

**Environmental Management Plan  
Marcela Farms Wastewater Biogas Facility**

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## I. BRIEF PROJECT INFORMATION

Proponent : **MARCELA FARMS INC.**  
Business Address : Brgy. Lourdes, Cortes, Bohol  
  
President / CEO : Marlito C. Uy  
  
Project : Methane Recovery and Combustion from the  
Biogas Digester  
Project Location : Brgy. Lourdes, Cortes, Bohol  
Project Type : Livestock Project  
PSIC : A 02 – Farming of Animals (project is a component)

### Contact Persons on the Environmental Assessment Report

#### Marcela Farms

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## I.1 THE PIGGERY FARM

The livestock of Marcela Farms Inc. is a farrow to finish piggery farm with an existing sow level of 3,758 heads. The estimated hog population is 37,580 heads if one (1) sow produces ten (10) piglets. Marcela plans to expand their farm to 4,360 sows in 2010 which will have an estimated total hog population of 43,600 heads. The Standing Pig Population (SPP) for the 4,360 sows is as follows:

Pig Type	SPP, heads	Weight, kg
Sows	4,360	220
Wean	7,373	5
Finish	7,373	25
Nursery	18,433	90

Pigpens are already being constructed for the expansion. There will be a total of eight (8) pigpens for gestating sows, lactating sows, boars, feeder pigs and nursery pigs. The floors of each pigpen are slatted and perforated which allows the wastes to be flushed to the canal underneath.

The farm occupies an area of 165,884 square meters located at Brgy. Lourdes, Cortes, Bohol. It existed since 1995.

Photos of the piggery farm:



The pigpen buildings



On going development inside the pigpen buildings



Final set-up of a pigpen

## I.2 FARM LOCATION

The piggery farm of Marcela Farms is located at Brgy. Lourdes, Municipality of Cortes in the Province of Bohol. The geographical coordinates at one point is at latitude 9°41'21.45" and longitude 123°52'15.20". The area of the farm is 165,884 square meters covered by Tax Declaration Nos. 3-006-00102, 93-006-00112, 1606-217, 93-006-00110, 93-006-00138, 93-006-00161, 93-006-00162, 93-006-00163, 93-006-00164, 93-006-00160 and 93-006-00151, Original Certificate of Title Nos. 78564, 78566, 77337, 79999 and 75279, and Deed of Sale Nos. 3583, 3762 and 3774.

Below are maps of the project site.





### I.3 ENVIRONMENTAL CONSIDERATIONS IN THE AREA

In the early stage of the piggery farm, the vicinity of the project site was idle, with no human developments. The area was undeveloped occupied by natural vegetation of grasslands and trees in an undulating terrain. Residents were not visible then by the naked eye from the farm. However, as time passed, little by little the residents settled in. There are now more or less 10 residential houses in a hundred meters. Farm workers also migrated near the area. The residents in the vicinity may get affected by the environmental impacts of the piggery farm, especially, the foul odor and contamination of the wastewater.

Bacong Creek is situated one (1) kilometer away, north of the project site. The creek is continuous, average of four (4) meters wide flowing from south-east to north-west that discharges to the Bohol Strait. Contamination of the creek is unlikely to occur considering the distance and the permeability property of the soil. Bacong Creek is classified as Class D pursuant to DENR Administrative Order No. 1992-34.

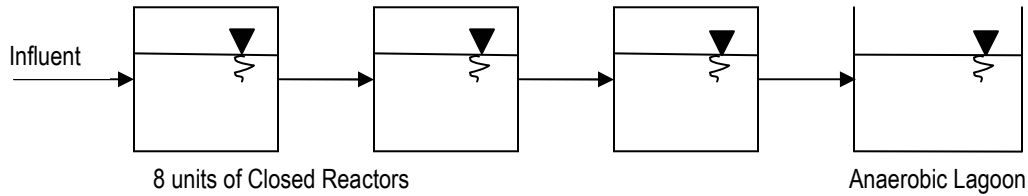
Marcela Farms will manage a thirty (30) hectares banana plantation adjacent west of the piggery farm. Marcela Farms plans to discharge its treated effluent and sludge to the plantation.

Moreover, the farm relies on groundwater, as this is being utilized for drinking and for other utilities. There are three (3) groundwater wells in the vicinity, each are situated about 200 meters from the location of the anaerobic digesters. Based on the latest Test Report conducted by a water testing laboratory, the water source is not contaminated (refer to Annex VII.1).

**I.4 EXISTING WASTEWATER SET-UP**

Manure in the pigpens is washed with water and discharged into to eight (8) cement reactors. Overflow from the reactors flows into an anaerobic lagoon. The anaerobic lagoon stores the wastewater for an indefinite period.. It was constructed in 1996 with a capacity of around 105,000 cu.m.

Flow Diagram:



Design Parameters:

Reactors	Quantity / Unit	Dimension (m)			Capacity (cu.m.)
		Length	Width	Depth	
Closed reactors	8	20	3	3	180
Anaerobic lagoon	1	≈ 125	≈ 56	15	105,000

**I.5 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS**

An Environmental Compliance Certificate (ECC) was secured from the Environmental Management Bureau (EMB) Region VII on January 29, 2004 for a 2,500 sow level and a total hog population of 25,000 heads in an area of 165,884 square meters land. Concerns raised during the public consultation were 1] odor issue, 2] health hazards and 3] local employment. The concerns were resolved by Marcela Farms and the stakeholders as evidence of the approved ECC.

Marcela Farms likewise secured a Discharge Permit (DP) from EMB Region VII in compliance with Republic Act No. 9275 or known as the Philippine Clean Water Act. The latest DP was issued on January 7, 2009 which allows Marcela Farms to discharge to Bacong Creek with a wastewater volume not to exceed 54,000 cu.m per year. Despite the Discharge Permit, the farm does not discharge their effluent in the creek considering its distance, but instead, the farm currently stores them in lagoons within the farm premises. Marcela Farms analyzed the water sourced from a deep well. Based on the latest Test Report conducted by a water testing laboratory, the water source is not contaminated (refer to Annex VII.1)

The farm installed a 280KW gas engine to combust the methane. Marcela Farms will be securing a Permit to Operate (PTO) at EMB Region VII in compliance with Republic Act No. 8749 or known as the Philippine Clean Air Act of 1999.

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<b>Permit</b>	<b>Reference No.</b>	<b>Date Secured</b>	<b>Validity</b>	<b>Conditions</b>
ECC	07 04 01-29 0051 116-A	Jan. 29, 2004	No expiration	1. Sow level – 2,500 heads 2. Hog population – 25,000 heads 3. Piggens – 36 units 4. Land area – 165,884 sq.m.
DP	DP-09-A- 071216-002	Jan. 7, 2009	Jan. 30, 2010	1. Volume discharge to creek – 54,000 cu.m.



## II. METHANE RECOVERY

### II.1 PROJECT ACTIVITY

The main components of the methane recovery project are as follows:

- a. Anaerobic digester (with liner and cover)
- b. Gas engine
- c. Flaring equipment
- d. Sludge drying bed
- e. Gas collection pipes
- f. Iron piling scrubber
- g. Aeration and settling ponds

Design Parameters:

Component	Quantity	Capacity / Specifications	Remarks
Anaerobic digester	2	20,000 & 63,000 cu.m.	Set-up is parallel
Bottom Liner and Cover		1 mm thick HDPE	
Gas engine	3	280 KW each	1 unit is already installed
Flaring equipment			To be used to burn the methane when the gas engine will not be utilized
Sludge drying bed			Sludge drying will only be 20cm high
Gas collection pipes		117mm diameter PE	
Iron piling scrubber			To remove hydrogen sulfide
Aeration and settling ponds			Final containment of the effluent prior to discharge to the banana plantation.

Wastewater from the flushing of the wastes will be discharged to the anaerobic digester. Gas trapped in the digester will flow to the collection pipes directed to the gas engine. An iron piling scrubber will be placed at the end of the pipe to remove hydrogen sulfide prior to combustion. When the gas engines are not in use, the gas shall be diverted for flaring.

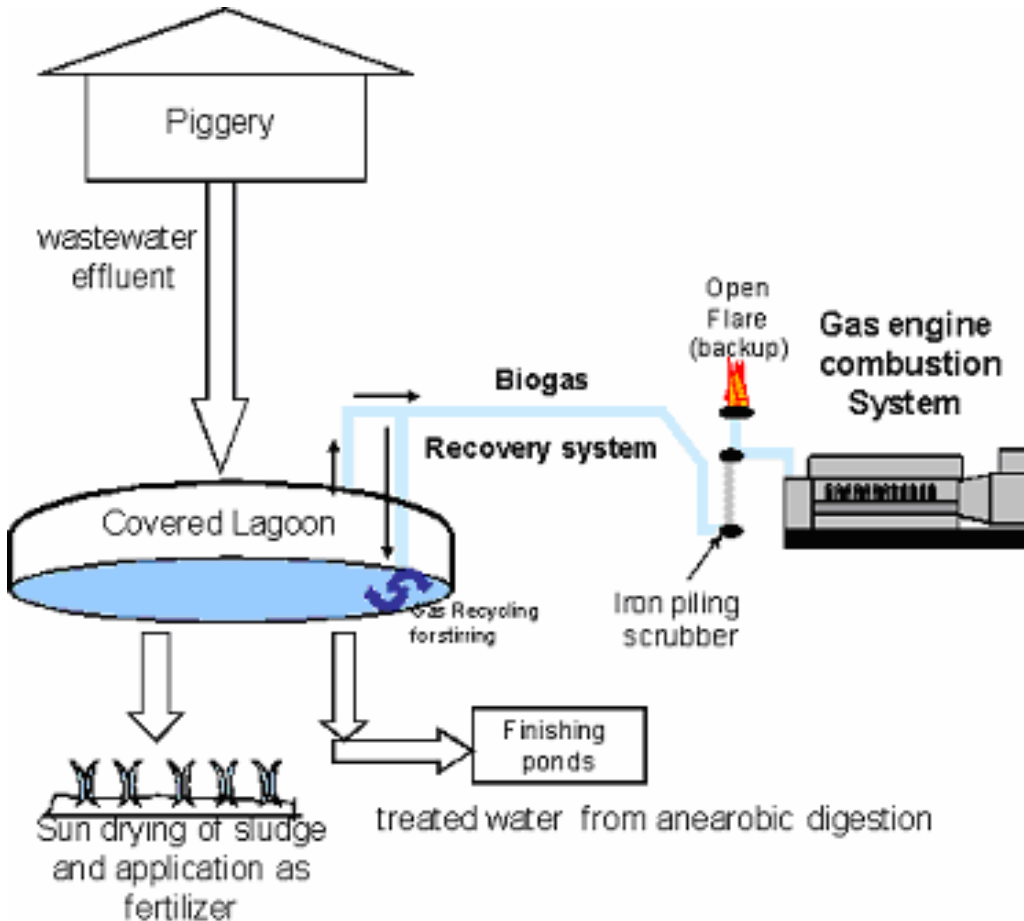
Overflow from the anaerobic digesters will be discharged to an open lagoon. The treated effluent shall be used to irrigate the 30 ha. banana plantation.

Based on information from the Department of Agriculture and FAO, bananas typically require about 2,000 to 2,500 mm of rainfall per year. Hence, for a 30 hectare banana plantation, it would need about 62,000 cu.m. of water per month. On the other hand, the wastewater is generated at the rate of 500 cu.m. daily, and the average annual rainfall in

the area is 1,639 mm/yr. Further, the evapotranspiration rate of bananas is approximately 6 mm per day. Considering the rate of water inflow and utilization of the plantation, it is theoretically verified that the water requirement of the plantation is partially met by the rainfall water and wastewater combined.

Solids shall be flushed into the anaerobic digester and form sludge. Perforated drain pipes had been installed in the bottom of the digester to collect the sludge and pump it to the sludge drying bed. Sludge shall be used as fertilizer to the 30 ha. banana plantation.

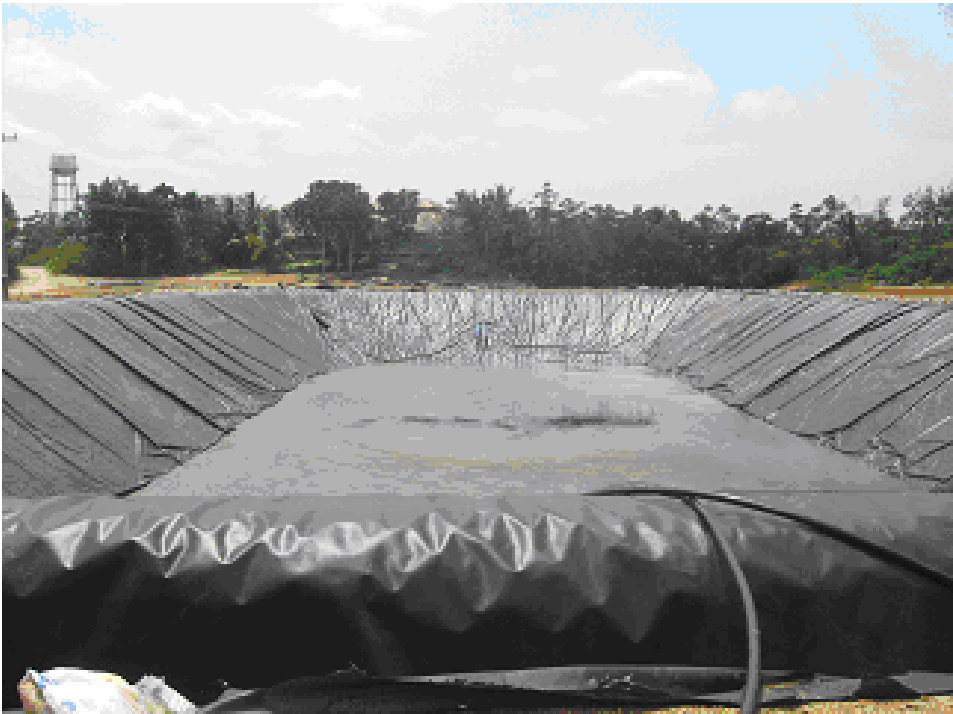
Diagram of the Methane Recovery Project



Photos of the Anaerobic Digesters:



The anaerobic digester with HDPE cover. Biogas is already trapped inside.



On going development of the other anaerobic digester. HDPE lining had already been placed and wastewater is being filled inside. HDPE material will be used to cover the digester

## II.2 WASTEWATER AND GAS GENERATION

### II.2.1 Wastewater

The wastewater of Marcela Farms is estimated at 0.01137 cu.m. per pig per day. With a total hog population of 43,600 heads, the wastewater generated is estimated at 500 cu.m per day.

Design considerations of the two (2) anaerobic digesters are as follows:

Parameters	Digester 1	Digester 2	Total
Volume (cu.m.)	22,500	53,000	75,500
No. of pigs (heads)	11,733	18,433	30,166
HRT (days)	169	253	- - -

### II.2.2 Biogas

Based on the pig waste properties, biogas production for the anaerobic digesters are as follows:

Parameters	Digester 1	Digester 2	Total
Estimated methane production (ft <sup>3</sup> /day)	41,000	74,890	115,890
Power Output (kW)	122	223	345
Energy Output (kWh/day)	2,925	5,349	7,821
Methane Reduction (MT/yr)	237	433	670
CO <sub>2</sub> Reduction (MT/yr)	4,977	9,093	14,070

### III. MANPOWER AND PROJECT COST

#### III.1 MANPOWER

The manpower requirement of the previous operation without the methane recovery project was two (2) personnel while with the methane recovery project is two (2) engineers and six (6) workers.

Manpower summary:

	<b>Baseline Scenario</b>	<b>Project Activity</b>
<b>Manpower Requirement</b>	2 personnel for maintenance	6 personnel for maintenance 2 engineers

#### III.2 PROJECT COST

The cost of the methane recovery project is as follows:

<b>Detail</b>	<b>Costing (Php)</b>
Construction / Investment Cost of the methane recovery project	24,881,000.00
Annual maintenance of the methane recovery project	1,582,000.00
<b>Total</b>	<b>26,463,000.00</b>

## **IV. ENVIRONMENTAL MANAGEMENT PLAN**

### **IV.1 CONSTRUCTION PHASE**

#### **IV.1.1 Solid Wastes Generation**

##### Impact Identification

The set-up and installation of perforated plastic for the flooring, corrugated metal sheet for the ceiling, materials such as metal bars and panels for partitioning and the plastic containers for the feeding system in the piggens had generated various solid wastes from small pieces to bulk spoils that include scrap plastics, scrap metal sheets bars, scrap wood, fractured hollow blocks and other construction debris.

Solid wastes improperly managed can be easily dumped on the ground. Waste is a nuisance to Marcela Farms.

The regular hygiene of the workers / laborers generated human wastes. Besides foul odor, the wastes carry harmful bacteria. The wastes can contaminate the working area and the ground soil.

##### Prevention / Mitigation

A solid wastes storage area had been provided by the contractor. Recyclable wastes was recovered and used or sold to junk buyers. Wastes were disposed to the municipality's garbage collector once a week.

The existing toilet facility of the piggery farm was used by the contractor's workers / laborers. It has a facility for women and a separate facility for men. It accommodated all the sanitation needs of the workers and the septic tank was adequate to receive the domestic wastewater generated.

##### Monitoring

The storage area of the solid wastes was regularly inspected by the project engineer once a week to ensure that the wastes were properly managed and stored. The project engineer ensured that the wastes did not accumulate in the area. For the toilet facility, if the water is not immediately discharged into the bowl during flushing, the septic tank is desludged. The project engineer reports his activities to the PCO.

#### **IV.1.2 Health and Safety**

##### Hazard Identification

The placement of the one (1) mm HDPE cover in the anaerobic digester increased the generation of biogas. Likewise, the trapped gas increased the risk of escaping to the atmosphere and the potential to catch fire that may lead to explosion if the gas is exposed to heat.

The existing flare equipment is a hazard since it is exposed and its nozzle's orientation is horizontal.

#### Prevention / Mitigation

The Project Engineer ensured that the HDPE cover is not damaged nor has any holes before installing it on the anaerobic digester.

Equipment that are sources of heat had been kept at a safe distance away from the methane recovery project especially from the anaerobic digester.

Marcela Farms shall enclose the flaring equipment and re-orient the nozzle vertical with an elevated height. It shall have a windshield and an auto ignition system.

Workers operating the gas engines and flaring equipment shall wear personal protective.

#### Monitoring

The project engineer inspected the HDPE cover and the collection pipes for leaks after installation.

The PCO shall observe the operator of the gas engine and the flaring equipment if safety protocols are observed.

### **IV.1.3 Noise Generation**

#### Impact Identification

Construction works and the use of heavy equipment generated noise. Noise is a nuisance to the employees and workers. It can impair the hearing senses of a person if he/she is overexposed to noise beyond the allowable levels.

#### Prevention / Mitigation

Workers assigned in noisy areas of the construction activity wore earplugs. They were also not overexposed by allowing the workers to leave the area once in a while and the heavy equipment were not operated continuously for long hours.

#### Monitoring

The project engineer inspected the area daily and measures the noise levels using a Sound Meter Level.

#### **IV.1.4 Traffic Congestion**

##### Impact Identification

The heavy equipment transported to the project site caused slowing of the traffic flow in major and barangay roads.

##### Prevention / Mitigation

Traffic enforcers were assigned at the intersections and at the entrance roads leading to the project site. Appropriate traffic signages were also placed. The heavy equipment were parked inside the project site and not on public roads.

##### Monitoring

The project engineer daily observes the traffic flow in the area. He provides recommendations to Marcela Farms if traffic congestion occurs.

### **IV.2 OPERATION PHASE**

#### **IV.2.1 Wastewater Generation**

##### Impact Identification

Liquid waste that shall be generated from the washing of the pigpens shall be directed and treated in the Wastewater Treatment Facility (WTF) of Marcela Farms. Improper flushing of the wastes may not enter the WTF and will contaminate the ground soil and percolate to the ground water.

Effluent may still be pollutive after treatment. Thus, discharge may still contaminate the soil and ground water.

##### Prevention / Mitigation

Wastes shall be daily flushed in a precise manner to prevent water wastage and shall ensure that the wastes shall be directly discharged to the two (2) anaerobic digesters. Maintenance of the facility shall be done regularly.

The effluent from the final stage of the treatment process should be within the allowable standards of the DENR. To ensure that there will be no contamination from the treated effluent, the finishing and settling ponds shall be properly closed to disallow the discharge of wastewater anywhere except to the banana plantation. Marcela Farms shall utilize the impounded water to irrigate their 30 ha banana plantation. They have also the option to discharge the treated effluent to Bacong Creek based on the issued DP.

##### Monitoring



The Pollution Control Officer (PCO) shall inspect monthly the WTF and the drainage system for any leaks. Wastewater sampling at the final pond shall be conducted at least once a year.

Parameters to be monitored compared with the Surface Waters Class D Effluent Standards of DENR Administrative Order No. 1990-35, as stipulated under Republic Act No. 9275 or known as the Philippine Clean Water Act of 2004, are as follows:

Parameter	Unit	Standard
BOD	mg/L	120
COD	mg/L	200
TSS	mg/L	1,500
Fecal Coliforms	MPN/100ml	500
pH	-	6.0-9.0
Color	PCU	-

Result of monitoring shall be reported by the PCO to the farm manager with recommendations for improvement of the effluent, if necessary.

Groundwater quality will also be monitored in terms of its bacteriological characteristics and nitrates content to conform to the Philippine National Standard for Drinking Water.

#### **IV.2.2 Air Pollution from Burning the Biogas**

##### Impact Identification

The combustion of the biogas using the three (3) gas engines each at 280KW may still result in incomplete combustion and generate carbon monoxide.

##### Prevention / Mitigation

The three (3) gas engines shall each have an air pollution control device to minimize the generation of carbon monoxide. The gas engines shall also be provided with a muffler and smoke stack to reduce carbon concentrations. An iron piling scrubber was placed at the collection pipe to remove hydrogen sulfide before combusting the biogas.

The equipments should be regularly maintained by the O&M crew to generate efficient electricity.

##### Monitoring

Particulate matter and carbon monoxide shall be analyzed at least annually from the gas engines to determine the level of the pollutants. The concentration should be within the Emission Standards set by the DENR under Republic Act No. 8749 or known as the Philippine Clean Air Act of 1999, as follows:

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Parameter	Unit	Concentration
Particulates	mg/Ncm	200
Carbon Monoxide	mg/Ncm	500

The PCO shall report the air sampling results with recommendations, if appropriate, to the farm manager.

#### **IV.2.3 Sludge Generation**

##### Impact Identification

Accumulation of sludge in the anaerobic digesters will affect the methane generation process. Although the amount of generation of sludge is slow, accumulated sludge may create anaerobic conditions and generate methane. Sludge dumped anywhere may contaminate the ground soil and its leachate may percolate to the ground water.

##### Prevention / Mitigation

The perforated drain pipes installed in the bottom of the anaerobic digesters shall collect the sludge and pump it to the sludge drying bed. The sludge shall not be more than 20cm high to minimize methane generation. Sludge shall be applied to the 30 ha. banana plantation.

##### Monitoring

The PCO shall monthly inspect the amount of sludge in the sludge drying bed to ensure that the sludge is not accumulating and not more than 20 cm high.

#### **IV.2.4 Odor Generation**

##### Impact Identification

Pig wastes consisting of manure and urine generate an odorous smell. Urine gives off ammonia which has a distinct odor that can irritate the skin, eyes, throat and lungs. It can also cause coughing and burns<sup>1</sup>. Wet pig manure also generates foul odor. Thus, insufficient washing of the wastes from the pigpens will generate foul odor that shall be a nuisance to the laborers and the employees of Marcela Farms.

Biogas is composed of methane, carbon dioxide, carbon monoxide, hydrogen, nitrogen and hydrogen sulfide. The intentional production of biogas from the anaerobic digester will also increase the potential of release of the gas to the atmosphere. Hydrogen sulfide is an odorous gas (similar to the smell of rotten eggs) that shall be a nuisance to the workers and employees of Marcel Farms.

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<sup>1</sup>DOH, *Health Advisory on Ammonia*, March 30, 2006

### Prevention / Mitigation

Good housekeeping is the practical way in eliminating the foul odor. Sufficient water should be used in washing / flushing the wastes in the piggens. At least once a day the piggens shall be cleaned.

Since the biogas and the wastewater have a distinct odor, the WTF, HDPE cover and the drainage system shall be well maintained for possible leaks. The O&M crew shall ensure that the wastewater continuously flows to the anaerobic digesters and to the finishing and settling ponds without any interruptions.

### Monitoring

The PCO shall inspect the WTF and the methane recovery project for leaks. A methane monitoring system shall be installed in the facility to continuously monitor methane generation.

## **IV.2.5 Noise Generation**

### Impact Identification

The source of noise in the methane recovery project is the gas engines when it is being operated.

### Prevention / Mitigation

The gas engines had been placed in an insulated room away from the farm's office and piggens to avoid disturbance during operation. Mufflers and shock absorbers were installed to minimize the noise. Engine operators shall wear earplugs during maintenance of the equipment.

### Monitoring

During the operation of the gas engines, the PCO shall determine if the noise generated is at a tolerable level using a Sound Level Meter.

## **IV.2.6 Health and Safety**

### Hazard Identification

Trapped biogas in the two (2) anaerobic digesters, including those collected in the pipes, have the potential to escape to the atmosphere and pollute the air quality if there are leaks. In addition, methane, hydrogen and carbon monoxide (which are among the components of the biogas) are combustible. There is a potential that the biogas will catch fire and/or explode if exposed to heat.

### Prevention / Mitigation

The PCO shall ensure that the HDPE cover and the gas collection pipes are not damaged. Leaks shall immediately be sealed.

Equipments that are sources of heat shall be kept at a safe distance away from the methane recovery project especially from the anaerobic digester.

Workers operating the gas engines and flaring equipment shall wear personal protective.

### Monitoring

The PCO shall monthly inspect the HDPE cover and the collection pipes for leaks. He shall observe also the operator of the gas engine if safety protocols are observed.

**V. MATRIX OF THE ENVIRONMENTAL MANAGEMENT PLAN**

Project Phase / Env't Aspect	Env't Component Likely to be Affected	Potential Impact	Implementation Arrangements					Monitoring Plan				
			Prevention / Mitigation	Schedule	Responsible Entity	Cost	Reporting to	Monitoring Method	Parameters to be Monitored	Schedule	Responsible Entity	Cost
<b>Construction Phase</b>												
Solid Wastes Generation												
<ul style="list-style-type: none"> <li>Set-up and installation of equipment / facilities in the pigpen.</li> </ul>	<ul style="list-style-type: none"> <li>Marcela Farms</li> </ul>	<ul style="list-style-type: none"> <li>Solid wastes posed nuisance to Marcela Farm</li> </ul>	<ul style="list-style-type: none"> <li>Solid wastes shall be regularly disposed to the Municipality's garbage collector.</li> </ul>	<ul style="list-style-type: none"> <li>Solid wastes was disposed at least once a week.</li> </ul>	Workers	P5,000.00 for the trash bins.	Project engineer	Visual inspection	Solid wastes in the storage area.	Once a week	Project engineer	Pollution Control Officer (PCO)
<ul style="list-style-type: none"> <li>Hygienic practices</li> </ul>	<ul style="list-style-type: none"> <li>Ground soil</li> <li>Ground water</li> </ul>	<ul style="list-style-type: none"> <li>Generate human wastes that will contaminate the ground soil and ground water.</li> </ul>	<ul style="list-style-type: none"> <li>Existing toilet facility of Marcela Farms was utilized.</li> </ul>	<ul style="list-style-type: none"> <li>Toilet facility had been provided</li> </ul>	Workers		Project engineer	Visual inspection	Solid wastes in the storage area.	Once a week	Project engineer	Pollution Control Officer (PCO)

Placement of the 1mm HDPE cover in the anaerobic lagoons	<ul style="list-style-type: none"> <li>Air quality</li> <li>Health and safety</li> </ul>	<ul style="list-style-type: none"> <li>Increase the risk to pollute the air quality.</li> <li>Biogas may catch fire that may lead to explosion.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure the HDPE cover is not damaged.</li> <li>Heat sources shall be kept away from the Project.</li> </ul>	Before installation of the HDPE cover	Project engineer	P 735,000.00 for the HDPE cover	PCO	Observation	Leaks in the HDPE cover	Two weeks after placement of the cover	Project engineer		Farm manager	
Open flare	<ul style="list-style-type: none"> <li>Health and safety</li> </ul>	Hazard to employees	Enclose the flaring equipment and install vertical nozzle with windshield.	Operation phase	PCO		Farm manager	Visual observation	Flaring area	Within the month after installation	Farm manager		Marcela Farms	
Operation Phase														
Wastewater Generation	<ul style="list-style-type: none"> <li>Washing of the pig wastes.</li> <li>Ground soil</li> <li>Ground water</li> </ul>	Liquid wastes will contaminate the ground soil and percolate to the ground water.	<ul style="list-style-type: none"> <li>Wastewater is directed to the Wastewater Treatment Facility (WTF).</li> <li>Maintenance of the WTF.</li> <li>The final pond shall be closed to disallow</li> </ul>	<ul style="list-style-type: none"> <li>Daily flushing of wastes to the WTF.</li> <li>Monthly maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Laborers</li> <li>Operation and Maintenance (O&amp;M) crew</li> </ul>	<p>P10,875,591.30 for the construction of the biogas facility</p> <p>P3,500.00 for maintenance cost.</p>	The laborers and O&M crew shall report to the PCO	<ul style="list-style-type: none"> <li>Visual inspection of the pig wastes.</li> <li>Effluent wastewater sampling</li> </ul>	Wastes in the pigpens	<ul style="list-style-type: none"> <li>BOD, TSS, pH and color</li> </ul>	<ul style="list-style-type: none"> <li>Daily</li> <li>Yearly</li> </ul>	PCO	P30,000.00 per year for wastewater sampling	Farm manager

			discharge of the treated effluent anywhere except to the banana plantation. • • • •										
Health and Safety	<ul style="list-style-type: none"> <li>Biogas trapped in the 2 anaerobic digesters and collection gas pipes</li> </ul>	<ul style="list-style-type: none"> <li>Air quality</li> <li>Health and safety</li> </ul>	<ul style="list-style-type: none"> <li>Leaks will release the biogas and pollute the air quality.</li> <li>Biogas will catch fire that may lead to explosion when exposed to heat.</li> </ul>	Regular maintenance of the HDPE cover and the collection gas pipes.  Heat sources shall be kept at a safe distance away from the biogas facility  Personal protective equipment shall be used by the engine operators	Weekly	Operation & Maintenance (O&M) crew	P3,500.00 for maintenance cost.	PCO	Methane monitoring system	Methane	Monthly	PCO	Farm manager
Emission of Air													

<p><b>Pollutants</b></p> <ul style="list-style-type: none"> <li>• Combustion of the 3 units gas engines</li> <li>• Flaring when gas engines are not in use</li> </ul>	<p>Air quality</p> <p>Air quality</p>	<p>Incomplete combustion of biogas will release carbon monoxide.</p> <p>Incomplete combustion of biogas will release carbon monoxide.</p>	<ul style="list-style-type: none"> <li>• Installation of a muffler, smoke stack and other air pollution control device/s</li> <li>• Maintenance of the gas engines</li> <li>• Systematic flaring operation</li> <li>• Maintenance of the flaring equipment.</li> </ul>	<ul style="list-style-type: none"> <li>• Was considered during the installation of the gas engines.</li> <li>• Quarterly maintenance</li> </ul> <p>During non-operation of the gas engines</p>	<ul style="list-style-type: none"> <li>• Farm manager</li> <li>• O&amp;M crew</li> </ul> <p>Gas engine operator</p>	<p>P3,500.00 for maintenance cost.</p> <p>P3,500.00 for maintenance cost.</p>	<p>O&amp;M shall report to the PCO</p> <p>PCO</p>	<p>Point source air emission test</p> <p>Visual inspection</p>	<p>PM and CO</p> <p>Status of the flaring equipment</p>	<p>Yearly</p> <p>Quarterly</p>	<p>PCO</p> <p>PCO</p>	<p>P30,000.00 / emission test</p>	<p>Farm manager</p> <p>Farm manager</p>
<p><b>Solid Wastes Generation</b></p> <ul style="list-style-type: none"> <li>• Operation of the 2 anaerobic digesters</li> </ul>	<ul style="list-style-type: none"> <li>• Ground soil</li> <li>• Ground water</li> </ul>	<p>Sludge will be generated that will produce leachate and contaminate the ground soil and percolate to the ground water</p>	<p>Sludge shall be placed in the sludge drying bed. Piled sludge shall not be more than 20cm high.</p>	<p>Yearly or as the need arises.</p>	<p>Marcela Farms</p>	<p>P400,000.00 for the sludge drying bed</p>		<p>Visual inspection</p>	<p>Sludge</p>	<p>Weekly</p>	<p>PCO</p>		<p>Farm manager</p>



<p>Odor Generation</p> <ul style="list-style-type: none"> <li>• Pig wastes</li> <li>• Wastewater</li> </ul>	<ul style="list-style-type: none"> <li>• Marcela Farms</li> </ul>	<p>Foul odor from the pig wastes will be a nuisance</p>	<ul style="list-style-type: none"> <li>• Good housekeeping practices will be observed</li> <li>• Regular washing of the piggens</li> <li>• Ensure continuous flow of the wastewater in the treatment system</li> </ul>	<p>Daily washing of the piggens</p>	<p>Laborers</p>		<p>PCO</p>	<p>Sense of smell</p>	<p>Amount of pig wastes</p>	<p>Weekly</p>	<p>PCO</p>		<p>Farm manager</p>
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## **VI. PUBLIC CONSULTATION**

As part of the CDM requirements, a Stakeholders' Consultation was conducted at the Coralandia Resort and Restaurant on February 22, 2008, where it was attended by representatives of the community living near the piggery farm and those that have administrative, social or political interest in the project or its vicinity. Information on the project, as well as the climate change and CDM were discussed. This has been a venue where stakeholders' comments and concerns were solicited, considered and addressed.

## **VII. INSTITUTIONAL ARRANGEMENT ON MONITORING AND VALIDATION**

### **VII.1 CAPACITY BUILDING ON IEC**

LBP will establish partnerships with donors and universities to provide technical support/training and outreach to assist the piggery owners establishing their monitoring and reporting system for the EMP and the anaerobic digesters focusing on environmental performance/compliance on the EMP, proper quality controls; troubleshooting on monitoring issues; and in undertaking calibration of the biodigester system.

### **VII.2 MONITORING OF ENVIRONMENTAL PERFORMANCE**

To ensure the sustainability of the project, the long-term and accountable implementation of the environmental safeguards will be one of the obligations under the Emission Reduction Purchase Agreement (ERPA), and hence, will be monitored by LBP and will form part of the annual Emission Reduction (ER) monitoring report. For guidance, WB will supervise the safeguards implementation.

An Environmental Monitoring Report (EMR), which shall include the review of the proponent's Self Monitoring Report, shall be prepared on a semi-annual frequency, i.e. January and July of each year, to be submitted to the EMB regional office concerned and a copy of the submitted EMR must be provided to the PMO for reference and review purposes.

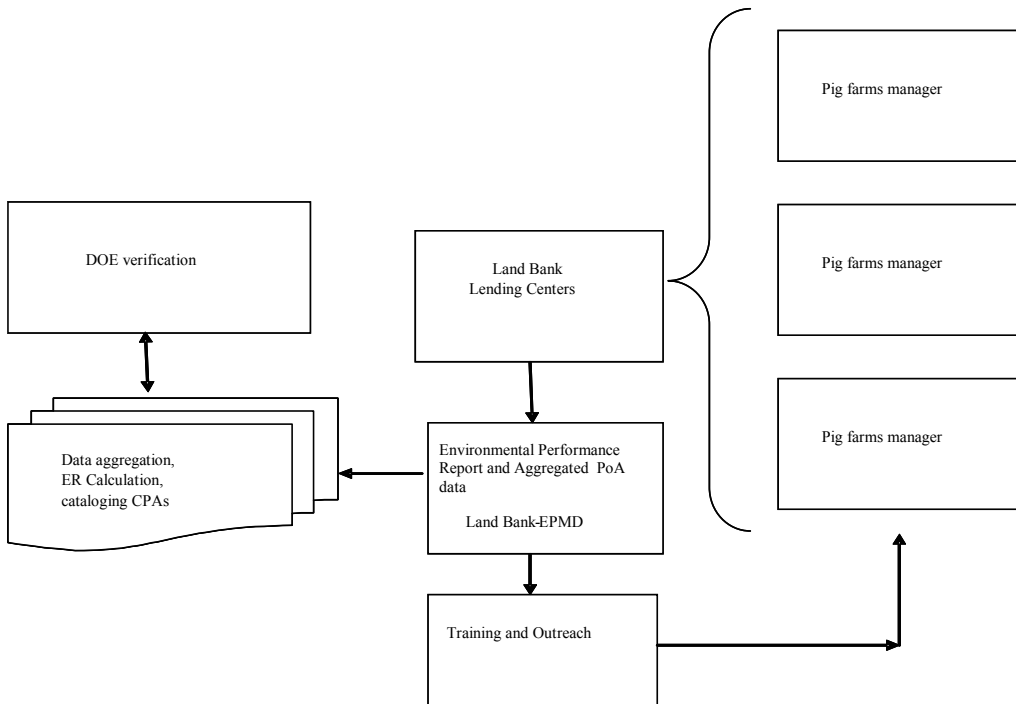
The primary purpose of compliance monitoring is to ensure the implementation of sound and standard environmental procedures as defined during the project preparation. Specifically, it aims to:

- Monitor project compliance with the conditions set in the ECC;
- Monitor compliance with the EMP(s) and applicable laws, rules and regulations; and
- Provide a basis for timely decision-making and effective planning and management of environmental measures through the monitoring of actual project impacts vis-à-vis the predicted impacts in the EIS / IEE.

### VI.2.1 INSTITUTIONAL SET-UP OF THE MONITORING SYSTEM

The operation and management of the PoA will be led by LBP in their role as technical and financial intermediary and the group in charge of organizing and ensuring compliance with the rules under the PoA. Thus, LBP has established an Environment and Social Safeguard Framework to make sure that all projects under the PoA (e.g. Marcela Farms, etc.) will follow an agreed standard framework to address the project's environmental aspects/impacts.

The diagram below illustrates how the monitoring plan will be implemented:



LBP, being an ISO 14001 certified institution, will establish a Project Management Office (PMO) under the LBP's Environmental Program and Management Department (EPMD) to primarily implement the safeguards activities. For this purpose, the Environmental Program Management Unit (EPMU) will serve as the project's PMO. Part of this activities will be to exercise environmental due diligence by keeping records of project 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. Environmental safeguards documents may undergo substantive review by the PMO environmental engineer or the LBP-EPMD, particularly if pressing environmentally critical issues exist.

The conduct of review by PMO / LBP-EPMD, particularly of the Environmental Review and Assessment Unit (ERAU), 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. ERAU is currently manned by four (4) regular personnel of LBP, 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. This type of review performed by either the PMO or WB is entirely independent and does not conflict with the nature of evaluation the DENR performs.

## VIII. ACCOUNTABILITY STATEMENT

This is to certify that all the information in this Environmental Assessment Report for the Methane Recovery and Combustion Project of Marcela Farms, Inc. 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. Marcela Farms, Inc. shall be held responsible for any liabilities and/or penalties arising from the Methane Recovery and Combustion Project.

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

\_\_\_\_\_  
Pollution Control Officer

\_\_\_\_\_  
Farm Manager


\_\_\_\_\_  
President

SUBSCRIBED AND SWORN TO before me this \_\_\_\_\_ day of \_\_\_\_\_, affiant exhibiting his / her \_\_\_\_\_  
No. issued at \_\_\_\_\_ on \_\_\_\_\_.

Doc. No. \_\_\_\_\_  
Page No. \_\_\_\_\_  
Book No. \_\_\_\_\_  
Series of \_\_\_\_\_

## **IX. ANNEX**

VII.1 TEST REPORT



**Holy Name University**  
**Water Assessment, Testing, Education and Research Support Services**  
Cor. Lesage and Gallares Streets  
Tagbilaran City, Bohol  
6300 Philippines

Tel. No. +6338 411-3764 / 411-3432 / 235-3399 /  
501-9817 local 403  
Email: waterss@hnu.edu.ph

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**TEST REPORT**  
WATERSS Lab. Form 3

Request Information Sheet (RIS) No. : 2009-0029-84  
 Date reported : April 22, 2009  
 Date and time sample submitted : April 21, 2009 (10:35 am)  
 Date and time sample collected : April 21, 2009 (09:12 am)  
 Sample type and source : Drinking water - Lourdes Cortes (PROPER)  
Lourdes, Cortes, Bohol  
 Sampled by : Emerald Simbajon  
 Sample submitted by : Emerald Simbajon  
 Sample received by : Jepril Marie Sumaylo  
 Requested by : Emerald Simbajon  
Marcela Farms Inc., Piggery Division

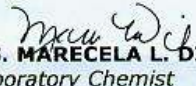
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**Results:**

Laboratory Code	2009- 0029-84	<b>Method used*</b>
Client's Code	Station 2	
<b>pH</b>	-	Using Oakton pH meter
<b>Microbiological Test:</b>		
Escherichia Coli (per 100 ml)	<1/100 ml	Membrane Filtration Method (mTEC agar, 44.5°C, 24 hrs)
Fecal Coliforms (per 100 ml)	<1/100 ml	Membrane Filtration Method (mFC broth, 44.5°C, 24 hrs)
Total Coliforms (per 100 ml)	<1/100ml	Membrane Filtration Method (M Endo Broth, 35°C, 24 hrs)


\*Standard Values for Bacteriological Quality from the Philippine National Standards for Drinking Water is available at the back.  
 \*Reference: APHA, AWWA, WPCF, Standard Methods for the Examination of Water and Wastewater, 21<sup>st</sup> ed., USA; APHA (2005)

**Analyzed by:**




**MS. MARCECLA L. DILOY**  
Laboratory Chemist

**Analyzed / Checked by:**



**MS. MARIA PUREZA B. ENRIQUEZ**  
Medical Technologist

**Certified true and correct by:**



**ENGR. JULIET M. SALGADOS**  
Laboratory Head, HNU WATERSS

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