

**MONITORING REPORT FORM (CDM-MR)**
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**MONITORING REPORT**

Version 3 31/05/2011

AWMS METHANE RECOVERY PROJECT**BR07-S-34, BAHIA, ESPIRITO SANTO, MINAS GERAIS, AND SAO PAULO, BRAZIL
UNFCCC1534****Monitoring Period #1 10/4/2008 – 31/05/2010****SECTION A. General description of the project activity****A.1. Brief description of the project activity: >>**

The purpose of the AWMS Methane Recovery Project, BR07-S-34, Bahia, Espirito Santo, Minas Gerais, and Sao Paulo, Brazil is to mitigate animal effluent related GHG emissions by improving the animal waste management system (AWMS) at several swine farms (See A.1 below).

Source Id	Source Name	OMS Start Date	Legal Entity Name	Renewable Energy Equipment
10965	Fazenda Pimenta	3-Apr-06	Leila Maria Souza Vicente Araújo	
21522	Granja Courotex Ltda	5-Oct-06	Granja Courotex Comércio e Exportação de Suínos e Couros Ltda.	
27512	Granja Esperança	21-Feb-06	Saulo de Deus Vieira	X
30412	Fazenda Esmeralda Lote 38	24-Jul-07	João Gilberto Mário Van Den Broek	

Table A.1 Project Source Ids and Legal Entity

The project comprises of reduction of methane (CH₄) emissions by means of installing ambient temperature anaerobic digesters for treatment of manure and by capturing and flaring the resulting biogas or utilizing biogas for energy generation at selected sites.

The technology employed by the project activity includes installation of new covered lagoons creating an anaerobic digester. The covered and lined lagoon system creates a digester with sufficient capacity and hydraulic retention time (HRT) to nearly eliminate the volatile solids loading in the effluent. Processed effluent from the lagoon cells is routed to the clarification lagoon(s) and captured gas will be removed and combusted.

This project was registered on 10 April 2008 with a 7 year renewal, and projects were constructed and entered into monitoring per the Table A.2.

Total emission reductions achieved in this monitoring period are 8,320.

**A.2. Project Participants**

>>

Name of Party involved (*) (host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	AgCert Do Brasil Solucoes Ambientais Ltda.	No
United Kingdom of Great Britain and Northern Ireland	AgCert International Ltd.	No
Switzerland	AgCert International Ltd.	No

A.3. Location of the project activity:

>> The location of the sites within the project activity are below in Table A.2.

Source Name	Latitude	Longitude	City	Region
Fazenda Pimenta	-20.730000	-43.360000	Piranga	Minas Gerais
Granja Courotex Ltda	-12.659940	-38.485877	Candeias	Bahia
Granja Esperança	-18.619010	-46.320360	Patos de Minas	Minas Gerais
Fazenda Esmeralda Lote 38	-22.561000	-46.962767	Mogi Mirim	Sao Paulo

Table A.2 Project location

A.4. Technical description of the project

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The technology employed by the project activity includes the total replacement of the open primary lagoon at the project activity sites with positive pressure covered lagoon “cells”, creating ambient temperature anaerobic digesters. The system is comprised of identical cells with sufficient combined capacity to create an adequate Hydraulic Retention Time (HRT). Each cell uses a liner affixed to a reinforced outer concrete frame. The outer cover consists of a synthetic UV-treated multi-layer membrane, which is also fastened to the frame. The liner and cover are sealed together. The cells have been designed to enable solids residue removal without breaking seal and the biogas from each cell can be independently sectioned off. Maintenance and repairs can be made to one cell without affecting operation of the other cells. All cell components are sourced from in-country manufacturers. Processed effluent from the lagoon cells is routed to the clarification lagoon(s) and captured gas is routed to flare and/or generator and combusted.

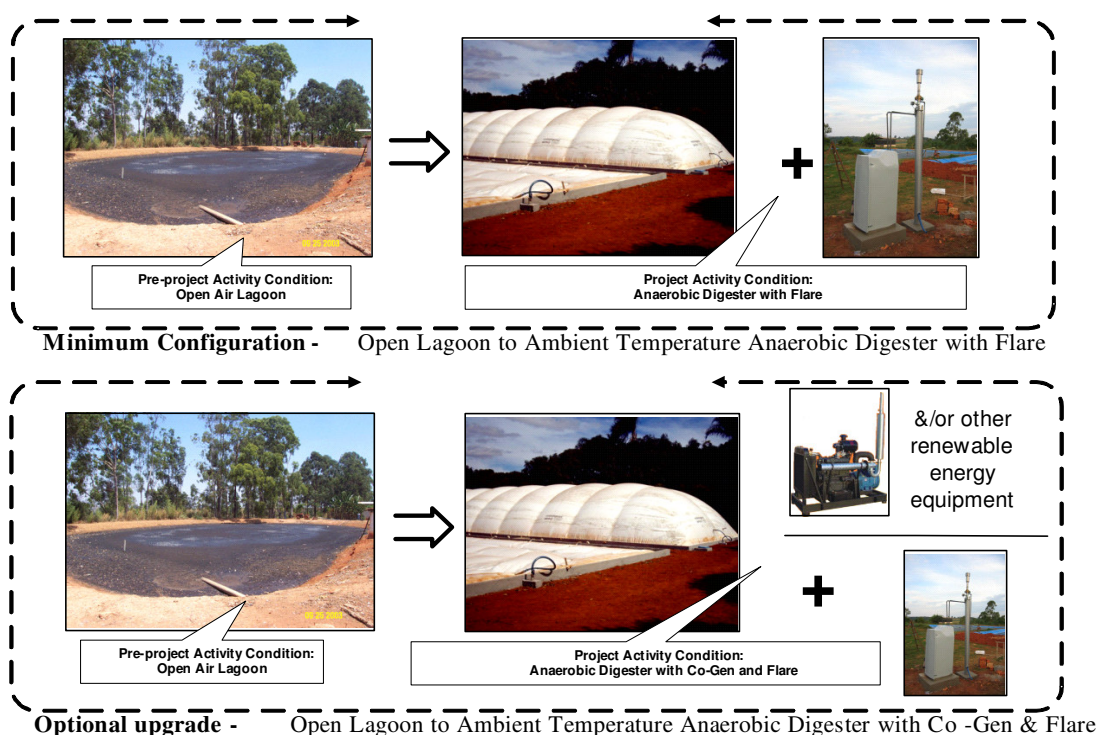


Figure A2. Project Activity Configurations.

Figure A2 depicts two approaches to mitigate AWMS GHG emissions. The minimum configuration constructs cells and a flaring system, as described above. The optional upgrade incorporates the use of a cogeneration system to produce on-farm electricity, using methane produced by the covered cells as fuel. The minimum configuration flare is retained to burn methane not required by the engine/generator set.

Care was given to use compatible components in the design of the AWMS. For example, the geomembrane cover has a tensile and tear strength which far exceeds the flare over-pressure release threshold. Furthermore, the flare combustion capacity exceeds the estimated GHG production forecasts.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

>>

This project activity utilized the CDM-approved methodology AMS III.D, Version 11: *Methane recovery in agricultural and agro industrial activities*.

A.6. Registration date of the project activity:

>>

This project was registered 10 April 2008.

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

>>



The Crediting Period of the project activity is 10 April 2008 to 9 April 2015 (renewable)

A.8. Name of responsible person(s)/entity(ies):

>>

The person responsible for completing the monitoring report form is Pamela McRoy, Monitoring and Verification Manager; AgCert International. Phone (321) 775-4872.

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

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The Operations Monitoring System (OMS) Start Date is indicated in the below table, with the construction completion date for each site. Events that were significant impact to operations are listed in Table B.1 per site. Per mutual contractual agreement between farm owner and project participant, the latter will no longer monitor Site ID 21522. No emissions reductions are taken for this monitoring report.

Source Id	Source Name	OMS Start Date	Construction Completion Date	Equipment Replaced	Replacement Date	Significant Events
10965	Fazenda Pimenta	3-Apr-06	18-Mar-06			manure piping blocked, unblocked
21522	Granja Courotex Ltda	5-Oct-06	1-Sep-06			site no longer monitored per mutual contractual agreement between farm owner and PP.
27512	Granja Esperança	21-Feb-06	12-Dec-05			
30412	Fazenda Esmeralda Lote 38	24-Jul-07	9-Aug-07			

Table B.1 Project Implementation Status

Table B.2 lists all monitoring reports for this project.

Report Number	Dates		Resulting emission reductions	Verifying DOE
	From	To		
MR01-BR07-S-34	10 Apr 2008	31 May 2010	See A.1	DNV

Table B.2. Monitoring Reports

B.2. Revision of the monitoring plan

>>

No revisions were requested.

B.3. Request for deviation applied to this monitoring period

>>

A request for deviation was submitted for this project, and the CDM Executive Board accepted the request for deviation (I-DEV0342). The percentage of biogas that is methane was directly measured starting from Feb 2009 onward for site 10965, Jul 2008 for site 27512 and Nov 2008 for site 30412 while the CO₂ content of biogas was measured throughout the whole monitoring period. Prior to this the methane content was calculated in accordance with the accepted request for deviation (I-DEV0342) as 94% minus the measured content of CO₂.



Also in accordance with the accepted request for deviation (I-DEV0342), a default flare efficiency of 50% as stipulated by the “Tool to determine project emissions from flaring gases containing methane” was applied at the farm with site ID 10965 for the periods from when the one year validity of the previous flare efficiency test expired until the next flare efficiency test.

B.4. Notification or request of approval of changes

>>

Approved; I-DEV0342

SECTION C. Description of the monitoring system

>>

The biogas transfer system and biogas flow meter system consists of biogas trapped under a positive pressure geomembrane cover installed over the digester cell. The biogas is routed from the digester to the flare via PVC tubing. A Roots flow meter, which measures gas flow is fitted in the biogas transfer system piping. Readings and operation of the flow meter is recorded weekly and monthly. A LandTec biogas check gas analyzer is used to check the CH₄ concentration of the gas at a port, located near the meter, at least quarterly. The flare system is designed to combust the biogas. Weekly checks of the enclosed flare ensures the correct operation of the system. In the case the flare system becomes unusable, the farm manager immediately notifies the PP, and the system is shut down until repairs are made.

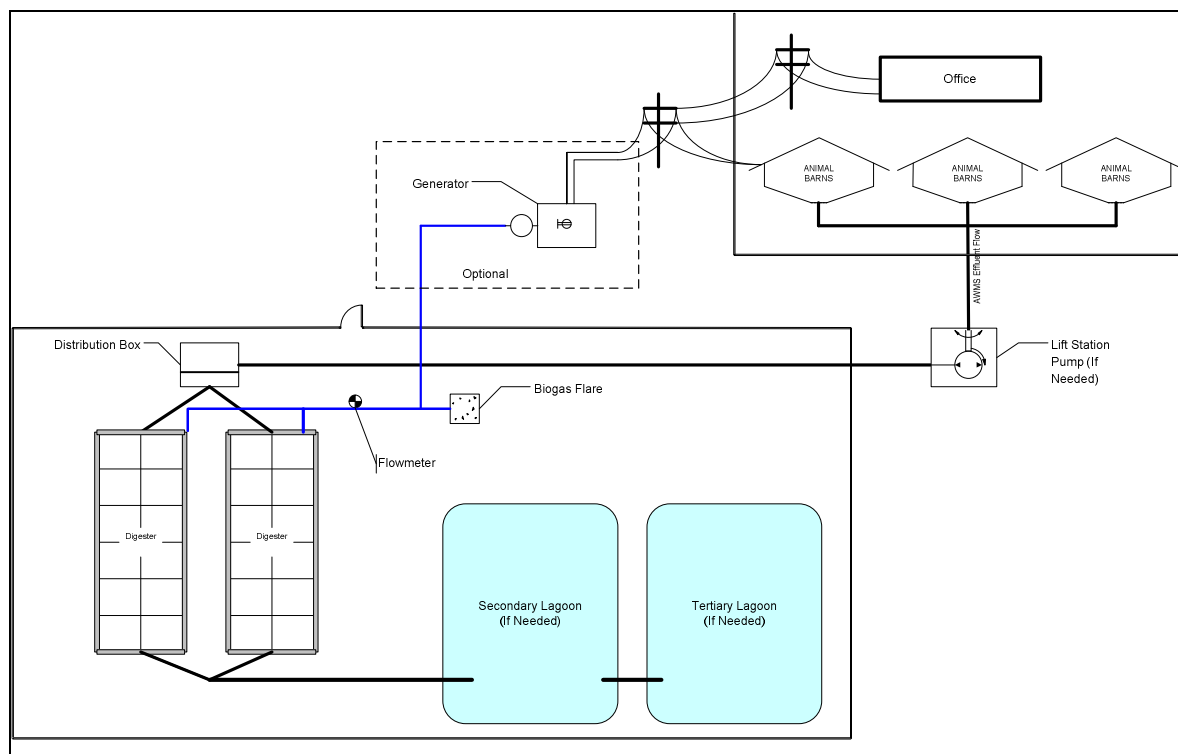


Figure C-1. Project Activity Configuration

QA/QC roles and responsibilities

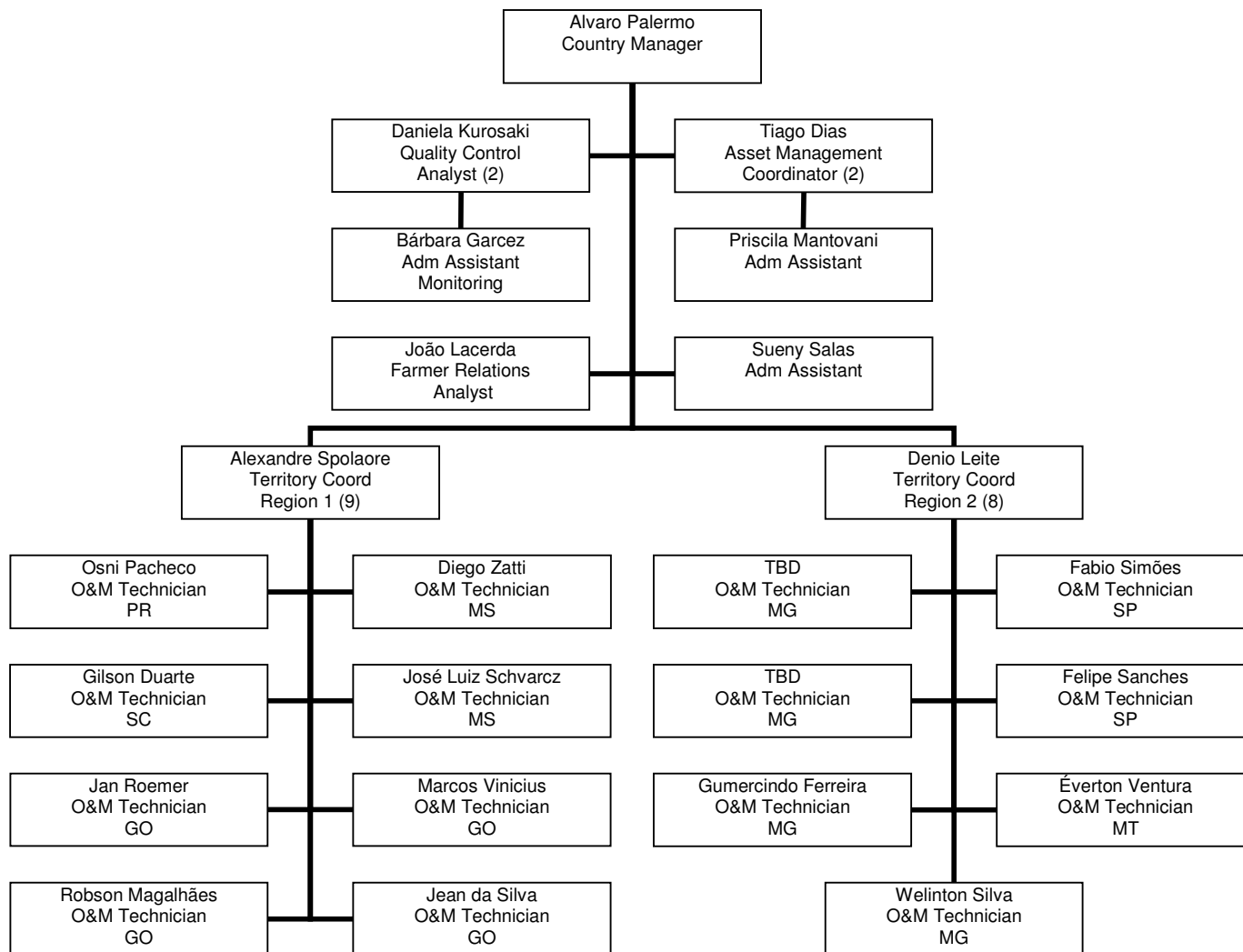
Complete work instructions and QA/QC roles and responsibilities are listed in the O&M plan. Below is a summary of QA/QC responsibilities and documentation applied for the monitored parameters:

Parameter	Documentation	Performed by	QA/QC check performed by:
Biogas Produced	Monthly Report	RMT	QA, OP
CH ₄ produced	Reported on Monthly Report; taken quarterly	RMT	QA, OP
Sludge removal	Report	RMT	QA, OP
Combustion Equipment Efficiency	Quarterly	RMT	QA, OP
Efficiency of Flaring Process	Initial and Yearly	RMT	QA, OP

RMT - Regional maintenance technician; QA - quality assurance; OP – operations



The organization chart below in Figure 2.1 shows how the organization is structured for Operations and Maintenance of the sites.



**SECTION D. Data and parameters**

The parameters used to calculate baseline, project, and leakage emissions as well as other relevant parameters required by the approved methodology and the monitoring plan; and specific information on how data and parameters have been monitored during the monitoring period are listed below.

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors	
Data / Parameter:	CH₄ GWP
Data unit:	integer
Description:	Global Warming Potential of Methane
Source of data used:	Intergovernmental Panel on Climate Change, <i>Climate Change 1995: The Science of Climate Change</i> (Cambridge, UK: Cambridge University Press, 1996)
Value(s) :	21
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline/Project Activity
Additional comment:	

Data / Parameter:	MS%_{ijk}
Data unit:	percent
Description:	Percent of effluent used in system
Source of data used:	
Value(s) :	100%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline/Project Activity/
Additional comment:	

Data / Parameter:	VS_{i,market}
Data unit:	Kg-dm/day
Description:	Volatile solids excretion rate
Source of data used:	Obtained from 2006 IPCC, Annex 10A.2, Table 10A-7, p. 10.81
Value(s) :	0.27
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline/Project Activity
Additional comment:	



Data / Parameter:	$VS_{i,breeding}$
Data unit:	Kg-dm/day
Description:	Volatile solids excretion rate
Source of data used:	Obtained from 2006 IPCC, Annex 10A.2, Table 10A-8, p. 10.82
Value(s) :	0.50
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline/Project Activity
Additional comment:	

Data / Parameter:	B_{oi}
Data unit:	integer
Description:	Maximum methane producing capacity (B_o) for the animal waste
Source of data used:	Obtained from 2006 IPCC, Annex 10A.2, Tables 10A-7 and 10A-8, p. 10.81 and 10.82
Value(s) :	0.48
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline/Project Activity
Additional comment:	

Data / Parameter:	MCF_{jk}
Data unit:	integer
Description:	Methane conversion factor per month
Source of data used:	Obtained from 2006 IPCC, Table 10.17, p. 10.46
Value(s) :	Table 10.17
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline/Project Activity
Additional comment:	

Data / Parameter:	$Population_{year}$
Data unit:	integer
Description:	Animal population used to estimate baseline and project emission estimates was based on a 12 month period of actual or projected operation production data. See Table E1 of PDD.
Source of data used:	Table E1



Value(s) :	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline/Project Activity
Additional comment:	

Data / Parameter:	n_m
Data unit:	integer
Description:	Days resident in system
Source of data used:	Table E1
Value(s) :	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline/Project Activity

D.2. Data and parameters monitored	
Data / Parameter:	1.SIR
Data unit:	#
Description:	Sludge Removal Count
Measured /Calculated /Default:	Measured
Source of data:	Farm Records
Value(s) of monitored parameter:	Number of times removed.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline/Project Activity
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	As required
Calculation method (if applicable):	
QA/QC procedures applied:	AgCert employs an internal QA process that ensure monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported



Data / Parameter:	2.BGP
Data unit:	m ³
Description:	Biogas produced
Measured /Calculated /Default:	Measured
Source of data:	metered
Value(s) of monitored parameter:	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Activity
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Roots Meter, Serial #s. Table D.1 below lists all roots meter, serial number, calibration dates, and installation dates. According to manufacturer; no calibration after correct installation is required. Table D.5 provides the monthly biogas totals.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	
QA/QC procedures applied:	AgCert employs an internal QA process that ensure monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported.

Data / Parameter:	4.CEE
Data unit:	%
Description:	Combustion Equipment Efficiency
Measured /Calculated /Default:	Measured
Source of data:	Weekly Reports
Value(s) of monitored parameter:	% of the time equipment combustion equipment available for operation. Table D.2 below lists the efficiency for this project
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Activity
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Quarterly



Calculation method (if applicable):																													
QA/QC procedures applied:	AgCert employs an internal QA process that ensure monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported																												
Data / Parameter:	3.MC																												
Data unit:	%																												
Description:	Methane content																												
Measured /Calculated /Default:	Measured																												
Source of data:	Landtec Biogas Check																												
Value(s) of monitored parameter:	Varies																												
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Activity																												
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>Landtec Biogas Check analyzer; calibrated against bottled gas samples at every farm visited. Every 6 months the equipment is taken out of service. It is sent back to manufacturer for recalibration. Equipment is rotated between sites to ensure that calibrated equipment is available for readings. Prior to Landtec equipment, a Bacharach Fyrite Gas analyzer was used; calibration of this equipment is not required per the manufacturer.</p> <table><tr><th>Landtec Serial Number</th><th>Calibration Date</th><th>Calibration Date</th><th>Calibration Date</th></tr><tr><td>BM10257</td><td>10-Feb-09</td><td></td><td></td></tr><tr><td>BM10042</td><td>04-Sep-08</td><td></td><td></td></tr><tr><td>GM10236</td><td>15-May-08</td><td></td><td></td></tr><tr><td>GM11382</td><td>21-Jan-09</td><td>03-Sep-09</td><td>26-Feb-10</td></tr><tr><td>GM11384</td><td>21-Jan-09</td><td>19-Aug-09</td><td>26-Feb-10</td></tr><tr><td>GM11595</td><td>24-Apr-09</td><td>05-Nov-09</td><td></td></tr></table>	Landtec Serial Number	Calibration Date	Calibration Date	Calibration Date	BM10257	10-Feb-09			BM10042	04-Sep-08			GM10236	15-May-08			GM11382	21-Jan-09	03-Sep-09	26-Feb-10	GM11384	21-Jan-09	19-Aug-09	26-Feb-10	GM11595	24-Apr-09	05-Nov-09	
Landtec Serial Number	Calibration Date	Calibration Date	Calibration Date																										
BM10257	10-Feb-09																												
BM10042	04-Sep-08																												
GM10236	15-May-08																												
GM11382	21-Jan-09	03-Sep-09	26-Feb-10																										
GM11384	21-Jan-09	19-Aug-09	26-Feb-10																										
GM11595	24-Apr-09	05-Nov-09																											
Measuring/ Reading/ Recording frequency:	Quarterly																												
Calculation method (if applicable):																													
QA/QC procedures applied:	AgCert employs an internal QA process that ensure monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported																												



Data / Parameter:	5.EFP
Data unit:	%
Description:	Efficiency of flaring process
Measured /Calculated /Default:	measured
Source of data:	Efficiency Test
Value(s) of monitored parameter:	Varies. Table D.3 contains flare efficiency test dates, and Table D.4 contains application dates for flare efficiency
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Activity
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Initial and yearly
Calculation method (if applicable):	
QA/QC procedures applied:	AgCert employs an internal QA process that ensure monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported

D.3 Detailed data for Parameters

Table D.1 provides the serial number of Roots meter equipment installed per site, the date the meter was calibrated at the manufacturers facility, and the date of installation. Per the manufacturer, Roots meters do not require calibration after correct installation. This flow meter type applied has a tendency to measure lower volumes if there are any operating problems, resulting in rather an underestimation of actual biogas flows.

Site ID	Roots Meter Serial Number	Calibration Date	Installation Date
10965	544003	21-Oct-05	3-Apr-06
27512	538129	17-Aug-05	21-Feb-06
30412	543939	21-Oct-05	12-Nov-08

Table D.1. Roots meter calibration date and installation date



Table D.2 provides the Combustion Equipment Efficiency for the period.

Combustion Equipment Efficiency (ID3)				
Quarter Ending	Site ID			
	10965	21522	27512	30412
Jun-08	100%	N/A	100%	100%
Sep-08	100%	N/A	100%	100%
Dec-08	100%	N/A	100%	100%
Mar-09	100%	N/A	100%	100%
Jun-09	100%	N/A	100%	100%
Sep-09	100%	N/A	100%	100%
Dec-09	100%	N/A	100%	100%
Mar-10	100%	N/A	100%	100%
May-10	100%	N/A	100%	100%

Table D.2 Combustion Equipment Efficiency (ID3)

Table D.3 and Table D.4 provide the Flare Efficiency test date and applicable periods.

Site ID	Date of FE Test	Result	Date of FE Test	Result	Date of FE Test	Result	Date of FE Test	Result
10965	17-Sep-07	100.00%	4/15/2008	95.77%	5-Nov-09	99.96%		
21522	N/A							
27512	21-Sep-07	99.84%	7/21/2008	99.70%	15-May-09	100.00%	8-Feb-10	92.80%
30412	13-Dec-07	99.85%	7/17/2008	100.00%	18-May-09	99.70%	22-Apr-10	99.80%

Table D.3 Flare Efficiency Test Dates

Site ID	Monitoring Period		Period Applied	Applied FE	Period Applied	Applied FE	Period Applied	Applied FE	Period Applied	Applied FE
	Start	End								
10965	10-Apr-08	31-May-10	4/10/2008 - 4/14/2008	100.00%	4/15/2008 - 4/14/2009	95.77%	4/15/2009 - 11/4/2009	50%	11/5/2009 - 5/31/2010	99.96%
21522			N/A							
27512			4/10/2008 - 7/20/2008	99.84%	7/21/2008 - 5/14/2009	99.70%	5/15/2009 - 2/7/2010	100.00%	2/8/2010 - 5/31/2010	92.80%
30412			4/10/2008 - 7/16/2008	99.85%	7/17/2008 - 5/17/2009	100.00%	5/18/2009 - 4/21/2010	99.70%	4/22/2010 - 5/31/2010	99.80%

Table D.4 Flare Efficiency

Table D.5 Project Data

The AWMS for the project activity is an anaerobic digester and is continually operational, unless otherwise noted. The project activity data collected in accordance with the registered PDD and approved methodology, AMS.III-D, Version 11 is shown in Table D.5. Methane has been calculated using a formula of $100\% - \text{CO}_2\% - 6\%$ for trace gases per the Request for Deviation for Measurement of Percentage of Biogas that is Methane for the period before direct methane readings. The operational sites have direct methane readings from March 2009 and onwards for all sites. Prior to direct methane readings with Landtec equipment, Bacharach Fyrite gas analyzers were used to obtain the CO₂ readings. Per the manufacturer, no calibration of the Fyrite gas analyzers is required.



Project Activity Data						
Year	Month	Temp (°C)	Biogas (m ³)	CO ₂ (%)	CH ₄ (%)	Sludge Removal Count
2008	4	22.16	30,403	40.06	53.94	0
2008	5	20.91	40,429			0
2008	6	18.96	31,843			0
2008	7	18.45	27,484	36.17	59.35	0
2008	8	19.41	28,556			0
2008	9	20.41	36,781			0
2008	10	21.80	31,404	33.92	62.57	0
2008	11	22.33	34,857			0
2008	12	21.67	40,582			0
2009	1	22.32	40,627	33.75	61.63	0
2009	2	23.43	37,831			0
2009	3	23.34	49,822			0
2009	4	22.35	44,656	34.09	65.13	0
2009	5	20.74	46,697			0
2009	6	19.23	45,672			0
2009	7	18.41	50,696	34.10	64.87	0
2009	8	18.97	52,044			0
2009	9	20.58	52,685			0
2009	10	21.78	53,466	33.26	65.19	0
2009	11	22.74	39,742			0
2009	12	23.25	37,825			0
2010	1	23.23	35,819	33.86	64.43	0
2010	2	24.19	24,525			0
2010	3	23.93	41,553			0
2010	4	22.39	37,396	33.39	65.30	0
2010	5	20.51	43,723			0

Table D.5 Project Activity Data

The table below indicates the equipment that was used for each methane reading for each site. Prior to the first methane reading listed for each site in this table, Bacharach Fyrite Gas Analyzers were used. Per the manufacturer, no calibration of this equipment is required.



Source ID	Source Name	Date	Serial Number Landtec Equip	Calibration Date
10965	Fazenda Pimenta	15-Apr-08	Bacharach Fyrite Gas Analyzer	
		13-May-08		
		02-Jun-08		
		19-Aug-08		
		02-Sep-08		
		11-Nov-08		
		23-Dec-08		
		13-Jan-09		
		17-Feb-09	GM11384	21-Jan-09
		11-May-09	GM11384	21-Jan-09
		02-Jun-09	GM11384	21-Jan-09
		14-Jul-09	GM11384	21-Jan-09
		15-Sep-09	GM11384	19-Aug-09
		19-Oct-09	GM11384	19-Aug-09
		05-Nov-09	GM11384	19-Aug-09
		22-Dec-09	GM11384	19-Aug-09
		20-Jan-10	GM11384	19-Aug-09
		10-Feb-10	GM11384	19-Aug-09
		05-Apr-10	GM11384	26-Feb-10
		05-May-10	GM11384	26-Feb-10
27512	Granja Esperança	24-May-08	Bacharach Fyrite Gas Analyzer	
		09-Jun-08		
		21-Jul-08	GM10236	15-May-08
		24-Sep-08	GM10236	15-May-08
		18-Dec-08	BM10042	04-Sep-08
		28-Jan-09	GM11382	21-Jan-09
		23-Feb-09	GM11382	21-Jan-09
		15-Apr-09	GM11382	21-Jan-09
		14-May-09	GM11382	21-Jan-09
		23-Jun-09	GM11382	21-Jan-09
		14-Jul-09	GM11382	21-Jan-09
		12-Aug-09	BM10042	09-Apr-09
		05-Nov-09	GM11382	03-Sep-09
		17-Dec-09	GM11382	03-Sep-09
		12-Jan-10	GM11382	03-Sep-09
		08-Feb-10	GM11382	03-Sep-09
		16-Mar-10	GM11382	26-Feb-10
		19-Apr-10	GM11382	26-Feb-10
		24-May-10	GM11382	26-Feb-10
30412	Fazenda Esmeralda Lote 38	15-Apr-08	Bacharach Fyrite Gas Analyzer	
		13-May-08		
		15-Jul-08		
		14-Oct-08		
		12-Nov-08	GM10236	15-May-08
		04-Dec-08	BM10042	04-Sep-08
		25-Feb-09	BM10257	10-Feb-09
		23-Apr-09	BM10257	10-Feb-09
		18-May-09	GM11595	24-Apr-09
		09-Jun-09	GM11595	24-Apr-09
		15-Jul-09	GM11595	24-Apr-09
		06-Aug-09	GM11595	24-Apr-09
		23-Sep-09	GM11595	24-Apr-09
		14-Oct-09	GM11595	24-Apr-09
		24-Nov-09	GM11595	05-Nov-09
		09-Dec-09	GM11595	05-Nov-09
		21-Jan-10	GM11595	05-Nov-09
		19-Feb-10	GM11595	05-Nov-09

Table D.6 Landtec equipment serial numbers and calibration dates for methane readings

**SECTION E. Emission reductions calculation****E.1. Baseline emissions calculation**

To calculate the baseline emissions, the baseline emissions from each year are divided by the number of days in the year, then multiplied by the number of days within the reporting period to determine the exact ex-post baseline emissions. The specific calculations are provided per site in 1534-MR01-BR07-S-34 Envirocert Calculations in rows 278-281, an excel spreadsheet which has been provided to DNV.

Metered emissions are the actual amount of methane that is captured and destroyed by the project. Actual emission reductions are calculated as follows (see Variable Definitions below for descriptions):

- 1) Avg. daily biogas = Cumulative biogas in monitoring period / # days in monitoring period
- 2) Biogas generated for each month = Avg. daily biogas * # of days in month
- 3) CH₄ volume = Biogas generated for each month * CH₄
- 4) CH₄ density¹ = 1/ (1.39403497+(0.005103551*Temp for each month))
- 5) kg CH₄ = CH₄ volume * CH₄ density
- 6) Monthly monitored emission reduction in tonnes of CO₂e = (Kg CH₄ * GWP)/ 1000

Variable Definitions

Variable	Value	Description
Avg. daily biogas	Calculated	m ³
Cumulative biogas in monitoring period	Measured	Based on the monthly biogas meter readings entered by Operations
Biogas generated for each month	Calculated	Normalized biogas volume for month
CH ₄ volume	Measured	Volume of methane (m ³)
CH ₄ density	Calculated	Density of methane (kg/m ³)

The lower of the two values, baseline or actual, is used for the monitored baseline emissions.

E.2. Project emissions calculation

>> The project emissions are those emissions considered from flare inefficiency and from electrical consumption. According to the methodology, direct emissions from the use of fossil fuels and/or electricity for the operation of the facility must be considered as part of the project emissions. For this project, the direct emissions are 13.99 metric Tons/year. The direct emissions are applied to each site in the project. This is calculated in rows 271-274 in 1534-MR01-BR07-S-34 Envirocert Calculations. Flare Inefficiency is also considered a project emission and it is determined by subtracting the Metered ERs with Flare efficiency from the actual Metered ERs. This difference represents the Flare Inefficiency and is subtracted from the sites per rows 271-274 in 1534-MR01-BR07-S-34 Envirocert Calculations, an excel spreadsheet that has been provided to DNV.

E.3. Leakage calculation

>> In accordance with the baseline methodology, leakage calculations are not required

¹ Density of methane http://www.engineeringtoolbox.com/gas-density-d_158.html

**E.4. Emission reductions calculation / table**

>>

The baseline emissions calculated will be compared to the actual monitored amount of methane captured and combusted by the project activity. The lesser of these values will be used as the project emission reductions of the crediting period.

$$ER_{net} = BE - (PE + DE)$$

Where:

BE = Baseline carbon dioxide equivalent emission in metric tons per year,

PE = Project activity carbon dioxide equivalent emission in metric tons per year,

DE = Direct emissions from use of fossil fuels or electricity for operation of facility

Table E.1 displays baseline emissions for the current monitoring period:

E.1 - Baseline Emissions during the Monitoring Period			
No.	Site ID	Source	GHG Emissions (CO₂e) metric tonnes
1	10965	Fazenda Pimenta	7,046
2	21522	Granja Courotex Ltda	0
3	27512	Granja Esperança	3,933
4	30412	Fazenda Esmeralda Lote 38	5,699
Total:			16,678

The direct Emissions during the monitoring period are shown in Table E.2. Complete calculations can be found in the spreadsheet 1534-MR01-BR07-S-34 Envirocert Calculations.

E.2 - Project Activity Direct Emissions During the Monitoring Period					
No.	Site ID	Source	GHG Emissions (CO₂e) metric tonnes		
			Flare Inefficiency	Direct Emissions Due to Operation of Facility	Total Project Activity Direct Emissions
1	10965	Fazenda Pimenta	752.5	7.5	760.2
2	21522	Granja Courotex Ltda	0.0	0.0	0.0
3	27512	Granja Esperança	36.0	7.5	43.5
4	30412	Fazenda Esmeralda Lote 38	3.4	7.5	11.1
Total:					815

Table E.3 provides the total metered emissions per site:



E.3. Total Metered Project Emissions			
GHG Emissions (CO₂e) metric tonnes			
No.	Site ID	Source	Metered Emissions
1	10965	Fazenda Pimenta	3,661
2	21522	Granja Courotex Ltda	0
3	27512	Granja Esperança	3,403
4	30412	Fazenda Esmeralda Lote 38	2,071
Total:			9,135

Table E.4 presents emission reductions derived , and using the methodology takes the lower of baseline and actual emission minus the total direct emissions.

E.4 Lower of Baseline Emissions and Metered Emissions During the Monitoring Period					
GHG Emissions (CO₂e) metric tonnes					
No.	Site ID	Source	Baseline Emissions	Metered Emissions	Lower of Baseline or Metered Emissions
1	10965	Fazenda Pimenta	7046	3,661	2,901
2	21522	Granja Courotex Ltda	0	0	0
3	27512	Granja Esperança	3933	3,403	3,359
4	30412	Fazenda Esmeralda Lote 38	5699	2,071	2,060
Total:					8,320

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

>>

This section shall include a comparison of actual values of the emission reductions achieved during the monitoring period with the estimations in the registered CDM-PDD.

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO₂e)	20,491	8,320



Item	Values applied in ex-ante calculation of the registered CDM-PDD, removing site ID 21522 from totals	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)	17,497	8,320

E.6. Remarks on difference from estimated value in the PDD

There was no increase from actual values compared with estimated values.

History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory Document Type: Guideline, Form Business Function: Issuance		