlet temperatures and altitudes. Use this information along with the fuel usage guide chart to help determine actual engine power for your site.

INLET AND EXHAUST RESTRICTION CORRECTIONS FOR ALTITUDE CAPABILITY:

To determine the appropriate altitude derate factor to be applied to this engine for inlet or exhaust restrictions differing from the standard conditions listed on page 1, a correction to the site altitude can be made to adjust for this difference. Add 141 feet to the site altitude for each additional inch of H₂O of exhaust stack pressure greater than spec sheet conditions. Add 282 feet to the site altitude for each additional inch of H₂O of inlet restriction greater than spec sheet conditions. If site inlet restriction or exhaust stack pressure are less than spec sheet conditions, the same trends apply to lower the site altitude.

ACTUAL ENGINE RATING:

It is important to note that the Altitude/Temperature deration and the Fuel Usage Guide deration are not cumulative. They are not to be added together. The same is true for the Low Energy Fuel deration (reference the Caterpillar Methane Number Program) and the Fuel Usage Guide deration. However, the Altitude/Temperature deration and Low Energy Fuel deration are cumulative; and they must be added together in the method shown below. To determine the actual power available, take the lowest rating between 1) and 2).

- 1) (Altitude/Temperature Deration) + (Low Energy Fuel Deration)
- 2) Fuel Usage Guide Deration

Note: For NA's always add the Low Energy Fuel deration to the Altitude/Temperature deration. For TA engines only add the Low Energy Fuel deration to the Altitude/Temperature deration whenever the Altitude/Temperature deration is less than 1.0 (100%). This will give the actual rating for the engine at the conditions specified.

AFTERCOOLER HEAT REJECTION FACTORS:

Aftercooler heat rejection is given for standard conditions of 77°F and 500 ft altitude. To maintain a constant air inlet manifold temperature, as the air to turbo temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor to adjust for ambient and altitude conditions. Multiply this factor by the standard aftercooler heat rejection. Failure to properly account for these factors could result in detonation and cause the engine to shutdown or fail. For 2 Stage Aftercoolers with separate circuits, the 1st stage will collect 90% of the additional heat.

SOUND DATA:

Data determined by methods similar to ISO Standard DIS-8528-10. Accuracy Grade 3. SPL = Sound Pressure Level.

NOTES

- 1 ENGINE RATING IS WITH 2 ENGINE DRIVEN WATER PUMPS. TOLERANCE IS $\pm 3\%$ OF FULL LOAD.
- 2 GENERATOR POWER DETERMINED WITH AN ASSUMED GENERATOR EFFICIENCY OF 96.1% AND POWER FACTOR OF 0.8 [GENERATOR POWER = ENGINE POWER \times GENERATOR EFFICIENCY].
- 3 ISO 3046/1 ENGINE EFFICIENCY TOLERANCE IS (+)0, (-)5% OF FULL LOAD % EFFICIENCY VALUE. NOMINAL ENGINE EFFICIENCY TOLERANCE IS $\pm 2.5\%$ OF FULL LOAD % EFFICIENCY VALUE.
- 4 THERMAL EFFICIENCY: JACKET HEAT + STAGE 1 A/C HEAT + EXH. HEAT TO 350°F.
- 5 TOTAL EFFICIENCY = ENGINE EFF. + THERMAL EFF. TOLERANCE IS $\pm 10\%$ OF FULL LOAD DATA.
- 6 ISO 3046/1 FUEL CONSUMPTION TOLERANCE IS (+)5, (-)0% OF FULL LOAD DATA. NOMINAL FUEL CONSUMPTION TOLERANCE IS $\pm 2.5\%$ OF FULL LOAD DATA.
- 7 UNDRIED AIR. FLOW TOLERANCE IS $\pm 5\%$
- 8 INLET MANIFOLD PRESSURE TOLERANCE IS $\pm 5\%$
- 9 INLET MANIFOLD TEMPERATURE TOLERANCE IS $\pm 9^\circ\text{F}$.
- 10 TIMING INDICATED IS FOR USE WITH THE MINIMUM FUEL METHANE NUMBER SPECIFIED. CONSULT THE APPROPRIATE FUEL USAGE GUIDE FOR TIMING AT OTHER METHANE NUMBERS.
- 11 EXHAUST STACK TEMPERATURE TOLERANCE IS (+)63°F, (-)54°F.
- 12 WET EXHAUST. FLOW TOLERANCE IS $\pm 6\%$
- 13 NOX TOLERANCES ARE $\pm 18\%$ OF SPECIFIED VALUE.
- 14 NTE CO, CO₂, THC, and NMHC VALUES ARE "NOT TO EXCEED".
- 15 NOMINAL CO IS A NOMINAL VALUE AND IS REPRESENTATIVE OF A NEW ENGINE DURING THE FIRST 100 HOURS OF ENGINE OPERATION.
- 16 O₂% TOLERANCE IS ± 0.5 ; LAMBDA TOLERANCE IS ± 0.05 . LAMBDA AND O₂ LEVEL ARE THE RESULT OF ADJUSTING THE ENGINE TO OPERATE AT THE SPECIFIED NOX LEVEL.
- 17 LHV RATE TOLERANCE IS $\pm 2.5\%$.
- 18 TOTAL JW HEAT (based on treated water) = JACKET HEAT + STAGE 1 A/C HEAT + 0.90 \times (STAGE 1 + STAGE 2) \times (ACHRF-1). TOLERANCE IS $\pm 10\%$ OF FULL LOAD DATA.
- 19 RADIATION HEAT RATE BASED ON TREATED WATER. TOLERANCE IS $\pm 50\%$ OF FULL LOAD DATA.
- 20 LUBE OIL HEAT RATE BASED ON TREATED WATER. TOLERANCE IS $\pm 20\%$ OF FULL LOAD DATA.
- 21 EXHAUST HEAT RATE BASED ON TREATED WATER. TOLERANCE IS $\pm 10\%$ OF FULL LOAD DATA.
- 22 STAGE 1 A/C HEAT (based on treated water) = STAGE 1 A/C HEAT + 0.90 \times (STAGE 1 + STAGE 2) \times (ACHRF-1). TOLERANCE IS $\pm 5\%$ OF FULL LOAD DATA.
- 23 STAGE 2 A/C HEAT (based on treated water) = (STAGE 2 A/C HEAT + (STAGE 1 + STAGE 2) \times 0.10 \times (ACHRF - 1)) + LUBE OIL HEAT. TOLERANCE IS $\pm 5\%$ OF FULL LOAD DATA.

ATTACHMENT O

MONITORING/RECORDKEEPING/REPORTING/TESTING PLANS

MONITORING/RECORDKEEPING/REPORTING/TESTING

MONITORING

1. Engine hour meters (non-resettable) will be installed to track engine usage.
2. Flow meters will be installed on the inlet gas flow to each engine.

RECORDKEEPING

1. Engine hours will be recorded.
2. Engine flow will be recorded on a data logger totalizer.
3. Engine maintenance will be recorded.

REPORTING

1. Standard WVDEP DAQ air compliance reporting will be performed.

TESTING

1. Each engine will be certified from the manufacturer to meet EPA emissions requirements.

ATTACHMENT P

PUBLIC NOTICE

PUBLIC NOTICE

On or about the same day as the submission of this Application to WVDEP, SIES will submit the attached Air Quality Public Notice to the Register-Herald Newspaper located at 801 N. Kanawha St. Beckley, WV. SIES will submit the original affidavit of the publication to the WVDEP as soon as it is available and no later than the last day of the public comment period for the Application.

In addition, the Raleigh County Solid Waste Authority has held an open public meeting on January 25, 2016 to inform the public on the proposed New River Clean Energy Facility. The meeting was held at the offices of the Authority at 200 Fernandez Drive in Beckley, WV.

AIR QUALITY PERMIT NOTICE NOTICE OF APPLICATION

Notice is given that Seven Island's Environmental Solutions, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Construction Permit for a Landfill Gas-to-Energy Facility to be constructed at the Raleigh County Solid Waste Authority Landfill located at 200 Fernandez Drive in Beckley and within Raleigh County, West Virginia. The project will be called the New River Clean Energy Facility. The latitude and longitude coordinates are: UTM Zone 17 N4186.39 km and UTM Zone 17 E485.50 km.

The applicant estimates the project will have the potential to discharge the following Regulated Air Pollutants: Carbon Monoxide – 93.84 tons, Sulfur Dioxide – 1.71 tons, Nitrous Oxide – 18.76 tons, Particulate Matter – 4.15 tons, Particulate Matter (10) – 4.15 tons, Particulate Matter (2.5) – 4.15 tons, Volatile Organic Compounds – 33.03 tons, and Hazardous Air Pollutants – 0.52 tons. A corresponding reduction in Regulated Air Pollutants will occur from the existing Raleigh County Solid Waste Authority air emissions.

Startup of operation of the facility is planned to begin on or about October 1, 2016. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.

Dated this the 10th day of March, 2016.

By: Seven Island's Environmental Solutions, LLC
Robert Fairey
Vice President
6205 Peachtree Dunwoody Road
Atlanta, GA 30328

ATTACHMENT R
AUTHORITY FORMS

AUTHORITY OF LIMITED LIABILITY COMPANY (LLC)

TO: The West Virginia Department of Environmental Protection, Division of Air Quality

DATE: February 22, 2016

ATTN: Director

LLC's Federal Employer I.D. Number: 47-3963320

The undersigned hereby files with the West Virginia Department of Environmental Protection, Division of Air Quality, a permit application and hereby certifies that the said name is a trade name which we are using in the conduct of an unincorporated business.

Further, we have agreed or certified as follows:

- (1) The undersigned is a member and in that capacity may represent the interests of the LLC and may obligate and legally bind all current or future members and the LLC.
- (2) The LLC is authorized to do business in the State of West Virginia.
- (3) The name and business address of each member:

Member: Cox Corporate Services, Inc.
Address: 6205-A Peachtree Dunwoody Road
Atlanta, GA 30328
Telephone No.: 678-645-0000


Member: _____
Address: _____

Telephone No.: _____

Member: _____
Address: _____

Telephone No.: _____

- (4) If any other persons become members of the undersigned or our relations as such be altered in any way or if the business should become incorporated, the undersigned will notify you promptly.



MEMBER OF LLC (Signature)

Charles N. Bowen

Address: 6205-A Peachtree Dunwoody Road
Atlanta, GA 30328
Telephone No.: 678-645-0000

MEMBER OF LLC (Typed)

Seven Islands Environmental Solutions, LLC

LIMITED LIABILITY COMPANY'S NAME