



# **ENVIRONMENTAL MANAGEMENT PLAN**

## **Montalban Methane Power Corporation - Rizal Provincial Sanitary Landfill Methane Recovery and Power Generation Project**

**PoA Ref. # 6707 – Landfill gas recovery and combustion with  
renewable energy generation from sanitary landfill sites under Land  
Bank of the Philippines Carbon Finance Support Facility**

September 2018

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## I. OVERVIEW OF THE PROJECT AND PURPOSE OF DOCUMENT

The Rizal Provincial Sanitary Landfill (RPSL) is a state-of-the-art sanitary landfill situated in the municipality of Rodriguez, Rizal. It is one of the three disposal sites in Rodriguez together with Montalban Solid Waste Disposal Facility (MSWDF) and Green Leap Sanitary Landfill (GLSL). GLSL site is presently under development while MSWDF, the disposal site that previously caters solid wastes from several cities of Metro Manila has been non-operational since 2007 because of full-capacity. The closure led to the start of operation for RPSL so that incoming solid wastes from Rodriguez and Metro Manila can continuously be accommodated. As per DENR, RPSL meets or exceeds the requirements of Republic Act 9003 or the Philippine Ecological Solid Waste Management Act of 2000. Currently, this sanitary landfill is under full-operation. The International Solid Waste Integrated Management Specialist, Inc. (ISWIMS) serves as the private owner and operator of the disposal areas.

To mitigate anticipated impacts of methane production associated with the operation of a sanitary landfill, installation of a landfill methane recovery and power generation facility in RPSL (the Project) was undertaken by Montalban Methane Power Corporation (MMPC). Correspondingly, installation of said facility serves as an integral part of the design concept of the sanitary landfill as stipulated in the Environmental Compliance Certificate (ECC) of RPSL issued by Department of Environment and Natural Resources – Environmental Management Bureau (DENR-EMB) on July 20, 2012 with reference number ECC-R4A-1206-0227. Hence, the Project completes the required facilities of the sanitary landfill while simultaneously complying with the environmental regulations of the country.

MMPC, a company that engages in capturing, recovering, harnessing and appropriating various gases emitted from solid/liquefied wastes deposited in a landfill, stands as the owner and implementer of the Project. The company provides the technical capabilities to collect landfill gas (LFG) in RPSL and use it to generate electricity through installing gas collection wells and piping network, power generation system and flare.

The primary objective of MMPC upon its foundation in 2007 is to engage projects in the Clean Development Mechanism (CDM) scheme of the Kyoto Protocol, an international agreement linked to the United Nations Framework Convention on Climate Change that commits UN participating countries by setting internationally binding emission reduction targets. September 22, 2016 marks the day that the Project was officially registered as a CDM Program of Activity (PoA) with reference number CPA 6707-0002.

The Project will generate approximately 8.19 MW of energy during the 10-year period of its operation. The sites included in the Project include: the existing RPSL cell of 19 hectares that is currently receiving wastes and is expected to close in 2017; and a possible extension of the 50 hectares of GLSL site. Therefore, the project area covers approximately 69 hectares in total. For identification purposes, the 69-hectare project site is named as RPSL in this document.

This Environmental Management Plan is prepared as part of the requirements of the Safeguards Framework for CDM projects implemented under the Carbon Finance Support Facility of the Land Bank of the Philippines (LBP), under which this Methane Recovery and Power Generation Project is to be applied. The Safeguards Framework was developed for ensuring establishment of protection, compliance, and mitigation measures for relevant environmental and social aspects for projects included, specifically for methane recovery from the livestock wastewater treatment and municipal solid waste management projects.

## I.1. LOCATION AND AREA

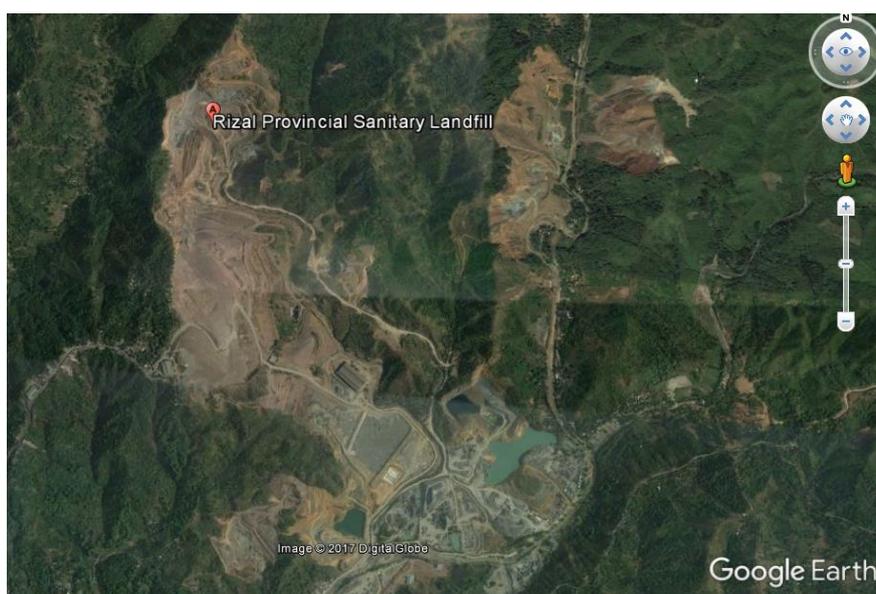
The RPSL is situated in the municipality of Rodriguez (commonly known as Montalban), the northernmost town of Rizal province. Rodriguez has a total land area of 312.7 km<sup>2</sup>, eighty-three percent (83%) of which is composed of upland areas, hills and mountain ranges. Approximately 50 km northeast of Manila lies MMPC's methane recovery and power generation facility which is specifically located at Sitio Lukutan Munti, Barangay San Isidro, Rodriguez, Rizal. Geographic coordinates is at 14° 46'47" N and 121° 9'13"E (equivalent to 14.779722 latitude and 121.153611 longitude in decimal degrees).<sup>[1]</sup>

Figure 1 shows the location of the project in the province of Rizal and municipality of Rodriguez. Specific location of the project is shown in the satellite image provided in Figure 2.



**Figure 1. Vicinity map showing the location of Rodriguez, Rizal**

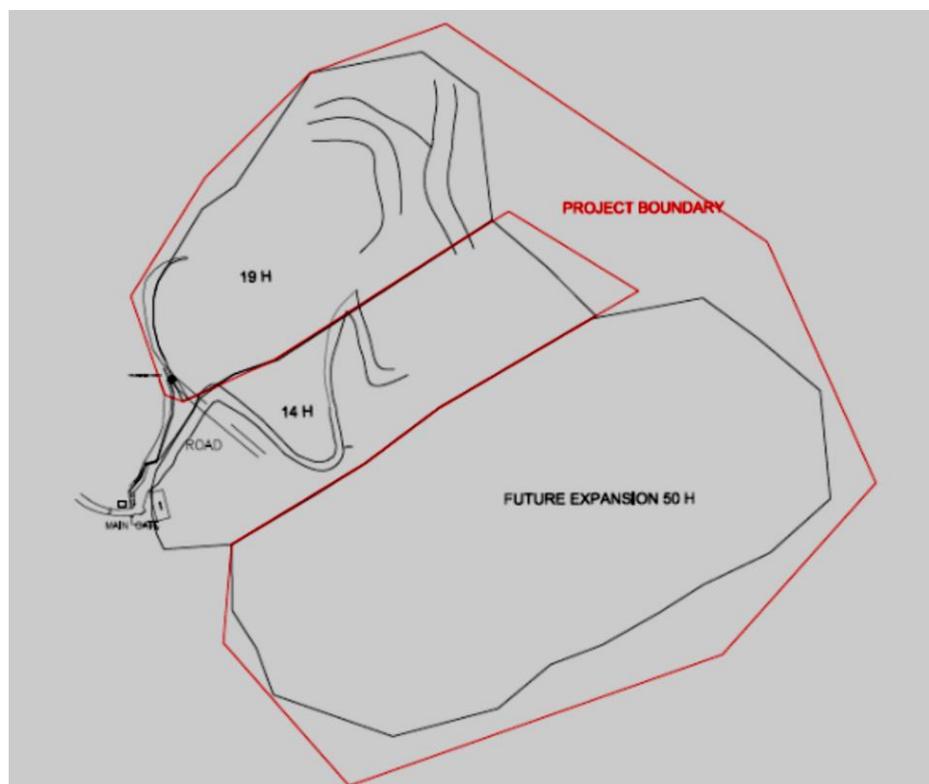
Source: Rodriguez, Rizal. (2017, May 4). In Wikipedia, The Free Encyclopedia. Retrieved 15:03, May 7, 2017, from [https://en.wikipedia.org/w/index.php?title=Rodriguez,\\_Rizal&oldid=778600066](https://en.wikipedia.org/w/index.php?title=Rodriguez,_Rizal&oldid=778600066)



**Figure 2. Satellite image of Rizal Provincial Sanitary Landfill**

Source: "Rizal Provincial Sanitary Landfill." 14°47'8.63"N and 121° 9'12.07"E. GOOGLE EARTH. October 25, 2016. May 7, 2017.

RPSL is one of the three disposal sites in Rodriguez, Rizal along with Montalban Solid Waste Disposal Facility (MSWDF) and Green Leap Sanitary Landfill (GLSL). As per land area, RPSL, MSWDF and GLSL occupy roughly 19 ha (190,000 sq.m), 14 ha (140,000 sq.m) and 50 ha (500,000 sq.m), respectively (Figure 3).



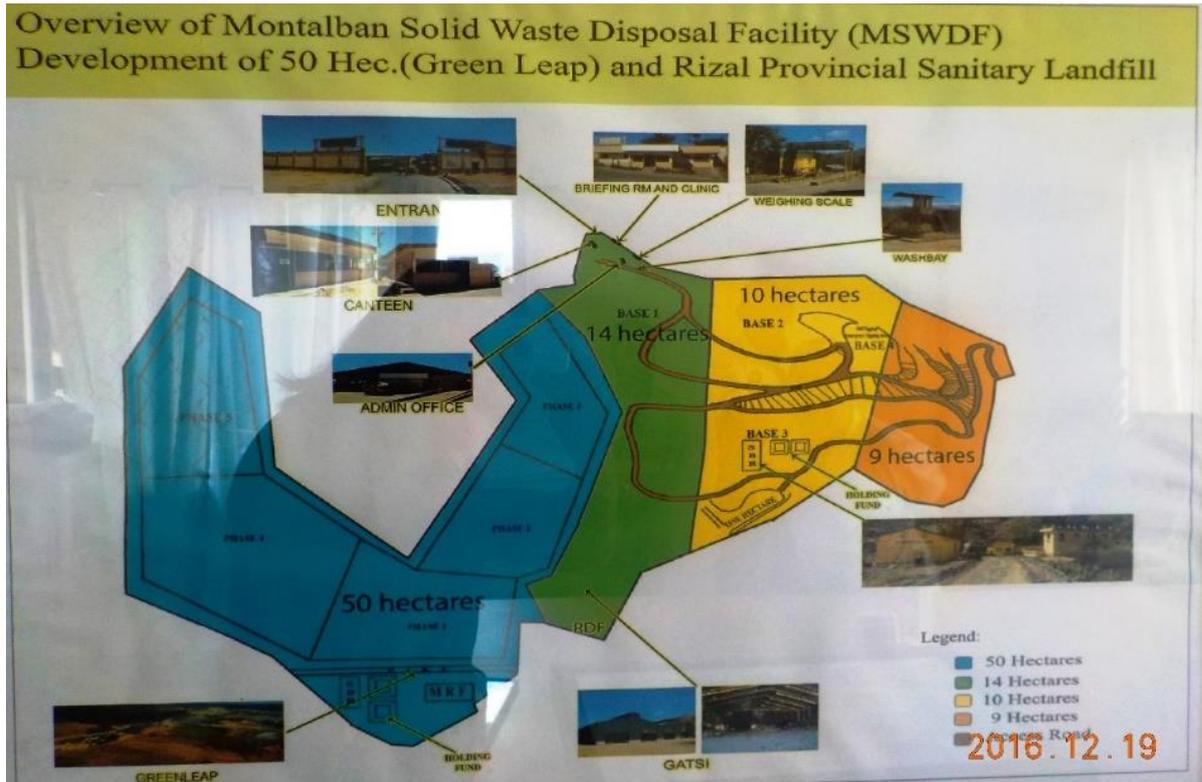
**Figure 3. Layout of RPSL showing the project boundary**

*Source: CPA 6707-002 Landfill gas recovery and combustion with renewable energy generation from Rizal Provincial Sanitary Landfill Project (RPSLP) site under Land Bank of the Philippines Carbon Finance Support Facility CPA Design Document*

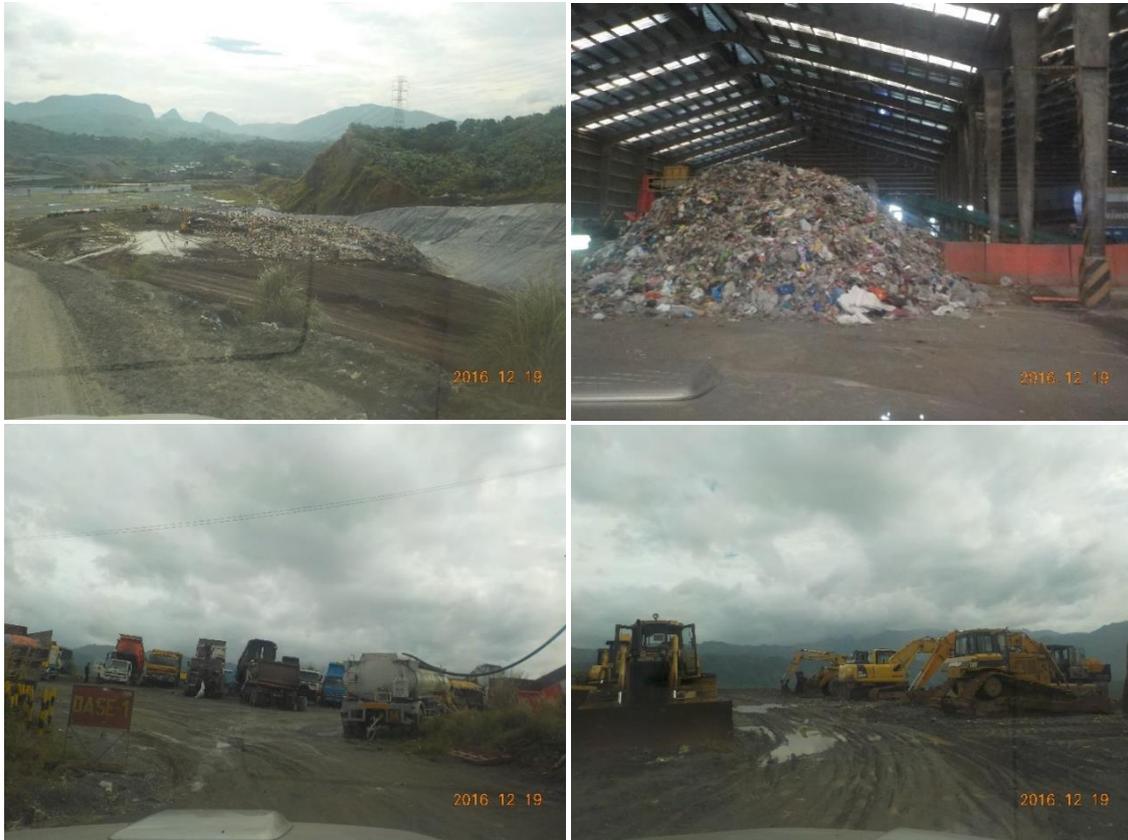
MSWDF started its operation in year 2002 but has since reached its capacity in 2007 leading to the establishment and operation of RPSL. The facility has a capacity of receiving about 3,500 metric tons of wastes per day. On the other hand, GLSL undergoes continuous development as per site assessment conducted by EPMD personnel last December 19, 2016. It was noted that phase 1 of the development is ready for garbage disposal which can cater about 3,500 metric tons of waste per day. In present operation, the entire landfill receives 4,000 metric tons of solid wastes per day. Layout of the disposal sites is shown in Figure 4.

The sites included in the project are: the existing 19 ha cell of RPSL, which is expected to close in 2017; and the 50 ha (GLSL) possible extension of the landfill. Altogether, this CDM-registered PoA accommodates solid wastes received/will be receiving from the 69-ha landfill in total. Actual images of the sanitary landfill are shown in Figure 5.

ISWIMS, which was incorporated in 2003 operates the sanitary landfill. In regular operation, ISWIMS and representatives from Metro Manila Development Authority (MMDA) jointly evaluate incoming solid wastes in the disposal site.



**Figure 4. Layout of the three disposal sites (RPSL, MSWDF, GLSL) in Rodriguez, Rizal**  
 Source: LANDBANK-EPMD (2016). Environmental Compliance Report No. 012017-0003: International Solid Waste Integrated Management Specialist, Inc.



**Figure 5. Rizal Provincial Sanitary Landfill**

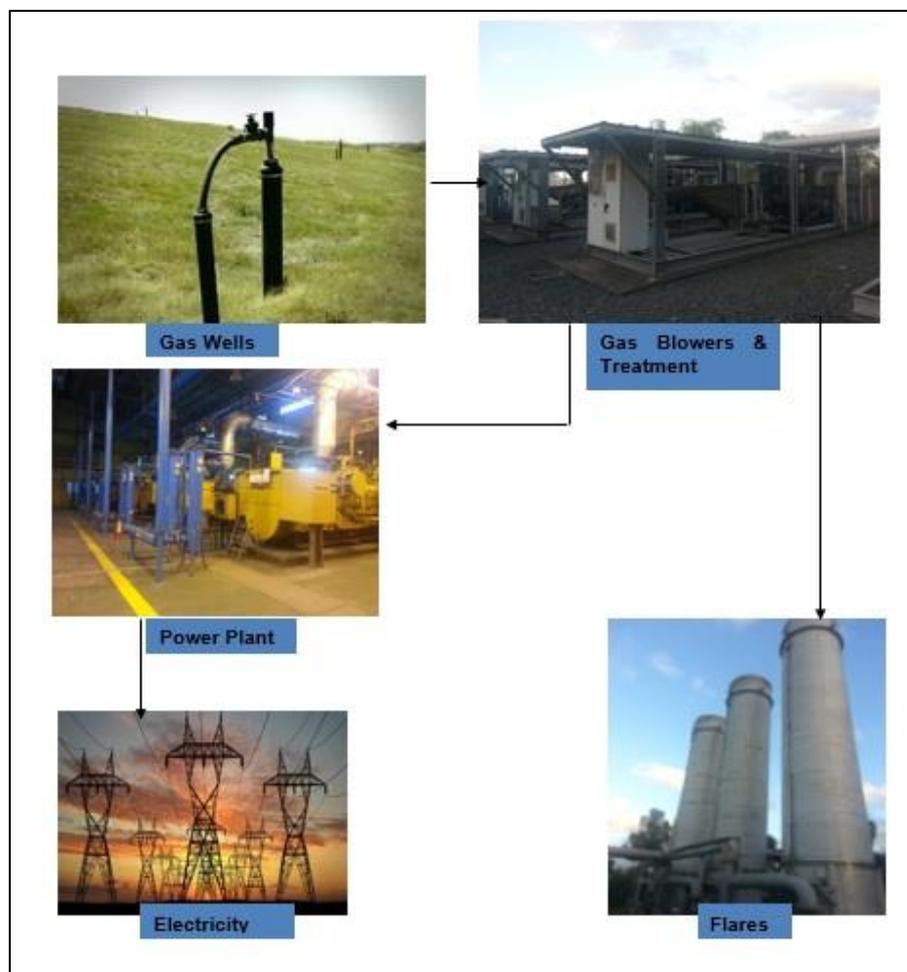
## I.2. PROJECT DESIGN

The objective of the Project is to control and manage landfill gas (LFG), specifically methane ( $\text{CH}_4$ ) generated from the regular operation of the landfill while simultaneously reducing, if not eliminating, emission of methane generated by the disposal site. The Project also reduces incidents involving onsite fires and gas migration to nearby communities.

The components of the facility include the following:

- LFG collection;
- Pre-treatment system for particulates and moisture;
- Electricity generation and grid connection;
- Flaring;
- A monitoring and protection system; and
- Supervisory Control and Data Acquisition (SCADA) system.

The process flow and technical layout of the Project are presented in Figures 6 and 7, respectively.



**Figure 6. Process flow of the methane recovery and power generation facility of MMPC**

*Source: CPA 6707-002 Landfill gas recovery and combustion with renewable energy generation from Rizal Provincial Sanitary Landfill Project (RPSLP) site under Land Bank of the Philippines Carbon Finance Support Facility CPA Design Document*

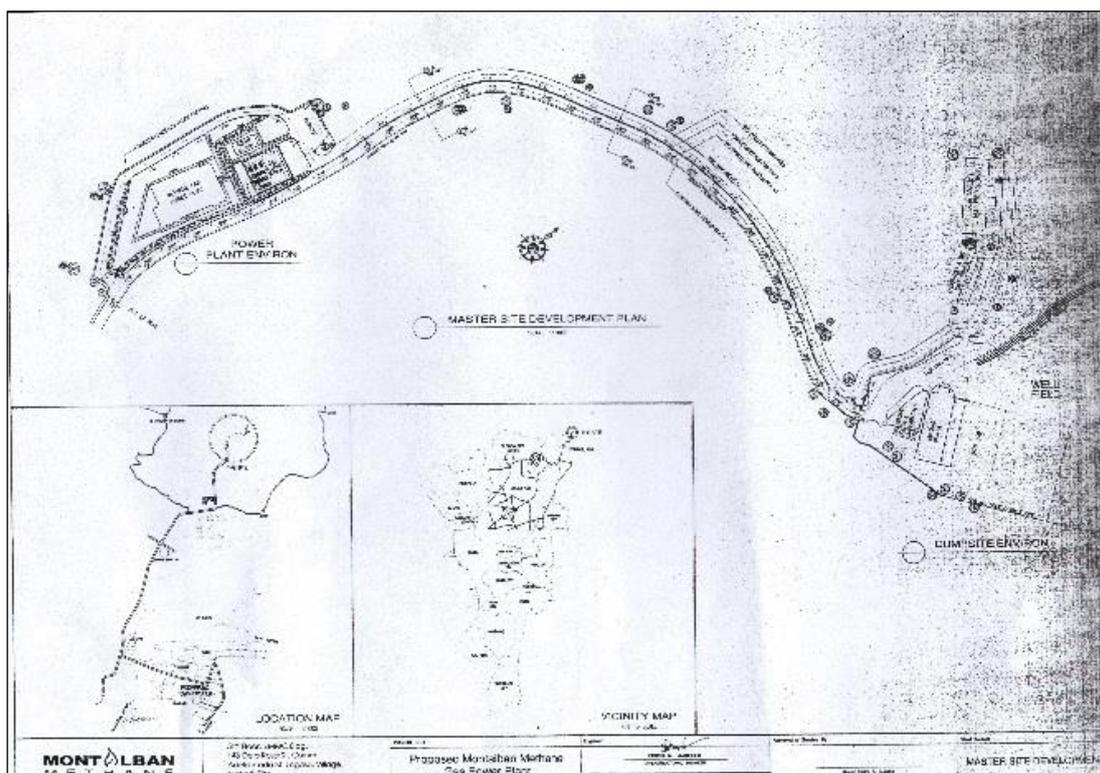


Figure 7. Project technical layout

### I.3. PROJECT COMPONENTS, OPERATIONS AND MONITORING

An LFG system consists of a network of wells interconnected by pipes, a gas treatment, gas engines and enclosed flares, and a supervision system. In addition, a cover is usually installed over the waste in order to optimize the landfill gas collecting rate. A low pressure is created in the system, in order to generate suction for the extraction of the LFG.

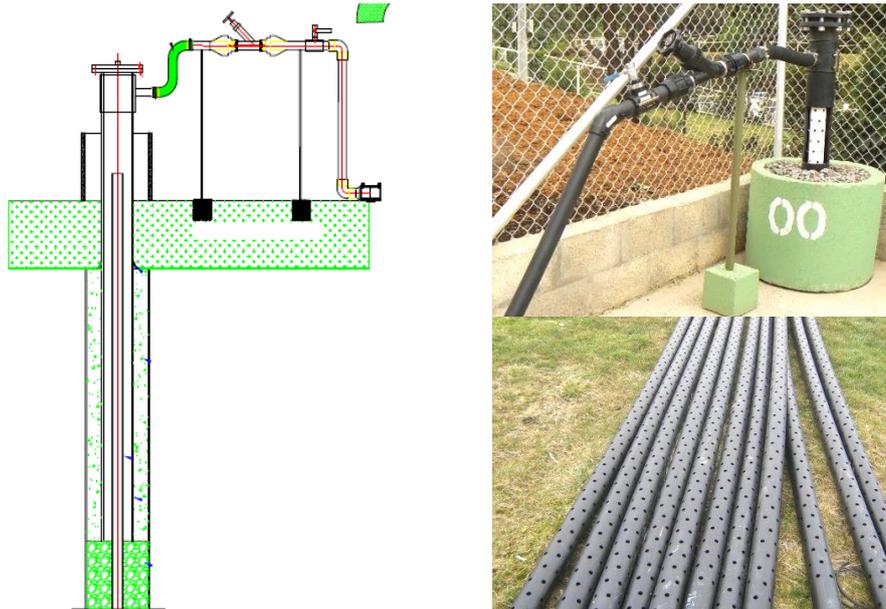
The main components of an LFG recovery and destruction system are:

- A. **Gas collecting network.** Vertical wells are drilled vertically to a depth of around 20 to 25 meters. Perforated pipe material is HDPE (High Density Polyethylene) to allow maximum flexibility and no collapsing.



Figure 8. Piped vertical wells of the gas collecting network

Source: World Bank-Carbon Finance (2014). CDM Operations Plan for a Landfill Gas Plant Under Program of Activities: PoA Ref. #6707 (Appendix 1)



**Figure 9. Layout of vertical well in the gas collecting network**

Source: World Bank-Carbon Finance (2014). CDM Operations Plan for a Landfill Gas Plant Under Program of Activities: PoA Ref. #6707

The wellhead is a primary tool for the control of landfill gas extraction on a landfill. Control valves on the gas wells and collection lines allow the regulation of the network.

LFG is saturated with vapor. As the gas cools in the piping of the collection system, the vapor condensates into droplets that become entrained in the gas flow. Eventually, the droplets combine and pool as LFG condensate. The accumulation of condensate in LFG pipelines can obstruct and in some cases completely block the flow of gas. This can lead to surging in the gas lines, making the control and tuning of the collection system difficult. Therefore, the LFG condensate must be removed in a controlled manner. Condensate control begins at the recovery system, where sloping laterals and headers are used to provide drainage into condensate traps and knock out pots, where it is drained back into the landfill.

## B. Gas Plant



**Figure 10. Gas plant**

Source: World Bank-Carbon Finance (2014). CDM Operations Plan for a Landfill Gas Plant Under Program of Activities: PoA Ref. #6707

- **Heat Exchanger and Condensate Knock out Pot.** At the Gas Plant, the landfill gas is cooled through a heat exchanger to further remove the moisture. A knock out pot separates the condensate and the landfill gas, and is located before each blower.



**Figure 11. Heat exchanger and condensate knock-out pot**

Source: World Bank-Carbon Finance (2014). CDM Operations Plan for a Landfill Gas Plant Under Program of Activities: PoA Ref. #6707

- **Blowers.** The blowers are used to generate and apply the vacuum to collect LFG and supply to the power generation system and/or flare.

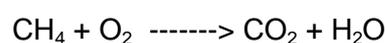


**Figure 12. Blowers**

Source: World Bank-Carbon Finance (2014). CDM Operations Plan for a Landfill Gas Plant Under Program of Activities: PoA Ref. #6707

- **Flare Stack.** This equipment is designed to destroy the LFG. High-temperature flaring of LFG results in the conversion of methane components of the LFG to carbon dioxide and water. High-temperature combustion ensures that the trace compounds in LFG are largely destroyed.

The methane content in LFG is oxidized and converted into CO<sub>2</sub> as follows:





**Figure 13. Flare stack**

Source: World Bank-Carbon Finance (2014). CDM Operations Plan for a Landfill Gas Plant Under Program of Activities: PoA Ref. #6707

C. **Gas Engines.** Equipment for electricity generation includes:

- Generating set, including engine(s), alternator, compressor and control panel
- Electrical substation, including switching gear and electricity metering equipment to facilitate the connection to the grid
- Transformer



**Figure 14. Gas engines**

Source: World Bank-Carbon Finance (2014). CDM Operations Plan for a Landfill Gas Plant Under Program of Activities: PoA Ref. #6707

D. **CDM Instruments.** The LFG plant is equipped with measuring instruments, which allow a safe control of the operations, in particular by triggering alarms and notifying the plant personnel in case of unusual event.

In addition to the control and safety devices, the LFG plant is equipped with the necessary instruments for monitoring of emission reductions and indeed claiming CERs. The CDM instruments will require particular attention in terms of maintenance and calibration. The instruments required to monitor the CDM parameters are presented in the tables below:

**Table 1. Instruments for monitoring amount of methane collected**

Instrument	Data Monitored	Remarks
Gas analyzer	Fraction of CH <sub>4</sub> in LFG  Other gases (CO <sub>2</sub> and O <sub>2</sub> ) are measured in the LFG, for operational purposes	<ul style="list-style-type: none"> <li>▪ Main measurement: linear relation between CH<sub>4</sub> concentration and ER</li> <li>▪ Highly sensitive instrument: high deviations might be observed during calibration</li> <li>▪ Regular internal calibration should be carried out to avoid deviations</li> <li>▪ Ensure there is enough gas test available on site for calibration</li> <li>▪ Cells are fragile and sensitive to humidity</li> <li>▪ Cells need to be cleaned regularly</li> <li>▪ Best practice: Keep spare cells available on site: no cell → no CERs</li> </ul>
Flow meter (electricity)	Amount of LFG captured and used for power generation	<ul style="list-style-type: none"> <li>▪ Measure of flow is done in the same basis as methane concentration (wet basis)</li> <li>▪ Installed type:</li> <li>▪ Differential pressure: a venturi tube measures an averaged differential pressure (DP) signal proportional to the square of the flow rate.</li> <li>▪ Robust and accurate</li> </ul>
Flow meter (flare)	Amount of LFG captured and flared	<ul style="list-style-type: none"> <li>▪ Measure of flow is done in the same basis as methane concentration (wet basis)</li> <li>▪ Installed type:</li> <li>▪ Differential pressure: a venturi tube measures an averaged differential pressure (DP) signal proportional to the square of the flow rate.</li> <li>▪ Robust and accurate</li> </ul>
Pressure sensor	Pressure of the LFG	<ul style="list-style-type: none"> <li>▪ Must measure the gas pressure, not the relative pressure (gauge): LFG pressure = gauge + atmospheric</li> </ul>
Temperature sensor	Temperature of the LFG	<ul style="list-style-type: none"> <li>▪ It is highly recommended to monitor temperature, in order to make sure – and be able to prove – that the temperature remains below 60°C. For CDM, a gas temp</li> </ul>

		<p>&gt; 60°C means that the gas is humid → measure of flow is not in dry conditions</p> <ul style="list-style-type: none"> <li>▪ A high gas temperature can also be caused by the installation, for instance a blower working at full capacity with a low flow will heat the gas</li> <li>▪ Ensure to keep gas temperature below 60°C</li> </ul>
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**Table 2. Instruments for monitoring flare operations/flare efficiency**

Instrument	Data Monitored	Remarks
Thermocouple	Temperature in the exhaust gas of the flare	<ul style="list-style-type: none"> <li>▪ Must be replaced or calibrated at least every year</li> <li>▪ Minimum accuracy required: type N (tolerance class 3 with accuracy <math>\pm 2.5^{\circ}\text{C}</math> or <math>\pm 1.5\%</math> of the measure).</li> <li>▪ Keep spare thermocouple available on site: no exhaust gas temperature → flare efficiency is considered to be 0 → no CERs</li> </ul>

**Table 3. Instruments for monitoring power plant operations**

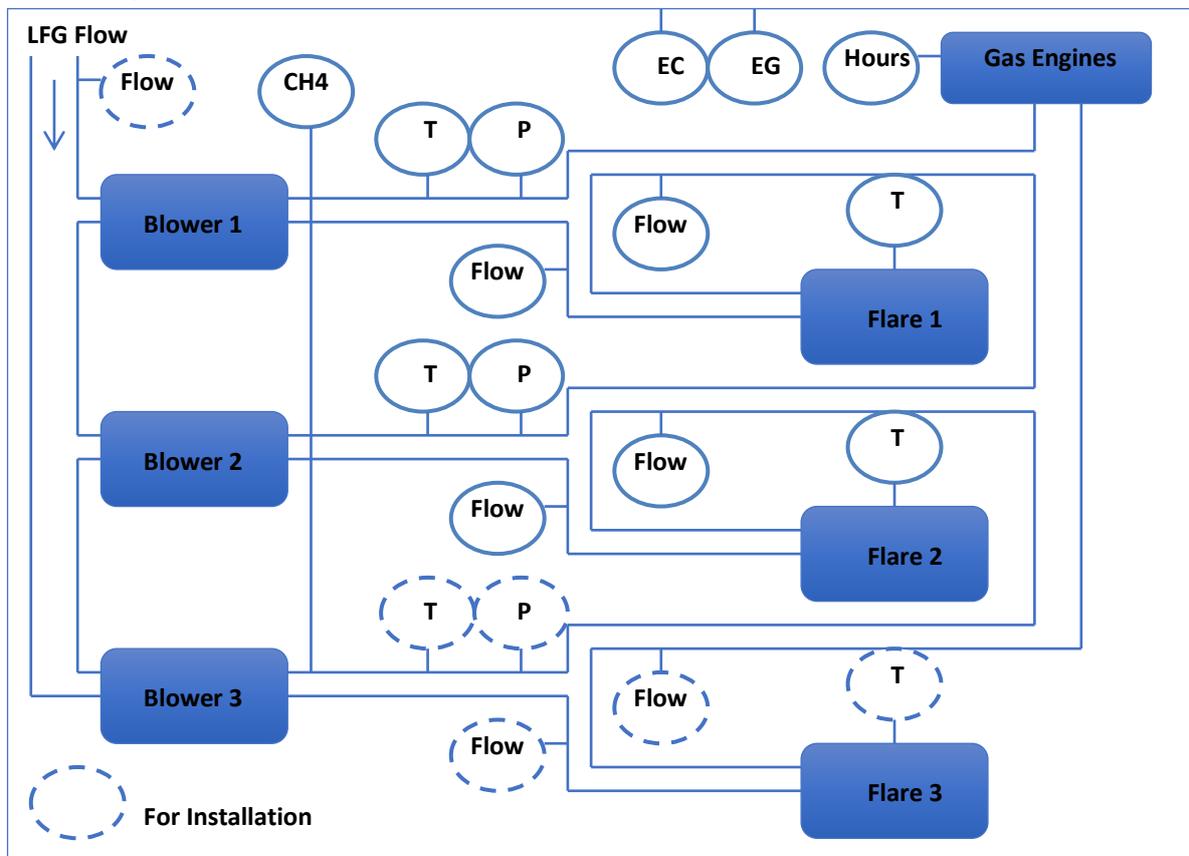
Instrument	Data Monitored	Remarks
Electricity meter (export)	Amount of electricity displaced by the project	<ul style="list-style-type: none"> <li>▪ Monthly meter reading from the grid operator</li> <li>▪ Manual readings are reported at least every week.</li> <li>▪ Keep record of electricity invoices for cross-check purposes</li> </ul>
Hour counter	Operating hours of the power plant	<ul style="list-style-type: none"> <li>▪ Manual readings are reported at least every week.</li> </ul>

**Table 4. Instruments for monitoring project emissions**

Instrument	Data Monitored	Remarks
Electricity meter (import)	Amount of electricity consumed by the project	<ul style="list-style-type: none"> <li>▪ Monthly meter reading from the grid operator</li> <li>▪ Manual readings are reported at least every week.</li> <li>▪ Keep record of electricity invoices for cross-check purposes</li> </ul>
Electricity meter (diesel generator)	Amount of electricity generated by the diesel generator for start-up	<ul style="list-style-type: none"> <li>▪ Manual readings are reported at least every week.</li> </ul>
Volume of fuel consumed	Amount of fuel consumed by the project for start-up only	<ul style="list-style-type: none"> <li>▪ Diesel consumed by the diesel generator for start-up is monitored by a ruler on the storage tank.</li> <li>▪ Manual readings are reported at least every week.</li> <li>▪ In case only small quantities are used for operation (e.g. in case of fuel used to start up the plant), keep records of fuel</li> </ul>

		purchases/invoices for cross-check purposes
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The diagram below summarizes the location of the CDM instruments:

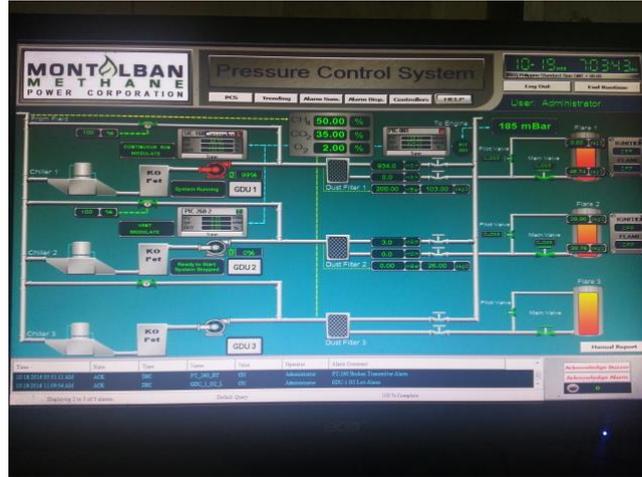


**Figure 15. Location of CDM instruments in the facility**

Source: World Bank-Carbon Finance (2014). CDM Operations Plan for a Landfill Gas Plant Under Program of Activities: PoA Ref. #6707

The CDM equipment also includes the data logging and storage system. Parameters are also manually recorded every hour, except for the electricity meters, hour counter and diesel fuel consumption, which are recorded weekly, in case of data logger failure.

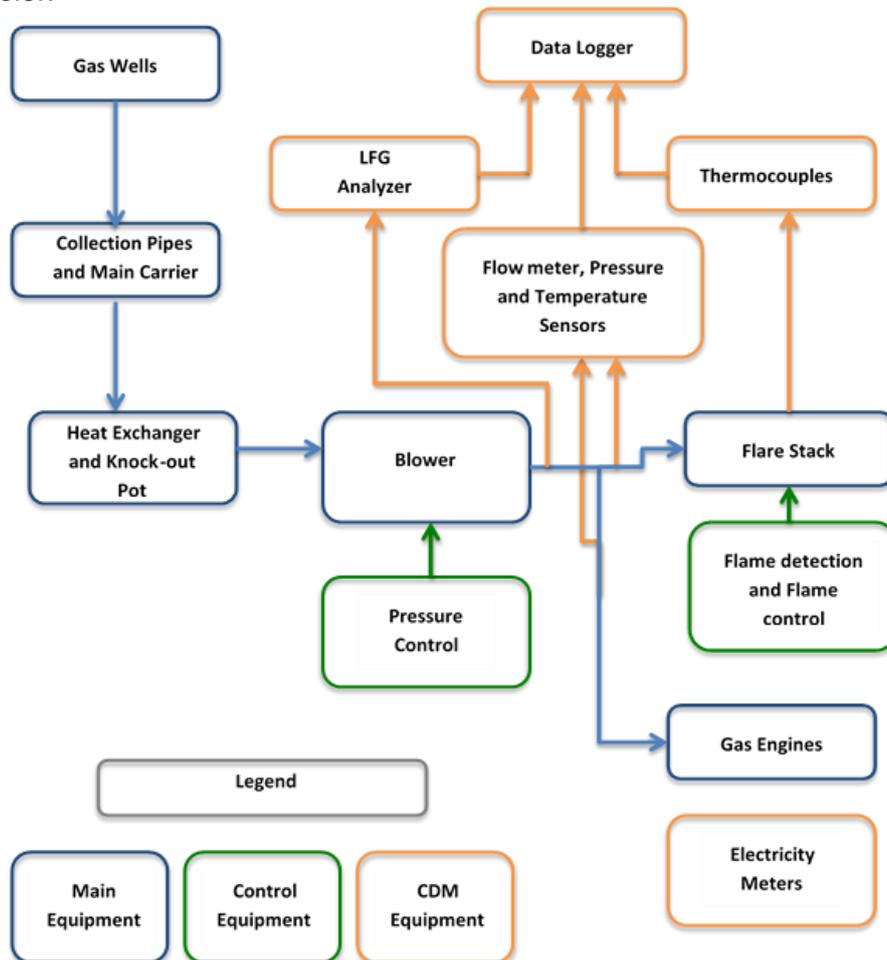
The measured data must be assessable which means the auditors (UNFCCC-certified bodies called Designated Operational Entities or DOE) shall be able to access and retrieve the data monitored by the CDM instruments mentioned above over a defined period (monitoring period). Then they shall be able to compute the CER calculations based on the raw data in order to cross-check the amount of claimed CERs.



**Figure 16. Gas plant SCADA**

Source: World Bank-Carbon Finance (2014). CDM Operations Plan for a Landfill Gas Plant Under Program of Activities: PoA Ref. #6707

The diagram below summarizes the equipment sequence of an LFG electricity generation and flaring plant. For CDM monitoring, attention must be focused on the CDM instruments, in orange color:



**Figure 17. Sequence of equipment**

Source: World Bank-Carbon Finance (2014). CDM Operations Plan for a Landfill Gas Plant Under Program of Activities: PoA Ref. #6707

#### I.4. ENVIRONMENTAL SAFEGUARDS COMPLIANCE

In compliance to the Environmental Due Diligence system of LANDBANK, various environment-related clearances and permits issued to MMPC are discussed and highlighted below:

**Environmental Compliance Certificate (DENR-EMB).** An Environmental Compliance Certificate (ECC) is a document issued by DENR-EMB after a positive review of the ECC application, certifying that based on the representations of the proponent, the proposed project or undertaking will not cause significant negative environmental impact. It contains specific measures and conditions that the project proponent has to undertake before and during the operation of the project, and in some cases, during the project's abandonment phase to mitigate identified environmental impacts. The ECC also certifies that the proponent has complied with all the requirements of the Environmental Impact Statement (EIS) System and has committed to implement its approved Environmental Management Plan.

Annex 2-1b of the Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 Annex 2-1b provides the project grouping matrix for the determination of EIA report types to prepare for the issuance of an environment-related clearance such as ECC and CNC. Projects like MMPC's Methane Recovery and Power Generation Project which involves methane recovery from waste management fall under Group II category (Non-Environmentally Critical Projects in Environmentally Critical Areas). In this type of project, the decision document to secure and the EIA report type to prepare are dependent on the project's power production capacity.

A project with power plant capacity less than or equal to 1 MW is only obliged to prepare a Project Description document for the issuance of Certificate of Non-Coverage (CNC) from DENR-EMB. On the other hand, project proponents are required to secure an Environmental Compliance Certificate (ECC) if the power generation capacity of the project is above 1 MW but lower than 50 MW, or equal to or above 50 MW. The decision document to prepare for projects which will generate above 1 MW but lower than 50 MW of power is an Initial Environmental Examination (IEE report or checklist) while an Environmental Impact Statement (EIS) is obligatory for projects with power generation capacity equal to or above 50 MW.

In the case of MMPC's project, since the facility is expected to have an 8.19 MWe power plant, the company has submitted an IEE report to DENR-EMB (*Appendix 2*) which resulted to the issuance of the ECC on May 11, 2009 with Reference No. ECC-LDBW-0812-211-4020 (*Appendix 3*). The document obliged the company to undertake close monitoring in all stages of the project implementation to maintain a high level of environmental safety and performance efficiency and immediately address any environmental hazards that may arise. The specific conditions of the document are as follows:

1. The proponent shall ensure all commitments in the EMP as approved by the EMB shall be strictly implemented;
2. A Pollution Control Officer (PCO) must be appointed to handle environmental impact management related aspects as specified in the Impact Management Plan and the Environmental Monitoring Plan (EMoP);
3. Emission of air pollutant sources shall conform with DENR emission and ambient standards; and

4. The proponent shall submit an Abandonment Plan to EMB at least one year prior to abandonment.

**Certificate of Compliance (Energy Regulatory Committee).** A Certificate of Compliance (COC) refers to a license issued by the ERC to an entity to operate a power plant or other facilities used in the generation of electricity pursuant to Section 6 of RA 9136 or the Electric Power Industry Reform Act and Section 4 of the Implementing Rules and Regulations of RA 9136.

On June 15, 2015, MMPC was granted a COC with reference number COC No. 15-06-M-000144 (*Appendix 4*) for the operation of a Biomass Power Plant with the following specifics:

- 8.19 MW power capacity;
- Methane gas fueled;
- 20 years economic life

The issuance of the COC signifies that MMPC have complied with all the requirements stipulated in the 2014 Revised COC Rules, the Philippine Grid Code, the Philippine Distribution Code, the Wholesale Electricity Spot Market (WESM) Rules, and related laws, orders and regulations. The COC will be valid for 5 years from the date of issuance.

**Permit to Operate.** A Permit to Operate (PTO) is a legal authorization granted by DENR-EMB to industries that operate or maintain any installation that have air pollution sources for a specified period of time. This permit is pursuant to Part IV, Rule XIX of the Rules and Regulations of RA 8749 or the Philippine Clean Air Act.

MMPC ensures the renewal of their PTO from time to time or depending on the validity of the permit. They make use of permit/document tracking sheet to regularly monitor the validity status of permits and identify documents/reports required to submit to concerned government agencies.

The latest PTO of the Project was granted by DENR-EMB Region 4A to MMPC on February 2, 2016 with Permit No. 2016-POA-0458-302 (*Appendix 5*). The permit covers the operation of nine (9) units 925 kW Caterpillar Methane engine generator sets. It is valid from the date of issuance until December 16, 2016 with the following permit conditions:

1. Stack emission testing for the given generator set, which is categorized as medium size, should be conducted once per year of its operation to verify its compliance to RA 8749;
2. The permit is subject to revocation if found violating provisions of RA 8749;
3. Any authorized DENR-EMB personnel shall be allowed unconditional access to conduct an on-the-spot inspection and monitoring to oversee compliance to the permits;
4. Non-compliance shall be sufficient cause for the suspension or cancellation of permit and/or payment of fine; and
5. A Self-Monitoring Report on the operation and maintenance of the installation shall be made quarterly

Due to the approaching expiration date of the PTO of MMPC last November 2016, an application of PTO renewal was conducted. The application was received by DENR-EMB Region 4A on November 22, 2016 as shown in *Appendix 6*.

**Sanitary Permit (DOH).** A Sanitary Permit refers to a written permission or certification of the city or municipal health officer or in his absence, the chief or head of the sanitation division/ section/ unit, that the establishment complies with existing sanitation requirements upon evaluation or inspection conducted in accordance with Presidential Decree No. 522 and 856 and local ordinances.

The Sanitary Permit No. 1587 of MMPC for its power plant generation facility was issued by DOH Regional Health Office No.4 on January 22, 2017 and will be valid until December 31, 2016 (*Appendix 7*).

**Certificate of Treatment.** A waste treater is a person or entity (natural or juridical) who is licensed to treat, store, recycle, or dispose hazardous wastes. A waste generator designates a waste treater to recycle, reprocess, treat, or dispose hazardous wastes. In return, a waste generator shall require the said waste treater to issue a Certificate of Treatment (COT) which represents the completion of recycling, reprocessing, treatment, or disposal of hazardous waste. The issuance of the certificate is in compliance with RA 6969, otherwise known as Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990.

Generated hazardous waste of MMPC's facility has been contracted for transport and treatment to Asiaunited Oil Industry Corporation (AOIC), a DENR-EMB accredited waste treater (Transport Permit No. PT No. 03-14-0616-0733) (*Appendix 8*). A COT dated June 25, 2016 with reference number COT No. 2016-06-461 was granted by the company to MMPC for classified 10,000 liters of used oil with waste number I 101 (*Appendix 9*). The wastes were transported by AOIC last June 23, 2016 and were completely treated last June 24, 2016.

**Compliance to ECC Conditions.** Annex B of the Project's ECC specified that "Montalban Methane Power Corporation must implement segregation...for solid waste in accordance with RA 9003". Site visit conducted by EPMD officers and staff determined the compliance of the proponent to such Act. As shown in Figure 17, MMPC ensures proper segregation of solid waste under the provision of Rule 2 Section D of DENR Administrative Order No. 2001-34 or the Implementing Rules and Regulations of Republic Act 9003.



**Figure 18. Solid waste segregation in the facility**

Furthermore, one of the conditions stated in the ECC is for MMPC to ensure that appropriate mitigating measures contained in the Environmental Plan submitted to EMB for ECC issuance shall be instituted and strictly implemented throughout the project implementation.

As shown in Figure 18, provision of sand to mitigate any potential occurrence of oil spill is implemented in the project site to comply with such ECC condition. Evacuation map highlighting exit routes and locations of fire extinguishers (Figure 19), and safety signage (Figure 20) are also provided to address any potential untoward incidents (e.g. fire, earthquake, accidents, etc.).



Figure 19. Sand for potential occurrence of oil spill



Figure 20. Evacuation map showing the exit routes and locations of fire extinguishers



Figure 21. Safety signage

Table 5. List of environmental compliance-related permits with its corresponding permit code, issuing agency, date of issuance, validity period and activities permitted

Permit	Permit Code/No.	Issuing Agency	Date of Issuance	Validity Period	Activity Permitted
1. Environmental Compliance Certificate	ECC-LDBW-0812-211-4020	DENR-EMB Region 4A	May 11, 2009	N/A	Project operations
2. Certificate of Compliance	COC No. 15-06-M-00014L	ERC Ortigas, Pasig City	June 15, 2015	N/A	Project operations
3. Permit to Operate (Air Pollution Source Installations)	Permit No. 2017-POA-0458-302	DENR-EMB Region 4A	May 11, 2017	June 10, 2022	Operation of nine (9) units 925 kW Caterpillar Methane engine generator sets
	Permit No. 2016-POA-0458-302	DENR-EMB Region 4A	February 2, 2016	December 16, 2016	
	Permit No. 2015-POA-0458-302	DENR-EMB Region 4A	February 5, 2015	December 31, 2015	
4. Sanitary Permit	Sanitary Permit No. 2044	DOH Regional Health Office Rodriguez, Rizal	January 20, 2018	December 31, 2018	Project operations
5. Certificate of Treatment	COT No. 2016-06-461	Asiaunited Oil Industry Corporation	June 25, 2016	N/A	Completion of recycling, reprocessing, treatment, or disposal of hazardous waste

## I.5. SOCIAL SAFEGUARDS COMPLIANCE

To date, there are no records showing displacement/resettlement incidents (e.g., physical displacement/relocation, loss of assets, loss of access to resources due to land acquisition, forced eviction, conflict on land tenure arrangements, community-based property rights/customary rights to land, territories and resources, etc.) in the project site. Indigenous peoples are also not present in the project area, therefore, no resources, lands, territories, and/or cultural heritage areas within the site are being claimed by IPs. Similarly, no traditional livelihoods and resources for the physical and cultural survival of IPs are affected by project implementation thereby indicating that the project proponent need not to address any resettlement issues for IPs prior to construction and eventual operation of the biogas facility.

Instead, a community of informal settler families (ISFs) exist just outside the perimeters of RPSL. The numbers were at the minimum during the time when MSWDF started its operation in 2002. The population eventually grew following the tragic dump-slide incident that took place at the Payatas Dumpsite on July 2000 that resulted to the migration of settlers to Rodriguez, Rizal. In effect, waste pickers or scavengers are prevalent in the landfill. Nonetheless, according to MMDA and DPWH in the Environmental and Social Impact Assessment (ESIA) of Metro Manila Flood Management Project conducted in 2016, ISFs community do not thrive within the vicinity of the project.

Such document reported that the management of RPSL allow waste pickers to enter the landfill in given shifts—one shift in the morning, from 6am to 12 pm, and one in the afternoon, from 12pm to 6pm. When there are incoming solid wastes, waste pickers are not allowed to be inside the landfill site. To emphasize: MMPC has no operational control of the landfill, especially matters concerning waste pickers or giving them permission to access the landfill site. MMPC only operates on the closed section of the landfill to extract methane gas and convert it to electricity.

## I.6. OCCUPATIONAL HEALTH AND SAFETY

MMPC recognizes the importance of maintaining a safe working environment for its employees. To this end, the organization endeavors to promote, maintain, and implement occupational health and safety standards, as written out in the Occupational Safety and Health Standards (as Amended, 1989) manual of the Department of Labor and Employment. The sections of said manual relevant to MMPC operations are identified as follows:

- Rule 1030 Training of Personnel in Occupational Safety and Health
- Rule 1040 Health and Safety Committee
- Rule 1050 Notification and Keeping of Records of Accidents and/or Occupational Illnesses
- Rule 1080 Personal Protective Equipment and Devices
- Rule 1940 Fire Protection and Control
- Rule 1960 Occupational Health Services

A Safety Officer is assigned to ensure that occupational health and safety requirements and concerns are managed and properly implemented in the MMPC workplace. Christopher A. Parungao is the designated Safety Officer / OSH focal person at MMPC.

## **I.7. GRIEVANCE REDRESS MECHANISM**

Grievance mechanism is an integral part of a company's approach to stakeholder engagement. They are one element in a mutually reinforcing set of systems and activities that is not seen as a stand-alone processor as a substitute for engagement. Stakeholder engagement is designed to involve affected communities in the process of identifying and managing risks and impacts. When engagement is broad, continuous and inclusive, potential sources of concern are addressed at an early stage, helping to prevent complaints from arising in the first place.

Grievance mechanisms are designed to deal with complaints as and when they arise. It serves to channel conflict into an institutionalized mechanism for peaceful resolution. It facilitates communication between stakeholders and management regarding problems that arise, and enable them to complain with dignity, knowing that there is a system of appeals leading to an impartial decision maker. Finally, they assist the company in ensuring that its stakeholders are complying with company standards on ethical conduct.

The grievance mechanism encourages feedback from the community, provides an opportunity for the company to respond to questions and concerns and allows both real and perceived impacts to be addressed. Embedding the mechanism within existing management systems has the added benefit of ensuring that it has internal traction and becomes part of the normal way of doing business. The Pollution Control Officer/Environmental Officer shall be the receptor or focal person for any grievances from the community. The designated Pollution Control Officer/Environmental Officer at MMPC is Mr. James Paul Cacho, and may be reached through +63917-303-4583.

MMPC shall formulate a detailed Grievance Redress Mechanism and shall be publicly inform its stakeholders on its procedures.

## **I.8 GENDER EQUALITY**

MMPC shall promote gender equality in all aspect of its operation. The promotion of gender equality and the elimination of discrimination was the first international binding instrument during the ILO Equal Remuneration Convention in 1951 (NO. 100). This stipulates the importance of equal remuneration for men and women for work of equal value (ILO-CLS). This report also takes cognizance of Republic Act 7192 promoting the integration of women as full and equal partners of men in development and nation building, and for other purposes. This is otherwise known as the "Women in Development and Nation Building Act." Thus, it must ensure that women and women's organizations actively participate in the development programs and/or projects including their involvement in the planning, design, implementation, management, monitoring, and evaluation.

MMPC shall encourage the participation of women in its operation and decision making. The company will also open more work and livelihood opportunities for women and increase their access to health and social services. There will also be an enhanced skill development through the conduct of more training programs for women. Also, a gender sensitivity and equality training shall be conducted for all employees to increase awareness of the essence of gender equality.

### I.9. ENVIRONMENTAL MANAGEMENT PLANT OF RPSL METHANE RECOVERY AND POWER GENERATION PROJECT

As part of Environmental Management for the Landfill Methane Recovery and Power Generation Project, Table 6 below shows the Environmental Mitigation and Monitoring Plan (EMMP) for the Biogas Facility, based on relevant environmental impacts of activities associated with the current operations of the facility. A summary of EMMP applied during Construction Phase (which is already completed) is also included below.

**Table 6. Environmental Management and Mitigation Plan for the biogas facility**

<b>CONSTRUCTION PHASE</b>								
<b>Activity</b>	<b>Potential Environmental Impacts</b>	<b>Mitigating Measures</b>	<b>Monitoring Method</b>	<b>Monitoring Parameters</b>	<b>Monitoring Frequency</b>	<b>Responsible Entity</b>	<b>Cost</b>	<b>Reporting To</b>
<ul style="list-style-type: none"> <li>- Earth moving and area preparation for the Biogas Facility;</li> <li>- Drilling and construction of wells;</li> <li>- Construction of the biogas collection pipework;</li> <li>- Plant installation and assembly.</li> </ul>	<ul style="list-style-type: none"> <li>- Dust generation;</li> <li>- Noise generation from drilling operations;</li> <li>- Health and Occupational Safety issues related to construction works</li> </ul>	<ul style="list-style-type: none"> <li>- Work Management Plan as guide for tasks to be completed;</li> <li>- Required use of appropriate PPE (personal protective equipment) for employees involved in construction work.</li> </ul>	Supervision by competent and authorized construction project supervisors and managers.	<ul style="list-style-type: none"> <li>- Project phases/ tasks completed;</li> <li>- Record of work-related incidents/ accidents/injuries.</li> </ul>	Daily	Project Supervisors	Included in contract for construction of Biogas Facility	Project Managers, Project Owners
<b>OPERATION PHASE</b>								
	Generation of solid waste materials	<ul style="list-style-type: none"> <li>- Development of a solid waste management program, to ensure proper handling, disposal, and management of solid waste generated according to</li> </ul>	Recording of amount of solid waste materials generated	As reported in Quarterly Self-Monitoring Report, submitted to DENR: <ul style="list-style-type: none"> <li>- Average/ Total quantity of solid</li> </ul>	Daily / Monthly	Biogas Facility staff	Allotment of Php5,000 per month for related costs	Pollution Control Officer / Plant Manager

Administrative activities in operation of Biogas Facility		<ul style="list-style-type: none"> <li>type;</li> <li>- Coordination with the proper barangay or city authorities for the effective implementation of solid waste management program developed.</li> </ul>		wastes generated per month/ quarter				
	Generation of domestic wastewater	<ul style="list-style-type: none"> <li>- Toilet amenities of Biogas Facility connected to Septic Tanks, in accordance to the minimum requirements indicated in <i>Sections 75 to 77 of PD 856 (Code of Sanitation of the Philippines)</i>.</li> </ul>	Recording of volume amount of domestic wastewater generated	<p>As reported in Quarterly Self-Monitoring Report, submitted to DENR:</p> <ul style="list-style-type: none"> <li>- Domestic wastewater generated, cubic meters per day</li> </ul>	Monthly	Biogas Facility staff	Allotment of Php15,000 per year for related construction/maintenance costs	Pollution Control Officer / Plant Manager
Operation and Maintenance activities of the Biogas Facility	Fugitive leaks of methane from biogas collection network and biogas flaring system may lead to suffocation or explosion hazards within premises of Biogas Facility	<ul style="list-style-type: none"> <li>- Biogas collection network equipped with SCADA system, for remote monitoring of parameters for advance determination of potential leaks in network.</li> <li>- Gas leak</li> </ul>	<ul style="list-style-type: none"> <li>- Monitoring through SCADA (supervisory control and data acquisition) system, for biogas collection network;</li> <li>- Gas leak detector, for monitoring methane</li> </ul>	<ul style="list-style-type: none"> <li>- Temperature, pressure parameters monitored for determining leak in biogas collection network;</li> <li>- Methane levels monitored within plant, to prevent possibility of explosion.</li> </ul>	Daily	Biogas Facility staff	Allotment of Php50,000 per year for related equipment repair, replacement, and maintenance costs	Pollution Control Officer / Plant Manager

		detector installed within plant facility premises (situated before flare), for odor management of background methane level, as well as control against explosion hazard.	levels within plant premises.					
<p>Generation of Waste Oil from oil-change activities performed for various engines, generator sets employed in Biogas Facility operations</p> <p>Generation of used or spent containers (steel drums) from engine oils used for various engines/ generator sets at the site. These spent containers considered as hazardous waste materials.</p>	<ul style="list-style-type: none"> <li>- Regular monitoring and recording of equipment performance, effective implementation of change-oil activities;</li> <li>- Collection, proper storage, and disposal of waste oil material, in accordance with Implementing Rules and Regulations of RA 6969 (Hazardous Waste Management Act of 1990).</li> <li>- Projected frequency of stored waste oil hauling and disposal is twice a year; to</li> </ul>	<p>Recording of volume amount of waste oil material generated; and frequency of hauling and disposal (per year) of waste oil collected and stored at the site.</p> <p>Monitoring of amount of spent containers (steel drums) generated from site operations, and hauled/ transported/ disposed with waste oil material.</p>	<ul style="list-style-type: none"> <li>- Average/ Total quantity of Chemical (waste oil) generated per month/ quarter.</li> <li>- Frequency of hauling and disposal (per year) of waste oil collected and stored at the site.</li> <li>- Volume of waste oil material transported and disposed offsite, thru accredited hazardous waste materials transporters.</li> <li>- Number of spent containers (steel drums) generated vs. number of spent containers hauled/ transported/ disposed with waste oil material.</li> </ul>	<p>Monthly (Change-oil activities performed per 500 runhours of engine/ equipment, or approximately 20 working days)</p>	<p>Biogas Facility staff</p>	<p>Allotment of Php30,000 per year for related equipment repair, replacement, and maintenance costs; and related contract disposal costs for accredited hazardous waste haulers/ handlers.</p>	<p>Pollution Control Officer / Plant Manager</p>	

		<p>be contracted out to DENR-accredited hazardous waste material transporters.</p> <p>Note: Spent containers (steel drums) also used as storage containers for waste oil material generated.</p>						
	Noise generation from operation of the blower system and the three units of landfill gas generators	<ul style="list-style-type: none"> <li>- Required use of noise protective equipment, for employees, contractors involved in work settings with high level of noise;</li> <li>- Hiring of noise monitoring service providers for regular validation of noise levels at plant premises.</li> </ul>	Hiring of noise monitoring service providers	Noise levels, in dBA units	Quarterly	Pollution Control Officer / Plant Manager	Allotment of Php13,000 per year for related noise protective equipment; and related service provider costs.	CEO/President
	Use of resources, specifically water consumption (for general operations use) and methane gas (generated from landfill decomposition processes and	<ul style="list-style-type: none"> <li>- Conservation measures, for efficient use of water resource in general operation of Biogas Facility;</li> <li>- Effective operations and maintenance of Biogas Facility</li> </ul>	<ul style="list-style-type: none"> <li>- Recording of total water consumption, in cubic meters; Recording of Average Daily Production Output (in kWh).</li> </ul>	<ul style="list-style-type: none"> <li>- Total water consumption in cubic meters; Average Daily Production Output (in kWh).</li> </ul>	Monthly	Biogas Facility staff	No separate allotment needed; already part of general operations at Biogas Facility.	Pollution Control Officer / Plant Manager

	converted to electrical power through combustion processes)	equipment, for optimum conversion of methane gas resource.						
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The LANDBANK-EPMD will monitor MMPC'S compliance to the EMP on a semestral basis. An environmental performance monitoring report will be submitted by LBP-EPMD to WB on a semestral basis.

## II. DUE DILIGENCE OF THE SANITARY LANDFILL

### II.1. OVERVIEW OF THE LANDFILL

According to The Garbage Book: Solid Waste Management in Metro Manila by Asian Development Bank (ADB) in 2004, the seventeen (17) municipalities and cities of Metro Manila generate an estimated solid waste amount of 6,600 tons per day. Six (6) of these cities and municipalities exclusively operate their own dumpsites while two (2) of them – Manila and Navotas dump their wastes in Tanza, Cavite. The remaining nine (9) localities (i.e., Muntinlupa, Pasig, Parañaque, Makati, Pasay, Mandaluyong, Taguig, Pateros, San Juan) dispose solid wastes in Rodriguez, Rizal. This site in Rodriguez was constructed in an attempt to mitigate solid waste crisis in Metro Manila.

Figure 21 shows the waste characteristics of the cities and municipalities in Metro Manila. Organic matter, which is the source of GHG as methane, accounts for roughly 70% of the total waste. According to local hearings, since scavengers on the site mainly collect non-organic items such as metals, cardboard, bottles, rubber, PET bottles, etc., the ratio of organic matter in waste on this site is even higher. On the other hand, Figure 22 shows that household sources account as the greatest generator among all sectors.

Table 2-2 Solid Waste Compositions

Composition		%	
Organic matter	Food waste	55.7	69.6
	textile	7.0	
	wood,leaf	5.2	
	paper	1.7	
Other	plastics	30.4	30.4

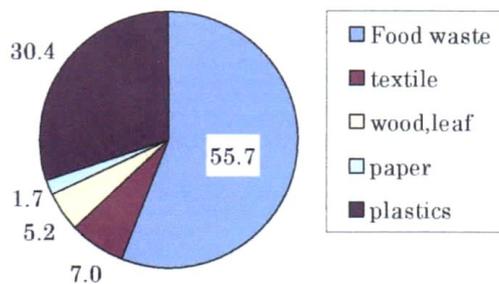


Figure 2-3 Solid Waste Compositions

Figure 22. Result of waste characterization survey conducted in Metro Manila cities and municipalities

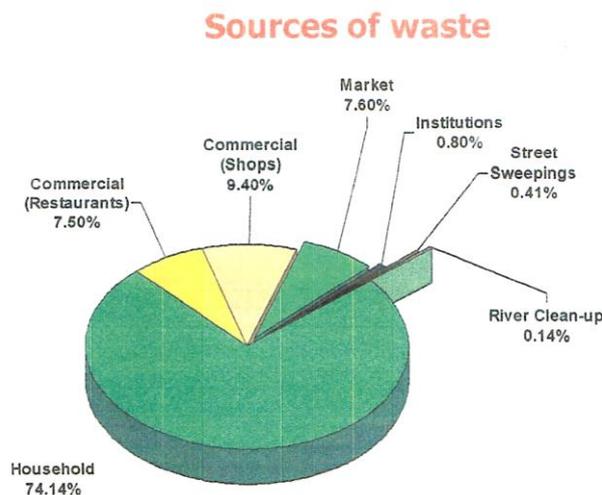


Figure 23. Graph showing the sources of wastes in Metro Manila

Source: Metro Manila Development Authority (2016)

The issuance of RA 9003 or the Philippine Ecological Solid Waste Management Act in 2000 represents the beginning of the transition of most dumpsites in the country into sanitary landfills, as stipulated correspondingly in RA 9003. For the case of the disposal facilities in Rodriguez, development took place in early 2001 and operation started in 2002. The 14-ha facility (known as Montalban Solid Waste Disposal Facility) is located in a remote upland extremity of Marikina Valley, an easterly-trending steep-sided valley that drains into the Lukutan Munti River. The local government of Rodriguez is the responsible agency to enable the operation in the area, though the Metro Manila Development Authority (MMDA) is instrumental in facilitating the development, and in coordinating the waste disposal activities in the site. Likewise, ISWIMS or the International Solid Waste Integrated Management Specialist, Inc., which owns the site, has been cosigned by the municipality for the actual landfill and management work.

Data from Metro Manila Solid Waste Management Project Report shows that, as early as 2003, disposal site in Rodriguez has been receiving 1, 200 tons of solid waste per day. At that time, it was projected that remaining life of active dumpsites in other parts of the country will soon reach full-capacity by year 2004, and the only facility which would have been operational by then is the Rodriguez facility, as per optimistic estimate. This resulted to several initiatives to develop the site – one of which is the implementation of the project involving landfill methane recovery and electricity generation.

As a way to mitigate environmental impacts posed by landfill activities, the establishment of the biogas facility was included in the sanitary landfill design concept of the disposal site as approved and required by DENR-EMB through their issuance of an Environmental Compliance Certificate (ECC No. 0403-010-213) (*Appendix 10*) for the disposal site. The biogas project owned by MMPC intended to register the LFG recovery and power generation facility as a CDM PoA. March 10, 2009 marks the day that such project was formally registered in UNFCCC with project reference number #1853. Prior to implementation, the project proposed to collect LFG, composed mainly of methane gas and to use this as a clean source of energy in power generation, with the goals of improving the global environment and contributing to sustainable development through imparting environmental and economic benefits in the local area.

The initial project of MMPC in the landfill has a total area of 5,000 sq.m located in Sitio Lukutan Munti, Brgy. San Isidro, Rodriguez, Rizal. The project involves that actual recovery of methane from MSWDF operated by ISWIMS. The landfill started its operation in 2002 with an area of 14 hectares and with an average daily waste acceptance of 3,000 tons of household and market wastes. The 14 hectares was recommended for closure in 2007 and the operation of the 19-hectare RPSL started. At present, the landfill operates with an average of 3,000 to 3,500 per day of waste acceptance. The landfill is presently being developed for expansion, that is the GLSL site.

There are 34 active gas wells drilled in strategic area within the landfill site with an average of 20-meter depth. These wells captured methane and connecting pipes were provided. The pipes were then connected to the power plant where methane or landfill gas is converted to energy. The distance from the sanitary landfill to the power plant is approximately one (1) kilometer. The plant has existing 9 engines (925 kW methane-fired caterpillar generators). There are only 3 engines running with an output of 1.92 MW since the amount of methane capture is low due to insufficient number of wells drilled in the landfill site. Methane capture is 1,400-1,500 cu.m. per hour. There is also a provision of the flaring system although this is not being used since the amount of methane captured is low therefore no excess gas for flaring. The plant is planning to construct additional 20 wells and may run 4 to 5 generators including the existing.

The timeline of the significant developments in the landfill site as reported by Teves (2010) of ABS-CBN News is shown below:

<b>Year</b>	<b>Developments</b>
December 1, 2001	The municipality of Rodriguez and the Metropolitan Manila Development Authority (MMDA) enter into a memorandum of agreement, allowing MMDA to dump garbage in the Montalban Solid Waste Disposal Facilities (MSWDF).
January 16, 2002	The MSWDF formally opens.
April 10, 2003	The Rodriguez municipality enters into a contract with the International Solid Waste Management Specialist (ISWIMS) Inc. for the establishment of the MSWDF. ISWIMS is the private owner of the landfill and will be the operator.
August 25, 2004	<p>The 14-hectare MSWDF located at Sitio Lukutang Munti, Barangay San Isidro, Rodriguez, Rizal secures an Environmental Compliance Certificate (ECC) from the Department of Environment and Natural Resources.</p> <p>The MSWDF enters into contract with Karbon Kredit Philippines for the operations of the planned Methane Gas Recovery and Electricity Generation Project.</p>
August 10, 2006	The Municipality of Rodriguez implements the Methane Gas Recovery and Electricity Generation Project.
September 17, 2007	The Rizal government, through Resolution 123, recommends the closure Montalban Solid Waste Disposal Facilities (MSWDF) located in Sitio Lukutang Munti, Barangay San Isidro, Rodriguez, Rizal.
October 9, 2007	<p>The provincial government issues Resolution 137, declaring the operationalization of the 19-hectare Rizal Provincial Sanitary Landfill (RPSL) located at Sitio Lukutang Munti, San Isidro, Rodriguez, Rizal, under a cluster scheme composed of the municipalities of Angono, Taytay, Cainta, San Mateo, including the Municipality of Rodriguez, Rizal.</p> <p>Resolution 138, allowing the MMDA to use the landfill, is also issued by the local government.</p>
July 24, 2008	The Montalban Methane Power Plant opens.
May 13, 2009	The Manila Electric Co. (MERALCO) files an application for the approval of the Contract for the Supply Electricity (CSE) with the Energy Regulatory Commission (ERC) between MERALCO and MMPC.
June 1, 2009	The ERC approves MERALCO's application.

## **II.2. PERMITS AND IMPLEMENTATION PLANS RELATED TO OPERATION OF RIZAL PROVINCIAL SANITARY LANDFILL**

MMPC project scope is limited to implementation of the Methane Recovery and Power Generation Project, one aspect of which is to provide the technical capability and advice for

the operation of the facility installed at the landfill site. Over-all operation of RPSL has been contracted to ISWIMS by the Rizal Provincial Government since 2003.

In compliance with ESM Framework of LANDBANK, it is essential for MMPC to affirm whether the construction and operation of the project site is compliant with the various environmental policies of the country. Thus, environmental clearances issued to RPSL relative to its compliance are discussed and highlighted in this report.

**Environmental Compliance Certificate.** Three (3) ECCs has been granted for the construction and operation of RPSL, all of which signifies that the landfill satisfies the requirements needed for the issuance of the ECC.

The ECC with Reference Number ECC-LLDA-2007-394-92001 was issued to RPSL on January 15, 2008 by the Laguna Lake Development Authority (LLDA) (*Appendix 11*). The application was pursued by the Provincial Government of Rizal represented by Governor Casimiro A. Ynares III. It was issued on January 15, 2008 and was confirmed by the DENR Secretary on January 17, 2008.

The reason for which the LLDA and not the DENR-EMB issued the said ECC in 2008 is given below:

*"To reduce red tape, the LLDA, not the Department of Environment and Natural Resources, has been designated in 2004 by Malacañang as the main agency tasked to issue clearances for projects that have an impact on Laguna de Bay and its environs". – Alquitran (2007)*

However, the DENR, represented by former Secretary Lito Atienza has recalled the authority of LLDA to issue ECCs and CNCs in the Laguna de Bay region in 2008 through DENR Administrative Order No. 2008-11. This directive transferred the authority to issue ECCs and CNCs from the LLDA to the regional offices of the EMB.

For this reason, another ECC has been applied for the operation of RPSL in year 2008 which supersedes the ECC-LLDA-2007-394-92001 issued by LLDA on 2008. The ECC with Reference No. ECC-R4A-1206-0227 was then granted by DENR-EMB Region 4A on July 10, 2012 covering TCT Nos. 459429, 459430, 459431, 502600, 502801, 502802, 502803 (*Appendix 12*). At that time, the application was carried out by the International Solid Waste Integrated Management Specialist, Inc. (ISWIMS), thus making them the project proponent.

According to the ECC, the landfill will have a maximum daily disposal capacity not exceeding 3,500 MT of non-toxic/non-hazardous residual wastes within a total land area of 19 hectares and will contain the following components/facilities:

- Landfill area;
- Admin building;
- Leachate treatment plant using batch reactor technology;
- Gas connection system;
- Sewer and drainage system;
- Materials recovery facility using refused-derived fuel technology;
- Weighing bridge;
- Composting facility;
- Internal road system;
- Power and water supply system;
- Sewer and drainage system;
- Motor pool;
- Truck wash bay;

- Guard/security house;
- Contractor's office;
- Personnel quarters;
- Mess hall/canteen;
- Comfort rooms;
- Parking area;
- Overhead water tank;
- Mechanical/utility room; and
- Other support/ancillary facilities.

RPSL is expected to be non-operational by year 2017. For this apparent reason, the fifty-hectare expansion of the landfill (named as GLSL) is currently being developed. ISWIMS, as the project proponent, applied for the ECC of this site. It was issued on September 11, 2013 with Reference No. ECC-R4A-1309-0576 by DENR-EMB Region 4A. It is covered by TCT Nos. T-009-2011003958, T-009-2011008846, T-009-2011008847, T-009-20122008519 and T-009-201300854 (*Appendix 13*).

It is stipulated in the ECC that the landfill will have a maximum disposal capacity not exceeding 3,500 MT of non-toxic/non-hazardous residual wastes per day and it will comprise of the following project components:

- Five Phases (5 Cells) with High Density Polyethylene (HDPE) Liner;
- Motorpool;
- Parking Area;
- Material Recovery Facility (MRF);
- Guardhouse;
- Weighing Bridge;
- Main Gate;
- Administration Building;
- Leachate Collection Pipes and Leachate Ponds;
- Leachate Treatment Facility;
- Dikes;
- Gas Vent System;
- Deepwells;
- Electrical System;
- Open Space;
- Access Road; and
- Drainage System.

**Permit to Operate.** A Permit to Operate indicates permission pursuant to Part IV, Rule XIX of the Rules and Regulations of RA 8749 or the Philippine Clean Air Act. Such permit with Permit No. 2015-POA-0458-329 was granted to ISWIMS for the landfill on August 10, 2015 with expiration dated on June 30, 2020 (*Appendix 14*). The permit allows the operation of the following engines:

- Three (3) units 60 kVA Denyo diesel engine generator sets;
- One (1) unit 163 kVA Cummins diesel engine generator set;
- One (1) unit 25 kVA Denyo diesel engine generator set;
- One (1) unit 2.3 kVA Kobal gasonline generator set; and
- One (1) unit kVA Fabricated generator set

### II.3. IMPACTS IDENTIFIED AND MITIGATION OF IMPACTS OF THE SANITARY LANDFILL

LANDBANK through the Environmental Program and Management Department (EPMD) conducted an environmental assessment last December 19, 2016 at the Project site (69 hectares in total) for ISWIMS. The assessed project impacts and mitigating measures are summarized in the table below:

**Table 7. Identified impacts and mitigating measures in RPSL site assessment**

Impact	Mitigating Measures
Methane gas is produced and released which pollutes the atmospheric air and poses a threat to the employees in the facility since it is combustible.	Release of methane gas is addressed by the methane to energy project operated by MMPC. Gas vent system is in place to prevent pressure build-up and avoid incident of explosion. Around 9MW of power is currently generated from the project.
Wastes generate leachate which carries dissolved and suspended materials that may contaminate groundwater and flow to nearby bodies of water if not provided with proper drainage.	Landfill is provided with leachate collection pipes and leachate pond. This directs the collected leachate to the treatment facility which uses Sequence Batch Reactor Technology. Water testing is regularly conducted for the upstream and downstream flow. ISWIMS has an on-going application of Discharge Permit. ISWIMS continues to coordinate with the regulatory agencies such as DENR-EMB, MENRO, LLDA, DPWH, DOH, and MMDA during the regular quarterly multi-partite monitoring team meeting.
There are seven associations of waste-pickers benefiting from scavenging. Employees that work in the landfill sites and the waste pickers are exposed to health hazards present in the dumpsite.	Employees wear PPEs during operation of the landfill. Waste picking is allowed at 6am-6pm. Waste pickers should also wear PPEs such as masks, gloves, proper cleaning tools, etc.) to minimize direct contact with the wastes, leachate and methane gas produced in the facility. Sanitation tools and area are provided for hygienic practices of the employees.
Generation of foul odor and flies	The project covers a large area, eighty-eight (88) hectares in total. Soil covering/soil capping is regularly observed every 2 meters of garbage piling.
Generation of hazardous wastes such as busted light bulbs, used oil, batteries, etc.	All hazardous wastes generated from the project are collected and kept in a storage facility. A Hazardous Waste ID should be secured from DENR-EMB.
Emission from the seven (7) operational generator sets causes air pollution.	Operation of the following generator sets are covered by a Permit to Operate valid until June 30, 2020: <ul style="list-style-type: none"> <li>○ Three (3) units 60 kVA Denyo diesel engine generator sets;</li> <li>○ One (1) unit 163 kVA Cummins diesel engine generator set;</li> <li>○ One (1) unit 25 kVA Denyo diesel engine generator set;</li> <li>○ One (1) unit 2.3 kVA Kobal gasonline generator set; and</li> <li>○ One (1) unit kVA Fabricated generator set</li> </ul> All units should be properly maintained to meet DENR Emission Standards. This is to ensure compliance with the Philippine Clean Air Act of 1999 (RA 8749).

**Proponent’s Environmental Commitment/Initiatives.** As of site visit conducted by EPMD, the plant designated a Pollution Control Officer (PCO) and has a methane-to-energy project component which reduces environmental pollution.

**Environmental Benefits.** Proper operation and strict compliance if the landfill operations to environmental rules and regulation will ensure that the project will not adversely affect the environment. Methane capture to produce electricity through generator set prevents GHG emissions and global warming.

### III. PUBLIC CONSULTATION AND DISCLOSURE

Stakeholders were invited through letters and the general public was informed and invited to come to the public consultation meeting through posters posted at the gate of the landfill and at the barangay house two weeks prior to the meeting.

The public consultation took place at the MMPC Staff House Compound, Rodriguez, Rizal on October 22, 2017 to present the Project to the public. Sixty-eight people attended the meeting. The following are the summary of the issues raised during the question and answer (Q&A) portion of the meeting:

**Table 8. Summary of issues and concerns raised in the stakeholders' consultation meeting**

Issues Raised	Responses/ Recommended Measures to Address Response
Bagong Buhay Association mentioned that they are near the power plant but they have no power supply. Maybe MMPC can allocate power supply to them?	Roberto Romarate II and Irineo Arbis of MMPC responded that as per Renewable Energy regulation of the Department of Energy, power generators/ plant owners are prohibited for giving power supply to the residents directly. They must apply to the power distributor in the area which is MERALCO. MMPC pays corresponding taxes to the government and part of it is given to the barangay where the MMPC is located.
The Sanitation Office of Rodriguez, Rizal asked:  1. Is there wastewater to be generated in the operation and how it will be mitigated?  2. Is methane capture solution to climate change? How MMPC capture gas?	1. Irineo Arbis of MMPC responded that the wastewater or leachate generated in the landfill is handled by ISWIMS who is the landfill operator. The leachate is re-circulated back to the landfill site to sustain methane gas production. Only methane gas from the landfill is being transported to the MMPC power plant.  2. A series of horizontal gas pipes and gas wells are excavated and placed in the landfill. These allow extraction of the methane gas and will course through the connected pipes to the power plant.
S.J. Association Inc. asked: Will the project affect the waste pickers? Is there a possibility that the landfill operator will no longer allow the presence of waste pickers to preserve the amount of garbage to produce more methane?	Roberto Romarate II of MMPC clarified that they have no direct control on the operation of the landfill. However, they assured the group of waste pickers that they will not recommend prohibiting their presence in the landfill.
Rodriguez Municipal Health Office	Roberto Romarate II and Irineo Arbis of MMPC

<p>asked:</p> <ol style="list-style-type: none"> <li>1. How much power MMPC produced?</li> <li>2. Does MMPC helps lessen the power charge being implemented by MERALCO?</li> </ol>	<p>responded:</p> <ol style="list-style-type: none"> <li>1. The plant has a capacity of 8.19 MW, However, due to insufficient gas wells resulting to low methane capture, the plant produces 1.6 MW only.</li> <li>2. In a way, MMPC helps lessen the price of power by supplying to the Wholesale Electricity Spot Market (WESM), since higher supply results to lower price.</li> </ol>
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## IV. INSTITUTIONAL ARRANGEMENTS

### IV.1. INSTITUTIONAL PARTNERS

**Berkeley Energy Netherlands (BEN).** MMPC was registered with the Philippine Securities and Exchange Commission (SEC) on January 25, 2007 and has started commercial operations in 2009. The company is sixty percent (60%) Filipino-owned and used to be 40% owned by Carbon Assets Fund (CAF) of Cayman Islands, a majority-owned company of United Kingdom-based Carbon Capital Markets. However, on January 15, 2013, Berkeley Energy Netherlands (BEN), Mr. Salvador B. Zamora II and La Costa Development Corporation, Inc. (LCDCI) entered into an investment agreement wherein BEN will acquire all rights, title and interest of the 40% of the total issues and outstanding capital stock of the company that were previously owned by CAF.

BEN, which has extensive, hands-on knowledge of developing and delivering renewable energy projects utilizing full-range technologies, is to manage and operate the generation and electricity of MMPC subject to the terms and conditions of the said agreement.

**ISWIMS.** ISWIMS is the private owner and operator of the landfill in Rodriguez where landfill gas, specifically methane is extracted to power the power plant of MMPC.

**MERALCO.** On April 3, 2009, the Manila Electric Company (MERALCO) formalized an agreement, specifically a purchase service contract with MMPC that would allow MERALCO to source as much as 8 megawatts (MW) of energy from MMPC's power plant. The contract, known as Contract for the Supply of Electricity (CSE) was applied by MERALCO to ERC for approval on May 13, 2009. The ERC approved the application on December 3, 2012. In another agreement dated June 6, 2013, MERALCO and MMPC agreed to extend the CSE for three (3) months from June 11, 2013 until September 11, 2013 and automatically renew the said CSE for a series of three (3) month terms, unless MMPC notifies MERALCO that it is no longer willing to extend the CSE. Thereafter, MMPC informed MERALCO of its intention to terminate the CSE as it intends to register in the Wholesale Electricity Spot Market (WESM) and participate in the Feed-in Tariff (FIT) Program. Consequently, in a Letter Agreement dated January 21, 2015 MMPC and MERALCO agreed to terminate the CSE effective January 26, 2015 (*Appendix 15*).

The application for registration of MMPC as Direct WESM Member and Trading Participant-Generator Category in the Philippine WESM was completed on July 22, 2015 and was approved on July 29, 2015 with Reference No. MLO/PEMC-2015/409 (*Appendix 16*).

## IV.2. INSTITUTIONAL SETUP OF MONITORING SYSTEM

The operation and management of the CFSF's Environment and Social Safeguards Framework (ESSF) will be led by LBP-EPMD as follows:

- MMPC shall report to LBP-EPMD the progress on the implementation of the ESSF and EMP including any corrective and preventive actions on a quarterly basis. This shall form integral part of the safeguards monitoring report that will be reported by MMPS as part of its obligations under the terms of the Sub-Project Purchase Agreement (SPA) for the purchase and sale of CERs of the Project; and
- LBP-EPMD will submit safeguards monitoring report to the World Bank on a semestral basis as part of its obligation under the Emissions Reduction Purchase Agreement (ERPA).

LANDBANK, being an ISO 14001-certified institution, established the EPMD to primarily implement the safeguards activities. Part of its functions is to exercise environmental due diligence by keeping records of project Environmental Assessment (EA) reports, feedbacks / technical information (which may include but not limited to environmental performance history, issuance of related environmental permits, notice of violations, dumpsite closure plan, etc.), and ECCs / CNCs. This is part of its oversight function and task enumerated in the LBP CPI 2009-002 to verify that projects are in compliance to environmental standards and regulations.

EPMD is currently manned by ten (10) regular personnel, whose primary function is to implement the LBP-CPI 2009-002. As the LBP-CPI 2009-002 primarily requires environmental assessment of the projects covered by the Philippine EIS system and collaterals which are part of the project or used as project site only, the environmental assessment will be extended and conducted to CDM projects (which are usually not covered by the Philippine EIS system) for this purpose. The review performed by EPMD and WB is entirely independent and does not conflict with the nature of evaluation the DENR performs.

MMPC is a non-critical project and as per DENR Administrative Order No. 2017-15 Guidelines on Public Participation under Philippine Environmental Impact Statement System, the project is not required to organize a Multipartite Monitoring Team. No permit and/or license requires MMPC to conduct any third-party audits except for its annual emission testing. Since the project does not have any Multipartite Monitoring Team, the Environmental Monitoring Fund is not required as per DAO 2017-15 Section 19. On the other hand, Environmental Guarantee Fund is not necessary since this has not been required in the issued Environmental Compliance Certificate and DENR has determined that the project does not pose any significant public risk (DAO 2003-30 Section 9.3).

MMPC has been submitting Self-Monitoring Reports (SMR) to DENR-Environmental Management Bureau and Health and Safety Statistics to the Department of Energy.

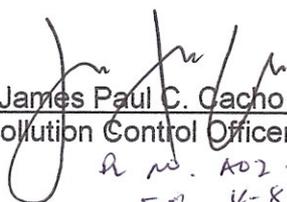
## VI. ACCOUNTABILITY STATEMENT

This is to certify that all the information in this Environmental Management Plan for the Landfill Gas Energy Project of Montalban Methane Power Corporation are accurate and complete to the best of our knowledge, and that an objective and thorough assessment of the Project was undertaken in accordance with the dictates of professional and reasonable judgment.

All the commitments contained herein including the Environmental Management Plan shall be strictly complied. In case of any deviation, the same shall be of interest in environmental protection and sustainable development. Montalban Methane Power Corporation shall be held responsible for any liabilities and/or penalties arising from the Landfill Gas Energy Project.

12 MAR 2018

In witness whereof, we hereby set our hands this \_\_\_\_\_ day of \_\_\_\_\_ at TAGUIG CITY.

  
James Paul C. Gacho  
Pollution Control Officer

R. No. A02-12-002897  
EP. 4-8-2018

  
Irineo A. Arbis Jr.  
Plant Manager

RNC # 0027643  
EP. 3-8-2020

  
Napoleon M. Opiniano  
Vice President

SUBSCRIBED AND SWORN TO before me this 12 MAR 2018 day of 2018, affiant exhibiting his / her DL NO 201-82-94324 No. issued at CP EP. on 4-8-2019.

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Page No. 96  
Book No. XLV  
Series of 2018

  
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