North Carolina Department of Environment and Natural Resources
Division of Waste Management
Dexter R. Matthews
Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

October 13, 2011

Permit No.	Scan Date	DIN
9504-COMPOST-	August 23, 2012	17108

Ms. Jennifer Maxwell
Appalachian State University
Physical Plant
P.O. Box 32105
Boone, North Carolina 28608-2105

Re: Appalachian State University – SWC-95-04 – Watauga County

Dear Ms. Maxwell:

Enclosed is Appalachian State University's permit to operate a Small Type III compost facility in Watauga County. Your permit number remains SWC-95-04. Please carefully review all permit conditions including condition thirteen which lists the permitted capacity for the facility.

Ms. Deb Aja, Environmental Senior Specialist, will be responsible for conducting inspections of the facility. Ms. Aja can be contacted at 828-296-4702.

Should you have any questions please feel free to contact me at 919-508-8497.

Sincerely,

Michael Scott, Chief
Solid Waste Section

cc: Deb Aja, Environmental Senior Specialist, Asheville Regional Office
Central File, Solid Waste Section

s:cla/Compost/permits/95-watauga/swc-95-04_10-11_cl

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT
1646 MAIL SERVICE CENTER
RALEIGH, N.C. 27699

Appalachian State University

is hereby issued a permit to operate a

Small, TYPE 3 SOLID WASTE COMPOST FACILITY

at

ASU Physical Plant on Dale Street
in Watauga County, NC

Permit Number SWC-95-04

in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit.

10/13/11
Date

Michael E. Scott, Chief
Solid Waste Section

Permit Conditions:

1. Operation and maintenance of this facility shall be in accordance with the Solid Waste Compost Rules (15A NCAC 13B, Section .1400), the permit application and the operation and maintenance manual submitted with the permit application, and these permit conditions. Failure to comply may result in compliance actions or permit revocation by the Division of Waste Management.

2. This facility shall be operated in such a manner that erosion and runoff from the site shall be controlled. Any leachate generated at the facility and any runoff from the facility shall be managed in such a manner that ground or surface water quality will not be adversely affected. The facility shall be maintained to prevent the accumulation of stormwater or leachate on travel or storage areas.

3. An appropriate Division of Water Quality permit for managing any stormwater or wastewater at the facility shall be obtained within six months of the issuance of this permit as required.

4. Only materials specifically listed in the permit application may be managed at this facility. Before additional materials may be added, there must be adequate testing and prior approval by the Division of Waste Management in writing.

5. All compost produced at the facility shall meet the requirements of Rule .1407 of the Solid Waste Compost Rules and the permit application.

6. Testing and reporting shall be conducted in accordance with the requirements of Rule .1408 and the permit application. An annual report of facility activities for the fiscal year July 1 to June 30 shall be submitted to the Division by August 1 of each year on forms provided by the Division. This report shall include the amount of materials composted in tons.

7. The compost operation and the compost pad shall be operated and maintained with sufficient dust control measures to minimize airborne emissions and to prevent dust from becoming a nuisance or safety hazard.

8. Compost process data shall be maintained in writing as required to document temperatures, moisture levels and aeration intervals.

9. The odor management procedures shall be followed to minimize odors at the facility boundary. Upon receipt of a facility complaint the facility operator shall investigate and take action as necessary to minimize the cause of the complaint. A copy of all complaints regarding this facility shall be maintained for the duration of the permit including the operator's actions taken to resolve the complaints.

10. Feedstocks shall not be received that are in an anaerobic state.

11. The facility shall be operated in a manner that reduces the potential for vector attraction.

12. Stockpiling of finished product shall be limited to a height of 10'.

13. The facility operational capacity for this permit shall be limited to 275 tons per year.

14. Groundwater monitoring wells may be required if there is indication of the potential for groundwater contamination.

15. This permit shall expire on October 13, 2016. Changes in ownership, increase in facility capacity, or receiving feedstocks not identified in the permit application shall require a permit modification.

APPROVED
MES 10/13/11

REQUEST FOR SMALL TYPE III COMPOST PERMIT TO OPERATE:
APPALACHIAN STATE UNIVERSITY- swc-95-04 WATAUGA COUNTY

.1405

1) Aerial photograph or scaled drawing- Attached
2) University property is not governed by local zoning regulations.
3) **Section .1404:**
   a) Site is not located in a floodplain.
   b) Site is located approximately 525 feet from nearest property not owned by permittee.
   c) Site is located approximately 550 feet from nearest residence not owned and occupied by permittee.
   d) Site is located more than 5oo feet from a well.
   e) Site is located approximately 1,350 feet from the South Fork of the New River.
   f) Compost facility is located approximately 1,350 feet from the South Fork of the New River, which is classified C+.
   g) No portions of the compost facility are located over a closed-out disposal area.
   h) There is adequate access for the allowance of firefighting equipment. The site is accessible from paved parking area above for fire suppression if needed.
   i) Surface water requirements:
      i) Due to leachate collection system built into compost facility, there will be no migration of liquids or solids from the site.
      ii) Due to leachate collection system, there will be no discharge of pollutants.
      iii) Due to leachate collection system, there will be no migration of material.
   j) Groundwater Requirements:
      i) Site does not contravene groundwater standards as established under 15A NCAC 2L.
      ii) Site meets this requirement.
      iii) Request is for a Type III Facility so this does not apply.
      iv) Site is on asphalt pavement and concrete pad.
      v) Request is for a Type III Facility do this does not apply.

.1404 Subparagraph C:

1. Site does not allow uncontrollable public access- ASU Police Department routinely patrols site.
2. Site will meet the requirements of the Sedimentation Pollution Control Law (15A NCAC 4).
3. Site will meet Air Pollution Control Requirements (15A NCAC 2D) to minimize fugitive emissions and odors.
4. More than 11 years experience indicates no problems with odors at the property boundary.

4) Detailed Reports:
   a. Waste stream consists of pre-consumer and post-consumer food waste generated by ASU Food Services. Currently processing approximately 100 tons of food waste annually, 12 tons of sawdust and 4 tons of wood chips as bulking agents. Amount varies according to the academic calendar. New facility will lend us the opportunity to process 275 tons annually.
   b. Concrete pad and asphalt is the base for the composting area.

5) Site Plan Attached...
6) Operation of the Facility:
   a) Jennifer Maxwell, Resource Conservation Manager
      265 Dale St. Boone, NC 28608
      Phone: 828-262-3190 x108
      Fax: 828-262-4017
      Email: maxwelljb@appstate.edu
      Web: www.recycle.appstate.edu
   b) One of three campus crew members will be responsible for the transport of materials from campus to the compost facility for processing- Monday through Friday. Temperatures will be monitored daily as well as inspection for odor control and leachate issues.
   c) On our daily schedule, materials will be delivered to the compost facility and incorporated using wood chips, sawdust, or shredded pine bark as a bulking agent. Aeration system will be operated as needed to aerate the piles(s). Site is inspected for signs of scavenger activity, odor, or leachate.
   d) See O and M- attached
   e) See O and M- attached
   f) The entire production is dedicated for use as a soil amendment by ASU Landscape Services in landscape plantings on the ASU campus. Finished compost will be loaded onto dump trucks using a front end loader, and then delivered to planting projects on campus. Unsuitable materials will be re-composted or taken to the local C&D landfill for disposal.
7) Design of the facility:
   a) The facility is designed to be capable of composting 275 tons annually- initially we will be composting approximately 100-125 tons annually.
   b) Process flow diagram- Attached
   c) Input materials are incorporated into the pile using a front end loader.
   d) See O and M- attached
   e) Temperature readings will be taken at the front, middle, and back on each active pile daily.
   f) Temperature records will be maintained to ensure pathogen kill is achieved. Compost will be tested every 6 months for the following: fecal coliform, manmade inerts, and NCDA Waste Analysis.
   g) Built in aeration system of evenly spaced aerated pvc piping inlaid in concrete floor of compost bins capable of pumping up to seven minutes of air every hour.

h) New facility is equipped with a leachate collection system that consists of a 1000 gallon collection tank underground. Leachate is collected and held in this tank and can then be reintroduced to the compost process as moisture by a quick connect hose attached to the facility.

8) Instructions for compost use as a soil amendment in landscape plantings: Finished compost is intended for use as a soil amendment. Compost should be incorporated into the planting area and thoroughly tilled in or otherwise combined with existing soil.

9) See O and M- attached

10) Operations and Maintenance Manual- attached

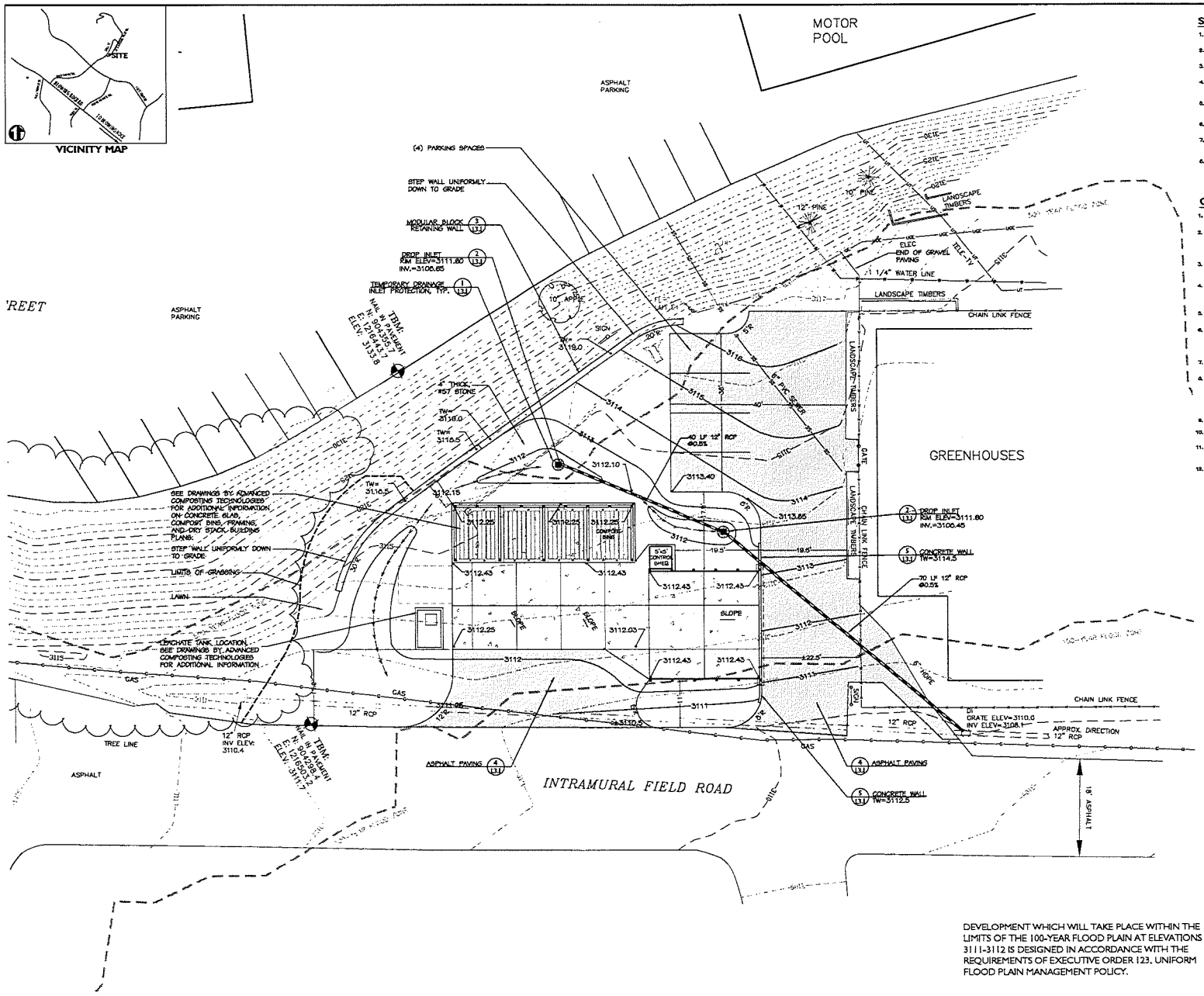
A. Temperatures are recorded daily.
Representative samples are taken at six month intervals and examined for fecal coliform by a testing laboratory and a waste analysis is performed by NCDA.
Samples:

- Samples are extracted with a clean spoon by an employee wearing sterile gloves and placed into a clean Ziploc baggie.
- Each sample is extracted with a new spoon while wearing new gloves.
- Samples do not come in contact with the sampler's skin or other samples.
- Samples are placed into a cooler and transported to the testing laboratory within three hours.

Manmade inert tests are performed by in-house personnel.
Recordkeeping shall conform to provisions as detailed in 1408 (b) and (c).

B. Additional equipment (loaders, dump trucks, etc.) is located at the Landscape Services shop area at a distance of 500 feet and is available at all hours as needed throughout the year. 24 hour security is provided by routine patrols by the ASU Police Department to prevent unauthorized input or removal of material from the site.

C. Temperatures will be monitored and reported as required; samples will be analyzed for fecal coliform and a waste analysis will be submitted every six months as required. Manmade inerts will be reported.



SITE NOTES

1. DIMENSIONS AND COORDINATE POINTS ARE TO FACE OF CURB, EDGE OF PAVEMENT, OR CORNER OF BUILDING UNLESS OTHERWISE NOTED.
2. ALL IMPROVEMENTS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH STATE AND LOCAL STANDARDS.
3. ANY DISCREPANCIES FOUND IN THE FIELD SHALL BE CALLED TO THE ATTENTION OF THE OWNER OR ENGINEER PRIOR TO PROCEEDING WITH WORK.
4. PRIOR TO BEGINNING CONSTRUCTION, THE GENERAL CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS AND APPROVALS FROM ALL REGULATORY AUTHORITIES.
5. THE GENERAL CONTRACTOR SHALL CONTACT ALL OWNERS OF EASEMENTS, UTILITIES AND RIGHT-OF-WAYS, PUBLIC AND PRIVATE, PRIOR TO WORKING IN THESE AREAS.
6. GENERAL CONTRACTOR SHALL MAINTAIN THE SITE IN A MANNER SO THAT WORKMEN AND THE PUBLIC SHALL BE PROTECTED FROM INJURY.
7. DO NOT SCALE DRAWING FOR ACTUAL DIMENSIONS, AS IT IS A REPRODUCTION AND SUBJECT TO DISTORTION.
8. THE ENGINEER WILL PROVIDE THE CONTRACTOR WITH AN ELECTRONIC FILE OF THESE DRAWINGS UPON REQUEST.

GRADING AND DRAINAGE NOTES

1. EARTHWORK QUANTITIES HAVE NOT BEEN ESTIMATED AND SITE AS SHOWN IS NOT ASSUMED TO REPRESENT A BALANCED CUT/FILL CONDITION.
2. CONTRACTOR SHALL PERFORM HIS OWN ESTIMATES AND SHALL PROVIDE ALL EARTHWORK NECESSARY TO ACHIEVE THE DESIGN GRADE, INCLUDING ANY OFFSITE BORROW OR SPOILS REQUIRED. CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE IN ALL GRADED AREAS, INCLUDING PAVING, LAWN AND LANDSCAPE AREAS.
3. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO OWNER ANY DISCREPANCIES FOUND BETWEEN ACTUAL FIELD CONDITIONS AND CONSTRUCTION DOCUMENTS AND SHALL WAIT FOR INSTRUCTION PRIOR TO PROCEEDING.
4. CONTRACTOR SHALL VERIFY LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO BEGINNING WORK. BOTH PUBLIC AND PRIVATE. CONTRACTOR IS FULLY RESPONSIBLE FOR ALL UNDERGROUND UTILITIES AND SHALL REPAIR ANY DAMAGE AS A RESULT OF THIS CONTRACT.
5. CONTRACTOR SHALL BLEND NEW EARTHWORK SMOOTHLY TO TRANSITION BACK TO EXISTING GRADE.
6. THE PROPOSED CONTOURS AND SPOT ELEVATIONS SHOWN IN DRIVES, PARKING LOTS AND ROADWAYS ARE FINISHED ELEVATIONS INCLUDING ASPHALT. REFER TO PAVEMENT CROSS SECTION DATA TO ESTABLISH CORRECT SUBGRADE OR AGGREGATE BASE COURSE ELEVATIONS TO BE COMPLETED UNDER THIS CONTRACT.
7. GRADING MORE THAN ONE ACRE WITHOUT AN APPROVED EROSION CONTROL PLAN IS SUBJECT TO A FINE.
8. STABILIZATION IS THE BEST FORM OF EROSION CONTROL. TEMPORARY SEEDING IS NECESSARY TO ACHIEVE EROSION CONTROL ON LARGE DENUDED AREAS AND ESPECIALLY WHEN SPECIFICALLY REQUIRED AS PART OF THE CONSTRUCTION SEQUENCE SHOWN ON THE PLAN. ALL SLOPES MUST BE SEEDED AND MULCHED WITHIN 15 WORKING DAYS OR 30 CALENDAR DAYS, WHICHEVER IS SHORTER. ALL OTHER AREAS, 15 WORKING DAYS OR 90 CALENDAR DAYS WHICHEVER IS SHORTER.
9. TOTAL DENUDED AREA = 0.26 AC.
10. ROOF LEADERS SHALL BE SCH-35 PVC, SIZE INDICATED, 1.0% MIN. SLOPE, 12" MINIMUM COVER.
11. UNLESS OTHERWISE NOTED, THE PHYSICAL CONNECTION BETWEEN THE SITE ROOF DRAIN PIPE AND THE PIPE INSTALLED BY THE PLUMBING CONTRACTOR SHALL BE MADE BY THE SITE UTILITY CONTRACTOR.
12. SOIL TYPE IN: URBAN DEVELOPMENT

LEGEND

- EXISTING SIGN
- EXISTING UTILITY POLE
- EXISTING TREE TO REMAIN
- EXISTING FIRE HYDRANT
- EXISTING FENCE
- UGE — EXISTING UNDERGROUND UTILITY LINE
- EXISTING UNDERGROUND TELEPHONE LINE
- EXISTING SANITARY SEWER LINE
- EXISTING WATER LINE
- EXISTING GAS LINE
- 3112 — EXISTING CONTOUR LINE
- 3113 — PROPOSED CONTOUR LINE
- 3112.60 PROPOSED SPOT ELEVATION
- TEMPORARY TREE PROTECTION BARRICADE
- EXISTING STORM DRAINAGE LINE
- PROPOSED STORM DRAIN PIPE
- EXISTING DRAINAGE STRUCTURE
- PROPOSED DROP INLET
- ASPHALT PAVING
- VEHICULAR CONCRETE PAVING

DEVELOPMENT WHICH WILL TAKE PLACE WITHIN THE LIMITS OF THE 100-YEAR FLOOD PLAIN AT ELEVATIONS 3111-3112 IS DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF EXECUTIVE ORDER 123, UNIFORM FLOOD PLAIN MANAGEMENT POLICY.

10 0 5 10 20
1"=10'

SITE SOLUTIONS
2320 W Morehead Street
Charlotte, NC 28208
Landscape Architecture
Site Planning
Civil Engineering
www.sitesolutionspa.com
Telephone: 704-521-4980
Facsimile: 704-521-4995

Seal:

NORTH CAROLINA REGISTERED LANDSCAPE ARCHITECT 534 PAUL A. SMITH
NOT FOR CONSTRUCTION

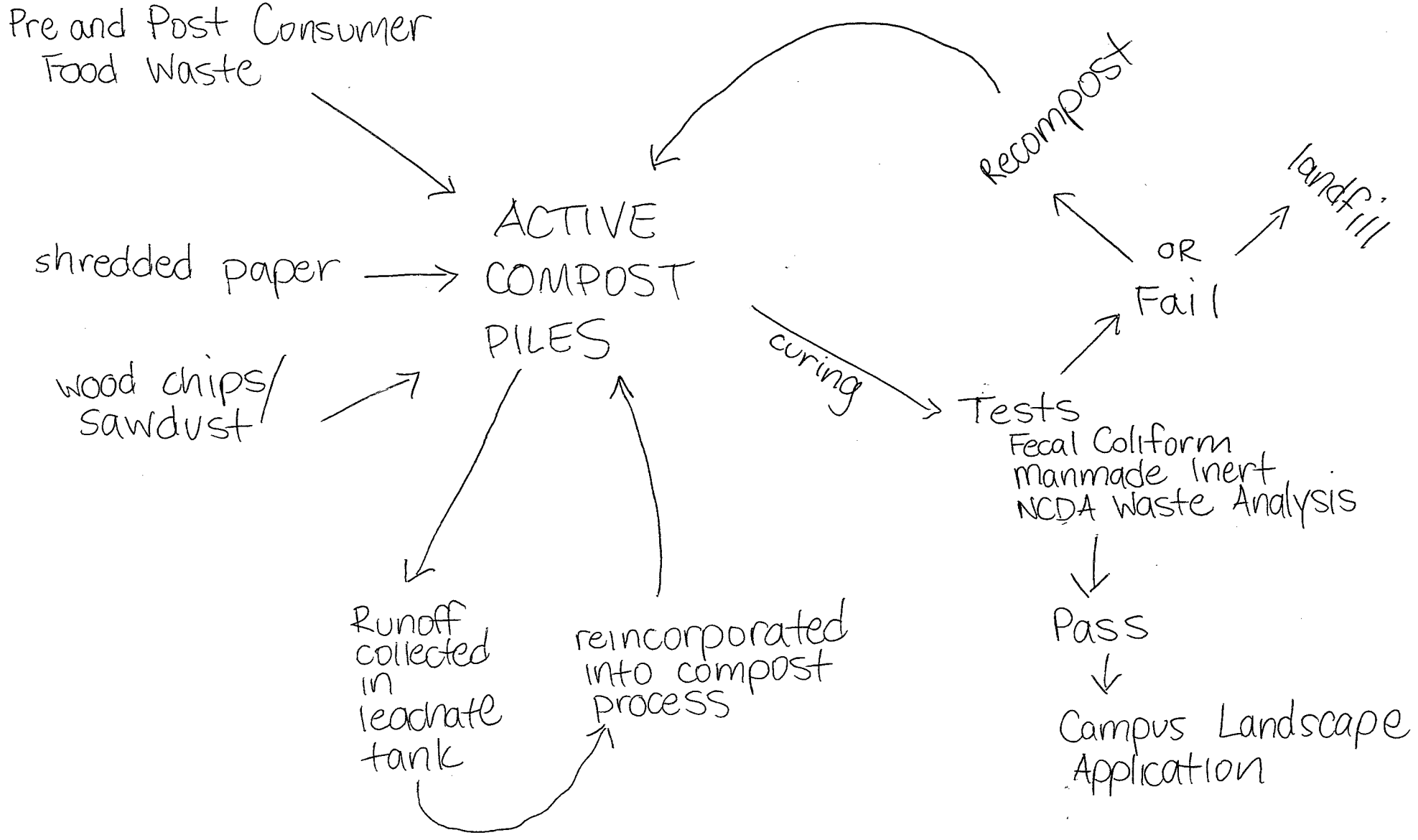
Appalachian STATE UNIVERSITY
Compost Facility
Boone, North Carolina

Project No: 32
Drawn By: P
Designed By: PJ
Checked By: PJ
Date: 12/1/10

Revisions:

Sheet Title:
Site/ Grading/ Drainage Plar

Sheet No:
L-2.1


Pre and Post Consumer Food Waste
shredded paper
wood chips/ sawdust
ACTIVE COMPOST PILES
Runoff collected in leachate tank
reincorporated into compost process
curing
Tests
Fecal Coliform
manmade Inert
NCDA Waste Analysis
Pass
Campus Landscape Application
Fail
OR
recompost
landfill

Advanced Composting
TECHNOLOGIES

ASU RECYCLES

OPERATION AND MAINTENANCE PLAN FOR A FORCED AERATED COMPOSTING FACILITY

OWNER / OPERATOR:	Appalachian State University
LOCATION:	265 Dale St. Boone NC 28608 Watauga County
TYPE OF OPERATION:	Food Waste Composting
SIZE OF OPERATION:	550,000 lbs per Year- Max Capacity
SYSTEM SUPPLIER:	Advanced Composting Technologies, LLC 1-828-665-8600

Composting facilities and the resultant compost, when sold, shall be in accordance with the policy of NCDENR's Solid Waste Section. The address of the Solid Waste Section is:

North Carolina Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646
Phone: 919-733-4996

APPROVED
MES 10/13/11

Basics of Composting

Composting is a natural biological process of decomposition of organic materials in a predominantly **aerobic** environment. Because forced aeration mechanically moves fresh oxygen-rich air up through the composting pile, evenly and at pre-determined intervals, optimum aerobic conditions are maintained throughout the duration of the composting process. Forced aeration removes one of the limiting factors associated with the traditional static pile composting process – the lack of oxygen within the pile – and results in maximum breakdown of the material in a minimum of time.

During the process, bacteria, fungi and other microorganisms break down organic materials to a stable mixture called compost while consuming oxygen and releasing heat, water, and carbon dioxide (CO_2). The finished compost resembles humus and can be used as a soil amendment. Composting reduces the volume of the parent materials and pathogens are destroyed if the process is controlled properly.

All disease-causing organisms are subjected to at least three adverse conditions during composting: heat, toxicity caused by products of decomposition, and microbial antagonism. Heat generated in the composting process is the primary determinant studied as the in-activator of disease-causing organisms. Heat is also the performance indicator of microbial activity within the composting pile. An extended period of heat (minimum of 5 consecutive days) in the desired range (above 140°F) achieved during composting is essential for the destruction of most pathogens. With proper management, the forced aeration composting process will produce temperatures consistently higher than the typical static pile composting pile as noted earlier. Higher temperatures translate into higher microbial activity, reduced retention time in each bin and better pathogen reduction. Normal temperatures for forced aeration are typically in the range of 140°F to 150°F for 10 or more consecutive days.

The effect of pH and the action of other bacteria and fungi on the destruction of disease-causing organisms is still largely unknown. Only minimal research has been done with disease-causing organisms of animals with regard to the ability of the composting process to destroy them. A recent review of chemical and microbial hazards to humans from urban waste composting facilities indicates that the assumption that all disease-causing organisms are killed by composting may be faulty.

Some important procedures to minimize risk include the following.

- Entry apron to the compost bins and the first 3' of the dry storage (curing area) should be cleared of any spillage following loading and transporting material
- Prevent rodents and scavenging animals from digging in 1st stage compost bins and spreading the contaminated material.
    - Following recommendations for sawdust/ litter covering will provide a barrier to most pests.
    - Fencing may be necessary if proper coverage is not maintained

and animals have gained access.

- Fly infestation problems are minimized with appropriate bin temperature and a sawdust/compost cover over the food waste and capping the bin with 3-4 inches of clean sawdust.

All living organism require carbon, nitrogen, oxygen, hydrogen, and many other elements to survive. Any requirement that is not met will limit the growth, reproduction, and ultimate survival of the organism. Composting is focused on understanding and meeting the needs of the organisms that are actually doing the composting. While composting occurs naturally, the process requires proper conditions to occur rapidly, minimize odor generation, and prevent nuisance problems. Over 20 controllable factors affect composting. Table 1 lists eight of those factors and acceptable ranges to aim for when composting. Of these factors, the four major factors to be controlled in the composting process are the **material mix (nutrient balance)**, **water content**, **porosity or aeration**, and **temperature**.

Table 1. Guidelines for composting- major factors.

	Reasonable Range	**Preferred Range**
Nutrient balance, C/N	25:1 - 40:1	30:1 – 35:1
Water Content	45-65% w.b.	50-60% w.b.
Particle Size	0.8-1.2 cm (1/8-1/2 inch)	Depends on Material
Porosity	30-50%	35-45%
Bulk Density	<640 kg/m^3 (1100lb/yd^3)	
pH	5.8-9.0	6.5-8.0
Oxygen Concentration	>5%	> 10%
Temperature	(110-155°F)	(140-150°F)

Material Mix (C/N)

The proper composting mixture requires both carbon and nitrogen at the proper Carbon/Nitrogen ratio. A proper C/N ratio will result in a composting process that generates little odor, yet offers an environment where microorganisms can flourish. Generally an initial C/N ratio that is 25:1 to 40:1 is satisfactory. Most "compostable" animal materials have a C/N ratio that is too low to compost properly on their own, usually below 10:1. In order to compost these materials, amendments that contain high levels of carbon must be added. Plant materials such as wood chips, peanut hulls, sawdust and shavings have a high C/N ratio and are ideal for composting.

Water Content & Porosity

Like all living things, microorganisms need water. To encourage their growth and rapid composting, water content of the mixture should be 50 to 60% (wet basis). It is critical to the process that this moisture content be maintained from the very beginning and throughout the composting process. The forced aeration floor design compensates for excess moisture by allowing it to leach out of the materials and drain to the front and back of each bin then draining to a storage tank, where it is stored and aerated and returned to newly built piles as the primary source of moisture.

Determining the level of moisture present in each pile is not as complicated as one might think. **Take a small sample of material from each pile. If the mixture feels moist, and when a handful is squeezed only one or two drops of moisture is released, the mixture has adequate water content.** Low moisture content significantly slows down the composting process. Since the bins are always covered, leachate in the initial stages and clean water in second stage may need to be added to avoid process inhibition.

Microorganisms that are encouraged to grow in a compost pile are aerobic, or require oxygen. Open spaces (porosity) must be maintained to allow air to penetrate and move through the pile providing oxygen. Approximately 25% of the pile volume should be small open spaces. The addition of forced aeration greatly improves the availability of fresh oxygen for microbial activity. The rule of thumb for controlling the amount of aeration in this particular system is approximately 3-5 minutes per bin per hour. A control panel has been provided to make selecting and directing aeration to the bins extremely simple. Since each bin is aerated separately, simply switch the on/off switch to the "On" position, and set the aeration cycle time for that bin to the desired number of minutes, from one to six.

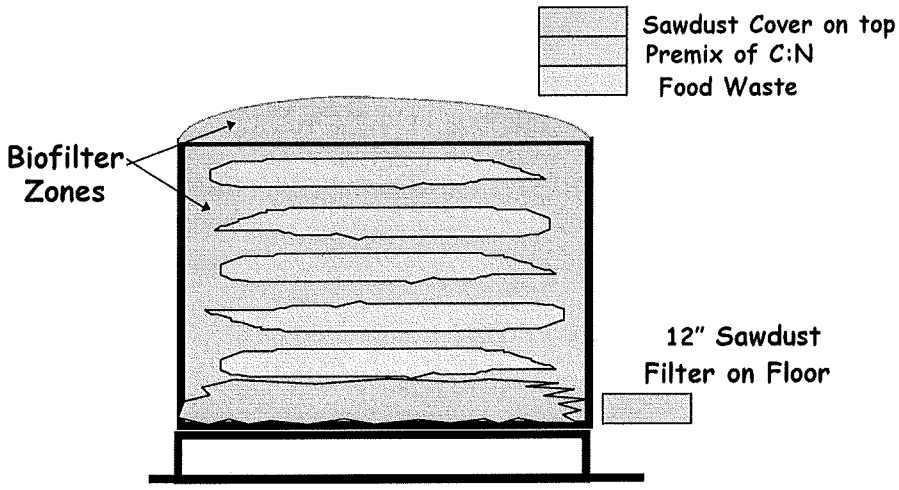
Temperature

"The typical static pile composting process will generate and regulate its own temperature. As the pile heats up, warm air within the mixture will rise and move out of the pile, while fresh air will be drawn in to replace it. This process exhausts CO_2 created in the pile, and maintains an aerobic environment for the microorganisms."

By forcing fresh air up through the pile, exhausting the CO_2, aerobic environments can be maintained even in the denser environments. Forced aeration composting allows the user to somewhat regulate temperature by controlling the amount of aeration, generating greater microbial activity and therefore higher processing temperatures.

Since concrete has little insulation value, it is recommended that at least 6" of clearance (buffer or insulation) from the mortality and the concrete wall. Temperatures measured less than 12" from the wall will reveal a 10 to 20 degree drop from those further than 12" away from a wall surface. The NC Dept. of Environment and Natural Resources, Division of Waste Management, Solid Waste Division policy requires a type III facility to meet a minimum of 131°F for

three consecutive days. In addition, type III facilities must maintain temperatures about 104°F with an average of at least 113°F for 11 consecutive days following. With forced aeration composting you should target a minimum of 15 days above 150°F therefore exceeding the above mentioned policy. You are required to make the composting operation available for inspection by any NCDENR's Officer. All records of material composted and temperature records must be available.



The above figure is a cross section of the compost bin. The layering process is critical to getting consistent decomposition as fast as possible. Thin layering of the food waste surrounded by a very wet layer of wood chip mix allows the process to begin immediately after the filling of the bins takes place. The pile is not turned until the material has finished the first phase of composting where required temperatures are met.

The decomposition process in static pile composting typically is anaerobic (lacking oxygen) in and around the food waste, which generates odors in turning. Forced aeration minimizes this anaerobic zone by continually purging CO_2 and replacing it with fresh oxygen-rich ambient air. Surrounding the layers of mortality with a high carbon source and frequently aerating the compost pile has the potential to accelerate the process significantly faster than static pile composting, up to three times faster. For food waste, this period is generally 20 days after the bin is filled and capped off. After this time the compost is either moved to an area for curing, or reused back in the process as a layering mix or cover.

Managing the Composting of Food waste

Practices of composting food waste are very simple. The following is recommended as a guide for properly operating the composter.

1. Inspect each aeration tube for the correct connection,
2. Construct a base from sawdust or acceptable amendment at least 12" thick. This base will filter out liquids that are present in the food waste. It also permits air movement and microbial action underneath the first layer of food waste. With the sloped floor, excess leachate will be drained and captured for recirculation back into the pile. If liquids begin to leach out of the pile under the front door, spread sawdust around the pile to absorb the liquids, and check the drains in the front of the bins..
3. Then place a layer of food waste on the mix. A single layer of food waste should be dumped out and spread evenly across the base. A rake or other long handled tool may be needed to spread the food waste evenly out on the sawdust bed. Add four to six inches of mix to the top of each layer of process waste in order to minimize odors and vectors as well as providing an absorbing layer for the next addition of waste. After the first layer of food waste is added to the bin, turn the control switch for that bin to the "On" position and set the timing for 2 minutes. This aeration will also accelerate the growth of microbes while the bin is being filled.
4. Once the day's food waste has been added to the bin in a relatively thin layer, add leachate by spraying or soaking the mix with the accumulated leachate. This step is absolutely critical to getting the process working properly. It is almost impossible to add moisture to a pile after it is built, so do it now.
5. Once the bin is completely filed, cover the pile with at least 6" of pure sawdust or other carbon-rich source. This cover acts as the Biofilter for odor control around the pile and insulates the pile to retain heat. Odors may be released when an inadequate cover is used or when it is too dry. The released odors may also attract scavenging animals and pets to the pile. The Biofilter can be increased to 1-foot if necessary. Critical: do not add leachate to the top of the pile. Add clean water to the top of the bin only. This will minimize flies and other vectors and varmints and will also avoid contamination once entered into the temperature requirement process.
6. Increase the timing for that bin to the maximum 6 minutes. This aeration cycle time can be adjusted down once the material has reached the desired 150°F processing window.

Data Collection and Record Keeping

In order to monitor the composting process, it is necessary to measure and record temperatures of the compost pile. Pathogen kill can be monitored by measuring the internal pile temperature. Progress of the pile can also be surveyed from temperature records. Temperatures should be taken at several places in the bin that represent the entire pile; usually one along the back of the bin, one in the middle of the bin, and one at the front of the bin. Temperature recording can be done easily with a three ft. probe thermometer (1/4 inch probe diameter is recommended).

Data recorded while loading the bin should include date and the total estimated weight added each day. Once the bin is completely filled, record the internal temperature of the pile at three locations; near the back, near the middle, and near the front, and calculate the average for that bin on that day.
In order to properly manage the composting facility and to meet the permitting requirements stated earlier, daily temperature records must be kept for each bin. This is absolutely critical in the first several weeks of the compost process. Take as many readings as necessary to insure that the pile is reaching temperatures throughout. This can be extremely helpful in identifying problems that may occur during start-up of each bin. Typically, once the process is running, checking temperatures and adding moisture is about all that is required.

Representative samples are taken at six month intervals and examined for fecal coliform by a testing laboratory and a waste analysis is performed by NCDA and CS. Manmade inert tests are performed by in-house personnel.
Recordkeeping shall conform to provisions as detailed in 1408 (b) and (c).

Land Application of Compost

First and foremost, follow an approved nutrient management plan. Test compost material for carbon, nitrogen, moisture, and pH if compost fails to reach the proper temperature or if odor problems develop. The finished compost material should be periodically tested for constituents that could cause plant phytotoxicity as the result of application to crops. Compost made from dead animal or animal parts should be tested for indicator pathogens such as E. coli and salmonella. The disposal of the compost shall adhere to all federal, state, and local laws, rules, and regulations. It is the responsibility of the producer to properly manage the facility on a daily basis.

Pest Management

Animals digging into the compost can be a problem, although it is less likely in forced aerated concrete bins with high temperatures. Measures must be taken if this occurs to maintain bio-security and a positive public perception. The easiest way to prevent this from occurring is to maintain the necessary minimum cover (4-6 inches sawdust/litter mix used to cover all mortality).

NEVER ALLOW FOOD WASTE TO BE EXPOSED.

Maintenance
Daily

- Clear the front drain trough of debris to allow for optimum flow to the drain.
- Entry apron to the compost bins and the first 3' of the dry storage (curing area) should be cleared of any spillage following loading and transporting material

Weekly

- flush leachate trunk line's front and rear by inserting your flexible hose into the control room side cleanouts and turn on for 1 minute per line. If blockages do occur unstop by using garden hose flowing upstream from the lower cleanout. If blockage still remains you might need to use a drainage snake to cut through the clog.
- Weekly or after a large rain check the level of the leachate tank. If the facility cannot handle the excess volume the tank will need to be pumped by a septic pumping company.

Monthly

- The regenerative blower is equipped with an inlet filter that should be cleaned monthly and replaced at least annually. Because there are few moving parts in the air blower, reliability has been excellent. After five years it is recommended that the blowers be returned to Advanced Composting for credit on a refurbished unit. Contact Advanced Composting @ 1-828-230-1729 for replacement filters

When Emptying the bin

- Inspect each compost bin unit when it is empty. Inspect the tubes, and the aeration holes. These holes must be open in order to provide uniform and even distribution of the aeration. The pipes should be cleaned as needed. Check the bin pressure and be sure that it is in the acceptable operating range of 20"-60" PSI before refilling. All of the plastic components of the system are common plumbing supplies and are conveniently carried by most large home improvement retailers.

Bi-Annually or as Needed

- Patch concrete floors, curbs, or gravel areas as necessary to assure proper operation and integrity.
- Examine roofed structures for structural integrity and leaks.
- Maintain a dense stand of vegetation around the composting facility year round.

Emergency Disposal of Food Waste

It is critical that you make specific plans for waste disposal in the event of an emergency. Depending on the type and degree of emergency, there are several alternatives. Contact your local NRCS office for recommendations when composting is the selected alternative.

Emergency Management Plan

If the Compost Operations Coordinator cannot be reached in the event of an emergency, the following will serve as contacts for this facility:

Jim Bryan, Landscape Services Superintendent
828-262-3190 x133
bryanjl@appstate.edu

Eddie Hyle, Landscape Services Superintendent
828-262-3190 x154
hyleea@appstate.edu

Jennifer Maxwell, Resource Conservation Manager
828-406-4090
maxwelljb@appstate.edu

Greg Taylor, Director of Campus Services
828-262-3190 x172
taylorgm@appstate.edu

Chandler Cummins, Advanced Composting Technologies
828-665-8600
cc@advancedcomposting.com

Advanced Composting
TECHNOLOGIES

ASU RECYCLES

General Operating Procedures:

- Be sure aeration pipes are connected and there are no air leaks at the pipe connections.
- Be sure small holes in pipes are turned up and are clean.
- Check bins operating pressure to ensure it is between 20-60 PSI before filling.
- If pressures are higher then take the pipes apart and clean with a pressure washer; recheck pressure to be sure it is in the 20-60 PSI range.

Filling each bin with food waste:

- Place 12" sawdust or wood chip filter on floor of bin that will be receiving food waste. Place a single layer of food waste on the filter in the back of the bin. Start the layer or terrace about 3 feet wide.
- Keep the food waste at least 6" from walls. Cover food waste with 3-4" of the wood chip mixture keeping a level bed to receive the next layer of food waste. Turn air on to 2 minutes.
- Continue building that terrace or layer about 3-4 feet high and then start your second 3 foot layer in front of the first layer and build it up to the height of the 1st run. Then go back and finish out the 1st run.
- Continue terracing to the front using the split doors to finish filling the bin. Up the air to 3 minutes when the bin is ¾ full and then to 4 minutes when full.

- Wet the bin during filling to maintain 50% moisture and wet as needed before you place a clean 3-4" cap of sawdust on the bin to reduce flies.
- Once a week flush leachate trunk line's front and rear by inserting your flexible hose into the control room side cleanouts and turn on for 1 minute per line.
- Monitor and record temperatures daily after the bin is filled and capped for 15-20 Days. Our goal is to have temperatures above 150 degrees for the whole time. Call ACT personnel if temperatures are not reached for assistance.
- Leave food waste in this stage so that the temperature requirements are met: Above 131 degrees for three consecutive days followed by an additional 11 consecutive days above 104 degrees with an average of at least 113 degrees.
- Empty the bin and move the material to curing for 45-60 Days or reuse back in the process as a layering mix or cover.
- Land-apply the cured compost according to your nutrient management plan.