Village Green Maine, LLC
Cumberland County
Brunswick, Maine
A-1086-71-A-N (SM)

Departmental

Findings of Fact and Order
Air Emission License

FINDINGS OF FACT

After review of the air emissions license application, staff investigation reports and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 M.R.S.A., §344 and §590, the Maine Department of Environmental Protection (Department) finds the following facts:

I. REGISTRATION

A. Introduction

Village Green Maine, LLC (Village Green) submitted an air emission application to construct and operate a new anaerobic digester/energy production facility. This facility generates biogas which will be used in a combined heat and power (CHP) unit to produce electric power and heat. The facility will be located on Orion Street, Brunswick Landing of the former Brunswick Naval Air Station.

B. Emission Equipment

The following equipment is addressed in this air emission license:

Fuel Burning Equipment

Equipment	Maximum Capacity (MMBtu/hr)	Maximum Firing Rate (scfm)	Fuel Type	Pollution Control Equipment	Stack #
CHP #1 (1 MW Gen-set)	9.7	295 scfm 163 scfm	digester gas, natural gas	Fuel and Air Filters	1
Boiler #1	1.6	25.9 scfm	natural gas	none	2

Process Equipment

Emissions Unit ID	Equipment Type	Production Rate	Pollution Control Equipment
AD #1	Anaerobic Digester	Feed to produce gas at Max capacity of CHP	CHP or Flare

C. Application Classification

A new source is considered a major source based on whether or not expected emissions exceed the "Significant Emission Levels" as defined in the Department's regulations. The emissions for the new source are determined by the maximum future license allowed emissions, as follows:

Pollutant	Max. Future License (TPY)	Sig. Level
PM	2.2	100
PM_{10}	2.2	100
SO_2	10.2	100
NO_x	14.9	100
CO	31.6	100
VOC	10.0	50
CO_2e	<100,000	100,000

The Department has determined Village Green is a minor source and the application has been processed through *Major and Minor Source Air Emission License Regulations*, 06-096 CMR 115 (as amended). Taking into account the proposed pollution control equipment, the facility is licensed below the major source thresholds and is considered a synthetic minor.

D. Regulatory Overview

Provided in this section is a summary of State and Federal air regulations that apply to the Village Green facility. Village Green has designed a facility and selected specific equipment that will achieve compliance with these State and Federal air regulations.

Maine Air Regulations

The proposed Project has been reviewed for potential applicability to the following MEDEP Bureau of Air Quality:

06-096 CMR 101 Visible Emission Regulation

This rule establishes opacity limitations for emissions from several categories of air contaminant sources.

The CHP #1 and AD#1 are subject to Section (2)(B)(1)(f), which limits visible emissions from any fuel burning equipment not specifically listed in the Section to an opacity of 30 percent on a six (6) minute block average basis, except for no more than two (2) six (6) minute block averages in a 3-hour period. The BACT limit is more stringent.

06-096 CMR 103 Fuel Burning Equipment Particulate Emission Standard

This rule applies to all fuel burning equipment that has a rated heat input capacity of 3 MMBtu per hour or greater. CHP #1 is considered a new source since an application for licensure is being submitted after December 22, 1982. Specifically, the CHP unit will comply with Section 2(B)(4)(a), which establishes a PM limit of 0.30 lb/MMBtu for units with a heat input capacity less than 50 MMBtu/hr. The BACT limit is more stringent.

06-096 CMR 104 Incinerator Particulate Matter Standard

This rule establishes a limitation on the amount of particulate matter allowed to be emitted from each of several categories and sizes of incinerators and a limitation on the opacity of emissions from all incinerators. CHP #1 and AD #1 are not subject to this rule because the anaerobic digester is not an incinerator. 06-096 CMR 100 defines incinerator to mean "any device, apparatus or equipment used for destroying, reducing or salvaging by fire or heat any material or substance." The digester processes the organic sludge to create biogas which will be burned in the CHP to produce electric power.

06-096 CMR 115 Major and Minor Source Air Emission License Regulations

This rule specifies who must obtain an air emission license, describes the information an applicant must submit for a license, and describes the standards and criteria that must be complied with during and following the air licensing process. For minor sources such as Village Green, 06-096 CMR 115 serves as a minor operating licensing program and a pre-construction license review program.

06-096 CMR 121 Emission Limits and Emission Testing of Resource Recovery Facilities

This rule establishes stack emission limitations, operating practices, compliance and performance testing, and reporting and recordkeeping requirements for all new, existing, and modified resource recovery facilities. The Village Green digester process is not subject to this rule because it is not a resource recovery facility. The definitions in 40 CFR Part 60 Subparts Cb, Eb, and BBBB are

incorporated by reference and municipal solid waste is defined in these Subparts to mean "household, commercial/retail, or institutional waste…Household, commercial/retail, and institutional waste does not include used oil; sewage sludge…" The sludge feeding into Village Green and the proposed AD do not meet the definition of municipal solid waste since it is comprised solely of sewage sludge and organic wastes.

06-096 CMR 137 Emission Statements

This rule establishes requirements for the reporting of pollutant emissions from stationary sources of air pollution. Village Green is not subject to this regulation because it will be licensed to below the ton per year reporting thresholds.

Federal Air Regulations

New Source Performance Standards (NSPS)

This program is codified in 40 CFR Part 60 and is referred to as the NSPS program. There are numerous categories of emission sources for which a specific NSPS subpart applies. The paragraphs below present a description of the NSPS Subparts that are relevant to Village Green and discuss the applicability of each.

Subpart Dc

Subpart Dc, Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units applies to new, modified and reconstructed steam generating units with a maximum design heat input capacity of 100 MMBtu/hr or less, but greater than or equal to 10 MMBtu/hr. Subpart Dc defines steam generating unit as "*a device that combusts any fuel and produces steam or heats water or heats any heat transfer medium. This term includes any duct burner that combusts fuel and is part of a combined cycle system. This term does not include process heaters as defined in this subpart.*" The CHP is rated at 9.7 MMBtu/hr and therefore is below the 10 MMBtu/hr threshold. The facility is not subject to 40 CFR Part 60 Subpart Dc.

Subpart LLLL

Subpart LLLL, Standards of Performance for New Sewage Sludge Incineration (SSI) Units applies to units commencing construction after October 14, 2010 or modification after September 21, 2011. Village Green is not subject to this rule because it is not an SSI unit and it is not proposed to be located at a wastewater treatment plant. An SSI unit is defined to mean "an incineration unit combusting sewage sludge for the purpose of reducing the volume of the sewage sludge by removing combustible matter." Village Green is not an SSI unit because it is not incinerating sludge, the anaerobic digester will process the organic wastes to create biogas which will then be burned in the CHP unit to produce electric power.

Subpart JJJJ

CHP #1 is subject to the New Source Performance Standards (NSPS) 40 CFR Part 60, Subpart JJJJ, *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*. The applicability for this engine is under the category of engines manufactured on or after July 1, 2008 with a maximum engine power greater than 500 hp manufactured (§60.4230(a)(4)(iii)). Owners of these units are required to purchase an engine certified to the standards of Subpart JJJJ, Table 1 (manufacturer certification is acceptable).

Subparts Ea, Eb, Cb, AAAA, BBBB

Subparts Ea, Eb, Cb, AAAA, and BBBB provide New Source Performance Standards for small and large, new and existing municipal waste combustion units. CHP #1 and AD#1 are not subject to these Subparts because they do not burn municipal waste as defined by the rules. Municipal solid waste is defined to mean "household, commercial/retail, or institutional waste…Household, commercial/retail, and institutional waste does not include used oil; sewage sludge…" The biosolids feeding the Village Green anaerobic digester do not meet the definition of municipal solid waste since it is comprised solely of sewage sludge and organic wastes.

National Emission Standards for Hazardous Air Pollutants

In the late 1970s, amendments to the CAA authorized EPA to require national standards for hazardous air pollutants (HAPs) at levels that would ensure the protection of the public health with an ample margin of safety and to prevent any significant and adverse environmental effects, which may reasonably be anticipated, on wildlife, aquatic life, or other natural resources. The passage of 1990 amendments renewed emphasis on controlling emissions of HAPS on the federal level but it changed the approach to regulating HAPs based on two types of emission standards: maximum achievable control technologies (MACTs) and generally available control technologies (GACTs). A list of 189 compounds was provided by the Congress to be controlled by EPA as HAPs. This program is codified in 40 CFR Part 63 and is referred to as the NESHAP program or as MACT Standards. There are numerous categories of emission sources for which a specific NESHAP subpart applies. The paragraphs below present a description of the NESHAP applicability of this emissions source.

Subpart JJJJJJ

Subpart JJJJJJ, *National Emissions Standards for Hazardous Air Pollutants for Industrial, Commercial and Institutional Boilers at Area Sources* applies to all new, reconstructed and existing boilers within three subcategories (coal, biomass and oil) located at an area source of hazardous air pollutants. The Village Green

AD #1 and CHP #1 are not subject to this rule because they are not "boilers" as defined by the rule. Village Green's potential to emit is less than 10 TPY of a single HAP and 25 TPY of all HAP combined and is therefore an area source for HAP. Subpart JJJJJJ defines boiler to mean "an enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam or hot water." Because AD#1 and CHP#1 are not boilers, they are not subject to Subpart JJJJJJ.

Village Green will operate a small natural gas fired heater rated at 1.6 MMBtu/hr. Subpart JJJJJJ is not applicable to units firing gas, hot water heaters, temporary boilers, residential boilers, etc.

Subpart ZZZZ

CHP #1 is also subject to 40 CFR Part 63, Subpart ZZZZ, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines*. The generator is considered new stationary reciprocating internal combustion engines at an area HAP source (construction commenced on or after June 12, 2006); however, since the unit is subject to 40 CFR Part 60, Subpart JJJJ there are no further requirements under 40 CFR Part 60, Subpart ZZZZ (§63.6590(c)(1)).

Subpart E

40 CFR Part 61 - Subpart E - National Emission Standard for Mercury. Subpart E applies to stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge. Village Green is not subject to this rule because it does not meet the definition of a sludge dryer as defined by the rule. Subpart E defines sludge dryer to mean "a device used to reduce the moisture content of sludge by heating to temperatures above 150°F directly with combustion gases." The Village Green AD #1 and CHP #1 are not subject to this rule because they are not incinerating sludge.

II. BEST PRACTICAL TREATMENT (BPT)

A. Introduction

In order to receive a license the applicant must control emissions from each unit to a level considered by the Department to represent Best Practical Treatment (BPT), as defined in *Definitions Regulation*, 06-096 CMR 100 (as amended). Separate control requirement categories exist for new and existing equipment as well as for those sources located in designated non-attainment areas.

BPT for new sources and modifications requires a demonstration that emissions are receiving Best Available Control Technology (BACT), as defined in *Definitions Regulation*, 06-096 CMR 100 (as amended). BACT is a top-down approach to selecting air emission controls considering economic, environmental and energy impacts.

Project Overview

Village Green proposes to install and operate an Anaerobic Digester/Energy Production Facility near the southerly end of the airport tarmac at Brunswick Landing. The proposed facility will include an anaerobic digester designed to anaerobically digest a mixture of organics to produce electricity, and stabilized digestate. The facility will receive by truck both solids and liquid feeds to be processed in the digester. Feeds will be transferred directly to tanks/containers, be contained in equipment or buildings at all times, and will not be stored or processed outside. The feeds will include wastewater treatment plant sludge, septage, Fats, Oils & Grease (FOG), food waste, and other organic wastes. The anaerobic digestion process will include the creation of biogas that will be burned in a Combined Heat and Power unit (CHP) to produce electric power for sale. The system is designed to produce a stabilized digestate which will be pasteurized (or time & temperature per DEP rule) to meet CLASS A biosolids classification. This digestate will be dewatered with the liquid fraction being sent to the Brunswick Sewer District (BSD) through the existing Brunswick Landing sewer infrastructure and the solids fraction being managed by a company licensed to handle or dispose of the digestate solids.

CHP #1 will be able to use both digester gas and natural gas as a fuel. Digester gas will be the primary fuel with natural gas used as a secondary fuel to maximize electricity generation and to run the generator at capacity. The air license uses the maximum fuel rate that the CHP #1 is designed for to allow flexibility in how the unit is used.

The proposed anaerobic digester system will be designed and supplied primarily by Quasar Energy Group. This process will be permitted as a solid waste processing facility under the Maine Solid Waste Management Rules.

The facility includes the following components:

1. Liquids receiving area with in-ground 12,000 gallon concrete receiving tank
2. Solids receiving hopper, with a grinder and macerator
3. 230,000 gallon biomass equalization tankage
4. 75,000 gallon dilution tank
5. 75,000 gallon pasteurization tank
6. 850,000 gallon main digester tank & gas dome

7. Heat Exchanger
8. CHP unit (Combined Heat and Power)
9. Desulfurization Blower
10. H_2S/gas drying (Desulfurization using ferrous sulfate)
11. Gas flare
12. Controls module/monitoring system
13. Process piping
14. Process electrical
15. Biofilter designed and operated to handle odors from solids module and receiving tank
16. Start-up boiler – A start-up boiler will be used for start-up of the digester system to bring the system up to temperature. This boiler will fire natural gas and will be approximately 1.6 MMBtu/hr.

Biogas production and use

1. **Main Digester Tank and Gas Dome**

The digester tank is an insulated, bolted, steel tank with a working volume of 850,000 gallons. Four side-entry prop mixers prevent layer formation of the material, ensuring a consistent mix of feedstock and bacteria in the digester tank. The conditioned biomass from the tank system is fed into the digester tank at a turbulence zone created by the mixer to minimize the time required to obtain a complete mix.

The vapor space of all of the liquid storage tanks on site are connected to the top of the digester tank to allow any digester gas formed in these tanks to be collected and handled in a common system. (The only exception to this is the liquid receiving tank which is tied to the biofilter for odor control and is emptied as soon as deliveries are made to get the material into the process as soon as possible.)

The digester tank allows methanogenic bacteria to convert organic biomass into biogas. Some of the waste heat from the engine is used to maintain the digestate temperature in the tank. The digestate is held at approximately 100°F via a sludge to water heat exchanger.

Gas storage in the digester tank will be accomplished with a double membrane roof system ("Gas Dome"). The inner membrane, which inflates as biogas is produced in the system, is supported by biogas pressure. The outer membrane is supported by a blower with a consistent amount of outside air introduced to maintain constant pressure levels. Safe pressure levels are maintained by a combined pressure and vacuum relief valve mounted to the digester tank.

A small amount of air is injected into the vapor space of the digester tank which biologically converts most of the hydrogen sulfide (H_2S) to sulfate (SO_4).

The digester tank gas space is connected to the combined heat and power unit which is designed to use all of the digester gas generated. It also has a connection to the emergency flare should the CHP unit be off-line sufficiently long that the digester gas storage fills and gas must be flared. The tank also has a second emergency relief valve which will discharge the gas to the atmosphere in the case that both the CHP unit and the flare are not operating. This second emergency relief valve protects the tank integrity in an extreme situation which is not expected to occur.

2. **H_2S/Gas Drying**

Biogas is passed through a desulphurization reactor filled with media impregnated with ferrous sulfate. The hydrogen sulfide (H_2S) gas reacts with the ferrous sulfate effectively removing the H_2S from the gas stream. Subsequently, in the CHP unit, the gas passes through a filter and the dew point is lowered via a gas chiller, which reduces the moisture content in the biogas. The amount of H_2S generated in the digester can vary greatly with the feed and conditions. The system uses a hydrogen sulfide monitor to determine the H_2S level in the treated digester gas and to determine when the desulphurization media may need to be replaced. The H_2S level in the gas will be reduced to level less than 800 ppm H_2S and generally less than 200 ppm H_2S prior to the CHP unit.

3. **CHP #1**

Biogas will be used as the primary fuel in a CHP where electricity is produced. The system monitors the methane level of the biogas before it is burned. Electricity in excess of the plant's requirements is metered in to the electrical distribution grid. In order to maximize energy production, natural gas may be used as a secondary fuel when there is insufficient digester gas produced to run the generator at capacity.

Heat from the water jacket and exhaust is used to maintain temperature in the digester and is available as a local heat source (heat loop to non-digester facilities is outside the scope of the construction project). Through electrical generation and thermal recovery, the anticipated efficiency is approximately 85%. CHP #1 is rated at 1000 kW continuous duty and 1475 BHP. The generator includes a gas particulate filter as well as an after cooler filter. The exhaust temperature is 957°F.

4. **Flare**

Whenever biogas is being generated beyond what can be held in the digester tank when the generator is off-line or is generated in excess of the needs of the CHP unit, the biogas will be burned by the flare. Pressure in the gas dome controls flare ignition and run time. The flare is designed to burn 150% of the expected biogas volume or 333 standard cubic feet per minute (scfm) biogas. The flame from this flare will be semi-enclosed. The flare does not have a pilot; the flare will be ignited electronically.

B. Anaerobic Digester and Combined Heat & Power (BACT))

BACT Analysis for PM/PM_{10} emissions

The options for controlling particulate matter from generators include add-on controls and good operating practices. The AD #1 system includes gas cleaning using a particulate filter to remove particulate matter from the biogas prior to combustion. CHP #1 has its own fuel and air filters which further remove particulates and improve engine performance and reliability. These filters, the inherent combustion efficiencies of a new unit, and good operating practices are proposed as BACT. The emission factors obtained from the San Diego Air Pollution Control District were used for estimating the PM/PM_{10} emissions based on the volume of digester gas and natural gas. Due to economic considerations, add-on controls for the exhaust were not considered BACT. Therefore the standard filters and good engine performance is BACT for particulate.

BACT Analysis for SO_2 emissions

Sulfur Dioxide forms from the oxidation of the sulfur contained in the fuel when it is burned in the generator. Very low levels of sulfur is contained in natural gas, therefore the use of natural gas when fired is considered BACT. When firing biogas, the anaerobic digestion process does not produce sulfur dioxide directly, however, it does produce hydrogen sulfide and possibly other reduced sulfur compounds from the digestion of feedstock containing sulfur compounds. It is estimated, based on the anticipated feedstock, that the anaerobic digestion process has the capacity to produce as much as 3000 ppm of hydrogen sulfide.

Sulfides in the digester gas will be oxidized to SO_2 when it is burned in CHP #1. There are several methods for reducing the level of hydrogen sulfide in the digester gas prior to burning the digester gas including biological removal of hydrogen sulfide in the digester head space, addition of ferric chloride to the digesters and use of ferrous sulfate desulfurization unit. While it is possible to use an aqueous scrubber system to remove SO_2 from an exhaust stream from a burner system, this is not typically done for generator exhaust since there are

other efficient, cost effective options for sulfur removal before burning the gas. Exhaust scrubber systems were not considered further.

Biological removal followed by an ferrous sulfate desulfurization unit for removing hydrogen sulfide from the digester gas is proposed as BACT for SO_2. Biological removal involves injecting a small amount of air into the head space of the anaerobic digester. This air allows micro-organisms to develop in the headspace of the tank which biologically convert the hydrogen sulfide to sulfate (SO_4) which is not volatile and returns to the digester liquid effluent. Once the digester gas leaves the digester vessel it is treated in a H_2S Scrubber Unit which is filled with media impregnated with ferrous sulfate. The hydrogen sulfide gas reacts with the ferrous sulfate removing it from the gas stream. The hydrogen sulfide concentration is expected to generally be below 200 ppm after this treatment, however due to the variable nature of the feedstock and anaerobic digestion, levels as high a 800 ppm are possible.

Both the air injection method and the iron sponge (similar to ferrous sulfate) have been used alone as BACT for SO_2 at other facilities in Maine. To meet BACT, Village Green will install and operate the ferrous sulfate desulfurization technology to limit the hydrogen sulfide concentration to less than 800 ppm (2.3 lb of SO_2/hr when operating on digester gas).

BACT Analysis for NOx emissions

There are many options for controlling NOx emissions from an internal combustion engine including combustion controls to limit NOx formation, Ignition Timing Retard, lean burn combustion, combustion of biogas, selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR)

Using biogas fuel can be considered as part of a NOx emissions reduction control. Digester gas is approximately 60% carbon dioxide which causes peak engine temperatures to be reduced, thereby minimizing NOx formation. Using as much digester gas as can be produced for power production is proposed as an element of BACT for NOx.

Lean burn combustion engines are designed to be operated at high excess air levels resulting in lower combustion temperature and therefore lower NOx emissions. Lean burn combustion simultaneously minimizes emissions of NOx along with PM, CO, and VOC. Lean burn combustion is widely accepted as BACT.

Ignition timing retard delays the ignition timing to minimize peak combustion temperature. NOx formation can be reduced, but CO and PM emissions potentially increase, along with a decrease in engine performance and operational stability. Ignition timing retard delays is not BACT for this engine.

Derating or limiting the engine capacity to less than full power reduces NOx formation by reducing cylinder pressures and temperatures. Derating is also not BACT to reduce NOx for this engine due to the loss of income from power production.

SCR is an add-on control system which uses urea or ammonia injection and a catalyst to react with the NOx in the flue gas to form water and nitrogen. SCR catalysts are in use in some diesel fueled engines but are not generally used for biogas fueled engines due to the potential for poisoning of the catalyst by compounds found in the digester gas. In several California Air Districts, use of SCR in landfill gas fueled engines is experimental and there are no known stable, long-term operations using SCR on similar digester gas systems in practice. Therefore, SCR is not considered a feasible technology for this application.

SNCR is an add-on control which also uses ammonia or urea injection but without a catalyst. The reaction required the injection point at specific temperature (1600°F to 2100°F), which is above the expected exhaust temperature of 957°F for the proposed generator, therefore SNCR is not considered a feasible technology for this application.

The use of digester gas as the primary fuel, using a lean burn engine, and good operating, combustion and maintenance practices are considered BACT for NOx.

BACT Analysis for CO emissions

The options for controlling carbon monoxide emissions from the generator include good combustion control of a lean burn engine, good operating practice and an add-on oxidation catalyst. Add-on oxidation catalyst was not considered. The inherent combustion efficiency of a new lean burn generator and good operating practices are proposed as BACT for carbon monoxide.

BACT Analysis for VOC emissions

The options for controlling volatile organic compounds (VOC) emissions from the generator include good combustion control of a lean burn engine, good operating practice and an add-on oxidation catalyst. Add-on oxidation catalyst was not economically feasible. The inherent combustion efficiency of a new lean burn generator and good operating practices are considered BACT for VOCs and have been considered BACT at other Maine facilities. It should be noted that the generator data sheet lists VOC emissions as <0.7 g/bHPh for non-methane hydrocarbons (NMHC). The supplier of the equipment has indicated that there are no NMHC in the biogas. An emissions factor of 0.7 g/bHPh was used for calculating the VOC emissions.

Summary

Village Green's anaerobic digester facility plans to generate digester gas in an aerobic digester vessel and burn this digester gas in a generator to produce electricity. In order to maximize the production of power, Village Green plans to burn natural gas in the generator when there is insufficient digester gas to run the generator at capacity.

The following control options are proposed as BACT for the Village Green anaerobic digester facility:

General: Proper operation and good combustion and maintenance practices

PM/PM_{10}:	Fuel and Air Filters, efficiency of a new unit
SO_2:	Injection of air into the top of the digester, ferrous sulfate desulfurization.
NOx:	Lean burn engine, use of digester gas
CO:	Good combustion practices, lean burn engine
VOC:	Good combustion practices, lean burn engine

The BACT analysis for the project is based on a baseline generator operating at full capacity using 295 SCFM digester gas or 163 SCFM of natural gas and use of the digester gas and natural gas in a generator to produce power.

SUMMARY OF EMISSIONS

Pollutant	**Estimated Controlled Emissions**	
	Natural Gas	Digester Gas
PM / PM_{10}	0.1 lb/hr 0.4 tpy	0.5 lb/hr 2.1 tpy
SO_2	0.1 lb/hr 0.4 tpy	2.3 lb/hr 10 tpy
NOx	3.3 lb/hr 14 tpy	4.3 lb/hr 18.6 tpy
CO	7.1 lb/hr 31 tpy	7.1 lb/hr 31 tpy
VOC	2.3 lb/hr 9.9 tpy	2.3 lb/hr 9.9 tpy

Proper operation and good combustion and maintenance practices minimize emissions for all pollutants. Village Green will maintain the anaerobic digester and generator in accordance with the manufacturers' written instruction for proper operation and maintenance.

Visible Emissions

Visible emissions from the stack for CHP #1 shall not exceed 10% opacity on a six (6) minute block average, except for no more than two (2) six (6) minute block averages in a continuous 3-hour period.

Periodic Monitoring

Village Green shall keep records of the hours of operation of CHP #1 unit on a 12- month rolling total basis.

To monitor the performance of the ferrous sulfate media, Village Green will operate a hydrogen sulfide monitor to determine the H_2S level in the treated digester gas (after the desulfurization unit) and to determine when the desulfurization media may need to be replaced. The media in the desulfurization unit shall be replaced when the monitor shows breakthrough of H_2S (greater than 500 ppm). Records shall be maintained of the monitor results and dates of when the media is replaced.

Compliance with the emission requirements in 40 CFR Part 60, Subpart JJJJ shall be demonstrated by certification from the manufacturer or an initial performance test and subsequent tests every 8760 hours or 3 years, whichever comes first, if a manufacturer certification is unavailable.

Operational Monitoring for Control Technologies

The following table outlines the operational monitor for the control technology selected as BACT (scrubber) so that the facility may demonstrate ongoing compliance with BACT limits when it operates. Based on the design of Village Green, the following monitor will be used to ensure the proper operation of the control device described in the BACT analysis.

Control Device	Operational Monitor
H_2S/Gas Scrubber (ferrous sulfate desulfurization unit)	H_2S monitor

Following startup of the facility and based on the results of initial stack testing, Village Green will define the thresholds corresponding to the required level of

emissions control. Compliance with the emission requirements for SO_2, NOx, and VOC shall be demonstrated by an initial performance test.

C. Digester Flare

The digester flare is rated at 150% of the expected biogas volume or 333 scfm biogas (approximately 15 MMBtu/hr). The flare will be utilized as a back-up combustion device when biogas cannot be combusted in the engine due to equipment downtime, malfunction, or other scenarios in which the biogas would otherwise be vented.

BACT is proposed to be the use of the flare for control of digester gases when the gases are not able to be fired in CHP #1.

The BACT emission limits for the flare were based on the following emission factors provided by the San Diego Air Pollution Control District (http://www.sdapcd.org/toxics/emissions/combgas/combgas.html) for the flare burner and "fuel" SO_2 and NOx generated from oxidizing the ammonia and hydrogen sulfide in the fuel :

PM/PM_{10} – 0.02 lb/MMBtu (0.3 lb/hr)
SO_2 – 2.0 lb/$MMft^3$ (0.1 lb/hr) + 8.9 lb/hr = 9.0 lb/hr
NO_X – 48.0 lb/$MMft^3$ (1.0 lb/hr) + 1.1 lb/hr = 2.1 lb/hr
CO – 1.8 lb/$MMft^3$ (0.1 lb/hr)
VOC – 12.10 lb/$MMft^3$ (0.3 lb/hr)
Opacity – Visible emissions from the flare shall not exceed an opacity of 10% on a 6 minute block average basis, except for no more than one (1) six (6) minute block average in a 3 hour period.

Periodic Monitoring

Village Green shall maintain a log documenting the hours of flare operation.

D. BACT for the natural gas fired heater (Boiler #1)

Village Green will operate a boiler which will be used for start-up of the digester system to bring the system up to temperature. This boiler will combust natural gas and will be rated with a maximum heat input of 1.6 MMBtu/hr.

NOx, SO2, CO, PM, and VOC

NOx control techniques are generally organized into two separate groups: combustion controls, and post-combustion controls. Combustion controls affect the combustion conditions to minimize the formation of NOx, while post-

combustion controls remove NOx after it has formed. Add-on pollution control equipment is not economically viable, therefore Village Green will meet BACT for NOx emissions using the boiler's existing combustion controls.

Emissions of SO_2, CO, PM and VOC from small natural gas fired boilers/heaters are generally very low. Emission control equipment is not economically practical. Village Green will meet BACT for these pollutants through the use of the boiler's existing combustion controls.

1. BACT Findings

The BACT emission limits for Boiler #1 were based on the following:

PM/PM_{10} – 0.05 lb/MMBtu based on 06-096 CMR 115, BACT
SO_2 – 0.6 lb/MMscf: AP-42, Table 1.4-2 (dated 7/98)
NO_X – 100 lb/MMscf: AP-42, Table 1.4-1 (dated 7/98)
CO – 84 lb/MMscf: AP-42, Table 1.4-1 (dated 7/98)
VOC – 5.5 lb/MMscf: AP-42, Table 1.4-2 (dated 7/98)
Opacity – Visible emissions from Boiler #1 firing natural gas shall not exceed 10% opacity on a 6 minute block average basis, except for no more than one (1) six (6) minute block average in a 3 hour period. 06-096 CMR 115, BACT

The BACT emission limits for the boiler are the following:

Unit	PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Boiler #1	0.1	0.1	0.1	0.2	0.2	0.1

Visible emissions from Boiler #1 shall not exceed 10% opacity on a 6 minute block average basis, except for no more than one (1) six (6) minute block average in a 3 hour period.

2. Periodic Monitoring

Village Green operating the boiler at maximum capacity for 8760 hours per year results in emissions of each pollutant to less than 1 ton per year. Therefore, no fuel limit or periodic monitoring for fuel use is needed for this particular unit.

3. 40 CFR Part 63 Subpart JJJJJJ

The natural gas fired heater is not subject to the National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources (40 CFR Part 63 Subpart JJJJJJ).

E. Fugitive Emissions

Visible emissions from a fugitive emission source (including stockpiles and roadways) shall not exceed an opacity of 20%, except for no more than five (5) minutes in any 1-hour period. Compliance shall be determined by an aggregate of the individual fifteen (15)-second opacity observations which exceed 20% in any one (1) hour.

F. General Process Emissions

Visible emissions from any general process source shall not exceed an opacity of 20% on a six (6) minute block average basis, except for no more than one (1) six (6) minute block average in a 1-hour period.

G. Annual Emissions

Potential emissions from the CHP #1 and the AD#1 depend on the characteristics of the biosolids feedstock which is highly variable. Potential emissions for NOx, CO, SO_2, PM and VOC were calculated using estimates supplied by Village Green and the design engineering firm for the digester gas characteristics. Assumptions were included based on experience with similar systems using best engineering judgment. Annual uncontrolled emissions assume an annual operating schedule of 8760 hours per year and digester gas generation rate of 295 scfm (capacity of the generator). Controlled emissions include the use of an H_2S scrubber and a fabric filter as described in the BACT analysis.

Village Green shall be restricted to the following annual emissions, calculated with the process operating 8760 hrs/year, based on a 12 month rolling total:

Total Licensed Annual Emissions for the Facility
Tons/year
(used to calculate the annual license fee)

	PM	**PM_{10}**	**SO_2**	**NO_x**	**CO**	**VOC**
CHP #1 and AD#1	**2.1**	**2.1**	**10.1**	**18.6**	**31.0**	**9.9**
Boiler #1	**0.1**	**0.1**	**0.1**	**0.7**	**0.6**	**0.1**
Total TPY	**2.2**	**2.2**	**10.2**	**19.3**	**31.6**	**10.0**

Hazardous Air Pollutants (HAP)

Through this air emission license, Village Green's HAP emissions are limited/capped at 9.9 TPY for a single HAP and 14.9 TPY for all HAP combined.

Greenhouse Gases

Greenhouse gases are considered regulated pollutants as of January 2, 2011, through 'Tailoring' revisions made to EPA's *Approval and Promulgation of Implementation Plans,* 40 CFR Part 52, Subpart A, §52.21 Prevention of Significant Deterioration of Air Quality rule. Greenhouse gases, as defined in 06-096 CMR 100 (as amended), are the aggregate group of the following gases: Carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. For licensing purposes, greenhouse gases (GHG) are calculated and reported as carbon dioxide equivalents (CO_2e).

Based on the facility's fuel use limit(s), the worst case emission factors from AP-42, IPCC (Intergovernmental Panel on Climate Change), and *Mandatory Greenhouse Gas Reporting*, 40 CFR Part 98, and the global warming potentials contained in 40 CFR Part 98, Village Green is below the major source threshold of 100,000 tons of CO_2e per year. Therefore, no additional licensing requirements are needed to address GHG emissions at this time.

III. AMBIENT AIR QUALITY ANALYSIS

According to 06-096 CMR 115, the level of air quality analyses required for a minor new source shall be determined on a case-by case basis. Based on the information available in the file, and the similarity to existing sources, Maine Ambient Air Quality Standards (MAAQS) will not be violated by this source.

ORDER

Based on the above Findings and subject to conditions listed below, the Department concludes that the emissions from this source:

- will receive Best Practical Treatment,
- will not violate applicable emission standards,
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants Air Emission License A-1086-71-A-N subject to the following conditions.

Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

STANDARD CONDITIONS

(1) Employees and authorized representatives of the Department shall be allowed access to the licensee's premises during business hours, or any time during which any emissions units are in operation, and at such other times as the Department deems necessary for the purpose of performing tests, collecting samples, conducting inspections, or examining and copying records relating to emissions (38 M.R.S.A. §347-C).

(2) The licensee shall acquire a new or amended air emission license prior to commencing construction of a modification, unless specifically provided for in Chapter 115. [06-096 CMR 115]

(3) Approval to construct shall become invalid if the source has not commenced construction within eighteen (18) months after receipt of such approval or if construction is discontinued for a period of eighteen (18) months or more. The Department may extend this time period upon a satisfactory showing that an extension is justified, but may condition such extension upon a review of either the control technology analysis or the ambient air quality standards analysis, or both. [06-096 CMR 115]

(4) The licensee shall establish and maintain a continuing program of best management practices for suppression of fugitive particulate matter during any period of construction, reconstruction, or operation which may result in fugitive dust, and shall submit a description of the program to the Department upon request. [06-096 CMR 115]

(5) The licensee shall pay the annual air emission license fee to the Department, calculated pursuant to Title 38 M.R.S.A. §353. [06-096 CMR 115]

(6) The license does not convey any property rights of any sort, or any exclusive privilege. [06-096 CMR 115]

(7) The licensee shall maintain and operate all emission units and air pollution systems required by the air emission license in a manner consistent with good air pollution control practice for minimizing emissions. [06-096 CMR 115]

(8) The licensee shall maintain sufficient records to accurately document compliance with emission standards and license conditions and shall maintain such records

for a minimum of six (6) years. The records shall be submitted to the Department upon written request. [06-096 CMR 115]

(9) The licensee shall comply with all terms and conditions of the air emission license. The filing of an appeal by the licensee, the notification of planned changes or anticipated noncompliance by the licensee, or the filing of an application by the licensee for a renewal of a license or amendment shall not stay any condition of the license. [06-096 CMR 115]

(10) The licensee may not use as a defense in an enforcement action that the disruption, cessation, or reduction of licensed operations would have been necessary in order to maintain compliance with the conditions of the air emission license. [06-096 CMR 115]

(11) In accordance with the Department's air emission compliance test protocol and 40 CFR Part 60 or other method approved or required by the Department, the licensee shall:

A. perform stack testing to demonstrate compliance with the applicable emission standards under circumstances representative of the facility's normal process and operating conditions:
   1. within sixty (60) calendar days of receipt of a notification to test from the Department or EPA, if visible emissions, equipment operating parameters, staff inspection, air monitoring or other cause indicate to the Department that equipment may be operating out of compliance with emission standards or license conditions; or
   2. pursuant to any other requirement of this license to perform stack testing.

B. install or make provisions to install test ports that meet the criteria of 40 CFR Part 60, Appendix A, and test platforms, if necessary, and other accommodations necessary to allow emission testing; and

C. submit a written report to the Department within thirty (30) days from date of test completion.

[06-096 CMR 115]

(12) If the results of a stack test performed under circumstances representative of the facility's normal process and operating conditions indicate emissions in excess of the applicable standards, then:

A. within thirty (30) days following receipt of such test results, the licensee shall re-test the non-complying emission source under circumstances representative of the facility's normal process and operating conditions and in accordance with the Department's air emission compliance test protocol and 40 CFR Part 60 or other method approved or required by the Department; and

B. the days of violation shall be presumed to include the date of stack test and each and every day of operation thereafter until compliance is demonstrated under normal and representative process and operating conditions, except to

the extent that the facility can prove to the satisfaction of the Department that there were intervening days during which no violation occurred or that the violation was not continuing in nature; and

C. the licensee may, upon the approval of the Department following the successful demonstration of compliance at alternative load conditions, operate under such alternative load conditions on an interim basis prior to a demonstration of compliance under normal and representative process and operating conditions. [06-096 CMR 115]

(13) Notwithstanding any other provisions in the State Implementation Plan approved by the EPA or Section 114(a) of the CAA, any credible evidence may be used for the purpose of establishing whether a person has violated or is in violation of any statute, regulation, or Part 70 license requirement. [06-096 CMR 115]

(14) The licensee shall maintain records of malfunctions, failures, downtime, and any other similar change in operation of air pollution control systems or the emissions unit itself that would affect emission and that is not consistent with the terms and conditions of the air emission license. The licensee shall notify the Department within two (2) days or the next state working day, whichever is later, of such occasions where such changes result in an increase of emissions. The licensee shall report all excess emissions in the units of the applicable emission limitation. [06-096 CMR 115]

(15) Upon written request from the Department, the licensee shall establish and maintain such records, make such reports, install, use and maintain such monitoring equipment, sample such emissions (in accordance with such methods, at such locations, at such intervals, and in such a manner as the Department shall prescribe), and provide other information as the Department may reasonably require to determine the licensee's compliance status. [06-096 CMR 115]

SPECIFIC CONDITIONS

(16) **CHP #1 and AD#1**

A. The Village Green Anaerobic Digester (AD #1) and power generation system shall be limited to processing up to 295 scfm biogas in the CHP unit measured by the quantity of power produced. [06-096 CMR 115, BACT]

B. Emissions from the CHP #1 and AD#1 shall not exceed the following [06-096 CMR 115, BACT]:

When firing/operating on Natural gas:

PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
0.1	0.1	0.1	3.3	7.1	2.3

When firing/operating on Digester gas:

PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
0.5	0.5	2.3	4.3	7.1	2.3

C. Visible emissions from the stack for CHP #1 shall not exceed 10% opacity on a six (6) minute block average, except for no more than two (2) six (6) minute block averages in a continuous 3-hour period.
[06-096 CMR 115, BACT]

D. The stack for the CHP #1 shall be a minimum of 20 feet in height above ground level. [06-096 CMR 115, BACT]

E. Village Green shall keep records of the hours of operation of CHP #1 and AD #1 on a monthly and 12 month rolling total basis. The units shall be maintained and operated according to the manufacturer's emission-related instructions and records shall be kept of conducted maintenance. [06-096 CMR 115, BACT]

F. Village Green shall install and operate an desulfurization unit to reduce H_2S emissions from the AD#1 which will be measured by a H2S monitor. The media in the desulfurization unit shall be replaced when the test results show breakthrough of H_2S (over 500 ppm). Records shall be maintained of monitor results and dates of when the media is replaced. [06-096 CMR 115, BACT]

G. Village Green shall perform an initial performance stack test to determine NOx, SO2, and VOC emissions within 180 days after start-up. Compliance with the emission requirements for NOx, SO2, and VOC shall be demonstrated by an initial performance test. [06-096 CMR 115, BACT]

H. NSPS, 40 CFR Part 60, Subpart JJJJ
Village Green shall meet all applicable requirements of 40 CFR Part 60, Subpart JJJJ for CHP #1, including:

1. CHP #1 shall be maintained and operated according to the manufacturer's emission-related written instructions and records shall be kept of

conducted maintenance. [40 CFR §60.4243, 40 CFR §60.4245, and 06-096 CMR 115, BACT]

2. CHP #1 is subject to emission requirements set forth in 40 CFR 60, Subpart JJJJ. Compliance with these emission requirements shall be demonstrated by certification from the manufacturer or an initial performance test and subsequent tests every 8760 hours or 3 years, whichever comes first, if a manufacturer certification is unavailable. [40 CFR §60.4233 and Table 1, and 40 CFR §60.4245]

I. The following monitor shall be used to ensure the proper operation of the control device:

Control Device	Operational Monitor
H_2S/Gas Scrubber (desulfurization unit)	H_2S monitor

Following startup of the facility and based on the results of initial stack testing, Village Green shall define the thresholds corresponding to the required level of emissions control. Village Green shall maintain records of all maintenance, repair, and calibration activity for the operational monitor. [06-096 CMR 115, BACT]

(17) **Boiler #1**

A. Boiler #1 (1.6 MMBtu/hr) shall fire natural gas. [06-096 CMR 115, BACT]

B. Emissions from Boiler #1 shall not exceed the following [06-096 CMR 115, BACT]:

Unit	PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Boiler #1	0.1	0.1	0.1	0.2	0.2	0.1

C. Visible emissions from the boiler stack shall not exceed an opacity of 10% on a 6 minute block average basis, except for no more than one (1) six (6) minute block average in a 3 hour period. [06-096 CMR 101, BACT]

(18) **Flare**

A. The Flare (15 MMBtu/hr) shall fire biogas and shall only be operated when AD #1 is in operation and CHP #1 is offline or unable to combust all of the biogas. [06-096 CMR 115, BACT]

C. Emissions from the Flare shall not exceed the following:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.02	06-096 CMR 115, BACT

D. Emissions from the Flare shall not exceed the following [06-096 CMR 115, BACT]:

PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
0.3	0.3	9.0	2.1	0.1	0.3

E. Visible emissions from the flare shall not exceed an opacity of 10% on a 6 minute block average basis, except for no more than one (1) six (6) minute block average in a 3 hour period. [06-096 CMR 115, BACT]

F. A log recording the reason, date, time, and duration of flare operations shall be maintained. [06-096 CMR 115, BACT]

(19) **Fugitive Emissions**

Visible emissions from a fugitive emission source (including stockpiles and roadways) shall not exceed an opacity of 20%, except for no more than five (5) minutes in any 1-hour period. Compliance shall be determined by an aggregate of the individual fifteen (15)-second opacity observations which exceed 20% in any one (1) hour. [06-096 CMR 101]

(20) **General Process Sources**

Visible emissions from any general process source shall not exceed an opacity of 20% on a six (6) minute block average basis, except for no more than one (1) six (6) minute block average in a 1-hour period. [06-096 CMR 101]

(21) **Operational Monitor**

The operational monitor listed in Condition (16)(I) must record accurate and reliable data. If the operational monitor is recording accurate and reliable data less than 90% of the source operating time within any quarter of the calendar year, the Department may initiate enforcement action and may include in that enforcement action any period of time that the operational monitor was not recording accurate and reliable data during that quarter unless the licensee can demonstrate to the satisfaction of the Department that the failure of the system to

record accurate and reliable data was due to the performance of established quality assurance and quality control procedures or unavoidable malfunctions. The monitor shall be maintained in accordance with manufacturer specifications. [06-096 CMR 115, BPT]

(22) **Malfunction and Breakdown**
Village Green shall notify the Department within 48 hours and submit a report to the Department on a quarterly basis if a malfunction or breakdown in any component causes a violation of any emission standard (38 M.R.S.A. §605).

DONE AND DATED IN AUGUSTA, MAINE THIS 13 DAY OF January , 2014.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Marc Allen Robert Cone for
PATRICIA W. AHO, COMMISSIONER

The term of this license shall be ten (10) years from the signature date above.

[Note: If a complete renewal application, as determined by the Department, is submitted prior to expiration of this license, then pursuant to Title 5 MRSA §10002, all terms and conditions of the license shall remain in effect until the Department takes final action on the renewal of the license.]

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: June 6, 2013
Date of application acceptance: June 20, 2013

Date filed with the Board of Environmental Protection:

Filed
JAN 15 2014
State of Maine
Board of Environmental Protection

This Order prepared by Edwin Cousins, Bureau of Air Quality