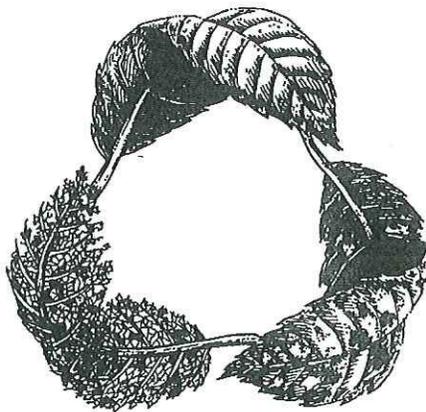


State of Connecticut
Department of Environmental Protection

OFFICE FOOD SCRAP
COMPOSTING PROJECT

First Year Report
on Building-wide In-vessel Expansion
September 1997 - August 1998



Prepared by:
DEP Waste Management Bureau
79 Elm Street
Hartford, CT 06106

Table of Contents

Introduction.....	1
Project Start-Up.....	1
Summary of Operations.....	2
Use of Finished Compost.....	3
Data Collection.....	3
Program Logistics Assessment.....	6
Technology Assessment.....	8
Cost Analysis.....	12
Next Steps.....	15
Conclusions.....	16
For More Information.....	16
Appendixes.....	17
A. Fact Sheet "Office Food Scrap Composting Demonstration"	
B. Food Collection Data	
C. Temperature Data	
D. Laboratory Analysis	
E. Field Notes of Operations	
F. Photos of Operation	

Introduction

This in-vessel composting project is part of the CT DEP's Model Agency Initiative for Pollution Prevention, Source Reduction and Recycling. After successful completion of a mini-pilot using a backyard compost bin, this expanded building-wide project was approved by the P2 Implementation Committee in the Spring of 1997 to fund the purchase a 100 pound/day Earth Tub from Green Mountain Technologies and other capital expenses. The system was installed in August of 1997 and operations began on September 2, 1997. There was no budget for labor, so the entire project has been operated and maintained thru in-house volunteer services of DEP staff. This is a detailed report to the DEP P2 Implementation Committee of the first year of operation and can be considered a supplement to the October, 1997 fact sheet which outlines the general aspects of the project (Appendix A).

Project Start-Up

Collection Equipment

Each of six break rooms were outfitted with a bucket-lined Rubbermaid step-on container, hanging scale, clipboard, and data sheets prior to starting operations. The buckets were specially labeled as "Compost" and listed the items which could and couldn't be accepted.

Composting Vessel Installation

Green Mountain Technologies (GMT) delivered the Earth Tub on 8/7/97, and completed installation on 9/3/97. Prior to delivery, an electrician hired by building management installed electricity, outlets, ground faults, circuit breakers, power box, conduit, etc. at the location for the composter.

Staff Training

Staff training occurred on both general and specific levels. The entire staff occupying the DEP building (766 people) were educated thru a series of brown bag seminars, fact sheets, posters, e-mail and voice-mail communications. They were given the basics of what makes composting happen, encouraged to participate by putting only the correct things in the collection bucket and given a contact name for their floor.

More specific training was given to "Compost Collectors"(109 people) through a one hour seminar which included a slide show of our project, handouts, and question and answer session. They were instructed on the importance of weighing and recording data, monitoring collection buckets for unwanted items, and placement of the food scraps into the Earth Tub.

Another specific group of "Compost Turners" (18 people) were trained on the operation of the Earth Tub. A one hour hands-on workshop covered the design of the Earth Tub, how to run it, safety issues and daily procedures.

The final group of "Floor Representatives" (6 people) are the point persons for general questions and responsible for recruitment and scheduling of volunteers. They are the backbone on which the project coordinator relies for such things as data collection, continuing education, assistance with other duties, etc. They have been through all of the training mentioned above.

Summary of Operations

Daily Operations

During the course of the day, employees placed food scraps (any kind of food, but mostly post consumer), paper towels and coffee grounds/filters in the collection buckets located in the break rooms. Each afternoon, staff volunteers weighed the collection buckets, emptied the contents into the composting vessel, rinsed and returned the buckets to their proper location. Each morning, another volunteer turned the compost mixture by running the motor/auger on the Earth Tub, and also checked the leachate collection tank, biofilter drain and condensate drain, and blower function. The project coordinator took temperature readings every morning, usually prior to turning and dealt with any operational problems as they arose.

Weekly Operations

At the end of each week, the floor representatives totaled the number of pounds collected on their floors and reported this to the project coordinator. The project coordinator summarized the results and e-mailed them back to the floor reps. Running tallies were posted in each break room.

Bi-weekly Operations

Every two weeks, the grease fitting on the auger assembly was serviced by the Project Coordinator.

Periodic Operations

Every four months, the composting vessel was emptied and readied for another batch of food scraps. Volunteers (6-7) shoveled out the hot composting mixture from the Earth Tub and wheelbarrowed it to the back of a flat bed truck next to the loading dock. Here, they screened the material through a ½" home-made garden screen removing any oversized items and physical

contaminants. The truck and driver was provided by one of the DEP District offices, and the wheelbarrows, screen and garden tools were loaned by the Project Coordinator. The composting vessel was cleaned with a hose, inspected, and repaired if needed. A shallow layer of wood chips was placed in the bottom and then the Tub was filled almost full with dry wood shavings provided by the DEP sawmill and inoculated with some compost from the previous batch. The screened compost mixture averaged about 1.25 cubic yards per batch, and was brought to the DEP Portland Depot for curing.

Use of Finished Compost

The first cured batch of compost was used to create a butterfly garden at Dinosaur State Park in Rocky Hill and also applied to the annual garden at DEP Headquarters. Future batches are slated to go to Gillete Castle and other high profile parks. Forty samples of compost (one gallon each) were given to employees at an Earth Day '98 event with the response being very positive.

Data Collection

Quantities

The weight of food scraps collected was almost exactly what was anticipated. A total of 8,841 pounds, or 4.42 tons of food scraps/paper towels were collected for composting (Table 1). This represents 6.0% of the total waste stream from the building. Tonnages varied slightly during the year probably due to vacation schedules, increased field work, availability of in-season fruits and vegetables and employees eating lunch outside in the adjacent park during warmer weather (Figure 1). Tonnage increased slightly during the week of 12/14 due to several holiday pot-luck luncheons. An unexplained peak occurred during the month of March 1998 and cannot be correlated with any significant event. The weekly average of food scraps collected was 170 pounds, the daily average was 35.8 pounds (Figure 2), and the average per person for the year was 11.5 pounds (Figure 3). Wood shavings used as a bulking agent and carbon source totaled 527 pounds resulting in an average mix ratio of 16.8 pounds of food to 1 pound of wood shavings. The average C:N ratio of the mixture is estimated at 87:1 based on 94% food/paper waste (57:1) and 6% wood shavings (560:1) by weight. Three batches of compost were harvested and ranged between 1 and 1.75 cubic yards each. Average weight of finished compost was approximately 515 lbs. per cubic yard. Tailings from the screening process totaled 283 pounds and consisted of bones, pits, paper towels, uncomposted food, plastic and wood chips. Approximately 21 gallons of "compost tea" or leachate was generated, all of which was recycled back into the composting mixture. Tonnage data is presented in Appendix B.

Table 1. Pounds of Organics Composted during first year of building-wide composting project.

Month	Food/Paper	Wood Shavings	Totals
Sept '97	757.85	108	865.85
Oct '97	685.80		685.80
Nov '97	678.25		678.25
Dec '97	830.61		830.61
Jan '98	786.07	225	1,011.07
Feb '98	697.65		697.65
Mar '98	919.34		919.34
April '98	784.56		784.56
May '98	717.77	194	911.77
June '98	716.65		716.65
July '98	643.50		643.50
Aug '98	623.30		623.30
Totals	8841.35	527	9,368.35

Figure 1.

Variation in Monthly Totals of Organics Composted (pounds)

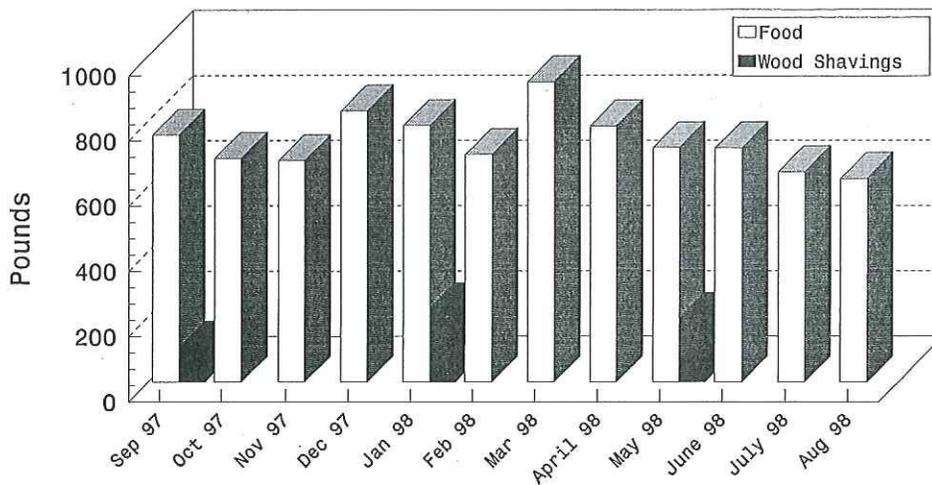


Figure 2.

Average Daily Weight of Food Composted (pounds)

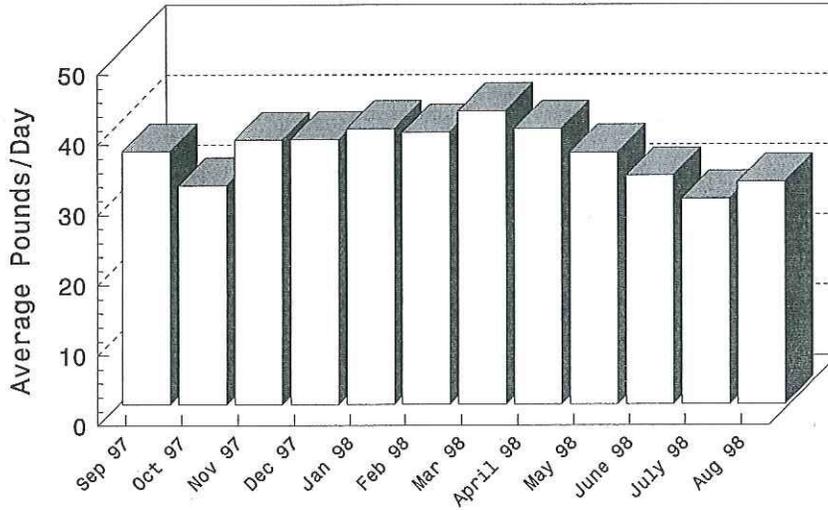
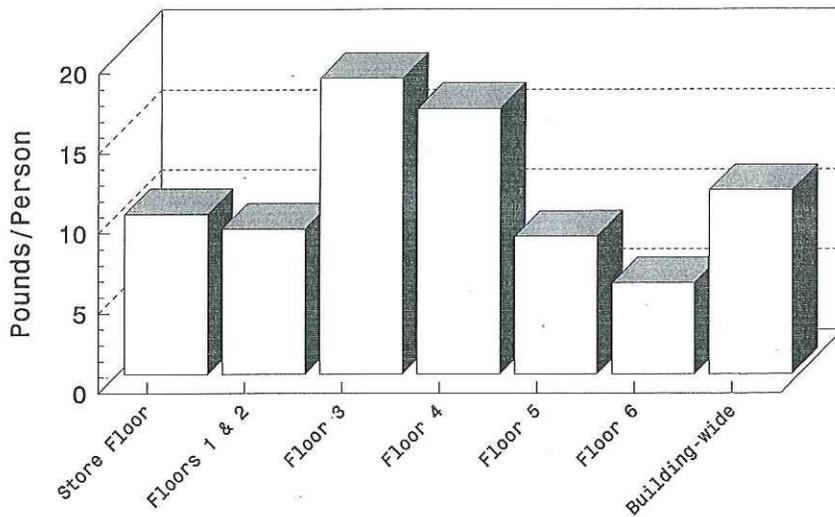


Figure 3.

Average Weight of Food Composted Per Person During First Year of Project (pounds)



Temperature

Temperature readings inside the Tub and ambient temperatures were monitored throughout the year. During the first few months, temperatures were taken only periodically, about 2-3 times a week, and were only used to make sure heat was being generated. It was assumed that the Earth Tub's built-in temperature probe and automatic aeration control would eliminate the need for intensive monitoring. However, when we began to experience difficulty with moisture control and switched to aerating from the headspace of the Tub, this rendered the probe and auto-aeration obsolete (see Technology Assessment section, page 8). A more serious effort to keep daily logs of temperature was initiated in January, 1998. Temperatures inside the Tub have always been warm, but never consistent throughout the pile, and rarely in the optimum 140° F range. Differences of 30 or 40 degrees Fahrenheit would be noticed in places only 3' apart. Temperature seemed to be most influenced by moisture content and amount of aeration as opposed to C:N ratio. Temperature data can be found in Appendix C.

Laboratory Analysis of Compost

A composite sample of compost from the first batch was sent to the CT Agricultural Experiment Station soon after removing it from the Tub, and again after about 4 months of curing under a Compostex cover. The results were very good and consistent with what one would expect to find as active compost cures into a more stable product. The ammonia level, soluble salts, and organic matter decreased with age, pH was near neutral and plant nutrients were indicative of a very fertile soil. A sample from the second batch was analyzed after 14 weeks of curing and was also high quality. When used to amend planting soil, our compost should perform very well. Samples of future batches will be taken only after curing, as it is more useful for our purposes to know the quality of finished compost as opposed to active compost. Analysis results can be found in Appendix D.

Program Logistics Assessment

Staffing

Cooperation from staff in all aspects of the program has been tremendous. They seem to value the opportunity to participate in an expanded recycling effort simply by dropping their leftovers into the collection bucket. Much of the success in keeping volunteers committed to helping out centers around their own environmental stewardship ethics, a certain amount of peer pressure, and the floor representatives who keep people active in the project. Weekly tallies are posted in each break room as a way to let staff know how they are doing and how they compare to other floors. Incentives such as compost give-aways and an Earth Week competition between floors for the most food scraps collected, helped with awareness and participation. In most cases something related to composting, such as a backyard bin was raffled off. Active involvement by staff has gone a long way in educating them about composting, both at the office and at home.

Although staff commitment has been fantastic, we haven't been without our problems. Initially, recruitment wasn't a problem because the program was new and we offered fun incentives. However, the building-wide volunteer pool has dropped 30% over the year with some floors experiencing a 50% decrease. Although the people who have continued to help are doing it gladly, they would like some relief. Some have commented that they didn't volunteer for life. Particular recruitment problems have been encountered on the Store (basement) floor. There are only 41 people who work on this floor, and many of them are in the field often. Only about six people take turns emptying the bucket, and 4 of them are contracted employees. The Floor Representative resigned after about four months and a replacement wasn't found until May 1, 1998. The Project Coordinator collected the data during the interim. The replacement is a contracted employee who is absent during the summer months and will only be with us through 1999.

Materials Handling

The process of weighing, emptying, and rinsing the collection buckets has been going well. At first, concerns arose about possible odors from the buckets and coffee grounds clogging the sink when the bucket is rinsed, but these fears have been unfounded. Sometimes people forget to empty the collection bucket in the afternoon and it sits until the next morning. This has not been a problem either.

The first floor does not have a break room, and therefore does not have a collection bucket. First floor employees use the second floor break room and bucket. Although it would be more convenient to find a first floor location for the bucket, we may not get volunteers to empty it, as there are only 69 employees on this floor and currently, none help with emptying the bucket on the second floor. The gain in tonnage may be negligible for the effort.

Physical Contamination

Physical contamination is a periodic problem and was worse earlier in the project. Items like plastic baggies, plastic wrap, plastic tops to juice bottles, aluminum foil, pre-measured coffee packets, plastic coffee stirrers, individual creamers, soy sauce and ketchup packets, foam cups, and even ½ gallon gable top milk containers have been found in the composter. There is a possibility that this problem is being caused by the cleaning contractor or from people using the composter as an outdoor trash can. The building manager was asked to reiterate to the cleaning crew not to use the buckets. Floor Reps have had to remind staff not to put these things in the collection buckets and Turners are doing a better job of picking out trash from the composter before they turn the compost. Items which elude these efforts get screened out in the end. These remedies seem to have worked for the most part.

Paper towels seem to break down adequately if the compost mix is moist enough. Brown towels seem to degrade faster than white. When building management changed from perforated white towels to rolls of un-perforated white towels, an increase in toweling in the buckets was noticed.

Instead of taking one towel, people are taking a yard at a time. As a result, these long strips of paper are getting wrapped around the auger, and our ratio of paper to food (carbon : nitrogen) has increased. This could result in a slower composting process and decreased moisture content.

Hazards

Ice dams which form on the tile roof of the building break loose and fall 6 stories into the compost area. This is a dangerous situation which could result in serious injury or damage to the composter.

Performing collection, turning or troubleshooting duties outside in the rain, ice and snow, although not a problem, is an inconvenience. It also gets very slippery in the winter due to ice forming on the ground around the Tub.

Building Management

Accessibility to the building maintenance workers is limited. Although they seem supportive of the project, they are not assigned the responsibility of managing or maintaining the composting unit. Because 79 Elm Street is managed by a private company, a DEP floor liaison must contact the company for any of our work requests such as checking circuit breakers, calling the electrician, or snow removal. This is further compounded by the fact that contact must first be made via a telephone call to New York. When we have needed something in a hurry, this hasn't been a reliable system. Direct access to the building management staff would be helpful.

Technology Assessment

General

The installation and operation of the Earth Tub has been more involved than anticipated. A greater degree of knowledge about composting is necessary to be able to make decisions concerning process management. Keeping the mix "right" is tricky, so the project coordinator must be in tune with how the mix looks, smells and feels on an almost daily basis.

Our purchase of the Earth Tub was based on several provisions including a specification that the technology not be a prototype under development. We wanted a turn-key operation that we could feel confident showing to other state agencies, schools and businesses. The Earth Tub was advertized through brochures and trade shows, and therefore we were not expecting to be a proving ground for a new product. However, the problems we experienced went beyond the logistical difficulties one would expect in starting up a new program and were related to such things as materials and design of the unit. Management of the unit required daily attention by the project coordinator especially during the first six months of operation and required service and retrofit visits by the manufacturer. Continued and additional problems noted below seem more

analogous to a research and development project than operation of performance tested and approved equipment. Furthermore, the lack of service agreement provisions have posed additional difficulties.

Aeration

The Earth Tub experienced design, mechanical and operational problems from the very start of the project. Operation of the Tub began on September 2, 1997 and it was heating up well until 8 days later when the unit's operating temperatures dropped to only five degrees above ambient. Staff concluded that the blower was pulling too much air thru the composter thereby drying out the mix and killing the microbes. We requested that the manufacturer (GMT) devise a way to draw air off the headspace of the Tub rather than from the bottom. Meanwhile, we bought and installed an outdoor timer and set it so that the blower would only go on for six hours a day. This seemed to help, but we ran the risk of odors while the blower was off and this was not how the Earth Tub was intended to work. After discussions with GMT, they installed a temporary flex hose which vented the air thru the motor slot on October 6, 1997. This seemed to solve the problem, but the hose was always in the way and by doing this, it rendered the automatic temperature sensor obsolete. This sensor was supposed to automatically regulate the speed of the blower based on the temperature of the air passing thru the compost. After a long negotiation with the manufacturer, they permanently installed an aeration retrofit designed by GMT and DEP engineers on February 18, 1998. The retrofit allows us to choose whether to draw air from the top, bottom or both, and provides for air intake through the bottom of the Tub. The design also has separate discharge valves for condensate and leachate. Still missing from this design is the automatic temperature sensor. Decisions about regulating air flow must still be made by the Project Coordinator.

Warping

The lid to the Earth Tub is not water tight and is warped allowing rain to leak into the Tub. When the mix inside the Tub is dry, the rain is mostly absorbed. However, when the mix is at the right moisture content, the rain waterlogs the mix and discharges into the leachate collection tank. Sometimes the leaking water causes channeling in the mixture and fills the collection tank quickly. Besides being a nuisance to empty the tank back into the Tub (it can be messy and smelly); excess rain water can also make the compost over-wet and result in anaerobic conditions which slow down composting and result in odor generation. GMT installed a "warp bar" early in the project, but it did not work completely. As an added prevention, we cover the Tub with a plastic tarp when the forecast is for rain. A permanent roof would fix this problem and provide a more comfortable work space for volunteers.

The warped lid is causing two other problems. First, inside air escapes before going to the biofilter as confirmed by the presence of steam during the colder months. So far, there haven't been severe odors due to this, but slight odors have been noticed within eight feet of the Tub. Had we been adding much larger quantities of food, odors could have been worse. Second, we

suspect the warp is at least somewhat to blame for the increasing difficulty experienced when moving the lid during turning. It has gotten progressively worse to the point where it now takes two people to turn the compost. An industrial grease was applied as a temporary measure and seems to help. GMT has been notified and is working on a solution.

Leachate Collection

The Earth Tub is not designed to collect the “compost tea” or leachate that is produced. Rather, the leachate drains from the reservoir in the bottom of the unit. This presented us with a problem in that from a pollution prevention standpoint, we did not want to transfer potential pollutants from the trash waste stream to the water treatment facility via the sewer. Nor would we want to discharge the leachate into the storm drain. We requested that a collection tank (3 ½ gal.) be installed. All of the leachate we produced was recycled back into the Tub, but it was a difficult and unpleasant chore. A portable hand or electric pump, or an in-line device which would automatically pump the leachate back into the Tub would be a significant improvement.

Security

The original loading hatch cover was not lockable. GMT provided another cover, but the locking mechanism was difficult to use and volunteers complained. The new cover was also badly warped. We continue to use the original hatch cover, and so far, have not experienced any noticeable “illegal dumping” into the Tub. In other settings, such as an elementary school, safety and/or contamination may be an issue.

Boifilter and Blower

The biofilter has been doing a good job of scrubbing odors from the air that is pulled thru the compost. However, rain, snowmelt and condensate accumulate in the bottom of the biofilter causing back pressure on the blower and tripping the ground fault. When this occurs, the blower is not functioning and therefore not pulling air through the compost or through the biofilter which provides odor control. This happened on several occasions, especially in the colder months when condensation was heaviest. On at least one occasion, the fan was off long enough to allow the biofilter medium to freeze. An elevated plywood cover was placed over the biofilter to keep excess moisture out. Also, the electrician was called back to replace our existing ground fault with a 20A 120V GFI duplex receptacle and a 1P 20A GE bolt-in circuit breaker. Insulation of the PVC piping prior to winter may help to reduce condensate thereby allowing absorption and release of moisture through the biofilter. It may also prevent freezing of the biofilter medium and condensate.

On July 25, 1998 the blower shut off by tripping the GFI as it had done several times in the past, but this time we were unable to restart it. The electrician was called in and verified thru the process of elimination that there was a problem somewhere in the blower itself. GMT was notified and subsequently installed a new blower during the week of July 12. In the interim, we borrowed a blower from another Earth Tub installation at Trinity College.

Motor

Apparently, the motor which drives the mixing auger is not rated for outdoor use (or not waterproof). This was discovered when all ten motors installed on the Trinity College Earth Tubs rusted and failed, needing to be repaired or replaced. GMT responded by designing a "motor cap" to prevent water from entering the motors. This consisted of an inverted 8" round aluminum cake pan with bolts thru it. We installed ours on May 21, 1998, shortly after receiving it from GMT. Our concern is that damage has already been done and won't present itself until after the warrantee is over, or damage resulting from using the motor outside may not be covered by the warrantee. As an extra precaution, we have put a 5 gallon pail over the motor.

The male plug at the end of the electrical cord coming from the motor was not water resistant. As a result, it shorted out and melted. We replaced the plug and added a rubber "boot" commonly used on electrical plugs at boat docks.

Discharging and Re-filling

Discharging the compost from the Tub was accomplished mostly by shovel and rake. The mixing auger wasn't much help in moving material to the discharge door, and we felt this was a dangerous practice anyway. It helped to have the Earth Tub elevated on a layer of cement blocks, as this allowed us to get the wheelbarrows under the discharge door. The operator's manual says to leave some compost in the bottom of the Tub when emptying the compost. We did this the first time. However, after the second and third batches, we felt the need to remove everything to inspect the inside and bottom of the Tub. We found that the wood chips we placed on the bottom had all been mixed into the batch and that fines had gone through the grate and accumulated in the drainage channels. Some of the drainage channels were blocked with compacted fines. It is questionable whether the wood chips are serving the intended purpose of porosity for air movement and preventing fines from dropping through the grate. Repairs were needed after the second batch was removed because the steel plate covering the reservoir had been sheered off.

Although the concept of the Earth Tub is a good beginning, based on our experience mentioned above, there are some major design problems which GMT should address.

Cost Analysis

General

Although the cost of implementing this program will probably always be greater than our cost savings through composting, there are other benefits which should be considered when looking at the viability of the project. Unfortunately, these benefits are very hard to quantify and even harder to assign a value. For example: How much air and water pollution did we prevent by not incinerating our organics and burying the ash in a landfill? How many staff and visitors have started to compost at home because they were educated about composting at work? How far did this program go in DEP's efforts to be an environmental "model agency"? Because DEP is a public agency, these kinds of benefits may, in fact, outweigh the actual cost savings. Although we would hope that private businesses think these factors are important too, actual economics may play a larger roll in their decision to take on such a project.

There is, however, potential for increased savings. Obviously, the more food we compost, the more disposal costs we avoid. This would mean a stepped up effort to capture more food scraps. One way to do this would be to eliminate work station wastebaskets and require all trash to go to the break rooms providing more opportunity to source separate organics. Another option would be to only empty wastebaskets on the last day of the week and require that all soiled food containers and organics be brought to the break rooms where, again, staff would source separate their own trash. The third option would be to hand over collection responsibilities to the building manager's cleaning staff. This alone, or combined with one of the first two options, may be more cost effective than having higher paid DEP staff do this task. The elimination of daily wastebasket emptying may be a significant savings, regardless of organics collection. A careful analysis would necessary to establish how much could be saved using these techniques.

Annual Operating Costs

Annual operating costs for the first year were approximately \$10,861, most of which were labor costs (Table 2). Unfortunately, these costs were not offset by avoided food disposal and compost purchase costs. Almost 4.5 tons of food was composted resulting in avoided disposal costs of \$247.50 and one avoided compactor "pull" charge of \$170. We produced 3.87 cubic yards of compost worth \$15 per cu.yd. Therefore, a total of \$475.10 in potential costs were avoided (Table 3). When annual operating costs are compared with avoided costs, the project results in a \$10,387 loss per year.

Capital Costs

Capital costs were approximately \$8,586.49, most of which was the cost of the Earth Tub (Table 4). Since the vessel is a new technology, we do not know how long it will remain operable. If we divide the capital costs over a 10 year life span, this adds \$858 per year to the annual project costs. If a more conservative 5 year life-span is assumed, additional costs rise to \$1,717 per year. At the current organics diversion rate, the project would break even on capital costs in 18.1 years. Using the 10 year life-span scenario in comparing the total project costs, we would have to compost 95 tons per year to break even on capital and operating costs. This would be impossible because the annual capacity of the Earth Tub based on 100 lbs/day, 248 working days/yr is only 12.4 tons.

Table 2. Annual Operating Costs

Ongoing Costs					
Materials/Services	Description	Total Costs			
Compost Testing	CT Agricultural Experiment Station	\$	00.00		
Bulking Agent	DEP Sawmill	\$	00.00		
Electricity Usage	Estimate by Manufacturer	\$	120.00		
Total Ongoing Costs		\$	120.00		

Labor Costs					
Labor	Services By	Labor Rate \$/hr	Hours	Unit	Total Labor
Food Collection	DEP Staff	20	1	day	\$ 4,960.00
Compost Turning	DEP Staff	20	.33	day	\$ 1,636.00
Weight Data Collection	DEP Staff	20	.03	day	\$ 165.00
Temp. Data Collection	Proj. Coord.	20	.25	day	\$ 1,240.00
Grease Fittings	Proj. Coord.	20	.50	month	\$ 120.00
Data Recording/Reporting	Proj. Coord.	20	1	month	\$ 240.00
Project Coordination	Proj. Coord.	20	.50	month	\$ 120.00
Troubleshooting	Proj. Coord.	20	1	week	\$ 1,040.00
Empty Composter	DEP Staff	20	54	year	\$ 1,080.00
Truck Driver	DEP Staff	20	7	year	\$ 140.00
Total Labor Costs			2.16	day	\$ 10,741.00

Table 3. Avoided Costs

Food Composted (tons)	Disposal Cost (per ton)	Pull Charge	Avoided Disposal Cost
4.5 tons	\$ 55.00	\$ 170.00	\$ 417.05
Compost Produced (cubic yards)	Retail Value of Compost (cubic yards)		Avoided Purchase Cost
3.87 cy	\$ 15.00 per cy		\$ 58.05
	Total Avoided Costs		\$ 475.10

Table 4. Capital Costs.

Capital Costs		
Materials/Services	Purchased By	Total Cost
Earth Tub and Shipping	DEP	\$ 6,350.00
Electrical Installation	DPW	\$ 1,650.00
Collection Containers	DEP	\$ 265.42
Scales	DEP	\$ 52.50
Plumbing Supplies	DEP	\$ 38.79
Hardware Supplies	DEP	\$ 21.91
Outdoor Timer	DEP	\$ 19.02
Signs (outdoor & buckets)	DEP	\$ 31.00
Grease Gun and Axel Grease	DEP	\$ 14.81
Duct Tape	DEP	\$ 3.69
Tongs	DEP	\$ 7.05
Lubricant (food grade)	DEP	\$ 15.21
Cement Blocks	DEP	\$ 10.22
Locks	DEP	\$ 20.37
Thermometer	DEP	\$ 86.50
	Total Capital Cost	\$ 8,586.49

Next Steps

There are still several goals that we would like to accomplish. The first being to iron out the turning difficulty and water leaking problems with GMT. We need to increase our capture rate, decrease our costs, and work on reducing physical contamination. Volunteers need to be relieved from some duties before they resent shouldering the burden. We also need to provide some tools for smoother operation of the program. The following is a list of recommendations which, if implemented, would help achieve these goals and significantly improve the composting program at 79 Elm Street:

- ▶ **Amend the cleaning contract to include collection of organics and emptying of compostables into the Earth Tub.** The contract should also include sorting food from trash during monthly refrigerator cleaning. Responsibility of keeping the compost collection buckets free of contaminants will remain with DEP. Operation of the Earth Tub will also remain with DEP for now, unless building management expresses an interest in doing so.
- ▶ **Reduce frequency of emptying work station trash cans from every day to once or twice a week.** In conjunction, require staff to put all food scraps in the compost collection bucket, and all food soiled containers (such as polystyrene take-out dishes) in the break room garbage cans. In theory, our capture rate of food should increase, and the cost of emptying wastebaskets should decrease.
- ▶ **Eliminate coffee stirrers altogether or replace plastic ones with wooden ones.** Wooden stirrers would be able to go into the composter.
- ▶ **Eliminate individual creamers and replace them with cartons of half and half.**
- ▶ **Switch to cloth toweling in break rooms.** In the meantime, switch to perforated or metered brown paper toweling. This should decrease the volume of paper towels used and the brown towels will decompose faster than the white.
- ▶ **Erect a roof structure over the composting area to protect staff from falling roof-ice and elements, and to prevent rain from infiltrating the composter.**
- ▶ **Install a water spigot or rain water collection system in back of our building to better facilitate watering the compost and cleaning the Earth Tub.**
- ▶ **Devise or purchase a pump to be able to pump leachate directly from the discharge valve into the Earth Tub.**
- ▶ **Provide a locked cabinet to store tools, thermometer, cleaners, etc. used frequently at the composter.**
- ▶ **Provide more reminders about keeping non-compostables out of the sort using e-mail and voice-mail messages.**

Conclusions

The first year of operation was a bumpy one having been plagued with mechanical problems and fluctuations in equipment performance, but it has been successful in other ways. DEP headquarters has diverted 4 ½ tons or 6% of our waste stream from disposal, and there seems to be potential to increase that amount by implementing some changes in waste management techniques. We also managed to accomplish this in a highly visible urban setting with no complaints about odor or vectors. The program educated staff about composting and hopefully inspired some to set up a compost bin at home. Provided the manufacturer can solve the design and operational problems with the Earth Tub, we anticipate a smoother second year of operation.

Aside from equipment problems, the most significant negative factor has been costs. Capital costs were high for the amount of organics that were processed and we do not know if the Earth Tub will last long enough (18 years in our case) to recoup those costs. The hours required to operate the system were more than anticipated and therefore drove labor costs high as well. While these costs are not totally prohibitive for a public agency's Pollution Prevention effort or an educational institution, it may be harder for a private entity to justify the purchase and operation of such a system for this size operation.

For More Information

Contact the Project Coordinator:

K.C. Alexander
CT DEP Recycling Program
79 Elm Street.
Hartford, CT 06106-5127

Phone (860) 424-3365
Fax (860) 424-4081
e-mail: kathy.alexander@po.state.ct.us

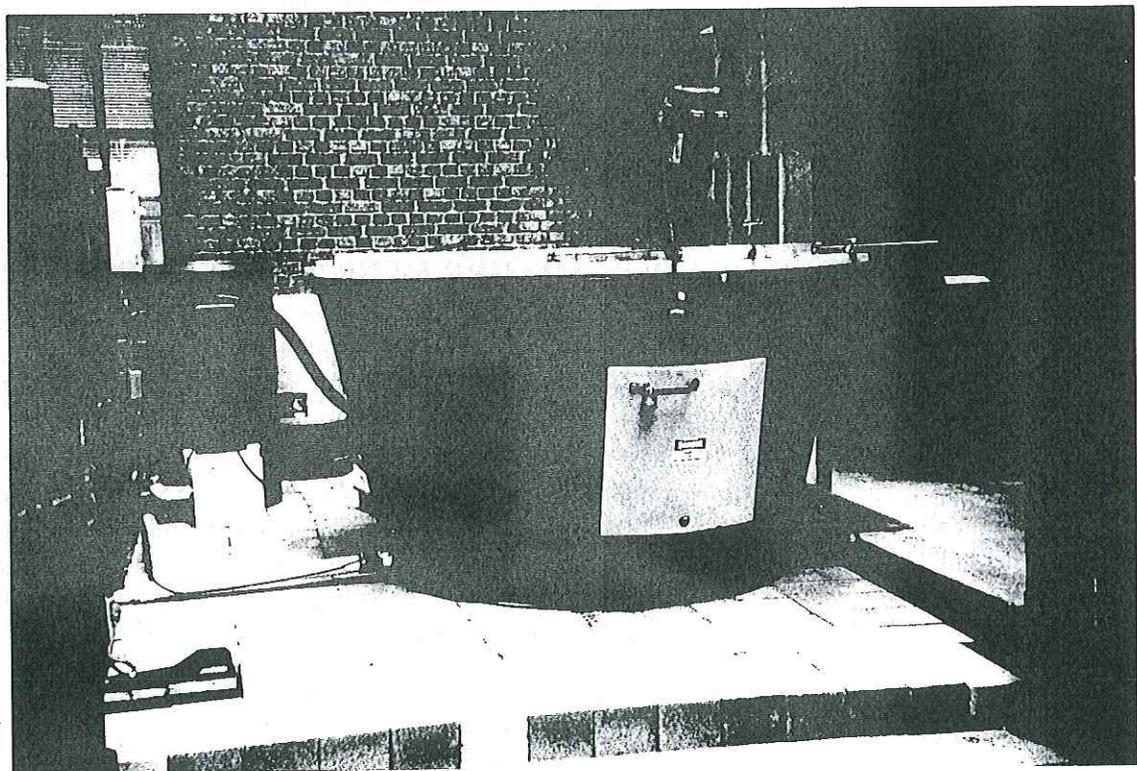
Appendixes

- A. Fact Sheet "Office Food Scrap Composting Demonstration", CT DEP, October, 1997.
- B. Food Collection Data
 - Weekly Building-wide (includes daily averages and year-to-date)
 - Weekly By Floor (includes year-to-date)
- C. Temperature Data
- D. Laboratory Analysis
- E. Field Notes of Operations
- F. Photos of Operation

State of Connecticut
Department of Environmental Protection

OFFICE FOOD SCRAP
COMPOSTING DEMONSTRATION

Hartford, CT



Source Reduction and Recycling Program
79 Elm Street
Hartford, CT 06106-5127
(860) 424-3365

PROJECT DESCRIPTION

Office buildings tend to generate large quantities of recyclable items. Although many offices recycle the traditional items such as corrugated cardboard, high grade white paper, glass and metal, the organic fraction of their waste stream goes largely unrecycled. Often, food from kitchens and cafeterias is dumped down the drain through an industrial food grinder and ends up at the sewage treatment plant where it must be chemically treated before being released into the environment. An alternative method for dealing with food scraps and other organic materials like soiled paper and yard trimmings is through composting. Diverting organics to composting can result in reduced tipping fees and a usable end product.

In an effort to reduce waste, promote environmental stewardship, show leadership in pollution prevention and source reduction, and provide an example of how businesses can help the State achieve it's goal to recycle and reduce 40% of it's waste stream by the year 2000, the CT Department of Environmental Protection has implemented an office composting demonstration project. The equipment being used to process the organics, an "Earth Tub" manufactured by Green Mountain Technologies, was purchased for \$5,800 by the CT Department of Environmental Protection (DEP). The DEP is the first in the country to test this new in-vessel technology in an office setting. Located behind the DEP building in downtown Hartford, the project composts food scraps (mostly post consumer), napkins and paper towels from approximately 800 employees along with wood shavings which are generated at the DEP sawmill. The demonstration is designed to handle up to 150 pounds of food scraps per day plus bulking agent. The finished compost product will be used at the DEP office building and Pachaug State Nursery for landscape and soil amendment needs.

Various parameters will be evaluated during the course of the project including equipment performance, materials handling, economics and compost quality. The experience and information gained in conducting such a demonstration will be transferred to other public and private institutions to facilitate the establishment of composting and organics diversion programs throughout Connecticut.

THE DEP HEADQUARTERS OFFICE WASTE STREAM

The CT DEP Headquarters is a six story building located in the Capitol area of the City of Hartford and provides work space for approximately 800 employees. The building currently generates a total waste stream of 74.5 tons of trash per year (including recyclables and food scraps). A recycling program has been in place since the DEP moved into the building in 1993. The most recent data indicates that approximately 8.5 tons of corrugated, 2.5 tons of newspaper, 15.5 tons of white and mixed office paper, and 1 ton of bottles and cans are collected for recycling annually. This represents a 37% recycling rate. In 1996, a fluorescent bulb recycling program was implemented in which approximately 900 bulbs per year are recycled. Every effort is made to buy recycled products such as copy paper, and also re-fillable products like writing pens. The opportunity to further enhance the recycling program by composting food scraps was the logical next step.

There is no central cafeteria in the building. Many people bring their lunch, while others visit the assortment of food vending trucks parked in front of the building. Since there is no kitchen staff preparing food, the majority of food scraps are post consumer and are generated at individual work stations and in the break rooms where employees use the microwave and refrigerator. Based on the first two months of data since the inception of the building wide composting program on September 2, 1997, food scraps are being collected at a rate of about 156 lbs/week (or 4 tons/year). Assuming this rate continues, the program will compost approximately 5.4% of the building waste stream.

Food scrap recycling is accomplished entirely by a dedicated group of 100 volunteer employees who have been trained in various compost related duties. In the future, it is possible that the organics recycling program will be turned over to the contracted building management company and become a integral part of the waste management strategy for this location.

BENEFITS OF COMPOSTING FOR DEP

- ✓ Increased recycling rate
- ✓ Opportunity to show leadership in pollution prevention, source reduction, and environmental stewardship
- ✓ Generation of a quality compost product for use in landscaping state facilities
- ✓ Opportunity to educate employees, visitors and other building managers about on-site composting
- ✓ Consistency with the DEP's Model Agency Initiative for Pollution Prevention and Source Reduction
- ✓ Reduced Tipping fees

COMPOSTING METHOD AND EQUIPMENT

There are several methods and a number of technologies which have been developed in response to the growing need to recycle organic materials. These range from a simple outdoor windrow to an enclosed in-vessel system. Each has its advantages and drawbacks. The object is to figure out which one will suit the needs and budget of the operator. The urban setting of the DEP Headquarters presents a special challenge to accomplish composting without creating a nuisance or interrupting the daily routine of building management.

For this demonstration, a continuous feed, in-vessel technology called the "Earth Tub" was chosen. One of these units is necessary to handle the amount of food scraps generated in the building. Each "Earth Tub" is flower pot in shape standing 48" high with an upper diameter of 89" and a lower diameter of 64". It has a volume capacity of 3.5 cubic yards and a composting capacity of 150 pounds per day. The container, cover and doors are molded foam core polyethylene. It has 2.5" of insulation in the walls and 4" of insulation in the cover for winter operation. The loading hatch and two discharge doors allow access for loading organics and discharging compost. The mixing auger which is suspended from the cover is stainless steel with sharp cutting blades and has a permanent heavy duty three-phase gearmotor. Helical cut gearing provides efficient transfer of power and minimal noise. Temperatures inside the unit are controlled with forced aeration. Blowers are automatically turned on and off in response to signals from a thermocouple probe mounted through a port on the side of the unit. A biofilter is included to control odors. Leachate collected in the bottom of the units is gravity fed through PVC piping into a three gallon collection tank and is periodically recycled back into the composter.

The "Earth Tub" is filled 3/4 full with wood shavings from the DEP Sawmill as a carbon rich bulking material. Food scraps and paper towels are source separated by employees and placed into unlined Rubbermaid step-on containers with removable buckets located in each of the six break rooms. At the end of each day, trained volunteer employees from each floor take turns weighing the organics, emptying them into the composter, rinsing the buckets and returning them to their proper locations. The following morning, another group of volunteers trained in the operation of the "Earth Tub" take turns running the mixing auger on the composter. This ensures that the food scraps are incorporated into the wood shavings. There are enough volunteers so that collection duties, which take approximately 10 minutes per floor, are performed only 1 to 3 times/person/month, and turning duties, which take approximately 20 minutes per day, are performed only 5 times/person/ 4 1/2 months.

As the tub reaches its capacity and after the initial phase of composting is complete, approximately 1 1/2 cubic yards of material will be discharged and brought to the DEP Pachaug Nursery for curing. The tub will then be re-filled 3/4 full with wood shavings for the next batch of compost. Plans are to use the finished compost product in nursery operations, for landscaping at state parks, in flower beds at DEP Headquarters and as tokens of appreciation to the employees who make this project successful.

TOURS

One of the main purposes of this demonstration is to share the knowledge gained with others so that they can have information on which to base their decisions about composting. Although you are always welcome to drop by, we would appreciate it if visitors call ahead so we can arrange for someone to show you around. Food service and hospitality business owners, building managers, institution directors, teachers, and recycling professionals are especially encouraged to visit. All visitors are requested to make an appointment at least one day in advance by calling the DEP Recycling Program at (860) 424-3365. Directions will be provided when you call. Remember to bring your cameras and video recorders.

FOR MORE INFORMATION

Kathy (K.C.) Alexander
Compost Specialist/Project Coordinator
CT DEP Recycling Program
79 Elm Street
Hartford, CT 06106-5127

Phone: (860) 424-3365
Fax: (860) 424-4081
E-mail: kathy.alexander@po.state.ct.us



October, 1997

This fact sheet is printed on 50% recycled paper, 20% post consumer content.

Office Compost Project Progress Report Building-Wide

Week of (1997)	Daily Average (pounds)	Weekly Total (pounds)	Total to Date (pounds)
8/31	29.60	118.40	118.40
9/7	31.05	155.25	273.65
9/14	28.99	144.95	418.60
9/21	33.30	166.50	585.10
9/28	34.50	172.75	757.85
10/5	32.95	164.75	922.60
10/12	35.93	143.75	1066.35
10/19	36.74	183.70	1250.05
10/26	38.72	193.60	1443.65
11/2	37.50	187.50	1631.15
11/9	41.17	164.70	1795.85
11/16	35.95	179.75	1975.60
11/23	36.57	146.30	2121.90
11/30	40.05	200.25	2322.15
12/7	33.75	168.75	2490.90
12/14	42.85	214.25	2705.15
12/21	35.80	143.50	2848.65
12/28	34.62	138.50	2987.15

Office Compost Project

Progress Report

Building-Wide

Week of (1998)	Daily Average (pounds)	Weekly Total (pounds)	Total to Date (pounds)
1/4	36.75	183.75	3170.90
1/11	39.14	195.70	3366.60
1/18	39.75	158.30	3524.90
1/25	42.74	213.70	3738.60
2/1	36.89	184.45	3923.05
2/8	40.10	160.40	4083.45
2/15	38.75	155.00	4238.45
2/22	39.56	197.80	4436.25
3/1	42.30	211.50	4647.75
3/8	42.50	212.50	4860.25
3/15	42.50	212.50	5072.75
3/22	43.00	215.00	5287.75
3/29	33.92	169.60	5457.35
4/5	42.90	171.70	5629.05
4/12	34.92	174.60	5803.65
4/19	38.50	192.50	5996.15
4/26	36.00	180.00	6176.15

Office Compost Project

Progress Report

Building-Wide

Week of (1998)	Daily Average (pounds)	Weekly Total (pounds)	Total to Date (pounds)
5/3	39.29	196.45	6372.60
5/10	33.75	168.75	6541.35
5/17	35.40	177.00	6718.35
5/24	35.24	140.95	6859.30
5/31	33.46	167.30	7026.60
6/7	31.09	155.45	7182.05
6/14	34.15	170.75	7352.80
6/21	30.93	154.65	7507.45
6/28	34.25	137.00	7644.45
7/5	28.84	144.20	7788.65
7/12	27.40	137.00	7925.65
7/19	30.80	154.00	8079.65
7/26	27.96	139.80	8219.45
8/2	30.65	153.25	8372.70
8/9	30.26	151.30	8524.00
8/16	29.75	148.75	8672.75
8/23	34.15	170.75	8843.50

Office Compost Project

Progress Report

Totals By Floor

Week of (1997)	Floor Store	Floor 1 & 2	Floor 3	Floor 4	Floor 5	Floor 6	Total to Date
8/31	9	27	14.5	35.5	13.9	18.5	118.40
9/7	4	42	26	37.5	19.5	26.5	273.65
9/14	3.5	38	22.75	42.95	16	21.75	418.60
9/21	8	40.5	39	41.5	15	22.5	585.10
9/28	7.25	39.5	31	44	26	20	757.85
10/5	8	41.5	32.25	46.5	15.5	21	922.6
10/12	13.25	33.75	29	33.5	13.5	20.75	1066.35
10/19	4.5	46.5	44.95	45.8	18.7	23.25	1250.05
10/26	14.1	46	35.5	50.5	24	23.5	1443.65
11/2	7.5	46	37.5	51.5	18	27	1631.15
11/9	15	36.5	41.5	35.5	13.2	23	1795.85
11/16	13	46.25	28	51.5	20	21	1975.60
11/23	9	31	35.5	40.8	10	20	2121.90
11/30	8.75	50	40	56	21	24.5	2322.15
12/7	4	45.5	35	49	17	18.25	2490.90
12/14	10.5	44.5	45	44.25	43	27	2705.15
12/21	5.25	26	39	42.25	11	20	2848.65
12/28	4	35.5	30	42	8	19	2987.15

Office Compost Project

Progress Report

Totals By Floor

Week of (1998)	Floor Store	Floor 1 & 2	Floor 3	Floor 4	Floor 5	Floor 6	Total to Date
1/4	9	43.5	41	49.75	14	26.5	3170.9
1/11	11.5	42	37.5	58	18.2	28.5	3366.6
1/18	7.8	32.0	33	44.5	18.5	22.5	3524.9
1/25	8.2	50	40	68.5	22	25	3738.6
2/1	10	41.5	33.5	61.4	16.5	21.5	3923.05
2/8	7.4	32.5	35	49	16.5	20	4083.45
2/15	12.0	38.0	34	39.5	15.5	16.0	4238.45
2/22	15.0	48	36	57.5	18.8	22.5	4436.25
3/1	9	41	51	65.0	19.5	26	4647.75
3/8	13	50.5	43	63	21.5	21.5	4860.25
3/15	11	44.5	49.5	62	25	20.5	5072.75
3/22	13.8	38.5	38	69	29	26.7	5287.75
3/29	5	42.1	35	42	25	20.5	5457.35
4/5	6.25	32	25	54	34	20.5	5629.05
4/12	4.5	36.5	37	55.6	20	21	5803.65
4/19	4	44	36	54	31.5	23	5996.15
4/26	12.5	42	32.5	44.5	20.5	28	6176.15

Temperature Record
79 Elm Street
Earth Tub

DATE	TIME (a.m.) OR AS NOTED	BEFORE OR AFTER TURNING	CENTER "F	LEFT OF HATCH "F	OUTSIDE EDGE "F	RIGHT OF HATCH "F	AMBIENT "F
1997							
12-31	9:00	Before	120	Discharged	compost for	first time	today. 31
1998	Start of	second batch					
1-2	8:00	Before	63				33
1-5	7:45	Before	120				38
1-6	7:45	Before	140	120		70	47
1-7	7:45	Before	130	110			45
1-8	8:00	Before	140	120			38
1-12	8:00	Before	125	125			28
1-13	7:45	Before	120	100			41
1-14	7:45	Before	120	100			25
1-16	8:00	Before	130	100		70	30
1-20	8:00	Before	100	80		70	31
1-21	2:00pm	After	140	140		120	30
1-22	7:45	Before	130	120		110	24
1-23	8:00	Before	125	125	100	70	27
1-26	8:00	Before	110	100	110	70	22
1-27	7:45	Before	80	85	100	140	16
1-28	7:30	Before	120	140	140	90	22
1-30	7:40	Before	138	102	82	120	30
2-2	7:45	Before	100	95	80	140	26
2-3	8:00	Before	100	138	85	120	32
	2:30 pm	After	135	125	95	95	45
2-4	7:30	Before	122	125	95	84	40

Temperature Record
79 Elm Street
Earth Tub

DATE	TIME (a.m.) OR AS NOTED	BEFORE OR AFTER TURNING	CENTER "F	LEFT OF HATCH "F	OUTSIDE EDGE "F	RIGHT OF HATCH "F	AMBIENT "F
2-5	7:45	Before	138	120	80	130	30
2-6	7:30	Before	135	118	108	140	28
2-9	7:40	Before	108	128	118	120	25
2-10	8:45	After	123	98	90	88	50 (in sun)
2-11	7:40	Before	144	100	80	130	38
2-17	7:40	Before	100	120	110	110	30
2-19	7:30	Before	140	125	100	120	37
2-20	7:30	Before	130	120	110	140	40
2-25	7:45	Before	138	138	95	98	36
3-2	7:30	Before	115	140	102	100	36
3-5	9:00	Before	125	150	120	120	40
3-6	7:30	Before	140	130	110	135	30
3-9	7:30	Before	90	110	130	120	35
3-10	7:30	Before	138	142	92	90	55
3-11	7:30	Before	148	102	122	122	20 (BF=40)
3-12	8:00	Before	100	110	110	140	20
3-13	8:00	Before	120	123	125	123	18
3-16	7:45	Before	102	115	98	95	28
3-17	7:30	Before	130	118	90	114	28
3-18	7:30	Before	120	95	98	115	30
3-19	7:45	Before	120	120	140	120	36
3-20	7:30	Before	120	115	120	115	35
3-23	10:30	Before	100	115	80	100	42
3-24	7:20	Before	110	90	80	115	30

Temperature Record
79 Elm Street
Earth Tub

DATE	TIME (a.m.) OR AS NOTED	BEFORE OR AFTER TURNING	CENTER °F	LEFT OF HATCH °F	OUTSIDE EDGE °F	RIGHT OF HATCH °F	AMBIENT °F
3-25	7:10	Before	118	132	135	105	30
3-26	7:30	Before	100	100	138	115	40
3-30	7:30	Before	130	115	115	120	53 (BF=80)
4-1	8:00	Before	128	118	120	140	56 (BF=78)
4-2	2:30	After	130	140	118	118	50
4-3	7:20	Before	115	140	124	120	42
4-7	7:30	Before	116	90	92	90	40 (BF=58)
4-8	7:30	Before	134	118	98	120	40
4-13	7:30	Before	84	108	120	104	40
4-15	7:30	Before	110	140	115	94	42 (BF=60)
4-16	7:30	Before	130	110	100	108	50
4-20	7:30	Before	115	115	100	120	45
4-21	7:30	Before	115	120	120	132	42 (BF=62)
4-22	7:30	Before	102	135	142	128	45
4-23	7:30	Before	118	148	120	116	50 (BF=64)
4-28	7:30	Before	120	114	114	118	40 (BF=54)
4-29	7:30	Before	130	140	125	120	42
4-30	7:30	Before	108	138	105	106	54 (h=70)
5-1	7:30	Before	138	130	130	122	58 (h=70)
5-4	7:30	Before	120	118	115	120	55
	Emptied	composter	today (5/4)	for second	time.	Started batch	II
5-5	7:30	Before	62	64	62	60	56
5-6	7:30	Before	78	76	70	68	58
5-7	7:30	Before	90	82	80	80	55

Temperature Record
79 Elm Street
Earth Tub

DATE	TIME (a.m.) OR AS NOTED	BEFORE OR AFTER TURNING	CENTER °F	LEFT OF HATCH °F	OUTSIDE EDGE °F	RIGHT OF HATCH °F	AMBIENT °F
5-8	7:30	Before	102	98	74	74	54
5-11	7:30	Before	96	70	66	74	50
5-12	7:30	Before	108	88	75	68	49
5-13	7:30	Before	95	75	60	108	40
5-14	7:30	Before	110	100	94	80	43
5-15	7:30	Before	118	115	84	80	50
5-18	7:30	Before	104	82	80	66	52
5-19	7:30	Before	116	94	75	92	60
5-20	7:30	Before	100	80	82	120	55
5-21	7:30	Before	92	100	104	98	60
5-22	7:30	Before	96	110	96	98	50
5-28	7:30	Before	125	100	80	82	52
5-29	7:30	Before	116	100	80	115	62
6-1	7:30	Before	120	112	115	130	60
6-2	7:30	Before	112	116	110	102	50
6-3	8:00	Before	120	120	94	90	54
6-4	7:30	Before	140	115	82	82	48
6-8	7:30	Before	110	90	80	80	50
6-9	7:30	Before	100	100	70	118	53
6-10	7:30	Before	120	116	120	98	58
6-11	7:30	Before	125	136	92	96	56
6-12	7:30	Before	132	98	90	88	58
6-15	7:30	Before	128	115	115	115	60
6-16	8:00	Before	140	135	135	122	63

Temperature Record
79 Elm Street
Earth Tub

DATE	TIME (a.m.) OR AS NOTED	BEFORE OR AFTER TURNING	CENTER "F	LEFT OF HATCH "F	OUTSIDE EDGE "F	RIGHT OF HATCH "F	AMBIENT "F
6-17	8:00	Before	126	126	138	122	69
6-18	8:00	Before	135	150	110	110	67
6-19	9:30	Before	146	115	115	100	72 (BF 82)
6-22	7:30	Before	126	106	106	128	62
6-24	7:30	Before	128	140	140	118	65
6-25	7:30	Before	140	124	100	104	69
6-26	7:30	Before	132	116	113	140	75
6-29	7:30	Before	119	94	98	133	65
7-1	7:30	Before	130	136	118	114	62
7-2	7:45	Before	125	140	110	100	62
7-6	7:45	Before	122	110	98	98	60
7-7	7:30	Before	120	100	92	142	62
7-8	7:30	Before	117	117	124	138	62
7-20	7:30	Before	122	105	86	90	70
7-21	7:30	Before	118	100	85	125	67
7-22	7:30	Before	118	110	125	140	75
7-23	7:30	Before	120	132	140	120	73
7-24	7:30	Before	116	132	134	115	70
7-27	7:30	Before	110	128	90	84	62
7-28	7:30	Before	132	122	100	100	68
7-29	7:30	Before	120	110	98	140	70
7-30	7:30	Before	118	108	120	142	65
7-31	7:30	Before	128	142	132	122	62
8-3	7:30	Before	105	118	104	90	62

Temperature Record
79 Elm Street
Earth Tub

DATE	TIME (a.m.) OR AS NOTED	BEFORE OR AFTER TURNING	CENTER °F	LEFT OF HATCH °F	OUTSIDE EDGE °F	RIGHT OF HATCH °F	AMBIENT °F
8-4	7:30	Before	135	105	94	105	65
8-5	7:30	Before	105	110	100	140	68
8-6	7:30	Before	110	100	102	130	70
8-7	7:30	Before	124	140	130	112	67
8-10	7:30	Before	118	130	110	101	70
8-11	7:30	Before	134	122	96	118	68
8-12	7:30	Before	128	102	92	100	64
8-13	7:30	Before	122	106	100	94	60
8-17	7:30	Before	102	100	100	120	70
8-18	7:30	Before	118	109	122	140	70
8-19	7:30	Before	110	110	120	145	55
8-20	7:30	Before	112	130	143	125	55
8-21	7:30	Before	115	130	134	118	60
8-25	7:30	Before	140	120	110	110	72
8-26	7:30	Before	138	120	118	130	64
8-27	7:30	Before	150	147	130	142	67
8-28	7:30	Before	150	150	148	144	63
8-31	7:30	Before	124	135	120	100	60
8-31	Emptied	composter	for third	time today.			

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

FERTILITY OF YOUR SOIL MEASURED BY THE MORGAN METHOD. A PRODUCT OF RESEARCH AT THIS STATION

K.C. Alexander
 Conn. DEP Recycling Program
 79 Elm Street
 Hartford CT 06106-5127

RECEIVED

FEB 10 1998

Waste Management Bureau
 Planning & Standards Division

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION
 123 HUNTINGTON ST.
 P.O. BOX 1106
 NEW HAVEN, CT 06504-1106
 TELEPHONE 789-7235

CAES-56-N Rev. 03/95

DATE: 1/26/98 Page 1		TEST RESULTS--SEE OTHER SIDE FOR EXPLANATION		
LABORATORY NUMBER	1041			
YOUR SAMPLE	DEP 1			
CROP TO BE GROWN	Compost			
SOIL TEXTURE (<i>% moisture</i>)	Organic (47.3)			
ORGANIC MATTER CONTENT (<i>%wt</i>)	Medium (87.9)			
pH	7.3			
NITRATE NITROGEN	Medium High			
AMMONIUM NITROGEN	Very High			
PHOSPHORUS	Very High			
POTASSIUM	Very High			
CALCIUM	High			
MAGNESIUM	High			
SOLUBLE SALTS(mmhos/cm)	Excessive(5.2)			

SUGGESTED TREATMENT IN POUNDS PER 1000 SQUARE FEET

LIMESTONE AMOUNT	← NONE →		
FERTILIZER GRADE	← NONE →		
FERTILIZER AMOUNT			

Remarks:

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

FERTILITY OF YOUR SOIL MEASURED BY THE MORGAN METHOD. A PRODUCT OF RESEARCH AT THIS STATION

Kathy Alexander
 State of CT/Dept. of Env. Protection
 79 Elm Street
 Hartford CT 06106-5127

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION
 123 HUNTINGTON ST.
 P.O. BOX 1106
 NEW HAVEN, CT 06504-1106
 TELEPHONE 789-7235

CAES-58-N Rev. 03/95

DATE: 8/19/98 Page 1		TEST RESULTS--SEE OTHER SIDE FOR EXPLANATION		
LABORATORY NUMBER	4717			
YOUR SAMPLE	DEP 2			
CROP TO BE GROWN	Compost			
SOIL TEXTURE	Organic			
ORGANIC MATTER CONTENT	High (88.0 %/wt)			
pH	6.8			
NITRATE NITROGEN	High			
AMMONIUM NITROGEN	High			
PHOSPHORUS	Very High			
POTASSIUM	Medium High			
CALCIUM	High			
MAGNESIUM	High			
Moisture (%/wt)	59.0			

Sol. Salts

3.5 %

SUGGESTED TREATMENT IN POUNDS PER 1000 SQUARE FEET

LIMESTONE AMOUNT				
FERTILIZER GRADE				
FERTILIZER AMOUNT				

Remarks:

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

FERTILITY OF YOUR SOIL MEASURED BY THE MORGAN METHOD. A PRODUCT OF RESEARCH AT THIS STATION

Kathy Alexander
Dept. Environ. Protection
79 Elm Street
Hartford CT 06106-5127

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION
123 HUNTINGTON ST.
P.O. BOX 1106
NEW HAVEN, CT 06504-1106
TELEPHONE 789-7235

CAES-55-N Rev. 03/95

DATE: 5/12/98 Page 1		TEST RESULTS—SEE OTHER SIDE FOR EXPLANATION		
LABORATORY NUMBER	3303			
YOUR SAMPLE	DEP 1			
CROP TO BE GROWN	Compost			
SOIL TEXTURE	Organic			
ORGANIC MATTER CONTENT	Very High - 80.6 %/wt			
pH	8.1			
NITRATE NITROGEN	Medium Low			
AMMONIUM NITROGEN	High			
PHOSPHORUS	High			
POTASSIUM	Excessive			
CALCIUM	Medium Low			
MAGNESIUM	High			
Per cent Moisture	55.3 %/wt			

Soluble Salts (mehlich) MEDIUM (2.2)

SUGGESTED TREATMENT IN POUNDS PER 1000 SQUARE FEET

LIMESTONE AMOUNT			
FERTILIZER GRADE			
FERTILIZER AMOUNT			

Remarks:

EXPLANATION OF RESULTS

Soil tests, when supported by information on cropping history and past soil treatment, serve as a guide to intelligent use of fertilizers, lime, and other soil amendments. Information from soil tests cannot correct plant problems caused by insects or disease or site limitations such as not enough sunlight.

SOIL TEXTURE: Texture influences the amount of water and nutrients a soil can hold. *Sands, loamy sands* and *sandy loams* require more frequent watering and lose nutrients more readily by leaching than do fine sandy loams and loams. *Silt loams, silty clay loams* and *clay loams* may retain excessive moisture and reduce aeration of plant roots.

ORGANIC MATTER: Organic matter also influences the amount of water and nutrients held by the soil. *High* organic soils have better structure and retain nutrients and water better than *Medium* organic soils. *Low* organic soils may be improved by the addition of organic materials such as compost.

pH: Soil pH affects the availability of nutrients and, when interpreted with texture and organic matter, indicates the limestone needs of the soil. The results are expressed in pH units, with pH 7.0 being neutral. Connecticut soils are generally somewhat acidic in the pH range of 4.5 to 6.5. Most plants except for rhododendrons, azaleas, mountain laurel and blueberries grow best at a soil pH between 6.0 and 7.0.

SOIL CHEMICAL TESTS

Chemical tests indicate the nutrients in soil that can be extracted by Morgan's solution which provides an estimate of their availability to plants during the growing season. The results are given in relative terms from very low to very high. Excessive is used when nutrient concentrations may damage plants. Generally, plant nutrients should be high during periods of rapid plant growth.

NITRATE: Plants generally take up nitrogen in the form of nitrate, either from applied fertilizers or microbial conversion of other forms of organic nitrogen in the soil. This test indicates how much nitrogen is immediately available to plants, but it does not reveal how much may later be liberated in the soil. Excess nitrate nitrogen can be harmful to plants and may leach to ground water.

AMMONIUM: Soils generally do not contain high concentrations of ammonium unless they have been recently fertilized. High ammonium levels are sometimes harmful to plants.

PHOSPHORUS: Readily available phosphorus is reported. This test in conjunction with our knowledge of the release of less readily available forms of phosphorus in Connecticut soils results in the fertilizer suggestion.

POTASSIUM: The availability of potassium is readily indicated by the tests. Fast-growing leafy plants generally

require more potassium than slower-growing trees and shrubs.

CALCIUM: The availability of calcium is readily revealed, and, in conjunction with the pH test, will determine the need for limestone or gypsum.

MAGNESIUM: This test identifies soils where magnesium treatments such as dolomitic limestone or Epsom salts may be beneficial.

SALTS: Measurements of soluble salts are sometimes reported on our tests where over-fertilization or other sources of salt may have injured plants.

CORRECTING DEFICIENCIES OR EXCESSES

Based on the soil test, applications of limestone and fertilizers are often suggested, as well as a schedule for application where appropriate.

LIMESTONE: Limestone suggestions are based on the use of dolomitic limestone. Hydrated lime may be used if the rate is reduced to three-fourths of that for limestone.

FERTILIZER: The principal plant nutrients in mixed fertilizers are nitrogen (N), phosphorus (P) and potassium (K). Although they may be present in various forms, the formula is always expressed as percent of N, P₂O₅ and K₂O in that order. Thus a 5-10-5 mixture would contain 5 lbs. of N, 10 lbs. of P₂O₅ and 5 lbs. of K₂O in each 100 lbs. of fertilizer. Fertilizers other than those suggested on the report may be used if the amounts of nutrients applied are similar.

If manure or compost is applied, less commercial fertilizer may be required. Most organic materials contain fewer nutrients; a typical analysis for cow manure would be 0.5-0.25-0.5. Fresh manure is often high in ammonium and may damage some plants. It should be worked into the soil well in advance of planting. Use of composted sewage sludge is regulated by the Connecticut Department of Environmental Protection.

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION, founded in 1875, is the first Experiment Station in America. It is chartered by the General Assembly as an independent State agency governed by a Board of Control. Station Scientists do research on plant growth and genetics, plant diseases, insects, soil and water quality, food safety, and perform analyses for State agencies. The laboratories of the Station are at 123 Huntington Street, New Haven.

The Experiment Station is an Equal Opportunity/Affirmative Action Employer

Field Notes of Operations

DEP Headquarters

79 Elm Street

Hartford, CT

K.C. Alexander, Project Coordinator

1997

- August 7 Green Mountain Technologies delivered the "Earth Tub" to our building. Set most of it up, but couldn't do the connections for biofilter and leachate collection. Will return at later date.
- August 21 GMT returned and made connections to biofilter and leachate collection. Locking discharge doors arrived, but had to be brought back to Vermont for attachment of handles. Needed to get wood shavings off loading dock, so put cardboard in front of the discharge holes, used old doors, and filled tub 3/4 full with shavings (12-33 gal plastic bags). Will come back next week with new doors. It was raining steady and I noticed that water was coming in at the top of the discharge doors. Tub needs to be leveled out. Will bring in a piece of plywood tomorrow and place under low side of tub.
- August 25 GMT returned with new doors, but took away motor, auger and "warp bar". Discovered a new way to support auger to motor which will take some weight off motor. Will return 8/28.
- August 28 GMT not showing up until next Wednesday (the day after we start using the tub). Chris Field from GreenCycle delivered 3-33 gal barrels of biofilter medium consisting of wood chips and leaf compost. Did not put medium in biofilter - waiting for approval of material from GMT when they come back to complete installation.
- Sept. 2 Started collecting food scraps from building and deposited 29 pounds into tub!
- Sept. 3 GMT comes back with motor, auger and new warp bar (bigger bar, bigger bend in it). Gregg said we needed more woodchips in the biofilter medium. I went to Trinity and got 1-33 gal barrel of dry chips and blended with 2 of the barrels of GreenCycle material. We dumped the other barrel of medium into the tub to inoculate it. Did first turning of tub.
- Sept. 4 Turned compost early this morning. Noticed the slightest bit of heat already. Leaving the loading hatch in a different location each day so that scraps are distributed evenly.
- Sept. 5 Turned compost early this morning. Starting to cook well. Noticed a few fruit flies hanging around hatch and motor slot. No heat or moisture coming out of biofilter yet. Leachate collection tank not quite half full, emptied into Tub and mixed again. Also noticed that the lid directly opposite motor is a good inch off the tub as if the motor is heavy and lifting it up. Condensation under lid at this point, so conclude heat and possibly odors are escaping from this spot. Will take old Earth Machine home tonight for curing. Also, replaced hollow cinder blocks on corners of patio with solid ones to discourage and prevent critters from harboring inside blocks.

- Sept. 5 Talked to Gregg re: above. Said to make sure drain from biofilter is closed so odors and moisture don't escape through there. Drain periodically. Also told him about lid and he said he would look at the ones at the shop to see if doing same thing. He said I can recycle leachate back into tub. Will schedule training for turners for early October.
- Sept. 8 Turned compost early this morning. Noticed many maggots crawling on what appeared to be a piece of meat. Cooking well, lots of steam. No flies. Faxed Bob Jasse info for new sign. Will try to get it done by next Monday.
- Sept. 9 Turned compost early this morning. Heating well, but not as much as yesterday.
- Sept. 10 Turned compost early this morning. NO STEAM OR HEAT. Thermometer read 5 degrees above ambient (around 70). Mix looks dry. Biofilter moist all the way to top. No water draining into leachate tank (had been trickling up to now). Talked to Gregg...said to turn off blower for the next 24 hours to let heat build up. Moisten with what water is in leachate tank. If not hot by Friday, add more water and give it a shot of bloodmeal and turn on blower on Auto over weekend. I suggested the blower might be removing too much moisture with the air exchange. He said blowers need to be powerful enough to suck through a more dense mix than what we have. I suggested they find a way to remove air from the top of Tub rather than the bottom to help with odor control when opening hatch. He said they are kicking around this idea. Also told him the plastic cover behind the motor is warped and will funnel rain water into Tub. He didn't offer a good solution and said he will work on either a new cover or braces for this one. Meanwhile, I may cover with plywood. Also reminded him of big lid lifting off Tub opposite the motor. He said they noticed it on theirs too and are working on a solution. I said I wanted to be sure we get whatever improvements they make.
- Sept. 10 Poured leachate tank into tub (about 3 qts.), plus added 1 gallon of new water. Mixed with auger again to distribute water. Turned off blower for the night. Spoke with Paul Turci from City Green in NYC and he said he put his blower on a timer to shut off at night and on in the morning. Has helped somewhat with retaining moisture.
- Sept. 11 Turned compost early this morning. Temperature rose overnight from 70 to 105. Obvious heat when opened lid. Turned on blower (auto) for the day. No odor noticed around tub. Takes about 20 min to turn.
- Sept. 11 Checked tub before leaving work. No steam, felt cool. Turned off blower for the night.
- Sept. 12 Picked up an outdoor timer on the way home last night. I'm worried that if I keep blower on all weekend that tub will be cold on Monday for Commissioner's Assembly. Turned compost early this morning, lots of steam, internal temp (1 1/2' down) was 120 degrees. Moisture seemed better, although heat escaping through lift in lid across from motor. Leaving blower off for the day. Will install timer and set to go on for 6 hours during the day and off for the rest. Hopefully this will make the bugs happy and not dry it out too much. If odor occurs, no one should be around over the weekend to complain. Paul Turci is visiting us and Trinity this afternoon. Will pick his brain about solutions to drying problem.
- Sept. 19-
Sept. 26 On vacation. Tom and Lynn took over. Tom emptied leachate on 26th, he thinks it was

3/4 full.

- Sept. 29 Bin looks good. Temp in center finally up to 140. Temp in previous days waste area 110; following days area 100.
- Sept 30 Emptied leachate container into tub, 1/4 full. Released water from biofilter...none. Timer still on only from 11 am to 3 pm every day. No odors.
- Oct. 6 GMT came down to do Turner Training. It was just okay. 15 out of 18 volunteers showed up. I trained the rest later. Michael put the temporary positive aeration on the tub. He put a hole in the motor cover and connected a flex hose to the fan instead of the rigid PVC coming from the bottom. Fan was put on manual.
- Nov. 3 Things have been going well. Temperatures are now reaching 140 most of the time, but still can have variation in different parts of the tub.
- I went down this morning to check the tub and found the leachate container over-full. We had 3" of rain on Saturday and I suspect it leaked into the tub. Also the flex hose was disconnected from the fan. This means the tub wasn't getting aerated for probably the whole weekend, maybe longer depending on when it happened. Luckily, there was no odor. This also could have contributed to the leachate production, as moisture was not being drawn out of the tub. I changed the aeration back to the bottom and put it on manual to get it oxygenated again. I then switched this to auto at 3:00 pm. I also dumped the leachate back into the tub as it was being turned by Pete and Newt.
- Nov. 4 Temperature in the tub this morning was much lower than it has been and also varied considerably from one place to the next. 130 in center, 140 to the right and 100 to the left and in the middle of yesterdays deposit. Afraid that we would cool off the mass too much, and with colder weather this week, I switched the aeration back to the top and put fan on manual. No leachate in collection tank. Will check temp again tomorrow morning.
- Nov. 24 Temperature had been good up 'til this morning when it was 115 in center and 80 to 100 toward the sides. Aeration still on manual/top. Looks like materials are drying out a little. May add water sometime this week if no improvement. No water in leachate tank and biofilter seems to be draining itself because seal around the tap is not tight. Received picture from GMT re: new aeration plumbing, but have not heard yet when they will be coming down to do work. Started a punch list of all the things which need fixing before we can accept the job. Will give something final to purchasing next week. Going to Mansfield tomorrow to see their set-up. Also stopping by Trinity.
- Nov. 26 Added 3 1/2 gal of warm water to tub as it was being turned. Temps still on the low side hovering around 100. No leachate in tank.
- Dec. 4 Temps back up to 120-140. Called Greg and asked when he would be down. Said he would call me Monday to make an appointment. Told him I wrote a memo to our purchasing folks explaining what my concerns are and offered to fax him a copy. He accepted. They will be down to Trinity next Tuesday for a full day of work.
- Dec. 5 Added 25 pounds of old annual plants taken from in front of our building. Asked Turner to do a thorough job today to incorporate. Temps still high, probably because

weather has been milder this week.

Dec. 9

Dec.10

Blower has stopped running (12/9). Last known day it was functioning was last Friday (12/5). Was not functioning yesterday either (12/8) (new turner thought it was on a timer, so she didn't think anything was wrong). Circuit breaker in basement was tripped. We re-set it and tested voltage in 110 outlet with meter. It was getting 110 volts, yet when we plugged in the blower, it wouldn't work. We left it unplugged and called GMT who happened to be at Trinity. Greg stopped by after hours, plugged the blower in, and it worked...so he left. The following morning, it wasn't working and the circuit had been tripped again. Greg said he thinks the GFI is the problem because GFIs are sensitive to temperature and humidity changes. I'm not even sure that the GFI is connected to the 110, I think it's only on the 220 line. Greg says there is something wrong with our wiring, I say something is wrong with the blower. I went down again with Bob from building management and he re-set the circuit, we plugged the blower in and it worked (2:00 pm), but by 3:00, it had gone off again. Bob seems to think it's the blower, because the circuit would have tripped immediately after plugging in the blower if there were something wrong with the wiring. GMT is sending John DeRham over on Thursday to take a look (12/11).

Scraped sides of Tub while being turned to pull matted material away from sides. Temperatures okay at 120-130. No leachate in container, but a little was emptied last week. Covered Tub with tarp because forecast is for rain/sleet beginning tomorrow morning (12/10). Greg left a message that they will be down on Wednesday, Dec. 17 to fix our Tub as per the memo I sent him last week.

12/11

John deRham came over at 2:00 pm and looked at the tub. He and I and Bob from Fusco discussed the possibilities as to why the blower keeps tripping the circuit. We got the fan running again after resetting the circuit breaker, opened the biofilter valve to prevent back pressure and tilted the biofilter toward the drain hole. John came back the next morning (12/12) and it was still running.

12/12

John came over again after hours and plugged the fan into an extension cord running from the building from another outlet on a different circuit. We closed the biofilter valve for the weekend. John said If it is still running on Monday, chances are its a problem with the GFI on the breaker box in the basement.

12/15

Fan is still running, but medium in the biofilter is frozen. Also, there is ice build-up in the flex tube, and a gallon of water was drained from the bottom of the biofilter. I called John and GMT to let them know the situation. John was totally supportive of ideas to correct the problem ie: insulating biofilter and tubing, among others. However, when I called Greg, he informed me that he has sent a long letter to me and the others copied in my last memo explaining that he was postponing the Dec. 17th visit until we could "be on the same page". He also said that "DEP has had higher expectations for the Tub than GMT". He was evasive on the phone and said he would fax me a copy of the letter.

12/17

Received GMT letter and met with Bill Evans, Kathy S., Vic M. and John C. re:

response. Agreed we don't want to stop project because we have too much money and time already invested, not to mention that staff likes program. Decided to respond to inaccuracies in his letter and propose a compromise.

- 12/19 Covered Tub to prevent infiltration of rain & snow expected this weekend. Also put a plastic tent over biofilter for same.
- 12/22? Electrician came to rewire GFI. Installed (1) 20A, 120V GFI duplex receptacle and (1) 1P 20A GE bolt in circuit breaker to replace existing ground fault set-up for blower. Fan now plugged into original power source, not the extension cord. Air inside Tub smells like ammonia. Temps anywhere from 90 - 130 F. Still working on response to GMT letter.
- 12/26 Turned compost late in day so that new food will have time to start decomposing over the weekend. Will put Monday and Tuesday food scraps in a separate holding bin in anticipation of cleaning out bin next week.
- 12/29 Stronger smell of ammonia, temps still around 110 F. Have put off emptying bin until Wednesday because of a storm approaching tonight into tomorrow. Had trouble with original plan to use truck and bring compost to Pachaug to cure. Truck broke down, so using another truck from Cockaponset and compost will cure at Portland Depot. Pachaug will get next batch.
- 12/30 Wood shavings delivered from Portland Depot. Bill Evans finished reading my draft of GMT response and said it was okay to send under my signature. I will double check with John and try to send it out today or tomorrow.
- 12/31 Discharged our first batch of compost. Still hot at 120 F and had ammonia smell. Fred Bordman, Rob Clapper, Tom Metzner, Meg Enkler, Jim Creighton, Gary ? our truck driver from Cockaponset, and myself performed the duty. Removed some cinder blocks to get lower to bottom of discharge hatch. Set up garden cart with screen inside truck. Two people worked on discharging into a large garden cart and wheelbarrow, three people worked on screening, and two people took photos and did odd jobs. Material at the bottom of Tub seemed more decomposed than top (less paper near bottom). More paper left than we expected. Thinking about ceasing paper in compost buckets. Took 1 ½ hours to discharge and screen, ½ hour to clean up, pack up and reload tub with shavings. We got 1 cubic yard of screened compost! Tailings amounted to one full 32 gallon garbage can and weighed 100 pounds. Consisted of mostly wood chips, paper, plastic (coffee stirrers, baggies, protective plastic which comes off individual bottles of water, etc.), pits and bones. Left some unscreened in Tub to inoculate next batch (filled to bottom of discharge hatches). Refilled Tub with 15 bags of wood shavings, but still needs more. Added about 60 pounds of food saved from last two days and mixed thoroughly. Left blower off until it heats up again. Did not add any water because we didn't want it to freeze inside tub. Will wait until temp rises before adding water if necessary.

Notes: Auger didn't really discharge material except at the very beginning when Tub was full. Had to use rakes and hoes. Had to scrape sides because some stuck to it.

1998

- 1/02 Temp in newly filled bin taken by Rob Clapper and reported to be 63 F.
- 1/5 Temp up to 120 F in center of pile. Wood shavings have shrunk. Need more. Re-attached top aeration hose and turned on blower to manual.
- 1/6 Temp up to 140 F in center, 120 in mid area and 70 on outside perimeter. There was a light rain after midnight continuing into today. Did not cover Tub because a little moisture inside at this stage (beginning with dry shavings) won't hurt. May cover it tonight if forecast is for heavy rain. Most of the moisture seemed to be toward the center, beginning about 8 inches in from the outside wall. Shavings along outside wall were dry. Have not heard back from GMT re: letter we sent last week.
- 1/7 Did cover Tub last evening. Rain collected on tarp. Temps between 110 and 130 F. Keeping on tarp for rest of week, rain expected through Saturday morning.
- 1/8 Temps between 120 and 140 F. Took photos of tarp over Tub and tee-pee over biofilter. Added 10 more bags of wood shavings and turned them in well. Also, I prepared a sample for the Solvita maturity test. Test will be run tomorrow morning. I expect since this is fresh, uncured compost, that the test will come back as "raw" or "active".
- 1/9/98 Solvita test results were "Active" Compost #4 = Compost in medium or moderately active stage of decomposition; may be ready for curing. Talked to Paul Turci today and he asked me if I received a memo from GMT concerning a change in the maintenance. I said no, so he faxed me a copy. GMT had sent this to "All Earth Tub Operators", but neglected to send this to me, Bob Laptas or Ginny Walton. It states that there is a fitting on the auger shaft which should be greased every two weeks for smooth operation. I looked in the manual, and it says every two months. This seems like a pretty important thing not to have told us about.
- 1/12 Temps around 125 F. I looked on the plastic block which hangs into the Tub and supports the auger. There are little plastic shavings around the top of the block and a glob of hard plastic that looks like it oozed out from the bottom of the block. I will buy a grease gun tonight.
- 1/13 Temps around 100 - 120 F. Tried to use grease gun, but had trouble putting it over fitting.
- 1/14 Temps around 100 - 120 F. Ice forming in flex tube. Tried grease gun again after getting a lesson from John C. This time it fit. Pumped it about 50 times before I encountered resistance, then kept pumping until I saw grease coming out from around the auger and plastic block. Also, I sprayed some Teflon lubricant between the lid and Tub. It didn't really seem to help much. Still hard to push in certain places.
- 1/16 Kevin Zawoy reported that the motor seized up. It turned on, but then after a couple of seconds, it shut itself off. This happened after I had left for the day, so I couldn't troubleshoot. Compost didn't get turned until the following Tuesday (Monday was a Holiday). Earlier this morning, I spent an hour chipping off a ½ inch coat of ice from the storm. It was obvious from the accumulation in certain spots that the top still

probably leaks near the top right corner of the loading hatch. There is a warp in the lid and the ice was much thicker here reaching to the top of the loading hatch lip.

Responded to GMT's latest acceptance letter of the retrofit explaining payment procedure and giving them dates when I will be available. Also faxed this. They want a detailed drawing of what we want for the three valves. I will call them next week after I have a chance to meet with Mike Beskind. Temps were 130, 100 and 70 F.

- 1/20 Tried using the reset button on the electrical box to start motor, but this didn't work. Asked building management to check circuit breaker in the basement for the Tub motor. It was tripped, so he re-set it and the motor worked fine. I don't know why the reset button on the box didn't do the job. Temps were 100, 80 and 70 F. Mike Beskind and I looked at the composter and kicked around ideas for the aeration retrofit. He will go to Trinity to see what theirs looks like. Hope to have something on paper by the end of this week. Bought a pair of tongs for picking non-compostable out of Tub.
- 1/21 Temps were 140, 140, and 120 F. These were taken in the late afternoon after it was turned in the morning. Most times, I take the temps before it is turned.
- 1/22 Temps were 130, 120 and 110.
- 1/28 Temps now recorded on a separate table. Have still been erratic. Today I installed the top for the biofilter that me and my husband made at home. It seems to fit fine, now just have to wait for rain. Also greased the fitting and turned the compost three revolutions instead of two. As I moved the power cord, sparks came out of the pigtail connection. I stopped the motor, disconnected the cord, re connected and started motor again. It worked fine. May have come apart a little as I was moving it. Top of Tub is still harder to push than it was in September. Teflon spray doesn't seem to have worked.
- Mike Beskind and I have been working out the details of the aeration retrofit and have a couple of ideas. I spoke with Greg at GMT today and he is scheduling a Trinity visit at which time he will come here for a preliminary inspection of what we want. Then we will schedule a day for the retrofit.
- 1/30 Sparks and smoke from connector again this morning. Motor also hesitated. Managed to get the compost turned. Passed the bucket to Bruce Wittchen and told him of the problem and to keep an eye on it when turning.
- 2/2 Bruce turned the Tub, but only could go around once. Smoke and electrical odor from plug. He let it cool down and took apart the plug to find that one of the wires were completely black and beginning to melt the plug. He also noticed that the screws which hold the wires into the plug were not screwed down tightly at all. He suspects this is not a weather-tight plug and that water somehow got into the plug. He prepared the wires for a new plug which I will pick up tonight. The guy at home Depot said they don't make a weatherproof plug, but that they have a rubber boot to cover them. Plug will cost \$8.60, boot \$7.00. Bruce or John C will help me install it tomorrow morning.
- 2/3 Bruce installed the new plug and rubber boot, and it works fine.

2/4 Greg from GMT came down on his way to Trinity to talk to us about the retrofit and see for himself what we had in mind. Me and Mike Beskind went over the scenario and showed him sketches of the tree valve system we are proposing. We figured out a way to keep all the piping on the ground so it will be less of a trip hazard and so that there will be more room between the new vertical piping and the fence. We showed him where water ponds on the lid causing leakage, the new plug and the biofilter top. We also told him that the Teflon spray for the lid doesn't seem to do make it any easier to turn, and that steam is observed coming out from under the lid, especially during and after turning. He will get back to us on a day for the retrofit.

2/9 GMT will be doing the retrofit work on Wednesday, February 18.

2/10 Received nutrient test results from Agr. Exp. Station of uncured compost from first batch. Everything good except ammonium nitrogen and soluble salts are high. This is to be expected. Should get better as compost cures.

2/18 Retrofit rescheduled for 2/20 due to weather.

2/20 Temps a little higher than usual, probably because the condensate in the aeration hose is blocking flow of air. No air being pulled through hose (no suction). Postponed turning bin this morning until GMT gets here. Lots of steam evident from around edge of tub. Slight odor associated with this steam. Steam escaping more than usual because of blocked air hose.

GMT performed the retrofit as follows: 1) Routed the outside edge of the green Tub to deflect rain water to outside instead of inside the Tub; 2) Applied four small plastic blocks (screwed and glued) to inside edge of the lid to help keep lid centered on the Tub; 3) Replaced temporary flex tube aeration with permanent PVC tubing aeration which has three valves, a fresh air intake and spigot for leachate drainage; 4) Provided a new hatch cover with a locking mechanism; 5) Provided new sheet metal slot cover; 6) Provided a new operator's manual, equipment spec sheets, general warrantee information and a memo on maintenance update.

2/23 -
2/27

Mike Beskind turned this week while. He reported that the lid was much harder to turn. On 2/26 I noticed a large amount of water trapped in the PVC piping where the pipes are elevated to make the run to the blower. Hardly any air was being pulled thru the pipes because the water was blocking it. No suction in front of the vent inside the Tub. I drained the water and it was clean condensate. Mike and I discussed putting a spigot at the elbow so we can drain this water easily. On 2/27 we went to Carlton Plumbing Supply and picked up the fittings we would need.

We are not using the new hatch cover because it is very warped and collects rain water, but more importantly, it is hard for people to get on and off. The slot cover is already bent, but still functional. We have continued to cover the Tub with plastic when the forecast calls for heavy rain because the lid is still warped near one corner of the hatch and water gets in. Not convinced the routing will solve our water problem. The new piping is good in that we don't have to bother with removing and replacing the flex tube.

Called GMT to tell them of our experiences with retrofit and to let them know that it is much harder to turn since then.

3/2 Noticed condensate dripping from unglued connections in PVC piping. If you stub your toe on the PVC, it loosens the connections and sometimes falls apart at the disconnect points. May need to make a stool to protect pipes and/or glue some of these joints once we know they work. Need to be able to disconnect PVC assembly from the tub for cleaning. Also, Elizabeth is turning this week and mentioned that it was much harder to turn since the retrofit. We think those blocks are on too tight.

3/5 Added 10 bags of wood shavings and scraped down the sides of the Tub while turning. Mike and I did surgery on the PVC piping and put a drain valve in for the condensate. I also greased the auger fitting.

3/6 Temperatures were higher than usual. At first I thought it was because we added wood shavings and balanced the C:N ratio better, but then I realized there was no suction on the vent inside the Tub. Somehow, the connection to the fan had come apart, so there had been no aeration overnight. As a result, temps were higher and there was not any condensate accumulating in the pipes. Also, there was lots of steam escaping from under the motor mount and from around the edge of the Tub. This didn't change even after the fan was re-connected. These are potential places for odors to escape.

3/9 It really rained last night and will continue thru today, at times coming down at a rate of 1 inch per hour. It was raining when I took the temp of the Tub this morning and I noticed the water was rolling off the Tub on the south side in a steady stream (we have not covered the Tub with a tarp in order to see if it still leaks after the retrofit). Droplets of water were also dripping off the lid and onto the green edge of the Tub. In most places, it seemed to be rolling off to the outside, but in other places it was falling on the flat surface of the edge and may have been rolling into the Tub. Water did not appear to be entering the hatch this time because the hatch was on the uphill side of the Tub. Had the hatch been on the south side, chances are water would have poured into the Tub. Some rain could have entered thru the slot cover, as this is not a tight fit.

We had leachate in the collection tank for the first time in months. We emptied about three gallons of leachate back into the Tub. It appears that water did in fact enter the Tub somehow because of the correlation of leachate production and rain event. Condensate was also drained from the pipes, but none was noticed in the biofilter. It seems we have intercepted the condensate at the drain pipe with the new aeration pipes, and it now drains at the valve instead of the biofilter. Previously, the condensate which was trapped in the flex tube was drained directly to the biofilter.

Called GMT and told them we are still leaking, and also asked if there was anything they could do to make the lid easier to turn, as I have received comments back from the Turners who say it is much more difficult and that they are afraid if it becomes a chore, people will not want to do it. Greg is supposed to get back to me.

3/10 Emptied about 3 gallons of leachate from collection container and added it back into the Tub (rained again last night).

3/11 Ambient temps plummeted into the teens last night, but Tub temps are fine. Temp of biofilter is 40F about 2 feet down from the top. Condensate still accumulates in the

pipng, but did not freeze because it is constantly moving.

- 3/23 Blower was not running when I went down to take temps. Must have gone off over the weekend. Circuit breakers in basement were fine, however, the one at the outlet was tripped. I reset it and the blower went back on. Tub was covered most of the week last week and all weekend due to rain/snow, but there was significant amount of leachate drained from Tub this morning (approx 2 gal). I suspect this was because the blower was not on and all the steam condensed on the lid causing it to "rain" inside the Tub. This could explain why there was no condensate to drain from the aeration pipes. Tub was not turned until 3:00pm on Friday. Odor was noticed in immediate vicinity of the Tub (near gaps between lid and Tub), and intensified during turning but did not appear to leave the site. Temps were much lower than last week (100F).
- 3/30 Blower not running again. Went off sometime over weekend. Pushed re-set button on 110 outlet and blower went back on.
- 4/1 Greased auger fitting and scraped compost off inside wall of Tub as Rob turned.
- 4/6 Blower not running again. Went off over weekend. This time re-set button did not work. Every time I plugged the blower in, the re-set button would pop out. This happened while the blower was set on any setting (auto, manual or off). I could, however, plug a pencil sharpener into the outlet and it worked. I could also plug in a three prong extension cord, and then the sharpener, and it worked. The only way I could get the blower running was to plug it into an outlet inside the building. I have a call in to GMT and will see if the electrician can be called back.
- 2:30 pm...checked the blower and just for fun I tried plugging it back into the outside outlet and it worked! Can't figure this one out. The next time it happens, I may just call the electrician.
- 4/20 Compost looked dry, so added 4 gallons of warm water while Sandy turned. Also turned off blower to conserve heat and moisture. Sandy commented that it was harder to turn since the last time she did it. I told her it was because of the blocks and that we would be fixing it when we empty the Tub in a couple of weeks.
- 4/21 Turned blower back on. Not much change in temperature, but looked moister.
- 4/30 John deRham (GMT) came to remove two of the plastic blocks on the lid. Also removed a small block behind the bracket that holds the lid onto the Tub which was rubbing on the outside of the Tub. This did not make any difference in ease of turning.
- 5/4 Emptied Composter. 7 volunteers shoveled and screened compost. Ended up with 1.75 cy (780 lbs) of compost and 2 muck buckets (60 lbs) of discards (mostly paper towels). Compost was on the dry side, but this made shoveling much easier. Auger didn't do anything to help with discharge, so just pulled it out with metal rakes and shovels. Bolts (4) holding stainless steel plate covering leachate reservoir were sheered off. Luckily, John deRham was available to repair it. Leachate channels were clogged with compacted, dry fine compost. Removed floor and cleaned whole thing out with hose. Checked that drainage was working and adjusted Tub level accordingly. Placed 1.5" layer of dry wood chips on the bottom of Tub, followed by 18 bags of dry wood

shavings @ approx 9 lbs/bag = 162 lbs (could use some more and will add sometime this week when I can get them delivered). Watered shavings with hose and turned in food scraps from previous day, plus the last bit of compost we took out of the Tub. Greased auger fitting and sprayed Teflon spray onto lip of Tub. It took 7 people 45 minutes to empty Tub and screen the compost. This does not include set-up, clean-up, repairs, refilling Tub, bringing truck to site, trucking compost from site, or transporting wheelbarrows, tools etc, to and from site. We started at 9:30 am and finished at 1:00 pm. Left blower off to let heat build up and to retain water.

- 5/7 Blower still off. Temps a bit higher than previous days. Added 2 gallons of warm water, plus 1 gallon of leachate to Tub. Although we checked to be sure drainage was flowing toward discharge hole when the Tub was empty, it seems to be having a hard time draining into collection container.
- 5/8 Blower still off and will keep it off through the weekend. Odor should not be a problem because mix is so new. Temps a bit higher. Added 4 bags of wood shavings (36 lbs.) because volume in tub has settled and turners can't reach into surface of material to pick out contaminants.
- 5/11 Temps still not very high, so keeping blower off to conserve heat and moisture. Turner Tom reported that even though tarp was over Tub, the motor still got wet.
- 5/12 Turner Lynn reported that Tub was still hard to turn.
- 5/14 Slight odor noticed as approached Tub. Blower has been turned off since May 1st for process management, therefor biofilter not being used. It seems as though a choice has to be made between odor control and heat/moisture/process management. So, Lynn and I decided to leave the blower off, as the odor wasn't that bad yet...still pretty new.
- 5/15 Again, slight odor around Tub. Blower still off and will keep off for the weekend. Added 4 gallons of warm water to the Biofilter...was dry as a bone since blower has been off. Want to keep it damp so it will work when I turn blower on again.
- 5/18 Greased auger fitting.
- 5/21 Installed motor cap. Motors apparently not water proof because the ones at Trinity are all broken. GMT came to take them away and said water had entered through the top and corroded wires inside. Must be re-wound or replaced. Luckily, we have been covering our Tub and motor with a plastic tarp every time it rains because it leaks. This may have prevented our motor from water damage.
- Temps still only hovering around 100, moisture is low, and blower is still turned off. More prominent odor noticed as approached Tub, but not quite bad enough to turn blower on yet. I trained Brian for next week's turning and showed him how to turn the blower on if the odor gets bad.
- 5/22 Pete reported an awful noise, like a submarine dive tone, when he turned on the motor. He decided that it had something to do with the motor cap I put on the previous day. The fan blades seem to have hit the screw heads. So, he took the cap off and fiddled with the position of the screws. This seems to have worked, but we need to re-tighten the lock nuts because he didn't have the proper tool. He also greased worm gear which

moves motor in and out.

Received second round of testing for batch 1. Ammonium nitrogen and soluble salts decreased. Looks like great stuff!

5/28 Blower still off and temps erratic, 125 in center and 80 in other places. So far, odors not unbearable.

5/29 Tightened down lock nuts on motor cap. One of the stand-offs came thru the cover. John deRahm stopped by this morning to see about the difficulty we are having with turning. It literally takes two people to move the lid. He theorized that it was the blocks on the lid, so he took the last two off (none now). This didn't help. He told us about some modifications to the new Tubs, namely a center pole to prevent warping, and a new waterproof motor. He said he would call GMT and tell them about our problem. He also calked the lock nuts on the motor cap.

6/1 Added a 5 gallon bucket of compost from last batch to see if I could inoculate the pile more because temps still fluctuating. Drained about 1 gallon of leachate from bottom of Tub and added back to bin. Material inside is on the dry side, so all the rain that got in over the weekend was absorbed. Seemed a bit moister than it has been. Blower still off.

Received a call from Greg at GMT. He spoke to John deRahm re: turning problem. Wanted my take on the situation. I told him it has been getting progressively worse, but now it takes two people to turn the lid. I theorized about expansion of the plastic, and warping of the lid, also asked if the bottom could be warped or off kilter causing problem. He said he'd get back to me. I also expressed my concern that my warrantee on the motor may not be honored since we had it outside unprotected for 9 months before the motor cap was installed. He said that if we didn't experience any problems yet, we were unlikely to later.

6/8 Received a e-mail from Greg at GMT suggesting that we pay them \$300 to retrofit the lid with a center post and wheel to make it easier to turn. He said these are items which are now included as a standard feature on the new Tubs. We haven't decided what to do, but are exploring why this wouldn't be covered under our warrantee, as we have been telling GMT and/or their rep. John deRahm of the difficulty with turning for months. Probably should ask GMT for list of other owners and which ones have this new design.

Blower is still turned off. Moisture seems better than a few weeks ago. Temps are usually over 100. Still very hard to turn.

6/11 Greased auger fitting. Still very hard to turn.

6/15 Emptied 3 gallons of leachate (rained about 3-4 inches over weekend). Took clamp off Tub (the one under the handle opposite the motor) to see if this was causing too much friction. Didn't make a difference. Also cleaned contact edges of lid, sanded down the burrs where the blocks were taken off and any place else which looked a bit rough. Didn't make any difference. It was obvious that the two pieces of plastic are rubbing hard as evidenced by rub/wear marks on all parts of the lid and Tub where they touch.

Still need two people to turn. Brain stormed a lot with Jim, Newt and John and decided that just the roller wheels under the motor may even out the warping lid and relieve some friction without having to do the center post option suggested by GMT. Also discussed putting petroleum jelly on the contact points (Newt looked it up and discovered it is a food grade material used on food preparation and food industry, so we are assuming it's safe to use around the compost).

Turned blower on "Auto" to see if it dries out too much. We planted a cherry tomato plant in the biofilter medium just for the fun of it!

- 6/16 Spoke with Paul Turci (City Green, NYC) who said they are having problems with the "Post and wheel" retrofit. The lid is undulating a lot (warped) and the roller wheel jumps off the tub and slides inside wedging itself tightly against the inside of the Tub. He said he has notified GMT that this isn't going to work. Told me I should consider holding off until they get it straightened out.
- 6/17 Blower still on Auto and mix is still moist. Lubricated contact surfaces of Tub with KY Jelly. Seemed to help once you got it going, but starting it is still difficult. Will leave this on to see how long it lasts. If we think lubrication is the key, we will put something more permanent on. Ken Neumann (DEP industrial engineer) is looking up sources for silicon grease. Tub was not turned yesterday, and the place where the food was put had a 150 temp today.
- 6/19 I turned the compost for John today. Although I could barely push it myself, I was able to manage with difficulty. We need a more permanent solution.
- 6/22 Leachate tank, biofilter and condensate drain all full. Must have had rain over the weekend. Temps a bit lower than last week (106-126). Blower still on "Auto"
- 6/24 Blower switch was turned off. I was out yesterday and am trying to determine if blower went off by itself or if someone turned it off. Temps pretty good 118-140. Turned blower back on "Auto".
- 6/25 Blower tripped the GFI at the outlet. Electrician came and isolated the problem to the blower motor. Called GMT and told them. Said they would call John deRahm and may take one from Trinity until they can fix ours.
- 6/29 John swapped blowers with Trinity and sent other one to GMT over the weekend. Blower working fine today. John left it on "manual" I switched to "Auto" because temps were down from last week. Greg Howe called to tell me this and that there was 3" of water in the bottom of the biofilter. He thought maybe there was something blocking the drain in the hose or valve. I checked with Bruce the turner and he said some water came out in pulses, but not an exceptionally large amount. I later went down, disconnected the hose and spigot...nothing blocking it. A little more water came out and I tilted it for about 5 minutes more. Didn't seem to be any problem with blockage. I ran my fingers inside the spigot hole and felt no blockage either. Bruce covered the Tub over the weekend and today...rain expected.
- 6/30 Spoke to a grease salesman, Michael Richards (John deRahm gave me his name). Nice guy, stopping by tomorrow to take a look at our turning problem and hopefully will recommend a grease to use. Blower still fine. On "AUTO" so that we don't draw too

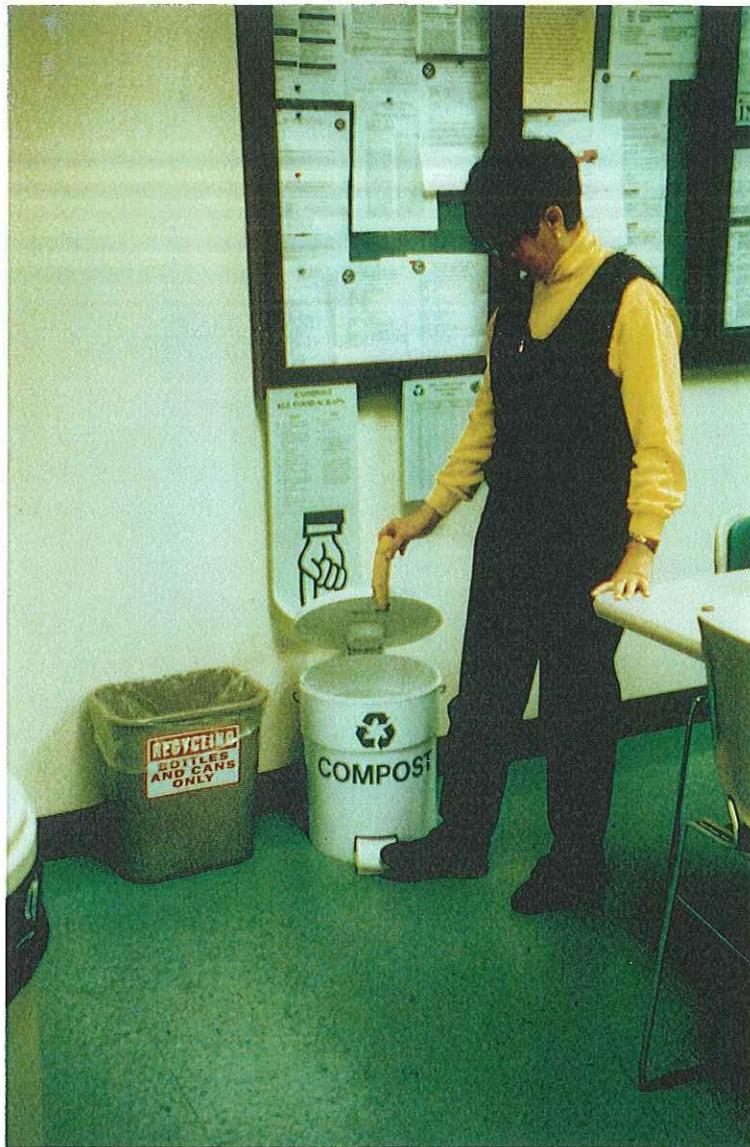
much air thru pile.

- 7/2 Grease salesman looked at our problem and is sending us a tube of a calcium based grease that is used in the food industry. Ken Neumann also obtained two tubes of another type of grease containing lithium stearate. We will try the calcium bases one first, hopefully next week, or when I get back from vacation.
- 7/7 Greased fitting on auger. Still haven't received grease sample from Michael Richards (Preventative Maintenance Specialties 1-800-634-5014). I spoke to Greg at GMT and he gave me the okay to use lubricant on the Tub. The new blower was shipped to John deRahm almost immediately after he switched our blower with one from Trinity on 6/29. Greg will let him know that I will be on vacation next week and that he can come any time to install the new one. I told Greg again that it is very difficult to turn and that I received his e-mail on the proposed \$300 retrofit. I told him I spoke with Paul Turci who said that his retrofit wasn't working well at all. Greg said he is going to cut off 3/4" from the center pole to see if that helps. I think whatever the fix is, we think we should have it done for free.
- 7/21 Back from vacation. Compost very dry. Added several gallons of water via hose, so couldn't measure. Still hard to turn. Haven't confirmed whether our new blower was installed. Grease isn't here yet either...called to remind them to send it.
- 7/22 Spoke to Paul Turci in NYC re his pole and wheel retrofit. He said the pole melted, bent and was hit by the auger. They are trying another one on another bin.
- 7/24 Received grease today and applied to contact surfaces on the Tub and lid. It is a "special exposed gear grease" containing tackifying agents, cushioning agents, lubricity agents and thickening agents in a refined based stock oil. It is manufactured by Texas Refinery Corp., Fort Worth Texas, and our distributor is Michael Richards of Preventative Maintenance Specialties in Wilbraham, Mass, 1-800-634-5014 or 413-596-5018, or car phone 413-531-3114. We applied it liberally and turned the lid two complete revolutions to distribute evenly. It did make it easier to turn and one person can do the job now. However, it is not as easy as it was during the first few months of operation. This doesn't seem like a permanent fix to the problem. We will monitor to see how long lubrication lasts. We also have another type of grease to try next time.
- Confirmed with Greg that we did get a new blower during the week of 7/12/98. Also, told him that we are scheduled to empty the composter on August 31 and asked if they had come up with a better turning retrofit than the pole and wheel. He said no, but they were thinking about putting on more wheels and eliminating the pole.
- 7/30 Added several gallons of water to Tub with hose, so could not measure. Compost very dry and temps not very high. Also, greased auger fitting. Lid still seems easier to push and can be done with one person. Noticed that grease is beginning to migrate toward outside edge of Tub.
- 7/31 Temps are a bit higher than yesterday. Rain is expected for this morning, but leaving tarp off. No leachate in tank yet.
- 8/3 Maggots noticed on surface of compost. Turned blower off to see if I could raise temps

and kill maggots.

- 8/4 Temp in head space is hotter (noticed lots of steam compared to previous days), but temps in compost mix only slightly higher with hot spots here and there. Left blower off.
- 8/5 Again, lots of steam, but temps in mix not higher. Mix moister than usual. Slight ammonia smell noticed in Tub. Turned blower back on "Auto". No maggots.
- 8/6 Turned blower off because temps low.
- 8/7 Blower still off and biofilter drying out. Added 2 gallons of water to biofilter to keep organisms happy and so that tomato plant won't die.
- 8/12 Greg left a message saying that they still aren't finished with the turning retrofit. He will be on vacation next week. If they go with the wheels without the center pole, it will not be necessary to remove the contents of the Tub to install.
- 8/13 Grease still seems to be helping, as turner hasn't complained this week. Grease also seems to be migrating toward the outside edge of Tub (beading up on edge). Added two gallons of water to biofilter.
- 8/20 Temps are getting warmer (112-145). Blower still turned off. Steam noticed escaping from under lid. Slight odor detected as approaching Tub. Greased auger fitting. Lining up volunteers to help empty Tub on Aug. 31.
- 8/28 All set for Monday with rain date of Tuesday for emptying Tub. Retrofit for making turning easier not going to happen. The one in NYC has had problems and they are now two weeks into testing another pole made out of ABS instead of PVC plastic. Paul Turci said the jury is still out on how or whether it will work. He'll keep me posted.
- 8/31 Emptied Earth Tub for third time. Harvested 1.12 cy (700 lbs.) of hot compost. Getting a little faster at discharging operation. Tub was only half full and it took 1 hour to empty and screen, and another hour to clean, service and refill. Set-up, clean-up took another ½ hour or so. Compost dry except at bottom where it was wet. Drainage holes and drainage channels in floor were clogged with fines. Greased auger fitting. Refilled tub with a shallow layer of woodchips, then the rest with 20 bags @ approx. 9 lbs each of wood shavings. Watered well with hose. Keeping blower off until it heats up.

**Depositing
food scraps
into
collection
bucket.**



**Emptying collection
bucket into the
Earth Tub.**

**Mixing organics
in the Earth Tub
by rotating the
lid.**



**Pulling immature
compost out of
Earth Tub.**

**Eager volunteers
helping to discharge
immature compost
from Earth Tub.**



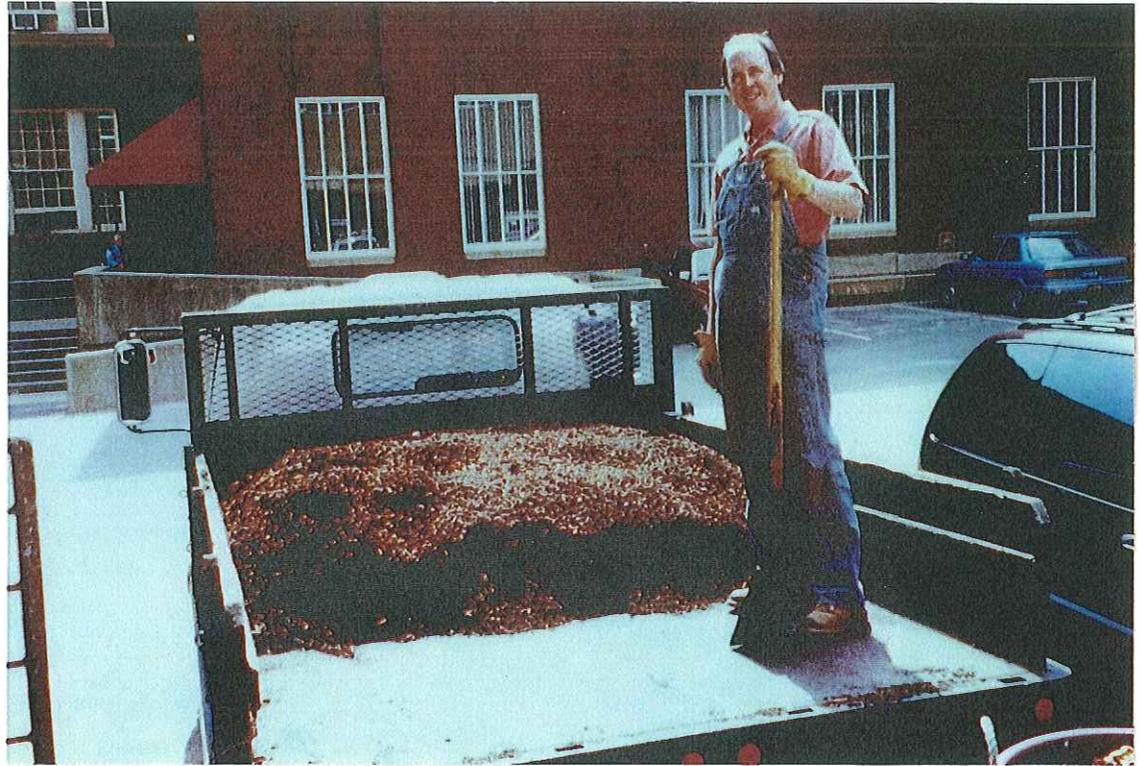
**Moving discharged
material to screening
area.**

Screening discharged material through 1/2" hardware cloth.



Tailings from screening process.

Dedicated “Compost Commando” next to screened compost ready for transport to curing area.



Finished, cured compost being used by building maintenance in the garden at DEP headquarters, 79 Elm Street, Hartford, CT