



VERIFICATION/ CERTIFICATION REPORT

AWMS GHG MITIGATION PROJECT, MX05-B-09, NUEVO LEÓN, MÉXICO

(UNFCCC Registration Ref. No. 0163)

Verification Period:
01 October 2005 to 28 February 2006

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DET NORSKE VERITAS



VERIFICATION/ CERTIFICATION REPORT

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Summary:

Det Norske Veritas Certification Ltd. (DNV) has performed the verification of the emission reductions reported for the "AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México" (UNFCCC Registration Ref. No. 0163) for the period 01 October 2005 to 28 February 2006.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (MR01-MX05-B-09, V.1) of 7 April 2006 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology AM0016 (version 02) and the monitoring plan and formulae given in the Project Design Document of 28 November 2005.

Det Norske Veritas Certification Ltd. is able to certify that the emission reductions from the "AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México" during the period 01 October 2005 to 28 February 2006 amount to 2345 tonnes of CO₂ equivalent.

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Work verified by: Michael Lehmann			
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Abbreviations

AWMS	Animal Waste Management System
B ₀	Maximum methane potential
CAFO	Confined Animal Feeding Operations
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CH ₄	Methane
C _m	Conversion factor from [N ₂ O – N] to N ₂ O
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
EF ₃	Emission factor for direct N ₂ O emissions from manure management systems
EF ₄	Emission factor for indirect N ₂ O emissions from atmospheric deposition of N on soils and water surfaces
ERU	Emission Reduction Units(s)
FAR	Forward Action Request
F _{gasm}	Fraction of animal manure N that volatilizes as NH ₃ and NO _x
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
HRT	Hydraulic Retention Time
IPCC	Intergovernmental Panel on Climate Change
MCF	Methane conversion factor
MP	Monitoring Plan
N ₂ O	Nitrous oxide
N _{ex}	Average annual N excretion per head per animal category
PDD	Project Design Document
QMS	Quality management system
UNFCCC	United Nations Framework Convention for Climate Change
VS	Volatile solids excretion rate in kg/day



1 INTRODUCTION

AgCert International Limited (AgCert) has commissioned Det Norske Veritas Certification Ltd. (DNV) to carry out the verification and certification of emission reductions reported for the “AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México” (the project) for the period 01 October 2005 to 28 February 2006. This report contains the findings from the verification and a certification statement for the certified emission reductions.

1.1 Objective

Verification is the periodic independent review and *ex post* determination by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM project activity during a defined verification period.

Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the “AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México” for the period 01 October 2005 to 28 February 2006.

1.2 Scope

The scope of the verification is:

- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan.
- To evaluate the GHG emission reduction data and express a conclusion with a high level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that the reported GHG emission data is sufficiently supported by evidence.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified.

The verification team has, based on the recommendations in the Validation and Verification Manual /9/, employed a risk-based approach, focusing on the identification of significant reporting risks and verifying the mitigation measures for these.

1.3 Description of the Project Activity

Participating Party(ies):	Mexico
Title of project activity:	AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México
UNFCCC Registration Ref. No.:	0163
Project's crediting period:	01 October 2005 to 30 September 2015



Project's actual starting date: 9 October 2005 (Start of monitoring at farm Turimaky 4)

Period verified in this verification: 01 October 2005 to 28 February 2006

The purpose of the "AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México" is to mitigate animal effluent related GHG emissions by improving the Animal Waste Management System (AWMS) at several swine farms located in México (see Table 1).

Table 1 List of farms included by the project activity

Name of farm owner	Name of farm	Site ID	Starting date for reporting emission reductions
Aldabi	Granja El Chanco	23642	9 October 2005
	Los Tres Cochinitos	23652	14 November 2005
Ester Tamez-Flores	Granja Ana Margarita	23612	1 October 2005
Jesus G. Serna-Uribe	Granja La Prietita	23662	16 October 2005
Mario Humberto Quintanilla-Gonzalez	Granja El Milagro	23682	<i>Not yet included in monitoring report</i>
	Las Tortolas	23672	<i>Not yet included in monitoring report</i>

The project comprises 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.

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

Prior to project implementation, the project farms used open anaerobic lagoon systems to treat manure. Treatment of manure in open anaerobic lagoons and associated CH₄ emissions to the atmosphere is thus the selected baseline scenario.

1.4 Methodology for Determining Emission Reductions

Project and baseline CH₄ emissions are determined on a monthly basis by monitoring the livestock (swine) population and by calculating emissions using the validated calculation formulas and validated IPCC default factors emission factors for e.g.

- the volatile solid excretion rate (VS expressed in kg of volatile solid/swine/day) for swine manure
- the maximum methane production capacity (B₀ expressed in m³/kg of VS) and
- methane conversion factor (MCF expressed in %) applicable for the relevant animal waste management system (AWMS), i.e. anaerobic lagoon in the baseline scenario and anaerobic digester in the project scenario.

The project activity does not affect N₂O emissions from manure treatment. N₂O emissions from manure treatment in the project and the baseline scenario are identical when calculated in



accordance with AM0016. Validated IPCC default values are used for nitrogen excreted (Nex expressed in kg/swine/day) and emission factors (EF₃ and EF₄ expressed in kg N₂O-N/kg) applicable for determining direct and indirect N₂O emissions.

According to the validated project design, potential leakage effects are associated with the net electricity consumed by the project and possible changes to the land application of treated manure effluent. Electricity used by the project activity equipment, such as fans, blowers, motors, pumps, igniters, etc. has been estimated and CO₂ emissions associated with the generation of this electricity has been determined using the validated emission factor of 0.5230 kg CO₂ per kWh.

Emission reductions are determined as the difference between baseline emissions and project emissions and leakage ($ER_{net} = BE - PE - L_o$).

Moreover, the amount of CH₄ generated by the digester and flared based on the monitored volume of biogas produced and CO₂ content of the biogas has been calculated and compared with the CH₄ emission reductions calculated based on livestock population data and IPCC default emission factors (as described above). As required by AM0016, the lowest value of these two approaches was selected to determine the emission reductions of the project.

For the reporting period 01 October 2005 to 28 February 2006, the amount of CH₄ generated by the digester and flared is for all farms except Los Tres Conchnitos less than the amount of CH₄ emission reductions that have been calculated based on livestock population data and IPCC default emission factors. The amount of CH₄ that i) has been calculated for all farms (except Los Tres Conchnitos) based on the monitored volume of biogas produced by the digester and sent to the flare and ii) has been calculated for Los Tres Conchnitos based on livestock population data and IPCC default emission factors has thus been used as basis for reported emission reductions of the project for the period 01 October 2005 to 28 February 2006.

2 VERIFICATION METHODOLOGY

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. These include:

- i) The livestock populations managed by the farms which is recorded monthly;
- ii) The selection of appropriate IPCC default emission factors for determining project and baseline CH₄ and N₂O emissions;
- iii) The biogas flow to the flares and the CO₂ contents of the biogas in order to determine the amount of CH₄ that has been captured and flared;
- iv) The assumptions made to estimate the electricity consumption that occurs as a result of the project and associated emissions.

Verification team

Michael Lehmann	DNV Oslo, Norway	Team Leader, Technical Reviewer
Alfonso Capuchino	DNV Mexico, Brazil	CDM Auditor
Filipe Tavares	DNV Rio, Brazil	Waste Sector Expert

***Duration of verification***

Preparations: 25 March 2006 - 29 March 2006

On-site verification: 30 - 31 March 2006

Reporting: 01 April 2006 – 6 June 2006

2.1 Review of Documentation

The draft monitoring reports and the final monitoring report of 7 April 2006 /1/ for the period 01 October 2005 to 28 February 2006 and supporting documentation consisting of farm specific monthly livestock population data and biogas generation data /2/, the spreadsheets used for calculation emission reductions /3/ and the instruction manuals for the applied flow meter type and the CO₂ content measurement instrument /4//5/ were assessed. In addition, the project's Project Design Document (PDD) /6/, in particular the monitoring plan contained in the PDD, and the project's validation report /7/ were reviewed.

Prior to the on-site audits DNV received a draft monitoring of 25 March 2006. This monitoring report included livestock inventory data and biogas meter readings which were cross-checked during the on-site audits. However, this version of the monitoring report only included preliminary emission reduction calculations. The project participants thus submitted the final monitoring report of 7 April 2006, which included the final emission reduction calculations.

The monitoring report of 7 April 2006 has been made publicly available on the CDM website on 30 May 2006.

2.2 Selection of Farm Offices and Farms for On-Site Audits

In its verification of AgCert's AWMS projects in Mexico, DNV applies a sampling approach and only a selection of farms and farm offices is audited during each periodic verification. Visiting all farms and auditing all farm owner offices during a periodic verification would entail unreasonable verification costs. Nonetheless, DNV's sampling strategy ensures that all farms and farm owner offices will be audited several times during the 10 years crediting period.

For this verification, DNV visited all 4 farms for which emission reductions have been reported and audited all 3 farm owner offices for which farms livestock inventory data have been reported. The farms and farm owner offices that were audited are listed in Protocol 1 in Appendix A to this report.

2.3 On-Site Audits at Farm Offices and Inspection of Project Implementation

On 30 and 31 March 2006, DNV visited selected farms and audited selected farm owner offices (refer to Protocols 1 and 2 in Appendix A). During these visits DNV verified that the actual implementation of the project was as described in the PDD. Moreover, the information contained in the monitoring report was assessed by:

- Verifying the implementation and the effectiveness of operation and maintenance of the anaerobic digester and biogas handling system;



- Comparing livestock population inventory records kept at the farm owner office of selected months with the livestock population data reported in the monitoring report;
- Verifying that the volumes of biogas produced by the digester and sent to the flare are measured with a gas flow meter and that the CO₂ content of biogas is analysed at least quarterly;
- Verifying that monitoring equipment is calibrated and correctly operated and maintained; and
- Verifying the effectiveness of the data quality assurance and control performed by farm owners and by local AgCert employees.

In addition to the farm owner office audit and the visits at selected farms, AgCert's office in Melbourne, Florida, USA, was visited on 13 March 2006. DNV audited the processes for recording data collected by AgCert's employees in Mexico, determining baseline and project emissions and reporting emission reductions. DNV audited in particular the QA/QC procedures for data recording, processing and reporting.

2.4 Assessment of Emission Reductions Calculations

The spreadsheets used for calculation emission reductions /3/ were assessed. In addition, DNV performed control calculations and interviewed AgCert personnel that carried out the calculations.

2.5 Reporting of Findings

The verification was able to verify that the GHG emission reductions reported for the project in the monitoring report of 7 April 2006 are fairly stated.

Moreover, some Forward Action Requests (FARs) were identified (see Protocol 6 in Appendix A). These FARs should be addressed by AgCert during the next consecutive monitoring period(s) in order to ensure that reported emission reductions can be verified and certified. These FARs will also have special attention during the next verification of reported emission reductions.

3 VERIFICATION FINDINGS

This section summarises the findings from the verification of the emission reductions reported for the "AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México" for the period 01 October 2005 to 28 February 2006. The findings of the verification are documented in more detail in the verification protocols given in Appendix A to this report.

3.1 Open Issues from Validation and/or Previous Verifications

The validation report for the project did not state any issues that needed to be followed-up during the first periodic verification. As this was the first periodic verification, there are no remaining issues from previous verifications. No initial verification was carried out for the project.



3.2 Project Implementation

The inspections of selected farms and the review of the “as built” drawings for all farms available provided DNV with sufficient assurance that anaerobic digesters and systems for capturing and flaring biogas have been implemented at all farms for which emission reductions have been reported. Nonetheless, evidence documenting the construction of the digesters and the reports of the Acceptance Test Procedures for the biogas handling system should be provided during at the next verification audit (FAR 1 and FAR 2).

The digesters performance is as planned and captured landfill gas is captured and flared. Visual checks of the digesters’ membrane integrity and the gas handling system are performed by AgCert and/or the farm owner. However, these checks are not systematically recorded and should be recorded in the future (FAR 4).

The flares have a continuous ignition device that assures the effective combustion of CH₄ during the time the biogas is directed to the flare. Approximately 60 times a minute the spark is ignited in order to ensure complete combustion. The flare design ensures that no gas is sent through the flare without the flare being ignited and thus ensures appropriate destruction of CH₄. Nonetheless, the flares will have to be inspected and maintained as required by the operation manual and the result of the flare inspections and maintenances need to be recorded (FAR 5).

3.3 Completeness of Monitoring

All indicators stated in the validated monitoring plan and the monitoring methodology AM0016 have been monitored and the data have been reported as specified.

Livestock population data is recorded by the farm owners. There is daily or at least a monthly count of the livestock population (based on entrance and exit records of livestock) and birth and mortality are recorded on a daily basis. Livestock inventories are aggregated in weekly or monthly reports by the farm owner. The records of the farm owners are collected by AgCert’s local employees, and monthly livestock inventories are reported to AgCert’s data processing unit in Melbourne, Florida, USA. After QA/QC of the reported data, the monthly livestock inventory data are recorded in AgCert’s database EnviroCert.

Biogas meters are read at least once a month by a local AgCert employee and the meter readings are reported and recorded in EnviroCert by AgCert’s data processing unit in Melbourne.

The CO₂ content of biogas is measured at least every third month as required by AM0016. At most farms the CO₂ content of biogas is measured monthly by a local employee of AgCert and reported and recorded in EnviroCert.

At the farms visited by DNV, the biogas flow meters were correctly installed. According to the installation, operation and maintenance manual /4/, no initial calibration after correct installation is required. Nonetheless, the biogas flow meter will in the future have to be checked in accordance with the installation, operation and maintenance manual and these checks have to be documented (FAR 6).

3.4 Evidence Provided for Data Used for Determining Emission Reductions

DNV compared the livestock population data reported in the monitoring plan for selected months with livestock population inventory records kept at the farm owner office that was audited. The reported data was found to be in accordance with records kept at the farm owner offices. This



cross-checking of reported livestock population data provided DNV with sufficient assurance that the reported data are fairly stated.

The biogas volumes reported in the monitoring plan were assessed against the records on biogas flow meter readings reported in a spreadsheet and recorded in EnviroCert. Moreover, the biogas volume meter reading at the farms at the time of the on-site audit was compared with the last biogas meter reading recorded by AgCert to cross-check the reported biogas meter readings.

3.5 Accuracy of Emission Reduction Calculations

CH₄ and N₂O emissions in the project and the baseline scenario during the reporting period were correctly calculated based on reported livestock population data and using the validated calculation formulas and the validated IPCC default factors emission factors contained in the PDD.

Since many of the sites were not farrow-to-finish, AgCert decided to adjust the IPCC default VS with regard to the actual weight of the particular swine classes, although this is not foreseen in the monitoring plan of the PDD. VS has been adjusted in accordance with AM0016. Instead of using actual average weights of the livestock populations at the farms included in the project activity, standard North American animal class weights (Sows 181 kg, gilts 181 kg, boars 204 kg, finishers 56 kg, wieners 13 kg) were applied. Given that the livestock at the farms has similar genetics, this is deemed acceptable. Moreover, VS was capped at 0.5 kg/day for all swine classes. The adjustment of VS thus results in more conservative emission reduction estimates since the VS for finishers and wieners are adjusted to 0.3 kg/day and 0.1 kg/day, respectively, while the VS for sows, gilts, boars are capped at 0.5 kg/day even though AM0016 would allow use of higher values for these swine classes.

In accordance with AM0016 the calculation of emission reductions was for each farm compared with the actual gas captured and flared. For the reporting period 01 October 2005 to 28 February 2006, the amount of CH₄ generated by the digester and flared is at all farms less than the amount of CH₄ emission reductions that have been calculated based on livestock population data and IPCC default emission factors. The amount of CH₄ that has been calculated for each farm based on the monitored volume of biogas produced by the digester and sent to the flare has thus been used as basis for reported emission reductions for the period 01 October 2005 to 28 February 2006.

An average biogas volume generated per day is determined based on the difference between the first biogas meter reading after the ending date of the reporting period and the first biogas meter reading within the reporting period. This average biogas volume per day is then multiplied with the number of days of each month. This extrapolation is necessary since biogas flow meter readings are not always recorded at the last day of the month, and no exact monthly biogas volumes can be determined. Moreover, this calculation procedure smoothes out monthly variations in biogas productions, and the calculated biogas volumes are more suitable for comparison with the emission reductions calculated based on annualized IPCC emission factors.

In the absence of any guidance by AM0016 to calculate the actual biogas captured and flared, emission reductions for each month were calculated by multiplying the biogas volumes determined for each month with the CH₄ content of biogas. The CH₄ content of biogas was determined based on the measured CO₂ content, assuming that biogas consists of mainly CH₄ and CO₂ only, so that the CH₄ content is 100% less the measured CO₂ content in %. In addition,



the volume of CH₄ was converted to mass of CH₄ using the density of CH₄ at the average ambient temperature reported for each months (assuming the biogas has standard atmospheric pressure). This approach is in DNV's opinion appropriate.

The electricity consumption of the project is not metered, but is estimated based on the equipments rated electricity consumption and conservative assumptions on the equipments operating hours.

3.6 Data Management System and Quality Assurance

Livestock population data is recorded by the farm owners. Not all farmers are very well known with regard to the kind of inventories that are needed in order to report inventories that are adequate for determining emission reductions. In particular, the inventory of Granja Ana Margarita was not well developed. For future reporting periods it must ensure that all farms develop adequate livestock population inventories and that farm owners implement QA/QC procedures for reporting of inventories (FAR 3). However, since emission reductions are determined based on measured biogas volume, possible minor mistakes in the inventory of Granja Ana Margarita have no material impact on reported emission reductions for this reporting period*.

Data is collected and processed by AgCert according to well defined data collection and processing procedures:

- i) Data on livestock population is collected by the farm manager;
- ii) A local AgCert employee visits the farm owner office at least once a month to obtain a monthly livestock inventory and visits the farms to read the biogas flow meters and perform measurements of the CO₂ content of biogas;
- iii) Data is checked by employees of AgCert's Mexico City office before being reported to AgCert's data processing unit at Melbourne, Florida, USA;
- iv) Reported data is thoroughly checked prior to being entered into AgCert's EnviroCert database;
- v) Data is processed using well established procedures and automated processes.

QA/QC for reported data and calculations is generally adequate.

* Emission reductions determined based on measured biogas volume are only 70% of the emission reductions determined based on livestock population data. Minor reporting errors do hence not have any material impact on reported emission reductions



4 CERTIFICATION STATEMENT

Det Norske Veritas Certification Ltd. (DNV) has performed a verification of the emission reductions that have been reported for the “AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México” (UNFCCC Registration Reference No. 0163) for the period 01 October 2005 to 28 February 2006.

AgCert International Ltd. is responsible for the collection of data in accordance with the validated monitoring plan and the reporting of GHG emissions reductions from the project.

It is DNV’s responsibility to express an independent verification statement on the reported GHG emission reductions from the project. DNV does not express any opinion on the selected baseline scenario or on the validated and registered PDD.

DNV conducted the verification on the basis of the monitoring methodology AM0016 (version 02), the monitoring plan included in the PDD of the project and the monitoring report (MR01-MX05-B-09, V.1) dated 7 April 2006. The verification included i) checking whether the provisions of the monitoring methodology AM0016 and the monitoring plan in the PDD were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.

DNV’s verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. DNV planned and performed the verification by obtaining evidence and other information and explanations that DNV considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions of the “AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México” (UNFCCC Registration Ref. No. 0163) for the period 01 October 2005 to 28 February 2006 are fairly stated in the monitoring report (MR01-MX05-B-09, V.1) dated 7 April 2006.

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AM00016 (version 02) and the monitoring plan and formulae provided in the validated PDD of 28 November 2005.

Det Norske Veritas Certification Ltd. is able to certify that the emission reductions from the “AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México” during the period 01 October 2005 to 28 February 2006 amount to 2345 tonnes of CO₂ equivalent.

Oslo, 6 June 2006

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REFERENCES

Documents provided by the Project Participants that relate directly to the reporting of emission reductions.

- /1/ AgCert: *Monitoring Report for “AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México” for period 01 October 2005 to 28 February 2006.* Draft version dated 25 March 2006 and final version MR01-MX05-B-07, V.1 dated 7 April 2006.
- /2/ AgCert: *Supporting Documentation for Monitoring Report for “AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México” for period 01 October 2005 to 28 February 2006.* Draft versions dated 25 March 2006, 5 April 2006 and final version MR01-MX05-B-07, V.1 dated 7 April 2006.
- /3/ AgCert: *Excel sheets documenting the emission reduction calculations.*
- /4/ Dresser ROOTS Meter and Instruments: *Installation, Operation & Maintenance - Series B3 ROOTS Meters Models.*
- /5/ Bacharach: *Instruction 11-9026 FYRITE Gas Analyzer - CO₂ and O₂ Indicators.*
- /6/ AgCert: *Project Design Document of “AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México”.* Version 2.0 of 28 November 2005.

Background documents:

- /7/ TÜV Industries Service GmbH TÜV SÜD Group: *Validation Report for “AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México”.* Report No 708614, Revision 01, 6 December 2005
- /8/ CDM EB: *Approved baseline and monitoring methodology AM0016 – Greenhouse gas mitigation from improved Animal Waste Management Systems in confined animal feeding operations.* Version 02, 3 December 2004
- /9/ International Emission Trading Association (IETA) & World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual.* <http://www.vvmanual.info>

Persons interviewed during the verification, or persons who contributed with other information that are not included in the documents listed above. Please refer also to Protocol 4 in Appendix A for a list of persons who were interviewed during the farm office audits and farm visits.

- /10/ Alvaro Galaz, AgCert Mexico City, Project Coordinator
- /11/ Alejandro Pacheco López, AgCert, Monterrey
- /12/ Leo Perkowski, AgCert Melbourne, Director, Climate Change Programs
- /13/ Tony Calenda, AgCert Melbourne
- /14/ George Mirda, AgCert Melbourne, Director, Global Project Surveillance
- /15/ Jim Winch, AgCert Melbourne

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APPENDIX A

VERIFICATION PROTOCOLS

Protocol 1: List of farms that were audited

Name of farm owner	Name of farm	1 st Period verification 30-31/03/2006	2 nd Period verification	3 rd Period verification	4 th Period verification	5 th Period verification	6 th Period verification
Aldabi	Granja El Chanco	✓					
	Los Tres Cochinitos	✓					
Ester Tamez-Flores	Granja Ana Margarita	✓					
Jesus G. Serna-Uribe	Granja La Prietita	✓					
Mario Humberto Quintanilla-Gonzalez	Granja El Milagro	<i>Not yet included in monitoring report</i>					
	Las Tortolas	<i>Not yet included in monitoring report</i>					

Note: Where several farms belong to the same farm owner, DNV visited the farm owner office in addition to visiting the farm and audited livestock population records of all farms managed by the farm owner.

Protocol 2: Documentary evidence provided by AgCert and used for verification that improved AWMS have been implemented at all farms (including farms not visited)

1) As built” drawings of digester systems and evidence documenting construction of digester and proper installation of gas handling system

Name of farm owner	Name of farm	“As built” drawings	Post Construction Assessment	Acceptance test record by supplier of gas handling system
Aldabi	Granja El Chanco	As built drawings for all visited farms (except Los Tres Cochinitos) were available and reviewed for the visited farms during the on site visit. The as built drawings for Los Tres Cochinitos was provided after the on site visit.	Post Construction Assessment Report was not yet available for any farm. This documentation should be provided during the next verification audit (FAR 1).	Acceptance test records by the supplier of gas handling system were not yet available for any farm. These should be provided during at the next verification audit (FAR 2)
	Los Tres Cochinitos			
Ester Tamez-Flores	Granja Ana Margarita			
Jesus G. Serna-Uribe	Granja La Prietita			
Mario Humberto Quintanilla-Gonzalez	Granja El Milagro	<i>Not yet included in monitoring report</i>		
	Las Tortolas	<i>Not yet included in monitoring report</i>		

Protocol 3: Conformity of audited AWMS with AMWS characteristics indicated in PDD and monitoring report

Type of AMWS system, method for destruction of biogas (generator and/or flare), controlled animal feed, flush system, flush volume and land application method (refer also to Protocol 6)

Name of farm owner	Name of farm	1 st Period verification 30-31/03/2006	2 nd Period verification	3 rd Period verification	4 th Period verification	5 th Period verification	6 th Period verification
Aldabi	Granja El Chanco	✓					
	Los Tres Cochinitos	✓					
Ester Tamez-Flores	Granja Ana Margarita	✓					
Jesus G. Serna-Urbe	Granja La Prietita	✓					
Mario Humberto Quintanilla-Gonzalez	Granja El Milagro	<i>Not yet included in monitoring report</i>					
	Las Tortolas	<i>Not yet included in monitoring report</i>					

Protocol 4: Findings from farm owner office audits and farm visits

Name of farm owner or farm	Name(s) of persons interviewed			
	1 st Period verification 30-31/03/2006	X Period verification	X Period verification	X Period verification
Aldabi / Granja Los Chanchos & Los 3 cochinitos	- Jorge Alfredo Newell-Gerente Administrativo	-	-	-
Ester Tamez-Flores / Granja Ana Margarita	- José Luis Taméz Taméz-Gerente Administrador	-	-	-
Jesus G. Serna-Uribe / Granja La Prietita	- Jesus Gilberto Serna González-Gerente Administrativo	-	-	-

Management system/controls for data collection and recording

The data management system/controls are assessed to identify reporting risks and to assess the data management system's/control's ability to mitigate reporting risks. The GHG data management system/controls are assessed against expectations for best practise. A score is assigned as follows:

F: Full - all best practice expectations are implemented.

P: Partial - a proportion of the best practice expectations is implemented

L: Limited - this should be given if little or none of the system component is in place.

A Forward Action Request (FAR) is issued where the management system/controls need to be improved in order to assure that data is adequately collected and recorded during the subsequent monitoring and reporting period.

Checklist question	MoV*	Score	Observations, if any, including FARs	FAR
<i>1) Livestock population data</i> Is there a clear allocation of responsibility and authority for data collection and recording and have persons assigned to specific tasks received sufficient training?	I	F	The responsibility for data collection and recording is with the person in charge of the farm.	

Checklist question	MoV*	Score	Observations, if any, including FARs	FAR
Is data collected and recorded in a consistent manner in terms of data collection frequency, data collection and recoding practise, etc.?	Ins DR	P	Not all farmers are very well known with regard to the kind of inventories that are needed in order to report inventories that are adequate for determining emission reductions. In particular, the inventory of Granja Ana Margarita was not well developed. For future reporting periods it must ensure that all farms develop adequate livestock population inventories and that farm owners implement QA/QC procedures for reporting of inventories. Since emission reductions are determined based on measured biogas volume, possible minor mistakes in the inventory of Granja Ana Margarita have no material impact on reported emission reductions for this reporting period.	FAR 3
Is there any QA/QC performed by farm owner with regard to data collection and recording?	I	P	For future reporting periods it must ensure that all farms develop adequate livestock population inventories and that farm owners implement QA/QC procedures for reporting of inventories.	FAR 3
Is there any QA/QC performed by local employees of AgCert with regard to data collection and recording?	I DR	F		
Is the collection of data and QA/QC of reported data carried out in a consistent and systematic manner?	Ins	F		
2) Data on average weight of livestock population data (if applicable) Is there a clear allocation of responsibility and authority for data collection and recording and have persons assigned to specific tasks received sufficient training?			<i>Not applicable.</i> VS has been weight adjusted in accordance with equation 1 of AM0016 and the VS was capped at 0.5 for all animal classes. Instead of using actual average weights, standard North American animal class weights (Sows 181 kg, gilts 181 kg, boars 204 kg, finishers 56 kg, wieners 13 kg) were applied.	
Is data collected and recorded in a consistent manner in terms of data collection frequency, data collection and recoding practise, etc.?			<i>Not applicable.</i>	
Is there any QA/QC performed by farm owner with regard to data collection and recording?			<i>Not applicable.</i>	
Is there any QA/QC performed by local employees of AgCert with regard to data collection and recording?			<i>Not applicable.</i>	

Checklist question	MoV*	Score	Observations, if any, including FARs	FAR
3) Data on biogas volume and CO₂ content of biogas Is there a clear allocation of responsibility and authority for data collection and recording and have persons assigned to specific tasks received sufficient training?	I DR	F	AgCert personnel verify the correct functioning of the flow meter, and data is collected and sent to AgCert's Mexico City office.	
Is data collected and recorded in a consistent manner in terms of data collection frequency, data collection and recoding practise, etc.?	Ins DR	F	Yes, data is collected and recorded in a consistent manner.	
Is there any QA/QC performed with regard to data collection and recording?	I Ins DR	F	QA/QC is performed	
4) Data on electricity generation (if applicable) Is there a clear allocation of responsibility and authority for data collection and recording and have persons assigned to specific tasks received sufficient training?		N/A	<i>Not applicable.</i> No electricity is generated.	
Is data collected and recorded in a consistent manner in terms of data collection frequency, data collection and recoding practise, etc.?		N/A	<i>Not applicable.</i>	
Is there any QA/QC performed with regard to data collection and recording?		N/A	<i>Not applicable.</i>	
5) Data on electricity consumption Is there a clear allocation of responsibility and authority for data collection and recording and have persons assigned to specific tasks received sufficient training?	I	F	Electrical consumption is not recorded. The values described in monitoring report are estimated based on equipment specs.	
Is data collected and recorded in a consistent manner in terms of data collection frequency, data collection and recoding practise, etc.?	I	F	Electrical consumption is not recorded. The values described in monitoring report are estimated based on equipment specs.	
Is there any QA/QC performed by local employees of AgCert with regard to data collection and recording?	I	F	Electrical consumption is not recorded. The values described in monitoring report are estimated based on equipment specs.	
6) Data processing by AgCert Is there a clear allocation of responsibility and authority for data processing and have persons assigned to specific tasks received sufficient training?	I	F	Data is collected by local AgCert employees and checked by employees of AgCert's Mexico City office before being reported to AgCert's data processing unit at Melbourne, Florida, USA. Reported data is thoroughly checked prior to being entered into AgCert's EnviroCert database and processed using well established procedures and automated processes.	
Is data processing carried out in a consistent manner?	I	F	Data processing is carried out in a consistent manner using automated processes.	
Is there any QA/QC performed with regard to data processing?	I	F	QA/QC is checked.	

Checklist question	MoV*	Score	Observations, if any, including FARs	FAR
Are there any written procedures for data processing and QA/QC of data processing?	I	F	AgCert is in the process of becoming certified for ISO 9001. Written procedures for data processing and QA/QC of data are developed.	

Project implementation and installation of monitoring equipment

It is assessed whether

- the project has been implemented as described in the Project Design Document
- the AWMS characteristics are as described in the Project Design Document and the monitoring report
- appropriate monitoring equipment has been installed and calibrated as required in the monitoring plan described in the Project Design Document

A Forward Action Request (FAR) is issued where special attention has to be given in the subsequent monitoring and reporting period with regard to

- project implementation in order to ensure appropriate project performance
- maintenance and calibration of monitoring equipment to assure that relevant indicators are accurately measured

Checklist question	MoV*	Concl.	Observations (if any), including FARs	FAR
<i>1) Project implementation and AWMS characteristics</i>	Ins I	OK		
Have anaerobic digesters been installed and is all manure produced at the farm treated in the anaerobic digesters before being treated in secondary lagoons?				
Is biogas utilised for electricity generation and/or flared as described in the PDD?	Ins I	OK	Biogas is flared only	
Has the farm used the same or similar animal feed throughout the whole monitoring and reporting period?	I DR	OK		
Is the flush system as described in the PDD?	Ins I	OK		
Have there been any significant changes to the flush volume during the selected monitoring and reporting period?	I DR	OK		
Is the land application of treated manure as described in PDD?	I DR	OK		
<i>2) Digester performance</i>	DR I	OK		
Is digester performance as anticipated?				

Checklist question	MoV*	Concl.	Observations (if any), including FARs	FAR
Are the digesters' membranes regularly checked for possible leaks through visual checks? Are visual checks of the digesters' membrane integrity recorded?	DR I	OK	There is no documentary evidence of the visual checks performed. Visual checks of the digesters' membrane integrity performed by AgCert or the farm owner should be recorded.	FAR 4
3) Biogas handling system Has the biogas handling system been tested and are the test results recorded?	DR I	OK	Acceptance test records by the supplier of gas handling system were not yet available for any farm. These should be provided during at the next verification audit.	FAR 2
Is the biogas handling system regularly checked for possible leaks through visual checks? Are visual checks of gas handling system recorded?	Ins	(OK)	There is no documentary evidence of the visual checks performed. Visual checks of the digesters' membrane integrity performed by AgCert or the farm owner should be recorded.	FAR 4
4) Electricity generation (if applicable) Is the electricity generated from biogas measured with an electricity meter and recorded on a monthly basis?		N/A	<i>Not applicable. No electricity is generated.</i>	
Is the electricity meter used of adequate accuracy?		N/A	<i>Not applicable. No electricity is generated.</i>	
Has the electricity meter been calibrated in accordance with the meter producer's specifications for calibration?		N/A	<i>Not applicable. No electricity is generated.</i>	
5) Electricity consumption of project equipment Has the electricity consumption of all equipment that needed to be installed as a consequence of the project been accounted?	Ins DR	OK	The electricity consumption of the project is not metered, but is estimated based on the equipments rated electricity consumption and conservative assumptions on the equipments operating hours.	
6) Flare Has the flare been tested as required by the flare's producer?	Ins DR	OK	Flares are correctly installed and rather new and flare performance are as anticipated. However, the flares will have to be tested as required by the operation manual and the result of these tests need to be recorded.	FAR 5
Has the flare been regularly inspected and has maintenance been carried out as required by the by the flare's producer and has flare inspections and maintenance been recorded?	DR I	OK	The flares will have to be inspected and maintained as required by operation manual and flare inspections and maintenances need to be recorded.	FAR 5
7) Biogas flow meter Has the biogas flow meter continuously monitored the biogas flow from the digesters to the generator and/or flare during the selected monitoring and reporting period?	Ins	OK	The meters are correctly installed. They continuously measure the biogas being diverted to the flare.	

Checklist question	MoV*	Concl.	Observations (if any), including FARs	FAR
Is the biogas flow meter used of adequate accuracy?	DR I	OK	According to the installation, operation and maintenance manual, no initial calibration after correct installation is required. Nonetheless, the biogas flow meter will in the future have to be checked in accordance with the installation, operation and maintenance manual and these checks have to be documented.	FAR 6
Has the biogas flow meter been tested as required by the by the flow meter's producer and have flow meter calibrations been recorded?	DR I	OK	No initial calibration after correct installation is required. Nonetheless, the biogas flow meter will in the future have to be checked in accordance with the installation, operation and maintenance manual and these checks have to be documented.	FAR 6
8) Measurements of CO₂ content of biogas Has the CO ₂ content of biogas been measured on a quarterly basis during the whole monitoring and reporting period?	I DR	OK	The CO ₂ content of biogas is measured at least every third month as required by AM0016. At most farms the CO ₂ content of biogas is measured monthly and reported to AgCert's data processing unit in Melbourne, Florida, USA.	
Has the CO ₂ content of biogas been accurately measured and have measurement results been recorded?	I DR	OK	The CO ₂ contents of biogas have been correctly determined and measurements are recorded.	

Evidence and correctness of reported data

Data reported in the monitoring report (and if applicable, in more detailed data reports provided by AgCert) is assessed against data records kept at the farm owner office. Reported data may be verified by checking an adequate sample of data records kept at the farm owner office. The sample size may be selected based on the findings of the assessment of the management system/controls for data collection and recording. More data record samples should be verified if the assessment of the management system/controls indicated that there is a risk for misreporting due to inadequate management system/controls and lack of QA/QC procedures.

If deviations from reported data are observed, these deviation have to be documented below and all data records have to be verified in order to ensure that there are no other reporting errors.

A Corrective Action Request (CAR) is issued where data reported in the monitoring report has to be corrected.

A Forward Action Request (FAR) is issued where data evidence and archiving of records need to be improved in order to assure that adequate evidence for reported data is available for the subsequent monitoring and reporting period.

Checklist question	MoV*	Verification basis	Concl.	Observations (if any), including CARs and FARs	C/FAR
1) Livestock population data Is there evidence for the reported data for the selected verification period?	DR	Print out from farm office data management system	OK		
Is the data collected in accordance with required data collection and recording frequency?	DR	Daily, weekly and monthly basis	OK		
Is the data in the monitoring report sustained by data records kept at the farm owner office and has data been correctly transferred from the farm owner data management system to AgCert's data management system?	DR	Livestock inventory records kept at the farm office	OK		
2) Data on average weight of livestock population data (if applicable) Is there evidence for the reported data for the selected verification period?	DR			<i>Not applicable.</i> VS has been weight adjusted in accordance with equation 1 of AM0016 and the VS was capped at 0.5 for all animal classes. Instead of using actual average weights, standard North American animal class weights (Sows 181 kg, gilts 181 kg, boars 204 kg, finishers 56 kg, wieners 13 kg) were applied. These animal class weights are representative for the average weights recorded by the farm owner.	
Is the data collected in accordance with required data collection and recording frequency?	DR			<i>Not applicable.</i>	

Checklist question	MoV*	Verification basis	Concl.	Observations (if any), including CARs and FARs	C/FAR
Is the data in the monitoring report sustained by data records kept at the farm owner office and has data been correctly transferred from the farm owner data management system to AgCert's data management system?	DR			<i>Not applicable.</i>	
3) Data on biogas volume and CO₂ content of biogas Is there evidence for the reported data for the selected verification period?	I	Excel spreadsheet documenting records of biogas meter readings and results of periodic CO ₂ content measurements	OK		
Is the data collected in accordance with required data collection and recording frequency?	I	Excel spreadsheet documenting records of biogas meter readings and results of periodic CO ₂ content measurements	OK	Biogas meters are read once a months and meter readings are reported to AgCert's data processing unit in Melbourne, Florida, USA and recorded in EnviroCert. The CO ₂ content of biogas is measured at least every third month as required by AM0016. At most farms the CO ₂ content of biogas is measured monthly and reported to AgCert's data processing unit in Melbourne, Florida, USA.	
Is the data in the monitoring report sustained by data records kept at AgCert's Mexico City office?				<i>Not applicable.</i> No electricity is generated.	
Does the biogas volume meter reading at the farms match the last biogas meter reading recorded by AgCert?				<i>Not applicable.</i>	
4) Data on electricity generation (if applicable) Is there evidence for the reported data for the selected verification period?				<i>Not applicable.</i>	
Is the data collected in accordance with required data collection and recording frequency?	DR	PDD As-build drawing	OK	Electricity consumption is not metered, but is estimated based on the equipments rated electricity consumption and conservative assumptions on the equipments operating hours.	

Checklist question	MoV*	Verification basis	Concl.	Observations (if any), including CARs and FARs	C/FAR
Is the data in the monitoring report sustained by data records kept at the farm owner office and has data been correctly transferred from the farm owner data management system to AgCert's data management system?	DR	Print out from farm office data management system	OK		
5) Data on electricity consumption Is the electricity consumption estimated using appropriate and conservative assumptions?	DR	Daily, weekly and monthly basis	OK		

Protocol 5: Check of emission reduction calculations

Emission reduction calculations

It is assessed whether

- baseline and project emissions have been calculated correctly using correct emission factors
- input data has been correctly transferred into emission reductions calculation sheets

A Corrective Action Request (CAR) is issued where mistakes in the emission reduction calculations have to be corrected.

A Forward Action Request (FAR) is issued where special attention has to be given in the subsequent monitoring and reporting period with regard to

- the transparency of the emission reduction calculations
- reducing risks of calculation errors

Checklist question	MoV*	Verification basis	Concl.	Observations (if any), including CARs and FARs	C/FAR
<i>1) Calculation of project and baseline emissions based on livestock population data (Note that the calculation of project and baseline emissions only differs with regard to the MCF selected for the project and the baseline scenario)</i> Has correct input data been used in the calculations?	DR I Ins	Excel spreadsheets documenting calculations	OK	Through cross-check calculations, DNV was able to confirm the correctness of reported project and baseline emissions determined based on livestock population data.	
Have correct emission factors been applied?	DR Ins	Excel spreadsheets documenting calculations	OK	Correct and validated values for B ₀ , MCF, C _m , F _{gasm} , EF ₃ , EF ₄ and Nex were applied. Since many of the sites were not farrow-to-finish, AgCert decided to adjust the IPCC default VS with regard to the actual weight of the particular swine classes, although this is not foreseen in the monitoring plan of the PDD. VS has been adjusted in accordance with AM0016. Instead of using actual average weights of the livestock populations at the farms included in the project activity, standard North American animal class weights (Sows 181 kg, gilts 181 kg, boars 204 kg, finishers 56 kg, wieners 13 kg) were applied. Given that the livestock at the farms has similar genetics, this is deemed acceptable. Moreover, VS was capped at 0.5 kg/day for all swine classes. The adjustment of VS thus results in conservative emission reduction estimates since the VS for finishers and wieners are adjusted to	

* MoV: Means of Verification - Interview (I), Document review (DR), Witnessing of actual practise (W), Inspection (Ins)

Checklist question	MoV*	Verification basis	Concl.	Observations (if any), including CARs and FARs	C/FAR
				0.3 kg/day and 0.1 kg/day, respectively, while the VS for sows, gilts, boars are capped at 0.5 kg/day even though AM0016 would allow the use of higher values for these swine classes.	
Are the calculations correct and transparently presented and the results correctly reported in the monitoring report?	DR Ins	Excel spreadsheets documenting calculations	OK		
2) Calculation of leakage Has correct input data been used in the calculations?	DR Ins	Excel spreadsheets documenting calculations	OK	Electricity consumption is not metered, but is estimated based on the equipments rated electricity consumption and conservative assumptions on the equipments operating hours.	
Have correct emission factors been applied?	DR Ins	Excel spreadsheets documenting calculations	OK		
Are the calculations correct and transparently presented and the results correctly reported in the monitoring report?	DR Ins	Excel spreadsheets documenting calculations	OK		
3) Calculation of emission reductions based on measured biogas volumes Has correct input data been used in the calculations?	DR Ins	Excel spreadsheets documenting calculations	OK	<p>An average biogas volume generated per day is determined based on the difference between the first biogas meter reading after the ending date of the reporting period and the first biogas meter reading within the reporting period. This average biogas volume per day is then multiplied with the number of days of each month. This extrapolation is necessary since biogas flow meter readings are not always recorded at the last day of the month, and no exact monthly biogas volumes can be determined. Moreover, this calculation procedure smoothes out monthly variations in biogas productions and the calculated biogas volumes can be better compared with the calculated emission reductions using average IPCC default factors.</p> <p>In the absence of any guidance by AM0016 to calculate the actual biogas captured and flared, emission reductions for each month were calculated by multiplying the biogas volumes determined for each month with the CH₄ content of biogas. The CH₄ content</p>	

* MoV: Means of Verification - Interview (I), Document review (DR), Witnessing of actual practise (W), Inspection (Ins)

Checklist question	MoV*	Verification basis	Concl.	Observations (if any), including CARs and FARs	C/FAR
				of biogas was determined based on the measured CO ₂ content, assuming that biogas consists of mainly CH ₄ and CO ₂ only, so that the CH ₄ content is 100% minus the measured CO ₂ content in %. In addition, the volume of CH ₄ was converted to mass of CH ₄ using the density of CH ₄ at the average ambient temperature reported for each month (assuming the biogas has standard atmospheric pressure). This approach is in DNV's opinion appropriate.	
Have correct emission factors been applied?	DR Ins	Excel spreadsheets documenting calculations	OK		
Are the calculations correct and transparently presented and the results correctly reported in the monitoring report?	DR Ins	Excel spreadsheets documenting calculations	OK	The calculations are correct and are transparently presented.	

Protocol 6: Summary of Forward Action Requests

List of identified FARs

Veri- fication No.	FAR No.	Forward Action Request	Summary of how FARs have been addressed in consecutive reporting period(s)	Assessment of how FARs have been addressed
1 st	FAR 1	Post Construction Assessment Report was not yet available for any farm. This documentation should be provided during the next verification audit.	<i>to be completed in report of 2nd periodic verification</i>	<i>to be completed in report of 2nd periodic verification</i>
1 st	FAR 2	Acceptance test records by the supplier of gas handling system were not yet available for any farm. These should be provided during at the next verification audit.	<i>to be completed in report of 2nd periodic verification</i>	<i>to be completed in report of 2nd periodic verification</i>
1 st	FAR 3	For future reporting periods it must ensured that all farms develop adequate livestock population inventories and that farm owners implement QA/QC procedures for reporting of inventories.	<i>to be completed in report of 2nd periodic verification</i>	<i>to be completed in report of 2nd periodic verification</i>
1 st	FAR 4	Visual checks of the digesters' membrane integrity and the gas handling system performed by AgCert or the farm owner should be recorded.	<i>to be completed in report of 2nd periodic verification</i>	<i>to be completed in report of 2nd periodic verification</i>
1 st	FAR 5	The flares will have to be tested as required by the operation manual and the result of these tests need to be recorded.	<i>to be completed in report of 2nd periodic verification</i>	<i>to be completed in report of 2nd periodic verification</i>
1 st	FAR 6	The biogas flow meter will in the future have to be checked in accordance with the installation, operation and maintenance manual and these checks have to be documented.	<i>to be completed in report of 2nd periodic verification</i>	<i>to be completed in report of 2nd periodic verification</i>

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