

# Business Plan for Recycling Food Waste on Martha's Vineyard, Massachusetts

Prepared For

Island-Wide Organics Waste Management Study Oversight Committee Martha's Vineyard, MA

Prepared By:

# Coker Composting and Consulting Troutville, VA

In association with:

# Robert L. Spencer, Environmental Consultant

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# **Executive Summary**

Massachusetts' food waste ban went into effect October 1, 2014. In response to this ban, the Martha's Vineyard Vision Fellowship funded an Island-wide organic waste management feasibility study which was finalized in May 2017. That study assessed various technologies and approaches to managing food waste on the Island and made specific recommendations for next steps. This report was commissioned by the Island-Wide Organics Waste Management Study Oversight Committee in order to begin to understand the magnitude of the infrastructure investment needed to process food waste on Martha's Vineyard, rather than to ship it back to mainland Massachusetts for processing at a landfill or combustion facility as is currently the practice.

This business plan examines three composting alternatives and a proprietary animal feed production technology. The composting alternatives are turned windrow, aerated static pile and in-vessel rotary drum. This plan includes capital, operating and cash flow forecasts for the three composting alternatives which are summarized below. As the animal feed technology would be provided and operated by a private company, only estimated capital costs are provided, with their proposal included in the Appendix.

The economic evaluation in this study is based on a facility sized to process 4,000 tons/year of food wastes. For the composting alternatives, to meet the desired process design criteria, another 6,000 tons/year of brush, leaves, grass clippings and old corrugated cardboard were included in the compost recipe (Appendix A). The footprint analysis (Appendix B) was based on total incoming compostables of 10,600 tons/year. The rotary drum composting and animal feed production technologies were sized for 15,600 tons/year due to the inability to scale down the technologies below a certain point<sup>1</sup>.

No site has yet been selected for the proposed organics recycling facility. The composting alternatives will need a site in the range of 6-8 acres. The animal feed alternative will only require 1.5 - 2 acres. The economic evaluation includes proposed land acquisition, but if the implementing entity is a public-sector government, that expense may not be needed.

A summary of the capital cost estimates is provided in Table ES-1 and detailed cost estimates are in the Appendix E.

Cost Element	Windrow Composting	ASP Composting	Rotary Drum Composting	Animal Feed Extrusion
Site development & design	\$2,871,500	\$2,779,953	\$2,856,500	\$2,725,000
Equipment	\$1,101,000	<u>\$917,444</u>	\$3,040,500	<u>\$8,700,000</u>
Total	\$3,972,500	\$3,697,397	\$5,897,000	\$11,425,000

#### Table ES-1. Summary of Initial Capital Cost Estimates

<sup>&</sup>lt;sup>1</sup> Rotary drum technology is available in either small (< 60 CY capacity) or large (> 750 CY capacity), if using the smaller drums, eight units would be required to handle expected daily throughputs.



Estimated operating costs for the three composting options were prepared by using a "time-andmotion" prediction of the steps in the volumetric compost production process, which resulted in estimates of labor needed, and equipment costs for operations. Production in the turned windrow and rotary drum alternatives would need 2 full-time equivalents (FTEs) while the aerated static pile alternative would require 2 FTEs and 1 part-time equivalent. The pro forma analysis assumed 2 FTEs for the windrow and drum composting and 3 FTEs for ASP composting to account for housekeeping, recordkeeping and process monitoring, along with sales support. Annual operating costs per ton are estimated to be \$32.70/ton for turned windrows, \$33.30/ton for rotary drum and \$45.10/ton for ASP. The primary differences between them are higher processing costs for active composting with straddle-turned windrows and higher processing costs for curing with the rotary drum, along with mixing and electricity costs for rotary drum and ASP. The operating costs for the animal feed production alternative were estimated at \$87/ton by the technology provider.

Financial *pro formas*, projections of monthly profit or loss over a three-year period (2019 – 2021), were prepared. For all composting approaches, the assumptions used are shown in Table ES-2. It was assumed that operating costs and tip fees would go up 3% per year. Timing of compost sales was based on experiences from other compost producers and the timing of production expenses was proportional to the tonnages collected by IGI in 2017. Capital cost recovery factors used were 3.75% per year for equipment with less than a 12-yr anticipated life and 5.5% per year for site improvements and infrastructure, assuming a 20-year life. As the implementing entity is not yet known, it is unknown how financing would be arranged, so the *pro forma* analysis does not include any cost of capital.

<u>Parameter</u>		<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>Notes</u>
Tip fee		\$50.00	\$51.50	\$53.00	\$ per ton
Tip fee tonnage	Tons	2,215	2,900	4,000	No tip fee for carbon materials
Compost sales price	Commercial	\$25.00	\$25.00	\$25.00	\$ per CY
	Residential	\$35.00	\$35.00	\$35.00	\$ per CY
Annual sales volume		10,500	13,775	19,000	СҮ

Table ES-2.	Pro forma	assumptions	for	composting
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The results of the *pro forma* analysis are summarized in Tables ES-3, ES-4 and ES-5. Detailed spreadsheets are in Appendix F. All options are similar in terms of predicted financial performance. The facility can be profitable within three years if the tonnages go up year-over-year as shown, and all the compost is sold at the assumed price points. These estimates do not include any collection costs or revenues, nor any corporate or governmental overhead allocations.

#### Table ES-3. Summary of windrow composting pro forma analysis

	<u>2019</u>	<u>2020</u>	<u>2021</u>
Revenues	\$399,500	\$528,163	\$734,500
Expenses	\$589,500	\$579,653	\$590,388
Net income	(\$190,000)	(\$51,491)	\$144,112



Table ES-4. Summary of ASP composting <i>pro forma</i> analysis			
	<u>2019</u>	<u>2020</u>	<u>2021</u>
Revenues	\$399,500	\$528,163	\$734,500
Expenses	\$687,111	\$701,484	\$716,287
Net income	(\$287,612)	(\$173,322)	\$18,213

#### Table ES-5. Summary of rotary drum composting pro forma analysis

	<u>2019</u>	<u>2020</u>	<u>2021</u>
Revenues	\$399,500	\$528,163	\$734,500
Expenses	\$659,908	\$643,650	\$654,826
Net income	(\$260,408)	(\$115,488)	\$79,674

Of the four alternatives evaluated, the animal feed production is the most expensive, in part because it is sized for 50 tons/day and would require inputs from off-island for the economics to work out. Rotary drum composting is well-practiced in Massachusetts (Marlborough and Nantucket) but would also be sized larger than needed. Windrow composting is the most widely practiced composting approach and is the least expensive and most flexible to changes in quantities of feedstocks. ASP composting is becoming more common as it offers better process and odor control but has the least favorable financial performance projection.

There are a number of factors that could influence these calculations, as outlined in Table ES-6. Readers should consider these factors before drawing any conclusions.

Assumptions used in study	Value chosen	<b>Uncertainties</b>
<u>Feedstocks</u>		
Food wastes from residential	1,090 tons/year to 1,816	Will residential diversion
sources	tons/year	program be implemented?
Carbon sources from MVRD	1,980 CY/yr brush, 1,600 CY/yr	Will this be made available
	leaves	given it is being recycled now?
Processing Alternatives		
Rotary drum composting	Single drum - 50 ton/day capacity	This is more capacity than needed, will off-island sources be included?
Animal Feed Extrusion	SAFE proposed ~16,000 tons/yr capacity	This is more capacity than needed, will off-island sources be included?
Economic Analysis		
Cost factors used	Labor - \$22.50/hr	Is this appropriate?
Cost of land	\$74,000/acre	Could be higher or lower? If municipal implementation, could be free.
Construction costs	No land clearing needed	Is this appropriate?

#### Table ES-6. Factors Affecting Financial Analysis

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	On-site well, on-site septic, 500' utility extensions	Are these appropriate?
Equipment costs	Equipment costs based largely on late 2017 prices	Will March 2018 steel tariffs raise prices?
Pro Forma Analyses		
Capital cost recovery factors	3.75%/yr for equipment; 5.5% for site improvements	Are these appropriate?
Food waste tipping fee	\$50 - \$53/ton	Is this appropriate? Better financial performance at tip fee = \$75/ton
Compost sales prices	\$25 - \$35/CY	Is this appropriate?
Animal feed revenues	None provided by SAFE	

The next steps in the process should be to find one or more candidate sites, identify who the implementing entity will be, quantify the real market potential for compost sales on the Island, and refine this preliminary sizing analysis and estimates of costs.



# Introduction

Massachusetts' food waste ban was proposed in July 2013, accepted to update the state's Solid Waste Facility Regulations (310 CMR 19.006) in January 2014, and went into effect October 1, 2014. The regulatory body responsible for enforcing the ban is the Massachusetts Department of Environmental Protection (MassDEP). Under the ban, generators of food wastes are prohibited from disposing, transferring for disposal, contracting for the disposal, or transporting commercial organic material. "Commercial Organic Material" means food material and vegetative material from any entity that generates more than one ton of those materials for solid waste disposal per week but excludes material from a residence.

MassDEP's guidance materials for the Commercial Organics Waste Ban give the following guidelines for some of the commercial and institutional generators who may be affected by the ban, based on generic sector-based estimates:

- Residential Colleges or Universities with ≥ 730 students
- Non-residential Colleges or Universities with ≥ 2,750 students
- Secondary Schools with ≥ 4,000 students
- Hospitals with  $\geq$  80 beds
- Nursing Homes with  $\geq$  160 beds
- Restaurants with ≥ 70 or more full time employees
- Resort/Conference Properties with ≥ 475 seats
- Supermarkets with  $\geq$  35 full time employees.

In response to this ban, the Martha's Vineyard Vision Fellowship funded an Island-wide organic waste management feasibility study which was finalized in May 2017. The study's oversight committee members were chosen for their knowledge of and experience with food waste diversion, waste management and/or their unique perspectives on how to introduce new projects/programs to the Island community. The committee members currently are: Don Hatch, Director of the Martha's Vineyard Refuse Disposal and Resource Recovery District; Michael Loberg, chairman of the Tisbury Board of Health; Chris Murphy, Chilmark Conservation Commission and former MV Commission member; Jon Previant, Agricultural Consultant; Richard Toole, Vineyard Conservation Society board president; Matt Poole, Edgartown Board of Health Agent and Rebecca Haag, Executive Director at Island Grown Initiative.

The study assessed various technologies and approaches to managing food waste on the Island and made specific recommendations for next steps. The Committee applied for and received funding from the Vision Fellowship for a Phase II, the purpose of which is to lay the groundwork for community and investor commitments to specific organic waste management for the Island.



The precursor study to this report, "Island-Wide Organics Feasibility Study Final Report"<sup>2</sup> concluded that two composting technologies and one animal feed manufacturing technology should be considered for implementation to help Island businesses comply with the new rules. The composting technologies selected were open-air turned windrow and an in-vessel composting system. The project team has based its analysis in this report on the rotary drum composting technology, due to its years of experience in recycling organic wastes (particularly in Marlborough and Nantucket, MA) and its proven capability for handling food wastes. This report also evaluates an aerated static pile (ASP) composting approach. The animal feed manufacturing technology suggested in that report was based on the use of a proprietary dry extrusion system.

This report was commissioned by the Island-Wide Organics Waste Management Study Oversight Committee in order to begin to understand the magnitude of the infrastructure investment needed to process food waste on Martha's Vineyard, rather than to ship it back to mainland Massachusetts for processing at a landfill or combustion facility as is currently the practice. This plan was prepared from the perspective of a private-sector company opening an organics recycling facility on the Island and handling all compost sales and marketing. It is possible that a public-sector entity would develop and operate the facility.

#### About the authors

This report was prepared by Coker Composting & Consulting, with the assistance of Robert L. Spencer, Environmental Planning Consultant.

Coker Composting & Consulting is a sole proprietorship consulting operation run by Craig S. Coker. Mr. Coker has over 40 years' experience in the planning, permitting, design, construction and operation of organics recycling facilities processing animal manures, animal mortalities, food wastes, biosolids, yard trimmings and source-separated organic solid wastes. He has planned, permitted, built and/or operated twelve ASP facilities in eight states. He is a licensed Waste Management Facility Operator, a certified Nutrient Management Planner (both Agriculture and Turf/Landscape) and a USCC/SWANA Certified Compost Systems Manager. He holds an undergraduate degree in Environmental Science from the University of Virginia and a graduate degree in Environmental Engineering from George Washington University.

Robert L. Spencer is an Environmental Planner with extensive experience in Massachusetts and in the previous evaluations of food wastes on Martha's Vineyard. His experience working with Martha's Vineyard started in the fall of 2014 when he was retained by Bruno's Roll-Off Inc. to assist the company in identifying options for complying with the Massachusetts Food Waste Ban that took effect in October 2014. Spencer was then retained by the Martha's Vineyard Vision Fellowship in December 2015 for a 12-month feasibility study of food waste recycling options. Spencer has also been retained by the Massachusetts DEP's RecyclingWorks technical assistance program to assist the following Martha's Vineyard farms with composting food waste: Whippoorwill Farm, Beetlebung Farm, and Thimble Farm.

<sup>&</sup>lt;sup>2</sup> S. Abrams and R.L. Spencer, "Island-Wide Organics Feasibility Study", Martha's Vineyard Vision Fellowship, May 2017 www.cokercomposting.com



#### Acknowledgements

The project team would like to acknowledge the invaluable assistance provided by the following people during this project:

- Rebecca Haag, Executive Director, Martha's Vineyard Island Grown Initiative
- Jon Previant, Island-Wide Organics Waste Management Oversight Committee
- Sophie Abrams Mazza, Food Equity and Recovery Director, Island Grown Initiative



# **Compost Facility Sizing**

Composting, at any scale, is a biological manufacturing process, where the inputs to the process are compostable materials (feedstocks), air and water, and the outputs are compost, heat, water vapor and carbon dioxide. Compost production requires a medium dry enough to provide pore spaces with free air but wet enough to sustain biological activity (around 50% to 55% moisture). Porosity (around 35% to 50%) typically is provided by mixing organic wastes with a structural bulking agent or amendment, such as wood chips. The addition of woody materials as amendments also serves to raise the carbon-to-nitrogen (C:N) ratio of the organic waste materials into the preferred range of 20% to 35%. Other carbon-adjusting amendments include leaves, sawdust and horse manure and bedding.

Composting is also a batch-type volumetric materials handling process. The steps in this process are feedstock receipt and storage, mixing, active composting, curing (also known as maturation), screening (needed to recover oversized bulking agent), and product storage. Each of these process steps is sized individually, then summed to determine the total area needed. For this project, sizing was done for turned windrow and rotary drum composting methods. For the animal feed alternative, the technology vendor offered sizing suggestions.

Once estimates of compostable feedstocks are determined, a compost recipe can be prepared. Compost recipes are developed on a mass, or weight, basis to ensure that the mix conforms to desired process design criteria, but the feedstocks are commingled on a volumetric basis (i.e. so many cubic yards [CY] of Feedstock A mixed with so many CY of Feedstock B, etc.). Incoming source-separated organic materials (SSO) would be processed by grinding/shredding/mixing to achieve a consistent particle size, and to combine the SSO with fresh bulking agent, oversized bulking agent from the screening process, and finished compost (used as a microbial inoculum).

#### Feedstock Estimates

## Food Wastes

The 2017 Abrams and Spencer report estimated potential food waste diversion on Martha's Vineyard at 6,500 tons per year. That estimate was based on a combination of visual observations by Mr. Don Hatch of the Martha's Vineyard Refuse Disposal District of the percentage of food (45%) in the municipal solid waste stream shipped off-island for disposal (19,000 tons/year), supplemented with Mr. Spencer riding with a commercial hauler collecting trash in Edgartown in the fall of 2014 to inspect loads tipped at the Oak Bluffs transfer station.

## Industrial/Commercial/Institutional (I/C/I) sources

Tables 3 and 4 in the 2017 Abrams and Spencer report list the 26 establishments that are, or might be, subject to the MassDEP food waste ban which applies to generators of 1 tons per week or more of food waste. This list included 16 establishments open only 20 weeks per year, one open 40 weeks/year, two open 48 weeks/year and 7 open 52 weeks/year, so it reflects the higher waste generation of the spring/summer/fall tourist seasons. Estimates of waste generation for those



establishments were developed based on MassDEP Recycling Works methodology, which is a reasonable method of estimation. Based on the Spencer and Abrams calculations, the total expected annual waste generation from those MV establishments is approximately 1,006 tons/year. Those estimates were compared to estimates from a "State List" which consists of a spreadsheet of food waste sources by community in Massachusetts prepared in 2002 by Draper/Lennon, Inc. It is reasonable to assume that all 1,006 tons/year will be available to the organics recycling facility.

Abrams and Spencer calculated potential tonnages from another 89 food waste generators on MV, not necessarily subject to the ban, who might be producing another 740 tons/year. If any of those establishments produce 1 ton per week for any portion of the year, they are subject to the ban. As many of these generators are small, it is reasonable to assume that 50% of this tonnage (370 tons/year) will be available to the facility.

As part of this current project, Mr. Spencer confirmed that there have been no major new food waste generators (i.e. restaurants or grocery stores) built since the previous calculations were done in Nov. 2016, through interviews with health agents in all six towns. Food service establishments must have a permit from the Board of Health, and that permit lists the number of seats in the establishment, which can then be used to estimate the amount of food waste per establishment.

#### Residential Sources

The 2017 report estimated a total yearly residential food waste stream of 4,844 tons, with 1,963 tons coming from year-round residents and 2,881 tons coming from summer visitors. This was based on an estimate of year-round population of 16,500 producing 238 lbs. of food waste per year and a summer population estimate of 98,500 producing 0.65 lbs./day for 90 days. This is a reasonable method of estimation.

As there is no mandate for residential diversion of food wastes, then any residential diversion program must be a voluntary participation model, paid for either by usage fees or public funds subsidies. In either case, voluntary programs are characterized by participation rates (the percentage of households participating in the program) and setout rates (the percentage of households that actually set their organics out for collection on their assigned collection day, or who actually take their organics to a drop-off station weekly). For this study, assumed participation rates were 30% in 2020, rising 10% per year to 50% by 2022. Of those participating, a setout rate of 75% was assumed (based on data from a Vermont residential diversion program).

The estimated food waste generation is shown in Table 1.



	F	ood waste (tons/yea	r)
<u>Source</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>
I/C/I subject to ban	1,000	1,200	1,500
I/C/I not subject to ban	125	250	370
Residential (year-round)	442	590	736
Residential (visitor)	648	864	1,080
Totals	2,215	2,904	3,686

#### Table 1. Estimated food waste generation

The economic evaluation in this study is based on a facility sized to process 4,000 tons/year of food wastes.

#### Carbon sources

Although food-soiled paper is often included in the food wastes collected in SSO diversion programs (as they are not recyclable elsewhere), they alone rarely provide enough biodegradable carbon to satisfy the recipe criteria. Other sources of carbon amendments on Martha's Vineyard were identified in a 2014 study<sup>3</sup>. That study estimated that 5,699 cubic yards (CY) of wood chips, 4,868 CY of leaves, and 117 CY of sawdust could be available to a composting facility. Those estimates were used to develop the compost recipe.

In addition, the Martha's Vineyard Refuse District (MVRD) in West Tisbury reports they collect approximately 1,980 CY of brush and 1,600 CY of leaves annually that is diverted to the Keene Excavating Compost Facility. Those quantities were included in the recipe.

#### Old Corrugated Cardboard (OCC)

There are old corrugated cardboard (OCC) and waxed cardboard materials in the waste stream that could potentially be captured and diverted to the composting facility. The 2017 Abrams and Spencer study estimated that 19,000 tons/year of mixed solid waste were shipped off-island for disposal annually. A 2011 Waste Characterization Analysis by MassDEP estimates that compostable paper comprises 6.2% of solid waste disposed, that OCC comprises 8.7% and that waxed cardboard comprises 1%<sup>4</sup>. The compostable paper will likely be collected with the food waste, but a separate OCC collection effort would have to be initiated. OCC/waxed cardboard were estimated to potentially add another 468 tons/year of divertable SSO assuming 25% of OCC/waxed cardboard waste stream could be captured by 2022.

<sup>&</sup>lt;sup>3</sup> Abrams, S., "Closing the Loop on the Thimble Farm Slaughterhouse: A Waste Composting Feasibility Study", Marlboro Graduate School, July 2014

<sup>&</sup>lt;sup>4</sup> Massachusetts Dept. of Environmental Protection, "Massachusetts Waste Characterization Data, Material Category Profiles", March 2011



#### **Compost Recipe**

A mass-based compost recipe was developed for the estimated quantities above. The recipe was based on the food waste plus leaves, sawdust, wood chips, OCC, yard waste, compost inoculant and overs from the product screen. The recipe is based on the four key process design criteria for good composting:

- Carbon:Nitrogen (C:N) ratio of more than 20:1
- Mix moisture content of 50% 65%
- Volatile solids content greater than 80%
- Predicted (based on bulk density) free air space content of 40%-60%

Compost recipes should be adjusted to reflect the fact that not all carbon in compostable materials is available to the bacteria responsible for primary decomposition in active composting. This is because some carbon is contained within lignin molecules in wood, carbonaceous and paper products. Lignaceous carbon is biodegraded by fungi in curing/maturation. Carbon content is adjusted for the lignin content using a methodology by Chandler (1980)<sup>5</sup>:

Biodegradable Fraction (B.F.) = 0.83 – (0.028 x Lignin Content of Volatile Solids) Biodegradable-C = Total Carbon x B.F. x Volatile Solids

A summary of the recipe is in Table 2 and the detailed recipe and calculations are in the Appendix.

Parameter	Targets	Values
Average Daily Compostables Volumes (CY/day)		121
Carbon:Nitrogen Ratio	> 20:1	20
Moisture Content	50%-65%	53%
Volatile Solids	> 80%	85%
Predicted Free Air Space	40% - 60%	70%

#### Table 2. Daily Compost Recipe Summary

The only recipe model parameter outside the recommended range is predicted free air space (FAS). FAS is defined as pore space minus the pore space volume occupied by water. The equation predicting FAS is based on Alburquerque (2008)<sup>6</sup> and is a function of bulk density. So, materials with low bulk densities have higher predicted FAS and vice-versa. Compost piles with high FAS may have difficulty retaining heat during active composting and can be mitigated by covering piles with finished compost or a fabric cover. This will be monitored by the facility's operating staff, so is not considered problematic at this early stage.

<sup>&</sup>lt;sup>5</sup> Chandler, J.A., "Predicting Methane Fermentation Biodegradability", *Biotechnology and Bioengineering Symposium*, 10, 93, 1980

<sup>&</sup>lt;sup>6</sup> Alburquerque, J.A., et. al., "Air Space in Composting Research: A Literature Review", Compost Science and Utilization, Vol. 16, No. 3, 2008, p. 159-170



#### **Facilities Footprint**

The technologies initially under consideration by the Oversight Committee include three composting approaches and a dry extrusion animal feed facility. The three composting approaches modeled were turned windrow composting and curing, aerated static pile (ASP) composting with windrow curing and rotary drum composting followed by windrow curing.

The sizing models used are based on the volumes determined by the recipe model due to the volumetric materials handling nature of composting. Windrow systems are more flexible in terms of changing quantities of feedstocks (to be expected on Martha's Vineyard given seasonal tourism) where in-vessel systems have fixed volumetric capacities.

For the windrow alternative, the sizing analysis was based on the use of a straddle windrow turner with a 6' H x 12' W drum (Figure 1). The ASP alternative was based on the use of concrete block bunkers and Fuji ring compressors (Figure 2). For the rotary drum alternative (Figure 3), the sizing was based on the use of a single 12' diameter, 185' long rotary drum with mixer<sup>7</sup>.



#### Figure 1. Straddle Windrow Turner Composting

<sup>&</sup>lt;sup>7</sup> Rotary drum technology is available in either small (< 60 CY capacity) or large (> 750 CY capacity), if using the smaller drums, eight units would be required to handle expected daily throughputs.





Figure 2. ASP Composting

Figure 3. Rotary Drum Composting





A summary of area needs is shown in Table 3. Detailed calculations are in the Appendix.

#### Windrow Composting ASP Composting **Rotary Drum Composting** Area Summary Area Area Area (sq. ft.) (sq. ft.) (sq. ft.) Feedstock Receipt 1,600 1,600 1,600 Feedstock Storage Food wastes 400 400 400 OCC 400 400 400 19,900 Leaves 19,900 19,900 Wood chips 8,400 8,400 8,400 Yard wastes 6,000 6,000 6,000 Overs from Screen 750 750 750 **Composting Area** 87,500 24,000 26,250 115,500 Curing Area 75,000 95.625 4,500 Screening Area 4,500 4,500 Product Storage Area 24,000 24,000 24,000 Retail sales area 6,400 6,400 6,400 Subtotal 234,850 194,225 216,650 Equip storage, etc. @ 25% 58,713 48,556 54,163 Total square feet needed 293,563 242,781 270,812 Total acreage needed 6.7 5.8 6.2

#### Table 3. Summary of Area Needs

As much of the space needs are taken up by non-composting/curing activities, the key differences are in the composting and curing footprints. While rotary drum composting takes up the least space, it requires the largest curing (maturation) footprint. Essentially, all alternatives will require a 6-8 acre site.



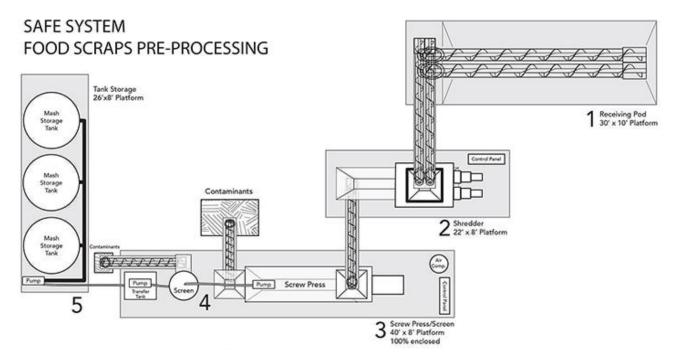
# **Animal Feed Extrusion Facility**

The animal feed manufacturing process recommended for further evaluation in the 2017 study is a dry extrusion process, patented by Sustainable Alternative Feed Enterprises (<u>www.forktofeed.com</u>) which has a 100 ton/day facility operating in Santa Clara, CA.

#### **Description of Operation**

The Santa Clara facility operated by S.A.F.E. consists of a pre-processing step to remove contaminants and make the food waste compatible with the feed production system, which consists of a dehydrator, a sterilizer, and an extruder press to recover oils from grease trap wastes.

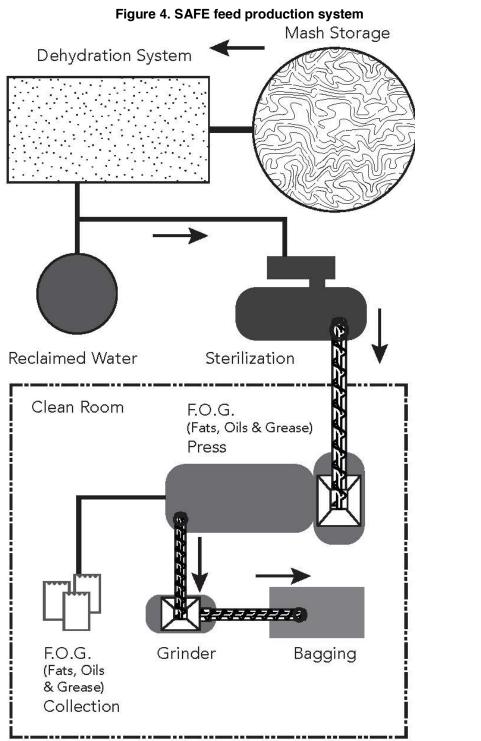
The pre-processing system Is shown in Figure 3 and consists of a shredder, a screw press, a filtering screen, and mash storage tanks. The screw press is the primary contaminant removal mechanism, producing a high-solids thick liquid, called mash.



#### Figure 3. SAFE pre-processing system

The feed production system is shown in Figure 4. Company officials have indicated that, in future installations, they plan to move the Fats/Oils/Greases (FOG) press between the mash storage tanks and the dehydration system. The extruder technology (labeled Sterilization in Figure 4) is based on Insta-Pro International dry extruders, which generate heat through friction to accomplish numerous processes including: cooking, expanding, sterilizing, stabilizing, dehydrating and texturizing. The extruders can be either high or medium shear which create various pressures and temperatures.





#### The output

from the extruder is a

dry pelleted product, which can be fed to non-ruminant animals. The Santa Clara facility has experimented with making treats for domestic dogs from the process, which was apparently successful.



A key advantage to a SAFE system on Martha's Vineyard is that it is a compact processing system. The Santa Clara plant takes up about 15,000 square feet of processing area. However, as the 2017 study noted, "Only food waste would be processed. The technology does not process other organics like leaf and yard waste, cardboard or soiled paper, meaning either a missed opportunity to recycle those materials locally, or the need for a separate composting facility." Company officials have estimated the facility will need approximately 11,000 SF of processing area, and this study assumes this to be done inside a building on a 0.5 acre site

Company officials have indicated that it may be difficult to downsize some of the system components to meet the projected 12.8 ton/day food waste diversion rate (based on 4,000 tons/year over a 312-day year), so there may be interest in bringing in other material off-island for processing.

Neither the 2017 study or this evaluation has assessed the on-island market(s) for animal feed produced by a SAFE system.

SAFE provided a preliminary budgetary design-build proposal for their technology, consisting of a preprocessing system to produce the food mash and an animal food production system consisting of a dryer, decanting centrifuge, pumps, tanks, the extrusion system, and a suspended air flotation system for pretreating the decanted wastewater prior to sewer discharge. Their proposal is included in the Appendix.

As a site has not been selected yet for any organics recycling facility, it is not known whether adequate 3-phase power is available nearby, nor if any one of the island's five wastewater treatment plants can accept the pretreated wastewater.



# **Cost Estimates**

#### **Cost Factors Used**

In the absence of any island-specific construction cost factors, this analysis used cost factors from two sources: a general contractor's Schedule of Values for a composting facility under construction in the northern Virginia suburbs of Washington, D.C., and from construction estimating software I use (Craftsman National Construction Cost Estimator), adjusted for costs in Zip Code 02575 (materials +4%, labor +36%, equipment +1%).

For windrow composting operating costs, we assumed a labor rate of \$22.50/hour, a machine rate for loaders/trucks of \$55/hr, for grinder at \$110/hr, and for a windrow turner at \$450/hour. The rotary drum vendor (Waste Options) and SAFE provided estimates of equipment and operating costs for those equipment alternatives. We assumed all alternatives to be open 6 days/week.

#### **Capital Cost Estimates**

#### **Composting Facility**

For all composting approaches, a greenfields development was assumed on a site with minimal tree cover requiring clearing, fine grading only (i.e. a reasonably flat site), 6" stone base, 6" asphalt paving (recommended to protect island groundwater resources), concrete slab for waste receipt and feedstock storage bunkers (food and OCC only; other feedstocks stored in open trapezoidal piles), concrete block walls for bunkers, a portable construction trailer office (8' x 24') with minimal landscaping, 500' extension of 3-phase power from the road (for the ASP and rotary drum alternatives only), an on-site 4" well for water (60' deep), an on-site septic tank for sewage (and maybe leachate), sediment and erosion control (construction entrance, silt fence and erosion control blankets), storm water runoff management using run-on berms, runoff swales, solids separator, and closed (i.e. lined) bioretention pond, and a 50' wide planted vegetative buffer (tree/shrub density 1,000 plants/acre). Site development costs also included a 7.5% design fee and a 25% contingency.

The ASP alternative was based on the generic positive (forced) aeration design, with one blower per bunker. The capital cost estimate assumed a concrete bunker floor with aeration trenches and aeration pipe covered with galvanized steel trench covers, concrete block bunker walls, and a sliding timber panel end wall (so that bunkers could be filled to capacity). During this project, two technology providers (AgriLabs in VT and Engineered Compost Systems in WA) offered possible ASP facilities based on their technologies. This information has been included in Appendix C. If ASP composting is the selected alternative, these vendor offerings should be investigated in more detail.

The rotary drum capital cost estimate also included two buildings, one for waste receipt and drum loading and one for product discharge and screening, a mechanical mixer and a biofilter. The estimate was based on a March 2017 preliminary layout prepared for the Martha's Vineyard Refuse District by Structor Engineering.



The equipment included in the cost estimates was a well pump and pressure tank, a horizontal grinder (Morbark 2600 wood hog), a straddle windrow turner (Scarab 612) or a rotary drum (Citic 12' x 165') with a Luck mechanical mixer, Vortron TX 714 fabric windrow covers with punched tire hold-downs, Fuji ring compressor blowers with Intermatic timers, a yard truck (10 CY dump) for moving materials through the production process, a rubber-tired front-end loader (John Deere 524K with 2 – 3CY buckets, one for waste and one for product), and a TROM 406 trommel screen.

## Food Extrusion Facility

SAFE provided estimates for facility design, pre-processing equipment, animal food production equipment, and wastewater pretreatment equipment<sup>8</sup>. They estimated about 11,000 square feet (SF) would be needed in a building somewhere. This study used the same site development cost factors used for composting site development and added estimated cost for a 11,000 SF pre-engineered metal building.

A summary of the capital cost estimates is provided in Table 5 and detailed cost estimates are in the Appendix E.

Cost Element	Windrow Composting	ASP Composting	Rotary Drum Composting	Animal Feed Extrusion
Site development & design	\$2,871,500	\$2,779,953	\$2,856,500	\$2,725,000
Equipment	<u>\$1,101,000</u>	<u>\$917,444</u>	<u>\$3,040,500</u>	<u>\$8,700,000</u>
Total	\$3,972,500	\$3,697,397	\$5,897,000	\$11,425,000

#### Table 5. Summary of Initial Capital Cost Estimates

#### **Operating Cost Estimates**

#### **Composting Facility**

Estimated operating costs for the three composting options are shown in Table 6 and detailed cost estimates are in the Appendix. The estimates were prepared by using a "time-and-motion" prediction of the steps in the volumetric compost production process, which resulted in estimates of labor needed, and equipment costs for operations.

Production in the turned windrow and rotary drum alternatives would need 2 full-time equivalents (FTEs) while the aerated static pile alternative would require 2 FTEs and 1 part-time equivalent. The pro forma analysis assumed 2 FTEs for the windrow and drum composting and 3 FTEs for ASP composting to account for housekeeping, recordkeeping and process monitoring, along with sales support. Annual operating costs per ton are estimated to be \$32.70/ton for turned windrows, \$33.30/ton for rotary drum and \$45.10/ton for ASP. The primary differences between them are higher

<sup>&</sup>lt;sup>8</sup> SAFE based their estimates on late 2017 materials prices but noted that pending tariffs on Chinese steel would require that the estimates be revisited before placing an equipment order.



processing costs for active composting with straddle-turned windrows and higher processing costs for curing with the rotary drum, along with mixing and electricity costs for rotary drum and ASP.

		Turned Windrow	
Process	<u>Hours per day</u>	Labor Cost	Machine Cost
Waste Receipt	0.7	\$4,734	\$11,572
Grinding/shredding	0.7	\$7,020	\$34,320
Transport to Pad	2.4	\$16,569	\$40,503
Building Windrows	2.0	\$14,202	\$34,717
Windrow Mixing/Turning	1.1	\$7,898	\$19,305
Moving Compost to Curing	1.4	\$9,942	\$24,302
Managing Curing Piles	1.3	\$9,042	\$22,103
Screening Compost	1.5	\$11,504	\$28,121
Moving Compost to Storage	1.0	\$7,158	\$17,497
Moving Overs to Storage	0.3	\$2,193	\$5,360
Product Marketing & Sales	0.8	\$5,616	\$13,728
Total Workhours	13.2	Totals	\$347,406
FTEs needed*	1.93	Annual Tonnage	10,623
		Cost per ton	\$32.70
		<b>Rotary Drum</b>	
Process	Hours per day	Labor Cost	Machine Cost
Waste Receipt	0.7	\$4,734	\$11,572
Grinding/shredding	0.7	\$7,020	\$34,320
Transport to Pad	2.4	\$16,569	\$40,503
Loading Rotary Drum	0.4	\$5,616	\$13,728
Electricity for Rotary Drum			\$28,852
Moving Compost to Curing	1.7	\$11,599	\$28,352
Managing Curing Piles	3.0	\$21,304	\$52,076
Screening Compost	1.5	\$12,079	\$29,527
Moving Compost to Storage	1.5	\$10,439	\$25,517
Moving Overs to Storage	0.3	\$2,244	\$5,485
Product Marketing & Sales	0.8	\$5,616	\$13,728
Total Workhours	12.1	Totals	\$353,771
FTEs needed*	1.78	Annual Tonnage	10,623
	1.70	Cost per ton	\$33.30
		Aerated Static Pile	<b>33.30</b>
Process	Hours per day	Labor Cost	Machine Cost
Waste Receipt	0.7	\$4,734	\$11,572
Grinding/shredding	0.7	\$7,020	\$34,320
Mixing	4.2	\$18,937	\$72,029
-	2.1		\$72,029
Transport to Pad		\$14,913	
Building ASPs	2.4	\$17,043	\$41,660
Electricity for blowers			\$78,122
Moving Compost to Curing	1.5	\$10,439	\$25,517
Managing Curing Piles	1.3	\$9,326	\$22,797
Screening Compost	1.5	\$12,079	\$10,410

### Table 6. Annual Composting Operational Expenses



Moving Compost to Storage	1.1	\$7,516	\$18,372
Move Overs to Storage	0.3	\$1,879	\$4,593
Product Marketing & Sales	0.8	\$5,616	\$13,728
Total Workhours	19.5	Totals	\$479,075
FTEs needed*	2.44	Annual Tonnage	10,623
		Cost per ton	\$45.10

\*Assumes 85% productivity of on-site staff

#### Food Extrusion Facility

SAFE provided the following operating cost estimate for feed production:

- Energy \$25/ton
- Labor \$25/ton
- Maintenance \$ 4/ton
- G&A<sup>9</sup> <u>\$ 8/ton</u> Total \$62/ton

They estimated the pre-processing system would add another \$25/ton to the operating cost, for a grand total of \$87/ton. This is based on processing 15,600 – 16,800 tons/year, which is considerably more than is available on Martha's Vineyard. Generally speaking, lower-capacity systems have higher operational costs due to a lack of economies of scale.

<sup>&</sup>lt;sup>9</sup> G&A – General and Administrative costs



# Financial Pro Formas

As noted previously, this study is based on the assumption that a private- or public-sector entity will develop an organics recycling facility based on composting. As the implementing entity is not yet known, it is unknown how financing would be arranged, so the *pro forma* analysis does not include any cost of capital. For the animal feed extrusion alternative, SAFE, a private company, has offered to design/build a new facility on Martha's Vineyard, so no *pro forma* analysis was performed. These *pro formas* are, in essence, projections of monthly profit or loss over a three-year period (2019 – 2021).

#### **Methodology and Assumptions**

#### Composting

For all composting approaches, the assumptions used are shown in Table 7. Compost sales prices were set lower than current Vineyard prices in order to capture market share. It was assumed that operating costs and tip fees would go up 3% per year. Timing of compost sales was based on experiences from other compost producers and the timing of production expenses was proportional to the tonnages collected by IGI in 2017 (as delineated in Table 8).

Capital cost recovery factors used were 3.75% per year for equipment with less than a 12-yr anticipated life and 5.5% per year for site improvements and infrastructure, assuming a 20-year life.

Parameter		2019	2020	2021	Notes
Tip fee		\$50.00	\$51.50	\$53.00	\$ per ton
Tip fee tonnage	Tons	2,215	2,900	4,000	No tip fee for carbon materials
Compost sales price	Commercial	\$25.00	\$25.00	\$25.00	\$ per CY
	Residential	\$35.00	\$35.00	\$35.00	\$ per CY
Annual sales volume		10,500	13,775	19,000	СҮ

#### Table 7. Pro forma assumptions for composting

#### Table 8. Timing of Sales and Expenses

Month	Percent of Sales	Percent of incoming tonnages
January	0.2%	1.5%
February	4.4%	1.8%
March	12.8%	1.6%
April	15.3%	2.2%
May	9.5%	7.4%
June	9.1%	11.5%
July	2.1%	19.5%
August	4.2%	24.5%
September	16.2%	10.2%
October	14.0%	8.4%
November	5.5%	5.7%
December	6.7%	5.8%



#### Pro Forma Summary

The results of the *pro forma* analysis are summarized in Tables 9, 10 and 11. Detailed spreadsheets are in Appendix F.

All options are similar in terms of predicted financial performance. The facility can be profitable within three years if the tonnages go up year-over-year as shown, and all the compost is sold at the assumed price points. These estimates do not include any collection costs or revenues, nor any corporate or governmental overhead allocations.

#### Table 9. Summary of windrow composting pro forma analysis

	2019	2020	2021
Revenues	\$399,500	\$528,163	\$734,500
Expenses	\$589 <i>,</i> 500	\$579,653	\$590,388
Net income	(\$190,000)	(\$51,491)	\$144,112

#### Table 9. Summary of ASP composting pro forma analysis

	2019	2020	2021
Revenues	\$399,500	\$528,163	\$734,500
Expenses	\$687,111	\$701,484	\$716,287
Net income	(\$287,612)	(\$173,322)	\$18,213

#### Table 11. Summary of rotary drum composting pro forma analysis

	2019	2020	2021
Revenues	\$399,500	\$528,163	\$734,500
Expenses	\$659,908	\$643,650	\$654,826
Net income	(\$260,408)	(\$115,488)	\$79,674

## **Summary and Recommendations**

Of the four alternatives evaluated, the animal feed production is the most expensive, in part because it is sized for 50 tons/day and would require inputs from off-island for the economics to work out. Rotary drum composting is well-practiced in Massachusetts (Marlborough and Nantucket) but would also be sized larger than needed. Windrow composting is the most widely practiced composting approach and is the least expensive and most flexible to changes in quantities of feedstocks. ASP composting is becoming more common as it offers better process and odor control but has the least favorable financial performance projection.

There are a number of factors that could influence these calculations, as outlined in Table 12. Readers should consider these factors before drawing any conclusions.



Assumptions used in studyValue chosenUncertaintiesFeedstocksFood wastes from residential1,090 tons/year to 1,816 tons/yearWill residential diversion program be implemented?Carbon sources from MVRD1,980 CY/yr brush, 1,600 CY/yr leavesWill this be made available given it is being recycled now?Processing AlternativesSingle drum - 50 ton/day capacityThis is more capacity than needed, will off-island sources be included?Animal Feed ExtrusionSAFE proposed ~16,000 tons/yr capacityThis is more capacity than needed, will off-island sources be include?Economic AnalysisLabor - \$22.50/hrIs this appropriate?Cost of land\$74,000/acreCould be higher or lower? If municipal implementation, could be free.Construction costsNo land clearing needed on late 2017 pricesWill March 2018 steel tariffs raise prices?Pro Forma Analyses		_	-
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Capital cost recovery factors3.75%/yr for equipment; 5.5% for site improvementsAre these appropriate?Food waste tipping fee\$50 - \$53/tonIs this appropriate? Better financial performance at tip fee = \$75/tonCompost sales prices\$25 - \$35/CYIs this appropriate?		on late 2017 prices	raise prices?
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Food waste tipping fee\$50 - \$53/tonIs this appropriate? Better financial performance at tip fee = \$75/tonCompost sales prices\$25 - \$35/CYIs this appropriate?	Capital cost recovery factors	3.75%/yr for equipment; 5.5%	Are these appropriate?
Compost sales prices\$25 - \$35/CYIs this appropriate?		for site improvements	
Compost sales prices\$25 - \$35/CYIs this appropriate?	Food waste tipping fee	\$50 - \$53/ton	Is this appropriate? Better
Compost sales prices \$25 - \$35/CY Is this appropriate?			
			= \$75/ton
Animal feed revenues None provided by SAFE	Compost sales prices	\$25 - \$35/CY	Is this appropriate?
	Animal feed revenues	None provided by SAFE	

Table 12. Factors Affecting Financial Analysis
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The next steps in the process should be to find one or more candidate sites, identify who the implementing entity will be, quantify the real market potential for compost sales on the Island, and refine this preliminary sizing analysis and estimates of costs.



# Appendices

A. Compost Recipe

B. Footprint Analysis

Windrow composting

Aerated Static Pile composting

Drum composting

- C. Aerated static pile system information from AgriLabs and Engineered Compost Systems
- D. Rotary drum layout and quote
- E. Cost Estimates

Capital costs

Operating costs

F. Pro Forma Analyses Windrow composting

Aerated static pile composting

- Rotary drum composting
- G. SAFE proposal



Appendix A - Compost recipe

#### Martha's Vineyard Organics Composting Business Plan

#### Assumptions:

Composting facility open 6 days/week (312 days/yr)

Food waste tonnage based on 4K ton/year; 50% comm'l, 50% residential

Carbon amendments based on 2014 Abrams study: Wood chips - 5,699 cy, Leaves - 4,868 cy, Sawdust - 117 cy

Additional carbon amendments from MVRD: 1,980 CY brush & 1,600 CY leaves & grass

OCC & Waxed = 9.7% (Source: MassDEP, 2011) of 19,000 tons/year sent off-island, assume 25% captured Compost recycle added at 10% by volume

MIX RATIO CALCULATIONS- AVERAGE DAILY CONDITIONS

		Residential									
	I/C/I Food	Food		0		MVRD Yard	& 220	Compost	Overs from		
INGREDIENTS	Wastes	Wastes	Leaves	Sawdusts	Wood Chips	waste	waxed	Recycle	Screen	TOTAL MIX TARGET	
C (% DWB)	31.4	36.6	30.4	41.0	33.2	34.4	34.1	34.0	30.3		
N (% DWB)	5.5	0.68	0.8	0.2	0.8	0.9	0.05	1.7	0.29		
MOISTURE%	71.2	38.2	59.5	39.8	61.6	40.1	8	47.5	61.6		
UNITS IN MIX BY WGT (T)	6.41	6.41	2.7	0.1	5.2	3	1.5	4.0	4.8	34	
UNITS IN MIX BY WGT (LB)	12,821	12,821	5,461	103	10,468	5,995	2,954	7,933	9,540	68,095	
UNITS IN MIX BY VOL (CY)	16.0	25.6	15.6	0.4	18.3	11	11.4	6.7	15.9	121	
DENSITY (LBS/CY)	800	500	350	275	573	523	259	1184	600	561.0	
POUNDS OF BIODEG. CARBO	4,026	4,692	1,660	42	3,475	2,062	1,007	2,697	2,891	22,553	
POUNDS OF NITROGEN	705	87	44	0.2	84	54	1	135	28	1,138	
BIODEGRADABLE C:N RATIO	6	54	38	205	42	38	682	20	104	<b>20</b> 20 TO 30	)
POUNDS OF MOISTURE	9,128	4,897	3,249	41	6,448	2,404	236	3,768	5,877	36,050	
NUMBER OF UNITS	12,821	12,821	5,461	103	10,468	5,995	2,954	7,933	9,540	68,095	
PERCENT MOISTURE										53 50 TO 65	\$%
VOLATILE SOLIDS (%)	96.2	91.7	98	99.6	89.5	98.3	94	57.1	59	]	
VOLATILE SOLIDS (LBS)	12333	11756	5352	103	9369	5893	2776	4530	5629	57,741	
NUMBER OF UNITS	12821	12821	5461	103	10468	5995	2954	7933	9540	68,095	
MIX VS (%)										<mark>85</mark> > 80%	
DENSITY (LBS/CY)	800	500	350	275	573	523	259	1184	573	]	
DENSITY (KG/M3)	474.6	296.6	207.6	163.2	340.0	310.0	153.7	702.4	340.0		
% AIR SPACE	57.28	73.30	81.31	85.32	69.40	72.10	86.17	36.78	69.40		
FEEDSTOCK VOLUME (CY)	16.03	25.64	15.60	0.38	18.27	11.47	11.40	6.70	15.90	121.4	
AIR VOLUME (CY)	9.2	18.8	12.7	0.3	12.7	8.3	9.8	2.5	11.0	85.3	
PREDICTED FREE AIR SPACE										<b>70%</b> 40-60%	

#### Data Sources:

I/C/I food wastes - March 2012 lab analysis of dining hall pre-consumer food wastes, Culver, IN

Residential food wastes - Jan. 2012 lab analysis of cafeteria post-consumer food wastes, Smyrna, TN

Bulk densities for food wastes from Brattleboro (VT) comm'l and curbside collection programs

Leaves - March 2012 analysis of fallen leaves, City of Richmond, VA

Sawdust - April 2012 analysis of hardwood sawmill sawdust, Smith Mountain Lake, VA

Wood chips - Jan. 2014 analysis of wood chips, Royal Oak Farm, Evington VA

Yard waste - June 2011 lab analysis of mixed yard waste, Prince William Co., VA

OCC - On-Farm Composting Handbook, NRAES-54, 1992

Compost recycle - April 2017 analysis of 3/8" screened yard waste compost, Prince William Co., VA

Overs C,N, Moisture - Jan. 2014 lab analysis from Royal Oak Farm in VA; other from literature

Predicted Free Air Space equation from Alburquerque, J.A., et. al., "Air Space in Composting Research: A Literature Review"

Compost Science and Utilization, Vol. 16, No. 3, 2008, p. 159-170

#### Adjusting for Biodegradable Carbon:

Biodegradable Fraction (B.F.) =  $0.83 - (0.028) \times \text{Lignin Content of Volatile Solids (L.C._{VS})}$ Biodegradable-C = Total C x B.F. x Volatile Solids (VS)

			<u></u>		
		Lignin	e Fraction	Volatile	<u>Biodegradabl</u>
Feedstock	Carbon (%)	Content (%)	<u>(B.F.)</u>	Solids (%)	e Carbon (%)
Example: Yard Trimmings	49.2%	4.1%	82.89%	98.3%	40.1%
Sawdust	49.8	12.7	47.44%	99.6	41.0
I/C/I food waste	39.3	0.4	81.88%	96.2	31.4
Residential food waste	45.9	0.4	81.88%	96.2	36.6
Leaves	37.6	18.1	32.32%	98.0	30.4
Wood chips	44.8	12.7	47.44%	89.6	33.2
Yard waste	49.2	4.1	71.52%	84.2	34.4
OCC	44.0	17.4	34.28%	94.0	34.1
Cleaned overs	38.6	12.7	47.44%	95.0	30.3

Biodegradable Fraction & Carbon equations from Chandler, J.A., et.al., "Predicting Methane Fermentation Biodegradability", *Biotechnology and Bioengineering Symposium*, 10,93, 1980

Lignin content data sources:

Sawdusts- Richards, T. "Effect of Lignin on Biodegradability", Cornell University, 1996

Food waste - Das, K.C., "Odor Related Issues in Commercial Composting", University of Georgia, 2000

Leaves- Quarles, R.G., "Long-term decomposition rates of forest floor litter", Forests 2016, 7, 231

Wood chips- Richards, T. "Effect of Lignin on Biodegradability", Cornell University, 1996

Yard waste - Das, K.C., "Odor Related Issues in Commercial Composting", University of Georgia, 2000

OCC - Gonzalez-Estrella, J., et.al., "A review of anaerobic digestion of paper and paper board waste", Reviews in Environmental Science and Bio/Technology 16.3 (2017): 569-590. Cleaned overs - assumed the same as woodchips



Appendix B - Footprint Analyses

AB / F									· · · · · · · · · · · · · · · · · · ·
MV Food Wa		ıng - wind	rows - strad	dle turners					
Assumptions.		100k (210	dave/vaar)						
	open 6 days/v			ما	A				
2. Facility Will	use open-air	turned wir	narows turne	d with straddle	turner				
Wasto Volun	nes (in cubic	varde)							
waste volui		yarusj				-			
						Avera	ge Daily V		
I/C/I food was								CY/day	
Residential fo	ood wastes						25.6		
Leaves							15.6		
Sawdusts							0.4		
Wood chips							18.3		
MVRD yard w	vaste						11.5		
OCC Compost recy	vele						<u>11.4</u> 6.7		
Overs from so	Totals				-		15.9	CY/day	
	TOLAIS				-		121.4	CT/uay	
Compositing	Materials Flo								
			tina (winterti	me conditions)					
Residence til			Composting		Curing		Total		
	Windrow		45	days	60	days		days	
Daily Volume	s going to co	mnostina		aayo	00	aayo	105	auyo	
Daily Volume			mes of mixed	d feedstocks =	1		121 /	CY/day	
Volume of ma	aterial in Prima						121.4	Jiruuy	
			Residence	Mixed	-			-	
			Days	feedstocks					
	Windrow		<u>45</u>	5,462	CY				
Daily Volume		ing (assur		me shrink in co					
Daily Volume				osted feedsto			85.0	CY/day	
Volume of me	aterial in Curir						00.0	Jiruuy	
		.a.	Residence	Composted	-			-	
			Days	Feedstocks					
	Windrow		<u>60</u>	5,098	CY				
Daily Volume		eening (as		olume shrink i					
Dully Volumo	e geing te eel			feedstocks =	n ouning).		76.5	CY/day	
Screening	a Assume			compost captu	ire rate and	20% going		onday	
corcorning			t production			geg	10 01010		
				ened compost =	=		61.2	CY/day	
	c. Daily vo							CY/day	
				annually, base	d on 312-d	av vear)			
				ened compost			19.088	CY/year	
							,	- · · <b>j</b> - · · ·	
Feedstocks	Receipt								
	scape/carbon	delivery c	nce/week (e	xcept leaves)					
Assume food	l wastes delive	ery daily							
	area for 2.0x		aily volume			=	242.8	CY/day	
to allow eq	uipment to m	ove feeds	tocks into sto	orage		=	6,555	CF/day	
Assumed pile	e height					=	6	ft	
Pile footprint						=	1092	SF	
Plus equipme	ent access/mo	ovement				=	546	SF	
Receipt area	needed					=	1639	SF	
Proposed din	nensions					=	40	ft. W	
							40	ft. L	
Feedstocks									
		astes, OC	C in rectangu	ular concrete b	lock bunker	s, rest in op	en piles		
Food Wastes									
	in recipe dail					=		CY	
	aximum storaç					=		days	
Storage volu	me needed fo	or food wa	stes			=		CY	
						=	2,430		
Assume bunk						=		ft	
Bunker footp						=	608		
Proposed din	nensions					=		ft W	
						=	30	ft L	
000									
	e daily (on av					=	11.4		
	orage capacity					=		days	
Storage volu	me needed fo	or paper/O	CC			=	80	-	
						=	2,160		
Assume bunk						=		ft	
Bunker footp						=	360		
Proposed din	nensions					=		ft W	
						=	20	ft L	
Leaves				ezoidal piles o	utdoors				
Annual volum	nes of leaves			L		=	4,868		
			Il come in No	ov - Jan.		=	131,436		
	imum storage	pile heigh	t			=	10		
Assume pile						=	30		
	near foot (tra			52)*H*L)	<u> </u>	=		CY/LF	
	potage of stor	age piles	needed	VOLUME (V) = L x H	(P+Q)	=	660		
					2	_	~~~	£1	
Assume pile Number of st	length			where, L - Length H - Height	^(2)	=	200 3	ft.	

Space allowance around Needed storage area foc Proposed dimensions <u>Wood chips</u> Wood chips in recipe dail				8			6	
Proposed dimensions Wood chips Wood chips in recipe dail		upment, etc	P - Base Width Q - Top Width	Burthe	=	25		
<u>Wood chips</u> Wood chips in recipe dail	tprint		H		=	19900		
Wood chips in recipe dail				- C	=	250		
Wood chips in recipe dail					=	80	ft W	
			ezoidal piles o	utdoors				
					=	18	CY/day	
Assume a storage period	prior to us	е			=	30	days	
Storage volume needed	or wood ch	nips			=	550	CY	
					=	14,850	CF	
Assume maximum storag	e pile heigh	nt			=	10	ft	
Assume pile base width	T'				=	30	ft	
Volume per linear foot (ti	anezoidal	- V=1/2(B1+F	32)*H*L)		=		CY/LF	
Total linear footage of sto			, , , , , , , , , , , , , , , , , , , ,		=	80		
Assume pile length	lage piles				=	80		
					=	1	π.	
Number of storage piles r		 					<i>t</i> u	
Space allowance around		upment, etc			=	25		
Needed storage area for	tprint				=	2450		
Proposed dimensions					=	105	-	
					=	80	ft W	
Yard waste	Assume s	stored in trap	ezoidal piles o	utdoors				
Yard waste in recipe daily	(on avera	ge)			=	11	CY/day	
Assume a storage period					=		days	
Storage volume needed					=	350		
		1	1		=	9,450		1
Assume maximum storag	nile boict	<u>i</u>			=	9,430		
	, his risidi	н. Г	ł		=	30		1
Assume pile base width	nno-rei-l-l		) ))*ロ*! \					
Volume per linear foot (ti			⊃∠) Π`L)		=		CY/LF	
Total linear footage of sto	rage piles	needed			=	50		
Assume pile length	<u> </u>				=	50	tt.	
Number of storage piles r			<u> </u>		=	1		
Space allowance around		quipment, etc			=	25		
Needed storage area foo	tprint				=	1550	SF	
Proposed dimensions	Т	Γ			=	75	ft L	
•					=	80	ft W	
Overs from screening		Assume sto	red in trapezoi	dal piles or	itdoors			
Screen overs in recipe da					=	16	CY/day	
Assume a storage period					=		days	
Storage volume needed					=	120		
Stolage volulie needed	or screen o	Jvers						
	<u> </u>	Ļ			=	3,240		
Assume maximum storag	e pile heigh	nt			=	10		
Assume pile base width					=	30		
Volume per linear foot (tr			32)*H*L)		=		CY/LF	
Total linear footage of sto	orage piles	needed			=	20	LF	
Assume pile length					=	20	ft.	
Number of storage piles r	leeded				=	1		
Space allowance around		uipment. etc			=	25	ft	
Needed storage area foo	torint	Ĺ			=	650	SF	
Proposed dimensions					=		ft L	
					=		ft W	
	-				-	23	11 VV	
Esselsta els Missieres	-							
Feedstock Mixing	بصبا	L						
Assume all feedstock mix	ing done b	y windrow tu	ner on pad					
Active Composting								
Assume use of a straddle	turner with	n a 6' x 12' tu	nnel					
A source transmissional using	ow shape							
Assume trapezoidal wind		ow:						
		B-H)), where						
a. Volume per linear fo			H = neiant. H	= width at I	base			
			H = neight, B	= width at I	base =	6	ft	
	Height		H = neight, B	= width at I	=		ft ft	
	Height Base			= width at I	= =	12	ft	
	Height Base Cross-sec	ctional area p	per linear foot	= width at I	= = =	12 36	ft SF	
a. Volume per linear fo	Height Base Cross-see Volume p	ctional area p per linear foot	per linear foot	= width at I	= =	12 36	ft	
	Height Base Cross-see Volume p f new windr	ctional area p per linear foot rows daily	per linear foot		= = = =	12 36 1.3	ft SF CY/ LF	
a. Volume per linear fo	Height Base Cross-see Volume p f new windr Daily volu	ctional area p per linear foot rows daily ume from mixi	per linear foot	er linear foo	= = = = t	12 36 1.3 91.0	ft SF CY/ LF LF / day	
a. Volume per linear fo	Height Base Cross-see Volume p f new windr Daily volu n windrows	ctional area poer linear fool ows daily une from mixi during 45-da	per linear foot	er linear foo	= = = =	12 36 1.3 91.0 5,462	ft SF CY/LF LF/day CY	
a. Volume per linear fo	Height Base Cross-see Volume p f new windr Daily volu n windrows	ctional area poer linear fool ows daily une from mixi during 45-da	per linear foot	er linear foo	= = = = t	12 36 1.3 91.0	ft SF CY/LF LF/day CY	
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of ma Total area occupied by w	Height Base Cross-see Volume p new windr Daily volu m windrows aterial in wir	ctional area p per linear foot rows daily ime from mixi during 45-da ndrows	er linear foot ng / volume pe ay active comp	er linear foc osting	= = = = = t = = = = = = = =	12 36 1.3 91.0 5,462	ft SF CY/LF LF/day CY LF	
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of material i	Height Base Cross-see Volume p new windr Daily volu m windrows aterial in wir	ctional area p per linear foot rows daily ime from mixi during 45-da ndrows	er linear foot ng / volume pe ay active comp	er linear foc osting	= = = = = t = = = = = = = =	12 36 1.3 91.0 5,462 4,097	ft SF CY/LF LF/day CY LF	
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of ma Total area occupied by w	Height Base Cross-sec Volume p f new windr Daily volu n windrows aterial in wir indrows Ids 2 days	ctional area p per linear foot ows daily ime from mixi during 45-da ndrows worth of mixi	er linear foot ng / volume pe ay active comp	er linear foc osting	= = = = = t = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162	ft SF CY/LF LF / day CY LF SF	
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of ma Total area occupied by w Assume each windrow ho	Height Base Cross-sec Volume p f new windr Daily volu n windrows terial in wir indrows Ids 2 days 94 LF / d	ctional area p per linear foot rows daily ime from mixi during 45-da ndrows	er linear foot ng / volume pe ay active comp	er linear foc osting	= = = = = t = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182	ft SF CY/ LF LF / day CY LF SF LF	
a. Volume per linear fo	Height Base Cross-sec Volume p f new windr Daily volu n windrows aterial in wir indrows Ids 2 days 94 LF / d h windrow	tional area p ber linear fool rows daily ime from mixi during 45-da ndrows worth of mixi ay x 2 days	er linear foot ng / volume pe ay active comp	er linear foc osting	= = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243	ft SF CY/LF LF/day CY LF SF LF CY	
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of ma Total area occupied by w Assume each windrow ho Volume of material in eac Number of windrows in ac	Height Base Cross-see Volume p Daily volu n windrows aterial in wir indrows Ids 2 days 94 LF / d h windrow	tional area p per linear fool rows daily mme from mixing 45-da ndrows worth of mixing ay x 2 days sting	per linear foot ng / volume pe ay active comp ed material/3 b	er linear foc osting uilt per wee	= = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243	ft SF CY/ LF LF / day CY LF SF LF	
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of ma Total area occupied by w Assume each windrow ho Volume of material in eac Number of windrows in ac Assume 3' spacing betwee	Height Base Cross-see Volume p Daily volu n windrows aterial in wir indrows Ids 2 days 94 LF / d h windrow	tional area p per linear fool rows daily mme from mixing 45-da ndrows worth of mixing ay x 2 days sting	per linear foot ng / volume pe ay active comp ed material/3 b	er linear foc osting uilt per wee	= = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243	ft SF CY/LF LF/day CY LF SF LF CY	
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of ma Total area occupied by w Assume each windrow ho Volume of material in eac Number of windrows in ac	Height Base Cross-sec Volume p f new windr Daily volu n windrows aterial in wir indrows Ids 2 days 94 LF / d h windrow tive compo	tional area p per linear fool rows daily ume from mixi during 45-da ndrows worth of mixi ay x 2 days ssting ws and 25' tu	er linear foot	er linear foc osting uilt per wee	= = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 23	ft SF CY/LF LF/day CY LF SF CY Windrows	
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of ma Total area occupied by w Assume each windrow ho Volume of material in eac Number of windrows in ac Assume 3' spacing betwee	Height Base Cross-sec Volume p f new windr Daily volu m windrows iterial in win indrows 1ds 2 days 94 LF / d h windrow tive compo- een windrow Length	tional area per linear fool ows daily ime from mixi during 45-da ndrows worth of mixi ay x 2 days issting vs and 25' tu 189 ft + 25	er linear foot	er linear foc osting uilt per wee	= = = = = = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 23 232	ft SF CY/LF LF/day CY LF SF CY Windrows ft	
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of ma Total area occupied by w Assume each windrow ho Volume of material in eac Number of windrows in ac Assume 3' spacing betwee	Height Base Cross-sec Volume p I Daily volu m windrows Iterial in wir indrows 94 LF / d h windrow tive compo- tive compo- tive compo- ten windrow Length Width	tional area per linear fool rows daily ime from mixi during 45-da ndrows worth of mixi ay x 2 days sisting vs and 25' tu 189 ft + 25 12 ft + 3 ft	per linear foot ng / volume pe ay active comp ed material/3 b ming radius at ft + 25 ft	er linear foc osting uilt per wee	= = = = = = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 23 23 23 232 15	ft SF CY/LF LF/day CY LF SF CY windrows ft ft	
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of ma Total area occupied by w Assume each windrow ho Volume of material in eac Number of windrows in ac Assume 3' spacing betwee	Height Base Cross-sec Volume p forew windr Daily volu n windrows aterial in wir indrows Idds 2 days 94 LF / d h windrow tive compo- en windrow Length Width Area of e	tional area per linear fool rows daily ime from mixi during 45-da ndrows worth of mixi ay x 2 days sting ws and 25' tu 189 ft + 25 12 ft + 3 ft ach windrow	er linear foot ng / volume pe ay active comp ed material/3 b ming radius at ft + 25 ft (gross)	er linear foc osting uilt per wee	= = = = = = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 23 232 232 15 3,481	ft SF CY/LF LF/day CY LF SF LF CY windrows ft ft SF	Avg Month Rair
a. Volume per linear fo	Height Base Cross-see Volume p forew windr Daily volu n windrows aterial in wir indrows Ids 2 days 94 LF / d h windrow tive compo- ten windrow Length Width Area of a	tional area p per linear fool rows daily imme from mixing during 45-da ndrows worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing ay x 2 days listing ws and 25' tu lag ft + 25 lag ft + 25 lag ft + 3 ft ach windrows (g	per linear foot ng / volume pe ay active comp ed material/3 b ming radius at ft + 25 ft (gross) gross)	er linear foc osting uilt per wee	= = = = = = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 23 23 23 232 15	ft SF CY/LF LF/day CY LF SF LF CY windrows ft ft SF	Avg Month Rair 0.25
a. Volume per linear fo Average linear footage o Total volume of material i Total linear footage of ma Total area occupied by w Assume each windrow ho Volume of material in eac Number of windrows in ac Assume 3' spacing betwee	Height Base Cross-see Volume p forew windr Daily volu n windrows aterial in wir indrows Ids 2 days 94 LF / d h windrow tive compo- ten windrow Length Width Area of a	tional area p per linear fool rows daily imme from mixing during 45-da ndrows worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing ay x 2 days listing ws and 25' tu lag ft + 25 lag ft + 25 lag ft + 3 ft ach windrows (g	per linear foot ng / volume pe ay active comp ed material/3 b ming radius at ft + 25 ft (gross) gross)	er linear foc osting uilt per wee	= = = = t = = t = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 23 232 232 15 3,481	ft SF CY/LF LF/day CY LF SF LF CY windrows ft ft SF SF	
a. Volume per linear fo	Height Base Cross-sec Volume p forew windr Daily volu n windrows aterial in wir indrows 1ds 2 days 94 LF / d h windrow tive compo- tive co	tional area prover linear fool rows daily mme from mixinduring 45-da ndrows worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing string worth of mixing string worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing string worth of mixing worth of mixi	per linear foot ng / volume pe ay active comp ed material/3 b ming radius at ft + 25 ft (gross) gth	each end	= = = = = = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 243 23 23 23 23 23 5 3,481 78,328 250	ft SF CY/LF LF/day CY LF SF LF CY windrows ft ft SF SF ft. L	
a. Volume per linear fo	Height Base Cross-see Volume p forew windr Daily volu n windrows aterial in wir indrows Ids 2 days 94 LF / d h windrow tive compo- ten windrow Length Width Area of a	tional area prover linear fool rows daily mme from mixinduring 45-da ndrows worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing string worth of mixing string worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing string worth of mixing worth of mixi	per linear foot ng / volume pe ay active comp ed material/3 b ded material/3 b ft + 25 ft (gross) gross) gth windrows @ 15	er linear foc osting uilt per wee each end	= = = = = = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 23 23 23 23 23 23 5 3,481 78,328 250 338	ft SF CY/LF LF/day CY LF SF CY windrows ft ft ft ft ft. SF SF ft. L ft. W	
a. Volume per linear fo	Height Base Cross-sec Volume p forew windr Daily volu n windrows aterial in wir indrows 1ds 2 days 94 LF / d h windrow tive compo en windrow Length Width Area of e Area of a ual to gross	tional area prover linear fool rows daily mme from mixinduring 45-da ndrows worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing string worth of mixing string worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing string worth of mixing worth of mixi	per linear foot ng / volume pe ay active comp ed material/3 b ming radius at ft + 25 ft (gross) gth	er linear foc osting uilt per wee each end	= = = = = = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 232 15 3,481 78,328 250 338 350	ft SF CY/LF LF/day CY LF SF CY windrows ft ft ft SF SF SF SF ft. L ft. W ft. W	
a. Volume per linear fo	Height Base Cross-sec Volume p forew windr Daily volu n windrows aterial in wir indrows 1ds 2 days 94 LF / d h windrow tive compo en windrow Length Width Area of e Area of a ual to gross	tional area prover linear fool rows daily mme from mixinduring 45-da ndrows worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing string worth of mixing string worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing string worth of mixing worth of mixi	per linear foot ng / volume pe ay active comp ed material/3 b ded material/3 b ft + 25 ft (gross) gross) gth windrows @ 15	er linear foc osting uilt per wee each end	= = = = = = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 232 15 3,481 78,328 250 338 350	ft SF CY/LF LF/day CY LF SF CY windrows ft ft ft ft ft. SF SF ft. L ft. W	
a. Volume per linear fo	Height Base Cross-sec Volume p forew windr Daily volu n windrows aterial in wir indrows 1ds 2 days 94 LF / d h windrow tive compo en windrow Length Width Area of e Area of a ual to gross	tional area prover linear fool rows daily mme from mixinduring 45-da ndrows worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing string worth of mixing string worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing worth of mixing string worth of mixing worth of mixi	per linear foot ng / volume pe ay active comp ed material/3 b ded material/3 b ft + 25 ft (gross) gross) gth windrows @ 15	er linear foc osting uilt per wee each end	= = = = = = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 232 15 3,481 78,328 250 338 350	ft SF CY/LF LF/day CY LF SF CY windrows ft ft ft SF SF SF SF ft. L ft. W ft. W	
a. Volume per linear fo	Height Base Cross-sec Volume p forew windr Daily volu n windrows iterial in wir indrows ids 2 days 94 LF / d h windrow tive compo- en windrow Length Width Area of a ual to gross Pad width	tional area per linear fool ows daily ime from mixing 45-da ndrows worth of mixing worth of mi	per linear foot ng / volume pe ay active comp ed material/3 b ming radius at ft + 25 ft (gross) gth windrows @ 15 Composting P	er linear foc osting uilt per wee each end	= = = = = = = = = = = = = = = = = = =	12 36 1.3 91.0 5,462 4,097 49,162 182 243 232 15 3,481 78,328 250 338 350	ft SF CY/LF LF/day CY LF SF CY windrows ft ft ft SF SF SF SF ft. L ft. W ft. W	Avg Month Rair 0.25

Assume 30%         rolume abrit during composing         =         121         CV/day           Average inters for lage of material in windrows during 60 day cump period         =         485         CV/day           Average inters for lage of material in windrows during 60 day cump period         =         5,098         CV           Total volume for material in windrows during 60 day cump period         =         45,885         SF           Total average for material in windrows         =         45,885         SF           Assume asch cump windrow holds         5         CV         CV           Lingth of asch windrows         =         45,885         SF           Assume asch cump windrow holds         =         =         250         CV           Assume asch cump windrow holds         =         =         251         CV         =         251         CV         =         251         CV         E         CV										
Avarage inerse Verdings day         =         85         C/Y day           Avarage inerse Verdings day butter from composing / volume perinear toot         =         64         LF / day           Total area cocaped by windraws         =         686         CY         =           Total area cocaped by windraws         100         =         5.685         CY           Total area cocaped by windraws         150         cocaped         =         20         Mode           Total area cocaped by windraws         150         cocaped         =         20         Mode           Length         15 a / 55         CY         cocaped         =         20         Mode           Length         150 ft = 25 ft = 25 ft         =         20         Mode         Each windraws         16         =         15 ft         =         20         Mode         Each windraws         16         =         2365         SF         =         2365         SF         =         2361         SF         =         2361         SF         =         2361         SF         =         2360         Rt         Cocame         Se         Se         Se         Se         Se         Se         Se         Se         Se         S	Assume 30%									
Average inter footage of new windows day         =         4.1							=			
Avg. caky volume from composing / volume perimear foot         =         6.4         F / day           Total volume of material in windrows         =         3.022         F           Assume acch caring windrow holds 1.5 composing windrows         =         4.028         F           Assume acch caring windrow holds 1.5 composing windrows         =         4.028         F           Assume 3 space between windrows         =         4.014         =         1.014           Length of ach windrow in cure 3.7.5 C/Vm/mtows (20% shimkage         =         1.014         =         1.014           Each windrow is         =         4.014         =         1.014         =         1.014           Each windrow is         =         4.014         =         3.018         SF           Assume pad length is equivaliant in draw forces         =         3.018         SF           Assume pad length is equivaliant in draw forces         =         3.006         N.W           Assume pad length is equivaliant in draw forces         =         3.000         N.W           Assume approximately 05/W/02/SF index on signt         =         76         C/Vday           Assume approximately 05/W/02/SF index on signt         =         76         C/Vday           Assume approximately 05/W/02			Avg. daily	volume to c	uring		=	85	CY/day	
Total volume of material in windrows         =         5.082         CY           Total inservotage of material in windrows         =         3.824         LF           Total inservotage of material in windrows         =         45.885         SF           Assume each cump windrow holes 1.5 composition windrows         =         255.6         CY           Length of each windrow         =         291.8         CY         =           Assume 27 particip between windrows and 251 turning radius at each end         =         241.8         =         10.8           Each windrow is         =         15.8         FS         =         241.8         =         10.8         = </td <td>Average line</td> <td>ar footage of</td> <td>new windr</td> <td>ows daily</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Average line	ar footage of	new windr	ows daily						
Total area cocupies of muterial in windrows         =         3.824         LF           Assume ach curing windrow holds 1.5 corropsing windrows         =         4.5885         SF           Assume ach curing windrow holds 1.5 corropsing windrows         =         200 windrows         =         200 windrows           Number of windrows in curing         In Str X555         CV         =         200 windrows           Same 3' space base windrows and 25' turning radius at each end         =         16 R         =           Area of each windrow (gross)         =         3.618         SF           Assume pad length is equal to areas windrow (gross)         =         3.618         SF           Assume pad length is equal to areas windrow (gross)         =         3.618         SF           Assume pad length is equal to areas windrow (gross)         =         3.618         SF           Assume pad length is equal to areas windrow strong         =         3.618         SF           Screening & Poduct Storage Staing and Layout Calculations         =         72.556         SF           Assume approximately 60%/20% / Viday         =         560         CV/day           Screening Area of all windrows stain         =         560         CV/day           Badwowe good base base base base base base base base		Avg. daily vo	lume from	composting	/ volume per li	near foot	=	64	LF / day	
Total area cocupies of muterial in windrows         =         3.824         LF           Assume ach curing windrow holds 1.5 corropsing windrows         =         4.5885         SF           Assume ach curing windrow holds 1.5 corropsing windrows         =         200 windrows         =         200 windrows           Number of windrows in curing         In Str X555         CV         =         200 windrows           Same 3' space base windrows and 25' turning radius at each end         =         16 R         =           Area of each windrow (gross)         =         3.618         SF           Assume pad length is equal to areas windrow (gross)         =         3.618         SF           Assume pad length is equal to areas windrow (gross)         =         3.618         SF           Assume pad length is equal to areas windrow (gross)         =         3.618         SF           Assume pad length is equal to areas windrow strong         =         3.618         SF           Screening & Poduct Storage Staing and Layout Calculations         =         72.556         SF           Assume approximately 60%/20% / Viday         =         560         CV/day           Screening Area of all windrows stain         =         560         CV/day           Badwowe good base base base base base base base base	Total volume							5.098	CY	
Total area occupied by windrows         =         45.885         SF           Assume each curing windrow solves         =         255         CY           Number of windrows in curing         =         200         Mintrows           Length of each windrow         =         200         Mintrows           Length of each windrow         =         210         Mintrows           Sature 3: Spacing Detween windrows         =         241         Mintrows           Each windrow 5         Length Sp5 ft + 25 ft + 25 ft         =         23.618         SF           Area of each windrow (gross)         =         3.618         SF         =           Area of each windrow (gross)         =         3.618         SF         =           Assume apad ength is equal to gross windrow spath         =         2.301 ft.         H           Assume approximately 80%/20% ftnes/overs spith         =         2.501 ft.         L           Assume approximately 80%/20% ftnes/overs spith         =         7.601 CV/day         E           Daily volume oging to screening         =         =         7.60 ft.         K           Daily volume oging to screening         =         =         7.60 ft.         K           Daily volume oging to screening					<u> </u>		=	3.824	LF	
Assume each curing windrow holds 1.5 composing windrows         =         225         CY           Number of windrows in curing         =         225         CY           Assume 3 spacing between windrows and 25 turning radius at each end         =         241         It           Each windrow in curing         =         72.55         SF         =         72.55         SF           Each windrow in curing to the space windrow (gross)         =         72.555         SF         =         72.555         SF           Assume pad length is equal to gross windrow length         =         72.555         SF				u.o.i.o			=	- / -		
I 1.5 x 755 CY/mdrow x 30% shinkage         =         255 CY           Length of each windrow         =         20 windrows           Langth of each windrow         =         191 ft           Each windrow is         Length 1956 ft + 25 ft + 25 ft         =         215 ft           Area of each windrow (ross)         =         3.613 SF         3.613 SF           Area of each windrow (ross)         =         3.613 SF         55           Area of each windrow (ross)         =         3.613 SF         55           Area of each windrow (ross)         =         3.613 SF         55           Area of each windrow (ross)         =         3.613 SF         55           Assume approximately 50%/20% Storeen Assume approximat				5 composti	na windrows			.0,000	0.	
Number of windrows in curing         =         20         windrows           Assume 3' spacing between windrows and 25' turning radius at each end         =         191 R           Each windrow         Longth         95 ft + 25 ft         =         241 ft           Width         12 ft + 3 ft         =         3.51 6 ft           Width         12 ft + 3 ft         =         3.51 6 ft           Assume pad height is equal to gross windrow (gross)         =         72.350 6 ft           Assume pad height is equal to gross windrow (gross)         =         300 ft           Assume pad ength is equal to gross windrow storage         =         3200 ft           Screening & Product Storage Storage         =         300 ft           Assume use of trommel screener veth 3.8' screen         =         76 CY/day           Daily volume of overs recycled as buiking agent         =         76 CY/day           Daily volume overs recycled as buiking agent         =         76 O ft. Widay           Screening Area         =         60 ft. W           Allow 25 ft all sides for equipment movement         Width         6 ft.           Allow 25 ft all sides for equipment movement         Width         6 ft.           Allow 25 ft all sides for equipment movement         Width         6 ft.						200	-	255	CY	
Langth of each windrow is	Number of w				X 50 /0 SIIIIIK	iye				
Assume 3: spacing between windrows and 25' tuming radius at each end         2           Each windrow is         Length         565 ft + 25 ft         =         241 ft           Area of each windrow (gross)         =         3.618 [SF           Area of each windrow (gross)         =         3.618 [SF           Area of each windrow (gross)         =         3.618 [SF           Area of each windrow (gross)         =         3.601 ft           Servening & Product Storage Sizing and Layout Calculations         =         3.600 ft.W           Assume use of inomel scenering with 3/8' scenerin         =         2.236 [SF           Assume use of inomel scenering with 3/8' scenerin         =         =           Assume use of onvers recycled as bulking agent         =         =         15 [CV/day           Daily volume going to screaning         =         =         15 [CV/day           Daily volume going to screaning         =         16 [CV/day         =           Daily volume going to screaning         =         16 [CV/day         =           Daily volume going to screaning         =         16 [CV/day         =           Daily volume going to screaning         =         16 [CV/day         =           Daily volume going to screaning         =         16 [CV/day			ing				_			
Each windrow is         Length         595 ft + 25 ft + 25 ft         =         241 ft           Width         12 H + 3 ft         =         15 ft           Area of all windrows (gross)         =         72,366 [SF           Assume pad length is equal to gross windrow length         =         72,366 [SF           Assume pad length is equal to gross windrow length         =         300 ft           Assume pad length is equal to gross windrow length         =         300 ft           Assume pad length is equal to gross windrow length         =         300 ft           Assume pad length is equal to gross windrow length         =         2250 ft. L           Screening & Product Storage Sizing and Layout Calculations         =         60 ft. W           Assume pad upot motion going to screening         =         61 CV/day           Daily volume going to screening         =         61 CV/day           Daily volume going to screening         =         15 ft. V           Assume pad equipment movement         Width         6 ft           Allow 25 ft all sides for equipment movement         =         60 ft. W           Screening Area =         60 ft. W         58.73 CV           Assume pad base with max oft angle Line with 30' access in front for equipment/ft.         =         72 ft. CV/LF					and a second back and			191	π	
Length         565 ft + 25 ft - 25 ft         =         241 ft           Area of each windrow (gross)         =         3.618 SF           Area of all windrow (gross)         =         72.366 SF           Assume pad length is equal to gross windrow length         =         241 ft           Pad with is         Curing Pad =         300 ft           Assume pad length is equal to gross windrow length         =         241 ft           Screening & Product Storage Sizing and Layout Calculations         200 ft         200 ft           Assume gad only ft how with 30° screening         =         76 CV/day           Daily volume going to screening         =         60 ft. W           Total Volume in Storage Pie         =         76 ft. L           Screening and the patient screen			an windrow	/s and 25 tu	ming radius a	. each en	a			
Weth         12 H + 3 ft         =         15 ft           Area of ack windrows (gross)         =         3.618 SF	Each windrow								<i>a</i>	
Area of each windrow (gross)         =         3,618 SF           Assume pad length is equal to gross windrow length         =         72,356 SF           Assume pad length is equal to gross windrow length         =         300 ft           Pad width is         Curing Pad =         300 ft           Screening & Product Storage Sizing and Layout Calculations         =         250 ft. L           Assume approximately S0%/2005 (fnes/overs spit         =         =           Plan on four months finished compost storage         =         75 ft. L           Daily volume going to screening         =         75 ft. L           Screening A for overs recycled as buiking agent         =         16 (CY/day           Screening Area =         60 ft. W         6 ft           Screening Area =         75 ft. L         =           Daily volume of overs recycled as buiking agent         =         15 (CY/day           Screening Area =         75 ft. L         =           Total Volume in Storage Pile         =         15 (CY/day           Screening Area =         16 (fr. W         =           Assume pile base with         =         17 ft. L           Total Volume in Storage Pile         =         75 ft. L           Total Volume in Storage Pile         = <t< td=""><td></td><td></td><td></td><td></td><td>ft + 25 ft</td><td></td><td></td><td></td><td></td><td></td></t<>					ft + 25 ft					
Area of all windrows (gross)         =         72.358 [SF           Assume pad length is equal to gross windrow length         =         300 [R           Assume pad length is equal to gross windrow length         =         300 [R           Screening & Product Storage Sizing and Layout Calculations         =         300 [R           Assume use of trommel screener with 3/8" screen         =         =           Assume ose of trommel screener with 3/8" screen         =         =           Baily volume going to screening         =         =         61 [CY/day           Daily volume going to screening         =         =         61 [CY/day           Daily volume going to screening         =         61 [CY/day         =           Screen size         =         61 [CY/day         =           Daily volume going to screening         =         78 [CY/day         =           Screen size         =         15 [CY/day         =         15 [CY/day           Screen size         =         60 [R. W         =         16 [CY/day           Screen size         =         76 [CY/day         =         76 [CY/day           Total Volume in Storage Pile         =         76 [CY/day         =         270 [R           Total volume in Storage piles needed <td></td>										
Assume pad length is equal to gross windrow length         =         241 ft           Pad width is         =         300 ft           Curing Pad =         300 ft           Screening & Product Storage Sizing and Layout Calculations         -           Assume approximately 80%/20% fines/overs split         -           Plan on four months finished compost storage         -           Daily volume going to screening         =         76           Daily volume going to screening         =         76           Daily volume going to screening         =         61           Screen size									-	
Pad width is         =         300 ft           Screening & Product Storage Sizing and Layout Calculations         250 ft. L           Screening & Product Storage Sizing and Layout Calculations         250 ft. L           Assume use of trommel screen with 3/8" screen         250 ft. L           Daily volume going to screening         2           Screen size         1           Cital Volume in Storage Plae         2           Daily volume screening Ara =         60 ft. W           Total Volume in Storage Plae         2           Daily volume x 6 days/week operation x 4 months capacity         5.873 CY           Assume bia widting poiles needed         2           Total Wolume in Storage Plae         200 ft.           Volume of storage ara forogint         2           Total inser forol (tmpezzidal V=1/2(B1+B2)*H1         2           Total inser forol (tmpezzidal V=1/2(B1+B2)*H1         2           Product Storage Arae =         200 ft.     <										
Curing Pad =         300 ft. W           Screening & Product Storage Sizing and Layout Calculations         250 ft. L           Assume provide Screener with 3/8* screen         250 ft. L           Daily volume going to screening         =           Plan on four months finished compost storage         =           Daily volume going to screening         =           Daily volume going to screening         =           Daily volume going to screening         =           Screen size         Length           Daily volume going to screening         =           Screen size         Length           Daily volume going to screening         =           Screening Area =         60 ft. W           Screening Area =         60 ft. W           Total Volume in storage Pile         Total ft. K           Daily volume s 6 days/week operation x 4 months capacity         5.873 CY           Assume pile base width         =         10 ft.           Assume pile base width         =         10 ft.           Assume pile base width         =         200 ft.           Volume goring piles needed         #         200 ft.           Assume pile base width         =         20 ft.           Space allowance between piles for equipmentruct.         =<	Assume pad				gth					
Screening & Product Storage Sizing and Layout Calculations         250 ft. L           Assume use of tormels creener with 3/8" creener         -         -           Pain on four moths finished compost storage         -         -           Daily volume going to screening         =         -         -           Daily volume going to screening         =         -         -         -           Daily volume going to screening         =         -         -         -         -           Daily volume going to screening         -<			Pad width	is is			=			
Screening A Product Storage Sizing and Layout Calculations         Image: Calculations           Assume approximately 80%/X0%/K fines/overs split         Image: Calculations         Image: Calculations           Plan on four months finished compost storage         Image: Calculations         Image: Calculations         Image: Calculations           Daily volume going to screening         Image: Calculations         Image: Calculations         Image: Calculations           Daily volume going to screening         Image: Calculations         Image: Calculations         Image: Calculations           Screening X         Image: Calculations         Image: Calculations         Image: Calculations         Image: Calculations           Daily volume of volume x 6 days/week operation x 4 months capacity         5.873 CV         Image: Calculations         Image: Calculations           Yolume per insartioot         Image: Calculations         Image: Calculations         Image: Calculations         Image: Calculations           Yolume per insartioot         Image: Calculations         Image: Calculations         Image: Calculations         Image: Calculations           Yolume per insartioot         Image: Calculations         Image: Calculations         Image: Calculations         Image: Calculations           Yolume per insartioot         Image: Calculations         Image: Calculations         Image: Calculations         Image: Calculat					Curing Pad =			300	ft. W	
Assume approximately 69%-(25% fines/overs split         Image: Comparison of the composition of the composite compositencomposition of the composition of the composition o								250	ft. L	
Assume approximately 69%-(25% fines/overs split         Image: Comparison of the composition of the composite compositencomposition of the composition of the composition o										
Assume approximately 69%-(25% fines/overs split         Image: Comparison of the composition of the composite compositencomposition of the composition of the composition o	Screening &	Product Sto	rage Sizin	g and Layo	ut Calculation	s				
Assume approximately 80%/20% fines/vers split         =         File         =         File         CV/day           Daily volume going to sorgening         =         =         File         CV/day           Daily volume going to sorgening         =         =         File         CV/day           Daily volume of overs recycled as buking agent         =         =         File         CV/day           Screen size						ſ				
Pin on four months finished compositions are provided as poing to screening         =         Fit         CY/day           Daily volume going to screening         =         61         CY/day           Daily volume oping to screening         =         61         CY/day           Screen size						1				
Daily volume going to screening         =         76 CV/day           Daily volume of overs recycled as bulking agent         =         61 CV/day           Screen size         =         15 CV/day           Screen size         =         16 CV/day           Allow 25 ft all sides for equipment movement         =         60 ft. W           Total Volume in Storage Pile         =         16 SV/day           Daily volume storage pile height         =         16 Storage TF           Assume pile base width         =         16 Storage TF           Volume porting of storage piles needed         =         16 Storage TF           Volume open storage piles needed         =         36 ft           Number of storage piles needed         =         20 Storage piles           Number of storage piles needed         =         21 Storage piles						1				
Daily volume çoing to storage         =         61 (2//day           Screen size         =         15 (2//day           Screen size         Length         24.5 ft           Screen size         Width         6 ft           Allow 25 ft all sides for equipment movement         Width         6 ft           Daily volume so torage Pile         75 ft. L         60 ft. W           Total Volume in Storage Pile         =         158.678 (CF           Assume maximum storage pile height         =         10 ft.           Assume pile base width         =         10 ft.           Assume pile base width         =         30 ft.v           Volume per linear foot (trapezoidal - V=1/2(B1+E2)'H'L         =         30 ft.v           Space allowance between piles for equipment, etc.         =         2200 ft.           Number of storage piles needed         Imment/trucks         =         220 ft.           Space allowance between piles for equipment/trucks         =         120 ft.         =           Needed storage pile         =         120 ft.         =         220 ft.           Length of storage pile         =         200 ft.         Length of storage pile         =         120 ft.           Retail Sales Area         =         120 ft.<							=	76	CY/dav	
Daily volume of overs recycled as buiking agent         =         15 (CV/day           Screen size         Width         6 ft           Allow 25 ft all sides for equipment movement         Width         6 ft           Allow 25 ft all sides for equipment movement         Screen size         60 ft. W           Total Volume in Storage Pile         Ft         60 ft. W           Maxume pile base width         =         158,578 (CF           Assume pile base width         =         168,578 (CF           Assume pile base width         =         7.41 (CV/LF           Volume of age piles needed         =         7.41 (CV/LF           Number of storage piles needed         =         7.41 (CV/LF           Space allowance between piles for equipment, etc.         =         221 ft           Number of storage piles needed         =         120 (ft.           Space allowance between piles for equipment, etc.         =         221 ft           Space allowance between piles for equipment, etc.         =         120 (ft.           Assume open storage pile needed         =         220 (ft.           Space allowance between piles for equipment realisates         =         120 (ft.           Assume open storage pile         Product Storage Area         200 (ft.           Midt						1				
Screen size         Length         24.5 ft           Allow 25 ft all sides for equipment movement         Width         6 ft           Allow 25 ft all sides for equipment movement         Screening Area =         60 ft. W           Total Volume in Storage Pile         E         75 ft. L           Daily volume x 6 days/week operation x 4 months capacity         5,873 CY           Assume maximum storage pile height         =         158,578 CF           Assume pile base width         =         10 ft           Volume per linear foot (rapezoidal - V=1/2(B1+B2)*H*U summers.str(#*)         =         7.41 [CY/LF           Total Notume to the storage piles needed         #         800 ltF         #           Assume pile length         =         225 ft         #         #           Number of storage piles needed         #         #         4         #           Space allowance between piles for equipment, etc.         #         221 ft         #         #         4           Nuth (depth) of storage area         =         120 ft         #         #         120 ft           Length of storage pile         Product Storage Area =         120 ft         #         #         120 ft           Length of storage area         =         120 ft         #				lking agent		1				
Allow 25 ft all sides for equipment movement         Width         6 ft           Allow 25 ft all sides for equipment movement         Screening Area =         60 ft. W           Total Volume in Storage Pile         75 ft. L         75 ft. L           Total Volume in Storage Pile         =         158,578 CF           Assume pile base width         =         158,578 CF           Assume pile base width         =         30 ft           Volume per linear foot (trapezoidal - V=1/2(B1+B2)'H'L mater or an (trape)         =         7.41 (CV/LF           Total linear footage of bas needed         =         200 ft.           Number of storage piles needed         =         225 ft.           Space allowance between piles for equipment, etc.         =         220 ft.           Length of storage pile         Product Storage Area         =         120 ft.           Assume öjö of production goes out in transfer trailers, 10% is small truck retail sales         =         120 ft.           Retail sales Area         =         200 ft.         =           Midth (depth) of storage of storage with 30' on either side for loading:         =         68.5 ft.W           Retail sales         =         120 ft.         =           Image of the dimensions with 30' on either side for loading:         =         68.5 ft.W			່ວເວີດ ສຸດ ການ							
Allow 25 ft all sides for equipment movement         Screening Area =         60 ft. W           Total Volume in Storage Pile         75 ft. L         75 ft. L           Total Volume in Storage Pile         1         75 ft. L           Daily volume x 6 days/week operation x 4 months capacity         5.873 CY           Assume maximum storage pile height         =         156.578 CF           Assume pile base width         Volume per line art foot (trapezoidal - V=1/2(B1+B2)*H*I) water max art (fg)         =         7.41 CYLF           Total linear foot (trapezoidal - V=1/2(B1+B2)*H*I) water max art (fg)         =         7.41 CYLF         200 ft.           Number of storage piles needed         1         1         200 ft.         200 ft.           Number of storage piles for equipment, etc.         =         25 ft         24150 SF           Assume pile logth         =         201 ft         =         200 ft.           Length of storage area         =         120 ft         =         200 ft.           Retail Sales Area         1         1         1         1         1           Dump trailer dimensions with 30' on either side for loading:         =         68 ft ft W         1           Retail Sales         1         1         1         1         1	SCIECTI SIZE									
Screening Area =         60 ft. W           Total Volume in Storage Pile         75 ft. L           Daily volume x 6 days/week operation x 4 months capacity         5.873 CY           Assume pile base width         =         158,578 CF           Assume pile base width         =         30 ft           Volume per linear foot (trapezoidal - V=1/2(B1+B2)*H*U mum recent(%)         =         7.41 CYLF           Total linear footage of storage piles needed         #         800 LF           Assume pile length         =         20 ft           Number of storage piles needed         #         #           Space allowance between piles for equipment, etc.         =         201 ft           Needed storage area footprint         =         210 ft           Assume open storage pile         =         200 ft.           Retail Sales Area         =         200 ft.           Mdth (depth) of storage area         =         200 ft.           Length of storage piles         =         200 ft.           Retail Sales Area         =         200 ft.           Mdth (depth) of storage area         =         200 ft.           Length of storage piles needed         =         201 ft.           Assume open storage pile mether trainsfer trailers. 10% is small truck retail	Allow OF ft al	l aidea far agu	un mont mo	voment			wiath	0	11	
Total Volume in Storage Pie         Figure 1         Figure 2         Fi	Allow 25 ft al	I sides for equ	lipment mo	ovement	0				(L. ). A. (	
Total Volume in Storage Pie         Daily volume x 6 days/week operation x 4 months capacity         5.873         CF           Assume pie base width         =         158,578         CF           Assume pie base width         =         30 ft         158,578         CF           Yolume per linear foot (trapezoidal - V=1/2(B1+B2/YH1) water exacts)         =         7.41         CYLE           Total linear footage of storage piles needed         =         7.41         CYLE           Assume pile length         =         200 ft.         200 ft.           Number of storage piles needed         =         24150 SF         24150 SF           Assume optic storage piles needed         =         210 ft.         =           Number of storage piles needed         =         210 ft.         =           Assume open storage piles needed         =         210 ft.         =           Needed storage area footprint         =         210 ft.         =         210 ft.           Assume optic storage piles needed         =         210 ft.         =         210 ft.           Storage pile         =         210 ft.         =         210 ft.           Length of storage piles needed         =         210 ft.         =         210 ft.           St					Screening Are	<u>ea =</u>				
Daily volume x 6 days/week operation x 4 months capacity         58,73         CY           Assume maximum storage pile height         =         158,678         CF           Assume pile base width         =         10         ft           Assume pile base width         =         30         ft           Volume per linear foot (trapezoidal - V=1/2(B1+B2)'H'L water on units (%)         =         7.41         CY/LF           Total linear footage of storage piles needed								75	ft. L	
Assume pile base width         =         158,578         CF           Assume pile base width         =         10         ft           Yolume per linear foot (trapezoidal - V=1/2(B1+B2)*H*L)         =         30         ft           Assume pile length         =         300         LF           Assume pile length         =         200         ft           Number of Storage piles needed         =         44           Space allowance between piles for equipment, etc.         =         24150         SF           Needed storage piles needed         =         220         ft         =           Width (depth) of storage area         =         1200         ft         =           Length of storage pile         =         200         ft.         =           Midth (depth) of storage area         =         200         ft.         =           Length of storage pile with 30° access in front for equipment/trucks         =         200         ft.           Retail Sales Area         =         200         ft.         =           Muck loading area:         =         68.5 ft.W         =         20         ft.           Retail sales:         =         421         SF         =         30	Total Volume	e in Storage P								
Assume maximum storage pile height         =         10 ft           Assume pile base width         =         30 ft           Volume per linear foot (rapezoidal - V=1/2(B1+B2)*H*L)         =         7.41 (CY/LF           Total linear foot (rapezoidal - V=1/2(B1+B2)*H*L)         =         7.41 (CY/LF           Assume pile length         =         200 ft           Number of storage piles needed         =         4           Space allowance between piles for equipment, etc.         =         24150 SF           Assume pile storage pile with 30' access in front for equipment/trucks         =         2201 ft           Assume open storage pile with 30' access in front for equipment/trucks         =         2201 ft           Length of storage area         =         120 ft. W           Retail Sales Area         =         200 ft. L           Multin (depth) of storage area         =         120 ft. W           Retail sales         =         200 ft. L           Retail sales         =         120 ft. W           Product Storage Area =         120 ft. W           Massume pile dimensions with 30' on either side for loading:         =         64.5 ft. W           Retail sales:         =         120 ft. L         =           Mean needed         = <td< td=""><td></td><td></td><td>Daily volu</td><td>me x 6 days</td><td>week operatio</td><td>on x 4 mo</td><td></td><td></td><td></td><td></td></td<>			Daily volu	me x 6 days	week operatio	on x 4 mo				
Assume pile base width       =       30 ft         Volume per linear foot (trapezoidal - V=1/2(B1+B2)*H'L moment (12))       =       7.41 (CY/LF         Total linear footage of storage piles needed       1       800 LF         Assume pile length       200 ft.       200 ft.         Number of storage piles needed       1       200 ft.         Space allowance between piles for equipment, etc.       =       25 ft         Needed storage pile with 30' access in front for equipment/trucks       =       120 ft         Length of storage pile       =       120 ft.         Length of storage pile       Product Storage Area =       120 ft.         Midth (depth) of storage pile       Product Storage Area =       120 ft.         Masume 90% of production goes out in transfer trailers, 10% is small truck retail sales       -         Tuck loading area:										
Volume per linear foot (trapezoidal - V=1/2(B1+B2)*H*U         =         7.41 CY/LF           Total linear footage of storage piles needed         =         800 LF           Assume pile length         =         200 ft.           Number of storage piles needed         =         241 CY/LF           Space allowance between piles for equipment, etc.         =         25 ft           Needed storage area footprint         =         25 ft           Assume open storage pile with 30' access in front for equipment/trucks         =         200 ft.           Midth (depth) of storage area         =         200 ft.         =           Length of storage pile         =         200 ft.         =           Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales         =         200 ft. L           Retail Sales Area         =         201 ft.         =           Dump trailer dimensions with 30' on either side for loading:         =         68.5 ft W           Pick up truck dimensions with 30' on either side for loading:         =         46 ft W           Area needed         =         800 ft. L         =           Area needed         =         80 ft. W         =           Fixed wastes         20         20 ft. L         =			pile heigh	t			=	-		
Total linear footage of storage piles needed       800       LF         Assume pile length       200       ft.         Number of storage piles needed       200       ft.         Space allowance between piles for equipment, etc.       24150       SF         Needed storage pile with 30° access in front for equipment/trucks       24150       SF         Assume open storage pile with 30° access in front for equipment/trucks       =       120       ft.         Length of storage pile       Product Storage Area =       120       ft.         Length of storage pile       Product Storage Area =       120       ft.         Retail Sales Area       Product Storage Area =       200       ft.         Dump trailer dimensions with 30° on either side for loading:       =       68.5       ft.         Retail sales:	Assume pile	base width					=	30	ft	
Assume pile length       200 ft.         Number of storage piles needed       0 w mode         Space allowance between piles for equipment, etc.       =         Needed storage area footprint       =         Assume open storage pile       =         Width (depth) of storage area       =         Length of storage area       =         Retail Sales Area       =         Much of production goes out in transfer trailers, 10% is small truck retail sales       =         Truck loading area:       =         Dump trailer dimensions with 30' on either side for loading:       =         Pick up truck dimensions with 30' on either side for loading:       =         Area needed       =       201 ft.         Area needed       =       4 ft.W         Area needed       =       201 ft.         Area Needed       =       80 ft. U         Area Needed       =       80 ft. U         Area Needed       =       80 ft. U         Pick up truck dimensions with 30' on either side for loading:       =         Add another 25% for vehicle queuing       =       80 ft. U         Area areaded       =       80 ft. U         Area areaded       =       80 ft. U         Piecedstock Receipt </td <td>Volume per li</td> <td>inear foot (tra</td> <td>pezoidal -</td> <td>V=1/2(B1+E</td> <td>32)*H*L VOLUME (V) =</td> <td><math>L x H x \left(\frac{P+Q}{2}\right)</math></td> <td>=</td> <td>7.41</td> <td>CY/LF</td> <td></td>	Volume per li	inear foot (tra	pezoidal -	V=1/2(B1+E	32)*H*L VOLUME (V) =	$L x H x \left(\frac{P+Q}{2}\right)$	=	7.41	CY/LF	
Assume pile length       200 ft.         Space allowance between piles for equipment, etc.       =       4         Needed storage piles needed       =       24150         Needed storage pile with 30' access in front for equipment/trucks       =       24150         Width (depth) of storage area       =       120 ft.         Length of storage pile       =       120 ft.         Retail Sales Area       =       120 ft.         Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales       =         Truck loading area:       =       68.5 ft.W         Dump trailer dimensions with 30' on either side for loading:       =       64.5 ft.W         Pick up truck dimensions with 30' on either side for loading:       =       40 ft.         Area needed       =       411 SF       =         Add another 25% for vehicle queuing       =       80 ft. W       =         Area Summary       Width       Length       Area       Area         Mode Area       20       400       0.04       =         Feedstock Receipt       40       40       1.600       0.04         Feedstock Receipt       40       40       1.600       0.04         Feedstock Receipt       40	Total linear for	potage of stor	age piles	needed	where, L - Length			800	LF	
Number of storage piles needed         image of storage piles needed         image of storage piles (if a storage pile)         image of storage pile	Assume pile	length				1014		200	ft.	
Space allowance between piles for equipment, etc.         =         25 ft           Needed storage area footprint         =         24150         SF           Assume open storage pile         =         220 ft         =           Length of storage area         =         120 ft         =           Length of storage area         =         200 ft.         L           Retail Sales Area         =         200 ft.         L           Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales         =         -           Truck loading area:         =         68.5 ft W         =           Dump trailer dimensions with 30' on either side for loading:         =         64.ft W           Retail sales:         =         200 ft L         =           Madd another 25% for vehicle queuing         =         120 ft L           Area needed         =         80 ft. W         =           Dimensions:         =         80 ft. W         =           Area Storage         =         80 ft. W         =           Pick up truck dimensions with 30' on either side for loading:         =         80 ft. W           Area needed         =         20 ft L         =           Add another 25% for vehicle queuing </td <td>Number of st</td> <td>orage piles ne</td> <td>eded</td> <td></td> <td></td> <td></td> <td>=</td> <td>4</td> <td></td> <td></td>	Number of st	orage piles ne	eded				=	4		
Assume open storage pile with 30' access in front for equipment/trucks         =         120         ft           Width (depth) of storage area         =         201 ft         =         201 ft           Length of storage pile         Product Storage Area         =         120 ft. W           Retail Sales Area         =         120 ft. W         =         200 ft. L           Retail Sales Area         =         100 ft. W         =         200 ft. L           Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales         =         1         =           Truck loading area:         =         53 ft. L         =         =         68.5 ft.W           Retail sales:         =         =         64 ft.W         =         20 ft. L           Area needed         =         =         20 ft. L         =         =           Add another 25% for vehicle queuing         =         128 SF         =         =         80 ft. W           Dimensions:         =         =         80 ft. L         =         80 ft. L         =         =         80 ft. L           Feedstock Receipt         (ft.)         (ft.)         (ft.)         (sq. ft.)         (acres)         =         =         =         <				auinment e	tc #	the way and the second		05	ft	
Assume open storage pile with 30' access in front for equipment/trucks         =         120         ft           Width (depth) of storage area         =         201 ft         =         201 ft           Length of storage pile         Product Storage Area         =         120 ft. W           Retail Sales Area         =         120 ft. W         =         200 ft. L           Retail Sales Area         =         100 ft. W         =         200 ft. L           Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales         =         1         =           Truck loading area:         =         53 ft. L         =         =         68.5 ft.W           Retail sales:         =         =         64 ft.W         =         20 ft. L           Area needed         =         =         20 ft. L         =         =           Add another 25% for vehicle queuing         =         128 SF         =         =         80 ft. W           Dimensions:         =         =         80 ft. L         =         80 ft. L         =         =         80 ft. L           Feedstock Receipt         (ft.)         (ft.)         (ft.)         (sq. ft.)         (acres)         =         =         =         <						and the second se	=	25	11	
Width (depth) of storage area         =         120         ft           Length of storage pile         =         201         ft           Retail Sales Area         =         120         ft. W           Retail Sales Area         =         200         ft. L           Retail Sales Area         =         200         ft. L           Retail Sales Area         =         68.5         ft W           Truck loading area:         =         68.5         ft W           Dump trailer dimensions with 30' on either side for loading:         =         68.5         ft W           Retail sales:         =         20         ft L         =           Pick up truck dimensions with 30' on either side for loading:         =         64         ft W           Area needed         =         20         ft L         =         20         ft L           Add another 25% for vehicle queuing         =         10         10         =         20         ft W           Immensions:         =         =         80         ft. W         =         80         ft. W           Immensions:         =         =         80         ft. U         =         80         1.6000         0.04 </td <td>Needed stor</td> <td>age area foot</td> <td></td> <td>quipinent, e</td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td>	Needed stor	age area foot		quipinent, e				-		
Length of storage pile         =         201 ft           Product Storage Area =         120 ft. W           Retail Sales Area         200 ft. L           Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales         -           Truck loading area:         -           Dump trailer dimensions with 30' on either side for loading:         =           Pick up truck dimensions with 30' on either side for loading:         =           Pick up truck dimensions with 30' on either side for loading:         =           Pick up truck dimensions with 30' on either side for loading:         =           Add another 25% for vehicle queuing         =         1228 SF           Dimensions:         =         128 SF         =           Metal Submary         Width         Length         Area           Metal Sub<			print			nt/trucks		-		
Brit         Product Storage Area =         120         ft. W           Retail Sales Area         200         ft. L           Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales         200         ft. L           Truck loading area:         Image: Comparison of the side for loading:         Employed and the side for loading:         Employed and the side for loading:         Employed and the side for loading:           Retail sales:         Image: Comparison of the side for loading:         Employed and the side	Assume oper	n storage pile	print with 30' a			nt/trucks	=	24150	SF	
Retail Sales Area         200 ft. L           Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales	Assume oper Width (depth	n storage pile ) of storage a	print with 30' a			nt/trucks	=	24150	SF ft	
Retail Sales         Area         Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales         Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales           Truck loading area:         Image: Imag	Assume oper Width (depth	n storage pile ) of storage a	print with 30' a		t for equipmer		= = = =	24150 120 201	SF ft ft	
Assume 90% of production goes out in transfer trailers, 10% is small truck retail sales         Image: Constraint of the state of	Assume oper Width (depth	n storage pile ) of storage a	print with 30' a		t for equipmer		= = = =	24150 120 201 120	SF ft ft ft. W	
Truck loading area:         Image:         Image: <thimage:< th="">         Image:         <thimage:< th=""></thimage:<></thimage:<>	Assume oper Width (depth Length of sto	n storage pile ) of storage a prage pile	print with 30' a		t for equipmer		= = = =	24150 120 201 120	SF ft ft ft. W	
Dump trailer dimensions with 30' on either side for loading:         =         68.5         ft W           Retail sales:	Assume oper Width (depth Length of sto	n storage pile ) of storage a prage pile Area	print with 30' a rea	ccess in fron	t for equipmer	ge Area	=	24150 120 201 120	SF ft ft ft. W	
Retail sales:       53 ft L         Pick up truck dimensions with 30' on either side for loading:       =       64 ft W         Area needed       =       4911 SF         Area needed       =       4911 SF         Marka and the state of t	Assume oper Width (depth Length of sto Retail Sales Assume 90%	n storage pile ) of storage a prage pile Area of production	print with 30' a rea	ccess in fron	t for equipmer	ge Area	=	24150 120 201 120	SF ft ft ft. W	
Retail sales:         Pick up truck dimensions with 30' on either side for loading:         =         64 ft W           Area needed         =         4011 SF         20 ft L           Area needed         =         4911 SF         =           Add another 25% for vehicle queuing         =         1228 SF           Dimensions:         =         80 ft. W           Dimensions:         =         80 ft. W           Area Summary         Width         Length         Area           Area Summary         Width         Length         Area           Feedstock Receipt         40         1,600         0.04           Feedstocks Storage         0         1         (acres)           Food wastes         20         20         4000         0.01           OCC         20         20         400         0.01           Users         80         105         8,400         0.19           Yard waste         75         80         6,000         0.14           Overs from screen         25         30         750         0.02           Composting Pad         3500         250         87,500         2.01           Couring Pad         3000         250<	Assume oper Width (depth Length of sto Retail Sales Assume 90%	n storage pile ) of storage a prage pile Area of production g area:	print with 30' a rea	ccess in fron	Product Stora	ige Area small truc	= = = ck retail sales	24150 120 201 120 200	SF ft ft. ft. W ft. L	
Pick up truck dimensions with 30' on either side for loading:         =         64         ft W           Area needed         =         4911         SF           Add another 25% for vehicle queuing         =         1228         SF           Dimensions:         =         80         ft. W           Area Summary         Width         Length         Area           Area Summary         Width         Length         Area           Feedstock Receipt         40         40         1,600         0.04           Feedstock Storage         20         20         400         0.01           CCC         20         20         400         0.01         0.02           Leaves         80         250         19,900         0.46         14           Overs from screen         25         30         750         0.02         20           Composting Pad         350         250         87,500         2.01         172           Screening Area         60         75         4,500         0.10         172           Screening Area         60         75         4,500         0.10         172           Screening Area         60         75         4,	Assume oper Width (depth Length of sto Retail Sales Assume 90%	n storage pile ) of storage a prage pile Area of production g area:	print with 30' a rea	ccess in fron	Product Stora	ige Area small truc	= = = ck retail sales	24150 120 201 120 200 68.5	SF ft ft. W ft. L ft. W	
Area needed       =       4911 SF         Add another 25% for vehicle queuing       =       1228 SF         Dimensions:       =       80 ft. W         Image: Second Sec	Assume ope Width (depth Length of sto Retail Sales Assume 90% Truck loading	n storage pile ) of storage a prage pile Area of production g area:	print with 30' a rea	ccess in fron	Product Stora	ige Area small truc	= = = ck retail sales	24150 120 201 120 200 68.5	SF ft ft. W ft. L ft. W	
Area needed       =       4911       SF         Add another 25% for vehicle queuing       =       1228       SF         Dimensions:       =       80       ft. W         Dimensions:       =       80       ft. W         Area Summary       Width       Length       Area       Area         Marca Summary       Width       Length       Area       Area         Feedstock Receipt       40       40       1,600       0.04         Feedstock Storage       -       -       -       -         Food wastes       20       20       400       0.01         OCC       20       20       400       0.01       -         Vood chips       80       105       8,400       0.19       -         Yard waste       75       80       6,000       0.14       -         Overs from screen       25       30       750       0.02       -         Composting Pad       300       250       87,500       2.01       -         Cores form screen       25       30       75,000       1.72       -         Screening Area       60       75       4,500       0.10       -	Assume ope Width (depth Length of sto Retail Sales Assume 90% Truck loading	n storage pile ) of storage a prage pile Area of production g area: Dump trailer of	print with 30' a rea n goes out dimension	ccess in fron	t for equipmer Product Store railers, 10% is either side for	ge Area small truc	= = = = 	24150 120 201 120 200 68.5 53	SF ft ft. W ft. L ft W ft W ft L	
Add another 25% for vehicle queuing       =       1228 SF         Dimensions:       =       80 ft. W         =       80 ft. L         Area Summary       Width       Length         Area Summary       (ft.)       (ft.)         (ft.)       (ft.)       (sq. ft.)         Feedstock Receipt       40       40         Food wastes       20       20         Avod chips       80       250         Yard waste       75       80         Overs from screen       25         250       250         87,500       2.01         Cump Pad       300         250       75,000         920       250         920       400         0.105       8,400         0.104       105         0.205       80         105       8,400         0.11       105         105       8,400         0.105       19,900         107       10,50         108       105         109       105         1000       10,000         1000       10,000         1000       10,00	Assume ope Width (depth Length of sto Retail Sales Assume 90% Truck loading	n storage pile ) of storage a prage pile Area of production g area: Dump trailer of	print with 30' a rea n goes out dimension	ccess in fron	t for equipmer Product Store railers, 10% is either side for	ge Area small truc	= = = = 	24150 120 201 120 200 68.5 53 64	SF ft ft. W ft. L ft W ft L ft W ft L	
Dimensions:         Total         6138 SF           Dimensions:         =         80 ft. W           =         80 ft. L           =         80 ft. L           Area Summary         Width         Length           Area Summary         (ft.)           (ft.)         (ft.)           (ft.)         (ft.)           (ft.)         (ft.)           Feedstock Receipt         40           40         40           Food wastes         20           20         20           400         0.01           OCC         20           20         20           400         0.01           0CC         20           20         20           400         0.01           Leaves         80           80         105           8,400         0.19           Yard waste         75           75         80           60,000         0.14           Overs from screen         25           250         87,500           200         24,000           201         300           250         <	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales:	n storage pile ) of storage a prage pile Area of production g area: Dump trailer Pick up truck	print with 30' a rea n goes out dimension	ccess in fron	t for equipmer Product Store railers, 10% is either side for	ge Area small truc	= = = ck retail sales = : =	24150 120 201 120 200 68.5 53 68.5 53 64 20	SF ft ft. W ft. L ft W ft L ft W ft L	
Dimensions:         =         80         ft. W           Area Summary         Width         Length         Area         Area           (ft.)         (ft.)         (ft.)         (sq. ft.)         (acres)           Feedstock Receipt         40         40         1,600         0.04           Feedstocks Storage	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales:	n storage pile ) of storage a orage pile Area of production area: Dump trailer of Pick up truck	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on as with 30' or	t for equipmer Product Stora ailers, 10% is either side for	ge Area small truc	= = = ck retail sales = : : : = : = : = :	24150 120 201 120 200 68.5 53 68.5 53 64 20 4911	SF ft ft. W ft. L ft W ft L ft W ft L SF	
Area Summary         Width         Length         Area         Area           Image: Constraint of the system         (ft.)         (ft.)         (ft.)         (sq. ft.)         (acres)           Feedstock Receipt         40         40         1,600         0.04         Image: Constraint of the system         Image:	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales:	n storage pile ) of storage a orage pile Area of production area: Dump trailer of Pick up truck	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on as with 30' or	t for equipmer Product Stora ailers, 10% is either side for	ge Area small truc	= = = ck retail sales = : : = : = : = : = : = : = : = : = :	24150 120 201 120 200 68.5 53 64 20 4911 1228	SF ft ft. W ft. L ft W ft L ft W ft L SF SF	
Area Summary         Width         Length         Area         Area           (ft.)         (ft.)         (ft.)         (sq. ft.)         (acres)           Feedstock Receipt         40         40         1,600         0.04           Feedstock Storage	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed	n storage pile ) of storage a orage pile Area of production area: Dump trailer of Pick up truck	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on as with 30' or	t for equipmer Product Stora ailers, 10% is either side for	ge Area small truc	= = = = = = = = = = = = = = = = = = =	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138	SF ft ft. W ft. L ft W ft L ft W ft L SF SF SF	
Image: ft.         (ft.)         (ft.)         (gq. ft.)         (acres)           Feedstock Receipt         40         40         1,600         0.04         Feedstock Storage         Feedstock Storage Stor	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed	n storage pile ) of storage a orage pile Area of production area: Dump trailer of Pick up truck	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on as with 30' or	t for equipmer Product Stora ailers, 10% is either side for n either side for	ge Area small truc	= = = = = = = = = = = = = = = = = = =	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Image: ft.         (ft.)         (ft.)         (gq. ft.)         (acres)           Feedstock Receipt         40         40         1,600         0.04         Feedstock Storage         Feedstock Storage Stor	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed	n storage pile ) of storage a orage pile Area of production area: Dump trailer of Pick up truck	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on as with 30' or	t for equipmer Product Stora ailers, 10% is either side for n either side for	ge Area small truc	= = = = = = = = = = = = = = = = = = =	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Image: ft.         (ft.)         (ft.)         (gq. ft.)         (acres)           Feedstock Receipt         40         40         1,600         0.04         Feedstock Storage         Feedstock Storage Stor	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed	n storage pile ) of storage a orage pile Area of production area: Dump trailer of Pick up truck	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on as with 30' or	t for equipmer Product Stora ailers, 10% is either side for n either side for	ge Area small truc	= = = = = = = = = = = = = = = = = = =	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Feedstock Receipt         40         40         1,600         0.04           Feedstocks Storage	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions:	n storage pile ) of storage a orage pile Area of production g area: Dump trailer of Pick up truck Add another	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on s with 30' or ehicle queuir	t for equipmer Product Stora railers, 10% is either side for h either side for h	ge Area small truc	= = = ck retail sales = = = = = : : = = = = = = = = = = = =	24150 120 201 120 200 200 68.5 53 64 20 4911 1228 6138 80 80	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Feedstocks Storage         20         20         400         0.01           OCC         20         20         400         0.01         0.01           Leaves         80         250         19,900         0.46         0.01         0.01           Leaves         80         250         19,900         0.46         0.01         0.0	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions:	n storage pile ) of storage a orage pile Area of production g area: Dump trailer of Pick up truck Add another	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on s with 30' or ehicle queuir <u>Width</u>	t for equipmer Product Stora railers, 10% is either side for n either side for ng Length	ge Area small truc	= = = ck retail sales = = = : : = = : : = : : = : : : = :	24150 120 201 120 200 68.5 53 64 20 4911 1228 6138 80 80 <u>Area</u>	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Food wastes         20         20         400         0.01           OCC         20         20         400         0.01           Leaves         80         250         19,900         0.46           Wood chips         80         105         8,400         0.19           Yard waste         75         80         6,000         0.14           Overs from screen         25         30         750         0.02           Composting Pad         350         250         87,500         2.01           Curing Pad         300         250         75,000         1.72           Screening Area         60         75         4,500         0.10           Product Storage Area         120         200         24,000         0.55           Retail Sales Area         80         80         6,400         0.15	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area Summa	n storage pile ) of storage a prage pile Area o of production g area: Dump trailer of Pick up truck Add another Add another	print with 30' a rea n goes out dimension dimensior	in transfer to s with 30' on s with 30' or ehicle queuir Width (ft.)	t for equipmer Product Stora railers, 10% is either side for n either side for	ge Area small truc	= = = = = = = = = = = = = = = = = = =	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80 80 Area (acres)	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
OCC         20         20         400         0.01           Leaves         80         250         19,900         0.46           Wood chips         80         105         8,400         0.19           Yard waste         75         80         6,000         0.14           Overs from screen         25         30         750         0.02           Composting Pad         350         250         87,500         2.01           Curing Pad         300         250         75,000         1.72           Screening Area         60         75         4,500         0.10           Product Storage Area         120         200         24,000         0.55           Retail Sales Area         80         80         6,400         0.15	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area Summa Feedstock Ro	n storage pile ) of storage a prage pile Area of production g area: Dump trailer of Pick up truck Add another Add another ary eccipt	print with 30' a rea n goes out dimension dimensior	in transfer to s with 30' on s with 30' or ehicle queuir Width (ft.)	t for equipmer Product Stora railers, 10% is either side for n either side for	ge Area small truc	= = = = = = = = = = = = = = = = = = =	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80 80 Area (acres)	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Leaves         80         250         19,900         0.46           Wood chips         80         105         8,400         0.19           Yard waste         75         80         6,000         0.14           Overs from screen         25         30         750         0.02           Composting Pad         350         250         87,500         2.01           Curing Pad         300         250         75,000         1.72           Screening Area         60         75         4,500         0.10           Product Storage Area         120         200         24,000         0.55           Retail Sales Area         80         80         6,400         0.15	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area Summa Feedstock R Feedstock S	n storage pile ) of storage a prage pile Area of production area: Dump trailer Pick up truck Add another Add another ary ecceipt Storage	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on s with 30' on ehicle queuin with 30' or ehicle queuin (ft.) 40	t for equipmer Product Store railers, 10% is either side for the e	ge Area small truc	= = = 	24150 120 201 120 200 68.5 53 64 20 4911 1228 6138 80 80 Area (acres) 0.04	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Wood chips         80         105         8,400         0.19           Yard waste         75         80         6,000         0.14           Overs from screen         25         30         750         0.02           Composting Pad         350         250         87,500         2.01           Curing Pad         300         250         75,000         1.72           Screening Area         60         75         4,500         0.10           Product Storage Area         120         200         24,000         0.55           Retail Sales Area         80         80         6,400         0.15	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area Summa Feedstock R Feedstock R Feedstock S Food was	n storage pile ) of storage a prage pile Area of production area: Dump trailer Pick up truck Add another Add another ary ecceipt Storage	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on s with 30' on ehicle queuin with 30' or ehicle queuin (ft.) 40 20	t for equipmer Product Stora railers, 10% is either side for n either side for n ther side for the side	ge Area small truc	= = = ck retail sales = = = = : = = Total = = = = (sq. ft.) 1,600 = 400	24150 120 201 120 200 200 68.5 53 64 20 4911 1228 6138 80 80 80 80 80 80 80 80 80 8	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Yard waste         75         80         6,000         0.14           Overs from screen         25         30         750         0.02           Composting Pad         350         250         87,500         2.01           Curing Pad         300         250         75,000         1.72           Screening Area         60         75         4,500         0.10           Product Storage Area         120         200         24,000         0.55           Retail Sales Area         80         80         6,400         0.15	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area Summa Feedstock R Feedstocks S Food was OCC	n storage pile ) of storage a prage pile Area of production area: Dump trailer Pick up truck Add another Add another ary ecceipt Storage	print with 30' a rea n goes out dimension dimensior	ccess in fron in transfer to s with 30' on s with 30' or ehicle queuin width (ft.) 40 20 20	t for equipmer Product Stora railers, 10% is either side for the e	ge Area small truc	= = = = ck retail sales = = = : = = = = : = = = = : = = = : = = = : = = : = = : = :	24150 120 201 120 200 200 68.5 53 64 20 4911 1228 6138 80 80 80 80 80 80 80 80 80 8	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Overs from screen         25         30         750         0.02           Composting Pad         350         250         87,500         2.01           Curing Pad         300         250         75,000         1.72           Screening Area         60         75         4,500         0.10           Product Storage Area         120         200         24,000         0.55           Retail Sales Area         80         80         6,400         0.15	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area Summa Feedstocks R Feedstocks R Feedstocks S Food was OCC Leaves	n storage pile ) of storage a prage pile Area of production area: Dump trailer Pick up truck Add another Add another cecipt Storage ites	print with 30' a rea n goes out dimension dimensior	in transfer tr s with 30' on s with 30' or ehicle queuir <u>Width</u> (ft.) 40 20 20 80	t for equipmer Product Stora railers, 10% is either side for the e	ge Area small truc	= = = = = = = = = = = = = = = = = = =	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80 80 Area (acres) 0.04 0.01 0.01 0.46	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Composting Pad         350         250         87,500         2.01           Curing Pad         300         250         75,000         1.72           Screening Area         60         75         4,500         0.10           Product Storage Area         120         200         24,000         0.55           Retail Sales Area         80         80         6,400         0.15	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area Summa Feedstocks S Food was OCC Leaves Wood chi	n storage pile ) of storage pile ) of storage pile Area of production parea: Dump trailer Pick up truck Add another Add another ecceipt Storage tes ps	print with 30' a rea n goes out dimension dimensior	ccess in fron ccess in fron in transfer to s with 30' on s with 30' on ehicle queuin ehicle queuin (ft.) 40 20 20 80 80 80	t for equipmer  Product Store  railers, 10% is  either side for  n either side for  Length (ft.) 40 20 20 250 105	ge Area small truc	= = = = 	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80 80 Area (acres) 0.04 0.01 0.01 0.01 0.46 0.19	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Curing Pad         300         250         75,000         1.72           Screening Area         60         75         4,500         0.10           Product Storage Area         120         200         24,000         0.55           Retail Sales Area         80         80         6,400         0.15	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area Summa Feedstock R Feedstocks S Food was OCC Leaves Wood chij Yard was	n storage pile ) of storage pile ) of storage pile Area of production area: Dump trailer Pick up truck Add another Add another ecceipt Storage tes	print with 30' a rea n goes out dimension dimensior	ccess in fron ccess in fron in transfer to s with 30' on s with 30' on ehicle queuin ehicle queuin (ft.) 40 20 20 80 80 75	t for equipmer  Product Store  railers, 10% is  either side for  n either side for  texture  texture texture texture  texture texture texture texture texture texture texture texture texture texture texture texture texture textur	ge Area small truc	= = = = - - - - - - - - - - - - - - - -	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80 80 80 80 80 80 80 0.04 0.01 0.01 0.46 0.19 0.14	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Screening Area         60         75         4,500         0.10           Product Storage Area         120         200         24,000         0.55           Retail Sales Area         80         80         6,400         0.15           234,850         5.39         5.39         5.39	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area Summa Feedstock R Feedstocks S Food was OCC Leaves Wood chi Yard was Overs fror	n storage pile ) of storage pile ) of storage pile Area of production area: Dump trailer Pick up truck Add another Add another ecceipt Storage tes ps te n screen	print with 30' a rea n goes out dimension dimensior	ccess in fron ccess in fron in transfer th s with 30' on ehicle queuin ehicle queuin (ft.) 40 20 20 80 80 75 25	t for equipmer  Product Store  railers, 10% is  either side for  n either side for  texture (ft.)  40  20 20 250 105 80 30	ge Area small truc	= = = = ck retail sales = = = = Total = = Total = = (sq. ft.) 1,600 400 400 400 400 19,900 8,400 6,000 750	24150 120 201 120 200 68.5 53 64 20 4911 1228 6138 80 80 80 Area (acres) 0.04 0.01 0.46 0.19 0.14 0.02	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Product Storage Area         120         200         24,000         0.55           Retail Sales Area         80         80         6,400         0.15           234,850         5.39         5.39         5.39	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area Summa Feedstock Re Feedstocks S Food was OCC Leaves Wood chi Yard was Overs fror Composting	n storage pile ) of storage pile ) of storage pile Area of production area: Dump trailer Pick up truck Add another Add another ecceipt Storage tes ps te n screen	print with 30' a rea n goes out dimension dimensior	ccess in fron ccess in fron in transfer th s with 30' on s with 30' on ehicle queuin with 30' or ehicle queuin 20 20 80 80 75 25 350	t for equipmer Product Store railers, 10% is either side for the either side for <u>Length</u> (ft.) 40 20 20 20 250 105 80 30 250	ge Area small truc	= = = = ck retail sales = = = = = Total = = = Total = = (sq. ft.) 1,600 400 400 400 400 19,900 8,400 6,000 750 87,500	24150 120 201 120 200 200 68.5 53 64 20 4911 1228 6138 80 80 80 Area (acres) 0.04 0.01 0.01 0.01 0.04 0.19 0.14 0.02 2.01	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Retail Sales Area         80         80         6,400         0.15           234,850         5.39         5.39         5.39         5.39	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Retail sales: Area needed Dimensions: Area Summa Feedstocks & Food was OCC Leaves Wood chi Yard was Overs fror Composting Curing Pad	n storage pile ) of storage pile ) of storage pile Area of production g area: Dump trailer Pick up truck Add another Add another Comparison Com	print with 30' a rea n goes out dimension dimensior	with 30' on s with 30' on s with 30' on with 30' or ehicle queuir with 10' or 20 20 80 80 75 25 350 300	t for equipmer Product Stora railers, 10% is either side for the e	ge Area small truc	= = = = = = = = = = = = = = = = = = =	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80 80 Area (acres) 0.04 0.01 0.01 0.04 0.01 0.01 0.46 0.19 0.14 0.02 2.01 1.72	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
234,850 5.39	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area needed Dimensions: Feedstocks S Food was OCC Leaves Wood chi Yard was Overs fror Composting Pad Screening Ar	n storage pile ) of storage a prage pile Area of production area: Dump trailer Pick up truck Add another Add another Add another Constrained Constraine Constrained Constrained Constrained Constrained Constraine	print with 30' a rea n goes out dimension dimensior	with 30' on           s with 30' on           s with 30' on           with 30' on           b with 30' on           s with 30' on	t for equipmer  Product Store  railers, 10% is  either side for  reither side for  texture  texture texture texture texture  texture texture textur	ge Area small truc	= = = = - 	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80 80 Area (acres) 0.04 0.01 0.01 0.01 0.04 0.01 0.01 0.02 2.01 1.72 0.10	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area needed Dimensions: Area Summa Feedstocks S Food was OCC Leaves Wood chi Yard wasi Overs fror Composting Pad Screening Ar	n storage pile ) of storage pile ) of storage pile Area of production area: Dump trailer Pick up truck Add another Add another Compared Co	print with 30' a rea n goes out dimension dimensior	with 30' on           s with 30' on           s with 30' on           s with 30' on           with 30' on           s with 30' on <td>t for equipmer  Product Store  ailers, 10% is  either side for  teither side for  te</td> <td>ge Area small truc</td> <td>= = = = - </td> <td>24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80 80 Area (acres) 0.04 0.01 0.01 0.04 0.01 0.01 0.04 0.01 0.02 2.01 1.72 0.10 0.55</td> <td>SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W</td> <td></td>	t for equipmer  Product Store  ailers, 10% is  either side for  teither side for  te	ge Area small truc	= = = = - 	24150 120 201 120 200 68.5 53 64 200 4911 1228 6138 80 80 Area (acres) 0.04 0.01 0.01 0.04 0.01 0.01 0.04 0.01 0.02 2.01 1.72 0.10 0.55	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
Allowance for equipment storage, movement, etc. @ 25%   Totals   293.563   6.74	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area needed Dimensions: Area Summa Feedstocks S Food was OCC Leaves Wood chi Yard wasi Overs fror Composting Pad Screening Ar	n storage pile ) of storage pile ) of storage pile Area of production area: Dump trailer Pick up truck Add another Add another Compared Co	print with 30' a rea n goes out dimension dimensior	with 30' on           s with 30' on           s with 30' on           s with 30' on           with 30' on           s with 30' on <td>t for equipmer  Product Store  ailers, 10% is  either side for  teither side for  te</td> <td>ge Area small truc</td> <td>= = = = - - - - - - - - - - - - - - - -</td> <td>24150 120 201 120 200 68.5 53 64 20 4911 1228 6138 80 80 80 Area (acres) 0.04 0.01 0.01 0.04 0.01 0.02 2.01 1.72 0.10 0.55 0.15</td> <td>SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W</td> <td></td>	t for equipmer  Product Store  ailers, 10% is  either side for  teither side for  te	ge Area small truc	= = = = - - - - - - - - - - - - - - - -	24150 120 201 120 200 68.5 53 64 20 4911 1228 6138 80 80 80 Area (acres) 0.04 0.01 0.01 0.04 0.01 0.02 2.01 1.72 0.10 0.55 0.15	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	
	Assume oper Width (depth Length of sto Retail Sales Assume 90% Truck loading Retail sales: Area needed Dimensions: Area needed Dimensions: Feedstocks S Food was OCC Leaves Wood chi Yard was Overs fror Composting Pad Screening An Product Stor Retail Sales a	n storage pile ) of storage pile ) of storage pile Area of production g area: Dump trailer Pick up truck Add another Add another ecceipt Storage te m screen Pad age Area Area	print with 30' a rea n goes out dimension dimensior 25% for v	with 30' on           s with 30' on           s with 30' on           ehicle queuir           Width           (ft.)           40           20           20           20           300           60           120           80           75           350           300           60           120           80	t for equipmer  Product Store  railers, 10% is  either side for  n either side for  Length (ft.) 40 20 20 20 250 105 80 30 250 250 75 200 80	ige Area	= = = = - - - - - - - - - - - - - - - -	24150 120 201 120 200 68.5 53 64 20 4911 1228 6138 80 80 80 80 80 80 80 80 80 8	SF           ft           ft. W           ft. L           ft W           ft L           ft W           ft SF           Mt. W	

				<b>D</b>	[]	_			
	iste Compost	ıng - Aeı	rated Static	Piles					
Assumptions									
1. Facility is o	open 6 days/w	veek (31)	2 days/year)						
2. Facility wil	l use aerated	static pile	es (positive a	ir) with loader-	turned curin	g	piles		
Waste Volur	nes (in cubic	yards)							
						A	verage Da	ily Volume	
I/C/I food wa	stes							CY/day	
Residential f							25.6		
Leaves							15.6		
Sawdusts							0.4		
Wood chips							18.3		
MVRD yard v	vaste						11.5		
OCC							11.4		
Compost rec	vcle						6.7		
Overs from s							15.9		
0 1010 110111 3	Totals							CY/day	
							121.4		
Composting	Materials Flo	ws							
	mes for ASP c		na (wintertim	e conditione)		$\vdash$			
		Junposti	Composting		Curing	$\vdash$	Total		
	ASP		28	days	60	d		days	
Daily Valuma	-	mostino		1% volume shri		-	00	uays	
Dally Volume	s going to coi			ed feedstocks			100.2	CV/day	
Valuma of m	etarial in Drime				_		109.2	CY/day	
	aterial in Prima	ary com		Mixed		$\vdash$			
			Residence	<u>Mixed</u>					
			<u>Days</u>	feedstocks		$\square$			
	ASP		28	3,059		Ļ			
Daily Volume	es going to cui			lume shrink in		)	70 -		
			iumes of con	nposted feedst	ocks =		/6.5	CY/day	
volume of m	aterial in Curir	ig:	Desiderer						
			_	Composted					
			<u>Days</u>	Feedstocks					
	Windrow		60	4,588					
Daily Volume	es going to scr			volume shrink					
	· · ·			ed feedstocks		Ļ		CY/day	
Screening				d compost cap	ture rate ar	۱d	20% goin	g to overs	
	b. Finishe		st production						
				ened compos	τ =			CY/day	
	c. Daily vo					Ļ		CY/day	
	d. Finished			(annually, ba		da		<u></u>	
		Annual	volume of sc	reened compo	st =		17,179	CY/year	
Feedstocks									
			once/week	(except leaves	)				
	d wastes delive								
	area for 2.0x					=		CY/day	
	quipment to m	ove feed	stocks into s	storage		=		CF/day	
Assumed pile						=		ft	
Pile footprint						Ξ	1092		
Plus equipm	ent access/mo	vement				=	546		
Receipt area	needed					=	1639		
Proposed di	mensions					=	40	ft. W	
								ft. L	

Г								
Feedstocks Storage								
Assume storage of food w	astes 0	CC in rectan	ullar concrete	hlock hu	nkers	rest in or	nen niles	
Food Wastes	<i>asics</i> , <i>c</i>					5, 1031 11 0	Jen piles	
Food wastes in recipe daily					=	42	CV	
Assume a maximum storage		prior to use					days	
Storage volume needed for						90		
	01 1000 W	asies				2,430		ł
Assume bunker denth						2,430		
Assume bunker depth Bunker footprint						4 608		
							Sr ft W	
Proposed dimensions						30		
000					-	30		
					_	11 1	CV	
OCC in recipe daily (on ave						11.4		
Assume a storage capacity		000			=		days	
Storage volume needed for	or paper/				=	80		
					=	2,160		
Assume bunker depth					=	6		<b> </b>
Bunker footprint					=	360		<b> </b>
Proposed dimensions					=		ft W	<b> </b>
					=	20	ft L	
Leaves			apezoidal piles	outdoors			0.4	<b> </b>
Annual volumes of leaves					=	4,868		
		all come in	Nov - Jan.		=	131,436		
Assume maximum storage	pile heig	ht			=	10		
Assume pile base width					=	30		
Volume per linear foot (tra			+B2)*H*L)		=		CY/LF	
Total linear footage of stor	age pile	s needed	VOLUME (V) = L x H	$x\left(\frac{P+Q}{P+Q}\right)$	=	660		
Assume pile length			where, L - Length	2 /	=	200	ft.	
Number of storage piles ne	eded		H - Height	g	=	3		
Space allowance around p	oiles for e	equipment, e	P - Base Width	12210.0	=	25	ft	
Needed storage area foot	print		Q - Top Width	a	=	19900	SF	
Proposed dimensions			H		=	250	ft L	
			P		=	80	ft W	
Wood chips	Assume	stored in tra	apezoidal piles	outdoors	6			
Wood chips in recipe daily	(on aver	age)			=	18	CY/day	
Assume a storage period p	orior to u	se			=	30	days	
Storage volume needed for					=	550		
		•			=	14,850	CF	
Assume maximum storage	pile heic	jht			=	10		
Assume pile base width					=	30		
Volume per linear foot (tra	pezoida	I - V=1/2(B1	+B2)*H*L)		=		CY/LF	Ī
Total linear footage of stor			. ,		=	80		
Assume pile length					=	80		Ì
Number of storage piles ne	eded				=	1		1
Space allowance around p		auipment. e	etc.		=	25	ft	1
Needed storage area foot		, , , , , <b>,</b> ,			=	2450		1
Proposed dimensions					=	105		
					=		ft W	1
Yard waste	Assume	stored in tra	apezoidal piles	outdoors				1
Yard waste in recipe daily					=	11	CY/day	1
Assume a storage period p					=		days	1
Storage volume needed for					=	350		1
	, yaru w					9,450		<u> </u>
Assume maximum storage	nile hoic	uht				9,430 10		<u> </u>
Assume pile base width		ji i L				30		<del> </del>
Volume per linear foot (tra	nozoida	_\/-1/2/D1	L +B2)*U*L \				n CY/LF	<del> </del>
			τοζη Π L)					<u> </u>
Total linear footage of stor	age plies					50		
Assume pile length			2		=	50	it.	

Number of storage piles needed			:	= 1		
Space allowance around piles for e	quipment, e	tc.	:	= 25	ft	
Needed storage area footprint	· · ·			= 1550	SF	
Proposed dimensions				= 75	ft L	
				= 80	ft W	
Overs from screening	Assume sto	red in trapezoi	dal piles outo	doors		
Screen overs in recipe daily (on ave					CY/day	
Assume a storage period prior to us					days	
Storage volume needed for screen				= 120		
	01010			= 3,240		
Assume maximum storage pile heig	ht			= 10		
Assume pile base width				= 30		
Volume per linear foot (trapezoidal	V-1/2/P1				CY/LF	
Total linear footage of storage piles		τ <u>σζ) η L)</u>				
¥¥	needed					
Assume pile length				= 20	π.	
Number of storage piles needed		ļ		= 1	<i>c</i> ,	
Space allowance around piles for e	quipment, e	tc.		= 25		
Needed storage area footprint				= 650		
Proposed dimensions					ft L	
				= 25	ft W	
Feedstock Mixing						
Assume all feedstock mixing done I	oy mechanic	al mixer				
Assumed mixer dimensions: 20.4' L	x 9.2' W					
Allow 20' on long axis sides for trac	tor/equip ac	cess				
Assumed dimensions			:	= 30	ft. W	
				= 22	ft. L	
Total Feedstock Mixing Area				= 660	SF	
					_	
Active Composting						
Composting residence time				= 28	days/cycle	
ASP sizing					weeks/cycle	
a. Total volume each cycle				= 3,059.0		
b. Assume ASP height (w/o 6" co	omnost can)				ft. H	
c. Assume ASP width	Jinpust cap)				ft. W	
					ft. L	
d. Assume maximum ASP length			l [·	- 30	π. ∟	
6" Comp	osi Cap			<i>.</i>		
Т				/		
				g		
			2	a		
				End boards in U- channel		
8'				nd board in U- channel		
				d an ر		
			3	Ë <sup>i</sup> į		
			l l	ЪČ		
				8		
				a		
6" mulch layer				<b>/</b>	┟───┤	
	261			4	<u>                                     </u>	
	36'			0.100	(10	
V = (36' x 18' x 8') + (0	J.5' x 18' x 3	(b <sup>°</sup> ) =		= 6426		
				= 238		
e. ASP Volume				= 238	CY	
f. No. of days to fill one bunker			:	= 2		
Number of ASP bunkers needed			:	= 13		

Assume two rows of 7 bunkers each separated by 50' wide access aisle and 20' wide utility aisle behind each row ASP # 1 ASP # 1 ASP # 2 ASP # 2 ASP # 3 ASP # 3 ASP # 4 ASP # 4 ASP # 10 ASP # 4 ASP # 10 ASP # 4 ASP # 5 ASP # 10 ASP # 4 ASP # 10 ASP # 6 ASP # 12 ASP # 7 Co' ASP # 14 ASP # 7 ASP # 7 Co' ASP # 14 ASP # 7 ASP # 14 ASP # 7 Co' ASP # 14 ASP # 7 ASP # 12 ASP #	
ASP # 1       ASP # 3         ASP # 2       ASP # 3         ASP # 3       18'         ASP # 4       ASP # 10         ASP # 4       ASP # 10         ASP # 5       ASP # 11         ASP # 6       ASP # 12         ASP # 7       60'         ASP # 13       -         ASP # 7       60'         ASP # 14       -         ASP # 7       -         ASP # 7       -         ASP # 7       -         ASP # 7       -         ASP # 14       -         -       -         ASP # 7       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -<	
ASP # 2       ASP # 9         ASP # 3       18' ASP # 10         ASP # 4       ASP # 10         ASP # 4       ASP # 10         ASP # 5       ASP # 11         ASP # 5       ASP # 12         ASP # 6       ASP # 13         ASP # 7       60'         ASP # 7       60'         ASP # 7       60'         ASP # 14       -         Base # 7       60'         ASP # 14       -         Base # 7       60'         ASP # 7       60'         ASP # 14       -         Base # 7       60'         ASP # 7       60'         ASP # 14       -         Base # 7       60'         ASP # 7       60'         Composting Area Dimensions =       =         175 ft L       -         Composting Aeration System       -         Volume of each pile       =         Assume d pile moisture content at beginning<	
ASP # 2       ASP # 9         ASP # 3       18' ASP # 10         ASP # 4       ASP # 10         ASP # 4       ASP # 10         ASP # 5       ASP # 11         ASP # 5       ASP # 12         ASP # 6       ASP # 13         ASP # 7       60'         ASP # 7       60'         ASP # 7       60'         ASP # 14       -         Base # 7       60'         ASP # 14       -         Base # 7       60'         ASP # 7       60'         ASP # 14       -         Base # 7       60'         ASP # 7       60'         ASP # 14       -         Base # 7       60'         ASP # 7       60'         Composting Area Dimensions =       =         175 ft L       -         Composting Aeration System       -         Volume of each pile       =         Assume d pile moisture content at beginning<	
ASP # 3       18' ASP # 10         ASP # 4       ASP # 11         ASP # 5       ASP # 12         ASP # 6       ASP # 12         ASP # 6       ASP # 13         ASP # 6       ASP # 13         ASP # 7       60'         ASP # 7       60'         ASP # 14       -         ASP # 14       -         ASP # 14       -         ASP # 14       -         ASP # 16       -         ASP # 17       -         ASP # 16'       -         ASP # 16'       -         ASP # 16'       -         Composting Aeration System       -         Volume of each pile	
ASP # 4       ASP # 11       Image: Constraint of the second seco	
ASP # 5       ASP # 12         ASP # 6       ASP # 13         ASP # 7       ASP # 14         36'       36         Width = (7 ASPs x 21' / ASP) + (8 walls x 2' each)       =         1000       163 ft         Length = (2 rows x 36' / ASP) + (1 aisle x 50' ea) + (2 utility x 20' ea)       =         1100       175 ft L         Composting Area Dimensions =       =         1100       175 ft L         Composting Areation System       =         Volume of each pile       =         Assumed bulk density of each pile       =         1100       =         Assumed pile moisture content at beginning       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       =         1100       = <t< td=""><td></td></t<>	
ASP # 6       ASP # 13         ASP # 7 <td></td>	
ASP # 6       ASP # 13         ASP # 7 <td></td>	
ASP # 7       Solv       ASP # 14         36'       36       36         Width = (7 ASPs x 21' / ASP) + (8 walls x 2' each)       =       163 ft         Length = (2 rows x 36' / ASP) + (1 aisle x 50' ea) + (2 utility x 20' ea) =       162 ft         Composting Area Dimensions =       =       162 ft         Volume of each pile       =       175 ft L         Composting Aeration System       =       900 lbs/CY         Volume of each pile       =       900 lbs/CY         Wet tonnage in each pile       =       107.1 wet tons         Assumed bilk density of each pile       =       66.4 dry tons         Assumed pile moisture content at beginning       =       62 %         Dry tonnage in each pile       =       39,841 CFH         Fan Air Flow needed       =       664 CFM         Assume one blower for each ASP bunker       =       600 CFH / dry ton         Maximum Air Flow @ 6" W.C.       =       600 CFM         Maximum Air Flow @ 6" W.C.       =       600 CFM         Assume curing is windrows turned with front end loader       =       Assume 30% volume shrink during composting	
36'       36         Width = (7 ASPs x 21' / ASP) + (8 walls x 2' each)       = 163 ft         Length = (2 rows x 36' / ASP) + (1 aisle x 50' ea) + (2 utility x 20' ea) = 162 ft         Composting Area Dimensions =       = 150 ft W         Image: Composting Area Dimensions =       = 150 ft W         Image: Composting Area Dimensions =       = 162 ft         Composting Area Dimensions =       = 175 ft L         Composting Aeration System       Image: Composting Aeration System         Volume of each pile       = 238 CY/bunker         Assumed bulk density of each pile       = 900 lbs/CY         Wet tonnage in each pile       = 107.1 wet tons         Assumed pile moisture content at beginning       = 62 %         Dry tonnage in each pile       = 66.4 dry tons         Aeration rate       = 600 CFH / dry ton         Aeration needed for each pile       = 39,841 CFH         Fan Air Flow needed       = 664 CFM         Assume one blower for each ASP bunker       Image: Criming System         Maximum Air Flow @ 6" W.C.       = 600 CFM         Maximum Air Flow @ 6" W.C.       = 600 CFM         Assume curing is windrows turned with front end loader       Image: Criming System	
Width = (7 ASPs x 21' / ASP) + (8 walls x 2' each)=163 ftLength = (2 rows x 36' / ASP) + (1 aisle x 50' ea) + (2 utility x 20' ea) =162 ftComposting Area Dimensions ==150 ft WImage: State of the state o	
Length = (2 rows x 36' / ASP) + (1 aisle x 50' ea) + (2 utility x 20' ea) =       162 ft         Composting Area Dimensions =       =       150 ft W         Image: Composting Aeration System       =       175 ft L         Composting Aeration System       =       238 CY/bunker         Volume of each pile       =       238 CY/bunker         Assumed bulk density of each pile       =       900 lbs/CY         Wet tonnage in each pile       =       107.1 wet tons         Assumed pile moisture content at beginning       =       62 %         Dry tonnage in each pile       =       600 CFH / dry tons         Aeration rate       =       600 CFH / dry ton         Aeration needed for each pile       =       664 CFM         Fan Air Flow needed       =       660 CFM         Maximum Air Flow @ 6" W.C.       =       600 CFM         Curing System       =       600 CFM         Assume curing is windrows turned with front end loader       =       600 CFM	
Length = (2 rows x 36' / ASP) + (1 aisle x 50' ea) + (2 utility x 20' ea) =       162 ft         Composting Area Dimensions =       =       150 ft W         Image: Composting Aeration System       =       175 ft L         Composting Aeration System       =       238 CY/bunker         Volume of each pile       =       238 CY/bunker         Assumed bulk density of each pile       =       900 lbs/CY         Wet tonnage in each pile       =       107.1 wet tons         Assumed pile moisture content at beginning       =       62 %         Dry tonnage in each pile       =       600 CFH / dry tons         Aeration nate       =       600 CFH / dry ton         Aeration needed for each pile       =       664 CFM         Fan Air Flow needed       =       660 CFM         Maximum Air Flow @ 6" W.C.       =       600 CFM         Curing System       =       600 CFM         Assume curing is windrows turned with front end loader       =       600 CFM	
Composting Area Dimensions =       =       150 ft W         Composting Aeration System       175 ft L         Volume of each pile       =       238 CY/bunker         Assumed bulk density of each pile       =       900 lbs/CY         Wet tonnage in each pile       =       107.1 wet tons         Assumed pile moisture content at beginning       =       62 %         Dry tonnage in each pile       =       66.4 dry tons         Aeration rate       =       600 CFH / dry ton         Aeration needed for each pile       =       39,841 CFH         Fan Air Flow needed       =       664 CFM         Assume one blower for each ASP bunker       =       600 CFM         Maximum Air Flow @ 6" W.C.       =       600 CFM         Curing System       =       600 CFM         Assume curing is windrows turned with front end loader       =       600 CFM	
Composting Aeration System       175 ft L         Volume of each pile       = 238 CY/bunker         Assumed bulk density of each pile       = 900 lbs/CY         Wet tonnage in each pile       = 107.1 wet tons         Assumed pile moisture content at beginning       = 62 %         Dry tonnage in each pile       = 66.4 dry tons         Aeration rate       = 600 CFH / dry ton         Aeration needed for each pile       = 39,841 CFH         Fan Air Flow needed       = 664 CFM         Assume one blower for each ASP bunker       =         Maximum Air Flow @ 6" W.C.       = 600 CFM         Curing System       =         Assume curing is windrows turned with front end loader       =         Assume 30% volume shrink during composting       =	
Composting Aeration System       =       238       CY/bunker         Volume of each pile       =       238       CY/bunker         Assumed bulk density of each pile       =       900       lbs/CY         Wet tonnage in each pile       =       107.1       wet tons         Assumed pile moisture content at beginning       =       62       %         Dry tonnage in each pile       =       66.4       dry tons         Aeration rate       =       600       CFH / dry ton         Aeration needed for each pile       =       39,841       CFH         Fan Air Flow needed       =       664       CFM         Assume one blower for each ASP bunker       =       600       CFM         Maximum Air Flow @ 6" W.C.       =       600       CFM         Assume curing is windrows turned with front end loader       =       600       CFM         Assume 30% volume shrink during composting       =       =       =       =	
Volume of each pile=238CY/bunkerAssumed bulk density of each pile=900lbs/CYWet tonnage in each pile=107.1wet tonsAssumed pile moisture content at beginning=62%Dry tonnage in each pile=66.4dry tonsAeration rate=600CFH / dry tonAeration needed for each pile=39,841CFHFan Air Flow needed=664CFMAssume one blower for each ASP bunker=600CFMMaximum Air Flow @ 6" W.C.=600CFMAssume curing is windrows turned with front end loader=600CFMAssume 30% volume shrink during composting===	
Assumed bulk density of each pile       =       900       lbs/CY         Wet tonnage in each pile       =       107.1       wet tons         Assumed pile moisture content at beginning       =       62       %         Dry tonnage in each pile       =       66.4       dry tons         Aeration rate       =       600       CFH / dry ton         Aeration needed for each pile       =       39,841       CFH         Fan Air Flow needed       =       664       CFM         Assume one blower for each ASP bunker       =       600       CFM         Maximum Air Flow @ 6" W.C.       =       600       CFM         Assume curing is windrows turned with front end loader       =       600       CFM	
Wet tonnage in each pile       =       107.1       wet tons         Assumed pile moisture content at beginning       =       62       %         Dry tonnage in each pile       =       66.4       dry tons         Aeration rate       =       600       CFH / dry ton         Aeration needed for each pile       =       39,841       CFH         Fan Air Flow needed       =       664       CFM         Assume one blower for each ASP bunker       =       600       CFM         Maximum Air Flow @ 6" W.C.       =       600       CFM         Assume curing is windrows turned with front end loader       =       600       CFM         Assume 30% volume shrink during composting       =       =       =       =	
Assumed pile moisture content at beginning       =       62 %         Dry tonnage in each pile       =       66.4 dry tons         Aeration rate       =       600 CFH / dry ton         Aeration needed for each pile       =       39,841 CFH         Fan Air Flow needed       =       664 CFM         Assume one blower for each ASP bunker       =       6600 CFM         Maximum Air Flow @ 6" W.C.       =       600 CFM         Curing System       =       600 CFM         Assume curing is windrows turned with front end loader       =       600 CFM	
Dry tonnage in each pile       =       66.4       dry tons         Aeration rate       =       600       CFH / dry ton         Aeration needed for each pile       =       39,841       CFH         Fan Air Flow needed       =       664       CFM         Assume one blower for each ASP bunker       =       660       CFM         Maximum Air Flow @ 6" W.C.       =       600       CFM         Curing System	
Aeration rate       =       600       CFH / dry ton         Aeration needed for each pile       =       39,841       CFH         Fan Air Flow needed       =       664       CFM         Assume one blower for each ASP bunker       =       664       CFM         Maximum Air Flow @ 6" W.C.       =       600       CFM         Curing System       =       600       CFM         Assume curing is windrows turned with front end loader       =       =       =         Assume 30% volume shrink during composting       =       =       =	
Aeration needed for each pile       = 39,841 CFH         Fan Air Flow needed       = 664 CFM         Assume one blower for each ASP bunker       =         Maximum Air Flow @ 6" W.C.       = 600 CFM         Curing System       =         Assume curing is windrows turned with front end loader       =         Assume 30% volume shrink during composting       =	
Fan Air Flow needed       =       664       CFM         Assume one blower for each ASP bunker       =       664       CFM         Maximum Air Flow @ 6" W.C.       =       600       CFM         Curing System       =       600       CFM         Assume curing is windrows turned with front end loader       =       600       CFM         Assume 30% volume shrink during composting       =       =       =       =	
Assume one blower for each ASP bunker       Imaximum Air Flow @ 6" W.C.       = 600 CFM         Maximum Air Flow @ 6" W.C.       = 600 CFM         Curing System       Imaximum Air Flow @ 6" W.C.       Imaximum Air Flow @ 6" W.C.         Assume curing is windrows turned with front end loader       Imaximum Air Flow @ 6" W.C.       Imaximum Air Flow @ 6" W.C.         Assume 30% volume shrink during composting       Imaximum Air Flow @ 6" W.C.       Imaximum Air Flow @ 6" W.C.	
Maximum Air Flow @ 6" W.C.       =       600 CFM         Curing System       Image: Curing is windrows turned with front end loader       Image: Curing is windrows turned with front end loader         Assume 30% volume shrink during composting       Image: Curing is windrows turned with front end loader       Image: Curing is windrows turned with front end loader	
Curing System     Image: Curing System       Assume curing is windrows turned with front end loader     Image: Curing System       Assume 30% volume shrink during composting     Image: Curing System	
Assume curing is windrows turned with front end loader Assume 30% volume shrink during composting	
Assume curing is windrows turned with front end loader Assume 30% volume shrink during composting	
Assume 30% volume shrink during composting	
Total valume of motorial in pilos during 60 day suring naried 1	
Total volume of material in piles during 60-day curing period = 4,588 CY	
Assume high parabolic windrow shape (NRAES-114, p. 13)	
Volume per linear foot of windrow:	
A = 0.667 x (b) x (h), where h = height, b = width at base	
Height of loader reach without driving up on pile = 9 ft	
Base of parabolic pile = 18 ft	
Cross-sectional area per linear foot = 108 SF	
Volume per linear foot = 4.0 CY/ LF	
Linear footage of new windrows weekly	
Avg. weekly volume from composting / volume per linear foo = 115 LF / week	
Total linear footage of material in windrows = 1,147 LF	
Assume each windrow holds 3 ASP bunker volumes	
204 CY/bunker x 30% shrink	
Volume of material in each windrow = 500 CY	
Number of windrows in curing     =     9 windrows	
Assume each windrow is 225' long 225 ft	
Assume 20' spacing between windrows and 15' at each end (turning radii + pile displacement)	
Each windrow is	
Length         225 ft + 15 ft + 15 ft         =         255 ft           Width         18 ft + 20 ft         =         38 ft	
Area of each windrow (gross) = 9,690 SF	
Area of all windrows (gross) = 88,960 SF	
Assume curing area length is equal to gross windrow length = 255 ft. L	
Curing area width is = 349 ft W	
Curing area = 225 ft. W	
425 ft. L	

Core on the o	Dreduct Of									
				out Calculatio	ons		$\square$			
	of trommel sc				<b> </b>		$\square$			+
	oximately 80%			lit						
	months finish	-	ost storage						0.44	
	going to scre						=		CY/day	
Daily volume					ļ		=		CY/day	
	of overs recy	cled as b	ulking agent	t			=		CY/day	<u> </u>
Screen size					Length	ו		24.5		
I					Width			6	ft	
Allow 25 ft all	sides for equ	lipment r	novement							
				Screening Are	ea =			60	ft. W	
								75	ft. L	
Total Volume	in Storage P	ile								
			/week opera	tion x 4 month	ns capa	city		5,286	CY	
	-		·			-	=	142,720		
Assume maxi	imum storage	pile heic	jht				=	10		1
Assume pile							=	30		
		pezoida	I - V=1/2(B1-	+B2)*H VOLUME (V) =	$L \times H \times (P+Q)$		=		CY/LF	1
	otage of stor			where, L - Length	2		$\square$	720		1
Assume pile				H - Height	uoj.		$\square$	200		+
Number of sto	<u> </u>	bahad		P - Base Widt Q - Top Width	3			200	11.	+
Space allowa			auinmont	T	$ \geq $		Ξ	25	ft	+
			equipment,		ī			25 21750		+
Needed store				nt for a sub-	o. n.t./t		=	21/50	эг	
	<u> </u>		access in tro	ont for equipm	ent/truc	KS		100	<i>c</i> i	-
	) of storage a	rea					=	120		+
Length of sto	orage pile				<u> </u>		=	181		
				Product Stora	age Area	a =			ft. W	
								200	ft. L	
<b>Retail Sales</b>										
		n goes o	ut in transfer	trailers, 10%	is small	truck	re	etail sales		
Truck loading										
	Dump trailer of	dimensio	ns with 30' o	on either side f	or loadi	ng:	=	68.5	ft W	
								53	ft L	
Retail sales:										
	Pick up truck	dimensi	ons with 30'	on either side	for load	ling:	=	64	ft W	
						<u> </u>		20		
Area needed							=	4911		
	Add another	25% for	vehicle quei	Jina	1		=	1228		1
					Total			6138		1
Dimensions:							=		ft. W	+
							_		ft. L	+
							Ē	00	п. <b>ш</b>	+
Area Summa	ar\/		Width	Length	Are	2	$\square$	Area		+
	y						$\vdash$			+
Eoodata ali Di	againt		(ft.)	(ft.)	(sq. 1		$\vdash$	(acres)		+
Feedstock Re			40	40	1,60	0	$\square$	0.04		+
Feedstocks S	ě.			0.0	100		$\square$	0.01		+
Food was	tes		20	20	400		Ц	0.01		
000			20	20	400		Ц	0.01		
Leaves			80	250	19,9			0.46		
Wood chip			80	105	8,40			0.19		<u> </u>
Yard wast			75	80	6,00			0.14		
Overs from			25	30	750			0.02		
Composting I	Pad		150	175	26,2	50		0.60		
Curing Pad			225	425	95,6	25		2.20		
Screening Ar	ea		60	75	4,50			0.10		
Product Stora			120	200	24,0			0.55		
Retail Sales A			80	80	6,40			0.15		
					194,2			4.46		1
Allowance for	requipments	torage r	novement e	tc. @ 25%	242,7			5.57		1
				<u></u>	,/	• •	ш	0.01		

	ste Compost	ing - rotar	<u>y drum com</u>	posting				
Assumptions. 1. Facility is c		vook (212	dava/voor)					
				ng, turned wind	drow curing	(turned with	loador)	
2. I achity will	use lotary un			ig, tunned wind			i ioauei)	
Waste Volun	nes (in cubic	vards)			h			
Hubb Fold	<u>100 (11 00010</u>	Juiuoj				A		
	-1					Avera	ge Daily V	
I/C/I food was					<u>.</u>		25.6	CY/day
Residential fo	od wastes				<u>.</u>			
Leaves Sawdusts					·		15.6 0.4	
Wood chips					·		18.3	
MVRD yard w	astas				ł		11.5	
OCC	45165				1		11.3	
Compost recy	ICLE				<u>.</u>		6.7	
Overs from so							15.9	
01013 110111 30	Totals				r			CY/day
	101015				r		121.4	Olliday
Composting	Materials Flo	ows			1			
			postina (wint	tertime conditio	ons)			
			Composting		Curing		Total	
	Rotary Drum		5	days	90	days		days
	s going to co	mposting						
		Daily volu	mes of mixed	d feedstocks =	•		121.4	CY/day
Volume of ma	aterial in Prima							
			Residence	Mixed				
			Days	feedstocks				
	Windrow		5	607				
	s going to cu	ring (assur	ne 30% volu	me shrink in co	omposting)			
		Daily volu	mes of comp	osted feedsto	cks =		85.0	CY/day
Volume of ma	aterial in Curir							
			Residence	Composted				
			Days	Feedstocks			<u> </u>	
	Windrow		90	7,647				
Daily Volume	s going to scr			volume shrink i	n curing):			
		Daily volu	mes of cureo	d feedstocks =			76.5	CY/day
Screening	a. Assume	) approx. 8	0% finished	compost captu	ure rate and	20% going	to overs	
	b. Finishe		t production					
				ened compost	=			CY/day
	c. Daily vo						15.3	CY/day
	d. Finisheo			annually, base		ay year)		
		Annual vo	plume of scre	ened compost	i =		19,088	CY/year
					<u> </u>			
Feedstocks		L <u></u>						
			nce/week (e	xcept leaves)				
	wastes deliv				ł		040.0	0//11
Size receipts	area for 2.0x	average of	ally volume			=		CY/day
	uipment to m	love reeds	tocks into sto	orage	<u>.</u>	=		CF/day
Assumed pile	neight					=		ft
Pile footprint						=	1092	5F
	ent access/mo	ovement					E 4 C	0
Receipt area Proposed din		1			ł	=	546	
	JEOSIONS	· · · · · ·				=	1639	SF
						= = =	1639 40	SF ft. W
						= = = 	1639 40	SF
						= = = 	1639 40	SF ft. W
Feedstocks	Storage	astes	er & OCC in	rectangular ca			1639 40 40	SF ft. W ft. L
Feedstocks Assume stora	Storage age of food w	astes, pap	er & OCC in	rectangular co	ncrete bloc		1639 40 40	SF ft. W ft. L
Feedstocks Assume stora Food Wastes	Storage age of food w		ver & OCC in	rectangular cc	ncrete bloc	k bunkers,	1639 40 40 rest in ope	SF ft. W ft. L en piles
Feedstocks Assume stora Food Wastes Food wastes	Storage age of food w in recipe daily	у		rectangular cc	oncrete bloc	k bunkers, =	1639 40 40 rest in ope	SF ft. W ft. L en piles CY
Feedstocks Assume stora Food Wastes Food wastes Assume a ma	Storage age of food w in recipe dail aximum storag	y ge period p	prior to use	rectangular cc	oncrete bloc	k bunkers, = =	1639 40 40 rest in ope 42 2	SF ft. W ft. L en piles CY days
Feedstocks Assume stora Food Wastes Food wastes Assume a ma	Storage age of food w in recipe daily	y ge period p	prior to use	rectangular cc	oncrete bloc	k bunkers, = = =	1639 40 40 rest in ope 42 2 90	SF ft. W ft. L en piles CY days CY
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu	Storage age of food w in recipe dail aximum storag me needed fo	y ge period p	prior to use	rectangular cc	Dincrete bloc	k bunkers, = =	1639 40 40 40 40 40 40 40 40 40 2,430	SF ft. W ft. L en piles CY days CY CF
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunk	Storage age of food w in recipe daily aximum storag me needed fo ker depth	y ge period p	prior to use	rectangular cc	Dincrete bloc	k bunkers, = = = =	1639 40 40 40 40 40 40 40 40 40 40 40 40 40	SF ft. W ft. L en piles CY days CY CF ft
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunk	Storage age of food w in recipe daily aximum storag me needed fo ker depth rint	y ge period p	prior to use	rectangular cc	increte bloc	k bunkers, = = = =	1639 40 40 rest in ope 42 2 90 2,430 4 608	SF ft. W ft. L en piles CY days CY CY CF ft SF
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunk	Storage age of food w in recipe daily aximum storag me needed fo ker depth rint	y ge period p	prior to use	rectangular co	ncrete bloc	k bunkers, = = = = = = =	1639 40 40 rest in ope 42 2 90 2,430 4 608 20	SF ft. W ft. L en piles CY days CY CY CF ft SF ft W
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunk Bunker footp Proposed din	Storage age of food w in recipe daily aximum storag me needed fo ker depth rint	y ge period p	prior to use	rectangular cc	ncrete bloc	k bunkers, = = = = = = = = =	1639 40 40 rest in ope 42 2 90 2,430 4 608 20	SF ft. W ft. L en piles CY days CY CY CF ft SF
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunh Bunker footp Proposed din OCC	Storage age of food w in recipe daily aximum storag me needed fo ker depth rint mensions	y ge period p or food wa:	prior to use	rectangular cc		k bunkers, = = = = = = = = =	1639 40 40 rest in ope 42 2 90 2,430 4 608 20 30	SF ft. W ft. L cn piles CY CY CF ft SF ft W ft L
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunh Bunker footp Proposed din OCC OCC in recipe	Storage age of food w in recipe daily aximum storag me needed fo ker depth rint mensions e daily (on ave	y ge period p or food wa:	prior to use	rectangular cc		k bunkers, = = = = = = = = = =	1639 40 40 rest in ope 42 2 90 2,430 4 608 20 30 11.4	SF ft. W ft. L cn piles CY CY CF ft SF ft W ft L CY
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunk Bunker footp Proposed dir OCC OCC in recipe Assume a sto	Storage age of food w in recipe daily aximum storag me needed fo ker depth rint mensions	y ge period p or food was erage) y	prior to use stes	rectangular cc	oncrete bloc	k bunkers, = = = = = = = = = = = = =	1639 40 40 7 est in ope 42 90 2,430 4 608 20 30 11.4 7	SF ft. W ft. L cn piles CY CY CF ft SF ft W ft L
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunk Bunker footp Proposed dir OCC OCC in recipe Assume a sto	Storage age of food w in recipe daily aximum storag me needed for ker depth rint nensions e daily (on avorage capacit	y ge period p or food was erage) y	prior to use stes	rectangular cc	Dincrete bloc	k bunkers, = = = = = = = = = = = = = = =	1639 40 40 7 est in ope 42 90 2,430 4 608 20 30 11.4 7	SF ft. W ft. L n piles CY days CY CF ft SF ft W ft L CY days CY
Feedstocks Assume stora Food Wastes Assume a ma Storage volu Assume bunk Bunker footp Proposed din OCC OCC in recipe Assume a sto Storage volu	Storage age of food w in recipe dail aximum storag me needed fo ker depth rint nensions e daily (on av orage capacit me needed fo	y ge period p or food was erage) y	prior to use stes	rectangular co	increte bloc	k bunkers, = = = = = = = = = = = = = = = = = = =	1639 40 40 7 est in ope 42 2 90 2,430 4 608 20 30 30 11.4 7 80 2,160	SF ft. W ft. L CY days CY CF ft SF ft W ft L CY days CY CF
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunk Bunker footp Proposed din OCC OCC in recipe Assume a sto Storage volu Assume bunk	Storage age of food w in recipe dail aximum storag me needed fo ker depth rint nensions e daily (on av orage capacit me needed fo ker depth	y ge period p or food was erage) y	prior to use stes	rectangular cc		k bunkers, = = = = = = = = = = = = = = = = = = =	1639 40 40 rest in ope 42 2 90 2,430 2,430 4 608 20 30 11.4 7 80 2,160 6	SF ft. W ft. L m piles CY days CY CF ft W ft L CY days CY CF ft
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunh Bunker footp Proposed din OCC OCC in recipe Assume a sto Storage volu Assume bunh Bunker footp	Storage age of food w in recipe daily aximum storage me needed for wer depth rint e daily (on avy prage capacity me needed for ker depth rint	y ge period p or food was erage) y	prior to use stes	rectangular cc		k bunkers, = = = = = = = = = = = = = = = = = = =	1639 40 40 40 rest in ope 42 2 90 2,430 4 608 20 30 4 11.4 7 80 2,160 6 360	SF ft. W ft. L m piles CY days CY CF ft ft W ft L CY days CY CF ft ft SF ft ft SF ft SF ft SF
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunh Bunker footp Proposed din OCC OCC in recipe Assume a sto Storage volu Assume bunh Bunker footp	Storage age of food w in recipe daily aximum storage me needed for wer depth rint e daily (on avy prage capacity me needed for ker depth rint	y ge period p or food was erage) y	prior to use stes	rectangular cc		k bunkers, = = = = = = = = = = = = = = = = = = =	1639 40 40 rest in ope 42 2 90 2,430 4 608 20 30 30 11.4 7 80 2,160 6 360 20	SF ft. W ft. L cr piles CY days CY CF ft SF ft W ft L CY days CY CF ft SF ft SF ft K SF ft K SF ft K
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunh Bunker footp OCC in recipe Assume a sto Storage volu Assume bunh Bunker footp Proposed din	Storage age of food w in recipe daily aximum storage me needed for wer depth rint e daily (on avy prage capacity me needed for ker depth rint	y ge period p or food was erage) y or paper/O	orior to use stes			k bunkers, = = = = = = = = = = = = =	1639 40 40 rest in ope 42 2 90 2,430 4 608 20 30 30 11.4 7 80 2,160 6 360 20	SF ft. W ft. L m piles CY days CY CF ft ft W ft L CY days CY CF ft ft SF ft ft SF ft SF ft SF
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunk Bunker footp Proposed din OCC in recipe Assume a sto Storage volu Bunker footp Proposed din Bunker footp Proposed din	Storage age of food w in recipe daily aximum storag me needed for ker depth rint nensions e daily (on avo orage capacity me needed for ker depth rint nensions	y ge period p or food was erage) y or paper/O	orior to use stes	rectangular co		k bunkers, = = = = = = = = = = = = =	1639 40 40 rest in ope 42 2 90 2,430 4 608 20 30 4 11.4 7 80 2,160 6 360 20 20	SF           ft. W           ft. L           m piles           CY           days           CY           Gays           CY           days           CY           Gays           CF           ft           CY           days           CF           ft           SF           ft           SF           ft           SF           ft W           ft L
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunk Bunker footp Proposed din OCC OCC in recipe Assume a sto Storage volu Assume bunk Bunker footp Proposed din Leaves	Storage age of food w in recipe daily aximum storage me needed for wer depth rint e daily (on avy prage capacity me needed for ker depth rint	y ge period p or food wa erage) y or paper/O Assume s to be han	orior to use stes	ezoidal piles o		k bunkers, = = = = = = = = = = = = = = = = = = =	1639 40 40 40 7 est in ope 42 2 90 2,430 4 608 20 30 4 608 20 30 20 2,160 6 360 20 20 20 4,868	SF           ft. W           ft. L           m piles           CY           days           CY           CF           ft W           ft L           CY           CF           ft SF           ft W           ft L           SF           ft W           ft CY           CF           ft           CY           CF           ft           CY           CF           ft           CY           CF           ft           CY           CF           ft           CY           CF           ft           CY/yr
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunl Bunker footp Proposed din OCC OCC in recipe Assume a sto Storage volu Assume bunl Bunker footp Proposed din Leaves Annual volun	Storage age of food w in recipe dail aximum storag me needed fo ker depth rint nensions e daily (on av orage capacit me needed fo ker depth rint nensions hes of leaves	y ge period p or food wa erage) y or paper/O Assume s to be han Assume a	orior to use stes CC CC tored in trap dled all come in No	ezoidal piles o		k bunkers, = = = = = = = = = = = = =	1639 40 40 40 7 est in ope 42 2 90 2,430 4 608 20 30 4 608 20 30 4 608 20 30 20 20 20 20 20 20 20 20 20 20	SF           ft. W           ft. L           m piles           CY           days           CY           days           CY           ft           SF           ft W           ft           CY           CF           ft           SF           ft           SF           ft           CY           CF           ft           CY           CF           ft           CY/yr           CF
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunk Bunker footp Proposed din OCC OCC in recipe Assume a stor Storage volu Assume bunk Bunker footp Proposed din Leaves Annual volun Assume max	Storage age of food w in recipe dail aximum storage me needed for wer depth rint nensions e daily (on avy prage capacity me needed for wer depth rint nensions ensions mes of leaves imum storage	y ge period p or food wa erage) y or paper/O Assume s to be han Assume a	orior to use stes CC CC tored in trap dled all come in No	ezoidal piles o		k bunkers, k bunkers, = = = = = = = = = = = = =	1639 40 40 40 rest in ope 42 2 90 2,430 2,430 30 4 608 20 30 2,160 6 360 20 20 20 4,868 131,436 10	SF ft. W ft. L CY days CY CF ft W ft L CY CF ft SF ft CY CF ft SF ft U CY CF ft CY CF ft ft CY CF ft
Feedstocks Assume stora Food Wastes Food wastes Assume a ma Storage volu Assume bunh Bunker footp Proposed din OCC OCC in recipe Assume a sto Storage volu Assume bunh Bunker footp Proposed din Leaves Annual volun Assume max Assume pile	Storage age of food w in recipe dail aximum storage me needed for wer depth rint nensions e daily (on avy prage capacity me needed for wer depth rint nensions ensions mes of leaves imum storage	y ge period p or food was erage) y or paper/O Assume s to be han Assume <i>a</i> pile heigh	crior to use stes CC CC cc itored in trap dled all come in No t	ezoidal piles o		k bunkers, = = = = = = = = = = = = =	1639 40 40 40 rest in ope 42 2 90 2,430 4 608 20 30 2,430 4 608 20 30 2,160 6 6 360 20 20 20 4,868 131,436 10 30	SF ft. W ft. L CY days CY CF ft W ft L CY CF ft SF ft CY CF ft SF ft U CY CF ft CY CF ft ft CY CF ft

Total linear footage of sto	rage piles	needed	VOLUME (V) = L x H	x ( <u>P+0</u> )	=	660	LF
Assume pile length			where, L - Length		=	200	ft.
Number of storage piles n	eeded		H - Height	8	=	3	
Space allowance around	oiles for eq	uipment, etc	P - Base Width	a Buzzle, o	=	25	ft
Needed storage area foot	print		Q - Top Width		=	19900	SF
Proposed dimensions				Comment	=	250	ft L
			Р	L	=	80	ft W
Wood chips	Assume s	tored in trap	ezoidal piles o	utdoors			
Wood chips in recipe daily					=	18	CY/day
Assume a storage period					=		days
Storage volume needed for					=	550	
eterage volume needed it		ipo			=	14,850	-
Assume maximum storage	nile heigh	t			=	10	
Assume pile base width	plie neigh				=	30	
		V=1/2/D1+D	0)*11*1 \		_		
Volume per linear foot (tra			32)"H"L)		=		CY/LF
Total linear footage of sto	rage piles i	needed			=	80	
Assume pile length	<u> </u>				=	80	ft.
Number of storage piles n					=	1	
Space allowance around	<u>piles for eq</u>	uipment, etc			=	25	
Needed storage area foot	print				=	2450	SF
Proposed dimensions					=	105	ft L
					=	80	ft W
Yard waste	Assume s	tored in trap	ezoidal piles o	utdoors			
Yard waste in recipe daily					=	11	CY/day
Assume a storage period					=		days
Storage volume needed for					=	350	
					-	9,450	
Assume maximum stars	nilo boiat	l				9,450	
Assume maximum storage	hie neign		ļ				
Assume pile base width			0)*1.1*1.)		=	30	-
Volume per linear foot (tra			32)*H*L)		=		CY/LF
Total linear footage of sto	rage piles	needed			=	50	
Assume pile length					=	50	ft.
Number of storage piles n	eeded				=	1	
Space allowance around	oiles for eq	uipment, etc			=	25	ft
Needed storage area foot	print				=	1550	SF
Proposed dimensions					=		ft L
					=	80	ft W
Overs from screening	1	Assume sto	red in trapezoi	dal piles ou	tdoors		
Screen overs in recipe dai	ly (on aver				=	16	CY/day
Assume a storage period					=		days
					_	120	
Storage volume needed for		overs			-		
ļ.,	L				=	3,240	
Assume maximum storage	pile heigh	t			=	10	
Assume pile base width					=	30	
Volume per linear foot (tra			32)*H*L)		=		CY/LF
Total linear footage of sto	rage piles i	needed			=	20	
Assume pile length					=	20	ft.
Number of storage piles n	eeded				=	1	
Space allowance around	oiles for eq	uipment, etc			=	25	ft
Needed storage area foot	print				=	650	SF
Proposed dimensions					=	25	ft L
					=		61. 1. 1. 1
	1				-	30	ft VV
Feedstock Mixing					-	30	ft W
Assume all feedstock mixing	1				-	30	ft VV
	na done hi	windrow tur	ner on pad		-	30	ft VV
	ng done by	y windrow tur	ner on pad		-	30	ft VV
	ng done by	y windrow tur	ner on pad		- - -	30	ft VV
Active Composting		y windrow tur	ner on pad		- - - - -		
		y windrow tur	ner on pad		=	12	ft diameter
Active Composting Assumed dimensions of ro	otary drum		ner on pad		= =	12 165	ft diameter ft long
Active Composting	otary drum		ner on pad		= = =	12 165 44,787	ft diameter ft long CF
Active Composting Assumed dimensions of ro Volume of drum at 60% fu	tary drum II (V= π x <sup>2</sup> r		ner on pad			12 165 44,787 1,659	ft diameter ft long CF CY
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A								
Average line	ar footage of			/ volume per lir	oor foot	=	27	LF / day
Total volume				ay curing period		=	7,647	
	ootage of mat			ry curing period		=	2,418	
	ccupied by wir					=	38,696	
	h curing windr		days (1 bui	lt/week)			,	
			38 CY/day co			=	510	CY
Number of w	indrows in cur					=	15	windrows
Length of ea	ch windrow					=	161	ft
		en windro	ws and 20' v	vorking space	at each end	ł		
Each windrov	w is							
		Length	167 ft + 20			=	201	
		Width	16 ft + 20 ft			=	36	
			ach windrow	<u>()</u>		=	7,244	
			ll windrows (g			=	108,666	
Assume pad	length is equ			gth		=	201	
		Pad width	IS			=	540	
				Curing Pad =				ft. W
							210	π. L
Saraaning 8	Broduct Sto	rogo Sizin	a and Lava	ut Calculations				
	of trommel sc				5			
	roximately 80							
	months finish							
	going to scre		si sioraye			=	76	CY/day
	going to stor					=		CY/day
	of overs recy		lking agent			=		CY/day
Screen size			agont			Length	24.5	
						Width		ft
Allow 25 ft a	ll sides for equ	uipment mo	ovement				-	
				Screening Are	ea =		60	ft. W
							75	ft. L
Total Volume	in Storage P	lile						
		Daily volu	me x 6 days	/week operatio	n x 4 month	ns capacity	5,873	CY
						=	158,578	
	imum storage	pile heigh	t			=	10	
Assume pile						=	30	
	inear foot (tra			32)*H*L VOLUME (V) =	L X H X (P+Q)	=		CY/LF
	ootage of stor	rage piles i	needed	where, L - Length H - Height			800	
Assume pile				P - Base Widt			200	ft.
	orage piles n			Q - Top Width	But	=	4	
	ance around p		uipment, etc	·		=	25	
	age area foot		in <i>f</i>	1 fo a o av la mo o a	4/4	=	24150	SF
			ccess in fron	t for equipmen	t/trucks	=	120	£4
Length of sto	) of storage a	lea				-	201	
Length of sit	liage plie			Product Stora	ao Aroa -	-		ft. W
				FIDUUCI SIDIA	<u>ye Alea –</u>		240	
Retail Sales	Area						240	п. с
			in transfer t	railers, 10% is :	small truck i	etail sales		
Truck loading		i gues un						
		dimension	s with 30' on	either side for	loading	=	68.5	ft W
			00 011					ft L
Retail sales:	1						00	
	Pick up truck	dimension	ns with 30' or	n either side fo	r loading:	=	64	ft W
					g.			ft L
Area needeo	ł	1			1	=	4911	
	Add another	25% for v	ehicle queuir	ng	1	=	1228	
				~		Total	6138	
		1			1	=		ft. W
Dimensions:						1		ft. L
Dimensions:						=	60	
Dimensions:						=	00	
	ary		Width	Length		= <u>Area</u>	Area	
Dimensions: Area Summa	ary		<u>Width</u> (ft.)	Length (ft.)				
<b>Area Summ</b> Feedstock R	eceipt					Area	Area	
Area Summ Feedstock R Feedstocks S	eceipt Storage		(ft.)	(ft.) 40		<u>Area</u> (sq. ft.) 1,600	<u>Area</u> (acres)	
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## Appendix C - Aerated Static Pile information from AgriLabs & Engineered Compost Systems



# The Compost Hot Box 250R™

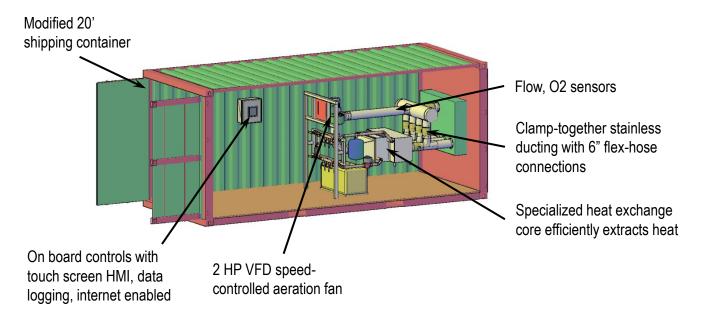
The Compost Hot Box 250R<sup>™</sup> is a mobile plug and play compost aeration and heat recovery system with recirculation capability, featuring Agrilab Inside<sup>™</sup> technology designed for negatively aerated or enclosed composting systems on medium to large scale farms and commercial/municipal compost operations.

Aerated Static Pile processing means minimal mechanical tumbling of material is required to aerate and break down the material into stable compost.

It includes remote data monitoring, computerized controls, hot water, and condensate recirculation systems. Aeration exhaust can be automatically vented back into the compost for moisture and heat retention, or directly into a bio-filter for odor control. Everything is assembled in a standard 20ft intermodal cargo container for easy setup alongside existing structures or other enclosures. Data captured is used to optimize compost production efficiency and quality. System documents temperature and oxygen level tracking to meet Process for Further Reduction of Pathogens (PFRP) quality standards, and maximize renewable thermal energy captured.

## Annual Maximum Compost Volume Processing Capacity: 700 CY/month or 8,400 CY/year

## Annual Maximum Energy ROI when heating water to 120F based on \$15 per million Btu energy prices: \$30,000+



## What is Agrilab Inside<sup>™</sup>?

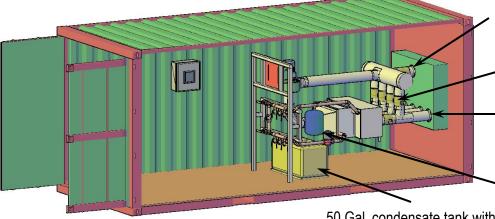
- The patented Agrilab Inside<sup>™</sup> process takes aerated compost systems to the most advanced level with the ability to modulate air flow rates relative to oxygen and temperature levels, capturing useful heat and moisture, and recirculating compost vapor or fresh air into the compost to optimize heat and moisture levels.
- Renewable thermal energy captured as moist hot compost vapor is run through specialized heat exchangers where water is heated and condensate water is reclaimed. Aeration exhaust can be automatically sent back into the compost for moisture and energy optimization. Cooled aeration vapor can be vented directly into a bio-filter for odor control.
- This process is the first and most advanced compost heat recovery system available and saves time and money compared to turned windrow composting. Agrilab Inside™ optimizes the overall composting process and enables effective bio-filter odor control, fast compost production and predictable heat and water recovery.



# Compost Hot Box 250R™

The Compost Hot Box 250R<sup>™</sup> is an integrated, plug and play system that contains the core mechanical and control equipment for aerated composting with heat recovery - the "brains, lungs and heart" of the system. The Hot Box 250R<sup>™</sup> is designed for aeration flow of 100 to 350 cubic feet per minute, with 4 compost batch zones and the ability to recirculate into any zone for additional heat recovery. All pumps, blowers and valves are controlled by an on board SCADA system with touch screen interface, data logging and remote monitoring software.

Specifications:	
Dimensions, Installation:	Customized metal shipping container; 8' wide by 20' long by 8' high, ~6,000 lbs. 6" hoses for compost aeration and exhaust connections.
Aeration:	3 Horsepower blower, speed controlled, 100 to 350 CFM range adjusted manually or with feedback controls. Four compost and exhaust zones with fresh air intake.
Recirculation:	Exhaust from any compost zone can be injected into another zone. This conserves heat and moisture, and can jump-start cold or frozen material.
Sample Heating Output:	<ul> <li>With 250 CFM of saturated 140F compost exhaust:</li> <li>124,000 Btu heating loop: 9 GPM heated from 100F to 128 F</li> <li>160,000 Btu water pre-heating: 5 GPM heated from 55 to 120 F</li> <li>With 350 CFM of saturated 140F compost exhaust:</li> <li>151,000 Btu heating loop: 12 GPM heated from 100 to 125 F</li> <li>237,000 Btu water pre-heating: 8.75 GPM heated from 55 to 110 F</li> </ul>
Monitoring:	<ul> <li>Parameters can be used to optimize composting and heat recovery, linked to SCADA system:</li> <li>Oxygen level of compost vapor</li> <li>Temperatures at all critical points</li> <li>Air and water flow rates</li> </ul>
Control:	<ul> <li>Touch screen with web server for intuitive operator control</li> <li>Full control and monitoring via internet. Remote support available by contract.</li> <li>Expandable to control auxiliary systems (i.e. greenhouse climate control)</li> </ul>
Delivery, Purchase or Lease:	Delivery/shipping to be paid for directly by buyer with logistics support from AGT. Purchase includes 8 hours of remote startup support during the first week of operation. Site preparation, Hot Box installation and on going technical support packages available under separate agreement. No \$ down lease-to-own financing is available.



- 6" Exhaust may be sent to bio-filter
  - Actuated dampers modulate air flow
  - (4) 6" Compost zone connections

"Plug and play" hydronic system including pump and expansion tank

50 Gal. condensate tank with pumped & gravity outflows

#### Date: April 3, 2018 at 10:57 AM

To: Bob Spencer spencebbc@aol.com

Cc: ccoker@cokercompost.com, jason@agrilabtech.com, Jaime Tibbits jaime@agrilabtech.com

#### Hi Craig and Bob-

Here are some responses to your questions above.

At full build-out of 121 cy/day, assuming 600 cy/week inputs, 3 modular units would provide 3-4 weeks capacity. Depending on the bulk density and oxygen demand of the "standard recipe", each modular system could have 4 aeration bays of 150 cy each. Actual capacity could be up to 200 cy per bay but this provides some margin of safety. 3 modular systems would then have a total 12 aeration bays of 1800 cy aeration capacity (and up to 2400 cy with more porous/lower bulk density blends). Typical batches would have a 3 week aeration retention time before being moved to windrows for further composting and curing.

As the facility would likely take months or years to achieve full capacity, the modular systems could be built out in phases, spreading out capital costs for the operator.

Oxygen levels are targeted for 5-15% and are achieved through adjusting fan speed, and length of aeration cycle. On-board oxygen sensors provide the operator and remote support staff trending graphs to adjust settings to achieve desired oxygen and temperature levels.

We have primarily used NY Blowers and would expect a project of this scale to use 2 to 3hp fans. Actual sizing would depend both on targeted batch size and length (and diameter) of pipe runs.

Biofilter sizing matches the "neighbor sensitivity" of the site, but generally with typical operation of a system of this size having 3 bays under aeration at one time, in a rotating schedule, a biofilter would need roughly 500-600 cy of carbon-rich media to match the vapor/air handling on the incoming aeration side. A secondary booster fan can be evaluated based on predicted resistance. Leaving space to expand biofilter cells is recommended if observed odors exceed desired levels.

We do not typically specify number of air exchanges per hour as we recommend composting building have ample passive ventilation through exaggerated ridge vents in metal-sided pole barn structures or mesh gable end vents in coverall type buildings. We do not recommend insulated buildings for several reasons - initial cost and need to included active ventilation. We have seen systems in operation up to 12 years without moisture condensation and rusting issues on hardware, trusses and roofs using these passive ventilation approaches. With primarily negative aeration, less vapor is released into the building head space versus positive aeration. If active ventilation was absolutely necessary at a facility, we would consult with other building professionals. We see the primary benefits of enclosures to be stormwater management, and avoiding direct wind on windrows wicking away heat.

While I am unfamiliar with your proposed location and possible heating loads I can share applications of recovered compost thermal energy that have been implemented or considered. Product drying to reduce screening costs could likely justify the investment. A quick economic assessment can be completed for one or more of these energy off-takes:

Building heating - office, shop (radiant floor, baseboard or hydronic modine-style heaters)

Greenhouse heating - in floor or under-bench, or modine-style heaters for product testing or diversification of plant/crop sales Wash water - food scrap totes, trucks and equipment

Product drying - used for drying down finished compost prior to screening (can significantly increase screening yields/hour) and bagging. Also applied to some feedstocks such a green (non-kiln dried) sawdust, short paper fiber or wood chips to increase absorbency.

Recovered thermal energy is also applied to the composting process via recirculated hot vapor to new batches of cold feedstocks or reheating overcooled compost batches. This capability also acts to accelerate decomposition rates, given it achieves reversing aeration, primarily negative but also positive.

We can add more detail to several of these responses as needed for this phase to rough in estimated costs. We would not complete detailed engineering calculations until engaged in a technical services agreement or other design contract.

Thanks again for the interest. I have a site visit this afternoon but can follow up on additional details as needed tomorrow. I've copied Jason and Jaime on our team in case they can also respond while I'm out of the office.

Thanks Brian

On Thu, Mar 29, 2018 at 9:21 AM, Bob Spencer <<u>spencebbc@aol.com</u>> wrote: Craig:

Brian should be able to address your questions by early next week.

Bob Spencer Environmental Planning Consultant <u>15 Christine Court</u> BJ

Vernon, Vermont 05354 978-479-1450

-----Original Message-----From: Craig Coker <<u>ccoker@cokercompost.com</u>> To: Robert Spencer <<u>spencebbc@aol.com</u>> Cc: Brian Jerose <<u>brian@agrilabtech.com</u>> Sent: Thu, Mar 29, 2018 8:43 am Subject: Re: ASP for MV

Bob/Brian - enclosed is the recipe for MV; at build-out, it projects daily incoming compostables at 121 CY/day. Please modify your concept design below to reflect this incoming volume. What is the oxygen loading rate for your proposed aeration system, what blowers are you recommending, what size biofilter are you recommending, how many building air exchanges per hour are you recommending?

As there is no identified market for the recovered heat at this time, what would the cost be without heat recovery?

Craig

Craig Coker Coker Composting & Consulting <u>www.cokercompost.com</u> <u>ccoker@cokercompost.com</u> <u>540.874.5168</u>

On Mar 29, 2018, at 8:23 AM, Bob Spencer <<u>spencebbc@aol.com</u>> wrote:

Craig:

I met with Brian Jerose, President of Agrilab Technologies yesterday to discuss ASP/heat recovery for our MV project.

See current issue of BioCycle for my article on the Agrilab system at Vermont Natural Ag Products.

Based on the design at VNAP, Brian proposes the following modular ASP approach for MV:

- 3,000 sf asphalt pad
- Four 12' X 60' windrows with dual 8" diameter recessed HDPE aeration pipes, sloped for leachate drainage to retention pond
- Each windrow contains 200 cy, for a total of 800 cy on ASP
- 14 day retention time on ASP
- Hot Box heat exchanger and computer controls for heat capture and accelerated composting/product drying (spec sheet attached)
- 50' X 80' Coverall building
- biofilter

Estimated capital cost \$200,000.

Agrilab would charge \$6,000 - \$10,000 for construction plans (no PE stamp), and provide construction oversight for \$5,000.

Additional pad, ASP, Hot Box at \$200,000 each.

Larger pads can be designed.

For MV, the Agrilab system qualifies for funding from the Massachusetts Clean Energy Center as renewable energy, and was recently awarded feasibility study funding, and construction funding at Dave Smith's Black Gold Compost facility which you designed with Andrew Carpenter.

We can set up a time to talk with Brian on Friday this week. He's hosting an open house at a new installation in CT today (see attached).

Bob Spencer Environmental Planning Consultant <u>15 Christine Court</u> Vernon, Vermont 05354 <u>978-479-1450</u> <Compost-Hot-Box-250R-SpecSheet-March2017.pdf><Collins Powder Hill Dairy Farm-Compost Aeration and Heat Recovery Open House.pdf>

--Brian Jerose, President/Co-founder Agrilab Technologies Inc. (802) 933-8336 office (802) 370-4774 mobile brian@agrilabtech.com www.agrilabtech.com www.facebook.com/agrilabtech



### ECS Multi-Use ASP Pilot System

ECS ASP pilot systems allow operators to run simultaneous batches with different control settings, aeration types (positive, negative, and reversing), retention times, pile geometries and configurations. The ECS Pilot System mechanical components and skid-mounted controls are pre-tested at our shop. They typically have 4 compost piles/zones each holding around 200 yd3. The zones can be configured as three sided bunkers, in a massbed or as individual piles. The pilot can also be placed within a fabric building with building air capture and scrubbing through a biofilter to best



simulate an in-vessel facility. Each zone is individually and automatically monitored and controlled and can be run in a specific way to test a design hypothesis prior to investing in a major infrastructure project. The pilot system can include a controlled and monitored biofilter to scrub the air from piles when zones are in negative mode or when building air above the piles needs to be filtered.

### **ECS ASP Pilot Equipment Description**

The ECS ASP Pilot System has two aeration fans; one to provide positively pressured air to the composting zones and one to provide negatively pressured air by drawing from each zone and exhausting to a biofilter. The speed of each fan is controlled by a variable frequency drive (VFD) located on the Control Skid which determines how much air is being provided to each compost pile. The Supply Fan (for positive aeration) and Exhaust fans are mounted on the Control Skid that is pre-wired to the VFDs.

The Control Skid houses most of the pre-mounted and pre-wired electronics of the pilot system. The skid requires a 480VAC, 3 phase power connection. The CompTroller<sup>™</sup> Server has an industrial embedded computer, with UPS, that runs the pilot system and provides an operator interface webpage for managing the system. The Control Server requires access to the internet, and is provided with a wireless interface and antenna so that it can be connected to a wi-fi network provided by the site.





### **ECS Pilot Description**

The four individual compost zones are approximately 21' wide by 57' long (see attached drawing 261-M01). Each zone or pile requires two 6" HDPE aeration sparger pipes that are approximately 60' long. ECS supplied sparger pipes include specially reinforced ends with pull cables so they can be removed with a FEL prior to breaking the pile down. In addition to the zone sparger pipes, the pilot system uses pipe on grade sparger pipes for the 30' x 40' odor scrubbing biofilter.

The negative aeration plenum (suction), and the biofilter plenum, are made of 304 stainless-steel since it handles wet corrosive compost exhaust air. The exhaust fan is made of corrosion resistant aluminum for this same reason. The positive aeration plenum is made of standard galvanized steel duct since it handles ambient air. Both plenums are connected to the zone spargers via motorized dampers. The CompTroller<sup>™</sup> system controls the motorized dampers to automatically match the air flow to the ever-changing process conditions, and can alternate between positive and negative aeration modes without operator input.

## **ECS Supplied Equipment & Services**

## A. Aeration System

- 1. Supply and Exhaust Fans
- 2. Zones to Fan Ductwork (Plenums, branches, transitions)
- 3. Duct Supports
- 4. Motorized Zone Dampers
- 5. Cooling Air Inlet Damper for Biofilter Exhaust
- 6. Fan to Biofilter Ductwork

## B. (Optional) Pipe-on-Grade Aeration System

- 1. HDPE Zone Sparger Pipes
- 2. HDPE Biofilter Sparger Pipes

## C. Control System

- 1. CompTroller<sup>™</sup> Software
- 2. Control Server
- 3. Zone Controller in J-Box (1 per zone)
- 4. Aeration Panel
- 5. Compost Temp Probes
- 6. Ambient Temp Probe
- 7. Pressure Sensor

## D. Technical Services included with the Pilot:

- 1. Pre-project on-site planning meeting
- 2. Process, mechanical and electrical drawings (ECS drawings do not carry local engineering stamps)
- 3. Technical support of construction and installation of ECS provided equipment
- 4. Operations and maintenance manual for ECS provided equipment
- 5. System start-up and training for site personnel
- 6. Remote technical support (ongoing during rental period)

# E. Technical Services NOT included with the Pilot and available on a Time and Expenses Basis

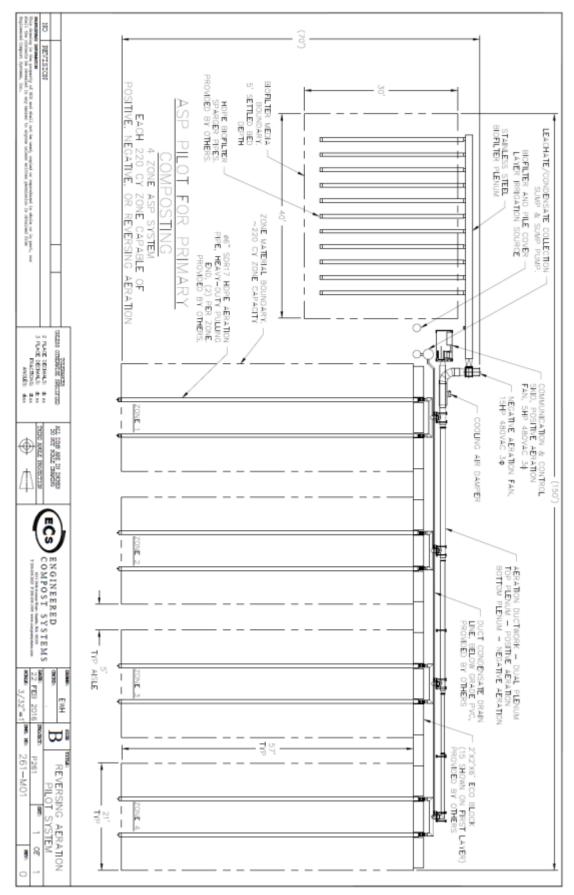
- 1. Pilot trial planning
- 2. Data collection planning
- 3. Data collection
  - a. Odor concentration and flux rate
  - b. Stability
  - c. Oxygen
  - d. pH
- 4. Odor dispersion modelling
- 5. Data analysis and report writing

## **Equipment & Services NOT Included and Supplied by Others:**

- 1. Site permits, stamped construction drawings if required.
- 2. Site preparation, construction, electrical power, electrical and mechanical installation and commodity parts
- 3. Ecology blocks for push walls
- 4. Compost leachate drain line, pumped sump, leachate/condensate tanks or other means of disposal
- 5. Pile and biofilter irrigation components (can be sourced and specified by ECS)
- 6. Biofilter media (can be sourced and specified by ECS)

### ECS Pilot Description

## System Layout Diagram





#### Pilot System Rental or Purchase Quotation

For Craig Coker Project Martha's Vineyard - Research ASP Pilot System By Steve Diddy Date 5/18/2018

**Basis of Design:** Four (4) zone pilot system. Each zone capable of Positive, Negative, or Reversing aeration. Compatible with in-floor aeration or pipe-on-grade aeration floor.

ECS Pilot System Design Data		
Nominal Throughput	tpy	5,000 - 6,000
Total Number of Zones	#	4
Zone Length	ft	56
Zone Width	ft	21
Standard Initial Pile Depth	ft	8
Zone Capacity	су	220
Standard Bio-cover Layer Depth	ft	1
Installed Fan Power	Нр	22.5
Nominal Biofilter Size	ft2	1,300
Rental Terms		
Down Payment with order		\$25,000
Monthly Rental Payment	month	\$6,000
Minimum Rental Duration	months	9
Rental Months to Ownership	months	18
Purchase Terms - Optional		
List Price		\$155,000
Discount (some components used previously)		19%
Purchase Price (instead of rental)		\$125,000

### **Pilot System Description**

**Includes:** Installation drawings and technical support; Pre-Assembled aeration and control skid; CompTroller automated controls; Aeration system; Biofilter mechanical components; Start up; Operator training; O&M Manual; and Allowances for freight FOB site & ECS staff travel expenses.

**Does not include:** Permits, civil engineering, ECS equipment installation, construction, utilities, electrical connections, biofilter media, HDPE pipe on grade aeration with pulling ends and drilled holes, specialized transition pipes to use existing in-floor aeration; HDPE biofilter pipes with drilled holes, surface water & leachate storage and treatment, access roads and storage pads, lights, utilities, buildings, pre-processing design, taxes -- Post rental equipment cleaning, demobilization, crating and shipping back to Seattle.



Appendix D - Rotary Drum Layout and Quote



From: CITIC HIC Engineering & Technology CO., LTD. 206 JIANSHE ROAD, LUOYANG, CHINA Phone: +86 0379 64087625 Fax: +86 0379 64086016 To: Mr. Pearse Okane Subject: Quotation for supply of one 12×185 feet Digester April. 11th, 2018

We are very happy to receive your enquiry for the digester; we hereby take great pleasure to quote one digester according to your requirement by email as follows:

### 1. Scope of supply of each digester:

Shell, two casting tyres, girth gear, pinion, supporting system, motor and gearbox.

### 2. Price of one digester:

Description	Price (USD)	Remarks
Design	120,000	
Equipment (FOB Shanghai)	1,579,000	
Total	1,699,000	

### **Remarks:**

1) The quotation is based on the following materials.

Description	Material
Shell	ASTM A-36
Tyre	ZG42CrMo
Girth Gear	GS42CrMo
Pinion	34CrNiMoA
Pinion shaft	35CrMo
Supporting roller	42CrMo
Supporting roller shaft	35CrMo

### 2) Remarks for all above prices:

a. The price will be adjusted accordingly if the material is changed.

b. All prices above are subject to bulk cargo ship to be used. In case of container ship, the Client shall bear any extra charge arising from it.

c. The above prices are based on the exchange rate of USD/RMB=1/6.28.



### 3. Payment:

- 30% within 7 days of the date of the Contract (to be paid by the Client to the Supplier by telegraphic transfer).

-35% shall be paid within 10 days after receipt of all the shell plates for the digester by Supplier at its manufacturing facility and finishing the casting work of the tyre. -35% shall be paid at ex-work before delivery

### 4. Delivery

240 consecutive calendar days after drawing confirmation.

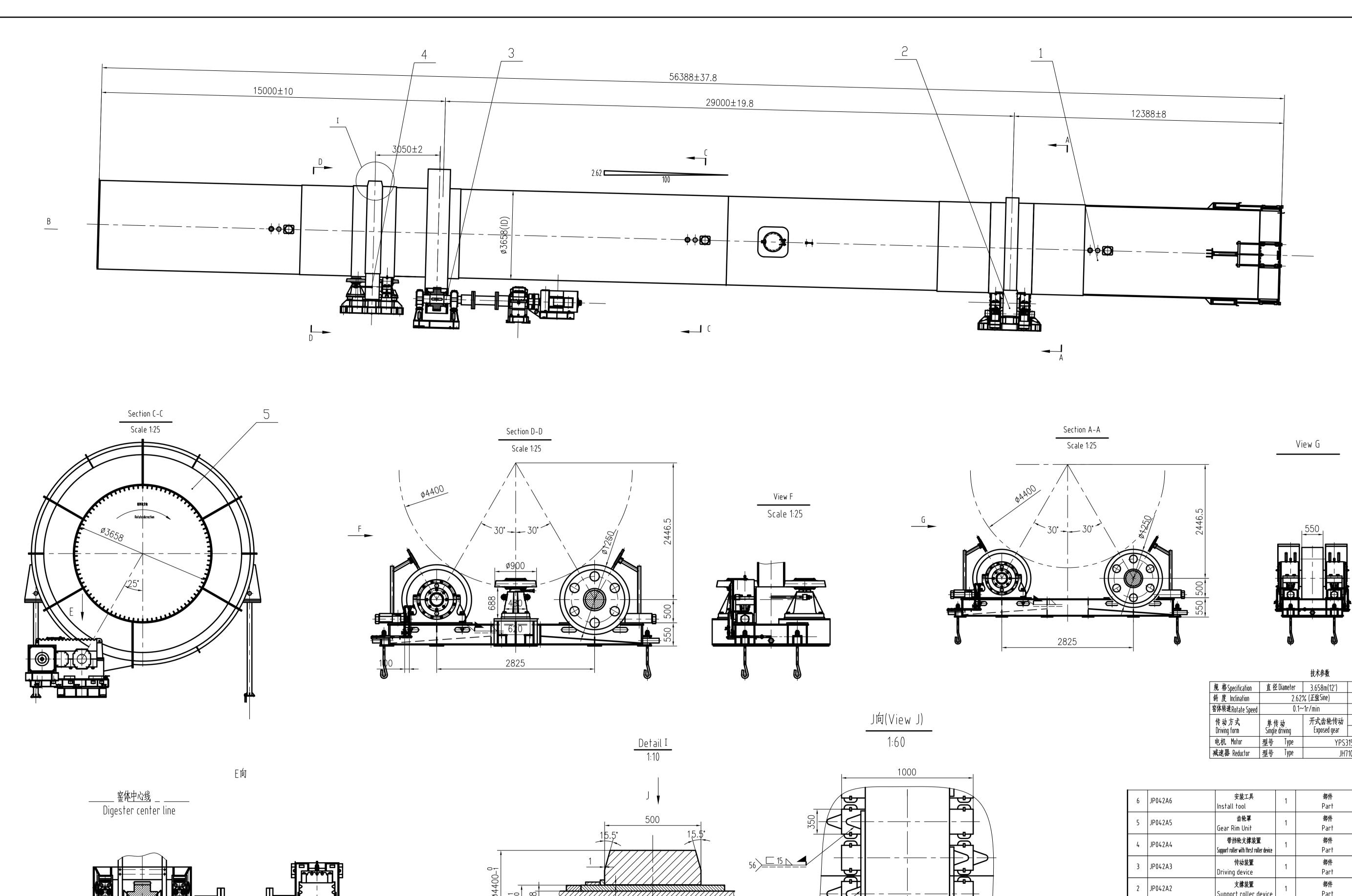
### 5. Warranty:

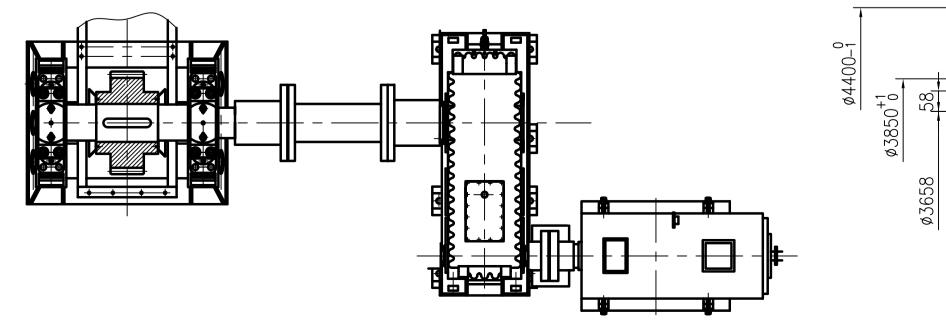
The warranty period for Products amounts to 18 months from FOB Shanghai shipping date or twelve (12) months from the date of commissioning, whichever comes first.

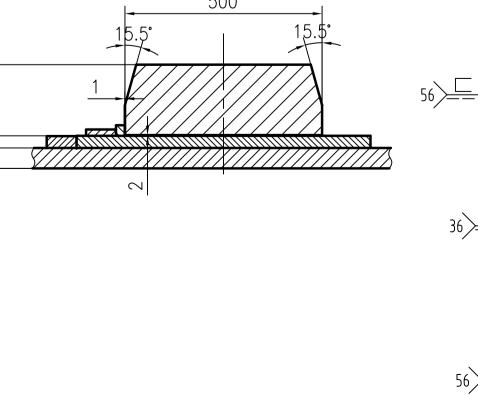
### 6. Validity

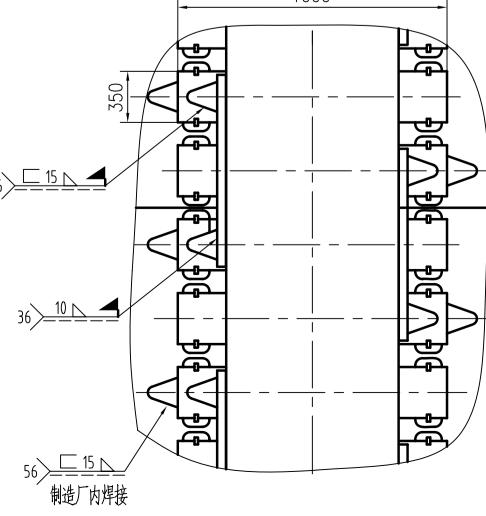
The above quotation is valid for 30 days from the date hereof. If any question, please do not hesitate to contact us.

Best regards , Guo Tingting CITIC HIC Engineering & Technology Co., Ltd



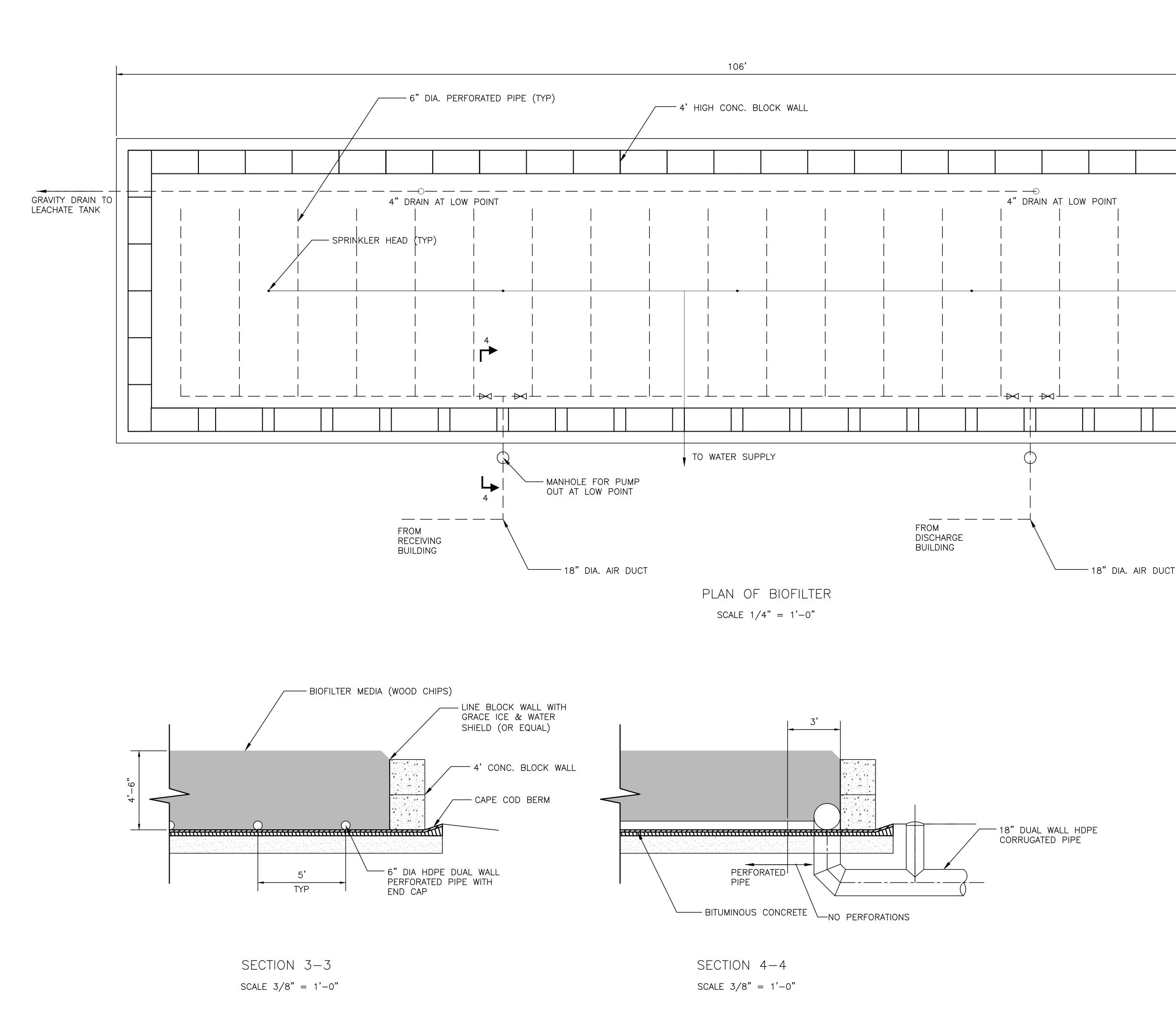


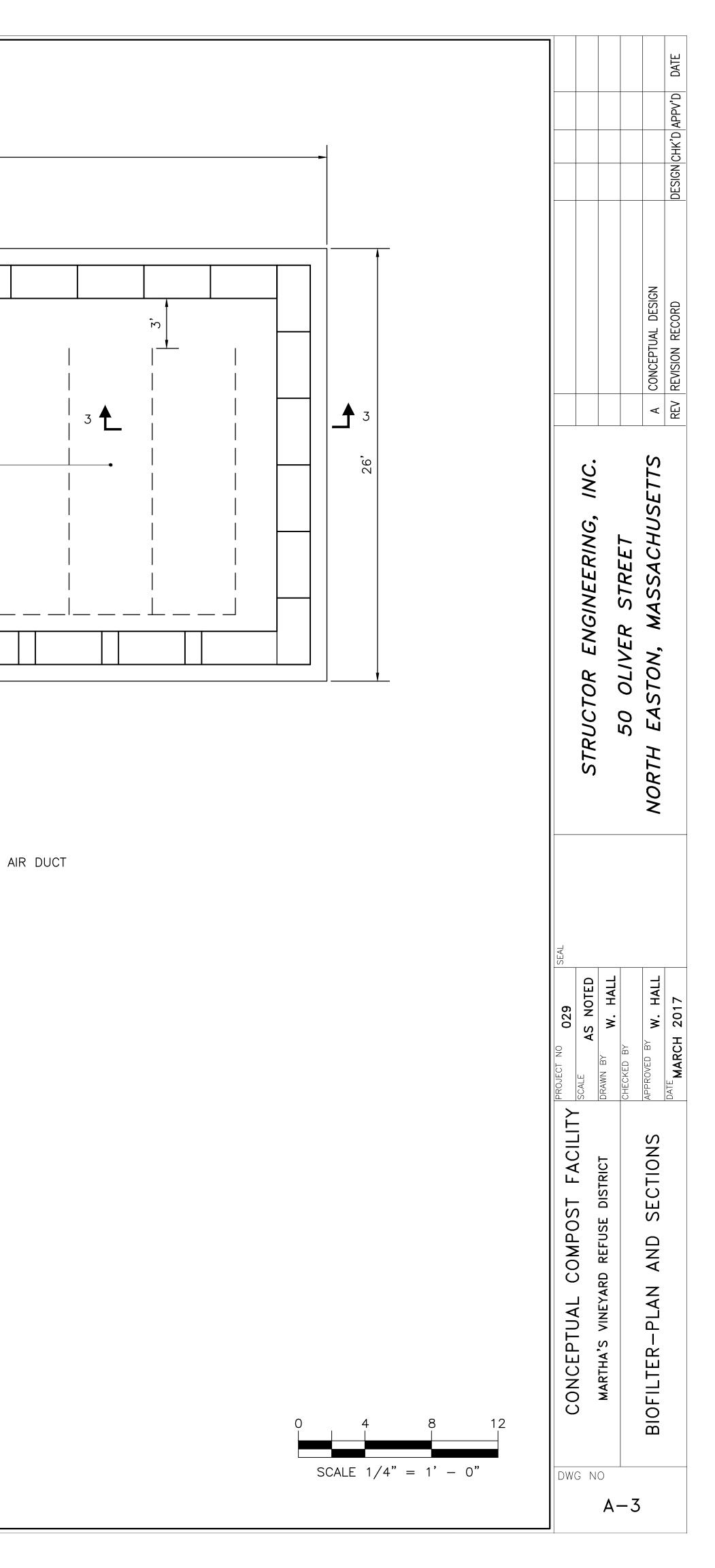




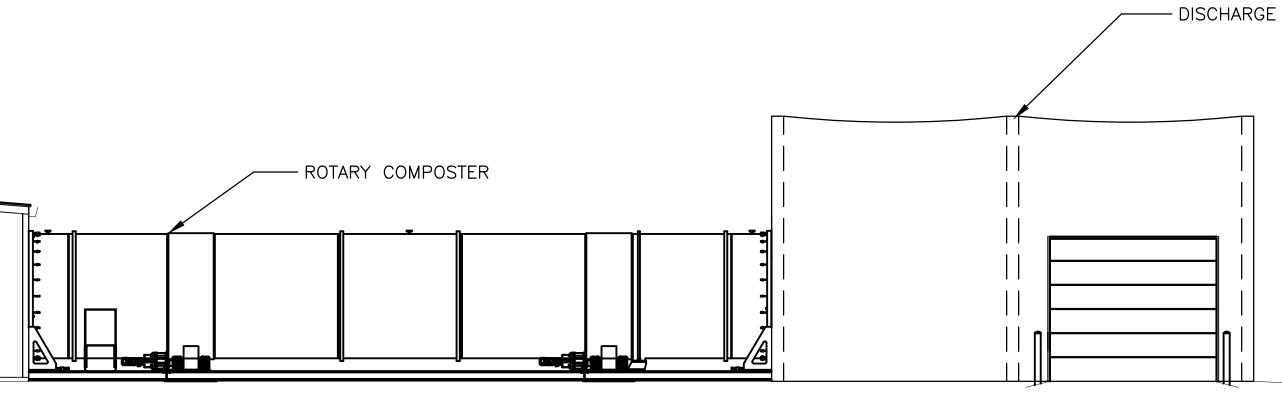
规格Specification	直径Diameter	3.658m(12')	长度 Length	56.388m(185′)			
斜度 Inclination	2.62	2% (正弦Sine)	支承数 Suppol	2			
密体转速Rotate Speed	0.1	~1r/min	筒体板厚 Thic	22、38、58			
传动方式	单传动	开式齿轮传动	模数 Modulus	28mm 速比	Ratio of speed 8.84		
Driving form	单传动 Single driving	Exposed gear	齿数 Teeth no.	Z1=23	Z2=200		
电机 Motor	型号 Type	YPS	YPS315M3-6,132KW				
减速器 Reductor	型号 Type	JH7	JH710-112				

_								
6	JP042A6	安装工具		1	部件			
		Install to	ol		Part			
5	JP042A5		轮罩	1	部件			
		Gear Rim	Unit		Part			
4	JP042A4	-	支撑装置	1	部件			
		Support roller w	ith thrst roller device		Part			
3	JP042A3		放装置	1	部件			
	51 0 12/15	Driving de	evice		Part			
2	JP042A2	支	掌装置	1	部件			
2	51 042112	Support i	Support roller device		Part			
1	JP042A1	筒	本装置	1	部件			
		Shell ass	embly		Part			
肟	代号	名	称	数量	材 料	<b>単重(</b> Si	ngle) 总重(Total)	备注
No.	Code		lame	Quantity	Material	Í	🖥 Weight (Kg)	Remark
山	盲重型机械·	公司	φ	3.65	8X56.38	18m 发酢	皆筒	第几页 PageNo 1
	IC Heavy Machiner	-	Ф3.6	58X5	56.388m W	aste Di	gester	共几页 TotalPaper 1
	计 审 查	批准		总图		重量(公斤)	0	比例 Scale 1:85
Design	er Check	Approve	Gene		rawing	Weight(Kg)	V	
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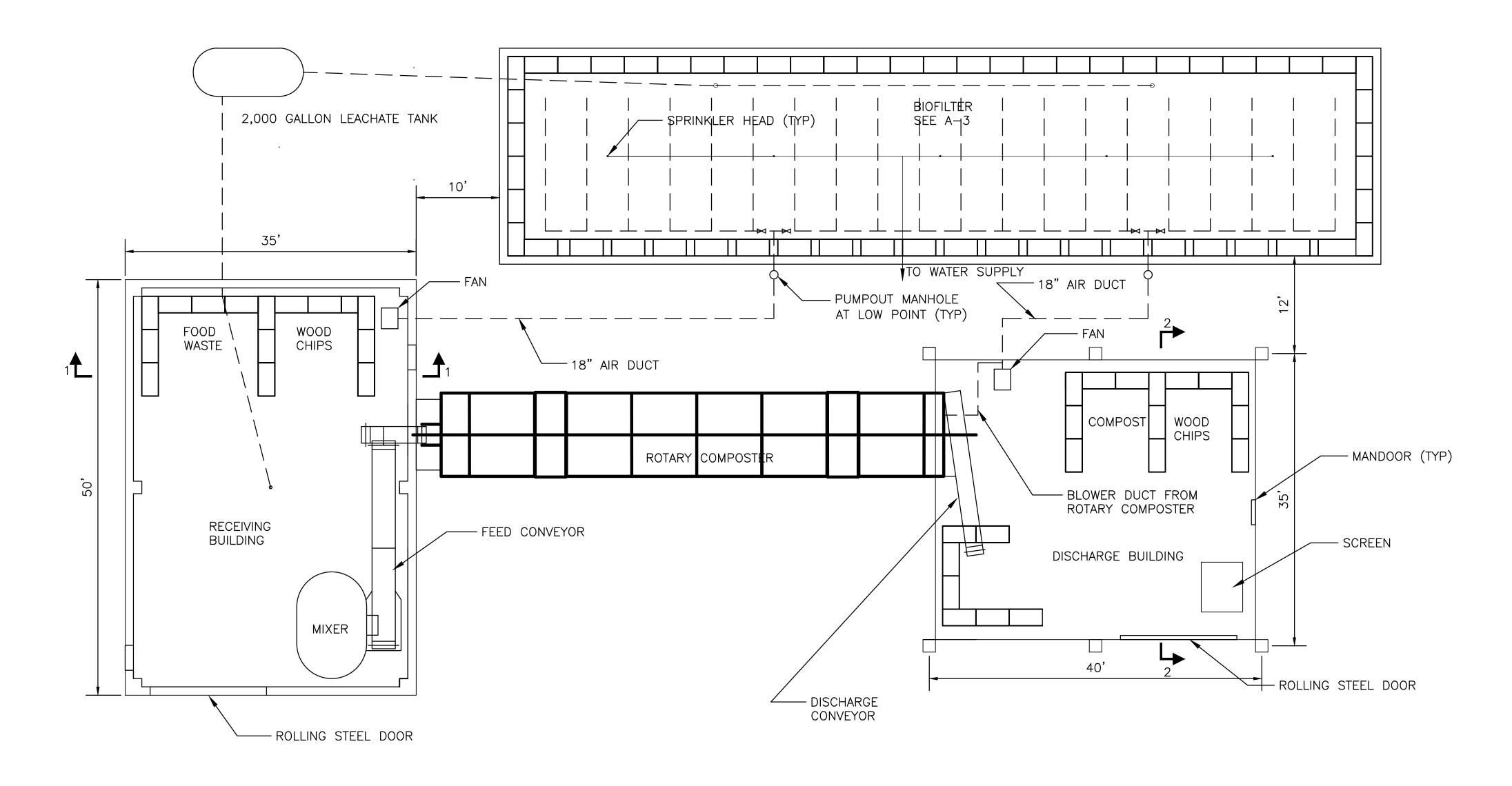




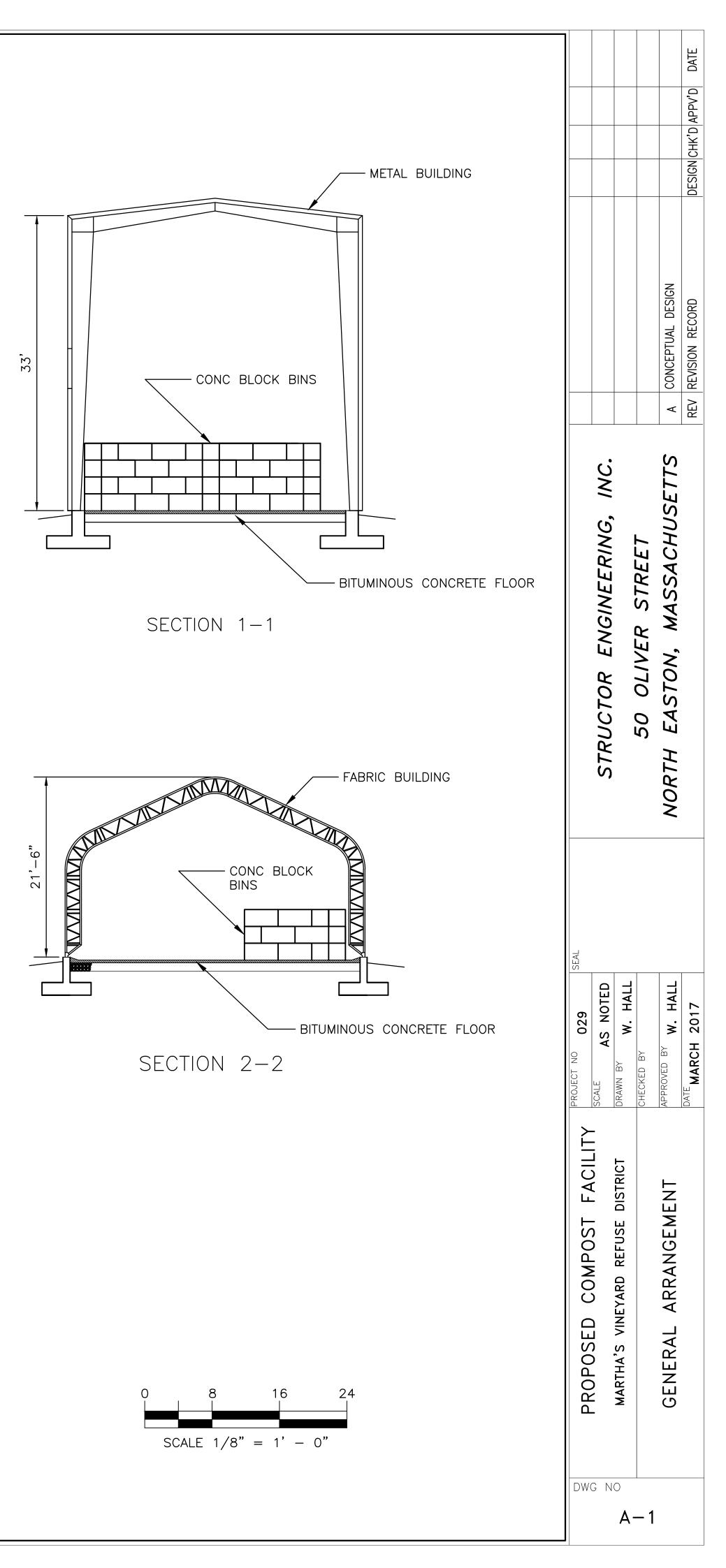




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	A CONCEPTUAL DESIGN REV REVISION RECORD
BUILDING	STRUCTOR ENGINEERING, INC. 50 OLIVER STREET NORTH EASTON, MASSACHUSETTS
	PROJECT NOSEALSCALE <b>AS NOTED</b> SCALE <b>AS NOTED</b> DRAWN BY <b>W. HALL</b> DRAWN BY <b>W. HALL</b> CHECKED BY <b>W. HALL</b> DATE <b>W. HALL</b> DATE <b>W. HALL</b> DATE <b>W. HALL</b>
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	DWG NO A-2



PLAN





Appendix E - Cost estimates

Martha's Vineyard Composting Facility											
Cost Estimates - Site Development											
				Straddle	Turner	AS	P	Rotary	Drum	Animal	Feed
ltem	Ur	nit Price	Units	Quantity	Costs	Quantity	Costs	Quantity	Costs	Quantity	Costs
Land acquisition											
Site purchase	\$	75,000	Ac	7	\$525,000	5.6	\$418,012	7	\$525,000	0.5	\$37,500
Permits and Approvals											
Local- zoning, S&EC, bldg permits	<u> </u>		Ea	Allowance	\$10.000	Allowance	\$10.000	Allowance	\$10.000	Allowance	\$10.000
MADEP Permitting - solid waste compost			Ea	Allowance	\$12,000		\$12,000		\$12,000	Allowance	\$12,000
EPA Permitting - storm water			Ea	Allowance	\$5,000		\$5,000		\$5,000	Allowance	\$5,000
			Ľα	7 liowance	ψ0,000	7 liowance	ψ0,000	7 liowanoc	ψ0,000	Allowalloc	ψ0,000
Clearing and Grading											
Assume no tree/stump clearing needed											
Fine grading of site for drainage	\$	2.00	SY	33,880	\$67,760	26,976	\$53,951	33,880	\$67,760	2,420	\$4,840
Erosion and Sediment Control	L										
Construction entrance	\$	1.000	Ea.		\$1.000	\$1	\$1.000		\$1.000		\$1.000
Silt fence	ֆ \$	1		1,500	1 1		1 /		1 1	1,500	1 /
Erosion control fabric	ֆ \$	1.47	L.F. SY	,	\$2,205		\$2,205		\$2,205	,	\$2,205
	\$	1.71	SY	2,500	\$4,275	\$2,500	\$4,275	2,500	\$4,275	2,500	\$4,275
Hardscape construction											
Fine grading and subbase compaction	\$	5.88	SY	33,880	\$199,220	26,976	\$158,620	33,880	\$199,220	2,420	\$14,230
Asphalt access roads (4" paving over 4" base)	\$	44.60	SY	1.000	\$44,600	1.000	\$44,600	1,000	\$44,600	1.000	\$44.600
Assume 15' W x 600' L					, , , , , , , , , , , , , , , , , , , ,			1	, ,	,	, ,
Asphalt working surface (6" paving over 6" base)	\$	58.45	SY	22,017	\$1,286,880	17,419	\$1,018,170	19,772	\$1,155,690		
Assume under composting, curing, screening, st	orage	e, retail sa	les								
Concrete slab for recpt & storage (6" reinf.)	\$	6.45	SF	1,600	\$10,320	1,600	\$10,320	1,600	\$10,320		
Area = 1,600 SF for receipt, FW/OCC stor	rage b	bunkers									
Concrete block bunkers for feedstock storage	\$	148.76	Ea	90	\$13,388	90	\$13,388	90	\$13,388		
Assume 8' H walls, 2' x 2' x 6' tongue & groove	concr	rete block	S								
\$74.38 ea in Oak Bluffs, assume 2x for shippin	ig and	d installing	3								
Concrete block ASP bunkers											
Formwork for aeration trenches	\$	17.01	SF			667	\$11,346				
Concrete aeration floors (6" thick reinf slab)	\$	3.83	SF			11,000	\$42,130				
Galvanized steel slotted trench covers (5"x 20")	\$	37.95	Ea			1,120	\$42,504				
Concrete block bunker walls, installed	\$	148.76	Ea			735	\$109,339				
End wall U-channel, 2" x 12" blocking boards	\$	40.00	Ea			112	\$4,480				
Pre-engineered metal building on 6" concrete slab	\$	75.00	SF							11,000	\$825,000
Asphalt parking lot (4" paving over 4" base)	\$	44.60	SY							2,500	\$111,500
Weter menorement	L										
Water management	¢	0.00		000	<b> </b>	000	<b>#^^</b>	000	<b>#</b> ^^^	000	<b>#^^</b>
Run-on berm (8" high compacted earth) Runoff swales (24" W x 24" D)	\$	2.00		300 300	\$600		\$600		\$600	300 300	\$600
	\$	3.00	LF		\$900		\$900		\$900		\$900
Solids separator	\$	5,000	Ea	Allowance		Allowance		Allowance	. ,	Allowance	\$5,000
Closed bioretention ponds	\$	6.80	SF	40,910	\$279,000	,	\$222,000		\$279,000	3,757	\$26,000
Pond liner - 60 mil HDPE	\$	1.19	SF	40,910	\$48,683	32,573	\$38,762	40,910	\$48,683	417	\$497
Utilities	<u> </u>										
Extend 3-phase power	\$	200	LF			500	\$100,000	500	\$100,000	500	\$100,000

On-site well - assume 4" well, 60' deep	\$ 39.28	LF	60	\$2,357	60		\$2,357	60	\$2,357	60	\$2
On-site septic tank - assume 1K gpd capacity	\$ 2.75	gal	1,000	\$2,750	1,000		\$2,750	1,000	\$2,750	1,000	\$2
on-site drainfield - assume 1 gpd/sf of trench	\$ 13.77		1,000	\$13,770	1,000		\$13,770	1,000	\$13,770	1,000	\$13
Site items		-									
Construction trailer (8' x 24')	\$ 68.50	SF	192	\$13,152	192		\$13,152	192	\$13,152		
Landscaping inside facility		Ea	Allowance	\$500	Allowance		\$500	Allowance	\$500	Allowance	
Perimeter vegetative screen (1000 units/acre)	\$ 250	Ea	620	\$154,959	620		\$154,959	597	\$149,219		
Assume 50' wide perimeter plantings				. ,			. ,				
Subtotals				\$2,178,319			\$2,098,078		\$2,141,390		\$1,18
Design Fee	7.5%			\$163,374			\$157,356		\$160,604		\$89
Contingency	25%	Ea		<u>\$544,580</u>			\$524,519		<u>\$535,347</u>		<u>\$296</u>
Totals				\$2,886,273			\$2,779,953		\$2,837,341		\$1,572
Notes											
Site development costs based on greenfield site											
Compost cost factors from Contractor Schedule of \	/alues, Freesta	te Far	m Composting Fac	ility, Manassas, V	A, Oct 2017						
Other cost factors from National Construction Cost	Estimator softw	are (C	raftsman, 2018) ad	ljusted for Zip Co	de 02575 (maťls +	-4%,	labor +36%, eo	quipment +1%)			
Disectantian Dand											
Bioretention Pond - assume handling whole site	age runoff coe	ficient		0.7			0.7		0.7		
	d precipitation			0.7			0.7		0.7		
	drainage area	( ) /		304,920			242,781		304,920		2
	olume (V, cubi			40,910			32,573		40,910		2
	etention pond (	/		40,910			32,573		40,910		
	Irface Area (SA			40.910			32.573		40.910		;
	adjusted to 20			\$ 278,189		\$	221,497		\$ 278,189		\$ 25
603		unded		\$ 279,000		φ \$	222,000		\$ 279,000		\$ 26
Notes:		T					1		, ,,,,,,,		
Assume precipitation = 1-hr, 10-yr storm = 2.3"											
	( 1)										
Cost based on \$4.00/SF for rain garden in Piedmor	nt solis					arder	ns". 2001				
Cost based on \$4.00/SF for rain garden in Piedmor	nt solls	Sour	ce: NCSU Coopera	ative Extension, "[	Jesigning Rain Ga						
Cost based on \$4.00/SF for rain garden in Piedmor			ce: NCSU Coopera s adjusted to 2018		<u> </u>		,				
Cost based on \$4.00/SF for rain garden in Piedmor					uction Cost Index		,				
Cost based on \$4.00/SF for rain garden in Piedmor			s adjusted to 2018	with ENR Constru	uction Cost Index						

				Strad	dle	Turner	A	\SP	Rota	arv D	Drum	Ani	mal Feed	
Item	Specifications	Unit Price	Units	Quantity		Costs	Quantity	Costs	Quantity	Ĺ	Costs	Quantity	Costs	
	18 gpm @ 400' TDH	\$ 22,600	-	1	\$	22.600	1	\$ 22.600	1	\$	22,600	1	\$ 22.600	
Horizontal grinder	Morbark 2600 horizontal electric grinder	\$ 320,000		1	\$	1	1	\$ 320,000	1	\$	,			
	Shipping, on-island transport	Included			-	,		+,	-	-	,			
Straddle windrow turner	Diesel-powered 6' H x 12' W tunnel	\$ 308,450	Ea	1	\$	308,450								
	Shipping, on-island transport	Allowance			\$	12,500								
Windrow covers	Vortron TX 714 fabric covers	\$ 3.520	Ea	46	\$	161.920								
	Shipping, on-island transport	Included			Ť	,								
Cover hold-downs	Punched tire sidewalls	\$ 3.00	Ea	1,015	\$	3,045								
	Shipping, on-island transport	Allowance		.,	\$	2,750								
Yard truck	10CY dump truck	\$ 25,000	Fa	1	\$	25,000	1	\$ 25.000	1	\$	25,000			
	Shipping, on-island transport	Allowance			\$	2,000				\$	2,000			
ASP equipment	Mixer	\$ 273,000	Ea		Ŷ	,000	1	\$ 273,000		Ţ	,000			
	Blowers - Fuji VFZ901A-7W	\$ 4,215					14	\$ 59,010						
	Piping - 3" HDPE perforated	\$ 5.00					1800	\$ 9,000		+				1
	T-fittings and other fittings for piping	Allowance			1		1000	\$ 3,500		-				1
	Timers - Intermatic C8835 Cycle timer	\$ 164.50	Ea				14	\$ 2,303						
Rotary Drum & mixer	CITIC 11 x 65 rotary drum	\$ 1,699,000						φ 2,000 	1	\$	1.699.000			
	Mechanical mixer	\$ 273.000							1	\$	1			
	Shipping, on-island transport, installation	Allowance	La							\$	600,000			
	Buildings/equip for mixing, discharge	\$ 80	SF						3,150	\$	252,000			
	Biofilter	\$ 38							2,750	\$	103,950			
Trommel screen	Screen USA Trom 406	\$ 50.000		1	\$	50,000	1	\$ 1	2,750	φ \$	50,000			
	Shipping, on-island transport, installation	Allowance	La	1	\$	10.000		\$ 10,000		φ \$	10,000			
Rubber-tired front-end loaders	140 hp FEL with 2.5 CY bucket	\$ 175,000	Ea	1	\$	175,000	1	\$ 175,000	1	\$	175,000			
Rubbel-lifed iront-end loaders	2nd bucket for handling product	\$ 8,000		1	\$	8,000	1	\$ 8,000	1	φ \$	8.000			
	Shipping, on-island transport	Allowance	La		\$	10,000	· ·	\$ 10,000	· ·	\$	10,000			
Animal Feed extruder system	SAFE system like Santa Clara CA	SAFE quote			Ψ			ψ 10,000		Ψ		1	\$ 10,000,000	
Totals	Totals				\$1	1,111,265		\$917,414		\$2	3,550,550		\$ 10,022,600	
Data Sources:	10(8)3				Ψ	1,111,200		ψ <b>3</b> 17,414		ψυ	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		ψ 10,022,000	
Loader	John Deere 524K with 3 CY bucket													
Loadel	James River Equipment, Salem VA													
Straddle turner	Scarab 612, Scarab Int'l White Deer, TX		1											
	ships on low-boy trailer													
	Shipping \$7-\$10K													
Rotary drum	CITIC quote 4/11/18													
Mixer for ASP, rotary drum	Freestate Farms guote from ECS 8/2016		1											
Biofilter for rotary drum	Freestate Farms quote from ECS 8/2016													
Trommel screen	TROM 406 guote from ScreenUSA													
Dump truck	Commercialtrucktrader.com				$\vdash$					$\vdash$				
Grinder	Quote from Schmidt Equipment, Plymouth	и МА			$\vdash$					$\vdash$				
Windrow covers	CompostTex quote 3/15/18				-					-				
Cover holders	F&B Rubberized guote 3/15/18												+	
ASP blowers	W.W. Grainger online quote 5/22/18												+	
ASP timers	W.W. Grainger online quote 5/22/18												+	
Piping	W.W. Grainger online quote 5/22/18 W.W. Grainger online quote 5/22/18				-					-			<u> </u>	
Fihilig	w.w. Granger online quote 5/22/18		1		1									

	-	ard Food Wast		-						
Wind	Irow Comp	posting Operation	ing Cost Est	imate						
5	/25/18									
	mptions									
Labo	or rate (load	ded) per hour						\$22.50	per hour	
Load	ler/yard tru	ck machine rate	e (fuel + insu	rance + ma	intenance)				per hour	
Grind	der machin	e rate						\$110.00	per hour	
Turne	er machine	e rate						\$450.00	per hour	
Facil	ity is open	6 days/week, 5	2 weeks/yr					312	days/yr	
Oper	ating cost	estimate based	on peak sur	nmer waste	generation	at full build out				
Negl	ects any o	verlap of labor f	unctions bet	ween tasks						
Proc	essing Vo	lumes								
					Averag	<u>ge Daily Volume</u>				
I/C/I f	food waste	s			16.0	CY/day				
Resid	dential foo	d wastes			25.6	-				
Leav	/es				15.6					
Sawo	dusts				0.4					
	d chips				18.3					
000					11.4					
	post recycl	е			6.7					
	s from scre				15.9					
		Totals				CY/day				
						<b>,</b>	_			
Mate		lling Assumpti								
		vastes & produc			rate loaders	S				
		Bucket capacit	•	der				3	CY/loader	
		done by site sta								
		ne by straddle								
	Materials	moved to comp	osting and c	uring with y	/ard truck					
	Materials	moved to stora	ge (overs an	d compost)	by loaders					
Mato	riale Hand	lling - Waste R	acaint & Sta	r200						
Wate		imes coming in		laye				100.0	CY/day	
		of loader "bucke		o" ta kaan h	unkore 8 ni	los managod		103.3	CT/uay	
		Daily volume /				les manageu		37	buckets/day	
		-	· · ·						minutes	
		me spent per lo		ient						
	Time spei	nt handling feed	DSTOCKS		Comunitation				minutes/day	
					Convert to		-		hours/day	
					Labor cost		\$	4,734		
					Machine c	ost/year	\$	11,572		
Mate	erials Hand	lling - Grinding	/shreddina		1					
		vood chips/OC		grinder				19	CY/day	
		ise of Morbark 2			nder			-		
		rinder used on						1	hr/day	
				~,	Labor cost	/vear	\$	7,020		
					Machine c		\$	34,320		
							-	- 1,020		
Mate	1	lling - Transpo					_			
		volume going		g			_		CY/day	
		of loader bucket							buckets/day	
		ar down, pick u							min/bucket	
	Total time	needed to mov	ve compost to	o transport	truck				minutes/day	
			oftrananart	truck				10	CY	
	Assume v	olume capacity	ortransport							
		of truck trips/day						11	trips/day	
	Number o		1						trips/day minutes/trip	
	Number of Transport	of truck trips/day	area					5		

1					Convert to	hours		2.4	hours/day	
					Labor cost	/year	\$	16,589		
					Machine c		\$	40,552		
								•		
Build		osting Windro								
		all windrows bu							CY/bucket	
		ume coming to	· • ·	bad					CY/day	
		of buckets per d							buckets/day	
		ded to move fe		n unload sit	e to windro	W			minutes/bucke	et
	Time nee	ded to build wir	ndrows			-			minutes/day	
					Convert to		•		hours/day	
					Labor cost		\$	14,202		
					Machine c	ost/year	\$	34,715		
Mate	rials Hand	dling - Windrow	/ Mixina & Tu	irning - Stra	addle Turne	er				
		of turner passes						1	pass/windrow	
		of turner passes		ostina					passes/week/	windrow
		ber of windrow		l					passes/windro	
		of windrows							windrows	
	Windrow		+						linear ft/ windr	OW
		eed = 0.25 mpl	h =						ft/min.	• **
		ake one windro							minutes/windr	OW
		irn around =							minutes/winu	- 11
		avel down pad	to another w	indrow =					minutes	
		e needed per w							minutes	
		ded to mix wind							minutes	
		ded to turn win		) Dok					minutes/week	
		e spent mixing/t							minutes	
		spent mixing/t		0003	Convert to	hours			hours	
						per day equiv			hours/day <sub>equiv</sub>	
					Labor cost		\$	7,898	nours/uay <sub>equiv</sub>	
					Machine c		ን \$	19,305		
						USilyeai	9	19,305		
Wind	lrow Irriga	tion								
			<u>Formula</u>		<u>Units</u>	<u>Value</u>				
Wind	Irow Dime	nsions								
Leng	jth				Ft.	182				
Width	h				Ft.	12				
Heigl	ht				Ft.	6				
Volur	me per line	ear foot	A = h x (b - ł	า)	CY/LF	1.33				
		erial in windrow		1	CY	243				
	density of		assumed		lbs/CY	800				
	ht of wind		bulk density	x volume	lbs	194,221				
* veiu									i	
	ture contei	nt of sample	assumed		%	40%				
Moist		nt of sample re content	-		% %	40% 50%				
Moist Desir	red moistu	re content	assumed	isture %		50%				
Moist Desir Weig	red moistu jht of water	re content r in windrow	assumed weight x mo		%	50% 77,688				
Moist Desir Weig	red moistu ht of water red weight	re content r in windrow	assumed weight x mo weight x 50	%	% Ibs	50% 77,688 97,111				
Moist Desir Weig Desir Short	red moistu ht of water red weight tfall	re content r in windrow of water	assumed weight x mo weight x 50 Desired - ac	% ctual	% Ibs Ibs Ibs	50% 77,688 97,111 19,422				
Moist Desir Weig Desir Short	red moistu ht of water red weight	re content r in windrow of water	assumed weight x mo weight x 50	% ctual	% Ibs Ibs	50% 77,688 97,111				
Moist Desir Weig Desir Short	red moistu yht of water red weight tfall ons to be a	re content r in windrow of water dded	assumed weight x mo weight x 50' Desired - ac Shortfall / 8.	% ctual 34 lbs/gal	% Ibs Ibs Ibs	50% 77,688 97,111 19,422		3.9	inches/month	
Moist Desir Weig Desir Short	red moistu ht of water red weight tfall ons to be a Average	re content r in windrow c of water dded monthly rainfall	assumed weight x mo weight x 50' Desired - ac Shortfall / 8. on Martha's	% ctual 34 lbs/gal	% Ibs Ibs Ibs	50% 77,688 97,111 19,422			inches/month SF	
Moist Desir Weig Desir Short	red moistu ht of water red weight tfall ons to be a Average r Area of w	re content r in windrow c of water dded monthly rainfall indrows in com	assumed weight x mo weight x 50' Desired - ac Shortfall / 8. on Martha's posting	% ctual 34 lbs/gal Vineyard	% Ibs Ibs Ibs	50% 77,688 97,111 19,422 2,329 =		50,994	SF	
Moist Desir Weig Desir Short	red moistu ht of water red weight tfall ons to be a Average r Area of w	re content r in windrow c of water dded monthly rainfall	assumed weight x mo weight x 50' Desired - ac Shortfall / 8. on Martha's posting	% ctual 34 lbs/gal Vineyard	% Ibs Ibs Ibs	50% 77,688 97,111 19,422 2,329 = =		50,994 16,616	SF CF	
Moist Desir Weig Desir Short	red moistu ht of water red weight tfall ons to be a Average i Area of w Monthly v	re content r in windrow c of water dded monthly rainfall indrows in com rolume of rain fa	assumed weight x mo weight x 50' Desired - ac Shortfall / 8. Shortfall / 8. on Martha's posting alling on wing	% 24 Ibs/gal Vineyard drows	% Ibs Ibs gal	50% 77,688 97,111 19,422 2,329 = = = =		50,994 16,616	SF	
Moist Desir Weig Desir Short	red moistu ht of water red weight tfall ons to be a Average i Area of w Monthly v	re content r in windrow c of water dded monthly rainfall indrows in com rolume of rain fa	assumed weight x mo weight x 50' Desired - ac Shortfall / 8. Shortfall / 8. on Martha's posting alling on wing	% 24 Ibs/gal Vineyard drows	% Ibs Ibs gal rned in at e	50% 77,688 97,111 19,422 2,329 = = = = very rain event		50,994 16,616 2,221	SF CF	
Moist Desir Weig Desir Short Gallo	red moistu ht of water red weight tfall ons to be a Average i Area of w Monthly v Assume r	re content r in windrow c of water dded monthly rainfall indrows in com rolume of rain fa ainfall adequat	assumed weight x mo weight x 50' Desired - ac Shortfall / 8. on Martha's posting alling on wind e to supply m	% 34 Ibs/gal Vineyard drows noisture if tu	% Ibs Ibs gal	50% 77,688 97,111 19,422 2,329 = = = = very rain event	\$	50,994 16,616	SF CF	
Moist Desir Weig Desir Short Gallo	red moistu iht of water red weight tfall ons to be a Average i Area of w Monthly v Assume r	re content r in windrow cof water dded monthly rainfall indrows in com rolume of rain fa ainfall adequat dling - Moving (	assumed weight x mo weight x 50' Desired - ac Shortfall / 8. on Martha's posting alling on wind e to supply m Compost to 0	% 34 Ibs/gal Vineyard drows noisture if tu	% Ibs Ibs gal rned in at e Labor cost	50% 77,688 97,111 19,422 2,329 = = = = very rain event	\$	50,994 16,616 2,221 -	SF CF gallons/month	
Moist Desir Weig Desir Short Gallo	red moistu ht of water red weight tfall ons to be a Average r Area of w Monthly v Assume r erials Hance Avg. daily	re content r in windrow c of water dded monthly rainfall indrows in com rolume of rain fa ainfall adequat	assumed weight x mo weight x 50' Desired - ac Shortfall / 8. on Martha's posting alling on wind e to supply m Compost to 0 to curing (as	% 34 Ibs/gal Vineyard drows noisture if tu Curing sume 40%	% Ibs Ibs gal rned in at e Labor cost	50% 77,688 97,111 19,422 2,329 = = = = very rain event	\$	50,994 16,616 2,221 - 66	SF CF	

		volume going t						12	CY/day	
ate	rials Hanc	lling - Overs to	Storage							
					wachine C	usiyedi	φ	17,496		
					Labor cost Machine c		\$	7,157		
					Convert to				hours/day	
_	i otal time	needed to load	and move		Converte	haura			minutes/day	
		needed to mov		y truck					minutes/day	
	-	time to storage							minutes/trip	
		of truck trips/day							trips/day	
		olume capacity		truck					CY	
		needed to mov			truck				minutes/day	
		ar down, pick u							minutes/bucke	et
		floader bucket							buckets/day	
		volume going t			shrink in c	uring)			CY/day	
		lling - Screene								
							Ψ	20,120		
					Machine c		\$ \$	28,125		
	Screen ru	n time per day	assume no a	auu i iadof i	Labor cost	wear	¢	11,504	hrs/day	
		creen througpu		add" labor						
	A	aroon these	trata		Convert to	nours	_		hrs/day CY/hr	
	i otal time	needed to mov	e compost		Correct 11	h			min/day	
		ove compost fro		screening					min/bucket	
		floader bucket							buckets/day	
		creen hopper v			/olume			_	CY/hr	
		volume going t				n curing)			CY/day	
	ening Con	-								
					wachine C	usiyedi	\$	22,104		
_					Machine c		۶ ۶	<u>9,043</u> 22,104		
_					Labor cost	<u> </u>	\$	9,043	nours/uay <sub>equiv</sub>	
					Convert to	hours per day equiv	_		hours hours/day <sub>equiv</sub>	
	i otal time	spent building/	urning wind	IOWS	Converte	houro	_		minutes	
		ded to turn wind					_		minutes/week	
		needed per wi							minutes	
		avel down pad l		ndrow =					minutes	
		rn around =		a aluc · · ·					minutes/turn	
		ake one windro	w pass =				_		minutes/windr	ow
		eed = 0.25 mph					_			
_	Windrow I						_		linear ft/ windr ft/min.	ow
		of windrows						-	windrows	
		urner used to tu	rn windrows	once/ ever	y 2 weeks				pass/week	
		ded to build win							minutes/day	
		ded to move fee		h unload sit	e to windro	W			minutes/bucke	et
		f buckets per da			<u> </u>		_		buckets/day	Ļ
	-	me coming to c	-						CY/day	
		uring windrows		ader					CY/bucket	
	ging Curi	•								
						JStryear	Ψ	24,300		
					Machine c	•	\$	24,306		
					Labor cost		\$	9,943	nours/uay	
	Total time	needed to load	and move		Convert to	houro			minutes/day hours/day	
		needed to mov		y truck					minutes/day	
		time to curing a							minutes/trip	
		f truck trips/day							trips/day	
		olume capacity		truck					CY	
				o transport f				02.0	minutes/day	

Numbe	er of loader bucke	t movements						4	buckets/day	
	o tear down, pick u		and load tru	ck					minutes/buck	et.
	ime needed to mo								minutes/day	
	ne volume capacity			IUCK					CY	
	er of truck trips/day		uuuk						trips/day	
	port time to storage		roturn						minutes/trip	
	ime needed to mo								minutes/day	
	ime needed to hid		yuuck						minutes/day	
101211				Convert to	houre				hours/day	
				Labor cost			\$	2,193	nour s/uay	
<u> </u>				Machine c			φ \$	5,361		
				Machine C	osiyear		Ą	5,301		
roduct Ma	rketing & Sales									
Annua	I compost product	ion volume						19,088	CY/yr	
Averaç	ge daily production	n volume						61	CY/day	
Assum	ne 90% wholesale	/10% retail								
	sale (assume deli		ed)					55	CY/day	
	Tractor-trailer	volume capa	city					30	CY	
	Number of trai		-					2		
	Time to load tr	ailers						0.5	hrs/day	
	Assumed deliv	/ery fee					\$		per load	
				Labor cost	/year		\$	3,510	•	
				Machine c			\$	8,580		
Retail								6	CY/day	
	Pick-up truck c	apacity							CY	
	Number of reta		led daily					3	per day	
	Time needed t			er					hrs/day	
				Labor cost	/vear		\$	2,106	, í	
				Machine c			\$	5,148		
Totals				Labor cos				\$5,616		
				Machine c	•			\$13,728		
						_	-			
					Operatin	g Expense		-		
		Labor Sum				Straddle T				
		Process	<u>Hrs/Day</u>					chine Costs		
	\\/	anto Donaint	07	1					10 10 007	
1		aste Receipt	0.7		\$	4,734	\$	11,572		
	Grindir	ng/shredding	0.7		\$	7,020	\$	34,320	\$ 41,340	
	Grindir Trar	ng/shredding nsport to pad	0.7 2.4		\$ \$	7,020 16,589	\$ \$	34,320 40,552	\$ 41,340 \$ 57,141	
	Grindir Trar Buildi	ng/shredding nsport to pad ng windrows	0.7 2.4 2.0		\$ \$ \$	7,020 16,589 14,202	\$ \$	34,320 40,552 34,715	\$ 41,340 \$ 57,141 \$ 48,917	
	Grindir Trar Buildi Windrow Mixir	ng/shredding nsport to pad ng windrows ng & Turning	0.7 2.4 2.0 1.1		\$ \$ \$	7,020 16,589	\$ \$ \$	34,320 40,552	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203	
	Grindir Trar Buildi Windrow Mixir Windrow Windr	ng/shredding nsport to pad ng windrows ng & Turning ow Irrigation	0.7 2.4 2.0 1.1 0.0		\$ \$ \$ \$	7,020 16,589 14,202 7,898	\$ \$ \$ \$	34,320 40,552 34,715 19,305 -	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203 \$ -	
	Grindir Trar Buildi Windrow Mixir Windr Windr Moving Comp	ng/shredding nsport to pad ng windrows ng & Turning row Irrigation ost to Curing	0.7 2.4 2.0 1.1 0.0 1.4		\$ \$ \$ \$ \$	7,020 16,589 14,202 7,898 - 9,943	\$\$         \$\$<	34,320 40,552 34,715 19,305 - 24,306	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203 \$ - \$ 34,249	
	Grindir Trar Buildi Windrow Mixir Windrow Mixir Moving Comp Moving Comp Managing	ng/shredding nsport to pad ng windrows ng & Turning row Irrigation ost to Curing Curing Piles	0.7 2.4 2.0 1.1 0.0 1.4 1.3		\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	7,020 16,589 14,202 7,898 - 9,943 9,043	(x)         (x) <th(x)< th=""> <th(x)< th=""></th(x)<></th(x)<>	34,320 40,552 34,715 19,305 - 24,306 22,104	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203 \$ - \$ 34,249 \$ 31,147	
	Grindir Trar Buildi Windrow Mixir Windr Windr Moving Comp Managing Screen	ng/shredding nsport to pad ng windrows ng & Turning ow Irrigation ost to Curing Curing Piles ing Compost	0.7 2.4 2.0 1.1 0.0 1.4 1.3 1.6		\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	7,020 16,589 14,202 7,898 - 9,943 9,043 11,504	\$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$	34,320 40,552 34,715 19,305 - 24,306 22,104 28,125	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203 \$ - \$ 34,249 \$ 31,147 \$ 39,630	
Moving	Grindir Trar Buildi Windrow Mixir Windrow Mixir Woving Compo Managing Screen Screened Compo	ng/shredding nsport to pad ng windrows ng & Turning ow Irrigation ost to Curing Curing Piles ing Compost st to Storage	0.7 2.4 2.0 1.1 0.0 1.4 1.3 1.6 1.0		\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	7,020 16,589 14,202 7,898 - 9,943 9,043 11,504 7,157	(b)         (b)         (b)         (b)         (c)         (c) <th(c)< th=""> <th(c)< th=""> <th(c)< th=""></th(c)<></th(c)<></th(c)<>	34,320 40,552 34,715 19,305 - 24,306 22,104 28,125 17,496	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203 \$ - \$ 34,249 \$ 31,147 \$ 39,630 \$ 24,653	
Moving	Grindir Trar Buildi Windrow Mixir Windr Windr Moving Compo Screened Screened Compo Moving Over	ng/shredding nsport to pad ng windrows ng & Turning row Irrigation ost to Curing Curing Piles ing Compost st to Storage rs to Storage	0.7 2.4 2.0 1.1 0.0 1.4 1.3 1.6 1.0 0.3		\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	7,020 16,589 14,202 7,898 - 9,943 9,043 11,504 7,157 2,193	Solution	34,320 40,552 34,715 19,305 - 24,306 22,104 28,125 17,496 5,361	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203 \$ - \$ 34,249 \$ 31,147 \$ 39,630 \$ 24,653 \$ 7,554	
Moving	Grindir Trar Buildi Windrow Mixir Windrow Mixir Woving Compo Managing Screen Screened Compo	ng/shredding nsport to pad ng windrows ng & Turning ow Irrigation ost to Curing Curing Piles ing Compost st to Storage rs to Storage sting & Sales	0.7 2.4 2.0 1.1 0.0 1.4 1.3 1.6 1.0 0.3 0.8		\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	7,020 16,589 14,202 7,898 - 9,943 9,043 11,504 7,157 2,193 5,616	\$\omega\$         \$\omega\$	34,320 40,552 34,715 19,305 - 24,306 22,104 28,125 17,496 5,361 13,728	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203 \$ - \$ 34,249 \$ 31,147 \$ 39,630 \$ 24,653 \$ 7,554 \$ 19,344	
Moving	Grindir Trar Buildi Windrow Mixir Windr Windr Moving Compo Screened Screened Compo Moving Over	ng/shredding nsport to pad ng windrows ng & Turning row Irrigation ost to Curing Curing Piles ing Compost st to Storage rs to Storage	0.7 2.4 2.0 1.1 0.0 1.4 1.3 1.6 1.0 0.3	Subtotals	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	7,020 16,589 14,202 7,898 - 9,943 9,043 11,504 7,157 2,193	Solution	34,320 40,552 34,715 19,305 - 24,306 22,104 28,125 17,496 5,361	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203 \$ - \$ 34,249 \$ 31,147 \$ 39,630 \$ 24,653 \$ 7,554	
	Grindir Trar Buildi Windrow Mixir Windr Windr Moving Compo Screened Screened Compo Moving Over Product Marke	ng/shredding nsport to pad ng windrows ng & Turning ow Irrigation ost to Curing Curing Piles ing Compost st to Storage rs to Storage eting & Sales TOTALS	0.7 2.4 2.0 1.1 0.0 1.4 1.3 1.6 1.0 0.3 0.8	Subtotals	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	7,020 16,589 14,202 7,898 - 9,943 9,043 11,504 7,157 2,193 5,616 <b>95,899</b>	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	34,320 40,552 34,715 19,305 - 24,306 22,104 28,125 17,496 5,361 13,728 <b>251,584</b>	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203 \$ - \$ 34,249 \$ 31,147 \$ 39,630 \$ 24,653 \$ 7,554 \$ 19,344	
Assume	Grindir Trar Buildi Windrow Mixir Windr Windr Moving Compo Screened Screened Compo Moving Over	ng/shredding nsport to pad ng windrows ng & Turning row Irrigation ost to Curing Curing Piles ing Compost st to Storage rs to Storage eting & Sales TOTALS site workers	0.7 2.4 2.0 1.1 0.0 1.4 1.3 1.6 1.0 0.3 0.8 13.3	Subtotals	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	7,020 16,589 14,202 7,898 - 9,943 9,043 11,504 7,157 2,193 5,616	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	34,320 40,552 34,715 19,305 - 24,306 22,104 28,125 17,496 5,361 13,728	\$ 41,340 \$ 57,141 \$ 48,917 \$ 27,203 \$ - \$ 34,249 \$ 31,147 \$ 39,630 \$ 24,653 \$ 7,554 \$ 19,344	

		ard Food Wast		_						
	-	ing Operating C	ost Estimat	е						
5	/22/18									
	<u>mptions</u>									
	<b>`</b>	ded) per hour							per hour	
			een machine	rate (fuel +	+ insurance	+ maintenance)			per hour	
	der machir								per hour	
	<u> </u>	6 days/week, 5						312	days/yr	
-	-					at full build out				
Negl	ects any o	verlap of labor f	unctions bet	ween tasks						
Proc	essing Vo	lumes								
						e Daily Volume				
	food waste					CY/day				
Resi	dential foo	d wastes			25.6					
Leav	es				15.6		_			
	dusts				0.4					
	d chips				18.3					
Pape					11.5					
000					11.4					
Com	post recyc	le			6.7					
Over	s from scre	en			<u>15.9</u>					
		Totals			121.4	CY/day				
Mata	riale Hand	dling Assumpti	ons							
wate		vastes & produc		w two sono	rate loader	1	+			
	Assume V	Bucket capacit				3 	+	<b>n</b>	CY/loader	
	Grinding	done by site sta						3		
		one by site sta		dturner						
					ord truck					
		moved to comp moved to stora							<u> </u>	
	waterials		ge (overs and	u compost)	by loaders					
Mate	rials Hand	dling - Waste R	eceipt & Sto	rage						
		umes coming in						121.4	CY/day	
		of loader "bucke		s" to keep b	unkers & pi	les managed			-	
		Daily volume /				-		40	buckets/day	
	Assume t	ime spent per lo	· ·					1	minutes	
		nt handling feed						40	minutes/day	
		0			Convert to	hours			hours/day	
					Labor cost		\$	4,734	· · · ·	
					Machine c		\$	11,572		
			/= h == 1 !!			-		•		
Mate		dling - Grinding						~~		
		vood chips/OCO						30	CY/day	
		ise of Morbark 2			nder				l	
	Assume g	grinder used on	e hour per da	ау	 	<u> </u>			hr/day	
					Labor cost		\$	7,020		
					Machine c	ost/year	\$	34,320		
Mate	rials Hand	dling - Mixing					+			
		imes coming in	to facility		1			121	CY/day	
	-	of loader bucket		to load mix	er				buckets/day	
		time spent per					+		minutes/buck	ı ⊃t
		time to load ya							minutes/buck	
		nt handling feed							minutes/buck	
	nine spe		JOUKS		Convort to	bours			hours/day	
	Mixor	timo			Convert to	nouis			-	
	Mixer run				Total march	l Vino timo			hours/day	
					Total mach				hours/day	
1	1	1			Total labor	ume	1	2.(	hours/day	1

					Labor cost	/year	\$	18,937		
					Machine c	-	\$	72,029		
Mata	niele Llena			ating Dad						
		<b>dling - Transpo</b> / volume going			10% obrink	in mixing)		100	CV/day	
		of loader bucket			10% SIIIIIK	in mixing)			CY/day buckets/day	
		ear down, pick u			lick				min/bucket	
		e needed to mov	· · ·						minutes/day	
		volume capacity							CY	
		of truck trips/day	· ·	liuuk					trips/day	
		t time to curing a	, ,						minutes/trip	
		e needed to mov		w truck					minutes/day	
		e needed to load		y uuok					minutes/day	
	Total anio				Convert to	hours			hours/day	
			+		Labor cost		\$	14,913	nouro, auy	
			1		Machine c		\$	36,453		
			<u>+</u>		Walline o		Ψ	00,400		
	ling ASPs		<u> </u>	ļ						
		all windrows bu							CY/bucket	
		ume coming to o		unkers			ļ		CY/day	
		of buckets per d		L					buckets/day	
		ded to install pl		ounker, insta	all cap		ļ		minutes/bucke	et
	Time nee	ded to build AS	Ps	ļ			ļ		minutes/day	
	ļ	ļ	<u> </u>	ļ	Convert to				hours/day	
			<u> </u>		Labor cost		\$	17,043		
			<u> </u>		Machine c	ost/year	\$	41,660		
Aera	ted Static	Pile Composti	ing Cost							
	Size of blo		<u> </u>					14.7	hp	
		Assume 10 mil	<u>1</u> n on/20 min (	off: hours ru	nning each	dav			hrs/day	
		Assumed elect							kilowatts	
		kWh per day							kWh/day	
		Cost of electric	<u> </u>	Eversource	e Rate 24 -	Medium Gen'l Rate	\$		per kWh	
		Annual cost of					\$	5,580		
		lectricity cost for					\$	78,122		
								- ,		
Mate		dling - Moving (							<b>a</b> ) (()	
ł	• •	volume going	to curing (as		shrink)			76	CY/day	
		<u> </u>								
		of loader bucket							buckets/day	
	Time to te	of loader bucket ear down, pick u	up, transport a	and load tru				2	min/bucket	
	Time to te Total time	of loader bucket ear down, pick u e needed to mov	up, transport a ve compost to	and load tru o transport t				2 51.0	min/bucket minutes/day	
	Time to te Total time Assume v	of loader bucket ear down, pick u e needed to mov volume capacity	up, transport a ve compost to y of transport	and load tru o transport t				2 51.0 10	min/bucket minutes/day CY	
	Time to te Total time Assume v Number c	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day	up, transport a ve compost to y of transport y	and load tru o transport t				2 51.0 10 8	min/bucket minutes/day CY trips/day	
	Time to te Total time Assume v Number c Transport	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a	up, transport a ve compost to y of transport y area	and load tru o transport t truck				2 51.0 10 8 5	min/bucket minutes/day CY trips/day minutes/trip	
	Time to te Total time Assume v Number o Transport Total time	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a e needed to mov	up, transport a ve compost to y of transport y area ve compost b	and load tru o transport t truck				2 51.0 10 8 5 38	min/bucket minutes/day CY trips/day minutes/trip minutes/day	
	Time to te Total time Assume v Number o Transport Total time	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a	up, transport a ve compost to y of transport y area ve compost b	and load tru o transport t truck				2 51.0 10 8 5 38 89	min/bucket minutes/day CY trips/day minutes/trip minutes/day minutes/day	
	Time to te Total time Assume v Number o Transport Total time	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a e needed to mov	up, transport a ve compost to y of transport y area ve compost b	and load tru o transport t truck	truck Convert to			2 51.0 10 8 5 38 89 1.5	min/bucket minutes/day CY trips/day minutes/trip minutes/day	
	Time to te Total time Assume v Number o Transport Total time	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a e needed to mov	up, transport a ve compost to y of transport y area ve compost b	and load tru o transport t truck	ruck Convert to Labor cost	/year	\$	2 51.0 10 8 5 38 89 1.5 <b>10,439</b>	min/bucket minutes/day CY trips/day minutes/trip minutes/day minutes/day	
	Time to te Total time Assume v Number o Transport Total time	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a e needed to mov	up, transport a ve compost to y of transport y area ve compost b	and load tru o transport t truck	truck Convert to	/year	\$ \$	2 51.0 10 8 5 38 89 1.5	min/bucket minutes/day CY trips/day minutes/trip minutes/day minutes/day	
Mana	Time to te Total time Assume v Number c Transport Total time Total time	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a e needed to mov e needed to load	up, transport a ve compost to y of transport y area ve compost b	and load tru o transport t truck	ruck Convert to Labor cost	/year		2 51.0 10 8 5 38 89 1.5 <b>10,439</b>	min/bucket minutes/day CY trips/day minutes/trip minutes/day minutes/day	
	Time to te Total time Assume v Number c Transport Total time Total time	of loader bucket ear down, pick u e needed to mov /olume capacity of truck trips/day t time to curing a e needed to mov e needed to load needed to load	up, transport a ve compost to y of transport y area ve compost b d and move	and load tru o transport t truck by truck	ruck Convert to Labor cost	/year		2 51.0 10 8 5 38 89 1.5 <b>10,439</b> 25,517	min/bucket minutes/day CY trips/day minutes/trip minutes/day hours/day	
	Time to te Total time Assume v Number of Transport Total time Total time aging Curi Assume of	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a e needed to mov e needed to load needed to load ing Piles curing windrows	up, transport a ve compost to y of transport area ve compost b d and move and move s built with loa	and load tru o transport t truck by truck	ruck Convert to Labor cost	/year		2 51.0 10 8 5 38 89 1.5 10,439 25,517 3	min/bucket minutes/day CY trips/day minutes/trip minutes/day hours/day CY/bucket	
	Time to te Total time Assume v Number c Transport Total time Total time aging Curi Assume c Daily volu	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a e needed to nov e needed to load needed to load	up, transport a ve compost to y of transport area ve compost b d and move and move s built with loc curing	and load tru o transport t truck by truck	ruck Convert to Labor cost	/year		2 51.0 10 8 5 38 89 1.5 <b>10,439</b> <b>25,517</b> 3 76.5	min/bucket minutes/day CY trips/day minutes/trip minutes/day hours/day CY/bucket CY/bucket	
	Time to te Total time Assume v Number c Transport Total time Total time Assume c Daily volu Number c	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a e needed to nov e needed to load needed to load	up, transport a ve compost to y of transport y area ve compost b d and move and move s built with loc curing lay	and load tru o transport t truck oy truck oy truck ader	Convert to Labor cost Machine c	/year ost/year		2 51.0 10 8 5 38 89 1.5 <b>10,439</b> <b>25,517</b> 3 76.5 25	min/bucket minutes/day CY trips/day minutes/trip minutes/day hours/day CY/bucket CY/bucket CY/day buckets/day	
	Time to te Total time Assume v Number c Transport Total time Total time Total time Assume c Daily volu Number c Time nee	of loader bucket ear down, pick u e needed to mov volume capacity of truck trips/day t time to curing a e needed to mov e needed to load ing Piles curing windrows une coming to do of buckets per d ded to move fee	up, transport a ve compost to y of transport area ve compost b d and move d and move s built with loa curing lay edstocks fron	and load tru o transport t truck oy truck oy truck ader	Convert to Labor cost Machine c	/year ost/year		2 51.0 10 8 5 38 89 1.5 <b>10,439</b> <b>25,517</b> 3 76.5 25 25 2	min/bucket minutes/day CY trips/day minutes/trip minutes/day hours/day hours/day CY/bucket CY/bucket CY/day buckets/day minutes/bucket	et
	Time to te Total time Assume v Number c Transport Total time Total time Total time Assume c Daily volu Number c Time nee Time nee	of loader bucket ear down, pick use e needed to movy volume capacity of truck trips/day t time to curing a e needed to move a needed to load ing Piles curing windrows ume coming to do of buckets per d ded to move fee ded to build wir	up, transport a ve compost to y of transport area ve compost b d and move d and move d and move s built with loa curing lay edstocks from ndrows	and load tru o transport t truck by truck ader ader	Convert to Labor cost Machine c	/year ost/year		2 51.0 10 8 5 38 89 1.5 <b>10,439</b> <b>25,517</b> 3 76.5 25 25 25 20 51.0	min/bucket minutes/day CY trips/day minutes/trip minutes/day hours/day hours/day CY/bucket CY/bucket CY/day buckets/day minutes/bucket minutes/bucket	
	Time to te Total time Assume v Number of Transport Total time Total time Total time Assume of Daily volu Number of Time nee Assume to	of loader bucket ear down, pick u e needed to mov /olume capacity of truck trips/day t time to curing a e needed to move e needed to load a needed to load a needed to load buckets per d ded to move fee ded to build win urner used to tu	up, transport a ve compost to y of transport area ve compost b d and move d and move d and move s built with loa curing lay edstocks from ndrows	and load tru o transport t truck by truck ader ader	Convert to Labor cost Machine c	/year ost/year		2 51.0 10 8 5 38 89 1.5 <b>10,439</b> <b>25,517</b> 3 76.5 25 25 2 51.0 0.5	min/bucket minutes/day CY trips/day minutes/trip minutes/day hours/day hours/day CY/bucket CY/bucket CY/day buckets/day minutes/bucket minutes/day pass/week	
	Time to te Total time Assume v Number of Transport Total time Total time Total time Assume of Daily volu Number of Time nee Assume to Number of	of loader bucket ear down, pick u e needed to mov /olume capacity of truck trips/day t time to curing a e needed to move a needed to load a ne	up, transport a ve compost to y of transport area ve compost b d and move d and move d and move s built with loa curing lay edstocks from ndrows	and load tru o transport t truck by truck ader ader	Convert to Labor cost Machine c	/year ost/year		2 51.0 10 8 5 38 89 1.5 <b>10,439</b> <b>25,517</b> 3 76.5 25 25 20 51.0 0.5 20	min/bucket minutes/day CY trips/day minutes/trip minutes/day hours/day CY/bucket CY/bucket CY/day buckets/day minutes/bucket minutes/bucket windrows	
	Time to te Total time Assume v Number of Transport Total time Total time Total time Assume of Daily volu Number of Time nee Assume te Number of Windrow	of loader bucket ear down, pick u e needed to mov /olume capacity of truck trips/day t time to curing a e needed to move a needed to load a ne	up, transport a ve compost to y of transport area ve compost b d and move d and move s built with loc curing lay edstocks from ndrows urn windrows	and load tru o transport t truck by truck ader ader	Convert to Labor cost Machine c	/year ost/year		2 51.0 10 8 5 38 89 1.5 <b>10,439</b> <b>25,517</b> 3 76.5 25 25 25 51.0 0.5 20 250	min/bucket minutes/day CY trips/day minutes/trip minutes/day hours/day hours/day CY/bucket CY/bucket CY/day buckets/day minutes/bucket minutes/day pass/week	

Time to turn around =				1.0	minutes/turn
Time to travel down pad	to another windrow -	-			minutes
Total time needed per w		-			minutes
					minutes/week
Time needed to turn win					
Total time spent building	/turning windrows				minutes
		Convert to hours			hours
		Convert to per day equiv			hours/day <sub>equiv</sub>
		Labor cost/year	\$	9,326	
		Machine cost/year	\$	22,797	
creening Compost					
Avg. daily volume going	to screening (assume	e 10% shrink in curing)		69	CY/day
Assume screen hopper					CY/loader
Number of loader bucke	t movements daily			23	buckets/day
Time to move compost fr		na			min/bucket
Total time needed to mo					min/day
		Convert to hours			hrs/day
Assume screen througp	it rate				CY/hr
Screen run time per day		or needed)			hrs/day
		Labor cost/year	\$	<u> </u>	in orday
		Machine cost/year	\$ \$	10,410	
			Ψ	10,410	
laterials Handling - Screene		ge			
Avg. daily volume comin	g off screen			55	CY/day
Number of loader bucke	t movements			18	buckets/day
Time to tear down, pick u	up, transport and load	I truck		2	minutes/bucket
Total time needed to mo				36.7	minutes/day
Assume volume capacity					CY
Number of truck trips/day					trips/day
Transport time to storage					minutes/trip
Total time needed to mo	-				minutes/day
Total time needed to loa	//				minutes/day
		Convert to hours			hours/day
		Labor cost/year	\$	7,516	nourorady
		Machine cost/year	\$	18,372	
			•	10,012	
laterials Handling - Overs to					
Avg. daily volume comin	g off screen				CY/day
Number of loader bucke	t movements			5	buckets/day
Time to tear down, pick u	up, transport and load	l truck		2	minutes/bucket
Total time needed to mo	ve compost to transp	ort truck		9.2	minutes/day
Assume volume capacity	y of transport truck			10	CY
Number of truck trips/day	/			1	trips/day
Transport time to storage					minutes/trip
Total time needed to mo					minutes/day
Total time needed to loa	· /				minutes/day
		Convert to hours			hours/day
<u> </u>	1	Labor cost/year	\$	1,879	· · · · · · · · · · · · · · · · · · ·
		Machine cost/year	\$	4,593	
			+	.,	
roduct Markating 9 Salas					
roduct Marketing & Sales Annual compost product	ion volumo			19,088	CV/r
Average daily production				61	CY/day
Assume 90% wholesale		<u> </u>			0)//days
Wholesale (assume deli					CY/day
	volume capacity				CY
	lers needed daily			2	
Time to load tr					hrs/day
Assumed deliv	very fee		\$	150	per load

				Labor cost/year			\$	3,510			
				Machine cost/year			\$	8,580			
Reta	ail							6	CY/	day	
	Pick-up truck	capacity							CY		
	Number of retail sales need								per	day	
	Time needed to deal with ea			ner					hrs/	day	
				Labor cost/year			\$	2,106			
				Machine cost/year			\$	5,148			
Tota	lls			Labor cost/year				\$5,616			
				Machine c	ost/y	ear	-	\$13,728			
				Operating Expense			s Summary				
		Labor Sum		ASP Comp			osti	ing			
		Process	<u>Hrs/Day</u>		<u> </u>	Labor Cost	Ma	chine Costs	Con	sumables	<u>Total</u>
	V	Vaste Receipt	0.7		\$	4,734	\$	11,572			\$ 16,306
	Grinding/shredding		0.7		\$	7,020	\$	34,320			\$ 41,340
		Mixing	4.2		\$	18,937	\$	72,029			\$ 90,966
	Transport to pad Building ASPs Electricity for ASPs		2.1		\$	14,913	\$	36,453			\$ 51,365
			2.4		\$	17,043	\$	41,660			\$ 58,703
									\$	78,122	\$ 78,122
	Moving Compost to Curing				\$	10,439	\$	25,517			\$ 35,956
	Managing Curing Piles				\$	9,326	\$	22,797			\$ 32,123
	Screening Compost				\$	12,079	\$	10,410			\$ 22,489
Movir	Moving Screened Compost to Storage				\$	7,516	\$	18,372			\$ 25,888
	Move Overs to Storage				\$	1,879	\$	4,593			\$ 6,472
	Product Marketing & Sales		0.8		\$	5,616	\$	13,728			\$ 19,344
		TOTALS	16.6	Subtotals	\$	109,501	\$	291,453	\$	78,122	\$ 479,075
Assur	Assume 85% efficiency of site workers					Total	\$	479,075			
	Number of work-h		hrs/day		Annual Tons		10,623				
	FTE's in a 8-hour day			FTEs		Per Ton	\$	45.10			

	πα 5 νπιεν	ard Food Was	te Diversion	Program						
		composting Op								
	/25/18	<b>. .</b>								
Assu	mptions									
		ded) per hour						\$22.50	per hour	
		ck machine rate	e (fuel + insu	rance + ma	intenance)				per hour	
	ler machin								per hour	
	er machine								per hour	
		6 days/week, 5	2 wooke/ur	<u> </u>				-	days/yr	
				morwacto	gonoration	at full build out	-	512	uays/yi	
		verlap of labor f			generation	at iuli bullu out	_			
Negi	ects any o	venap of labor i								
D										
Proc	essing Vo	iumes			<b>A</b>		_			
				ļ		e Daily Volume				
	ood waste			l		CY/day				
	dential foo	d wastes		ļ	25.6					
Leav					15.6					
Sawo					0.4					
	d chips			ļ	18.3					
	D yard wa	ste			11.5					
000					11.4					
Com	post recycl	е			6.7					
	s from scre				<u>15.9</u>					
		Totals			121.4	CY/day				
						,				
Mate		lling Assumpti		L						
		vastes & produc			rate loaders	3				
		Bucket capacit		der				3	CY/loader	
		done by site sta		l						
		ne by straddle								
		moved to comp								
	Materials	moved to stora	ge (overs and	d compost)	by loaders					
Mato	riale Hand	lling - Waste R	accint & Sta							
Wale		imes coming in		Tage			-	101.4	CY/day	
		of loader "bucke			unkora 8 ni	loo monogod		121.4	CT/uay	
						les managed		40	h	
		Daily volume /			20				buckets/day	
		me spent per lo		ient					minutes	
	Time sper	nt handling feed	dstocks			-			minutes/day	
				ļ	Convert to				hours/day	
				ļ	Labor cost		\$	4,734		
					Machine co	ost/year	\$	11,572		
Mate	rials Hand	lling - Grinding	/shredding							
		vood chips/pap		rough aring	der			30	CY/day	
		ise of Morbark						00	21,300 y	
		rinder used on						1	hr/day	
	Assume g			ху Г	Lobor cost	woor	¢	7,020	muay	
					Labor cost		\$ \$	34,320		
					Machine co	JSVyear	Þ	54,520		
Mate	rials Hand	lling - Transpo	rt To Compo	sting Pad						
-		volume going						109	CY/day	
		of loader bucket							buckets/day	
		ar down, pick u			ick				min/bucket	
		needed to mov							minutes/day	
		olume capacity							CY	
		of truck trips/day							trips/day	
		time to curing a					_		minutes/trip	
				w truck						
		needed to mov		y uruck					minutes/day minutes/day	
		noodod to lo -						127	minutes/dav	
		needed to load	d and move	ļ	Constant	h				
		needed to load	d and move		Convert to		*	2.1	hours/day	
		needed to load	d and move		Convert to Labor cost Machine co	/year	\$ \$			

_oading/Unloa			T	rr					
	ading Rotary D	rum							
Time to ι	unload drum						2.0	hrs/cycle	
Length o	of cycle						5	days	
	uivalent time							hrs/day	
	oad drum							hrs/cycle	
Length o			<u> </u>					days	
	uivalent time							hrs/day	
	ily equivalent tir						0.8	hrs/day	
Machine	cost based on	use of loader	to load/unl	oad					
				Labor cost	vear	\$	5,616		
		_		Machine co		\$	13,728		
			<u> </u>	Machine co	JSilyeai	Ψ	13,720		
Operating Rot	arv Drum								
	otor running 24/	/7	1						
Electrica		1	-				240	volts	
			<b> </b>						
Motor An								amps	
Power co	onsumed	$W = A \times V \times$	SQRT3				54,040		
						=	54	kilowatts	
Hours of	operation per y	/ear						hrs/year	
	Il consumption p		<u> </u>	<u> </u>				kWh/year	
					Suma of the s		413,390	kwii/yeal	
Electrica	l power cost	Eversource					<b>A A - -</b>		
				istomer chai	rge			per month	
			Electric rat	e			\$0.03	per kWh	
Add hiat	n maintenance i	tems like are:	ase					per year	
			1	Labor cost	vear	\$	,		
		+	<u> </u>		/	•	-		
			<u> </u>	Machine co	osiyear	\$	28,852		
		-	<u> </u>						
	ndling - Moving								
Avg. dail	ly volume going	to curing (as	sume 30%	shrink)				CY/day	
Number	of loader bucke	t movements		-			25	buckets/day	
	ear down, pick			ick				min/bucket	
	e needed to mo								
				uuck				minutes/day	
	volume capacit		truck					CY	
Number	of truck trips/da	У						trips/day	
Transpor	rt time to curing	area					5	minutes/trip	
	e needed to mo		w truck					minutes/day	
	e needed to loa							minutes/day	
TOtal till				0 11	1				
				Convert to				hours/day	
					'vear	\$			
				Labor cost	/	Ψ	10,439		
		+		Labor cost	/	\$	25,517		
		<u> </u>			/	•			
					/	•	25,517		
Assume	curing windrow		ader		/	•	<b>25,517</b> 3	CY/bucket	
Assume			ader		/	•	<b>25,517</b> 3	CY/bucket CY/day	
Assume Daily vol	curing windrow	curing	ader		/	•	<b>25,517</b> 3 76.5	CY/day	
Daily vol Number	curing windrow lume coming to of buckets per c	curing day		Machine co	ost/year	•	<b>25,517</b> 3 76.5 25	CY/day buckets/day	st
Assume Daily vol Number Time nee	curing windrow lume coming to of buckets per c eded to move fe	curing day eedstocks fror		Machine co	ost/year	•	<b>25,517</b> 3 76.5 25 2	CY/day buckets/day minutes/bucke	et
Assume Daily vol Number Time nee Time nee	curing windrow lume coming to of buckets per c eded to move fe eded to build wi	curing day eedstocks fror indrows	n unload sit	Machine co	ost/year	•	<b>25,517</b> 3 76.5 25 2 51.0	CY/day buckets/day minutes/bucke minutes/day	et
Assume Daily vol Number Time nee Time nee Assume	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to	curing day eedstocks fror indrows	n unload sit	Machine co	ost/year	•	<b>25,517</b> 3 76.5 25 2 51.0 6	CY/day buckets/day minutes/bucke minutes/day turns/cycle	et
Assume Daily vol Number Time nee Time nee Assume	curing windrow lume coming to of buckets per c eded to move fe eded to build wi	curing day eedstocks fror indrows	n unload sit	Machine co	ost/year	•	25,517 3 76.5 25 2 51.0 6 15	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows	et
Assume Daily vol Number Time nee Time nee Assume Number	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to	curing day eedstocks fror indrows	n unload sit	Machine co	ost/year	•	25,517 3 76.5 25 2 51.0 6 15	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows	et
Assume Daily vol Number Time nee Time nee Assume Number Total win	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume	curing day eedstocks fror indrows	n unload sit	Machine co	ost/year	•	<b>25,517</b> 3 76.5 25 25 51.0 6 15 6883	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle	ət
Assume Daily vol Number Time nee Assume Number Total win Bucket m	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements	curing day eedstocks fror indrows turn windrows	n unload sit	Machine co	ost/year	•	25,517 3 76.5 25 25 51.0 6 15 6883 14749	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket	curing day eedstocks fror indrows turn windrows	n unload sit	Machine co	ost/year	•	25,517 3 76.5 25 2 51.0 6 15 6883 14749 1.0	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucket	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements	curing day eedstocks fror indrows turn windrows	n unload sit	Machine co	ost/year	•	25,517 3 76.5 25 25 20 51.0 6 883 14749 1.0 14748.7	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucket minutes/cycle	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket	curing day eedstocks fror indrows turn windrows	n unload sit	Machine co Machine co te to windrov ry 2 weeks	bst/year w hours	•	25,517 3 76.5 25 25 2 51.0 6 15 6883 14749 1.0 14748.7 245.8	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucke minutes/cycle hours	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket	curing day eedstocks fror indrows turn windrows	n unload sit	Machine co Machine co te to windrov ry 2 weeks	ost/year	•	25,517 3 76.5 25 25 2 51.0 6 15 6883 14749 1.0 14748.7 245.8	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucket minutes/cycle	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket	curing day eedstocks fror indrows turn windrows	n unload sit	Machine co Machine co te to windrov ry 2 weeks Convert to Convert to	hours per day equiv		25,517 3 76.5 25 25 51.0 6 15 6883 14749 1.0 14748.7 245.8 2.7	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucke minutes/cycle hours	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket	curing day eedstocks fror indrows turn windrows	n unload sit	Machine cc Machine cc te to windrov ry 2 weeks Convert to Convert to Labor cost	hours per day equiv	\$ 	25,517 3 76.5 25 2 51.0 6 15 6883 14749 1.0 14748.7 245.8 2.7 19,173	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucke minutes/cycle hours	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket	curing day eedstocks fror indrows turn windrows	n unload sit	Machine co Machine co te to windrov ry 2 weeks Convert to Convert to	hours per day equiv		25,517 3 76.5 25 25 51.0 6 15 6883 14749 1.0 14748.7 245.8 2.7	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucke minutes/cycle hours	
Assume         Daily vol         Number         Time nee         Assume         Number         Total win         Bucket m         Time to t         Time to t	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket urn all windrow	curing day eedstocks fror indrows turn windrows	n unload sit	Machine cc Machine cc te to windrov ry 2 weeks Convert to Convert to Labor cost	hours per day equiv	\$ 	25,517 3 76.5 25 2 51.0 6 15 6883 14749 1.0 14748.7 245.8 2.7 19,173	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucke minutes/cycle hours	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t Time to t Screening Co	curing windrow lume coming to of buckets per of eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket urn all windrow	curing day eedstocks fror indrows turn windrows s/cure cycle	n unload sit	Machine co Machine co te to windrov ry 2 weeks Convert to Convert to Labor cost Machine co	hours per day equiv /year ost/year	\$ 	25,517 3 76.5 25 2 51.0 6 15 6883 14749 1.0 14748.7 245.8 2.7 19,173 46,868	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucket minutes/cycle hours hours/day <sub>equiv</sub>	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t Time to t Assume Assume Comparison	curing windrow lume coming to of buckets per of eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket urn all windrow	curing day eedstocks fror indrows turn windrows s/cure cycle	n unload sit	Machine co Machine co te to windrov ry 2 weeks Convert to Convert to Labor cost Machine co 0% shrink in	hours per day equiv /year ost/year	\$ 	25,517 3 76.5 25 2 51.0 6 15 6883 14749 1.0 14748.7 245.8 2.7 19,173 46,868	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucke minutes/cycle hours hours/day <sub>equiv</sub>	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t Time to t Screening Co Avg. dail Assume	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket urn all windrow mpost y volume going screen hopper	curing day eedstocks from indrows turn windrows solure cycle	n unload sit	Machine co Machine co te to windrov ry 2 weeks Convert to Convert to Labor cost Machine co 0% shrink in	hours per day equiv /year ost/year	\$ 	25,517 3 76.5 25 2 51.0 6 15 6883 14749 1.0 14748.7 245.8 2.7 19,173 46,868 69 3	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucke minutes/cycle hours hours/day <sub>equiv</sub> CY/day CY/day	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t Time to t Screening Co Avg. dail Assume Number	curing windrow lume coming to of buckets per of eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket urn all windrow mpost y volume going screen hopper of loader bucket	curing day eedstocks from indrows turn windrows s/cure cycle s/cure cycle	n unload sit	Machine co Machine co te to windrov ry 2 weeks Convert to Convert to Labor cost Machine co 0% shrink in	hours per day equiv /year ost/year	\$ 	25,517 3 76.5 25 2 51.0 6 15 6883 14749 1.0 14748.7 245.8 2.7 19,173 46,868 69 3 23	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucke minutes/cycle hours hours/day <sub>equiv</sub> CY/day CY/day	
Assume Daily vol Number Time nee Assume Number Total win Bucket m Time to t Time to t Screening Co Avg. dail Assume Number	curing windrow lume coming to of buckets per c eded to move fe eded to build wi loader used to of windrows ndrows volume novements urn one bucket urn all windrow mpost y volume going screen hopper	curing day eedstocks from indrows turn windrows s/cure cycle s/cure cycle	n unload sit	Machine co Machine co te to windrov ry 2 weeks Convert to Convert to Labor cost Machine co 0% shrink in	hours per day equiv /year ost/year	\$ 	25,517 3 76.5 25 2 51.0 6 15 6883 14749 1.0 14748.7 245.8 2.7 19,173 46,868 69 3 23 4	CY/day buckets/day minutes/bucke minutes/day turns/cycle windrows CY/cure cycle buckets/cycle minutes/bucke minutes/cycle hours hours/day <sub>equiv</sub> CY/day CY/day	

					Convert to	houro			1 5	hrs/day	
	A	are an through	t roto		Conventio	nours				CY/hr	
		creen througpu									
	Screen ru	in time per day (	assume no	add'i labor i				•		hrs/day	
					Labor cost			\$	12,079		
					Machine c	ost/year		\$	29,527		
Mate	rials Hand	dling - Screene	d Compost t	o Storage							
mate		volume going f		ootorage					55	CY/day	
		of loader bucket								buckets/day	
				متعالم مرافس						minutes/bucke	
		ar down, pick u									el .
		e needed to mov			Iruck					minutes/day	
		olume capacity		truck						CY	
		of truck trips/day								trips/day	
		t time to storage								minutes/trip	
		e needed to mov		y truck						minutes/day	
	Total time	needed to load	and move							minutes/day	
					Convert to	hours				hours/day	
					Labor cost			\$	7,516		
					Machine c	ost/year		\$	18,372		
Mata	riale Harr	dling Overete	Storage								
wate		dling - Overs to							4.4	CV/dov/	
		volume going t								CY/day	
		of loader bucket			l					buckets/day	
		ar down, pick u								minutes/bucke	et
		e needed to mov			truck					minutes/day	
		olume capacity		truck						CY	
		of truck trips/day								trips/day	
	Transport	t time to storage	area, dump	return					5	minutes/trip	
	Total time	e needed to mov	/e compost b	y truck					10.0	minutes/day	
	Total time	e needed to load	and move						19	minutes/day	
					Convert to	hours			0.3	hours/day	
					Labor cost	/vear		\$	2,244		
					Machine c			\$	5,485		
									-,		
Prod		ting & Sales									
		ompost producti							19,088		
		daily production							61	CY/day	
	Assume 9	0% wholesale/	10% retail								
	Wholesal	e (assume deliv	ery outsour	ced)					55	CY/day	
		Tractor-trailer v	olume capa	city					30	CY	
		Number of trail	ers needed o	daily					2		
		Time to load tra							0.5	hrs/day	
		Assumed deliv						\$		per load	
					Labor cost	/vear		\$	3,510	- 5. 1000	
					Machine c			\$	8,580		
	Retail				machille C	Jouyear		Ψ		CY/day	
	IVEIGII									CY	
		Pick-up truck ca		lad dall.							
		Number of reta								per day	
		Time needed to	o deal with e	acn custom	1			¢		hrs/day	
					Labor cost			\$	2,106		
					Machine c			\$	5,148		
	Totals				Labor cos				\$5,616		
					Machine c	ost/year			\$13,728		
							noretine '			mony	
							Derating I		ises sum	mary	
ا ما ا	r summai	y .	Du			<u> </u>	Rotary D		- la - 0 - 1		
Labo		1	Process	Hrs/Day			r Cost		nine Costs		
Labo					1	\$	4,734	\$	11,572	\$ 16,306	
Labo			aste Receipt	0.7							
Labo		Grindin	g/shredding	1.0		\$	7,020	\$	34,320	\$ 41,340	
Labo		Grindin Tran	g/shredding sport to pad	1.0 2.1		\$	14,913	\$ \$	36,453	\$ 51,365	
Labo		Grindin Tran Loading F	g/shredding sport to pad Rotary Drum	1.0		\$ \$			36,453 13,728	\$ 51,365 \$ 19,344	
Labo		Grindin Tran Loading F	g/shredding sport to pad	1.0 2.1		\$	14,913	\$	36,453	\$ 51,365	
Labo		Grindin Tran Loading F	g/shredding sport to pad Rotary Drum Rotary Drum	1.0 2.1 0.4		\$ \$	14,913	\$ \$	36,453 13,728	\$ 51,365 \$ 19,344	

		Screenii	ng Compost	1.5		\$	12,079	\$ 29,527	\$ 41,606	
N	Moving Screened Compost to Storage			1.1		\$	7,516	\$ 18,372	\$ 25,888	
		Move Over	s to Storage	0.3		\$	2,244	\$ 5,485	\$ 7,728	
		Product Marke	ting & Sales	0.8		\$	5,616	\$ 13,728	\$ 19,344	
			TOTALS	12.1	Subtotals	\$	89,349	\$ 264,421	\$ 353,771	
Assur	ne 85% e	fficiency of site	workers				Total	\$ 353,771		
Numb	per of work	<-hours needed	14.3	hrs/day		Annua	l Tons	10,623		
FTE's	in a 8-hou	ur day	1.78	FTEs		F	Per Ton	\$ 33.30		



Appendix F- Pro Forma Analyses

#### Martha's Vineyard Windrow Composting

#### Pro Forma Assumptions - 2019 Capacity = 10,000 tons/year

Revenues:				
1. Tip fees =			\$50.00	per ton
Tip fee tor	ns per year =		2,215	tons/year
2. Compost sales pri	ce=			
Commerc	ial sales	ç	25.00	per CY
Residentia	al sales	ę	35.00	per CY
	<b>a</b>			
	Commercial =		75%	
	Residential =		25%	
3. Compost sales dis	tribution:			
Annual qu		10,500	CY/year	
Assume sa	Assume sales timing :			
	January		0.2%	
	February		4.4%	
	March		12.8%	
	April		15.3%	
	May		9.5%	
	June		9.1%	
	July		2.1%	
	August		4.2%	
	September		16.2%	
	October		14.0%	
	November		5.5%	
	December		6.7%	
			100.0%	

#### Cost of Compost Production

1. From spreadsheet "Windrow Opex Estimate"

Tomopreducineet Trindron open Estimate		
	Anr	ual Costs
Waste Receipt	\$	16,306
Grinding/shredding	\$	41,340
Transport to pad	\$	57,073
Building windrows	\$	48,919
Windrow Mixing & Turning	\$	27,203
Windrow Irrigation	\$	-
Moving Compost to Curing	\$	39,951
Managing Curing Piles	\$	34,406
Screening Compost	\$	39,625
Moving Screened Compost to Storage	\$	35,956
Moving Overs to Storage	\$	7,552
Product Marketing & Sales	\$	19,344

#### 2. Assume costs are distributed through the year proportional to incoming loads:

January	1.5%
February	1.8%
March	1.6%
April	2.2%
May	7.4%
June	11.5%
July	19.5%
August	24.5%
September	10.2%
October	8.4%
November	5.7%
December	5.8%

3. Assume production costs increase by 3% annually in 2020 and 2021

<ol> <li>Capital cost recovery factor for equipment =</li> </ol>	3.75%	per year	<12-yr life
Estimated capex for equipment =	\$ 1,101,265		
2. Capital cost recovery factor for site improvements =	5.5%	per year	20 yrs
Estimated capex Phase I =	\$ 2,905,300		
<ol><li>Housekeeping, Monitoring &amp; Recordkeeping</li></ol>			
Remaining time after materials handling	1.6	hrs/day/FT	E
Assume loaded labor rate =	\$ 22.50	per hour	

											For the Y	Year Ending	12/31/2
	January	February	March	April	May	June	July	August	September	October	November	December	YTD
Je													
Tip Fees	\$1,613	\$2,033	\$1,729	\$2,436	\$8,146	\$12,760	\$21,565	\$27,100	\$11,327	\$9,310	\$6,311	\$6,421	\$110,
Compost Sales - commercial	\$394	\$8,663	\$25,200	\$30,122	\$18,703	\$17,916	\$4,134	\$8,269	\$31,894	\$27,563	\$10,828	\$13,191	\$196
Compost Sales - residential	\$184	\$4,043	\$11,760	\$14,057	\$8,728	\$8,361	\$1,929	\$3,859	\$14,884	\$12,863	\$5 <i>,</i> 053	\$6,156	\$91,
<other revenue=""></other>	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$
Net Sales	\$2,191	\$14,738	\$38,689	\$46,614	\$35,578	\$39,036	\$27,629	\$39,227	\$58,104	\$49,735	\$22,192	\$25,768	\$399
Compost Production													
Waste Receipt	\$238	\$299	\$255	\$359	\$1,199	\$1 <i>,</i> 879	\$3,175	\$3,990	\$1,668	\$1,371	\$929	\$945	\$16
Grinding/shredding	\$602	\$759	\$645	\$909	\$3,041	\$4,763	\$8 <i>,</i> 050	\$10,116	\$4,228	\$3 <i>,</i> 475	\$2,356	\$2,397	\$41
Transport to pad	\$831	\$1,048	\$891	\$1,255	\$4,198	\$6,576	\$11,113	\$13,965	\$5,837	\$4,798	\$3,252	\$3,309	\$57
Building windrows	\$713	\$898	\$764	\$1,076	\$3 <i>,</i> 598	\$5,636	\$9,526	\$11,970	\$5,003	\$4,112	\$2,787	\$2,836	\$48
Windrow Mixing & Turning	\$396	\$499	\$425	\$598	\$2,001	\$3,134	\$5,297	\$6,656	\$2,782	\$2,287	\$1,550	\$1,577	\$27
Windrow Irrigation	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$
Moving Compost to Curing	\$582	\$733	\$624	\$879	\$2,939	\$4,603	\$7,779	\$9,776	\$4,086	\$3,358	\$2,276	\$2,316	\$39
Managing Curing Piles	\$501	\$632	\$537	\$757	\$2,531	\$3,964	\$6,700	\$8,419	\$3,519	\$2,892	\$1,960	\$1,995	\$34
Screening Compost	\$577	\$727	\$619	\$871	\$2,915	\$4,565	\$7,716	\$9,696	\$4,053	\$3,331	\$2,258	\$2,298	\$39
Moving Screened Compost to Storage	\$524	\$660	\$561	\$791	\$2,645	\$4,143	\$7,001	\$8,798	\$3,677	\$3,022	\$2,049	\$2,085	\$35
Moving Overs to Storage	\$110	\$139	\$118	\$166	\$556	\$870	\$1,471	\$1,848	\$772	\$635	\$430	\$438	\$7,
Product Marketing & Sales	\$282	\$355	\$302	\$425	\$1,423	\$2,229	\$3,767	\$4,733	\$1,978	\$1,626	\$1,102	\$1,122	\$19
Cost of Compost Production	\$5,356	\$6,750	\$5,740	\$8,086	\$27,044	\$42,361	\$71,594	\$89,967	\$37,603	\$30,907	\$20,950	\$21,318	\$367
istrative Costs													
Capital Recovery - equipment	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$41
Capital Recovery - site improvements	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$159
Housekeeping, Monitoring & Recordkeepin	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$20
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$
– Total Admin Costs	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$221,
Net Income	(\$21,650)	(\$10,497)	\$14,464	\$20,043	(\$9,952)	(\$21,810)	(\$62,450)	(\$69,225)	\$2,016	\$343	(\$17,244)	(\$14,036)	(\$190,

#### Martha's Vineyard Windrow Composting

#### Pro Forma Assumptions - 2020 Capacity = 10,000 tons/year

Rev	/en	u	es	:	
			~		

1. Tip fees =			\$51.50	per ton		
Tip fee tor	ns per year =		2,900	tons/year		
2. Compost sales pri	ce=					
Commerc	ial sales	\$	25.00	per CY		
Residentia	al sales	\$	35.00	per CY		
	Commercial =		75%			
	Residential =		25%			
3. Compost sales dis	3. Compost sales distribution:					
Annual qu		13.775	CY/year			
	les timing :		,			
	January		0.2%			
	February		4.4%			
	March		12.8%			
	April	15.3%				
	May	9.5%				
	June		9.1%			
	July		2.1%			
	August		4.2%			
	September		16.2%			
	October		14.0%			
	November		5.5%			
	December		6.7%			
			100.0%			

#### Cost of Compost Production

1. From spreadsheet "Windrow Opex Estimate"

From spreadsheet "Windrow Opex Estimate"		
	Anr	nual Costs
Waste Receipt	\$	16,796
Grinding/shredding	\$	42,580
Transport to pad	\$	58,785
Building windrows	\$	50,387
Windrow Mixing & Turning	\$	28,019
Windrow Irrigation	\$	-
Moving Compost to Curing	\$	35,271
Managing Curing Piles	\$	32,079
Screening Compost	\$	40,813
Moving Screened Compost to Storage	\$	25,395
Moving Overs to Storage	\$	7,779
Product Marketing & Sales	\$	19,924

#### 2. Assume costs are distributed through the year proportional to incoming loads:

January	1.5%
February	1.8%
March	1.6%
April	2.2%
May	7.4%
June	11.5%
July	19.5%
August	24.5%
September	10.2%
October	8.4%
November	5.7%
December	5.8%

3. Assume production costs increase by 3% annually in 2020 and 2021

<ol> <li>Capital cost recovery factor for equipment =</li> </ol>	3.75%	per year	<12-yr life
Estimated capex for equipment =	\$ 1,101,265		
2. Capital cost recovery factor for site improvements =	5.5%	per year	20 yrs
Estimated capex Phase I =	\$ 2,905,300		
3. Housekeeping, Monitoring & Recordkeeping			
Remaining time after materials handling	1.6	hrs/day/FT	E
Assume loaded labor rate =	\$ 22.50	per hour	

	January	February	March	April	May	June	July	August	September	October	November	December	YTD
ve	January	rebruary	Warch	Арті	ividy	June	July	August	September	October	November	December	
Tip Fees	\$2,175	\$2,742	\$2,332	\$3,284	\$10,985	\$17,207	\$29,081	\$36,545	\$15,274	\$12,554	\$8,510	\$8,660	\$149,3
Compost Sales - commercial	\$517	\$11,364	\$33,060	\$39,517	\$24,537	\$23,504	\$5,424	\$10,848	\$41,842	\$36,159	\$14,205	\$17,305	\$258,
Compost Sales - residential	\$241	\$5,303	\$15,428	\$18,441	\$11,450	\$10,968	\$2,531	\$5,062	\$19,526	\$16,874	\$6,629	\$8,076	\$120
<pre><other revenue=""></other></pre>	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$120
Net Sales	\$2,933	\$19,409	\$50,820	\$61,243	\$46,973	\$51,679	\$37,037	\$52,455	\$76,642	\$65,588	\$29,345	\$34,040	\$528
Compost Production	+ - /	+	+)	+ /	+ ,	+/	+/	+,	<b>*</b> ·• <b>/</b> •·-	+)	+/-	<i>+,</i>	,
Waste Receipt	\$245	\$308	\$262	\$369	\$1,235	\$1,935	\$3,270	\$4,110	\$1,718	\$1,412	\$957	\$974	\$16,
Grinding/shredding	\$620	\$782	\$665	\$936	\$3,132	\$4,906	\$8,291	\$10,419	\$4,355	\$3,579	\$2,426	\$2,469	\$42
Transport to pad	\$856	\$1,079	\$918	\$1,293	\$4,324	\$6,773	\$11,447	\$14,384	\$6,012	\$4,941	\$3,350	\$3,408	\$58
Building windrows	\$734	\$925	\$787	\$1,108	\$3,706	\$5,805	\$9,811	\$12,329	\$5,153	\$4,236	\$2,871	\$2,922	\$50
Windrow Mixing & Turning	\$408	\$514	\$437	\$616	\$2,061	\$3,228	\$5,456	\$6,856	\$2,866	\$2,355	\$1,597	\$1,625	\$28
Windrow Irrigation	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$
Moving Compost to Curing	\$514	\$647	\$551	\$776	\$2,594	\$4,064	\$6,868	\$8,630	\$3,607	\$2,965	\$2,010	\$2,045	\$35
Managing Curing Piles	\$467	\$589	\$501	\$705	\$2,360	\$3,696	\$6,246	\$7,850	\$3,281	\$2,697	\$1,828	\$1,860	\$32
Screening Compost	\$594	\$749	\$637	\$898	\$3,002	\$4,702	\$7,947	\$9,987	\$4,174	\$3,431	\$2,326	\$2,366	\$40
Moving Screened Compost to Storage	\$370	\$466	\$396	\$558	\$1,868	\$2 <i>,</i> 926	\$4,945	\$6,214	\$2,597	\$2,135	\$1,447	\$1,472	\$25,
Moving Overs to Storage	\$113	\$143	\$121	\$171	\$572	\$896	\$1,515	\$1,903	\$796	\$654	\$443	\$451	\$7,
Product Marketing & Sales	\$290	\$366	\$311	\$438	\$1,466	\$2,296	\$3,880	\$4,875	\$2,038	\$1,675	\$1,135	\$1,155	\$19
Cost of Compost Production	\$5,212	\$6,569	\$5,586	\$7,869	\$26,320	\$41,227	\$69 <i>,</i> 676	\$87,557	\$36,596	\$30,079	\$20,389	\$20,747	\$357
istrative Costs													
Capital Recovery - equipment	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3 <i>,</i> 441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$41,
Capital Recovery - site improvements	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$159
Housekeeping, Monitoring & Recordkeepin	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$20,
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$
- Total Admin Costs	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18 <i>,</i> 485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$221
Net Income	(\$20,765)	(\$5,645)	\$26,748	\$34,888	\$2,167	(\$8,033)	(\$51,125)	(\$53,588)	\$21,561	\$17,024	(\$9,530)	(\$5,193)	(\$51,4

#### Martha's Vineyard Windrow Composting

#### Pro Forma Assumptions - 2021 Capacity = 10,000 tons/year

Revenues:						
1. Tip fees =		\$53.00	per ton			
Tip fee	tons per year =		4,000	tons/year		
2. Compost sales	price =					
Comm	ercial sales	\$	25.00	per CY		
Resider	ntial sales	\$	35.00	per CY		
	Commercial =		75%			
	Residential =		25%			
3. Compost sales	distribution:					
Annual	quantity =		19,000	CY/year		
Assume	e sales timing :					
	January	0.2%				
	February	4.4%				
	March	12.8%				
	April		15.3%			
	May		9.5%			
	June		9.1%			
	July		2.1%			
	August		4.2%			
	September		16.2%			
	October		14.0%			
	November		5.5%			
	December		6.7%			
		1	100.0%			

#### Cost of Compost Production

1. From spreadsheet "Windrow Opex Estimate"

Tom spiced sheet wind ow opex Estimate		
	Anr	nual Costs
Waste Receipt	\$	17,300
Grinding/shredding	\$	43,858
Transport to pad	\$	60,548
Building windrows	\$	51,899
Windrow Mixing & Turning	\$	28,859
Windrow Irrigation	\$	-
Moving Compost to Curing	\$	36,329
Managing Curing Piles	\$	33,042
Screening Compost	\$	42,038
Moving Screened Compost to Storage	\$	26,157
Moving Overs to Storage	\$	8,012
Product Marketing & Sales	\$	20,522

#### 2. Assume costs are distributed through the year proportional to incoming loads:

January	1.5%
February	1.8%
March	1.6%
April	2.2%
May	7.4%
June	11.5%
July	19.5%
August	24.5%
September	10.2%
October	8.4%
November	5.7%
December	5.8%

3. Assume production costs increase by 3% annually in 2020 and 2021

<ol> <li>Capital cost recovery factor for equipment =</li> </ol>	3.75%	per year	<12-yr life
Estimated capex for equipment =	\$ 1,101,265		
2. Capital cost recovery factor for site improvements =	5.5%	per year	20 yrs
Estimated capex Phase I =	\$ 2,905,300		
<ol><li>Housekeeping, Monitoring &amp; Recordkeeping</li></ol>			
Remaining time after materials handling	1.6	hrs/day/FT	E
Assume loaded labor rate =	\$ 22.50	per hour	

Martha's Vineyard Windrow													
4,000 ton/year food waste capacity (2021 tip	o fee tonna	ge = 4,000 1	tons; 2021 c	ompost pro	duction = 1	9,000 CY/yı	•				For the \	′ear Ending	12/31/2021
	January	February	March	April	Мау	June	July	August	September	October	November	December	YTD
Revenue													
Tip Fees	\$3,088	\$3 <i>,</i> 892	\$3,310	\$4,662	\$15,594	\$24,425	\$41,281	\$51,875	\$21,682	\$17,821	\$12,080	\$12,292	\$212,000
Compost Sales - commercial	\$713	\$15,675	\$45,600	\$54,506	\$33 <i>,</i> 844	\$32,419	\$7 <i>,</i> 481	\$14,963	\$57,713	\$49,875	\$19,594	\$23 <i>,</i> 869	\$356,250
Compost Sales - residential	\$333	\$7,315	\$21,280	\$25 <i>,</i> 436	\$15,794	\$15,129	\$3 <i>,</i> 491	\$6,983	\$26,933	\$23,275	\$9,144	\$11,139	\$166,250
<other revenue=""></other>	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Sales	\$4,133	\$26,882	\$70,190	\$84,605	\$65,231	\$71,973	\$52 <i>,</i> 253	\$73 <i>,</i> 820	\$106,327	\$90,971	\$40,817	\$47 <i>,</i> 300	\$734,500
Cost of Compost Production													
Waste Receipt	\$252	\$318	\$270	\$380	\$1,272	\$1,993	\$3 <i>,</i> 369	\$4,233	\$1,769	\$1,454	\$986	\$1,003	\$17,300
Grinding/shredding	\$639	\$805	\$685	\$964	\$3,226	\$5 <i>,</i> 053	\$8 <i>,</i> 540	\$10,732	\$4,485	\$3 <i>,</i> 687	\$2,499	\$2,543	\$43 <i>,</i> 858
Transport to pad	\$882	\$1,112	\$945	\$1,332	\$4,454	\$6,976	\$11,790	\$14,816	\$6,192	\$5 <i>,</i> 090	\$3 <i>,</i> 450	\$3,511	\$60,548
Building windrows	\$756	\$953	\$810	\$1,141	\$3,817	\$5,979	\$10,106	\$12,699	\$5,308	\$4,363	\$2,957	\$3,009	\$51,899
Windrow Mixing & Turning	\$420	\$530	\$451	\$635	\$2,123	\$3,325	\$5 <i>,</i> 619	\$7,062	\$2 <i>,</i> 951	\$2,426	\$1,644	\$1,673	\$28,859
Windrow Irrigation	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Moving Compost to Curing	\$529	\$667	\$567	\$799	\$2,672	\$4,186	\$7 <i>,</i> 074	\$8,889	\$3,715	\$3,054	\$2,070	\$2,106	\$36,329
Managing Curing Piles	\$481	\$607	\$516	\$727	\$2 <i>,</i> 430	\$3 <i>,</i> 807	\$6 <i>,</i> 434	\$8,085	\$3,379	\$2,777	\$1,883	\$1,916	\$33,042
Screening Compost	\$612	\$772	\$656	\$924	\$3 <i>,</i> 092	\$4,843	\$8,186	\$10,286	\$4,299	\$3,534	\$2,395	\$2,437	\$42,038
Moving Screened Compost to Storage	\$381	\$480	\$408	\$575	\$1,924	\$3,014	\$5 <i>,</i> 093	\$6,400	\$2 <i>,</i> 675	\$2,199	\$1,490	\$1,517	\$26,157
Moving Overs to Storage	\$117	\$147	\$125	\$176	\$589	\$923	\$1,560	\$1,960	\$819	\$673	\$457	\$465	\$8,012
Product Marketing & Sales	\$299	\$377	\$320	\$451	\$1,510	\$2,364	\$3,996	\$5,022	\$2,099	\$1,725	\$1,169	\$1,190	\$20,522
Cost of Compost Production	\$5 <i>,</i> 369	\$6,766	\$5,754	\$8,105	\$27,110	\$42 <i>,</i> 463	\$71,767	\$90,184	\$37,694	\$30,981	\$21,001	\$21,370	\$368,563
Administrative Costs													
Capital Recovery - equipment	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$3 <i>,</i> 441	\$3,441	\$3,441	\$3,441	\$3,441	\$3,441	\$41,297
Capital Recovery - site improvements	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$13,316	\$159,791
Housekeeping, Monitoring & Recordkeepin	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$20,736
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Admin Costs	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18,485	\$18 <i>,</i> 485	\$18,485	\$18,485	\$18 <i>,</i> 485	\$221,825
NetIncome	(\$19,721)	\$1,631	\$45,950	\$58,014	\$19,636	\$11,024	(\$37,999)	(\$34,850)	\$50,148	\$41,504	\$1,331	\$7,444	\$144,112

#### Martha's Vineyard Windrow / ASP Composting

## Pro Forma Assumptions - 2019

Capacity = 10,000 tons/year

Rev	enues:	
1	Tin fees -	

Nevenues.			
1. Tip fees =		\$50.00	per ton
Tip fee ton:	s per year =	2,215	tons/year
2. Compost sales pric	e =		
Commercia	al sales	\$ 25.00	per CY
Residentia	sales	\$ 35.00	per CY
	Commercial =	75%	
	Residential =	25%	
3. Compost sales dist	ribution:		
Annual qua	10,500	CY/year	
Assume sal	es timing :		
	January	0.2%	
	February	4.4%	
	March	12.8%	
	April	15.3%	
	May	9.5%	
	June	9.1%	
	July	2.1%	
	August	4.2%	
	September	16.2%	
	October	14.0%	
	November	5.5%	
	December	6.7%	
		100.0%	

#### Cost of Compost Production

1. From spreadsheet "Windrow Opex Estimate"

rom spreadsheet "Windrow Opex Estimate"		
	Anr	nual Costs
Waste Receipt	\$	16,306
Grinding/shredding	\$	41,340
Mixing	\$	90,966
Transport to pad	\$	51,365
Building ASPs	\$	58,703
Electricity	\$	78,122
Moving Compost to Curing	\$	35,956
Managing Curing Piles	\$	32,123
Screening Compost	\$	22,489
Moving Screened Compost to Storage	\$	25,888
Moving Overs to Storage	\$	6,472
Product Marketing & Sales	\$	19,344

#### 2. Assume costs are distributed through the year proportional to incoming loads:

January	1.5%
February	1.8%
March	1.6%
April	2.2%
May	7.4%
June	11.5%
July	19.5%
August	24.5%
September	10.2%
October	8.4%
November	5.7%
December	5.8%

3. Assume production costs increase by 3% annually in 2020 and 2021

1. Capital cost recovery factor for equipment =	3.75%	per year	<12-yr life
Estimated capex for equipment =	\$ 917,414		
2. Capital cost recovery factor for site improvements =	5.5%	per year	20 yrs
Estimated capex Phase I =	\$ 2,779,953		
3. Housekeeping, Monitoring & Recordkeeping			
Remaining time after materials handling	1.6	hrs/day/FT	E
Assume loaded labor rate =	\$ 22.50	per hour	

Martha's Vineyard	ASP Composting
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4,000 ton/year food waste capacity (2019 tip fee tonnage = 2,215 tons; 2019 compost production = 10,500 CY/yr

											For the Y	/ear Ending	12/31/201
	January	February	March	April	May	June	July	August	September	October	November	December	YTD
Revenue													
Tip Fees	\$1,613	\$2,033	\$1,729	\$2,436	\$8,146	\$12,760	\$21,565	\$27,100	\$11,327	\$9,310	\$6,311	\$6,421	\$110,750
Compost Sales - commercial	\$394	\$8,663	\$25,200	\$30,122	\$18,703	\$17,916	\$4,134	\$8,269	\$31,894	\$27,563	\$10,828	\$13,191	\$196,875
Compost Sales - residential	\$184	\$4,043	\$11,760	\$14,057	\$8,728	\$8,361	\$1,929	\$3,859	\$14,884	\$12,863	\$5,053	\$6,156	\$91,875
<other revenue=""></other>	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Sales	\$2,191	\$14,738	\$38,689	\$46,614	\$35,578	\$39,036	\$27,629	\$39,227	\$58,104	\$49,735	\$22,192	\$25,768	\$399,500
Cost of Compost Production													
Waste Receipt	\$238	\$299	\$255	\$359	\$1,199	\$1,879	\$3,175	\$3,990	\$1,668	\$1,371	\$929	\$945	\$16,306
Grinding/shredding	\$602	\$759	\$645	\$909	\$3,041	\$4,763	\$8,050	\$10,116	\$4,228	\$3,475	\$2,356	\$2,397	\$41,340
Mixing	\$1,325	\$1,670	\$1,420	\$2,000	\$6,691	\$10,481	\$17,713	\$22,259	\$9,303	\$7,647	\$5,183	\$5,274	\$90,966
Transport to pad	\$748	\$943	\$802	\$1,130	\$3,778	\$5,918	\$10,002	\$12,569	\$5,253	\$4,318	\$2,927	\$2,978	\$51,365
Building ASPs	\$855	\$1,078	\$916	\$1,291	\$4,318	\$6,763	\$11,431	\$14,364	\$6,004	\$4,935	\$3,345	\$3,404	\$58,703
Electricity	\$1,138	\$1,434	\$1,220	\$1,718	\$5,746	\$9,001	\$15,212	\$19,116	\$7,990	\$6,567	\$4,451	\$4,530	\$78,122
Moving Compost to Curing	\$524	\$660	\$561	\$791	\$2,645	\$4,143	\$7,001	\$8,798	\$3,677	\$3,022	\$2,049	\$2,085	\$35,956
Managing Curing Piles	\$468	\$590	\$501	\$706	\$2 <i>,</i> 363	\$3,701	\$6,255	\$7,860	\$3,285	\$2,700	\$1,830	\$1,863	\$32,123
Screening Compost	\$328	\$413	\$351	\$495	\$1,654	\$2,591	\$4,379	\$5,503	\$2,300	\$1,890	\$1,281	\$1,304	\$22,489
Moving Screened Compost to Storage	\$377	\$475	\$404	\$569	\$1,904	\$2,983	\$5,041	\$6,335	\$2,648	\$2,176	\$1,475	\$1,501	\$25,888
Moving Overs to Storage	\$94	\$119	\$101	\$142	\$476	\$746	\$1,260	\$1,584	\$662	\$544	\$369	\$375	\$6,472
Product Marketing & Sales	\$282	\$355	\$302	\$425	\$1,423	\$2,229	\$3,767	\$4,733	\$1,978	\$1,626	\$1,102	\$1,122	\$19,344
Cost of Compost Production	\$6,978	\$8,795	\$7,479	\$10,535	\$35,239	\$55,196	\$93,286	\$117,226	\$48,996	\$40,271	\$27,298	\$27,778	\$479,075
Administrative Costs													
Capital Recovery - equipment	\$2,867	\$2,867	\$2 <i>,</i> 867	\$2 <i>,</i> 867	\$2,867	\$2 <i>,</i> 867	\$2,867	\$2,867	\$2,867	\$2,867	\$2,867	\$2,867	\$34,403
Capital Recovery - site improvements	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$152 <i>,</i> 897
Housekeeping, Monitoring & Recordkeepin	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$20,736
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Admin Costs	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17 <i>,</i> 336	\$17,336	\$17,336	\$17,336	\$208,036
Net Income	(\$22,124)	(\$11,393)	\$13,873	\$18,743	(\$16,997)	(\$33,496)	(\$82,993)	(\$95,335)	(\$8,228)	(\$7,873)	(\$22,442)	(\$19,346)	(\$287,612)

#### Martha's Vineyard Windrow / ASP Composting

# Pro Forma Assumptions - 2020

Capacity = 10,000 tons/year

Revenues:
1. Tip fees =
Tip fee tons per year =
<ol><li>Compost sales price =</li></ol>
Commercial sales
Residential sales
Commerci

	Commercial =	75%	
	Residential =	25%	
3. Compost sales dist	ribution:		
Annual qu	antity =	13,775	CY/year
Assume sal	les timing :		
	January	0.2%	
	February	4.4%	
	March	12.8%	
	April	15.3%	
	May	9.5%	
	June	9.1%	
	July	2.1%	
	August	4.2%	
	September	16.2%	
	October	14.0%	
	November	5.5%	
	December	6.7%	
		100.0%	

\$51.50 perton 2,900 tons/year

\$ 25.00 per CY \$ 35.00 per CY

#### Cost of Compost Production

1. From spreadsheet "Windrow Opex Estimate"

rom spreadsheet "Windrow Opex Estimate"		
	Anr	nual Costs
Waste Receipt	\$	16,796
Grinding/shredding	\$	42,580
Mixing	\$	93,695
Transport to pad	\$	52,906
Building ASPs	\$	60,464
Electricity	\$	80,465
Moving Compost to Curing	\$	37,034
Managing Curing Piles	\$	33,087
Screening Compost	\$	23,164
Moving Screened Compost to Storage	\$	26,665
Moving Overs to Storage	\$	6,666
Product Marketing & Sales	\$	19,924

#### 2. Assume costs are distributed through the year proportional to incoming loads:

January	1.5%
February	1.8%
March	1.6%
April	2.2%
May	7.4%
June	11.5%
July	19.5%
August	24.5%
September	10.2%
October	8.4%
November	5.7%
December	5.8%

3. Assume production costs increase by 3% annually in 2020 and 2021

1. Capital cost recovery factor for equipment =	3.75%	per year	<12-yr life
Estimated capex for equipment =	\$ 917,414		
2. Capital cost recovery factor for site improvements =	5.5%	per year	20 yrs
Estimated capex Phase I =	\$ 2,779,953		
<ol><li>Housekeeping, Monitoring &amp; Recordkeeping</li></ol>			
Remaining time after materials handling	1.6	hrs/day/FT	E
Assume loaded labor rate =	\$ 22.50	per hour	

4,000 ton/year food waste capacity (2020 tip fee tonnage = 2,900 tons; 2020 compost production = 13,775 CY/yr

											For the Y	/ear Ending	12/31/20
	January	February	March	April	Мау	June	July	August	September	October	November	December	YTD
evenue													
Tip Fees	\$2,175	\$2,742	\$2,332	\$3,284	\$10,985	\$17,207	\$29,081	\$36,545	\$15,274	\$12,554	\$8,510	\$8 <i>,</i> 660	\$149,35
Compost Sales - commercial	\$517	\$11,364	\$33,060	\$39,517	\$24,537	\$23,504	\$5 <i>,</i> 424	\$10,848	\$41,842	\$36,159	\$14,205	\$17,305	\$258,28
Compost Sales - residential	\$241	\$5 <i>,</i> 303	\$15,428	\$18,441	\$11,450	\$10,968	\$2 <i>,</i> 531	\$5,062	\$19,526	\$16,874	\$6,629	\$8,076	\$120,53
<other revenue=""></other>	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Sales	\$2,933	\$19,409	\$50,820	\$61,243	\$46,973	\$51,679	\$37,037	\$52,455	\$76,642	\$65 <i>,</i> 588	\$29,345	\$34,040	\$528,16
ost of Compost Production													
Waste Receipt	\$245	\$308	\$262	\$369	\$1,235	\$1,935	\$3 <i>,</i> 270	\$4,110	\$1,718	\$1,412	\$957	\$974	\$16,796
Grinding/shredding	\$620	\$782	\$665	\$936	\$3,132	\$4,906	\$8,291	\$10,419	\$4,355	\$3 <i>,</i> 579	\$2,426	\$2,469	\$42,580
Mixing	\$1,365	\$1,720	\$1,463	\$2,060	\$6,892	\$10,795	\$18,244	\$22,926	\$9 <i>,</i> 582	\$7 <i>,</i> 876	\$5 <i>,</i> 339	\$5,433	\$93 <i>,</i> 69
Transport to pad	\$771	\$971	\$826	\$1,163	\$3 <i>,</i> 892	\$6 <i>,</i> 096	\$10,302	\$12,946	\$5 <i>,</i> 411	\$4,447	\$3,015	\$3,068	\$52,90
Building ASPs	\$881	\$1,110	\$944	\$1,330	\$4,447	\$6 <i>,</i> 966	\$11,774	\$14,795	\$6,184	\$5 <i>,</i> 083	\$3,445	\$3,506	\$60,46
Electricity	\$1,172	\$1,477	\$1,256	\$1,770	\$5,919	\$9,271	\$15,668	\$19,689	\$8,229	\$6,764	\$4,585	\$4,666	\$80,46
Moving Compost to Curing	\$539	\$680	\$578	\$814	\$2,724	\$4,267	\$7,211	\$9,062	\$3,788	\$3,113	\$2,110	\$2,147	\$37,03
Managing Curing Piles	\$482	\$607	\$517	\$728	\$2,434	\$3,812	\$6 <i>,</i> 443	\$8,096	\$3,384	\$2,781	\$1,885	\$1,918	\$33,083
Screening Compost	\$337	\$425	\$362	\$509	\$1,704	\$2 <i>,</i> 669	\$4,510	\$5,668	\$2,369	\$1,947	\$1,320	\$1,343	\$23,16
Moving Screened Compost to Storage	\$388	\$489	\$416	\$586	\$1,961	\$3 <i>,</i> 072	\$5,192	\$6,525	\$2,727	\$2,241	\$1,519	\$1,546	\$26,665
Moving Overs to Storage	\$97	\$122	\$104	\$147	\$490	\$768	\$1,298	\$1,631	\$682	\$560	\$380	\$387	\$6,666
Product Marketing & Sales	\$290	\$366	\$311	\$438	\$1,466	\$2,296	\$3 <i>,</i> 880	\$4,875	\$2 <i>,</i> 038	\$1,675	\$1,135	\$1,155	\$19,924
Cost of Compost Production	\$7,188	\$9 <i>,</i> 058	\$7,704	\$10,851	\$36,296	\$56,852	\$96,084	\$120,742	\$50 <i>,</i> 466	\$41,479	\$28,117	\$28,611	\$493 <i>,</i> 44
dministrative Costs													
Capital Recovery - equipment	\$2,867	\$2,867	\$2 <i>,</i> 867	\$2,867	\$2,867	\$2 <i>,</i> 867	\$2 <i>,</i> 867	\$2,867	\$2 <i>,</i> 867	\$2 <i>,</i> 867	\$2 <i>,</i> 867	\$2 <i>,</i> 867	\$34,403
Capital Recovery - site improvements	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$152,89
Housekeeping, Monitoring & Recordkeepin	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$20,73
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Admin Costs	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$208,03
Net Income	(\$21,591)	(\$6,985)	\$25,780	\$33,055	(\$6,659)	(\$22,509)	(\$76,384)	(\$85,624)	\$8,840	\$6,773	(\$16,108)	(\$11,907)	(\$173,32

#### Martha's Vineyard Windrow / ASP Composting

# Pro Forma Assumptions - 2021

Capacity = 10,000 tons/year

Revenues:						
1. Tip fees =			\$53.00	per ton		
Tip f	ee tons per year =		4,000	tons/year		
2. Compost sal	es price =					
Com	imercial sales	\$	25.00	per CY		
Resid	dential sales	\$	35.00	per CY		
	Commercial =		75%			
	Residential =		25%			
<ol><li>Compost sal</li></ol>	es distribution:					
Ann	ual quantity =		19,000	CY/year		
Assu	me sales timing :					
	January	0.2%				
	February		4.4%			
	March		12.8%			
	April		15.3%			
	May		9.5%			
	June		9.1%			
	July		2.1%			
	August		4.2%			
	September		16.2%			
	October		14.0%			
	November		5.5%			
	December		6.7%			
		1	00.0%			

#### Cost of Compost Production

1. From spreadsheet "Windrow Opex Estimate"

rom spreadsheet "Windrow Opex Estimate"		
	Anr	nual Costs
Waste Receipt	\$	17,300
Grinding/shredding	\$	43,858
Mixing	\$	96,506
Transport to pad	\$	54,494
Building ASPs	\$	62,278
Electricity	\$	82,879
Moving Compost to Curing	\$	38,145
Managing Curing Piles	\$	34,080
Screening Compost	\$	23,859
Moving Screened Compost to Storage	\$	27,465
Moving Overs to Storage	\$	6,866
Product Marketing & Sales	\$	20,522

#### 2. Assume costs are distributed through the year proportional to incoming loads:

January	1.5%
February	1.8%
March	1.6%
April	2.2%
May	7.4%
June	11.5%
July	19.5%
August	24.5%
September	10.2%
October	8.4%
November	5.7%
December	5.8%

3. Assume production costs increase by 3% annually in 2020 and 2021

<ol> <li>Capital cost recovery factor for equipment =</li> </ol>	3.75%	per year	<12-yr life
Estimated capex for equipment =	\$ 917,414		
2. Capital cost recovery factor for site improvements =	5.5%	per year	20 yrs
Estimated capex Phase I =	\$ 2,779,953		
3. Housekeeping, Monitoring & Recordkeeping			
Remaining time after materials handling	1.6	hrs/day/FT	E
Assume loaded labor rate =	\$ 22.50	per hour	

Martha's Vineyard ASP Composting 4,000 ton/year food waste capacity (2021 tip fee tonnage = 4,000 tons; 2021 compost production = 19,000 CY/yr

											For the	Year Ending	12/31/202
	January	February	March	April	May	June	July	August	September	October	November	December	YTD
Revenue													
Tip Fees	\$3,088	\$3 <i>,</i> 892	\$3,310	\$4,662	\$15,594	\$24,425	\$41,281	\$51,875	\$21,682	\$17,821	\$12,080	\$12,292	\$212,000
Compost Sales - commercial	\$713	\$15,675	\$45,600	\$54,506	\$33 <i>,</i> 844	\$32,419	\$7,481	\$14,963	\$57,713	\$49,875	\$19,594	\$23 <i>,</i> 869	\$356,250
Compost Sales - residential	\$333	\$7,315	\$21,280	\$25,436	\$15,794	\$15,129	\$3,491	\$6,983	\$26,933	\$23,275	\$9,144	\$11,139	\$166,250
<other revenue=""></other>	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Sales	\$4,133	\$26,882	\$70,190	\$84,605	\$65,231	\$71,973	\$52 <i>,</i> 253	\$73 <i>,</i> 820	\$106,327	\$90,971	\$40,817	\$47,300	\$734,500
Cost of Compost Production													
Waste Receipt	\$252	\$318	\$270	\$380	\$1,272	\$1,993	\$3 <i>,</i> 369	\$4,233	\$1,769	\$1,454	\$986	\$1,003	\$17,300
Grinding/shredding	\$639	\$805	\$685	\$964	\$3,226	\$5 <i>,</i> 053	\$8,540	\$10,732	\$4,485	\$3,687	\$2,499	\$2,543	\$43 <i>,</i> 858
Mixing	\$1,406	\$1,772	\$1,507	\$2,122	\$7,099	\$11,119	\$18,792	\$23,614	\$9 <i>,</i> 870	\$8,112	\$5,499	\$5,596	\$96,506
Transport to pad	\$794	\$1,000	\$851	\$1,198	\$4,008	\$6,278	\$10,611	\$13 <i>,</i> 334	\$5 <i>,</i> 573	\$4,581	\$3,105	\$3,160	\$54,494
Building ASPs	\$907	\$1,143	\$972	\$1,370	\$4,581	\$7,175	\$12,127	\$15,239	\$6,369	\$5,235	\$3,549	\$3,611	\$62,278
Electricity	\$1,207	\$1,521	\$1,294	\$1,823	\$6,096	\$9,549	\$16,138	\$20,280	\$8,476	\$6,967	\$4,722	\$4,805	\$82,879
Moving Compost to Curing	\$556	\$700	\$596	\$839	\$2,806	\$4,395	\$7,428	\$9,334	\$3,901	\$3,206	\$2,174	\$2,212	\$38,145
Managing Curing Piles	\$496	\$626	\$532	\$749	\$2,507	\$3,926	\$6,636	\$8,339	\$3,485	\$2,865	\$1,942	\$1,976	\$34,080
Screening Compost	\$348	\$438	\$372	\$525	\$1,755	\$2,749	\$4,646	\$5,838	\$2,440	\$2,006	\$1,359	\$1,383	\$23,859
Moving Screened Compost to Storage	\$400	\$504	\$429	\$604	\$2,020	\$3,164	\$5,348	\$6,720	\$2 <i>,</i> 809	\$2,309	\$1,565	\$1,592	\$27,465
Moving Overs to Storage	\$100	\$126	\$107	\$151	\$505	\$791	\$1,337	\$1,680	\$702	\$577	\$391	\$398	\$6,866
Product Marketing & Sales	\$299	\$377	\$320	\$451	\$1,510	\$2,364	\$3,996	\$5,022	\$2,099	\$1,725	\$1,169	\$1,190	\$20,522
Cost of Compost Production	\$7,403	\$9,330	\$7 <i>,</i> 935	\$11,177	\$37,385	\$58,557	\$98,967	\$124,365	\$51,980	\$42,723	\$28 <i>,</i> 960	\$29,469	\$508,251
Administrative Costs													
Capital Recovery - equipment	\$2,867	\$2,867	\$2 <i>,</i> 867	\$2 <i>,</i> 867	\$2,867	\$2,867	\$2 <i>,</i> 867	\$2,867	\$2 <i>,</i> 867	\$2,867	\$2 <i>,</i> 867	\$2,867	\$34,403
Capital Recovery - site improvements	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$12,741	\$152 <i>,</i> 897
Housekeeping, Monitoring & Recordkeepin	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$1,728	\$20,736
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Admin Costs	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$17,336	\$208,036
Net Income	(\$20,607)	\$215	\$44,919	\$56,091	\$10,510	(\$3,921)	(\$64,050)	(\$67,881)	\$37,010	\$30,911	(\$5,479)	\$494	\$18,213

#### Martha's Vineyard Rotary Drum Composting

#### <u>Pro Forma</u> Assumptions - 2019 Capacity = 10,000 tons/year

Revenues:			
1. Tip fees =		\$50.00	per ton
Tip fee to	ns per year =	2,215	tons/year
2. Compost sales pri	ce=		
Commerc	cial sales	\$ 25.00	per CY
Residenti	al sales	\$ 35.00	per CY
	Commercial =	75%	
	Residential =	25%	
3. Compost sales dis	tribution:		
Annual qu	uantity =	10,500	CY/year
Assume sa	ales timing :		
	January	0.2%	
	February	4.4%	
	March	12.8%	
	April	15.3%	
	May	9.5%	
	June	9.1%	
	July	2.1%	
	August	4.2%	
	September	16.2%	
	October	14.0%	
	November	5.5%	
	December	6.7%	
		100.0%	

#### Cost of Compost Production

1. From spreadsheet "Drum Opex Estimate"

om spreadsneet "Drum Opex Estimate"		
	Ann	ual Costs
Waste Receipt	\$	16,306
Grinding/shredding	\$	41,340
Transport to pad	\$	57,073
Loading Rotary Drum	\$	19,344
Operating Rotary Drum	\$	28,852
Moving Compost to Curing	\$	39,951
Managing Curing Piles	\$	73,379
Screening Compost	\$	41,606
Moving Cured Compost to Storage	\$	35,956
Move Overs to Storage	\$	7,728
Product Marketing & Sales	\$	19,344

#### 2. Assume costs are distributed through the year proportional to incoming loads:

1.5%
1.8%
1.6%
2.2%
7.4%
11.5%
19.5%
24.5%
10.2%
8.4%
5.7%
5.8%

3. Assume production costs increase by 3% annually in 2020 and 2021

<ol> <li>Capital cost recovery factor for equipment =</li> </ol>	3.75% per year <	12-yr life
Estimated capex for equipment =	\$ 3,040,550	
<ol><li>Capital cost recovery factor for site improvements =</li></ol>	5.5% per year 20	0 yrs
Estimated capex Phase I =	\$ 2,856,368	
<ol><li>Housekeeping, Monitoring &amp; Recordkeeping</li></ol>		
Remaining time after materials handling	3.8 hrs/day/FTE	
Assume loaded labor rate =	\$ 22.50 per hour	

									For the Year Ending 12/31/										
	January	February	March	April	May	June	July	August	September	October	November	December	YTD						
enue																			
Tip Fees	\$222	\$4,873	\$14,176	\$16,945	\$10,521	\$10,078	\$2,326	\$4,652	\$17,942	\$15 <i>,</i> 505	\$6,091	\$7,420	\$110,75						
Compost Sales - commercial	\$394	\$8,663	\$25 <i>,</i> 200	\$30,122	\$18,703	\$17,916	\$4,134	\$8,269	\$31,894	\$27 <i>,</i> 563	\$10,828	\$13,191	\$196,8						
Compost Sales - residential	\$184	\$4,043	\$11,760	\$14,057	\$8,728	\$8,361	\$1,929	\$3,859	\$14,884	\$12,863	\$5,053	\$6,156	\$91,87						
<other revenue=""></other>	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0						
Net Sales	\$799	\$17,578	\$51,136	\$61,124	\$37,953	\$36 <i>,</i> 355	\$8,390	\$16,779	\$64,719	\$55 <i>,</i> 930	\$21,973	\$26,767	\$399,50						
t of Compost Production																			
Waste Receipt	\$238	\$299	\$255	\$359	\$1,199	\$1,879	\$3,175	\$3,990	\$1,668	\$1,371	\$929	\$945	\$16,30						
Grinding/shredding	\$602	\$759	\$645	\$909	\$3,041	\$4,763	\$8,050	\$10,116	\$4,228	\$3,475	\$2,356	\$2 <i>,</i> 397	\$41,34						
Transport to pad	\$831	\$1,048	\$891	\$1,255	\$4,198	\$6,576	\$11,113	\$13,965	\$5,837	\$4,798	\$3,252	\$3 <i>,</i> 309	\$57,07						
Loading Rotary Drum	\$282	\$355	\$302	\$425	\$1,423	\$2,229	\$3,767	\$4,733	\$1,978	\$1,626	\$1,102	\$1,122	\$19,34						
Operating Rotary Drum	\$2,404	\$2,404	\$2,404	\$2,404	\$2,404	\$2,404	\$2,404	\$2,404	\$2,404	\$2,404	\$2,404	\$2,404	\$28,85						
Moving Compost to Curing	\$582	\$733	\$624	\$879	\$2,939	\$4,603	\$7,779	\$9,776	\$4,086	\$3 <i>,</i> 358	\$2,276	\$2,316	\$39,95						
Managing Curing Piles	\$1,069	\$1,347	\$1,146	\$1,614	\$5,397	\$8,454	\$14,288	\$17,955	\$7,505	\$6,168	\$4,181	\$4,255	\$73,37						
Screening Compost	\$606	\$764	\$650	\$915	\$3,060	\$4,794	\$8,102	\$10,181	\$4,255	\$3,497	\$2,371	\$2,412	\$41,60						
Moving Screened Compost to Storage	\$524	\$660	\$561	\$791	\$2,645	\$4,143	\$7,001	\$8,798	\$3,677	\$3,022	\$2,049	\$2,085	\$35,95						
Screening Compost	\$113	\$142	\$121	\$170	\$568	\$890	\$1,505	\$1,891	\$790	\$650	\$440	\$448	\$7,72						
Product Marketing & Sales	\$282	\$355	\$302	\$425	\$1,423	\$2,229	\$3,767	\$4,733	\$1,978	\$1,626	\$1,102	\$1,122	\$19,34						
Cost of Compost Production	\$7,532	\$8,867	\$7,900	\$10,146	\$28,298	\$42,963	\$70,951	\$88,542	\$38,407	\$31,996	\$22,463	\$22,815	\$380,8						
ninistrative Costs																			
Capital Recovery - equipment	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$114,0						
Capital Recovery - site improvements	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$157,1						
Housekeeping, Monitoring & Recordkeeping	\$4,104	\$4,104	\$4,104	\$4,104	\$4,104	\$4,104	\$4,104	\$4,104	\$4,104	\$4,104	\$4,104	\$4,104	\$49,24						
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0						
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0						
 Total Admin Costs	\$26,697	\$26,697	\$26,697	\$26,697	\$26,697	\$26,697	\$26,697	\$26,697	\$26,697	\$26,697	\$26,697	\$26,697	\$320,3						
Net Income	(\$33,430)	(\$17,986)	\$16,539	\$24,280	(\$17,043)	(\$33,306)	(\$89,259)	(\$98,461)	(\$385)	(\$2,763)	(\$27,188)	(\$22,746)	(\$301,7						

#### Martha's Vineyard Drum Composting

<u>Pro Forma</u> Assumptions - 2020 Capacity = 10,000 tons/year

Revenues:			
1. Tip fees =		\$51.50	per ton
Т	ïp fee tons per year =	2,900	tons/year
2. Compost	sales price =		
C	Commercial sales	\$ 25.00	per CY
R	Residential sales	\$ 35.00	per CY
	Commercial =	75%	
	Residential =	25%	
<ol><li>Compost</li></ol>	sales distribution:		
A	nnual quantity =	13,775	CY/year
A	Assume sales timing :		
	January	0.2%	
	February	4.4%	
	March	12.8%	
	April	15.3%	
	May	9.5%	
	June	9.1%	
	July	2.1%	
	August	4.2%	
	September	16.2%	
	October	14.0%	
	November	5.5%	
	December	6.7%	
		100.0%	
		20010/0	

#### Cost of Compost Production

1. From spreadsheet "Drum Opex Estimate"

om spreadsneet Drum Opex Estimate		
	Ann	ual Costs
Waste Receipt	\$	16,796
Grinding/shredding	\$	42,580
Transport to pad	\$	52,906
Loading Rotary Drum	\$	19,924
Operating Rotary Drum	\$	29,717
Moving Compost to Curing	\$	37,034
Managing Curing Piles	\$	68,022
Screening Compost	\$	42,854
Moving Cured Compost to Storage	\$	26,665
Move Overs to Storage	\$	7,960
Product Marketing & Sales	\$	19,924

#### 2. Assume costs are distributed through the year proportional to incoming loads:

January	1.5%
February	1.8%
March	1.6%
April	2.2%
May	7.4%
June	11.5%
July	19.5%
August	24.5%
September	10.2%
October	8.4%
November	5.7%
December	5.8%

3. Assume production costs increase by 3% annually in 2020 and 2021

<ol> <li>Capital cost recovery factor for equipment =</li> </ol>	3.75% per year	<12-yr life
Estimated capex for equipment =	\$ 3,040,550	
<ol><li>Capital cost recovery factor for site improvements =</li></ol>	5.5% per year	20 yrs
Estimated capex Phase I =	\$ 2,856,368	
3. Housekeeping, Monitoring & Recordkeeping		
Remaining time after materials handling	3.8 hrs/day/FT	E
Assume loaded labor rate =	\$ 23.18 per hour	

											For the Y	/ear Ending	12/31/2
	January	February	March	April	May	June	July	August	September	October	November	December	YTD
enue													
Tip Fees	\$299	\$6,571	\$19,117	\$22,851	\$14,188	\$13,591	\$3,136	\$6,273	\$24,195	\$20,909	\$8,214	\$10,006	\$149,3
Compost Sales - commercial	\$517	\$11,364	\$33,060	\$39,517	\$24,537	\$23 <i>,</i> 504	\$5,424	\$10,848	\$41,842	\$36,159	\$14,205	\$17 <i>,</i> 305	\$258,2
Compost Sales - residential	\$241	\$5,303	\$15,428	\$18,441	\$11,450	\$10,968	\$2,531	\$5,062	\$19,526	\$16,874	\$6,629	\$8,076	\$120,5
<other revenue=""></other>	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Sales	\$1,056	\$23,239	\$67,605	\$80,809	\$50,175	\$48,063	\$11,091	\$22,183	\$85 <i>,</i> 562	\$73,943	\$29,049	\$35,387	\$528,1
t of Compost Production													
Waste Receipt	\$245	\$308	\$262	\$369	\$1,235	\$1,935	\$3,270	\$4,110	\$1,718	\$1,412	\$957	\$974	\$16,7
Grinding/shredding	\$620	\$782	\$665	\$936	\$3,132	\$4,906	\$8,291	\$10,419	\$4,355	\$3,579	\$2,426	\$2,469	\$42,5
Transport to pad	\$771	\$971	\$826	\$1,163	\$3,892	\$6,096	\$10,302	\$12,946	\$5,411	\$4,447	\$3,015	\$3 <i>,</i> 068	\$52,9
Loading Rotary Drum	\$290	\$366	\$311	\$438	\$1,466	\$2,296	\$3,880	\$4,875	\$2 <i>,</i> 038	\$1,675	\$1,135	\$1,155	\$19,9
Operating Rotary Drum	\$2,476	\$2,476	\$2,476	\$2,476	\$2,476	\$2,476	\$2,476	\$2,476	\$2,476	\$2,476	\$2,476	\$2,476	\$29,7
Moving Compost to Curing	\$539	\$680	\$578	\$814	\$2,724	\$4,267	\$7,211	\$9,062	\$3,788	\$3,113	\$2,110	\$2,147	\$37,0
Managing Curing Piles	\$991	\$1,249	\$1,062	\$1,496	\$5,003	\$7,837	\$13,245	\$16,645	\$6,957	\$5,718	\$3,876	\$3,944	\$68,0
Screening Compost	\$624	\$787	\$669	\$942	\$3,152	\$4,937	\$8,345	\$10,486	\$4,383	\$3,602	\$2,442	\$2,485	\$42,8
Moving Screened Compost to Storage	\$388	\$489	\$416	\$586	\$1,961	\$3,072	\$5,192	\$6,525	\$2,727	\$2,241	\$1,519	\$1,546	\$26,6
Move Overs to Storage	\$116	\$146	\$124	\$175	\$586	\$917	\$1,550	\$1,948	\$814	\$669	\$454	\$462	\$7,9
Product Marketing & Sales	\$290	\$366	\$311	\$438	\$1,466	\$2,296	\$3,880	\$4,875	\$2,038	\$1,675	\$1,135	\$1,155	\$19,9
Cost of Compost Production	\$7,351	\$8,620	\$7,701	\$9 <i>,</i> 836	\$27,093	\$41,035	\$67,643	\$84,366	\$36,704	\$30,608	\$21,546	\$21,881	\$364,3
inistrative Costs													
Capital Recovery - equipment	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$114,
Capital Recovery - site improvements	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$157,
Housekeeping, Monitoring & Recordkeeping	\$4,227	\$4,227	\$4,227	\$4,227	\$4,227	\$4,227	\$4,227	\$4,227	\$4,227	\$4,227	\$4,227	\$4,227	\$50,7
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
– Total Admin Costs	\$26,821	\$26,821	\$26,821	\$26,821	\$26,821	\$26,821	\$26,821	\$26,821	\$26,821	\$26,821	\$26,821	\$26,821	\$321,8
Net Income	(\$33,115)	(\$12,201)	\$33,083	\$44.152	(\$3,738)	(\$19,792)	(\$83,372)	(\$89,004)	\$22.038	\$16,514	(\$19,317)	(\$13,315)	(\$158,0

#### Martha's Vineyard Drum Composting

<u>Pro Forma</u> Assumptions - 2021 Capacity = 10,000 tons/year

Revenues:				
1. Tip fees =			\$53.00	per ton
Tip fee tons	s per year =		4,000	tons/year
2. Compost sales pric	e =			
Commercia	al sales	\$	25.00	per CY
Residential	sales	\$	35.00	per CY
	Commercial =		75%	
	Residential =		25%	
<ol><li>Compost sales distr</li></ol>	ribution:			
Annual qua	antity =		19,000	CY/year
Assume sal	es timing :			
	January		0.2%	
	February		4.4%	
	March	:	12.8%	
	April	:	15.3%	
	May		9.5%	
	June		9.1%	
	July		2.1%	
	August		4.2%	
	September	:	16.2%	
	October	:	14.0%	
	November		5.5%	
	December		6.7%	
		1	00.0%	

#### Cost of Compost Production

1. From spreadsheet "Drum Opex Estimate"

m spreausneer Drum Opex Estimate		
	Ann	ual Costs
Waste Receipt	\$	17,300
Grinding/shredding	\$	43,858
Transport to pad	\$	54,494
Loading Rotary Drum	\$	20,522
Operating Rotary Drum	\$	30,609
Moving Compost to Curing	\$	38,145
Managing Curing Piles	\$	70,063
Screening Compost	\$	44,140
Moving Cured Compost to Storage	\$	27,465
Move Overs to Storage	\$	8,199
Product Marketing & Sales	\$	20,522

#### 2. Assume costs are distributed through the year proportional to incoming loads:

January	1.5%
February	1.8%
March	1.6%
April	2.2%
May	7.4%
June	11.5%
July	19.5%
August	24.5%
September	10.2%
October	8.4%
November	5.7%
December	5.8%

3. Assume production costs increase by 3% annually in 2020 and 2021

<ol> <li>Capital cost recovery factor for equipment =</li> </ol>	3.75% per year <12-yr life	
Estimated capex for equipment =	\$ 3,040,550	
<ol><li>Capital cost recovery factor for site improvements =</li></ol>	5.5% per year 20 yrs	
Estimated capex Phase I =	\$ 2,856,368	
3. Housekeeping, Monitoring & Recordkeeping		
Remaining time after materials handling	3.8 hrs/day/FTE	
Assume loaded labor rate =	\$ 23.87 per hour	

											For the \	Year Ending	12/31/2
	January	February	March	April	Мау	June	July	August	September	October	November	December	YTD
enue													
Tip Fees	\$424	\$9,328	\$27,136	\$32,436	\$20,140	\$19,292	\$4,452	\$8,904	\$34,344	\$29,680	\$11,660	\$14,204	\$212,0
Compost Sales - commercial	\$713	\$15,675	\$45,600	\$54 <i>,</i> 506	\$33,844	\$32,419	\$7,481	\$14,963	\$57,713	\$49 <i>,</i> 875	\$19,594	\$23 <i>,</i> 869	\$356,2
Compost Sales - residential	\$333	\$7,315	\$21,280	\$25,436	\$15,794	\$15,129	\$3,491	\$6,983	\$26,933	\$23,275	\$9,144	\$11,139	\$166,2
<other revenue=""></other>	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Sales	\$1,469	\$32,318	\$94,016	\$112,379	\$69,778	\$66 <i>,</i> 840	\$15,425	\$30,849	\$118,989	\$102,830	\$40,398	\$49,212	\$734,5
of Compost Production													
Waste Receipt	\$252	\$318	\$270	\$380	\$1,272	\$1,993	\$3,369	\$4,233	\$1,769	\$1,454	\$986	\$1,003	\$17,3
Grinding/shredding	\$639	\$805	\$685	\$964	\$3,226	\$5,053	\$8,540	\$10,732	\$4,485	\$3,687	\$2,499	\$2,543	\$43,8
Transport to pad	\$794	\$1,000	\$851	\$1,198	\$4,008	\$6,278	\$10,611	\$13,334	\$5,573	\$4,581	\$3,105	\$3,160	\$54,4
Loading Rotary Drum	\$299	\$377	\$320	\$451	\$1,510	\$2,364	\$3,996	\$5,022	\$2,099	\$1,725	\$1,169	\$1,190	\$20,5
Operating Rotary Drum	\$2,551	\$2,551	\$2,551	\$2,551	\$2,551	\$2,551	\$2,551	\$2,551	\$2,551	\$2,551	\$2,551	\$2,551	\$30,6
Moving Compost to Curing	\$556	\$700	\$596	\$839	\$2 <i>,</i> 806	\$4,395	\$7,428	\$9,334	\$3,901	\$3,206	\$2,174	\$2,212	\$38,1
Managing Curing Piles	\$1,021	\$1,286	\$1,094	\$1,541	\$5,154	\$8,072	\$13,643	\$17,144	\$7,166	\$5 <i>,</i> 889	\$3,992	\$4,062	\$70,0
Screening Compost	\$643	\$810	\$689	\$971	\$3,247	\$5,086	\$8,595	\$10,801	\$4,514	\$3,710	\$2,515	\$2,559	\$44,1
Moving Screened Compost to Storage	\$400	\$504	\$429	\$604	\$2 <i>,</i> 020	\$3,164	\$5 <i>,</i> 348	\$6,720	\$2 <i>,</i> 809	\$2,309	\$1,565	\$1,592	\$27,4
Move Overs to Storage	\$119	\$151	\$128	\$180	\$603	\$945	\$1,597	\$2,006	\$839	\$689	\$467	\$475	\$8,19
Product Marketing & Sales	\$299	\$377	\$320	\$451	\$1,510	\$2,364	\$3,996	\$5,022	\$2,099	\$1,725	\$1,169	\$1,190	\$20,5
Cost of Compost Production	\$7,572	\$8,879	\$7,932	\$10,131	\$27,906	\$42,266	\$69,672	\$86,897	\$37,805	\$31,527	\$22,192	\$22,537	\$375,3
inistrative Costs													
Capital Recovery - equipment	\$9,502	\$9,502	\$9 <i>,</i> 502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$9,502	\$114,0
Capital Recovery - site improvements	\$13 <i>,</i> 092	\$13,092	\$13 <i>,</i> 092	\$13,092	\$13,092	\$13 <i>,</i> 092	\$13,092	\$13,092	\$13,092	\$13,092	\$13,092	\$13 <i>,</i> 092	\$157,2
Housekeeping, Monitoring & Recordkeeping	\$4,354	\$4,354	\$4,354	\$4,354	\$4,354	\$4,354	\$4,354	\$4,354	\$4,354	\$4,354	\$4,354	\$4,354	\$52,2
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Admin Costs	\$26,947	\$26,947	\$26,947	\$26,947	\$26,947	\$26,947	\$26,947	\$26,947	\$26,947	\$26,947	\$26,947	\$26,947	\$323,3
Net Income	(\$33,050)	(\$3,508)	\$59,137	\$75,300	\$14,924	(\$2,373)	(\$81,195)	(\$82,996)	\$54,237	\$44,356	(\$8,742)	(\$273)	\$35,81



Appendix G - Sustainable Alternative Feed Enterprises proposal

# MARTHA'S VINEYARD – FOOD RECOVERY SYSTEM

**Proposal Number:** 

2018xxxx-SAFE

Proposal Date: mmm dd yyyy

Prepared For: Bob Spencer, Environmental Planning Consultant / Martha's Vineyard – Food Recovery Project - Budgetary consideration only.

The following is not a formal proposal, but budgetary data and explanation of project work required to construct a food recovery facility capable of handling approximately 300 tons per day of post-consumer food scraps from commercial establishments. The flow of material, yield of recovered product, mass balance and flow of material is based on this assumption.

The cost data is representative of a system that is capable of handling the throughput you describe, however no analysis for your specific site, your processing needs, operational constraints have been taken into account. As such your costs could be significantly different. Also, equipment deliver lead times are based on end of year 2017 estimates and may be longer now. Raw material costs are also expected to rise based on steel tariffs not anticipated when this was generated.

# **CONFIDENTIAL**

# **CONFIDENTIALITY STATEMENT**

THE INFORMATION CONTAINED WITHIN THIS DOCUMENT IS THE INTELLECTUAL PROPERTY OF SUSTAINABLE ALTERNATIVE FEED ENTERPRISES, INC (SAFE). THE CONTENT PROVIDED IS CONSIDERED CONFIDENTIAL AND PROPRIETARY IN NATURE. THE INFORMATION IS NOT TO BE COPIED OR CIRCULATED TO ANY SECONDARY PARTIES OR UNINTENDED SOURCES WITHOUT THE EXPRESSED WRITTEN CONSENT OF S.A.F.E.

The following is for budgetary and planning considerations only. Any work, service, or sale shall be initiated and executed under the terms of a separate Purchase Agreement or Service Contract **NOT** contained herein.

April 09, 2018

Mr. Bob Spencer

Dear Bob,

SAFE is pleased to offer this budgetary estimate for Martha's Vineyard for a food recovery facility. We appreciate the opportunity to collaborate with you and your team to design and implement what we believe is the complete solution to food waste recovery.

This information is based on generic information from our experience building and operating our facility in Santa Clara, CA as well as design work and research we have collected from engineers, contractors, and vendors on constructing a facility to process up to 300 tons per day of raw food waste from post consumer commercial entities, source separated to achieve less than 25% contamination. Our operational projections are based on our experience processing food waste, processing logs, lab tests, at our Santa Clara plant.

If asked to submit a proposal, we anticipate it would look similar to the following where we would map out a design phase to get the project off on the right foot. This thorough exercise can focus on fully developing detailed equipment specification first and expediting purchase agreements with suppliers to secure our place in their supply chain.

The intent of the following is to establish a starting place from which to engage on this project, to provide budgetary guidance, and get detailed information in your hands about the specific pieces of equipment that make up the system. We envision a collaborative process with your team to dial in operational parameters, equipment specifications, and pricing to meet your needs. Don't hesitate to reach out with any questions. We are excited by the prospect of working with you on this project and we look forward to doing what we can to best serve you in this endeavor.

Creg Shaffer

President / CEO Sustainable Alternative Feed Enterprises, Inc.

# **PROJECT PROPOSAL - DRAFT**

# **PROJECT DESCRIPTION**

SAFE suggests a project to design, plan, build, and commission a food-scraps recovery and processing facility. The facility will house a system and processes designed and patented by Sustainable Alternative Feed Enterprises, Inc. (SAFE) to accept source separated food scraps. Generate produced by SAFE preprocessing facilities (budgetary numbers for pre-processing in separate document). The project proposed is based on SAFE's development, testing and experience building and operating similar systems in Santa Clara, California.

Due to the complexity and the cost of such a project, SAFE encourages a two-phase design approach that begins with a rigorous planning and design phase conducted by experienced industrial contractors and experts in plant design, The SAFE system, and the waste industry engaged by SAFE to work collaboratively with knowledgeable staff in operational requirements.

PROJECT PLAN – SUMMARY	
PROJECT PHASE	DELIVERABLES
PHASE IA: SITE SELECTION / VALIDATION AND DESIGN - Conceptual Design / Drafting - Cost analysis	<ul><li>a. Capacity / Throughput modeling</li><li>b. Preliminary equipment specs / costs</li><li>c. System Requirements Document</li></ul>
PHASE IB: SITE SELECTION / VALIDATION AND DESIGN - Engineering - Architectural Drafting - Site permitting analysis	<ul> <li>a. Complete bid package, RFQ</li> <li>b. Complete supply list, P&amp;IDs</li> <li>c. Plant design specs, equipment layout, architectural rendering</li> </ul>
PHASE II: CONSTRUCTION PLANNING & AQUISITION - Product characterization - Finalize equipment specs - Finalize equipment quotes	<ul> <li>a. Industrial contractor signed to project</li> <li>b. Final process map</li> <li>c. Initial operating plan and estimated capital, startup, and operating costs</li> <li>d. Final mechanical requirements</li> <li>e. Equipment Purchase Orders</li> <li>f. Equipment delivery plan</li> </ul>

# END PLANNING AND DESIGN PROJECT

At the conclusion of the Planning and Design Phase, outlined above, stakeholders will have detailed information regarding the overall project, plant construction, equipment delivery and installation, expected operating schedules, associated timelines, and finalized costs based on specific selections relative to non-required/ancillary equipment.

PROJECT PHASE	DELIVERABLES
PHASE III: SITE PREPARATION – TENANT IMPROVEMENTS	
<ul> <li>Building modifications per structural and mechanical plans</li> <li>Building inspections, process regulatory reviews</li> </ul>	<ul> <li>a. Local regulatory approvals</li> <li>b. Local certificate of occupancy</li> <li>c. SAFE sign-off for equipment placement and process flow.</li> </ul>
PHASE IV: EQUIPMENT INSTALLATION	
<ul> <li>Equipment delivery, placement, anchorage.</li> <li>System mechanical integration</li> <li>System electrical hookups</li> <li>System controls integration</li> <li>Operator interface (HMI) testing</li> </ul>	<ul> <li>a. Equipment install</li> <li>b. Piping and Plumbing in place</li> <li>c. Electrical hookups to equipment</li> <li>d. Low voltage control wiring, and control panel wiring complete</li> <li>e. Operator interfaces installed and sign-off</li> <li>f. Complete Alarm and Safety shut-offs</li> </ul>
PHASE V: SYSTEM COMMISSIONING / TURNOVER	
- Equipment Unit Testing	a. Isolated process Sign-off

- Equipment Unit Testing
- System Integration Testing -
- Process rework, bug fix
- Operator training -

- a. Isolated process Sign-off
- b. Integrated, full process sign-off
- c. System Turn-over

# PHASE I AND II TIMELINE AND COSTS

To ensure the highest degree of success we propose a preliminary engagement to complete the first two phases. This level of effort and due diligence will produce significant and required insight into every detail of the buildout and system implementation project. It will provide the complete design and budget for the site improvements, the complete equipment and supply lists, and the budget for capital expenditures.

Phase One (Site Design & Planning) is expected to take approximately six weeks and achieve the major milestones required for site selection, forecasting project costs, and stakeholder buy-in for site prep & acquisition.

		Weeks													
Phase I: Site	e Design & Planning	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Activity 1	Conceptual Design														
Task 1.a	Validate Site and Throughput Requirements														
Milestone	Site and Throughput Requirements:	•													
Milestone	Conceptual Design Complete: Required Payment for Phase I:														
Task 1.b	Analysis and Planning - Project Specific	c			-										
Task 1.c	Refine Design			_											
Task 1.d	Refine Estimated Costs - Corresponde to Updated Design				1										
Milestone	Updated Design & Costs: Stakeholder Sigh-Off														
Activity 2	Engineering														
Task 2.a	Document site specific engineering requirements														
Task 2.b	Draft Architectural Plans					<b>V</b>									
Activity 3	Finalize Build Plan														
Task 3.a	Develop bid package				ļ		*								
Milestone	Final Bid Package: Stakeholder Sign-Off														

Phase Two, Construction Planning & Equipment Acquisition, will focus on selecting the general contractor and industrial contractors for the site tenant improvements and the system implementation, as well as generating the precise equipment specifications and generating purchase orders.

Phase II: Co	1	2	3	4	5	6	7	8	9	10	11	12	13 14	F	
Activity 4	Building Contractor Selection														T
Task 4.a	Select / Contract with Building Contractor (Customer)								1						
Activity 5	Validate product characteristics														
Task 5.a	Analyze Local Product									1					
Activity 6	Finalize Equipment Order														
Task 6.a	Finalize equipment specs														
Task 6.b	Finalize all costs and timelines											1			
Milestone:	Approve project budget, Order Equipment, Required Payment Phas	e II											→◆		
Activity 7	Equip Delivery & Install Planning												•		
Task 7.a	Set plan and timelines for equipment delivery, rigging, and setu	р.													

Timelines and milestones are heavily dependent on factors that are often beyond the control of the project team. Our timelines, milestones, and costs assume typical turnaround times for site selection, local enforcement agency approvals and availability of TDI staff. Activities will be completed by team members assigned to project tasks as needed for hours required to meet deliverables and milestones.

# PRELIMINARY PROJECT TEAM

# <u>To Be Determined – SAFE Team including Creg V Shaffer</u>

# <u>Mike Holman – MRH Enterprises</u>

SAFE System Design Partner – Industrial Contractor

Owner of AWD industrial contractors, Mikes experience covers nearly all aspects of the design, planning, and implementation of complex processing systems relevant to this project.

# John Pastusek

SAFE Chief Engineer

JDP Manufacturing specializes in vacuum vessels along with full extrusion line design and manufacturing. His expertise has focused on the process planning and production design for D&J Technologies engineering and manufacturing. John understands the full technical specifications of the SAFE system and will guide the project team's technical design efforts and system specifications.

# **Innovative Food Specialists, LLC**

SAFE Partner for Animal Feed

IFS understands the system process requirements for manufacturing marketable feed products from various food and feed by-products and waste streams. On this project, IFS will analyze and monitor food scrap samples from the generators covered by this project to ensure the sydstem and processes deliver a product suitable for feed markets.

# **Bill Freeman**

SAFE Partner for Finance, Accounting and Tax Matters

# Nicole Rinauro

SAFE Project Process Manager

Nicole brings life-long waste industry and project management experience to SAFE. Growing up in a family business that included hauling, transfer, and landfill operations; she will assist with RFQ, RFI and bid package assembly. She will ensure that effective training and operational hand-offs are accomplished including clear and relevant documentation.

# TOTAL COSTS AND ASSUMPTIONS

The planning and design project will start immediately with verification of the project location for system compatibility and continue through complete conceptual design, layout and construction project planning. The design phase is expected to run approximately 12 to 16 weeks.

# PROJECT ASSUMPTIONS

- 1. Project goal is to design a food recovery facility capable of taking food scrap mash from a SAFE pre-processing facility and delivered to the processing site via tanker truck or direct piping. Note: this project is designed for food scraps processing only.
- 2. Mash delivered to the plant will be a pumpable consistency.
- 3. Project team members will have access to the site / area as needed for on-site research, planning and design activities.
- 4. Customer staff will be available to provide information about food scrap volumes available, and ramp-up estimates.
- 5. Documents and deliverables will be the property of Customer, but used only for the construction, commissioning and operation documents for this site.
- 6. Buyerl will assign a project lead from the company to be the principal contact for the project.

# ASSUMPTIONS ON SCOPE OF SUPPLY

The following is a conceptual layout based on a working floor plan for a system with similar required through-put. The system cost estimate detailed below is for budgetary planning based on this concept.

# <u>NOTE: The cost projections are as of year end 2017 and will need to be revised based on</u> <u>manufacturing supply chain bottlenecks</u> and effects of higher raw material costs specifically steel.

# CONCEPTUAL LAYOUT (TBD):

# INITIAL PRODUCT FLOW ASSUMPTION ()

The estimates below assume a throughput of up to 50 tons per day.

The SAFE dryer system is built and mounted on several equipment skids built by SAFE's suppliers and manufacturing affiliates. Each equipment skid will be integrated mechanically and operationally under the supervision of SAFE's technicians. Integrating product and thermal fluid piping, utilities, exhausting, and discharge are all required to support the system. A cost estimate of on-site installation and integration of the system skids and components is provided, for budgetary planning. Actionable cost quotes will be dependent on the design customized to meet the actual documented requirements, the specific site's constraints, and the safe and sustainable operation of the system. The Planning and Design phase will detail all install and integration materials, structures and parts. Specifications of supply and

returns, required parts will be supplied by SAFE as well as startup, testing, commissioning, maintenance instruction and training.

# LIST 1: DRYER SYSTEM (OBJECT 5 ON LAYOUT)

Designed to dry food waste mash produced by the SAFE pre-processing system after passing through the separation process where free water and FOG has been removed to a target moisture level near 75%. Output moisture requirement is 12%. Dwell time, temperature, pressures are set and monitored by the system control and user interface. Alarms and programmed system shut-offs are programmed in to protect the equipment in the case of operating parameters outside established thresholds.

ltem	QTY	Description	Net Price USD
1-A	2	<ul> <li>Product Feed System</li> <li>Type - Progressing Cavity Pump – 1 ea.</li> <li>Scraped surface heat exchanger</li> <li>Product and thermal fluid valves and instruments</li> <li>Product divert valve and inlet valve including orifices</li> <li>Mass flow transmitter</li> <li>Double orifice inlet plate and manual bypass valves</li> <li>Automated orifice plug bypass loop</li> <li>Duplicate orifices</li> </ul>	
1-B	4	<ul> <li>Twin Screw Vacuum Drying Conveyors.</li> <li>Twin screw vacuum drying conveyors, including the following features: <ul> <li>15' long with dual 24" diameter, hollow flight screws</li> <li>Constructed of 2205 duplex stainless steel</li> <li>ASME "U" stamped for 90 psi @ 350 degrees Fahrenheit</li> <li>Rotation safety sensors</li> <li>Housing sight glasses with wipers 6" diameter – 4 per conveyor section</li> <li>Housing product temperature transmitters – 2 per conveyor section</li> <li>Outlet vapor transitions with insulated blankets – 3 per conveyor section.</li> <li>Flexible hoses included for connection to vapor header</li> <li>Rotary unions – 2 per conveyor section</li> <li>Hot oil supply and return manifolds (insulated) including all valves and gauges, temperature/pressure</li> <li>Flexible braided SS hoses with fire sleeves connecting the manifolds to each zone</li> <li>Teflon insulation blankets covering each conveyor</li> <li>Material for 2205 duplex SS on augers and troughs product contact zones</li> <li>Skid interconnecting piping, valves, instrumentation (see exclusions)</li> <li>Independent control and safety system panel (remote control included)</li> </ul> </li> </ul>	

ltem	QTY	Description	Net Price USD
1-C	1	<ul> <li>Conveyor Discharge, Lump Breaker, Conveyor</li> <li>9" Dia. (was 6") Discharge Incline Auger w/ Rotation Sensors – 1 ea.</li> <li>Airlock, Hopper Style w/ 2 sections – 1 ea.</li> <li>Pneumatic Valves and Level Switches, Airlock – Lot</li> <li>Lump Breaker after the Airlock VFD w/integrated control</li> <li>Product Removal Inclined Belt Conveyor after the Airlock Lump Breaker VFD w/integrated control</li> </ul>	
1-D	1	<ul> <li>Utility System Skid</li> <li>Utility Skid, 304 SS Framework w/ mounted Main Control Cabinet – 1 ea.</li> <li>Vapor Condenser, Horizontal U-Tube Style – 1 ea.</li> <li>Surge Tank mounted under the Condenser w/ Level Switches</li> <li>Vapor Condenser, Horizontal U-Tube Style – 1 ea.</li> <li>Vacuum Pump, Liquid Ring – 1 ea.</li> <li>Seal Water System including Outlet Collection Tank</li> <li>Condensate Pump – 1 ea.</li> <li>Seal Water Discharge Pump – 1 ea.</li> <li>Water Recirculation Pump, Cooling Tower – 1 ea.</li> <li>Valves and Instrumentation, Utility Skid – Lot</li> <li>Interconnecting Piping and Pre-wired, Utility Skid – Lot</li> </ul>	
1-E	1	<ul> <li>Cooling Tower System</li> <li>Evapco, ESWB Closed Circuit Cooler, 3.6 MMBTUHR (location based) – 1 ea.</li> <li>Lift Pump, Cooling Tower – 1 ea.</li> <li>Air Circulation Fan, Cooling Tower – 1 ea.</li> <li>Water Supply and Level System – Lot</li> <li>Instrumentation and Valves – Lot</li> </ul>	
1-F	1	Thermal Fluid Heater System – TBD, Must be electric or propane. •	

# List 1: Dryer System – Continued

# List 1: Dryer System – Continued

#### 1-G 1 Automated Control System

- Electrical Engineering Design and Programming
- Main Electrical Control Panel
- Remote Skid Enclosures
- Panel View Display mounted on Main Panel
- I/O, Power Supply, Ethernet Connection
- VFD's, Starters, Breakers
- I/O for Remote Control of Thermal Fluid System
- Remote Viewing and Firewall Equipment
- Utility Skid pre-wired to Main Panel
- System Transmitters and Switches

#### Catwalks for Drying Chambers

- OSHA compliant conveyor catwalk
- Progressive stepped catwalk to follow conveyor incline
- 304L SS construction; frame, kickplates, and handrails
- Interior connection to frame plates
- Exterior legs to floor
- Stairwell with landing to the first level platform
- Handrail around ends and exterior of platforms
- Chemgrate deck and tread plates

#### Dryer System Total

\$3,094,000

#### LIST 2: DECANTING SYSTEM ()

This system uses g-force to separate liquid materials based on mass using two machines; a 2 phase decanter and a high speed centrifuge. The first (decanting step) separates mash into 2 outputs, centrate (free water & FOG) and solids (wet cake). It is not a complete dewatering but it gives us the ability to take food scraps mash of various moisture levels and pull off free water to the specified 72% moisture. The free water pulled off is called centrate and contains FOG at this stage. The second step runs the centrate through a higher g-force Centrifuge. The centrifuge separates the FOG from the water as well as removing much of the suspended solids. FOG is pulled off into the oil tanks. The solids out of the centrifuge are called sludge and that material is pumped to and mixed with the wet cake coming off the decanter. The separation system below is also doubled up entirely, for maximum redundancy and capacity. Based on information provided, the flow rates to decanting are assumed to be 24 GPM. For the centrifuge, 18 GPM is assumed.

ltem	QTY	Description	Net Price USD
872-A 2-B	1	Decanter Centrifuge System:         2-Phase Decanter Centrifuge         • 20 HP main motor         • TM21 hard-surfaced conveyor         • All 316 stainless steel 14" bowl         • All stainless steel vessel         • Vibration sensor with auto shut-off         • Air actuated 3-way valve for feed/circulate         Decanter Centrifuge System: Decanter Control System	030
		<ul> <li>NEMA4 enclosure(s)</li> <li>Main power disconnect</li> <li>VFD drive for man motor</li> <li>VFD drive for back-drive motor</li> <li>VFD drive for feed pump</li> <li>Vibration alarm with shut-down</li> <li>Over-torque alarm with feed interlock</li> <li>Fully automatic control system with PLC and HMI</li> <li>Touch screen control with graphic interface</li> <li>Subtotal 2-Phase Decanter</li> </ul>	\$ 367,510
2-C	1	Skid Accessories         • Approximately 5' x 10' welded steel base         • Control panel mounted and wired         • 1.5" all steel welded flanged piping         • Stainless steel wafer check valves         • 1 ½ " steel control valves (feed control)         • Decanter inlet/outlet connectors with flexible hoses         • Vibration dampers         • Vibration isolating pipe supports         • Heavy phase sight-glass         • ¼" sample ports with valves         • Air actuated 3-way valve for feed/circulate         • 56 gal/minute progressive cavity feed pump	¥ 007,010
2-D	1	Separated Fluid Collection Tank         • Approximately 250 gal capacity         • Level sensor for automatic pump cycling         • 1 ½ " all steel welded flanged piping         • Integrated into above skid and controls         • 56 gal/minute progressive cavity discharge pump         • VFD for pump speed control         Subtotal decanter skid	\$ 221,650

ltem	QTY	Description	Net Price USD
2-E	1	Self-Cleaning High Speed Centrifuge System:         Self-Cleaning Centrifuge         • 460/60 motor (≈15HP)         • Clutch drive, horizontal         • Nickel plate non-SS bowl parts	
2-F	1	Self-Cleaning High Speed Centrifuge System:         Centrifuge Control Panel         • NEMA4 enclosure         • Main power disconnect         • DOL starter for main motor         • VFD drive for feed pump         • Fully automatic control system with PLC and HMI         • Elaborate manual overrides for most functions         • PB control with status indicator lights         • Touch screen control with graphic interface	
2-G	1	Self-Cleaning High Seed Centrifuge System:         Centrifuge Skid Accessories         • 1 ½" all steel welded flanged piping         • 1½" steel control valves (feed control)         • Vibration dampers         • Vibration isolating pipe supports         • Heavy phase sight glass         • ¼" sample ports with valves         • Air actuated 3-way valve for feed/circulate         • 56 gal/minute progressive cavity feed pump	
2-Н	1	Self-Cleaning High Speed Centrifuge System:         Product Pre-Heater         • 60kW low-watt-density electric heater         • Digital temperature display (main control panel)         • Multi-bank design for incremental loading         • Pressure relief valve         • Over-heat shut-off         Subtotal High Speed Centrifuge	\$ 280,280
		Decanting System Total	\$ 869,440

### List 2: Decanting System - Continued

#### LIST 3: PUMPS AND FILTERS

The items in this section are dependent on final design based on customer requirements. Below the budgetary quote allows for the most effective flow of material and cleaning solutions to maximize the useful life of the equipment, the safety of the operation and ability to maintain continual operations through cleaning and maintenance cycles. The pumps must be able to move high volumes of product at low pressures. This conceptual design allows for CIP of any tank or supply line without shutting down the separation and dehydration functions.

Item	QTY	Description	Preliminary Allowance USD
3-A	1	Tanker Offload Pump	
		<ul> <li>High capacity low pressure, 200 GPM (type – gear pump)</li> </ul>	
3-B	1	Mash Tanks to Process / CIP	
		<ul> <li>PD, VFD to 50 GPM, low shear (type – gear pump)</li> </ul>	
3-B	1	Wet Cake Tanks to Process / CIP	
		<ul> <li>PD, VFD to 25 GPM, low shear (moyno pump)</li> </ul>	
3-C		Grit/Silica Filters, Traps	
		Total Pumps and Filtration	\$258,700

### LIST 4: TANKS

The items in this section are dependent on final design based on customer requirements. The proposed tank set focuses on providing adequate staging and storage capacity for operating 1-dryer line. It does not provide for surge capacity beyond the daily requirement. Recommended tanks below will meet safety requirements for access, cleaning and permitting. Not included below is the valving and piping required to integrate the various tanks with the processing and CIP equipment. Equipment integration costs are estimated in the Equipment Install / Fabrication / Hook-up line item.

ltem	QTY	Description	Preliminary Allowance USD
4-A	1	Mash Tanks () • 3,000 gal stainless cone-bottom agitated, CIP	\$ 52,000
4-B	1	<ul> <li>Wet Cake Staging Tanks ()</li> <li>2,500 gal ss cone-bottom agitated, CIP</li> </ul>	52,000
4-C	1	Condensate Cooling Tanks • 3,000 gal FRP tanks	5,200
4-D	1	Process Water Equalization Tank     3,000 gal FRP tank, level sensors SAF control     integrated	29,250
4-E	1	<ul> <li>Clean Oil Storage</li> <li>3,000 gal clean oil storage tank, holding prior to shipping</li> </ul>	16,250
		Total Tanks	\$ 154,700

### LIST 5: EXTRUDER SYSTEM ()

The final processing step of the system is sterilizing the product and achieves the final moisture level to ensure product stabilization. The flow rate anticipated into the extruder needs to exceed the exit flow rate out of the two dryers (). This dryer system will generate approximately one (1) ton per hour of hot dried output (meal) at about 12% moisture. Prior to running through the extruder, the meal will load into a ribbon blender/mixer to breakup any clumps and make a uniform and consistent feed into the extruder. Maintaining consistent moisture and uniformity is essential for the extruder to reach and maintain the required temperature and pressure.

Product exiting the extruder will be hot (about 300 degree F). Out of the extruder, the product will be conveyed to the cooling drum via a vented conveyor in order to allow steam release and containment. The cooling drum will manage up to 4,000 lbs per hour of material that is 10% moisture or less.

ltem	QTY	Description	Net Price USD
5-A	1	<ul> <li>Extruder with feeder 125 hp drive</li> <li>125 hp (94 kW) main drive motor</li> <li>Remote mount control panel w/digital readout and A/C frequency drive</li> <li>Variable speed feeder motor</li> </ul>	\$ 75,703
5-B		<ul> <li>Wear Parts Package</li> <li>Custom wear parts package of selected parts to fit specific application</li> </ul>	6,332
5-C		Dry Meal Cooler Gear driven main drive motor 1800 CFM fan motor Cyclone and airlock assembly Airlock motor	38,905
5-D		<ul> <li>Water Injection System</li> <li>Water injection manifold, injector and flow meter</li> </ul>	4,061
5-E		<ul> <li>Vendor Startup Service</li> <li>A 5 day professional service by technology specialist for operator use training and maintenance</li> </ul>	7,280
5-F		<ul> <li>Mixer/Blender Pre-Extruder</li> <li>304 stainless steel mixer clump breaker</li> <li>50 cu. ft. capacity</li> <li>Motor, gear box,</li> <li>Feeder mechanism to extruder</li> </ul>	127,400
		Total Extruder System	\$ 259,682

### LIST 6: CLEAN IN PLACE (CIP) SYSTEM

SAFE proposes installing and integrating a fully functional cleaning system including a multi-tank skid with heat exchangers and solvent injectors to allow for CIP functions critical to maintaining sanitary conditions, maximizing the longevity of the equipment, and conducive to feed production guidelines, safety, and maximizing up-time.

ltem	QTY	Description	Net Price USD
6-A	1	<ul> <li>CIP System <ul> <li>Skid mounted, integrated with system piping, tanks, vessels, pre-heaters.</li> <li>Interior pipe, fitting, tank, vessel, flushing / cleaning system</li> <li>Engineered and custom built for specific plant layout</li> <li>Pressurized to ensure residue removal with minimal chemicals, water usage, operating costs.</li> <li>Custom CIP program designed to optimize cycle times based on work flow and safety protocol.</li> <li>Stainless steel tanks (2 tank system)</li> <li>Circulation pump</li> <li>Heat exchanger</li> </ul> </li> </ul>	
		CIP System	\$ 162,500

### LIST 7: SUSPENDED AIR FLOTATION SYSTEM (SAF) – WATER TREATMENT SYSTEM

SAFE is proposing the installation of Heron Innovators Suspended Air Flotation system for treatment of the mechanically separated free water from the liquid phase of the decanter and the heavy phase of the high speed centrifuge. The proposed system is capable of removing 90+ percent of the Total Suspended Solids (TSS), and essentially all the remaining FOG. The proposed and costs below provide for a 30 GPM influent from the separation system. The proposed skid will also provide for balancing discharge water.

ltem	QTY	Description	Net Price USD
7-A		<ul> <li>SAF Skid Base</li> <li>50 gpm self-priming feed pump; VFD control</li> <li>304 stainless steel flotation cell</li> <li>Skimmer assembly w/electric motor drive and VFD</li> <li>Flocculation tank, mixers motor and VFD drive</li> <li>Maintenance platform</li> <li>Control Panel</li> <li>Skid mounted unit (assembled) read to operate</li> </ul>	
7-B		<ul> <li>Expand water launder to include SS working tank</li> <li>Level sensor</li> <li>Discharge pump</li> <li>Process and ID loop for automated manual operation.</li> </ul>	
7-C		<ul> <li>PH Control</li> <li>PH Controller</li> <li>Insertion-style probe</li> <li>Caustic safety tank</li> <li>Metering pump</li> <li>Process and ID loop for automated and manual operation.</li> </ul>	
7-D		<ul> <li>Electric Lobe Solids Pump</li> <li>2" Borger lobe pump</li> <li>Gear box/gear reducer</li> <li>2HP 480V/3P electric motor</li> <li>Powder coated skid assembly</li> <li>P&amp;ID loop for automated and manual operation</li> </ul>	
		SAF System	\$ 351,000

### LIST 8: CENTRAL INTEGRATED CONTROL SYSTEM

Important to the efficient control of the system is the ability of the staff to operate and monitor all components of the system. Each manufacturer will provide control and I/O interfaces. Given our experience with the system, SAFE's technical experts and suppliers will coordinate to custom build and implement a consolidated control panel specific to this site's operating parameters. This feature will provide centralized, user friendly monitoring and control interfaces, including remote monitoring and control of specific functions. It will eliminate the need for each supplier to provide a complete UI. It will provide a uniform interface and integrated e-stop functions across the various system skids, and eliminate the need for operators to learn multiple and disparate control interfaces.

ltem	QTY	Description	Net Price USD
8-A		<ul> <li>Integrated Control System</li> <li>Integrated equipment start/stop</li> <li>Integrated alarm monitoring</li> <li>Integrated system shut-off</li> <li>Electrical engineering design and programming</li> </ul>	
8-B		Main Electrical Control Panel         •       Panel view display mounted on main panel         •       I/O, power supply Ethernet connection         •       I/O for remote control of each system         •       Remote viewing and firewall equipment         •       Utility skids wired to main panel         •       System transmitters and switches	
		Central Control System	\$ 520,000

#### LIST 9: REQUIRED ANCILLARY EQUIPMENT

ltem	QTY	Description	Net Price USD
9-A		<ul> <li>Air Compressor</li> <li>Compressor, rotary, 20HP, 120 gal, 150 PSI, 65.6 cfm, 460vac, 3</li> </ul>	\$ 20,434
9-B		<ul> <li>N-2 Nitrogen Blanket System</li> <li>Hot oil heater, required fire suppression system</li> </ul>	12,968
9-C		<ul> <li>Flex Auger/Conveyors</li> <li>Estimated 2, type – Model 90 flex auger systems, 100 lbs/minute, at 40 lbs per sf, 18% moisture max</li> </ul>	37,082
9-D		<ul> <li>Stainless/Vented Conveyors</li> <li>T-304 stainless steel, double flanged troughs, flanged covers, 1 HP, 3/60/230/460V, electric motor</li> </ul>	69,017
9-F		Dry Storage Bags / Scales / Racks or Bulk Hopper option <ul> <li>110 cu yrd, 24 ton capacity</li> </ul>	130,000
9-G		<ul> <li>Water Heater / Softer System</li> <li>Hot, soft water needed for Centrifuge ops</li> </ul>	13,813
9-H		Bulk Totes <ul> <li>250 gal poly storage (over flow / temp storage)</li> </ul>	8,409
9-1		Forklift <ul> <li>4000LB electric, 36V battery with water sys-tank and charger</li> </ul>	56,621
9-J		Moisture Analyzer     Required measuring instrument	21,198
9-К		<ul> <li>Tools, testing lab, supplies</li> <li>Required product testing equipment and equipment maintenance tools</li> </ul>	63,180
		Total Ancillary Equipment	\$ 432,721

### LIST 10: SUGGESTED ANCILLARY EQUIPMENT

ltem	QTY	Description	Net Price USD
10-A		System Monitoring Sensors	\$ 53,625
10-B		Office Equipment, Networking and Signage	19,500
10-C		Computers, Software and SAFE Data Capture Application	7,313
10-D		Shop floor desks, tables, chairs, cabinets	4,063
10-E		Floor Scrubber	6,825
10-F		Pressure Washer	1,300
10-G		Equipment Safety Barriers	4,875
10-H		Job Box	3,250
			\$ 100,750

### SUMMARY OF EQUIPMENT COSTS

Below is the summary of SAFE's equipment set for the conceptual layout provided. Included in the summary below is SAFE's costs for providing required technical configuration, monitoring equipment acquisition and delivery, directing and conducting full scale unit, system, integration, and performance testing. The budget shown allows for 120 man days on-site.

Description	Net Price USD
Dryer System (2 Lines)	\$ 3,094,000
Decanting System	869,440
Water Treatment System (SAF)	351,00
Tanks	154,700
Pumps/Filters	258,700
Clean-in-Place Utility Skid	162,500
Integrated Controls	520,000
Extruding System Including Cooling	259,682
Ancillary Equipment	533,471
Technical Configuration, Testing, Commissioning	216,000
Subtotal – Equipment Costs	\$6,419,492

### ESTIMATE OF SYSTEM EQUIPMENT INSTALLATION AND ENGINEERING COSTS

Description	Net Price USD	
Equipment Installation/Fabrication/Hook-up	1,150,000 *	
Permitting, Engineering, Architecture	205,000	
Subtotal Estimate of Install Costs *Implementation costs shown are an estimate to be determined by the planning and design phase of this project.	\$ 1,355,000	*
Not Included in this Proposal: - Fire Protection/Sprinkler System - Building Modification/Civil Work - Taxes - Electrical feed to new MCC panels - Seismic (SAFE can provide seismic if client prefers) - Additional training package - Preventive maintenance package - Unforeseen local code deviations from national code st - ANY ITEM NOT SPECIFICALLY SET FORTH HEREIN, INCLUDIN LIMITATION SITE WORK OR STRUCTURAL MODIFICATIONS C IMPROVEMENTS, BUILDING OR UTILITY PERMITS, SALES TAXE APPLICABLE, OR SHIPPING COSTS	NG WITHOUT	
SAFE reserves the right to modify any equipment s new technologies are available, while maintaining		

production capacity and maintaining for improving product quality.

\*\*This is an estimate only. Any unforeseen increase in raw materials including material import fees, extraordinary costs or fees beyond our control attributable to a change in law, or increases resulting from customization or a customergenerated change order, if any, will be assessed at the time a purchase order is issued and will be reflected in final contract documents. If SAFE does do the work, all work, including parts, will come under the same warranty provided for other items in this sales order.

Grand Total \$USD Sales tax not included Quote is good for 30 days.

\$ 7,774,492

Martha's Vineyard SAFE FOOD RECOVERY SYSTEM April 11, 2018

## PAYMENT SCHEDULE

TBD

### PROJECT PLAN

	Task	Work	Deliverables		
Phase I: Site D	esign & Plar	nning			
Activity 1					
	Task 1.a	Validate Site and Throughput Requirements	System requirements docume Site Selected		
Milestone	Site and Thr	oughput Requirements:	Stakeholder Sign-off		
Milestone	Conceptual	Design Complete: Required Payment for	or Phase I:		
	Task 1.b	Analysis and Planning - Project Specific	Infrastructure plan: Utility supp accessibility, traffic, permittin requirements.		
	Task 1.c	Refine Design	Updated design specs, tonnag storage, utilities, emissions discharge		
	Task 1.d	Refine Estimated Costs - Corresponde to Updated Design	Updated Project Costs		
Milestone	Updated De	sign & Costs: Stakeholder Sigh-Off			
Activity 2	Engineering	5			
	Task 2.a	Document site specific engineering requirements	Engineering analysis & Prelin P&ID		
	Task 2.b	Draft Architectural Plans	Final Equipment Layout		
Activity 3	Finalize Bui	ld Plan			
	Task 3.a	Develop bid package	Contractor Bid Pachage		
Milestone	Final Bid Pa	ckage: Stakeholder Sign-Off	Bid package illustrations		
Pha <u>se II: Cons</u>	truction Plai	nning & Acquisition			
Activity 4	Building Co	ntractor Selection			
	Task 4.a	Select / Contract with Building Contractor (Customer)	Building Contractor Signed		
Activity 5	Validate pro	oduct characteristics			
	Task 5.a	Analyze Local Product	Final process map, initial operating plan and estimate costs.		
Activity 6	Finalize Equ	ipment Order			
	Task 6.a	Finalize equipment specs	Final mechanical requirement equipment specs		
	Task 6.b	Finalize all costs and timelines	Buildout illustrations, Comple supply list, P&IDs		
Milestone:	Approve pro	oject budget, Order Equipment, Require	ed Payment Phase II		
Activity 7	Equip Delive	Delivery & Install Planning			
	Task 7.a	Set plan and timelines for equipment delivery, rigging, and	Equipment delivery schedule riggers contract, anchor		

## PROJECT PLAN (CONTINUED)

	Activity	Task	Work	Deliverables				
Pha	hase III: Site Preparations / Tenant Improvements							
	Activity 8	Building / Ter	nant Improvements					
		Task 8.a	Site Construction / Preparation Work	Complete building / T.I.s for equipment install				
	Milestone:	Site Inspectio	n	Sign-offs: LEA, SAFE, Stakeholder				
Pha	se IV: Equip	oment Install	ation					
	Activity 9	Equipment de	elivery, rigging, anchorage					
		Task 9.a	Ship / receive, rig, anchor equipment set	Equipment set in place				
	Activity 11	Process mech	anical integration					
		Task 11.a	Process piping and plumbing work	Completed process piping and plumbing				
	Task 11.b		Final Mechanical Docs & Inspection	Mechanical Sign-off / Certification				
	Activity 12	Process elect	rical hookups					
	Task 12.a		Process power supply, drops, connection	Completed equipment power connections				
		Task 12.b	Final Electrical Docs & Inspection	Electrical Sign-off / Certification				
	Activity 13	Process contr	ols integratoin					
		Task 13.a	Low Voltage Control Integration	Completed control panel wiring				
		Task 13.b	Process programming, Alarms, Safety Shutoff Testing	Completed Alarm and Safety Shut- off Programs				
		Task 13.c	Controls User Interface testing.	Control System & Operator Docs				
	Milestone:	System Instal	led	Sign-offs: SAFE, Stakeholder				
		Task 13.c	Final User Interface Testing / Docs	M & O Documents				
Pha	se V: Comn	nision / Turne	over / Training					
	Activity 14	Commission I	Equipment					
		Task 14.a	System Unit Testing	Isolated Process Sign-off				
		Task 14.b	System Integration Testing	Integrated, full process, Sign-off				
		Task 14.c	Processing Fixes	Fix Testing Failures				
		Task 14.d	Unit Test Fixes	Testing Sign-off				
	Activity 15	Training / Tru	nover					
		Task 15.a	Operator training					

This estimate is for budgetary and planning considerations only. Any work, service, or sale shall be initiated and executed under the terms of a separate Purchase Agreement or Service Contract not contained herein.

### END OF DOCUMENT



# **SAFE Pre-Processing System Estimate**

Estimate Prepared for: Martha's Vineyard - 50 TPD March 1, 2018

Note: Material cost are rising rapidly, these estimates will need to be formally quoted prior to an order.

Item	Qty.	Description	Model	HP	Size	Cost (\$USD) for a Single Line		
	CPG - EQUIPMENT LIST							
1	1	Feed Ramp				\$75,205		
	1	~ CP Ramp			48"H x 50'L			
	1	~ Transition to Eliminate Leaking						
2	1	Receiving Pod			10'W x 30'L	\$181,441		
	1	~ Dual Augers	SC-1 16"	15 x 2	16"D x 24'L			
	2	~ Augers to move material						
3	1	Auger Conveyor Transition				\$42,491		
	1	~ Single Auger Shredder Feed Conveyor	SC-1 24"	15 x 2	24"D x 24'L			
	1 lot	~ Transition Chutes						
4	1	Shredder Pod			8'W x 24'L	\$330,351		
	1	~ Shredder Shred Tech	ST 75E	30 x 2	10 TPH			
	2	~ Auger under Shredder	SC-1 16"	10	16"D x 17'L			

1					т	1 1
	1	~ Auger to Press 20 Degree Incline	SC-1 16"	10	16"D x 15'L	
	1	~ Auger to Press	SC-1 16"	10	16"D x 15'L	
	1	~ Storage Tank 37 cubic yards			8.5'W x 26'L	
	1	~ Lower Feed Auger 5 Degree Incline	SC-1 16"	15	16"D x 20'L	
	1	~ Upper Leveling Auger	SC-1 16"	10	16"D x 20'L	
5	1	Press Pod			8.5'W x 26'L	\$587,162
	1	~ Vincent Press 24"				
	1	~ Single Auger to Compactor 24 Degree Incline	SC-1 16"	10	16"D x 22'L	
	1	~ Single Auger to Compactor	SC-1 16"	10	16"D x 42'L	
	1	~ Bi-Directional Single Auger to Compactor	SC-1 16"	10	16"D x 20'L	
6	1	Screen Pod			8'W x 20'L	\$99,080
	2	~ Screen	Sweco MX- 44S88			
	4	~ Surge Tanks				
7	1	Tank Pod			8.5'W x 26'L	\$33,700
	3	~ Tanks  3000 Gallon each	Translucent Chemical		1	

## **CPG - TOTAL EQUIPMENT:**

\$1,349,430

### **Estimated Power Consumption**

kW Total:64 kWPeak LoadkW @40%:26 kWRunning Load

Item	Qty.	Description	Model	HP	Size	Cost (\$USD) for a Single Line
		CPG - OTHERS				
ICP		Electrical Controls - Advanced MRF - UL508a Compliant			Siemens	\$99,000
ENG		Engineering			CP Staff	Included
PE		Certified Professional Engineering (Stamp and Certified Docum	nents)			Not Included
MECH		Mechanical Installation - Non Union - No Prevailing Wages				\$66,000
		Includes: Three CP techs for five days. Any additional days will be charged at \$1,420 per tech. Price includes all necessary lifting equipmnet and tools to complete the installation.				
ELEC		Electrical Installation - Non Union - No Prevailing Wages NOTE: All electrical drops will be the responsibility of the custo	omer			\$33,000
SUP		Project Management: One PM assigned as main contact through start up and testing.				\$30,250
START		Startup and Testing: Included in PM line item, PM to be onsite for three days of testing. Any additional days to be charged at \$1,420.				Included
FRT		Freight and Truck Loading Note: Due to the current volatility of transportation costs, all freight quotes are an estimate and not guaranteed. Shipping costs will be re-evaluated at the time of shipment and adjustments may be made			Estimate Only	\$37,065

## **CPG - TOTAL "OTHERS":**

\$265,315

# <u>CPG SUBTOTAL: PODS, CONVEYORS, CONTROLS</u>

\$1,614,744

NOT INCLUDED IN PROPOSAL - CPG				
~ Fire protection / Sprinkler system				
~ Building modification / Civil work				
~ Sort cabins / HVAC				
~ Permitting				
~ Taxes				
~ Mobilization				
~ Electrical feed to new MCC panels				

\*\*All Items Noted As "Existing" or "By Others" or any other indicator that infers not provided by CP Mfg.

During the course of the project, if CP MFG. finds that items listed on this sales order as "Existing" or infered not by CP Mfg need to be replaced, modified, repaired, painted or in any way upgraded, we will provide the customer with a written explanation and quote in order to carry out this work. It will be up to the customer to approve this work at the additional cost or perform the work itself. If CP does do the work, all work, including parts, will come under the same warranty provided for other items in this sales order.

Item	Qty.	Description	Model	HP	Size	Cost (\$USD) for a Single Line	
AWD	AWD - PIPING, PUMP, & VALVE PACKAGE						
		Note: The following estimate is based on conceptual design budgetary purposes.	gn and only to	) be use	d for		
А		Process lines between screw press and first set of hold tanks.					
В		Process lines between first set of hold tanks sweco filters.					
С							
D							
Е		Pumps and regulators for pumping at each location					
F		Hangers and supports as required for piping					
G	Air main and piping drops to each location.						
Н		Air compressors and dryers as required					
Ι	1 Air receiver and filter						
J	J 1 Process line from receiving building to dry processing building						
K	1	High pressure washer with hot water boiler					

# AWD - SUBTOTAL: PIPING, PUMPS, & VALVES

\$736,340

NOT INCLUDED IN PROPOSAL - AWD	
~ Seismic design, engineering, materials, and labor	
~ Electrical and controls	
~ Cleaning and drain lines	
~ Stamped engineered drawings, Permits and Fees	
~ Rentals	
~ Mobilization	
~ Freight	
<u>GRAND TOTAL:</u>	<mark>\$2,351,084</mark>

Note: Material cost are rising rapidly, these estimates will need to be formally quoted prior to an order.