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PREPARED FOR:
WILKES COUNTY DEPARTMENT OF SOLID WASTE
9219 ELKIN HIGHWAY
ROARING RIVER, NORTH CAROLINA 28669

ROARING RIVER LANDFILL
WILKES COUNTY, NORTH CAROLINA
PERMIT No. 97-04

OPERATION PLAN FOR THE
ROARING RIVER LANDFILL PHASE 3
WILKES COUNTY, NORTH CAROLINA



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MAR 10 2009

SOLID WASTE SECTION
ASHEVILLE REGIONAL OFFICE

REVISED MARCH 2009

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JEI PROJECT No. 356.08.36



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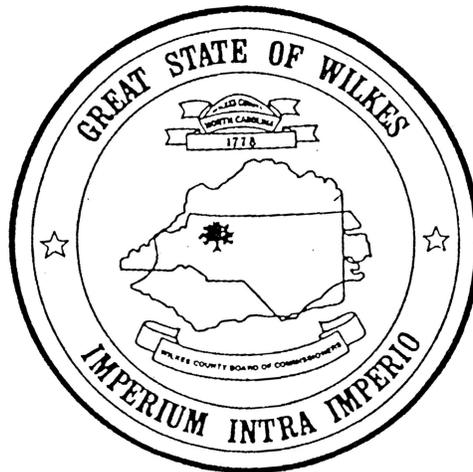
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Appendix V-2	Tarp Data Sheet
Appendix V-3	Temperature Log
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V. OPERATION PLAN

This operation plan describes how the design and construction plans will be implemented during the life of the facility. The plan consists of three drawings and accompanying text which illustrate existing conditions, cell progression, waste placement and daily operations, leachate management, special waste management, buffer zones and soil borrow procedures.

A. LANDFILL DEVELOPMENT PLAN

1.0 Existing Conditions

The Wilkes County Landfill is owned and operated by Wilkes County. Approximately 200 tons of municipal solid waste is managed daily at the site which is located off Highway 268 in Roaring River. The facility began accepting waste in October 1993 when lined Phase 1 began operating. Wastes are currently placed in the approximate 7 acre Phase 2 cell. Leachate collected from Phases 1 and 2 is stored in a lined surface impoundment, and then transported to the Wilkesboro Wastewater Treatment Plant for disposal.

Other on-site development consists of a scale house and office, maintenance building, recycling area, wood disposal area, and a soil borrow area. Much of the remainder of the site is wooded. See Drawing OP-1 for an illustration of the existing conditions at the site.

1.1 Proposed Development

Four additional phases of development for municipal solid waste disposal are proposed, along with a construction and demolition (C&D) waste disposal area. This proposed development is located in areas that have previously been designated as suitable for landfill development and are described in more detail in the Facility Plan. The Phase 3 disposal area described in the Engineering Plan consists of 6.7 acres immediately north of the active Phase 2 cell. Phase 4 expansion is a vertical expansion over Phase 3. Development of subsequent Phases 5 will progress to the north before crossing to the area west of an on-site drainage feature. Development in accordance with the phasing plan will allow the landfill to be closed at various times during its projected operating life. This will provide for an expeditious closure in the event that a decision is made to close an active cell before the cell's ultimate capacity is reached.

The on-site soil resources, usage, and balances are shown by phase in Table 4 of the Facility Plan. The deficit of soil during the operation of Phase 3 can be satisfied by excavating from the C&D area or by excavating from the large stockpile on the southern end of Phase 6. (The soils more suitable for final cover construction will be identified and reserved for that purpose.) Overall, based on conceptual design volumes, there is a surplus of soil over the life of the facility of approximately 90,000 cubic yards.

B. GENERAL OPERATING CONDITIONS

2.0 Hours of Operation

The landfill is open to private waste haulers and the public from 7:00 a.m. to 5:00 p.m. and the convenience center hours are 7:00 a.m. to 6:00 p.m. Monday through Saturday. The following holidays are observed: New Year's Day, Martin Luther King Day, Easter, Memorial Day, July 4, Labor Day, Veterans Day, Thanksgiving, Christmas Eve and Christmas Day.

2.1 Site Access and Safety

Access to the landfill is controlled through a single access road with a secure gate to prevent access when the landfill is not open. A sign containing information required in Rule .1626(6)(e), (i.e., dumping procedures, hours, permit number, etc.) is posted at the landfill entrance. During the hours of operation, traffic is routed from the entrance gate and scale house to a gravel road leading to the disposal area. Directional signs and speed limit signs are posted to provide traffic control. The road is maintained so that it is passable during all weather conditions. An attendant is on duty at the scale house at all times during operating hours.

2.2 Acceptable Waste

The landfill will accept only those solid wastes included in the current permit, including household, commercial and industrial solid wastes. These are defined in Rule .1602 as follows:

- Household waste means any solid waste derived from households including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas.
- Commercial solid waste means all types of solid waste generated by stores, offices, restaurants, warehouses, and other nonmanufacturing activities, excluding residential and industrial wastes.
- Industrial solid waste means solid waste generated by manufacturing or industrial processes that is not a hazardous waste regulated under Subtitle C of RCRA. Such waste may include, but is not limited to, waste resulting from the following manufacturing processes: electric power generation; fertilizer/agricultural chemicals; food and related products/by-products; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metals manufacturing/ foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay, and concrete products; textile manufacturing; transportation equipment; and water treatment. This term does not include mining waste or oil and gas waste.

Neither spoiled food, hatchery waste, nor other animal waste has been received historically in quantities large enough to be problematic for operations. In the event that such wastes are received, they will be immediately buried and covered with a thick layer of soil followed by nonputrescible municipal solid waste. If asbestos waste is received, it shall be managed in accordance with 40 CFR 61. The waste will be disposed of at the bottom of the working face and covered immediately with soil in a manner that will not cause asbestos particles to become airborne.

On or before August 1 of each year, Wilkes County will report to the Solid Waste Section the amount of waste received in tons at this facility and disposed of in the landfill units. Data will be transmitted on forms prescribed by the Section. The report will include the following:

- The reporting period shall be for the previous year beginning July 1 and ending on June 30.
- The amount of waste received and landfilled in tons, compiled on a monthly basis by county or transfer station of origin and by specific waste type if diverted to a specific unit within the permitted facility; and
- The completed report shall be forwarded to the Regional Waste Management Specialist for the facility. A copy of the completed report shall be forwarded to the County Manager of each county from which waste was received.

2.3 Prohibited Waste

A sign is posted at the landfill gate (see Section 2.B above) that reads "No hazardous or liquid waste accepted without written permission from the Division of Solid Waste Management". The landfill will not accept:

- hazardous waste as defined within 15A NCAC 13A, including hazardous waste from conditionally exempt small quantity generators;
- Polychlorinated biphenyl (PCB) wastes as defined in 40 CFR 761; liquid wastes (i.e., any waste material that is determined to contain "free liquids" as defined by SW-846 Method 9095 (Paint Filter Liquids Test), unless the waste is household waste other than septic waste or waste oil, or leachate or gas condensate derived from the landfill (however, leachate and gas condensate may only be recirculated in cells with liner constructed as described in Rule .1624(b)(1)(A)(i).); and
- barrels and drums unless they are empty and sufficiently perforated, except fiber drums containing asbestos;
- other wastes specifically banned from landfill disposal by rule or statute, such as lead acid batteries, whole tires, used oil, or aluminum cans.

Wilkes County will notify the Division within 24 hours of attempted disposal of any waste the landfill is not permitted to receive, including waste from outside the area the landfill is permitted to serve. The waste screening program is described later in this Operation Plan.

2.4 Special Waste

The landfill accepts "special waste" such as tires, white goods, and wood waste. These special waste are separated from the general disposal area.

The tire collection shall be managed in accordance with Solid Waste Management Regulations Section .1100. Section .1107 provides detailed scrap tire collection site operational requirements.

- 1) Scrap tires stored indoors shall meet conditions for the Standard for Storage of Rubber Tires, NFPA 231-D1986 by the National Fire Protection Association.
- 2) All scrap tire collection sites processing tires outdoors must comply with technical and operational standards (2)(a) through (2)(l) of the Section .1107.
- 3) Processed tires shall be stored in accordance with the requirements of indoor/outdoor storage rules (a) temperature rules, and (b) residuals from the scrap tire disposal.

- 4) The Division may approve exceptions to the technical and operational standards (a) at least once during 30-day period all scrap tires are removed from the site for disposal; and (b) the site owner has sufficient fire suppression equipment or materials on-site to extinguish potential fire.

Tires are collected at the designated tire collection area and placed in a trailer for transportation to disposal. The County contracts with a private hauler to transport the tires to an approved facility for recycling and/or disposal.

White goods are separated from the general waste and stored for salvage by a private recycler. The landfill's recycling area handles cardboard, mixed paper, old newsprint, aluminum, steel cans, used motor oil and plastic.

Clean, untreated wood waste (largely pallets) is separated and stored on-site until it can be recycled or ground for mulch. C&D waste that is not appropriate for recycling or mulching is currently disposed in the lined landfill.

2.5 Litter Control

The public judges a landfill site by the things that they see. While there is no way to catch every piece of paper, scattered and blowing litter can be minimized by keeping the size of the working face small and by covering parts of the cell as it is constructed. Some measures that may be taken to minimize litter are:

- a. Unload vehicles at the base of the working slopes to use the working face itself as a wind screen.
- b. Unloading against the wind can help to keep the load compacted until the loader can push the waste onto the working face.
- c. Add a thin layer of cover material to the compacted working face periodically throughout windy days to help
- d. Heavier waste materials can be used on the surface to help keep lighter waste materials from dislodging or becoming airborne.
- e. Temporary litter fences strategically located on the working face help intercept and trap blowing litter. Any litter recovered from such fences, as well as litter blown into adjacent areas, must be collected and landfilled on a regular basis. Multiple defenses of temporary fences and/or berms help to contain windblown material during operations. In addition, landfill personnel will pick up windblown litter along the access road and in locations around the active disposal area.

2.6 Equipment

The following list of equipment is currently in use at the landfill for current operations averaging approximately 200 tons of waste disposed per day (TPD₆):

Type	Make/Model	Year
Trucks	Mack RD688 Rolloff	2000
	International 7600 Rolloff	2008
	Kenworth W900 Road Tractor with 40' Dump Trailer	2006
	Mack CV 713 Dump Truck	2007
	Volvo A30D Dirt Truck	2004
Compactors	Terex 390E	2005
	Cat 826G (Back-up)	1999
Bulldozer	Cat D3B	1982
	Cat D6NXL	2005
Excavator	Cat 320BL	1999
	Volvo EC55B Excavator	2005
Loader	Cat 973C Trackloader	2007
	Bobcat S300 Skidsteer Loader	2003
Other	Champion 710A Motorgrader	1999
	Ford 4630 Tractor	1995
	Finn T90 Hydroseeder	1998

As the waste stream changes during the operational life of the facility, equipment needs will be periodically reviewed and additional equipment purchased or leased as needed. New equipment will be phased in as older equipment is retired.

2.7 Air Quality

Open burning of solid waste including yard waste and brush is prohibited at the landfill. Burning of brush and/or stumps would only be requested on an infrequent basis in conjunction with construction events, if at all.

2.8 Dust, Odor, Fire and Vector Control

Dusty road surfaces will be sprayed with water from a water truck during windy, dry weather. Odors and disease vectors will be controlled by promptly covering the waste at the working face, and by the use of daily cover. Daily cover is described in more detail in a subsequent section.

Incoming waste loads shall be observed by site operators for evidence of fire such as flames, smoke, or the odor of burning material. Burning loads will be extinguished before dumping if possible. If there is evidence of fire in the landfill itself, the Wilkes County Solid Waste Director will be notified immediately. If possible, the waste will be removed or segregated from other waste in the disposal area. The landfill operator will evaluate the situation to determine whether the fire can be extinguished using fire extinguishers or equipment present at the site, or if off-site equipment will be needed. If necessary, the local fire department (Roaring River Volunteer Fire Department) will be called to render assistance in extinguishing the fire. Fires that occur at the landfill will be reported verbally to the Division within 24 hours and in writing within 15 days.

Fire extinguishers shall be located on each piece of equipment on site. Equipment operators shall be trained in the use of these extinguishers. Fire extinguishers will be used for small, localized fires. A stockpile of soil shall be maintained near the working face to be used for extinguishing small surface fires that may be too large to control with the fire extinguishers carried on the landfill equipment.

Emergency equipment will be called in the case of fires too large to be extinguished with fire extinguishers or soil as described above. Water contained in sedimentation ponds and the Yadkin River can serve as emergency reservoirs to aid local firefighters in the extinguishing of larger fires.

2.9 Scavenging/Salvaging

The unauthorized removal of waste and scavenging at the landfill is prohibited. Removal of recyclable or reusable items is sometimes authorized when recovery of such items can be accomplished with no risk to landfill staff or the general public, for instance, prior to disposal on the working face. Landfill personnel may remove salvageable materials and place them at the recycling center for removal by others. The general public is not allowed to scavenge items from the working face, and landfill staff attempts to prevent them from coming in contact with waste. The placement of additional roll-off containers near the scalehouse should help keep residential users from coming in contact with the waste.

C. RANDOM WASTE SCREENING PROGRAM

3.0 Authority

The Wilkes County Solid Waste Department has developed this "Random Waste Screening Program" in accordance with North Carolina's Solid Waste Management Regulations, Rule .1626(1)(f). Key elements of Rule .1626(1)(f) addressing waste screening are as follows:

No hazardous or liquid wastes as defined in 15A NCAC 13A or materials shall be accepted at the landfill except as specifically authorized by the facility permit or by the Division. The owner or operator shall implement an inspection program to detect and prevent disposal of hazardous and liquid wastes and polychlorinated biphenyls (PCB). This program shall include, at a minimum:

- Random inspections of incoming loads unless the owner or operator takes other steps to ensure that incoming loads do not contain regulated hazardous or liquid wastes or PCB wastes;
- Records of any inspections;
- Training of facility personnel to recognize regulated hazardous waste, liquid waste, and PCB wastes; and
- Development of a contingency plan to properly manage any identified hazardous and/or liquid wastes.

3.1 Random Selection

Random selection of vehicles to be inspected will be conducted on a regular basis, depending on personnel available. At least one vehicle per week, but not less than one percent by weight of the waste stream (based on the previous week's total), will be randomly selected at the working face by

the personnel conducting the inspection. A random truck number and time will be selected (e.g., the tenth load after 10:00 a.m.) on the day of inspections.

3.2 Record Keeping

Report forms for record-keeping purposes are included in Appendix V-1. These forms are completed at each inspection. All reports and resulting correspondence are maintained at the Wilkes County Landfill office for the life of the landfill and during the post-closure period.

3.3 Training

Inspections will be carried out and supervised by landfill staff trained to identify and manage hazardous and liquid waste. Landfill operators responsible for screening waste are trained by attending the Waste Screening training course offered by the Solid Waste Association of North America.

3.4 Inspection Site

Inspections will be conducted in a designated area near the working face of the landfill.

3.5 Action Plan

The following action plan details the procedure for conducting random waste inspections.

- 1) Dump single load in prepared area. Detain truck and driver until inspection is completed.
- 2) Spread waste with compactor and/or hand tools as appropriate. Hand rake loads that include items such as large closed containers to avoid possible rupturing of the containers. Have appropriate safety equipment present. Minimum safety equipment will include:
 - Rubber gloves;
 - Rubber boots;
 - Safety glasses; and
 - Long handled hoe.
- 3) Examine waste for excluded waste and/or safety hazards:
 - Containers labeled hazardous;
 - Excessive or unusual moisture;
 - Regulated biomedical (red bag) waste;
 - Powders, dusts, smoke, vapors, or chemical odors;
 - Sludges, pastes, slurries, or bright colors (such as dyes); and
 - Unauthorized out-of-County waste.
- 4) Take appropriate action(s) as follows:
 - Incorporate acceptable waste into working face.
 - Hold suspect waste for identification by on-site personnel and, if necessary, confirmation by others such as a contract laboratory, hazardous waste management firm, or state and/or federal regulator.

- Interview driver and hauler to identify the source of suspect waste in the load.
- Hold rejected hazardous or liquid waste for generator.
- Arrange for hazardous or liquid waste collection by licensed collector.

5) Document Actions:

- Record Inspection.
- Retain Reports.
- Report hazardous, liquid or PCB wastes to Solid Waste Section - DENR.

D. SUBCELL PROGRESSION AND WASTE PLACEMENT

4.0 Subcell Progression

The method of filling shall be the area method in accordance with the filling sequence shown on Drawing OP- 2. Phase 3, as well as successive phases, will be constructed with multiple subcells and stormwater segregation features to limit the amount of stormwater runoff that becomes leachate. Inactive subcells will be separated from the active area by the use of temporary berms and a geosynthetic raincover to segregate the uncontaminated runoff. As filling progresses, the raincover will be retracted from an individual subcell as the subcell opens to receive waste. The first subcell will be in the southwest area of the phase. Constructing the first subcell at this location provides for a convenient transition from Phase 2 to Phase 3 since haul trucks can access the disposal face without having to traverse unopened lined areas. This will reduce the potential for damage to the underlying leachate collection system and liner by limiting traffic to those subcells that already have a lift of waste in place. Also, as subsequent subcells are opened in the planned sequence, uncontaminated stormwater can be diverted around the active subcells for collection and removal at the northwest corner of the cell. Stormwater will be pumped from the collection area into the existing drainage channel leading to the sediment basin north of Phase 3.

Drawing OP-3 shows annual phases of development for Phase 3 of the landfill. The grades are projected based on the waste stream increasing at a rate of 1% as discussed in the Facility Plan.

4.1 Waste Placement and Compaction

The waste will be tipped in the active subcell as closely as possible to the working face, then pushed, if necessary, to the desired area. The length of the daily working face will be maintained at approximately 100 feet in order to provide adequate space for several trucks to dump at the same time. The width of the working face will vary somewhat depending on the rate of waste acceptance on a given day, weather conditions and other factors, but will be maintained as small as possible. The waste will be compacted as described below with one of two steel-wheeled compactors the County owns (see equipment list earlier in this section).

To minimize the chance of damage to the liner in any new subcell, the initial lift of waste will be at least 5 feet thick, and will consist of only residential, non-bulky waste. Compaction will be minimal because later lifts will surcharge the initial lift so that there is no net loss of density. Typical compaction procedures on lifts above the initial one will involve placement of waste in thin layers (1-2 feet thick) as flat as is practical. The compactor will roll across and slightly past the waste (to prevent wind-blown material leaving from the edge of the lift) a minimum of three times. Previous

calculations have determined that the approximate in-place density of waste and soil combined is around 1200 pounds per cubic yard. This waste density calculation will be reviewed periodically and operational procedures may be revised to improve the efficiency of the site.

4.2 Daily Cover

At the end of each day's operation, compacted waste in the subcell shall be covered with either a minimum six inches of soil, or an approved alternative cover material approved by the Solid Waste Section (SWS). When soil is used for daily cover, at least two passes of heavy equipment will be made over the area to provide adequate soil compaction. Waste may be covered more frequently than once per day if necessary to control fires, odors, or blowing litter.

4.3 Intermediate Cover

In areas where another lift of waste will not be placed for at least 12 months, an additional 6 inches of soil shall be placed over the daily cover for a total of 12 inches of intermediate cover. Organic soil amendment in ratio 50/50 is allowed with the cover soil to promote healthy vegetative growth. Provisions for a vegetative ground cover sufficient to restrain erosion shall be accomplished within 120 calendar days following completion of each phase of development.

4.4 Alternate Cover Material

One alternate cover material (ACM) method is described in this section; tarps. The ACM shall provide control for disease vectors, fires, odor, blowing litter, and scavenging. An ACM in addition to soil may be used daily. Through a NCDENR Solid Waste Section demonstration period October 29, 2008 through February 20, 2009, the ACM has been determined to provide an equal or better element control as soil.

For precautionary measures regarding fire in the waste, ACM shall not be used more than 5 consecutive days. Soil will be used on the 6th day of covering.

4.4.1 Tarps

Tarps are proposed as an ACM. The tarps will be placed either manually or by using equipment. Tarps will not be used on any waste area that will not receive additional waste over a 24 hour period.

4.4.1.1 Properties of Tarps

Tarps shall be Fabrene TGP3N3M or equal (manufacturer data sheet is included in Appendix V-2) and have properties as follows:

Unit Weight	9oz/yd ²
Warp Construction	23.9 Tapes/in (Warp)
	16.0 Tapes/in (Weft)
Tensile Grab Strength	495 lbf (Warp)
	326 lbf (Weft)
Tear Strength (tongue)	135 lbf (Warp)
	152 lbf (Weft)

Tear Strength (trapezoid)	162 lbf (Warp) 107 lbf (Weft)
Coating Thickness	1.5 mil
Mullen Burst Strength	609 psi
Nominal Thickness	20 mil
Dimensions	48'-0" x 50'-0" (approximate)

Tarps shall be coated on two sides with low density polyethylene and will contain ultraviolet inhibitors.

4.4.1.2 Tarp Cover System Application Procedures

Procedure for Inspecting Tarps

The tarps are inspected for tears each morning and afternoon. Should a tear be found in the tarp, an attempt will be made to repair the area by stitching the material. If repair is inadequate or cannot be made, the tarp will not be used on the working face.

Application Procedure for Placement of Tarps

Application of the tarp will employ the following minimum procedures:

- Visually inspect working face to ensure that no sharp objects are protruding from the compacted waste which may tear the tarp;
- If necessary, run compactor or tracked machine over any protruding objections;
- Deploy tarp onto the landfill face by attaching the tarp to the spreader bar via integrated D-rings. Final placement is completed by hand to ensure proper coverage;
- Place additional tarps as needed to adequately cover working face;
- Tarps are self anchored with perimeter chains;
- The tarps will be visually inspected following placement to ensure that uplift will not occur; and,
- Soil will be placed over any areas of exposed waste and/or inadequate coverage.

Maximum Daily Area Coverage

Based on the 2008 Airspace Analysis Report:

- Annual waste disposal rate (MSW only) = approximately 54,300 tons
- Operating days per year = 303 days;
- Approximate daily waste disposal rate = 179 tons In-place density = 901 lbs/cy of MSW per cubic yard;
- Daily cubic yards disposed = daily waste disposal rate / in-place density = 397 cy or 10,728 cf
- The working face will be restricted to the smallest area feasible; and
- The working lift is typically 2-3 feet high. Based on a working lift thickness of 2 feet, the working face area averages 5,000 square feet (daily cubic yards disposed / working lift thickness), which is equal to the daily coverage area.

Any additional areas of uncovered waste will be covered each day with 6 inches of soil.

Daily Depth and Quantity to be Applied

N/A

Average Monthly Volume of Daily Cover

N/A

List of Equipment

Equipment utilized for Tarps consists of:

Dozer, Loader, or other equipment available on-site will be the equipment used for the tarp installation.

Material and Equipment Storage

Tarps will be stored adjacent to the working face in a County designated area that will not conflict with daily haul and disposal operations.

The equipment will be stored in a County designated area that will not conflict with daily haul and disposal operations.

Wet Weather Operation

The tarping wet weather operation will be similar to operations the County currently follows when using soil as daily cover during wet weather.

Contingency Plans

If, for any reason the County cannot use tarps as ACM material; soil will be used.

Screening Criteria

N/A

E. LEACHATE MANAGEMENT PLAN

5.0 Maintenance of the Leachate Collection System

Leachate control and migration begins with proper operational safeguards. Proper facility operation by maintaining design grades, placement of daily cover, intermediate and final covers, maintaining good vegetative cover, and applying run-on and run-off controls will help to reduce leachate production. The operator will conduct weekly inspections of the leachate collection and storage system. Leachate levels in the storage lagoon will be monitored at least weekly and after storm events to assess the need for leachate removal and hauling. Cleanouts are provided to allow access to the leachate collection system. Water under pressure has been and will continue to be introduced through these cleanouts periodically as preventive maintenance of the piping system. Mechanical equipment or chemical cleaning agents may also be used to mitigate clogging. Maintenance needs will be re-evaluated if there is an unexpected decrease or increase in leachate production rates.

5.1 Leachate Generation Records

Wilkes County maintains records of leachate hauled from the leachate pond at the landfill to the wastewater treatment plant. The County is currently considering the installation of a flowmeter in the manhole upgradient of the pond so that accurate quantities of leachate flowing from the landfill can be measured. The volume of leachate in the lagoon is checked on a regular basis and after every significant storm event. Records will be maintained at the landfill throughout the operating life and during the post-closure care period. In addition to leachate generation quantities, Wilkes County will maintain analytical data from leachate sampling events. See Appendix III-4 of the Engineering Plan for additional information on leachate generation rates.

5.2 Leachate Monitoring

The chemical composition of untreated leachate generated will be analyzed at least semi-annually, concurrent with water quality sampling. The leachate will be analyzed for the Detection Monitoring constituents (EPA Appendix I list from Subtitle D) required by Rule.1633, as well as pH, specific conductance, BOD, COD, phosphate, nitrate and sulfate. Test results will be submitted to the Solid Waste Section. Monitoring parameters include the following:

PARAMETER	Sample Type	FREQUENCY
PH	Grab	Semi-annually
Oil and Grease	Grab	Semi-annually
BOD	Grab	Semi-annually
TSS	Grab	Semi-annually
Cd-Cadmium	Grab	Semi-annually
Cr-Chromium (Total)	Grab	Semi-annually
Cu-Copper	Grab	Semi-annually
Ni-Nickel	Grab	Semi-annually
Cyanide	Grab	Semi-annually
Zn-Zinc	Grab	Semi-annually
Pb-Lead	Grab	Semi-annually
Mercury	Grab	Semi-annually
Temperature	Grab	Semi-annually

5.3 Leachate Disposal and Recirculation

Leachate will continue to be collected on site and stored in the existing on-site leachate storage pond. The leachate is periodically removed by pumping the leachate into a tanker truck for transport to the Wilkesboro Wastewater Treatment Plant for treatment and disposal. This practice is expected to continue with the opening of subsequent phases at the landfill. An agreement with the Town of Wilkesboro is in place for the discharge of wastewater from the landfill to the plant. Leachate will be tested in accordance with pretreatment conditions as described above. Although no pretreatment has been required to date, aerators are being installed in the pond to reduce BOD levels in the wastewater.

As previously approved in the Wilkes County Transition Plan and other correspondence, Wilkes County intends to continue leachate recirculation in the existing Phase 1 area. The current practice consists of the introduction of minimal amounts of leachate back into the lined cell by applying it with a water truck or by using a pump and sprinkler system to control dust.

5.4 Contingency Plan for Extreme Conditions

Wilkes County Landfill staff hauls leachate from the pond to the wastewater treatment plant using a leased vehicle. If required due to extreme conditions, additional hauling capacity will be obtained from subcontract haulers or by the rental of additional tanker trucks. If for some reason the receiving facility no longer accepts the leachate, it will be pre-treated to facilitate acceptance, or hauled to another POTW or commercial pretreatment facility.

F. ENVIRONMENTAL MONITORING PROGRAMS

6.0 Water Quality

The water quality monitoring program for groundwater and surface water is described in the Water Quality Monitoring Plan. Refer to that plan in Section 8 of the *Design Hydrogeologic Report and Groundwater Monitoring Plan for the Wilkes County Roaring River Phase 3 & 4 Expansion*, submitted to the Section on May 5, 2004, for a detailed discussion of the program.

6.1 Landfill Gas

Landfill gas is a by-product from the decomposition of organic waste in a sanitary landfill. The major components of landfill gas are methane and carbon dioxide. Other gases, such as volatile organic compounds, are present in trace quantities. To protect public health and safety in the vicinity of the landfill, landfill gas produced by the decomposition of refuse will be controlled and monitored during the operational, closure, and post-closure periods. A gas management plan and gas monitoring program will be implemented for the purpose of maintaining the concentration of methane gas below the following regulatory levels:

- The concentration of methane gas generated is not to exceed 25 percent of the lower explosive limit (LEL) for methane in on-site structures (excluding gas control or recovery system components); and
- The concentration of methane gas is not to exceed the LEL for methane at the facility property boundary.

The landfill gas management plan is currently proposed to include monitoring, and passive gas collection in the landfill. The gas may be actively recovered in the future if generation rates are sufficient to justify the additional costs of an active system. Other remedial measures will be implemented as needed to mitigate a potential gas migration problem.

6.1.1 General

Gas monitoring at the Wilkes County Landfill will be performed during the active life of the landfill and throughout the post-closure care period. At a minimum, quarterly monitoring will be conducted at all subsurface gas detection probes and in all structures located on the landfill property. Currently these structures include the scalehouse, a maintenance building, and a small trailer.

Additional gas detection probes will be installed on the site as additional phases are constructed. They will be designed to extend to a depth at least equal to the maximum depth of waste within 1,000 feet of the monitoring point or to either bedrock or the water table, whichever is encountered first. Proposed probe locations will likely be field engineered due to rough topography adjacent to expansion areas which may limit access with a drill rig. Sufficient numbers of gas wells will be installed to adequately monitor the unit. At least three probes will be installed within each borehole to monitor shallow, intermediate, and deep zones within the subsurface profile. The actual spacing of the probes within the borehole will be established after review of the drilling log to identify

potential preferential pathways. Construction records for the gas probes will be submitted to the Division upon completion.

Passive landfill gas vents will be installed along with the final cover system to allow release of gas to the atmosphere. These vents will be installed at a density of approximately one per acre of cap surface area.

6.1.2 Monitoring Procedure

Record Keeping: The operator will record the date, time, location, sampling personnel, atmospheric temperature, reported barometric pressure, and general weather conditions at the time of sampling, in addition to the concentration of combustible gases. The records will be maintained in the landfill operating record.

On-site Structures: Gas monitoring in on-site structures will attempt to identify the "worst case" concentrations. Monitoring will be conducted at the earliest possible time after the structure has been unused (e.g., a morning after a weekend or holiday). The monitoring locations will be in corners along floors and ceilings, at cracks in the floor, and at other areas likely to accumulate gas. Gas monitoring will also be conducted in any confined space requiring the entry of personnel for maintenance or inspection. The monitoring will take place prior to entry by personnel in accordance with OSHA regulations.

Gas Detection Probes: Gas monitoring in detection probes will consist of attaching the monitor to each tubing within the probes, and recording both the initial concentration and steady state concentration of combustible gases. SWANA guidelines for purging wells and other monitoring procedures will be followed.

Equipment: A portable combustible gas monitor, measuring the concentration of combustible gases in units of percent of lower explosive limit, shall be used to conduct gas monitoring. Lower explosive limit (LEL) means the lowest percent by volume of a mixture of combustible gas in air that will propagate a flame at 25 degrees Celsius and atmospheric pressure. The gas monitor shall be calibrated to methane using the manufacturer's calibration kit and procedure before the monitoring activities begin.

6.1.3 Response to Detected Combustible Gases

The regulatory action levels for combustible gas monitoring in gas detection probes are 100% LEL at the facility boundary and 25% LEL in on-site structures. Readings exceeding the regulatory action levels shall be reported to Wilkes County immediately. The County will notify the North Carolina Department of Environment, Health, and Natural Resources, Solid Waste Section in writing and will take immediate steps to ensure safety and protection of human health.

At a minimum, the following actions will be taken if the methane concentration exceeds 25% in any structure:

- Put out all smoking materials and turn off all ignition sources;
- Evacuate all personnel;

- Vent the structure;
- Do not allow personnel to reenter the building except to perform gas monitoring until the results of additional monitoring indicate that methane concentrations are sustained or stabilized below 25% LEL;
- Begin continuous monitoring within the structure; and
- Undertake an assessment to determine the origin and pathways of the gas migration.

Within seven days of detection, the monitoring results will be placed in the Operating Record and the County will indicate actions taken and actions proposed to resolve the problem. Within 60 days of detection, the County will develop and implement a landfill gas remediation plan for the combustible gas releases and notify the Division that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.

The County will also use monitoring action levels of 75% LEL in the gas detection probes at the property boundary, if installed in the future, and 15% LEL in structures. If gas readings exceed the monitoring action levels, the monitoring frequency will be increased to monthly until three consecutive readings below those levels are recorded. If the monitoring action level is exceeded in structures, options will be evaluated to permanently reduce the current levels and to prevent a further increase in gas levels in the structures.

6.2 Title V Air Quality Permitting

A facility is subject to NSPS and will require a Title V Operating Permit once the facility has

- a design capacity greater than or equal to 2.75 million tons or 2.5 million cubic meters; and
- a non-methane organic compound (NMOC) emission rate of 55 tons per year or more.

The Wilkes County Roaring River Landfill currently has a design capacity of 2.1 million tons; thus, a Title V Operating Permit is not required for the facility at this time based on its design capacity. In the event the facility permit is amended in the future, the need for a Title V permit shall be reevaluated.

A facility may also be subject to the requirements of Title V if the air emissions are greater than 100 tons/year or the hazardous air pollutant (HAP) emissions are greater than 10 tons per year for one HAP or 25 tons/year for a combination of HAPs. Based on the size of the facility, the amount of waste in place and the results of preliminary air emissions modeling completed to date, the facility is not expected to have more than 100 tons/year of total emissions, nor emit more than 10 tons per year for one HAP or 25 tons/year for a combination of HAPs during operation of Phase 3. Therefore, the facility is not subject to the requirements of Title V based on total emissions as of this date. Air emissions modeling of future phases will be completed to determine whether the facility is subject to the requirements of Title V as they are permitted.

G. EROSION AND SEDIMENT CONTROL REQUIREMENTS

The operator shall not cause a discharge of pollutants into waters of the United States, including wetlands, that violates any requirements of the Clean Water Act, including, but not limited to, the National Pollutant Discharge Elimination System (NPDES) requirements, pursuant to Section 402, or cause the discharge of a nonpoint source of pollution to waters of the United States, including

wetlands, that violates any requirement of an area-wide or State-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended. Surface water shall be diverted from the operational area and shall not be impounded over or in waste.

All vegetative and structural erosion and sediment control practices have been designed and shall be constructed and maintained according to the North Carolina Erosion and Sediment Control Planning and Design Manual (NCESCPDM). An *Erosion and Sediment Control Plan for the Wilkes County Landfill* has been prepared and sent to the Land Quality Section for approval. A copy of that Plan is provided as Appendix III-6 of the Engineering Plan.

H. RECORD KEEPING REQUIREMENTS

The following records will be maintained in the Operating Record at the landfill office:

- The operating permit and pertinent correspondence;
- Operation Plan;
- Emergency Response Plan;
- Inspection records, waste determination records, and training procedures for waste screening programs;
- Amounts by weight of solid waste received at the facility, including the source of generation;
- Gas monitoring plan, monitoring results and any remediation plans developed in accordance with Division requirements if required as a response to elevated gas concentrations;
- Water Quality Monitoring Plan and any demonstration, certification, finding, monitoring, testing, or analytical data required by the water quality monitoring program at the site;
- Closure and Post-Closure Plans and any required monitoring, testing or analytical data performed during the closure and post-closure periods;
- Required cost estimates and financial assurance documentation;
- Leachate management records; and
- Safety training records.

I. TYPE 1 YARD WASTE COMPOSTING FACILITY

7.0 Waste Quantities

Wilkes County receives yard waste from Wilkes County this waste consists of yard and garden waste, silvicultural waste, untreated and unpainted wood waste. The facility may receive up to 175 tons of this type of waste per month.

Accurate records of incoming waste should be kept at the scale house. These records should differentiate between loads of brush (including all land clearing debris), clean wood, and loads of leaves or grass clippings.

7.1 Design Considerations

7.1.1 Design Capacities and Product Quality

The facility currently receives an average of 100 tons per month of compostable waste. This waste is stockpiled until sufficient material is available to produce a windrow.

The following table summarizes the design criteria used to verify adequate space at the facility for the composting operation. As a factor of safety, it was assumed that the density of the product remains the same as the incoming waste stream.

Total waste stream (by weight)	1,000 tons (annual)
Total waste stream for composting (95%)	950 tons
Density (assumed average)	500 lb/cubic yard
Composting waste stream (by volume)	3,800 cubic yards (102,600 ft ³)
Cross-section windrow 2' (top) x 15' (base) x 5' (ht)	42 square feet
Total length windrow required	2,500 feet
At 100' length	25 windrows needed annually
With 15' base and 10' aisle, total acreage required	0.25 acres maximum (running 3 windrows at a time)

The site is designed with a working area for the Type 1 facility of approximately 0.25 acres as illustrated on Drawing No. OP-01. Sufficient room is available for the operations.

7.1.2 Site Plan

The composting facility is located northeast of the active cell. The location is shown on Drawing No. OP-01.

The grinding and composting area shown on Drawing No. OP-01 has an approved Erosion and Sediment Control Plan that diverts stormwater. The area will continue to operate under the guidelines of the approved plan.

7.2 Operations

7.2.1 General Description

Incoming yard waste is weighed and directed to the mulching operational area. The yard waste is stockpiled until a sufficient quantity is accumulated to form a windrow. On average approximately one windrow can be formed weekly. The material is run through a tub grinder which can process all incoming waste. Once ground, the material is formed into windrows using a front end loader. The windrows are spaced approximately 10 feet apart and each has a

north/south orientation and the following geometry: 5 feet high x 15 feet wide at base x 2 feet wide at top.

Once the windrow is formed, it will be turned several times using a front end loader to mix the materials. If necessary, water will be added as the windrow is constructed and then periodically during the stabilization process. The pile will be sprayed as it is turned on an as needed basis. For optimum composting the moisture should be maintained between 45% and 60%. Drier than 45% and the microbial action is slowed; higher than 60% and the material becomes difficult to handle and difficult to aerate.

The temperatures are taken at a minimum of each third (3 separate places) of the windrow. It is suggested that the temperature be controlled by turning (aerating) to assure that the compostable material is maintained at an optimum range for decomposition (between 104°F and 113°F) and then allowed to elevate to 131°F where it must be maintained for a period of 3 consecutive days as required by Rule .1406(10). When the temperature within the windrow falls below 120 °F – 130°F during the final stages of composting, the windrow is turned. Windrow construction and turning frequency will be sufficient to maintain aerobic conditions to produce a compost product in the desired time frame. Separate records are kept for each windrow. Once a windrow is constructed, it is assigned an I.D. number and folder which are used over the lifespan of the windrow. Every time windrow data is taken, it is documented and logged in the folder.

A nitrogen source may be added to the yard waste as needed to promote the compost process. The County uses calcium nitrate when necessary. The calcium nitrate is spread by hand and mechanically mixed.

The process from grinding through stabilization is expected to take 4 weeks. The final time frame is a function of material density, material type, moisture and operational controls.

Once the windrow begins to cool indicating stabilization, the County removes the larger particles and reuses them in the process or used as woodchips or mulch. By keeping the coarser materials in the compost, it enables more oxygen to get into the windrows and produces more compost in the finished product. The compost is now stockpiled. Depending on the end use requirements, the compost may be screened again prior to stockpiling if a finer screen is available. The larger particles would be either reused in the process or used as a coarser product.

If the material is free of sharp particles, has no offensive odor, and has minimal pathogens, it may be used in an unrestricted way.

Once the compost meets the regulatory requirements for distribution to the public, it can be released for use. As the public obtains the material they must be given the information indicated in Section H.2.

7.2.2 Waste Acceptance

Rule .1402 (6)

The Type 1 compost facility shall accept only yard and garden waste, silvicultural waste, untreated and unpainted wood waste. No municipal solid waste (MSW), hazardous waste,

asbestos containing waste, or medical waste shall be accepted at the facility. The County accepts yard waste in a non-bagged state or in approved biodegradable bags. Deliveries are monitored at the site. The County anticipates little contamination of the material.

7.2.3 Monitoring Requirements Rule .1406 (9)

The windrows are monitored for temperature daily. A log will be kept of all temperature readings, which includes the location of the probes. A copy of the temperature log is contained in Appendix VII-1.

Moisture should be kept in the range of 45% - 60%. Water should be added as required to stay within this range. Temperature will be monitored daily until readings of 131°F are achieved for three (3) consecutive days. To monitor temperature, the probe should be inserted 12"- 24" every 50' along the windrow at a 45° - 90° angle.

7.2.4 Temperature Parameters Rule .1406 (10)

For Type I facilities, the compost process must be maintained at or above 55°C (131°F) for 3 consecutive days and aerated to maintain elevated temperatures.

7.2.5 Addition of Nitrogen Bearing Materials Rule .1406 (13)

Nitrogen compounds may be added as necessary to adjust the nutrient balance for optimum product development. Only approved waste materials (i.e. grass clippings, leaves) or chemical compounds may be added. Nitrogen rich materials can decompose rapidly and cause odor problems. Materials such as grass clippings must be incorporated into the process as soon as possible.

To determine if nitrogen is necessary, the carbon to nitrogen ratio should be calculated. For proper composting, this ratio should be greater than 25:1, but less than 40:1 at the start of composting. Incoming materials have the following estimated ratios:

- Grass clippings 12 - 15:1
- Dry leaves 40:1
- Paper and wood 200:1
- Sawdust 200 - 500:1

Thus, adjustment may be necessary after grinding, screening and blending the feedstock materials.

7.3.1 Classification/Distribution of MSW Compost Products Rule .1407

7.3.1 Requirements

For unrestricted use, the finished Type I compost must meet the following criteria:

- Minimal pathogenic organisms
- Free from offensive odors
- Containing no sharp particles
- Man made inerts do not exceed 1 inch in size

If these criteria are met then the finished compost material will be marketed to residents of the County and surrounding areas with directions provided.

7.3.2 Labeling

When the Type 1 compost material is to be marketed to the public, sufficient information should be provided to the public to:

- Inform users of the benefits of using compost
- Advise users on suggested uses of product
- Inform users of cautions in using product
- Inform users of composition of the material including nutrients and contaminants
- Inform users of source of feedstock

Appendix VII-2 includes samples of informative brochures that may be provided to the end user.

End

APPENDIX V-1
WASTE INSPECTION FORMS

GROUNDWATER MONITORING WELL MAINTENANCE RECORD

FACILITY: _____ PERMIT NO. _____

LOCATION: _____ DATE: _____

INSPECTOR: _____ COMPANY: _____

1. Is surface water diverted away from the well head? _____

2. Is the concrete pad still intact and free of cracks? _____

3. Has surface water runoff undercut the concrete pad? _____

4. Is the outer casing still secure and locked? _____

5. Is the well identification tag present and is it legible? _____

5a. Does the well identification tag provide the following information:

. The well identification number? _____

. Drilling contractor name and registration number? _____

. Total depth of well? _____

. Depth to screen? _____

. A warning that the well is not for water supply and that the ground water may contain hazardous materials? _____

6. Is the grout between the inner and outer well casings all the way to the ground surface? _____

7. Is the inner casing firmly grouted in place? _____

8. Are the inner and outer casings upright and unobstructed? _____

9. Is water collecting in the outer casing? Does a weep hole need to be bored in the outer casing to provide drainage? _____

10. Is the monitoring well accessible by a four-wheel drive vehicle? _____

11. Have brush and weeds been trimmed so that the well is easy to locate and access? _____

12. Does the inner well casing have a vented cap? _____

13. Is the monitoring well visible and adequately protected from moving equipment? _____

POST-CLOSURE INSPECTION RECORD

FACILITY: _____ PERMIT NO. _____
LOCATION: _____ DATE: _____
INSPECTOR: _____ COMPANY: _____

1. Access and Security Control

- Is a notice prohibiting the further disposal of waste materials clearly visible at the entrance to the facility?
- Is the site adequately secured by means of gates, chains, berms, fences or other security measures to prevent unauthorized entry?
- Are the access roads to and within the site maintained to provide access to the closed disposal area and to all monitoring points?

2. Erosion and Sediment Control

- Is the vegetation adequate to stabilize the site and prevent erosion?
- Are the erosion control measures adequate to prevent silt from leaving the site and to prevent excessive on-site erosion?
- Do the sediment basins require cleaning out, as indicted by the level of sediment buildup?

3. Drainage Control Requirements

- Are all areas adequately sloped to promote surface water runoff in a controlled manner?
- Are there areas of observed settlement, subsidence, and/or displacement of the closure cap?
- Are all drainage channels free of accumulated sediment?

4. Uncontrolled Escape of Leachate or Landfill Gas

- Are there any leachate seeps observed?
- Are there any signs of uncontrolled releases of landfill gas?

5. Environmental Monitoring Systems

- Are all monitoring wells (gas and groundwater) properly maintained? (Note: Complete the Groundwater Monitoring Well Maintenance Record during semi-annual sampling events.)

6. Miscellaneous

- Are all site benchmarks marked and evident?
- Do vector control measures appear adequate?

REFUSE/UNIDENTIFIED WASTE INSPECTION

FORM - B

FACILITY: _____ PERMIT NO. _____

LOCATION: _____ DATE: _____

INSPECTOR: _____ COMPANY: _____

REJECTABLE WASTE DESCRIPTION: _____

WASTE: Rejected Accepted

NOTIFIED: Waste Source Hauling Management Federal
 Site Management State

REFUSED WASTE TRANSPORTED BY:

Hauler Address: _____

Destination: _____

ACCEPTED WASTE:

Contained area: _____

Secured by: _____

Lab to complete testing: _____

ADDITIONAL COMMENTS: _____

CONTAINER INVENTORY

FORM A

FACILITY: _____

PERMIT NO. _____

LOCATION: _____

DATE: _____

INSPECTOR: _____

COMPANY: _____

Container:

Drum [] Metal [] Cardboard [] Plastic [] Other []

Other: _____

Contents:

1. Full [] Partially Full [] Empty []

2. Crushed [] Punctured []

3. Labeled [] Hazardous []

Identified: _____

Additional Information:

Container:

Drum [] Metal [] Cardboard [] Plastic [] Other []

Other: _____

Contents:

1. Full [] Partially Full [] Empty []

2. Crushed [] Punctured []

3. Labeled [] Hazardous []

Identified: _____

Additional Information:

INSPECTION CHECK LIST: (Check all that apply)

FORM A

(If "YES" Please explain in the space provided below)

FACILITY: _____ PERMIT NO. _____

LOCATION: _____ DATE: _____

INSPECTOR: _____ COMPANY: _____

	YES	NO
1. Powders/Dusts	_____	_____
Identified: _____		
Unknown	_____	_____
2. Unacceptable Saturation	_____	_____
3. Odor/Fumes	_____	_____
Strong	_____	_____
Faint	_____	_____
Describe: _____		
4. Heat	_____	_____
Item: _____		
5. Battery	_____	_____
6. Oil	_____	_____
7. Biomedical	_____	_____
8. Radioactivity	_____	_____
9. Ashes/Residue	_____	_____
10. Sod/Soil	_____	_____
11. Asbestos (not properly contained)	_____	_____
12. PCB	_____	_____
13. Out of County Waste	_____	_____

Explanation:

APPENDIX V-2
TARP DATA SHEET

FABRENE®

INDUSTRIAL SYNTHETIC FABRICS

TYPE TGP3N3M

Made from high density polyethylene tapes, coated on two sides with low density polyethylene.

<u>PROPERTY</u>	<u>UNIT</u>		<u>VALUES</u>	<u>TEST METHOD</u>
Unit Weight	g/m ²		305	ASTM D3776
Warp Construction	Tapes/10cm	Warp	94	ASTM D3775
		Weft	63	
Tensile Grab Strength	Newtons	Warp	2200	ASTM D751
		Weft	1450	
Tear Strength * (tongue)	Newtons	Warp	600	ASTM D2261
		Weft	675	
Tear Strength (trapezoid)	Newtons	Warp	720	ASTM D4533
		Weft	475	
Coating	µm		38	ASTM D1777 MOD
Mullen Burst Strength	kPa		4200	ASTM D751
Nominal Thickness	µm		513	ASTM D1777 MOD

* Includes force to shift tapes - Tear may be crosswise to direction of force.

Fabrene® TGP3N3M contains ultraviolet inhibitors and is suitable for outdoor applications.
For further information, contact your FABRENE Inc. representative.

Suggested Applications: Heavy tarpaulins, Geomembranes

SALES INQUIRIES

Fabrene Inc.
(888) 322-7363 ext 234
Tel: (705) 476-7057 ext 234
Fax: (705) 476-7787

ORDER DESK

North Bay, ON, Canada
Tel: (888) FABRENE
(888) 322-7363
ext. 222 or 226
Fax: (705) 476-0665

MAILING ADDRESS

Fabrene Inc.
240 Dupont Rd.
P.O. Box 4040
North Bay, ON, Canada
P1B 9B4

Date: 00/10/23



APPENDIX V-3
TEMPERATURE LOG

**WILKES COUNTY
LANDFILL
TEMPERATURE LOG**
(Complete one (1) per windrow)

Windrow ID Number: _____

Date Windrow Started: _____

General windrow location and length: _____

Date & Initials	(x) if turned and number of times turned	Temp. at Location #1	Temp. at Location #2	Temp. at Location #3	Temp. at Location #4	Weather: Temp/Condition

APPENDIX V-4
COMPOSTING END USER BROCHURE



USCC Factsheet: Compost and Its Benefits¹

What is Compost?

Compost is the product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth. Compost bears little physical resemblance to the raw material from which it originated.

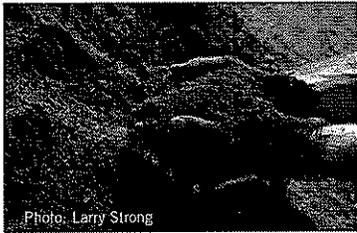


Photo: Larry Strong

Compost is an organic matter resource that has the unique ability to improve the chemical, physical, and biological characteristics of soils or growing media. It contains plant nutrients but is typically not characterized as a fertilizer.

How is Compost Produced?

Compost is produced through the activity of aerobic (oxygen-requiring) microorganisms. These microbes require oxygen, moisture, and food in order to grow and multiply. When these factors are maintained at optimal levels, the natural decomposition process is greatly accelerated. The microbes generate heat, water vapor, and carbon dioxide as they transform raw materials into a stable soil conditioner. Active composting is typically characterized by a high-temperature phase that sanitizes the product and allows a high rate of decomposition, followed by a lower-temperature phase that allows the product to stabilize while still decomposing at a lower rate. Compost can be produced from many "feedstocks" (the raw organic materials, such as leaves, manures or food scraps). State and federal regulations exist to ensure that only safe and environmentally beneficial composts are marketed.

Benefits of Compost and its Effects on Soils and Plants

Thanks to its many attributes, compost is extremely versatile and beneficial in many applications. Compost has the unique ability to improve the properties of soils and growing media physically (structurally), chemically (nutritionally), and biologically. Although some equate the benefit of compost use to lush green growth, caused by plant-available nitrogen, the real benefits of using compost are long-term and related to its organic matter content.

Benefits of Using Compost

- ④ Improves the soil structure, porosity, and density, thus creating a better plant root environment.

- ④ Increases infiltration and permeability of heavy soils, thus reducing erosion and runoff.
- ④ Improves water holding capacity, thus reducing water loss and leaching in sandy soils.
- ④ Supplies a variety of macro and micronutrients.
- ④ May control or suppress certain soil-borne plant pathogens.
- ④ Supplies significant quantities of organic matter.
- ④ Improves cation exchange capacity (CEC) of soils and growing media, thus improving their ability to hold nutrients for plant use.
- ④ Supplies beneficial microorganisms to soils and growing media.
- ④ Improves and stabilizes soil pH.
- ④ Can bind and degrade specific pollutants.

Physical Benefits

Improved Structure

Compost can greatly enhance the physical structure of soil. In fine-textured (clay, clay loam) soils, the addition of compost will reduce bulk density, improve friability (workability) and porosity, and increase its gas and water permeability, thus reducing erosion. When used in sufficient quantities, the addition of compost has both an immediate and long-term positive impact on soil structure. It resists compaction in fine-textured soils and increases water holding capacity and improves soil aggregation in coarse-textured (sandy) soils. The soil-binding properties of compost are due to its humus content. Humus is a stable residue resulting from a high degree of organic matter decomposition. The constituents of the humus act as a soil 'glue,' holding soil particles together, making them more resistant to erosion and improving the soil's ability to hold moisture.

Moisture Management

The addition of compost may provide greater drought resistance and more efficient water utilization. Therefore, the frequency and intensity of irrigation may be reduced. Recent research also suggests that the addition of compost in sandy soils can facilitate moisture dispersion by allowing water to more readily move laterally from its point of application.

Chemical Benefits

Modifies and Stabilizes pH

The addition of compost to soil may modify the pH of the final mix. Depending on the pH of the compost and of the native soil, compost addition may raise or lower the soil/compost blend's pH. Therefore, the addition of a neutral to slightly alkaline compost to an acidic soil will increase soil pH if added in appropriate quantities. In specific conditions, compost has been found to affect soil pH even when applied at quantities as low as 10-20 tons per acre. The incorporation of compost also has the ability to buffer or stabilize soil pH, whereby it will more effectively resist pH change.

¹ Excerpted from the Field Guide to Compost Use, ©2001 The United States Composting Council

Increases Cation Exchange Capacity

Compost will also improve the cation exchange capacity of soils, enabling them to retain nutrients longer. It will also allow crops to more effectively utilize nutrients, while reducing nutrient loss by leaching. For this reason, the fertility of soils is often tied to their organic matter content. Improving the cation exchange capacity of sandy soils by adding compost can greatly improve the retention of plant nutrients in the root zone.

Provides Nutrients

Compost products contain a considerable variety of macro and micronutrients. Although often seen as a good source of nitrogen, phosphorous, and potassium, compost also contains micronutrients essential for plant growth. Since compost contains relatively stable sources of organic matter, these nutrients are supplied in a slow-release form. On a pound-by-pound basis, large quantities of nutrients are not typically found in compost in comparison to most commercial fertilizers. However, compost is usually applied at much greater rates; therefore, it can have a significant cumulative effect on nutrient availability. The addition of compost can affect both fertilizer and pH adjustment (lime/sulfur addition). Compost not only provides some nutrition, but often makes current fertilizer programs more effective.

Biological Benefits

Provides Soil Biota

The activity of soil organisms is essential in productive soils and for healthy plants. Their activity is largely based on the presence of organic matter. Soil microorganisms include bacteria, protozoa, actinomycetes, and fungi. They are not only found within compost, but proliferate within soil media. Microorganisms play an important role in organic matter decomposition which, in turn, leads to humus formation and nutrient availability. Microorganisms can also promote root activity as specific fungi work symbiotically with plant roots, assisting them in the extraction of nutrients from soils. Sufficient levels of organic matter also encourage the growth of earthworms, which through tunneling, increase water infiltration and aeration.

Suppresses Plant Diseases

Disease incidence on many plants may be influenced by the level and type of organic matter and microorganisms present in soils. Research has shown that increased population of certain microorganisms may suppress specific plant diseases such as pythium and fusarium as well as nematodes. Efforts are being made to optimize the composting process in order to increase the population of these beneficial microbes.

Additional Benefits of Compost

Some additional benefits of compost have been identified, and has led to new uses for it. These benefits and uses are described below.

Binds Contaminants

Compost has the ability to bind heavy metals and other contaminants, reducing both their leachability and absorption

by plants. Therefore, sites contaminated with various pollutants may often be improved by amending the native soil with compost. The same binding affect allows compost to be used as a filter media for storm water treatment and has been shown to minimize leaching of pesticides in soil systems.

Degrades Compounds

The microbes found in compost are also able to degrade some toxic organic compounds, including petroleum (hydrocarbons). This is one of the reasons why compost is being used in bioremediation of petroleum contaminated soils.

Wetland Restoration

Compost has also been used for the restoration of native wetlands. Rich in organic matter and microbial population, compost and soil/compost blends can closely simulate the characteristics of wetland soils, thereby encouraging the re-establishment of native plant species.

Erosion Control

Coarser composts have been used with great success as a mulch for erosion control and have been successfully used on sites where conventional erosion control methods have not performed well. In Europe, fine compost has been mixed with water and sprayed onto slopes to control erosion.

Weed Control

Immature composts or ones which possess substances detrimental to plant growth (phytotoxins), are also being tested as an alternative to plastic mulches for vegetable and fruit production. While aiding in moisture conservation and moderating soil temperatures, immature composts also can act as mild herbicides.

A Bright Future

With these many benefits and its myriad of applications, from the traditional growing of plants to novel uses in stormwater management and climate change mitigation, the production and use of compost has a bright future indeed!

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About the USCC: The United States Composting Council (USCC) is a national not-for-profit organization dedicated to the development, expansion and promotion of the composting industry. For more information visit www.compostingcouncil.org

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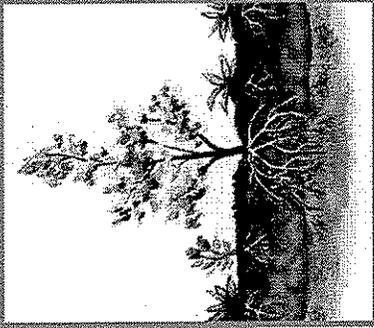
How much compost to use when planting?*

- ☛ **Trees and Shrubs** – Backfill plantings with a 50:50 mix of compost and native soil. Mulch a 2 to 3 inch layer of compost around plants extending 6 inches beyond the drip line. Do not mound compost or mulch around stems and tree trunks because this invites insects and diseases.
- ☛ **Flowers and Vegetable Gardens** – Work 2 to 3 inches of compost into the top 6 inches of soil before planting.
- ☛ **Turf Grass** – Work 2 to 3 inches of compost into the top 6 inches of soil prior to sod placement or seeding.
- ☛ **Containers and Raised Beds**. Add transplants to containers and beds filled with a 30 percent blend of compost and potting soil.
- ☛ **Foundations** – Replace compacted and contaminated fill along building foundations with a blend of compost, sand and topsoil.
- ☛ **Mulch** – Spread a 2 to 3 inch layer around plants to prevent erosion, act as a weed barrier and conserve water.

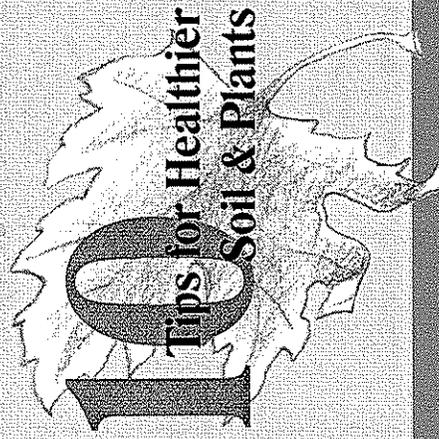
MIX CALCULATOR: Creating a landscape bed? Use this formula: **square feet to be covered X depth to be filled (in inches) X 0.0031 = cubic yards of mix needed.** Use compost instead of peat moss.

Depth of Compost Layer	Cubic Yards Needed Per 1,000 Square Feet
1/2 inch	1.5
1 inch	3.0
2 inches	6.0
3 inches	9.0

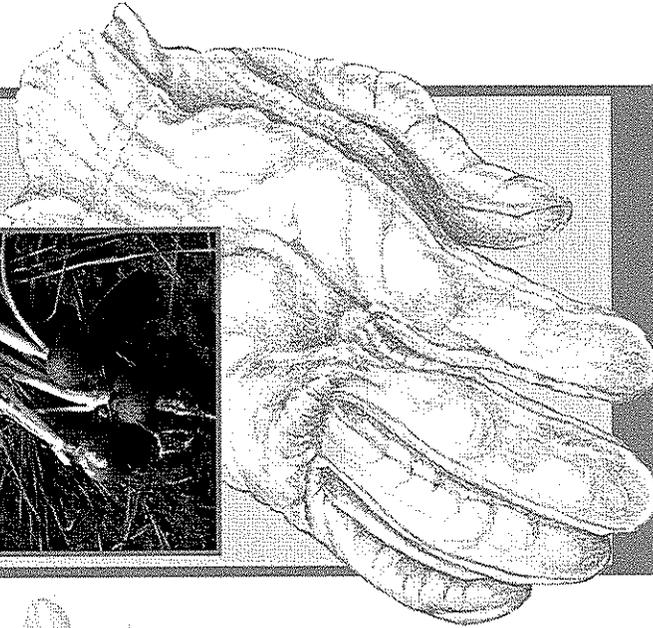
* Provided by Gardening and Recycling Organics Wisely (GROW), a program sponsored by S.C. DHEC's Office of Solid Waste Reduction and Recycling.



Landscape with Compost



**CAROLINAS
COMPOSTING COUNCIL**
www.carolinascompostingcouncil.org
(919) 545-9050



Artwork provided by the Seattle, Washington Saving Water Partnership's "The Natural Lawn & Garden" series. Reprinted with permission.

Layout and design provided by the S.C. Department of Health and Environmental Control's (S.C. DHEC) Office of Solid Waste Reduction and Recycling.

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Landscape with compost!

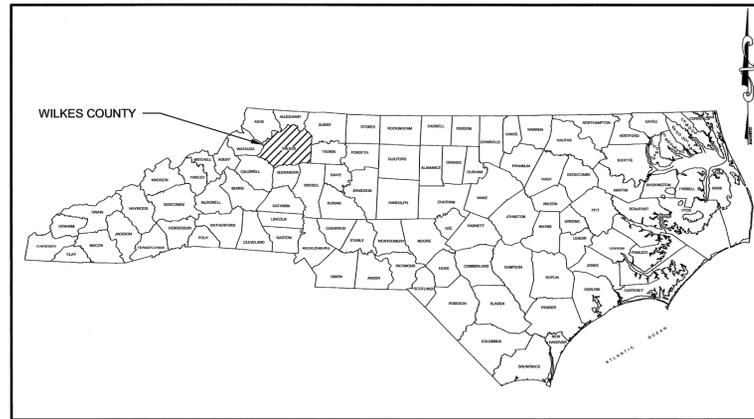
- 1. It's alive!** Like every other living organism, soil needs food, water and oxygen. Feed your soil to grow healthier plants. Keep it aerated. Don't let it dry out or become water logged.
- 2. Break it up.** Soil preparation is an important first step. Don't skip it. Break up large areas of high compaction by tilling and amending with compost before planting. Dig planting beds to a depth of 6 to 12 inches and add compost.
- 3. Boost resistance.** Compost is microbiologically active like yogurt and yeast. This helps plants with nutrient uptake as well as builds resistance to pests and diseases. Do not use fumigants and harsh chemicals that will kill hard-working microbes and cancel one of compost's most desirable benefits.
- 4. Control run-off.** Compost is one of the best products you can use to encourage rainwater to stay on your property. It will reduce erosion and minimize run-off of soils and nutrients to rivers and streams. Sediment and excess nutrients negatively impact water quality and aquatic life.
- 5. Waterhogs unite!** Consider water resources when placing plants in the landscape. Plants that need more water should be located where water naturally collects -- near downspouts, roof drip lines and similar locations. Use compost to improve both moisture retention and drainage.
- 6. It looks like soil.** Look for compost that is dark in color and smells like soil. Immature compost is light in color and/or smells like ammonia. Immature compost may burn sensitive plants and compete for nutrients.
- 7. A little bit does a lot.** As little as 1/4 inch of compost as a top dressing can give lawns a boost. Bare spot? Add a layer of compost and rake into the soil before seeding.
- 8. Quality counts.** The U.S. Composting Council has developed a marketing label to identify tested compost. Look for the Seal of Testing Assurance when comparing products.
- 9. Don't concentrate!** Add no more than 30 percent compost in a blend with bark, topsoil, sand, clay and other ingredients. Use in raised beds or in potting and planting mixes for trees, shrubs and garden plants. As mulch, add 2 to 3 inches to the surface.
- 10. Dress it up.** Top dress with 1/4 to 1/2 inch of compost to replenish nutrients and keep root zones cool and moist. Surface applications should always be well incorporated with a rake or tilling equipment.

Pictured (right): This garden shows many places to use compost -- around trees as mulch, in flower and vegetable beds, in raised beds and containers as well as around shrubs.

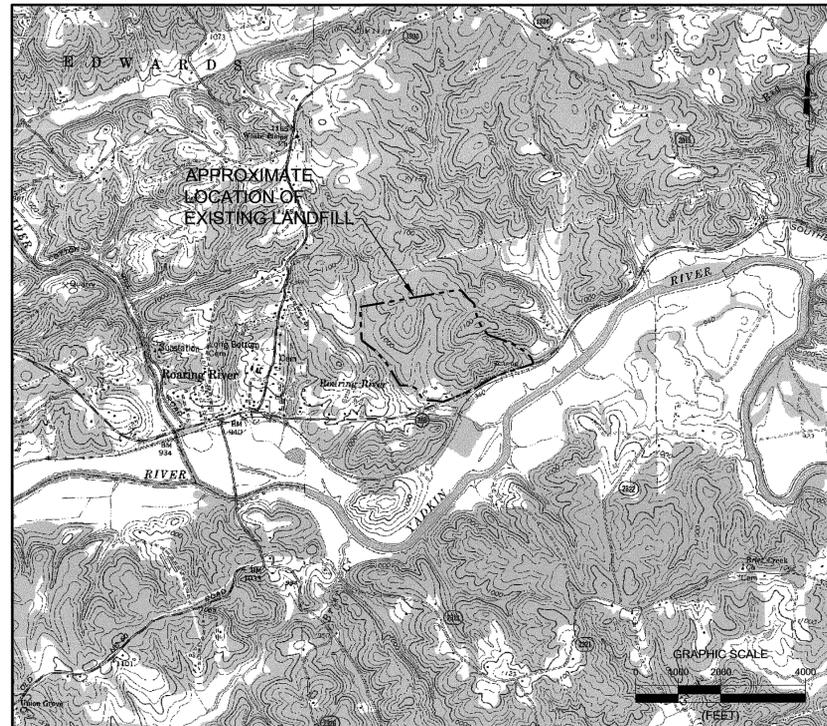
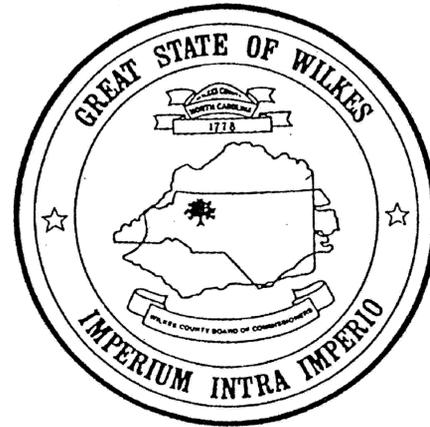


WILKES COUNTY LANDFILL OPERATIONS PLAN

WILKESBORO, NORTH CAROLINA



NORTH CAROLINA
COUNTY LOCATION MAP



VICINITY MAP

DRAWING INDEX	
SHEET	DESCRIPTION
OP-T	TITLE SHEET
OP-01	EXISTING SITE CONDITIONS
OP-02	PROGRESSION OF OPERATION STORMWATER/LEACHATE SEGREGATION
OP-03	PHASE 3 ANNUAL PHASES OF DEVELOPMENT

OWNER INFORMATION	
PREPARED FOR:	WILKES COUNTY DEPARTMENT OF SOLID WASTE
ADDRESS:	9219 ELKIN HIGHWAY ROARING RIVER, NORTH CAROLINA 28669
CONTACT:	KENT BRANDON (336) 696-5806
FAX:	(336) 927-4117
PROPERTY INFORMATION	
ADDRESS:	9219 ELKIN HIGHWAY ROARING RIVER, NORTH CAROLINA 28669
NC DENR FACILITY ID:	97-04
ACREAGE:	3 ACRES (REVISION TO PHASE 3 NCDENR PROJECT ID #WILKE 2005-021)

DECEMBER 2008

NO	BY	CK	APP
1	KWB	EEA	EEA



DESIGNED	KWB
DRAWN	KWB
CHECKED	EEA
APPROVED	EEA
DATE	5/28/04



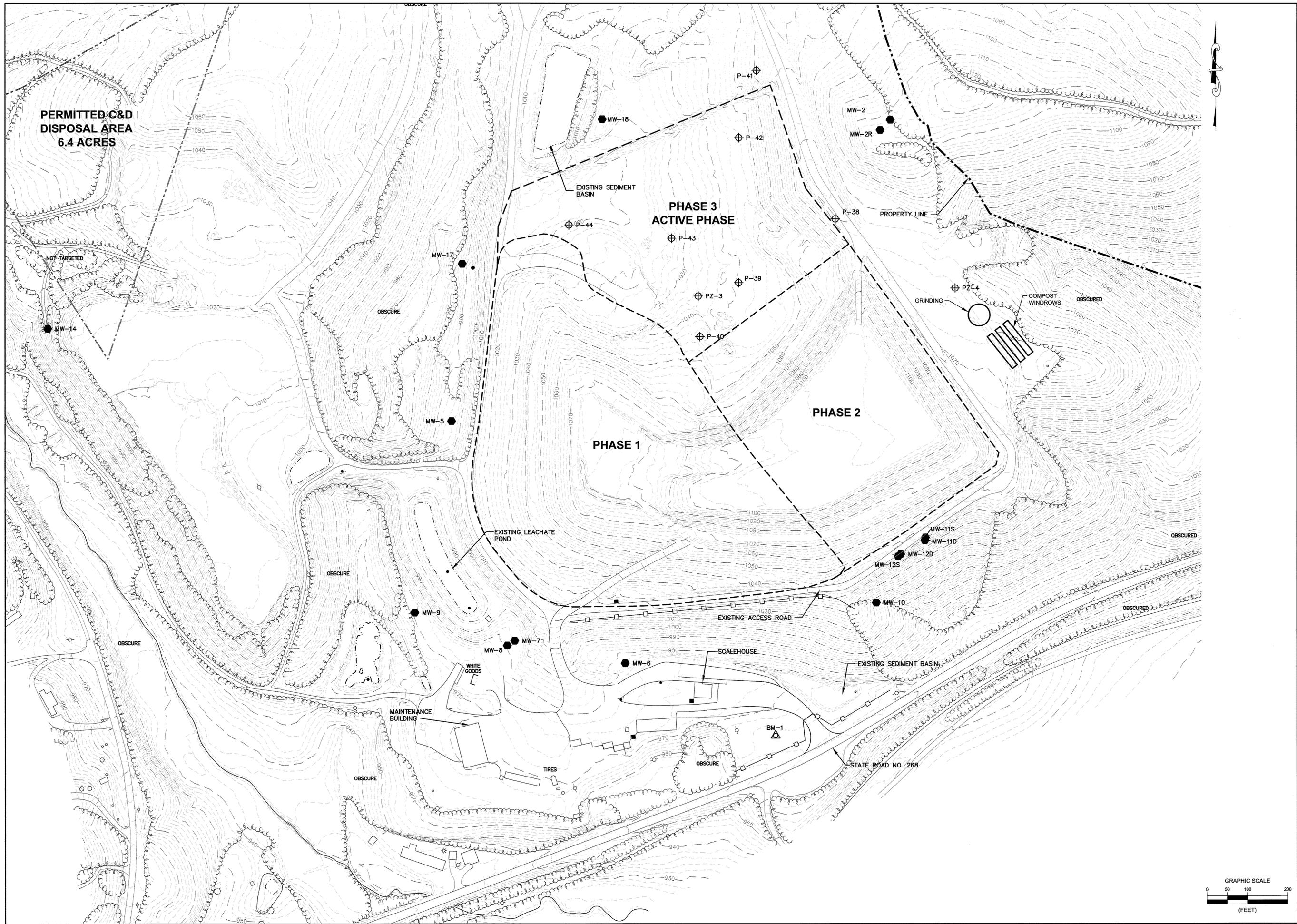
**WILKES COUNTY LANDFILL
WILKESBORO, NORTH CAROLINA**

TITLE SHEET

PROJECT NO.
356.00.08

SCALE
N.T.S.

DRAWING NO.
OP-T



NO	BY	CK	APP
1	KWB	KWB	EEA
DATE			12/29/08
REVISIONS AND RECORD OF ISSUE			UPDATED OPERATIONS PLAN



DESIGNED	KWB
DRAWN	KWB
CHECKED	EEA
APPROVED	EEA
DATE	5/28/04

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**WILKES COUNTY LANDFILL
 WILKESBORO, NORTH CAROLINA**

EXISTING SITE CONDITIONS

PROJECT NO.	356.00.08
SCALE	AS NOTED
DRAWING NO.	OP-01

