# Section 4
# Gas Collection System Design

As outlined on pages 14 and 15 of the FPA, a gas collection system will be implemented in conjunction with the bioreactor system. It should be noted that the description of the Phase 1 installation provided on page 14 of the FPA does not reflect the latest design. The trench and well layouts for the various phases are shown on the plan sheets 2, 3, and 4. The following section describes the proposed gas collection system for the Buncombe County Landfill.

The bioreactor operation will spur the generation of landfill gas earlier than normal due to the accelerated decomposition rate. The rate of gas generation will also be higher than normal. As stated on page 17 of the FPA, the design of the gas collection accounts for the higher peak flows of landfill gas resulting from the accelerated decomposition process and will be in-place and operational when the bioreactor operation begins.

To control the emissions and odors, an active gas collection system is proposed that utilizes the injection system and the leachate collection system as shown on Sheet 7. Using these landfill components will allow gas collection to operate concurrently with the bioreactor operation. The proposed design also avoids obstructing the disposal operation and it will limit the amount of additional construction required to operate a gas collection system.

## 4.1 Combined Landfill Gas Collection/Pressure Injection System Design

The components of the bioreactor system will be used to collect landfill gas. As shown in Detail C on Sheet 9 and Detail A on Sheet 10, a separate connection will be made to each of the HIT and VIW for gas collection. A wellhead and valve will be used to control the gas collection operation and to close off the line during injection of leachate or water. The lateral header pipes for the gas system will be sloped at a minimum 3% grade to direct condensate to the condensate drip legs to be installed beneath the final cover (refer to Detail F on Sheet 9**).** The lateral header pipes will be connected to the perimeter gas main by gas mains varying in size from 6 to 14-inches depending on the amount of capacity required for the specific pipe network. The injection trenches and wells are designed to perform the liquid injection and gas collection functions at separate times. During the injection periods and shortly after, the active trenches and wells will contain too much liquid to allow gas collection to occur without flooding the gas header.

The initial approach for collecting gas from the HIT is to vertically separate the gas collection operation from the pressure injection operation. As the filling operation moves up in elevation new tiers of HIT will be installed every 30 vertical-feet. The

proposed approach is to utilize the uppermost tier of HIT at any given time for gas collection only. The 30-foot vertical separation between the HIT will be sufficient to prevent leachate and water injected at lower tiers from flooding the upper HIT that are collecting gas. The combined use of the uppermost tier of HIT and the leachate collection system at the bottom of the landfill to collect gas is intended to envelop the gas generated in the landfill with negative pressure zones from above and below. Over time the size of the HIT network will continue to grow. When multiple networks are in place, it will be possible to supplement the "Over/Under" approach to collecting gas with additional HIT located on either side of the active injection areas. The surficial gravity trenches and vertical injection wells will also be used for gas collection during periods when they are not being used for wetting.

## 4.2 Combined Landfill Gas/Leachate Collection System Design

The leachate collection system of the landfill will be used to collect gas from the lower lifts of the landfill. The high permeability rock drainage layer is well suited to collecting gas. Use of the leachate collection system for gas collection has proven to be very successful at other landfills.

An HDPE gas main will be installed along the perimeter containment berm of the landfill as shown on Sheet 7. A connection will be made from the gas main to each of the header pipe cleanouts and slope risers. The connection, as shown in Detail A on Sheet 9, will consist of a wellhead and HDPE elbow that protrudes from the side of the cleanout or slope riser. The gas main is sloped to drain condensate to knockouts located at low points around the landfill.

The combined gas collection/leachate collection system will be activated in increments as the filling operation progresses. For instance, when Cells 1-5 start producing gas, the wellheads connected to the respective cleanouts of those cells will be opened to collect gas while the other wellhead connections to cleanouts in unused cells remain closed. The gas system will be tested for air intrusion each time a new cleanout is activated to ensure it is not being used prematurely.

## 4.3 Gas Management Options

The gas management system will include a blower/flare station located onsite to combust the gas collected. The blower and flare will be sized to accommodate the peak capacity of gas generation expected for the facility. However, as stated on pages 19 and 20 of the FPA, Buncombe County is committed to finding a feasible re-use option for the landfill gas generated from the bioreactor. Buncombe County intends to employ one or more options for beneficial use of the gas as the primary means of control. The flare station will be used as a backup facility to control gas when the re-use systems are over-capacitated or taken offline for maintenance.

A large variety of beneficial use landfill gas projects have been developed to produce energy from the extracted gas. Virtually any process in which natural gas, propane, or other "virgin" fuel can be used can be adapted to the use of landfill gas in some form, either as a primary fuel, or as a supplement to these fuels. The uses for landfill gas as a substitute for, or supplement to various fuels provides many options for consideration.

Buncombe County is currently evaluating various options for implementation with the bioreactor system. A number of factors are being considered including: the location of a potential energy user facility (PEUF), the cyclical operation of PEUF demands, the amount of energy required / gas available, siting, and permitting issues. Some of the possibilities for beneficial use at the Buncombe County facility are:

- Direct firing of landfill gas in engine generators onsite for the production of electricity. The electricity could be sold to the power company as a form of "Green Power" that sells at a higher rate than electricity generated from extracted resources such as coal and oil.

- Piping the gas to offsite boilers for direct firing in the production of high temperature water, steam or other thermal fluid. A boiler-based use could provide process heating for industrial manufacturing, production facilities, and hospitals.

- Separating the methane and carbon dioxide for use of the methane in boilers for heating and the carbon dioxide to promote plant growth in greenhouses.

- Separating the methane for use as a vehicle fuel for the Buncombe County fleet. Landfill gas developed for this purpose is indistinguishable from natural gas and can be used in vehicles that are modified for combustion of natural gas. Vehicles of this type and aftermarket devices for converting conventional vehicles are available from auto manufacturers for "off the shelf" purchase.

- Production of pipeline quality natural gas to add directly to a natural gas pipeline. Pipeline quality gas can serve as a "replacement" for natural gas. The end user may be granted a reduced rate if the cleaned pipeline quality landfill gas is introduced to the pipeline closer to the usage point, which saves the gas utility the expense of transporting natural gas long distances through the pipeline. This savings can be shared with the end user and the landfill in a partnering arrangement.

- Since land is available at the Buncombe County Landfill, options are being considered in which a PEUF would be located onsite. This type of arrangement not only serves as a beneficial use for the landfill gas, but also provides new jobs in the area. An example of this would be to construct a wastewater sludge drying and

pelletizing facility on the landfill property. Dewatered wastewater sludge would be trucked to the facility where it would be dried in direct contact driers and the resultant product would be a useable soil amendment. The use of landfill gas as the fuel source enhances the economics of this option.

- Other options under consideration for use either at the landfill or piped off site include:

  - Waste incineration
  - Various material drying and agglomeration applications
  - Liquids heating and concentration
  - Fume incineration
  - Metallurgical production furnaces
  - Heat treating furnaces
  - Glass production