VALIDATION REPORT

ENVIROSERV CHLOORKOP LANDFILL GAS RECOVERY PROJECT IN SOUTH AFRICA

REPORT NO. 2006-1910

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DET NORSKE VERITAS

VALIDATION REPORT

Date of first issue: 2007-02-01	Project No.: 45010028
Approved by: Einar Telnes Director	Organisational unit: DNV Certification, International Climate Change Services
Client: EnviroServ Waste Management (Pty) Ltd	Client ref.: Esmé Gombault

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Summary:

Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the "EnviroServ Chloorkop Landfill Gas Recovery Project in South Africa" on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteriarefer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board. This draft validation report summarizes the findings of the validation.

The validation consisted of the following two phases: i) a desk review of the project design documents, ii) follow-up interviews with project stakeholders and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion.

In summary, it is DNV's opinion that the project, as described in the project design document Version 5 of 6 February 2007, meets all relevant UNFCCC requirements for the CDM and correctly applies the approved baseline and monitoring methodology AM0011 version 02. Hence, DNV requests the registration of the EnviroServ Chloorkop Landfill Gas Recovery Project in South Africa as a CDM project activity.

Report No.: 2006-1910	Subject Group: Environment	
Report title: EnviroServ Chloorkop Landfill Gas Recovery Project in South Africa		
Work carried out by: Hendrik W. Brinks, Wilson Tang		
Work verified by: Raman Kakaraparthi, Einar Telnes		
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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MVP	Monitoring and Verification Plan
N_2O	Nitrous oxide
NGO	Non-Governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change

1 INTRODUCTION

EnviroServ Waste Management (Pty) Ltd has commissioned Det Norske Veritas Certification Ltd. (DNV) to perform a validation of the "Chloorkop Landfill Gas Recovery Project in South Africa" (hereafter called "the project"). This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for CDM projects, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The validation team consists of the following personnel:

Mr Hendrik W. Brinks	DNV Oslo	Team Leader, CDM Validator
Mr Wilson Tang	DNV China	Sector Expert, CDM Validator
Mr Raman Kakaraparthi	DNV India	Technical Reviewer (applicant)
Mr Einar Telnes	DNV Oslo	Technical Reviewer

1.1 Validation Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

1.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AM0011 Version 02. The validation team has, based on the recommendations in the Validation and Verification Manual /5/ employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

The validation is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

1.3 Description of Proposed CDM Project

The proposed project involves the installation and application of landfill gas capture and flaring equipment at the Chloorkop landfill in South Africa. The methane in the landfill gas will be flared to CO_2 which has a lower GWP than CH_4. The activity is projected to generate 1 318 732 tCO_{2e} of emission reductions during its first seven year crediting period.

2 METHODOLOGY

The validation consists of the following three phases:

I a desk review of the project design documents
II follow-up interviews with project stakeholders
III the resolution of outstanding issues and the issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customised for the project, according to the Validation and Verification Manual /5/. The protocol shows in transparent manner criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of three tables. The different columns in these tables are described in Figure 1.

The validation protocol for the "Chloorkop Landfill Gas Recovery Project in South Africa" is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. Corrective action requests (CAR) are issued, where:

i) mistakes have been made with a direct influence on project results;
ii) validation protocol requirements have not been met; or
iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The term Clarification may be used where additional information is needed to fully clarify an issue.

Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities			
Requirement	***Reference***	***Conclusion***	***Cross reference***
The requirements the project must meet.	*Gives reference to the legislation or agreement where the requirement is found.*	*This is either acceptable based on evidence provided (**OK**), a **Corrective Action Request (CAR)** of risk or non-compliance with stated requirements or a request for **Clarification (CL)** where further clarifications are needed.*	*Used to refer to the relevant checklist questions in Table 2 to show how the specific requirement is validated. This is to ensure a transparent Validation process.*

Validation Protocol Table 2: Requirement Checklist				
Checklist Question	***Reference***	***Means of verification (MoV)***	***Comment***	***Draft and/or Final Conclusion***
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in seven different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.	*Gives reference to documents where the answer to the checklist question or item is found.*	*Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.*	*The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.*	*This is either acceptable based on evidence provided (**OK**), or a **Corrective Action Request (CAR)** due to non-compliance with the checklist question (See below).A request for **Clarification (CL)** is used when the validation team has identified a need for further clarification.*

Validation Protocol Table 3: Resolution of Corrective Action Requests and Requests for Clarification			
Draft report corrective action requests and requests for clarifications	***Ref. to Table 2***	***Summary of project participants' response***	***Final conclusion***
If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.	*Reference to the checklist question number in Table 2 where the Corrective Action Request or Clarification Request is explained.*	*The responses given by the project participants during the communications with the validation team should be summarised in this section.*	*This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".*

Figure 1 Validation protocol tables

2.1 Review of Documents

The PDD Revision 04 and 05 /1/ and Scoping Report with Environmental Impact Assessment /2/ submitted by the EnviroServ (Pty) Ltd, and additional background documents related to the project design and baseline were reviewed as part of the validation. The background documents consisted among other of the landfill permit, waste amounts, remaining landfill air space, flare specifications and record of decision from Department of Agriculture, Conservation and Environment,.

The main changes between Revision 04 and 05 are:

- More evidence for the waste amounts and remaining landfill air space of the landfill site.
- Other new baseline scenarios evaluated
- Description of the calculations made more comprehensive
- All parameters mentioned in the monitoring plan and a more complete description of the measurements given
- Improved description of the responsibility for the implementation of the project
- Crediting period corrected

2.2 Follow-up Interviews

At 18 January 2007, DNV performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of EnviroServ were interviewed. The main topics of the interviews are summarised in Table 1.

Table 1 Interview topics

Interviewed organisation	Interview topics
EnviroServ (Pty) Ltd	➢ Monitoring plan ➢ Pilot project ➢ Waste amounts
Monitoring Committee	➢ Local Stakeholder involvement process ➢ Landfill requirements ➢ Baseline scenario confirmation

2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation was to resolve the requests for corrective actions (CAR) and clarification (CL) and any other outstanding issues which needed to be clarified for DNV's positive conclusion on the project design.

The validation of the project identified five CARs and 13 CLs. To guarantee the transparency of the validation process, the concerns raised and responses given are documented in the validation protocol in Appendix A.

2.4 Internal Quality Control

The draft validation report including the initial validation findings underwent a technical review before being submitted to the project participants. The final validation report underwent another technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

3.1 Participation Requirements

The project participants are EnviroServ (Pty) Ltd and Japan Carbon Finance Ltd. Both parties involved, i.e. South Africa and Japan, meet the requirements to participate in the CDM.

The DNA of Japan has given approval of voluntary participation. The project has also been given approval of voluntary participation and confirmation of sustainable development by DNA of South Africa.

The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards South Africa.

3.2 Project Design

The main project characteristics are described in the PDD /1/. The Chloorkop landfill is located in the Ekurhuleni Metropolitan Municipality in South Africa. The landfill is owned by EnviroServ (Pty) Ltd and has been in operation since 1997.

The landfill gas use will, at least in the beginning of the project period, be flared. Other potential uses, in particular for industrial process heat off-site or for generation of electricity, will be investigated after the gas quantity and quality has been determined in more detail.

The project design engineering reflects current good practise. The company James and Wagener will be responsible for the design and construction monitoring of the project. The provider of the equipment will probably also be responsible for maintenance of the equipment.

The project is forecasted to start operation on 1 July 2007 and to operate for at least 20 years. The crediting period is a renewable crediting period of seven years starting at 1 July 2007.

3.3 Baseline Determination

The project correctly applies AM0011, version 02 dated 30 September 2005 /6/. The baseline scenario is the release of all methane produced by the decomposition of the waste deposited at the landfill. Leakage is not considered, in compliance with AM0011.

The total landfill air space of 4.5 million m^3 and the remaining 2.33 million m^3 as of January 2006 was confirmed from the Scoping Report /2/. Updated information from November 2006 shows a remaining landfill air space of 2.25 million m^3 to be filled in the remaining 7 years.

According to the PDD, there will be deposited approximately 2.41 million ton domestic waste and hence (with the assumed content from the PDD of 80% domestic waste of the total waste) 3.01 million ton total waste amount. This assumes a density of about 1.34 ton/m^3, which is considered reasonable after settlement of the landfill.

Contract for delivery of waste has been shown to DNV, and the site visit confirmed an operating landfill. The closing of a nearby landfill should also ensure enough supply of waste.

3.4 Additionality

The additionality has been evaluated by the following steps:

Step 1: Assessment of legal requirements. In an assessment of the operating permission for the landfill from 1997, DNV has confirmed that no destruction of methane is required. The permit requires monitoring of the gas and ventilation if the gas composition reaches dangerous compositions. A monitoring committee for the landfill, which also has members from the authorities, is also controlling the operation of the site.

Step 2: Financial analysis of the possible scenarios. Several scenarios were considered:

- without LFG recovery
- with a modified amount of LFG extracted
- with air or oxygen injection in the landfill
- with changed/changing waste composition
- with on-site LFG use
- with off-site LFG use
- deferred project with five years
- with combinations of the above
- the project activity itself
- with sale of LFG to off-site industry
- with electricity generation and supply to national grid

The most plausible of these scenarios were compared by net present values (NPV) analysis and several scenarios were found to be financially more attractive than the project activity. Hence, a financial barrier for the project activity was found, and the first scenario presented above, an activity without recovery of the landfill gas, was deemed as the most likely baseline scenario.

Step 3: Barriers analysis. Not applicable

Step 4: Extra check on credibility of the baseline.

- The baseline scenario is financially realistic. The site has been confirmed in operation, there is enough landfill air space available and a contract for delivery of waste is confirmed. Hence, there is sufficient evidence for continued operation of the landfill inclusive of the atmospheric release of methane without this CDM project.
- The landfill has local support and would have continued its present operation without the CDM project.

- No indications for any physical obstruction for the use of the landfill in the present type of operation to 2013 were found.
- No legislation that would prevent present operation was found.

3.5 Monitoring Plan

The project correctly applies AM0011, Version 02 dated 30 September 2005. The following parameter will be monitored:

- The amount of landfill gas captured: Continuously
- The methane fraction in landfill gas: Continuously
- The amount of landfill gas for leachate evaporation: N/A
- The amount of landfill gas for electricity generation: N/A
- The amount of landfill gas flared: Continuously
- The electricity generated: When applicable
- The combustion efficiency: Quarterly
- The LFG temperature and pressure: Continuously
- The flare working hours: Continuously
- The flare temperature: Monthly/yearly
- The electricity consumed by project (blower): Not required by AM0011, but will be estimated from monitored operating time of blower and the blower capacity and the combined margin of the grid will be used for accounting of leakage emissions.

The flare and the measurement equipment are not yet purchased, and therefore the accuracies of the different measurement devices are not in place. However, the planning of the measurements and for the training of staff is deemed satisfactory.

3.6 Calculation of GHG Emissions

The emission reduction forecasts are based on the application of the multi-component first-order kinetic model of Van Zanten and Scheepers. The landfill gas potential (L_0) calculation was based on a complete conversion of all organic carbon into landfill gas (mainly CH_4 and CO_2). This gives a potential of 1.87 Nm^3 landfill gas per kg organic carbon. The organic content of the waste was based on the assumption of the domestic waste amount being 80% of the total waste amount, with the remaining fraction being without landfill gas potential. The domestic waste consists of waste from affluent (70%) and non-affluent (30%) neighbourhoods. A South-African study gives an indication of the waste composition in fractions of putresible and paper from the different communities. Furthermore, putresibles is assumed to contain 40 wt% organic carbon and paper 30 wt% organic carbon. For the present waste, the organic carbon content is estimated to approximately 16.6 wt%, and the landfill gas potential is hence approximately 309 Nm^3 per ton waste. The kinetics constants have been set to the conservative values of 0.07 for putresibles and 0.04 for paper.

The methane fraction of the landfill gas is assumed to be 40%, which is conservative compared to the results for the pilot project on the landfill which has been shown to DNV and indicates about 55% methane. The recovery fraction of the landfill gas is set to 75% for the fully developed cells with both vertical and horizontal gas collection systems. This is relatively high but can be reached if the wells are sited and maintained optimally. The forecast emission reductions of 1 318 732 tCO_2 during its first seven year crediting period are deemed within reasonable limits, keeping in mind that the model applied has an inherent uncertainty of up to 50% in forecasting landfill gas generation potential.

3.7 Environmental Impacts

In a Scoping report of 15 May 2006 /2/, an Environmental Impact Assessment with a focus on air quality issues has been carried out and no flaws or negative impacts of high significance of the project were identified. In a Record of Decision of 5 October 2006 from Department of Agriculture, Conservation and Environment, the implementation of the project was acknowledged.

3.8 Comments by Local Stakeholders

For the pilot project, stakeholders were invited to give comments from 24 March to 19 May 2005, and the Chloorkop monitoring committee discussed the pilot project on a meeting 16 May 2005. No comments were raised.

For the full-scale project, local stakeholders were invited in a local newspaper on 2 February 2006 to register and a briefing document was distributed afterwards. A draft Scoping Report was made available to the stakeholder from 7 April to 8 May 2006, and the availability of this report was advertised in forehand in a local newspaper. An advertised meeting about the impact assessment was held on 18 April 2006. Only one comment was raised during the meeting about the present odours from the landfill and potential impact of the project. In the Scoping report /2/ the odours are expected to improve as a result of the project.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

The PDD Revision 04 was made publicly available on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties, stakeholder and NGOs were through the CDM website invited to provide comments during a 30 days period from 19 November 2006 to 18 December 2006. No comments were received.

5 VALIDATION OPINION

Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the "EnviroServ Chloorkop Landfill Gas Recovery Project in South Africa" on the basis of UNFCCC criteria for the Clean Development Mechanism and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfilment of stated criteria.

The project participants are EnviroServ (Pty) Ltd (South Africa) and Japan Carbon Finance Ltd (Japan). The participating Parties, i.e. South Africa and Japan, meet all relevant participation requirements. Japan has approved and authorized the participation in the project. South Africa has confirmed that the project contributes to sustainable development and has approved and authorized the participation in the project.

The proposed project involves recovery and flaring of landfill gas emanating from the Chloorkop landfill. By destroying the landfill gas, the project results in the reduction of CH_4 emissions that are real, measurable and give long-term benefits for the climate. Given that the project is implemented as designed, the project is likely to achieve the estimated amount of emission reductions. The annual average of emission reductions over the crediting period is estimated at 188 390 tonnes of CO_2 e.

The validation has confirmed that the project correctly applies the baseline and monitoring methodology AM0011 version 02. The determination of the baseline is well elaborated, transparent and sufficiently supported with facts. The selected baseline scenario is reasonable and an analysis of the barriers facing the project demonstrates that project is not a likely baseline scenario. The monitoring plan makes sufficient provision for monitoring relevant emission indicators.

The validation did not reveal any information indicating that the project can be seen as a diversion of ODA funding towards South Africa.

A local stakeholder consultation process has been carried out by the project participant. DNV published the PDD on the DNV Climate Change web site and comments by Parties, stakeholders and UNFCCC accredited NGOs were invited through the CDM web site. No comments were received.

In summary, it is DNV's opinion that the project, as described in the project design document of 5 February 2007, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the approved baseline and monitoring methodology AM0011 version 02. Hence, DNV requests the registration of the "EnviroServ Chloorkop Landfill Gas Recovery Project in South Africa" as a CDM project activity.

REFERENCES

Documents provided by the project proponent that relate directly to the project:

/1/ CDM Project design document "EnviroServ Chloorkop Landfill Gas Recovery Project". Revision 4 of 4 October 2006 and Revision 5 of 5 February 2007.

/2/ Scoping report from EnviroServ Waste Management (Pty) Ltd of 15 May 2006.

/3/ Letter of Approval from South Africa, 17 January 2007.

/4/ Letter of Approval from Japan, 11 November 2005.

Background documents related to the design and/or methodologies employed in the design or other reference documents:

/5/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. http://www.vvmanual.info

/6/ UNFCCC: Approved methodology AM0011, Version 02: "Landfill gas recovery with electricity generation and no capture or destruction of methane in the baseline scenario"

Persons interviewed during the validation, or persons who contributed with other information that are not included in the documents listed above:

/7/ Andre Koekemoer, EnviroServ

Nick Moela (Waste Management Officer), Monitoring Committee

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APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities

Requirement	Reference	Conclusion	Cross Reference / Comment
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3	Kyoto Protocol Art.12.2	OK	Table 2, Section E.4.1
2. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	~~CAR 1~~ OK	Table 2, Section A.3
3. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC	Kyoto Protocol Art.12.2.	OK	Table 2, Section E.4.1
4. The project shall have the written approval of voluntary participation from the designated national authority of each party involved	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	~~CAR 1~~ ~~CAR 2~~ OK	
5. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change	Kyoto Protocol Art. 12.5b	OK	Table 2, Section E
6. Reduction in GHG emissions shall be additional to any that would occur in absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	~~CAR 3~~ OK	Table 2, Section B.2
7. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	OK	The validation did not reveal any information on public funding of the project.
8. Parties participating in the CDM shall designate a national	CDM Modalities and	OK	The DNA of South Africa is Department

Requirement	Reference	Conclusion	Cross Reference / Comment
authority for the CDM	Procedures §29		of Minerals and Energy The DNA of Japan is The Liason committee for the utilization of the Kyoto Mechanism Ministry of Foreign Affairs, Climate Change Division, International Cooperation Bureau.
9. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol	CDM Modalities §30/31a	OK	South Africa ratified the Kyoto Protocol on 31 July 2002. Japan ratified the Kyoto Protocol on 4 June 2002.
10. The participating Annex I Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	OK	
11. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7	CDM Modalities and Procedures §31b	OK	
12. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received	CDM Modalities and Procedures §37b	OK	Table 2, Section G
13. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	OK	Table 2, Section F

Requirement	Reference	Conclusion	Cross Reference / Comment
14. Baseline and monitoring methodology shall be previously approved by the CDM Executive Board	CDM Modalities and Procedures §37e	OK	Table 2, Section B.1.1 and D.1.1
15. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP	CDM Modalities and Procedures §37f	OK	Table 2, Section D
16. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available	CDM Modalities and Procedures §40	OK	The PDD was published on http://www.dnv.com/certification/ClimateChange. Parties, stakeholder and NGOs were through the CDM website invited to provide comments on the validation requirements from 19 November 2006 to 18 December 2006. No comments have been received.
17. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances	CDM Modalities and Procedures §45c,d	OK	Table 2, Section B.2
18. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure	CDM Modalities and Procedures §47	OK	Table 2, Section B.2
19. The project design document shall be in conformance with the UNFCCC CDM-PDD format	CDM Modalities and Procedures Appendix B, EB Decision	OK	The PDD conforms with version 03 (28 July 2006) of the CDM-PDD

Table 2 Requirements Checklist

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A. General Description of Project Activity *The project design is assessed.*					
A.1. Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial (geographical) boundaries clearly defined?	/1/	DR	The project is located in the Northern Service Delivery Area of the Ekurhuleni metropolitan Municipality in Gauteng Province in South Africa.		OK
A.1.2. Are the project's system (components and facilities used to mitigate GHGs) boundaries clearly defined?	/1/	DR	The main project characteristics are clearly described. Landfill gas will be collected from Chloorkop landfill and flared.		OK
A.2. Technology to be employed *Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.*					
A.2.1. Does the project design engineering reflect current good practices?	/1/	DR	Yes, the project design engineering does reflect current good practices. The technology to be employed is already well experienced by its application in other countries.		OK
A.2.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used	/1/	DR	Yes, see above.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
technologies in the host country?					
A.2.3. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	/1/	DR	There are no indications that the project technology is likely to be substituted by other more efficient technologies in the first crediting period.		OK
A.2.4. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period?	/1/	DR	No extensive training and maintenance is expected to be required.		OK
A.2.5. Does the project make provisions for meeting training and maintenance needs?	/1/	DR,I	Yes, training is well addressed by the project development activities.		OK
A.3. Contribution to Sustainable Development *The project's contribution to sustainable development is assessed.*					
A.3.1. Is the project in line with relevant legislation and plans in the host country?	/1/	DR	Yes, from Record of Decision from Department of Agriculture, Conservation & Environment (5. October 2006) regarding the Chloorkop landfill, landfill gas capture and flaring is allowed. There are no regulations in South Africa concerning methane emissions from landfills except for safety requirements for avoiding explosive concentrations.		OK
A.3.2. Is the project in line with host-country specific CDM requirements?	/1/	DR,I	Yes		OK
A.3.3. Is the project in line with sustainable development policies of the host country?	/1/	DR	This is confirmed by DNA of South Africa	~~CAR 1~~	OK
A.3.4. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR	The project is likely to reduce local odour nuisances and improve air quality due to destruction of trace gases in landfill gas, strengthen local market for equipment and materials need for the project, training of personnel, promotion of future CDM projects in		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
			South Africa and possibility for future downstream utilisation of landfill gas.		
B. Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.1. Is the baseline methodology previously approved by the CDM Executive Board?	/1/	DR	The project applies AM0011 version 2		OK
B.1.2. Is the baseline methodology the one deemed most applicable for this project and is the appropriateness justified?	/1/	DR	AM0011 is applicable to landfill gas recovery projects with no capture/destruction of methane in the baseline scenario.		OK
B.2. Baseline Determination *The choice of baseline will be validated with focus on whether the baseline is a likely scenario, whether the project itself is not a likely baseline scenario, and whether the baseline is complete and transparent.*					
B.2.1. Is the application of the methodology and the discussion and determination of the chosen baseline transparent?	/1/	DR	The calculation of the baseline emissions uses organic carbon content as one of the parameters, but the numerical value(s) are not given. Therefore the baseline is not transparent. There is a contradiction between the different k-values used in section B.6.2 and Annex 3 of the PDD.	~~CAR 4~~ ~~CL 1~~	OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.2.2. Has the baseline been determined using conservative assumptions where possible?	/1/	DR	Given that the landfill is open and given DNVs experience with regards to problems owing to implementation/operation, recovery of 75% is rather optimistic. More information is requested on how such high capture efficiency is assured. Only two months were also used as basis for the 2005-2013 waste amount values, and this value is higher than all historical annual values. More evidence for this assumption is needed.	~~CL 2~~ ~~CL 3~~	OK
B.2.3. Has the baseline been established on a project-specific basis?	/1/	DR	The baseline has been determined on a project-specific basis.		OK
B.2.4. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR	Yes		OK
B.2.5. Is the baseline determination compatible with the available data?	/1/	DR	Yes		OK
B.2.6. Does the selected baseline represent the most likely scenario among other possible and/or discussed scenarios?	/1/	DR	A number of the required scenarios for evaluation of the additionality in AM0011 have not been considered.	~~CAR 3~~	OK
B.2.7. Is it demonstrated/justified that the project activity itself is not a likely baseline scenario?	/1/	DR,I	A number of the required scenarios for evaluation of the additionality in AM0011 have not been considered. In the internal rate of return analysis of those scenarios, costs for CDM verification have been included and the cost of gas analysis seems to be unrealistic. Gas analysis is according to Annex 4 measured continuously, whereas in the economical analysis is weekly analysis of 2000 Rand stated.	~~CAR 3~~ ~~CL 4~~	OK
B.2.8. Have the major risks to the baseline been identified?	/1/	DR,I	The baseline emissions are monitored directly, and there should not be further risks of		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
			overestimation of the baseline		
B.2.9. Is all literature and sources clearly referenced?	/1/	DR	Yes		OK
C. Duration of the Project/ Crediting Period *It is assessed whether the temporary boundaries of the project are clearly defined.*					
C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable?	/1/	DR	The expected starting date is stated to be 1 June 2007 in section C.1.1, The lifetime is more than 20 years		OK
C.1.2. Is the assumed crediting time clearly defined (renewable crediting period of seven years with two possible renewals or fixed crediting period of 10 years with no renewal)?	/1/	DR	A renewable crediting period of 7 years is selected, with the first crediting period starting on 1 January 2007. This is however before the expected starting date.	~~CL 5~~	OK
D. Monitoring Plan *The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed ((Blue text contains requirements to be assessed for optional review of monitoring methodology prior to submission and approval by CDM EB).*					
D.1. Monitoring Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
D.1.1. Is the monitoring methodology previously approved by the CDM Executive Board?	/1/	DR	The project applies AM0011, version 02.		OK
D.1.2. Is the monitoring methodology applicable for this project and is the appropriateness justified?	/1/	DR	Yes.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
D.1.3. Does the monitoring methodology reflect good monitoring and reporting practices?	/1/	DR,I	The accuracy of measurement methods is not given and how/where the calibration will be carried out is not stated. AM0011 requires measurement of % (volume%) of methane in landfill gas, not density. It is not explained how the combustion efficiency will be measured. The temperature and pressure of the landfill gas have to be measured in order to calculate Nm3 from m3. In Annex 4 these parameters have been related to flare efficiency.	~~CL 6~~ ~~CL 7~~ ~~CL 8~~ ~~CL 9~~	OK
D.1.4. Is the discussion and selection of the monitoring methodology transparent?	/1/	DR	All the four landfill gas flow meters required by the methodology are not referred to in the monitoring plan. AM0011 requires flow meters for all three possible uses of the gas as well as a flow meter of the total collected landfill gas. Two flow meters is a minimum for a flaring project.	~~CAR 5~~	OK
D.2. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
D.2.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/	DR, I	See D.1.4	~~CAR 5~~	OK
D.2.2. Are the choices of project GHG indicators reasonable?	/1/	DR	Yes		OK
D.2.3. Will it be possible to monitor / measure the	/1/	DR	Yes		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
specified project GHG indicators?					
D.2.4. Will the indicators give opportunity for real measurements of project emissions?	/1/	DR	Yes		OK
D.2.5. Will the indicators enable comparison of project data and performance over time?	/1/	DR	Yes		OK
D.3. Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
D.3.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR	Not applicable		OK
D.4. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
D.4.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR,I	Archiving of data are not considered in the PDD.	~~CL 10~~	OK
D.4.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/	DR	Yes		OK
D.4.3. Will it be possible to monitor / measure the specified baseline indicators?	/1/	DR	Yes		OK
D.4.4. Will the indicators give opportunity for real measurements of baseline emissions?			Yes		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
D.5. Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is checked that choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
D.5.1. Does the monitoring plan provide the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR,I	Not applicable		OK
D.5.2. Is the choice of indicators for sustainability development (social, environmental, economic) reasonable?	/1/	DR	Not applicable		OK
D.5.3. Will it be possible to monitor the specified sustainable development indicators?	/1/	DR	Not applicable		OK
D.5.4. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR	Not applicable		OK
D.6. Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
D.6.1. Is the authority and responsibility of project management clearly described?	/1/	DR	No, it is not clear whether EnviroServ will carry out the construction themselves or not. The provider of the equipment is not specified.	~~CL 11~~	OK
D.6.2. Is the authority and responsibility for registration, monitoring, measurement and reporting clearly described?	/1/	DR	Detailed procedures for this need to be created		OK
D.6.3. Are procedures identified for training of monitoring personnel?	/1/	DR,I	Procedures for training of monitoring personnel is described in B.7.2		OK
D.6.4. Are procedures identified for emergency	/1/	DR	Detailed procedures for this need to be created		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
preparedness for cases where emergencies can cause unintended emissions?					
D.6.5. Are procedures identified for calibration of monitoring equipment?	/1/	DR	Specified procedures for calibration of the monitoring equipment are not identified.	~~CL 6~~	OK
D.6.6. Are procedures identified for maintenance of monitoring equipment and installations?	/1/	DR	Detailed procedures for this need to be created.		OK
D.6.7. Are procedures identified for monitoring, measurements and reporting?	/1/	DR	Detailed procedures for this need to be created.		OK
D.6.8. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR	Detailed procedures for this need to be created.		OK
D.6.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	/1/	DR	Detailed procedures for this need to be created.		OK
D.6.10. Are procedures identified for review of reported results/data?	/1/	DR	Detailed procedures for this need to be created.		OK
D.6.11. Are procedures identified for internal audits of GHG project compliance with operational requirements where applicable?	/1/	DR	Detailed procedures for this need to be created.		OK
D.6.12. Are procedures identified for project performance reviews before data is submitted for verification, internally or externally?	/1/	DR	Detailed procedures for this need to be created.		OK
D.6.13. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR	Detailed procedures for this need to be created.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
E. Calculation of GHG Emissions by Source *It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.*					
E.1. Project GHG Emissions *The validation of ex-ante estimated project GHG emissions focuses on transparency and completeness of calculations.*					
E.1.1. Are all aspects related to direct and indirect GHG emissions captured in the project design?	/1/	DR	Yes		OK
E.1.2. Are the GHG calculations documented in a complete and transparent manner?	/1/	DR	The recovery fraction of methane has been described as 75%, but the calculations of project GHG emissions apparently have used different values, which are different in different years.	~~CL 12~~	OK
E.1.3. Have conservative assumptions been used to calculate project GHG emissions?	/1/	DR	See B.2.2; project calculations are derived from fractions of the baseline emissions. Calculations of emission reduction is based on 100% flare efficiency which is not realistic. The default value is 90%.	~~CL 2~~ ~~CL 3~~ ~~CL 13~~	OK
E.1.4. Are uncertainties in the GHG emissions estimates properly addressed in the documentation?	/1/	DR	The GHG emissions are estimated from a rough kinetic model with a considerable uncertainty, but the actual GHG emissions will be accurately monitored.		OK
E.1.5. Have all relevant greenhouse gases and source categories listed in Kyoto Protocol Annex A been evaluated?	/1/	DR	Yes		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
E.2. Leakage *It is assessed whether there leakage effects, i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project, have been properly assessed and estimated ex-ante.*					
E.2.1. Are potential leakage effects beyond the chosen project boundaries properly identified?	/1/	DR	Not applicable.		OK
E.3. Baseline Emissions *The validation of ex-ante estimated baseline GHG emissions focuses on transparency and completeness of calculations.*					
E.3.1. Have the most relevant and likely operational characteristics and baseline indicators been chosen as reference for baseline emissions?	/1/	DR	Yes.		OK
E.3.2. Are the baseline boundaries clearly defined and do they sufficiently cover sources and sinks for baseline emissions?	/1/	DR	Yes		OK
E.3.3. Are the GHG calculations documented in a complete and transparent manner?	/1/	DR	See B.2.1.	~~CAR 4~~ ~~CL 1~~	OK
E.3.4. Have conservative assumptions been used when calculating baseline emissions?	/1/	DR,I	See B.2.2.	~~CL 2~~ ~~CL 3~~	OK
E.3.5. Are uncertainties in the GHG emission estimates properly addressed in the documentation?	/1/	DR,I	The GHG emissions are estimated from a rough kinetic model with a considerable uncertainty, but the actual GHG emissions will be accurately monitored.		OK
E.3.6. Have the project baseline(s) and the project emissions been determined using the same appropriate methodology and conservative	/1/	DR	Yes		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
assumptions?					
E.4. Emission Reductions *Validation of ex-ante estimated emission reductions*.					
E.4.1. Will the project result in fewer GHG emissions than the baseline scenario?	/1/	DR	Yes		OK
F. Environmental Impacts *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.*					
F.1.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/		In a scoping report of 22 May 2006, an Environmental Impact Assessment has been carried out and no flaws or negative impacts of high significance were identified. In a Record of Decision of 5 October 2006 from Department of agriculture, conservation and environment, the implementation of the project was acknowledged.		OK
F.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1/	DR	Yes, see above.		OK
F.1.3. Will the project create any adverse environmental effects?	/1/	DR	No, see above.		OK
F.1.4. Are transboundary environmental impacts considered in the analysis?	/1/	DR	Yes		OK
F.1.5. Have identified environmental impacts been addressed in the project design?	/1/	DR	Yes, see above.		OK
F.1.6. Does the project comply with environmental legislation in the host country?	/1/	DR	Yes, see above.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
G. Stakeholder Comments *The validator should ensure that a stakeholder comments have been invited and that due account has been taken of any comments received.*					
G.1.1. Have relevant stakeholders been consulted?	/1/	DR,I	It was confirmed that relevant stakeholders has been contacted.		OK
G.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR,I	It was confirmed that appropriate media has been used to contact stakeholders.		OK
G.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR,I	Yes, the monitoring committee of the landfill has been consulted.		OK
G.1.4. Is a summary of the stakeholder comments received provided?	/1/	DR	Yes		OK
G.1.5. Has due account been taken of any stakeholder comments received?	/1/	DR	Yes		OK

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
CAR 1: Letter of Approval is required from DNA of South Africa	A.3.3	The LoA from South Africa has now been provided.	Reviewed and closed.
CAR 2: Letter of Approval is required from DNA of Japan	Table 1, 4	The LoA has now been provided.	Reviewed and closed.
CAR 3: A number of the required scenarios for evaluation of the additionality in AM0011 have not been considered.	B.2.6	The scenarios have now been added in the consideration of the project additionality.	Reviewed and closed
CAR 4: The calculation of the baseline emissions uses organic carbon content as one of the parameters, but the numerical values of the different waste fractions are not given. Therefore the baseline is not transparent.	B.2.1	General notes for gas production modeling: 1. Landfill gas (LFG) potential yield assumed to be 1.87 Normal m3 landfill gas/kg organic C. 2. For each fraction, LFG production in m^3 in year t = 1.87*tonnes*1000 (kg/tonne)*organic C fraction*k*e^{-kt} with k in 1/yr and t in yr (van Zanten and Scheepers, 1994). This first order multicomponent model was compared with zero order, first order single component, and second order models in a validation study at 9 fulll-scale landfills in the Netherlands with detailed waste input data, showing the best fit to field LFG production. 3. Assumptions for biodegradable organic C content of waste fractions dry fraction Organic C (fraction dry) k (1/yr)	Reviewed and closed

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
		Domestic putresibles 0.50 0.80 0.07 Domestic paper 0.75 0.40 0.04 Only general/domestic waste assumed to be biodegradable. 4. Only included gas production in a given year from waste in place that could be "welled" in that year(using either vertical wells or horizontal collectors) for the gas production estimates for the Chloorkop CDM project. Notes for Chloorkop waste data: 1. General waste assumed to be 70% from affluent communities and 30% from non-affluent communities. Assumed waste fraction characteristics as follows [all mass fractions]: a. Affluent domestic waste assumed to be 0.45 putresibles [food, garden,etc.] and 0.25 paper. (based on Benoni data from Shamrock, 1998, putresibles 0.46 and paper 0.24) b. Non-affluent domestic waste assumed to be 0.20 putresibles and 0.05 paper (based on Wattville data from Shamrock, 1998, putresibles 0.18 and paper 0.04) 2. General (domestic) waste inputs as follows:	

<table>
<tr><th>Draft report corrective action requests and requests for clarifications</th><th>Ref. to Table 2</th><th>Summary of project participants' response</th><th>Final conclusion</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Year</td><td>Domestic Waste</td><td></td><td>Waste Total</td></tr>
<tr><td>1997</td><td>16412</td><td></td><td>16412</td></tr>
<tr><td>1998</td><td>137125</td><td></td><td>137125</td></tr>
<tr><td>1999</td><td>198239</td><td></td><td>198239</td></tr>
<tr><td>2000</td><td>312867</td><td></td><td>312867</td></tr>
<tr><td>2001</td><td>338733</td><td></td><td>338733</td></tr>
<tr><td>2002</td><td>327923</td><td></td><td>327923</td></tr>
<tr><td>2003</td><td>317114</td><td></td><td>317114</td></tr>
<tr><td>2004</td><td>279566</td><td></td><td>349457</td></tr>
<tr><td>2005</td><td>344429</td><td></td><td>430536</td></tr>
<tr><td>2006</td><td>344429</td><td></td><td>430536</td></tr>
<tr><td>2007</td><td>344429</td><td></td><td>430536</td></tr>
<tr><td>2008</td><td>344429</td><td></td><td>430536</td></tr>
<tr><td>2009</td><td>344429</td><td></td><td>430536</td></tr>
<tr><td>2010</td><td>344429</td><td></td><td>430536</td></tr>
<tr><td>2011</td><td>344429</td><td></td><td>430536</td></tr>
<tr><td>2012</td><td>344429</td><td></td><td>430536</td></tr>
</table>
Cumulative mass of waste= 4683409.41 tonnes and 4257644.92 m^3
</td><td></td></tr>
<tr><td>CAR 5: All the four landfill gas flow meters required by the methodology are not referred to in the monitoring plan. AM0011 requires flow meters for all three possible uses of the gas as well as a flow meter of the total collected landfill gas. Two flow meters is a minimum for a flaring project.</td><td>D.1.4</td><td>There will be no landfill gas utilization for this CDM project, which will include flaring only. Two flow meters will be installed to provide redundancy for monitoring the flow of gas being flared.</td><td>Reviewed and closed</td></tr>
<tr><td>CL 1: There is a contradiction between the different k-values used in section B.6.2 and Annex 3 of the PDD.</td><td>B.2.1</td><td>There is a typographical error.
The 0.07 and 0.04 values for the kinetic constants were reversed.
This section should read:</td><td>The numbers have been corrected and the clarification is closed.</td></tr>
</table>

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
		Data / Parameter: k Data unit: 1/year Description: kinetic constant 0.07 (putresible "rapidly" biodegradable fraction of landfilled waste) or 0.04 ("slowly" biodegradable paper fraction of landfilled waste). Source of data used: Pipatti, R., and Vieira, S., 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5: Waste, EXCEL spreadsheet IPCC_ Waste_Model_sb24. Value applied: either 0.07 (for "rapidly" biodegradable putresible fraction of landfilled waste) or 0.04 (for "slowly" biodegradable paper fraction of landfilled waste). Justification of the choice of data or description of measurement methods and procedures actually applied : The value of 0.07 is the minimum values for k for "dry tropical climate" for the rapidly degradable putresible fraction consisting mainly of food waste while 0.04 is the minimum values for k for "dry tropical climate" for the slowly degradable paper fraction. Using the minimum values adds conservatism to this calculation. Refer to Annex 3 of PDD for additional information.	

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
CL 2: Given that the landfill is open and given DNVs experience with regards to problems owing to implementation/operation, recovery of 75% is rather optimistic. More information is requested on how such high capture efficiency is assured.	B.2.2	Please refer to journal article published in Waste Management "Methane mass balance at three landfill sites: What is the efficiency of capture by gas collection systems?"; K. Spokas, J. Bogner, JP. Chanton, M. Morcet, C. Aran, C. Graff, Y. Moreau-Le Golvan, I. Hebe; *Waste Management* (Elsevier) 26:516-525 (2006) Based on this study, the default capture rate currently being using by ADEME (French Environment Agency) for sites with final soil cover is 85%. The Chloorkop landfill has controlled placement of waste in engineered cells with daily, intermediate, and final cover. Gas collection will be initiated in cells at final grade using vertical wells and then extended with horizontal collectors in areas still undergoing active filling. Gas collection can only be initiated from horizontals after they are covered by approx. 10 m. waste. Thus, given the well-engineered site, 75% can be considered conservative. In addition, there were several other conservative assumptions applied to the results of the theoretical modeling to derive the projected CERs, including consideration of wellfield development (which areas are "welled" in particular years), assumption of 40% CH_4 (v/v) in landfill gas, and taking only 50% of the modeled CERS resulting from the previous assumptions. International experience over the past 30 years for landfill gas recovery projects has indicated that theoretical modeling should be only	Reviewed and closed.

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
		used as a rough guideline to anticipated CH_4 recovery; therefore, these conservative assumptions have been applied.	
CL 3: Two months only were also used as basis for the 2005-2013 waste amount values, and this value is higher than all historical annual values. More evidence for this assumption is needed.	B.2.2.	**Refer to Tables 2, 3 and 4 and Graph 1 in Annex 1** **Comments are as follows:** **Table 2 - Tonnage data and Table 3 Airspace data for Jan 03 to Dec 06** The monthly tonnages were compared to the surveyed airspace (AS) consumption data for the site. Every 6 months all the Enviroserv landfills are surveyed, the data is converted to a Digital Terrain Model (DTM) and AS consumption measured by comparing the current site DTM to the DTM of the as built survey of the base of the cells. The current DTM is then also compared to the DTM model of the Final Landform (FLF) to generate the amount of remaining AS. The AS consumption data over the previous 6 months (AS consumed/time between surveys) is then used to model when the site will reach its capacity. The data is used by Enviroserv to calculate if the cell development costs write off, rehabilitation provisions and post closure provisions for the sites are correct and to calculate what portion of the gate fee must be set aside over the next 6 month period for these funds. These provisions are externally audited annually in June. From this tonnage and AS data the calculated waste density in place is 1.43	Additional information about the waste amount in relation to the remaining air space has been provided by the project participants. The evidence does satisfactory predict the future waste amounts and that enough space at the landfill is available for these waste amounts. Clarification closed.

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
		A few assumptions regarding cover material that has been diverted to the cover stockpile on site were made. When the site was initially started most of the cover material for the waste was derived from an on site borrow and construction and demolition (C&D) waste through the gate. Since 2005 these tonnages have increased dramatically with the closure of one of the regional sites belonging to the Johannesburg Council. This trend was observed and Enviroserv started diverting the excess C&D waste, i.e. that in excess of what was required for cover, to a cover stockpile. This initially was not recorded so I had to make some assumptions in the spreadsheet based on discussions with the site personnel. This data has now been formally recorded since June 2006. I have removed this tonnage from the tonnage into landfill as it has been set aside. It will be used as part of daily cover operations when C&D waste coming into site is scarce. In the past Enviroserv have accepted C&D waste free of charge, as the on site stockpile has now grown they have since November started charging for C&D waste. **Graph 1 : Tonnage graph** On this curve I have plotted the total tons into the site, excluding C&D waste to stockpile vs time and have fitted an exponential curve to the data forecasting till 2012	

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
		Table 4 - PDD comparison In this table there is a comparison with the data in the PDD vs the most recent recorded data The first seven years of data assumed total tons = domestic tons, this is most likely due to the fact that the majority of cover material was being derived from on site borrow areas and low tonnages of C&D waste. From 2004 onwards the 80/20 split between domestic and inert waste was used The time to closure, based on the latest AS consumption data, has moved forward to April 2012. In order to try and incorporate the expected tonnage increase based on the tonnage curve fit, the predicted tonnage in June of each year was taken and used that to forecast the annual tonnage for that year. This results in a total tonnage in the site at closure of 5.3 million tons. The PDD predicted 5.8 million tons. The density of the 5.3 million tons will be 1.22. If the calculated density (1.43) is taken and converted to tons in place (volume is fixed by the base and FLF DTM) the site can accommodate 6.2 million tons. The truth will probably lie somewhere between all these numbers. Given the fact that Jean Bogner has used a very conservative gas generation model we feel that the predicted gas generation rates are	

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
		still valid.	
CL 4: In the internal rate of return (net present value) analysis of those scenarios, costs for CDM verification have been included and the cost of gas analysis seems to be unrealistic. Gas analysis is according to Annex 4 measured continuously, whereas in the economical analysis is weekly analysis of 2000 Rand stated.	B.2.7	The start of credit (sale of CERs) for the project (flaring) has been changed from January 2007 to July 2007. The effect on the IRR is small. CDM verification costs have been removed for those scenarios where there is no sale of CERs. Frequency of routine gas analysis changed from once a week to once a month.	Reviewed and closed.
CL 5: A renewable crediting period of 7 years is selected, with the first crediting period starting on 1 January 2007. This is however before the expected starting date.	C.1.2	The start of credit (sale of CERs) for the project (flaring) has been changed from January 2007 to July 2007.	Reviewed and closed
CL 6: The accuracy of measurement methods is not given and how/where the calibration will be carried out is not stated.	D.1.3	Typically thermal mass flow meters have a wide turn down of up to 100:1, and are very sensitive to gas flow. Their typical accuracy is ± 5% or better. As we have not gone out on tender yet we are unable to say which specific instrument we will be getting, that is part of the scope of supply for the flare tender. We have however asked the bidders to supply measurement accuracy and calibration procedures as part of the tenders, which we will use as part of the evaluation process.	Reviewed and closed.
CL 7: AM0011 requires measurement of % (volume%) of methane in landfill gas, not density in g/m^3. %-values have to be recorded.	D.1.3	Gas analytical instruments measure the volumetric mixing ratio of the gas of interest and that will be the standard practice for this project.	Reviewed and closed
CL 8: It is not explained how the combustion efficiency will be measured, i.e. what type of	D.1.3	We would use the specification referred to in AM0011 version 2, which requires a	Reviewed and closed

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
measurement device that will be used.		source test for residual (unburned) hydrocarbons in the flare stack twice a year.	
CL 9: The temperature and pressure of the landfill gas have to be measured in order to calculate Nm^3 from m^3. In Annex 4 these parameters have been related to flare efficiency.	D.1.3	Standard calculations for mass/volume of a given gas at NTP require measurement of gas temperature (in K) and pressure and calculations using standard gas law equations. These measurements and calculations will be performed.	The improvement of Annex 4 is reviewed and the clarification is closed
CL 10: Archiving of data is not considered in the PDD.	D.4.1	See CL 6 above. As we have not gone out on tender yet we are unable to say which specific instruments and archiving procedures will be followed. The intent, however, is to develop an electronic archiving system, which is fully compatible with the instruments chosen and gives daily summaries of CH4 destroyed in the enclosed flare.	Reviewed and closed.
CL 11: It is not clear whether EnviroServ will carry out the construction themselves or not. The provider of the equipment is not specified.	D.6.1	Vertical wells and pipework will go out on civil tender to a contractor, Horizontal wells will be constructed by Enviroserv. The flare and ancillary equipment will be put out to tender	Reviewed and closed.
CL 12: The recovery fraction of methane has been described as 75%, but the calculations of project GHG emissions apparently have used different values, which also are different in different years	E.1.2	See CL2 above. The fraction of waste which is "welled" in a particular year is considered in the theoretical modelling results. Then the LFG in a given year from the "welled' waste in place is assumed to be 75% recoverable and contain 40% CH_4 (v/v).	Reviewed and closed.
CL 13: Calculations of emission reduction is based on 100% flare efficiency which is not realistic.	E.1.3	We could probably get 99% with a biannual source test to confirm. Enclosed flares combust LFG at 1000ºC or greater. For methane, this typically gives destruction efficiencies of >99%.	Reviewed and closed

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APPENDIX B

CERTIFICATES OF COMPETENCE

CERTIFICATE OF COMPETENCE

Raman Venkata Kakaraparthi

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Wilson Tang

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 13		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes		
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029	Yes		

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Einar Telnes

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	Yes
CDM Verifier:	Yes	***JI Verifier:***	Yes
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 1,2,3,6 & 10		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes	*AM0021*	Yes
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029	Yes	*AM0023*	Yes
ACM003, ACM0005, AM0033, AM0040	Yes	*AM0024*	Yes
ACM0004	Yes	*AM0027*	Yes
ACM0006, AM0007, AM0015, AM0036, AM0042	Yes	*AM0028, AM0034*	Yes
ACM0007	Yes	*AM0030*	Yes
ACM0008	Yes	*AM0031*	Yes
ACM0009, AM0008, AMS-III.B	Yes	*AM0032*	Yes
AM0006, AM0016, AMS-III.D	Yes	*AM0035*	Yes
AM0009, AM0037	Yes	*AM0038*	Yes
AM0013, AM0022, AM0025, AM00379, AMS-III.H, AMS-III.I	Yes	*AM0041*	Yes
AM0014	Yes	*AM0034*	Yes
AM0017	Yes	*AMS-II.A-F*	Yes
AM0018	Yes	*AMS-III.A*	Yes
AM0020	Yes	*AMS-III.E, AMS-III.F*	Yes

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Hendrik W. Brinks

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	-
CDM Verifier:	Yes	***JI Verifier:***	-
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope-12		

Høvik, 6 November 2006

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director