



**LAC-IEE-04-025**

**INITIAL ENVIRONMENTAL EXAMINATION**

**COUNTRY:** Central America

**TITLE:** SO 6 Improved Environmental Management  
in the Mesoamerican Biological Corridor

**IEE Reference Number:** LAC-IEE-01-13

**DURATION:** FY04

**LOP FUNDING:** \$125,000

**IEE PREPARED BY:** Roberto Morales  
Anne Dix

**RECOMMENDED THRESHOLD DECISION:** Negative Determination with Conditions

**BUREAU THRESHOLD DECISION:** Concur with Recommendation

**Comments:**

The proposed activity is a pilot study to recover methane gas from the El Trebol dump in Guatemala City, to evaluate the feasibility of generating electricity and to advise the Municipality of Guatemala in the proper design of a landfill gas extraction and recovery system to collect uncontrolled landfill methane and other air pollutants, thus improving the overall environmental conditions in the area. A Negative Determination with conditions is recommended for this pilot activity. The conditions are that all the recommended language for the engineering and construction scope of work be included in the contracts, to be reviewed and approved by the Regional Environmental Advisor (REA) before contracts are funded.

Also the REA will visit the site at least once to ensure that the contractual requirements are followed. The SO team, including the Regional Environmental Officer (REO), will monitor the work at least three times: at the beginning, during, and at the end of the construction.

CTOs are responsible for making sure environmental requirements are met. It is the responsibility of the SO Team to ensure that implementing documents contain specific instructions to this effect.

\_\_\_\_\_ Date \_\_\_\_\_  
George R. Thompson, P.E.  
Bureau Environmental Officer  
Bureau for Latin America & the Caribbean

Copy to : Deborah Kennedy-Iraheta, Director, a.i.,  
USAID/G-CAP

Copy to : Anne Dix, REO, USAID/Guatemala

Copy to : Roberto Morales, PROARCA

Copy to : Liliana Gil, PDM, USAID/G-CAP

Copy to : Michael Kerst, LAC/CAM

Copy to : Michael Donald, REA, Central America

Copy to : IEE File

Attachment: IEE

**INITIAL ENVIRONMENTAL EXAMINATION**

**Country:** Central America

**Title:** SO 6 Improved Environmental Management in the Mesoamerican Biological Corridor

**IEE REFERENCE NUMBER:**

**DURATION:** Through September 2004

**LOP FUNDING:** \$125,000

**IEE PREPARED BY:** Roberto Morales  
Anne Dix

**RECOMMENDED THRESHOLD DECISION:** Negative Determination with conditions

**DATE PREPARED:** March 31, 2004

**RECOMMENDATION FOR THRESHOLD DECISION:**

Pursuant to Section 216.2(a) of A.I.D. environmental procedures, environmental analysis/evaluation is required for new projects, programs or activities authorized by A.I.D. The attached information describes a pilot activity to be developed under the PROARCA program.

LAC IEE-01-13 issued a Deferral for activities related to solid waste management (landfills) that may have an adverse impact on the environment. It also established, that Supplemental IEEs shall be submitted for LAC BEO approval for any activity not specifically covered in the IEE.

The proposed activity is a pilot study to recover methane gas from the El Trebol dump in Guatemala City, to evaluate the feasibility of generating electricity and to advise the Municipality of Guatemala in the proper design of a landfill gas extraction and recovery system to collect uncontrolled landfill methane and other air pollutants, thus improving the overall environmental conditions in the area. A Negative Determination with conditions is recommended for this pilot activity.

Concurrence: \_\_\_\_\_  
Deborah Kennedy Iraheta, USAID/ G-CAP, Mission Director, a.i.

Date: \_\_\_\_\_

## **METAHNE TO ELECTRICITY PROJECT**

### **A. Background**

The City of Guatemala disposes its solid waste in an open dump located in the center of the City. The lack of proper management has created a hazard for the dense population living in the vicinity, due to the emission of landfill gas, composed of methane, carbon dioxide, and non-methane organic compounds into the air as a result of the organic waste decomposition. In addition, landfill gas is a source of odor and a potential explosive hazard.

- a) The daily amount of waste disposed is in the range of 1,200-1,500 metric tones.
- b) The amount of waste estimated to be in place at the dump by 2004 is of more than 4 million metric tones, with a estimated landfill gas flow of 58 m<sup>3</sup> per minute.

A preliminary study was proposed in 2000 to evaluate the potential use of the Methane Gas for electricity generation. Through an Agreement with one of the DOE National Laboratories, USAID/G-CAP provided funds to The National Energy Technology Laboratory to conduct a pre-feasibility analysis, which demonstrated that the project was feasible and financially sound.

The study was presented at the Conference on Renewable Energy in Houston, Texas and later in Rio de Janeiro. A number of private investors have shown interest in the project, but the absence of a complete feasibility study has made difficult for them to commit themselves to the project.

Following up with the project, USAID/G-CAP through PROARCA has requested USEPA Landfill Methane Outreach Program to perform a more detailed landfill recovery and utilization assessment.

### ***B. Description***

The objective of the assessment project is to obtain useful data regarding typical methane gas quantity, gas generation rates, basic gas quality and composition, and solid waste composition within the landfill. The goal of the data collected should be sufficient for the preparation of a conceptual landfill gas extraction and utilization engineering design plans, and an economic feasibility assessment. Additionally, the data should be adequate to be utilized by the municipality of Guatemala City and the landfill land-owner to entice investment in developing a landfill methane gas recovery and utilization project.

The USEPA team, in close collaboration with USAID, will undertake the following steps to advance the work and share the results of the key findings with a Working Group and Stakeholders, as applicable:

1. Prepare an outline of specific activities to be undertaken and a timeline indicating completion dates for activities and key milestones.
2. Utilize the Mexico Landfill Gas Model to evaluate the methane generation and recovery potential from the El Trebol landfill. The Mexico LFG Model was recently developed under a joint AID/EPA project to adapt the USEPA LANDGEM model (LFG generation/recovery) to Mexico solid waste circumstances—Mexico’s solid waste characteristics are representative of Guatemala’s solid waste circumstances. Based on modeling outputs EPA will recommend suitable gas recovery and combustion system options (flare or utilization or both) for the landfill site.
3. Assess the engineering and economic feasibility of utilizing methane gas generated at the El Trebol landfill utilizing economically feasible reciprocating engines, turbines, direct thermal, or other energy recovery technologies suitable to developing country settings. In addition, the feasibility assessment will address potential longer-term sustainable development options for the site including, economic development and community benefits e.g., in-country LFG technician training. The final feasibility analysis report can be circulated to investment groups and used by the City to develop an RFP for an landfill gas energy project. Once the feasibility analysis is circulated or issued as an RFP, the selected investment group would be able to use the feasibility analysis as the baseline for engineering design of a comprehensive landfill gas extraction system and utilization project. The benefit of the upfront work to develop the feasibility analysis including the pump test is that investor groups will have a better understanding of risks associated with the project.
4. Install three gas recovery wells at the El Trebol landfill (includes well drilling, installation of well and collection piping, connection of a blower, and gas sampling and monitoring). The installation of the recovery wells is to conduct a “pump test” to collect waste composition and moisture content analysis on waste that is extracted in the drilling of the gas wells. In addition, landfill gas will be extracted to measure quantities (i.e., gas flow) and composition of the landfill gas generated in the landfill. The data will be used to determine the engineering and economic feasibility of the installation of a pilot- and full-scale landfill gas recovery and utilization system at the El Trebol landfill. Note: proposed pump test is based on the assumption that costs for construction will be relatively consistent with costs for similar projects in the U.S. (See Appendix B for a detailed explanation of a typical landfill gas pump test and U.S. EPA responsibility areas).
5. Develop two interim reports and a final report to be submitted to USAID and the Working Group. The reports will address methodologies, engineering and economic considerations at the El Trebol landfill. The first report will consist of a pump test plan. Based on pump test results, a second report will document basic waste characteristics, gas sampling data collected from the site, quantification of landfill gas generation and recovery potential at the site, and preliminary recommendations for a

LFG recovery and utilization project. A third and final feasibility assessment report will include engineering and economic considerations in the development of a pilot- and full-scale LFG recovery and utilization project.

- 6. Organize and conduct a one day workshop in which the results of the assessment project will be presented to stakeholders, including Working Group members and other organizations interested in landfill gas utilization in the Latin American region. A primary outcome is to attract investment in developing a LFG project at the El Trebol landfill. The workshop is tentatively scheduled for [TBD] 2004 in Guatemala City.**

**Determination** : Negative Determination with conditions that the U.S. EPA engineering scope of work will include the following:

1. Prior to the procurement of the construction services, the engineers will develop plans and specifications for the well drilling and gas collection system.
2. The project team will coordinate with the Guatemala City government and USAID regarding the procurement of construction services for the well and gas collection system; the proposed schedule for the well installation; and the arrangements needed to relocate filling activities away from the area in which the pump test will be conducted.
3. Prior to drilling, the engineers will field-locate drilling locations.
4. During the drilling and construction of the wells, the engineers will provide construction oversight, training, and quality control.
5. During drilling, the waste characteristics will be recorded, including type of waste encountered and relative percentages of each category (i.e., percent paper, plastic, wood, glass, etc.), degree of decomposition, approximate moisture content, and temperature of the excavated waste. Special consideration will be paid to layers of refuse in which there is significantly high moisture content. Waste characteristics and moisture content will be used in the modeling. The well logs also will include details of the well construction, including pipe measurements, type of backfill materials used, thickness of backfill layers, and lengths of solid-wall and slotted pipe.
6. After construction, the blower system will be started-up and the wells will be adjusted. These adjustments, which are known as “wellfield tuning” will be conducted by a trained landfill gas technician or engineer. The purpose of the tuning will be to maximize the methane content of the gas. The oxygen concentration will be minimized in order to minimize the potential for a landfill fire. Upon start-up, wellfield tuning is expected to take several hours in order to stabilize gas flows and concentrations. However, once the system has run for several days, the adjustments to wellheads should diminish.

7. During the two-week pump test, gas quality (i.e., percent methane, etc.), temperature, vacuum, and flow rate at each well and the blower inlet piping will be monitored and recorded at least twice per day. The discharge pressure from the blower will also be monitored. During the start-up period, and on an as-needed basis, monitoring may be conducted more frequently. The discharge pressure at the blower and other pertinent data will also be recorded during each monitoring event. The gas technician will make adjustments to the wellfield as necessary in order to attempt to stabilize gas extraction and prevent overpulling of the wells.
8. Data collected during the test will be compiled, evaluated, and incorporated into the models that will be used to estimate the potential landfill gas recovery rate from the site. The pump test data will allow the engineers to refine the computer model to the site-specific conditions witnessed during the testing, which will result in a more realistic estimate than might otherwise be obtained.
9. During drilling and pump test USEPA Team will instruct the Municipality and the Private Contractors about all kind of precautions that must be taken to avoid damage to the people living in the surrounding areas.

**The Guatemala City or private contractor construction scope of work will include the following:**

1. Installing three landfill gas extraction wells in the approximate location shown on Figure 1. The wells will be installed in a manner consistent with standard practices of the landfill gas industry in the United States. Figure 2 shows a typical well cross-section detail.
2. Each well will be fitted with a wellhead that includes monitoring ports, gate valve, and flow measurement components, such as a pitot tube or orifice plate.
3. Below ground lateral piping will be installed to connect each well to the temporary blower station. The piping will be installed in such a way to facilitate drainage of condensate in the gas back into the landfill. The lateral piping will be connected to a blower that will be installed in a secure location with a fenced enclosure (type and size to be determined) to house the blower. The blower will exhaust the collected landfill gas to the atmosphere through a short vertical stack.
4. After completion of the test, the wellheads, blower, any pumps, and above grade piping will be provided to the City for future use.
5. The Municipality will provide security to prevent vandalism to the installed equipment.

With these mitigations it is considered that the activity should have a net beneficial impact on the environment and result on an improvement in the way the dump is currently managed.

Clearances:

Michael Donald, REA

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Anne Dix, PROARCA

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Liliana Gil , PDM

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