ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

GREG III Farm
Methane Recovery and Power Generation Project

Ref. No. 5979-0027
CPA-51 Methane Recovery and Combustion with Renewable Energy Generation from Anaerobic Animal Manure Management Systems under the Land Bank of the Philippines' Carbon Finance Support Facility

June 2019

LIST OF ACRONYMS

BOD	Biological Oxygen Demand
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFSF	Carbon Finance Support Facility
CMR	Compliance Monitoring Report
CPA	Component Project Activity
DECORP	Dagupan Electric Corporation
DENR	Department of Environment and Natural Resources
DNA	Designated National Authority
DP	Discharge Permit
ECC	Environmental Compliance Certificate
EMB	Environmental Management Bureau
EPMD	Environmental Program and Management Department
ESMP	Environmental and Social Management Plan
ESSF	Environmental and Social Safeguards Framework
LBP	Land Bank of the Philippines
MOA	Memorandum of Agreement
MRF	Methane Recovery Facility
MSDS	Materials Safety Data Sheet
PCO	Pollution Control Officer
P.D.	Presidential Decree
PoA	Program of Activity
PPE	Personal Protective Equipment
PTO	Permit to Operate
R.A.	Republic Act
SMR	Self-Monitoring Report
SPA	Subproject Agreement
TSD	Treatment, Storage, Disposal
TSS	Total Suspended Solids
WTF	Water Treatment Facility

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PURPOSE OF THE DOCUMENT

This Environmental and Social Management Plan (ESMP) is prepared as part of the requirements of the Safeguards Framework for Clean Development Mechanism (CDM) projects implemented under the Carbon Finance Support Facility (CFSF) of the Land Bank of the Philippines (LBP). The Environmental and Social Safeguards Framework (ESSF) was developed to ensure the establishment of protection, compliance, and mitigation measures for relevant environmental and social aspects of projects under the CDM program which covers the Methane Recovery and Power Generation Projects of GREG III Farm.

Scope

Since the Project is a key component of GREG III's wastewater treatment facility (WWTF) – which handles the primary waste the piggery produces (manure) – this ESMP will cover the operations of the entire pig farm described herein, highlighting the management of impacts attributable to or associated with the Project.

1 PROJECT SUMMARY

The Methane Recovery and Power Generation Project of Greg III Farm owned by Greg III Agro-industrial Corporation is an initiative developed under LANDBANK's CFSF. Its goal is to capture greenhouse gases, particularly methane from piggery wastewaters that would otherwise dissipate into the atmosphere, and convert them into electrical energy.

1.1 Proponent Profile

Proponent:	Greg III Agro-industrial Corporation
Business Address:	103 Guilig St. Barangay Pogo Chico, Dagupan City, Pangasinan, Philippines
CEO / COO:	Georgina R. Guadiz
Farm Name:	Greg III Agro-industrial Farm
Project Site:	Barangay Balingueo, Sta. Barbara, Pangasinan, Philippines
Farm Coordinates:	15.952500, 120.409000
Project Type:	Livestock Project
Philippine Standard Industrial Classification:	0145 - Hog Farming

Contact Persons

Greg III Farm

Farm CEO:	Georgina R. Guadiz
Telephone No.:	(63) 917 8145439
Pollution Control Officer:	Ericson De Guzman
Telephone No.:	(63) 908 8960376
Lead Man:	Elef Oracoy

LANDBANK

Lending Programs Management Group:	Emellie V. Tamayo
Designation:	Head / First Vice President
Telephone No.:	(632) 405-7309
Fax No.:	(632) 528-8542
Environmental Program Management Department:	Prudencio E. Calado III
Designation:	Head / Assistant Vice President
Telephone No.:	(632) 405-7339
Fax No.:	(632) 528-8484

1.2 Pig Farm Profile

Farm area:	3,4957 m^2
Production:	Wean-to-Finish
Housing type:	Conventional, tunnel ventilated
Capacity of facilty:	3,000 heads
Permitted population:	3,000 heads
Average population:	2,400 heads
Start of operation:	September 2017
Operating hours:	24 h / day
Number of employees:	7

GREG III Farm is a contract grower farm of Charoan Pokphand Foods Philippines Corporation engaged by the latter to raise weanlings up to finishing phase of production. It is currently able and licensed (as per its Environmental Compliance Certificate) to house a maximum of 3,000 heads.

The Farm is mainly powered by a grid of a local concessionaire, Dagupan Electric Corporation (DECORP), but is also utilizing electricity from biogas through the Project. A deep well within its premises supplies the Farm's water needs. Figure 1 shows the layout and basic facilities of the Farm.

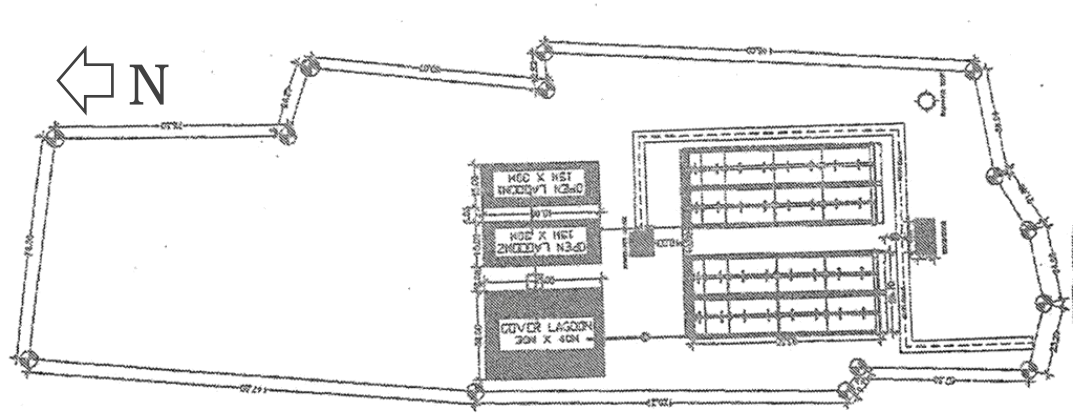


Figure 1. Site layout of GREG III Farm

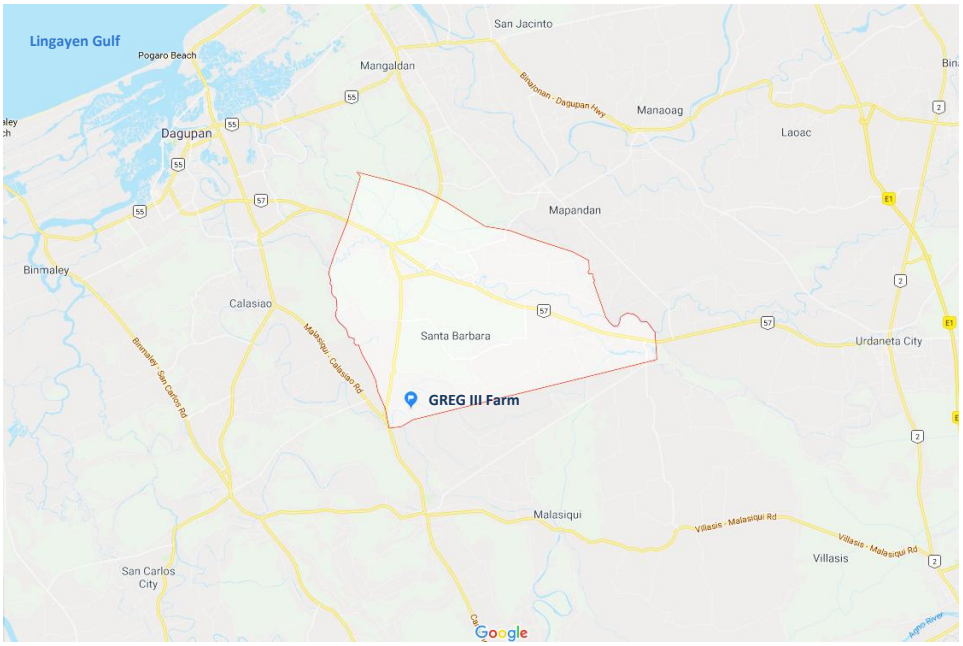
1.3 Exisitng Environmental Conditions

1.3.1 Project Site

The Project has been built within the premises of GREG III Farm (15.9525, 120.4090), a 3.4957-ha property in Barangay Balingueo, Santa Barbara, Pangasinan. Pangasinan is in the island of Luzon, northern Philippines.

The Farm is less than 100 m from the Camiling-Malasiqui-Santa Barbara Road through which an extensive road network leading to nearby town centers and cities can be

accessed (see Map1). The nearest emergency services are roughly a 5 to 20-min drive away, depending on the prevailing traffic.



Map 1. Map highlighting the Municipality of Santa Barbara and indicating the location of GREG III Farm (Image generated using *Google Maps*[a])

1.3.2 **Land Classification and Use**

The site of GREG III Farm is classified as agro-industrial. It is surrounded by wide plains used for crop production (see Map 2). Quite a number of households near the Farm are engaged in small-scale / backyard pig raising.

Map 2. Satellite image of GREG III Farm and its vicinity (Image generated using *Google Earth*[b])

1.3.3 **Climate**

The climate in Santa Barbara is Tropical Wet and Dry (Aw) according to the Köppen-Geiger classification.[1] It has an average annual temperature of 27.5 °C[1] and an average rainfall of 1845 mm in a year[1]. Typhoons are a common occurrence in Pangasinan.[2]

1.3.4 **Topography and Soil**

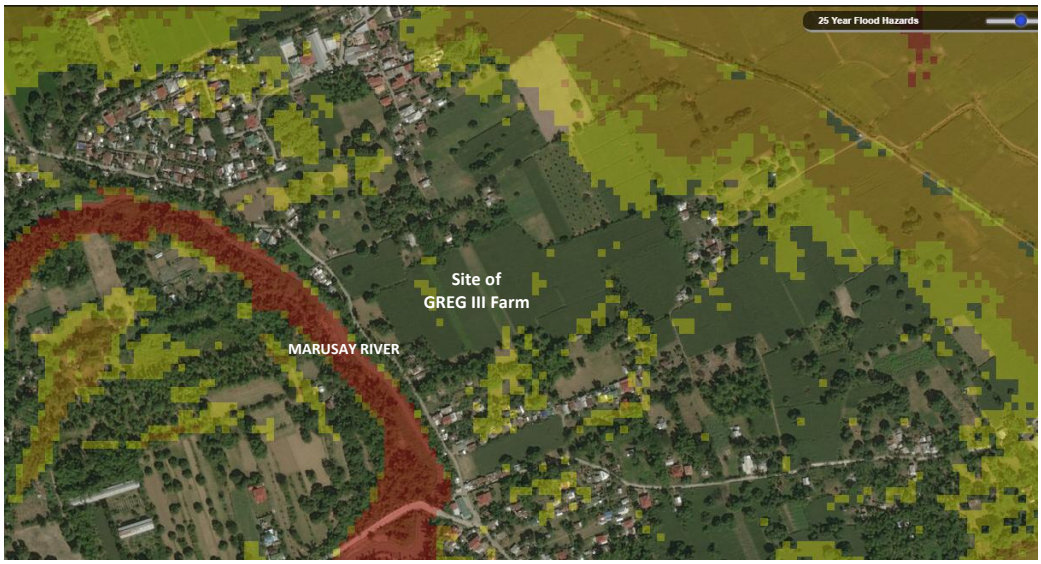
The Farm sits on a relatively flat land. The soil in the property and its immediate surroundings consists of a mixture of silt loam, silty clay loam, sandy loam and sand (San Manuel series).[3] Irrigation (with organic matter) during dry season / drought periods is suitable to the type of soil in the Farm.[3]

1.3.5 **Water Resources**

The closest surface water to the property is the Marusay River found 50 m across the Farm's entrance (see Map 3). During heavy rainfall, runoff from the Farm may drain into this river.

1.3.6 **Natural Hazards**

The site is frequented by typhoons during rainy seasons but the property itself is not affected by the seasonal flooding experienced by much of the lands surrounding it[4] (see Map 3). Earthquakes and landslides are not a significant risk.[4]



Map 3. Satellite image of GREG III Farm showing areas at risk to flooding (yellow: low; orange: moderate; red: high) (25 year flood hazard; Image generated through Project NOAH[c])

1.3.7 **People and Communities**

The Farm is in a sparsely populated area (see Maps 2 & 3). Several houses and a primary school are within its 0.5 m to 1-km radius.

1.4 Project Description

The Project covers the installation and operation of an anaerobic digester system and its ancillary facilities including post-treatment wastewater lagoons and a biogas-fueled electricity generation system. The biodigester and the power generation unit are collectively referred to herein as methane recovery facility (MRF).

1.4.1 Components and Design

GREG III's wastewater treatment process features three treatment phases:

- *Pre-Treatment*, which involves removal of indigestible materials and relatively large digestible particles in wastewaters prior to entering the reactors;
- *Anaerobic digestion*, or the disintegration of biodegradable materials in the wastewaters through biological processes facilitated by microbes which thrive in the conditions provided by the reactor; and
- *Post-Treatment* of the by-products of anaerobic digestion – biogas, effluent, and sludge.

The WWTF of the Farm is primarily consisted of two pre-treatment storage / settling tanks and one covered (reactor) and two uncovered (clarifying) earthen lagoons (see Figs 1 & 2). The power generation unit consists of biogas scrubbers and biogas-fueled generator sets.

Earthen lagoons are partially raised from the ground and are lined with HDPE sheets. The same material was used to cover the biodigester. The settling tank is made of concrete and is located underground.

Wet digestion is likely employed. Anaerobic process is likely mesophilic, occurring at around 30-40 °C. At this temperature range, the ideal retention time is 30-40 days.

Overall, the anaerobic digester was designed to accommodate wastes generated by the maximum number of pigs the farm could house (3,000 heads) and capture enough biogas to run the Project's facilities with a net energy requirement of zero. The design and layout of the WWTFs are in the construction plans in Appendix A. An assessment of the facilities performance will be undertaken. Its results, which will detail operational parameters and outputs, will be presented to the succeeding version of this ESMP.

Table 1 presents the particular processes and components involved in the treatment of wastewaters in the Farm.

Table 1. Specifications of GREG III Farm's Wastewater Treatment Facility-Methane Recovery Facility

Phase		Process	Component	No. of Units	Description / Equipment
Pre-treatment		Settling	pre-storage settling tank	2	concrete 1.0 x 1.0 x 0.65 m (height) --- equipped with submersible pump
Anaerobic treatment		anaerobic digestion / fermentation	reactor	1	earthen lagoon, lined and covered with 1 mm HDPE 30 x 40 x 6.6 m 875 m^3
Post-treatment	Biogas	Combustion	scrubber system	1	-
			generator set	1	70 kVA
	Effluent	clarification (settling, aeration)	open lagoon	2	earthen lagoon lined with 1mm HDPE 15 x 30 x 6.0 m
	Sludge	Drying	drying bed	1	earthen ditch lined with 1mm HDPE (for completion)

1.4.2 **Operation**

Inside pig buildings are wallows (along the perimeters) which also serve as wastewater drains. These are controlled by pulp-plug systems that when opened, direct wastewaters into the pre-storage settling tanks. Each tank receives wastewater from two pig buildings.

A submersible pump hauls the slurry from the storage tanks into the biodigester. The pump is positioned such that only the top layer of the slurry is transported, leaving settled materials in the tank. Stirring inside the biodigester is passive, facilitated by the current produced by the inflow and outflow of feedstock.

From the biodigester, partially treated wastewaters overflow into the first clarifying lagoon, and subsequently into the next where they are indefinitely stored for irrigation or until evaporated. Bioactive products are added in the clarifying lagoons for further treatment.

Sludge is removed from the biodigester and piled onto the adjacent drying bed through gravity release pipes. Dried sludge is stored and used a soil amendment within the farm.

Captured biogas in the covered lagoon is propelled by a blower to a gas conditioning equipment. The upgraded gas fuels the generator set to produce electrical energy used in the Farm.

Figure 2 illustrates the wastewater treatment process of GREG III.

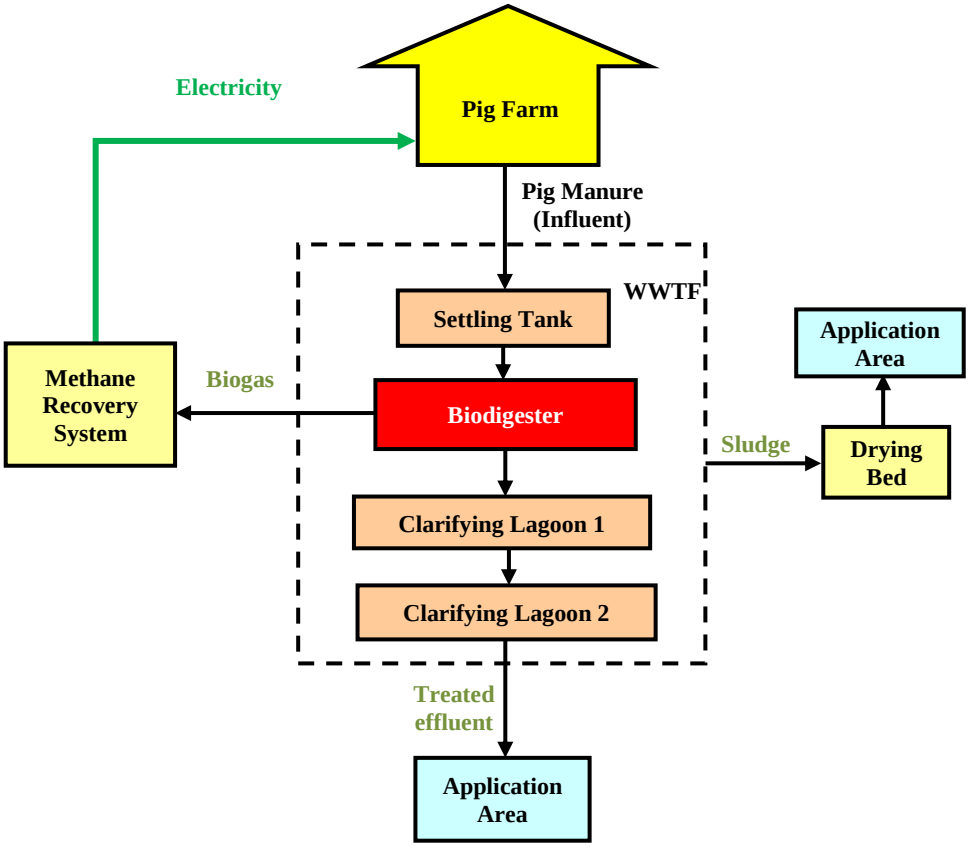


Figure 2. Wastewater treatment process of GREG III Farm

Figure 3. Satellite image of GREG III Farm's Wastewater Treatment Facility (Image generated using *Google Earth*[b])

2 ENVIRONMENTAL MANAGEMENT

2.1 Impacts

2.1.1 Positive

Environment

The primary treatment of pig wastes of GREG III Farm is accomplished mainly through the Project. Anaerobic digestion with the biodigester helps ensure that the Farm's effluents meet regulatory quality standards. Using recycled effluent for irrigation has reduce extraction of groundwater.

Significant reduction of foul odors emanating from stored effluents has been observed since the operation of the biodigester. This has improved the working condition of workers and the general environment in the Farm for its neighboring communities and livestock.

By providing a mechanism to capture methane and using it as a renewable source of energy, the Project is helping lower the Farm's overall carbon footprint – through preventing release of greenhouse gases into the atmosphere and decreasing its consumtion of conventional fuels (for power). With inputs coming from 2,400 hogs (current average), through the Project, GREG III is estimated to be capable of reducing greenhouse gas emissions equivalent to 2,866 tCO_2e annually.

Economy

Using biogas-generated electricity lessens the Farm's reliance on the grid, translating to savings for the piggery business. Sludge on site eliminates the need to purchase fertilizer for the Farm's vegetation. Selling it as soil amendment presents an opportunity to generate additional income. Further savings is also gained from reusing treated effluent.

Moreover, having been being registered as a component project activity (CPA) in the CDM Program, GREG III has an opportunity to earn monetary incentives by selling carbon credits to World Bank. It may also opt to trade its carbon credits in the wider carbon market after the Program.

Lastly, GREG III provides employment opportunities to residents of Santa Barbara and generates revenue for the local government.

2.1.2 Negative

Certain aspects of the pig farm's and the project's operations inevitably result in potential harm to the environment, including generation wastewaters; hazardous and non-hazardous wastes; air pollutants; foul odors, noise, dust and other nuisance; and depletion of natural resources, especially freshwater / groundwater. These pose inherent risks of variable degrees to environmental quality and natural ecosystems and health and safety of workers, communities, and livestock.

A. *Wastewater Generation*
   Wastewaters saturated with dissolved manure and feed materials are primarily generated from raising around 2,400 pigs through intensive farming methods.

B. Solid Wastes Generation

Pig manure, sludge from wastewater treatment, and carcasses make up the bulk of solid wastes generated in the Farm.

C. Hazardous Wastes Generation

Generation of potentially hazardous wastes mainly result from veterniary activities and use of various chemicals for cleaning and for maintenance of machineries. Biological materials from diseased pigs also pose significant risks to the health of workers and livestock.

D. Generation of Air Pollutants

Emssions from diesel- and biogas- fueled generator sets which supplement the grid for the Farm's power requirements are the main sources of air pollutants in the Farm.

E. Risks to Environmental Quality

- Pollution. The inadvertent release to the environment (through breaches and leaks) of the wastes listed above, especially of nutrient-rich meterials, may cause serious damage to the quality of affected soil and aquatic resources.

  The site is typhoon prone and receives significant amount of rainfall. Strong winds may damage WWTF and MRF causing release of pollutants. Long periods of heavy rainfall could overtop wastewater lagoons and wash off sludge piles.

- Global warming. Large amount of biogas, mostly composed of potent greenhouse gases, are produced during the anaerobic decomposition pig manure and other organic compounds. If allowed to escape to the atmosphere, these gases will contribute to the furthering of the deteriorating effects of global warming. Use of power from the grid consumes non-renewable fuels which generate greenhouse gases when processed for electricity production.

- Resource depletion. Intensive farming demands for significant volume of freshwater. Neglectful sourcing and use of water in the Farm could deplete water resources.

F. Health and Safety (Methane Recovery Facility)

Biogas is a mixture of gases produced during anaerobic digestion. It is mainly composed of methane and carbon dioxide, but other gases (nitrogen, hydrogen, hydrogen sulphide, ammonia, etc.) may also be present at lower concentrations.

- Fire and Explosion. The MRF presents a major fire and explosion hazard in the farm owing to the high concentrations of biogas (primarily consists of methane which is highly flammable and combustible) that it is designed to capture and process. Risk of explosion is elevated in areas where biogas is compressed for storage.

- Asphyxiation and Poisoning. Methane and carbon dioxide are asphyxiants, substances that cause suffocation by displacing oxygen in the ambient air. Furthermore, carbon dioxide and hydrogen sulfide are considered poisonous when inhaled at high concentrations. In the farm, risks of asphyxiation and gas poisoning are high in the areas associated with the MRF and in confined spaces and poorly ventilated areas where fugitive biogas may collect.

- ¬ Infection and Infestation. Handling and processing of manure, wastewaters, and sludge expose workers to various pathogens and parasites.

G. *Health and Safety (General Operations)*
Various elements and situations in the Farm could compromise the health and safety of workers and livestock. The comfort and convenience of surrounding communities may also be affected by impacts not contained by the Farm's boundaries.

- ¬ Odor, Noise, Dust. Fould odors are typically emitted from manure drains and storage and unclean pig houses. Loud noises may be produced by pigs (especially during feeding) and farm machines. Dust is generated from handling feeds and other dusty materials and by movement of vehicles on unsealed roads.

- ¬ Pests and vermin. Pests and vermin are attracted to foul odors and sources of food in the Farm (improperly disposed biodegradable wastes and Inadequately contained food and feed materials).

- ¬ Diseases and Injuries. Livestock, pathological materials, and excretions likely harbor harmful organims. Various injuries could result from accidents, particularly when handling pigs, operating machineries, and using toxic substances.

2.2 **Due Diligence**

GREG III Farm commits to undertake environmental due diligence in its dealings and operations through compliance with relevant regulatory safeguards and implementation of the measures provided in the environmental management and monitoring plan in Table 3 and in the existing and proposed plans presented herein.

2.2.1 **Compliance to Regulatory Instruments (Legal Framework)**

The Farm operates in the context of laws prescribing the regulatory safeguards in Tables 2 and 3. Table 2 lists relevant national legal instruments concerned with environmental protection, whereas Table 3 lists permits issued by local government agencies that mainly address health and safety aspects of the Farm and the Project.

Table 2. Environmental documents and statutory requirements regulating the operation of GREG III Farm

DOCUMENT	**PARTICULARS / STATUS**	
Environmental Compliance Certificate (ECC)	Reference No.	ECC-OL-R01-2017-0092
	Issuing Agency	EMB Region 1
	Date of Issuance	May 31, 2017
	Valid Until	- no expiration -
	Conditions	・ area of operation: 34,957 m^2 ・ maximum population: 3,000 heads ・ submission of CMR
Discharge Permit (DP)	Reference No.	WWDP-18A-01PA36-069
	Issuing Agency	EMB Region 1
	Date of Issuance	January 24, 2018
	Valid Until	January 23, 2023
	Conditions	・ annual effluent analysis
Permit to Operate (PTO) Air Pollution Source Control Installations	Reference No.	POA-10J-01PA36-069
	Issuing Agency	EMB Region 1
	Date of Issuance	October 23, 2017
	Valid Until	October 19, 2022
	Conditions	・ For the following equipment: - (1 unit) 147.75 HP CUMMINS diesel engine coupled to 131 kVA electric generator
Water Permit	Reference No.	- for application -
	Issuing Agency	National Water Resources Board
	Date of Issuance	NA
	Valid Until	- no expiration -
	Conditions	(P.D. 1067 Water Code)
Hazardous Waste Generator ID	Registration No.	- for application -
	Approving Agency	EMB Region 1
	Date of Approval	NA
	Valid Until	- no expiration -
	Conditions	
PCO (Pollution Control Officer) Accreditation Certificate	Accreditation No.	AVAILABLE AND UP-TO-DATE
	Issuing Agency	EMB Region 1
	Date of Issuance	---
	Valid Until	---

CMR Compliance Monitoring Report
EMB Environmental Management Bureau
P.D. Presidential Decree

Table 3. Permits ensuring the safety of GREG III Farm's facilities and operation

DOCUMENT	PARTICULARS	
Business Permit	Permit No.	AVAILABLE AND UP-TO-DATE
	Issuing Agency	Office of the Mayor - Municipality of Santa Barbara
	Date of Issuance	January 2019
	Valid Until	December 31, 2019
	Prerequisites	compliance with the requirements of the following: ・ Occupancy Permit (P.D. 1096 National Building Code) ・ Locational and Zoning Clearance ・ Fire Safety Inspection Certificate ・ Health and Sanitary Certificate
Zoning Clearance	Registration No.	AVAILABLE AND UP-TO-DATE
	Approving Agency	
	Date of Approval	
	Valid Until	- no expiration -
Fire Clearance	Reference No.	10-0025647
	Issuing Agency	Bureau of Fire Protection Regional Office 1
	Date of Issuance	January 2019
	Valid Until	December 31, 2019
	Prerequisites	・ compliance with R.A. 9514 (Revised Fire Code)
Sanitary Permit	Permit No.	AVAILABLE AND UP-TO-DATE
	Issuing Agency	Municipal Health Office – Municipality of Santa Barbara
	Date of Issuance	January 2019
	Valid Until	December 31, 2019
	Prerequisites	・ compliance with P.D. 522 ('Sanitation Requirements'), P.D. 856 (Code on Sanitation), and pertinent local ordinances

ENRO Environment and Natural Resources Office
P.D. Presidential Decree
R.A. Republic Act

2.2.2 **Environmental Management and Monitoring Plan**

Table 4 summarizes the measures GREG III is implementing and intends to implement to address the environmental impacts and risks identified in Section 2.1.2. Adequate training will be given to concerned employees to ensure that the content of this environmental management plan will be properly carried out.

Table 4. Environmental Management and Monitoring Plan of GREG III Farm

IMPACT	SOURCE / ACTIVITY	MEASURES	STATUS			MONITORING METHOD	FREQUENCY	PARAMETER / INDICATOR	RESPONSIBLE ENTITY	REPORTING TO	Cost^, Php
			Existing / Current Practice	To be Implemented / Under Construction	Adoption Under Review						
A. Wastewater											
a.1 generation of wastewater	pig raising	water conservation strategies	✓			quantify wastewater production	monthly	volume of wastewater produced	Lead man	Owner > reported in SMR	10,000 / yr
		treatment of wastewater in WWTF	✓								
a.2 generation of domestic wastewater	general farm activities	water conservation strategies	✓			check siphoning and hauling records	every 5 years	volume of sewage hauled	Lead man	Owner > reported in SMR	-
		lined sewage septic tanks	✓								
		sewage disposal to treatment plant		✓							
B. Solid Waste											
b.1 generation of manure, sludge	pig raising, feed wastage, WTF	minimize feed wastage - semi-automated feeding system - uses supplements for improved feed-to-mass conversion	✓			quantify (dried) sludge produced	annually	amount of sludge produced	Lead man	Owner > reported in SMR	10,000 / yr
		treatment of manure in WWTF	✓								
b.2 generation of (non-infectious) carcasses, blood	injuries, adverse environmental conditions, etc.	sound pig raising practices and biosecurity measures	✓			weigh disposed materials	daily	weight of materials disposed	Lead man	Owner > reported in SMR	-
		regular inspection and preventive maintenance of equipment regulating pig environment	✓								
		carcass disposal in concrete vault	✓								
b.3 generation of general solid wastes	general farm activities	waste segregation		✓		weigh solid wastes disposed of (recyclables and residuals)	every hauling	weight / details on wastes generated, stored, and disposed of	Lead man	Owner > reported in SMR	50,000 / yr
		adequate collection bins, proper storage	✓								
		recycling / selling of recyclables	✓								
		residuals hauled to the sanitary landfill	✓								
		composting		✓							
C. Hazardous Materials											
c.1 generation of hazardous, toxic wastes	facilities' operation and maintenance	monitors resource usage to avoid expiration of chemicals, etc.		✓		quantify each type of hazardous waste produced / stored and disposed of (check hazardous waste manifests)	every hauling and disposal	quantity of each hazardous waste type stored and disposed	Owner	PCO > reported in SMR	50,000 / yr
		disposal through accredited TSD		✓	✓						
c.2 generation of infectious, pathological wastes, carcasses	veterinary activities, infections, outbreaks	disposal in concrete vault	✓								
D. Air Pollution											
d.1 generation of air pollutants	stand-by generator sets (fossil fuel combustion)	operates equipent according to manufacturer's instruction	✓			review inspection and maintenance record	quarterly	number and details of machinery issues noted	Lead man	Owner	-
		regular inspection and preventive maintenance of equipment	✓								
E. Risk of Environmental Degradation											
e.1 surface water and groundwater quality degradation, disruption of soil properties, contamination	e.1.1 wastewater collection, transport, treatment, disposal	WWTF constructed with durable materials	✓			effluent sampling and testing by an EMB-accredited laboratory	quarterly - more frequently during rainy seasons	effluent quality indicators: BOD, TSS, ammonia, phosphate (must meet standards for Class C effluent)	Owner	PCO > reported in SMR	20,000 / yr
		operates WWTF as prescribed	✓								
		regular inspection and preventive maintenance of WWTF	✓								
		prevent overtopping, spills - raised lagoon walls to prevent ingress of runoff	✓								
		adequate rainwater and wastewater separation - wastewater channels are enclosed and underground	✓								
		establish vegetation (filter strips) around lagoons		✓							
		has and implements contingency response plan	✓		✓						
	e.1.2 sludge management, storage, leachate	regular inspection and preventive maintenance of drying bed		✓	✓	review inspection and maintenance record	monthly - more frequent during rainy seasons	number and details of leak / breach incidents	Lead man	Owner	-
		establish vegetation (filter strips) around drying bed and storage		✓							
		has and implements contingency response plan	✓		✓						
	e.1.3 pathological wastes, carcass disposal, leachate	disposal in concrete vault	✓			review inspection and maintenance record	monthly - more frequent during rainy season	number and details of leak / breach incidents	Lead man	Owner	-
		raised vault walls to prevent ingress of rainwater	✓								
		regular inspection and maintenance of mortality pit		✓							
		has and implements contingency response plan	✓		✓						
	e.1.4 handling, transport, storage, disposal of hazardous and infectious materials	use materials according to registered use / manufacturer's instruction	✓			review inspection and maintenance record	weekly	number and details of leak / breach incidents	Lead man	Owner	100,000 (storage building) 10,000 (signage)
		MSDS available and consulted		✓							
		proper and secured storage	✓								
		spill kits available	✓								
		appropriate signage, warnings in place	✓								
		regular inspection of storage, disposal facilities		✓							
		has and implements contingency response plan	✓		✓						
		adequate training on handling hazardous materials		✓							
e.2 (release of GHGs)	e.2.1 anaerobic digestion, biogas collection and utilization, fugitive biogas	biogas sequestered using biodigester	✓			review inspection and maintenance record	monthly	number and details of leak / breach incidents (odor detection)	Lead man	Owner	-
		MRF constructed with durable materials	✓								
		operate MRF as prescribed	✓								
		regular inspection and preventive maintenance of MRF	✓								
		has and implements contingency response plan	✓		✓						
		has flare			✓						

	e.2.2 use of electricity from grid	energy conservation strategies	✓			review billing statement	monthly	kWh consumption	Owner	>reported in SMR	-
		uses renewable fuel (biogas from MRF)	✓								
		uses energy-efficient equipment	✓								
e.3 groundwater depletion	pig raising, general farm activities	water conservation strategies	✓			quantify volume of freshwater consumption	monthly	volume of freshwater consumed	Lead man	Owner >reported in SMR	50,000 (flow meter)
		effluent recycling			✓						
		rainwater harvesting			✓						
F. Health and Safety – Anaerobic Digester System											
f.1 explosion, fire hazard	biogas collection, storage, combustion	WWTF-MRF constructed with durable materials	✓			review inspection and maintenance records, incident reports, complaints register	monthly	number and details of explosion, fire incidents	Lead man	Owner	10,000 (signage) 100,000 / yr (fire protection equipment)
		operates WWTF-MRF according to design	✓								
		regular monitoring of pressure within the MRF system	✓								
		regular inspection and preventive maintenance of MRF	✓								
		restricts access to MRF		✓							
		prohibits ignition sources near MRF	✓								
		'no smoking' policy / designated smoking area	✓								
		appropriate signage, warnings in place	✓								
		fire protection equipment on site	✓								
		adequate training on biogas safety		✓							
f.2 asphyxiation, poisoning	biogas	appropriate signage, warnings in place		✓		review incident reports	monthly	number and details of asphyxiation, poisoning incidents	Owner	-	5,000 / yr (PPE) 10,000 (signage)
		adequate training on biogas safety		✓							
		pull-plug system for draining and desludging WWTF	✓								
		use of appropriate PPE		✓							
f.3 infection, infestation	wastewater, sludge	appropriate signage, warnings in place		✓		review incident reports review results of health checks	monthly annually	number and details of infection, infestation incidents	Owner	-	5,000 / yr (PPE) 10,000 / yr (health checks)
		adequate training on handling infectious materials		✓							
		uses appropriate PPE		✓							
G. Health and Safety – General Farm Operations											
g.1 odor - nuisance, discomfort, health issues	g.1.1 pig houses, manure	regular cleaning, disinfection	✓			review complaints register	every two weeks - more frequent during typhoon (windy) season	number and details of odor complaints	Owner	-	100,000 / yr (cleaning materials) 100,000 / yr (bioactive products) 250,000 (biofilters) 2.5 M (perimeter walls) 50,000 (seedlings) 5,000 / yr (PPE)
		odor eraser, bioactiveproducts in feeds	✓								
		tunnel ventilated buildings	✓								
		biofiters in exhaust / vents of pig buildings	✓								
		high, concrete wall along farm perimetes	✓								
		plant / maintain buffer trees / vegetation	✓								
		uses appropriate PPE		✓							
	g.1.2 WTF, effluent, MRF	employs biodigester (traps odor and biogas)	✓								
		adequate retention time of wastewaters in the biodigester		✓							
		regular inspection and preventive maintenance of WWTF-MRF	✓								
		prevent overtopping, spillage	✓								
		plant / maintain buffer trees / vegetation	✓								
		uses appropriate PPE		✓							
	g.1.3 decomposing materials (sludge and organic solids)	sludge pile is well aerated, prevent waterlogging		✓							
		uses appropriate PPE		✓							
	g.1.4 decomposing materials (placental materials and carcasses)	disposal in concrete vault	✓								
		prevent leachate leakage		✓							
		uses of appropriate PPE		✓							
g.2 noise - nuisance, discomfort	g.2.1 pigs	uses appropriate PPE		✓		review complaints register	monthly	number and details of noise complaint	Owner	-	5,000 / yr (PPE) 2.5 M (perimeter walls) 50,000 (seedlings)
		high, concrete wall along farm perimetes	✓								
		plant / maintain buffer trees / vegetation	✓								
	g.2.2 vehicles, machineries	operates equipment according to manufacturer's instruction	✓								
		limits operation during day time	✓								
		regular inspection and preventive maintenance of machineries	✓								
		noise reduction equipment		✓							
		uses appropriate PPE		✓							
g.3 dust - nuisance, discomfort, health issues	g.2.1 pig houses, feed handling	semi-automated feeding system	✓			review complaints register	quarterly - more frequent during typhoon (windy) season	number and details of dust complaints	PCO	TSMD head	
		tunnel ventilated buildings	✓								
		uses appropriate PPE		✓							
	g.2.2 composting areas, dried compost handling	limit dust-generating activities during day time, low wind movement		✓							
		uses of appropriate PPE		✓							
	g.2.3 vehicles, machineries	sealing of unpaved roads	✓								
		limits vehiclular speed on unsealed roads	✓								
		limit dust-generating activities during day time	✓								
		uses of appropriate PPE		✓							
g.4 pest and vermin proliferation / infestation - nuisance, health issues	decomposing materials, sources of odors	observes good houskeeping practices	✓			review inspection results records and complaints register	monthly - more frequent during rainy season	number and details of incidents, complaints	Lead man	Owner	25,000 / yr (pest control)
		odor control measures	✓								
		pest, vermin control measures	✓								
		regular inspection of farm facilities, surroundings	✓								

g.5 health hazards, (risk of) contracting infectious diseases, sustaining injuries, livestock outbreak	handling, transport, storage of hazardous and infectious materials, movement of carrier pests and vermin, handling of ill pigs	adequate training on handling of hazardous, infectious materials		✓		review incident reports, inspection records and complaints register, results of employees' regular health checks	monthly	number and details of illness, injury incidents, complaints	Owner	-	5,000 / yr (PPE) 100,000 / yr (supplies for biosecurity)
		uses appropriate equipment (including PPE) for handling, storage of hazardous and infectious materials		✓							
		enforce, observe biosecurity, health and safety protocols	✓								
		pest and vermin control measures	✓								
g.6 drowning hazard	open ponds, lagoons, tanks	restricted access to WWTF		✓		review incident reports	monthly	number and details of drowning incidents	Lead man	Owner	10,000 (signage)
		appropriate signage and warnings	✓								

BOD Biological Oxygen Demand
MSDS Materials Safety Data Sheet
PCO Pollution Control Officer
PPE Personal Protective Equipment
SMR Self-Monitoring Report
TSD Treatment, Storage, Disposal
TSS Total Suspended Solids

^ Indicative cost

2.2.3 **Contingency Response**

The following is an overview of the Farm's current preparation and plan of action in response to certain emergency incidents:

a. Fire
   – Administration building and employees' dwellings are equipped with fire extinguishers whereas pig sheds have sprinklers and taps from which water for putting out fires can be sourced.

b. Earthquake
   - The open grounds in front of the Farm are designated as evacuation area for when an earthquake occurs.

c. Outbreak
   - The Farm's veterinarian or a specialist in animal production (provided by the integrator) is immediately notified to assess the situation and give instructions for the workers to carry out.

d. Power outage
   - A standby diesel-fueled generator is able to supply the Farm's electricity needs, in addition to the biogas genset.

e. Health emergencies
   - A first aid kit is available at the site for minor health issues. Farm personnel have access to vehicles which can be used for transporting cases that may be needing more advanced medical care.

In the event that any of the listed emergencies occur, farm personnel are to report to the Lead man (Mr. Elef Orayco) who is in charge of alerting the owner and emergency services near the property.

2.2.4 **Occupational Health and Safety**

GREG III's risk management plan for general occupational health and safety issues associated with work in the Farm is presented in Appendix B. Health complaints and accidents will be recorded in a register and will serve as indicators of the plans effectiveness, together with results of workers' annual health check-ups.

2.3 **Monitoring, Reporting and Auditing**

The Proponent will perform the monitoring plan in Table 4 and conduct regular inspection of its facilities not only for internal purposes but also to satisfy the requirements of the Environmental Management Bureau (EMB) for periodic self-monitoring reports (SMR) and compliance monitoring reports (CMR). Furthermore, asessments will also be initiated during or immediately after incidents that may have compromised the integrity of the Farm's facilities, especially of the MRF and WTF, and caused release of pollutants in the environment. A registry of such incidents and other environmental emergencies and accidents will be maintained in the Farm and its details reported in the SMR.

SMRs and CMRs will contain the results of audits on the Farm's environmental performance in terms of resource utilization, waste management, regulatory compliance, and fulfillment of environmental commitments among others. Copies of these documents will be tendered to EMB quarterly and semi-annually, respectively, as well as to LBP-EPMD (Environmental Program and Management Department) for its reference and review.

The Pollution Control Officer (PCO), Mr. Ericson De Guzman, has been tasked to ensure that the Farm is compliant with pertinent environmental regulations, including those listed in Table 2, and is performing its environmental commitments. The Farm's lead man, Mr. Elef Oracoy, is the main person in charge of the implementation of this ESMP

During the implementation of the CDM Program, LBP-EPMD will conduct monitoring activities in the farm at least twice a year to help the Proponent execute, identify gaps in, and improve and update this management plan.

3 SOCIAL DUE DILIGENCE

3.1 Consultation and Participation

Stakeholders of the Project were identified and invited by the Proponent, together with LBP-EPMD, through letters and notices to the consultative meeting held on March 4, 2017 (5 PM) at Barangay Balingueo's community hall. The meeting was attended by at least 38 individuals from various institutions, including local officials and residents of communities near the project site.

All relevant information, especially those that pertain to the Project's environmental and social impacts, was communicated to the stakeholders during the consultations. The issues and queries they raised were all satisfactorily addressed by the Proponent and other presenters. Details of the points discussed in the meeting are in the minutes in Appendix C, as well as some photos documenting the event.

3.2 Grievance Redress Mechanism

The Farm's lead man, Mr. Elef Oracoy, is hereby designated as the main contact person for grievances, feedbacks, and queries related to the Project. He is to ensure that the details of complaints and the actions made to address the same will be recorded completely and truthfully in a register. Such information shall be part of the regular monitoring report for the Project and will be made available to relevant stakeholders.

The Proponent will make reasonable effort to settle any concern at the project level. Should its attempts be unsuccessful, issues will be raised to the following third party institutions for arbitration and possible resolution:

- Office of the Barangay Chairman
  Complaints shall be entertained in the *barangay* where the farms are situated. The *barangay* office concerned will facilitate the negotiation process and LBP-EPMD will ensure that the complainant is properly represented.

- Municipal Office
  Should no agreement be reached at the *barangay* level, the matter will be elevated to a municipal government office. Depending on the nature of the complaint, grievances may be addressed to the Municipal Health Office, Agriculturist Office, Environment and Natural Resources Office, or other relevant municipal agencies.

- LBP
  LBP through EPMD will take part on the resolution process only after the aggravated party has gone through the previous levels and finds the decisions rendered there unacceptable. EPMD will coordinate with the Proponent to ensure that issues regarding the latter's project are resolved to the best interest of the complainant.

To further ensure the Proponent's accountability, contact details of the Farm's management and LPB-EPMD shall be provided to stakeholders during consultations and through postings at public notice boards in Balingueo. For the Project of GREG III Farm, the following individuals will serve as grievance administrators:

- Prudencio E. Calado III
  Head/Assistant Vice President, LBP-EPMD
  Telephone No.: (632) 405-7339
  Fax No.: (632) 528-8484

- Elef Oracoy
  Farm Lead Man, GREG III Farm

3.3 Information Disclosure

This ESMP and other relevant information regarding the Project will be published in LANDBANKS's website where it can be readily accessed by the public. Printed copies of this document will be submitted to EMB Region 1 and will also be available in Barangay Balingueo's office, in LANDBANK's library (1598 M.H. Del Pilar cor Dr. J. Quintos St., Malate, Manila, Philippines), and in World Bank's Info Shop.

3.4 Equal Opportunity

GREG III Farm is an equal opportunity employer, not regarding gender, age, disability, and ethnicity in evaluating and hiring potential employees. Presently, the Farm's workforce is consisted of seven males and one female with ages ranging from 20 to 60 years old. Most of the male workers take on manual, physically demanding work such as animal handling and facility maintenance. The only female in the roster has been tasked to perform administrative duties.

3.5 Resettlement

The Project is located inside the premises of GREG III Farm, a private property. No individual was displaced for nor were there any indigenous peoples affected by the establishment of the Farm and the Project.

3.6 Others

Employees of GREG III Farm receive standard basic salary at the minimum, 13th month pay, and other regular statutory benefits, in addition to free lodging at the Farm.

4 ESMP REVIEW AND UPDATING

This ESMP shall be reviewed annually and will be updated subject to the results of the semiannual monitoring activities conducted by the Proponent and LBP-EPMD. Reviews may be done more frequently or earlier than schedule, especially after events resulting in significant adverse effect to the environment.

5 INSTITUTIONAL ARRANGEMENTS

5.1 The Proponent

The Proponent, GREG III Agro-Industrial Corporation, will be responsible in all the aspects of the Project, including the implementation of this ESMP. It will shoulder all costs associated with the construction and operation of the Project, internal monitoring activities, and meeting various statutory requirements. Specifically, it shall / it shall cause the accomplishment of the following:

- exercise environmental and social due diligence in implementing the Project
- incorporate sound practices in environmental, health, and safety management
- comply with relevant national and local laws and satisfy regulatory obligations
- perform diligent environmental and system monitoring
- prepare and submit on schedule accurate monitoring reports to EMB and LBP
- cooperate with the LBP and other regulatory agencies by providing assistance and correct and relevant information regarding the Project and its environmental performance for reference, review, and monitoring purposes
- promote transparency by maintaining open lines of communication with project stakeholders and giving them access to relevant information
- initiate resolution of conflicts that may arise as a result of the Project's operation

The Proponent, in close coordination with LBP, shall implement the Project based on LBP's ESSF and on the agreed activities and timelines stipulated in the memorandum of agreement (MOA) and subproject agreement (SPA) between the said entities.

5.2 LANDBANK

LBP shall serve as the financial and technical intermediary for the CDM Program of Activity (PoA) under which the Project of GREG III Farm is being implemented. It shall provide the Proponent carbon and investment finance assistance for the installation of an anaerobic wastewater treatment facility equipped with a biodigester and methane-fueled power generator. Moreover, it shall act as the entity in charge of project validation and verification activities, and of collation of relevant information and monitoring data for the undertakings mentioned. Specifically, LANDBANK, through EPMD, shall:

- make available financing facilities to the Proponent, subject to existing lending policies of LBP
- coordinate and facilitate communications and transactions between the Proponent and World Bank or other Carbon Buyers, Designated Operational Entity, and when necessary, with other project partners
- administer the agreements (MOA, SPA) forged between LBP and the Proponent
- provide technical support and relevant trainings to farm owners and personnel in partnership with other institutions
- ensure compliance of the Project and its proponent with the rules governing PoAs and with its commitments in the MOA and SPA
- ensure compliance of the Project and its proponent with relevant standards and regulations and environmental commitments by conducting onsite monitoring and evaluation and desk reviews
- provide assistance to the Proponent in complying with statutory requirements for the Project

- ensure the Project's sustainability by monitoring the long-term implementation of the safeguards specified in this ESMP and its environmental performance in general
- gather, collate, and review pertinent information and documents (including safeguard instruments, reports, and permits and clearances) concerning the Project
- participate in conflict resolution initiated by the Proponent
- prepare and submit monitoring reports to World Bank regularly
- satisfy its obligations under the Emissions Reduction Purchase Agreement between LBP and World Bank

LBP shall assist the Proponent in its implementation of the Project based on LBP's Safeguards Framework and on the agreed activities and timelines stipulated in the MOA and SPA.

5.3 Department of Environment and Natural Resources

The Department of Environment and Natural Resources (DENR) is the primary government institution mandated to manage and protect the Philippines' environment and natural resources. It is also the Designated National Authority (DNA) of the CDM Program in the Philippines. As DNA, its main role is to review and endorse PoAs to the United Nations Framework Convention on Climate Change.

5.3.1 Environmental Management Bureau

Through the EMB, DENR sanctions and regulates the activities of the Project by means of various legal instruments. EMB also leads (whether or not as part of a Multi-partite Monitoring Team) the periodic monitoring of the Project's compliance and impacts, including the fulfillment of the commitments stated in this ESMP. Prior to construction, EMB was the agency tasked to review and evaluate the environmental soundness of the Project and authorize its establishment through the issuance of an Environmental Compliance Certificate.

5.4 Municipal Government

The municipal government of Santa Barbara licenses the operation of GREG III through the issuance of a business permit. This permit is only given to businesses after satisfying its prerequisites – building and occupancy permits, zoning clearance, sanitary permit, and fire clearance, among others.

Agencies and offices under the municpal government of Santa Barbara, will also, if necessary, lead / facilitate the resolution of complaints arising from the farm and the project's operations.

5.5 World Bank

The World Bank is the main Carbon Buyer of the Project, but will also serve as an advisor to LPB in carrying out the latter's responsibilities as the coordinating and managing entity for CDM projects. The Bank will conduct regular monitoring, audits, and appraisals on the Project's safeguards performance against its established policies, as well as provide technical guidance to LBP and to the Proponent.

6 SUB-PROJECT ACCOUNTABILITY

In line with Section 3.02 on *Sub-Project Development and Operation by the Sub-Project Entity*, Item (q) of the Sub-Project Purchase Agreement (SPA) signed by the Farm Management, stating that the Sub-Project Entity (Farm Management) agrees and undertakes to:

(q) implement and operate the Sub-Project in compliance with the World bank Operational Policies, including without limitation and as applicable, the Environmental Management Plan, Resettlement Plan, Indigenous Peoples Plan, and any other requirement resulting from the application of the World Bank Operational Policies.

Having signed the SPA, the Farm Management is accountable to comply with the commitments stated in this document.

REFERENCES

1 en.climate-data.org
2 vm.observatory.ph
3 dbmp.philrice.gov.ph/soils
4 noah.up.edu.ph (ESRI Base Map)

Maps and Images Sources

a https://www.google.com/maps
b Google Earth Pro
c http://noah.up.edu.ph/#/section/geoserver/flood25

APPENDICES

A Project Design, Plan and Specifications

B Health and Safety Risk Management Plan

C Public Consultation Records

APPENDIX A.

BIOGAS LAGOON 30M X 40 M.

CHAROEN POKPHAND GROUP OF COMPANIES

ENGR. LOUIE ALDRIN M. BAWAGAN
CIVIL ENGINEER
LIC. No 116766

GENERAL SPECIFICATION & ABBREVIATIONS

1. GENERAL

1.1 THE CONTRACTOR SHALL SUPPLY ALL REQUIRED OF MATERIALS LABOUR AND EVERYTHING ELSE NECESSARY FOR THE PROPER CONSTRUCTION AS SHOW ON THE DRAWINGS.

1.2 THE CONTRACTOR SHALL PROVIDE FOR THE PERFORMANCE OF ALL INCIDENTAL MATTERS WHICH MAY REASONABLY BE INFERRED FROM THE DRAWINGS OR SPECIFICATION IN ORDER TO LEAVE THE WORKS PERFECT AND COMPLETE, WHETHER EXPRESSLY STATED OR OTHERWISE.

1.3 ALL DIMENSIONS ARE IN METERS UNLESS INDICATED OTHERWISE.

1.4 ALL UTILITIES REQUIRED DURING CONSTRUCTION SHALL BE ARRANGED FOR AND FURNISHED BY THE CONTRACTOR.

1.5 ALL CONTRACTORS MUST ATTEND SITE MEETING AND STUDY THE DRAWINGS FAILING THE MEETING, QUOTATION MAY NOT BE CONTRACTOR

1.6 ITEMS WHICH ARE MISSING FROM THE DRAWINGS OR BILL OF QUANTITIES, AND WHICH ARE DEEMED NECESSARY, THE CONTRACTOR SHALL INFORM THE CONSULTANT OR AND THE MISSING ITEM (S) IN THE QUOTATION, OTHERWISE THE UNQUOTED ITEM (S) NEEDED TO COMPLETE THE WORK SHALL BE DONE AT NO EXTRA COST TO THE OWNER.

2. CONCRETE REINFORCING

2.1 TENSILE YIELD STRENGTH OF REINFORCING STEEL SHALL NOT LESS THAN 2,400 ksc FOR ROUND BARS AND 4,000 ksc FOR DEFORM BARS.

2.2 MINIMUM LENGTH OF LAP SPLICE SHALL BE 40 BAR DIAMETER FOR ROUND BARS AND 30 BAR DIAMETER FOR DEFORMED BARS.

2.3 EXCEPT AS OTHERWISE INDICATED ON THE DRAWINGS, REINFORCEMENT SHALL BE INSTALLED WITH CLEARANCE FOR CONCRETE COVERAGE IN MILLIMETERS AS FOLLOWS

2.3.1 FOOTING BOTTOMS: 50 mm

2.3.2 COLUMN & BEAMS: 40 mm

2.3.3 SLABS: 30 mm

2.4 DISTANCES FROM THE FORMS SHALL BE MAINTAINED CORRECTLY BY MEANS OF METAL SUPPORTS, MORTAR BLOCK OR OTHER SUPPORTS APPROVED BY THE ENGINEER. MORTAR BLOCK SHALL BE PREPARED USING A MIX OF 1 PART CEMENT TO 1 PART SAND.

3. CONCRETE FORMING

FORMS SHALL BE SO CONSTRUCTED AND PLACED THAT THE RESULTING CONCRETE WILL BE OF THE SHAPE, LINES, DIMENSIONS, APPEARANCE, AND TO THE ELEVATIONS INDICATED ON THE DRAWINGS.

WOODFORMS SHALL BE CONSTRUCTED OF SOUND LUMBER OR PLYWOOD OF SUITABLE DIMENSIONS FREE FROM KNOTHOLES AND LOOSE KNOTS ; PLYWOOD SHALL BE SANDED SMOOTH AND FITTED WITH TIGHT JOINTS BETWEEN PANELS. FORMS SHALL BE TIGHTED TO PREVENT THE PASSAGE OF MORTAR AND WATER AND GROUT. FORMS SHALL BE OILED BEFORE REINFORCEMENT IS PLACED, WITH AN APPROVED NONSTAINING OIL OR LIQUID FORM COATING NOT HAVING A PARAFFIN BASE.

4. CAST-IN-PLACE CONCRETE

4.1 ULTIMATE COMPRESSIVE STRENGTH OF ø15x30 cm CONCRETE CYLINDER AT THE AGE OF 28 DAYS SHALL BE NOT LESS THAN 240 ksc

4.2 ALL CONCRETE BEAMS AND COLUMNS ARE EXPOSED CONCRETE, WHICH ALL EXPOSED CORNERS SHALL HAVE 2 CM. CHAMFERS. ALL EXPOSED SURFACES SHALL BE FREE OF CHIPS, TIE AND ABNORMAL PROJECTIONS. ALL POCKETS, HOLES AND CLIP-OUT POINTS SHALL BE FILLED AND RUBBED WITH "THOROSET METALLIC GROUTING COMPOUND". ANY ABNORMAL FORM MARKS SHALL BE RUBBED OUT TO AN AVERAGE MATERIAL FINISH AND GROUTED. ALL HORIZONTAL SURFACE, WITH THE EXCEPTION OF FLOORS, SHALL BE GIVEN A WOOD FLOAT FINISH TO PROVIDE A TRUE AND REQULAR SURFACE.

4.3 ALL CONCRETE, PARTICULARLY EXPOSED SUFACES, SHALL BE PROVIDED WITH CONTINOUS MOIST CURING FOR AT LEAST 7 DAYS AFTER CONCRETING. COLUMNS AND VERTICAL SURFACES SHALL BE COVERED WITH CONTINUOUSLY SATURATED BURLAP, OR BY OTHER APPROVED MEANS ; HORIZONTAL SURFACES, SLABS, AND OTHER ITEMS SHALL BE PONDED TO A DEPTH OF 2 CM. AND KEPT CONTINUOUSLY WET.

4.4 EXCEPT AS OTHERWISE SPECIFICALLY AUTHORIZED BY THE ENGINEER FORMS SHALL NOT BE REMOVED BEFORE THE CONCRETE HAS ATTAINED A STRENGTH OF AT LEAST 30% OF THE ULTIMATE STRENGTH PRESCRIBED BY THE DESIGN, AND NOT BEFORE THE FOLLOWING NUMBER OF DAYS (WHICHEVER IS THE LONGER).

4.4.1 SIDING FORM OF COLUMN, BEAM, WALL: 2 DAYS

4.4.2 BOTTOM FORM OF SLAB: 14 DAYS

4.4.3 AND SUPPORT AT MIDDLE OF SPAN: 12 DAYS

4.4.5 BOTTOM FORM OF BEAM: 14 DAYS

4.4.6 AND SUPPORT AT MIDDLE OF SPAN: 12 DAYS

4.5 SLUMP OF CONCRETE SHALL BE IN ACCORDANCE WITH THE FOLLOWING

PORTION OF STRUCTURE	SLUMP (cm)	RECOMMENDED RANGE (cm)
PAVEMENTS AND SLABS ON GROUND	5	2.5-7.5
PLAIN FOOTINGS, SLABS AND BEAMS	5-7.5	2.5-10
THIN WALLS AND COLUMNS	10	7.5-12.5

4.6 CONCRETE FLOOR SHALL BE FREE FROM HOLLOWS OR LOW SPOTS THAT MAY RETAIN WATER AND SHALL SLOPE UNIFORMLY TO SUMP OF DRAINS. FLOORS SHALL HAVE MONOLITHIC FLOAT FINISH AND SHALL BE STEEL TROWELED TO A HARD FINISH SO AS TO BE SMOOTH BUT NOT SLIPPERY.

4.7 OPENINGS IN THE CONCRETE SHALL BE PLACED AT LOCATIONS SHOWN AND/OR INDICATED ON THE PLANS. ALL OPENINGS SHALL BE FORMED AND FASTENED SECURE IN POSITION TO MAINTAIN MINIMUM COVER OF ALL REINFORCEMENT AND TO LEAVE A SMOOTH AND TRUE OPENING AFTER THE FORMS ARE REMOVED.

4.8 NO CONCRETE SHALL BE PLACED WITHIN 25 M. FROM ANY ACTIVE PILE DRIVING LOCATIONS.

	JIS G3101 SS400
STEEL PIPES	JIS G3444 CLASS STK41
SQUARE AND RECTANGULAR STEEL TUBES	JIS G3466 CLASS STKR41
LIGHT GAUGE STEEL SHAPES	JIS G3350 CLASS SSC41
BOLTS FOR STRUCTURAL STEEL JOINTS	ASTM A325 OR F10T
ANCHOR BOLTS AND THREADED BAR	ASTM A325 OR F10T

5.2 FABRICATION

UNLESS OTHERWISE SHOWN FABRICATION OF STRUCTURAL STEEL SHALL BE BY WELDING. WELDING SHALL BE FULL LENGTH AROUND JOINT AND CONFORM TO THE STANDARDS OF THE AMERICAN WELDING SOCIET (AWS.).

THE MINIMUM SIZE OF WELD: EXCEPT WHERE SHOWN OTHERWISE ON THE DRAWINGS, SHALL BE DO PER STANDARD DETAIL.

WELDING ELECTRODES FOR STRUCTURAL MEMBER SHALL HAVE FILLER METAL WITH A MINIMUM NOMINAL TENSILE STRENGTH OF 60 ksi (4200 ksc).

THE COMPLETE SET OF DETAILED WORKING SHOP DRAWINGS SHOWING ALL SHOP AND ERECTION DETAILS INDLUDING CONNECTIONS, SPLICE ETC. SHALL BE SUBMITTED FOR THE ENGINEER'S APPROVAL PRIOR TO FABRICATION.

6. PAINTING

6.1 ALL PAINTING MATERIALS SHALL BE BROUGHT TO THE SITE IN THE MANUFACTURE'S SEALED CONTAINERS AND USED STRICTLY IN ACCORDANCE WITH THE MANUFACTURE'S INSTRUCTION. PAINTING MATERIALS SHALL BE _ _ _ _ _ _ _ OR EQUIVALENTS.

6.2 CONCRETE

THE SURFACE OF CONCRETE SHALL BE CLEANED AND ALL OIL, DIRT, ETC., MUST BE REMOVED. EMULSION PAINT SHALL BE THINNED WITH CLEAN WATER AND THE NUMBER OF COATS ARE 3. THE FIRST COAT REFERRED TO AS A MIST COAT SHALL BE THINNED WITH WATER IN THE PROPORTION OF 1:1. ALL SUBSEQUENT COAT SHALL BE TO PROPER WORKING CONSISTENCY AND TO MANUFACTURE'S INSTRUCTION. THE SUBSEQUENT COATS ARE PLASTIC EMULSION PAINT AND SHALL BE APPLIED BY BRUSH IN ADEQUATE AND UNIFORM FILM.

IN CASE OF PIPE OF PIPE OR RECTANGULAR TUBE THE INSIDE SURFACE COATED ONLY BY LEAD PAINT.

6.4 WOOD

WOOD SURFACE SHALL BE PRIMED WITH ONE COAT OF LEAD PRIMER AND SHALL BE PAINTED.

7. ABBREVIATION

7.1 UNIT

cu	CUBIC		
m	METER	(m^2	SQUARE METER)
mm	MILLIMETER	(mm^2	SQUARE MILLIMETER)
kg	KILOGRAM		
ksc	KILOGRAM PER SQUARE CENTIMETER		
pcs	PIECES		

7.2 GENERAL

AAC	AUTOCLAVED AERATED CONCRETE
ADD.	ADDITIONAL
B.M.	BENCH MARK
C/C	CENTER TO CENTER
CONC.	CONCRETE
DB	DEFORM BAR
DIA. (ø)	DIAMETER
EQ.	EQUAL
GALV.	GALVANIZE
ID	INSIDE DIAMETER
MAX.	MAXIMUM
MID.	MIDDLE
MIN.	MINIMUM
OD	OUTSIDE DIAMETER
RB	ROUND BAR
RC.	REINFORCED CONCRETE
STIR	STIRRUP BAR
TCT	TOTAL COATED THICKNESS
TYP.	TYPICAL
W/	WITH

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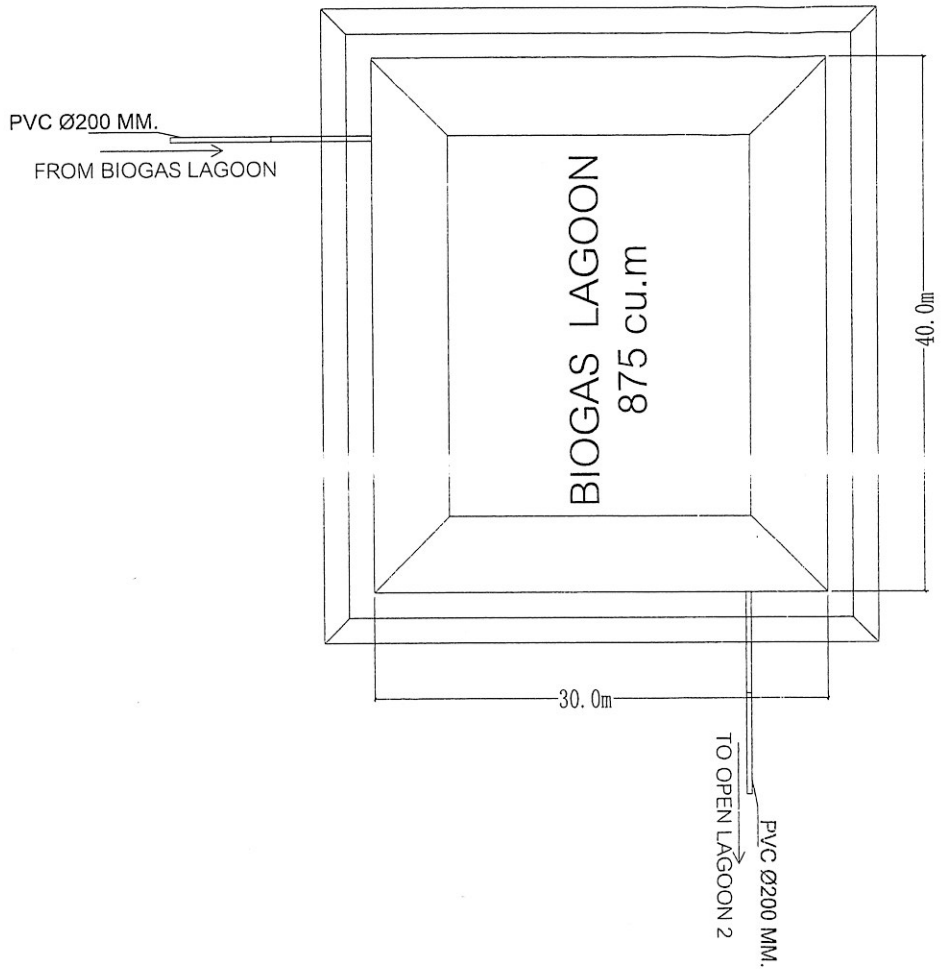

BIOGAS LAGOON

SCALE: 1:50 NTS

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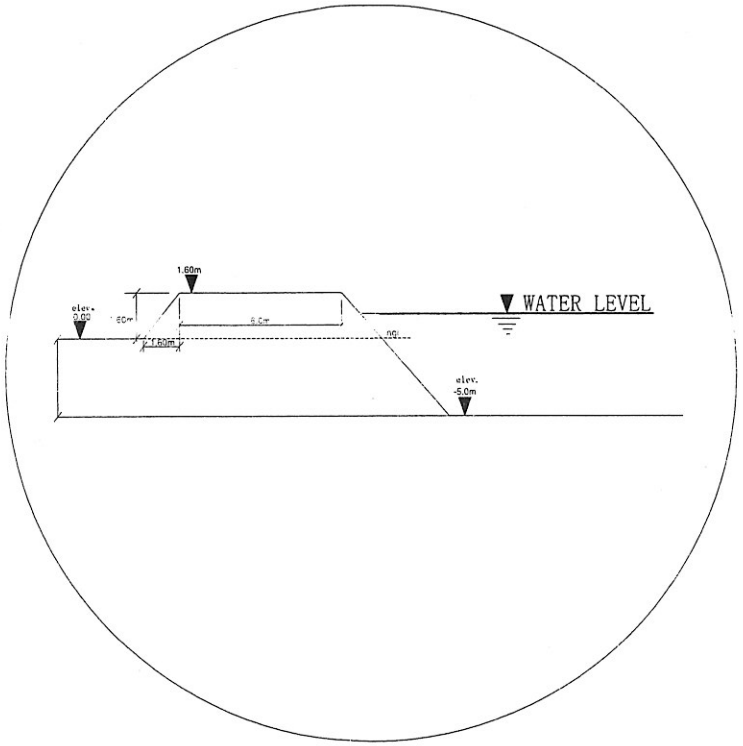
CIVIL ENGINEER
LIC. No 116766

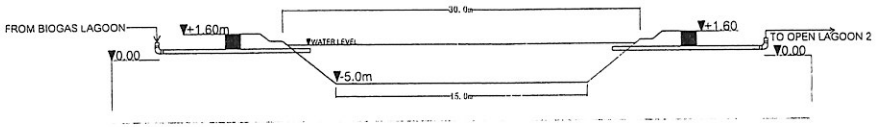


BLOW- UP DETAIL

SCALE: NTS

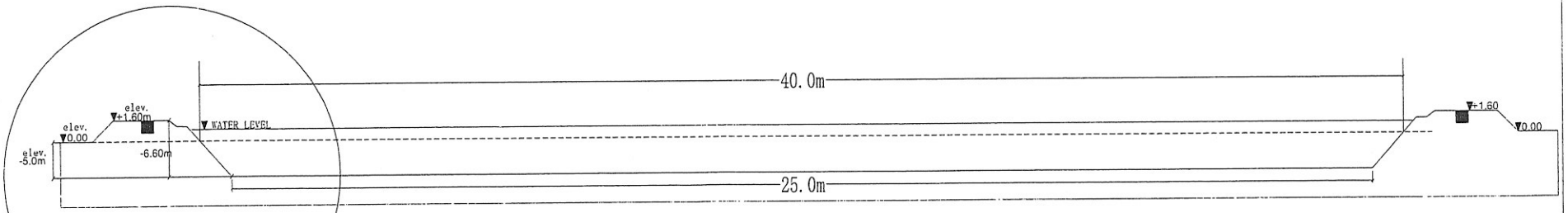
ENGR. LOUIE ALDRIN M. BAWAGAN
CIVIL ENGINEER
LIC. No 116766

CHAROEN POKPHAND FOODS PHILIPPINES CORPORATION
Lazatin Blvd. Dolores Homesite Exit 2,San Fernando, Pampanga
Tel No. (045) 961-4892 / 963-6510



SECTION (B)–(B)

SCALE NTS



SEE BLOW- UP DETAIL

SECTION (A)–(A)

SCALE NTS

ENGR. JULIE ALTHEA M. BAWAGAN
CIVIL ENGINEER
LIC. No 116766

CHAROEN POKPHAND FOODS PHILIPPINES CORPORATION
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Tel No. (045) 961-4892 / 963-6510

APPENDIX B.

Health and Safety Risks Management Plan of GREG III Farm

Hazard	Possible Harm	Source / Cause	Prevention / Minimization*	Person/s Responsible
physical				
noise	discomfort, hearing damage	pig squeals	- wear appropriate PPE (ear protection)	Farm Personnel
		running machineries and vehicles	- install noise-control devices when applicable - regular equipment inspection and maintenance - equipment housed in enclosed structure, if applicable - schedule shifting duties - install signage and warnings - wear appropriate PPE (ear protection)	Lead Man Farm Personnel
vibration	discomfort, ergonomic and nerve injuries, fatigue	running machineries	- ensure all loose equipment are securely placed - perform regular equipment inspection and maintenance - install signage and warnings	Lead Man Farm Personnel
electricity	shock, electrocution, burns	faulty machineries and power lines	- get services of a licensed electrician - consult equipment manual - perform regular equipment inspection and maintenance	Lead Man Farm Personnel
		improper use (or servicing) of electrical equipment	- restrict access to equipment - install signage and warnings - train staff (consult equipment manual) - wear appropriate PPE	
heat	burns	running machineries (hot surfaces, vapors, liquids)	- use insulation where possible - install machine guards - install signage and warnings - wear appropriate PPE (such as long sleeved shirts)	Lead Man Farm Personnel
	discomfort, heat exhaustion, heat stroke	working in enclosed spaces with limited ventilation	- adequate hydration and rest breaks	Lead Man
dust	irritation, respiratory distress / diseases	feeds, ambient dust	- calm work pacing to avoid exciting the pigs - thorough cleaning of indoor spaces - PPEs (mask)	Farm Personnel
poor lighting	eye strain, can't see hazards	unlit / inadequately lit areas	- install light sources - carry portable light sources - work during daytime whenever possible	Lead Man Farm Personnel
chemical				
harmful gases, dust, vapors (inhalation)	discomfort (odor), asphyxiation, poisoning, respiratory distress / diseases	degrading organic wastes	- observe measures for odor control - install signage and warning labels - train staff (on handling hazardous substances and wastes and working in confined spaces; review MSDS / product information sheets) - wear appropriate PPE (mask) - ensure first aid kits are readily available	Owner Lead Man Farm Personnel
		hazardous substances (cleaning and pest control chemicals, veterinary medicines, fuels, hazardous wastes, etc.)		
		fuel burning (machineries, vehicles)	- perform regular equipment inspection and maintenance	Lead Man
		fugitive gases	- perform regular inspection and maintenance of biogas system	Lead Man
hazardous substances (contact, ingestion)	irritation, burns, poisoning, skin problems	hazardous substances (cleaning and pest control chemicals, veterinary medicines, fuels, hazardous wastes, etc.)	- use proper labeling, containers, and storage - restrict access to chemical and hazardous waste storage - train staff (handling hazardous substances and wastes; review MSDS / product information sheets) - only competent staff should administer veterinary medicines - ensure first aid kits are readily available - PPEs (gloves, eye glasses)	Owner Lead Man
biological				
pathogens / infectious agents, toxins and other products	various infectious diseases, parasites, irritation	pathological materials / tissues	- observe proper disposal of animal and veterinary wastes - implement quarantine measures - good housekeeping practices (disinfection) - practice hygienic practices (especially hand hygiene) - perform workers' regular health examination - train staff (on animal handling, proper waste handling and disposal) - wear appropriate PPE (gloves, mask, goggles)	Owner Veterinarians Lead Man
		sick animals		
		animal excretions and fluids		
		manure (wastewaters)		
		sludge		
		veterinary wastes (especially sharps)		
		potential disease carriers (objects, people, dust)		
		insects, pests, vermin	- proper disposal of odorous wastes - good housekeeping practices - implement pest control measures	Farm Personnel
ergonomic				
ergonomic stress	ergonomic injuries	repetitive actions, forceful exertions, sustained awkward posture	- use aid of appropriate equipment for lifting/moving heavy objects - use of proper lifting techniques - implement buddy system at work - ensure job rotation / adequate rest (in between tasks)	Lead Man Farm Personnel
		improper use of equipment	- train staff (consult manuals)	Lead Man Farm Personnel
		use of faulty equipment	- repair or replace equipment	Lead Man
other accidents and contingencies				
slips, trips, falls	injuries, wounds, contusions	spills (slips)	- maintenance of walkways - daily safety briefings and regular trainings - barricading of work areas - wearing of appropriate PPE	Lead Man Farm Personnel
		various objects, debris (trips)		
		heights, slips (falls)		
entanglement	injuries, wounds, strangulation	machineries	- install machine guards - tie back long hair - wear long sleeve shirts - avoid wearing loose-fitting clothes and personal accessories - regular equipment inspection and maintenance	Farm Personnel
blows,	injuries, wounds,	pig handling	- use animal restraints	Lead Man

punctures	contusions		- ensure enough space to maneuver - train staff (animal handling techniques) - wear appropriate PPE (boots, gloves, etc.)	Farm Personnel
sharps	sharps injuries, wounds	veterinary activities, waste handling	- ensure only trained personnel conduct veterinary activities - wear appropriate PPE (gloves, goggles)	Lead Man Farm Personnel
fires	burns	faulty electrical systems, explosions, fugitive gases, accidental ignition	- comply with requirements and regulations of fire authorities - provide adequate and proper (multipurpose) fire protection equipment - designate smoking areas away from digester, gas tanks, and electrical equipment and storage of combustible materials (compost, sludge, chemicals) - regular clearing of vegetation near farm structures - install signage and warnings - train staff (on contingency plan and proper equipment use) - perform regular inspection and maintenance of electrical systems and equipment	Owner Lead Man
blast	blast injuries	excessive pressure in biodigester, fugitive gases, contained gases in confined spaces, fires	- keep sources of heat, including machineries, at a safe distance from biogas facility - prohibit smoking and use of cellphones around biogas system and gas storage facilities - perform regular inspection and maintenance of MRF - install signage and warnings	Lead Man Farm Personnel

* Shaded rows / items applicable for Anaerobic Digestion System

GREG III FARM SITE EVACUATION PLAN

In case of emergency / Pag nagka-sunog!

LOCAL EMERGENCY SERVICES

- **Santa Barbara Fire Station:** (075) 518 2116; (075) 518 3722
- **Pangasinan Provincial Hospital:** (075) 532 2603
- **Santa Barbara Police Station:** (075) 623-1044; 09205410627

Biodigester Supplier:
K & W Constructing and Services & Supply
0977 813 4905
Engr. Bawagan

Owner: Georgina Guadiz: 0917 8145439

- ✓ **Fire extinguishers** located at the **staff house** and inside each **pig building**.
- ✓ Tap on the **water supply** below the **overhead tank**.

Gawin and mga sumusunod:

1. Pag-aralan kung may kakayanang agapan ang apoy.

   WALA: Lumabas ng mga gusali at tumawag ng tulong (tignan ang mga numero sa itaas).
   MERON: Kung kayang agapan, gumamit ng pamatay sunog.
2. Tumawag ng tulong. (tignan ang mga numero sa itaas)
3. Lumabas ng farm at pumunta sa evacuation area.

APPENDIX C.

Republic of the Philippines
Province of Pangasinan
MUNICIPALITY OF STA. BARBARA
BARANGAY BALINGUEO

March 17, 2017
5:00 p.m.
Purok IV
Barangay Balingueo
Santa Barbara, Pangasinan

MINUTES OF THE MEETING

This is to certify that GReG III Agro-Industrial Corporation, a registered hog raiser of Barangay Balingueo, Municipality of Santa Barbara, Province of Pangasinan, has conducted a public consultation on March 4, 2017 at the village hall to inform our community regarding the construction and implementation of a piggery farm with biogas facility within the vicinity of the above-mentioned farm.

The meeting was attended by the following representatives of our barangay, as shown in the attached attendance sheet:

Barangay Officials

1. Jessie J. Casongsong – Barangay Captain
2. Federico DV. Carvajal Jr. – Barangay Kagawad
3. Romeo O. Pioquinto – Barangay Kagawad
4. Roberto DV Tamayo – Barangay Kagawad
5. Zaldy C. Espalarga – Barangay Kagawad
6. Tirso R. de Vera – Barangay Kagawad
7. Jessie S. Flores – Barangay Kagawad
8. Gerry T. Pontawe – Barangay Kagawad
9. Virgilio B. Diaz – Barangay Secretary
10. Alejandro T. Bauzon – Barangay Treasurer
11. Jeonarld T. de Guzman – Record Keeper

Barangay Residents

Jacqueline M. Espalarga
Teodorico R. Bruan
Rosemarie P. Rabanal
Leonora P. Roy

Myrna B. Osoteo
Dolores B. Ipolan
Nord Carles
Jorge R. Salvador
Violeta Bruan
Marissa P. Fernandez
Fernando Bruan
Tirso Bruan
Larry Bruan
Romnick Bruan
Orlando Bruan Sr.
Orlando Bruan Jr.
Remegia R. Patugan
Jenny P. Uban
Elvie Linguite
Oliver Linguite
Jacinto Boquiren
Billy Espalerga
Ma. Carmem R. Bruan
Julita Tirao
Carmelita T. Villacorta

GReG Agro-Industrial Corporation

Teofilo E. Guadiz III – Farm Representative
Elmer John Mercado – Representative of Charoen Phokpahn Farms

The meeting focused on the description of the project and the possible benefits to the local community. The following are the various environmental and social concerns raised during the consultation and the persons concerned.

Name & Position in Barangay	Question	Answer to Question (Answers Provided by T.E. Guadiz of GReG – III Corp)
Alejandro T. Bauzon Barangay Treasurer	Will the pig waste emit foul odor?	No. The animal waste is placed in a sealed lagoon. No foul spell will come out
Teodorico Bruan Resident	Will the Biogas explode if not properly handled?	Biogas can be explosive when mixed in the ratio of one part biogas to 8-20 parts air.
Myrna B. Osoteo Resident	What happens to the residual waste after the biogas was extracted from the pig feces	The feces will transmogrify into fertilizer. The by-product of the biogas generation process is enriched organic (digestate), which is a perfect supplement to, or substitute for, chemical fertilizers. Furthermore, this digestate mitigates erosion
Elena Bruan	What is Biogas? How will this affect us?	Biogas typically refers to a mixture of different gases produced by the breakdown of organic matter in the absence of oxygen. Biogas can be produced from raw materials such as agricultural waste, manure, or food waste.

Name & Position in the Barangay	Questions	Answer to Questions
Crispulo Untalan	What is the big hole that is being dug near the pig houses?	They are called biogas digester. A biodigester is like a mechanical stomach. It is fed with organic material, which is broken down (decomposed) by micro-organisms (bacteria) is an oxygen-free (anaerobic) environment to produce a renewable energy called biogas (methane and carbon dioxide) and other material that is mainly used as fertilizer
Fernando Bruan Resident	How can I benefit from the biogas that you are constructing?	Biogas is a renewable, as well as a clean, source of energy. Gas generated through biodigestion is non-polluting; it actually reduces greenhouse emissions (i.e. reduces the greenhouse effect). No combustion takes place in the process, meaning there is zero emission of greenhouse gasses to the atmosphere; therefore, using landfill gas as a form of energy production is actually a great way to combat global warming.
Leonora P. Roy Resident	After the biogas is extracted from the feces of the pig, what happens to the residue after the biogas is extracted?	The by-product of the biogas generation process is enriched organic (digestate), which is a perfect supplement to, or substitute for, chemical fertilizers. It can be used by the farmers as fertilizers.
Tirso R. De Vera Kagawad	Is biogas poisonous?	Although the methane and carbon dioxide of biogas are not poisonous, a person may stop breathing if there is too much biogas and not enough oxygen in the air they are trying to breath. ...
Lucia Untalan Resident	Will your biogas explode? Is it combustible?	When manure is anaerobically digested, the biogas produced is primarily composed of methane and carbon dioxide, with lesser amounts of hydrogen sulfide, ammonia, and other gases. Each of these gases has safety issues. Overall, biogas risks include explosion,

Note: The meeting was conducted in the vernacular dialect (Pangasinanse). The questions and answers were all done in the native tongue. For purposes of clarity and accuracy for the reader of this letter, and to fully comprehend the exchange of ideas, the series of questions and answers were translated to the English language.

Included in the discussion is that the project/farm will be in included in LANDBANK's program entitled, "Carbon Finance Support Facility" under the United Nations Framework Convention on Climate Change (UNFCCC) Clean Development Mechanism.

It was agreed that a separate consultation will be conducted in the succeeding days/months, whenever necessary, to accommodate majority of the local stakeholders.

Furthermore, the above-mentioned project was granted by the Sangguniang Barangay of Barangay Balingueo the authority to construct and implement the piggery farm project.

This certification is issued upon the request of Greg-III Agro-Industrial Corporation for whatever purpose it may serve.

Mr. Jessie J. Casongsong
Barangay Chairman
Barangay Balingueo
Santa Barbara, Pangasinan

Republic of the Philippines
Province of Pangasinan
MUNICIPALITY OF STA. BARBARA
BARANGAY BALINGUEO

NAME	SIGNATURE
1. KGWD. ZALDY ESPALARGA	
2. JACQUELINE M ESPALARGA	
3. TEODORICO R. BRUAN	
4. MYRNA B. OSOTEO	
5. DOLORES B. IPOLAN	
6. NORD CARLES	
7. Jorge R. Salvador	
8 Violita Bruan	
9. Marissa P. Fernandez	
10 ROSEMARIE P. RABANAL	
11 LEONORA P. ROY	
12 REMEGIA R. PATUNGAN	
13 JENNY P. UBAN	
14. Elvie Patungan	
15. OLIVER LINGUITE	
16. Jacinto Boquiren	
17. Billy Espalarga	
18 Fernando Bruan	

JESSIE J. CASONGSONG
Punong Barangay

Republic of the Philippines
Province of Pangasinan
MUNICIPALITY OF STA. BARBARA
BARANGAY BALINGUEO

NAME	SIGNATURE
19. Tirso Bruan	T. Bruan
20. Danny Bruan	
21. Ronnick Bruan	
22. ORLANDO BRUAN SR.	
23. ORLANDO BRUAN Jr.	
24. Elena B. Bruan	
25. Ma. Carmen R. Bruan	M.C.R.B.
26. Julita Tirao	J.Tirao
27. Amelita T. Villacorta	

Mr. Jessie J. Casongsong
Barangay Chairman
Barangay Balingueo
Santa Barbara, Pangasinan

A representative of Charoen Pokphand Foods Philippines, Inc. explains to the listeners of Barangay Balingueo, Sta. Barbara, Pangasinan environmental issues such; (a) Clean Development Mechanism, (b) Environmental Management Plan, and the (c) benefits of the Biogas project to the community

No nasty odor, No flies, No animal spoils assures Mr. Elmer John Mercado of Charoen Pokphand Foods Philippines, Inc on the establishment of a biogas facility

A representative of GReG Agro-Industrial Corporation explains how the swine contract-growing industry can generate employment for Barangay Balingueo.

A representative from GReG Agro-Industrial Corporation gets the consensus of the village people on the establishment of a biogas facility in the area.