Methods Used for Methane Monitoring
And Migration Control

- Installation of wells to monitor methane migration.
- Installation of methane gas vents to control methane migration.
- Survey of methane wells using RAE gas monitor and GEM 500 landfill gas monitor.
- Direct push technology (DPT) to sample landfill gas at depth.
- Geophysical surveys to locate subsurface debris and delineate landfill boundary.
- Exploratory trenching to confirm results of geophysical survey.
- Placement of soil barrier as a buffer between landfill and active tank trail.

Methane Monitoring

A methane monitoring program was implemented at the Fort Stewart South Central Landfill in accordance with the design and operations plan for the facility. A series of methane gas monitoring stations located along the horizontal perimeter of the landfill were used to detect the lateral movement of potentially explosive gases in the subsoil and along manmade migration pathways toward on-site and off-site structures. Gas vents installed within the landfill area were used to control methane migration.

In 2004, an investigation was conducted to study methane gas migration at the South Central Landfill. This investigation included a baseline survey of the methane monitoring wells. An entry RAE gas monitor was used to survey the wells at the site. In initial surveys six wells were found to exceed the limits of the RAE monitoring instrument. Retesting with a GEM 500 landfill gas monitor revealed that only one monitoring well had an elevated level of methane. Subsurface testing using direct push technology (DPT) was used to sample the landfill gas at depth in the area of this well. DPT sampling revealed that the elevated methane levels were at depth (i.e., 10 feet) and dissipated as measuring depths approached ground surface.

Methane Migration

Because of its low specific gravity methane gas produced by decay of sanitary waste will naturally migrate vertically, unless preferential pathways are present that promote lateral migration. Two such preferential pathways at the South Central Landfill are disposal trenches and concrete rubble. The voids and spaces created by disposal of solid waste in trenched areas can provide the lateral pathways required for methane gases to migrate.

Methane Migration Control Strategies

The potential migration of methane gases at the South Central Landfill is complicated by the presence of an active tank trail along the southern boundary of the landfill. This presents safety issues for military personnel. Several alternative strategies for controlling lateral flow of methane gas at the landfill were evaluated. The recommended alternative was for the installation of a barrier with an interceptor trench and gas vents. This strategy was chosen because it would prevent lateral migration of the landfill gas, while the interceptor trench would provide a pathway for the landfill gases to migrate to the gas vents and then to the atmosphere on the landfill side of the barrier. Such a strategy would also readily address the migration of landfill gases, and installation of the barrier, trench and vents would not impact the operation of the landfill or the tank trail. The most reliable and appropriate technology for installing a barrier to control the migration of methane gas along the southern perimeter of the landfill is...
landfill was evaluated. Determining the southern boundary of the landfill was a critical component of this evaluation. This was accomplished with the use of a non-intrusive geophysical survey to identify areas that may contain additional buried debris. The geophysical survey report indicated where test pits would help to confirm the presence of buried debris. Exploratory trenches were excavated to determine the location and depth of the debris and to verify geophysical survey findings. The trenching investigation verified that the landfill debris actually extended south of the current fill area and revealed that existing methane wells were within an area containing old landfill waste. The presence of methane monitoring wells within existing waste meant that they were not functioning for their intended purpose; that is, monitoring methane migration outside the boundaries of the fill line. In order to remedy this situation and to maintain the integrity of the existing tank trail, it was determined that landfill waste existing beyond the current perimeter boundary would be removed and replaced with less permeable soil that would provide an effective barrier. Concrete debris removed from this area was incorporated into an existing visual barrier wall between the tank trail and landfill perimeter. Landfill waste material removed from this area was transported to the active area of the South Central Landfill for disposal. Borrow soil used to replace the waste and create the barrier was a clayey sand material used by landfill operators for their daily and intermediate cover material. Additional borrow soil was obtained from an off-site borrow area on Fort Stewart. (Note: As an added bonus to the project, careful excavation, grading and contouring conducted at the off-site borrow area allowed for the creation of a pond suitable for fish and wildlife habitat.) Once the new soil barrier was in place and compacted, the site surface was seeded, fertilized and mulched to match surrounding terrain.

**Electromagnetic Conductivity Anomaly Map**

(significant anomalies interpreted as landfill debris are highlighted)

ORNL’s Involvement in the Methane Migration Study at Fort Stewart

- ORNL, through the Environmental Sciences Division (ESD), assisted Fort Stewart in the design and implementation of methane migration mitigation solutions at the South Central Landfill.
- ESD has significant experience on Department of Defense facilities in implementing pilot studies that evaluate potential solutions to a variety of environmental problems.
- ORNL has developed numerous technologies applicable to a broad range of environmental problems, and has demonstrated successful use of these technologies in the field.
- As a result of these experiences and technology developments, ORNL/ESD provides a significant value added to the Department of Defense in solving complicated environmental problems.

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