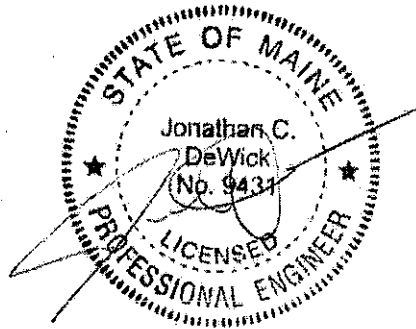


**Municipal Solid Waste
Disposal Evaluation**

Waldoboro, Maine



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Table of Contents

<u>SECTION</u>		<u>PAGE</u>
1	Overview: Options	1
2	Environmental Impacts	4
3	Costs	6
4	Considerations	8
5	Conclusions	10

Municipal Solid Waste Disposal Evaluation Waldoboro, Maine

INTRODUCTION

With changes taking place in Maine's solid waste disposal facilities, the Town of Waldoboro retained Pine Tree Engineering to research, compare, and analyze the options available for municipal solid waste (MSW) treatment and disposal for the Towns of Waldoboro, Friendship, and Cushing (Waldoboro Group) when the current contract with the Municipal Review Committee (MRC) and the Penobscot Energy Recovery Company (PERC) expires on March 31, 2018.

1. OVERVIEW: OPTIONS

A. FIBERIGHT - Municipal Review Committee membership and Mechanical-Biological Treatment and Biofuel Production by Fiberight LLC

Fiberight LLC intends to build a \$70 million facility in Hampden, Maine that will use a mechanical-biological treatment (MBT) process to separate recyclables and organic material from municipal solid waste (MSW). Most items smaller than 2" will be sifted out near the beginning of the process and these fines, representing 20% of the total MSW stream, will be sent directly to the landfill. An elaborate mechanical process will separate nearly all plastic and metals from the waste stream for recycling. The organics and paper will then be sent through a series of processes including anaerobic digestion, which will create both bio-gas and residual solids. The bio-gas will be piped to Bangor Gas. The remaining solids will be dried and burned to create electricity for facility operation. Fiberight may one day sell these solids on the commodities market. Ash resulting from burning the solids will be landfilled¹.

The Fiberight facility will be constructed with private funds, including financial support from Covanta Energy. MRC will purchase, develop, and lease the property, and so will retain a measure of interest in the operation.

The initial contract term is 15 years. Joining members have the option of terminating the contract at the end of the 15 year period or contracting for up to five additional 5-year extensions².

B. LANDFILLS

Landfills are presently the least expensive method of MSW disposal. Private, municipal, and state owned landfills have operated in Maine for many decades, and all operate under permits from the Maine Department of Environmental Protection. Landfills are accepted as an environmentally adequate option.

The following landfills were contacted:

Hatch Hill Landfill, Augusta: Leslie Jones (626-2435) indicated that due to the uncertainties facing future Maine MSW disposal, Hatch Hill Landfill is not accepting post-2018 contracts at this time.

Juniper Ridge Landfill: Don Meagher (862-4200) of Casella Waste Systems indicated that Juniper Ridge's ability to accept MSW directly from municipalities is limited by their Department of Environmental Protection permit. Terms of the permit will change in 2018, but under the current license, a contract with the Waldoboro Group is not an option. (In the interest of full disclosure, Mr. Meagher indicated that he is working with PERC as they develop options for post-2018 solid waste treatment.)

Bath Landfill: Lee Leiner (443-8357) indicated that due to current uncertainties such a bond issue for landfill expansion on the November 2016 ballot and, if that ballot fails, possible closure of their landfill, they do not anticipate being able to contract for the Waldoboro Group's post-2018 waste.

Brunswick Landfill: John Foster (725-6654) indicated that they are restricted to Brunswick-only waste and may be looking into closing the landfill. He indicated that because of this, they are not a viable candidate for accepting the Waldoboro Group's waste.

Crossroads Landfill, Norridgewock: Jeff McGown (240-9739) indicated that they are offering 5-year contracts and are pursuing an expansion of the current permitted capacity. At this time, Crossroads Landfill is the only facility with the capacity and ability to accept Waldoboro Group's MSW.

C. **ECOMAINE - Waste to Energy**

Founded in 1976 and originally named Regional Waste Services, Ecomaine now consists of 21 member municipalities along with other municipalities under contract for services. It operates three facilities in and near Portland, Maine: a landfill purchased in 1978, a waste-to-energy (WTE) plant built in 1988, and a recycling facility built in 1990 and updated for single-stream recycling in 2007. The waste-to-energy (WTE) facility being considered here uses MSW as fuel (mass burn) both to generate electricity and to reduce the volume of trash by 90%.

Lissa Bittermann, Business Development Manager of Ecomaine, was contacted on February 29, 2016. She indicated that the facility has some availability for new contracts.

D. **PERC - Penobscot Energy Recovery Company**

PERC is a WTE facility that began operation in Orrington, Maine in 1989. Flail mills, magnet separators, trommel and disc screens, and other equipment shred and separate combustibles and non-combustibles. Combustibles are ground to a uniform particle size for use as refuse derived fuel (RDF). Used in conjunction with wood chips and No. 2 fuel oil, the RDF drives a steam turbine generator which produces electric power. After ferrous metals are removed and recycled, non-combustible materials and ash residue are deposited at the Juniper Ridge Landfill in Old Town.

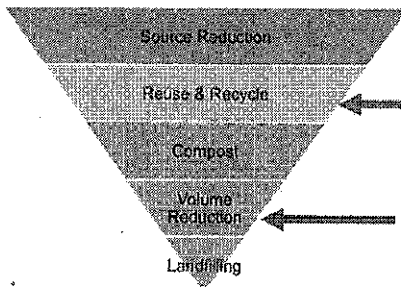
PERC is offering 10-year and 15-year contracts for service after the MRC/PERC agreement expires in 2018; however, according to the contract, an aggregate commitment of 180,000 tons/year MSW must be achieved by February 18, 2017 for the continued operation of the PERC facility³.

2. ENVIRONMENTAL IMPACTS

Although the Fiberight and Ecomaine facilities also accept and process "curbside" recyclables, for the purposes of this study disposal of MSW only is being examined.

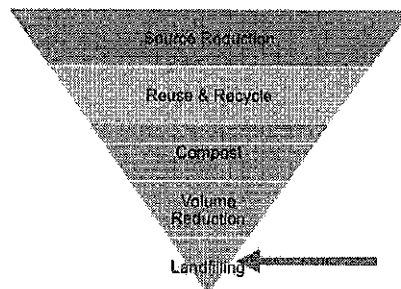
A. **FIBERIGHT**

Department of Environmental permit applications have been submitted and are currently under review. If those applications are approved, it can be assumed that the Fiberight facility design meets applicable environmental standards.



Metals and plastics will be removed and recycled during the treatment process. This places Fiberight in the Recycling and Volume Reduction categories of the Maine waste hierarchy

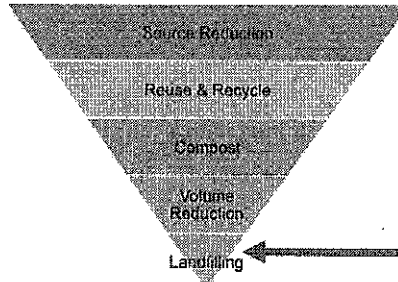
MRC has developed a contingency plan to use the Crossroads landfill facility in Norridgewock if construction of the Fiberight plant is delayed or if it fails to be built. While it is unknown if and for how long this option may be needed, landfill disposal of MSW over a significant length of time could impact the average environmental effectiveness of the Fiberight option over the life of the 15-year contract.



For any construction delays or other periods of down-time at the Fiberight facility, or if the project fails to be built, the impact falls into the least desirable category of the Maine waste hierarchy.

B. CROSSROADS LANDFILL

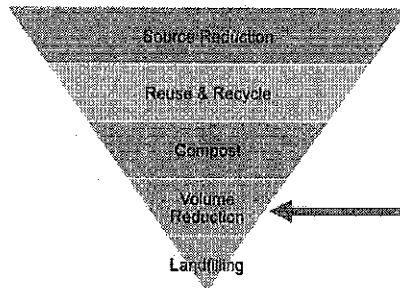
The Crossroads Landfill operates in accordance with permits issued by the Maine Department of Environmental Protection.



Landfills are in the least desirable category of the Maine waste hierarchy.

C. ECOMAINE

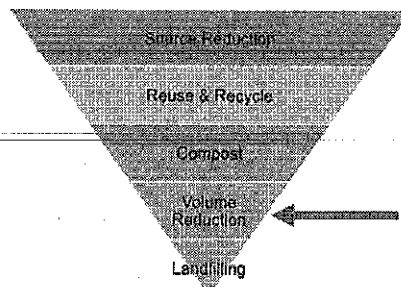
Ecomaine operates under all applicable environmental permits. Their waste-to-energy facility converts whole waste without pre-conversion processing. Stack monitoring devices therefore are able to record all emissions, accounting for virtually all material entering the plant. Ecomaine has earned and retains the International Standards for Operation 14001 certification for excellence. It also operates a single stream recycling facility and maintains a pro-active education and community outreach program which includes a full-time education program manager.



Ecomaine's waste-to-energy facility is placed in the Volume Reduction category of the Maine waste hierarchy. It is a mass burn facility which incinerates all MSW arriving at the plant. Ferrous metals are removed from the ash, and the ash is then landfilled.

D. PERC

The PERC waste-to-energy facility operates under all applicable environmental permits. However, in order to run efficiently, PERC relies on out-of-state waste, adding to Maine's pollution.



While some separation of material (metal) and recycling is performed before incineration, the PERC waste-to-energy facility most closely fits the Volume Reduction category of the Maine waste hierarchy.

3. **COSTS**

A. **FIBERIGHT**

Tipping fee is \$70/ton, subject to an annual Consumer Price Index adjustment. According to Exhibit B of the Municipal Joinder Agreement, MRC is to provide joining members a \$5/ton rebate for the first 36 months of the contract. This \$5/ton rebate will be taken from MRC's Target Value Reserve Fund, which is to be established from the Custody Account and Tip Fee Stabilization Fund when the existing PERC contract expires. Lower net tipping fees may be possible under a rebate program based on overall plant revenues from tipping fees and product sales. The initial contract period is 15 years. Equity charter members can contract for up to a total of five 5-year extensions after that time².

MRC member municipalities that do not sign up between January and June 2016 will be obligated to pay a surcharge of \$2.21 per ton and will not be eligible for rebates during the first term (15 years). Other financial requirements concerning re-admission to MRC will apply.

The distance from the Waldoboro transfer station to the Hampden Fiberight location is 67 miles.

(67 miles x \$0.30*/mile) \$20.10/ton + \$65.00/ton = \$85.10/ton first 36 months
(67 miles x \$0.30/mile) \$20.10/ton + \$70.00/ton = \$90.10/ton thereafter

MRC will use up to \$5 million from the \$25 million (estimated 2018 value) Tip Fee Stabilization Fund to develop the Fiberight site. By choosing the Fiberight option, a proportionate amount of the Waldoboro Group's equity in that fund (\$478,935 estimated 2018 value) will be used for site purchase and development, and so should be considered part of the cost associated with choosing this Fiberight option.

B. **CROSSROADS LANDFILL**

A tipping fee of \$64.50/ton was given by Jeff McGown.

The distance from the Waldoboro transfer station to the Norridgewock facility is 61 miles.

(61 miles x \$0.30/mile) \$18.30/ton + 64.50/ton = \$82.80/ton

If the Waldoboro Group ends its MRC membership in 2018 and chooses this option, there will be a release of equity funds. However, re-admission to membership in the MRC at a later date will require repayment of these funds as a condition of re-admittance.

* \$0.30/mile per ton was calculated using Waldoboro's current cost of \$400 to transport 20± tons 68 miles to the PERC facility. $\$400 \div 68 \text{ miles} \div 20 \text{ tons} = \$0.29/\text{mile}/\text{ton}$, rounded to \$0.30/mile.

C. **ECOMAINE**

Lissa Bittermann, Business Development Manager of Ecomaine has indicated that the tipping fee would begin at \$70.50 per ton and each year after the first full year it would increase based on the Consumer Price Index (not to exceed 7% per year). Contract length is negotiable and subject to approval by their Board of Directors.

The distance from the Waldoboro transfer station to the Ecomaine WTE facility in Portland is 70 miles.

$$(70 \text{ miles} \times \$0.30/\text{mile}) \$21.00/\text{ton} + \$70.50/\text{ton} = \$91.50/\text{ton}$$

If the Waldoboro Group ends its MRC membership in 2018 and chooses this option, there will be a release of equity funds. However, re-admission to membership in the MRC at a later date will require repayment of these funds as a condition of re-admittance.

Note: Mid Maine Waste Action Corporation was considered. Although the facility does not have the capacity during the summer months to accept any more MSW, the cost is included here:

$$(62 \text{ miles} \times \$0.30/\text{mile}) \$18.60 + \$67.32/\text{ton} = \$85.92/\text{ton}$$

D. **PERC**

The distance from the Waldoboro transfer station to the PERC facility is 68 miles.

$$(68 \text{ miles} \times \$0.30/\text{mile}) \$20.40/\text{ton} + \$84.36/\text{ton} = \$104.76/\text{ton} \text{ (15-year contract)}$$

$$(68 \text{ miles} \times \$0.30/\text{mile}) \$20.40/\text{ton} + \$89.57/\text{ton} = \$109.97/\text{ton} \text{ (10-year contract)}$$

If the Waldoboro Group ends its MRC membership in 2018 and chooses this option, there will be a release of equity funds. However, re-admission to membership in the MRC at a later date will require repayment of these funds as a condition of re-admittance.

4. CONSIDERATIONS

A. **FIBERIGHT**

According to a report by the University of Maine⁴, a model-sized facility built by Fiberight in Lawrenceville, VA shows that Fiberight's process is sound and capable of converting a portion of MSW organics into biogas and a cellulosic sugar solution. (Note: Since that study was issued, the decision to produce and sell the sugar solution has changed to production of cellulosic solids to be used as fuel to create electricity at the facility.) The concept of the MBT process in conjunction with a biofuel producing facility appears to be feasible. However, this will be the first plant of its kind to be built in the U.S.

The European models of waste treatment include a variety of techniques. Many of them include mechanical separation, thermal treatment (incineration) and, at times, biological treatment which often consists of conversion of organics to compost. MBT originated in Germany where it is now an established waste treatment method. MBT plants operate in many European countries, and the UK in particular is adding them quickly.

In our research we encountered an MBT facility in Manchester, England which is similar to the operation proposed for the Fiberight facility. See the link below to view their video:

http://www.recycleforgreatermanchester.com/recover/how-we-recover-energy/mbtad#tab_anchor

The Manchester, UK facility is maintained by Viridor-Laing (Greater Manchester) Ltd. for the Greater Manchester Waste Disposal Authority (GMWDA). John Bland, Treasurer and Deputy Clerk of GMWDA, expressed enthusiasm for Manchester's multiple facilities, which include five MBT plants. Four of these plants include anaerobic digesting. Mr. Bland estimates that these facilities normally take 18 months or more to construct and become operational, even for companies familiar with building similar facilities.

However, it is possible that biological facilities may be less financially viable than thermal treatment (i.e. incineration) facilities. An October 2015 conference paper by Beate Vielhaber, head of Construction Planning at Hanover Region Waste Management Organization in Germany states, "The cost-effectiveness of MBT technology compared to the incineration of waste is on trial." The paper also indicates that after 10 years the Hanover, Germany MBT facility faces growing damage due to aging of materials accelerated by microbiological attack and corrosive and abrasive ingredients in the residual waste. A link to the paper is shown below.

http://www.vivis.de/phocadownload/2015_wm/2015_WM_387-398_Vielhaber.pdf

B. CROSSROADS LANDFILL

The Crossroads Landfill has served as a solid waste facility since 1976. They have the capacity to accept the 2,700 tons/year MSW generated by the Waldoboro Group and are offering 5-year contracts. They are pursuing expansion of their currently permitted capacity. Landfills are a proven method of MSW management. While in general they are the least environmentally desirable method of MSW disposal, they pose little, if any, capital risk.

C. ECOMAINE

Waste-to-energy plants, including mass burn facilities, are a proven method of MSW management and are considered to be a better environmental alternative to landfilling. In conjunction with its WTE facility, Ecomaine owns and operates a 240-acre landfill which is now used exclusively for residual ash waste. The landfill is expected to accommodate their needs through 2038.

Ecomaine has an established reputation for conscientious operation. They seek to keep harmful substances from entering MSW with their pro-active educational programs. A contract with Ecomaine poses little capital risk.

D. PERC

Waste-to-energy plants are a proven method of MSW management and are considered to be a better environmental alternative to landfilling. PERC has a record of reliable operation. At the present time however, high tipping fees coupled with an uncertain future arising from the commitment requirement to continue operations make PERC an undesirable option.

4. CONCLUSIONS

There are three options that, in our opinion, would work best for the Waldoboro Group depending upon the priorities they wish to pursue.

A. **FIBERIGHT**

The Fiberight option presents an opportunity to support an environmentally progressive method of MSW treatment. Fiberight adds a recycling benefit to processing MSW which is not present in other options. MRC has worked diligently to provide their best option for 2018 when the PERC contract ends. Various configurations of MBT are being used throughout Europe, and it receives some enthusiastic support. Because this is Fiberight's first full-scale facility, some risks, such as delays or even failure, are possible. MRC acknowledges the risks inherent in a new project of this scope, and have carefully provided mitigation features to avoid financial risk to member communities and assure they will always have a secure method of MSW treatment in place. Fiberight is possibly the least financially desirable option when the upfront use of a portion of Waldoboro Group equity to develop the site is considered. However, equity will remain in the property itself.

B. **ECOMAINE**

If the possibility of Fiberight failure or delay and interim landfilling is not desirable, a contract with Ecomaine would give the Town of Waldoboro a secure solution for the 2018 dissolution of the MRC/PERC relationship. Ecomaine has proven to be a reliable organization. Their educational program optimizes the environmental advantages of WTE by helping to keep undesirable and recyclable items from entering the MSW feedstock.

If the Waldoboro Group ends its MRC membership in 2018 to choose Ecomaine, there will be a release of equity funds. It is possible that these funds could be used to establish an individual Waldoboro Group equity fund to offset unanticipated future MSW disposal costs. However, it is important to note that re-admission to membership in the MRC at a later date will require repayment of these funds as a condition of re-admittance.

C. **CROSSROADS LANDFILL**

A contract with Crossroads in Norridgewock is the least expensive disposal option. Though lowest in the waste hierarchy, it is an environmentally acceptable method for MSW disposal.

Again, if the Waldoboro Group ends their MRC membership in 2018 and chooses to landfill their MSW, there will be a release of equity funds. However, re-admission to MRC at a later date will require repayment of these funds as a condition of re-admittance.

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- ²MRC Municipal Joinder Agreement Charter Members, <http://mrcmaine.org/wp-content/uploads/2016/01/2-Municipal-Joinder-Agreement-Charter-Members-.pdf>
- ³Revised PERC Waste Disposal Agreement, March 11, 2016
- ⁴University of Maine Forest Byproducts Research Institute, Technology Review for Fiberight Process for MRC, January 30, 2015

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- Edmonton, Alberta website**: http://www.edmonton.ca/programs_services/garbage_waste/edmonton-waste-management-centre.aspx (advanced waste processing facility, composting, Enerkem's adjoining waste-to-biofuels facility)
- Enerkem News Release** June 4, 2014: "Enerkem launches world's first, game-changing full-scale waste-to-biofuels and chemicals facility" http://enerkem.com/newsroom/releases/?communique_id=122542
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- MRC Frequently Asked Questions www.MRCMaine.org (2. Fiberight, 4. Contracts)
- SME Evaluation of Waste Handling Options, January 15, 2016 <http://www.midcoastsolidwaste.org/wp-content/uploads/2015/08/SME-Evaluation-of-Waste-Handling-Options-Post-2013.pdf>

ABBREVIATIONS

- RDF: Refuse derived fuel
- MSW: Municipal solid waste
- MBT: Mechanical-biological treatment
- MRF: Materials recovery facility
- MRC: Municipal Review Committee