

Compliance and Process Review

Composting Facility – Miller Waste
80 Gloria McCluskey Avenue
Dartmouth, Nova Scotia

Halifax Regional Municipality

Executive Summary

GHD completed a compliance and process review of the Miller Waste Systems Inc. (Miller) compost facility located at 80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia. The facility is operated under a long-term design-build-operate contract with Halifax Regional Municipality (Halifax). In 2019, the 20-year contract term will be completed, with Halifax taking ownership of the facility and terminating the lease of the property and having multiple options for the succession of the facility including extending the operations contract with Miller or entering into a new long-term arrangement to operate and upgrade the facility (including operating at status quo capacity, or increasing or decreasing capacity) or shutting down the facility.

The objectives of the process review were therefore to:

- Identify requirements to bring the Miller compost facility into compliance with the 2010 Nova Scotia Environment (NSE) Composting Facility Guidelines (2010 NSE Guidelines).
- Identify facility process improvement opportunities in terms of improving throughout and compost quality.
- Evaluate options to both increase and decrease the capacity of the facility.

Following a site visit and review of historical reports, generating compost from the Miller compost facility that is fully compliant with the 2010 NSE Guidelines will require consideration of the following:

- Elmsdale Landscaping Ltd. is not an approved composting facility and therefore would not be able to act as a secondary curing facility for the Miller compost facility, if required, unless it obtains approval.
- The Miller compost facility will require additional signage to provide normal operating hours, emergency contact information and the types of acceptable materials at the site entrance.
- Additional bulking amendment and/or diversion of the wetter industrial, commercial and institutional (IC&I) organic waste would improve the final compost product.
- The Miller compost facility must increase the frequency of compost sampling to ensure compliance with the Approval to Operate (i.e., NSE Approval #2000-017965-R01) as in 2014 they met the sampling requirements but in 2012 and 2013 only half of the required number of tests were completed. The 2010 NSE Guideline requirement is the same as the sampling frequency in the Approval to Operate.
- The Approval to Operate references the CCME 2005 Guidelines¹ and not the CCME 1996 Guidelines¹. This is a discrepancy between the New Era Technologies Ltd. approval and the Miller approval. The reason for the discrepancy is unknown. GHD recommends consulting with the NSE and clarifying this requirement; and obtaining an amendment if necessary.
- Condition 14(b) of the Approval to Operate requires overs to be disposed of at an approved landfill site unless written permission for an alternative is received from the NSE. This condition should be clarified by consulting with NSE to ensure that Miller is meeting the requirements of the Approval to Operate. Currently, Miller tests larger size compost material (coarse compost)

¹ 1996 and 2005 versions of the Canadian Council of Ministers of the Environment (CCME) Guidelines for Compost Quality

prior to shipping according to the CCME Guidelines for every 1,000 tonnes generated and ships the material to Elmsdale Landscaping for further processing and curing.

- The following are options available to meet maturity requirements:
 - Option 1: Increased aeration during curing by forced aeration including the addition of a roof structure over screener bunkers and compost loading area, as piloted and proposed by Miller (\$1.5 - 2.2 million capital expenditure by 2019).
 - Option 2: Increased aeration during curing with turning equipment (\$3.8 – 6.0 million capital expenditure by 2019).
 - Option 3: Increased outdoor curing area (off-site); this option would require significant annual operating costs with respect to the trucking of immature compost to a secondary curing facility (\$0.4 – 1.5 million capital expenditure by 2019, excluding the cost of land).
 - Option 4: Partial implementation of Miller's proposal to implement forced aeration throughout the curing area and additional outdoor storage/polishing of compost at the site (\$0.5 – 1.0 million capital expenditure by 2019). This option should be piloted prior to applying for an amendment to the Approval to Operate.

Overall, the existing Ebara in-vessel composting process is generally effective at producing compost from Halifax's residential source separated organic (SSO) and IC&I organics. In 2019, when the 2010 NSE Guidelines will apply to the Miller compost facility, GHD recommends as a viable option that Halifax continue to operate the existing facility to meet Halifax's organics processing needs by incorporating one of the options to improve the maturity of the composted materials as outlined above.

It should be tested now to confirm whether or not compost maturity can be obtained within the facility such that part of the Miller proposal can be implemented with the exclusion of the roof structure over the screener bunkers and compost loading area (approximately 66.7% of the cost of Option 1). This would produce an unrestricted use product that can be stored on-site for further curing as a polishing stage prior to sale for increased revenue, and would cost approximately \$0.5 to \$1.0 million capital expenditure by 2019 (i.e., Option 4). If odours pose a problem with this option, then implementing the Miller proposal (Option 1) to produce mature compost and selling directly after curing is the next recommended option as all activities can be completed on-site, at approximately \$1.5 to \$2.2 million capital expenditure by 2019.

GHD did not identify significant additional process improvements at the facility during this assessment, as the process appears to be operating relatively efficiently. There is the option to further investigate the effectiveness of the manual sorting line in terms of glass removal, and to move the overs material inside the building instead of requiring a loader and labour to constantly move the overs material from outside to back inside the building. These process improvements will have little impact on the overall operational cost of the facility.

Building repairs and equipment replacement needs will cost Halifax \$606,950 over the next 5 years based on GHD's building assessment (submitted under separate cover in May 2015) and an assessment of the equipment by Machinex Industries Ltd. (dated May 13, 2015).

GHD recommends operating the Miller compost facility at its current capacity beyond 2019, as an increase in capacity to 40,000 - 45,000 tonnes per year would require a significant expansion to the facility, which may not be approved as per Section IV.9.a of the NSE 2010 Guidelines separation

distance requirement of at least 500 metres from the nearest residential or institutional building. The separation distance between the existing composting building and the neighbouring Central Nova Scotia Correctional Facility is less than 250 metres.

Table of Contents

1.	Introduction.....	1
2.	Miller Compost Process	1
3.	Compliance with 2010 NSE Composting Facility Guidelines.....	3
3.1	Current Compliance with Maturity Requirement.....	4
3.2	Feedstock and Process Considerations to Achieve Maturity Requirement.....	5
3.2.1	Option 1: Increased Aeration During Curing by Forced Aeration.....	6
3.2.2	Option 2: Increased Aeration During Curing with Turning Equipment	8
3.2.3	Option 3: Increased Outdoor Curing Area (Off-site).....	9
3.2.4	Option 4: Additional Outdoor Curing of Materials at the Facility	10
3.2.5	2010 NSE Guidelines Compliance Summary.....	10
4.	Process Improvement Assessment.....	11
5.	Future Operational Capacity Scenarios	11
6.	Conclusions and Recommendations.....	13
7.	Closure	14

Figure Index

Figure 2.1	Site Layout
Figure 2.2	Process Flow Diagram

Table Index

Table 2.1	Halifax Annual Precipitation Data.....	3
Table 3.3	Estimate of Additional Indoor Curing Area for Mechanical Turning	8
Table 3.4	Estimate of Additional Outdoor Curing Area	9

Table Index

(following text)

Table 3.1	2010 Nova Scotia Environment Composting Facility Guidelines Compliance Summary
Table 3.2	Summary of Results of Curing Area Aerated Static Pile Pilot Program

Appendices

Appendix A	Halifax Regional Municipality Maps
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1. Introduction

GHD has prepared this compliance and process review of the Miller Waste Systems Inc. (Miller) compost facility located at 80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia. The facility is operated under a long-term design-build-operate contract with Halifax Regional Municipality (Halifax), and processes organic materials collected by residential and commercial haulers. In 2019, the 20-year contract term will be completed, with Halifax taking ownership of the facility and terminating the lease of the property and having multiple options for the succession of the facility including extending the operations contract with Miller or entering into a new long-term arrangement to operate and upgrade the facility (including operating at status quo capacity, or increasing or decreasing capacity) or shutting down the facility. In reviewing these options, Halifax must consider the financial investment needed to continue operating the facility. The objectives of the process review were therefore to:

- Identify requirements to bring the Miller compost facility into compliance with the 2010 Nova Scotia Environment (NSE) Composting Facility Guidelines (2010 NSE Guidelines).
- Identify facility process improvement opportunities in terms of improving throughput and compost quality.
- Evaluate options to both increase and decrease the capacity of the facility.

The Miller compost facility was originally constructed and began operation in 1998, designed in accordance with NSE requirements that specified meeting compost quality in accordance with the 1996 Canadian Council of Ministers of the Environment (CCME) Guidelines for Compost Quality. Since that time, NSE has adopted the most recent 2005 CCME Guidelines for Compost Quality (2005 CCME Guidelines) and has required composting facilities in Nova Scotia be in compliance by the fall of 2015. GHD understands that NSE may grant Halifax permission to meet this requirement by 2019 for the Miller compost facility to coincide with the end of the 20-year contract term, and therefore it is assumed for this assessment that 2019 will be the year when the 2010 NSE Guidelines will be applied to the site.

In addition to the current study, GHD recently completed a building assessment of the Miller compost facility (submitted under separate cover in May 2015). Overall, the facility was found to be in fair condition with localized repairs and maintenance requirements; capital expenditures of \$491,000 are required over a five year investment horizon to maintain the facility for a remaining useful life of 10-15 years, assuming continued regular maintenance and no substantial change in the use of the facility. In addition, Machinex Industries Ltd. conducted an assessment of equipment replacement needs for the facility (dated May 13, 2015) and found that the infeed conveyor requires replacement at a cost of \$115,950. Building repairs and equipment replacement needs will therefore cost Halifax \$606,950 over the next 5 years to maintain the facility.

2. Miller Compost Process

Mr. Andrew Philopoulos and Mr. Mike Muffels of GHD toured the site on June 16, 2015 and met with the Operations Analyst, Mr. Sean Hagan. Observations documented from the site visit are incorporated into the appropriate sections below.

The Miller compost facility consists of one building split into three sections: a Receiving Hall, Vessel Area, and Curing Hall. It is located at 80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia on a piece of property owned by Halifax. The Miller compost facility site layout is shown on Figure 2.1. The Miller compost facility process flow is illustrated on Figure 2.2.

Residential and industrial, commercial and institutional (IC&I) organic wastes are accepted at the facility. Leaf and yard waste is accepted with the organic waste collection. Feedstock is received in the receiving hall, where trucks back up and dump onto the receiving hall located a few feet down from the truck door elevation. The doors remain open when the trucks are dumping but the receiving hall is separated from the processing areas by a wall to keep odours in the receiving hall to a minimum. Feedstock is loaded into a hopper by a front-end loader, which is then conveyed via an inclined conveyor belt to the sorting line. The feedstock passes through a manual sort station staffed with 3 – 4 people with a large magnet to remove metal for recycling. The conveyor belt drops the sorted feedstock material into a shredder with a 2.5 inch screen size. There is no additional bulking amendment material to mix in with the shredded feedstock as leaf and yard waste is collected and shredded with the organic material as incoming feedstock.

Miller also operates a green cart exchange program with some of their IC&I customers. As part of this program, cleaned carts are exchanged for full carts at the customer location. The full carts are taken directly to the facility for dumping. The carts are then rinsed out and returned to the customers as cleaned carts with the next collection period. A cart tipping machine is used to empty the carts onto the tip floor. The carts are manually rinsed with a high pressure washer. Leachate is collected and transferred to leachate collection tanks located underground outside the facility building.

The facility is based on the Ebara in-vessel composting process. The primary composting stage is completed in one bunker style vessel with a paddle turning system. The vessel is located indoors and is 62.5 m (205 feet) long and 21.3 m (70 feet) wide. It has a slotted floor that is elevated 0.46 m (18 inches) off the bottom of the bunker to provide a plenum for the forced negative aeration system; this was a later addition to the facility. The material is typically left in the bunker for 30 days. The paddle system turns the material and moves the material forward approximately 2 m per day, in 0.4 m (15 inch) increments, which allows for the addition of new material at the back end of the vessel. The paddle mixer is typically operated once per day, but occasionally less if not required and only operated at night when there are no personnel in the building. Leachate is introduced onto the material in the bunker as needed.

The material from the vessel is placed onto either an aerated or non-aerated floor area in the Curing Hall. The aerated static pile (ASP) curing area was set up as a pilot in 2011 to improve the curing process and overall maturity of the compost product. The compost cures for 3 to 4 weeks. The material cured on the non-aerated floor portion of the curing area is turned daily. Leachate is collected and stored in an above-ground leachate tank located in the curing area used for recirculating liquid back onto the curing compost if needed.

The cured compost is screened using a star screener and stored in the covered screening area just outside of the building. The star screen produces screened compost and an overs material pile also located outdoors in a covered area. Roughly 50 to 60 percent of incoming organics are converted into compost at the Miller compost facility. The fine and coarse compost is transported in bulk to Elmsdale Landscaping. Elmsdale Landscaping further cures the material, screens it and uses it in their landscaping products.

Condition 14(b) of the Approval to Operate (i.e., NSE Approval #2000-017965-R01) requires overs to be disposed of at an approved landfill site unless written permission for an alternative is received from the NSE. This condition should be clarified by consulting with NSE to ensure that Miller is meeting the requirements of the Approval to Operate. Currently, Miller tests larger size compost material (coarse compost) prior to shipping according to the CCME Guidelines for every 1,000 tonnes generated and ships the material to Elmsdale Landscaping for further processing and curing.

The composting hall building and process air is mechanically ventilated, humidified, and treated through an organic-media biofilter located to the north of the primary composting vessel hall. The Curing Hall air is mechanically ventilated and treated through a second biofilter located to the north of the Curing Hall. The Curing Hall building air is not humidified prior to exiting through the biofilter. The facility is maintained at a negative pressure and does receive occasional odour complaints.

All compost leachate and biofilter water is collected, stored and trucked off-site to a wastewater treatment facility. The biofilter water storage is located to the north of the receiving hall and the leachate storage tanks are located to the south of the receiving hall, all underground and outdoors. There is also one above-grade leachate tank located in the Curing Hall that is used for leachate recirculation.

Approximately 3.7 million liters of leachate and biofilter water was transported off-site in 2014 for treatment, which is an increase from 2.7 million in 2013 and 1.1 million in 2012. Mr. Hagan indicated that 2014 was a wet year and the organic material came in noticeably wetter, which contributed to additional leachate volumes in that year. The precipitation data summarized in Table 2.1 below confirms that Halifax received more precipitation in 2013 and 2014 than 2012.

Table 2.1 Halifax Annual Precipitation Data

Years	Precipitation (mm)	Leachate (L)
2012	1,328	1,100,000
2013	1,370	2,700,000
2014	1,592	3,700,000
Annual Historical Average	1,388	

Source: <http://halifax.weatherstats.ca/charts/precipitation-25years.html>

3. Compliance with 2010 NSE Composting Facility Guidelines

GHD completed a review of the Miller compost facility and the 2010 NSE Guidelines to identify compliance concerns. GHD understands that the Miller compost facility will not be required to comply with the 2010 NSE Guidelines until the end of the current contract with Miller in 2019. The results of this review are summarized in Table 3.1 following the text. It has been well documented that the primary challenge for source-separated organics (SSO) compost facilities, including the Miller compost facility, to achieve compliance with the 2010 NSE Guidelines is the more stringent maturity requirement. The compost maturity guideline is the primary non-compliance concern. This is discussed in more detail in Sections 3.1 and 3.2 below.

Other 2010 NSE Guidelines non-compliance and potential non-compliance items include:

- Elmsdale Landscaping Ltd. is not an approved composting facility and therefore would not be able to act as a secondary curing facility for the Miller compost facility, if required, unless it obtains approval.
- The Miller compost facility will require additional signage to provide normal operating hours, emergency contact information, and the types of acceptable materials at the site entrance.
- In 2012 and 2013, only half of the required compost testing was completed. In 2014, the composting testing frequency met the requirement of at least 1 sample per 1,000 tonnes of compost (not including overs). The 2010 NSE Guidelines requirement is the same as the sampling frequency in NSE Approval to Operate #2000-017965-R01. It is recommended that the compost sampling frequency be closely monitored in the future to ensure compliance with the Approval to Operate, as well as the 2010 NSE Guidelines.

3.1 Current Compliance with Maturity Requirement

Mature compost is material in which biological activity has slowed after most of the easily degraded molecules have been broken down into humus, leaving the complex organic material behind. In this state, it is difficult to identify the original feedstock materials. A fine texture, dark colour, and a rich earthy smell characterize mature composts.

The 2010 NSE Guidelines require that the resulting compost meet the 2005 CCME Guidelines. The compost maturity requirements in Section 3.4 of the 2005 CCME Guidelines are as follows:

Compost shall be mature and stable at the time of sale and distribution. To be considered mature and stable, a compost shall be cured for a minimum of 21 days and meet one of the following three requirements:

- a. the respiration rate is less than, or equal to, 400 milligrams of oxygen per kilogram of volatile solids (or organic matter) per hour [400 mg O₂/kg VS/h]; or,*
- b. the carbon dioxide evolution rate is less than, or equal to, 4 milligrams of carbon in the form of carbon dioxide per gram of organic matter per day [4 mg CO₂/g OM/d]; or,*
- c. the temperature rise of the compost above ambient temperature is less than 8°C.*

Over 2010 and 2011, prior to and during the startup of the aerated static pile curing pilot, CBCL Limited (CBCL Study) collected 4 batches of compost samples from the Miller compost facility (as well as the New Era Technologies and Elmsdale Landscaping facilities). While the sample taken on November 8, 2011 indicated that the compost was moving past the active phase of decomposition and ready for curing based on the re-heat test result of 0-10 degrees Celsius (as compared to the 2005 CCME Guidelines for Type A compost of less than 8 degrees Celsius), the respiration rates (ranging from 436 to 1,360 mg O₂/kg VS/h) and the carbon dioxide (CO₂) evolution rates (ranging from 7.10 to 13.00 mg CO₂/g OM/d), after 120 days, were still above the 2005 CCME Guideline threshold for all four samples.

Section IV.4(d)&(e) of the 2010 NSE Guidelines allows for immature compost to be transferred to an approved composting facility in order to complete the maturation process. In addition:

For immature compost to be transported to a secondary curing area, it must achieve one of the following requirements:

- i. cured for at least 21 days and must not reheat above 20°C;
- ii. cured for at least 21 days and organic matter is reduced by at least 60% by weight; or
- iii. able to germinate 90% of cress seed vs control and has a plant growth rate of compost/soil at least 50% of control.

The 2014 Miller compost facility Annual Report confirms that the compost generated at the Miller compost facility is currently able to meet the requirement for not reheating above 20°C. Thus, utilization of a secondary curing facility at an approved composting facility will be an option following the implementation of the 2010 NSE Guidelines for the Miller Compost Facility in 2019.

3.2 Feedstock and Process Considerations to Achieve Maturity Requirement

The feedstock processed at the Miller compost facility consists of a mix of residential and IC&I material. As there is currently no bulking amendment material mixed with the incoming organic material, the feedstock is not considered ideal for composting. The residential organics include some leaf and yard waste but this is limited to the spring through fall months, and the IC&I organic waste does not contain any appreciable bulking amendment material. Overs are only returned to the compost process over winter. Amendment material is important to the overall composting process for food waste as it allows for a more effective C:N ratio, increases the porosity of the material, and it provides more nutrients to the process.

No recent data on the feedstock materials was available. It is assumed to be similar to material received at the New Era Facility which was generally consistent with typical values published in the literature. Thus, it was assumed that the Miller feedstock material had a high moisture content, lower pH and lower C:N ratio than is considered ideal according to the Environment Canada 2013 Technical Document on Municipal Solid Waste Organics Processing; which recommends the following feedstock quality parameters:

- Moisture: 55 – 65 percent
- C:N Ratio: 25:1 – 30:1
- pH: 6.5 – 8.0
- Bulk Density: 475 – 590 kg/m³

Additional bulking amendment would improve the porosity, moisture, C:N ratio, and bulk density of the feedstock material, resulting in an improved final compost product. The daily turning of the primary compost vessel by the Ebara paddle wheel and of the non-aerated curing piles by front end loader does minimize, but not eliminate, the requirement for bulking amendment for porosity considerations. However, efficient and complete composting of food waste does require a minimum amount of amendment material. The amount of amendment material required varies depending on the nature of the feedstock material, which in the case of Halifax organic waste is seasonal due to the inclusion of leaf and yard waste in the SSO residential collection bins. The leaf and yard waste

does provide required amendment for food waste composting. Overs are used during the winter when there is no leaf and yard waste being collected and the incoming material is wet. The suitability of the overs as a bulking amendment is dependent on the quality of the feedstock at the start of the process. Less bulking amendment at the start of the process means there will be less suitable bulking amendment in the overs at the end of the process. Thus, the overs produced from a compost that is generated from food waste with minimal additional leaf and yard material have limited amendment value.

Additional bulking amendment materials, such as wood chips, are difficult and expensive to source in the Halifax region due to competing demands for the material. As the Miller facility is able to achieve the current compost quality requirements, including maturity, the expense of additional bulking amendment is difficult to justify for Miller under their current operating contract. In reality, achieving an ideal compost recipe with food waste, particularly IC&I organics, is often difficult to achieve and the compost process is often adapted to compensate.

Given the difficulty in securing bulking amendment, removing the relatively wet IC&I incoming organics from the process would be another means of improving the overall feedstock quality for composting. The residential SSO co-mingled with the leaf and yard waste will compost much better without additional amendment if the IC&I material was managed separately. However, this would require another processing option for the IC&I organics in order to continue to divert this significant quantity of organics from landfill. A wet processing or treatment option may be more suitable for this type of material, such as anaerobic digestion or hydrolysis.

The rate at which maturity is attained through the curing process is dependent primarily on how well the material is aerated during the curing stage. Manipulating air flow rates through a compost heap will only have a significant impact if the compost has adequate porosity or free air space to permit the air to flow through the heap. Porosity is a function of the range of particle sizes in the material, moisture content and homogeneity of the material (i.e., well mixed). Achieving maturity in a timely fashion also requires other material quality parameters such as C:N ratio, nutrients and pH to be maintained within certain bounds.

Potential process/facility changes that may aid in the production of mature compost at the Miller compost facility in 2019 are discussed in the following subsections, including:

- Option 1: Increased aeration during curing by forced aeration (as piloted and proposed by Miller).
- Option 2: Increased aeration during curing with turning equipment.
- Option 3: Increased outdoor curing area (off-site).
- Option 4: Additional outdoor curing of materials at the facility.

3.2.1 Option 1: Increased Aeration During Curing by Forced Aeration

This option is one that was proposed by Miller in a letter proposal to Halifax entitled "Miller Composting Dartmouth Certificate of Approval Compliance", dated April 11, 2014. Process change options as recommended by Miller in this proposal to bring the Miller compost facility into compliance with the updated maturity standards (and maintaining the same processing capacity and footprint) are outlined below:

- Changes to the loading floor and vessel configuration to remove free standing liquid (previously implemented).
- Increased aeration in the curing area to bring all curing materials under aeration (proposed future works):
 - Installation of a roof structure over the compost loading area and screen bunkers.
 - Installation of an additional ventilation fan and scrubber to the secondary biofilter.
 - Installation of a foundation collection liner along the north side of the Curing Hall.
 - Installation of aeration piping in the south west corner of the Curing Hall.
 - Moisture addition system to deliver liquid to the Curing Hall.

Miller's proposal includes the addition of a ventilation fan and scrubber to the secondary biofilter to accommodate the increase in air flow (31.6 m³/min or 1,117 cfm per 230 m³ of material) and to maintain the overall negative pressure in the building. Miller's proposal also includes the installation of aeration piping in the south west corner of the Curing Hall. This area is currently used for curing and storage, and by installing a new concrete slab with aeration piping, the material stored in this area for curing can be aerated.

The approach of forcing more air through the curing piles was demonstrated during a pilot program to test the results of increasing the aeration within the curing materials and providing additional moisture as required. Table 3.2, following the text, summarizes available sampling results from the aerated static pile (ASP) pilot program.

Limited data from the ASP pilot program was made available for review to draw conclusions with any degree of certainty. However, the three maturity tests completed do indicate that the compost finished over the aerated floor met the 2005 CCME Guidelines for maturity, namely a respiration or carbon evolution rate of less than 4 mg CO₂-C/g Organic Matter/day, at least once in 2011, 2012 and 2013. Moisture levels measured in 2011 were above 40 percent; which is the current Ontario requirement for curing (Ontario Compost Quality Standards, 2012). Moisture content results since 2011 were not available. The temperatures in the curing piles were in the thermophilic range (approximately 40-60 degrees Celsius). This is an indication that the material leaving the primary composting vessel has not been completely composted. The curing area is effectively being managed as a secondary composting process area. That being said, there is no available data to suggest that the compost generated from the pilot ASP program was not meeting the 2005 CCME Guidelines for maturity.

In 2014, Miller provided a cost estimate of \$1.445 million for converting the remainder of the curing floor area to ASPs and enclosing the star screen bunkers. Correcting for 1 year of inflation (approximately 2%) and adding a 10 percent contingency, the budgetary cost estimate is revised to \$1.7 million. GHD reviewed the estimate and it is considered reasonable; it is recommended that the cost estimate be considered accurate to -10% / +25% (\$1.5 – 2.2 million).

Forcing more air through the curing piles may be successful at meeting maturity requirements for the composted materials (based on available data), however, the addition of suitable external bulking amendment to the feedstock would also increase the effectiveness of any additional aeration efforts and may also decrease energy requirements for forced aeration through the curing piles to reach compost maturity.

Similar to Option 4 presented below, it may not be necessary to cover the screener bunkers and compost loading area if the forced aeration is fully implemented in the Curing Hall. Eliminating the roofing requirement would reduce the cost of Option 1 by 66.7%. Refer to discussion in Option 4. Phasing the implementation of Option 1 by first fully implementing the forced aeration system would allow for the evaluation of odours. Expanding the building envelope to enclose the screener bunkers could be implemented pending odour monitoring results, as needed.

3.2.2 Option 2: Increased Aeration During Curing with Turning Equipment

An alternative to increasing aeration (Option 1) is to mechanically turn the curing piles. The non-aerated areas of the Curing Hall were generally turned daily by a front end loader and the resulting compost did not meet the new maturity requirement within the 3 – 4 week curing period as demonstrated by the 2012 CBCL Study. Employing a purpose built compost turning machine will not provide any significant improvement over the same 3 – 4 week curing period given that the material was already turned daily. There is no opportunity at the Miller facility to improve the maturity of the compost by mechanically turning the curing compost within the space available.

The primary constraints to curing at the Miller compost facility are the stage in which the compost leaves the primary compost vessel and the space available for curing. The minimum length of time to cure blended feedstock material that has been fully composted is 3 - 4 weeks, however, if the material is not fully composted due to feedstock quality issues, the same feedstock quality issues (i.e., lack of suitable bulking amendment) will further inhibit the curing process. The curing area will need to be used to both finish the composting process and cure the less than ideal material. Assuming the current feedstock blend will not change in 2019, mechanical turning of the curing piles will not result in compost that complies with the 2010 NSE Guidelines within the space available.

Significant additional curing floor space will be required to cure the compost if mechanical turning will continue to be utilized past 2019. Table 3.3 summarizes the calculation for the estimated additional indoor curing area required. The calculation assumes 4 months of indoor curing capacity will be adequate and this is based on the assumption that the curing material will be turned at least twice a week with a dedicated compost turning machine, which is less labour intensive than turning with a front end loader.

Table 3.3 Estimate of Additional Indoor Curing Area for Mechanical Turning

Item	Value	Units
Mass to be Cured (110% of 4 months' worth of 2014 annual compost quantity)	5,200	tonnes
Assumed Bulk Density of Immature Compost	500	kg/m3
Volume to be Cured	10,400	m3
Stockpile Width	16	m
Stockpile Height	8	m
Stockpile Cross Sectional Area (triangle)	64	m2
Stockpile Length	163	m
Stockpile Footprint	2,600	m2
Allowance for Equipment Access and Work Areas (50%)	1,300	m2
Approximate Total Curing Area	3,900	m2
Subtract Existing Curing Area	-1,820	m2

Table 3.3 Estimate of Additional Indoor Curing Area for Mechanical Turning

Item	Value	Units
Additional Area to Enclose Screening Piles	620	m2
Approximate Additional Building Area (+/- 25%)	2,700	m2

Cost estimate to continue with mechanical turning of the curing piles and to meet the 2010 NSE Guidelines:

- New 2,700 m² curing building: \$4,000,000
- Additional compost turning equipment: \$500,000 (assuming new compost turning equipment)
- New biofilter: \$300,000
- Total: \$4.8 million (+/- 25%)
- Range: \$3.8 – 6.0 million

3.2.3 Option 3: Increased Outdoor Curing Area (Off-site)

The 2012 CBCL Study demonstrated that only the compost from the Elmsdale facility that had cured outdoors for 12 months consistently met the maturity and other compost quality criteria, including pathogen reduction. Thus, without any other significant improvements to the quality of fines exported from the Miller compost facility, an option to meet the 2010 NSE Guidelines would be to provide sufficient area for an additional 12 months of passive windrow curing, or potentially sufficient area for 6 months of passive windrow curing which would require further testing to ensure maturity requirements can be met. It is important to note that Elmsdale also cured immature compost from the New Era composting facility. Table 3.4 summarizes the calculations for the approximate additional outdoor curing area required assuming maturity could be achieved in an additional 6 months. This option is similar to current operations at the site, with additional curing at Elmsdale, however, this would provide Halifax with the option of utilizing an already-approved site for outdoor curing and storage.

Table 3.4 Estimate of Additional Outdoor Curing Area

Item	Value	Units
Mass to be Cured (110% of 6 months' worth of 2014 annual compost quantity)	7,820	tonnes
Assumed Bulk Density of Immature Compost	500	kg/m3
Volume to be Cured	15,640	m3
Stockpile Width	16	m
Stockpile Height	8	m
Stockpile Cross Sectional Area (triangle)	64	m2
Stockpile Length	244	m
Stockpile Footprint	3,910	m2
Allowance for Equipment Access and Work Areas (100%)	3,910	m2
Allowance for Water Management (50%)	1,960	m2
Approximate Total Additional Curing Area (-50% / +25%)	9,780	m2
	1.0	hectares
	2.4	acres

The cost to develop an additional 1.0 hectares (2.4 acres) for a curing pad will depend on a number of factors but could vary from \$0.4 to \$1.5 million depending on the site (excluding the cost of land).

Locating the additional curing pad at an existing serviced facility with an existing scale, a loader, staff and surface water management will greatly reduce the required capital investment and ongoing operational costs. The site may require NSE approval or an amendment to an existing approval to operate. Immature compost will need to be trucked to the off-site curing area if this option is selected which will add significant annual operating cost.

Increasing the curing area/time will likely address the maturity issues of the compost currently produced at the Miller compost facility. The overall operation of the facility appears to be effective at producing compost from the available feedstock and amendments with the exception of the maturity levels.

3.2.4 Option 4: Additional Outdoor Curing of Materials at the Facility

There is currently an old outdoor storage pad already at the site that is approximately 3 hectares. Currently, odour concerns due to the close proximity of neighbours prevent Miller from storing the compost they currently generate, which is an unrestricted use product, outdoors. Odour is a significant concern. GHD is not familiar with the history of the site and odour complaints that resulted from compost being stored outdoors at the Miller compost facility. Odour risk is a factor that Halifax will need to consider based on the history of the facility.

If the Curing Hall was converted to a forced aeration system, as outlined in Miller's proposal (Option 1) and an unrestricted use product could be generated within the current building footprint, it may be possible to store the compost outdoors for a period for final polishing or curing within the current site approval. Presumably compost that complies with the more stringent maturity requirements will be less odorous, thus possibly opening up the option of outdoor on-site compost storage again. This could be tested immediately as part of the pilot program. If successful, this option would eliminate the need to cover the screener bunkers and compost loading area (though a smaller extension may be desired for the back-end residues loading). The roof structure was \$1 million of the \$1.5 million total proposed cost by Miller. Providing additional curing on top of what was proposed may also result in a higher value compost that would not require lengthy storage at a landscaping yard. This option requires further testing to ensure that odours will not be an issue but would be expected to cost between \$0.5 and \$1.0 million; and is potentially the cheapest option. Outdoor curing of the compost will also require increased labour and a loader to move and turn the materials.

On the day of GHD's site visit, Miller was working to convert a significant portion of the outdoor compost storage area into a vegetated filter area for storm water. If the vegetated filter area system is successful, then the option to convert this area into an outdoor curing area may no longer be an option.

3.2.5 2010 NSE Guidelines Compliance Summary

To generate compost from the Miller compost facility that is fully compliant with the 2010 NSE Guidelines and applicable 2005 CCME Guidelines on compost quality will require, at a minimum one of the following options:

- Option 1: Increased aeration during curing by forced aeration.
 - \$1.5 - 2.2 million capital expenditure by 2019.

- Additional operational costs to operate the new ventilation fan and scrubber and moisture addition system.
- Option 2: Increased aeration during curing with turning equipment.
 - \$3.8 – 6.0 million capital expenditure by 2019.
 - Additional operational costs to operate the turner from fuel usage and labour.
- Option 3: Increased outdoor curing area (off-site).
 - \$0.4 – 1.5 million capital expenditure by 2019 (excluding the cost of land).
 - Additional operational costs to operate the loader from fuel usage and labour.
- Option 4: Additional outdoor curing of materials at the facility.
 - Odour concerns may prevent this option.
 - \$0.5 – 1.0 million capital expenditure by 2019.
 - Additional operational costs to operate the loader from fuel usage and labour.

By incorporating additional bulking amendment and/or removing (a portion of) the IC&I organic waste, especially during the winter months when leaf and yard waste is at a minimum within the collected residential organic materials, the composting process will benefit from a C:N ratio that is more suitable for producing mature compost. This should be confirmed through obtaining appropriate laboratory data.

This is all in addition to the approximately \$491,000 in building repairs required over the next 5 years identified in the building assessment completed by GHD, submitted under separate cover (CRA/GHD, May 2015). Based on equipment replacement needs for the facility according to an assessment conducted by Machinex Industries Inc. dated May 13, 2015, the infeed conveyor requires replacement at \$115,950; for a total additional cost of \$606,950.

Overall, the existing Ebara in-vessel composting process is generally effective at producing compost from Halifax's residential SSO and IC&I organics that is close to achieving maturity.

4. Process Improvement Assessment

As part of GHD's operational review, a process improvement assessment was to be completed. The assessment was to identify process improvements that could result in better compost quality, throughput, and use of space in addition to process improvements required to meet the 2010 NSE Guidelines. Based on the findings outlined in Section 3.0 and the building condition assessment completed previously, investing in the facility to produce mature compost and to complete the building maintenance and equipment replacement is recommended. In 2019, when the 2010 NSE Guidelines will apply to the Miller compost facility, it is recommended that Halifax consider continuing to operate the existing facility to meet Halifax's organics processing needs.

GHD did not identify many additional process improvements at the facility during this assessment as the process appears to be operating efficiently. There is the option to further investigate the effectiveness of the manual sorting line in terms of glass removal. As Elmsdale has expectations of no glass in the compost material, there may be a more effective way of removing the glass from the material at the facility. Currently, if glass is observed on the manual sorting line, all material is

removed and discarded as a waste. There are screening technologies (e.g. ballistic separators) that would increase glass removal from the processed material either before or after curing at the Site. One other potential improvement could be to move the overs material inside the building instead of requiring a loader and labour to constantly move the overs material from outside to back inside the building. These process improvements will have little impact on the overall operational cost of the facility.

5. Future Operational Capacity Scenarios

Halifax requested GHD evaluate three future capacity scenarios, namely:

1. Status Quo: 25,000 tonnes per year
2. Capacity increase: 40,000 – 45,000 tonnes per year
3. Capacity reduction: 10,000 – 15,000 tonnes per year

As discussed in Sections 3.0 and 4.0, GHD recommends operating the Miller compost facility at its current capacity beyond 2019. The status quo scenario with the incorporation of Miller's proposal to increase forced aeration during curing is likely the best option moving forward past 2019 from an operational and cost standpoint.

For the increase in processing capacity to 40,000 - 45,000 tonnes per year scenario, the facility is currently not large enough to accommodate an increase in processing capacity. The existing Ebara composting unit currently has difficulty fully composting the current feedstock amounts. Increasing the processing capacity of the facility will require a significant expansion to the facility, including new building(s) for primary composting and compost curing at a minimum. Section IV.9.a of the NSE 2010 Guidelines require that the separation distance between the active area of an in-vessel compost facility and the nearest residential or institutional building be at least 500 metres.

The separation distance between the existing composting building and the neighbouring Central Nova Scotia Correctional Facility, which was constructed over 1999 to 2001, is less than 250 metres. Thus, in order to increase capacity at the site significantly, a special request will need to be made of the NSE to waive the setback requirement of 500 metres for an expansion of an existing facility. GHD recommends consulting with NSE first regarding expansion and the setback requirements before considering this option further.

It was assumed that expanding the Miller facility to 45,000 tonnes per year would require installing a second mostly parallel system rated for 15,000 – 20,000 tonnes per capacity. Based on the costs to construct other similar sized composting facilities (15,000 to 20,000 tonnes per year), taken from GHD's memorandum regarding Preliminary Budget Estimate for a Source Separated Organics Processing Facility dated April 1, 2015, it is estimated that the additional structures and equipment required would cost approximately \$14 – 17 million. While the expansion does not have the same site development costs, it will have additional costs associated with a retrofit of an existing operation.

The capacity reduction scenario is possible, and should be considered if the current status quo scenario with the recommended changes is not successful at producing mature compost to meet the 2005 CCME Guidelines past 2019. Reducing capacity will allow for more overs to be recirculated in the composting process, improving the overall compost quality. However, as the

facility, with minimal upgrades, appears to be able to meet the NSE 2010 Guidelines, it is recommended that the Miller facility be operated at its original design capacity to maximize the benefit from the existing asset.

GHD would like to reiterate that the commercial organic material currently accepted at the Site is not ideally suited for this type of composting process, as it lacks bulking amendment material. GHD recommends that Halifax and Miller consider the addition of bulking amendment to increase the overall operations of the facility and potentially also increase the quality of the end product. Alternatively, reducing or eliminating the IC&I organic waste will also have a noticeable impact on the resulting compost quality.

6. Conclusions and Recommendations

Overall, the existing Ebara in-vessel composting process is generally effective at producing compost from Halifax's residential SSO and IC&I organics that is close to maturity. To generate compost from the Miller compost facility that is fully compliant with the 2010 NSE Guidelines and applicable 2005 CCME Guidelines on compost quality will require consideration of the following:

- Elmsdale Landscaping Ltd. is not an approved composting facility and therefore would not be able to act as a secondary curing facility for the Miller compost facility, if required, unless it obtains approval.
- The Miller compost facility will require additional signage to provide normal operating hours, emergency contact information and the types of acceptable materials at the site entrance.
- Additional bulking amendment and/or diversion of the wetter IC&I organic waste would improve the final compost product.
- The Miller compost facility must increase the frequency of compost sampling to ensure compliance with the Approval to Operate as in 2014 they met the sampling requirements but in 2012 and 2013 only half of the required number of tests were completed. The 2010 NSE Guideline requirement is the same as the sampling frequency in NSE Approval #2000-017965-R01.
- NSE Approval #2000-017965-R01 references the CCME 2005 Guidelines² and not the CCME 1996 Guidelines¹. This is a discrepancy between the New Era Technologies Ltd. approval and the Miller approval. The reason for the discrepancy is unknown. GHD recommends consulting with the NSE and clarifying this requirement; an obtaining an amendment if necessary.
- Condition 14(b) of the Approval to Operate requires overs to be disposed of at an approved landfill site unless written permission for an alternative is received from the NSE. This condition should be clarified by consulting with NSE to ensure that Miller is meeting the requirements of the Approval to Operate. Currently, Miller tests larger size compost material (coarse compost) prior to shipping according to the CCME Guidelines for every 1,000 tonnes generated and ships the material to Elmsdale Landscaping for further processing and curing.

² 1996 and 2005 versions of the Canadian Council of Ministers of the Environment (CCME) Guidelines for Compost Quality

- The following are options are available to meet maturity requirements:
 - Option 1: Increased aeration during curing by forced aeration including the addition of a roof structure over screener bunkers and compost loading area, as piloted and proposed by Miller (\$1.5 - 2.2 million capital expenditure by 2019).
 - Option 2: Increased aeration during curing with turning equipment (\$3.8 – 6.0 million capital expenditure by 2019).
 - Option 3: Increased outdoor curing area (off-site); this option would require significant annual operating costs with respect to the trucking of immature compost to the secondary curing facility (\$0.4 – 1.5 million capital expenditure by 2019, excluding the cost of land).
 - Option 4: Partial implementation of Miller's proposal to implement forced aeration throughout the curing area and additional outdoor storage and polishing of compost at the site (\$0.5 – 1.0 million capital expenditure by 2019). This option should be piloted prior to applying for an amendment to the Approval to Operate.

It should be tested now to confirm whether or not compost maturity can be obtained within the facility such that part of the Miller proposal can be implemented with the exclusion of the roof structure over the screener bunkers and compost loading area (approximately 66.7% of the cost of Option 1). This would produce an unrestricted use product that can be stored on-site for further curing as a polishing stage prior to sale for increased revenue, and would cost approximately \$0.5 to \$1.0 million capital expenditure by 2019 (i.e., Option 4). If odours pose a problem with this option, then implementing the Miller proposal (Option 1) to produce mature compost and selling directly after curing is the next recommended option as all activities can be completed on-site, at approximately \$1.5 to \$2.2 million capital expenditure by 2019.

In 2019, when the 2010 NSE Guidelines will apply to the Miller compost facility, GHD recommends that Halifax consider the continued operation of the existing facility to meet Halifax's organics processing needs by incorporating one of the options to improve the maturity of the composted materials as outlined above, at its current capacity. Increasing the processing capacity of the facility may not be possible due to the proximity (<500 metres) of the Central Nova Scotia Correctional Facility. NSE should be consulted prior to pursuing expansion at the site further.

GHD did not identify significant additional process improvements at the facility during this assessment, as the process appears to be operating relatively efficiently. There is the option to further investigate the effectiveness of the manual sorting line in terms of glass removal, and to move the overs material inside the building instead of requiring a loader and labour to constantly move the overs material from outside to back inside the building. These process improvements will have little impact on the overall operational cost of the facility.

7. Closure

We trust that this report meets your present requirements. Please do not hesitate to contact us, if any questions arise.

All of Which is Respectfully Submitted,
GHD

Mike Muffels, M.Sc., P. Eng.

Tej Gidda, Ph.D., P. Eng.

Andrew Philopoulos, M.Sc., P. Eng.



Source: Source:ESRI World Imagery Service, Accessed May 2015 (Not the capture date)

0 25 50 75
Meters

Coordinate System:
NAD 1983 UTM Zone 20N



HALIFAX REGIONAL MUNICIPALITY
80 GLORIA MCCLUSKY AVENUE, DARTMOUTH
HALIFAX SOURCE SEPARATED COMPOSTING FACILITY
SITE LAYOUT

071855
Jul 6, 2015

FIGURE 2.1

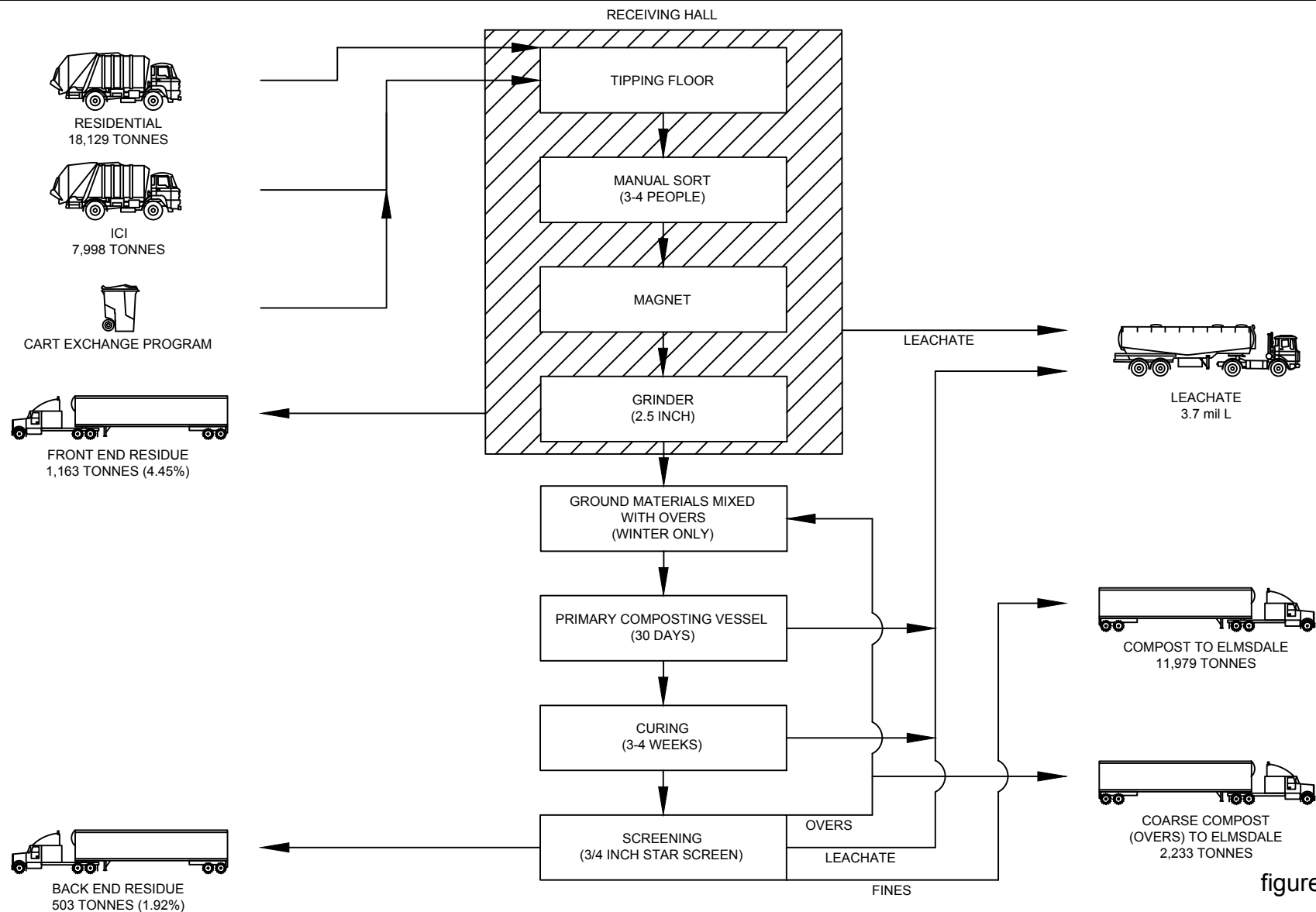


figure 2.2

PROCESS FLOW DIAGRAM
HALIFAX SOURCE SEPARATED COMPOSTING FACILITY
80 GLORIA MCCLUSKEY AVENUE, DARTMOUTH
Halifax Regional Municipality



NOTE:
TONNAGES FROM HRM CALENDAR 2014

Table 3.1

2010 Nova Scotia Environment Composting Facility Guidelines Compliance Summary
Compliance And Process Review, Composting Facility, Miller Waste
80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia
Halifax Regional Municipality

Section	Guideline Requirement	Compliant (Y/N)	Notes
I & II	General & Application for Approvals		
I.3.(a) II.1.(a)	No person shall construct, operate, expand or modify a facility which can process compost without obtaining approval from the Minister.	Y	NSE Approval #2000-017965-R01 Expires March 31, 2022
III	Leaf and Yard Waste Composting Facilities under 10 000 tonnes	NA	
IV.	In-Vessel Composting Facilities		
IV.2.(a)	The receiving and tipping area shall be underlain by an impermeable pad, the surface of which shall be concrete or asphalt. All drainage from the impermeable pad shall be collected for treatment or for return to the process.	Y	Receiving and tipping areas have concrete floor. Leachate collected and transported off-site for treatment or returned to the process.
IV.2.(b)	The receiving and tipping area shall be in an enclosed structure.	Y	
IV.3.(a)	The composting area shall be designed to fully contain the compostable organic material and all leachate which may be generated.	Y	Composting conducted in enclosed building with concrete floor.
IV.3.(b)	The containment system shall be impermeable, the surface of which shall be constructed of concrete, asphalt, steel or other material as approved by the Department.	Y	Composting conducted in enclosed building with concrete floor and foundation liner.
IV.3.(c)	All drainage from the composting area shall be collected for treatment or for return to the process.	Y	Leachate collected from composting process and transported off-site for treatment or returned to the process.
IV.4.(a)	The curing area shall be underlain by an impermeable pad, the surface of which shall be concrete, asphalt or other material as approved by the Department.	Y	Curing area has concrete floor. The section of aerated floor is underlain with a concrete floor with a leachate collection system.
IV.4.(b)	All drainage from the impermeable pad shall be collected for treatment or for return to the process.	Y	Leachate collected and transported off-site for treatment or returned to the process.
IV.4.(c)	All curing areas shall utilize permanent roof structures and/or proven management techniques to control moisture and minimize odour and leachate generation.	Y	Curing area enclosed in building.
IV.4.(d)	Where space limitations prevent the production of mature finished compost at in-vessel composting facilities, immature compost may be transferred to an approved composting facility in order to complete the maturation process.	N	Immature (per 2010 NSE Guidelines) compost is currently transferred to Elmsdale Landscaping Ltd. Elmsdale is not listed on the NSE list of Organic Composting Facilities in Nova Scotia.

Table 3.1

2010 Nova Scotia Environment Composting Facility Guidelines Compliance Summary
Compliance And Process Review, Composting Facility, Miller Waste
80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia
Halifax Regional Municipality

Section	Guideline Requirement	Compliant (Y/N)	Notes
IV.4.(e)	For immature compost to be transported to a secondary curing area (i.e., secondary site), it must achieve one of the following requirements: i) Cured for at least 21 days and must not reheat above 20°C. ii) Cured for at least 21 days and organic matter is reduced by at least 60% by weight. iii) Able to germinate 90 percent of cress seed vs control and has a plant growth rate of compost/soil at least 5 percent of control.	Y	Refer to facility Annual Reports. The fines or compost generated at the facility complies with requirement i).
IV.5	A leachate management system shall be developed which consists of infrastructure and monitoring systems designed to collect, monitor, control, and treat leachate prior to being discharged into the surrounding environment. The system shall: (i) Have a leachate collection and removal network in the active area. (ii) Function year round. (iii) Have a means of monitoring all treated leachate discharges.	Y	Leachate collected, stored and transported off-site for treatment.
IV.6	The applicant shall submit for approval from the Department, a surface water monitoring program.	Y	Compliance documented in annual reports reviewed by NSE.
IV.7	The applicant shall submit for approval from the Department, a groundwater monitoring program.	Y	Compliance documented in annual reports reviewed by NSE.
IV.8.(a)	Mechanical ventilation shall be provided for the composting area, areas for the storage of compostable organic feedstock and any other area containing readily putrescible materials such as the storage room for residuals.	Y	Mechanical ventilation is provided for all active areas.
IV.8.(b)	All areas referred to in clause (a) shall be under negative atmospheric pressure in order to avoid the escape of odours.	Y	On the day of GHD's site visit (June 16, 2015), slight inward air flow through open overhead and man doors was observed. Overhead doors for trucks must remain open while trucks unloaded. Overhead door at cart washing area was left open for an extended period of time during the visit.

Table 3.1

2010 Nova Scotia Environment Composting Facility Guidelines Compliance Summary
Compliance And Process Review, Composting Facility, Miller Waste
80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia
Halifax Regional Municipality

Section	Guideline Requirement	Compliant (Y/N)	Notes
IV.8.(c)	All ventilation air shall be subject to a treatment system designed to remove odours prior to release into the environment.	Y	Ventilation air treated through organic media biofilters. The compost building air is pre-humidified prior to the biofilter. The curing building air is not pre-humidified.
IV.9	Separation distance ² between active area and: Nearest residential or institutional building is at least 500 metres Nearest commercial or industrial building is at least 250 metres	Y Y	~450 metres ~130 metres, approved by NSE as permitted by IV.9.(f)
IV.9 (cont.)	Nearest property boundary is at least 100 metres, or 30 metres where it can be demonstrated that particular equipment will not release odours generated from the composting process Nearest watercourse or water body, including salt water, be at least 30 metres	Y Y	~50 metres, approved by NSE as permitted by IV.9.(f) ~800 metres
V.	Open Windrow Composting Facilities	NA	
VI.	Secondary Curing Areas	NA	
VII.	Composting Facility Operation		
VII.1.(b)	The objective of all composting facilities shall be to incorporate all compostable organic feedstock into the composting process the same day that it is delivered to the site. If some feedstock is not incorporated into the process in the same day, except leaf and yard waste feedstocks only, then it shall be stored in an enclosed area with a mechanical ventilation system for the capture and treatment of odorous emissions.	Y	Mr. Hagan confirmed that feedstock is generally processed and loaded into composting vessel on the same day it arrives. Receiving area and tipping floor is an enclosed area with mechanical ventilation for the capture and treatment of odorous emissions.
VII.1.(c)	The composting facility shall have constant supervision during the hours that the facility is open.	Y	On the day of GHD's site visit (June 16, 2015); Mr. Muffels observed at least 8 staff.
VII.1.(d)	The composting facility shall accept only feedstock identified in the approval.	Y	Not raised by HRM staff as a known issue. On the day of GHD's site visit (June 16, 2015); GHD did not observe any unapproved feedstock materials.
VII.1.(e)	Any residual products associated with the composting operation shall be disposed of in a manner acceptable to the Department.	Y	Compost residuals are taken to an approved landfill for disposal in accordance with Condition 13.c) of NSE Approval

Table 3.1

2010 Nova Scotia Environment Composting Facility Guidelines Compliance Summary
Compliance And Process Review, Composting Facility, Miller Waste
80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia
Halifax Regional Municipality

Section	Guideline Requirement	Compliant (Y/N)	Notes
			#2000-017965-R01.
VII.1.(f)	Litter shall be controlled on the entire site.	Y	On the day of GHD's site visit (June 16, 2015), no litter was observed.
VII.1.(g)	Exposed areas shall be stabilized to prevent erosion and sedimentation.	Y	Erosion and sedimentation a concern. On the day of GHD's site visit (June 16, 2015), staff were hydro-seeding an exposed area.
VII.1.(h)	Dust shall be controlled to Department requirements for particulate emissions.	Y	NSE Approval #2000-017965-R01
VII.1.(i)	Vectors shall be controlled in accordance with a control plan approved by the Department.	Y	NSE Approval #2000-017965-R01
VII.1.(j)	Signs shall be placed at the entrance to the site indicating the name of the facility, hours of operation, emergency contact, and the materials acceptable at the site.	N	Sign at front entrance does not indicate hours of operation, emergency contact and materials acceptable at the site
VII.2	An Operation and Maintenance Manual shall be submitted for review from the Department. The Operation and Maintenance Manual shall be left on site at all times and shall be available for inspection during operating hours.	Y	Operation and Maintenance Manual reviewed by NSE as part of NSE Approval #2000-017965-R01
VII.3	The applicant shall provide contingency plans addressing problems associated with vectors, groundwater contamination, equipment failure, and odour generation and complaints.	Y	Contingency Plan prepared as part of NSE Approval #2000-017965-R01
VII.4	Reports and Records	Y	Reports and records provided to NSE as required in NSE Approval #2000-017965-R01. GHD received copies of 2012-2014 Annual Reports.

Table 3.1

2010 Nova Scotia Environment Composting Facility Guidelines Compliance Summary
Compliance And Process Review, Composting Facility, Miller Waste
80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia
Halifax Regional Municipality

Section	Guideline Requirement	Compliant (Y/N)	Notes
VIII.	Compost Classification and Use		
VIII.1.(a)	All compost will be classified in accordance with the criteria identified in the 2005 CCME Guidelines. The compost must meet all criteria as established for foreign matter, maturity, pathogens and trace elements.	N	Regular testing compiled in Annual Reports demonstrate that compost consistently meets trace elements and fecal coliform requirements. Available salmonella results (2012 CBCL Report and additional analysis conducted by Miller, attached to this report) confirm salmonella has not been detected historically. With respect to maturity, the Miller facility, as originally designed and constructed has been unable to consistently meet 2005 CCME Maturity requirements. Compost cured in the ASP pilot area has been demonstrated to comply with the 2005 CCME Maturity requirements. Refer to Section 3.2 of this report for detailed discussion on maturity.

Table 3.1

2010 Nova Scotia Environment Composting Facility Guidelines Compliance Summary
Compliance And Process Review, Composting Facility, Miller Waste
80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia
Halifax Regional Municipality

Section	Guideline Requirement	Compliant (Y/N)	Notes																							
VIII.1.(b)	Testing of the compost quality shall be completed for every 1000 tonnes of compost produced or every three months and conducted in accordance with the minimum testing procedures identified in Section 4 of the 2005 CCME Guidelines.	N	<table><tr><th></th><th>Compost⁴ (tonnes)</th><th>No. of Samples</th><th>No. per 1000 tonnes</th></tr><tr><td>2012</td><td>13,917</td><td>8</td><td>0.57</td></tr><tr><td>2013</td><td>12,415</td><td>6</td><td>0.48</td></tr><tr><td>2014</td><td>11,979</td><td>13</td><td>1.09</td></tr><tr><td>Sum</td><td>38,311</td><td>27</td><td>0.70</td></tr></table> Note: 2012 and 2013 testing was not in compliance with condition of 12.b).(iii) of the NSE Approval #2000-017965-R01.					Compost ⁴ (tonnes)	No. of Samples	No. per 1000 tonnes	2012	13,917	8	0.57	2013	12,415	6	0.48	2014	11,979	13	1.09	Sum	38,311	27	0.70
	Compost ⁴ (tonnes)	No. of Samples	No. per 1000 tonnes																							
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2013	12,415	6	0.48																							
2014	11,979	13	1.09																							
Sum	38,311	27	0.70																							

Notes:

1. Condition or efficacy of infrastructure or systems such as concrete pads, containment systems, tanks, etc. not inspected or assessed as part of this compliance review. Scope restricted to a presence/absence determination.
2. Separation distances confirmed using exploreHRM online mapping tool. Printouts from exploreHRM included as Appendix A.
3. List of Organic Compost Facilities in Nova Scotia found at: <http://www.novascotia.ca/nse/waste.facilities/facilities.organic.composting.php>.
4. Compost tonnage does not include overs.

Table 3.2

**Summary of Results of Curing Area Aerated Static Pile Pilot Program
Compliance and Process Review, Composting Facility, Miller Waste
80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia
Halifax Regional Municipality**

	2005 CCME Guidelines	21-Oct-11	26-Oct-11	9-Nov-11	23-Feb-12	8-Aug-13	27-Aug-13
Sample Location	Screened Compost	Screened Compost	Curing Pile Prior to Screening	Curing Pile Prior to Screening	Screened Compost	Curing Pile Prior to Screening	Screened Compost
Temperature range of curing pile at 4 ft. depth (°C)							
Front			60.0	61.5		57.5	
Middle			62.0	61.0		63.5	
End			64.0	63.0		47.5	
Oxygen range of curing pile (%)						20.4 - 20.8	
Compost Stability Index		7			7		7
Moisture content (%)		55.9	55.0	53.0			
C:N Ratio		21:1					
Maturity (Respiration - CO ₂ -C/g OM/day)	≤ 4.00	2.90			3.20		3.20
Organic Matter (%)		80.28					

Note:

OM - organic matter

Appendices

Appendix A

Halifax Regional Municipality Maps

