



KENTUCKY LANDFILL MANAGER CERTIFICATION MANUAL

Kentucky Department for Environmental Protection

Division of Compliance Assistance

300 Fair Oaks Lane • Frankfort, KY 40601

Phone: 502.564.0323 • **800.926.8111** • Fax: 502.564.9720

Email: envhelp@ky.gov • Website: dca.ky.gov

Revised March 19, 2014

Certification and Licensing Program

Mission

Promote responsible environmental stewardship.

Goal

Provide operators with the basic knowledge required to manage drinking water, wastewater and solid waste systems.

The Division of Compliance Assistance offers free compliance assistance. Our services are available to all individuals, communities and businesses regulated by the Kentucky Department for Environmental Protection. We want to help you succeed!

Hotline and Website for regulatory, technical or operational concerns
800-926-8111
dca.ky.gov

Other programs administered by the Division of Compliance Assistance:

Kentucky Excel Program
Kentucky Brownfield Program
Kentucky Environmental Compliance Assistance Program

Disclaimer

All reasonable precautions have been taken in the preparation of this document, including both technical and non-technical proofing. The Kentucky Division of Compliance Assistance and all staff assume no responsibility for any errors or omissions. Should the summarized information in this document be inconsistent with a governing rule or statute, the language of the rule or statute shall prevail. Reference herein to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the Kentucky Division of Compliance Assistance.

Table of Contents

Chapter 1: CERTIFICATION AND LICENSING PROGRAM	4
Chapter 2: OPERATING YOUR LANDFILL	8
Chapter 3: LANDFILL CATEGORIES.....	26
Chapter 4: LANDFILL EQUIPMENT.....	46
Chapter 5: LANDFILL SAFETY.....	52
Chapter 6: PERMITTING PROCESS AND OPERATING CONDITIONS.....	66
Chapter 7: FACILITY MANAGEMENT	74
Chapter 8: MONITORING YOUR LANDFILL	82
Chapter 9: WASTE STREAM COMPOSITION AND DECOMPOSITION.....	94
Chapter 10: RESIDUAL LANDFILL.....	108
Chapter 11: SPECIAL WASTE LANDFILL	112
Chapter 12: CONSTRUCTION/DEMOLITION DEBRIS (CDD) LANDFILL	116
Chapter 13: CONTAINED LANDFILL	122
Chapter 14: OTHER REGULATIONS.....	132
APPENDIX A: Waste Management in Kentucky	138
APPENDIX B: A Guide for Monitoring Well Construction and Abandonment	144
APPENDIX C: Contacts by Topic	150
APPENDIX D: Glossary	154
APPENDIX E: Acronyms.....	164
APPENDIX F: Operator Certification Regulations.....	166
APPENDIX G: Groundwater Protection Plans	171
APPENDIX H: Sampling Procedures.....	176
APPENDIX I: Other Regulations	180
APPENDIX J: Methods for Handling Non-Detect or Censored Data	184
Index.....	186

This page left blank intentionally.

Chapter 1: CERTIFICATION AND LICENSING PROGRAM

Chapter 1 Objective

1. Understand and be able to apply the Kentucky regulations relating to the certification requirements for solid waste facilities.

Operator/Manager Certification Program

Facility Standards Relating to Certified Operators

Each construction/demolition debris landfill and contained landfill must have at least one certified landfill operator and one certified landfill manager or one individual certified for both categories. Special waste landfills must have at least a certified landfill operator. The Division of Waste Management may require a certified operator and/or manager at a permit-by-rule, registered permit-by-rule, or residual landfill facilities as a permit condition. This requirement will be based on the characteristics of the waste stream, the site, and the experience and qualifications of the operator and/or manager, which will vary by landfill type.

The certified landfill operator must be physically at the facility during working hours. However, in the event the certified landfill operator cannot be at the site, the certified landfill manager or an interim operator, physically located on site, can be designated responsible for daily site operations. This provision is intended to ensure that only qualified personnel supervise landfill operations.

Maintaining a certified operator and manager at a landfill is considered a condition of the landfill operating permit. The permit may be revoked and/or penalties sought for violation of this requirement.

Interim Operator

An interim operator must be appointed whenever a certified landfill operator or manager has to be absent for an extended period. An "extended absence" means:

- More than 10 consecutive operating days for landfill operators
- More than 30 consecutive operating days for landfill managers
- More than 5 consecutive operating days for land application operators.

The permit holder must select the interim operator and notify the Division of Compliance Assistance, Certification and Licensing Branch, in writing, 10 days prior to an anticipated absence and immediately upon discovery of an extended absence due to an emergency or unanticipated circumstance. The following information must be included in the notice:

- Name, address and qualifications of intended replacement operator (must complete an application for operator certification (DEP 6031) to obtain this information), and
- Length of replacement period.

The Division of Compliance Assistance, Certification and Licensing Branch will:

- Evaluate the qualifications

- Notify the permit holder, in writing, of approval or denial.
- Identify the length of time the interim operator may operate the facility.
- Specify any special conditions.
- Provide training and certification

Why should I become a certified operator?

Kentucky citizens generate millions of tons of solid waste annually. Landfill operators must have a thorough working knowledge of various waste streams since not all wastes may be accepted at a landfill. A variety of waste streams may be accepted at a landfill; however some of these waste streams may require unique handling methods. It takes knowledgeable, conscientious people to address the broad array of concepts critical to successfully managing landfill facilities.

Only operators that are certified by the Kentucky Division of Compliance Assistance, Certification and Licensing Branch can be in responsible charge of a landfill facility.

Certification Process

Certification is obtained by meeting minimum education and experience requirements, submitting the appropriate forms and fee and by passing the certification examination with at least a 70%. No person shall be eligible for examination for certification unless that person completes the appropriate training course provided by the cabinet, unless an alternative training program is accepted by the cabinet in accordance with Environmental Performance Standards (*standards that must be met by all waste types and facilities to protect the public health and environment*): [401 KAR 45:090](#) for special waste landfills and land farms and [401 KAR 47:070](#) for solid waste landfills.

Upon successful completion of the training session, the Division of Compliance Assistance will issue both a full and wallet size certificate indicating the category of certification acquired.

If the certified operator terminates employment at a landfill, the certificate will remain valid until expiration or revocation. Certificates must be carried during working hours or displayed onsite. An individual who is not certified and assumes the responsibility of operator or manager must meet interim operator requirements and attend the next scheduled training session.

Regulatory Education and Experience

Education and experience requirements for landfill operators and managers can be found in [401 KAR 45:090](#) and [401 KAR 47:070](#). If an applicant does not meet the education and experience requirements, the cabinet may consider substitutions. Information related to the substitutions or interim operators can be located in [401 KAR 45:090](#) and [401 KAR 47:070](#).

Applicants will be evaluated on education and experience as it relates to the appropriate category of landfill.

A landfill **operator** must have:

- Completed high school, either by graduation or by obtaining an equivalency certificate, and
- One year experience.

A landfill **manager** must have:

- Completed high school, either by graduation or by obtaining an equivalency certificate, and
- A minimum of two years administrative experience in a related field **or**
- A minimum of two years of postsecondary education; **or**
- A minimum of two years of a combination of experience in a related field and postsecondary education.

Certification Renewal or Maintenance

A certification shall be issued for a period of five (5) years at the end of which the certification shall expire, unless revoked. Renewal procedures and requirements shall be the same as those for a new certification. Certificates shall be prominently displayed at the facility office and the certified operator shall be able to present their wallet card and/or certificate during an inspection.

Operator Ethics – Standards of Professional Conduct for Certified Operators

In order to safeguard the life, health, and welfare of the public and the environment and to establish and maintain a high standard of integrity in the certified operator profession, standards of professional conduct apply to persons certified in accordance with [401 KAR 45:090](#) and/or [401 KAR 47:070](#). The cabinet may revoke the certification of an operator if it is determined that the operator:

- (a) Has practiced fraud or deception;
- (b) Has failed to perform his duties as required by [401 KAR 45:090](#) and/or [401 KAR 47:070](#);
- (c) Has failed to use reasonable care and judgment in performance of his duties under [401 KAR 45:090](#) and/or [401 KAR 47:070](#); or
- (d) Has knowingly or willfully violated the requirements of [401 KAR 45:090](#) and/or [401 KAR 47:070](#).

Individuals who have had their certification revoked shall be ineligible for future recertification.

Chapter 2: OPERATING YOUR LANDFILL

Chapter 2 Objectives

1. Read the EPS, regulations and permit for operating requirements.
2. Understand the necessary activities for the scalehouse for volumes, weight, sources, and type of wastes.
3. Demonstrate knowledge of the access regulations related to landfills.
4. Explain proper operations in the working face including waste placement, size of the working face, compaction, alternate daily cover material and litter.
5. Explain other operational practices such as control of surface water, erosion, leachate, gas and litter.
6. Understand the EPS regarding fire prevention, explosive gas control and vector control.
7. Managers should know recordkeeping requirements including waste quantity reports, random waste inspections and annual volume survey.

This section describes the operational requirements for all landfills as well as the purpose behind these requirements.

Operating requirements for your landfill may be found in several locations within the solid waste regulations. All landfills must comply with:

- Environmental Performance Standards, (401 KAR Chapter 47:030 for solid waste and 401 KAR Chapter 30:031 for special waste,
- Regulations, both in the general requirements and the design and operational standards for the specific category of landfill (401 KAR Chapter 47 & 48 Solid Waste & 401 KAR 45 Special Waste); and
- Conditions listed in the construction/operating permit.

The owner, certified operators, and certified landfill managers are responsible for operating the landfill in compliance with all regulatory and permit requirements. A copy of the current permit must be displayed at the site and a copy of approved plans shall be reasonably available.

At the Scalehouse

In order to determine whether your operational costs are acceptable, a common base of reference is needed. Without good records on the volume of waste disposed of at the landfill, you cannot determine cost per ton of waste. Volume data is also used to monitor the progress of filling and to project landfill space utilization.

The best data on waste volume is obtained by weighing the trucks at the landfill. This provides actual weights and records on how the waste stream varies. 401 KAR 48:070, Section 13 requires all contained landfills to install scales to measure the quantity of waste received daily. KRS 224.43 – 330(1) requires all MSW sites, including CDD landfills, to weigh wastes.

After the trucks are weighed, all data concerning waste volume, as well as the source of the waste from each truck, must be recorded. This information must be submitted as part of the quarterly report required by 401 KAR 47:190, Section 8.

The scalehouse and compactor operators must spot-check all incoming loads for: unauthorized wastes, hazardous wastes, etc. and waste from unpermitted geographic sources. Scale operators are the first line of defense against accepting unauthorized waste.

Travelling to the Working Face

Posting Signs (401 KAR 48:090 for solid waste landfills and 45:110 for special waste landfills open to the public): To prevent unauthorized dumping, after working hours, landfills are required to have entrance signs posted at all public and waste hauling vehicle entrances. Information required for the sign includes **landfill name, owner name, operator name, emergency phone number, and operating hours for acceptance of waste**. CDD and contained landfills are also required to post the permit number and ensure that the sign is readable from a distance. Facility operators are required to abide by the operating hours posted on the entrance sign and have a certified operator available during these hours.

Warning signs must be posted at all access points of a contained landfill. These signs must be readable at a distance of 100 feet and should warn of site hazards (i.e., explosive gases, heavy equipment, and truck movements).

Access (401 KAR 47:030, Section 11(3) for solid waste landfills and 30:031 Section 10(3) for special waste landfills): Owners and operators of solid waste landfills (contained, CDD, residual) and special waste landfills must control public access and prevent unauthorized vehicular traffic. Both artificial and natural barriers may be used, which must be constructed and maintained at all times.

Access (401 KAR 48:090): Additionally, owners and operators of contained landfills must have the following:

- Lockable entrance ways at all access points,
- Major access road from a publicly maintained highway to the landfill,
- Perimeter road, and
- All-weather road to within 200 feet of the working face.

The owner or operator is also responsible for removing all debris, mud and waste from vehicles before they leave the site. They are also responsible for removing any landfill debris, mud and waste from off-site roadways.

Although not required by regulation, **directing traffic** helps prevent unauthorized dumping away from the working face and helps **prevent accidents**. Traffic may be directed with barriers, signs, or a combination of both.

Acceptable barriers include:

- Fencing
- Logs
- Telephone Poles
- Rocks
- Tires
- Railroad Ties
- Jersey Barriers
- Mafia Blocks

Entering the Working Face Area

All waste unloaded at a landfill must be supervised by landfill personnel. The purpose of this is to:

- Prevent accidents,
- Prevent unauthorized scavenging,
- Ensure detection of problem or unauthorized wastes; and
- Prevent unloading at a rate that exceeds the capacity of on-site equipment used for compaction and cover placement.

Supervision also allows vehicles to be unloaded in specified areas. Since it takes more time for a vehicle to be unloaded manually, an improperly positioned vehicle could slow down the number of vehicles able to unload at a busy site or time.

Whether vehicles unload at the top or bottom of the working face will generally be determined by the design of the site. Dumping at the base of the operating face and pushing wastes up is preferred because:

- Equipment can operate more efficiently and obtain maximum compaction rates,
- It is easier to control the size of the working face, and
- Blowing litter is minimized.

The Working Face

The exact size of the working face is not specified by regulation, however, contained landfills are required (401 KAR 48:090, Section 9) to confine dumping to the smallest practical area. Some permits may designate specific dimensions; however, a general rule of thumb is to allow approximately 2 blade widths per piece of equipment operating. **The size will be influenced by:**

- Quantity of waste received,
- Number of pieces of equipment operating, and
- Approved plan.

The **advantages** of a small working face include:

- Minimized exposure to wind and rain,
- **Less** cover material needed at the end of the working day; and
- Lower equipment operating costs.

Compaction is an extremely important factor in reducing many of the problems associated with landfill operation. Benefits include:

- Less cover is used since large voids (or holes) in the garbage will be eliminated,
- Air space is conserved, since more waste can be placed in a smaller area,
- Amount of eventual settling in filled areas will be reduced,
- Amount of blowing litter is reduced,
- Runoff of surface waters is promoted; and
- Creates a less permeable fill by reducing the amount of rainfall entering the landfill and reducing the potential for leachate (a liquid containing decomposed waste, bacteria, and other dangerous materials) generation.

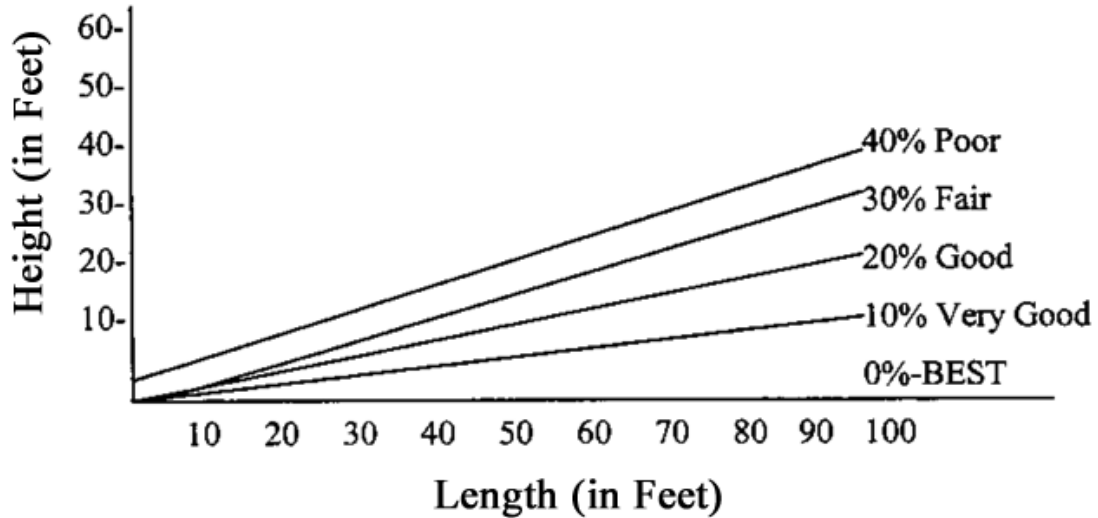
Optimum compaction (i.e., maximum practical density) can be obtained through use of the following methods.

Compaction Rate: Maximizing the waste compaction rate for the site is one of the most important aspects of landfill operation. For the example of a contained landfill the difference between 1,100 to 1,200 lbs/cu yd. of garbage density over a 1,000,000 cu yd. site which has a \$36 per ton tipping fee results in an additional gross profit of \$1.8 million without construction of additional airspace. Another way to look at the savings is at 500 tons per day of incoming wastes, a four-month postponement for construction of the next cell.

Equipment: Use appropriate equipment for the type, size and volume of waste received and soil to be moved. For specific information on determining the type and size most suitable for your landfill, consult equipment dealers. Guidelines for selecting equipment can be found in the Equipment chapter (Chapter 4).

Slope: At non-contained landfills, track type equipment works more efficiently when wastes are pushed uphill on a 3:1 slope. This allows the weight of the equipment to be concentrated over a smaller track surface area. At contained landfills, the design of a compactor allows the most efficient compaction to occur on flat ground since the weight is already concentrated over a small area. A comparison of the effects of slope on compaction with a compactor can be found in Figure 2.1.

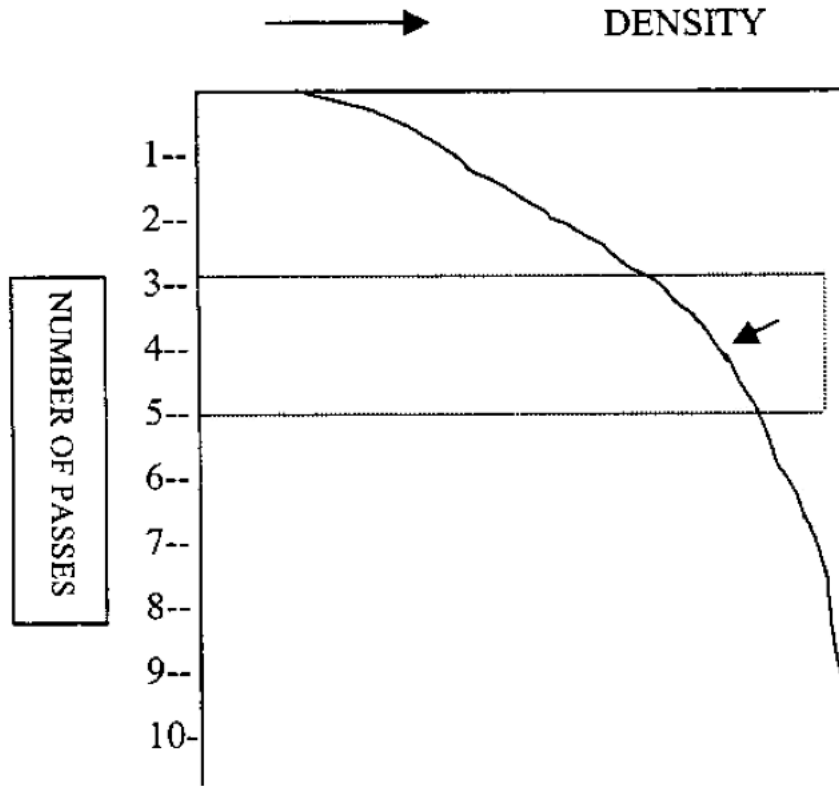
Figure 2.1. Slope vs. Future Settlement in Percent



Shallow Layers: Waste should be compacted in layers no more than 2 feet thick to reduce the effects of cushioning. As wastes are being pushed, lifting the dozer blade 2 to 3 feet off the ground can spread large piles of wastes. A lift height of 8 feet for construction/demolition debris landfills or the height specified in the contained landfill permit must not be exceeded.

Passes: Optimum compaction is obtained by running over waste 3 to 5 times. You can see in Figure 2.2, less than 3 passes results in poor compaction. Densities do not increase after 5 passes. Operators of contained landfills are required to ensure that the entire waste surface is passed over 4 times. More information on equipment passes will be discussed in the Equipment Chapter (Chapter 4).

Figure 2.2 Density vs. Number of Passes



401 KAR 48:090, Section 9 requires contained landfills to have sufficient equipment available to spread and compact all waste within 2 hours of receipt. Waste should be spread in layers not exceeding 24 inches in depth. Contained landfills should strive for an in-place waste density of 1,200 pounds per cubic yard in a completed cell. Steel wheel compactors with a minimum gross ground pressure of 325 pounds per linear inch of wheel width, a gross weight of 30,000 pounds and 130 horsepower engine are suggested to accomplish this. Backup equipment must be available within 24 hours of breakdown.

Cover: Waste cover consists of soil, properly weathered or crushed shale, siltstone, or other materials approved by the Cabinet. The purpose of cover is to:

- Reduce vectors - Fly eggs cannot emerge through 6 inches of soil. This also reduces the attractiveness for rats and birds.
- Litter control - No waste is exposed after operating hours.
- Fire control - Glass left exposed to the sun can ignite other wastes. Daily cover also controls atmospheric oxygen and provides a fire barrier between cells.

- Reduce odors
- Promotes runoff - Reduces infiltration of surface water that produces leachate.
- Controls the movement of leachate and gases.

Soils or other weathered/earthen materials that have been contaminated with petroleum may be used as daily cover if the maximum benzene concentration of the material is less than or equal to 1.0 ppm and the material is not placed as daily cover during a precipitation event.

Alternate daily cover can be used if approved by the Cabinet in advance. Different types of alternate daily cover include but are not limited to:

- Tarps (Belton)
- Posi-Shell

NOTE: Alternate daily cover may not be used unless the Cabinet has granted prior approval.

Litter is a common problem at many contained landfills. Because waste is only required to be covered on a periodic basis, there is a strong potential for waste to blow from the working face to other areas of the landfill. Litter can be controlled with litter fences or netting, but all litter attributable to the site's operation must be picked up within 48 hours per 401 KAR 48:090, Section 9. The area around the landfill must be policed on a regular basis to collect scattered material.

Surface water control is an important factor in maintaining your landfill. If not controlled, excessive amounts of rainfall and other precipitation will soak into the fill and produce leachate. The following methods are used to control surface water:

Prevent run-on - Surface water can be directed away from fill areas through the use of diversion ditches and berms. These structures must be shown on the engineering plans, and must be constructed.

Promote run-off - The entire site, including the area of the landfill being actively worked, shall be graded as necessary to drain rainwater from the fill area and to prevent standing water. Smoothly graded and crowned cover will allow water to runoff quicker and reduce the amount of water seeping into the fill.

Landfills are designed for surface water control based on the topography at a particular site. Therefore, it is important to use features (i.e., sediment structure, run-on/runoff ditches, grading) as designated in approved plans for that site.

Uncontrolled surface water can also cause erosion. Discharge of sediment or fill material into the waters of the Commonwealth is prohibited under the Environmental Performance Standards in 401 KAR 47:030 and 30:031.

Methods used to control erosion include the following:

- Vegetation - required for interim and long-term cover at contained landfills, and final cover at all landfills,
- Constructing permanent or temporary earthen berms, silt fences or straw bales - recommended on steep slopes or slopes longer than 50 feet,
- Erosion matting,
- Constructing permanent or temporary diversion ditches, and/or
- Operating equipment so track prints are perpendicular to the slope.

When erosion occurs, additional cover must be added and areas graded to maintain the required depth of cover.

Leachate Control: Normally leachate can be controlled through the following good management practices:

- Prohibiting the disposal of free liquids (401 KAR 48:060, Section 2(3), and 48:090, Section 8),
- Maintaining a small working face and obtaining optimum compaction,
- Using adequate cover on all areas,
- Maintaining proper surface water control, and
- Controlling erosion.
- Eliminate leachate outbreaks at contained landfills: prevent daily and interim cover soils matching up to create impermeable horizontal layers between waste lifts and a conduit for leachate to the outbreak at the side of the landfill. Use daily “windows” cut through soil daily cover, or use geosynthetics for daily cover, then window interim and long-term cover before filling wastes.

When leachate is observed, you should determine if the above practices are being followed. When problems are found, they should be corrected as soon as possible. The following may lead to production of leachate:

- Moisture content of the waste - watch for liquid draining from trucks,
- A large working face and poor compaction,
- Lack of adequate cover - use backhoe, dozer, or post hole digger to determine,
- Poor grading or waste settling - check for standing water after rain,
- Improperly functioning or blocked diversion ditches, and

- Erosion ditches or gullies in the cover.

Small leachate outbreaks can sometimes be corrected by covering them with soil particularly if the source is identified and eliminated. However, if leachate cannot be controlled and is allowed to enter the waters of the Commonwealth, you will be operating in violation of the Clean Water Act.

At one time it was a common practice to build ponds to collect leachate. Ponds also collect large volumes of surface water and have the potential to overflow during heavy rains. Most collection systems are now designed for placement under fill areas, or along the toe of the fill, so that they are not exposed to surface water runoff. Leachate is then collected in tanks for disposal. Design requirements for leachate collection systems are discussed later in this manual.

To maintain a leachate collection system that will function, it is important to remember:

- Leachate drainage layer designed and constructed to minimize clogging,
- Proper construction of leachate lines with cleanout entries is extremely critical in keeping the system draining properly and preventing clogging,
- Pipes should have a minimum of 1% slope,
- The system should be designed to allow internal inspection, cleaning, and maintenance, and
- Leachate must be pumped on a periodic basis to prevent overflow and clogging of collection lines.

Leachate from a contained landfill may be disposed of by:

- Discharging into sanitary sewers or wastewater treatment plant with prior approval,
- Returning it to completed waste cells, if previously approved by the Cabinet, and
- Properly treating it in a permitted onsite wastewater treatment plant.
- Hauling and properly treating it in a permitted offsite wastewater treatment plant
- For CDD landfills, discharging to a permitted surface impoundment for collection before further treatment and discharge per the KPDES permit, or handled as contained landfill leachate above per 401 KAR 48:060, Section 1. This is also true of special waste facilities.

The permit application includes a description of how leachate will be disposed of. The method of disposal selected must be utilized and proper approvals/permits obtained.

Landfill Methane Gas Control

Due to methane gas being so dangerous, contained landfills are required to monitor for its presence. Alarms must be installed in every building onsite to monitor for methane gas. 401 KAR 48:090, Section 4 requires the owner or operator to monitor for explosive gas quarterly at the following locations:

- Underneath or in the low area of each onsite building,
- Along the boundary as shown in the permit,
- At each passive gas vent installed under the final closure cap,
- At any potential gas problem areas, as revealed by dead vegetation or other indicators, and
- At any other points required by the permit.

It is necessary to control gas production to prevent the gas from damaging vegetation and endangering human health. To control landfill gas, the owner or operator must install at least one of the following:

- Passive gas vents (typically upon final cap construction), or
- Active gas collection wells with a flare or gas-to-energy system.

If CDD landfills receive abundant drywall, the gypsum will produce hydrogen sulfide gas (H₂S). H₂S is a poisonous gas and has an odor like rotten eggs. The cabinet may require gas monitoring and control as a permit condition to meet the Environmental Performance Standards of 401 KAR 47:030, Section 10(2) for complying with air pollution control requirements.

Potential Problems Associated with Operation

Litter: Environmental Performance Standards found in 401 KAR 47:030, as well as landfill operating requirements, prohibit the grounds in and around the landfill from becoming a nuisance due to litter. Interior fences may be required to prevent litter from blowing from the landfill. The permitted area shall be policed on a routine basis to collect all scattered material. Litter can be controlled through the following practices:

- Good compaction makes it more difficult for wind to scatter refuse,
- Install litter fences placed downwind of the unloading area,
- Require trucks to be covered, and
- Adequate placement of daily cover.

Fires: Environmental Performance Standards prohibit open burning of solid or hazardous wastes and/or violations of applicable air quality standards. While prohibited, fires do occur.

Fires can be caused by:

- Equipment fires,
- Burning adjacent to fill areas,
- Smoldering refuse,
- Glass wastes exposed to bright sunlight, and
- Vandalism and/or theft.

Prevent and control fires by:

- Carrying fire extinguishers on all landfill equipment,
- Fill areas if this method must be used for burning land clearing debris,
- Dump any smoldering wastes away from fill areas (401 KAR 48:060, Section 2(2), and 48:090, Section 5), and
- Cover glass wastes immediately.

If a fire breaks out call the fire department immediately. Depending upon the actual conditions, smoldering wastes should be carefully excavated, moved away from the waste area, and covered with soil. After the fire is extinguished and observed for some time, it may be returned to the fill.

A fire safety and response plan must be developed and maintained per 401 KAR 48:070, Section 12(4). The plan should include a topographic map showing the exact location of the landfill, a site map and an emergency contact, indicate the location of additional firefighting water sources, all roads and major site features. Additionally, it should address how to reduce the risk of fire, identify all onsite equipment, and list the procedures to follow when responding to a fire. A copy of this should be delivered or mailed to the local fire department.

Vectors: Insects or animals that carry disease-producing organisms are known as vectors. Common vectors include:

- Birds
- Cats
- Dogs
- Flies
- Mosquitoes
- Rats

Large flocks of birds attracted by a landfill can also create a hazard to aircraft. This is why new contained landfills are not be allowed to be sited within 5,000 feet of any airport

runway used by piston-type aircraft or 10,000 feet of any airport used by turbo-jet aircraft. In certain cases, it is possible for the Cabinet and the Federal Aviation Administration to grant a variance.

Adequate daily cover, which eliminates both food and shelter, is normally adequate to control vectors. However, the Division may require other control measures when necessary.

Inclement Weather: The following practices will help reduce the severity of problems associated with wet and extremely hot or cold working conditions.

- Maintain at least a 3-day stockpile of cover material near the working face. More may be needed if cover must be hauled a long distance,
- Construct stock piles to promote runoff,
- Drain surface water away from the working face,
- When needed, place a designated wet weather working area near the entrance and make sure adequate cover is readily available,
- Construct all-weather roads,
- Maintain a stockpile of gravel for use on roads,
- Provide a heated equipment shed,
- Maintain equipment in accordance with manufacturers recommendations, and
- On days that freeze and thaw, obtain cover early in the day before it has a chance to thaw.

Dust on haul roads and other areas of the landfill must be controlled to prevent a nuisance or violations of air quality standards. Water trucks may be used to reduce dust. However, used oil or leachate must not be used outside the waste footprint.

Land Settlement: The amount of settlement that will occur is dependent on several factors:

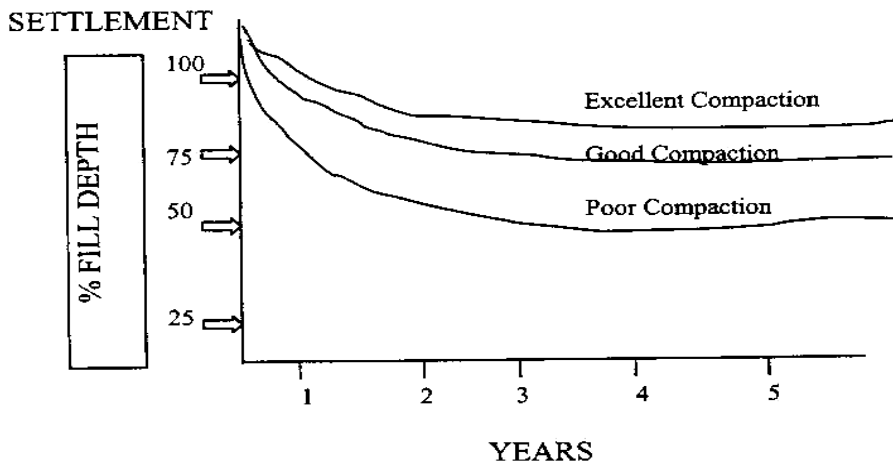
- Type of refuse,
- Depth of refuse,
- Amount of compaction,
- Rate of decomposition, and
- Moisture content.

There are 2 types of settlement - subsidence and differential. Subsidence Settlement is a uniform settlement or sinking of the entire fill that occurs slowly over time. Subsidence settlement is caused by:

- Weight of fill (related to height),
- Decomposition of waste resulting in less volume, and
- Poor compaction.

Control of settlement is accomplished by maximum compaction, final grade design, and refilling settled areas. The following figure shows fill settlement over time based on compaction.

Figure 2.3. Compaction vs. Rate of Settlement



Differential Settlement is a non-uniform settlement of selective filled areas. These areas may be large or small in size and occur randomly throughout time. Differential settlement is caused by:

- Traffic,
- Poor compaction,
- Uneven filling,
- Highly organic waste placed next to inorganic or inert waste, and
- Shifting of materials once decomposition occurs.

Problems created by differential settlement include:

- Allowing water to enter the fill through ponding,
- Increased leachate generation, and

- Reduction of vegetative growth.

Flexible pavements invariably fail when subjected to sub-grade settlement. How do you control differential settlement?

- Build roadways up with inert materials,
- Grade surface areas to promote runoff, and
- Employ principles of good compaction that include:
 - 3:1 slope on working face for CDD landfill operators using dozers for compaction,
 - 3 to 5 passes for maximum compaction,
 - Spreading in maximum 2 foot layers for garbage,
 - Push CDD waste up slope,
 - Separate bulky wastes; compact inorganic waste tightly around bulky waste,
 - Compact bulky wastes as much as possible prior to placing in fill,
 - Keep working area smooth and uniform, and
 - Fill depressions with clean fill (dirt) as they become evident and grade to promote runoff.

Settlement has occurred when any of the following conditions are noticeable:

- Standing water
- Visible holes
- Cracks in cover
- Creation of high water lines
- Ponding
- Depressions
- Flat slopes

Recordkeeping Requirements

Solid waste regulations outline information to be provided as part of the technical application for all solid waste sites or facilities. This regulation (401 KAR 47:190 Section 9) specifies that a recordkeeping and reporting system must be established to document:

- Construction activities,
- Monthly quantity of waste received from each source,
- Compliance with soil cover requirements,
- Environmental monitoring (surface water, ground water, methane, etc.),
- Random inspections of incoming waste,
- Quantity and concentration of leachate removed,
- For contained landfills, spill residues and limited quantity generator wastes received, and
- Remaining landfill volume.

Waste Quantity Records

Solid waste landfills must have a system for documenting the amount of waste received at the facility on a monthly basis. The intent behind the collection of this data is to document the amount of waste being disposed of at sanitary landfills in the state. This information benefits local and state officials, who are charged with planning for and management of the solid waste stream. Landfill owners should use the waste information to plan the construction of the next operating area or horizontal expansion, as needed. Owners or operators of special waste landfills are not required to record waste amounts or tonnage.

Screening Incoming Waste

The owner or operator of a contained landfill must implement a program designed to prevent the disposal of regulated hazardous waste as defined in 401 KAR Chapter 31 and polychlorinated biphenyls (PCB) wastes as defined in 40 CFR part 761. The requirements for this program can be found in 401 KAR 48:090, Section 2 and should be included in the approved permit application.

This program includes:

- Random inspections of incoming waste,
- Inspections of suspicious loads,
- Records of inspections,
- Training of facility personnel to recognize regulated hazardous waste,
- Procedures for notifying the proper authorities if a regulated hazardous waste is discovered at the facility, and
- Employee safety, health, training and equipment to be used in the inspections.

Annual Volume Survey

All solid waste landfills must conduct an annual survey to determine remaining landfill volume, which may be used for waste disposal. The quantity of waste disposed per day shall be determined by dividing the total waste received in one year by 365 calendar days. This survey must bear the seal and signature of the engineer or land surveyor who conducted the survey on each page of the drawings. The owner or operator shall notify the Cabinet no less than 15 calendar days prior to the date the survey will be conducted. The annual survey must be made between January 1 and May 1 and should include the following:

- Cross sections on 100-foot intervals which show present waste disposal,
- Waste elevations and final contours, and
- Remaining available capacity in cubic yards.

The cabinet may allow the use of topographic or isopach maps in lieu of cross-sections taken at 100-foot intervals if requested by the owner or operator and approved.

This information must be submitted to the Division within 60 days of a walking survey or within 90 days if aerial topography is used on a form provided by the Division.

This page left blank intentionally.

Chapter 3: LANDFILL CATEGORIES

Chapter 3 Objectives

1. List the types of landfills and the wastes that may be disposed.
2. List operational requirements for each type of landfill.
3. Understand the cover requirements for landfills.
4. Explain what can be done to protect the liner of a newly constructed contained landfill.
5. Explain random inspections for a contained landfill and specially designated handling areas for contained and CDD landfills.

The following section is an overview of the types of landfills and their permits offered by the Solid Waste Branch. These types of permits are specific to the waste streams and facility type.

Landfill Categories

The first step in deciding on building a landfill is to consider what kind of landfill best meets the needs of your waste type (e.g., CDD, contained). The following section outlines the solid waste permit types, which are classified, based on the waste managed and facility type.

Permit types are:

1. **Residual landfills** are facilities designed and permitted for the disposal of specific solid waste(s) or residue(s), which can be fully characterized (i.e., has a limited number of hazardous constituents that a lab may identify and quantify). Examples of residual wastes include:

- Industrial process waste; and
- Paper manufacturing wastes.

Residual landfills may take solid wastes that are industrial wastes.

Industrial/Residual Waste

Waste generated by manufacturing or industrial processes that is not a hazardous waste or a special waste is an industrial solid waste. Examples include: waste from fertilizer or agricultural chemical manufacturing, wastes from plastics and resin manufacturing, and bark waste from the pulp and paper industry. This term does not include commercial-like wastes that come from offices, lunchrooms and packaging (unless packaging is what is being made at a particular facility). Also not included are special wastes such as coal combustion ash, wastewater treatment sludges, or residues from air pollution control devices. Industrial waste should be disposed of in a contained or residual landfill. For more information, please refer to KRS 224.01-010(31)(a) for more information on the definition of “solid waste” and “industrial solid wastes”.

Some examples of industrial wastes are:

- Manufacturing process sludges (paint waste),
- Cuttings, grindings, stampings, product rejects,
- Contaminated soils if they result from an industrial process, and
- May contain small quantity hazardous wastes such as laboratory chemicals, if disposed

in a contained landfill. The entire amount generated at the facility may not exceed 220 pounds, or about one-half a 55 gallon drum, each month.

Unacceptable Types of Waste

There are no detailed acceptable waste streams for residual landfills listed in the regulations. A residual landfill can only dispose of the waste streams listed on their permit. A thorough analysis of each waste stream is required before disposal.

In general, the following waste streams are **NOT ACCEPTABLE** at residual landfills:

- Hazardous waste,
- Municipal solid waste, and
- Small quantity or limited quantity hazardous waste.

Residual Landfill Operational Requirements

Operations

The operational requirements for residual landfills can be found in 401 KAR 48:170, Section 2. Residual landfills are not required to have scales. However, the facility must propose in the permit application a method of collecting this data as monthly waste volumes are required as part of the quarterly reports.

Residual landfills must comply with the following operational requirements:

- **a sign** must be placed at the landfill **entrance** containing the landfill name, names of the owner and operator, operating hours, permit number, contact person, and emergency telephone number, and
- Operate in accordance with their approved plans and comply with any permit conditions.

Cover Requirements

Cover requirements for each landfill are listed in their approved landfill applications or on their permit as permit conditions. In order to be in compliance, approved plans must be followed.

More information about residual landfills is provided in Chapter 10.

2. **Special Waste landfills** are facilities designed and permitted for the disposal of high volume and low hazard wastes specifically mentioned in KRS 224.50-760:

For purposes of this section and KRS 224.46-580(7), special wastes are those wastes of high volume and low hazard which include but are not limited to mining wastes, utility wastes (fly ash, bottom ash, scrubber sludge), wastes from coal gasification facilities (vitrified coarse solid residues, prilled or blocked sulfur) approved by the cabinet based on submittal of appropriate testing demonstrating that the wastes are of low hazard, sludge from water treatment facilities

and wastewater treatment facilities, cement kiln dust, gas and oil drilling muds, and oil production brines. Other wastes may be designated special wastes by the cabinet.

Unacceptable Types of Waste

An owner or operator may dispose only special waste in a special waste landfill. These wastes include utility coal combustion ash, industrial wastewater and drinking water treatment sludges, residues from air pollution control equipment, and certain oil field wastes. As with residual landfills, there are no detailed acceptable waste streams for special waste landfills listed in the regulations.

In general, the following waste streams are **NOT acceptable** at special waste landfills:

- the same wastes listed as unacceptable for residual landfills, and
- industrial solid wastes

Special Waste Landfill Operating Requirements

The operational requirements for special waste landfills can be found in 401 KAR 45:110, Section 3. **Special waste landfills must comply with the Environmental Performance Standards in 401 KAR 30:031.**

Cover Requirements

Cover requirements for each landfill are listed in their approved landfill applications or on their permit as permit conditions. In order to be in compliance, approved plans must be followed.

More information about special waste landfills is provided in Chapter 11.

3. Construction/Demolition Debris (CDD) landfills are facilities designed and permitted to accept waste from non-hazardous construction and demolition debris resulting from:

- Construction
- Remodeling
- Repair
- Demolition
- Storm clean-up

CDD wastes is a form of commercial wastes:

Commercial waste is defined in KRS 224.01-010(31)(a)2. As “generated by stores, offices, restaurants, warehouses, and other service and non-manufacturing activities, excluding tire-derived fuel and household and industrial waste”. Examples include: food, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, tin cans, aluminum, ashes, leaves, tires, white goods, furniture, Limited Quantity Hazardous Wastes (LQHW), etc. This waste is disposed of at a contained landfill which has a liner designed to thwart LQHW from contaminating groundwater. The average density is 200 to 700 lbs. per cubic yard.

This waste may:

- Contain a large amount of paper and packing materials (i.e., paper, plastic, cans, etc.) and some wood which are combustible and have the potential to catch on fire,
- Be slower to decompose than food waste from households,
- Be difficult to get good compaction,
- May be disposed of at contained landfills but construction or demolition wastes may go to construction/demolition debris landfills, and
- Have an average density of 200 to 700 lb./cubic yard.

Construction/Demolition and Debris (CDD) Waste results from the construction, remodeling, repair, and demolition of structures and roads. This waste consists primarily of building materials and rubble, is relatively inert with the exception of wood and does not compact well (it ranges widely). Examples include: bricks, concrete and other masonry materials, wood, rock, uncontaminated soil, wall coverings, drywall, plumbing fixtures, metals, furniture, shingles, insulation, etc. Asbestos from these buildings may only be disposed of in a contained landfill unless specified in your permit. If specified, the cabinet will require daily covering and additional recordkeeping provisions. CDD wastes are:

- Building materials and rubble,
- Relatively inert with the exception of wood, and

- Primarily disposed of in construction/demolition debris landfills.

Types of Waste

401 KAR 47:080, Section 2(2) lists common acceptable and unacceptable waste streams.

Acceptable wastes include the following:

- Solid waste that results from the construction, remodeling, demolition or repair of structures and roads.
- Uncontaminated solid waste consisting of vegetation resulting from land clearing and grubbing, utility line maintenance, and seasonal storm-related clean up.

Such wastes include, but are not limited to:

- Bricks, concrete and other masonry material
- Shredded or segmented tires abandoned on lots or other land.
- Clean soil and rock
- Wood
- Wall coverings
- Plaster and drywall
- Plumbing fixtures
- Tree stumps, limbs, leaves and yard waste
- Sawdust
- Paper and paper products
- Metals
- Furniture
- Insulation
- Roofing shingles
- Asphaltic pavement
- Glass
- Plastics that are not sealed in a manner that conceals other waste
- Electrical wiring

- Components containing no liquids or hazardous metals that are incidental to any of the above materials
- Any other inert waste as approved by the Cabinet

Unacceptable waste includes the following:

- Waste from an unpermitted geographic source
- Waste not listed on the permit
- Waste that does not result from construction, demolition, remodeling or repair of structures or roads
- Electrical fixtures containing hazardous liquids such as fluorescent light ballasts or transformers
- PCB containing waste
- Hazardous material spill residues
- Conditionally exempt limited quantity generator waste or small quantity generator hazardous waste
- Any hazardous waste regulated by 401 KAR chapters 31 and 32
- Whole tires or tires not from demolition, site clearing, or storm debris.
- Liquids
- Drums
- Fuel tanks

When the applicant restricts the waste to non-putrescible (non-rotting) wastes and wastes that will not leach, the liner may be modified to remove the clay and leachate collection system. Non-putrescible means tightly baled paper or cardboard, wood boards, logs, stumps, asphalt, concrete, etc. Putrescible means anything subject to rapid decomposition such as loose paper or cardboard, wood shavings or chips in an amount sufficient to rot and degrade the groundwater.

Greater Than One Acre CDD Landfill Operating Requirements

The operating requirements for construction/demolition debris landfills are located in 401 KAR 48:060, Section 2.

The most important operational aspect is to operate in accordance with the approved plans and the permit conditions.

Construction/demolition debris landfills are required to have scales since they are a municipal solid waste disposal facility per KRS 224.43-330. CDD waste is a commercial waste and an MSW.

CDD landfills must comply with the following **operating requirements**:

- A sign must be placed at the junction of the landfill access road and public road for the active life of the facility
- A sign must be posted at the entrance to the landfill showing the names of the owner and operator, an emergency telephone number, operating hours and permit number. Signs must be constructed of durable, weather resistant material. Letters and numbers should be a minimum of 3 inches tall
- Unauthorized public access must be controlled
- All-weather roads must be constructed
- The operator must observe all loads during dumping and spreading
- Scavenging is prohibited. Salvaging and recycling will not be allowed without prior Cabinet approval.
- No free liquids or hazardous wastes may be disposed of at the landfill
- Maintain ditches and sediment basins
- Prevent run-on and runoff of surface water and prevent standing water
- No violations of Environmental Performance Standards (401 KAR 47:030)
- Includes a building for personnel which is:
 - Heated
 - Screened, and
 - Contains drinking water and sanitary facilities.

Compaction and Cover Requirements

CDD waste must be spread and compacted in thin layers sufficient to minimize void spaces during placement of lifts. No lift shall be greater than 8 feet or the depth approved in the application.

Operating equipment must be on site during operating hours and capable of spreading and compacting the volume of waste received at the site. Backup equipment must be available within one week of primary equipment breakdown.

A 12-inch soil cover must be applied to all areas of exposed waste at least once a week. Temporarily re-vegetate or otherwise protect against erosion all areas not set to additional

refuse or weekly cover within 90 days.

More information about CDD landfills is provided in Chapter 12.

4. Contained landfills are facilities designed and permitted for the disposal of solid wastes including:

- Non-hazardous solid waste (residential, commercial, institutional, industrial and municipal waste),
- Shredded tires,
- Household hazardous waste,
- Limited quantity generator hazardous waste, and
- Small quantity hazardous spill residues of less than 100 kilograms (220 pounds) of spill cleanup residues of wastes listed in 40 CFR 261.33 per 40 CFR 261.5.

Municipal Solid Waste

Contained landfills may take Municipal Solid Waste, or MSW. Under the definition at KRS 224.01-010(31)(a)4., MSW includes commercial and household waste.

Household solid waste consists of both putrescible and non-putrescible waste generated by households as stated in KRS 224.01-010(31)(a)1.: “Solid waste, including garbage and trash generated by single and multiple family residences, hotels, motels, bunkhouses, ranger stations, crew quarters, and recreational areas such as picnic areas, parks, and campgrounds but it does not include tire-derived fuel.” The average density of this waste is 500 to 1,000 lbs. per cubic yard as it enters the landfill. This type of waste must be disposed of at a contained landfill and will contain:

- Food wastes, which are putrescible (decay or rots quickly). These wastes attract flies and rats and can cause odors,
- Paper and packaging,
- Household Hazardous Waste allowed due to the landfill liner design.
- Bulky items (furniture, appliances or “white goods”), and other bulky items that can be difficult to handle and compact.

Acceptable Disposable Waste Streams

The contained landfill operating permit identifies the types and geographic source(s) (county/state of waste origination) of wastes a landfill is approved to receive. Once the permit is issued, any household or commercial waste from the approved counties may be accepted without further written approval.

- **Medical (Biohazard/Infectious) Waste** may be disposed in a contained landfill because of the daily cover requirement limiting transmission of disease. Medical wastes results from the operation of hospitals and nursing homes and may cause disease or reasonably be suspected of harboring pathogenic organisms. Hospitals and nursing homes generate medical wastes such as needles, bandages, body parts, bedding, etc., and
- Infectious wastes not classified as hazardous wastes may be disposed of in contained landfills since daily cover is designed to contained pathogens.

Agricultural Wastes

Agricultural wastes, although not specifically defined in KRS Chapter 224, are non-hazardous wastes generated from the use of agricultural products on the farm. Similar wastes produced by racetracks, tree services, or other businesses may also be considered agricultural waste. Both are considered commercial solid wastes and hence MSW and may go to a contained landfill. Limited quantity hazardous waste, i.e., less than 220 pounds per month, may also go to a contained landfill. However, waste from any homes on the farm are considered household and hence MSW and are also disposed at a contained landfill. Wastes resulting from the production and manufacturing of agricultural products are considered industrial solid wastes and may be disposed at a residual landfill. Demolition of barns, homes or out buildings is considered demolition wastes and may be treated as CDD wastes.

Manure and crop residues are exempt from the definition of solid waste when returned to the soil as fertilizer or soil conditioners in practices common for this use.

Herbicides and pesticides are not classified as agricultural wastes. Empty containers must contain less than one inch of residue and be triple rinsed before they may be disposed of at a contained landfill in accordance with label instructions.

Hazardous Waste

Hazardous Wastes (as defined in KRS 224.01-010(31)(b)): Any discarded material or material intended to be discarded or substance or combination of such substances intended to be discarded, in any form, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed or otherwise managed. More specifically, KRS 224.46-510(3) requires the cabinet to use the criteria and lists promulgated in federal hazardous waste rules, i.e., 40 CFR 261. Examples include: paint wastes, discarded chemicals, discarded pesticides, spent solvents, incinerator ash, electroplating wastes, etc. Manufacturing facilities, small businesses, and institutions such as hospitals, schools and universities typically generate hazardous wastes.

“Regulated” Hazardous Waste

A waste is classified as a hazardous waste if it is listed, or testing shows, it meets the characteristic of a hazardous waste. The regulations related to hazardous waste determinations can be found in 401 KAR Chapter 31 and 40 CFR 261:

- Listed wastes include wastes generated by nonspecific industrial operations such as degreasing solvents, other spent solvents, electroplating operations, and specific sources such as petroleum refiners, wood preservers, etc.,
- Discarded commercial products, off specification chemicals, container residues and spill cleanup residues may also be listed hazardous waste,
- Some of the wastes described in the preceding paragraph are considered to be acutely toxic and become regulated when as little as one quart (1 kg. or 2.2 pounds) is generated, and
- Hazardous waste characteristics in general terms are as follows:
 - Ignitable wastes are liquids with a flash point below 140 degrees Fahrenheit, the internal temperature of a garbage landfill,
 - Corrosive wastes are aqueous liquids with a pH below 2.0 and greater than 12.5,
 - Reactive wastes are unstable under normal conditions and can explode or react violently with water to explode or produce toxic gases (i.e., Class A or B explosives),and
 - Toxic wastes can leach contaminants when subject to the toxicity characteristic leaching procedure (TCLP) test. This test is designed to simulate landfill conditions.

Universal Wastes: The following types of wastes must be recycled or specially handled under federal regulations and are not allowed to be disposed at a solid waste landfill:

- Batteries;
- Pesticides;
- Mercury-containing equipment such as thermostats or automatic switches; and
- Florescent light bulbs.

The U.S. EPA requires handlers of universal wastes to generally maintain structural integrity of the casings or containers to prevent spills or releases. The agency generally requires recycling for lead acid batteries, spent fluorescent lights, recalled pesticides, and mercury-containing equipment. Households are exempt from this requirement. The requirements for universal wastes are found at 40 CFR 273. For more information, please see the EPA website at <http://www.epa.gov/wastes/hazard/wastetypes/universal/index.htm>

Small Quantity Generators and “Regular” Generators: Persons who generate more than 220 pounds but less than 2200 pounds of hazardous waste in any one-month at a particular facility location are small quantity generators. Persons who generate more than 2200 pounds of hazardous waste in any one-month at a particular facility location are regular generators. Hazardous wastes from both types of facilities are not exempt from hazardous waste disposal or

treatment regulations. Therefore, they are unacceptable for disposal at contained landfills. Small quantity and large quantity generators either must handle hazardous waste onsite or ship wastes to a permitted hazardous waste treatment, storage, disposal, or recycling facility.

- Do not accept any waste accompanied by a hazardous waste manifest.
- Division of Waste Management field office must be notified immediately when actual or suspected hazardous waste is found during random inspections or during unloading.

Random inspections are an important method to detect these wastes and prevent their disposal at a solid waste landfill.

“Exempt” Hazardous Waste

Conditionally Exempt Small Quantity Generators or Limited Quantity Generators:

Persons who generate less than 220 pounds of hazardous waste in any one-month at a particular facility location are conditionally exempt limited quantity generators. Hazardous wastes from this type of facility are exempt from hazardous waste disposal or treatment regulations. Therefore, they are acceptable for disposal at some contained landfills.

Household Hazardous Wastes (HHW) are leftover or unwanted commercial products used in the home. They have the same hazardous properties as regulated industrial hazardous wastes but are not regulated when generated by households. This means they can ignite or catch fire; react or explode when mixed with other substances; irritate or burn skin; or they are toxic and can adversely affect human health. Household hazardous wastes have the potential to pollute the air and water when disposed of in any landfill other than a contained landfill because they lack the required clay and plastic bottom liner. Examples of HHW include paints, pesticides, herbicides, solvents, and caustics, etc.

Wastes Requiring Specific Written Approval

For contained landfills, any non-MSW waste stream must be approved prior to being accepted and disposed at a contained landfill. The waste must first be characterized and, at a minimum, a TCLP or paint filter test conducted.

Sludges are defined as solids, semi-solids or dusts generated by wastewater treatment units and air pollution control devices. In order to be disposed of in a landfill, sludge cannot contain any free liquids or be hazardous.

Limited Quantity Generator of Hazardous Waste (LQGHW) is defined in the above section. These wastes may be disposed of in contained landfills provided:

- The waste passes the paint filter test and the TCLP,
- The industrial wastestream is approved in accordance with the procedures in the permit, and
- The daily cell location and placement of LQGHW should be clearly identified in facility records.

Contaminated Soils are soils that are not suitable for cover, except as noted below. During the clean up of spills and releases, contaminated soils and other debris may be generated. One of the most common sources of this waste is soil generated during the removal of underground storage tanks. The following guidelines should be adhered to when receiving these wastes:

- PCB spills of oils containing 49 ppm or less. PCBs are not toxic wastes per 40 CFR 761 and may be disposed of at a contained landfill, Petroleum contaminated soils generated during the removal of underground storage tanks are not a hazardous waste according to the UST regulations. However, other gasoline contaminated soils must be tested for a hazardous waste determination, and
- Petroleum contaminated soils may be used for daily cover if the maximum benzene concentration is equal to or less than 1.0 ppm and if the material is not placed during a precipitation event.
- Petroleum contaminated soil is considered a municipal solid waste unless it is the by-product of a manufacturing process.

Publically Owned Treatment Works (POTW) Sewage Treatment Plant Residues are wastes generated from the sewage treatment process. However, septic tank pumpings cannot be accepted at solid waste landfills without the addition of bulking agents, which will ensure that they are solidified and pass the paint filter test.

These residues:

- Contain coarse screenings and de-watered sludge,
- Must pass the **TCLP** test.

Waste Tires

Waste tires generated by households, dealers, junkyards, and other businesses are considered both municipal solid wastes and waste tires under the law. The cabinet encourages recycling of processed waste tire material but about 17.5% of waste tires go to contained landfills according to the Waste Tire Report for CY 2012.

Unacceptable Waste Streams

Unpermitted Geographic Source Waste: Any waste from a city, county or other geographic source not specifically listed in the contained or CDD permit cannot be accepted. An add/delete waste source application must be filed with and approval received from the Division before acceptance at a landfill.

Hazardous Waste: Manufacturing facilities, small businesses and institutions such as hospitals, schools and universities typically generate hazardous wastes. See the above discussion on types of “regulated” hazardous waste.

Liquids and Oils: Liquids and oils contribute to the generation of leachate and may contain hazardous constituents that are a threat to groundwater, surface water, and human health. Some liquids may contain certain vapors which could easily ignite, or cause severe breathing issues. The best way in dealing with these types of wastes are to either recycle them or bind them with a binding agent, such as cat litter or sawdust. All liquid and oil wastes must pass the paint filter test before they are disposed of in a contained or CDD landfill.

Lead Acid Batteries: Batteries contain a strong acid that could cause serious burns to the skin if operators came in contact with the liquid. They also contain high levels of lead, which can contaminate surface water or groundwater. They also become a hazardous waste when the case is broken. Lead acid batteries must be recycled and can only be accepted by a retail or wholesale seller of new lead acid batteries, a lead smelter, a recycler or collection facility delivering to a smelter or recycler. Please also refer to the discussion on Universal Wastes.

Whole Tires: KRS 224.50-820 requires tires to be processed to prevent the entrapment of air or water before disposal in a landfill. Large off the road tires, such as the tires used on construction and mining equipment, may be placed in the bottom of a daily landfill cell or mining pit since processing equipment for the giant tires are not available in all parts of the Commonwealth.

Special Handling Considerations for Specific Types of Waste

The following is an overview of how certain waste streams must be handled.

ASBESTOS

- Cover with daily cover at the end of the day (only a 6 inch cover is required).
- When covering asbestos, a 2-4 feet thickness of garbage must be maintained between the equipment and asbestos to prevent releases to the air.
- Landfill employees must comply with OSHA standards when handling asbestos wastes.
- Other landfill workers should not be allowed in an area where asbestos is being handled.
- Must be transported in approved containers (a truck is not a container) and exceptions require written approval from the Division for Air Quality.
- Containers or bags must not be ruptured during handling and compaction.
- If required by the permit, asbestos must be buried in a separate area.

SLUDGES

- Should be placed in the working face and co-mixed with refuse unless an alternate method is specified in permit,
- Cannot be used for daily cover, and
- Can only be applied to cover soil to aid in re-vegetation if approved by permit.

BULKY ITEMS

- Can lend to uneven settlement which prevents adequate runoff,
- If it cannot be recycled, crushing, compacting or shredding on solid ground before pushing into the working face is recommended,
- Place in bottom of cell or separate area,
- Objects placed in the initial lift must not be allowed to damage the bottom liner (401KAR 48:090, Section 9),
- Materials for salvage or recycling may only be accumulated if a separate area away from the working face has been designated in the permit (401 KAR 48:090, Section 9), and
- A chipper can be used to significantly reduce the volume of brush and the potential settlement.

SMOLDERING WASTE

- Empty load away from working face. For contained landfills, this is in the area designated in the permit (401 KAR48:090, Section 5),
- Water down only as much as needed to completely extinguish as additional liquids will contribute to leachate,
- Place in working face, compact and cover when no risk of fire remains, and
- Exposed glass wastes have been known to start landfill fires on sunny days and should be covered with waste or soil promptly.

DUSTS

- Containerization or wetting is strongly recommended to prevent a hazard to exposed persons.

DRUMS

- May conceal hazardous waste or waste with free liquids,
- Poor compaction may lead to uneven settlement and voids in the landfill,
- Drums must arrive open for inspection to ensure regulated hazardous waste or free liquids are not contained within,
- Sealed drums must not be opened or accepted for disposal by landfill personnel,
- Sealed drums may contain explosive vapors, regulated hazardous waste(s), or free liquids, and
- Return sealed drums to sender.

Waste Stream Testing

Before you dispose of certain wastes at your landfill, it is important to find out if you can accept those wastes at your landfill. By conducting a visual inspection of the waste, you cannot always determine if that waste is acceptable. Sometimes laboratory analyses are required to determine if a waste contains leachable material or if a waste is too wet.

When a TCLP test is conducted, the waste stream is tested in a manner that reproduces the slightly acidic environment of a landfill. The purpose of the test is to see how much of a particular constituent will leach out of the waste and potentially pollute the groundwater.

The paint filter test determines if a material contains free liquids. If a waste stream contains free liquids, it cannot be disposed of at a landfill. The waste must be processed or mixed with solids until it can pass the paint filter test before disposal is allowed.

Random Inspections

401 KAR 48:090, Section 2 describes the procedures for excluding the receipt of hazardous waste. This section requires random inspections of incoming loads. The purpose of random inspections is to make sure that no hazardous waste enters the landfill with the exception of exempt hazardous waste that falls under 401 KAR 31:010, Sections 4(2)(a) and 5(7)(c)5. These inspections are also helpful in preventing disposal of unauthorized solid waste and free liquids.

While the Cabinet does not have any specific regulations outlining how random inspections should be conducted, the following is required by 401 KAR 48:090, Section 2:

- Random inspections should be documented and kept on file.
- Facility personnel must be trained in hazardous waste identification.
- Upon discovery of a hazardous waste, the owner or operator of a contained landfill must isolate the load and notify the Cabinet immediately.

Separate Waste Handling Areas

401 KAR 48:070, Section 5 requires contained landfills to have specially designated handling areas, away from the working face, to handle certain wastes. Separate areas are required for:

- Loads containing burning or smoldering wastes,
- Wastes from pick-up trucks and automobiles, and
- Salvageable and recyclable materials—if the facility intends to manage these materials

Burning or smoldering waste could cause other wastes in the landfill to catch on fire. This creates a dangerous situation for landfill employees, people who are unloading and emergency personnel responding to the fire. It also causes air pollution. An area for these wastes must be designated on the permit.

Separate areas are required for pick-up trucks and automobiles simply because of safety reasons. It can be dangerous for smaller vehicles to unload at the working face because of heavy traffic from larger dump trucks and landfill equipment. An area for these wastes must be designated on the permit.

Because 401 KAR 48:090, Section 9(6) prohibits scavenging within 100 feet of the working face, incoming loads with salvageable and recyclable materials must be taken to an area separate from the working face. This area must be designated on the permit.

Methods of Operation

- Plan to deposit refuse in a method that reduces leachate production and litter,
- Prepare a waste dumping berm high enough for the protective layer and first waste layer,
- Spread refuse using light weight equipment (such as a D-6 dozer or equivalent), and
- Continue placing next lift normally using a landfill compactor.

Liner Protection

The Cabinet requires protection of the newly constructed contained landfill liner to prevent boards, pipes and other potentially damaging material from puncturing the liner. This is even more important as more designers specify GCL and geocomposite drainage netting instead of CCL (2 or 3 feet of clay) and 1 foot of gravel. The new GCL material, while much more resistant to water infiltration, is much thinner than the traditional clay liner. The GCL is typically less than one-half inch thick compared to the 24 to 36-inch thick normal liner. The drainage geocomposite is also much thinner.

The options for GCL/geocomposite liner protection include:

- Placing 6 to 12 inches of sand or gravel on top of the GCL/drainage net,
- Placing eight feet of “fluff” which is household garbage free of any damaging objects, such as boards or pipes, on top of the 12” thick drainage layer or sand/gravel protective layer.

This may require:

- Route management so that haulers pick up no boards, pipes, CDD material, swing sets, etc. during the time of fluff layer placement,
- Diversion of CDD waste trucks to the CDD landfill unit,
- Spotters to remove objects on the floor of the cell to remove damaging objects, and
- Use of a D-6 dozer (or equivalent) or smaller equipment for spreading with the GPS guidance unit turned “off” to prevent tearing the liner with the blade.

Cover Requirements

Contained landfills are required to utilize 4 types of cover. The type utilized depends on the amount of time it will be used as a cover for wastes.

Daily cover - 401 KAR 48:090, Section 3(1), requires a compacted layer of at least 6 inches of soil to cover all exposed wastes at the end of each operating day; or for continuously

operating landfills, once every 24 hours. Primary cover materials are soil, properly weathered or crushed shale or siltstone.

This cover must not allow waste to protrude except for occasional litter not exceeding 10% of the cover area. Daily cover must be placed and compacted to allow for proper drainage. The owner or operator may remove daily cover to allow methane gas to escape or for the removal of leachate. Any daily cover removed must be disposed of as a waste.

Interim cover - 401 KAR 48:090, Section 3(2) requires the placement of an additional 6 inches of cover material over an area not set to receive additional solid waste within 30 calendar days. Including the previously applied daily cover, this would result in a cover depth of 12 inches. Interim cover should be placed, compacted, and graded to allow proper drainage and should be protected by temporary erosion controls. Interim cover must be properly seeded during the fall seeding season.

Placement of interim cover normally means that the operator will utilize the area for disposal again in the near future. On the day waste is to be placed over an area that has interim cover, up to 6 inches of cover may be removed from the area of the cell for that day's operation.

Long-term cover - 401 KAR 48:090, Section 3(3) requires the operator to apply an additional 18 inches of cover over all areas not scheduled to receive additional wastes within 4 months by September 15 of each year. This will increase the depth, including daily and interim cover, to a total of 30 inches. Long-term cover must be placed, compacted, and graded to allow for proper drainage. Erosion controls and proper seeding must be completed during the fall seeding season.

The entire 18 inches of long-term cover may be removed within 7 calendar days of placement of additional wastes. An additional 6 inches of cover may be removed on the day new waste is to be placed in the cell.

Final cover - 401 KAR 48:090, Section 3(4) requires the initiation of applying final cover within thirty (30) days of filling a completed phase of the landfill to final design grade and annually such that the final cap is in place by September 15th in all areas of the landfill that has reached final grade by August 15th of each year. However, an alternate schedule may be approved when construction techniques shall preclude construction by the above referenced dates.

Contained landfills are required to record, on a form(s) approved by the Division, the daily cell locations, dates of all cover applications, and certification reports as required by 401 KAR 48:090, Section 3(5).

More information about contained landfills is provided in Chapter 13. A detailed look into the design requirements and additional information for each of these landfill categories will be discussed in Chapters 10 through 13.

This page left blank intentionally.

Chapter 4: LANDFILL EQUIPMENT

Chapter 4 Objectives

1. Understand the tasks associated with operations of a landfill and the types of equipment needed.
2. List the steps in an effective maintenance program.
3. Managers should comprehend equipment regulations for each type of landfill.

This section discusses operational considerations, equipment maintenance programs, and equipment related regulations.

Operational Considerations

Equipment is necessary for many different tasks at a landfill. Therefore, it may be required to have more than one type of equipment available. Tasks to be considered when choosing equipment are:

- **Hauling of Cover Material**
 - Volume required;
 - Distance cover material transported; and
 - Type of soil or material to be excavated.

- **Waste and Soil Cover Compaction**
 - Type and amount of solid waste being compacted;
 - Type and depth of cover material;
 - Number of passes machine is required to make;
 - Minimum weight and horsepower requirements; and
 - Peak rates of waste disposal (tons per hour).

- **Supplemental Tasks**
 - Site clearing;
 - Maintaining access road(s); and
 - Excavating ditches.

- **Machine Availability**
 - Recommended usage rates (capacity in units per hour);
 - Backup equipment availability;
 - Consideration of machine warranties when purchasing; and
 - Estimated cost of machine repairs and labor for the life of the machine.

Selecting Equipment

Equipment selection can be particularly difficult for a site such as a CDD or industrial landfill where only one machine will be used. The machine must be capable of spreading and compacting solid waste and cover material, as well as having to excavate ditches, an area, or cover material. Remember, just because a piece of equipment has exceptional performance in some activities, there is no guarantee that it will be exceptional for all needed activities. You should select a machine that will give high performance in all use categories.

Maintenance

Construction/Demolition/Debris (CDD) and Contained Landfills are required to have sufficient equipment to spread and compact all wastes received. In addition, backup equipment must be readily available in case the main equipment breaks down. Because the equipment is so essential to daily operations proper maintenance of equipment is a priority. Benefits of proper maintenance and repair include:

- Maximizes equipment effectiveness and equipment life;
- Minimizes equipment breakdown and excessive repairs;
- Allows for reliable service to public;
- Minimizes injuries from faulty equipment;
- Helps maintain sanitary conditions at landfill; and
- Minimizes downtime.

Contained landfills are required to have an equipment operating and maintenance recordkeeping program.

This program must allow a landfill to track, at a minimum, availability of primary and backup equipment utilized for:

- Spreading, covering, and compacting waste;
- Maintaining road and drainage features;
- Dust suppression; and
- Maintaining leachate and methane gas systems.

Daily Maintenance Program

Daily maintenance programs are designed to keep equipment in peak condition and prevent failure including items such as lubrication, checking the fluids, and retightening bolts and screws. Equipment maintenance programs are divided into periodic maintenance and preventive maintenance. Periodic maintenance is like when you change the oil on your car every 3,000 miles. All equipment has periodic needs, and should be checked on a regular schedule. Preventive maintenance is something you can do to prevent a piece of equipment from breaking down.

Just like human life is extended by preventive medicine, the equipment service life can be prolonged by doing preventive maintenance. Equipment manufacturers have recommended schedules for both periodic and preventive maintenance services. Follow these recommended schedules for each machine.

In addition to reducing costs and saving time, having daily equipment checks help avoid accidents that may result in death or injury to operating personnel.

Preventive Maintenance

Maintenance of equipment is achieved by preventing deterioration. Some maintenance procedures may include cleaning, inspection, oiling, and re-tightening. Other procedures may include checking the safety brakes, parking brake, and backup alarm.

Periodic Program Maintenance

Periodic inspections are a form of time-based maintenance. Periodic programs conduct inspections on a regular time interval schedule. These programs consist of inspecting, servicing and cleaning equipment, as well as replacing parts to prevent sudden failure and process problems. Periodic inspections typically take place at every 125 hours, 250 hours, 500 hours, and 1000 hours of equipment usage; or as specified by the manufacturer.

Predictive Maintenance Programs

The Predictive Maintenance Program is a method in which the service life of important parts is predicted based on inspection or diagnosis. This kind of program allows parts to be used for the duration of their service life. Compared to periodic maintenance, predictive maintenance is condition-based maintenance. Predictive programs manage trend values by measuring and analyzing data about deterioration, and employing a surveillance system designed to monitor conditions through an on-line system.

Managers: Equipment Regulations

Each section below lists important regulations that apply to equipment for different kinds of landfills. Be sure to read the “Note” portions where they appear under each landfill section.

Construction/ Demolition Debris Landfills

- All compaction equipment to be used for site operation shall have a minimum weight of 30,000 lbs and a minimum 130 horsepower motor. Sufficient equipment shall be listed on the application to handle the cover requirements in subsection (3) of this section as well as working cell grading and compaction. (401 KAR chapter 48:060, Section 1(5))
- Adequate soil material shall be available to provide one foot of compacted cover on lifts of every 10,000 square feet, at the end of each working week, or at intervals sufficient to reduce fire hazards, prevent an unsightly appearance, and eliminate disease vectors. (401 KAR 48:060, Section 1(3)).
- Alternate daily cover material may be used with the Cabinet’s written approval. Alternative daily covers are materials that shed water, resist poking by boards and pipes, and are inflammable.
- Operating equipment shall be onsite during operating hours and capable of spreading and compacting the volume of waste received at the site. Backup equipment shall be available within one week of primary equipment breakdown. (401 KAR 48:060, Section 2(12))
- Before earth-moving equipment is removed from the site, an inspection of the entire site shall be made by an authorized representative of the Cabinet to determine compliance with approved plans and specifications. The owner or operator shall present the quality control records demonstrating compliance with the permit. (401 KAR 48:060, Section 3(1)(e))

Contained Landfills

- Sufficient equipment shall be available to spread and compact all wastes within two (2) hours of receipt. (401 KAR 48:070, Section 6(1))
- Steel wheeled compactors, designed for landfill operation, shall be specified for residential and solid waste compaction. (401 KAR 48:070, Section 6(2))
- The owner or operator shall provide the landfill equipment required to (401 KAR 48:070, Section 6(3)):
 - Handle all daily, interim, long term and final cover requirements;
 - Maintain all roads and drainage features;
 - Provide dust suppression;
 - Maintain leachate and methane gas systems; and

- Properly compact waste at peak receipt rates. These rates shall be determined in tons per hour and kept on file with the Cabinet.
- Backup equipment shall be available for waste spreading and compaction, application of daily cover and maintenance of leachate systems within twenty-four (24) hours of primary equipment incapacitation. (401 KAR 48:070, Section 6(4))
- Landfill compactors shall have a minimum gross ground pressure of 325 lbs per linear inch of wheel width. (401 KAR 48:070, Section 6(5)) **Note:** There have been problems with this specification apparently pointing to one brand. The Cabinet will grant a variance to use another brand if the 1,200 lbs./cu yd. density goal is achieved.
- Any equipment used for compaction shall have a minimum gross weight of 30,000 lbs. and a minimum of 130 engine horsepower. (401 KAR 48:070, Section 6(6))
- The primary working face equipment used for waste spreading and compaction shall have the standard landfill guard package offered by the manufacturer, or an otherwise reasonable adaptation, to provide protection from waste damage hazards and other landfill operating hazards. (401 KAR 48:070, Section 6(7))
- The operator shall propose an equipment operating and maintenance recordkeeping system. The system shall, at a minimum, track the availability of each piece of equipment in subsection (1) and (4) of this section. (401 KAR 48:070, Section 6(8))
- Any equipment used for waste compaction shall have a specified maximum rated capacity. (401 KAR 48:070, Section 6(9))
- Compaction for residential solid waste, the in place waste density goal shall be to achieve greater than 1,200 lbs/cu yd in completed cells. The density shall be determined by dividing the total weight of waste received by the cubic yards of airspace used. The landfill density shall be computed annually per 401 KAR 48:070, Sections 6 and 7. (401 KAR 48:070, Section 7).
- Each landfill site shall include a building for maintenance of equipment. The building shall be large enough to hold the largest piece of equipment required for site operation. The building shall be heated for winter repair operations. (401 KAR 48:070, Section 9(2))
- Within two hours of receipt, the owner or operator shall spread wastes in loose layers (not exceeding twenty-four inches in depth) compacted to the maximum practicable density. The owner or operator shall use the equipment specified in the permit for compaction. The operator shall pass the equipment over 100 percent of the waste surface at least four times. Each loose layer shall be fully compacted before any additional waste is placed. (401 KAR 48:090, Section 9(1))
- The owner or operator shall not accept solid waste at a rate that exceeds the rated capacity of operational compaction and cover equipment available onsite. (401 KAR 48:090, Section 9(8))

Chapter 5: LANDFILL SAFETY

Chapter 5 Objectives

1. Identify the legal requirement for a safety program.
2. Understand the importance of and how to achieve safe operations.
3. Describe the steps in establishing a safety program.
4. List the associated hazards found at landfills.

This section discusses the benefits of safety, outlines safety procedures and describes how to establish a safety program.

Safety Regulations

Always comply with the regulations set forth in the Code of Federal Regulations (CFR), specifically 29 CFR 1910.146 and Kentucky's Occupational Safety and Health Standards for General Industry.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor develops and enforces comprehensive work practices and safety standards to protect American workers.

The General Duty Clause [5(a)(1)] of the 1972 OSHA establishes basic requirements employers must follow to provide their employees with a workplace free from recognized hazards.

Importance of Safe Operations

Safe operation of a landfill is only possible with the complete cooperation of all personnel participating in the operation. This cooperation can only be achieved when there is mutual trust and respect between members of management and labor employees. To maintain a safe workplace, management must demonstrate concern for the welfare of all employees. A safe workplace does not mean a workplace free of all risks; it does mean a workplace where every attempt is made by all involved, to recognize and minimize hazards. Training each employee in the proper procedures to manage those hazards is just one important step in ensuring safe operations.

National Safety Council statistics indicate that injury rates for refuse disposal operations are 14 times the national average for other industries. No data has been presented for landfill operations, but the nature of the work being conducted at a landfill facility presents a special risk to both employees and customers. More than 80 percent of all accidents are caused by unsafe acts. Yet most accidents and resulting injuries are preventable.

Landfill operations involve certain risks because of the potential for encounters with heavy equipment. Hazards occur during collection, transportation, and processing, from foreign materials contained in raw materials, and from vectors, pathogens, noise, dust, fire, etc. Landfill activities involve risks; however, those risks do not need to be unreasonable.

Fairness to workers requires that training be provided, including a thorough understanding of the risks and hazards present on the job, as well as how to deal with potential hazards.

The economic impacts of unsafe operations cannot be ignored. The effects of accidents and unprotected exposure to occupational hazards can and will overwhelm operational budgets.

The direct cost of treatment for injuries or disabilities, employee death, equipment and facility damage, and increased insurance costs are far more than the cost of training and

prevention. Furthermore, damage to workers morale and productivity will negatively affect the success of the operation.

In addition to fairness and economic concerns, safety on the worksite is mandated by OSHA regulations. The Kentucky Occupations Safety and Health Review Commission adopted the regulations contained in 29 CFR part 1910 and Health Standards Board as 803 KAR 2:300 through 2:320. OSHA regulations require employers to make employees aware of hazards they face in the workplace. Additionally, they must be trained to respond to those hazards in a safe manner. While it is not in the scope of this manual to address all regulatory requirements, we will consider some of the basics.

Benefits of Safe Operations: Safe operations benefit the landfill owner, manager and operator. Benefits to the owner and managers include:

- Workers are on the job, not the injury list;
- Morale is higher due to a safe working environment;
- Accident insurance may cost less; and
- Equipment will last longer and need fewer repairs.

Benefits to the operator include:

- Avoid pain and possible permanent injury;
- No loss of wages or job security;
- Better chance for promotions and transfers; and
- Morale is high as free time can be enjoyed more fully.

Remember: Your best protection against injury is your own attitude.

Landfill Operations Safety Programs

Safety training programs cover more than just holding safety meetings. These programs must also be used to identify hazards at your facility. All personnel must be trained to look for unsafe conditions or actions, and be informed of the correct reporting procedures so hazards can be mitigated. The development of the landfill operation safety program should include evaluation of hazards encountered in the normal workday, and developing procedures to reduce those hazards. Implementation of hazard reduction procedures can be achieved through a comprehensive safety program.

Risk Assessment: You should assess and prioritize existing hazards.

- Identify all adverse effects of those hazards.

- Under what situations could the hazard occur?
- If an accident happens, what are the results?
- Evaluate conditions of exposure and affects.
- Assess the degree of harm from a given affect/exposure. The effect to the person, if the hazard happens, divided by the number of exposures in a period of time.
- Develop control methods and procedures that minimize the harm to employees and the public.

Program Monitoring: Monitor and update your program as needed on an annual basis at a minimum.

- Check to see if control methods and procedures are working for known hazards.
- Set up a system to check for potential new hazards.
- Develop new control methods and procedures when new activities are undertaken at the landfill.
- Hold regular meetings to discuss causes and methods of preventing accidents.

Reporting Procedures: All personnel at the site must know the procedures for reporting accidents, injuries, fires and other unusual occurrences. Procedures should be posted by the phone and in the safety program documentation.

Records: Accurate records are very important to comply with state and federal safety regulations and to maintain an incentive program to help reduce accidents. In addition, records will provide an indication of the effectiveness of the safety program.

Landfill Hazards

Associated hazards can be divided into three broad categories: chemical, physical and biological. We will examine each of these categories.

Chemical Hazards

Employee Right to Know (29 CFR 1910.1200): The first steps in developing a safety program are to 1) identify all chemical hazards and to 2) ensure that all employees are informed. This means that employees have the right to know the identity of all hazardous chemicals they will encounter in the workplace, understand the health effects of exposure, and know and understand how to work safely with those materials. This information must be provided in writing and be available at all times. Generally, there are not a great number of different hazardous chemicals or materials on a landfill site. However, a survey and inventory should be conducted to assure the proper Material Safety Data Sheets (MSDS) are available.

Protection from Chemical Hazards

Hazardous materials may enter the body by inhalation (most common), ingestion, absorption through the skin and eyes, or injection. The primary ways workers are exposed to hazardous chemical include:

- Lack of knowledge of the materials;
- Failure to follow proper procedures or to use appropriate personal protective equipment (PPE);
- Failure to decontaminate oneself or equipment; or
- Carelessness, such as walking through puddles or into clouds of unknown vapors, or consuming food, water or smoking cigarettes contaminated by contact with gloves, equipment, or unwashed hands.

Once information on the chemical hazard has been obtained, the employer and employee can select the proper PPE for working with the chemical. The employer must make sure employees are properly trained in the use of the selected PPE.

Contained landfills are allowed to accept Household Hazardous Waste (HHW), Limited Quantity Hazardous Waste, and small quantity hazardous waste spill residues. If the operator remains on the compactor or dozer, little exposure should develop.

If an unknown waste, such as liquid waste in a drum, is encountered, contact the manager. The site manager should check with the scale house operator for the name of the generator and type of wastes. If the waste is unauthorized, the generator should be asked to **retrieve the material or pay for its safe removal and disposal elsewhere**. If the waste is unknown, the manager must call someone in the organization, a hazardous material contractor or the Division of Waste Management Regional Office personnel to assess the waste and determine its chemical consistency and threat. **The person assessing the waste must be trained with the initial 40-hour course and annual 8-hour refresher for OSHA 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response (HAZWOPER)**. The person should wear the appropriate PPE and follow proper procedures when approaching the unknown waste for sampling and assessment.

Physical Hazards

Physical hazards are abundant at landfill operations. Hazards range from the exposure to large equipment, electrical hazards and confined spaces, as well as minor injuries such as cuts, strains, sprains, bruises and abrasions. Injuries can occur because of slips and falls, improper lifting, incautious backing of equipment, improper confined space entry, failure to properly lock- out/tag-out energy sources, and improper use of hand or power tools.

While most injuries are minor, serious injuries or deaths may result. Prolonged exposure to

loud noises may permanently damage hearing. Failure to lock and tag energy sources and improper confined space entry may result in fatalities. Exposure to heat and cold may cause heat stroke or frost bite and can lead to indirect effects such as fatigue, dizziness and confusion which in turn can lead to accidents, injuries and death.

Equipment Operation

Every equipment operator should receive thorough instruction on safe use of equipment. The following guidelines are few examples that should be followed for equipment operation:

- Checked for defects before starting. Do not start or operate defective equipment.
- Be aware of your surroundings. Always look around work area to locate persons and/or other equipment.
- Clear a path. Walk around the machine and look for people and other equipment before moving equipment.

Operator Protective Equipment

There are many types of protective equipment available. Operators should use protective equipment to prevent injury. Some of the equipment available for operators includes:

- Hearing protection—reduces the potential of hearing loss from excessive noise.
- Hard hat—protects wearer from collision with stationary, falling and flying objects.
- Safety shoes—protects feet from crushing and puncture hazards.
- Safety goggles—protects eyes from dust, flying objects and chemical contact.
- Gloves—protects hands from sharp objects and chemical exposure.
- Long-sleeved shirts and trousers – protects from exposure to sunlight, dust, liquids, chemicals, insects and flying objects.
- Fluorescent vests—makes the wearer more visible to others in the work area.
- Respirators—protects wearer from exposure by inhalation for dusty operations (asbestos, fiberglass, ashes, etc.).

Biological Hazards

Workers at a landfill can potentially be exposed to biological hazards. Appropriate precautions must be taken. Materials such as glass, metals, used needles and other sharp objects offer a significant risk of puncture to the skin. If a puncture occurs, pathogenic organisms can be introduced into the body. These organisms may arise from human or animal waste sources.

Wastewater plant sludge is of human origin. Most sludge is decontaminated by undergoing one or more of the following processes: 1) a Process to Significantly Reduce Pathogens (PSRP), or 2) a Process to Further Reduce Pathogens (PRFP) or 3) one of the appropriate processes listed in 40 CFR 503 Subpart D. Wastewater plant sludge that has not undergone PRFP or PSRP may be accepted at a contained landfill, but it represents increased risk of exposure to landfill workers, because the sludge is likely to contain pathogenic organisms in high concentrations.

Bloodborne pathogens are of human origin, and highly hazardous to workers. OSHA defines blood to mean human blood, human blood components, and products made from human blood. Bloodborne pathogens may cause serious illness or disease, like Hepatitis B, Hepatitis C, HIV/AIDS, and others. Workers need to be highly cautious of materials in the waste stream containing human body fluids, such as semen, vaginal secretions, brain and spinal fluids, saliva from dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids where it is difficult or impossible to differentiate between body fluids.

Mold and fungi are another type of biological hazard that may be encountered at landfills. Molds and fungi may be present in flood demolition debris, such as drywall and insulation, and can cause allergic reactions, such as rashes, swelling, or difficulty breathing.

It's important for all employees to be aware of the possibility of exposure and know the steps they must take to reduce risk factors. As with the risk from chemical and physical hazards, selection of the proper PPE and personal hygiene will greatly reduce the risk of biological exposure.

Fire Safety

Equipment and buildings are required to have proper fire extinguishers that are checked regularly and serviced as needed. Employees must be trained in the proper use of fire extinguishers. Different types (classes) of fires require different types of fire extinguishers. The following is a list of the different fire classes:

- Class A Fires – occurring in wood, clothing, paper, rags and other solid materials.
- Class B Fires – occurring in flammable liquids, such as gasoline, fuel, oil, lube oil grease, some solvents, paints, etc. The materials needed to extinguish type B fires are those that dilute or eliminate the air by blanketing the surface of the fire to create a smothering effect.
- Class C Fires – occurring in electrical equipment and facilities. The extinguishing agent for this type of fire must be non-conductive of electricity and provide a smothering effect.
- Class D Fires – occurring from the chemical reaction of metal compounds such as aluminum, magnesium, phosphorous, etc.

See more on landfill fire regulation at the end of this chapter.

First Aid

First aid kits should be readily available to everyone at the site. The kits should be clearly marked and highly visible. Staff should be made aware of the first aid kit location. The kit should be maintained so supplies are stocked on a regular basis, and so that supplies do not expire.

At least one person at the site should have a first aid certificate. Contact the nearest Red Cross Chapter or education facility to receive information on the first aid course(s) offered. Approximately eight (8) hours of training is needed for the certificate.

Confined Space Entry

A confined space is large enough for an employee to enter fully and perform work; has limited or restricted means of entry or exit; and is not designed for continuous human occupancy. In 29 CFR 1910.146b, OSHA defines a non-permit confined space as a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm. Permit-required confined spaces are those having the potential to contain any hazard capable of causing death or serious physical harm.

Confined spaces are generally entered infrequently for cleaning, inspection and repair. OSHA has identified over 238,000 workplaces with confined spaces. There are approximately 12.2 million workers employed at facilities with confined spaces. About 13% of those workers enter over 4.8 million permit-required confined spaces each year. **OSHA estimates that compliance with the permit-required confined space standard could reduce fatalities, injuries, and illnesses by 80-90 percent.**

Training in confined space entry can be obtained through OSHA workshops. The following sections discuss confined spaces and some associated hazards.

Examples of Confined Spaces:

- Bins
- Boilers
- Ducts
- Furnaces
- Hoppers
- Manholes
- Pipes
- Pits
- Sewers
- Silos
- Tanks
- Trenches
- Tunnels
- Vaults

Hydrogen Sulfide gas may accumulate in a low area surrounded by earthen berms where the heavier-than-air fumes stay near the ground and do not escape. Entry into this situation may require a confined entry permit.

Confined Space Hazards

Confined space hazards include several conditions: those conditions which poses an immediate threat to the health or life of an entrant; conditions that would cause irreversible adverse health effects; or conditions that would interfere with an individual's ability to escape unaided from a permit space. Some of these hazards are listed below.

- Oxygen deficiency - <19.5% or >23.5% oxygen concentration
- IDLH (Immediately Dangerous to Life or Health) atmospheres
- Combustibles:
 - Methane
 - Hydrogen
 - Acetylene
 - Propane
 - Gasoline fumes
- Toxic materials:
 - Carbon monoxide
 - Methane gas
 - Hydrogen sulfide
 - Welding fumes
 - Corrosives
- Electricity
- Mechanical hazards
- Mixers
- Crushers

Contractor Confined Space Entry

Contractors must be informed of the hazards within the space. Contractors must follow their own established confined space entry procedures, and train their own personnel. However, owners and operators should ensure the emergency response teams are available **prior to entry**.

Training and Responsibilities

All authorized and affected employees shall be instructed in the safety significance of the lock-out procedures by their supervisor. Each new or transfer employee shall receive the same instruction.

Landfill Safety Regulations

The solid and special waste landfill regulations require certain activities.

CDD:

- Landfill operators shall not permit or engage in open burning of waste. Any open burning shall be immediately extinguished. Wastes which are burning or smoldering shall not be deposited in the fill. Such materials shall be deposited at a location safely removed from the normal fill area. (401 KAR 48:060, Section 2(2): We strongly recommend a designated area that is made known to all operators.
- Landfill operators shall not allow uncontrolled public access that would expose the public to potential health and safety hazards (401 KAR 48:060, Section 2(7)): At a minimum, we recommend a strong metal pole swinging gate with posts and a lock across the main access road; or similar.
- A fire safety and response plan shall be developed and maintained. The plan shall identify measures that shall reduce the risk of fire at the facility, identify the equipment and procedures to respond to a fire and supplement the local fire department's capabilities (401 KAR 48:060, Section 2(10)): The cabinet recommends meeting with the local Fire Chief and going over the plan. At a minimum, give the chief a topographic map with the site marked and show the location of the sediment pond or any other sources of water. Explain the landfill operators will excavate any burning wastes, move it off the waste area and cover it with soil to extinguish. Some water may be placed on the smoldering wastes outside the waste area, if needed.
- Adequate communication facilities shall be provided for emergency purposes (401 KAR 48:060, Section 2(2-11)): This is generally a cell phone on the manager and operator or a radio from the operator to the manager and a cell phone or landline for use by the manager. **Emergency numbers should be stored in the cell phone or displayed by a landline.** Note: If a cell phone is the primary means of communication, the **caller should have the location, by road address or by latitude and longitude, readily available.** Many dispatchers may not be able to read a location unless calling 911 from a permanent phone.

Contained:

- Separate Areas for Handling Problem Wastes. The applicant shall design an area separate from the daily working face to allow the safe handling of certain wastes.
- Separate areas are required for the handling of:
 - Loads containing burning waste;
 - Wastes from pick-up trucks and automobiles; and
 - Salvageable and recyclable materials when the facility intends to manage these materials (401 KAR 48:070, Section 5).
- The designer must note the location of these areas on the plans.
- The “hot load area” shall be away from the waste disposal area.
- Wastes from individual customers are usually a roll-off container located below grade off a paved pad near the main entrance off to the side where customers may back-up and unload. Owners usually call this area the “Citizens disposal” area. Before this rule, sometimes customers would place themselves in the way of operating equipment while unloading at the working face, creating a dangerous situation.
- Most contained landfills typically choose to have a recycling or salvaged materials area. Frequently, the landfill managers collect whole tires to be shipped to off-site processors, scrap metal destined for metal recyclers and other removable items. They may also have Freon and refrigerants removed from appliances by technicians before they are shipped. Before these rules, sometimes individual customers would compete with operating equipment for salvageable materials at the working face. Workers on the ground may try to salvage materials for the manager while daily operations were underway. Not a good scenario!
- **Safety and Communication Plan.** The landfill safety and communication plan shall contain:
 - (1) The safe operating and maintenance procedures for heavy equipment;
 - (2) Procedures to protect employees in a manner complying with the Kentucky Labor Cabinet OSHA requirements;
 - (3) A description of equipment to achieve emergency communication. At a minimum the applicant shall specify an on-site telephone or a two-way radio connection to an off-site telephone. The radio base station shall be monitored during landfill operations; and
 - (4) A fire fighting contingency plan containing a topographic map denoting the location of the landfill, a site map and an emergency contact. The operator shall mail a copy of the safety and communications plan to the

local fire chief. The plan shall include the location of fire fighting water sources, roads, and major site features (401 KAR 48:070, Section 12).

Items (1) and (2) are discussed in the Chapter on Equipment and in this chapter. Item (3) may be satisfied today with a cell phone on the operator and the manager in lieu of a radio system.

Residual and Special Waste Landfills:

- Both types of landfill managers and operators must comply with the EPS, which includes a clause on safety:

Safety

(1) **Explosive gases.** A solid waste site or facility shall not allow the concentration of explosive gases generated by the facility to exceed:

(a) Twenty-five (25) percent of the lower explosive limit for the gases in facility structures (excluding gas control or recovery system components); and

(b) The lower explosive limit for the gases at the facility property boundary.

(2) **Fires.** A solid waste site or facility shall not pose a hazard to the safety of persons or property from fires. This may be accomplished through compliance with Sections 8 (PCB limits) and 9 (cover) of this administrative regulation, through the periodic application of daily, interim, or long-term cover materials or other techniques such as, but not limited to, isolation, fire breaks, compliance with local fire codes, availability of fire fighting equipment, and normal fire prevention measures as appropriate.

(3) **Access.** A solid waste site or facility shall not allow uncontrolled public access, unauthorized vehicular traffic, or illegal dumping of wastes. This requirement to ensure protection of human health and the environment may be met by using artificial barriers, natural barriers, or other methods as appropriate.

Regarding (1), most industrial landfills do not accept materials that generate methane or explosive gases. If one did allow rotting wastes, adopting of some of the contained gas control standards is highly recommended.

The same reasoning applies to (2). Most industrial wastes are non-flammable. If the wastes, such as wood bark or paper materials, are flammable, the local fire chief should be notified and contained or CDD rules added to the permit as conditions. When landfills are located at a plant, the manager may choose to train and use the local plant fire brigade made from shift employees. If the site permit allows acceptance of burnable material, the permit should specify fire safety conditions similar to those specified in contained or CDD rules.

Restricting access in (3) applies to all landfills. Most industrial landfills are located near the plant behind the fence with a security guard at the gate which certainly meets the regulation. Landfills may be accessible by only a road through the plant main gate and then out a back

egress. Managers may control public access by a gate across the road at the landfill entrance. In rural areas, control of four-wheeler access may be done with trenches, barriers or warning signs.

This page left blank intentionally.

Chapter 6: PERMITTING PROCESS AND OPERATING CONDITIONS

Chapter 6 Objectives

1. Explain the purpose of the solid and special waste regulations.
2. List and understand the standards the permittee should be aware of when selecting a suitable site for landfill construction.
3. Know the steps in the application process.
4. Comprehend the closure and post-closure cost estimate and the financial assurance requirements.

The following section will guide you through major steps in the permitting process, and the guidelines associated with obtaining a permit. While this overview covers the main steps in the permitting process, but in order to complete the application correctly, please refer to the Kentucky Revised Statutes (KRS) Chapter 224, and the Kentucky Regulations (KAR) Chapters 30, 40, 45, 47, 48, 49.

The purpose of the regulations and the permit is to protect the human health and environment.

Site Suitability

This section details the site suitability process for **contained, construction/ demolition debris (CDD), residual, and special waste landfills**. It also outlines public notice requirements and general conditions applicable to all solid waste sites or facilities.

The Division of Waste Management's developed the solid waste regulations to protect Kentucky's human health and environment.

When selecting a site suitable to build a landfill, the permittee should be aware of site selection, operational, and safety standards of the regulations.

Site Selection Standards include:

- **Floodplain control** -A waste disposal site cannot be located in a floodway, restrict the flow of the 100-year flood, reduce the water storage capacity of the floodplain, or result in the washout of waste. A contained landfill cannot be constructed in the 100 year floodplain.
- **Water pollution control** - The site cannot contaminate ground water sources in excess of the maximum contaminant levels identified in 401 KAR 47:030. The site may not discharge to surface waters without a KPDES permit.
- **Wetlands and Streams Mitigation** – The applicant must mitigate any jurisdictional features that will be impacted by landfill construction and operations.
- **Groundwater protection** - A solid waste landfill must have more than 4 feet of compacted earth between the bottom of the landfill and the seasonal high water table or bedrock.
- **Endangered plants and animals** - A facility cannot be located where any federally protected endangered plants, fish, wildlife or their habitat would be threatened.

Operational Standards include:

- **Disease vector controls** - flies, rats, birds, and mosquitoes must be controlled through the application of daily cover material or other techniques.
- **Open burning** and violation of applicable air pollution requirements (KRS 224 and 401 KAR Chapters 40 to 63) are prohibited.
- Owners or operators must control and prevent **public nuisances** such as excess noise, litter, odors, and traffic.

Safety Standards include:

- Public access control,
- Specified methane gas limits,
- A contingency control plan for contained and CDD,
- Required fire control for contained and CDD,
- A communications plan for contained and CDD, and
- Application of cover material.

Other Factors to Consider

- Operations (must meet EPS requirements)
- Location (market area, neighbors, subdivision, airport, natural resources)
- Transportation Impacts

The Permit Application Process

Applications for contained, residual and >1acre CDD landfills consist of three major phases – **1) the Notice of Intent (NOI), 2) the Administrative Application and 3) the Technical Application. Kentucky Revised Statue (KRS) 224.40-310 and 401 KAR 47:140, Section 12 and 7(1)(a) through (d) describe the opportunities for public participation in the permitting process through oral and written comments and public hearings.**

Applications for **special waste landfills** consist of one application and two phases: administrative completeness review and technical review. **401 KAR 45:025, 45:030 and 45:050 describe the process including opportunities for public participation through oral and written comments and public hearing.**

One needs to consider the time it takes to get a construction permit, which allows you to build the landfill of your choice. Most solid waste landfill applications average 18 to 36 months

(including the time to correct any deficiencies with the application as well as hold public hearings that may be requested). Special waste landfills may take 18 to 24 months. It is important to remember that each site is unique. Unforeseen problems may occur that could possibly double the above estimates (For example, a formal hearing may add 4-12 months).

Solid Waste Landfill Permitting Process

STEP ONE: LOCAL DETERMINATION

Before you may submit your contained, CDD or off-site residual landfill permit application to the Division of Waste Management for review, you must submit your proposal to the Local Solid Waste governing body of the county in which the site is proposed. Usually, this is the county fiscal court but may be a solid waste management district per KRS Chapter 109. The governing body first needs to modify its Solid Waste Management Plan to site the proposed facility or expansion. Second, the applicant needs to request a local determination from the county or district. This determination ensures that the proposed facility is consistent with the county and/or area plan. The governing body has 60 calendar days from receipt of the written request to make the determination. A host county agreement that is negotiated by the landfill owner and the county may prompt a favorable local determination. The requirements for this determination can be found in KRS 224.40-315. However, this is not required if a landfill is on property where waste is generated and/or only accepts offsite waste from itself or its subsidiaries.

At this point, it is strongly suggested that you schedule a meeting with the Division of Waste Management to discuss the location of the site as well as discuss various other permits necessary for this project, such as KPDES discharge permits, floodplain permit, transportation permit, etc. The Division has a list of agencies and people to contact for these other permits. Division staff is also available to discuss the permitting and public notification process (see **Appendix C**).

STEP TWO - SUBMITTING THE NOTICE OF INTENT APPLICATION

Once you have your positive local determination in hand, place the determination with the Notice of Intent Application (NOI) and submit it to the Division. Requirements for the NOI application can be found in 401 KAR 47:170. Most on-site residual landfills do NOT need a local determination.

Generally, information required for the NOI application is a review of submittal of published information along with a soil boring and rock-coring plan. Published information includes Topographic maps, Geologic Quadrangle (GQ) maps, and general information on threatened and endangered species data, historic places, archeological sites, and wetlands.

When the Division first receives the application and accepts the local determination (if required), the applicant is required to publish a notice in the local newspaper (per KRS 224.40-310). The Division has 30 working days (about 41 calendar days) to review the application after it is accepted. If there are deficiencies with the application, you will be notified by letter listing all of the deficiencies. Once the deficiency letter is dated and signed, the review clock is stopped until the application is resubmitted with the deficiencies corrected. The review clock is re-started at the point it was stopped (the clock does not restart at thirty working days). An

important section of the application is to consider all the variances and/or alternate designs that may be necessary for your project. Siting requirements in 401 KAR 48:050 need to be closely evaluated for all solid waste landfills.

STEP THREE - THE ADMINISTRATIVE APPLICATION

The administrative application is the next major phase of the solid waste landfill permitting process. This phase contains site-specific information including soil borings, rock corings, aquifer characteristics and actual survey data on threatened and endangered species, historic places, archeological sites, and wetlands. The application will contain information concerning groundwater flow direction, estimates on the amount of soil that is available to construct and operate the landfill, types and sources of waste to be placed in the landfill, a conceptual design of the landfill cap and liner design, and an executive summary for the public. The requirements of the administrative application are found in 401 KAR 47:180. The Division has 60 working days (approximately 82 calendar days) to review the application.

Once the Division approves the administrative application, one Executive Summary will be sent to the County Judge Executive, and another will be sent to the county public library.

This public notice will have a 30-day comment period to allow any interested parties an opportunity to comment on the proposed landfill. This comment period will not hold up the review of the technical application once it is received. If requested, a public hearing (as described in 401 KAR 47:140, Sections 7 and 12) will be held. This public hearing is better described as an informal meeting to request or exchange information concerning the proposed landfill or expansion.

STEP FOUR - THE TECHNICAL APPLICATION

The technical application is the last phase of the solid waste permitting process. It contains the design of the landfill cap, liner, and groundwater, surface water, and methane monitoring plans along with any associated support facilities such as ponds, roads, maintenance buildings, etc. 401 KAR 47:190 contains the requirements for the technical application.

A public notice is required to be published once the Division receives the technical application. A member of the county Fiscal Court or an interested person may require an informal hearing. **The Division has 90 working days (about four months) for the review of the technical application.** When all the deficiencies have been corrected and the permit application has met the applicable regulations, the Division will issue a draft construction permit. **A final public notice is then published with a 30-day comment period.** This notice includes an opportunity to request an adjudicatory (formal) hearing.

Once the comment period expires and no comments or requests for a hearing have been received, the construction permit can be issued. **The plans for the technical application are absolutely necessary to construct the landfill correctly.**

Hearings requested during the draft permit comment period: If a hearing is requested during this period it is an adjudicatory hearing. This is an adversarial proceeding in which the opposing group, the cabinet, and the applicant has a lawyer. This proceeding will add four to

twelve months to the permitting process. **The Division cannot issue the construction permit until the issues are resolved.**

For more information on the solid waste landfill permitting and hearing process, please refer to KRS 224.40-310, 224.40-315 and 401 KAR 47:140.

STEP FIVE: CELL CONSTRUCTION

When it is time to build the landfill, the Division will periodically send representatives to the site to verify that construction of the landfill is the same as what is in the approved design.

The Division of Waste Management must be notified of construction activities prior to commencement. The minimum requirements include:

- Preconstruction meeting
- Provide tentative construction schedule
- Notification 48 hours prior to all inspections
- Submittal of Construction Progress Report (CPR)

Once the Division receives certification (CPR) from your consulting engineer and permittee that the landfill has been built according to the approved design, **the Division has 10 calendar days to issue the operating permit provided the financial assurance documents** (closure and closure care bonds) are in order and have been accepted by the Division.

Special Waste Landfill Permitting Process

STEP ONE: THE ADMINISTRATIVE COMPLETENESS REVIEW

Once the Division receives the special waste permit application from your consulting engineer the completeness review begins as outlined in 401 KAR 45:025. The division has 45 days to conduct the initial review, **the applicant has 30 days to respond to deficiencies and the cabinet has 30 days to review the resubmittal.** Once the submittal is complete, the cabinet issues a notice to be published by the applicant in a local newspaper allowing 30 days for comment or a request for an informal public meeting. Any such hearing does not necessarily delay technical review.

STEP TWO: THE TECHNICAL REVIEW

Once the Division declares the application complete, it has **180 days to review the application**, not counting time for deficiency corrections. If the application is technically sound, the cabinet issues a draft construction permit and a notice to be published by the applicant in a local newspaper allowing 30 days for comment or a request for an informal public meeting.

STEP THREE: THE CONSTRUCTION PERMIT

The cabinet considers comments and issues the construction permit with any conditions. An opponent may challenge the decision with a formal hearing request based on a final cabinet decision per KRS 224.10-420(2).

Operating Conditions

Once a permit has been issued, **the owner must comply with the following conditions**, as specified by 401 KAR 47:120, for solid waste landfills and 45:140 for special waste. The owner of operator must:

- Comply with all conditions of the permit. Failure to do so is grounds for enforcement action,
- Apply for and obtain a new permit to continue operating after the expiration date of the permit and comply with 401 KAR Chapters 47 and 48 (solid waste) and 45 (special waste) prior to operating the facility,
- In the event of noncompliance, steps must be taken to minimize releases and adverse impacts on human health and environment,
- Properly operate and maintain all facilities,
- Furnish information requested by the Cabinet to determine whether cause exists to modify, revoke, or terminate a permit or to determine compliance,
- Allow the Cabinet or its authorized representative to enter the facility, have access to and copy records, inspect equipment, and sample and monitor to ascertain compliance,
- Properly sign all applications, reports, and information submitted to the Division,
- Not operate new or modified facilities until a statement is received by the engineer that the facility has been constructed or modified according to the permit; and the Cabinet has inspected the facility, and issued the permit, and
- Submit monitoring reports at the specified permit or regulatory intervals and submit compliance or noncompliance reports no later than 14 days following each date in a specified compliance schedule.

In addition to the above, the owner should be aware that issuance of a permit by the Division does not convey property rights or exclusive privilege. **Any permit may be revoked or modified for cause.** The permit issued is not transferable to any person without prior approval of the Cabinet.

Financial assurance must be posted for closure and closure care. Bonding requirements are set forth in KRS 224.40-650 and 401 KAR 48:310 for solid waste facilities and 401 KAR 45:080 for special waste landfills. **Bonding should be checked periodically and following cell construction to ensure that it covers the uncapped areas of the constructed landfill.**

The first (closure costs) estimate provided for closing the facility should be calculated at the point in the active life when the extent and manner of its operation would make closure the most expensive. In addition, the cost estimate should be based on the following:

- Design,
- Site grading and drainage,
- Hauling and placement of each element of the cap,
- Final cap grading and drainage,
- Re-vegetation of the cap, and
- Quality control and construction certification.

This figure will be adjusted for inflation and other factors each year.

A second (post closure) cost estimate will be provided, in current dollars, of the cost of hiring a third party to conduct each phase of the closure care or post-closure monitoring and maintenance. This estimate can be calculated by multiplying the annual cost estimate for each phase of closure care by the number of years of closure care required. The number of years specified is 30 for contained, 2 for CDD and residual, and 5 for special waste. As with the closure estimate, the closure care cost estimate should be based on the most expensive costs and must be revised if changes result which increase the cost.

All applicants that obtain a permit for a solid waste site or facility must demonstrate that funds are available to them to meet the costs of closure and post closure care. For the private sector this assurance must be accomplished by posting a performance bond and one of the following:

- Surety bond,
- Letter of credit, or
- Escrow agreement.
- Trust fund
- Closure insurance

For **industrial solid waste sites** which are located on property of the generator which accept only industrial solid waste from the generator, the owner or operator may use a Corporate Guarantee with financial test. This instrument must meet several financial ratios to ensure that the company or parent corporation has enough assets and income to fund proper closure and closure care of all facilities under its ownership or control.

Publicly owned state or local facilities are exempt from posting a performance bond by KRS 224.40-650. However, the facility must provide a budget for the permitting, construction, operation, closure, and post-closure of the facility. This budget must be revised annually. When any of the elements identified above are to be accomplished by contract or agreement, a copy of these documents must be submitted to the Cabinet.

Information on each of these mechanisms may be found in 401 KAR 48:310 for solid wastes and 45:080 for special wastes along with the wording required for the actual agreements.

Chapter 7: FACILITY MANAGEMENT

Chapter 7 Objectives

1. Understand management responsibilities at a landfill.
2. Explain the individuals and their roles in developing and operating a landfill.
3. List what items should be included in proactive public relations.
4. Explain what is involved in regulatory compliance and how it relates to avoiding notices of violation and referral to Enforcement.
5. Understand closure and post-closure.

This section describes management responsibilities regarding all phases of the landfill (financing, monitoring, closure, etc.), personnel management and public relations.

Landfills are privately or publicly owned. Depending on the size of the operation and whether the operation is contracted to another party, a landfill may have one or more individuals responsible for management of the solid waste site or facility. Management responsibilities include:

- Designing,
- Financing,
- Permitting,
- Overseeing the operation (operating plan),
- Recruiting and training personnel,
- Public relations,
- Compliance,
- Site closure, and
- Closure care or post-closure.

Design

Managers are usually not directly responsible for designing a landfill. An engineering and geotechnical or geological consulting firm performs this task. However, the manager must work closely with the design team to see that everything regarding the particular site and waste volumes received or anticipated is considered in the design phase.

To assure that the site is operated well, the manager is also responsible for:

- Knowing the regulatory and statutory requirements,
- Knowing the contents of the permit document, and
- Reading and interpreting the engineering plans.

Operating Plan

The permit documents and regulations include both an operations and landfill development (phasing) plans that must be followed for the systematic operation of a landfill. When changes to the phasing happen, notify your consultant and the Division.

Communication: Public Relations

Public relations are one of the manager's most important functions. Solid waste disposal sites represent an extremely emotional issue, particularly to those who live in the vicinity of a site. Many sites are acceptable from an environmental control aspect, but are vigorously opposed by citizens who associate them with old-fashioned open dumps with bad odors, flies and rats. However, through explanation and education the public can be convinced of the advantages.

Public information should stress that:

- Waste is covered daily,
- Access is restricted,
- Insects and rodents are controlled,
- Open burning is prohibited,
- Monitoring controls exist (groundwater, surface water, methane gas),
- Liner requirements exist, and
- Mechanisms exist for local government to hire an enforcement officer to monitor the site.

In addition, the benefits of the post closure use of the site (park, playground, golf course, etc.) should be emphasized.

The media resources available to the manager include (but are not limited to):

- Newspapers
- Collection vehicles
- Billboards
- Garbage haulers
- Radio
- Billing receipts
- Television
- Elected or appointed officials

There are a few tips for handling complaints from the public:

- Listen to the complaint and get all details,
- Repeat the message to confirm your understanding,
- Explain your company's position and policy,
- Tell the customer what will be done and when,
- Handle complaints quickly,
- Follow through to be sure the complaint is solved,
- Confirm the complaint has received a satisfactory response and thank the customer,
- Inform public of services, your responsibilities and theirs,
- Be professional when handling the public and they will do the same,
- Honesty is best policy when interacting with the public, and
- Don't demand respect; respect is not given, it is earned.

Facility Operation

Citizens of the community are your customers. For this reason, there are several factors you must consider when scheduling operations:

- Community needs,
- Labor scheduling,
- Incoming waste quantity,
- Time needed to accomplish tasks,
- Neighbors and effect of the operation on them, and
- Season.

Hours of operation are a permit condition and must be consistent so people will know when the facility is open. In addition, the Division must be notified of any change in hours.

Facility Appearance

First impressions are the most lasting. Cluttered and unorganized looking facilities portray the image of a shoddy operation. On the other hand, neat, well-organized facilities give the general public confidence in your operation, thus resulting in few complaints. Items that can assist with giving an organized appearance include:

- Facility sign,
- Traffic signs to the working face or unloading area,
- Mowed grass,
- Neat entrance and facilities,
- Well organized salvage areas, and
- Other operational consideration such as litter, odors, insects and rodents.

Regulatory Compliance

Inspections:

- Routine inspections are conducted by the Cabinet,
- Operators are not notified in advance,
- Inspection form,
- Photographs are used to document findings and sampling is conducted as needed,
- Finding are discussed with operator after inspection,
- Inspector mails the final inspection later after supervisory review, and
- If no violations are observed, no further action is taken.

Warnings and Violations

Violations are marked and described on the inspection report. The violations noted are documented on either a Letter of Warning (LOW) or a Notice of Violation (NOV), which outlines remedial measures and compliance dates. A follow-up inspection is performed to determine if the violation was corrected by the specified date. Depending on the severity of the violation, the case may be referred for enforcement action or considered as resolved.

Enforcement:

Violations may be referred to the Division of Enforcement for further action.

- If so, an Agreed Order may be drafted and forwarded to permittee,
- Owner or operator may sign the Agreed Order or request a meeting,
- Meeting is held and terms of the agreement are discussed. Agreed Order is forwarded to permittee for signature, and
- Penalties are assessed in the Agreed Order:
 - If the permittee does not comply with the Agreed Order, the case will be referred for an administrative hearing, or
 - For serious or continued violations, the Division may seek an injunction to close the landfill through Franklin Circuit Court.

Landfill Closure Process

The closure of a landfill is a process that is intended to achieve an environmentally acceptable and stable condition. The owner or operator must begin closure in those areas that have received final waste within 30 days.

The process involves the following actions:

- Stop taking waste in the area to be closed,
- Re-grade for positive drainage, future settling and erosion control,
- Place final cover,
- Fertilize and seed cover,
- Have site inspected,
- For CDD landfills: once grading and cover depth are acceptable to the Cabinet, machinery may be removed from site (401KAR 48:060 section 3(1)(e)),
- Apply erosion control measures,
- Establish vegetative cover,

- Request inspection to start closure and post closure periods:
- Contained landfill: 2 year closure and 30 year closure care (post closure),
- CDD: 2 year closure,
- Residual: 2 year closure, and
- Special waste: 5 year post closure.
- Maintain site for required period,
- Request final inspection,
- Modify deed notice to warn purchasers of disposed wastes, and
- Request release of site and any bonds.

If a landfill is under groundwater assessment monitoring or corrective action, the final release of closure and closure care bonds may be delayed until the site returns to compliance.

This page left blank intentionally.

Chapter 8: MONITORING YOUR LANDFILL

Chapter 8 Objectives

1. Understand the Environmental Performance Standards.
2. Explain the purpose and the requirements of surface water and groundwater monitoring.
3. Know the importance of proper sampling and the considerations that should be given to surface water and groundwater.
4. Understand the requirements for data submittal and record keeping.
5. Comprehend the assessment monitoring and corrective action process.
6. Understand explosive gas monitoring systems and requirements.
7. Understand the primary ways a landfill can contaminate groundwater and surface water.

This section discusses the monitoring procedures associated with each type of landfill, with emphasis on groundwater and surface water monitoring.

Environmental Monitoring

All waste sites or facilities must comply fully with the Environmental Performance Standards (EPS) in 401 KAR 47:030 (for solid waste sites) or 401 KAR 30:031 (for special waste sites). **There are no exceptions to this requirement**, because the cabinet is prohibited from issuing variances to the EPS by 401 KAR 30:020, Section 2.

The Environmental Performance Standards include, in part, provisions that: 1) pollutants shall not be discharged into the surface waters of the Commonwealth; 2) groundwater shall not be contaminated beyond a point of compliance for the facility in excess of the drinking water maximum contaminant levels (MCLs) specified in **401 KAR 30:031 (for special waste sites) or 401 KAR 47:030 (for solid waste sites)**, or statistically elevated concentrations of parameters that lack MCLs; and 3) the concentrations of explosive gas in facility structures shall not exceed 25% of the lower explosive limit (LEL) for methane, and shall not exceed 100% of the LEL for methane at the property line of the facility.

Surface water, groundwater, and methane monitoring plans are included in the permit applications for special waste, residual, CDD, and contained landfills, and each facility must be monitored in accordance with the approved plans and the permit. The Division reviews the data submitted in the environmental compliance monitoring reports to determine whether the facility is in compliance with the Environmental Performance Standards as well as the facility's permit.

Surface Water Monitoring

Surface water sampling under solid waste and special waste permits allows for verification that leachate is not entering the surface water and that facility operations are not otherwise adversely impacting surface water. **Surface water monitoring points must be located to characterize the quality of water unaffected by the landfill and water that leaves the landfill in surface drainage.** This means every landfill should have at least one upgradient and one downgradient monitoring point.

The permitted monitoring locations include the upgradient point, upstream from the landfill or outside of the effects of waste placement, for use in background comparisons. The upgradient point may be a surface stream.

Downgradient monitoring points are located on the inlet side (landfill's surface water run-off ditches) of the surface water sediment structures to monitor the landfill runoff water before it enters the sediment ponds or monitoring can be done in the receiving stream.

An analysis shall be conducted for the following parameters by collecting **grab samples** at previously specified points as approved by the Division, on a quarterly basis.

Quarterly Monitoring checks for:

- Chlorides,
- Sodium,
- Sulfate,
- Total organic carbon (TOC) or biochemical oxygen demand (BOD),
- Iron,
- Specific conductance,
- pH,
- Solids (total suspended solids, total dissolved solids and total solids) chemical oxygen demand, and
- Other parameters in the permit.

All facilities with storm water runoff structures and point source discharges are required to have a KPDES from the Division of Water. Documentation that the application has been submitted will be required during the Division of Waste Management permitting process.

Groundwater Monitoring

The groundwater monitoring system approved within the application is meant to allow an **accurate assessment of the groundwater quality and characterize groundwater flow**. Residual, CDD, and Contained Landfills must have at least one background well hydraulically upgradient from the disposal area and at least 3 downgradient monitoring wells with the Division's approval. Special Waste Landfills must include at least one background well hydraulically upgradient from the disposal area and at least 2 downgradient monitoring wells with the Division's approval. The Division may approve springs in addition to or instead of downgradient wells. An alternate monitoring plan may be used if approved by the Division.

A groundwater characterization as required in 401 KAR 47:180 shall contain the chemical characteristics of the upper most aquifer down to and including the lowest aquifer that may be affected by the site or facility. This description shall include results of analysis of at least two (2) samples of groundwater collected at least 30 days apart from the site before waste placement for the parameters listed in 401 KAR 48:300, Section 10. Special Waste Landfills must perform groundwater characterization according to 401 KAR 45:160, Section 7.

Improved background characterization would include two years of quarterly data, or eight samples per well, before waste disposal begins. More monitoring data collected prior to waste placement can facilitate the use of an intra-well statistical method, which may reduce false positives that occur due to geological and chemical variability between upgradient and downgradient wells.

Groundwater sampling intervals and parameters differ for each type of solid or special waste site or facility. Residual landfills monitor quarterly for parameters determined by the Division based upon the chemical analysis of the waste to be disposed (401 KAR 48:300, Section 11(4)). The applicant for a residual or special waste landfill should do an industrial waste analyses for the chemical parameters based on a review of raw materials feed data or an analyses of the chemicals from one of the following:

- The “Long List” of parameters for contained landfill assessment or characterization monitoring available in 48:300, Section 10(3)(b),
- The hazardous constituent list in 40 CFR 261 Appendix IX, or the
- The parameters included in the NPDES Priority Pollutant list.

Detected chemical constituents could become the characterization or assessment list while the top two or three concentrated metals or organics with common indicators could make up the detection or quarterly (or, semi-annual for special waste) monitoring.

The following tables illustrate the monitoring parameter requirements for CDD, Residual, Special Waste, and Contained landfills.

CDD LANDFILLS MONITOR SEMI-ANNUALLY FOR:	
Chloride	Arsenic
Chemical Oxygen Demand (COD)	Barium
Total Dissolved Solids (TDS)	Cadmium
Total Organic Carbon	Chromium
Specific Conductance	Lead
pH	Mercury
Iron	Nitrate
Sodium	Selenium
Groundwater Elevations	Temperature

RESIDUAL LANDFILLS MONITOR QUARTERLY FOR:	
Chloride	Arsenic
Chemical Oxygen Demand (COD)	Barium
Total Dissolved Solids (TDS)	Cadmium
Total Organic Carbon	Chromium
Specific Conductance	Lead
pH	Mercury
Iron	Nitrate
Sodium	Selenium
Groundwater Elevations	Temperature
Detected constituents from waste analysis	

SPECIAL WASTE LANDFILLS MONITOR SEMI-ANNUALLY FOR:	
Chloride	Chemical Oxygen Demand (COD)
Total Dissolved Solids (TDS)	Total Organic Carbon
Specific Conductance	pH
Copper	Groundwater Elevation
Detected constituents from waste analyses	

CONTAINED LANDFILLS MONITOR QUARTERLY FOR:	
Arsenic	Silver
Antimony	Sodium
Barium	Thallium
Beryllium	Vanadium
Cadmium	Zinc
Chromium	Temperature
Cobalt	Chloride
Copper	Chemical Oxygen Demand (COD)
Iron	Total Dissolved Solids (TDS)
Lead	Total Organic Carbon
Mercury	Specific Conductance
Nickel	pH
Nitrate	Total Organic Halides
Selenium	Acetone
Acrolein	Acrylonitrile
Benzene	Bromochloromethane
Bromodichloromethane	Bromoform
Bromomethane	2-Butanone
Carbon Disulfide	Carbon Tetrachloride
Chlorobenzene	Chlorodibromomethane
Chloroethane	Chloroform
Chloromethane	Dibromomethane
1,2-Dibromo-3-chloro-propane	1,2-Dibromomethane
1,2-Dichlorobenzene	1,4-Dichlorobenzene
Trans-1,4-dichloro-2-butene	1,1-Dichloroethane
1,2-Dichloroethane	Cis-1,3-dichloropropene
Trans-1,3-dichloropropene	Ethylbenzene
2-Hexanone	Iodomethane
Methylene Chloride	4-Methyl-2-pentanone
1,1-Dichloroethene	Cis-1,2-dichloroethene
Trans-1,2-dichloroethene	1,2-Dichloropropane
Styrene	1,1,1,2,-Tetrachloroethane
1,1,2,2-Tetrachloroethane	Tetrachloroethylene
Toluene	1,1,1-Trichloroethane
1,1,2-Trichloroethane	Trichloroethene
Trichlorofluoromethane	1,2,3-Trichloropropane
Vinyl Acetate	Vinyl Chloride
Xylene	Groundwater Elevations
Rate and Direction of Groundwater Flow	

If after four initial monitoring events analyses for the required parameters indicate no results above the MCL's as specified in 401 KAR 30:031 for Special Waste sites or facilities or 47:030 for Solid Waste sites or facilities or significant increases over established background levels for parameters that have no MCL, the owner or operator may request to reduce the monitoring parameters to those listed in 401 KAR 48:300, Section 11(2)(a) for residual or CDD landfills, 401 KAR 45:160, Section 8(2)(a) for Special Waste fills disposing of coal-combustion wastes; and 401 KAR 48:300, Section 11(3)(f) for contained landfills. Other parameters may be added to the permit as required to ensure protection of human health and the environment.

The analytical methods used by the laboratory must be consistent with those outlined in USEPA SW-846 or other approved methods. SW-846 is a manual consisting of lab methods and procedures necessary to correctly analyze a sample. The permittee must also ensure that the laboratory method for each parameter is sufficiently accurate to determine compliance (i.e., the method detection limit must be below the MCL for that parameter).

If an MCL or background concentration has been exceeded by one or more parameters, and this exceedance has been verified by confirmation sampling, a groundwater assessment plan must be prepared and submitted within 30 days of the occurrence. Contents of the plan and confirmation sampling procedures are outlined in 401 KAR 48:300, Section 8.

Sample Collection

All landfills that are required to monitor groundwater and surface water must have samples collected using proper and permitted collection procedures that are specified in the approved monitoring plan. The landfill manager must ensure proper collection techniques are followed so that the samples are representative of the water being sampled.

Data Submittal and Recordkeeping

All lab results must be submitted, within 60 days of the sampling event or 15 days after receipt of the statistical analysis—whichever is sooner. The statistical analysis must be performed separately for each parameter for each sampling event and for each well to determine if there has been a significant increase over background values for each parameter that lacks an MCL. If laboratory delays are encountered, a letter requesting an extension must be sent to the Solid Waste Branch, Permit Review Section.

The owner or operator shall maintain records from all groundwater monitoring wells and associated groundwater surface elevations, for the active life of the facility and for the post-closure care period. Owners or operators normally submit construction reports as produced instead of waiting for the quarterly report deadlines. There is no need to duplicate the report when the remainder of environmental monitoring comes due.

Assessment and Corrective Action

If sample results indicate contamination (i.e., an MCL exceedance or a statistical exceedance for parameters lacking MCLs), the owner or operator must notify the Division

within 48 hours of analysis receipt and arrange to split confirmation samples within 10 days of analysis receipt. If it is determined that a drinking water supply has been affected and that the probable source of the contamination is the landfill, the facility shall provide alternate drinking water supplies to all affected parties within 24 hours of the notification of the Division. If the confirmation sampling verifies that an exceedance has occurred, the landfill must prepare a groundwater assessment plan, and submit it to the Division within 30 days. The assessment plan must specify the way in which the landfill intends to determine the existence, quality, quantity, areal extent, and depth of groundwater degradation, and the rate and direction of migration of contaminants in the groundwater.

The assessment plan must be implemented within 60 days of its approval by the Division. If the Division determines that the assessment plan is inadequate, it can either issue a Notice of Deficiency (NOD) or modify the plan and approve it as modified. The Division may require abatement measures prior to the approval of the assessment plan.

Within 90 days of the implementation of the assessment plan, the landfill must submit an assessment report that gives a summary of the data collected in the assessment investigation, an analysis of the data, and recommendations on the necessity of abatement. When considering the necessity of abatement (i.e., risk assessment), the Environmental Performance Standards of 401 KAR 47:030 and 401 KAR 30:031 prohibit the pollution of groundwater in excess of an MCL. As a consequence, risk assessment can only be approved for pollutants that lack MCLs.

If groundwater corrective action is deemed necessary for the protection of human health and the environment, the landfill must submit a corrective action plan within 120 days of the approval of the assessment report. The corrective action plan shall specify:

1. The methods that will be used to abate the groundwater contamination;
2. The actions that will prevent further releases from the facility;
3. The process by which affected water supplies will be restored or replaced; and
4. Any other measures necessary to protect human health and environment.

Within 15 days of approval of the groundwater assessment report, the cabinet prepares a public notice for the owner or operator to advertise in the newspaper. The notice must summarize the findings of the report, including proposed remedies, and allow for a **30-day comment period**. See 401 KAR 48:300, Section 8 for more information.

Corrective action must be performed until drinking water parameters are lowered below MCLs, or non-drinking water parameters are returned below background per 401 KAR 48:300, Section 8(14). Within 120 days of the approval of the assessment report, the landfill must submit a corrective action plan. The corrective action plan must include the methods that will be used to abate the groundwater contamination, the actions that will prevent further releases from the facility, the process by which affected water supplies will be restored or replaced, and any other measures necessary to protect human health and the environment. Corrective action must be continued until parameters with primary MCLs are lowered below MCLs, and until parameters without primary MCLs are returned below statistical background (401 KAR 48:300, Section 8(14)).

Explosive Gas Monitoring

Contained landfills must monitor for explosive gas in accordance with the permit to ensure that gas concentrations at the property line do not exceed 100% of the Lower Explosive Limit (LEL), and gas concentrations in facility structures do not exceed 25% of the LEL, as required by 401 KAR 47:030 Section 11.

Landfill gas forms in the waste mass and migrates through subsurface pathways from areas of higher pressure to areas of lower pressure. In the environment, landfill gas most commonly migrates through unsaturated soil, sand, or gravel, especially when the pathway is overlain by less permeable materials. The landfill gas monitoring plan submitted in the permit application should evaluate potential subsurface migration pathways and potential receptors such as nearby residences or buildings.

Facility structures must be monitored both continuously and quarterly in accordance with the approved plans. Continuous explosive gas monitors must be installed in each onsite building and quarterly monitoring must be conducted underneath or in the low area of each structure.

Landfill gas may be monitored along the perimeter of the landfill site with a handheld explosimeter using permanent gas monitoring wells and / or barhole punches. Permanent gas monitoring wells targeting the most likely migration pathways are preferred.

When monitoring shallow zones with permanent gas monitoring wells, monitoring at the wellhead is generally appropriate. However, for deeper wells with thick unsaturated zones or those with multiple potential migration pathways, a drop tube may be required.

Barhole punch hole monitoring involves driving a punch bar two to three feet into the ground and taking a gas reading. Barhole punch monitoring may not be appropriate for sites where the subsurface migration pathways are deeper than the punch hole or for sites with relatively impermeable surface soils.

How Landfills Contaminate Groundwater and Surface Water

Landfills contaminate groundwater and surface water when the landfill containment systems (liner, cap, leachate collection system, gas venting and extraction system, etc.) do not perform as intended, resulting in the release of leachate and / or landfill gas into the environment.

Leachate Contamination

Contained landfill leachate commonly contains elevated levels of the following: a) inorganic metals such as Ca, Mg, Fe, Cu, Mn, Ba, As, and Zn; b) inorganic ions such as Cl⁻, Na⁺, B (trihydroxy and tetrahydroxy borate), carbonate, bicarbonate, etc.; c) nitrogen sources such as ammonia (including the ammonium ion) and nitrate; d) phosphate; e) volatile organic compounds; f) pesticides; and g) tritium.

Landfill leachate and groundwater have markedly different chemical compositions, and leachate/groundwater mixing can usually be readily identified.

Parameters Commonly Elevated in Contained Landfill Leachate	
Constituent	Concentrations
Boron	0.5 to over 10mg/L
Chloride	2,000 - 6,000 mg/L
Sodium	1,000 - 6,000 mg/L
Nitrate/Ammonia Nitrogen	500 - 3000 mg/L
Total Organic Carbon	500 - 3000 mg/L
pH	6 - 8 Standard Units
Total VOCs	100 – 500 ug/L
Tritium	1,000 – 5,000 TU
Acetone and Methyl Ethyl Ketone (MEK)	Under 10 ug/L to over 10 mg/L
Alkalinity	400 – 7,000 mg/L

Leachate vs. Groundwater	
Leachate	Groundwater
Anaerobic	Anaerobic
Elevated Total Dissolved Solids	Low Total Dissolved Solids
Elevated Ammonia	Low Ammonia
Elevated Chloride	Low Chloride
Elevated Boron	Low Boron
Elevated Tritium	Low or Background Tritium
VOCs Present	VOCs Absent
Elevated Heavy Metals	Low Heavy Metals

Landfill Gas Contamination

Landfill gas consists of over 95% methane and carbon dioxide and less than 5% trace gases, and can contribute to significant groundwater and surface water degradation. Trace gases present in landfill gas include: hydrogen sulfide, ammonia, carbon monoxide, nitrogen, mercury, vinyl chloride, 1,1-dichloroethane, dichlorodifluoromethane, trichloroethene, tetrachloroethene, methylene chloride, and 1,1-tetrachloroethane.

In groundwater, landfill gas changes the oxidation-reduction potential (REDOX) and depletes dissolved oxygen in the water; microbes then rely on iron and manganese oxides for oxygen, increasing Fe and Mn in water.

Landfill gas also lowers pH by CO₂ and water forming carbonic acid, which is then offset by an alkalinity increase and the leaching of naturally-occurring metals from the geological materials at the site.

Finally, landfill gas migrating through the unsaturated zone partitions gaseous volatile

organic compounds (VOCs) to the water.

Differentiating Leachate and Landfill Gas Impacts

Given sufficient data, it is often possible to determine whether contamination detected in groundwater or surface water is the product of the release of leachate, landfill gas, or both.

Differentiating Leachate and Landfill Gas Impacts	
Landfill Gas Impact	Leachate Impact
VOCs: hydrogen sulfide, ammonia, carbon monoxide, nitrogen, mercury, vinyl chloride, 1,1-dichloroethane, dichlorodifluoromethane, trichloroethene, tetrachloroethene, methylene chloride, and 1,1-tetrachloroethane, benzene, chlorobenzene, etc.	VOCs: Any
	Elevated Tritium
	Increasing Boron
	Increasing ions (Cl, Na, etc.)
Increasing Iron, Manganese	Increasing Iron, Manganese
Increasing Alkalinity	Increasing Alkalinity
Increasing cations that are not present at elevated levels in leachate leach from natural geological materials	

This page left blank intentionally.

Chapter 9: WASTE STREAM COMPOSITION AND DECOMPOSITION

Chapter 9 Objectives

1. Explain decomposition of waste and the byproducts of this decomposition.
2. Understand the environmental impact of landfill gases.
3. Explain the production of leachate and how leachate is affected by the amount of water in the fill and the regulations relating to each.
4. Understand the movement of gas and leachate and how to control both.
5. Identify the air quality regulations governing gas control.

Waste Composition

Total MSW generation in the U.S. during 2010 was 250 million tons or 4.43 pounds per person per day. Of this, 1.51 pounds, or 34%, were recycled or composted. Organic materials continue to be the largest component of MSW. Paper and paperboard account for 28 percent and yard trimmings and food scraps account for another 27 percent. Plastics comprise 12 percent; metals make up 9 percent; and rubber, leather and textiles account for 8 percent. Wood follows at around 6 percent and glass at five percent. Other miscellaneous wastes make up approximately 3 percent of the MSW generated in 2010. (Agency, 2010)

Seasonal variations in waste composition affect the amount of waste generated. An example of a seasonal variation is yard wastes, which are a major component of residential waste in the summer months but practically non-existent in the winter.

Recycling can also have an important impact on the waste stream. As certain materials are recovered (such as newspaper, cardboard, and aluminum) the amount and composition of waste changes. Waste composition is also subject to change as one type of material displaces another and/or consumer buying habits change (e.g. plastic bottles or aluminum instead of glass).

Waste Decomposition

Wastes are decomposed both through chemical reactions with landfill liquids and the action of bacteria and other microbes that occur naturally in the environment.

Organisms feed on organic materials found in garbage breaking them down into end products consisting primarily of:

- CO₂ (carbon dioxide),
- NH₄ (ammonia),
- CH₄ (methane),
- Humus, and
- H₂O.

Complete decomposition may take fifty years or more. However, conditions are such that rapid decomposition occurs mainly within the first five to eight years. When leachate is recalcitrated or a bioreactor landfill is used, this time may be rapidly accelerated.

Landfill Gas

The gaseous end products produced in the most significant quantities are as follows.

CARBON DIOXIDE (CO₂)

- Is highly soluble in water, forms carbonic acid,
- Dissolves iron from metal cans and lime from materials containing calcium,
- Increases the hardness of water (including groundwater), and
- Odorless and colorless.

METHANE (CH₄)

- Non-toxic,
- Extremely flammable, may form explosive mixtures with air,
- Potential asphyxiant; may displace oxygen in an enclosed space,
- Violently reactive with oxidizers, halogens, and some halogen-containing compounds,
- Travels from areas of high pressure to areas of low pressure through fill into the atmosphere, pipes or buildings,
- Not very soluble in water, and
- Odorless, colorless and tasteless.

HYDROGEN SULFIDE (H₂S)

- Highly toxic and flammable gas (flammable range: 4.3–46%),
- Heavier than air, it tends to accumulate at the bottom of poorly ventilated spaces,
- Although very pungent at first, it quickly deadens the sense of smell, so potential victims may be unaware of its presence until it is too late,
- Creates odors (rotten egg) and a foul taste when dissolved in water, and
- In the presence of dissolved oxygen in the water, sulfide will be oxidized to tasteless and odorless sulfur and sulfates.

Environmental Impact of Landfill Gas

There are increasing concerns with the emissions of Landfill Gas (LFG) and its contribution to air pollution since volatile emissions from landfills represent a major source of organic contaminants entering the atmosphere. The concerns are based on the following:

- Landfill gas is highly combustible, making it a potential hazard in the landfill environment, or in structures on adjacent properties,
- LFG is capable of migrating significant distances through soil, thereby increasing the risk of explosion and exposure,
- As LFG is produced, the pressure gradient upward may create cracks and disrupt the geomembrane in the landfill cover,
- Migrating gas may result in adverse effects such as stress to vegetation by lowering the O₂ content of soil gas available in the root zone,
- Gas generated at landfills and vented to the atmosphere frequently release nuisance odors causing annoyance to individuals residing nearby,
- Emissions of Non-Methane Organic Compounds (NMOC) and Reactive Organic Gases (ROG), contained in LFG, may be contributing to the degradation of local air quality,
- Where landfills contain sources of sulfur, such as shredded construction/demolition material and gypsum board, there is increased potential for release of H₂S, which is noxious at low concentrations and can cause asphyxiation if gas is migrating to enclosed areas,
- Vinyl chloride from landfills has been found to be present in substantial concentrations in LFG's and has been detected in off site conduits, representing health and safety concerns. Vinyl chloride is found in municipal solid waste landfills, and is a breakdown product of household hazardous waste containing solvents, such as oven cleaners and other cleaning fluids,
- CH₄ gas, one of the "greenhouse gases," contributes to the possibility of global warming of the earth's climate, and
- Uncontrolled LFG is a loss of potential resources. Instead it can be a satisfactory fuel for a wide variety of applications. Many types of energy equipment designed for conventional fuels can operate on LFG with the power output reduced about five to twenty percent.

Leachate Generation

In addition to the gases, landfills produce leachate. The amount of leachate generated is directly affected by the amount of water that is allowed to enter the fill.

Water can enter the fill through:

- Moisture and liquids contained in wastes,
- Poor surface water control,
- Leachate recirculation or addition of liquids for a bioreactor and
- Inadequate cover.

Garbage leachate usually contains elevated levels of:

- Iron
- Chloride
- Sodium
- Calcium
- Magnesium
- Sulfates
- Metals
- Organic Carbon (TOC)
- Dissolved Solids
- Phosphorus
- Nitrogen
- Biological Oxygen Demand (BOD)
- Acid

Many studies indicate that leachate often contains Volatile Organic Compounds (VOCs) including several suspected carcinogens.

Therefore, the manager must ensure the proper pumping, hauling and treatment of landfill leachate in order to protect human health and the environment.

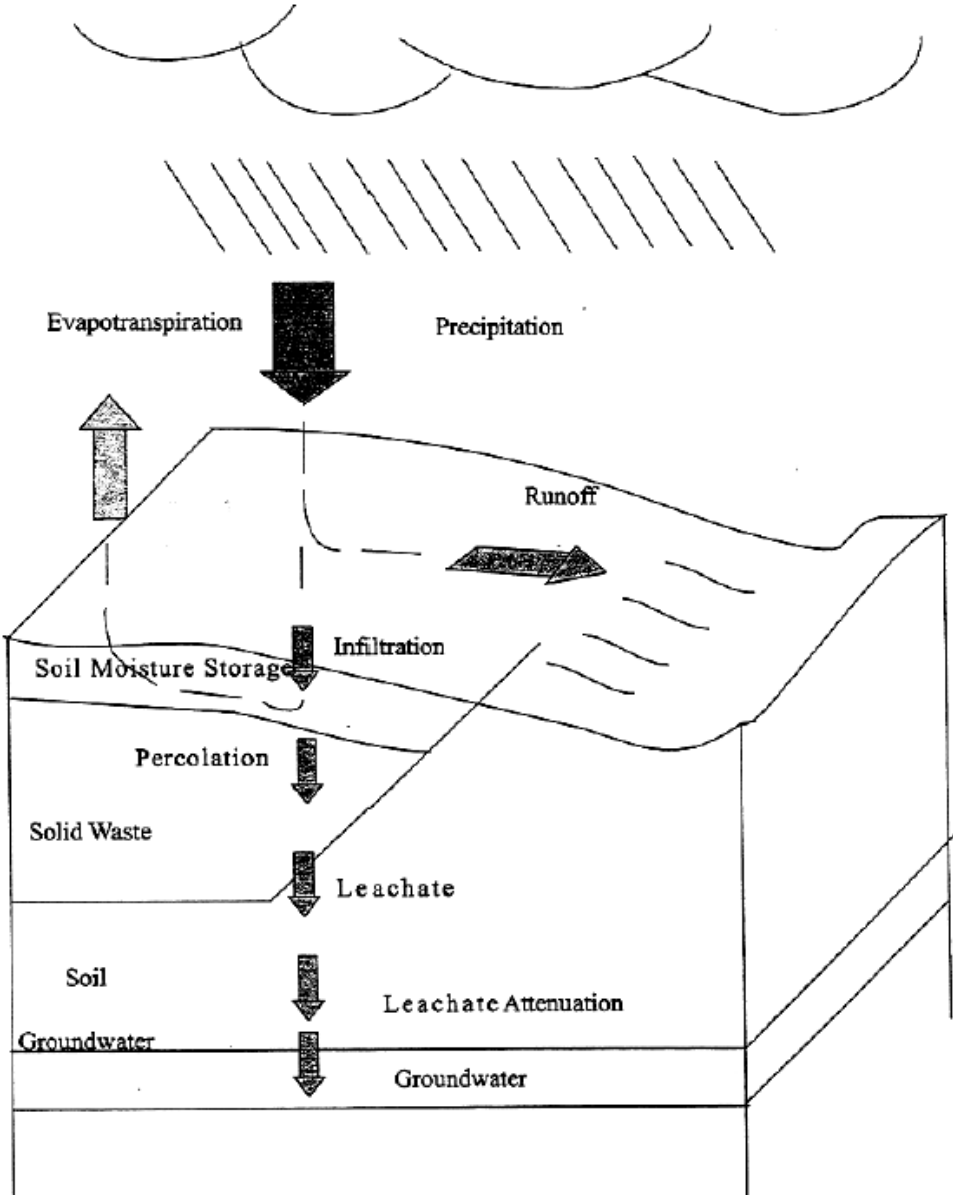
Movement of Gas and Leachate

Gas and leachate follow the path of least resistance and move more freely through permeable materials. Examples of highly permeable materials are sand and gravel, which are large, grained and have enough air space between grains to allow water and gas to move easily. Clay and shale have low permeability and slow the passage of water.

Several factors contribute to the effect that contaminants, found in leachate, may have on the environment:

- The type of landfill and the presence or absence of a synthetic liner,
- Permeability of surrounding soils or the ability of soils to allow liquids to pass through,
- Layers of rock under the site,
- Ability of the soil and rock layers surrounding the site to physically filter or form a chemical bond with contaminants,
- Depth of water table,
- Direction and rate of groundwater flow, and
- Concentration of contaminants.

Figure 9.1 Graphical Representation of Gas and Leachate Movement



$$L \text{ (Leachate)} = P - (E + T + R)$$

Gas Control

Generally, there are two types of systems to control migration of landfill gas. These are active and passive systems.

Passive Systems are vents or barriers built into or adjacent to the fill that collect gas for release to the atmosphere. They use existing variations in landfill pressure and gas concentrations to vent landfill gas into the atmosphere.

Active Systems include wells, vacuums or pumps to move gas out of the landfill and piping that connects the collection wells to the vacuum. Vacuums or pumps pull gas from the landfill by creating negative pressure within the gas collection wells. The negative pressure in the wells creates a preferred migration pathway for the landfill gas.

Figure 9.2 Passive Venting System

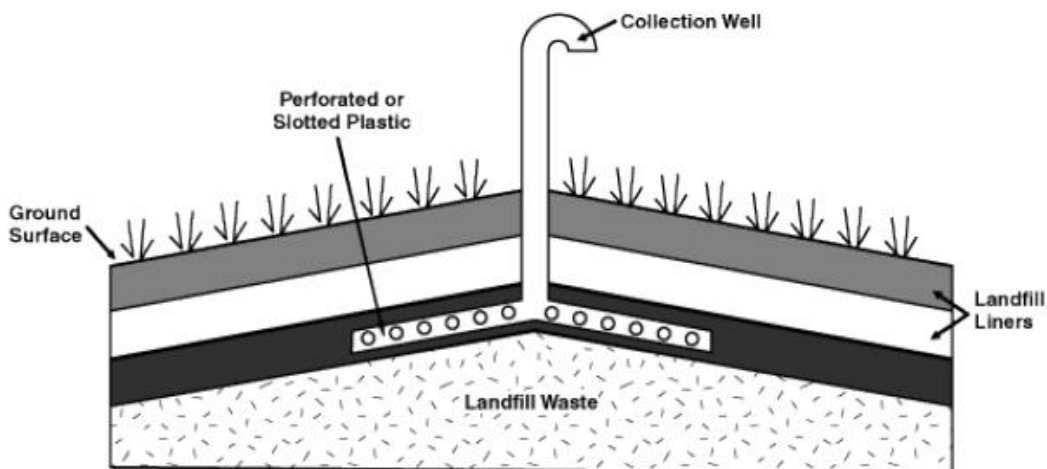
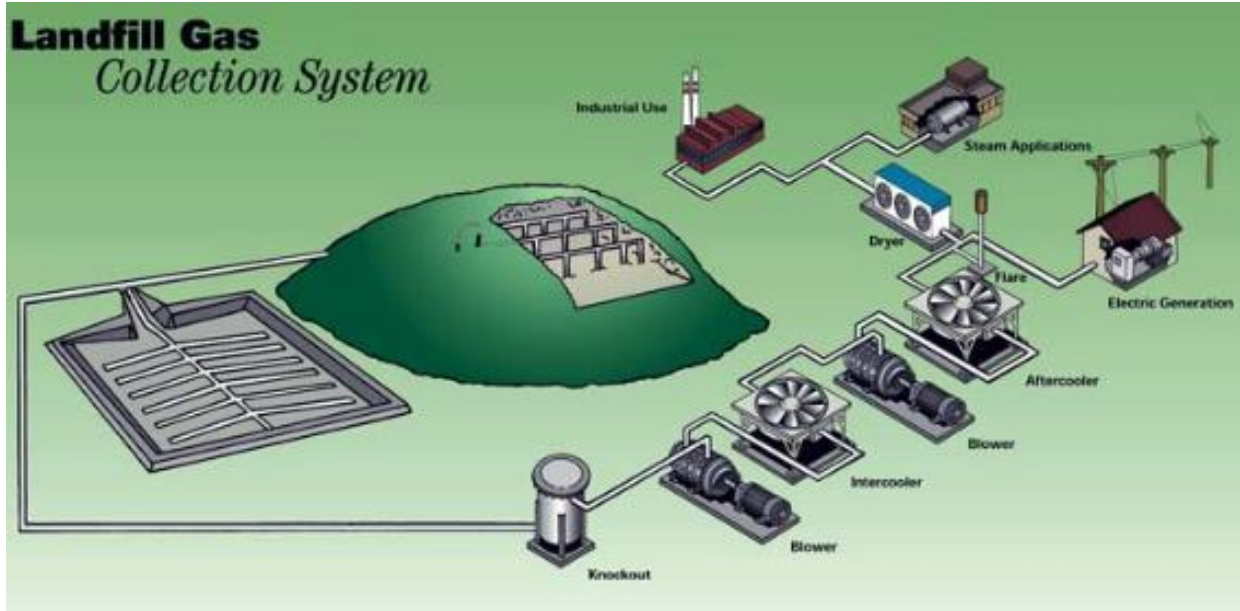


Figure 9.3 Active Methane Control System



Leachate Control

The most effective method of leachate control is to provide good drainage, high compaction of wastes and practice good surface water management. Newly developed contained landfills (as well as some CDD, residual, and special waste landfills) are required to install leachate collection systems. As discussed in Chapter 6, a composite liner consists of a leachate collection system. This system includes drainage provisions to promote runoff, pipes to provide collection of leachate flowing vertically and horizontally, and a tank for storage of the liquid collected until removal or treatment may occur.

Upon construction of a new landfill cell, proper control of stormwater is the key to reducing the amount of leachate hauling or treatment. The design engineer and the landfill manager should get together and focus on the phasing and diverting stormwater. Phasing is the sequence or order for cells, and the size. Diversion of stormwater is placing rain flaps, barrel flaps, temporary drainage berms, temporary ditches or other items to move rainfall on the new liner away from the current waste area.

Communication is the key! A design engineer cannot run a landfill and a manager cannot design a solid waste disposal site. Together, they make an effective team.

Figure 9.4 Surface Water Control Methods

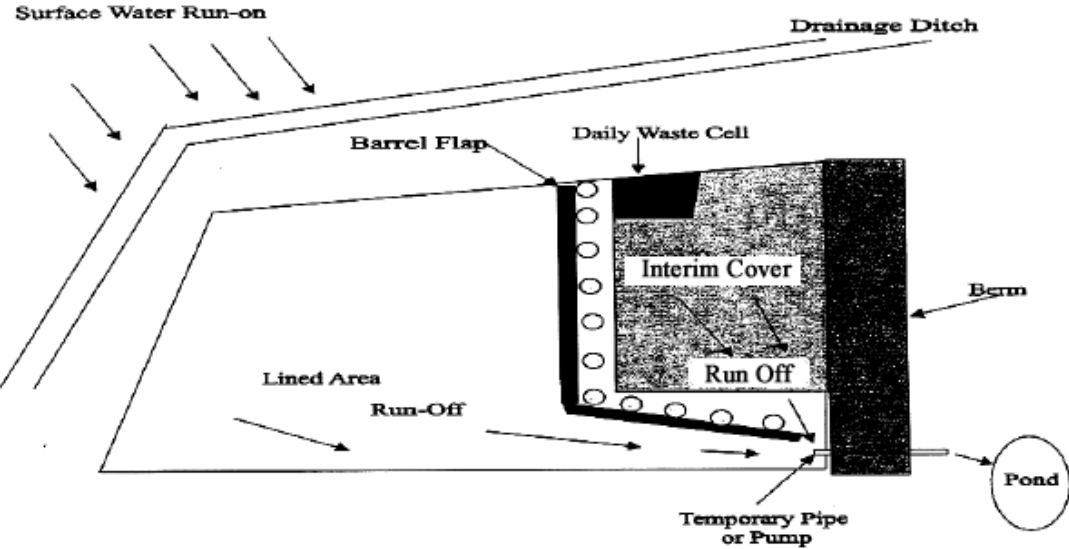


Figure 9.5 Drainage Control Using Berms

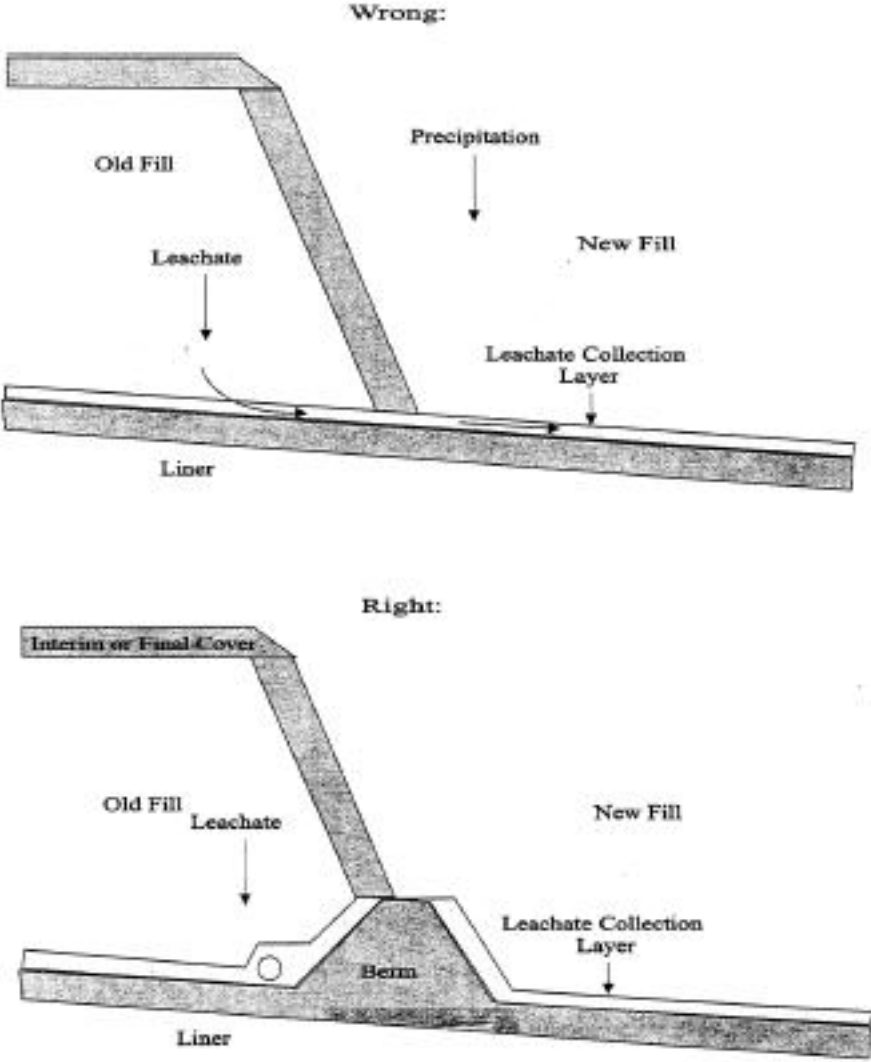


Figure 9.6 Landfill with Leachate Collection

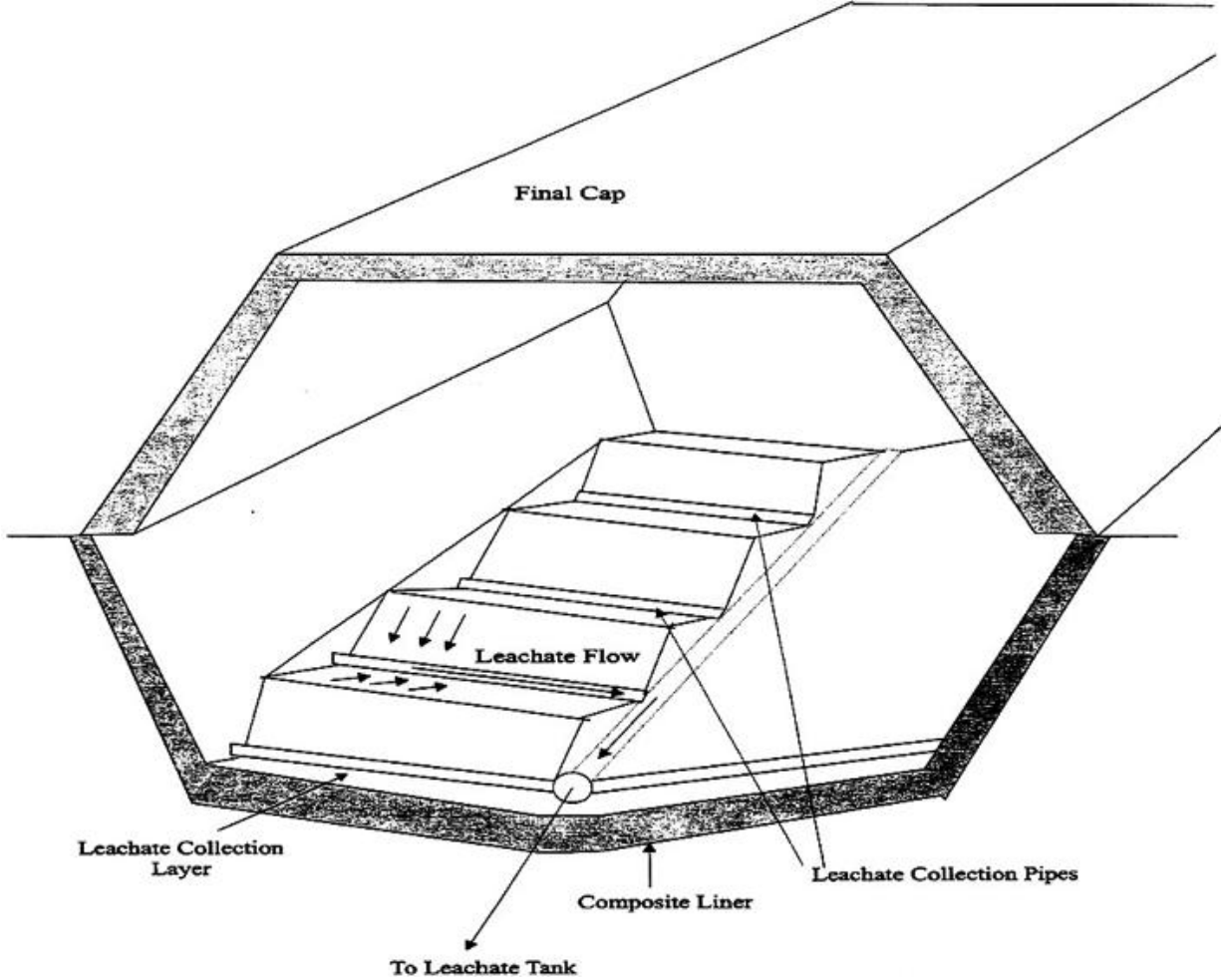


Figure 9.6 shows a cross-section of a landfill with a leachate collection system installed.

Landfill Emissions Monitoring & Reporting

1. Gas Regulations

The United States Environmental Protection Agency (EPA) issued regulations for control of air emissions from MSW landfills, based on section 111 the Clean Air Act (CAA). The federal government made the amendments to 40 CFR 60 by adding subparts CC and WW. The regulations require gas management systems as a component of the landfill final cover. Visit the following websites for more information:

- U.S. EPA Office of Air Quality Planning & Standards, Unified Air Toxics Website: Rule and Implementation Information for Standards of Performance for Municipal Solid Waste Landfills (Docket # A-88-09)
- <http://www.epa.gov/ttn/uatw/landfill/landflpg.html#RULE>
- The Energy Information Administration Landfill Gas Page for renewable and alternative fuels:
- <http://www.eia.gov/cneaf/solar.renewables/page/landfillgas/landfillgas.html>

2. Greenhouse Gas Regulations – 40 CFR Part 98 Subpart HH

Beginning with 2010, the U.S. EPA requires owners or operators of contained landfills to report emissions of greenhouse gases if amounts of CH₄ exceed equivalent to 25,000 metric tons CO₂e per year, as determined according to 40 CFR 98 Subpart HH. For more information, refer to the regulation 40 CFR Part 98 at:

- <http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=%2Findex.tpl>

and the EPA web pages at:

- <http://www.epa.gov/ghgreporting/reporters/index.html>
- <http://www.epa.gov/ghgreporting/>

Environmental Performance Standards

Air Pollution: No solid waste site or facility shall violate **applicable air pollution requirements** contained in KRS Chapter 224 or 401 KAR Chapters 50 through 63 (401 KAR 47:030, Section 10(2) and 401 KAR 30:031, Section 10(2)).

Safety for Explosive gases: No solid waste site or facility shall allow the concentration of explosive gases generated by the facility to exceed:

- 25% of the lower explosive limit (LEL) for the gases in facility structures (excluding gas control or recovery system components), and
- 100% LEL for the gases at the facility property boundary (401 KAR 47:030, Section 11 and 401 KAR 30:031, Section 11).

Chapter 10: RESIDUAL LANDFILL

Chapter 10 Objectives

1. Explain the siting and design requirements for a residual landfill.
2. Identify the closure and closure care requirements for residual landfills.

This section discusses the design requirements, and leachate regulations for Residual Landfills.

Buffer Zone Requirements

When siting residual landfills one must consider the following buffer zones in 401 KAR 48:050 stating that wastes shall not be placed within:

- 250 feet of an intermittent or perennial stream unless a 401 water quality certification has been issued pursuant to 401 KAR Chapter 10.
- The zone of collapse of deep-mine workings or within the critical angle of draw of such workings;
- 250 feet of a feature of karst terrain;
- 250 feet of the property line;
- 250 feet of a residence;
- 50 feet of a gas, sewer or water line; and
- 250 feet of a unplugged well except monitoring wells.

No facility shall be permitted unless:

- The uppermost aquifer can be monitored to detect the constituents identified in 401 KAR 48:300, and
- Corrective action can be performed on the aquifer as specified in 401 KAR 48:300.

Design Requirements

Residual landfills are designed and operated for the disposal of a specific type of waste; thus, **each design will vary**. The regulations specify that the **engineering design must be capable of meeting the Environmental Performance Standards**, siting standards and consider the following:

- Volume,
- Climate of area,
- Permeability of the liner material,
- Type of soil(s) underneath the facility,
- Hydrogeologic characteristics of the facility; including quality, quantity, current use and direction of groundwater flow,
- Proximity of the site to surface water and groundwater,
- Potential for gas emissions and odors,
- Design of the leachate, runoff and gas migration control systems relative to the specific waste to be disposed, climate and volume of leachate to be collected, and
- Characteristics of the waste—including how the liner and cover material will prevent hazardous chemicals from contaminating groundwater and surface water. One may arrive at the list of chemicals by comparing detectible constituents in the waste against the list of hazardous constituents in 401 KAR 48:300, Section 10(3), the Groundwater Monitoring List in 40 CFR 264 Appendix IX, the priority pollutants in the Clean Water Act, or similar list approved by the Cabinet. A good rule of thumb is to use a clay liner for waste containing only metals and a composite liner (clay and synthetic) for wastes containing organics. Otherwise, the engineer should model the effects of any hazardous substance migration through the liner and into the groundwater. Use the EPA help, ODAST, MODFLOW, IWEM or similar model to predict groundwater impacts of the proposed design.

Closure and Closure Care Requirements

As part of the technical application, the applicant is required to **develop closure plans for the site to ensure compliance with the Environmental Performance Standards**. A residual landfill closure plan must address the following:

Once the facility owner quits accepting wastes, he begins to cap the landfill. When the construction is completed, the owner notifies the Division whom must inspect the site. A DWM representative inspects the site and reviews the records to determine the site's compliance with all regulatory requirements. A 90% permanent vegetation cover should be in place before the request for a final construction inspection is made.

After the Division accepts the owner's closure report, **the facility must be maintained and monitored for a minimum of two years**. This period is referred to as the closure care period. Once the two-year closure care period expires, a DWM representative must inspect the site and review the records to determine the site's compliance with all regulatory requirements and that a ninety percent permanent vegetation cover exists. If the site is in compliance, the Division may release the closure and closure care bonds per 401 KAR 48:170, Section 3(6) and KRS 224.40-650(3).

The owner or operator must implement this plan, plus any other corrective work specified by the Division. The deed for the property has to be altered to notify future purchasers of the following:

- Location of the waste disposal area,
- Time of operation of the facility,
- Nature of the waste, and
- Caution against future disturbance.

Once this work has been accomplished, the Division may accept the closure care certification prepared by the owner or his representative.

Leachate Regulations

The design of the facility leachate control system, runoff control system and gas migration control, if required, must relate to the physical and chemical characteristics of the waste, the climatic conditions of the specific location: along with the volume of leachate and contaminated runoff collected at the facility (401 KAR 48:170 section 1(7)).

Chapter 11: SPECIAL WASTE LANDFILL

Chapter 11 Objectives

1. Explain the siting requirements for a special waste landfill.
2. Understand the regulations and requirements for the design of a special waste landfill.
3. Describe the closure and closure care requirements for special waste landfills.

This section discusses the siting requirement, design and leachate regulations for a Special Waste Landfill.

Siting Requirements

Siting requirements, outlined below, apply to all new special waste landfills (401 KAR 45:130).

Flood Plains

Sites cannot restrict the flow of the 100-year flood or reduce the temporary water storage capacity of the flood plain. Operational methods at the site must prevent the washout of waste.

Buffer Zones:

The distance between the fill area and the following must be:

- Property line: 100 feet
- Intermittent or perennial stream (Unless a water quality certification is issued): 250 feet
- Sinkhole or other similar feature of karst terrain: 250 feet
- Wastes cannot be placed in the zone of collapse of deep mine workings or within the critical angle of draw of such workings.

Aquifers:

No facility shall be permitted unless:

- The uppermost aquifer can be monitored to detect the constituents identified in 401 KAR 45:160, and
- Corrective action can be performed on the aquifer as specified in 401 KAR 45:160

Design Considerations

Special waste landfills are designed and operated for the disposal of a specific type waste; thus, each design will vary. The regulations at 401 KAR 45:110 specify that the engineering design must be capable of meeting the EPS of 401 KAR 30:031 and the siting standards of 401 KAR 45:130 considering the following:

For coal combustion ash groundwater monitoring parameters, the applicant uses those specified in 401 KAR 45:160, Section 8(2).

To determine groundwater monitoring parameters for wastes other than coal combustion ash, the applicant should **follow the same procedure recommended for residual landfills.**

Closure and Closure Care Plan Requirements

As part of the application, the applicant is required to develop a closure and a closure care plan for the site to ensure compliance with the EPS. The closure plan plus any other corrective work specified by the Division must be implemented. The deed for the property must be altered to notify future purchasers of the same factors that are listed on deeds for closed residual landfills.

Once this work has been accomplished, the Division may accept the closure care certification prepared by the owner or his representative.

After the Division accepts the owner's closure certification, the facility must be maintained and monitored for a **minimum of 5 years**. This period is referred to as the post closure period (401 KAR 45:110, Section 5(6)).

Once the 5-year closure care period expires, the site must be inspected and records reviewed to determine the site's compliance with all regulatory requirements and that 90% permanent vegetation cover exists. If the site is in compliance, the Division will release the closure bond.

Leachate Regulations

The design of the facility leachate control system, runoff control system and gas migration control, if required, as it related to the physical and chemical characteristics of the waste, the climatic conditions of the specific location, the volume of leachate and contaminated runoff collected at the facility (401 KAR 45:110, Section 1(7)). **Note:** This is a best professional judgment call by the design team. For example: most coal combustion fly ash usually does not have leachate collection, since it sets up and sheds water. However, another with more porous bottom ash and one with one paper sludge landfill do have leachate collection, since it has a plastic liner on clay.

This page left blank intentionally.

Chapter 12: CONSTRUCTION/DEMOLITION DEBRIS (CDD) LANDFILL

Chapter 12 Objectives

1. Understand the design requirements for CDD landfills.
2. Explain the closure and closure care requirements for CDD landfills required by regulation.
3. List what must be included in the design for leachate control and disposal.

This section discusses the design requirements for a Construction/Demolition Debris (CDD) Landfill.

Buffer Zone Requirements

Siting or buffer zone requirements specified for CDD landfills are identical to those specified for residual landfills in 401 KAR 48:050.

Design Requirements

Technical requirements specified for CDD landfills are outlined in 401 KAR 48:060.

The **design and closure plans** submitted must meet the following minimum criteria:

- They must be designed to keep surface water flows and leachate separate by:
 - Minimizing surface water running onto or through the operational or completed fill areas,
 - Designing diversion ditches and structures for a 100 year/24 hour storm flow (about 6 to 7 inches of rain), and
 - Designing sediment basins (silt pond) and emergency spillways:
 - To retain and safely pass a 25- year/24 hour storm event (about 4 to 5 inches of rain), without discharging through the emergency spillway.
 - To pass a 100 year/24 hour storm event (about 6 to 7 inches of rain) through the emergency spillway (ditch to carry the extra water that would have broken the dam) with no flow exceeding the design freeboard (i.e., space between the top of the water and top of the ditch),
 - To allow sediment storage from an operating period of one year (one may use shorter times with a more frequent clean out schedule),
 - With specified sediment basin clean out elevations (i.e., time to remove the soils when the top of the dirt reaches this mark), and
 - Using designs verified by a unit hydrograph method of calculation (an engineering method to calculate flow).

Liner and leachate collection systems must be designed with the following:

- 12 inches of soil, and
- 12 inches soil (clay, shale, etc.) with 1×10^{-7} centimeters per second maximum

permeability or equivalent (i.e., ten years for one foot of water to break through the bottom of one foot of clay).

Leachate collection system in areas with a slope of less than 25% which:

- Have a drainage layer of 12 inches of material with a minimum permeability of 1×10^{-3} centimeters per second or its equivalent (i.e. sand, pea gravel, or geocomposite),
- Is designed for a maximum head (standing water depth) of 12 inches,
- 4" diameter, perforated lateral pipes which are:
 - Installed perpendicular (right angles, or 90 degrees) to flow, and
 - With the piping layout having a minimum slope of one percent.
 - Uses an 8 inch diameter pipe for trunk lines, and
 - Has a filter fabric (i.e., cloth) or other material designed to protect the integrity of the drainage layer, and a filter fabric protection layer of 12 inches of material with a minimum permeability of 1×10^{-3} centimeters per second or its equivalent (sand). The Cabinet frequently waives these two requirements if the applicant can show equivalent environmental protection (little or not clogging of the sand by the waste constituents).

The leachate collection tank with 1,000 gallons minimum plus storage volume for **15 days of peak production** capacity during operation or closure using the HELP (Hydraulic Evaluation of Landfill Performance) or equivalent model. This is usually the wettest 15-day period during 20 years of area rainfall data.

- Plans must also include a description of how the leachate will be measured, disposed of and documented. If using an off-site wastewater treatment plant, provide an approval letter from the owner of the treatment facility,
- Adequate soil material must be documented to provide coverage of 1 foot of compacted cover at the end of the week or on lifts of 10,000 square feet area, whichever occurs first (for example, if you spread 20,000 square feet of wastes in one week, you must apply cover twice),
- Surface and groundwater monitoring plan which meets 401 KAR 48:300,
- Equipment sufficient to handle waste stream,
- Identify an area for handling hot or smoldering load and other special handling problems, and
- Include a shelter for operating personnel, which has drinking water, sanitary facilities, lights, heat and screened windows.

When the applicant restricts the waste to non-putrescible (non-rotting) wastes and wastes

that will not leach, the liner may be modified to consist of: 2 feet of soil re-compacted to 90 % standard proctor, and no leachate collection system.

Non-putrescible means tightly baled paper or cardboard, wood boards, logs, stumps, asphalt, concrete, etc. **Putrescible** means anything subject to rapid decomposition such as loose paper or cardboard, wood shavings or chips.

Figure 12.1 – Construction-Demolition Debris Landfill Putrescible Wastes Design Cross Section on Slopes

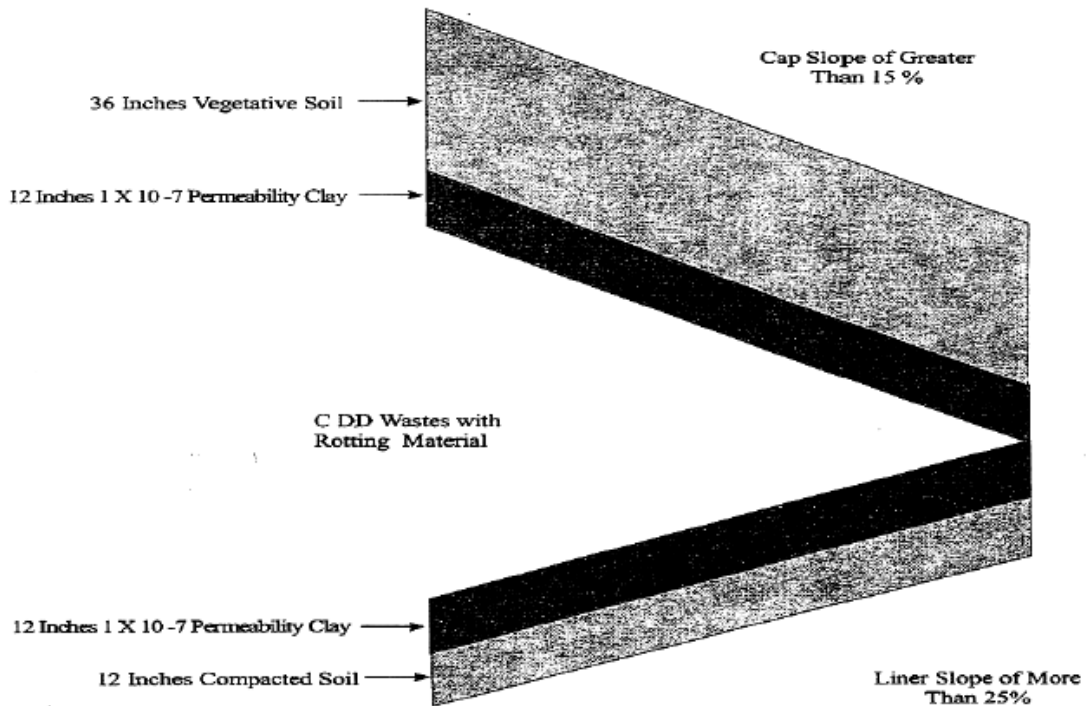
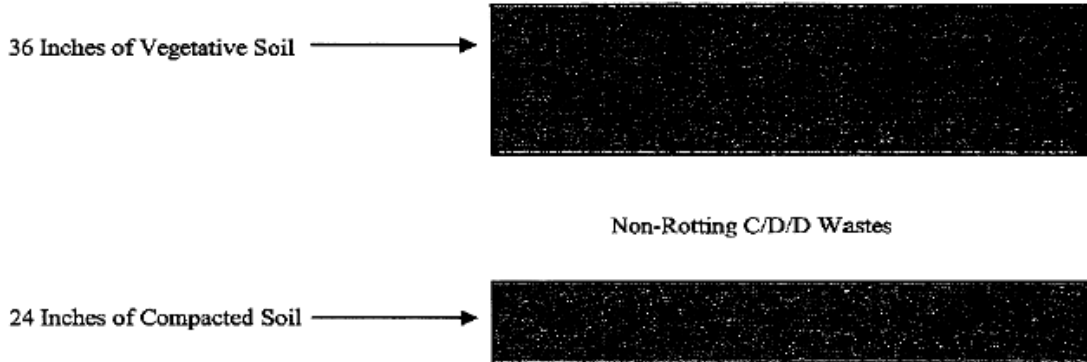


Figure 12.2 – Construction-Demolition-Debris Landfill Non-Putrescible Wastes Design Cross Section on Slopes



Closure and Closure Care Plan

The technical application requires the applicant to develop a **closure plan**, which describes:

- The procedures and schedule for final closure,
- The phased closure and sequence, and
- The **final cover** designed to meet the following (starting with the first layer above the interim cover):
 - Waste cells **graded** to a slope of more than 5% and less than or equal to 25%,
 - 12 inches of a **maximum** 1×10^{-7} cm/sec permeability clay or its equivalent,
 - On slopes of less than 15% , 6” **drainage layer** of 1×10^{-3} cm/sec permeability sand with a system of drainage tiles to relieve water collected,
 - **Filter fabric** to protect the drainage layer (this may be removed upon approval of an alternative specification),
 - 3 feet of vegetative cover,
 - Diversion berms for locations where the runoff exceeds the holding capacity of the final cover, and
 - When the wastes in the landfill have been restricted to non-putrescible wastes or wastes that don’t leach, the final cover layer may be reduced to a minimum of 3 feet of vegetative soil.

Closure regulations require the owner or operator to:

- Implement the closure plan. The owner or operator may submit a modification 90

days prior to the last date for accepting waste,

- Place final cover within 365 days over areas of the landfill which are completely filled (reached the final grade or maximum planned elevation),
- Not remove earth moving equipment until the Division inspects the site and determines compliance with approved plans and specification,
- Follow the closure care plan for a minimum of 2 years which includes narrative on the activities to be undertaken after closure relative to:
 - Surface and groundwater monitoring,
 - Leachate collection and treatment,
 - Cap erosion and sediment control,
 - Cap re-vegetation and regarding,
 - Access controls, and
 - A schedule for monitoring and accomplishing these activities.
- Maintain the sign which lists the name, address and telephone number of the owner during closure care (401 KAR 48:060, Section 2(5)),
- Submit the records that the owner shall submit to verify quality control of the cap,
- Alter the deed to caution against future site disturbance of the area and proof of this change provided,
- Perform corrective action work as specified by the Cabinet after the final cap inspection, and
- Obtain the bond release two years following the Division's acceptance of the closure certification.

Chapter 13: CONTAINED LANDFILL

Chapter 13 Objectives

1. Understand the minimum siting and design standards for a contained landfill.
2. Define possible solutions to address problems with storm water control.
3. Final cap components and their purpose.
4. Describe the closure and closure care requirements.
5. Understand leachate regulations.

This section discusses the design requirements and the gas and leachate regulations for a contained landfill.

Buffer Zone Requirements

Siting or buffer zone requirements specified for contained landfills are identical to those specified for residual and CDD landfills in 401 KAR 48:050.

Design Requirements

Design requirements for contained landfills are outlined in 401 KAR 48:070 and 48:080. 401 KAR 48:070 outlines the minimum design standards for the landfill, such as water control and 48:080 for the liner and cap. Owners or operators must ensure that the design:

- Maintains the separation of surface water and leachate. The contours of the landfill must minimize the surface water that runs on or through the landfill,
- Allows ditches to withstand a 100-year, 24 hour storm flow (runoff from a 6 to 7 inch rainfall),
- Meets the same requirements for CDD landfill sediment basins plus the following:
- The downhill toe of the slope of the sediment pond dam must be 50 feet from the property line
- Enables the landfill to resist an earthquake event (seismic) if it is constructed in the seismic impact zone,
- Ensures the stability of the system components (i.e., liner, leachate collection system, cover, liner, and cap) (i.e., karst, underground mines, unstable slopes),
- Ensures that sufficient equipment be onsite to compact wastes received within 2 hours of receipt. Backup equipment must be available within 24 hours. A recordkeeping system must be proposed to address equipment maintenance.
- Ensures an in-place waste density of at least 1,200 pounds per cubic yard, (except fluff lift or protective cover)
- Addresses soil availability to meet the liner and cap construction needs (soil volumes and permeability as well as operational cover),

Includes a building for personnel, which is:

- Heated,
- Air-conditioned or screened, and
- Has drinking water and sanitary facilities. Includes a building which is large enough to hold the largest piece of equipment for maintenance.

Outlines a quarterly explosive gas (methane) monitoring program which addresses:

- The control of explosive gases meeting the EPS of 401 KAR 47:030,
- Soil and water properties of the area around the landfill,
- Possible gas migration
- Location of facility structures and boundaries,
- Gas venting system with minimum of one vent per acre (passive gas system),
- Location of surrounding off-site structure and residences, and
- Ensures that each building has a monitoring alarm system to detect explosive gases,

Meets the following roadway requirements:

- Construction of a road from the publicly maintained highway to the waste disposal area,
- Construction of an all weather perimeter road (gravel or paved) around the landfill to each monitoring and sediment control structure,
- Internal roads must be all weather and designed to within 200 feet of the working face,
- All roads must be designed wide enough to allow passage of vehicles, carry normal traffic, and properly drain, and
- Entry to landfill must have enough space to safely accommodate trucks and prevent delays on the public roadway (include stacking lanes).

Has a safety and communication plan which addresses:

- Heavy equipment safe operation and maintenance to prevent accidents and breakdowns, and;
- Description of:
 - Communication equipment such as radios, mobile phones and base telephones (i.e., cell phones),
 - Fire fighting procedures, and OSHA-related requirements
- Has scales to weigh all waste,
- Has a leachate collection and treatment system meeting the same requirements as a CDD landfill, except that possible treatment in ponds before discharge is not allowed.

Liner System

- Has a **liner** containing (starting from the bottom and going up):
 - A **sub-grade**: the landfill sub-grade is the upper rock layer, soil layer, or select fill that is the foundation to support the liner. This sub-grade must be:
 - Graded according to plan,
 - Sufficiently dry and stable,
 - Proof-rolled,
 - Free of organic material, and
 - Soil embankment used to construct subgrade is verified by a minimum of 9 tests per acre to determine sub-grade compaction of 92%. Sufficient cross sections must be taken to document the finished elevation.
- For all areas, a **composite liner** with:
 - Ten percent slope minimum,
 - A 36-inch thick clay layer with a permeability of 1×10^{-7} cm/sec, or 24 inches thick for slopes 4:1 or greater,
 - A 60 mil thick synthetic (geomembrane) liner,
 - A 12-inch drainage layer with a permeability of 1×10^{-3} cm/sec (sand),
 - A filter fabric to protect the drainage layer (this may be removed upon approval of

an alternative specification),

- Geocomposite, a synthetic drainage netting heat-fused to upper and lower filter fabrics, may replace the drainage layer on slopes greater than ten percent, and
 - Geosynthetic Clay Liner (GCL) placed on a 24 inch compacted soil liner may replace the low permeable soil liner requirement. Compacted soil liner shall meet 1×10^{-7} cm/sec permeability in the laboratory.
- A **leachate collection system** that uses:
 - A maximum static head of 12" of depth,
 - 8" diameter schedule 80 plastic pipe (or equivalent) for the main collection lines or another design that meets the 12 inch maximum leachate depth rule,
 - 4" lateral lines installed perpendicular to flow or another design that meets the 12 inch maximum leachate depth rule,
 - A design for the pipes to withstand all encountered static and dynamic load (dead and live loads),
 - A 1% minimum slope for piping,
 - A leachate collection tank with the same amount of storage as a CDD landfill,
 - An identified and assured disposal method (letter of acceptance from an off site Publicly Owned Treatment Works (POTW)), and
 - Allowances for inspection and cleaning.

Figure 13.1 Contained Landfill Design Cross-Section Sloped Areas

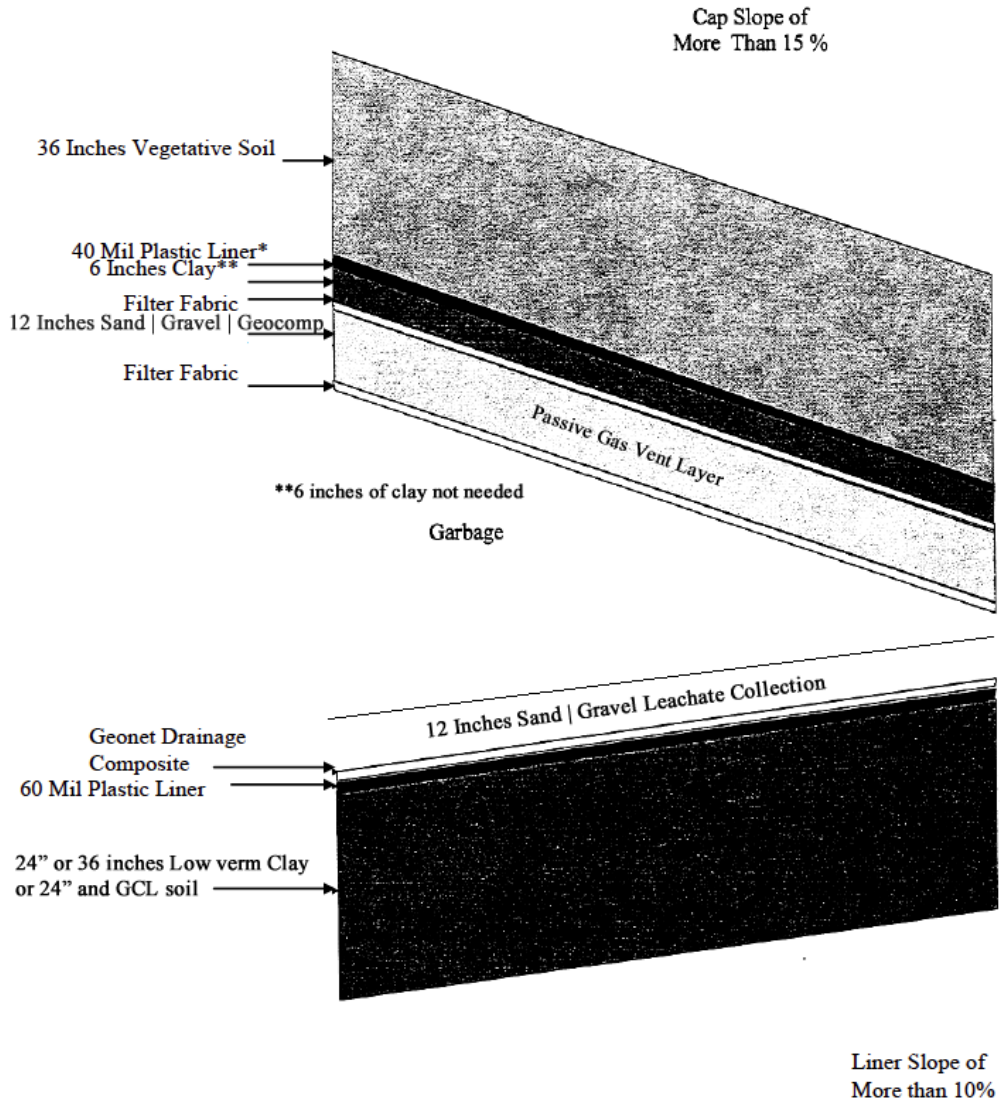
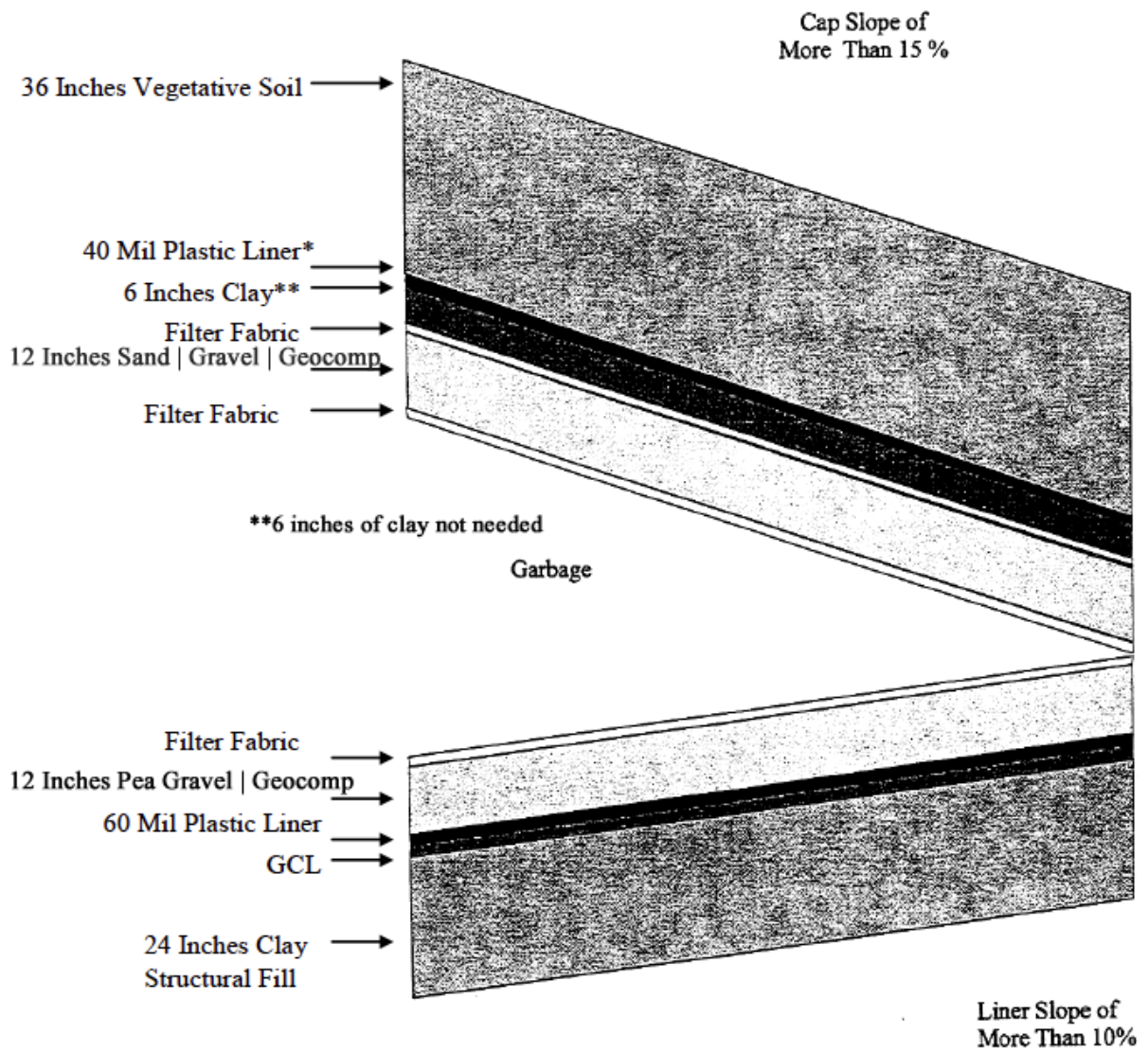


Figure 13.2 Contained Landfill Design Cross-Section Geosynthetic Clay Liners (GCL)



Leachate Reduction

Several problems have been documented with the design and operation of leachate collection systems at contained landfills. Failure to divert rainfall run-on and runoff away from the leachate collection layer overloaded the systems with rainwater and dilute leachate that nevertheless must be transported to a POTW for disposal (similar to mixing storm water and sewage). This results in an enormous increase in hauling and treatment costs or increases temptation to directly discharge to a stream. One company performed open dump clean up work over one million dollars in response to illegal discharges. Solutions include:

- The design and installation of plastic liner flaps between the new liner area and the current disposal area,
- Construction of a smaller cell since plastic encourages runoff (one year maximum is recommended),
- Installing partial berms between cells to separate leachate flows from filled area from surface water in new areas,
- Covering the entire new cell with waste and interim cover while directing rain water (runoff) from the top of the interim cover through the sediment pond,
- The design and installation of a drain pipe through the dam at the bottom of the landfill for storm water gravity flow (less expensive than pumping but must seal prior to filling),
- The design and installation of temporary runoff ditches from the covered working area to the main runoff ditches connecting to the sediment pond (Designed by a Professional Engineer per 401 KAR 48:070, Section 7(2)(c)), and
- Partnering the consulting engineer and the manager to sequence filling, i.e., onsite visits to look at the current situation and plan a way out for the storm water as filling progresses.

Final Cap

The cap is a layered system which must maintain a slope between 5% and 25%. The components of the cap are (from bottom to top):

- Filter fabric,
- Twelve inch thick sand gas venting system with a minimum hydraulic permeability of 1×10^{-3} cm/sec, or geocomposite (passive system only),
- Filter fabric to protect the venting system,

- Synthetic liner with specified elasticity (such as Very Low Density Polyethylene (VLDPE), Low Density Polyethylene (LDPE)) to meet minimum permeability of bottom liner as required by 401 KAR 48:090, Section 13(1)(a)1 and EPA regulations. For areas with a slope of less than fifteen percent, a twelve inch thick drainage layer with a permeability of 1×10^{-3} cm/sec sand, gravel, or geocomposite (rarely used), and
- A 36" thick vegetative cover.

Landfill Gas Regulations

- **Maintenance Equipment:** The owner or operator shall provide the landfill equipment required to maintain methane gas systems (401 KAR 48:070, Section 6(3)(d)),
- **Buildings:** Each building shall have an alarm installed in accordance with the manufacturer's recommendations to detect the presence of explosive gases (401 KAR 48:070, Section 9(3)),
- **Explosive Gas Program:** The application for a contained landfill unit shall include a quarterly methane monitoring program to ensure that the standards of 401 KAR 47:030, Section 11 are met.
- The minimum frequency of monitoring shall be quarterly.
- A gas venting system shall be designed for all landfills. A minimum of one vent shall be required per acre of landfill (passive system only) to be filled (401 KAR 48:070, Section 10; meets 40 CFR 258.23).
- **Alternative Specifications:** Alternative specifications may be used only after approval by the Cabinet upon a demonstration by a qualified registered professional engineer that they shall result in performance with regard to safety, stability and environmental protection equal to or better than that resulting from designs complying with the specifications of this administrative regulation (401 KAR 48:080, Section 11).

Closure and Closure Care Plan

The owner is required to prepare a closure plan as part of the technical application, which describes all the necessary steps to close all units of the landfill and provide maintenance. This plan must identify:

- Methods, procedures, and processes to close each unit in accordance with the:
 - Environmental Performance Standards of 401 KAR 47:030,
 - Groundwater rules of 48:300, and
 - Closure regulations in:
 - 401 KAR 48:070, Section 15,

- 401 KAR 48:080, Section 8 through 10, and
- 401 KAR 48:090, Section 13.
- An estimate of the maximum open area or uncapped area for each landfill unit or phase. (Note: The larger of the two must be used for bond per federal rules),
- A schedule for completing closure that includes beginning within thirty days following the final receipt of waste,
- The methods to maintain final cap, including necessary repairs due to erosion, settling, etc.,
- The maintenance and operation of the:
 - Leachate collection system,
 - Groundwater monitoring system, and
 - Explosive gas monitoring system.
- The name, address and telephone number of the contact person for the thirty year closure care period, and
- The description of the planned use of the property.

Following closure of a designated unit, the owner must submit a certification by a professional engineer that the phase has been closed in accordance with the approved plan. A copy of the approved closure plan must be kept onsite until the closure care period has ended. Once the Division has accepted the certification of closure, the owner must alter the deed to notify all potential purchasers of the location and time of operation, type of waste disposal, and caution against future disturbance of the area. Proof of this deed change is required before the Cabinet acceptance of the cap and release of the closure bond.

Chapter 14: OTHER REGULATIONS

Chapter 14 Objectives

1. Discuss the other state and federal programs noted in the EPS, statutes and regulations.

Landfill permits also require approvals or information gathering from agencies and organizations other than the Kentucky Division of Waste Management-Solid Waste Branch. This chapter lists the agencies, organizations and permitting programs run by agencies other than the Kentucky Division of Waste Management that influence landfill permitting and operations.

The requirements of other environmental, safety, planning, and permitting agencies for your landfill may be found in several locations within the solid and special waste regulations. The list of federal, state and local agencies, their requirements, and the type of landfill that must comply with each is found in Table 1 of this chapter. A more specific list, including the solid waste or special waste regulatory reference, is found in Table 1 of Appendix I.

Supporting Information

Prior to submission of the Notice of Intent, Administrative and Technical phases of the permit application, it is necessary to obtain a letter of Local Determination from the County government which approves or denies siting for a potential new landfill or expansion (except those landfills that only accept waste from the owners facilities). The determination letter will likely attach various resolutions, adopted ordinances and public advertisements showing proper procedures were followed.

Usually, the environmental consultant who prepares the landfill permit application contacts other agencies, listed in Table 1, on behalf of the applicant. Some of these additional actions, such as surface water discharge permits, 401 Water Quality Certifications, CWA Section 404 or Title V air quality permits, require separate permit applications and public notices. Some landfill permit applications require proof of certification within the permit application. Examples are: Water Quality Certifications from the Kentucky Division of Water, letters of finding, from the Kentucky Heritage Council regarding surveys for historically significant sites, and findings from the U.S. Fish and Wildlife Service regarding Threatened and Endangered Species.

Still other requirements are mentioned in the landfill application as a study or a statement. Consultants preparing the landfill application and state reviewers both frequently contact the U.S. Geological Survey and Kentucky Geological Survey for the latest studies involving Holocene faults, seismic activity and hydrogeologic conditions under or near the site. Private companies must submit the Security and Exchange Commission's Form 10-K to the Division of Waste Management, or Annual Report to Stockholders, as a part of the background information since it lists the Officers of the company and the relative financial health.

Landfill managers must train employees to comply with all laws and regulations applicable to his or her site. The following list is not all-inclusive, it merely lists other permissions, permits, or involvement by other agencies mentioned in the statutes and regulations for solid and special waste landfills. 401 KAR 47:100, Section 3 and KAR 45:030, Section 3 requires the owners or operators of a solid or special waste facility to comply with all federal laws. 401 KAR 47:100, Section 4(3) and 45:030, Section 4(3) states that the issuance of a permit "...shall not authorize...infringement of state and local laws." The Environmental Performance Standards at 401 KAR 47:030 and 30:031 require compliance with several specific state and federal programs and all of KRS Chapter 224, the state environmental protection law.

The primary responsibility for enforcement for each law or regulation depends on the wording of the laws and regulations. For example, final decisions on wetland mitigation are made by the U.S. Army Corps of Engineers. The landfill permit application must show a wetlands mitigation permit for wetland areas and/or jurisdictional streams impacted inside the proposed permit area. However, decisions on Holocene fault location are made by geologists within the Energy and Environment Cabinet. The reviewers may choose to consult with the U.S. Geological Survey or Kentucky Geological Survey regarding the latest published studies on the issue.

If a landfill manager has any questions about the applicability of a law or regulation, he or she should consult the company engineer, geologist, environmental consultant, company attorney, attorney specializing in that area of the law, agency responsible for enforcing that law or regulation, or the EEC.

Table 1: Other Agencies Involved in Landfills and their Requirements

Agency	Requirement	Contained	CDD	Residual	Special Waste
Agriculture, KY Dept. of	Impact on prime agricultural lands	X	X	X	X
Air Quality	Compliance with air regulations	X	X	X	X
County or 109 S.W. District	Compliance with county solid waste plan	X	X	X*	
County Fiscal Court	Permit application executive summary	X	X	X*	
Environmental Protection, Dept. for	Compliance with the environmental protection requirements of KRS Chapter 224	X	X	X	X
Federal Aviation Administration	Not contained within 5,000 ft. of jetport; Within 5 mi. notify FAA	X			
Fire Chief	Fire Safety	X	X	X	X
Labor Cabinet (OSHA)	Safety & Communication Plan	X	X	X	X
Nature Preserves	KRS 146.410 to 146.990 and KAR Title 400 (the Nature Preserves System)	X	X	X	X
Dept. for Natural Resources	Surface and deep mining issues	X	X	X	X
Planning & Zoning	Conditional use permit, building permit, nuisance regulations	X	X	X	X
Public Service Commission	Utility line location	X	X	X	X
Securities and Exchange Commission	Form 10-K Annual Report to Stockholders used for owner background information	X	X	X	X
State Historic Preservation Office**	The National Historic Preservation Act of 1966	X	X	X	X
Stormwater planning, local	Non-point source discharge	X	X	X	X

Transportation Cabinet	Impact on transportation facilities	X	X	X	X
US Army Corps of Engineers	Fill permits, wetlands mitigation permits (404)	X	X	X	X
US EPA Region 4	Sludge land application and Underground Injection Control permits, Green House Gas (GHG) Reporting	X	X	X	X
U.S. Fish & Wildlife	The Endangered Species Act, The Fish and Wildlife Coordination Act	X	X	X	X
US Geological Survey, KGS	Faults, Seismic design	X	X	X	X
Division of Water	KPDES discharge permits, floodplain, non-point source discharge, wild rivers, Water Quality Certification (401)	X	X	X	X

*If off-site & charges fee

**KY Heritage Council

This page left blank intentionally.

APPENDIX A: Waste Management in Kentucky

This appendix discusses the history of waste management in Kentucky, and current regulations and statutes dealing with the process of waste disposal.

Division of Waste Management

The Division of Waste Management consists of seven branches: Solid Waste Branch, Recycling and Local Assistance Branch, Hazardous Waste Branch, Field Operations Branch, Underground Storage Tank Branch (USTB), Superfund Branch and Program Planning and Administration Branch. The whole agency subscribes to the mission:

“Protect and enhance Kentucky’s environment to improve the quality of life for all Kentuckians.”

To accomplish this mission, the department has developed a set of objectives to be implemented by each division.

The objectives are to:

- Reduce and/or maintain elimination of division permit and data entry backlogs.,
- Protect human health and enhance Kentucky’s land resources.,
- Place emphasis on the reclamation and recycling of waste that is generated.,
- Design requirements to assure that the remaining waste is disposed of properly.
- Restore lands that are impacted from releases when wastes are *not* managed properly.

Solid Waste Branch

The Solid Waste Branch is responsible for the review and issuance or denial of permits for solid waste and special waste landfills, landfarming and composting facilities and registrations for permit-by-rule facilities.

The mission of the Solid Waste Branch is to assure proper solid and special waste management practices through the implementation of comprehensive permitting, monitoring and training.

General Overview

All counties in Kentucky offer a system of universal waste collection. Universal waste collection means that collection service is made available to households, either through curbside collection or through drop-off centers/collection centers/transfer stations for use by households. The total population in Kentucky is increasing, so the amount of waste generated in the state is increasing. The charts below show these trends of increasing population as well as increasing amounts of waste being generated.

In 2010, Kentucky experienced a 6 percent decrease in Kentucky waste disposal in Kentucky landfills and a 3 percent increase in the amount of out-of-state waste disposed in Kentucky landfills. Kentucky exported 9 percent of its waste to out-of-state landfills, an increase from 7 percent in 2009. Kentucky land-filled 4,191,066 tons of waste in 2010, a decrease of 161,952 tons from 2009.

Summary of HB 174 (KRS 224.43-500 & 505)

HB 174 establishes priorities for proper solid waste management in Kentucky through waste reduction, recycling, proper closure of abandoned landfills, education, proper collection and disposal of solid waste, elimination of illegal open dumps and abatement of litter. It creates revenue to begin to address some of the priority issues: illegal dumps, litter, and most important to the Solid Waste Branch, the final closure and remedial activities at abandoned landfills.

Revenue was initially generated through a \$25 million bond sale. The \$1.75 Environmental Remediation Fee (ERF) assessed on each ton of waste disposed in municipal solid waste disposal facilities and a \$5 million annual transfer from highway road and contingency funds continues to provide the main funding. The ERF is also assessed on waste disposed at municipal solid waste disposal facilities to be collected at transfer stations where the waste is disposed out of state.

The Kentucky Pride Fund was established to receive the funds, and is administered by the Energy and Environmental Cabinet. The interest on all monies deposited into the fund, up to \$1 million, will fund the Kentucky Environmental Education Master Plan. The first \$2.5 million is used to repay the original bond. The next \$2.5 million is used for the remediation of historic landfills. The remaining ERF revenues and road fund monies are to be used by the counties and cities for the cleanup of illegal dumps and litter.

Counties and cities receive litter monies based on their population and road miles. After receiving funding to clean up litter, counties must clean roadsides no less than three (3) times a year, and cities must clean city streets a minimum two (2) times a year.

The Cabinet prioritizes illegal dumps and abandoned landfills based on health and environmental risks. In order for counties to receive reimbursement for illegal dump cleanups, they must have an approved solid waste management plan and this requires them to employ a solid waste coordinator with enforcement powers. The Cabinet reimburses counties with the

county providing a 25% match for sites with a remediation cost less than \$50,000. For sites with a remediation cost greater than \$50,000, the Cabinet fully reimburses the county. Abandoned landfill remediation work is 100% funded by the Cabinet. To date, 20 historic landfills have been closed through this program at a cost of \$30 million.

Three landfill closure projects have completed the design phase and are scheduled in the next budget cycle for construction. The total construction cost estimate is approximately \$3 million, which includes site characterization as well as design and engineering oversight.

Kentucky Statutes

Landfill permitting laws are found in Kentucky Revised Statutes (KRS) Chapter 224. These statutes override any regulation in Kentucky.

The KRS subchapters related to Solid Waste are:

- KRS 224.001 Generalities
- KRS 224.010 Environmental and Public Protection Cabinet
- KRS 224.016 State—Federal Relations
- KRS 224.040 Waste Generalities
- KRS 224.043 Solid Waste
- KRS 224.046 Hazardous Waste
- KRS 224.050 Other Specific Types of Waste

Kentucky Statutes and Regulations

The regulations found in 401 KAR Chapters 30, 47, 48, and 49, address solid waste planning requirements, design, and operational standards applicable to all solid waste sites or facilities.

The general requirements for all landfill types are:

- 401 KAR 47:100 General Provisions for Obtaining a Solid Waste Permit
- 401 KAR 47:120 Conditions Applicable to all Solid Waste Permits
- 401 KAR 47:130 Changes to Solid Waste Permits; Expiration of Solid Waste Permits
- 401 KAR 47:160 Application Procedures
- 401 KAR 47:170 Notice of Intent to Apply for a Solid Waste Permit
- 401 KAR 47:180 Contents of the Administrative Application for Solid Waste Landfills
- 401 KAR 47:190 Contents of the Technical Application for Solid Waste Landfills

- 401 KAR 48:050 Siting Requirements for Solid Waste Landfills
- 401 KAR 48:300 Surface and Groundwater Monitoring and Corrective Action
- 401 KAR 48:310 Financial Requirements and Bonds

Environmental Performance Standards

The Environmental Performance Standards (401 KAR 47:030) outline the minimum requirements to assure disposal sites or facilities do not pose an unreasonable risk or adverse effect on human health or the environment. The rule is similar to 40 CFR 257, which was promulgated by the U.S. EPA. All solid waste management facilities in Kentucky must demonstrate compliance with these standards. Sites failing to meet these standards are considered open dumps, which are prohibited by law. The Environmental Performance Standards (EPS) are categorized by site selection, landfill operation, and safety.

This page left blank intentionally.

APPENDIX B: A Guide for Monitoring Well Construction and Abandonment

The Solid Waste Branch, Division of Waste Management, requires the following decontamination and construction activities at all solid waste facility monitoring well sites:

1. No monitoring well at a solid waste site may be constructed, modified, or abandoned without prior Division approval. Groundwater Monitoring Plan changes must be approved in advance by the Division.
2. A Kentucky certified monitoring well driller must perform all monitoring well construction, modification, or abandonment (see 401 KAR 6:350).
3. The Kentucky certified monitoring well driller must provide the Cabinet with a record of the monitoring well construction. The record must be submitted on the form entitled "Kentucky Monitoring Well Record" (DEP 8043) to the Kentucky Division of Water. A copy of this record must also be provided to the Division of Waste Management.
4. The Division must be notified at least ten (10) working days prior to any monitoring well construction, modification, or abandonment so that a Division representative may be present (401 KAR 6:350, Section 12).
5. Decontamination must be performed at the landfill site and between boreholes. This requirement applies to monitoring well construction, modification, and abandonment. A decontamination point may be established or the decontamination may occur at each well site, downgradient of the borehole location. Decontamination of equipment is required for each well. If possible, upgradient wells should be drilled first.
6. Decontamination must be performed on all downhole equipment. This should also include all tools that come in contact with downhole equipment as well as the drilling platform, vertical drill pipe assembly (lazy susan), etc. Anything that could affect the borehole should be decontaminated.
7. The decontamination medium should be, at a minimum, potable water, used under pressure and heated to steam. Well water or formation water must not be used. Soap, if used, must be non-phosphatic (e.g., Alcinox or Liquinox). The drill rig water tank, the truck mounted water tank, and all other water tanks must have been used only for potable water.
8. Well casing, if not kept in individual factory-sealed plastic wrappers, must also be decontaminated prior to installation in the borehole.
9. Disposable plastic gloves must be used when handling all downhole equipment and well casing. Disposable cotton gloves may be used to handle augers and similar equipment that would tear plastic gloves.

10. The borehole site must be free of debris, including grass. Drill rig oil leaks must be contained, using a minimum 6 mil thick plastic sheeting placed beneath the vehicle and drill rig. Alternate methods may be approved by the on-site Division geologist.
11. Air rotary drill rigs used to drill monitoring wells must prevent downhole contamination from the air compressor. A filtration system must be used that must remove 99.999% of 0.3 micron particles, both solid and aerosol, from the air stream when using an approved testing procedure. The air-filtration system must have a manufacturer's certification.
12. No lubricant may be used on drill pipe threads, unless approved in advance by the Division. An MSDS sheet must accompany such a request.
13. If coring has not been conducted prior to well construction within 10 feet of the well location, then geologic samples must be collected (at a minimum) every five feet. A professional geologist (or other person registered under KRS 322A in the Commonwealth of Kentucky) must describe all geologic cores, cuttings, or samples.
14. The well casing must consist of PVC or stainless steel. Other materials are acceptable if approved in advance by the Division. PVC monitoring well pipe must be certified for use in monitoring wells (e.g., NSF wc or NSF pw). The well casing diameter must be a minimum of 4.0-inches, unless otherwise approved in advance by the Division.
15. The borehole must be a minimum of 4.0 inches in diameter greater than the outside diameter of the casing. For instance, a 4.0-inch I.D., Schedule 40 PVC casing (which has an outer diameter of 4.5 inches) requires a 8.5-inch borehole. If the casing is set inside hollow-stem augers, the inside diameter of the hollow-stem auger should be at least 4.0 inches in diameter greater than the outside diameter of the monitoring well casing in order to prevent bridging of filter pack sand and bentonite pellets.
16. Centralizers are recommended in wells deeper than 50 feet.
17. The well casing must be threaded and gasket sealed with Teflon O-rings.
18. The well casing must extend a minimum of one (1.0) foot above ground level, unless otherwise approved by the Division.
19. A water-washed sand filter pack, with the sand sized larger than the screen openings, must be placed in the annulus in such a manner as to prevent bridging. (In general, the filter pack may be emplaced by the free-fall method if poured in slowly and carefully, and if the level of filter sand is constantly monitored with a weighted tape.) The filter pack must rise at least two feet above the screen. At least six inches of filter pack should be placed below the bottom of the casing for the screen cushion. All measurements should be made with a decontaminated measuring tape.

20. In unconsolidated aquifers, the sand filter pack size and screen opening width must be determined based upon sieve analysis of the aquifer materials.
21. Filter pack materials are not acceptable unless proper documentation can be furnished as to the composition, grain size distribution, cleaning procedures, and chemical analysis of the material.
22. A bentonite seal consisting of pure bentonite pellets (at least 3/8 inches in diameter) must be placed in the annulus in such a manner as to prevent bridging. Other forms of bentonite are not acceptable, unless approved in advance by the Division. In general, the bentonite pellets may be emplaced by the free-fall method if poured in slowly and carefully, and if the level of bentonite pellets is constantly monitored with a weighted tape. The seal must rise at least two feet above the top of the sand filter pack. All measurements should be made with a decontaminated measuring tape.
23. Potable water must be used, if necessary, as the hydration medium. Hydration time of the bentonite pellets must be a minimum of eight hours or the manufacturer's recommendation, whichever is greater.
24. Well integrity and annulus integrity must be protected during hydration of the bentonite pellets. The well should be covered during hydration to prevent material from falling down the borehole, and the borehole sidewalls should be protected from collapse with temporary casing if necessary.
25. The grout to be used in the annulus, above the bentonite seal, must consist of one of the following: a) high solids (at least 30% solids) pure bentonite grout; b) neat cement; or c) cement/bentonite grout of a 90/10 ratio. Pure, high solids bentonite grout is preferred.
26. The density of bentonite grouts must be measured while mixing. No pumping of bentonite grout into the annulus may occur until the minimum density of 9.4 pounds per gallon has been obtained. Only potable water may be used in mixing grouts.
27. Cement grouts should be mixed using 6.5 to 7.0 gallons of potable water per 94-pound bag of Portland cement (Type 1).
28. Drilling muds may not be used for grouting.
29. The grout must be placed in the annulus by the tremie method (pressure grouting) from the top of the bentonite seal to within three feet of the ground surface or below the frost line, whichever is greater.
30. The grout must be allowed to set for a minimum of 24 hours before the concrete pad, surface casing, and protective barrier are installed. Well integrity and annulus integrity must be protected during the curing of grout.
31. The top three feet of the annulus must be filled with a Portland cement concrete (50% sand 50% cement), bonded to the well casing, with the protective cover installed in the concrete.

32. Each monitoring well must have a concrete pad at least four inches thick, extending two feet around the well and sloped away from the well. This requirement is met by a four-foot square pad, four inches thick, or a four-foot diameter round pad, four inches thick. A frost sleeve should be installed between the pad and the protective surface casing. A minimum of one inch of the completed pad must extend below grade to prevent washing and undermining by soil erosion.
33. The monitoring well must be enclosed in a protective surface casing that is sufficient to reliably protect the well from damage. The protective surface casing: a) should be installed in firm rock unless otherwise provided for by the Division; b) should extend a minimum of three (3.0) feet below the ground surface; c) should be grouted and placed with a cement collar below the frost line to hold it firmly in place; d) should be numbered (with both the facility well number and the AKGWA number) and be painted a highly visible color; e) should protrude at least one inch above the top of the monitoring well casing; f) should have a locked cap; and g) should be made of steel or a material of equivalent strength.
34. The monitoring well must be protected by a barrier (i.e., steel posts) sufficient to shield the protective surface casing from damage by vehicles and equipment. A minimum of four posts is required. The posts: a) should be a minimum of three (3.0) inches in diameter and five (5.0) feet in length; b) should be set a minimum of two (2.0) feet below grade in concrete; c) should extend at least three (3.0) feet above grade; d) should be filled with concrete to increase strength; and e) should be painted a highly visible color.
35. A new monitoring well should not be developed until 24 hours after the completion of the surface pad, and the outer protective surface casing is installed.
36. During development, the well should be pumped until the water runs clear and three successive readings (taken at five-minute intervals) of pH, temperature, turbidity, and specific conductivity have stabilized.
37. All monitoring wells must be maintained to original as-built specifications. Any monitoring well which has been damaged, or is otherwise unsuitable for use as a monitoring well, must be abandoned within 30 days of the last sampling date, or when notified by the Division.
38. No monitoring well may be repaired without prior Division approval.
39. In abandoning monitoring wells, the monitoring well borehole must be over drilled, and all downhole materials (well casing, filter pack, bentonite seal, grout, cement, concrete, etc.) must be removed prior to filling the resulting borehole with pure high-solids (at least 30% solids) bentonite grout or cement-bentonite (90/10 ratio) grout by tremie pipe (pressure grouting) from the bottom to the top of the hole. The diameter of the drill bit or augers used to abandon monitoring wells must be at least equal to the original borehole diameter. In rare instances where the monitoring well casing cannot be removed, an alternate method of abandonment may be employed, but only if approved in advance by the

Division.

40. No formation, well, or surface water may be used in mixing grout for the construction or abandonment of monitoring wells. Only potable water from a municipal water source may be used in mixing grout or hydrating bentonite pellets.
41. Special precautions must be used at potentially contaminated sites. Contaminated groundwater or drilling fluids must be contained in drums or tanks, tested, and properly disposed of. Contaminated drill cuttings must be placed on plastic sheeting and covered prior to being tested, and properly disposed of.
42. The Kentucky certified monitoring well driller must provide the Cabinet with a record of the monitoring well abandonment. The record must be submitted on the form entitled -Kentucky Monitoring Well Record (DEP 8043) to the Kentucky Division of Water. A copy of this record should be provided to the Division of Waste Management.

This page left blank intentionally.

APPENDIX C: Contacts by Topic

The Division of Compliance Assistance is responsible for the implementation of the solid waste certification. The Division of Waste Management is still responsible for the permits, annual review and reporting requirements. The information below offers the reader a contact person for various areas of assistance.

Division of Compliance Assistance

Phone Number: 502-564-0323 or 800-926-8111

Fax Number: 502-564-9720

Certification (training, testing & fees)
Compliance Assistance
Open records requests related to certification
Regulations related to certification

Veronica Roland
Danielle Crosman
DEP.KORA@ky.gov
Jessica Wilhoite

Division of Waste Management

Phone Number: 502-564-6716

Fax Number: 502-564-3492

- Technical assistance on permits
- Landfarm & Compost
- Annual review assistance

- Solid Waste Landfills

- Forms and fees not related to certification;
Bonding and reporting requirements

- Open records requests related to facilities
- Regulations related to facility requirements
- Complaints
- Facility inspections
- Enforcement

Ron Gruzesky
Bob Bickner
Frank Whitney
Robin Green

Ron Gruzesky
Lindsey Briggs
Ken Melton

Robin Green
Anita Young

John Arnett
Deborah DeLong

DEP.KORA@ky.gov
John Maddy
Brian Osterman
Jon Maybriar
Jeff Cummins (502-564-2150)

DWM Field Offices

Field Offices	Phone Number	Office Supervisor
Bowling Green	270-746-7475	Barbara Hankins
Columbia	270-384-4735	John Rogers
Florence	859-525-4923	Michael Fant
Frankfort	502-564-3358	Richard Thomas
Hazard	606-435-6022	Todd Duff
London	606-330-2080	James McCloud
Louisville	502-429-7120	Duke York
Madisonville	270-824-7532	Larry Tichenor
Morehead	606-784-6634	Karen Hall
Paducah	270-898-8468	Marjorie Williams

Division of Waste Management Regional Office Map

Office	Supervisor Name	Phone Number	Fax Number
Central Office	Jon Maybriar	502-564-6716	502-564-4049
Bowling Green	Mike Sapp	270-746-7475	270-746-7865
Columbia	John Rogers	270-384-4735	270-384-5199
Florence	Michael Fant	859-525-4923	859-525-4157
Frankfort	Richard Thomas	502-564-3358	502-564-5043
Hazard	Todd Duff	606-435-6022	606-435-6025
London	James McCloud	606-330-2080	606-330-2097
Louisville	Keith Sims	502-429-7120	502-429-7125
Madisonville	Larry Tichenor	270-824-7532	270-824-7070
Morehead	Karen Hall	606-783-8655	606-783-8659
Paducah	Margie Williams	270-898-8468	270-898-8640



This page left blank intentionally.

APPENDIX D: Glossary

ACRE: Unit for measuring land, equal to 43,560 square feet, 4,840 square yards; or 160 square rods.

AERATION: The process of exposing something to air or charging a liquid with gas.

AEROBIC: Bacteria, which require the presence of free (dissolved or molecular) oxygen for their metabolic processes. Oxygen in chemical combination will not support aerobic organisms.

AGGREGATE: Crushed rock or gravel screened to sizes for use in road surfaces, concrete, or bituminous mixes.

AGRICULTURAL WASTE: Waste materials produced from the raising of plants and animals for food. These materials include such things as animal manure, plant stalks, hulls and leaves.

AIR POLLUTION: The presence of contaminants in the air to such a degree that the normal self-cleansing or dispersive ability of the atmosphere cannot cope with them.

ALKALINITY: A quantitative measure of the capacity of liquids or suspensions to neutralize strong acids or to resist the establishment of acidic conditions. Alkalinity results from the presence of bicarbonates, carbonates, hydroxides, volatile acids, salts, and occasionally of borates, silicates and phosphates. Numerically, it is expressed in terms of the concentration of calcium carbonates that would have an equivalent capacity to neutralize strong acids.

ALGAE: Plants found in sunlit situations on land, as well as in fresh and salt water over a wide range of latitude, grow as individual cells, small clumps, or as large masses.

ANAEROBIC: Bacteria that do not require the presence of free or dissolved oxygen for metabolism. Strict anaerobes are hindered or completely blocked by the presence of dissolved oxygen and in some cases by the presence of highly oxidized substances such as sodium nitrates and perhaps sulfates.

ANGLE OF REPOSE: The maximum angle at which the inclined surface of a pile of loosely divided material can make with the horizon.

AQUIFER: A geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs.

ASHES: The residue from the burning of wood, coal, coke, and other combustible material.

BACKEND LOADER (REAR-LOAD GARBAGE TRUCK): A compactor garbage truck, which has its power-driven, loading equipment at the rear, behind the body. Commonly used for residential garbage collection.

BACKFILL: The material used in refilling a ditch or other excavation or the process of such refilling. Primarily a rubber-tired backhoe/loader. Sometimes hydraulic excavators are referred to as a backhoe.

BACKHOE: Primarily a rubber-tired, mechanical backhoe/loader. Sometimes hydraulic excavators are referred to as a backhoe.

BACTERIA: Single-celled organisms, microscopic in size, which possess rigid cell walls and when moving have flagella. The cell nucleus is not surrounded by a membrane. There are three major groups: true bacteria, actinomycetes, and budding bacteria. Some are capable of causing human, animal, or plant diseases. Some are important in sewage or refuse stabilization.

BEARING CAPACITY: Maximum ability of a material, to support an imposed load, before failure.

BEDROCK: The solid rock underlying soils and the mantle rock or exposed rock at the surface without a cover.

BENCH MARK: A point of known or assumed elevation used as a reference in determining and recording other elevations.

BERM: An artificial ridge of earth.

BIODEGRADABLE: Waste material that is capable of being broken down by bacteria into basic elements. Most organic waste, such as food remains and paper, is biodegradable.

BIO-CHEMICAL OXYGEN DEMAND (BOD): A measure of the amount of oxygen used by microorganisms to break down organic waste materials in water.

BITUMINOUS: Containing asphalt or tar.

BLADE: Steel plate, concave in vertical plane, affixed to a tractor used for excavation and spreading.

BLADE (SANITARY LANDFILL): A U-blade with extension fabricated on top to increase volume of solid waste that may be pushed and spread.

BLADE (U): A dozer blade with-extension on both sides, protruding forward at an obtuse angle to the blade, enabling handling of a larger volume of solid waste.

BLUE TOPS: Grade stakes whose tops indicate finished grade level.

BORING: Rotary drilling.

BORROW PIT: An excavation from which material is taken to a nearby job.

BOULDER: A rock that is too heavy to be lifted readily by hand.

BUCKET: An open container affixed to movable arms of a loader to move and spread solid waste and soil and also to excavate soil.

BULKY WASTE: Large items of refuse, such as appliances, furniture, large auto parts, trees and branches, palm fronds, stumps, foliage, etc.

BULLDOZER: A tractor equipped with a front pusher blade.

BURNER, REFUSE: A device for either municipal or on-site volume reduction of refuse by burning and of simple construction, not to be confused with incinerator, which, properly designed and operated, can produce an acceptable emission and residue.

CARBON DIOXIDE: An odorless, tasteless, colorless, and nonpoisonous gas. One source is from sanitary landfills undergoing aerobic and/or anaerobic microbial decomposition, which is highly soluble in water, forming carbonic acid.

CARBON MONOXIDE (CO): A colorless gas characterized by an exceedingly faint metallic odor and taste. It is extremely poisonous, inducing asphyxiation. As much as 0.2% in air is poisonous and 0.43% will induce asphyxiation.

CELL: The volume of compacted solid waste enclosed in a portion of a landfill which is isolated, usually by means of an approved barrier.

CELL DEPTH: Vertical thickness of compacted solid waste enclosed in a portion of a landfill which is isolated, usually by means of an approved barrier.

CELL THICKNESS: Perpendicular distance between cover material placed over the last working faces of two successive cells in a sanitary landfill.

CHIPPER: A size reduction device relying primarily on the shearing, cutting, or chipping action produced by sharp-edged blades attached to a rotating shaft (mandrel) which shaves or chips off pieces of the charged object.

COLLECTION: The act of picking up waste materials at homes, businesses, or industrial sites, usually with an enclosed truck, and hauling it to a facility for further processing or action.

COMBUSTIBLES: Various materials in the waste stream which are burnable, in general, these are organic in nature; paper, plastics, wood and food wastes.

COMMERCIAL SOLID WASTE: Waste material which is generated by stores, offices, restaurants, warehouses, and other service and non manufacturing activities, excluding household and industrial solid waste.

COMMUNICABLE DISEASE: An illness due to an infectious agent or its toxic products which is transmitted directly or indirectly to a well person from an infected person or animal, or through the agency of an intermediate host, vector, or inanimate environment.

COMPACTION: Reduction in bulk of fill by rolling and tamping.

COMPACTOR: Any power driven mechanical equipment designed to compress and, thereby, reduce the volume of waste materials.

COMPACTOR TRUCK: A large truck with an enclosed body having special power driven equipment for loading, compressing and distributing waste materials within the body.

COMPOST: A type of solid waste which has undergone biological decomposition of organic matter, been disinfected using composting or similar technologies, been stabilized to a degree which is potentially beneficial to plant growth and which is approved for use or sale as a soil amendment, artificial topsoil, growing medium amendment, or other similar uses.

CONSTRUCTION MATERIALS: Non-hazardous, non-soluble material, including but not limited to steel, concrete, brick, asphalt roofing material, or lumber from a construction or demolition project. Mixture of construction and demolition debris with any amount of other types of waste may cause it to be classified as other than construction materials.

COVER MATERIAL: Soil or other suitable material that is spread and compacted on the top and side slopes of disposed waste in order to control disease vectors, gases, erosion, fires, and infiltration of precipitation or run-on; support vegetation; provide trafficability; or assure aesthetic appearance.

CRUSHER: A mechanical device used to break up waste material into smaller sized pieces by a pounding action (hammers or beaters).

CULLET: Scrap glass, usually broken up into small, uniform pieces.

DECOMPOSITION: The breakdown of organic waste materials by bacteria. Aerobic process refers to one using oxygen breathing bacteria, while anaerobic refers to a process using bacteria, which breathe an inorganic oxidant. Total decomposition leaves only carbon dioxide, water and inorganic solids. Decomposition occurs spontaneously in the open (dumps and landfills) or can be harnessed in waste treatment equipment to work under controlled conditions.

DEMOLITION WASTE: Waste materials produced from the destruction of buildings, roads, sidewalks, etc. The materials usually include large broken pieces of concrete, pipe, radiators, ductwork, electric wire, broken up plaster walls, lighting fixtures, bricks and glass.

DENSITY: The ratio of the weight of a substance to its volume.

DEPTH OF FILL: Total distance between undisturbed earth or bottom of solid waste in the sanitary landfill and top of final cover material.

DESIGN RUNOFF RATE: Maximum runoff rate (occurring expected) in a given period of time, during and immediately following rainfall.

DEWATERING: The removal of water by filtration, centrifugation, pressing, open air-drying of other methods. Dewatering makes sewage sludge suitable for disposal by burning or landfilling. The term is also applied when removing water from pulp.

DIGESTER: Specially designed equipment in which waste materials are softened or decomposed, usually for further processing.

DIKE: An embankment or ridge of either natural or plan-made materials used to prevent the movement of liquids, sludges, solids or other materials.

DISPOSAL, ONSITE: Includes all means of disposal of refuse on premises before collection. Examples are: garbage grinding, burning, or incineration, and burial.

DISTILLATION: A separation process used to remove water from waste materials in some treatment or recovery systems. The water is vaporized, removed from the unit and condensed back into a liquid.

DISPOSAL: The discharge, deposit, injection, dumping, spilling, leaking, or placing of any

nonhazardous solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may not enter the environment, be emitted into the air, or be discharged into any water, including groundwaters.

DUMP: An open land site where waste materials are burned, left to decompose, rust, or simply remain. In most localities, dumps are being phased out because of the problems they cause, such as water pollution, creating of unsanitary conditions and general unsightliness. Some dumps are left burning as waste is accumulated. This practice does not lend itself to control and, therefore, very little of the waste is actually consumed by fire. The burning also generates obnoxious smoke, fumes and ash particles.

ECOLOGY: A branch of science concerned with the interrelationship of all animals, plants, insects and other organisms and their environment.

EFFLUENT: Any solid, liquid, or gas which enters the environment as a by-product of man- oriented processes.

EMISSIONS (GASEOUS): Waste gases released into the atmosphere as the product of combustion.

ENERGY RECOVERY: One of the concepts of resource recovery where a part, or all, of the waste materials going into a recovery facility are burned to produce heat which can be used to produce steam for heating or for the generation of electricity.

ENVIRONMENT: The air, the water and the earth, sometimes called the biosphere.

ENVIRONMENTAL PROTECTION AGENCY (EPA): An agency of the Federal Government, formed in 1970, which has the responsibility for ensuring that governmental, residential, commercial and industrial waste disposal activities do not adversely impact the physical environment.

EROSION, SOIL: The wearing away of the land surface normally by wind or running water.

EVAPO-TRANSPARATION: The sum of water removed by vegetation and that lost by evaporation for a particular area during a specified time.

FERROUS: Metals which are predominantly composed of iron. In me waste stream, these usually include cans, automobiles, old refrigerators, stoves, etc.

FILTER: A device through which a liquid or gas is passed in order to remove small particles or dust.

FLY ASH: Small solid particles of ash and soot generated when burning coal, oil or waste materials. With proper equipment, fly ash is collected before getting into the atmosphere. Fly ash residue can be used for building materials (bricks) or in a sanitary landfill.

FOSSIL FUELS: Fuels, such as coal, oil and natural gas, which are the remains of ancient plant and animal life.

FRONTEND LOADER (REFUSE TRUCK): A compactor truck which has its power driven loading equipment at the front; ahead of the cab. Commonly used to empty dumpsters.

GARBAGE: Waste materials which are likely to decompose or putrefy and usually contain food wastes from a kitchen, restaurant, grocery store, slaughter house or food processing plant.

GASES: Normally formless fluids which occupy the space of enclosure and which can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature.

GOVERNING BODY: The body responsible for implementation of the area solid waste management plan and review of permit applications to construct or expand municipal solid waste disposal facilities. This review is to determine if the application is consistent with the plan.

GRADER: A gas or diesel pneumatic wheel machine equipped with a centrally located blade that can be angled to cast to either side, with independent hoist control on each side.

GRAVITY SEPARATION (FLOTATION, HEAVY MEDIA): The collection of substances immersed in a liquid by taking advantage of differences in specific gravities. In solid waste recovery, this process enables separation of the various non-ferrous metals from other heavy materials.

GRINDER: A mechanical device used to pulverize waste material into powder or small particles by a friction action (I.E., by rubbing between two hard surfaces).

GRINDING (GARBAGE): A method of uniformly breaking food waste or garbage into small pieces or particles. The grinding device may be in a home sink unit or a large central grinder which serves industry or the community. Home units are usually flushed with water into the sanitary sewer.

GROUND WATER: Water which is in a zone of saturation or confined by bedrock. It is differentiated from water held in the soil, from water in downward motion under the force of gravity in the unsaturated zone, and from water held in chemical or electrostatic bondage.

GROUSER: A ridge or cleat across a track shoe mat improves its grip on the ground.

HAMMERMILL: A mechanical device that is used to break up waste materials into smaller pieces or particles by using a system of heavy rotating hammers.

HARDPAN: Hardened; compacted or cemented soil horizon.

HAUL DISTANCE: (a) Distance which covered material must be transported to the working face. (b) Distance collection truck must travel from its last pick-up stop to the working face or a sanitary landfill or tipping floor of a solid waste volume reduction or disposal facility. (c) Distance transfer vehicle must travel from solid waste processing station to point of final disposal.

HAUL, TIME: Elapsed or cumulative time spent hauling collected refuse from the route or from transfer station to the disposal point

HAZARDOUS WASTE: As defined in 401 KAR 31:010, Section 3.

HOUSEHOLD SOLID WASTE: A type of solid waste including garbage and trash generated by single and multiple family residences, hotels, motels, bunkhouses, ranger stations, crew quarters, and recreational areas such as picnic areas, parks, and campgrounds.

INCINERATOR: An enclosed device using controlled flame combustion, the primary purpose of which is to thermally break down waste. Examples of incinerators are: rotary kiln, fluidized bed, and liquid injection incinerators.

INDUSTRIAL SOLID WASTE: Those solid waste materials generated by manufacturing or industrial processes that are not a hazardous waste or a special waste, including wastes resulting from manufacturing processes.

JUNK: Waste materials, such as brass, rags, paper or metals. The term usually implies that the materials can be recovered for reuse or converted to usable stock.

LEACHATE: A liquid derived from contact with waste possibly containing decomposed waste, bacteria and other dangerous materials that drains out of landfills and must be collected and treated so as not to contaminate water supplies, rivers or streams.

LITTER: That highly visible portion of solid waste, generated by the consumer and carelessly discarded outside of the regular disposal system. Litter accounts for about only 2 percent of the total solid waste volume.

LOAM: A soft, easily worked soil containing sand, salt, and clay.

MANUAL SEPARATION: The separation of waste materials by hand. Sometimes called hand picking, manual separation is done in the home or office by keeping garbage separate from newspapers, or in a recovery plant by picking out large cardboard or metal objects.

MATERIALS RECOVERY: One of the concepts of resource recovery where the emphasis is on collecting, separating and processing waste materials to be sold for various purposes. Materials include paper, glass, metals, plastics, etc.

METHANE: An odorless, colorless, flammable gas which can be formed by the decomposition of organic waste matter. It is also produced by the carbonization of coal and used as fuel.

MICROORGANISMS: Generally, any living thing microscopic in size and including: bacteria, yeast's, simple fungi, some algae, slime molds and protozoa's. They are involved in stabilization of waste materials (composting) and in sewage treatment processes.

MIXED PAPER: Waste paper of various kinds and quality usually collected from stores, offices and schools.

MUNICIPAL SOLID WASTE: The combined residential and commercial waste materials-generated in a given municipal area.

NEWSPRINT: The kind or type of paper generally used for printing newspapers.

NON-FERROUS: Metals which contain no iron. In waste materials, this is usually aluminum, copper wire, brass, bronze, etc.

OPEN BURNING: The combustion of any material without: (a) Control of combustion air to maintain adequate temperature for efficient combustion; (b) Containment of the combustion reaction in an enclosed device to provide sufficient residence time and mixing for complete combustion; and (c) Control of emission of the gaseous combustion products.

ORGANIC MATTER: Chemical compounds of carbon combined with other chemical elements and generally manufactured in the life processes of plants and animals. Most organic

compounds are a source of food for bacteria and are usually combustible.

PARTICULATES: Small particles of liquid or solid material.

PERCOLATION: A qualitative term applying to the downward movement of water through soil.

PERMEABILITY (QUALITATIVE): The quality or state of a porous medium relating to the readiness with which it conducts or transmits fluids. Rate of permeability is usually expressed in cm/sec.

POLLUTION: The presence in a body of water (or soil or air) of substances of such character and in such quantities that the, natural quality of the body of water (or soil or air) is degraded so it impairs the water's usefulness or renders it offensive to the senses of sight, taste, or smell.

Contamination may accompany pollution. In general, a public health hazard is created, but in some cases only economy or esthetics are involved as when waste salt brines contaminate surface waters and when foul odors pollute the air.

PRECIPITATION: The physical or chemical separation of a solid substance from solution. The separation is usually induced, such as in waste treatment process equipment

PRIMARY MATERIALS: Virgin or new materials used for manufacturing, basic products. Examples include wood pulp, iron ore and silica sand.

PRIVATE UTILITY: A firm providing service under a government license or monopoly franchise to collect, transport, process or dispose of waste materials.

PUTRESCIBLE: Susceptible to rapid decomposition by bacteria, fungi, or oxidation sufficient to cause nuisances such as odors, gases, or other offensive conditions.

RECLAMATION: The restoration to usefulness or productivity of materials found in the waste stream. The reclaimed materials may be used for purposes which are different from their original usage.

RECYCLING: Separating a given waste material (e.g., glass) from the waste stream and processing it so that it may be used again as the raw material for products which may, or may not be similar to the original.

REFUSE: A generally used term for solid waste materials.

RESIDENTIAL WASTE: Waste materials generated in houses and apartments. The materials include paper, cardboard, beverage and food cans, plastics, food wastes, glass containers and garden wastes.

RESIDUE: The solid materials remaining after completion of a chemical or physical process, such as burning, evaporation, distillation or filtration.

RESOURCE RECOVERY: The process by which material subject to the waste management regulations which still have useful physical or chemical properties are reused or recycled for the same or other purposes, including uses as an energy source.

RUBBISH: Waste materials, usually of a generally undefined nature.

RUBBLE: Waste materials made up mainly of fragments or pieces of rock or masonry. Sometimes containing lumber or other construction materials.

RUNOFF: Any rainwater, leachate or other liquid that drains overland from any part of a facility.

SALVAGING: The controlled removal, of waste materials for utilization in a manner approved by the department.

SANITARY LANDFILL: A solid waste disposal facility permitted for the disposal of solid waste which complies with the "Environmental Performance Standards" specified in 401 KAR 47:030.

SCAVENGING: The removal of waste materials from a waste management facility site in a manner deemed by the department to be dangerous to the health and safety of any person.

SCRAP: Waste material which is usually segregated and suitable for recovery or reclamation.

SECONDARY MATERIALS: Uniformly segregated and processed waste materials from a recycling plant which are sold to manufacturers for use in making basic products. For example, waste glass is turned into clean, uniform pieces of broken glass (cullet) which is sold to glass bottle manufacturers.

SEEPAGE: Movement of water through soil without formation of definite channels.

SEPARATION: To divide waste into groups of similar materials, such as paper products, glass, food wastes and metals. Also, used to describe the further sorting of materials into more specific categories, such as clear glass and dark glass. Separation may be done manually or with specialized equipment

SHALE: A rock formed of consolidated mud.

SHREDDER: A mechanical device used to break up waste materials into smaller pieces. The pieces are usually in the form of irregularly shaped strips.

SLOPE: Degree of deviation of a surface from the horizontal usually expressed in percent or degrees.

SLUDGE: Any solid, semi-solid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility exclusive of the treated effluent from a wastewater treatment plant or any other such waste having similar characteristics and effects.

SPOTTER: In truck use, the man who directs the driver into loading or dumping position.

STAKE, SLOPE: A stake marking the line where a cut or fill meets the original grade.

STOCKPILE: Material dug and piled for future use.

SUBSOIL: That part of the soil beneath the topsoil, usually not having an appreciable organic matter content.

SURFACE WATER: A body of water whose top surface is exposed to the atmosphere including a flowing body as well as a pond or lake.

SURVEYING: To find and record elevations, locations, directions, by means of instruments.

TOPSOIL: The topmost layer of soil, usually refers to soil containing humus, which is capable of supporting a good plant growth.

TOPOGRAPHIC MAP: A map indicating surface elevation and slope.

TRACK: A crawler track.

TRACK, CRAWLER: One of a pair of roller chains used to support and propel a machine. It has an upper surface which provides a track to carry the wheels of the machine, and a lower surface providing continuous ground contact.

TRACK, ROLLER: In a crawler machine, the small wheels which are under the track frame and rest on the track.

TRACTOR LOADER (TRACTOR SHOVEL OR SHOVEL DOZER): A tractor equipped with a bucket, which can be used to dig and to elevate to dump at truck height.

TRACTOR, PNEUMATIC WHEEL: A gas or diesel powered machine equipped with four pneumatic tires, used to spread, excavate and compact soil and solid waste.

TRACTOR, TRACK: A gas or diesel powered machine equipped with continuous roller belt over cogged wheels for moving over rough or low bearing capacity terrain, used to spread, excavate and compact soil and solid waste.

TRASH: Waste materials which usually do not include garbage but may include other organic materials, such as plant trimmings.

UNIVERSAL COLLECTION: A municipal solid waste collection system which is established by ordinance and approved by the Cabinet and requires access for each household or solid waste generator in a county.

URBAN WASTE: A general term used to categorize the entire waste stream from an urban area. It is sometimes used in contrast to "Rural Waste."

VIRGIN MATERIAL: Any basic material from industrial processes which has not previously been used. For example, wood pulp trees, iron ore, silica sand, crude oil, bauxite.

WATERSHED: Total land area above a given point on a stream or waterway that contributes runoff to that point

WATER TABLE: The surface of underground, gravity-controlled water.

WORKING FACE: That portion of the compacted solid waste at a sanitary landfill, which will have more waste placed on it and/or is being compacted prior to, placement of cover material.

APPENDIX E: Acronyms

ACRONYMS USED IN THIS MANUAL	
ADC	Alternative daily cover
BOD	Biochemical oxygen demand
CFR	Code of Federal Regulations
CDD	Construction/Demolition Debris
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COD	Chemical oxygen demand
CPR	Cardiopulmonary resuscitation
DOT	Department of Transportation
EHS	Extremely hazardous substance
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Program
ERP	Emergency response plan
ERT	Emergency response team
FD	Fire Department
FML	Flexible membrane liner
HDPE	High density polyethylene
HELP	Hydrologic evaluation of landfill performance
IDLH	Immediately dangerous to life and health
KAR	Kentucky Administrative Regulations
KPDES	Kentucky Pollutant Discharge Elimination System
KRS	Kentucky Revised Statute
LDPE	Low density polyethylene
LEL	Lower explosive level
LEPC	Local emergency planning committee
LF	Landfill
LULU	Locally unacceptable land use
MEK	Methyl ethyl ketone
MRF	Materials recovery facility
MSDS	Material safety data sheet
MSHA	Mine Safety and Health Administration
MSW	Municipal solid waste
NIOSH	National Institute of Occupational and Safety Health
NOI	Notice of Intent
NOV	Notice of Violation
NRC	National Response Center
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated biphenyl
PEL	Permissible exposure level
PETE	Polyethylene terephthalate
pH	Negative logarithm of hydrogen ion concentration
POTW	Publicly owned treatment works
PP	Polypropylene
PS	Polystyrene

PURPA	Public Utility Regulation and Policy Act
PVC	Polyvinyl chloride
QA/QC	Quality assurance/quality control
RCLA	Resource Conservation and Local Assistance
RCRA	Resource Conservation and Recovery Act
RDF	Refuse derived fuel
RQ	Reportable quantity
SARA	Superfund Amendments and Reauthorization Act
SERC	State emergency response coordinator
SIC	Standard industrial code
SVOC	Semi-volatile organic compound
TCLP	Toxicity characteristic leaching procedure
TDS	Total dissolved solids
TLV	Threshold limit value
TOC	Total organic carbon
TPQ	Threshold planning quantity
TQM	Total quality management
TSS	Total suspended solids
VOC	Volatile organic compound

APPENDIX F: Operator Certification Regulations

401 KAR 45:090. Special waste operator certification.

RELATES TO: KRS 224.01, 224.10, 224.40, 224.50

STATUTORY AUTHORITY: KRS 224.10-100, 224.40-100, 224.40-305, 224.40-605, 224.50-760

NECESSITY, FUNCTION, AND CONFORMITY: KRS Chapter 224 requires the cabinet to adopt administrative regulations for the management, processing, and disposal of special wastes. KRS 224.40-305 requires persons who establish, conduct, operate, maintain or permit the use of a waste site or facility to obtain a permit. This chapter establishes the permitting standards for special waste sites or facilities, and the standards applicable to all special waste sites or facilities. This administrative regulation establishes the program for education, testing, and certification of operators of special landfarming sites or facilities in accordance with KRS 224.40-605.

Section 1. Applicability. (1) The requirements of this administrative regulation apply to all special waste landfills, landfarms, and composting facilities operating under formal permits, as identified in 401 KAR 45:020, Section 2(1)(a) and (b).

(2) The owner or operator shall ensure that all technical operations at the special waste site or facility are conducted by or under the direction of an individual with a valid certification under this administrative regulation. The landfill, landfarming, or composting operator shall be reasonably available at the site or facility during operation.

(3) The certified operator shall ensure that all operations are conducted in compliance with this chapter.

(4) A special waste site or facility permit may be revoked or subject to other enforcement actions upon violation of the requirements of this administrative regulation.

Section 2. Transition of Certification. (1) Persons holding a valid certification for landfill manager, landfill operator, and landfarming operator under 401 KAR 47:070 shall be deemed to hold a valid certification under this chapter until the certification expires. At the time a certification expires, the certificate holder shall obtain special waste certification under this administrative regulation.

(2) Persons operating a special waste landfill who were not previously certified to operate a residual landfill under 401 KAR Chapter 47 shall obtain certification under this chapter within one (1) year of the effective date of this administrative regulation.

(3) Persons operating a special waste composting or landfarming site or facility shall obtain certification within one (1) year of the effective date of this administrative regulation.

Section 3. General Provisions for Landfills. (1) Each special waste landfill shall have a landfill operator certified in accordance with this administrative regulation.

(2) No special waste landfill shall operate in the absence of a certified operator without the appointment of an interim operator in accordance with Section 11 of this administrative regulation.

Section 4. General Provisions for Landfarming and Composting Facilities. (1) Each landfarming or composting facility shall have an operator certified in accordance with this administrative regulation.

(2) No landfarming or composting facility shall operate in the absence of a certified operator without the appointment of an interim operator in accordance with Section 11 of this administrative regulation.

Section 5. Application for Certification. (1) Persons desiring to be certified shall submit an application at least thirty (30) days prior to the scheduled training class. Applicants for training and examination shall use form DEP 6031 entitled "Application for Certification" (March 1992). The requirements contained in the application for certification are incorporated in this administrative regulation by reference. The application may be obtained from the Division of Waste Management, 14 Reilly Road, Frankfort, Kentucky 40601, (502) 564-6716, between the hours of 8 a.m. to 4:30 p.m., Eastern Time, Monday through Friday.

(2) The cabinet shall review applications and supporting documents, determine the eligibility of the applicant for examination, and notify the applicant of the determination.

(3) No person shall be eligible for examination for certification unless that person completes the appropriate training course provided by the cabinet, unless an alternative training program is accepted by the cabinet in accordance with Section 6 of this administrative regulation.

Section 6. Training Course Requirements. (1) The cabinet shall provide training courses for individuals desiring to become certified. All applicants for certification shall be required to attend a training course provided by the cabinet, unless alternate training is accepted under subsection (3) of this section.

(2) The training course shall address the technical and legal aspects of the facility type for which operator certification is sought. (a) The training course for landfill operators shall include:

1. Permit application requirements for special waste landfills, including technical and administrative requirements;
2. Waste characterization;
3. Chemical and biologic reactions associated with the waste;
4. Hydrogeologic and engineering factors associated with the facility;
5. Operational requirements and achieving compliance with 401 KAR 30:031;
6. Duties and responsibilities associated with landfill management;
7. Requirements of this chapter as they apply to facility operation, including environmental monitoring, operations requirements, and maintaining compliance with 401 KAR 30:031;
8. Evaluating site suitability to receive wastes;
9. Environmental considerations in preventing violations of this chapter;
10. Maintaining equipment; and
11. Facility safety.

(b) The training course for landfarm and composting operators shall include:

1. Requirements of this chapter as they apply to facility operation and management;
2. Wastewater treatment processes;
3. Waste characterization;
4. Chemical and biological reactions associated with the waste;
5. Landfarming design and management;
6. Permit application requirements for special waste landfarms;
7. Environmental considerations in preventing violations of this chapter;
8. Achieving and maintaining compliance with 401 KAR 30:031;
9. Evaluating site suitability to receive waste;

10. Maintaining equipment;
11. Facility safety; and
12. Duties and responsibilities associated with operating a landfarm.

(3) The cabinet may accept alternate training courses, provided they result in a level of competence equivalent to that of participation in the cabinet's training course. It shall be the applicant's responsibility to submit documentation as the cabinet requires for an equivalency judgement of the alternate training course. This information shall contain at a minimum the following specifics: the course name; sponsoring agency; the date, location, and beginning and ending times of the course; a summary of the course content of sufficient detail to determine relevance and quality of the course; and a copy of the certificate received.

Section 7. Training and Examinations. (1) After training is complete, time shall be set aside for the purpose of examinations to determine the knowledge and ability of the applicant.

(2) Separate examinations shall be prepared to cover basic differences in the duties and responsibilities for the operation of each category of special waste site or facility.

(3) Applicants who fail to pass an examination may reapply for the examination at a regularly scheduled examination or by appointment with the cabinet. The cabinet shall require the applicant to attend the training session again if the applicant fails to pass the examination in three (3) attempts.

Section 8. Education and Equivalencies. (1) All applicants shall be evaluated by the cabinet as to education and experience as related to the appropriate category of special waste site or facility.

(2)(a) Applicants for landfill operator shall have completed high school, by graduation or by obtaining an equivalency certificate, and shall have a minimum of one (1) year of experience at a landfill facility.

(b) If an applicant for landfill operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a landfill or experience in a related field such as heavy equipment operator, road construction, surface mining.

(3)(a) Applicants for landfarming or composting operator shall have completed high school, by graduation or by obtaining an equivalency certificate, and shall have a minimum of one (1) year of experience at a landfarming or composting facility.

(b) If an applicant for landfarming or composting operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a landfarming facility or experience in a related field such as wastewater treatment or water treatment in determining eligibility for examination on a year-for-year basis.

Section 9. Issuance of a Certificate. (1) Certification may be issued to individuals upon meeting the minimum education requirements, work experience, and the course work requirements of this administrative regulation and passing the examination in accordance with Section 5 of this administrative regulation.

(2) Certification shall not be valid if obtained through fraud, deceit, or the submission of inaccurate data.

Section 10. Issuance of Certificate. (1) A certification shall be issued for a period of five (5) years, at the end of which the certification shall expire, unless renewed. Renewal procedures and requirements shall be the same as those for a new certification.

(2) The certification of an operator whose employment at a special waste site or facility terminates shall remain valid until expiration or revocation of certification.

(3) Certificates shall be carried on the person of the certified operator during working hours at the facility, or shall be prominently displayed at the facility office.

(4)(a) The cabinet may revoke the certification of an operator if the operator:

1. Has practiced fraud or deception;
2. Has failed to perform his duties under this chapter;
3. Has failed to use reasonable care and judgement in performance of his duties under this chapter; or
4. Has knowingly or willfully violated the requirements of this chapter.

(b) Individuals who have had their certification revoked shall be ineligible for future recertification.

Section 11. Interim Operators. (1) The permittee shall be responsible for actions of an interim operator. The permittee shall notify the cabinet in writing if the special waste site or facility will not have a certified operator for more than fourteen (14) consecutive operating days.

(2) Consecutive operating days, as used in subsection (1) of this section, shall be determined as any days:

(a) When the special waste site or facility accepts waste, operates equipment, or otherwise performs the business of special waste management; and

(b) That occur in sequence, regardless of whether nonoperating days such as weekends or holidays fall in between.

(3) The notification required by subsection (1) of this section shall be provided at least ten (10) days prior to an anticipated absence, and immediately upon discovery of an unanticipated absence. The notification shall contain:

(a) The name, address, and qualifications of the interim operator;

(b) The length of time for which the permittee seeks to have an interim operator rather than a certified operator; and

(c) Reasons for replacement of the certified operator with an interim operator.

(4) The cabinet shall evaluate the qualifications of the designated interim operator and shall notify the permittee of the cabinet's determination in writing within thirty (30) days of receipt of the permittee's notice. The determination shall:

(a) Approve, conditionally approve, or deny the permittee's request for designation of the interim operator; (b)

Identify the length of time an interim operator may operate the special waste site or facility; and

(c) Specify conditions as appropriate to the site and the interim operator's qualifications.

(5) An interim operator shall obtain certification under this administrative regulation within fifteen (15) months of becoming an interim operator.

(6) The cabinet may revoke the appointment of an interim operator in accordance with Section 10(4)(a) of this administrative regulation. Revocation shall render the person ineligible for operator certification under Section 10(4)(b) of this administrative regulation.

Section 12. Fees. (1) Fees for application for certification shall be: (a)

\$125 for application for certification as a landfill operator;

(b) \$125 for certification as a landfarming or composting operator;

(c) Fifty (50) dollars for certification by reciprocity for all categories of operator; and

(d) \$100 dollars for attendance at the certification training without taking the examination.

(2) Fees shall accompany applications and shall not be returned to those who do not qualify for a certificate. (18 Ky.R. 3094; Am. 3440; eff. 6-24-92.)

401 KAR 47:070. Operator certification.

RELATES TO: KRS 224.01, 224.10, 224.40, 224.43, 224.46, 224.70, 224.99

STATUTORY AUTHORITY: KRS 224.10-100, 224.40-605

NECESSITY, FUNCTION, AND CONFORMITY: KRS Chapter 224 requires the cabinet to adopt rules and administrative regulations for the management, processing or disposal of wastes. KRS 224.40-605 requires the cabinet to promulgate administrative regulations that establish standards and a certification program for operators of waste sites or facilities. This chapter establishes the permitting standards for solid waste sites or facilities, the standards applicable to all solid waste sites or facilities, and the standards for certification of operators. An overview of the permit program is found in Section 1 of 401 KAR 47:080. This administrative regulation establishes the program for education, testing, and certification of facility operators of solid waste sites or facilities.

Section 1. Definitions. The following are definitions as used in this administrative regulation:

(1) "Category of solid waste site or facility" means inert, residual, construction demolition debris, residential or contained landfill and includes landfarming facilities receiving Class I, II and III sludges or wastes.

(2) "Certificate" means a written document issued by the cabinet stating that the operator has met all requirements for certification.

(3) "Certified operator" means a solid waste site or facility operator who holds a valid certificate. The following are categories of certified operators:

(a) "Landfarming operator" means a certified operator who is the individual responsible for ensuring compliance with all permit conditions at a landfarming facility in accordance with 401 KAR 48:200, and who is reasonably available to the site;

(b) "Landfill operator" means a certified operator who is the individual responsible for the daily operating requirements identified in 401 KAR 47:120, 48:060, 48:090, or 48:170;

(c) "Landfill manager" means a certified operator who is the individual with primary responsibility for management and operation of the residential or contained or construction/demolition debris sanitary landfill to assure compliance with all permit conditions including direct responsibility for providing guidance to the landfill operator, or the permittee and the authority to commit financial resources allocated for proper operation; or

(d) "Interim operator" means the individual identified by the permittee as the replacement landfarming operator, landfill operator, or landfill manager in accordance with Section 12 of this administrative regulation.

Section 2. Applicability. (1) The requirements in this administrative regulation apply to all solid waste sites or facilities except as subsection (2) of this section provides otherwise. Each solid waste site or facility shall have at least one (1) operator certified in accordance with Section 3 (sanitary landfills) or Section 4 (landfarming facilities) of this administrative regulation, as appropriate to the category of solid waste site or facility.

(2) Residual landfills and facilities operating under a registered permit-by-rule or a permit-by-rule are excluded from the requirements of this administrative regulation, unless the cabinet requires operator certification as a condition of the permit. In deciding whether to require operator certification at a residual landfill, a site or facility with a registered permit-by-rule or a permit-by-rule, the cabinet shall consider:

(a) The characteristics of the waste stream;

(b) The characteristics of the site, including geology and hydrology; and

(c) The experience and qualifications of the operator.

(3) It shall be the responsibility of the permittee to ensure that the solid waste site or facility complies with the requirements of this administrative regulation.

Section 3. General Provisions for Landfills. (1) Each construction/demolition debris, residential and contained landfill shall have a certified operator who is a landfill operator and a landfill manager. The requirements of this subsection may be fulfilled by:

(a) One (1) individual who has been certified in accordance with Section 6 of this administrative regulation for both categories of certified operator (provided this individual meets the qualifications in Sections 1(3) and 11 of this administrative regulation); or

(b) Two (2) individuals who have been certified in accordance with Section 6 of this administrative regulation in each category of operator such that one (1) individual is certified as a landfill operator and one (1) individual is certified as a landfill manager.

(2) As provided in Section 2 of this administrative regulation, the cabinet may require as a permit condition that a residual landfill or a site or facility with a permit-by-rule or registered permit-by-rule shall have a certified operator who is a landfill operator or a landfill manager or both. The permit condition imposed shall reference all applicable operating administrative regulations and requirements for the specific category of sanitary landfill.

(3) In the event the certified operator who is the landfill operator is not physically at the facility during operating hours, either the landfill manager or an interim operator shall be designated responsible for daily site operation and shall be physically located on site. If an interim operator assumes responsibility for daily operation of the landfill, the requirements in Section 12 of this administrative regulation shall be met.

(4) In carrying out its responsibilities, the cabinet shall examine the qualifications of applicants for certification and maintain records of certification and a register of certified operators.

(5)(a) Except as provided in Section 2 of this administrative regulation, no landfill shall continue operation in the absence of a landfill operator on site for more than ten (10) consecutive operating days without appointment of a qualified interim operator in accordance with Section 12 of this administrative regulation or written approval from the cabinet.

(b) Except as provided in Section 2 of this administrative regulation, no landfill shall continue operation in the absence of a landfill manager for a period longer than thirty (30) consecutive operating days without appointment of a qualified interim operator in accordance with Section 12 of this administrative regulation or written approval from the cabinet.

Section 4. General Provisions for Landfarming Facilities. (1) Each landfarming facility shall have a landfarming operator certified in accordance with Section 6 of this administrative regulation.

(2) No landfarming facility shall continue operation in the absence of a landfarming operator for a period longer than five (5) consecutive working days without appointment of a qualified interim operator in accordance with Section 12 of this administrative regulation or written approval from the cabinet.

Section 5. Application for Certification. (1) An individual desiring to be certified shall file an application on a form provided by the cabinet at least thirty (30) days before beginning training for a scheduled examination.

(2) The applicant shall submit all information needed to determine eligibility of the applicant for examination and certification.

(3) The cabinet shall review applications and supporting documents, determine the eligibility of the applicant for examination and notify the applicant of the determination.

(4) No person shall be eligible for examination for certification unless that person completes the appropriate training class or classes provided by the cabinet, unless an alternative training program or certification program is accepted by the cabinet in accordance with Section 7(6) of this administrative regulation.

Section 6. Training Classes and Examinations. (1) The cabinet will provide training classes for the certified operator.

(2) Training sessions will be held at least annually at places and times set by the cabinet. The last day of each training session will be set aside for the purpose of examinations to determine the knowledge and ability of the applicant.

(3) Certification shall be conditioned on successful passage of a written examination, unless an alternative examination process is accepted by the cabinet.

(4) Separate examinations will be prepared to cover basic differences in the duties and responsibilities for the operation of each category of solid waste site or facility and each category of certified operator.

(5) Applicants who fail to pass an examination may reapply for the examination at a regularly scheduled examination or by appointment with the cabinet. The cabinet shall require the applicant to attend the training session again if the applicant fails to pass the examination in three (3) attempts.

(6) In the event an applicant fails to meet the requirements for certification, he may petition the cabinet for a one (1) time only "temporary hardship certification." The cabinet will then conduct an informal hearing at which evidence shall be presented by the applicant to support his hardship request. Each temporary hardship certification request shall be considered on a case-by-case basis under the following guidelines:

(a) Failure of the applicant to receive certification would leave a significant area of the state without adequate waste disposal service.

(b) The applicant has shown a good faith effort by attending all required training sessions and met all requirements except the applicant has failed in three (3) attempts to pass the examination.

(c) The applicant has shown, through cabinet inspections, a capability for satisfactory operation of the solid waste site or facility.

Section 7. Training Course Requirements. (1) All applicants for certification shall be required to attend a training course provided by the cabinet in accordance with KRS 224.844.

(2) The training course provided by the cabinet shall be designed to provide information as appropriate to the category of certified operator. At a minimum, the training course shall provide information which enables the certified operator to perform his duties in a knowledgeable and competent manner.

(3) Landfill managers shall be trained on:

(a) The requirements for permit application for the applicable category of sanitary landfill including ownership, zoning, chapter 109 district boards, geologic and hydrologic information and specific design details;

(b) Characteristics of the waste stream; the physical, chemical and biological reactions including the hydrogeologic interactions of a landfill; and measures that shall be employed to meet the environmental performance standards in 401 KAR 47:030 and all other regulatory requirements; and

(c) Specific duties expected to be performed by individuals who are wholly responsible for the requirements associated with the operation of the applicable category of sanitary landfill permitted by the cabinet. These actions include at a minimum, the commitment of resources, oversight of operating personnel, and verification that site operation is in accordance with all provisions of the permit including technical documents.

(4) Landfill operators shall be trained on the requirements contained in the solid waste administrative regulations as they apply to daily site operation duties. These duties include judging indicators regarding a site's ability to receive wastes; judging waste characteristics for disposal acceptability; employing site equipment to maintain waste compaction, cover, and surface water management on a daily basis; maintaining equipment; maintaining site safety; and generally assuring compliance with the administrative regulations.

(5) Landfarming operators shall be trained on the Kentucky waste management program as it applies to landfarming; wastewater treatment processes; the nature and characteristics of sludges; the physical and chemical properties of sludges; landfarming design and management; environmental considerations; and the Kentucky waste management permit process. The permit process includes requirements for application, conditions for maintaining a permit in compliance with the application and administrative regulations, and amendments to the landfarming activity and associated permit.

(6) The cabinet shall provide the training course to applicants for certification. However, the cabinet may consider alternate training courses or certification programs provided they are equivalent to the content prescribed by the cabinet's training course. It shall be the

applicant's responsibility to submit such documentation as the cabinet requires for an equivalency judgment of the alternate training course. This information shall contain at a minimum the following specifics: the course name; sponsoring agency; the date, location and the beginning and ending times of the course; a summary of the course content of sufficient detail to determine relevance and quality of the course; and a copy of the certificate received.

Section 8. Issuance of Certificates. (1) Upon passage of the examination the cabinet will issue a certificate to the applicant which will indicate the category of solid waste site or facility and the category of certified operator for which the operator is certified.

(2) Certified operators shall be recertified every five (5) years.

(3) Certificates will be issued to holders of certificates of another state if the training requirements of the issuing state are deemed comparable as specified in Section 7(6) of this administrative regulation and if the operator passes the cabinet's examination.

(4) The certificates of operators who terminate their employment at a solid waste site or facility will remain valid until expiration or revocation of the certificate.

(5) Certificates shall be carried on the person of each certified operator during working hours at the facility or prominently displayed on site.

Section 9. Compliance Dates. (1) An operator who is not an appropriately certified operator and who assumes the responsibility of a certified operator shall immediately comply with the requirements in Section 12 of this administrative regulation; and

(2) Comply with the requirements in Section 6 of this administrative regulation within fifteen (15) months of assuming the responsibility.

Section 10. Revocation of Certificate. (1) The cabinet may revoke the certificate of an operator, following a cabinet hearing, when it determines that the operator has practiced fraud or deception, or that the operator has failed to perform an operator's duties including, but not limited to, failure to comply with permit conditions.

(2) The cabinet may revoke a certificate whenever the holder fails to use reasonable care and judgment in the performance of an operator's duties. No certificate shall be valid if obtained through fraud, deceit, or the submission of inaccurate data on qualifications.

(3) Individuals who have had their certificate revoked by the cabinet shall be ineligible for future recertification.

Section 11. Operator Qualifications: Education and Equivalencies. (1) All applicants shall be evaluated by the cabinet as to education, and experience as related to the appropriate category of solid waste site or facility.

(2)(a) Applicants for landfill operator shall have completed high school (by graduation or by obtaining an equivalency certificate) and shall have a minimum of one (1) year of experience at a landfill similar to the category of landfill for which certification is sought.

(b) If an applicant for landfill operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a landfill or experience in a related field (i.e., heavy equipment operator, road construction, surface mining, etc.) in determining eligibility for examination on a year-for-year basis.

(3)(a) Applicants for landfill manager shall have completed high school (by graduation or by obtaining an equivalency certificate) and shall have:

1. A minimum of two (2) years administrative experience in a related field (i.e., waste management, wastewater treatment, etc.); or
2. A minimum of two (2) years of postsecondary education; or
3. A minimum of two (2) years of a combination of experience in a related field and postsecondary education.

(b) If an applicant for landfill manager does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the qualifications of the applicant on a case-by-case basis.

(4)(a) Applicants for landfarming operator shall have completed high school (by graduation or by obtaining an equivalency certificate) and shall have a minimum of one (1) year of experience at a landfarming facility.

(b) If an applicant for landfarming operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a landfarming facility or experience in a related field (i.e., waste water treatment, water treatment, etc.) in determining eligibility for examination on a year for year basis.

Section 12. Interim Operators. (1) In accordance with the requirements in subsection (2) of this section, the permittee shall notify the cabinet in writing of the extended absence of a certified operator ten (10) days prior to an anticipated absence and immediately upon discovery of an extended absence due to an emergency or unanticipated circumstances. The notice from the permittee shall provide the cabinet with the following information:

(a) Name and qualifications of the individual intended to replace the certified operator; and

(b) The length of time for which the permittee seeks to have the interim operator fulfill the obligations of the certified operator. (2) The permittee shall notify the cabinet of the extended absence when the operator or manager shall be absent for:

- (a) More than ten (10) consecutive operating days for a landfill operator;
- (b) More than thirty (30) consecutive operating days for a landfill manager; and
- (c) More than five (5) consecutive operating days for a landfarming operator.

(3) Consecutive operating days as used in subsection (2) of this section shall be determined as any days:

(a) When the solid waste site or facility accepts waste, operates equipment or otherwise performs the business of solid waste management; and

(b) Which days occur in sequence regardless of whether nonoperating days such as weekends or holidays fall in between.

(4) The cabinet shall evaluate the qualifications of the designated interim operator and shall notify the permittee of the cabinet's determination in writing within thirty (30) days of receipt of the permittee's notice. The determination shall:

- (a) Approve or deny the permittee's request for designation of the interim operator;
- (b) Identify the length of time the interim operator may operate the solid waste site or facility; and
- (c) Specify conditions as appropriate to the site and the interim operator's qualifications.

Section 13. Permit Condition. As specified in Section 2 of this administrative regulation, every solid waste site or facility requiring a permit shall be operated by the operator certified pursuant to this administrative regulation. Pursuant to Sections 2 and 3 of this administrative regulation, maintaining the certified operator(s) shall be considered a permit condition, and the permit may be revoked, or

penalties for permit violations sought as appropriate, upon violation of the requirements and duties established by this administrative regulation.

Section 14. Fees. (1) Fees for application for certification shall be: (a)

\$125 for application for certification as a landfill operator;

(b) \$125 for application for certification as a landfill manager;

(c) \$150 for application for certification as both a landfill operator and a landfill manager when the application is made for certification for both categories at the same training session;

(d) \$125 for application for certification as a landfarming operator; and

(e) Fifty (50) dollars for certification by reciprocity for all categories of operator.

(2) Fees shall accompany applications and will not be returned to those who do not qualify for a certificate. (Recodified from 401 KAR 2:111, 3-1-83; Am. 10 Ky.R. 172; eff. 12-2-83; 13 Ky.R. 913; 1228; eff. 1-13-87; 16 Ky.R. 1642; 2174; eff. 5-8-90.)

APPENDIX G: Groundwater Protection Plans

Groundwater Protection Plans

Revised January 25, 2012

Effective August 24, 1995, anyone engaged in activities that have the potential to pollute groundwater is required to develop and implement a Groundwater Protection Plan (GPP). This applies to all commercial businesses, municipal, county, and federal governments, and private citizens. Activities associated with composting operations and the land application of solid and special waste also require the development and implementation of a GPP.

A GPP identifies activities being conducted at your site that have the potential to pollute groundwater and states the protective practices (BMPs) that you will use to protect groundwater. The regulation requires the person responsible for implementing your GPP to review the entire GPP every three years. If no changes have occurred in activities or BMPs, the GPP may be recertified by signing and dating another Certification Statement. If changes have occurred the plan must be revised to address the modifications. The revised GPP must also have a newly signed Certification Statement. Be sure to keep your GPP updated as a DEP inspector can issue a Notice of Violation (NOV) if you are implementing an out-of-date GPP.

GPPs do not have to be approved to be implemented. In fact, GPPs are not required to be submitted for review and approval unless (1) they are called in by a Department for Environmental Protection (DEP) inspector, (2) they are called in by the Groundwater Section staff or GPP Program, or (3) they are required as part of an Agreed Order (Enforcement). GPPs can be voluntarily submitted to the Groundwater Section for review. Anyone from the public or DEP may ask to review your GPP. However, official approval of the GPP can be issued only by the Groundwater Section's GPP Program.

The GPP Program is operated out of the Groundwater Section of the Watershed Management Branch of the Kentucky Division of Water, 4th Floor, 200 Fair Oaks Lane, Frankfort KY 40601. The program coordinator may be contacted at (502) 564-3410.

Kentucky Administrative Regulation 401 KAR 5:037, The Groundwater Protection Plan Regulation, was promulgated in August 1994 as required by Kentucky Revised Statute 224. The guidance for developing a GPP for land application of solid and special waste or the mini- guidance for composting operations are included in this manual. They also may be downloaded, along with the regulation, from the program web site at <http://water.ky.gov>. Click on Programs and the following links: Groundwater, Groundwater Protection, and Groundwater Protection Plans.

PREPARING A GROUNDWATER PROTECTION PLAN FOR LAND APPLICATION OF SOLID OR SPECIAL WASTE

Revised January 25, 2012

The Groundwater Protection Regulation, 401 KAR 5:037, requires anyone who conducts an activity having the potential to pollute groundwater to develop a Groundwater Protection Plan (GPP). A Groundwater Protection Plan identifies the activities being conducted at your site that have the potential to pollute groundwater and states the practices you will use that will prevent groundwater pollution. Section 2 of the regulation identifies the activities that require a GPP. Land application of sewage sludge is one of the activities identified under Section 2.

(1)(e) –Land treatment or land disposal of a pollutant, and

(1)(f) –Storing, treating, disposing, or related handling of hazardous waste, solid waste, or

special waste in landfills, incinerators, surface impoundments, tanks, drums, or other containers, or in piles.

Your GPP must include **all** the activities occurring at your sites that are subject to 401 KAR 5:037. Read Section 2 thoroughly to determine if there are any regulated activities other than the two above. If so, include them in the GPP. The regulation may be downloaded at <http://water.ky.gov/>. Click on Programs, Groundwater, Groundwater Protection, Groundwater Protection Plans.

USING THE GUIDANCE

Follow the Guidance Format.

Follow the format provided in this guidance to develop your GPP. Using this format will assure that most, if not all, of the information necessary for adequate review is included. It also organizes the information so that anyone from the general public can follow your plan without needing additional explanation.

Use all Headings and Subheadings as stated in the Guidance.

Do not make up your own headings or subheadings. Use the headings and subheadings in the order provided in the guidance. Do not leave out headings.

Provide all Information requested in the Guidance, where applicable.

Be sure that you have provided the information requested. The review process is delayed when necessary information has been left out.

Contact the GPP Program if you need assistance or have any questions.

Call the Program Coordinator at (502) 564-3410.

WHEN YOU HAVE COMPLETED THE GPP

When you have completed your plan, review the draft to be sure that the GPP has addressed **all** the activities occurring at your site that are covered by the Groundwater Protection Regulation and that you have provided **all** the information, where applicable, for each section.

Implement your GPP!

To be in compliance with 401 KAR 5:037 the GPP must be implemented **immediately** following development. This applies to **all** GPPs, even if your GPP is in review by the Groundwater Section. Implementation is not dependent upon approval of the plan. If your GPP is in review, continue to implement the practices in the submitted GPP. If changes are required, then the new practices should be implemented.

Submitting the GPP

Submittal of a GPP for review by the Groundwater Section, Watershed Management Branch, is optional unless:

1. required as part of an Agreed Order.
2. stated by a DEP inspector as a requirement in a Notice of Violation
3. requested by letter by the Groundwater Section.

To submit a GPP for review, send one (1) copy of the GPP to Patricia Keefe, Watershed Management Branch, Kentucky Division of Water, 200 Fair Oaks Lane, Frankfort, Kentucky, 40601. You will receive a letter stating that the Watershed Management Branch has received your plan.

Your initial GPP submittal and any further drafts **will not** be returned. Be sure you keep a copy of each draft so that required changes can be made. The approved draft will be retained in the Division of Water (DOW) files. You will receive a letter stating the GPP has been approved.

It is not necessary to include the Groundwater Protection Regulation or this guidance document with the GPP when submitting it to the Groundwater Section for review.

FORMAT FOR GPP

SECTION A. GENERAL INFORMATION

1. Name (if there is one) and Address of Land Application Facility

- Name of street, or route number (NOT mailing address).
- Latitude and longitude location of land application facility entrance. If you need to obtain latitude and longitude of your site, go to <http://www.batchgeocode.com/lookup>. Insert your address as directed.
- Name of County.

2. Person Developing GPP

- Name
- Address (business address, not home address unless business operates out of the home)
- Telephone Number (business phone, not home phone unless business operates out of the home).

3. Person Responsible for Implementing GPP

- Name
- Address (business address, not home address unless business operates out of the home).
- Telephone number

4. Location of Land Application Sites on Topographic Map

- Draw boundaries of sites on 8 ½ x 11 copy of the U.S. Geological Survey topographic quadrangle map. Only a United States Geological Survey topographic map will be accepted. Copy the 8 ½ x 11-inch section of the map that contains the location of the land application sites. Do **not** enlarge or reduce the size of the map. If that section does not have the name of the topographic quadrangle, please write it on the map.

SECTION B. ACTIVITIES THAT HAVE THE POTENTIAL TO POLLUTE GROUNDWATER

List all the activities performed in the storage of solid or special waste and the land application process that may possibly pollute groundwater. Some examples of the activities are:

- Storing waste in tank or lagoon prior to land incorporation.
- Unloading wastes from truck to storage tank or lagoon.
- Applying waste onto land surface or incorporating into soil.

List any other activities that require a GPP that are conducted at the site that are not part of the land application process.

SECTION C. PRACTICES SELECTED TO PROTECT GROUNDWATER

1. Provide protective practices for tanks or lagoon storing waste. What is done to prevent and detect leaks?
2. Provide protective practices for cleaning up spills that may occur during the unloading of wastes from truck to storage tank.
3. Provide name(s) of Certified Landfarming Operator(s).
4. Provide certification number of operator(s).
5. This activity is regulated by permit from the Kentucky Division of Waste Management. Provide permit number(s).
6. The Groundwater Section recognizes that requirements of 401 KAR 45:100, Section 6 is protective of groundwater. Therefore, the practices required by this regulation may be incorporated by reference.

Type the statement below as it is written.

All certified operators must sign the statement.

I (typed name) certify that the operation of this landfarm is in compliance with 401 KAR 45:100, Section 6.

Signature(s) Date

SECTION D. IMPLEMENTATION SCHEDULE

The GPP must be implemented immediately. Implementation **does not** depend upon approval of the GPP.

If you are already using the protective practices, just state so. If not, state the date by which you plan to use them.

If you must order protective equipment or build secondary containment structures, and the cost is not part of your business's budget, the Groundwater Section will work with you on an acceptable time frame for completing the project. List what is to be done and give an estimated date when the project will be completed.

SECTION E. EMPLOYEE TRAINING

If you have employees working for you at the disposal site, they must be trained to follow the management practices listed in 401 KAR 45:100, Section 6, and any other protective practices in the GPP to prevent surface water and groundwater pollution.

Briefly describe how you train the employees, when they receive the training, and how often they receive refresher training. Be specific. For example, state initially on hire and twice a year or once a year after that. Stating when needed or frequently is not acceptable.

SECTION F. INSPECTION SCHEDULE

The purpose of inspections is to insure that all the management practices are being followed and are

working to prevent groundwater pollution.

The application site must be inspected to determine that the management practices are working. Inspection records must be kept to show that you are implementing your Groundwater Protection Plan (GPP). The records should be in the form of a checklist.

The checklist must include:

- the management practice.
- observations.
- is the management practice working? (yes, no)
- actions taken (If management practice was not working, note was done to correct the problem.).
- date, and
- place for person doing the inspection to sign his/her name.

You must also state how often inspections will take place. Again, be specific. State an exact time interval. Saying when needed or frequently is not acceptable.

SECTION G. CERTIFICATION STATEMENT

The person who can make the managerial and/or financial decisions required to implement your plan should be the one signing the certification statement. Use the following statement just as it is:

I (typed name) certify that this Groundwater Protection Plan complies with the requirements of 401 KAR 5:037. I have read the plan and will implement its provisions.

Signature (hand signed) Date

SECTION H. REVIEW LOCATION FOR GROUNDWATER PROTECTION PLAN

Section 4(7) of 401 KAR 5:037 provides for public inspection of Groundwater Protection Plans. GPPs must be retained and implemented at the site for which they are developed. However, landfarms as a rule are not occupied 8 hours every day. The Groundwater Section recommends that you keep a copy of the GPP in the vehicle you use to access the landfarm. However, you must provide a place where the public may review your plan.

Even though approved GPPs are retained in the DOW files, you are not required to use the DOW in Frankfort as your site for public review. In fact, the Groundwater Section recommends that you use your office or place of business. This eliminates the requirement to send a recertified GPP every three years to the Ground-water Section. This does not mean, however, that you need not update your GPP.

The regulation requires you to review your entire GPP every three years. If no changes have occurred in responsible personnel, activities, or protective practices (BMPs), you may recertify your plan by signing and dating another certification statement under Section G. You must revise your plan at the time any changes occur, even if it has been less than three years since the last review. Contact Pat Keefe when your GPP has been recertified or revised. If you must submit a revised plan, send it to Program Coordinator, Groundwater Protection Plan Program, Watershed Management Branch, Kentucky Division of Water, 4th Floor, 200 Fair Oaks Lane, Frankfort KY 40601.

If you have any questions, contact the Program Coordinator at (502) 564-3410.

APPENDIX H: Sampling Procedures

General Sampling Considerations

- Always wear clean, chemically inert latex or plastic disposable gloves when taking samples. Change them each time a new sample is taken.
- Always clean the sample equipment before and after sample collection, unless the equipment is chemically inert and pre-cleaned. Distilled water and an approved non-phosphatic detergent may be employed if necessary.
- NEW sample containers must be used to collect samples.
- Use the proper container types (Teflon, glass, stainless steel, or plastic) for the analysis to be conducted.
- Avoid contaminating the inside of the sample bottle when removing the cap.
- Do not place anything other than the sample itself and the proper preservatives into a sample container.
- Collect a sufficient volume, yet leave some air space when sampling for bacteria or suspended solids. Samples for volatiles and semi-volatiles should have no air bubbles.
- Properly identify each collected sample.
- Protect collected samples by properly packing them in ice for transportation.
- Samples should include proper chain-of-custody seals.
- The chain-of-custody must be maintained from the point of collection to the laboratory.

Surface Water Sampling Considerations

- Do not sample during or immediately after a storm. Sample after storm-induced surface runoff has ceased and runoff continues under base flow conditions.
- Prepare a location for sampling.
- Standing downstream of the sample container, place the mouth of the collection container below the water surface and facing flow. Avoid the capture of floating material.
- Keep hands away from the mouth of the jar.

Groundwater Sampling Considerations

- Groundwater monitoring wells should be properly purged in accordance with the approved plans and the permit. Samples should be collected as soon as possible following purging (i.e., as soon as sufficient water is available). Wells should never be purged one day and sampled the next.
- The upgradient (background) well should always be sampled first.
- Provide a clean working surface at each well by placing a large sheet of plastic or aluminum foil around the well. After each use, dispose of all plastic, etc.
- The depth of water should be measured with a freshly cleaned instrument each time. Always BEFORE removal of water from the well.
- NEW plastic disposable gloves should be worn and changed between sampling of each well.
- The proper amount (3 well volumes) of water should be removed for each well BEFORE collecting a sample; or, micropurge stabilization parameters must have stabilized according to approved procedures.
- The bailer should ALWAYS be lowered slowly into a well to prevent disturbance of the water and to prevent the sample from becoming murky.
- All wells should be locked and inner casings should always have protective caps to prevent foreign matter from entering the well. Wells should also be protected with steel or concrete posts and clearly marked and labeled with appropriate well numbers (AKGWA). These well numbers (AKGWA) are those that are assigned by the Division of Water.

REMEMBER – Assume ANYTHING inserted into a monitoring well could be DIRTY, can easily AFFECT your final result, and can ruin the well for future monitoring.

Testing for Explosive Gases

In order to properly conduct testing for explosive gases the following equipment will be necessary:

1. Explosive gas detector
2. Weighted, insulated, bar hole punch (Not always used)

The explosive gas meter should read –percent lower explosive limit and should have a flexible probe capable of being placed in subsurface holes made by the bar hole punch.

Landfills must not exceed:

- 25% of the Lower Explosive Limit (LEL) for methane in facility structures (excluding gas control or recovery system components)
- 100% of the LEL for methane at property boundary

Gas detector alarms, set at 25 percent LEL, must be installed and maintained in each facility structure.

If methane gas levels are found to exceed the limits referenced above, the owner or operator must:

- Take all steps necessary to ensure immediate protection of human health;
- Immediately notify the Division of the exceedence and the remedial measures taken; and
- Within 14 days, submit a remediation plan detailing the nature and extent of the problem and proposed remedy.

Managers should observe testing procedures or conduct the tests themselves according to the guidelines below.

Subsurface Testing

Holes should be advanced into the ground by the bar hole punch (but not if methane wells are used), approximately 3 to 4 feet deep. The explosimeter probe should be carefully placed into the top 6 inches of the hole immediately after removing the hole punch. DO NOT allow soil or water (or other objects) to be drawn into the probe. This may damage or ruin the gas detector.

After inserting the probe, several volumes of air should be drawn into the gas meter while cautiously observing the needle. After obtaining the reading, remove the probe and clear the gas meter by allowing ambient air (air you breathe) to flow through the probe and detector until a reading of “0” is obtained. Seal the hole properly when finished.

Surface Testing

This method consists of placing the probe in areas in and around the landfill vicinity and simply drawing a sufficient amount of air to obtain a reading.

Test Locations

The sampling stations or locations will, at times be dynamic, but for the most part, certain areas should be tested at each round of testing. Underneath or at the lowest point of all buildings, basements, structures, manholes, pipes, etc., must be regularly tested. Set locations along the boundary, gas venting pipes and gas problem areas must also be monitored. Groundwater monitoring wells or, in karst terrain, springs, may also be tested. Adjacent structures off site and off the property boundary should also be tested. The subsurface near all structures should be tested. Both surface and subsurface testing at the facility boundary should take place. Small, brightly colored surveyor flags are recommended to mark test stations for future sampling events.

Frequency

Explosive gas testing should be conducted on a monthly basis through the spring (after the last freeze), summer and fall months (until the first freeze). Weekly testing programs should be conducted in the winter months. It may be appropriate to increase the frequency, depending on severity of the gas potential and other site-specific conditions. The reason for more frequent testing during colder weather is that frozen soils will tend to retain gases within the landfill (actually seal the site) and allow potentially explosive conditions to develop. Quarterly monitoring is required by regulation.

Weather Conditions

Exact weather conditions can affect explosive gas migration potential and should always be considered BEFORE beginning gas testing activities. The following conditions are optimal (the best) for testing:

- Just after a low pressure (thunderstorm or storm in general) has passed through the vicinity of the site. The low pressure will allow gases to escape more readily than high pressure.
- During time of extended freezing temperatures, the gases will not escape as easily. Potentially dangerous levels and quantities of gases can build up during cold weather.

APPENDIX I: Other Regulations

The information included in this appendix is intended to provide additional detail to support the material presented in Chapter 14 of this manual.

Table 1: Permits or Permissions Involving Agencies Other Than DWM and the Reference				
Other Agency:	Requirement:	Solid Waste Reference	Special Waste Reference	Permit or Permission
Agriculture, Dept. of.	Impact on prime agricultural lands	47:180, S 4(1)(b)	App. A.9 & Att. 5	Maps
Air Quality	Open burning prohibition	47:030, S 10(1)	30:031, S 9(1)	Compliance
	Air regulations	47:030, S 10(2); 47:170, S 2(13)(d) & (e); 48:090, S. 1;	30:031, S 9(2)	Compliance, Air Quality Permit
	Air Criteria, no open burning, dust control	48:090, Sec. 5		Contained operations
County Fiscal Court or KRS 109 S.W. District	Local Determination that permit application is in compliance with local solid waste plan.	KRS 224.40-315(1)		Local Determination
	Compliance with capacity needs in Solid Waste Plan	KRS 224.40-315(2)		DWM Certification with permit issuance
	County Solid Waste Management Plan	KRS 224.43-345		Site Listed in S.W. Management Plan
County Fiscal Court or Urban County Government KY Nature Preserves, KY Fish & Wildlife	Executive Summary	47:180, S 9 & KRS 224.310(3)		Solid waste permit application process
Environmental Protection, Dept. of	Compliance with KRS Chapter 224	47:030, S 14	30:031, S 14	Permits, operations
Federal Aviation Administration	No contained within 5,000 ft. of jetport; Within 5 mi. notify FAA	48:050, Sec. 4		Permit Application; Letter of acknowledgement
Fire Chief	Fire Safety	47:030, S 11(2):	30:031, S 10(2)	S.W. Permit, Letter
	Statement of assistance from Fire District	47:180, S 4(8)	Appl. A.12. & Att. 8	Permit Application
	Fire safety and response plan	48:060, Sec. 1(10)		Permit Application
Labor Cabinet (OSHA)	Contained Safety & Communication Plan	48:070, Sec. 12		Permit Application

Nature Preserves	KRS 146.410 to 146.990 and KAR Title 400 (the Nature Preserves System).		45:030, S 3(5)	Letter
Natural Resources, Dept. for	Permits issued for mineral or coal extraction under the Surface Mining and Reclamation Act and KRS Chapter 350; Mine works under site	47:170, S 2(12)(g)	45:130, S. 1(2)	Surface Mining permit
	Disposal of mining overburden, coal mining wastes, refuse, and coal mining by-products returned to the mine site of generation per KRS 350		45:030 & Appl. A.5. & Attachment 2	Surface Mining permit
	No wastes within the zone of collapse of deep-mine workings or within the critical angle of draw of such workings	48:050, Sec. 1(2)	45:130, S. 1(2)	Search of mining permits
Planning & Zoning	Local Planning and Zoning requirements	KRS 224.40-315(2)		DWM Certification with permit issuance, P & Z use permit
	Local Planning and Zoning requirements	47:180, S 4(5)	App. A.11 & Att. 7	Statement by applicant in landfill permit application
	Public nuisance prohibition	47:030, S 12	30:031, S 11	Operations
Public Service Commission	No wastes within fifty (50) feet of a gas, sewer or water line	48:050, Sec. 1(6)	Appl. F. 2(e)	Records check, buffer in landfill application
Securities and Exchange Commission	Ownership background information	KRS 224.40-330 & 47:180, S 10	Appl. B. & Att. 9	Form 10K, Annual Report to Stockholders, Annual SW background update
State Historic Preservation Office (SHPO): KY Heritage Council	The National Historic Preservation Act of 1966	47:100, S 3(2); 47:170, S. 2(14); 47:180, S 4(2)	Section 8 & Form 7094A Item D 4.; Appl. A.9. & Att. 5	Letter
Transportation Cabinet	Impact on transportation facilities	47:180, S 4(1)(a)	Appl. A.9. & Att. 5	Transportation Study by applicant
U.S. ACE, DOW	Fill	47:030, S 4(2)	30:031, S 4(2)	Fill Permit
U.S. ACE	Wetlands	47:030, S 13; 47:170, S. 2(14)	30:031, S 12	Wetlands Mitigation Permit
U.S. EPA Region 4	Application of sewage sludge to land used for growing food chain crops	47:030, S 7:	30:031, S 6	State Landfarming Permit, Op. record, Federal enforcement
	Underground Injection Control Program under the Safe Drinking Water Act;	47:170, S 2(12)(b)		UIC Permit, landfill application (existing facilities)

U.S. EPA Region 4, CHFS Dept. Public Health, Local Health Department	Sewage Land Application	47:030, S 9(2):	30:031, S 8(2)	Landfarm permit
U.S. Fish & Wildlife	The Endangered Species Act	47:030, S 3; 47:100, S 3(3); 47:170, S. 2(14); 47:180, S 4(3)	30:031, S 3; 45:030, S 3(3); Appl. A9 & Att 5	Letter
	The Fish and Wildlife Coordination Act	47:100, S 3(4)	45:030, S. 3(1)	Letter
U.S. Geological Survey, KY GS	No waste within 200 ft. of Holocene time fault (>11,000 years)	48:050, Sec. 5	Appl. F. 6.	Landfill application
	Seismic design	48:070, S. 3 & 48:080, S. 10		Contained landfill application
	Unstable area design	48:070, S. 4		Contained landfill application
Water, local stormwater planning agency	Non-Point Source Discharge	47:030, S 4(3):		Permit, user fee or both
Water, KY Division of	100-year floodplain & floodway	47:030, S 2; 47:180, S 5(1)(c); 48:050, Sec. 3	30:031, S 2; 45:130, S. 2	Floodplains Permit
	Discharge to Surface Water; Leachate treatment	47:030, S 4(1); 47:170, S. 2(12)(c); 48:060, S. 1(2)(e); 48:080, S. 6(4)(g); 48:300, S. 2	30:031, S 4(1); Appl. L.1.f. & Att. 43	KPDES Permit; WWTP letter
	Protection of Karst	47:170, S. 3(2)(a); 47:180, S. 6(2); 48:050, S. 1(3); 48:300, S. 4(4)	30:031, S 13	Landfill Application, KPDES Permit
	The Wild and Scenic Rivers Act	47:100, Section 3(1)	45:030, Section 3(1), 3(2), 3(4)	Letter
	Water Quality Certification under CWA	47:170, S 2(12)(f); 48:050, Section 1(1);	45:130, S. 1(1)	Certification
	Impact on Water Resources Statement	47:180, S 4(1)(c)	Appl. D.3. & Att. 14 (Topo)	Landfill Application

This page left blank intentionally.

APPENDIX J: Methods for Handling Non-Detect or Censored Data

The method of handling non-detects is under scrutiny. One excellent method is the Non-detects and Data Analysis: Statistics for Censored Environmental Data (Helsel, 2005), **See the Appendix titled “Methods for Handling Non-detect or Censored Data”** from EPA’s CLU-IN or Technology Innovation and Field Services Division and the website: <http://www.practicalstats.com/nada/> for more information

Statistics can be daunting. One rough check is to plot the data for one parameter going back one, two or more years. Then, compare the trend vs. the statistics.

This page left blank intentionally.

Index

A

A Guide for Monitoring Well Construction and Abandonment, 138
Acceptable Disposable Waste Streams, 79
ACRONYMS, 157

C

Certification and Licensing Program, 1
 Goal, 1
 Mission, 1
Compliance Monitoring, 64
Construction, 4, 8, 11, 12, 16, 17, 22, 27, 31, 33, 47, 48, 49, 51, 52, 53, 54, 70, 71, 74, 75, 81, 86, 92, 97, 103, 104, 105, 108, 110, 114, 115, 120, 123, 135, 135, 138, 139, 142, 149, 150, 155, 157
CONSTRUCTION/DEMOLITION/DEBRIS LANDFILL, 103
 Closure and Closure Care Requirements, 109
 Closure and registration of less and one acres sites, 109
 Design Requirements, 105
 Greater Than One Acre CDD Landfill Operational Requirements, 110
 Compaction and Cover Requirements, 111
 Leachate Collection System, 106
 Leachate Regulations, 106
 The Liner, 106
 Types of Waste That Can be Accepted, 104
CONTAINED LANDFILL, 113
 Closure and Closure Care Requirements, 124
 Cover Requirements, 122
 Design Requirements, 114
 Explosive Gases Control, 129
 Final Cap, 121
 Landfill Gas Regulations, 122
 Leachate Reduction, 120
 Liner Protection, 121
 Methods of Operation, 120
 Random Inspections, 123
 Separate Waste Handling Areas, 124
 Types of Waste that can be taken, 129
Cost Accounting, 120
 Full Cost Account, 120

D

Definition of a “New” Landfill, 124

E

Environmental Impact of Landfill Gas, 81
Environmental Performance Standards, 8, 14, 17, 18, 63, 64, 91, 97, 102, 111, 124, 128, 136, 155
 Air Pollution, 45, 49, 76, 81, 91, 100, 124, 147
 Safety for Explosive gases, 91

F

Facility Appearance, 61

FACILITY MANAGEMENT, 57

- Communication, 45, 46, 51, 59, 85, 117
 - Employees, 117
 - Public Relations, 59
- Design, 58
- Estimating Waste Volume and Type, 118
- Importance of Compaction Rate, 118
- Involved Parties in Landfill Management, 118
- Landfill Expenses, 118
 - Operation, 118
 - Post Closure Site Care and Maintenance, 56, 59, 63
 - Pre-development, 118
 - Site Closure, 62
 - Site Preparation and Construction Costs, 118
- Operating Plan, 58, 59
 - For Site Manager, 59
 - For Site Operator, 59
- Personnel Management, 58
- Planning, 118

Facility Operation, 60

Farming/Agricultural Wastes, 77

G

Gas Control, 84

Gas Regulations, 89

H

Hazardous Waste, 77, 90

I

Industrial/Residual Waste, 76

K

Kentucky Regulations, 137

Kentucky Statutes, 137

L

Landfill Categories

- Construction Other Categories
 - Beneficial Reuse, 18
 - Composting, 135
 - Emergency Permits, 18
 - Land application, 4, 138
 - Permit-by-Rule, 4, 138
 - Registered Permit-by-Rule, 138
 - Research, development, and demonstration permits, 18
- Construction/Demolition Debris (CDD), 106, 109
- Construction/Residual landfills, 97
- Construction/Special Waste Landfills, 102
- Construction Other Categories
 - Residential and inert landfills, 18
- Contained Landfills, 116

Landfill Closure Process, 62

LANDFILL EQUIPMENT, 30

- Equipment Extras and/or Modifications, 31
- Equipment Regulations, 34
 - Construction Landfill, 110
 - Construction/Demolition Debris Landfills, 34
 - Contained Landfills, 34
 - Residual Landfill, 34
 - Special Waste, 34
- Equipment Types, 31
- Maintenance, 32
 - Daily Maintenance, 33
 - Other Maintenance Programs, 33
 - Periodic Maintenance Program, 33
 - Preventative Maintenance, 33
- Operational Considerations, 31
- Other Equipment Used at Landfills, 32
- Selecting Equipment, 32

Landfill Gas, 80

- Carbon-Dioxide, 80
- Hydrogen Sulfide, 80
- Methane, 80

LANDFILL SAFETY, 36

- Confined Space Entry, 43
 - Confined Space Hazards, 44
- Employee Right to Know, 39
- Fire Safety, 42
- First Aid, 43
- Importance of Safe Operations, 37
 - Benefits of Safe Operations, 38
- Landfill Hazards, 39
 - Biological Hazards, 41
 - Chemical Hazards, 39
 - Equipment Operation, 41
 - Material Safety Data Sheet, 39
 - Operator Protective Equipment, 41
 - Physical Hazards, 40
 - Protection from Chemical Hazards, 40
- Landfill Operations Safety Programs, 38
 - Program Monitoring, 39
 - Records, 39
 - Reporting Procedures, 39
 - Risk Assessment, 38
- Lock-out/Tag-out, 97
 - Control of Hazardous Energy Sources, 45
 - Employee Classifications, 36
 - Hazards and Prevention, 36
 - Training and Responsibilities, 45
- Safety Regulations, 45

Leachate Control, 15

Leachate Generation, 20, 81

Limited Quantity Generators, 78

M

MONITORING YOUR LANDFILL, 65

- Additional Reporting Requirements, 72
- Annual Volume Survey, 23
- Data Submittal, 70
- Documentation of Construction Requirements, 71
- Documentation of Soil Cover, 72
- Documentation of Waste Quantity Records, 83
- Documentation Screening Incoming Waste, 83
- Environmental Monitoring, 66
 - Environmental Performance Standards (EPS), 66
- General Sampling Considerations, 83
- General Understanding of Landfill Plans, 83

- Groundwater Monitoring, 67
- Groundwater Sampling Considerations, 176
- Leachate, 72
- Quarterly Data Submittal, 72
- Recordkeeping Equipment, 83
- Sample Collection, 71
- Subsurface Testing, 177
- Surface Water Monitoring, 66
- Surface Water Sampling Considerations, 175
- Testing for Explosive Gases, 176

Movement of Gas and Leachate, 82

N

Need for Proper Management, 9

O

OPERATING YOUR LANDFILL, 7

- At the Scalehouse, 8
- Entering the Working Face Area, 10
- Landfill Gas Control, 17
- Leachate Control, 15
- Potential Problems Associated with Operation, 17
 - Dust, 19
 - Fires, 18
 - Inclement Weather, 19
 - Land settlement, 19
 - Litter, 17
 - Vectors, 18
- The Working Face, 10
 - 401 KAR 48 090, Section 9, 10
 - Compaction, 11
 - Compaction Rate, 11
 - Cover, 13
 - Equipment, 11
 - Litter, 14
 - Passes, 12
 - Promote runoff, 14
 - Prevent run-on, 14
 - Shallow Layers, 12
 - Slope, 11
 - Surface Water Control, 14
- Traveling to the Working Face, 9
 - Access, 9
 - Posting Signs, 9

Operator/Manager Certification Program, 138

- Applicant Qualifications, 140
- Certificate Issuance, 140
- Certification Applications, 139
- Classes and Exams, 166
- Interim Operator, 138
- Terms of Certification, 13

P

Public Information Process, 52

R

Regulatory Standards, 45

RESIDUAL LANDFILL, 95

- Closure and Closure Care Requirements, 197
- Cover Requirements, 99

Design Requirements, 97
Leachate Regulations, 98
Operations, 98
Types of waste that can be taken, 96

S

Solid Waste Management Plans, 191

Collection, 192
Incineration, 193
Landfilling, 193
Recycling, 192
Resource Recovery, 193
Source Reduction, 192
Tire Disposal Facility (TDF), 126
Universal Collection, 192

Special Handling Considerations for Specific Types of Waste, 92

Asbestos, 92
Bulky Items, 92
Drums, 93
Dusts, 93
Sludges, 92
Smoldering Waste, 93

SPECIAL WASTE LANDFILL, 100

Closure and Closure Care Requirements, 102
Cover Requirements, 103
Design Requirements, 102
Leachate Regulations, 102
Operational Requirements, 103
Operations, 168
Siting Requirements, 101
Types of waste that can be taken, 101

T

The Affect of New Source Review on Landfills, 44

The Application Process, 49

Financial assurance, 54, 55
Local Determination, 50
Submitting the Notice of Intent Application, 52
The Administrative Application, 53
The Technical Application, 53

The Determination of Controls for Landfills, 45

The Permitting Process, 49, 51

Operational Standards, 8, 51, 137
Disease vector controls, 51
Open burning, 51
Safety standards, 51
Site Selection Standards, 50
Endangered plants and animals, 50
Floodplain control, 50
Groundwater protection, 50
Water pollution control, 50

Transition Period, 64

U

Unacceptable Disposable Waste Streams, 91

Hazardous Waste, 91
Lead Acid Batteries, 91
Liquids and Oils, 91
Unpermitted Geographic Source Waste, 91
Whole Tires, 91

W

Waste Composition, 78

Waste Decomposition, 79

Waste Management in Kentucky, 134

- Division of Waste Management, 135
- Field Operations Branch, 135
- Hazardous Waste Branch, 135
- Municipal Solid Waste Collection Programs, 4
- Program Planning and Administration Branch, 135
- Recycling and Local Assistance Branch, 135
- Solid Waste Branch, 135
- Superfund Branch, 135
- Underground Storage Tank Branch, 135
- Waste Generation and Characteristics, 4

WASTE STREAM COMPOSITION AND DECOMPOSITION, 73

- Municipal Solid Waste, 74
 - Commercial Waste, 74
 - Construction/Demolition and Debris Waste, 75
 - Institutional wastes, 24
 - Medical (Biohazard/Infectious) Waste, 75
 - Petroleum contaminated soil, 24
 - Residential Waste, 24
 - Sewage Treatment Plant Residues, 76
 - Special Wastes, 76
 - Waste Tires, 76, 193
- Types of Waste, 74

Waste Stream Testing, 93

- paint filter test, 93
- TCLP, 90, 93

Wastes Requiring Specific Written Approval, 90

- Asbestos wastes, 92
- Contaminated Soils, 90
- Limited Quantity Generator of Hazardous Waste, 90
- PCB spills, 90
- Sludges, 90