

**SWANA RECYCLING
TECHNICAL ASSISTANCE STUDY
FINAL REPORT
CAMP HILL BOROUGH COMPOST FACILITY
REVIEW OF COMPOST FACILITY OPERATIONS &
IMPACTS FROM ROUTE 581 CONSTRUCTION**

Prepared for:

**BOROUGH OF CAMP HILL
CUMBERLAND COUNTY, PENNSYLVANIA**



Prepared by

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CAMP HILL BOROUGH COMPOST FACILITY

EXECUTIVE SUMMARY

REVIEW OF COMPOST FACILITY OPERATIONS & IMPACTS FROM ROUTE 581 CONSTRUCTION

The Camp Hill Borough compost site is used frequently by residents and commercial vendors that drop off mixed yard waste, including brush. The compost facility also processes truckloads of leaves collected at the curbside from Camp Hill, Shiremanstown and Wormleysburg Boroughs. In 2006 the compost facility managed **7,800** tons of incoming leaves and mixed yard waste. Although the site is near its maximum capacity for accepting and composting leaves, the Borough can continue to manage the current level of leaves, yard waste and brush without major changes to the compost site. However, there are some clear advantages for making site and operational improvements for the short and long term outlook for the compost facility.

Proposed highway construction to along the Route 15/581 corridor will take 0.1 acres of the leaf windrow area, and this should have only a nominal impact to the leaf compost operation. Removing equipment and supplies from the pad and paving a small section at the eastern end of the facility by the salt shed can offset this impact. Increased turning of leaf windrows plus the addition of nitrogen bearing material (grass and green trimmings) as well as the addition of bulking material (woodchips), will accelerate the leaf compost process and improve the overall quality of the Borough's finished leaf compost.

Based on GF's evaluation of the Camp Hill Compost facility, some key recommendations include:

- It is recommended the Borough purchase a new front end loader, retaining the existing loader as a backup.
- Because of access to the County rental equipment, it is not recommended the Borough procure a windrow turner, a grinder or screener. The frequency of obtaining County-owned processing equipment should be increased to expedite material processing.
- A procedure should be used to inspect bucket loads prior to adding to the grinder due to the risk of concrete fragments being loaded into the machinery.
- Conduct pilot studies of leaf windrows to compare compost pile size reduction and composting rates.
- All commercial vendors (e.g. local landscapers) should be required to register with the Borough and should be charged an annual registration fee.

- The Borough could designate an area at Seibert Park for mulch and compost pickup to improve the convenience to residents on the northern side of the Borough.
- It is recommended the Borough implement a strict operations policy prohibiting all public vehicles from entering the yard waste receiving area when the grinder is operating and prohibiting all public vehicles from driving onto the compost pad.
- Cut at least three (3) arborvitae on either side of any water faucets along the fence to increase visibility of persons using and stepping out from this area onto the roadway.
- The Borough should identify additional commercial markets for compost and mulch.
- The Borough should review the proposed site modification presented in Figure 3 and described in the body of this report and make the recommended improvements as feasible.
- It is recommended the Borough submit for Act 101, Section 902 Recycling Grant funding for eligible costs associated with the site improvements and equipment cost associated with the compost facility (refer to Section 7.1). Pole buildings for equipment and supplies are not eligible under this Recycling Grant program.
- In the future, if the Borough elects to allocate more time to the compost operation and improves the quality of finished compost and mulch, it should charge a fee for bucket loads (~3 cubic yards) for compost and mulch. \$5 - \$15 per cubic yard is reasonable price range for compost and mulch and cost should be based on quality and extent of processing.

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**REVIEW OF IMPACTS
FROM ROUTE 581 CONSTRUCTION
& COMPOST SITE MANAGEMENT**

1.0 INTRODUCTION

The Borough of Camp Hill (Borough) is located in Cumberland County, Pennsylvania. The Borough operates a yard waste compost facility that will be impacted by the Pennsylvania Department of Transportation (PENNDOT) construction that will occur along the Route 581/15 traffic corridor that parallels the leaf composting pad (see Figure 1, Project Location Map). This part of the compost facility is managed by the Borough Public Works Department (DPW), and is used to unload leaves, which are constructed into windrows.

The Borough submitted a Recycling Technical Assistance application that was approved by the Solid Waste Authority of North America (SWANA) in late June 2007. The Recycling Technical Assistance program is a partnership with SWANA, the Pennsylvania State Association of Township Supervisors, and the Pennsylvania Department of Environmental Protection (PADEP). The Borough was awarded \$7,500 in technical assistance to be provided by Gannett Fleming, Inc. (GF) to evaluate the compost facility and to identify ways to improve the yard waste processing capacity as a measure to minimize negative operational impacts caused by lost site area and to maintain a functional compost site for Borough residents.

1.1 Scope

GF worked with the Borough to develop the following tasks for this project.

Task #1 GF will gather and review background information provided by the Borough and from the compost facility site visit and other sources and will incorporate relevant information into the project report.

Task #2 GF will make one (1) site visit to the Borough’s compost site. GF will evaluate the site and make observations with consideration of the site layout and site area reduction, operations, processing, and composting methods used. GF will document observations and develop findings and recommendations for the compost operation.

Task #3 GF will prepare and provide the Borough with a project report including findings and recommendations. This task includes a review of the report by PADEP and response to PADEP comments. An electronic file of the final report will be submitted to PADEP and to the Borough. Two bound and one unbound hardcopy of the Final Report will be provided to the Borough.

2.0 BACKGROUND

Camp Hill Borough has approximately 5,000 households and is mandated to recycle by the Municipal Waste Planning, Recycling, and Waste Reduction Act of 1988 (Act 101). Act 101 mandates curbside recycling in communities with a population over 10,000 and in communities over 5,000 with a density of 300 persons per square mile. Mandated municipalities are required to provide for the collection of “leaf waste” for residents as described by Chapter 271 of the PA Code. “Leaf waste” is defined in Chapter 271 as **leaves, garden residues, shrubbery and tree trimmings, and similar material**. Leaf waste does not include grass clippings.

The Borough has operated a compost facility since 1996. Historically, the site has been a little cramped for space, but has been able to operate successfully and within the parameters of applicable PADEP guidelines for Permit-by Rule compost facilities. The pending Route 581/15 construction project will result in a small reduction in the area used for constructing and managing leaf windrows.

3.0 CURBSIDE LEAF AND YARD WASTE COLLECTION

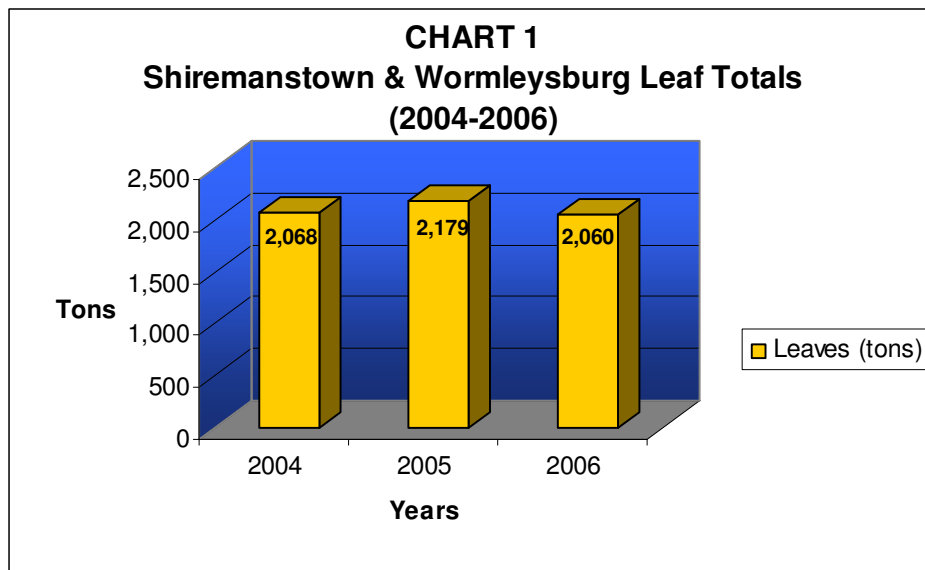
3.1 Camp Hill Borough Leaf and Yard Waste Collection

The DPW collects leaves using leaf vacuum trucks from early October until the end of November. The collection is provided weekly to residents and follows the trash collection schedule. After pick-up, leaves are taken to the compost facility and dumped to form long windrows on the asphalt compost pad. The DPW does not provide a curbside collection program for tree and brush trimmings or other yard waste. Residential curbside woody waste collection in the spring will soon be implemented by the Borough’s contracted waste hauler, including delivery to the Borough’s compost site.

Because the Borough operates a public compost facility allowing residents to drop-off materials and also provides spring and fall curbside leaf waste and woody waste collection, the Borough’s program complies with the Act 101 recycling requirements for leaf waste. Without the compost facility as a place for leaf and yard waste drop-off, the Borough would be required by Act 101 to collect leaf waste from the curbside at least once per month from residential establishments.

3.2 Shiremanstown Borough and Wormleysburg Borough

Truckloads of leaf and yard waste material are delivered to the Camp Hill Borough compost facility from Shiremanstown Borough and Wormleysburg Borough. Residents of Shiremanstown and Wormleysburg are also permitted to drop off materials at the compost facility. Residents from both municipalities pick up finished compost material and mulch for their use at no cost. Camp Hill Borough tracks the amount of material received annually from Shiremanstown and Wormleysburg Boroughs. The 2004 – 2006 totals for material received and processed at the Camp Hill Borough compost facility for Shiremanstown and Wormleysburg Boroughs is shown in the chart below. As can be seen, the combined quantity of incoming material from these two municipalities has been consistent over the last several years.

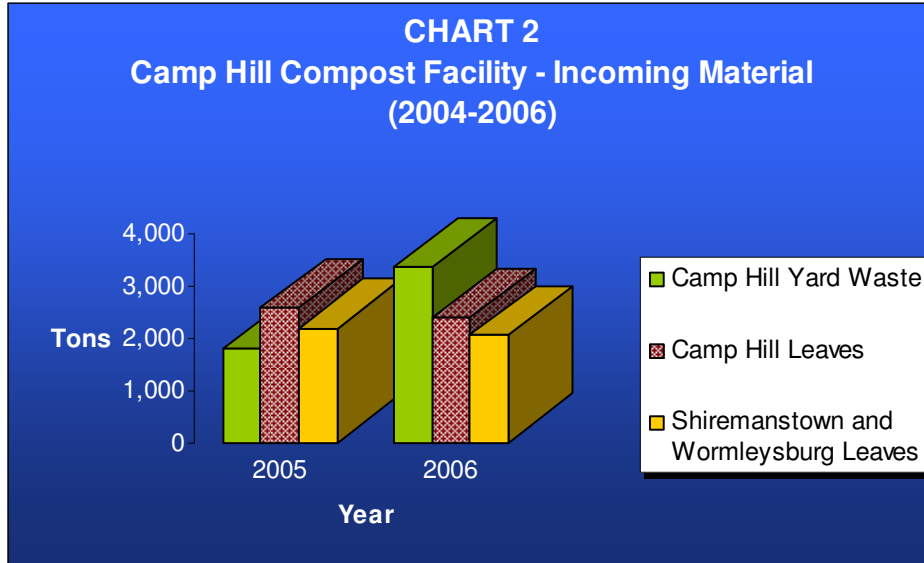


4.0 CAMP HILL BOROUGH COMPOST FACILITY

The Borough’s compost facility is located at the end of South 30th Street in Camp Hill Borough. The site is less than five acres and falls under the permit-by-rule guidelines established by PADEP for compost facilities. The facility is operated by the DPW, whose facilities and offices are located on the same property as the compost site. The compost site is only staffed during periods when yard waste grinding occurs or when windrows are being constructed, turned or otherwise maintained on the compost pad. **Figure 2** illustrates the existing features of the Borough’s compost facility.

Chart 2 shows the quantity of leaves and yard waste material (estimated in tons) received at the compost facility from Camp Hill Borough, Shiremanstown Borough and Wormleysburg Borough for 2005 and 2006. As can be seen, Camp Hill Borough brush and yard waste has

increased considerably from 2005 to 2006 but the total amount of leaves received annually has remained relatively constant for the Borough and for Wormleysburg and Shiremanstown Boroughs. The compost facility accepted 7,800 tons of leaves and mixed yard waste in 2006.



4.1 Yard Waste and Brush Drop-off and Receiving Area

The yard waste and brush receiving area has a gated entrance and is open for drop-off by residents and local commercial vendors (e.g. landscapers) Monday through Saturday from 7:30 am to 2:00 pm (Photo 1 below). The compost facility accepts leaves, mixed yard waste and some grass. Residents are discouraged from dropping off stumps, tree trunks, wood containing nails, roots or other non-compostable materials or contaminants.



Photo 1

The public drop-off and receiving area is unpaved and has an estimated 2 – 4 percent slope. The receiving area is surrounded by earthen embankment that has been constructed by the DPW to deter public access and to minimize noise and site visibility. The embankment varies from four to six feet in height and varies from about 7 to 15 feet wide along a partially flattened top. In periods of rain, ponding and muddy conditions have caused vehicles in the receiving area to become stuck.

The yard waste and brush receiving area sits over the foundation of an old farm. Pieces of concrete foundation can break off and become mixed into the leaf and yard piles that later are processed using a grinder creating a potential hazard if these pieces become airborne. Grinding takes place in the unpaved receiving area (see **Figure 2**). No restrictions are placed on public access to this area while operating the grinder. The Borough pays a fixed fee for use of a grinder as needed (if not in use by another municipality) from the Cumberland County Solid Waste Authority.

4.2 Leaf Composting Pad

Leaves collected curbside from the Borough and from Wormleysburg and Shiremanstown Boroughs are dumped in parallel rows onto the compost pad, which is a fenced area that is separate from the yard waste and brush area (Photo 2). The compost pad is approximately 2.0 acres. Windrows on the pad are typically constructed 8'H x 14'W and 250' – 400' long. Leaf boxes and miscellaneous supplies and equipment are stored along the fence.



Photo 2

4.3 Mulch and Compost

Mulch and compost is available at no cost to residents. The mulch and compost pickup area is located inside the gated receiving area to the right of the entrance (refer to **Figure 2**). Residents must make their own arrangements to load and haul the mulch or compost to their property. Residents should call the DPW to check on the availability of mulch and compost since it is not always available.

4.4 Equipment Sharing With the Cumberland County Solid Waste Authority

The Cumberland County Solid Waste Authority has an equipment sharing arrangement in place that enables the Borough and other municipalities within the County to share the County-owned compost equipment on a first-come first-serve basis. The County currently offers the following

equipment at a fixed annual fee that varies based on the type of equipment. The fixed price arrangement for equipment may be adjusted to an hourly rate in the future.

1. Two Scat Windrow Turners, Model 482B
2. Two Transport Trailers - Interstate Trailer Model 20DT
3. One Olathe 867TG Tub Grinder
4. One Vermeer HG 525 Horizontal Grinder
5. A Prospector Trommel Screen - Model 620
6. Mill Creek Top Dresser - Model Number 75

The Borough DPW borrows one of the County's grinders as needed. Cumberland County Solid Waste Authority records show the Borough used one of the grinders in January, March, April, May, June, August and October. The Borough brings a windrow turner on site for a couple weeks at a time about three or four times per year. In 2007, the Borough used the windrow turner for extended periods in January and in April. The Borough indicated it typically uses the windrow turner four (4) days per week when it is at the compost facility.

5.0 CAMP HILL BOROUGH SITE VISITS AND COMPOST SITE EVALUATION

5.1 Compost Site Evaluation

Site visits of the Camp Hill Borough compost facility were conducted by GF on October 3, 2007 and October 16th, 2007. GF evaluated the existing site with consideration of current operation and composting methods and the potential impact from proposed construction along the 581 corridor. **Table 1** is a site evaluation form that was completed that shows the compost site had positive (+), neutral (0), and negative (-) ratings for various criteria. Some favorable characteristics include:

- **Located adjacent to Public Works Facility** – facilitates site monitoring of public use and easy access by Public Works Staff as needed to complete tasks.
- **Compost pad is fenced and site is generally buffered from residential receptors or impacting other sensitive areas** – Reduces negative residential impacted by sight, noise, odors and dust.
- **Outgoing Material Demand** – Finished mulch and compost material moves offsite quickly because of the demand by residents and local landscapers. This minimizes the need for large material storing areas. Material is readily available for the rented gardens.
- **Paved Compost Pad** – The paved compost pad provides an efficient and solid working surface to manage compost piles, which minimizes impact (e.g. ponding) from rain events, reduces dust, improves vehicle mobility and eliminates soil and gravel being mixed into windrows.

COMPOST SITE CRITERIA	SITE RATING (+, 0, -)	ADDITIONAL COMMENTS
LAND/LOCATION/OWNERSHIP		
Remote from residential areas	+	Compost pad exceeds 300' recommended buffer; tree line buffer
Close proximity to material generation	+	Yes
Sufficient size/available land area	0	Receiving area is smaller than desirable & unpaved; Compost pad near max capacity – approximate .10 acre loss from PENNDOT construction.
Ownership/ Control of site	+	Borough owns site and access; public works facilities on site
Vacant	0	Gardens on property rented to borough residents
Level to moderate slopes	+	Compost pad is level (1% slope); drop-off is 3%-5% slope
Good drainage, no high water table	0	Generally, drainage is not a problem, but earthen berm could trap water
Not within 100 feet of a perennial stream or within 300 feet of a water source	+	No stream observed
Outside of floodplain	+	Yes
SENSITIVE AREAS		
No wetlands	+	none
No historic sites	+	none
No rare/endangered species	+	none
No restricted lands	+	none
No sensitive “receptors” nearby	0	Residents approximately 100-300' from stockpile; no complaints
No sinkhole areas (within 100 feet)	+	None observed
ACCESS		
Easy access for vehicles, equipment, & public	+	Adequate access for current traffic levels
Control of access to unauthorized persons	-	Gated entrance. Visual monitoring from public works building/staff. However, unsafe operation occurs when using the grinder and heavy equipment while residents are accessing the area. Residents drive onto compost pad to get material, which should be restricted from public access.
UTILITIES		
Water supply	+	Yes, near compost pad
Stormwater management	0	Unpaved Receiving Area has stormwater management problems. Paved area has stormwater controls in place.
PROCESSING CAPACITY		
Processing equipment	0	Borrow grinder from Cumberland County; loader in poor condition
Equipment utilization	0	Additional turning of leaves & pre-grind will accelerate composting
Staff Allocation	-	Added staff time will increase material processing/ throughput
Residential traffic flow	-	5 vehicles during 1 hour site visit; no continuous flow loop for traffic
Commercial traffic flow	-	No registration or tracking system in place
Onsite compost methods	-	Low level of compost knowledge by staff; slow compost process
Material distribution offsite	0	Residents take away; some is sold; used for public works applications
Processing equipment storage on-site	+	Loader on site at public works facility; storage is available
MATERIAL QUALITY		
Incoming Yard Waste	+	Clean incoming yard waste
Mulch	0	Higher wood content & additional curing is preferable
Leaf Compost	0	Unscreened; additional curing preferable
+ Positive 0 Neutral - Negative		

There are areas at the Borough's compost facility where the layout, operation and safety of the site can be improved. The neutral and negative ratings in the site evaluation are primarily associated with site layout, safety, and the limited amount of processing capacity, particularly for leaves. In the case of this evaluation, **processing capacity** refers to various aspects of the compost site: space or site area, operations and equipment utilization, composting methods, and material receipt and distribution, which all contribute to the full cycle of receiving and processing leaf and yard waste and moving finished material off site. Some of these findings may not have been observed during the site visits but were discussed during the walk through or determined as part of this evaluation. Some important neutral and negative ratings include the following:

- **Compost Pad Area Utilization** – Using current leaf composting methods, the existing compost pad is near its capacity to unload truckloads of leaves into windrows from fall leaf pickups from Wormleysburg, Shiremanstown, and the Camp Hill Boroughs. Pre-grinding leaves in a tub grinder will require additional staff time but will result in immediate size reduction of windrows creating more working space on the compost pad.
- **Staff Utilization** – Although GF did not conduct a staff utilization analysis, it is evident that increasing the availability and allocation of staff for operating the compost facility would increase processing capacity, increase the rate of composting and material throughput, improve material quality and consequently increase compost facility operating costs. Allocating more time to the compost activities could include: more frequent windrow turning using both the loader and windrow turner; pre-grinding leaves; occasional watering during dry periods; occasional screening of material; mixing of ground yard waste into leaf windrows (not currently done). Some allocation of staff time will be required temporarily to make site improvements recommended in this Report if the Borough chooses.
- **Storage of Miscellaneous Supplies and Equipment** – As seen as in **Figure 2**, the entire northern edge of the compost pad contains various miscellaneous supplies and equipment. The area used to operate equipment, particularly for the purpose of turning windrows, may be increased by as much as 12 feet (along the full length of the fence) by removing these obstructions from the compost pad. Moving these miscellaneous supplies and items to an alternate storage area is recommended.
- **Traffic Flow and Safety** – Residential and commercial vehicles that enter the drop-off/receiving area at the compost facility enter and park to unload or dump yard waste onto a centralized pile. In periods of low traffic volume, the current configuration appears to operate satisfactorily; however, GF believes that the configuration could be safer and more efficient. Because the finished compost and mulch is located inside the gate of the drop-off/receiving area, vehicles that visit to only pick-up material are

combined with those dropping off yard waste. It is preferred that vehicles entering the property to pick up material would not have to enter the gated drop-off area.

Vehicles are permitted to enter the drop-off area during periods when Borough staff are operating the County grinder to process accumulated piles of mixed yard waste. This activity is unsafe. Grinders may eject woody materials and rocks long distances during processing. Visitors should not be permitted to enter the grinder area when it is operating. **Figure 3** shows a proposed configuration for a temporary brush drop-off (TBD) area located beside the proposed mulch and compost pickup area that would allow visitors to drop-off brush and yard waste during periods when the grinder is in use without entering the gated drop-off/grinding area. After material has accumulated in the temporary yard waste staging area, it can be moved with a loader directly into the drop-off/grinding area. The temporary brush drop-off area could be paved, bordered by concrete barriers and have chained access so that the area can be opened and closed as needed.

GF also observed that a resident drove directly onto the compost pad while a loader was operating. All non-Public Works Department vehicles and persons should be restricted from the compost pad.

- **Windrow Composting Methods** - The application of windrow composting techniques to accelerate the decomposition of incoming material at the Borough's compost facility can be improved. The Borough indicated that constructed leaf windrows are 8' H x 20' W x 275 or greater in length, which are slightly larger in height and width than is optimal for composting. Windrows exceeding 6' H and 14' W can reach and sustain temperatures above optimum ranges, which slow down composting rates. Smaller windrows will take up more area of the compost pad.

Incoming leaves that are dumped out of leaf boxes are compacted and compost slower than uncompacted leaves. After a period of sitting on the pad in this pre-composting compacted state, the leaves are broken apart with a loader. This is done about a month before the arrival and use of a County-owned windrow turner. Even with the breaking apart of leaves with the loader, the composting process will remain slow and uneven within the windrow piles resulting in slower composting and slower pile size reduction.

Pre-grinding leaves could benefit the current leaf composting process by creating a uniform particle size, more surface area for microbial activity, and by achieving material size reduction in the grinding process. This should be considered by the Borough since the compost pad has limited space for processing. If implemented, leaf grinding should be done in conjunction with adding porosity/air flow by introducing wood chips or similar bulky material, adding some green materials for nitrogen, and increased turning frequency using a windrow turner (preferred) and loader. Pre-grinding will be an

additional step in the process, but can result immediate size reduction and accelerated composting if proper care is taken.

Proper understanding and application of composting methods including the requirements for moisture, oxygen, temperature, and nitrogen to carbon ratios and maintaining adequate levels for each of these factors will improve and accelerate the overall composting process and contribute to a higher quality finished product. Based on the current status quo for composting at the Borough’s facility, it is realistic that the Borough could accelerate the time frame to produce finished compost by several months.

- **Material Quality** – Incoming yard waste material has very low levels of contamination which helps to produce a desirable finished mulch or compost. However, there is little segregation of larger diameter woody material from mixed yard waste so the mulch that is produced appears decomposed and fine. The current mulch can be, and is used for landscaping, but might be considered lower quality mulch by some industry standards. Because the mulch is not windrowed and is cured only for a short duration in heaps it may become “sour” mulch and be toxic to some plants. Testing would be needed to verify toxicity.

The leaf compost that is produced is fair but could be markedly improved by adding nitrogen. Using green materials (e.g. grass, green shrubs and leaves, etc.), adding curing time, maintaining adequate moisture, oxygen, temperature, and nitrogen and carbon ratios will accelerate the composting process. Consistently building piles 6’H by 12’-14’W should improve composting rates and quality. Screening is not a required final step for composting, but use of the County trommel screen (or other screener) will improve the finished product. High quality and screened compost will increase the demand for the material and improve the Borough’s ability to move material quickly offsite to residents and commercial users, thus completing the lifecycle from incoming to outgoing material. If screened compost is produced and loaded into vehicles by Borough equipment, it should be sold (per cubic yard), to help offset processing costs.

5.2 Evaluation of PENNDOT Construction Impact to Compost Operation

GF evaluated the potential impact to composting activities that would result from the “take” of land along the southern edge of the Borough’s compost pad for the planned Route 581/15 highway construction (refer to **Figure 4**, PENNDOT Sheet 74). During the site visit on October 3rd, GF walked the edge of the compost pad where boundary markers had been placed by PENNDOT. As it is understood by GF, these markings delineate the new location of the fence enclosing the compost pad that will be installed by PENNDOT as part of their construction activity. The PENNDOT Sheet shows the area of the take shaded in orange. The green area is the temporary PENNDOT easement. Based on our field observations, and based on the

PENNDOT engineering drawings, it is estimated that 4,230 ft² or 0.1 acres will be lost from the compost pad area due to PENNDOT highway construction activities. Our analysis of the impact to the compost operation assumes the area that will be impacted by PENNDOT is accurate and will not increase when actual construction is performed.

GF concludes that PENNDOT construction will have only a marginal impact to the processing capacity and windrow composting activities for leaves, provided incoming leaf volumes don't increase noticeably. Data shows incoming leaf volumes have been steady for several years and are not anticipated to change. Further, it is expected that the impact from the reduction of the pad area can be partially or entirely offset by implementing several site and operational modifications. The Borough can create some space for operating windrow turning equipment by removing pieces of miscellaneous equipment and other supplies that are currently stored on pad. Site modifications, including an option for the Borough to construct a pole building structure for equipment/supply storage, are shown in **Figure 3**. There is also some opportunity for the Borough to reduce the amount of space taken up on the compost pad by leaf windrows by pre-grinding leaves.

6.0 FUNDAMENTAL COMPOSTING PARAMETERS

The Borough can improve the current leaf composting process by introducing ground green material (nitrogen) and some ground woody material to add porosity to the leaf windrows. Piles should achieve and sustain temperatures from 130°F to 150°F. A stable, well-decomposed compost product can be produced in three to four months and should be cured for at least two months. The Borough has limited access to materials with nitrogen content and this will slow composting rates. The following parameters work in concert and will influence the rate of decomposition and product quality:

Carbon (C) and nitrogen (N) balance - These essential nutrients are food for decomposer microbes. They must be provided in the organic materials being composted. Yard waste and leaves are low in nitrogen, which slows decomposition. 20-30:1 Carbon to Nitrogen is optimal.

Material (Carbon:Nitrogen)

Fallen Leaves (60:1)

Wood (400:1)

Grass (19:1)

Moisture - Moisture is contained in yard waste materials or added. Active composting is often a net user of water and dry periods will require watering of leaf and yard waste windrows.

Oxygen - Distribution of oxygen is governed by pile porosity and can be managed by including bulky materials like wood chips in active windrow piles. Oxygen can be added temporarily by mixing or turning piles. As particle size decreases in windrows, oxygen (air flow) generally decreases.

Surface area - Reducing the particle size by grinding, chopping, shredding, and turning materials increases surface area. Added surface area exposes more nutrients to microbes, but at the same time can reduce air flow.

Volume/pile size - The volume, or size and shape of the compost pile should be sufficient to create and hold heat generated by biological activity, but not so large as to inhibit air flow. Leaf and yard waste piles 6-8' high and 12-14' wide generally sustain heat and biological activity.

Temperature and time - Effective composting should produce temperatures in a range of 130°F to 150°F. Sustaining temperatures of compost at 140°F for 3 days is a conservative measure to kill weed seeds and pathogens. Achieving high compost temperatures that do not result in anaerobic conditions accelerates composting and will improve compost quality.

7.0 PROPOSED COMPOST SITE MODIFICATIONS

Figure 3 is a conceptual layout illustrating proposed changes recommended by GF for the Borough's compost site. The key site modifications include:

Vegetated Earthen Barrier – Reconstruct, seed, and relocate the existing earthen barrier/buffer. Pushing the material of the existing buffer back toward the existing tree-line to form a higher buffer with a level surface will add 10' – 15' to the receiving area along most portions of this berm. This should be done without further burying or removing existing trees, which buffer the site from nearby residential establishments. The existing earthen barrier forms a “c” shape and on the northeastern down slope side appears to be a potential catch point for rain and runoff. The new barrier should be constructed so that this area directs water to flow down slope to existing stormwater systems that are located below/behind the receiving area.

Compost/Mulch/Temporary Brush Pick-up and Drop-off – Construct a paved area approximately 75' by 85' to allow residents to pick up mulch and compost without entering the leaf and yard waste receiving area. This pick-up area should include a temporary drop-off area for brush and yard waste. This temporary brush drop-off area would be used when a grinder is operating in the receiving area to allow drop-off but keep visitors at a safe distance from the equipment. As proposed, the construction of this pick-up and drop-off area will impact one of the adjacent gardens that are rented to local residents.

Miscellaneous Supply/Equipment Storage – Move supplies and equipment that potentially obstruct activities on the compost pad to an alternate area.

Pole Building – Due to the observed need to cover equipment and supplies exposed to the elements, consideration should be given to the construction of a pole building to house these items. A possible location for this structure is identified in **Figure 3**.

Leaf Compost Curing/Stockpile Area – Extend paving on the east end of the compost pad to create a designated area for curing/stockpiling leaf compost. The area is approximately 60' by 60' and would be fenced.

7.1 Compost Site Modification - Preliminary Cost Estimate

GF has made several recommendations in this report to improve the operation efficiency and safety of Camp Hill Borough Compost facility operation. GF has provided a preliminary cost estimate for the recommended modifications (**Table 1**). The Proposed Compost Facility Modifications (**Figure 3**) and preliminary cost estimate is intended to be a guideline for the Borough. Items that are eligible for up to 90 percent reimbursement through the Section 902, Act 101 Recycling Grant program are checked. Due to the existing degraded condition of the Borough's front end loader, a new loader is included in the cost estimate. The old loader should be maintained and retained on site as a backup and for operating two loaders simultaneously on site.

GF encourages Borough staff and the DPW to review the proposed modifications and determine what cost/activities can be fully or partially absorbed by the DPW. Decisions regarding what proposed modifications are implemented and when they are implemented should be based on the Borough's final assessment of what features are a priority to the facility with consideration of future operating plans for the compost operation. A phased approach to implementing the items may be feasible.

Table 1: Preliminary Cost Estimate for Proposed Compost Facility Modifications

Item/modification	Unit Cost	Quantity	Extended Cost	Recycling Grant Eligible
PAVING				
Compost/Mulch Pickup area (75' x 85')	\$23.20/SY (installed 4" 2-A; 5" 25mm super base)	708 SY	\$16,425	✓
Leaf Curing/Stockpile area (60' x 60')	\$23.20/SY (installed 4" 2-A; 5" 25mm super base)	400 SF	\$9,280	✓
Pole Building/storage (60' x 60')	\$20/SF	3,600 SF	\$72,000	No
CONCRETE WALLS/BLOCKS				
2' x 4'	\$35 ea.	15	\$525	✓
2' x 6'	\$45 ea.	55	\$2,500	✓
Delivery	Lump Sum	Lump Sum	\$200	✓
FENCE				
8' Chain Link (70')	\$22/LF	70'	\$1,540	
EARTHWORK				
Vegetated Berm	DPW Labor	DPW Labor	--	NA
SIGNAGE				
- Mulch/Compost Pick-up - Temporary Brush Drop-off (hangs on chain)	Lump Sum	Lump Sum	\$250	✓
EQUIPMENT				
Front End Loader	\$100,000	1	\$100,000	✓

Note: Pricing for paving and concrete walls were provided by Hempt Brothers, Inc. (October 2007).

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

The Camp Hill Borough compost site has successfully operated since 1996. Since that time, the site has expanded in both its size and in the amount of leaves, brush and mixed yard waste that is received and processed. The site is used frequently by residents and commercial entities that drop off mixed yard waste, including brush. The compost facility also processes truckloads of leaves collected at the curbside from Camp Hill, Shiremanstown and Wormleysburg Boroughs. Camp Hill records show the compost facility accepted **7,800** tons of leaves and mixed yard waste in 2006.

Although the site is near its maximum capacity for accepting and composting leaves, the Borough can continue to manage the current level of leaves and yard waste without major changes to the compost site. Data shows incoming annual quantities of leaves are steady. It is not expected that substantial increases of leaves would be received at the compost facility in upcoming years unless the Borough or participating municipalities increase their level of collection service. If the processing capacity for leaves is exceeded (i.e. the compost pad runs out of space), the Borough could limit the quantity of leaves accepted from Wormleysburg and/or Shiremanstown, divert some leaves to nearby farm fields for leaf application, or construct an additional area for windrowing leaves on the site (likely in the area where rented gardens are currently located).

Proposed site modifications and estimated cost are presented in Sections 7.0 and 7.1 of this Report. GF believes site modifications and improved composting methods can benefit the overall compost operation performance in terms of accelerating the compost rates (i.e. reduce the number of months needed to produce finished compost), improving compost material quality, improving efficiency, and improving worker and public safety. The level of success achieved in some of these areas will be directly tied to the amount of staff time than can be allocated to the compost facility. GF understands that the current levels of DPW staff with consideration of existing work responsibilities may not afford the flexibility to dedicate more staff time to the compost operation. Additional staff time will increase operating costs.

Based on GF's evaluation of the Camp Hill Compost facility, the primary findings and conclusions are:

- The compost site is a benefit to the residents and communities of Camp Hill, Shiremanstown, and Wormleysburg Boroughs.
- Because of space limitations, the compost pad is near its maximum capacity for receiving, windrowing, and processing incoming truckloads of leaves. However, the need for addition compost pad area or processing capacity is not immediate.
- Marginal increases in processing capacity can be achieved through improved compost facility management and composting methods but the ability to accept additional quantities of leaves at the facility will require the development of an additional windrowing area. Developing another leaf composting pad or significant expansion of the existing pad is not recommended at this time since the leaf processing capacity approaches but does not exceed processing capacity.
- Because of space limitations, the brush and yard waste receiving area is near capacity. This area can be managed more effectively than leaf pad because the County grinder can be used regularly to reduce the size of accumulated piles of brush and other yard waste.

- The compost and mulch produced is quickly taken off site by residents and commercial users. Some of the compost and mulch that is produced is not cured for a sufficient duration for the material to be “mature”. Although it is beneficial to have a steady outgoing market for material, immature compost may damage plants if phytotoxic compounds like ammonia or organic acids are present.
- There are several safety risks at the facility. There are unsafe conditions for the public and for operators of commercial vehicles that enter the compost facility receiving area and compost pad while loaders and the grinder are operating. Because the brush and yard waste receiving area is located on the foundation of an old farm, concrete pieces break off the foundation and can be inadvertently loaded into the grinder. These pieces can damage equipment causing expensive repairs and down-time. Rocks and other materials may be ejected from the grinder creating a safety hazard. There are risks for people crossing the road to retrieve water for the purpose of watering their rented gardens. The faucets and people are obstructed from view by a row of arborvitae.
- The PENNDOT RT 581 construction along the southern edge of the compost pad should not have a noticeable negative impact to the compost site operation/processing capacity. The extent of impact to the compost pad operations can be partially offset by site and operation modifications recommended in this Report.
- Commercial vendors (e.g. local landscapers) frequent the compost facility to dump loads of yard waste, but they are not tracked in any way by the Borough.
- Leaf windrows are currently constructed slightly larger than is optimal for composting.

8.2 Recommendations

GF has provided recommendations throughout the body of this Report and identifies key recommendations in the following section. It should be clear that it will be up to the Borough Manager and staff to determine what future direction is desired for the compost facility. This direction will affect how, when, and if, certain recommendations are implemented. Finding an acceptable balance of staff that can be allocated to compost facility management/tasks will have a direct impact in the overall compost operation, material throughput and finished material quality.

Based on the evaluation of the Camp Hill Compost facility, GF recommends the following:

- Using a phased approach and with consideration of staff and financial resources, prioritize recommended site improvements and implement the site improvements and operational changes noted in this Report (refer to Section 7.0 and **Figure 2**).

- It is recommended the Borough submit for Act 101, Section 902 Recycling Grant funding for eligible costs associated with the site improvements and equipment cost associated with the compost facility (refer to Section 7.1). Based on GF's discussion with PADEP, the pole building for equipment and supplies is not eligible under this Recycling Grant program.
- It is recommended the Borough purchase a new front end loader for handling brush and yard waste and retain and maintain the old loader as a backup and so that two operators can operate simultaneously at the site as needed (e.g. during grinding when one operator could sort and inspect material while another load and stockpile processed material). Because of access to the County equipment, it is not recommended the Borough procure a windrow turner, a grinder or screener. The frequency of obtaining County-owned equipment items could be increased to expedite material processing when these items are not in use by other municipalities.
- Cut at least three (3) arborvitae on either side of any water faucets along the fence to increase visibility of persons using and stepping out from this area onto the roadway.
- Because of the risk of damage to County-owned grinding equipment from concrete debris, two operators are recommended to be on site for grinding operations. One person should be used to inspect loads prior to adding to the loader. Material could be picked up once, shaken and dropped onto the ground as a pre-check to allow unwanted rock and similar debris to fall from the brush before processing.
- Conduct a **pilot study** to compare compost pile size reduction and composting rates. Set 1: Three windrows should be constructed and managed as they are normally done at the site. Set 2: The material from three separate windrows (not the windrows from Set 1) should be pre-ground with a tub grinder on the pad and then windrowed. The Borough should visually observe and quantify the size reduction achieved through grinding and determine if there is an immediate benefit in terms of space on the pad. Using a loader, scoops of ground mulch should be spread 3-4 inches thick evenly across the top of each ground leaf windrow. The mulch that is added to the top of each windrow should contain some bulkier shredded woody pieces and some green material (green, leaves, grass, green shrubbery, etc.) if it is available, to add some nitrogen to the compost process. The windrows from Set 1 and Set 2 should be turned with a loader and windrow turner the same number of times from the end of November to the end of March (once every two weeks with a loader is recommended and two or three times per week when the Borough has the turner). The windrow Sets should be compared at the end of March to determine the rate of composting, pile size reduction achieved, compost quality, and to compare the amount of time remains for each windrow Set before they can be placed into curing piles.

- To expedite composting rates, leaves should be formed into windrows that are 6' H by 12'-14' wide and in parallel rows. With regular windrow turning, the parallel rows should then be combined after size reduction has been achieved over a 4-6 week period.
- All commercial vendors (e.g. local landscapers) should be required to register with the Borough and should be charged an annual registration fee. The registration process would include the completion of a form by the commercial vendor, payment of the registration fee, and either issuance of a windshield sticker or heavy-stock paper rearview mirror hanger that is displayed in the vehicle when entering the compost site. Stickers are sometimes undesirable because they adhere to and leave residue on the vehicle. Depending on placement and size, stickers may also be prohibited by PENNDOT. The registration process will be useful for tracking who accesses the facility and will help discourage dumping of unwanted materials.

A registration fee is justified since commercial landscapers and similar companies charge for their services and currently have free disposal at the Borough's compost facility, which incurs ongoing operational costs. In the first year, the Borough could charge the same fixed annual fee for each commercial vendor and inform registered vendors that in subsequent years the facility may base its fee on the amount of use by each commercial vendor. \$100 - \$300 per year is within a wide range of prices that GF has observed and this is far less than facilities that charge a tip fee by the load or ton (\$20 - \$45 per ton).

- The Borough could designate an area at Seibert Park for mulch and compost pickup to improve the convenience to residents on the northern side of the Borough. Since finished compost material already moves offsite quickly this is not necessary for compost operations but would be viewed positively by the community.
- It is recommended the Borough implement a strict operations policy prohibiting all public vehicles from entering the yard waste receiving area when the grinder is operating and prohibiting all public vehicles from driving onto the compost pad.
- In the future, if the Borough elects to allocate more time to the compost operation and improves the quality of finished compost and mulch, it should charge a fee for bucket loads (~3 cubic yards) for compost and mulch. \$5 - \$15 per cubic yard is reasonable price range for compost and mulch and is based primarily on the extent of processing.
- The Borough should identify additional commercial markets for compost and mulch. Although some finished material is sold to Zeager Brothers, the Borough could benefit from identifying other commercial outlets that will pay for compost and mulch to help offset operating costs. If the Borough improves the quality of the finished compost material (e.g. through screening), the Borough should charge a cost that reflects the quality of the material.

8.3 Future Recommendations

GF believes the Borough's compost site operates satisfactorily now and can be improved based on the guidance that has been provided. Looking ahead, GF also recognizes that the Borough's compost facility could benefit from providing a larger paved area to grind brush and additional paved area to receive, windrow, process, and stockpile leaves and yard waste. The current location of the gardens is a suitable and level area for such an expansion. This type of expansion would significantly reduce the area of the gardens that are currently rented to residents. If the Borough wishes to move in this direction at some time in the future, it should evaluate its ability to relocate the gardens to another park area (e.g. Willow Park). Moving the gardens to a different location would improve safety by reducing the number of visitors to the compost facility area, which already experiences a high volume of vehicle and pedestrian traffic.

Implementing this future phase would primarily consist of cost for paving that would be eligible (but not guaranteed) under the Act 101, Section 902 Recycling Grant program. Despite clear operational benefits from an additional paved working surface, GF would not recommend this large capital expense unless additional staff time will be committed to the compost facility to improve overall management of the compost facility, including an ongoing commitment to produce higher quality finished compost and to recover revenue from sale of compost and mulch products.

FIGURES

Figures 3&4 not in On-line Report



**Camp Hill Borough
Compost Facility**

Camp Hill Borough, Pennsylvania

LOCATION MAP



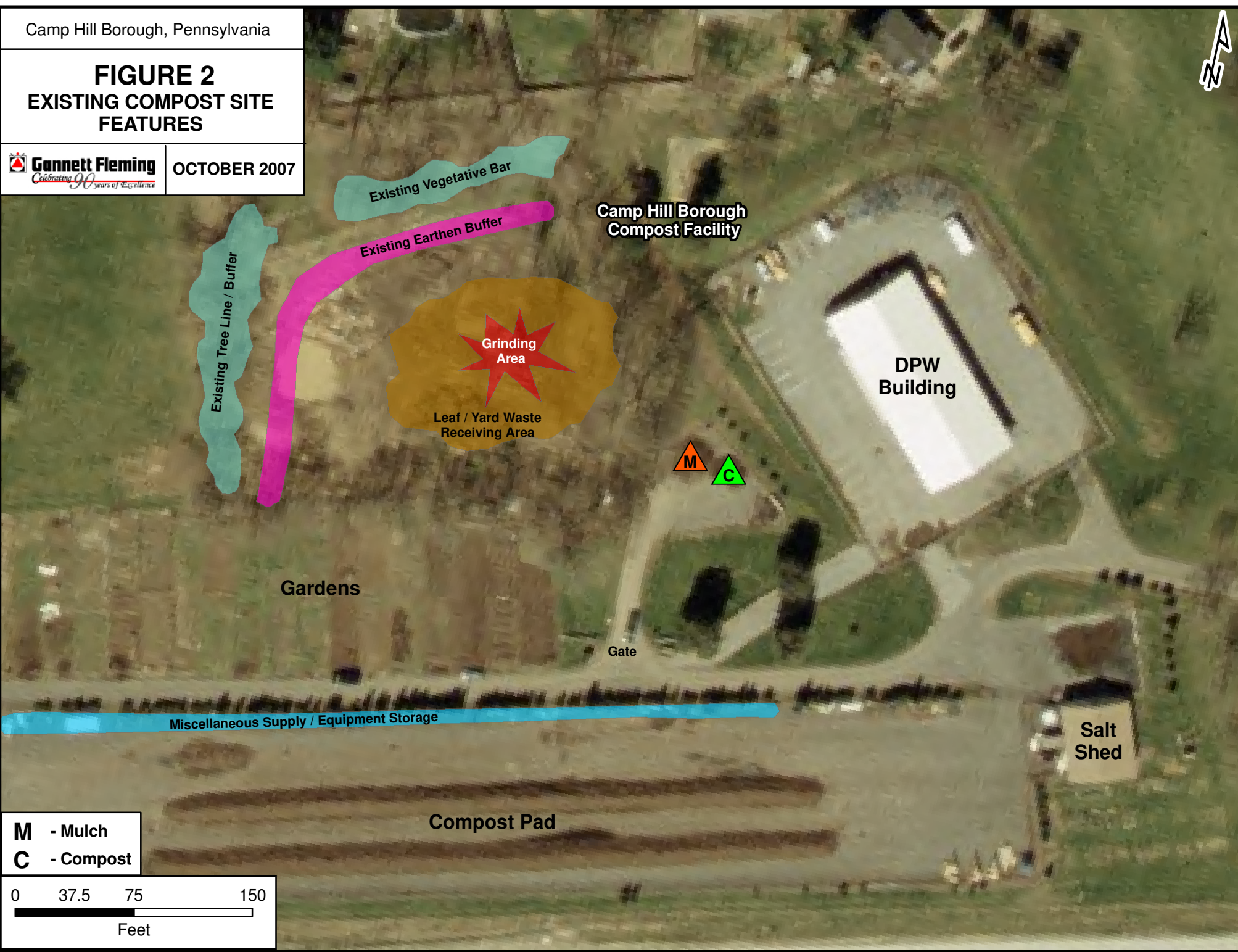
SEPTEMBER 2007

Camp Hill Borough, Pennsylvania

FIGURE 2 EXISTING COMPOST SITE FEATURES



OCTOBER 2007



M - Mulch
C - Compost

