ODOR CONTROL PLAN

Landfills smell. It is their Nature. There are a variety of smells at a landfill but most often, the reputation of a landfill is that it stinks. Landfills offer a variety of odors; however, those aromas typically fall into two basic categories: the 'fresh' trash smell; or, the landfill gas smell. Both varieties of odors offer distinct differences in the smells and require differing methods for managing them.

> ***Ada County*** *operates a typical municipal solid waste landfill facility. Activities at the landfill are subject to federal, state and local laws, rules and regulations. Ada County operates its landfill facility in compliance with the requirements.*

Fresh(?) Trash: The 'fresh' trash smell is the most common aroma at a landfill. Most everyone knows or recognizes the smell of 'fresh' trash. (Think: "trashcan in the garage.") This smell is created during decomposition of organic materials: It is the smell of rotting. It is the smell of food or other material gone 'bad'. The odor is present during the decomposition process when oxygen is available in the atmosphere around the waste material; this smell usually dissipates quickly with air movement. It is less noticeable the farther one is from the source. At a landfill, this type of smell is easily controlled through proper waste management - covering the waste with dirt, or more trash, soon after the waste is delivered.

Landfill Gas: Landfill gas (*LFG*) is another smell found at landfills and, as the name suggests, it is unique to landfill activities. Landfill gas is the by-product of decomposition within a landfill after available oxygen has been depleted and an anaerobic state attained in the confined space of a landfill.

Landfill gas is primarily made up of between 35% to 50% carbon dioxide (CO2) and between 40% to 60% methane (CH4). If the composition of landfill gas was only those two odorless and colorless gases, it would render Landfill gas undetectable to the human nose. But, landfill gas has trace amounts of other gases (typically found at levels of less than 2%) that include water vapor, carbon monoxide, hydrogen sulfide, and volatile organic compounds. It is this small percentage of the composition, principally hydrogen sulfide and volatile organic compounds that give landfill gas its unique odor.

LFG Production: It takes time for landfill gas to develop in a landfill – Time and the right conditions. As long as oxygen is available to the microbes and bacteria decomposing the organic components in a landfill, no landfill gas is produced. To achieve this anaerobic state, outside sources of oxygen must be cut off or eliminated. This is accomplished in the routine operation of a landfill facility where trash is spread in thin layers, compressed and compacted by heavy equipment. As the layers are built up with more and more trash, the outside source of oxygen is eliminated. Once the available oxygen is depleted, there is a change in microbial action. Aerobic microbes and bacteria die out; anaerobic microbes and bacteria take over and the process of

decomposition continues. As long as organic material and water are available in this oxygen-depleted environment, landfill gas is produced as the by-product of the life-cycle within the landfill. Should the food source (organics) and the water be depleted, or, oxygen reintroduced into this enclosed environment, production of landfill gas stops.

LFG: The Concerns: Landfill gas is a nuisance gas for landfill operators/owners. In certain conditions, landfill gas can be flammable and/or explosive because of the methane. (Methane [CH4] is natural gas.) Although both methane and carbon dioxide are odorless and colorless, the trace gases have a very distinctive smell to which the human nose is very sensitive. One of the culprits is hydrogen sulfide (H2S). Hydrogen sulfide has an odor similar to that of rotten eggs. Humans can detect the smell of hydrogen sulfide in extremely low concentrations. Because of this characteristic, landfill gas can smell as strong quite a distance from its source. It takes a good mixing breeze to sufficiently reduce the odor below levels detectable by the human nose.

How and Why Landfill Gas Moves: A landfill is the permanent final location for solid waste. It is a defined area that has been engineered to be environmentally safe. Efficient use of landfill space is an economic necessity to avoid undue burdens on society for waste disposal. One method of accomplishing this task is to maximize the use of the landfill airspace through compaction of waste material. Efficient compaction provides for maximum placement of waste within the smallest space possible. Compaction ensures less airspace is lost to voids or pockets within the landfill.

Compaction of waste in thin layers (or lifts) reduces the amount of air and limits opportunity for water to infiltrate into the waste pile. As stated previously, air and water are necessary components for aerobic decomposition. When the air runs out (consumed in biological processes), anaerobic decomposition begins with the production of landfill gas as a by-product. Because the waste has been compacted into a (relatively) small space, the production of landfill gas also produces pressure within the landfill – the landfill becomes, in essence, a pressure-vessel.

Gases moves from areas of high pressure/high concentration to areas of low pressure/low concentration. Landfill gas is no exception. Because the landfill is not a perfectly sealed vessel, the low pressure/low concentration area may be outside the landfill. If the low pressure/low concentration area is outside the landfill, the landfill gas will migrate - via paths of least resistance and may eventually pass through the sides of the landfill and into open air.

When landfill gas reaches the ambient air, the gas escapes into the atmosphere as ‘fugitive’ emissions. Barometric pressure (air pressure of the atmosphere) is a factor in fugitive emissions. (Remember: High pressure/concentration moves to low pressure/concentration.) High barometric pressure reduces fugitive emissions. Low barometric pressure encourages fugitive emissions.

Along with barometric pressure changes, wind, humidity, rain, snow, summer heat and other environmental influences determine how landfill gas moves. Changes in weather bring changes to landfill gas production, migration and control.

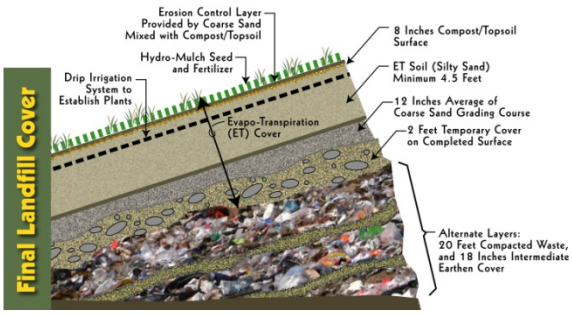
Controlling Landfill Gas Migration: Because landfill gas behaves according to physics (as discussed above), landfills can create paths of least resistance and areas of low pressure/concentration within a landfill. The process is simple: install a system of pipes in the landfill with a vacuum device attached. Within the landfill, the pipes must be perforated to create the path for the gas. By adjusting the vacuum on the collection system, areas of low pressure/low concentration are created and become the preferred pathways for the gas. Connect the collection system to a destruction device, such as a flare or internal combustion engine, and the landfill gas with its odorous components are destroyed.

Ada County's landfill contains a landfill gas collection system that includes vertical wells and horizontal collectors connected to a blower that creates low pressure in the collection pipes. Landfill gas is drawn to the blower and then directed for use as fuel in internal combustion engines for generation of electricity. Excess landfill gas (the landfill produces more landfill gas than the engines can consume as fuel) is destroyed in an enclosed utility flare.

Presently, the County's landfill gas collection system does not have 100% coverage for the Hidden Hollow Landfill. The collection system covers roughly 80% of the Hidden Hollow Landfill. When Hidden Hollow reaches its designed capacity, Ada County will complete the collection system to cover all of Hidden Hollow. Until that time, there is the possibility of fugitive landfill gas emissions from the area not influenced by the collection system. To help prevent fugitive emissions, the County maintains an intermediate soil cover over the areas outside the collection system.

Additional Controls: When areas of the landfill reach its capacity, Ada County, through application and review by the Idaho Department of Environmental Quality, install Final Cover on the completed portions of the landfill. The final cover used by the County is a thick layer of soil (4½ feet to 5 feet thick). The final cover design is called an "Evapo-Transpiration" Cap (or "ET").

The ET Cap is designed and installed to prevent water from infiltrating into the buried mass of solid waste. The sides of the ET Cap are sloped enough to prevent ponding but not so steep as to encourage erosion. Water that does not infiltrate into the soil evaporates. The ET Cap soil contains nutrients that promote growth of native plants. Plants growing on the ET Cap absorb water in their root-system and then transpire the water back into the atmosphere. The combination of the evaporation and transpiration ("Evapo-



Transpiration") actions, are where the ET Cap gets its name. ET Caps are generally not used in areas of high precipitation. However, in the semi-arid environment of Idaho, ET Caps are efficient in keeping water from passing through the buried trash.

Elements of Ada County's Odor Control Plan: Ada County's Odor Control Plan consists of:

- Daily Operations Plan – compaction and daily cover;
- Landfill Gas Monitoring – Landfill gas is sampled daily, according to regulatory requirements (*40 CFR Part 98 - Mandatory Greenhouse Gas Reporting)*. Samples are taken by staff using a Landtec® Gem 5000 gas analyzer.
- Active landfill gas control system
    - Gas collection – vertical and horizontal pipes;
    - Gas destruction – internal combustion engine (electricity generation) or flare;
    - Collection system expanded as areas of landfill reach capacity.
- Final Cover (ET Cap) – installed in phases as landfill reaches benchmarks in capacity.
- North Ravine Cell – landfill gas collection system installed within each lift.
    - Gas production in the NRC is closely monitored. As more waste is buried in the NRC, it will eventually produce landfill gas of sufficient quantity to be added to the existing landfill gas control system.
- Odor Reporting – the County's website includes a method for reporting incidents of landfill odors.
    - Reports or complaints of odors are investigated by County staff. Staff verifies there are no system malfunctions or failures. Operational anomalies are corrected and actions recorded.
    - If there is no indication of system malfunction or failure, examination of external environmental factors are considered to determine if the odors are transient and/or fugitive emissions.
    - Weather conditions are included as parts of the odor reporting process. Changes in atmospheric conditions can encourage fugitive emissions.
    - All odor reports are included in the Operating Records for the landfill.

Planned System Enhancements:

- To aid the efficiency of the gas collection system and to further comply with requirements of the Clean Air Act, Ada County is planning the installation of equipment to reduce sulfur emissions from the destruction of landfill gas in the County's flare and in the landfill gas-to-energy facility owned and operated by Fortistar Methane Group. The equipment removes hydrogen sulfide from the gas prior to destruction thus reducing sulfur emissions.

- Another odor control measure is the addition of final cover to part of Hidden Hollow Landfill. Hidden Hollow Landfill is approximately 120 acres in size. In 2001, roughly 40 acres of final cover was installed on Hidden Hollow. Another (approximate) 30 acres has reached capacity and is scheduled for installation of final cover during 2014. Engineering plans are being reviewed by the Idaho Department of Environmental Quality during the last few months of 2013. Installation of this next stage of Hidden Hollow closure will take about 9 months.