

**DRAFT Findings of Fact
Major Development Review
Combined Sketch and Final Plan
May 28, 2013**

Project Location: South end of airport tarmac, Brunswick Landing
Tax Map: N/A
Zoning District: BNAS Reuse Zoning District (B-RU), Aviation-Related (R-AR) land use district.
Case Number: 13-012
Applicant: Village Green Maine, LLC/Village Green Brunswick Landing, LLC

PROJECT SUMMARY

The applicant is proposing to construct and operate an anaerobic digester plant (plant) that converts organic waste into methane gas, which is then burned to create electricity. The plant will consist of a 69' tall by 60' in diameter digester tank, a 46' tall by 30' in diameter feedstock tank, a 46' tall by 20' in diameter effluent tank, a 46' tall by 20' in diameter dilution tank, and a 2,500 s.f., 22' tall office building that will contain mechanicals. The site currently is a grassy area bisected by paved roads with concrete pads, and is bounded by the airport tarmac to the north, airport runway to the west, and Orion Street to the south and east.

The application was reviewed by the Staff Review Committee (SRC) on March 21st – staff comments from that meeting are attached hereto. The Director of Planning, citing the SRC's general support for the project, the project's setback from residential neighborhoods (2,600 ± linear feet), and the absence of impacts to identified natural resources, has agreed to allow the application to undergo a combined sketch/final review by the Planning Board. Staff also notes that the application technically falls within the zoning ordinance's minor development review. However, the Town requested – and the applicant consented – to reviewing this application as a major development review.

The application contains a project narrative from Project Manager Jan B. Weigman of Wright-Pierce, dated May 7, 2013, which provides information on location, zoning, building coverage, stormwater management, utilities, impacts to natural resources, and requested waivers. The submission also contains an analysis of Section 411 Standards, a letter from Penobscot Environmental Consulting, Inc., and other supplementary materials.

The applicant has entered into a 15-year initial land lease with MRRA for 3.47 acres. Construction, which is anticipated to last 4 months, will include a 0.03 acre expansion of the entrance onto Orion Street (controlled by MRRA and not included in leased area), .23 acres of concrete and paved surfaces for the energy plant, 0.17 acres of tank and buildings, and 0.97 acres of lawn and landscaped areas. With regard to the net increase

in impervious surface area on the site, the applicant is removing 11,779 s.f. of paved area and will construct 18,682 s.f. of new impervious area, for a net increase of 6,903 s.f. of impervious area.

The submission contains a stormwater management plan and a corresponding technical review memorandum from the Maine DEP, Division of Land Resource Regulation, regarding the stormwater management plan that was submitted as part of the Site Location of Development (SLD) Permit to the DEP. Statewide, a SLD Permit is required for new development over 3 acres in size. A SLD Permit was issued for the BNAS; consequently any new development within BNAS requires a new Permit. Because the DEP conducted a full review of the stormwater management plan for the anaerobic digester and determined that it met the state's standards, staff is not requiring an engineering peer review.

The Town's GIS layers do not show any streams, ponds, floodplains, wetlands, steep slopes, natural resource protection zones, aquifer protection zones, rare communities, or deer wintering areas within or adjacent to the subject property. A letter included in the application packet from Michael Thompson of Penobscot Environmental Consulting, Inc., concludes that, in his opinion, the project will not influence any wetlands, vernal pools, vernal pool buffers, streams, or other regulated natural resources.

A lighting distribution plan was not part of the original submission but has been submitted under separate cover, and has been included with this packet.

The digester plant will be equipped with filters to treat all gaseous emissions. This mitigation, along with the substantial distance from residential neighborhoods, should adequately mitigate order impacts.

Drawing C-2 shows a proposed 20' wide storm drain easement that runs through the west side of the leased property and a 57' wide access and utility easement for the driveway and utilities entering the site from the east. Executed easements in form and substance satisfactory to the Planning Department will be recommended as a condition of approval.

Staff review of the application included drawings prepared by Wright-Pierce dated May 7, 2013, as follows:

- Drawing C-1, entitled General Notes, Abbreviations, and Legend.
- Drawing C-2, entitled Existing Conditions & Boundary Plan.
- Drawing C-3, entitled Site Layout.
- Drawing C-4, entitled Site Grading & Erosion Control.
- Drawing C-5, entitled Utilities Plan I.
- Drawing C-6, entitled Utilities Plan II.
- Drawing C-7, entitled Erosion Control Notes & Details.
- Drawing C-8, entitled Details.
- Drawing C-9, entitled Details.

The applicant has requested the following waivers:

1. Section 412.2.B.16 – A Class A (high intensity) Soil Survey prepared in accordance with the standards of the Maine Association of Professional Soil Scientists. *The applicant has provided a medium intensity survey and has done a geotechnical evaluation of the soils on the site. The project will not have an on-site septic disposal system.*
2. Section 412.2.B.17 – Location of all existing trees over 10 inches in diameter, locations of tree stands, and a plan showing trees to be removed as a result of the development proposal. *The site has only a few trees along the east-most boundary and none of the trees on the site are to be removed by the project.*
3. Section 412.2.C.17. – A site landscaping plan indicating grade change, vegetation to be preserved, new plantings used to stabilize areas of cut and fill, screening; the size, location, purpose and type of vegetation. *The airport manager has requested, out of concern for the safety of the airport operations, that only grass be used for the landscaping around the site because the shrubs and trees could provide habitat for animals that could conflict with airport operations. The red pine tree within the eastern lease line will remain.*

Motion 1: That the combined Sketch Plan and Major Development Final Plan application is deemed complete.

Review Standards from Section 411 of the Town of Brunswick Zoning Ordinance

411.1 Ordinance Provisions

The plan complies with all applicable standards in the BNAS Reuse Zoning District (B-RU), Aviation-Related (R-AR) land use district, and complies with all applicable provisions and requirements of this Ordinance. *The Committee finds that the provisions of Section 411.1 are satisfied.*

411.2 Preservation of Natural Features

The site contains no significant natural features of importance and does not support significant habitat, is not located within a natural resource protection zone, and has no steep slopes. There is no evidence of rare communities, inland waterfowl or wading bird habitat, deer wintering areas, or wildlife corridor districts. The site includes a small stand of trees along the east-most boundary line and none of the trees on the site are slated for removal. A letter included in the application packet from Michael Thompson of Penobscot Environmental Consulting, Inc., concludes that, in his opinion, the project will not influence regulated natural resources. The development does not occur within or cause harm to any land which is not suitable for development. *The Board finds that the provisions of Section 411.2 are satisfied.*

411.3 Surface Waters, Wetlands and Marine Resources

The Town's GIS layers do not show any streams, ponds, floodplains, wetlands, coastal bluffs, or natural resource protection zones, within or adjacent to the subject property. A letter included in the application packet from Michael Thompson of Penobscot

Environmental Consulting, Inc., concludes that, in his opinion, the project will not influence any wetlands, vernal pools, vernal pool buffers, streams, or other regulated natural resources. The development is within the Mare Brook watershed but stormwater treatment and mitigation techniques will result in no adverse effects to Mare Brook or the water quality of Casco Bay or its estuaries. *The Board finds that the provisions of Section 411.3 are satisfied.*

411.4 Flood Hazard Areas

The development activity does not occur within a FEMA flood hazard area and therefore there is minimal risk of flooding. *The Board finds that the provisions of Section 411.4 are satisfied.*

411.5 Stormwater Management

The District's maximum permitted impervious surface coverage is 80%; proposed impervious surfaces total approximately 12%. The application contains a stormwater management plan from Wright-Pierce and a corresponding technical review memorandum from the Maine DEP, Division of Land Resource Regulation. Stormwater runoff from the majority of the site will be directed into two grassed Underdrained Soil Filers (USFs) for water quality treatment and runoff control. In addition, the outlet for each of the USFs will be connected to a proposed storm drain system which will exit the site into an area currently receiving concentrated flows from the site. The DEP has stated that the plan meets the state's standards for stormwater management. The project satisfies the recommended stormwater quality standards described in the Storm Water Management for Maine: Best Management Practices, published by the State of Maine Department of Environmental Protection, as amended. *The Board finds that the provisions of Section 411.5 are satisfied.*

411.6 Groundwater

The proposed project is not expected to impact groundwater quality or quantity. Treatment of stormwater runoff and infiltration is addressed in 411.5. No groundwater will be used, discharged, or otherwise extracted by the development. The Board finds that the development will not, alone or in conjunction with existing activities, adversely affect the quality or quantity of groundwater. *The Board finds that the provisions of Section 411.6 are satisfied.*

411.7 Erosion and Sedimentation Control

A full erosion and sediment control plan was provided by Wright-Pierce. Sediment barriers will be installed on the downhill sides of the construction area to prevent sediments from moving off the construction area. Stone check dams will be installed in newly excavated ditch lines to reduce flow velocities and to trap sediments. Disturbed soils will be stabilized with mulch and seeded. The DEP concluded that the "site is on a plain of well-drained sand with no protected natural resources nearby; thus, the erosion potential and the risk of sediment impact are very low. The project development will be constructed in accordance with Best Management Practices and will not cause unreasonable soil erosion or reduction in the land's capacity to hold water so that a

dangerous or unhealthy situation results. *The Board finds that the provisions of Section 411.7 are satisfied.*

411.8 Sewage Disposal

No subsurface sewage disposal system is proposed. The Brunswick Sewer District has provided a letter stating their ability to serve the project's anticipated demands. It is proposed that the facility will tie into the BSD system through the existing Brunswick Landing wastewater disposal infrastructure. *The Board finds that the provisions of Section 411.8 are satisfied.*

411.9 Water Supply

The water supply for the proposed facility will be provided by MRRA, which operates the water distribution system at Brunswick Landing. MRRA obtains water from the Brunswick and Topsham Water District through a connection to the existing Brunswick Landing water supply infrastructure. The Brunswick Water District has provided a letter confirming their capacity to serve the proposed facility. The proposed development has a water source that is adequate to serve the proposed development, and that will have no adverse impact on existing water supplies. *The Board finds that the provisions of Section 411.9 are satisfied.*

411.10 Aesthetic, Cultural and Natural Values

The project is not within a Coast Protection Zone, a Natural Resource Protection Zone, or the Village Review Zone, and will have a negligible impact on existing natural features. The applicant has provided correspondence from Maine Historic Preservation Commission (letter dated October 15, 2012) indicating that no cultural or historic resources have been identified within the development area. Further, the application contains a letter (dated October 19, 2012) from Department of Conservation's Natural Areas Program confirming that there are no rare botanical features documented within the project area. Lastly, the application includes a letter from the Department of Inland Fisheries & Wildlife (dated October 19, 2012) stating that their records contain no occurrences of rare, threatened, or endangered animal species with the project area, nor any essential or significant wildlife or fisheries habitats. The proposed project will not have any undue adverse effect on the scenic or natural beauty of the area, historic sites, or significant wildlife habitat identified by the Maine Department of Environmental Protection and Inland Fisheries & Wildlife or by the Town of Brunswick, or rare and irreplaceable natural areas or any public rights for physical or visual access to the shoreline. *The Board finds that the provisions of Section 411.10 are satisfied.*

411.11 Community Impact

Impacts to public safety and public works resources are anticipated to be minimal; municipal resources are available to service the project. *The Board finds that the provisions of Section 411.11 are satisfied.*

411.12 Traffic

The proposed project will generate approximately 9 to 12 trucks per day and will have 2-5 employees / contractors on site daily. The truck traffic will use existing street networks

to access the site, which will occur over the course of daily operating hours, and is expect to have a minor impact during peak hour times. The projected traffic during the evening peak hour will be 5 to 6 trips. Truck maneuvering for the loading and unloading of material at the site has been satisfactorily accommodated. The proposed development will not cause unreasonable highway or public road congestion or unsafe conditions with respect to the use of highways or public roads existing and the traffic associated with the development shall maintain level of service within 200 feet of any existing curb cut. *The Board finds that the provisions of Section 411.12 are satisfied.*

411.13 Pedestrian and Bicycle Access and Safety

No new streets or curb-cuts are proposed. Pedestrian and bicycle access to the site is expected to be minimal, and the project as proposed will have no impact on pedestrian and bicycle access and safety. *The Board finds that the provisions of Section 411.13 are conditionally satisfied.*

411.14 Development Patterns

The industrial use proposed at the site is compatible with the industrial uses adjacent to the site. The development is respectful of Brunswick's historic development pattern and will have no adverse impact on adjacent residential areas. *The Board finds that the provisions of Section 411.14 are satisfied.*

411.15 Architectural Compatibility

For projects within the Base Reuse Zone, MRRA's Design Review Board will make findings on architectural compatibility.

411.16 Municipal Solid Waste Disposal

It is anticipated that the project will produce minimal solid waste. The applicant will contract with a private solid waste hauler for the trash generated at the facility. The development will not cause an unreasonable burden on the municipality's ability to dispose of solid waste. *The Board finds that the provisions of Section 411.16 are satisfied.*

411.17 Recreation Needs

No recreation impact fee is required for this nonresidential use. *The Board finds that the provisions of Section 411.17 are satisfied.*

411.18 Access for Persons with Disabilities

The development will meet the standards of the Americans with Disabilities Act, as applicable. *The Board finds that the provisions of Section 411.18 are satisfied.*

411.19 Financial Capacity and Maintenance

The project will be funded through a number of sources including equity, grants, and loans. The developer is applying for an Efficiency Maine Grant and has provided a letter from Coastal Enterprises, Inc., expressing interest in providing funding for the project. *The Board finds that the provisions of Section 411.19 are conditionally satisfied.*

411.20 Noise and Dust

The project has a relatively low noise profile. The project is located on the southerly end of the concrete tarmac of the airport facility, and the closest residential use is over 2,600 linear feet away. Minimal dust generation is anticipated during construction and will be addressed as part of the Erosion and Sediment Control Plan. The facility will not generate dust during operations. Upon construction completion, there are no anticipated impacts with regard to noise or dust. *The Board finds that the provisions of Section 411.20 are satisfied.*

411.21 Right, Title and Interest

The applicant has entered into a 15-year initial land lease with property owner MRRA, which has sufficient right, title and interest. *The Board finds that the provisions of Section 411.21 are satisfied.*

411.22 Payment of Application Fees

The applicant has paid the applicable development review application fee. *The Board finds that the provisions of Section 411.22 are satisfied.*

411.23 Additional Design Review Guidelines in the BNAS Reuse and Conservation Districts

MRRA staff completed a Design Development review of the proposed anaerobic digester project design on 21 May 2013, and determined that the proposed design conforms to MRRA's Design Guidelines. *The Board finds that the provisions of Section 411.23 are satisfied.*

411.24 Environmental Compliance in the BNAS Reuse and Conservation Districts

The site is within the BNAS Reuse District and ground disturbance activities at the site will require compliance with the Soil Management Plan. *The Board finds that the provisions of Section 411.24 are satisfied.*

**FINAL MOTIONS
VILLAGE GREEN VENTURES - ANAEROBIC DIGESTER
CASE NUMBER: 13-012**

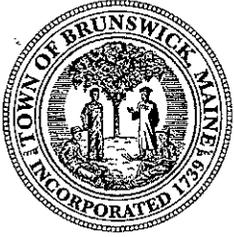
Motion 2: That the Planning Board waives the following requirements:

1. 412.2.B.16 – Class A Soil Survey
2. 412.2.B.17 – Location of trees over 10 inches in diameter
3. 412.2. C.17. – Site landscaping plan

Motion 3: That the combined Sketch Plan and Major Development Final Plan application is approved with the following condition:

1. That the Board's review and approval does hereby refer to these findings of fact, the plans and materials submitted by the applicant, and the written and oral comments of the applicant, their representatives, reviewing officials, and members of the public, as reflected in the public record. Any changes to the approved plan not called for in these conditions of approval, or otherwise approved by the Director of Planning and Development as a minor modification, shall require review and approval in accordance with the Brunswick Zoning Ordinance.
2. Prior to issuance of a building permit, the applicant shall obtain a sanitary sewer entry permit from the Brunswick Sewer District in order to discharge into District facilities.
3. Executed stormdrain and utility & access easements shall be submitted by the applicant, in form and substance satisfactory to the Director of Planning & Development.
4. Prior to issuance of a building permit, evidence of financial capability shall be submitted by the applicant, to the satisfaction of the Director of Planning & Development.
5. The applicant shall provide bicycle parking, to the satisfaction of the Director of Planning & Development.
6. Issuance of a Site Location of Development Permit from the Department of Environmental Protection.

* Please note that Development Review approvals by the Planning Board shall expire at the end of two years after the date of Final Plan approval unless all construction has been completed by that date (Section 407.4.B of the Brunswick Zoning Ordinance).



Town of Brunswick, Maine

INCORPORATED 1739

DEPARTMENT OF PLANNING AND DEVELOPMENT

28 FEDERAL STREET

BRUNSWICK, MAINE 04011-1583

TELEPHONE 207-725-6660

FAX 207-725-6663

Woodward Cove is a clam nursery. Varnish and marine paint is toxic – how will these materials be kept out of watershed. *Applicant explained boat yard “clean marina” standards and commitment to ecofriendly operational standards.*

Nancy Bogart (Kimberly Circle)

- When other, already-developed locations are available, why is the applicant seeking to locate on an undeveloped, wooded lot close to Woodward Cove? *Applicant explained circumstances that drove him to look for a new location for the boat yard, that they’ve been looking for 5 years, and why proposed location is best fit so far.*

Bruce Bogart (Kimberly Circle)

- Asked how upland edge of wetlands was demarcated. Indicated that they can see site from their house and asked about site lighting and possible impacts to neighborhood. *Applicant indicated that site lighting will be as minimal as possible, in accordance with Town standards.*

Case # 13-012 –Village Green Maine/Village Green Brunswick Landing, LLC: The Committee will review and provide a recommendation to the Planning Board regarding a Major Review Sketch Plan Application submitted by Village Green Maine/Village Green Brunswick Landing, LLC, regarding their proposal to construct an anaerobic digester project consisting of a 7,215 SF of new structures and 9,761 of additional impervious surfaces, totaling 16,976 SF in impervious surfaces, located at the southern end of the airport tarmac on a 4.23 acre parcel at Brunswick Landing, in the R-AR Land Use District.

Project overview by staff skipped - *no members of public present.*

Applicant Comments:

Dave Weyburn, President/Managing Director

- Gave overview of project, provided technical details of how anaerobic digester works, described biomass that digester uses to operate, likely providers of biomass fuel, described solid and effluent by-products of digester and disposal methods, number and type of buildings, site selection process, environmental benefits, and permitting requirements.
- Described number of daily truck trips (6-10) to deliver biomass fuel, and methods of disposal of solid waste. Explained that access drive and utilities as shown on Sketch Plan may change, and that both may be directed east of facility’s lease area to connect with Orion Dr.
- Gas emissions will be run through a biofilter, which will minimize odors.

- Highest structures will be 68' tall.

Jan Wiegman, PE, Wright-Pierce

- Gave overview of project engineering, stormwater, and sedimentation and erosion control plans.
- DEP administers solid waste permit, site location of development permit, and may require air quality permit.

Tom Brubaker, MRRA:

- Noted that since project is located with FAA conveyance (airport) no subdivision is required and property can only be leased.

Committee Comments:

Jeff Hutchinson

- Where will effluent and solid biomass fuel materials be obtained? Questioned about 100' foot setback shown on plan. After explanation by applicant, Jeff suggested that note be added to final plan explaining setback is required by DEP.
- Inquired about # of employees, as it pertains to parking and site lighting. *Applicant indicated 5 employees, not including contractors.*
- Inquired about landscaping plan and indicated that Planning Board may want some type of vegetative buffer.

Anna Breinich

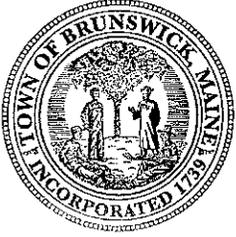
- Asked about plans for landscaping / vegetative buffer. *Tom Brubaker from MRRA questioned why landscaping was necessary and said design guidelines don't explicitly reference landscaping.* Anna stated that landscaping still required by Town ordinance.
- Asked about potential odor impacts. *Applicant indicated that gas emissions will be run through a biofilter, which will minimize odors.*
- Noted that DEP, as part of site location permit, will be reviewing stormwater management plan.
- Questioned whether MRRA's sanitary system is adequate for additional flows. *Tom Brubaker of MRRA replied that existing wastewater system is sufficient.*
- Given no public turnout, lack of natural resources on site, and concurrent DEP review of the project, a combined Sketch/Final review by the Planning Board is warranted.

Rob Pontau

- Sewer District has provided letter indicating adequate capacity for sanitary flows.
- Asked if pump station will be operated by MRRA or applicant. *Applicant replied that determination has not been made.*
- Sewer District in negotiations to sell applicant solid biomass.

Jeff Emerson

- Concern with creation of pressurized methane and create of hydrogen sulfide gases.
- Needs more information on water supply and access.



Town of Brunswick, Maine

INCORPORATED 1739

DEPARTMENT OF PLANNING AND DEVELOPMENT

28 FEDERAL STREET

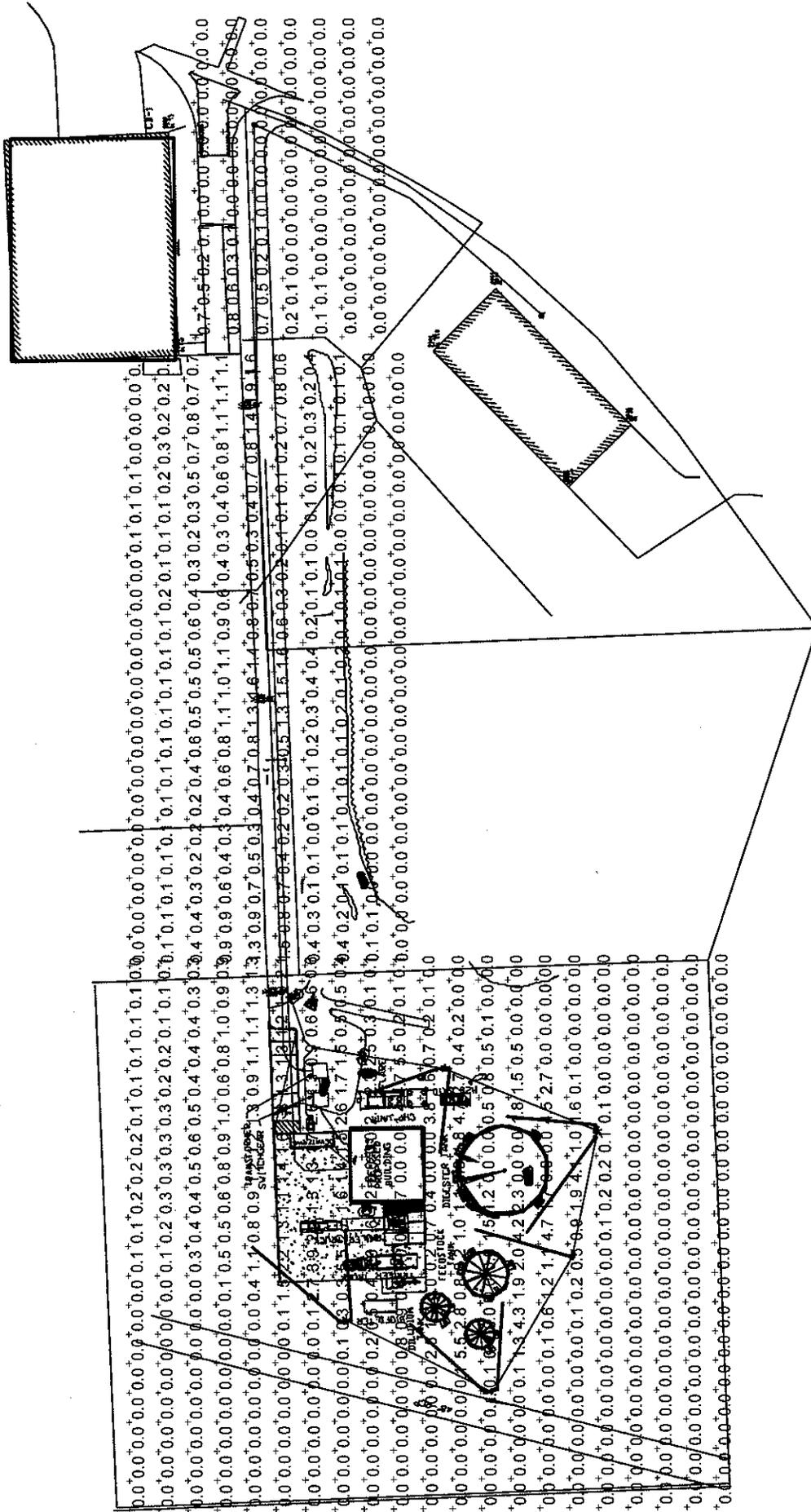
BRUNSWICK, MAINE 04011-1583

TELEPHONE 207-725-6660

FAX 207-725-6663

- Needs more information on construction specifications.
- All of the above will be handled through building permit process.

Cathy Donovan - no issues.



Plan View
Scale 1" = 100'

May 22, 2013
W-P Project No. 12600A

Mr. Jeremy Doxsee
Planner
Town of Brunswick
28 Federal Street
Brunswick, ME 04011

Subject: Response to Comments
Village Green Maine, LLC - Anaerobic Digester - Brunswick Landing

Dear Jeremy:

Thank you for taking the time to meet with me regarding our site plan application for the Anaerobic Digester project proposed for Brunswick Landing. Based upon our meeting we have prepared a construction schedule and construction cost estimate and have been in contact with Jeffrey Emerson at the Brunswick fire Department for concurrence on the site plan and fire hydrant locations.

The project construction cost estimate is as shown in the table below. We had submitted letters from CBI regarding financing for the project in support of the financial capability standard.

	Item	Estimated Costs
1	Site Work	\$ 440,000
2	Concrete and Building	\$ 870,000
3	Mechanical, Electrical and Piping	\$ 875,000
4	Equipment	\$ 3,540,000
	Total Construction	\$ 5,725,000

The construction for the entire project is anticipated to take four months and we have projected the following construction schedule based upon an early July 2013 start. A commissioning period will follow construction where the facility operation will be started:

<u>Activity</u>	<u>Date</u>
Start Site work Construction	July 2013
Start building Construction	July 2013
Equipment Installation	September 2013
Complete Construction	November 2013

During the meeting you had inquired about the height of the tanks and the building. The tanks will vary in height with the digester tank being the tallest at 69 feet to the top of the inflatable membrane roof. The metal walls of the tank will be 46 feet tall. The other smaller tanks will be 46 feet tall with fixed roofs. The building height is

Mr. Jeremy Doxsee
May 22, 2013
Page 2 of 2



22 feet at the peak of the roof. With regard to the net increase in impervious area on the site we are removing 11,779 s.f. of paved area and will be constructing 18,682 s.f. of new impervious area for a net increase of 6,903 s.f. of impervious area.

We look forward to your review and to meeting with the Planning Board to discuss the project. If you have any questions, please let me know.

Very truly yours,

WRIGHT-PIERCE



Jan B. Wiegman, P.E.
Project Manager

JBW/
Enclosure

cc: David Weyburn – Village Green Maine, LLC

Jeremy Doxsee

From: David Weyburn <dw@villagegreenventures.com>
Sent: Friday, May 24, 2013 12:43 AM
To: Jeremy Doxsee
Subject: Re: FW: anaerobic digester

Hi Jeremy,

Sorry for the delay. I'm out in Ohio with Quasar at the moment and until not too long ago have been on the road at some of their other facilities, in meetings, or having meals. To answer your question, we did come to terms with CEI on the pre-development piece. We also won the Efficiency Maine grant (conditionally) pending our success on a few milestones that were already on our critical path. We're currently working through the specifics of the larger construction finance piece with CEI. Not much else to say at the moment as we're in negotiations at the moment. Let me know if you have anything more you'd like to know.

Looking forward to Tuesday.

Thanks,
Dave

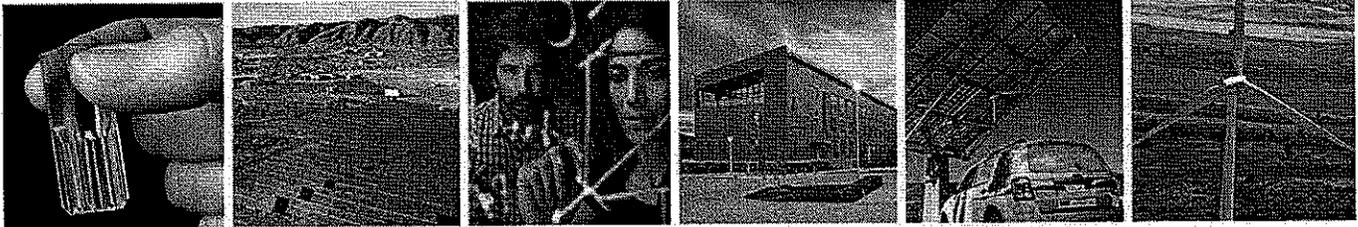
Dave Weyburn
President / Managing Director
Village Green Ventures ..
512-588-3283
www.villagegreenventures.com



On Thu, May 23, 2013 at 3:36 PM, Jeremy Doxsee <jdoxsee@brunswickme.org> wrote:

Hi Dave,

Was discussing the project with Anna and she asked about financial capability. I referred her to the letter from CEI dated February 21. In that letter, Michael Finnegan says "later this month, DEI Lending will consider an initial six-figure loan to VGBL for pre-development activities....and expects to consider a construction funding request from VGBL and to play a central role in the large lending consortium necessary to bring e development to completion." I know you applied for an Efficiency Maine grant, and have been in discussions with other institutions re. financing.



Using Net-Zero Energy Projects to Enable Sustainable Economic Redevelopment at the Former Brunswick Air Naval Base

S. Huffman

Produced under direction of the Environmental Protection Agency by the
National Renewable Energy Laboratory (NREL) under Interagency
Agreement IAG-09-1752 and Task No WFD5.1001

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy
Efficiency & Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Technical Report
NREL/TP-6A20-50710
October 2011

Contract No. DE-AC36-08GO28308

Executive Summary

The Brunswick Naval Air Station is a naval air facility and Environmental Protection Agency (EPA) Super Fund site that is being cleaned up, and closed down. The State of Maine has established a new entity, the Midcoast Regional Redevelopment Authority (MRRA), to repurpose the property and over 100 buildings on the site. As part of this repurposing, MRRA has renamed the property Brunswick Landing, and under a contract through EPA asked the U.S. Department of Energy's (DOE) National Renewable Energy Laboratory (NREL) to do a comprehensive analysis of the property to look for renewable energy as well as sustainable economic redevelopment opportunities that could be used to redevelop the site. NREL analyzed eight different renewable energy technologies: solar photovoltaics (PV), solar domestic hot water heating (SDHW), solar ventilation preheating, wind, fuel cells, micro gas turbines, biomass combined heat and power (CHP), and geothermal heat pumps as well as opportunities for energy efficiency upgrades in the buildings and infrastructure.

The objective of this report is not only to look at the economics of individual renewable energy technologies, but also to look at the systemic benefits that can be gained when cost-effective renewable energy technologies are integrated with other systems and businesses in a community; thus multiplying the total monetary, employment, and quality-of-life benefits they can provide to a community. This also included looking for opportunities for industrial symbiosis which can be defined as the concept of using the waste from one process as a feedstock for another process; lowering "disposal" costs, and up-cycling the former "waste" into a value-added commodity.

The technology that offers the strongest combined economic opportunity is a CHP system; due to the abundant wood resources in the area, the system's quick payback, and the system's ability to be combined systemically with other micro-enterprises.

By utilizing the State of Maine's Community Based Renewable Energy Production Incentive Pilot Program,¹ the Midcoast Regional Redevelopment Authority (MRRA) can enter into a long-term agreement with the Maine public utility commission (PUC) and the local utility that ensures MRRA would be paid for their cost to generate the wood-powered electricity, plus a reasonable profit. This rate can go up to a maximum of \$0.10/kilowatt hour (kWh) and contracts can be signed for up to 20 years. In addition, by leasing the power plant from a third party, MRRA could indirectly take advantage of significant federal tax incentives that would reduce the installed cost of the system. Calculations show that under a worst-case scenario, if MRRA installed a 2 megawatt (MW) wood-powered boiler and steam turbine to generate electrical power and installed a distribution pipeline system to distribute waste heat from the turbine to heat buildings (with no incentives for the pipeline), and if there were no building tenants to purchase the waste heat, the payback of the system would be 10 years. There are a number of ways in which the project could be structured. One of these scenarios would involve MRRA leasing the biomass CHP system for 10 years during which time MRRA would have \$133,000/yr in positive cash flow (not counting any heat sales). This money could be put into escrow and at the end of the 10-year lease, the system could be bought by MRRA for fair market value of \$2 million, which would be the amount that would have accumulated in escrow from the positive

¹ DSIRE. http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=ME13F&re=1&ee=1. Accessed March 28, 2011.

cash flow over those 10 years. These paybacks are based on taking advantage of the Federal Production Tax Credit and the Modified Accelerated Cost Recovery System (MACRS) (Depreciation) with a bonus 50% the first year.

In addition, waste heat from the power plant can be leveraged in a number of ways to spur economic growth or to create new businesses. A fairly typical way to do this is to give away free heat to entice new tenants to sign leases. However, the heat could also be leveraged to pay for part of a tenant's building energy improvements when combined with tax incentives, thus increasing the impact of the long-term PUC/utility contract and the resulting waste-heat resource on the physical infrastructure of the property.

By combining a CHP system with other optional systems, the waste hot water and carbon dioxide coming from the wood power plant could be used to jumpstart a greenhouse industry growing local foods and providing jobs all winter long. Carbon dioxide from power plants is commonly used in Europe to accelerate the growth of greenhouse crops by at least 30%. The moist, heated air resulting from the wood chip drying process could be used for locally grown produce that could be cultivated year-round in greenhouse facilities.

This strategy ties in nicely with the large tourism and retiree industry in the Midcoast region and the burgeoning local and quality food movement. In addition, Bowdoin College also represents a huge potential bulk market and has committed themselves to supporting the purchase of local food. None of these large markets have local organic buying options during the winter season, which stretches for over 8 months of the year.²

Many additional optional business opportunities can be added around the main starting biomass CHP cluster, which generates electricity and heat for the buildings. These are proposed later in this report. An analysis of the full potential for the manufacturing sector is outside the scope of this report. However, many other symbiotic business opportunities will become available as additional businesses relocate in Brunswick Landing and as more information emerges about possible manufacturing processes, wastes, and feedstocks. It is recommended that this be investigated further in the future.

By taking advantage of a newly-created corporate structure named low-profit limited liability company (L3C), which allows a nonprofit to control a for-profit corporation as long as it has a social mission, this biomass CHP business, or the new businesses in Brunswick Landing's business incubator, could access new sources of capital that have not been traditionally accessible to start-up companies. In addition, Brunswick can take advantage of NREL's prescreening of DOE's holdings of clean-tech intellectual property to act as technology matchmaker with potential local entrepreneurs for future start-ups.

In addition, initial discussions with consultants who specialize in other tax incentives not related to renewable energy, such as New Market tax incentives, indicate that there is a high possibility that Brunswick Landing would qualify for these tax incentives for the projects proposed. These

² Preliminary cash flows based on standard greenhouse industry figures show that a high-density greenhouse growing lettuce has a simple payback of 2.4 years. Combining a greenhouse business with the installation of a CHP system gives Brunswick a customer for waste heat and revenue to offset the cost of the CHP system. The greenhouse could provide a revenue stream even if other buildings at Brunswick fill up slowly.

tax incentives would be in addition to the tax incentives already included in the financial calculations presented in this report.

Every site has different renewable resources. In addition to the biomass, we evaluated seven renewable technologies, of these, only solar ventilation preheating was found to be economically viable for large-scale deployment. Solar ventilation preheating was found to have a payback of approximately 7.4 years if done as a standalone project, and a payback of approximately two years if done during the upgrading of the facade of a building. State tax incentives and rebates would buy down the cost enough to allow a very small solar PV and a very small wind system to become economically viable for demonstration purposes, but not on a large scale at this time. Natural gas micro turbines were found to have a payback of 6.2 years, but this would require that 1 MW of capacity be installed at one time and that all of its waste heat be sold. This would be a challenge with the current low occupancy rate and uncertainty at Brunswick Landing. Selling only 50% of the heat would make the payback increase to 17 years.

The conclusion of this study finds that by combining an aggressive building energy efficiency retrofit program with a biomass CHP system, it appears that Brunswick Landing could become one of the first net-zero energy developments in the country.

We recommend MRRA proceed to a more detailed implementation analysis to determine the optimal mix of technologies, partner companies, and financing mechanisms that MRRA might utilize to implement a project.