ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Ref. No. 5979-0004
CPA-03 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
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
INEC	Ilocos Norte Electric Cooperative
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
WWTF	Wastewater Treatment Facility
WP	Water Permit

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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 includes the Methane Recovery and Power Generation Project of CPA 3.

Scope

Since the Project is a key component of CPA 3's wastewater treatment facilities (WWTF) – which handle the primary waste (manure) the piggery produces – this ESMP will cover the operations of the pig farms 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 CPA 3 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

Proponent:	CPA 3
Project Site	San Nicolas, Ilocos Norte, Philippines
Project Type:	Livestock Project
Philippine Standard Industrial Classification:	0145 - Hog Farming

Contact Persons

LANDBANK

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1.2 The Pig Farm

CPA 3 operates under a consolidated Environmental Compliance Certificate (ECC No. 010403-210078-0502) issued for all of its existing and future activities within its 385.36-ha property mostly located in San Nicolas, Ilocos Norte. To wit, these activities include a crocodile farm, two poultry farms, and three pig farms – Phase 1, Phase 2, and Phase 3 (3A and 3B) (see Map 1) – the subject and scope of this ESMP.

CPA 3 (Phases 1, 2, and 3) is licensed to house a maximum of 69,800 heads in total. At present, only Phase 1 is at capacity and fully operational, although certain components of its WWTF are under rehabilitation. The shared WWTF of Phases 2 and 3B is still being constructed after their old biodigester sustained extensive damages from typhoons in 2018.

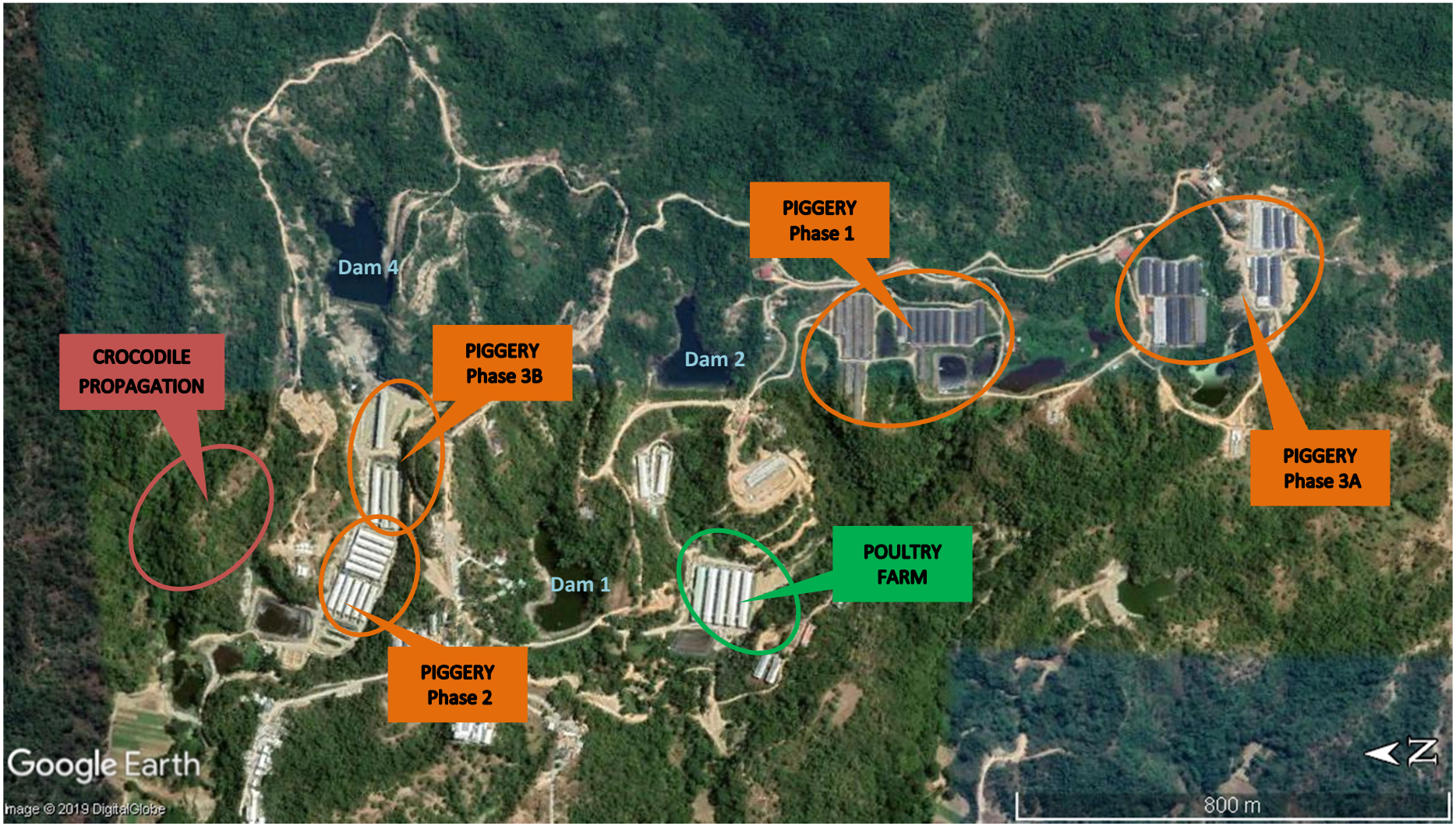
Owing to their proximity and since they share WWTFs, for the purposes of this document, Phase 1 and Phase 3A will be treated as a single farm (Phase 1/3A), as well as and Phase 2 and 3B (Phase 2/B). Phases 2 and 3B are intended to share biogas combustion facilities. Phases 1 and 3A are breeding and farrowing units. Pigs produced there are grown and finished in Phases 2 and 3B.

Structures in the Pig Farm, including WWTFs, occupy a combined area of around 30 ha (Phase 1/3A: 18 ha, Phase 2/3B: 12 ha). All pig buildings are equipped with tunnel ventilation / centralized cooling systems.

Water for pig production and other farm activities is mainly sourced from three man-made rain harvesting lagoons (called 'dams'; see Map 1), each able to contain at least 30,000 m^3 of rainwater.

In Phase 1/3A, treated wastewaters are recycled for flushing. Effluent from Phase 2/3B is also intended for recycling once its WWTF is completed.

The entire facility of CPA 3 is largely powered through a grid by Ilocos Norte Electricity Cooperative (INEC), except for Phase 1 which also utilizes electricity from biogas through the Project. With the construction of new biodigesters, Phase 3A and Phase 2/3B will also soon be partially run with biogas.



Map 1. Site layout of CPA 3 (Image from *Google Earth*[a])

Map 2.1. Site layout of Phase 1 and Phase 3A <arrows indicate downslopes>(Image from *Google Earth*[a])

Map 2.2. Site layout of Phase 2 and Phase 3B <arrows indicate downslopes> (Image from *Google Earth*[a])

1.3 Project Description

The Project covers the installation / rehabilitation and operation of two anaerobic digester systems and their ancillary facilities, including post-treatment wastewater lagoons and biogas-fueled electricity generation systems. The biodigesters and the power generation units are collectively referred to herein as methane recovery facilities (MRFs).

1.3.1 Components and Design

The pig farms' wastewater treatment process features three treatment phases:

- *Pre-Treatment*, which involves mechanical 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 WWTFs mainly consist of sand traps, covered earthen or concrete lagoons (biodigesters), and a series or aeration and clarifying earthen lagoons (see Maps 2.1 and 2.2). For effluents that will be reused in the Farms, further treatment is afforded by a filtration unit in Phase 1/3A and an aeration / settling / chlorination tank in Phase 2/3B. The power generations units basically consist of biogas scrubbers and biogas-powered generator sets.

Phase 1 biodigester is an earthen lagoon lined and enclosed with HDPE sheets. Phase 3A will have 2 biodigesters with concrete chambers covered with HDPE running in parallel. Three biodigesters similar to those in Phase 3A, also running in parallel, will be operating in Phase 2/3B. Only those in Phase 3A have built-in bubblers for feedstock stirring.

Wet digestion is likely the process involved in all the biodigester systems. 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 digesters were designed to accommodate wastes generated by the maximum number of pigs the Farm could house (69,800 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.

Tables 1.1 and 1.2 presents the particular processes and components involved in the treatment of wastewaters in the Farm.

Table 1.1 Specifications of Phase 1/3A's Wastewater Treatment Facility-Methane Recovery Facility

Phase		Process	Component	No. of Units	Description / Equipment
Pre-treatment		Settling	Sand trap	3	concrete, elevated
Anaerobic treatment		Anaerobic digestion / fermentation	Reactor	3	Phase 1: earthen lagoon, lined and covered with 1 mm HDPE Phase 3A: 2 concrete tanks covered with 1 mm HDPE, running in parallel
Post-treatment	Biogas	Combustion	Scrubber system	1	-
			Generator set	1	300 kVA
	Effluent	Clarification (settling, aeration)	Open lagoon	6	earthen lagoons
		Filtration	Filtration box	3	3-tiered concrete boxes with sand filling
	Sludge	Drying	Drying bed	1	concrete

Table 1.2 Specifications of Phase 2/3B's Wastewater Treatment Facility-Methane Recovery Facility

Phase		Process	Component	No. of Units	Description / Equipment
Pre-treatment		Settling	Sand trap	2	concrete, elevated
Anaerobic treatment		Anaerobic digestion / fermentation	Reactor	3	concrete tanks covered with 1 mm HDPE, running in parallel
Post-treatment	Biogas	Combustion	Scrubber system	1	-
			Generator set	1	625 kW
	Effluent	Clarification (settling, aeration)	Open lagoon	4 (chambers)	earthen lagoon lined with 1mm HDPE
		Aeration, Settling, Chlorination	Treatment tank	1	concrete and metal construction
	Sludge	Drying	Drying bed	1	concrete

1.3.2 **Operation**

Phase 1/3A

Wastewaters are collected in underfloor pits that are emptied via pull-plug systems. They flow through a sand trap before entering the biodigesters. Stirring inside the fermentation chamber is passive, facilitated by the current produced by the inflow and outflow of feedstock.

Partially treated wastewaters exit the covered lagoons through overflow pipes. These lead to open lagoons installed with paddle motors for aeration. Wastewaters then overflow or are pumped into successive clarifying lagoons (one to six lagoons, depending on the intended purpose for the effluent) where they are stored indefinitely or temporarily kept prior to reuse. Almost all of the clarifying lagoons have grown aquatic vegetation and some have been used to culture fish.

From storage, wastewaters are made to run through filtration boxes and sent back to pig buildings for cleaning and flushing.

Captured biogas in the biodigesters is refined in a conditioning system and then propelled into engines that generate electricity which power the buildings in Phase 1.

Sludge removed from treatment tanks and wastewater channels are piled onto a concrete bed or lined along wastewater channels for drying. Dried sludge is stored and used as soil amendment within the farm.

Phase 2/3B

Wastewaters are collected in underfloor pits that are emptied via pull-plug systems. They flow through a sand trap before entering the biodigesters. Stirring inside the fermentation chamber is mainly facilitated by currents produced by air rising from the bubblers at the bottom of the reactor.

Partially treated wastewaters exit the covered lagoons through overflow pipes. These lead to a 4-chambered uncovered earthen lagoon which facilitates settling and clarifying. From here, wastewaters will be made to run through a tank which will subject them to aeration (using bubblers), settling, and chlorination prior to being sent back to pig buildings for cleaning and flushing. Excess treated wastewaters are stored in clarifying lagoons where they remain indefinitely.

Captured biogas in the biodigesters is refined in a conditioning system and then propelled into engines that generate electricity which power the buildings in Phase 2.

Sludge removed from treatment tanks and wastewater channels will be piled onto a concrete bed and used as soil amendment after drying.

All the biodigesters have been fitted with pull-plug systems, eliminating the need for workers to enter the fermentation chambers for desludging.

Wastewaters from Phase 2/3B are currently contained in the decommissioned biodigester (damaged by typhoon) which will be converted into a reservoir of filtered effluent.

Until the completion of the biodigesters in Phase 3A, wastewaters from there will be directed to the post-treatment facility in Phase 1. Phase 1 and Phase 3A will share the existing clarifying lagoons and power generation facilities in Phase 1.

Assessment of the facilities' performance is currently being undertaken. Once completed, its results will be presented to the suceeding version of this ESMP (see Section 4).

Figure 1 illustrates the current processes involved and the Project components employed in the wastewater treatment and power generation process in CPA 3's pig farms.

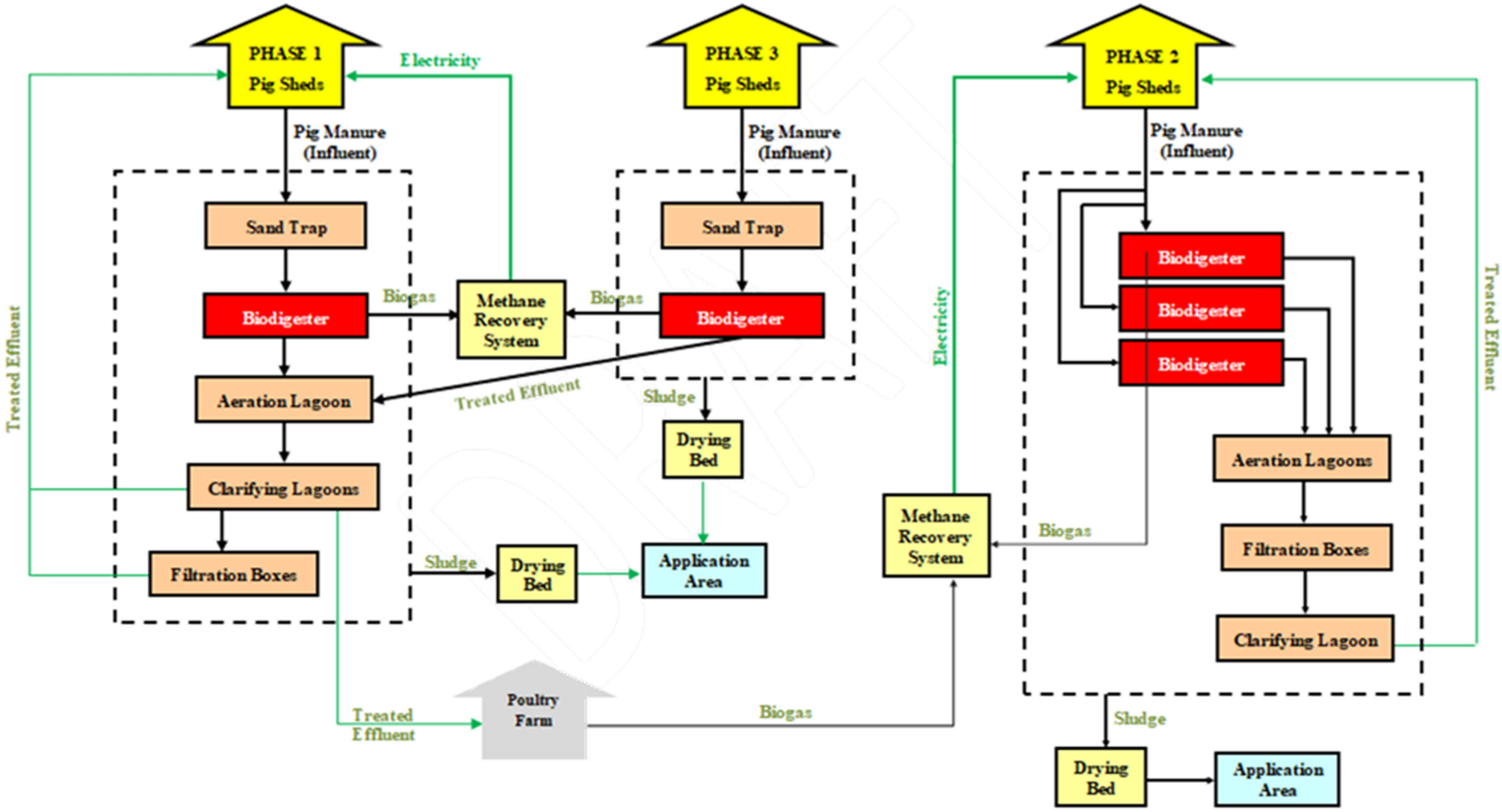


Figure 1. Wastewater treatment and power generation process in CPA 3

1.4 Project Site (Existing Environmental Conditions)

CPA 3 is largely located in San Nicolas, Ilocos Norte. Ilocos Norte is in the island of Luzon, northern Philippines. The Farm is about 3 km away from the national highway which leads to the cities of Laoag in the north and Batac in the south.

1.4.1 Land Classification and Use

The land occupied by the pig farms of CPA 3 are titled lots classified as agro-industrial and agro-livestock / agro-forest zones (based on the certification issued by the Office of the Municipal Planning and Development Coordinator, Municipality of San Nicolas).

Aside from livestock production, some areas inside the property are used to grow various tree species and ornamentals.

1.4.2 Climate

San Nicolas has Type I climate based on the modified coronas classification. The town has two pronounced seasons: dry – from November to April – and wet – from May to October. The highest amount of rainfall is experienced in August (average of 559.50 mm), whereas the lowest is during the months of February and December (average of 3.3 mm). [1] Typhoons are a common occurrence in this area.[2]

1.4.3 Topography and Soil

The pig farms are situated on top of a hilly feature with elevations ranging from about 75 m to 110 m asl. Slopes inside the property reach up to 50°, and in some construction and developemnet areas, up to 90° (see Maps 2.1 and 2.2).

Soil in the farm is classified as under the Bantay Series consisting of clay / clay loam, characterized by high water retention, poor to moderate drainage, and slow to moderate permeability.[3] Beneath the topsoil in some areas inside the property is compacted substrate or adobe, making such areas ideal for rainwater storage.

1.4.4 Water Resources

The landscape of the property features a number of gulleys and natural ditches through which rainwater flow down into surrounding plains and creeks.

The main source of water for the entire CPA 3 farm operations are mainly the lagoons dug to collect rainwater. Only three of these supply the piggeries.

1.4.5 Natural Hazards

San Nicolas is along frequent typhoon trails. Although the site is not at risk to flooding because of its elevation, heavy rains may cause erosion and flooding along gulleys and natutal drains, in natural depressions, and in steep terrains.

Ilocos Norte is not vulnerable to earthquakes.[2] The property does not seem to be susceptible to landslides except for steep slopes.

1.4.6 **People and Communities**

There are no dwellings or any establishments situated within the 500 m radius of CPA 3 pig farms. Below the property are sparsely to moderately populated areas. The main source of income for communities around the Farm are farming and employment in various industries in the nearby cities.

2 ENVIRONMENTAL MANAGEMENT

2.1 Impacts

2.1.1 Positive Impacts

Environment

The project has improved the CPA 3's method of handling manure and liquid waste. Compared to open lagoons, the biodigesters have significantly amended its wastewater treatment process, resulting in better effluent quality. Foul odors from effluents have been abated, improving the farm environment for workers, neighboring communities, and livestock.

Since treated effluent is recycled for cleaning and sludge is being used as soil amendment, extraction of freshwater and application of synthetic fertilizer in the farm have been reduced.

By providing a mechanism to capture methane and using it as a renewable source of energy, the Project has helped lower CPA 3'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 38,000 hogs (current average), through the Project, CPA 3 is estimated to be capable of reducing greenhouse gas emissions equivalent to 19,000 tCO_2e annually.

Economy

Using biogas-generated electricity lessens CPA 3's reliance on the grid, translating to savings for the piggery business. Expenses for cleaning water and fertilizers are reduced through effluent recycling and using sludge as soil amendment.

Moreover, having been being registered as a component project activity (CPA) in the CDM Program, CPA 3 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, the Farm provides employment opportunities to residents of San Nicolas and its neighboring towns and of provinces and generates considerable revenue for the local government.

2.1.2 Negative Impacts

Certain aspects of the Piggeries' 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 loads of manure and feed materials are primarily generated from raising 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 and from vehicles and heavy equipment 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 project site is typhoon prone and receives significant amount of rainfall. It also features natural and constructed slopes, drains, and steeps, making it vulnerable to flashfloods and significant erosion or landslide (caused by heavy rains and runoffs) that may result in siltation of watercourses in the surrounding lowlands. Long periods of heavy rainfall could overtop wastewater lagoons and wash off sludge piles. Strong winds may also damage WWTF and MRF causing release of pollutants.

- 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 MRFs present 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 they are 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**

CPA 3 aims to fulfill its guarantee to its clients of delivering products from environmentally responsible farms. Hence, the proponent hereby commits to undertake due diligence in its dealings and operations through compliance with relevant regulatory safeguards and implementation of the environmental management and monitoring plan in Table 4 and of other relevant provisions herein.

2.2.1 **Legal Framework**

CPA 3 pig farms operate in the context of laws prescribing the regulatory safeguards in Tables 2 and 3.

Table 2. Environmental documents and statutory requirements regulating the operation of CPA 3

DOCUMENT	PARTICULARS / STATUS	
Environmental Compliance Certificate (ECC)	Reference No.	010403-210078-0502 (5th amendment)
	Issuing Agency	EMB Region 1
	Date of Issuance	September 18, 2017
	Valid Until	- no expiration -
	Conditions	・ area of operation: 385.36 ha ・ maximum population: 69,800 heads ・ submission of CMR
Wastewater Discharge Permit (DP)	Reference No.	DP-R01-19-00677
	Issuing Agency	EMB Region 1
	Date of Issuance	March 14, 2019
	Valid Until	March 14, 2020
	Conditions	・ effluent discharge rate: 800 m^3/day ・ Class C effluent quality ・ submission of SMR
Permit to Operate (PTO) Air Pollution Source Control Installations	Reference No.	POA-15F-01IN16-016B
	Issuing Agency	EMB Region 1
	Date of Issuance	October 4, 2018
	Valid Until	June 1, 2020
	Conditions	・ For the following equipment: - (10 units) diesel powered engines
Hazardous Waste Generator ID	Registration No.	M-GR-R1-28-00116
	Approving Agency	EMB Region 1
	Date of Approval	April 23, 2019
	Valid Until	- no expiration -
	Conditions	・ For the following types of wastes: - lead compounds (D406) - mercury and mercury compounds (D407) - used industrial oil including sludge (I101) - oil-contaminated materials (I104) - containers (J201) - grease wastes (H802) - pathogenic and infectious wastes (M501) - pharmaceuticals and drugs (M503) - waste electrical and electronic equipment (H801)
PCO (Pollution Control Officer) Accreditation Certificate	Accreditation No.	PCO1-01092019-3058
	Issuing Agency	EMB Region 1
	Date of Issuance	January 9, 2019
	Valid Until	January 8, 2022

CMR Compliance Monitoring Report
EMB Environmental Management Bureau
EMF Environmental Monitoring Fund
P.D. Presidential Decree
SMR Self-Monitoring Report

Table 3. Permits ensuring the safety of CPA 3's facilities and operation

DOCUMENT	PARTICULARS	
Business Permit	Permit No.	AVAILABLE AND UP TO DATE
	Issuing Agency	Office of the Mayor - Municipality of San Nicolas
	Date of Issuance	January – 2019
	Valid Until	December 31, 2019
	Prerequisites	compliance with the requirements of the following: ・ Compliance to Building Code requirements, ・ Zoning Clearance ・ Sanitary / Health Certificate ・ Fire Safety Inspection Certificate
Land Use Clearance	Registration No.	AVAILABLE AND UP TO DATE
	Approving Agency	Municipality of San Nicolas
	Date of Approval	---
Fire Clearance	Reference No.	AVAILABLE AND UP TO DATE
	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 San Nicolas
	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 CPA 3 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 CPA 3 Pig Farms

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	PCO	TSMD > reported in SMR	/ 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	PCO	TSMD > 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 - automated feeding system	✓			quantify (dried) sludge produced	annually	amount of sludge produced	Maintenance	TSMD > reported in SMR	/ yr
		treatment of manure in WWTF	✓								
b.2 generation of (non-infectious) carcasses, blood	injuries, adverse environmental conditions, etc.	observe sound pig raising practices and biosecurity measures	✓			weigh disposed materials	daily	weight of materials disposed	Maintenance	TSMD > reported in SMR	-
		regular inspection and preventive maintenance of equipment regulating pig environment	✓								
		carcass disposal through burial	✓								
		composting of carcasses and pathological materials			✓						
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	Maintenance	TSMD > reported in SMR	(cost of hauling and dumping)
		adequate collection bins, proper storage		✓							
		reuse, 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	✓			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	Maintenance	TSMD > reported in SMR	/ yr
		disposal through accredited TSD	✓								
		reusing, recycling (for various construction and maintenance activities)	✓								
c.2 generation of infectious, pathological wastes, carcasses	veterinary activities, infections, outbreaks	disposal through burial	✓								
D. Air Pollution											
d.1 generation of air pollutants	vehicles, 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	Transportation	TSMD	(cost of maintenance, including salaries)
		use of diesel with low sulfur content	✓								
		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)	PCO	TSMD > reported in SMR	(cost of maintenance, including salaries)
		operates WWTF as prescribed	✓								
		regular inspection and preventive maintenance of WWTF	✓	✓							
		raised lagoon walls to prevent ingress of runoff		✓							
		adequate rainwater and wastewater separation		✓							
		adequate groundwater and wastewater separation	✓								
		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	Maintenance	TSMD	-
		adequate separation of storage from surface/groundwater	✓								
		establish vegetation (filter strips) around drying bed and storage	✓	✓	✓						
		has and implements contingency response plan	✓								
	e.1.3 pathological wastes, carcass disposal, leachate	disposal through burial	✓			review inspection and maintenance record	monthly - more frequent during rainy season	number and details of leak / breach incidents	Supervisors	TSMD	-
		disposal in concrete vault			✓						
		create diversion banks, drains around disposal site			✓						
		establish vegetation (filter strips) around disposal site		✓							
		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	PCO	TSMD	(signage cost) (cost for TSD disposal)
		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.1.5 natural hazards	raised lagoon walls	✓			review inspection and maintenance record	monthly - more frequently	details of inspection report	Maintenance	TSMD	(cost of slope protection)
		adequate runoff channels		✓							

		slope protection measures	✓	✓			during rainy seasons				
		plant / maintain vegetation along / on sloping areas		✓							
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)	Maintenance	TSMD	(cost of maintenance, including salaries)
		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	PCO	TSMD >reported in SMR	-
		uses renewable fuel (biogas from MRF)	✓								
		uses energy-efficient equipment and facilities - insulated pig houses	✓								
e.3 groundwater depletion	pig raising, general farm activities	water conservation strategies	✓			quantify volume of freshwater consumption	monthly	volume of freshwater consumed	PCO	TSMD >reported in SMR	(flow meter cost)
		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	Maintenance	TSMD	(signage cost) (cost of fire protection equipment) (cost of maintenance, including salaries)
		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	Maintenance	TSMD	(cost of PPE) (signage cost)
		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	Supervisors	TSMD	(cost of PPE) (cost of employees' 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	PCO	TSMD	(cost of cleaning materials) (cost of seedlings) (cost of PPE)
		tunnel ventilated buildings	✓								
		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 through burial	✓								
		prevent leachate leakage		✓							
		uses of appropriate PPE		✓							
g.2 noise - nuisance, discomfort	g.2.1 pigs	automated feeding system	✓			review complaints register	monthly	number and details of noise complaint	PCO	TSMD	(cost of PPE) (cost of seedlings)
		uses appropriate PPE		✓							
		adequate spatial buffer from surrounding communities	✓								
		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	automated feeding system	✓			review complaints register	quarterly - more frequent during typhoon (windy) season	number and details of dust complaints	PCO	TSMD	
		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	✓								

		operate loud equipment in enclosed areas	✓								
		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	Supervisors	TSMD	(cost of 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	Supervisors	TSMD	(cost of PPE) (cost of 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	Supervisors	TSMD	(cost of 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
TSMD Technical Support and Monitoring Department
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 (also see Appendix B):

a. Fire
   – Administration buildings, employees' quarters, and pig buildings are equipped with fire extinguishers.

b. Earthquake
   – The open grounds around the farm are designated as evacuation areas for when an earthquake occurs.

c. Outbreak
   - The farms have in-house veterinarians who could provide immediate assessment of outbreak situations and give instructions for workers to carry out.

d. Power outage
   - Standby diesel and biogas-fueled generators are able to supply the farms' electricity needs.

e. Health emergencies
   - First aid kits and medicines are available on site (admin buildings, staff houses) 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

Emergency services can be accessed in the town proper of San Nicolas after about a 10 to 15-min drive (at the minimum) from the farm, depending on the prevailing traffic.

In the event that any of the listed emergencies occur, farm personnel are to report to their immediate supervisors who is in charge of alerting the proper company authorities and emergency services.

2.2.4 **Occupational Health and Safety**

CPA 3's risk management plan for general occupational health and safety issues associated with work in the Farm is presented in Appendix C. 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 Farms' facilities, especially the WWTF-MRF, 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 will be reported in the SMR.

The SMRs and CMRs will contain the results of audits on the Farms' 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 semianually, respectively, as well as to LBP-EPMD (Environmental Program and Management Department) for its reference and review purposes.

CPA 3' designated Pollution Control Officer (PCO) has been tasked to ensure that the CPA 3 is compliant with pertinent environmental regulations, including those listed in Table 4, and is performing its environmental commitments, including 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 have been identified and invited by the proponent, together with LBP-EPMD, through letters and notices to the consultative meeting held on March 19, 2015 (2 PM) in San Nicolas, Ilocos Norte. The meeting was attended by at least 35 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. The issues and queries they raised were all satisfactorily addressed by the proponent and other presenters.

3.2 Grievance Redress Mechanism

CPA 3 will ensure that the details of complaints related to the Farm's existence and operations 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 shall make reasonable efforts 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 and at CPA 3's main gate. For this project, 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

3.3 Information Disclosure

This ESMP and other relevant information regarding the Project will be published in LANDBANK's website where it can be readily accessed by the public.

3.4 Equal Opportunity

CPA 3 is an equal opportunity employer, not regarding gender, age, disability, and ethnicity in evaluating and hiring potential employees. Presently, its workforce is composed of about 400 individuals with ages ranging from 20 to 60 years old. Various farm tasks, including animal handling, are performed by males and females laike.

3.5 Resettlement

The project is located inside the premises of 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 CPA 3 receive standard basic salaries at the minimum, 13th month pay, and other regular statutory benefits, in addition to free food and lodging at the farm for stay-in workers.

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 CPA 3 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

CPA 3 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 in accordance with LBP's ESSF and to 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 CPA 3 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 in accordance with LBP's Safeguards Framework and the agreed activities and timelines stipulated in the MOA and SPA.

5.3 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 San Nicolas licenses the operation of CPA 3 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 municipal government of San Nicolas, 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, 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 CPA 3 EPRMP (2017)
2 vm.observatory.ph
3 bmp.philrice.gov.ph

Maps Sources

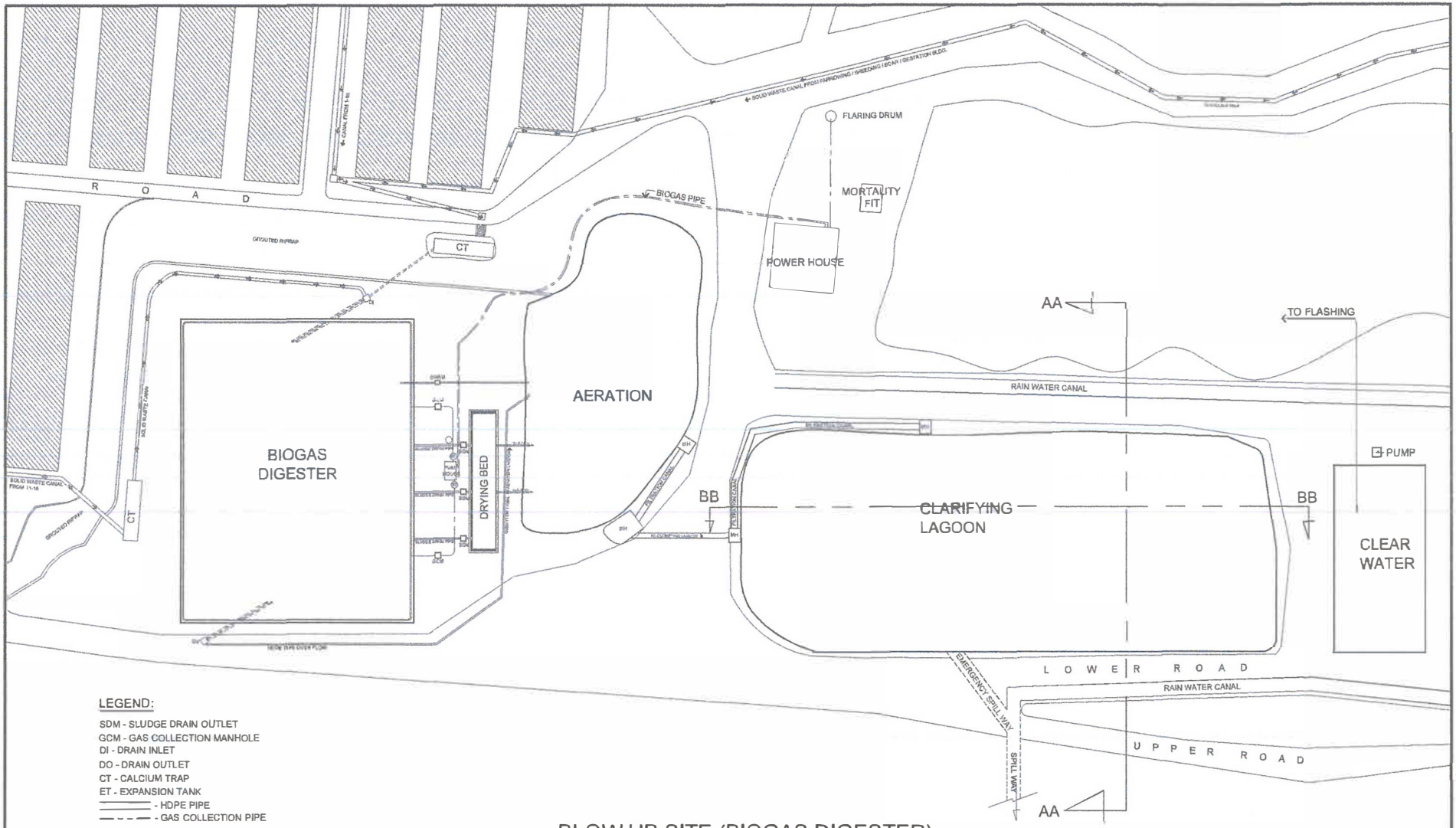
a Google Earth Pro

APPENDICES

A Project Design and Construction Plan

B Evacuation Plan

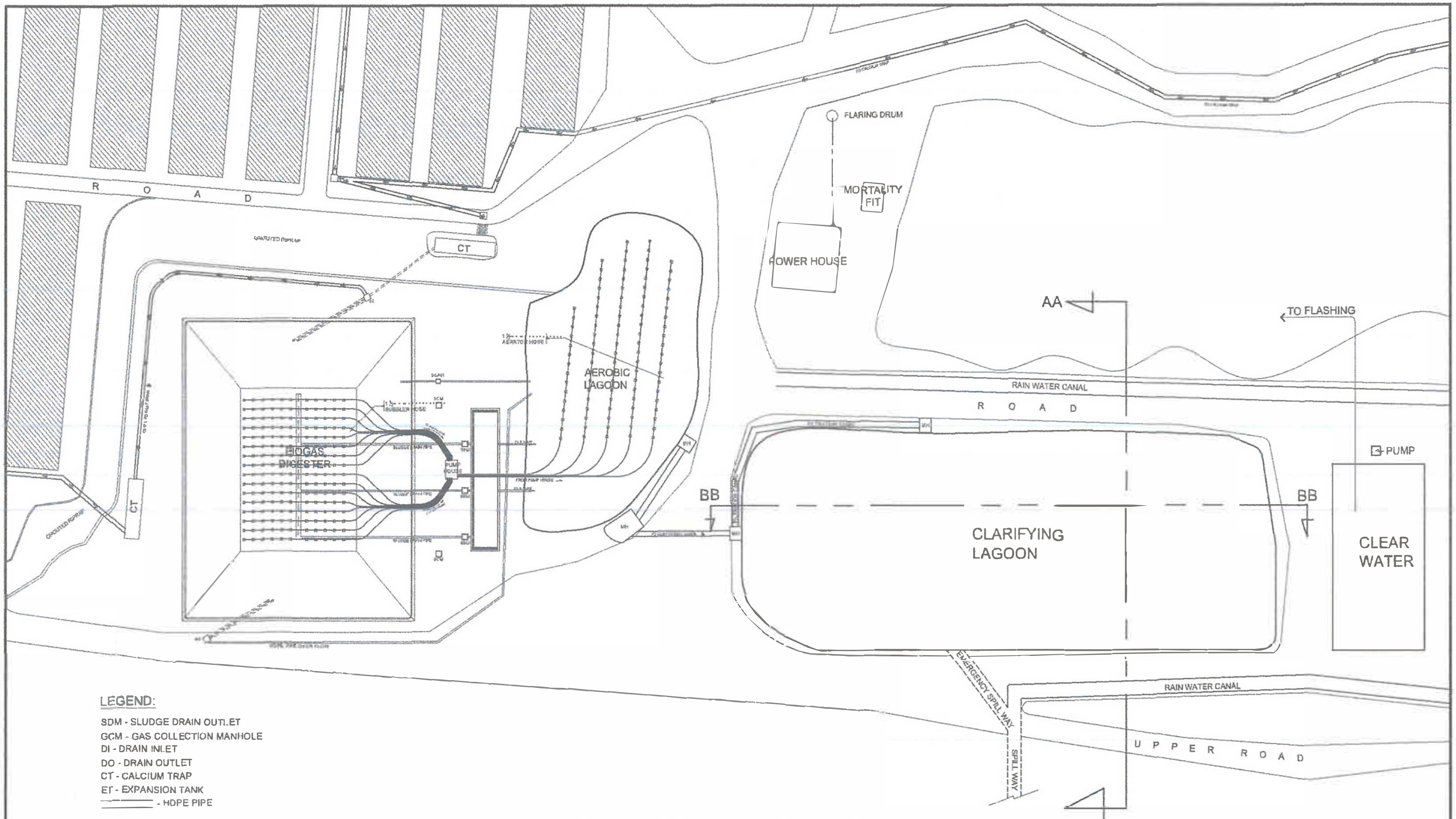
C Health and Safety Risk Management Plan



BLOW UP SITE (BIOGAS DIGESTER)

SCALE 1:800 MTR.

	COIVIL ENGINEER	Important: Drawings and specifications and other contract documents duly signed, stamped or sealed, as instruments of service, are the intellectual property and documents of the architect, whether the object for which they are made is executed or not. It shall be unlawful for any person(s), agencies or to make copies of said documents for use in the re-publication of and for other projects or buildings, whether executed partly or to include, without the written consent of architect or author of said documents.	Checked By:	Project Title: Proposed BIOGAS DIGESTER	Conforme:	Sheet Contents: AS SHOWN	Sheet No.: 1 / A 1
			Cad By:				
			C_OPERATOR		Owner		



DETAILS OF BUBBLER HOSE LINE

SCALE 1:800 MTR.

CIVIL ENGINEER			
Important: Drawings and specifications and other contract documents duly signed, stamped or sealed, as instruments of service, are the intellectual property and documents of the architect, whether the object for which they are made is executed or not. It shall be unlawful for any person to duplicate or to make copies of said documents for use in the repetition of and for other projects or buildings, whether executed partly or in whole, without the written consent of architect or author of said documents.	Checked By:	Project Title: Proposed BIOGAS DIGESTER	Conforme: Owner
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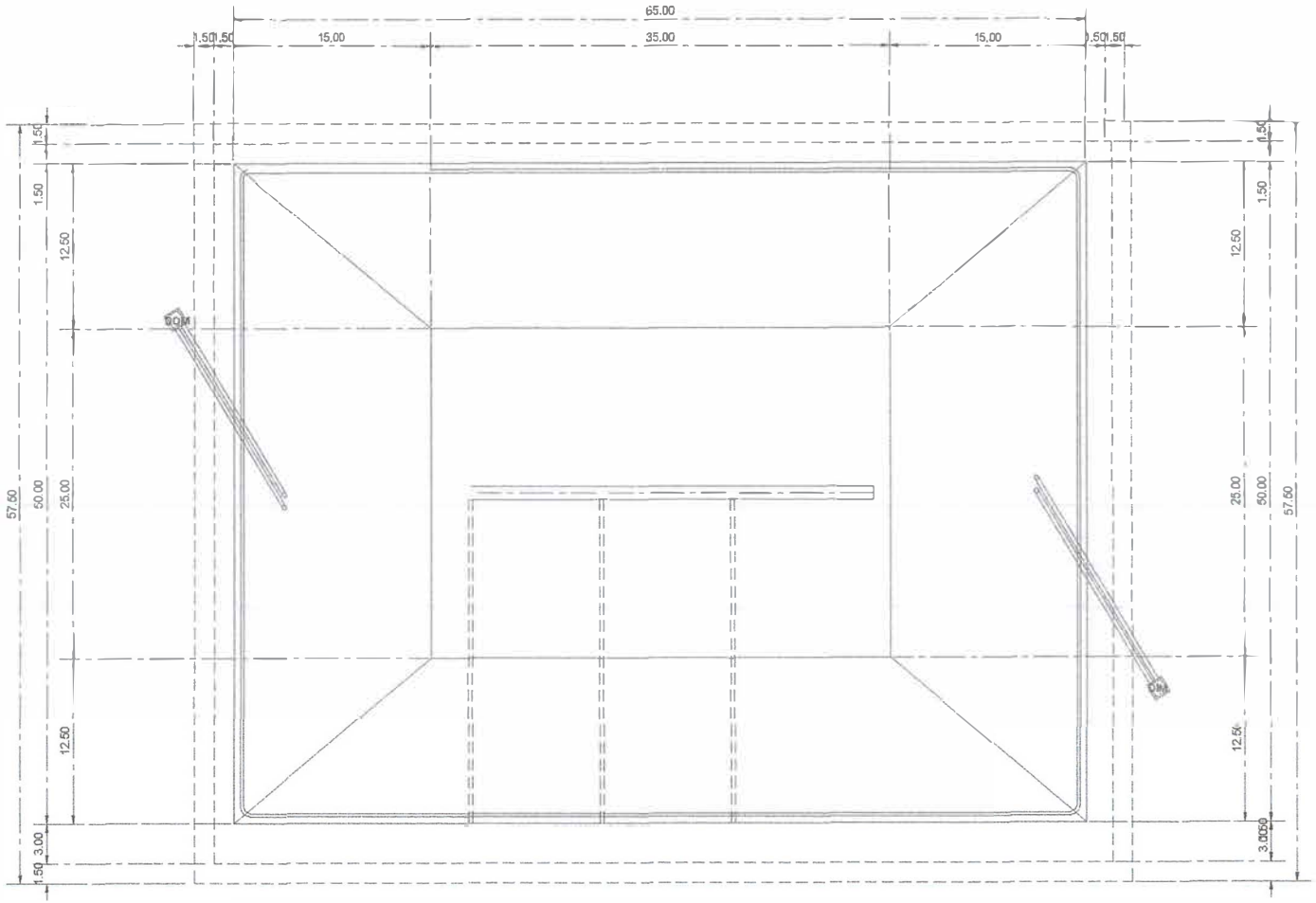
			Sheet No.: 2 A1



PLAN (BIOGAS DIGESTER)

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	CIVIL ENGINEER	Important: Drawings and specifications and other contract documents duly signed, stamped or sealed, as instruments of service, are the intellectual property and documents of the architect, whether the object for which they are made is executed or not. It shall be unlawful for any person to duplicate or to make copies of said documents for use in the re-publication of and for other projects or buildings, whether executed partly or in whole, without the written consent of and/or of author of said documents.	Checked By:	Project Title: Proposed BIOGAS DIGESTER	Conformed:	Sheet Contents: AS SHOWN	Sheet No.: 3 A1
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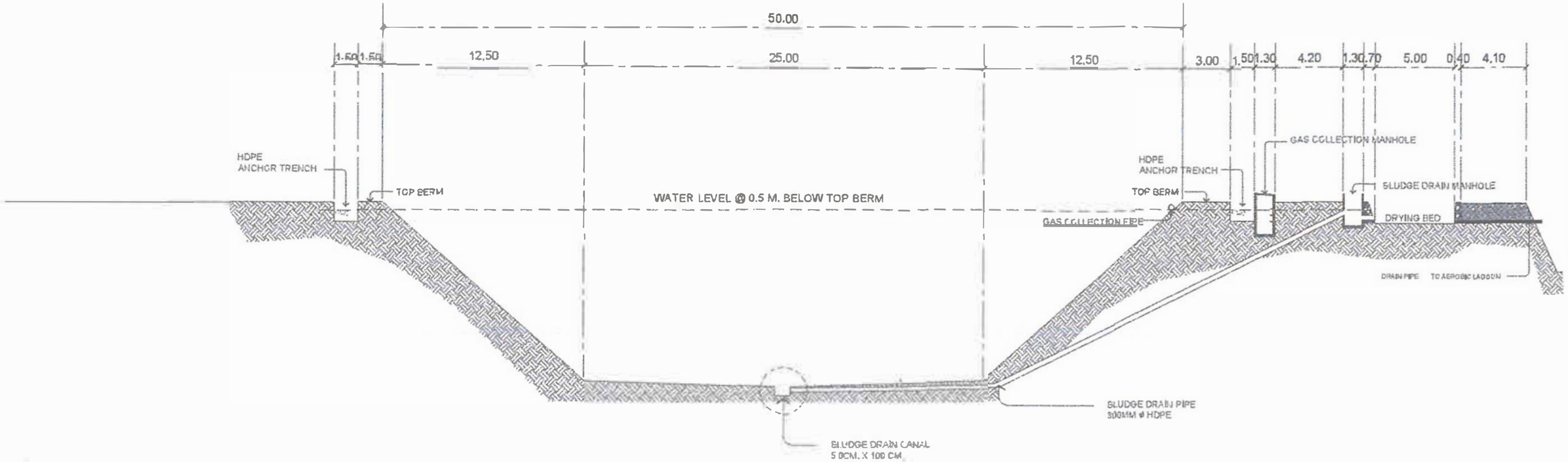

CROSS SECTION (BIOGAS DIGESTER)

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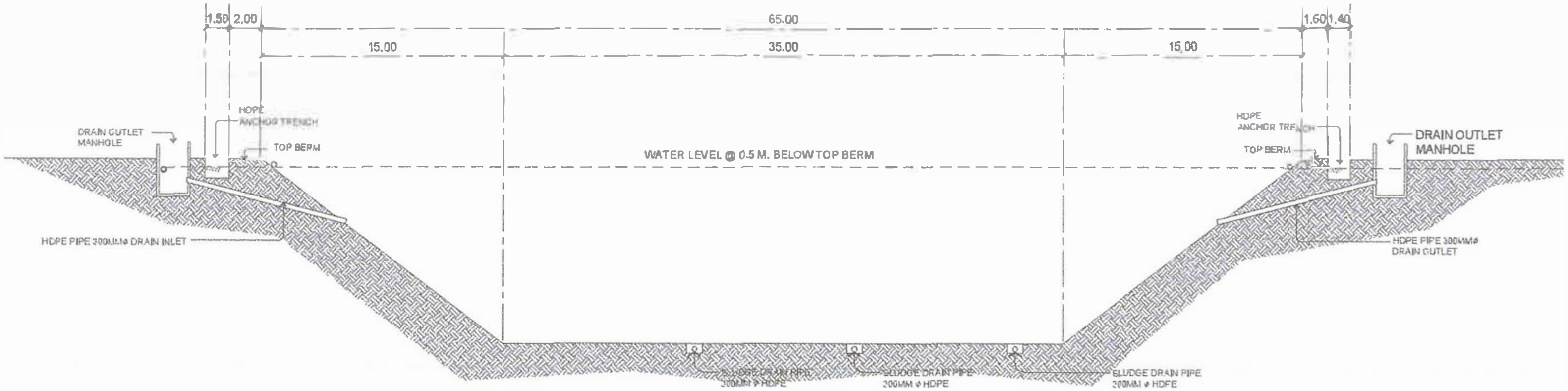

LONGITUDINAL SECTION (BIOGAS DIGESTER)

SCALE 1:300 MTR.

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		Cad By: C_OPERATOR		

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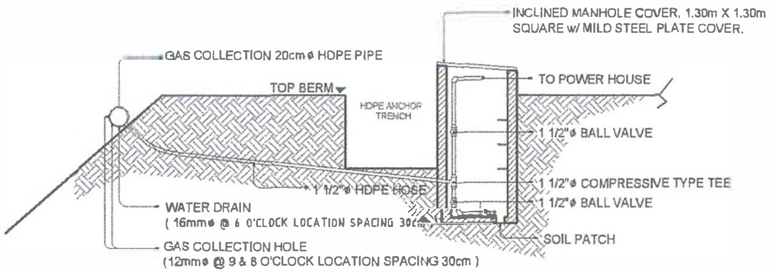
(ONE END THREADED, ONE END COMPRESSION TYPE COUPLING.)



SPOT DETAIL 1 (GAS COLLECTION MANHOLE)

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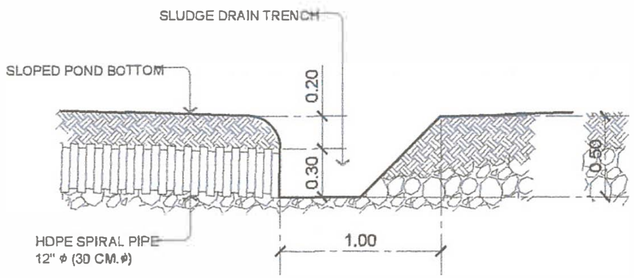

SPOT DETAIL 3 (SLUDGE TRENCH)

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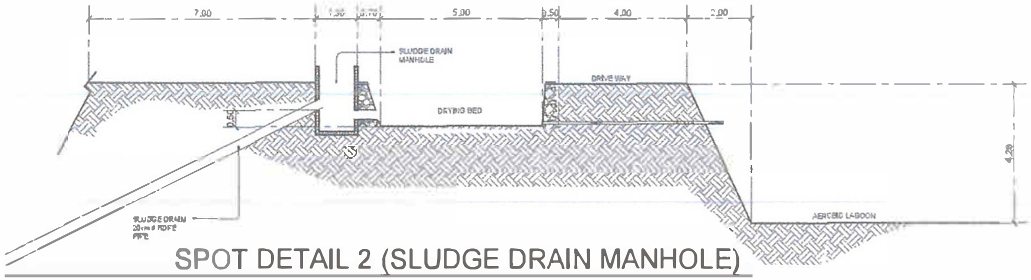

SPOT DETAIL 2 (SLUDGE DRAIN MANHOLE)

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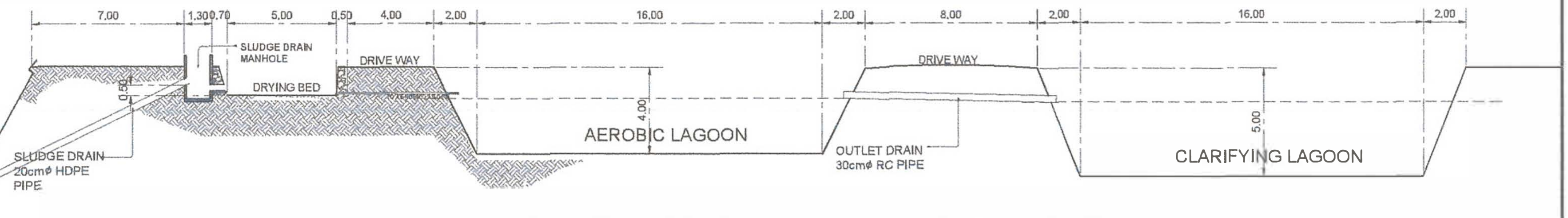

SECTION DETAIL (DRYING BED TO CLARIFYING LAGOON)

SCALE 1:200 MTR.

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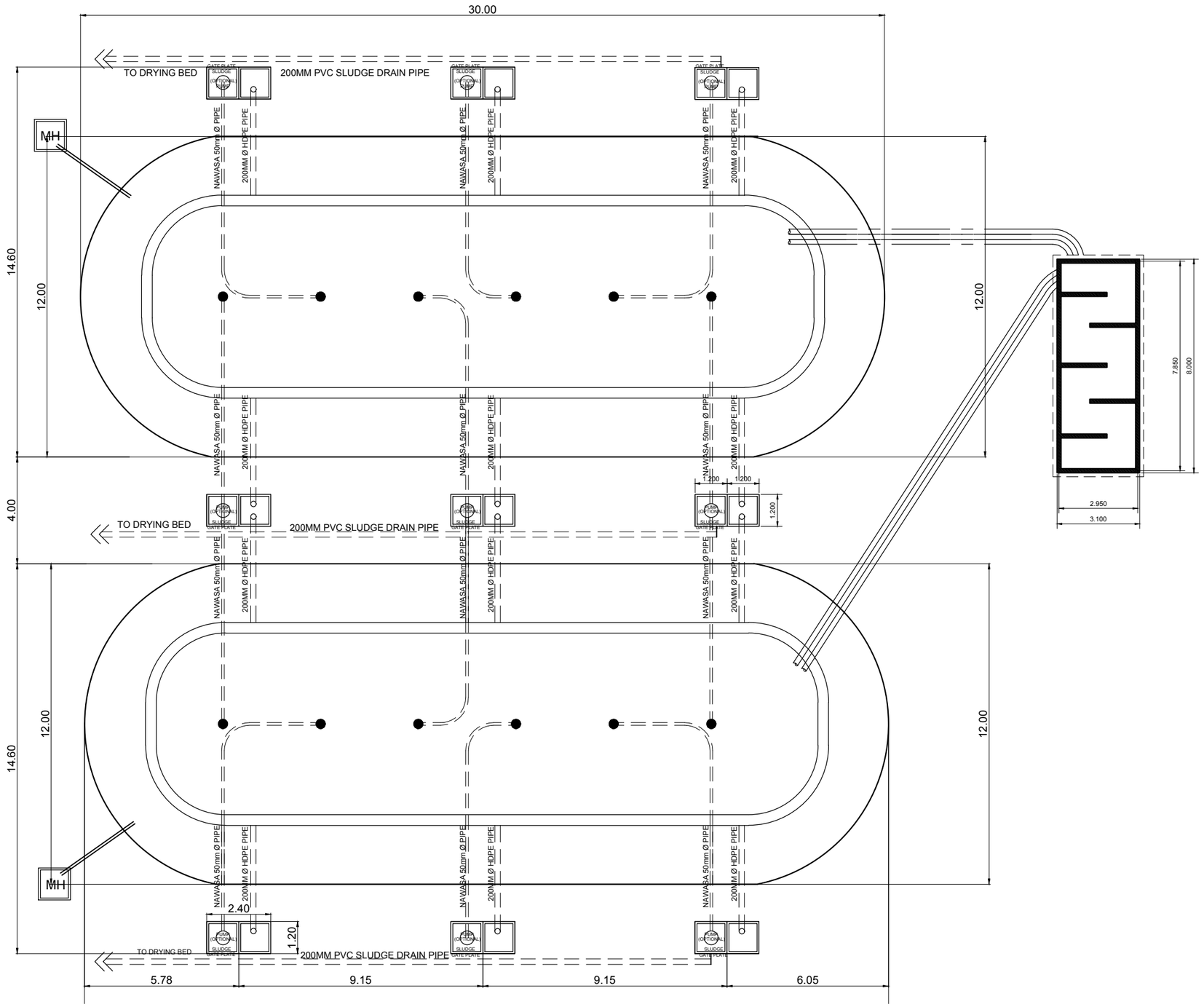

SLUDGE COLLECTION LAYOUT

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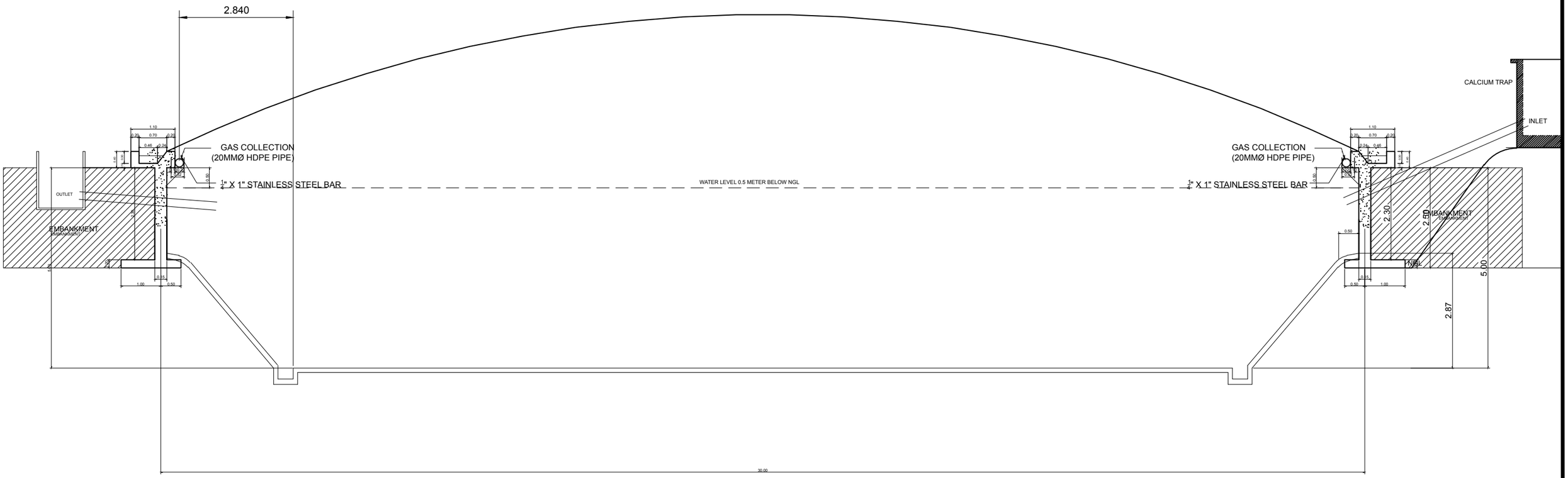
ENGR. GERALD G. DEUZ		PHASE 3 BIOGAS DIGESTER		REVIEWED BY:	2/11
TIN: 436-367-248	PTR NO: 4324984				
PRC NO: 0123981	ISSUED ON: 4/3/2018	PROJECT LOCATION:			
VALIDITY: 2/14/2021	ISSUED AT: SAN NICOLAS				



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DATE PLOTTED

REV NO.: PRJT NO.:

DWG NO.:

VVH CONSTRUCTION CORPORATION
ISO CERTIFIED
PCAB License No. 32689
(Category A)

ENGINEER / ARCHITECT	PROJECT TITLE	OWNER
ENGR. GERALD G. DEUZ	PHASE 3 BIOGAS DIGESTER	
TIN: 436-367-248 / PTR NO: 4324984		
PRC NO: 0123981 / ISSUED ON: 4/3/2018	PROJECT LOCATION:	
VALIDITY: 2/14/2021 / ISSUED AT: SAN NICOLAS		

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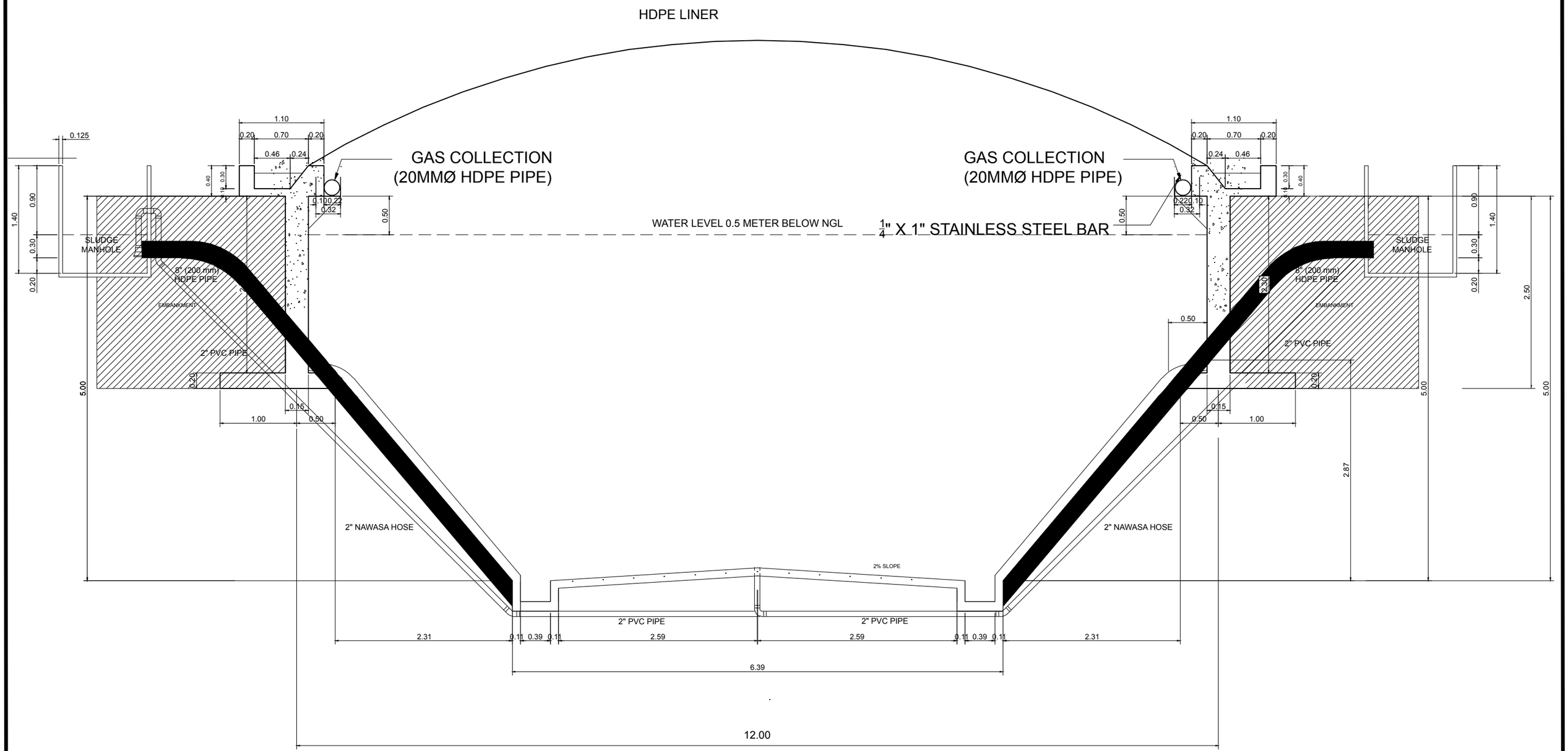

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VVH CONSTRUCTION CORPORATION
ISO CERTIFIED
PCAB License No. 32689
(Category A)

ENGINEER / ARCHITECT	PROJECT TITLE	OWNER	CADD BY:	SHEET NO.
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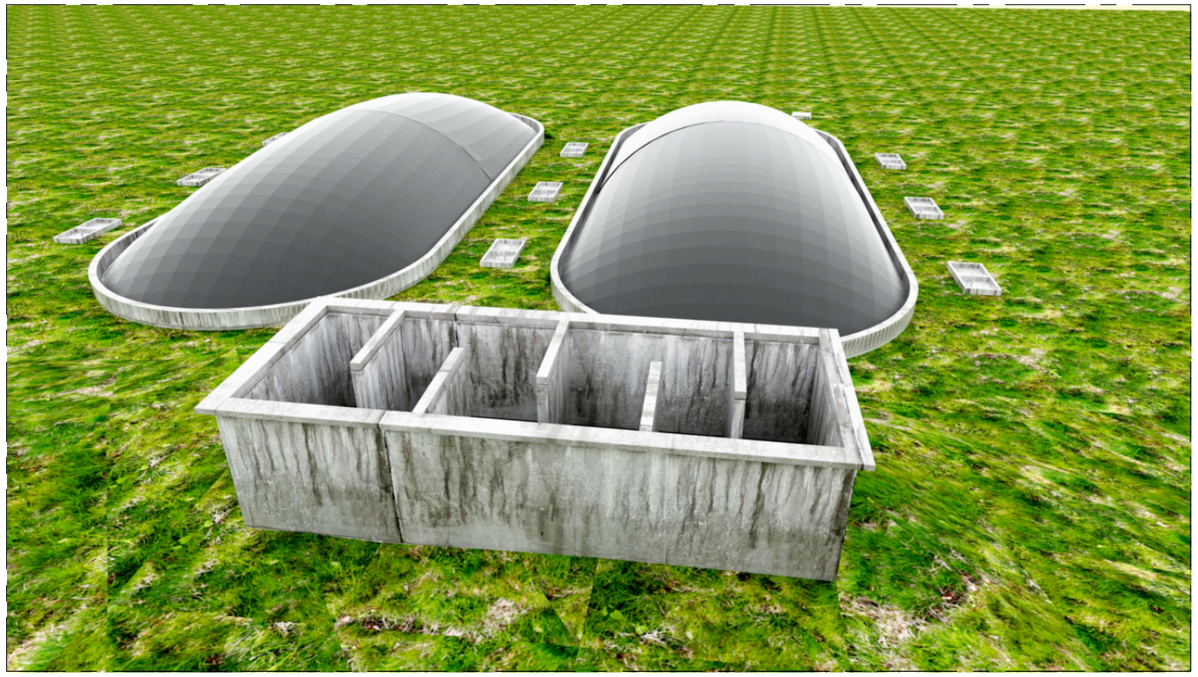
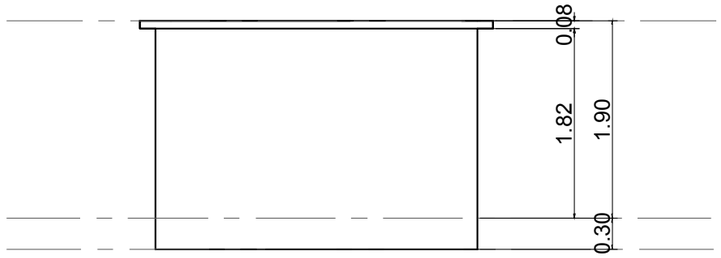
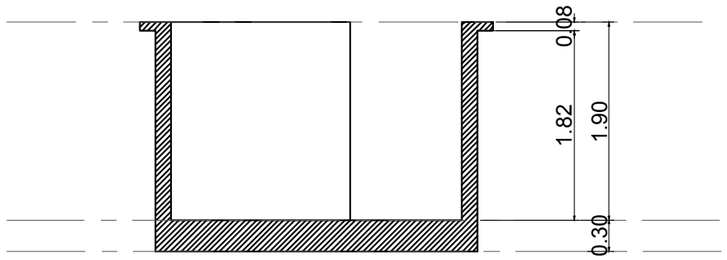
TIN: 436-367-248 / PTR NO: 4324984				
PRC NO: 0123981 / ISSUED ON: 4/3/2018	PROJECT LOCATION:			
VALIDITY: 2/14/2021 / ISSUED AT: SAN NICOLAS				



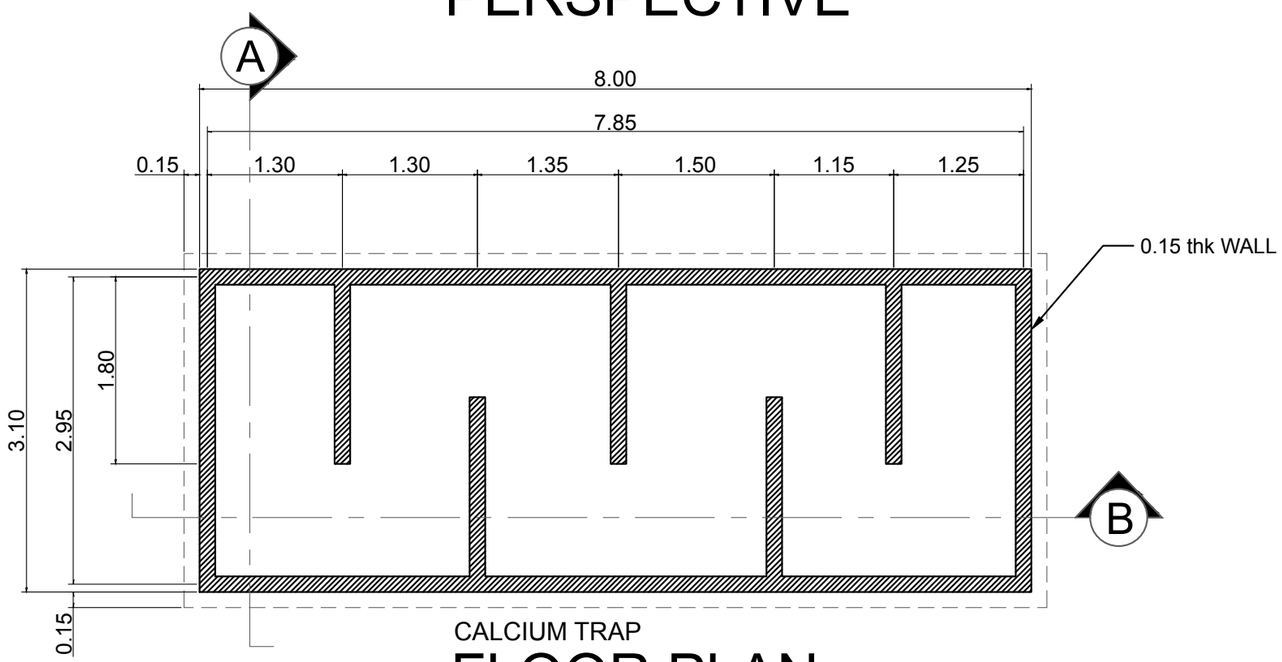
PERSPECTIVE



CROSS ELEVATION

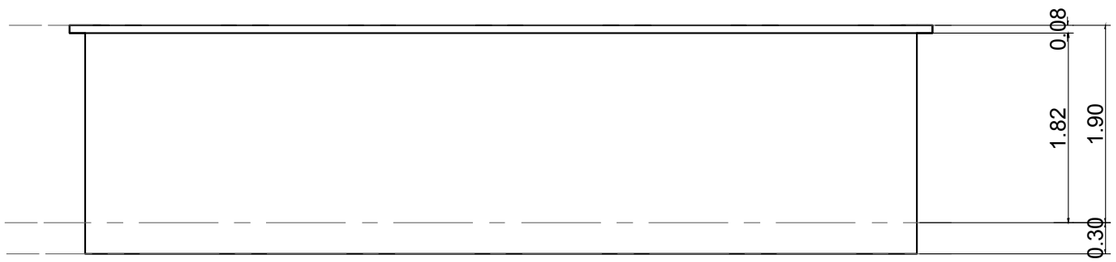


CROSS SECTION TRHU "A"

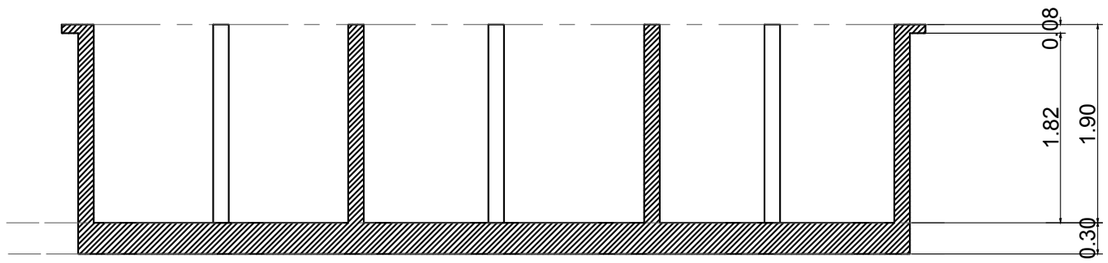


CALCIUM TRAP

FLOOR PLAN



LONGITUDINAL ELEVATION

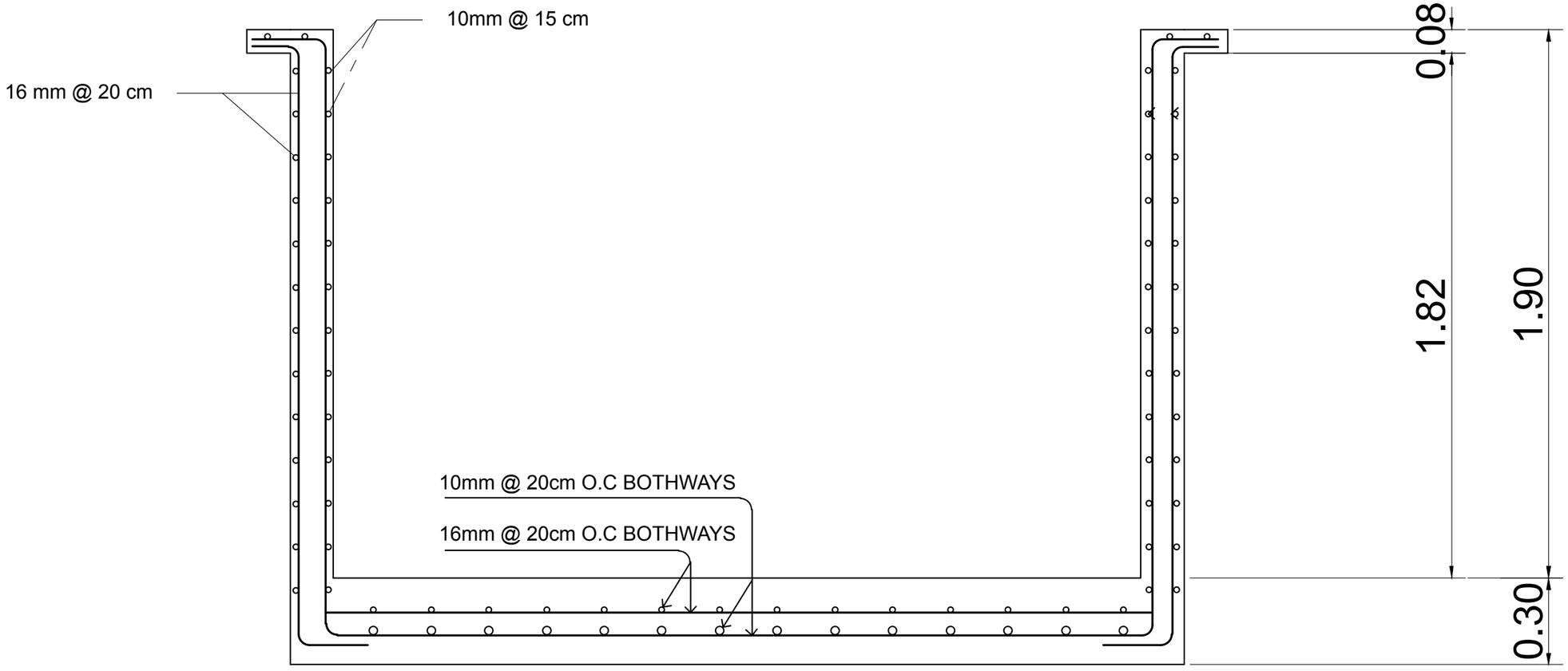


LONGITUDINAL SECTION TRHU "B"

DATE PLOTTED	
REV NO.:	PRJT NO.:
DWG NO.:	

VVH CONSTRUCTION CORPORATION
ISO CERTIFIED
PCAB License No. 32689
(Category A)

ENGINEER / ARCHITECT	PROJECT TITLE	OWNER	CADD BY:	SHEET NO.
ENGR. GERALD G. DEUZ	PHASE 3 BIOGAS DIGESTER		REVIEWED BY:	10/11
TIN: 436-367-248 / PTR NO: 4324984				
PRC NO: 0123981 / ISSUED ON: 4/3/2018	PROJECT LOCATION:			
VALIDITY: 2/14/2021 / ISSUED AT: SAN NICOLAS				



CALCIUM TRAP

REINFORCEMENT DETAILS

DATE PLOTTED			
REV NO.:		PRJT NO.:	
DWG NO.:			

VVH CONSTRUCTION CORPORATION
ISO CERTIFIED
PCAB License No. 32689
(Category A)

ENGINEER / ARCHITECT		PROJECT TITLE	OWNER	CADD BY:	SHEET NO.
ENGR. GERALD G. DEUZ		PHASE 3 BIOGAS DIGESTER		REVIEWED BY:	11/11
TIN: 436-367-248	PTR NO: 4324984				
PRC NO: 0123981	ISSUED ON: 4/3/2018	PROJECT LOCATION:			
VALIDITY: 2/14/2021	ISSUED AT: SAN NICOLAS				

APPENDIX B.

Site Evacuation Plan

CPA 3 PHASE 1 Point Persons:

TSMD Head: <name> <contact details>
PCO: <name><contact details>
Biodigester / Genset Maintenance Team: <name><contact details>

Local Emergency Contact Details:

911 Provincial Incident Response Management (PIRM)

ILOCOS NORTE FIRE DEPARTMENT
Batac: 792-3416
Laoag: 772-1885 / 772-0111792-3416

SAN NICOLAS POLICE
+6377 772–0560, +63 917-565-7309

MMSU Hospital, Batac: 792-3002
MMSU Emergency Room, Batac: 792-314

APPENDIX C.

Health and Safety Risks Management Plan of CPA 3 Pig 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)	Supervisor 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	Supervisor 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	Supervisor 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)	Supervisor Farm Personnel
	discomfort, heat exhaustion, heat stroke	working in enclosed spaces with limited ventilation	- adequate hydration and rest breaks	Supervisor
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	Supervisor 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	TSMD Supervisor 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	Supervisor
		fugitive gases	- perform regular inspection and maintenance of biogas system	Supervisor
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)	TSMD Supervisor
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)	TSMD Veterinarians Supervisor
		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)	Supervisor Farm Personnel
		improper use of equipment	- train staff (consult manuals)	Supervisor Farm Personnel
		use of faulty equipment	- repair or replace equipment	Supervisor
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	Supervisor Farm Personnel
		various objects, debris (trips)		
		heights, slips (falls)		
entanglement	injuries, wounds, strangulation	machineries	- install machine guards - tie back long hair	Farm Personnel

			- wear long sleeve shirts - avoid wearing loose-fitting clothes and personal accessories - regular equipment inspection and maintenance	
blows, punctures	injuries, wounds, contusions	pig handling	- use animal restraints - ensure enough space to maneuver - train staff (animal handling techniques) - wear appropriate PPE (boots, gloves, etc.)	Supervisor Farm Personnel
sharps	sharps injuries, wounds	veterinary activities, waste handling	- ensure only trained personnel conduct veterinary activities - wear appropriate PPE (gloves, goggles)	Supervisor 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	TSMD 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	Supervisor Farm Personnel

* Shaded rows / items applicable for Anaerobic Digestion System