

# MSW PROJECT OPPORTUNITY

## San Pedro Municipal Landfill

### San Pedro Sacatepéquez, San Marcos, Guatemala

#### Project Owner

#### OVERVIEW OF MSW PROJECT:

San Pedro Municipal Landfill, which began filling in 2012, is owned by Municipality of San Pedro Sacatepéquez. The landfill is a sanitary type of landfill with a designed area of waste placement totaling 1.5 hectares but with more than 10 adjacent hectares for future growth. Currently, there are 12,000 tonnes of waste in place with an average waste depth of 8 meters. The designed landfill capacity is 150,000 cubic meters and is expected to close in 2022 with an estimated 85 % of municipal wastes in place.

**TYPE OF PROJECT:** LFG Flaring and Direct Use for Waste Incineration

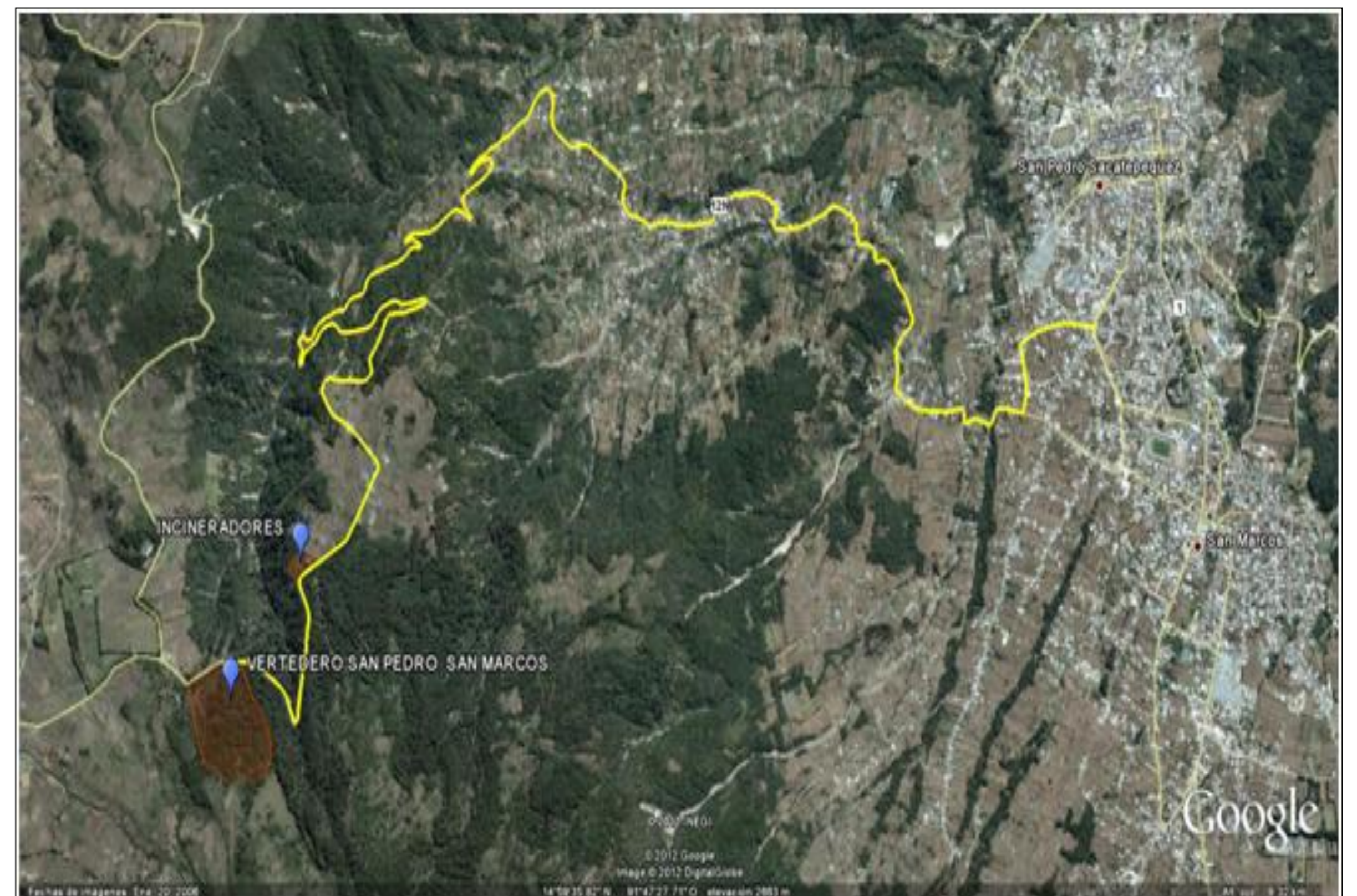
**PROJECT START DATE AND/OR SCHEDULE FOR COMPLETION:** March 2014 – March 2015

**ESTIMATED AVERAGE ANNUAL EMISSION REDUCTIONS:** 4,407 MTCO<sub>2</sub>E

#### PROJECT HIGHLIGHT(S)

This project has overcome the main obstacle to develop LFG recovery projects, which is local government and/or site operator understanding of the social and environmental benefits that may result from the project development. This is the result of previous training and involvement from the authorities in a landfill gas monitoring project carried out by a local NGO, from which the data were obtained.

The site is surrounded by forest and municipal properties where it may expand. There is a waste incineration plant currently using diesel, nearby (less than 2 miles), where almost 15% of the municipal waste is being reduced to ashes, one of the 2 small incinerators can be adapted to use biogas and therefore makes it a convenient direct use installation.



**DISCLAIMER:** The information and predictions contained within this poster are based on the data provided by the site owners and operators and site visits conducted by U.S. EPA. The Global Methane Initiative (GMI) cannot take responsibility for the accuracy of these data. It should be noted that conditions on landfills will vary with changes in waste input, management practices, engineering practices, and environmental conditions (particularly rainfall and temperature). GMI does not guarantee the quantity or quality of available landfill biogas from the landfill site, which may vary from the values predicted in this report.

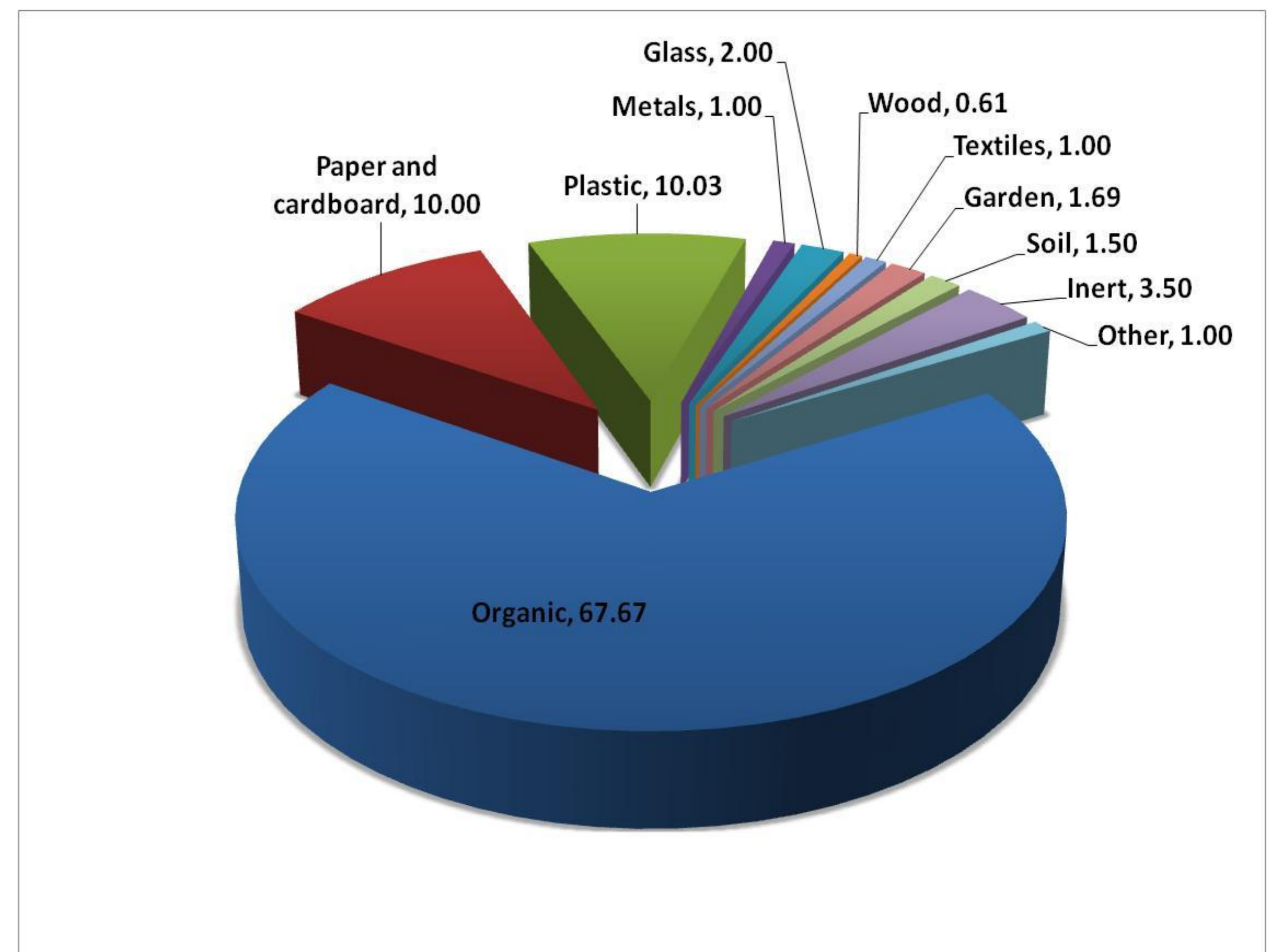
# LANDFILL GAS AND ENERGY POTENTIAL

Under contract to Fundación Solar (NGO), Servicios Carvel estimated the amount of biogas generated by the San Pedro Landfill using the EPA and IPCC models. Model input data for the preliminary assessment of a landfill methane capture and use project were provided by the municipality and collected during our site visits in August to November 2012.

## Other Landfill Physical/Operational Data

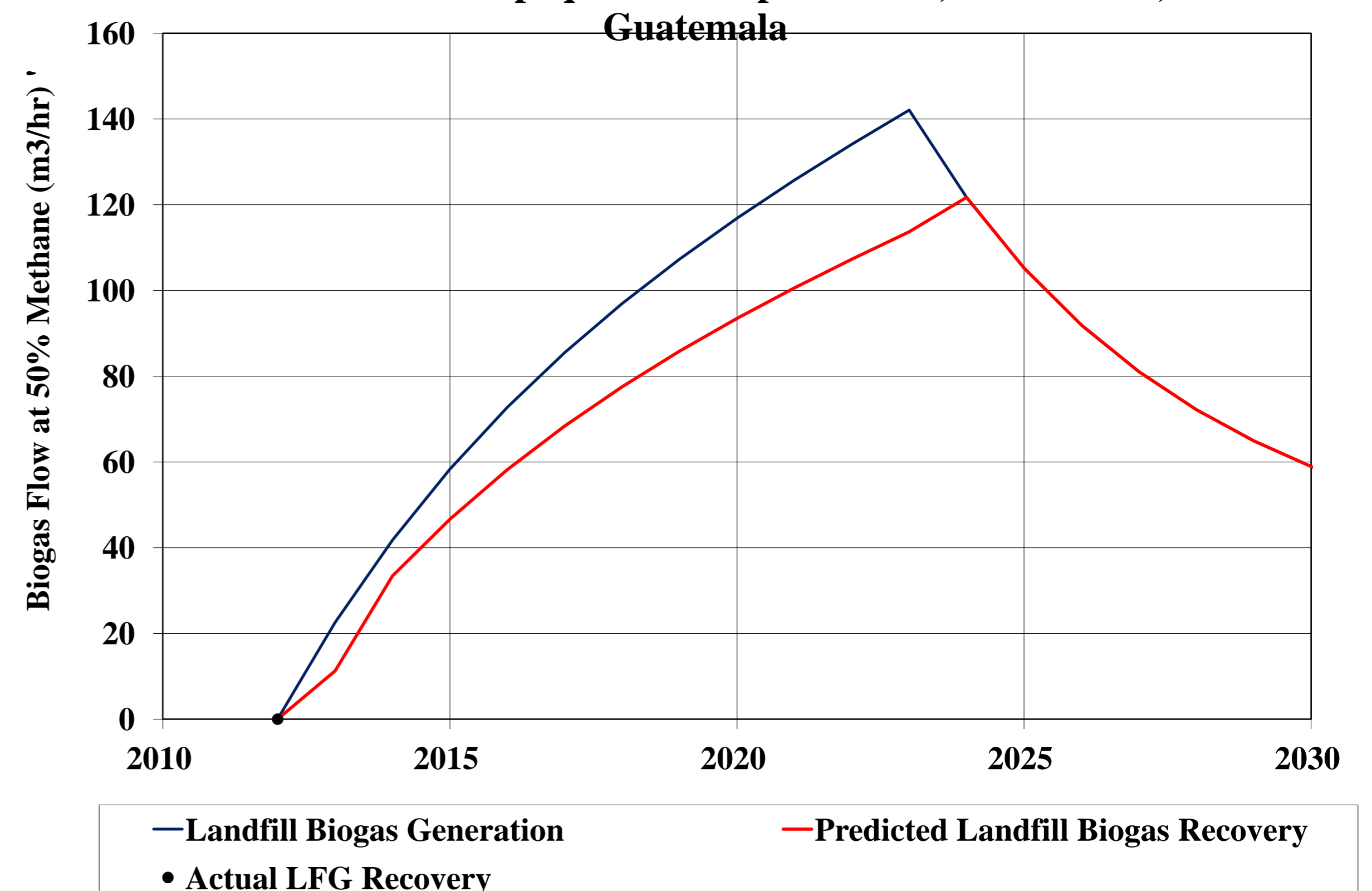
- Quantity of waste generated annually: 18,000 tonnes
- Quantity of waste collected per day: 35 tonnes
- Quantity of waste accepted annually: 18,000 tonnes
- Quantity of waste generated per capita: 0.65 kg
- Daily cover is applied: on a weekly basis
- Landfill site is capped with soil
- Landfill is lined with plastic
- Waste compaction is performed daily
- Landfill gas collection and control system: 2 passive venting wells installed
- Number of vertical or horizontal wells: one of each
- Average depth of wells: 7 meters
- Leachate management: accumulating in standing pools

## WASTE COMPOSITION DATA (%)



## LANDFILL GAS GENERATION AND RECOVERY PROJECTION GRAPH

Figure 1. Biogas Generation and Recovery Projection San Pedro Sacatepéquez municipal landfill, San Marcos, Guatemala



### Biogas Modeling Inputs:

- CH<sub>4</sub> generation potential (Lo): 89 m<sup>3</sup>/Mg
- CH<sub>4</sub> generation rate constant (k):  
0.23 for fast-decay organic waste (e.g., food)  
0.10 for medium-decay organic waste (e.g., paper)  
0.03 for slow-decay organic waste (e.g., rubber)
- Percent methane: 53%
- Gas availability factor: 80%

Values for these modeling variables have been developed based on the waste composition data, average annual precipitation at San Pedro Landfill, and the results of a monitoring test conducted in October 2013. It is not feasible to collect all the gas generated at the site for flaring or energy recovery, given site conditions and collection system limitations. Therefore, the amount of recoverable biogas was estimated by applying a gas availability factor to the results of the biogas generation model.

**Recoverable Biogas = 80% Landfill Area Available for Gas Collection x 80% Gas Collection Efficiency = 80%**

## PROJECT ECONOMICS

Estimated Cost: US\$700,000  
 Operation & Maintenance (US\$/year): US\$35,000  
 Estimated electricity offsets (US\$/year): 0

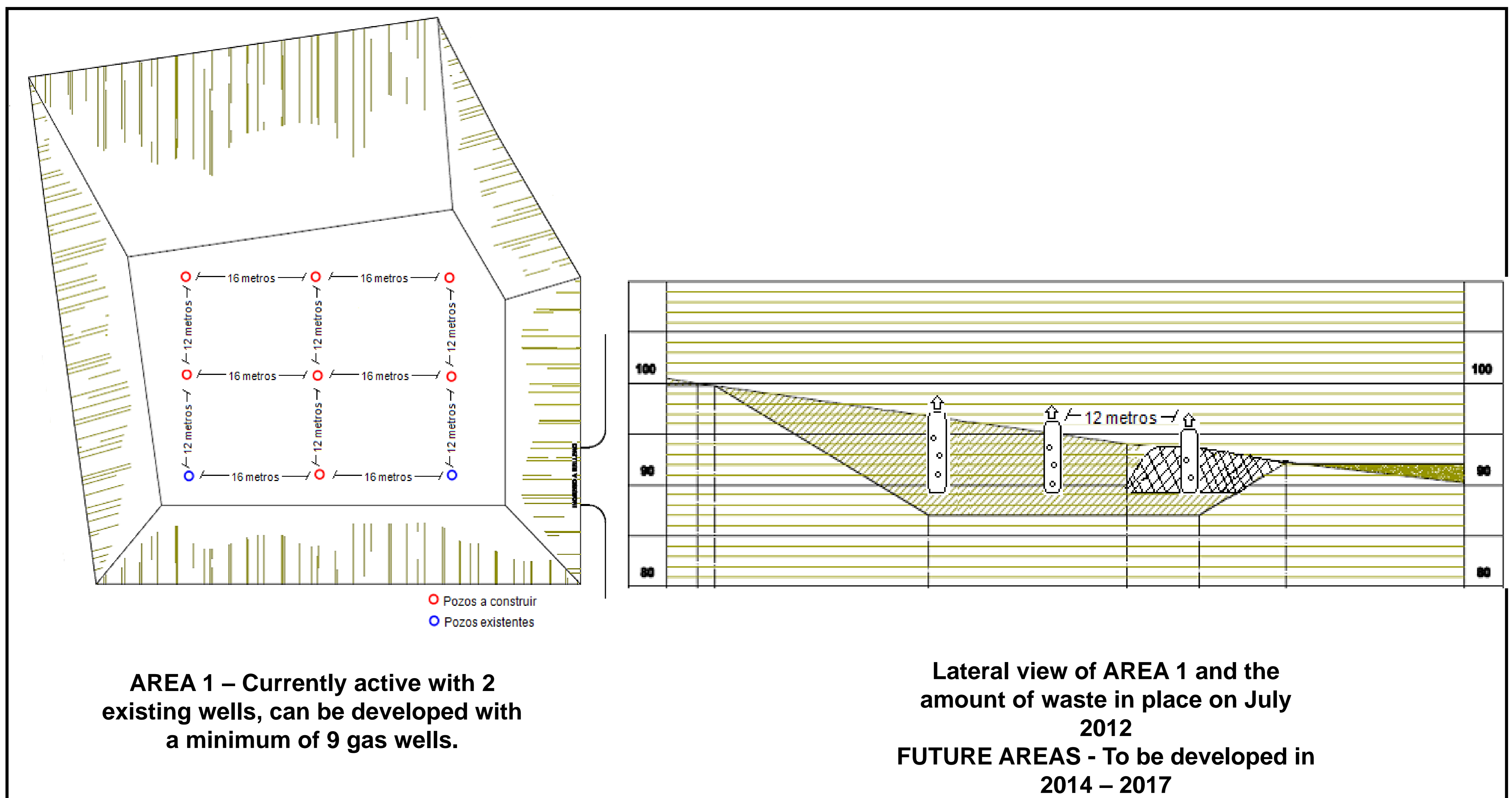
Estimated heating/other benefits (US\$/year): US\$25,000  
 Other revenue streams: None  
 Estimated payback period: 3 years

## ENVIRONMENTAL BENEFITS

Assuming that a gas collection and flaring system is installed in 2015, this landfill gas capture project has the opportunity to collect and destroy an average of half million cubic meters of methane annually over the next 7 years. This is equivalent to average emission reductions of more than 4,407 tonnes of CO<sub>2</sub> annually.

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Tonnes CO <sub>2</sub> eq from Flaring and Direct Use Activities	0	0	2441	2966	3462	3933	4381	4807	5214	5604	5979	5233	4806	4415	4055

## PROPOSED LANDFILL BIOGAS COLLECTION SYSTEM



## FOR MORE INFORMATION

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