CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Beatrix Borehole Methane Capture Project : Borehole 1400
Version .0
Date: 13 November 2007

A.2. Description of the small-scale project activity:

Purpose:

The purpose of the project activity is to mitigate greenhouse gas emissions by capturing and destroying methane venting from exploration borehole number 1400. The borehole is situated in the mineral rights area of the Beatrix Goldmine in the Freestate province of South Africa.

Greenhouse gas reduction:

Borehole 1400 was drilled in the year 1979 during the gold exploration program in the area. The exact date of drilling is unknown as drilling records have been lost. The drilling program in the area has been ongoing since the early 1950's. The purpose of drilling the hole was to accurately define the underlying gold ore-body for mining purposes. Geological data such bulk density, porosity, fracturing, fluid flow, oxidation, and susceptibility of gold bearing reefs aid in the design of the gold mines and the planning of the mining operation.

Since the start of the drilling program 5 decades ago a number of boreholes have intersected methane-carrying geological structures. During the development of this project 488 holes were identified in the Gold Fields mining area. Only 38 of the identified boreholes are still venting methane at detectable levels. Five of these boreholes, geographically far apart from each other, are venting methane at rates that justify the implementation of greenhouse gas reduction projects. Borehole 1400 is one of them.

The methane from borehole 1400 will be destroyed by flaring in an enclosed flare.

Contribution to Sustainable Development:

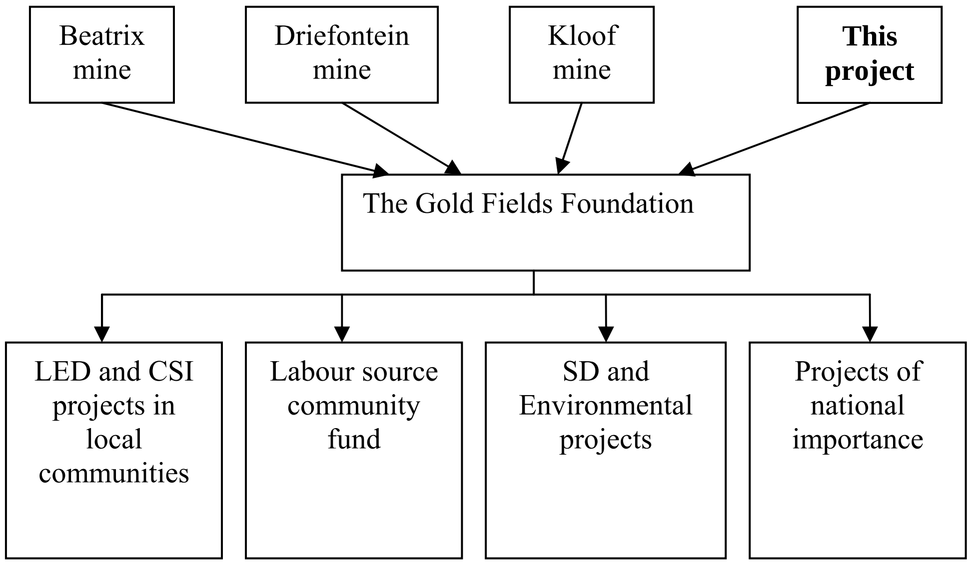
The project will make positive contributions to sustainable development. In terms of the sustainable development criteria published by the South African Designated National Authority, the sustainable development contribution is summarised under the following headings:

- **Social:**

  The project will assist in the social development of the region by via the Gold Fields Foundation. Work done by this Foundation forms the basis the social responsibility investment of Gold Fields in the region. The foundation is involved in a number of projects aimed at the social upliftment of the local communities. These projects target local economic development with positive environmental impact. The project gains significant economies of scale with respect to its impact of social development by contributing to this well established Foundation.

Gold Fields will use a percentage of the project revenue (R0.20 per ton of CO_2e and 0.5% of pretax profit) for the Goldfields Foundation.

The existing Gold Fields structure as well as the role of this project in the structure is presented below.



The four projects that Beatrix is currently involved in via the Goldfields foundation are:

Golden Oils, managed by Gold Fields' Agrihold, is a business focused on the commercialisation of indigenous plants identified through bio-prospecting research and development activity. The domain of bio-prospecting has been identified by government as a key component in addressing poverty alleviation by utilising the nation's natural asset base (plant kingdom) and extracting beneficial oils and essences. The opportunity of creating a new niche export industry for the economy is clearly aligned to national economic imperatives and local IDP's and, if proven to be successful, will enable repetition of "outgrow" farm schemes on a national basis, thus assisting in addressing the socio-economic developmental needs of our labour-sourcing communities.

The Lejweleputswa District has identified the provision of bulk water services for communities and industrial use as a major area for attention. In discussion and consultation with the District Municipality, Beatrix mine has been asked to consider a bulk water supply project to provide water in the Tokologo area. As part of this project, Beatrix will spend R630,000 over the next two years to access subterranean aqua-flow which will be pumped to the surface for use in the Tokologo district. This project will benefit communities in the area by:

- Residential consumption;
- Industrial use;
- Tourism development in the form of a game ranch;
- Employment creation in that people will be needed to build and maintain the facilities and then to staff these facilities such as the game ranch once completed; and
- People growth through portable skills training for the local community at the Bompodi development centre.

In Masilonyana a proactive project in addressing land and housing shortages has been designed. Beatrix has partnered with the district municipality to develop an integrated residential subsidised housing project in Masilonyana. The Sunrise Housing Association is currently in the process of securing subsidies from the provincial housing board. Once confirmation is received, the project can move to an implementation phase which is expected to be in February 2008.

Beatrix is creating day-care facilities which will go a long way to allow community members to become economically active. Many women and single parent family units are currently restricted or hampered in their freedom to become economically active because they have obligations in terms of the development and growth of their children. The quality development of community members and their ability to focus on their work is dependent on their state of mind. Beatrix has developed a day-care centre in Welkom in June 2007, and is planning on opening one in Theunissen by 2008 and another one on Virginia by 2009. The cost incurred in opening these centres will be R1,8 m over a period of 3 years and will create employment for approximately 27 people.

- **Environmental:**

The project makes a contribution to greenhouse gas emission reduction on a global scale.

The project makes a positive local environmental impact in the reduction of the risk of, and intensity of veld fires in the area. The risk of veld fires in the area comes from lightning strikes or human activity. This risk is aggravated by the presence of methane venting from boreholes. The project will therefore result in reduced risk of fires to grazing pastures, crops and informal settlements.

- **Economic:**

The project will contribute to the earnings of the Beatrix mine. It will have the highly beneficial impact of decreasing the volatility of the normal earnings profile of the mine which results from a volatile commodity price (gold) and the normal cyclical changes associated with the South African currency. The Beatrix gold mine comprises of gold deposits of various grades. More of these marginal gold deposits will become economically viable to mine if carbon credits could be earned to act as a subsidy. The contribution of the CERs towards the mine's income profile will be to enhance the mine's income and to reduce the volatility of the mine's income. The total life of the mine could be prolonged. Beatrix currently employs 12,000 people and as this project will enhance the viability of mining marginal gold mining reserves, the project will assist with protecting the jobs of the employees at the mine.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of South Africa (host)	Gold Fields Ltd	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		
Note: *When the PDD is filled in support of a proposed new methodology (forms CDM-NBM and CDM-NMM),* at least the host Party(ies) and any known project participant (e.g. those proposing a new methodology) shall be identified.		

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

The host party is the Republic of South Africa

A.4.1.2. Region/State/Province etc.:

The project is located in the Free State Province

A.4.1.3. City/Town/Community etc:

The project is located in the area know as the “Welkom Gold Fields”, close to the town of Virginia.

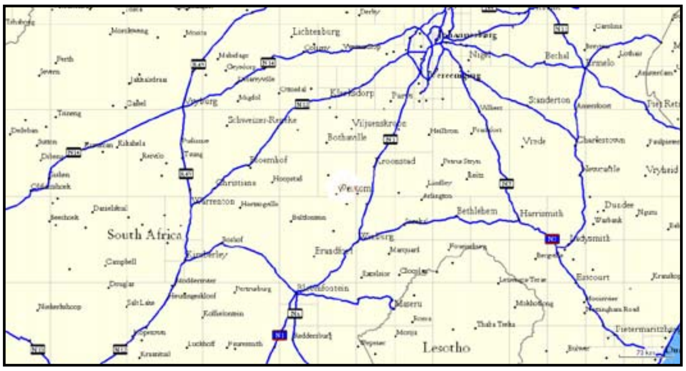
A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

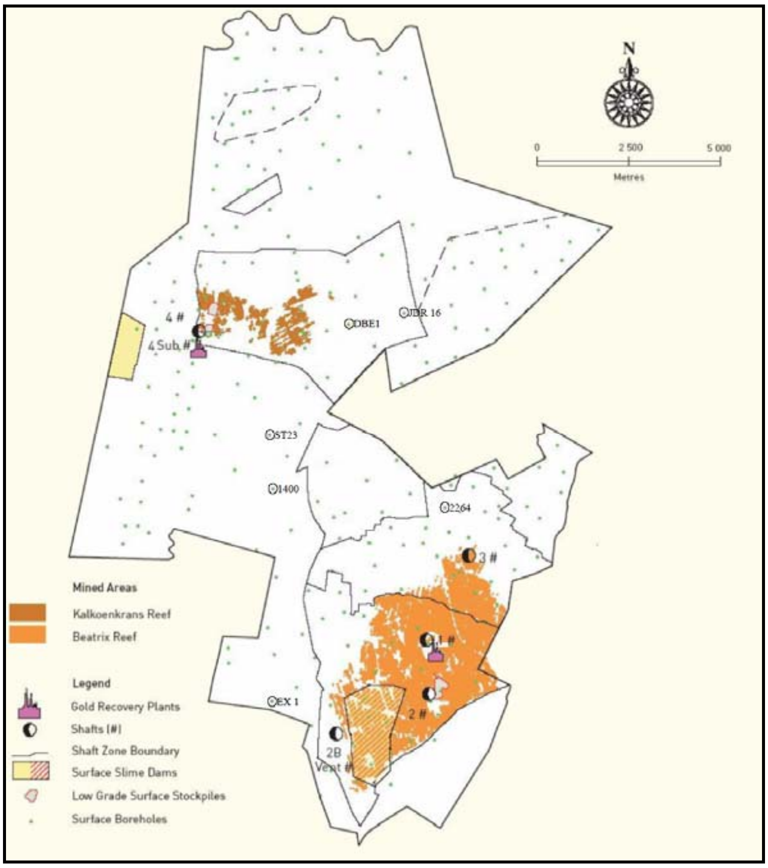
The Beatrix mine is located on the farm Leeubult 52 in the district of Theunisen. Borehole 1400 as well as the locations of the other boreholes currently venting methane at reasonable flow rates are summarized in the table below.

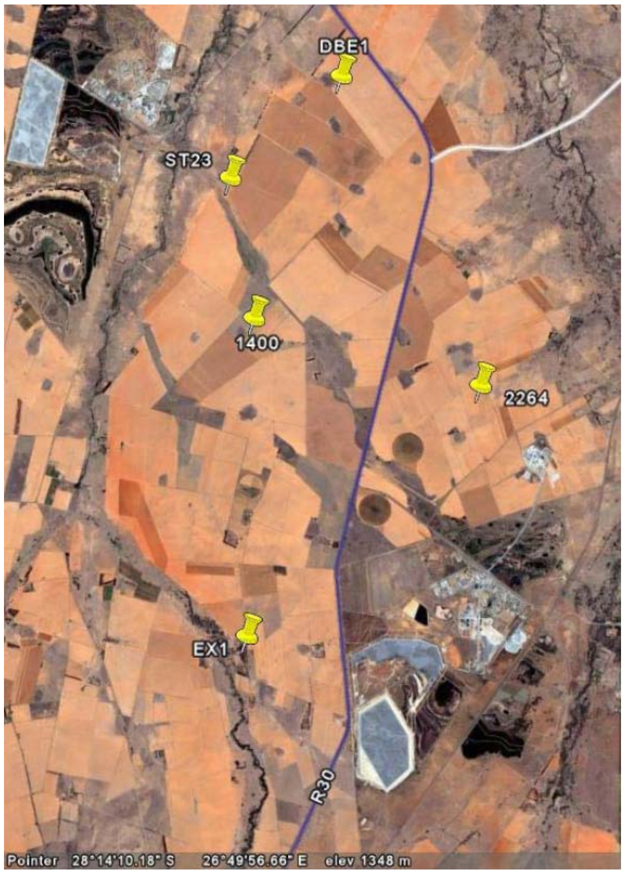
Table 1: CDM borehole project locations

Hole Number (Unique ID)	**1400**
Coordinates	S28 13.323 E26 44.607
Surface location	Tewie
Methane flow in 2005	35 l/s
Methane flow in 2006	30 l/s
Date Drilled	1979
Depth of borehole	1,459 m
Diameter of borehole	70 mm

The location is indicated below:







A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

Type III projects-other project activities that reduce anthropogenic emissions by less than 60 kilotonnes of carbon dioxide equivalent annually.

The technology measure is the capture and destroying of methane released from geological structures as a direct result of mining and related activities. Methane from this borehole will be destroyed through flaring.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The estimated amount of emission reduction over the chosen crediting period is:

Years	**Annual estimation of emission reduction in tonnes of CO2e**
	1400
2008	11 550
2009	11 550
2010	11 550
2011	11 550
2012	11 550
2013	11 550
2014	11 550
Total estimated reductions (tonnes of CO2e)	**80 850**
Total number of crediting years	**7 (renewable twice)**
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	11 550

A.4.4. Public funding of the small-scale project activity:

No public funding has been used in the development of this project and no public funding will be used in its implementation.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The guidance of the EB with respect to debundling states that a project activity will be deemed to be a debundled component of a large scale project if two projects by the same project participant are within one kilometre of each other. Gold Fields will register five separate small scale projects, with the closest distance between two venting boreholes being 2.48 km. The distances between all the boreholes are summarized in the table below. In addition the surface rights for each CDM small scale borehole projects belong to different owners. This confirms that each project is a stand alone projects and not a debundled component of a large scale project.

Table 2 Distances between the five separate small scale borehole CDM projects

	DBE1	EX1	ST23	1400	2264
DBE1	0				
EX1	9.91 km	0			
ST23	2.62 km	8.09 km	0		
1400	4.48 km	5.49 km	2.48 km	0	
2264	5.97 km	5.99 km	5.72 km	4.17 km	0

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

New methodology Type III

B.2 Justification of the choice of the project category:

The project meets the applicability criteria

1. The methane venting on the Beatrix property is the result of a geological structure. Historically, methane emissions from mining operations have occurred at depths ranging from 300 meters to 3 kilometres in the geological formations from the Karoo Supergroup through to the Virginia Formation. The methane in the Beatrix mining area is not liberated homogeneously as is the case in coal beds. Methane is carried in geological faults from some unknown reservoir(s) or source(s). Scientific research into the occurrence of the methane indicates that (a) the methane seems to come from a deep-seated source, and (b) that it may be of biological origin. Historic observations are that the methane emissions from these holes can be once off during drilling or intermittent. It is believed that the rate of methane emission depends on variables such as ground water level and rain fall. It is further believed that holes that are currently emitting methane may stop in the future, and holes that have stopped may start emitting methane again. Trials to reduce the methane hazard in future mining operations through drainage boreholes has failed as it is not possible to know the locations and pressure where combustible gases will be found.

2. a) For safety reasons no boreholes may be blocked and will therefore continue to vent methane as per the current practice. Photos showing the state of two of the bore holes are below. The other three boreholes just look like a hole in the ground and can only be traced via their respective GPS coordinates.

Hole EX1

Hole ST23

2. b) The boreholes were drilled solely for the prospecting of gold and not as pre mining drainage. Borehole information regarding the exploration borehole in terms of the descriptive log and detailed geological analysis of all boreholes are available.

3. The methane from these boreholes have been to date, and are currently, just venting into the atmosphere.

4. The methane will be destroyed on site and will not be transported or distributed outside the mining property. The small volumes of methane and remote locations do not justify any piping installation or other use of the gas. A lease is signed with the owner of the surface rights to allow fencing of the enclosed flare, monitoring equipment and a fire path around the fence.

5. This borehole is located on the terrain of an active underground goldmine however the borehole is more than 1 km from any other borehole or underground mining activity and is therefore a stand alone CDM project.

6. Capturing and destroying the methane from borehole EX1 will result in an estimated 11 550 tCO_2e/year well below the 60 000 tCO_2e/year limit of small scale projects.

7. The unpredictability of the gas flow rate, the low estimated flowrates as well as the distance to any consumer does not justify the generation of heat or electricity from this borehole.

B.3. Description of the project boundary:

In accordance with the methodology the project boundary is the actual area of the borehole and the surrounding fence or fire path.

B.4. Description of baseline and its development:

The baseline scenario is the situation where, in the absence of the project activity, methane is emitted to atmosphere. There is no flaring in the baseline.

It has happened in the past that some of the methane emitting surface boreholes caught fire and remained burning. In such cases the fires are always extinguished immediately by the farmers as these burning holes could, in strong windy conditions, cause veld fires again that lead to the destruction of grazing land and crop. As veld fires are typically started by lightning, negligent smokers or cooking fires and not the boreholes itself, no emissions from the burning of grassland is taken into account.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

In accordance with the simplified modalities and procedures for small scale projects this project activity should demonstrate that it is additional and would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

> To date no improvements have been made to the boreholes eg fencing them off due to the high incidence of theft in the area. Installing a flare and monitoring equipment as well as accompanying security devices will require capital which, without income from carbon credits, can not be justified. There is no other revenue for this project apart from carbon credits.

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

> Venting the boreholes requires no maintenance or monitoring and has been the accepted practice to date. An enclosed flare with monitoring equipment would be new technology for the area.

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

> There is no policy or regulations preventing the release of methane in South Africa. In terms of the Mines Health and Safety Act employers and employees are obliged to identify hazards and eliminate, control or minimise the risk to health and safety. Operational experience on Beatrix has lead the management to believe that the sealing off of surface holes forces methane that would have escaped on surface to escape into working areas. This increases the risk of workers in these working areas. The sealing of surface holes is therefore not allowed by management. See Annex 3 regarding the safety record of the mine.

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

> Logistical risk: The boreholes are located far from any other development and, combined with access constraints on farm roads the maintenance and monitoring of the flare is a risk to the project.
> There is a perceived fire risk associated with a permanent flame located in an agricultural crop. Currently if the borehole catches accidentally fire through lightning it will be put out to reduce veldfire risk. There is no incentive to install a flare apart from this project obtaining funding for emission reductions.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

An enclosed flare will be installed, as enclosed flares significantly reduce the risk of veldfires and offer higher methane destruction efficiencies.

Emission reduction is the difference between the methane released in the absence of the enclosed flare and the project emissions.

Project emissions are determined by the methodological tool to determine the project emissions from flaring gases containing methane (EB 28 Annex 13).

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$\mathbf{FV_{RG,h}}$
Data unit:	m^3/h
Description:	Volumetric flow rate of the residual gas (dry basis) at normal conditions as defined by the "tool to determine project emissions from flaring gases containing methane"
Source of data used:	Measurements on site
Value applied:	88.56 m^3/h
Justification of the choice of data or description of measurement methods and procedures actually applied :	Variety of different measurement techniques were employed. The methane emitted from the boreholes was measured according to the following procedure: 1.) Flow measurements were taken with a vane anemometer 2.) Methane concentration measurements were taken with handheld analysers 3.) Methane temperature measurements electronic thermometer 4.) Atmospheric pressure was measured with electronic barometer 5.) Inside diameter of the pipe was measured with vernier The most conservative value was taken as basis for the emission reduction calculations
Any comment:	

Data / Parameter:	**fv_{CH4}**
Data unit:	%
Description:	Methane concentration
Source of data used:	Field measurements with portable methane analyzer.
Value applied:	99%
Justification of the choice of data or description of measurement methods and procedures actually applied :	In accordance with the tool, as a simplified approach, project participants may only measure the volumetric fraction of methane and consider the difference to 100% being nitrogen.
Any comment:	

Data / Parameter:	GPS coordinates
Data unit:	Longitude and latitude
Description:	Location of the borehole 1400
Source of data used:	Measurement with Garmin GPS
Value applied:	S28 13.323 E26 44.607
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

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Flaring Tool Equation 1	**Unit**	**1400**
$FM_{RG,h} = \rho_{RG,n,h} \times FV_{RG,h}$	kg/h	63.41
$\rho_{RG,n,h}$	kg/m^3	0.716
$FV_{RG,h}$	m^3/hr	88.56

Flaring Tool Equation 2	**Unit**	**1400**
$\rho_{RG,n,h} = P_n /((R_u/MM_{RG,h} * T_n)$	kg/m^3	0.7210
P_n	Pa	101,325
R_u	$Pa.m^3/kmol.K$	8,314
$MM_{RG,h}$	kg/kmol	16.16
T_n	K	273.15

Flaring Tool Equation 3	Unit	1400
$MM_{RG,h} = \sum(fv_{i,h} * MM_i)$		16.1598
fv_{CH4}	-	99%
MM_{CH4}	kg/kmol	16.04
fv_{N2}	-	1%
MM_{N2}	kg/kmol	28.02

Flaring Tool Equation 4 part 1	Unit	1400
$fm_{C,h} = (\sum fv_{i,h} * AM_j * NA_j)/MM_{RG,h}$	-	0.7352
fv_{CH4}	-	99%
fv_{N2}	-	1%
AM_C	kg/kmol	12
$NA_{C,CH4}$	-	1
$NA_{C, N2}$	-	0
$MM_{RG,h}$	kg/kmol	16.1598

Flaring Tool Equation 4 part 2	Unit	1400
$fm_{H,h} = (\sum fv_{i,h} * AM_j * NA_j)/MM_{RG,h}$	-	0.2475
fv_{CH4}	-	99%
fv_{N2}	-	1%
$NA_{H,CH4}$	-	4
AM_H	kg/kmol	1.01
$NA_{H,N2}$	-	0
$MM_{RG,h}$	kg/kmol	16.1598

Flaring Tool Equation 4 part 3	Unit	1400
$fm_{O,h} = (\sum fv_{i,h} * AM_j * NA_j)/MM_{RG,h}$	-	0
fv_{CH4}	-	99%
fv_{N2}	-	1%
$NA_{O,CH4}$	-	0
$NA_{O,N2}$	-	0
AM_N	kg/kmol	14.01
$MM_{RG,h}$	kg/kmol	16.1598

Flaring Tool Equation 4 part 4	Unit	1400
$fm_{N,h} = (\sum fv_{i,h} * AM_j * NA_j)/MM_{RG,h}$	-	0.017
fv_{CH4}	-	99%
fv_{N2}	-	1%
AM_C	kg/kmol	12
AM_H	kg/kmol	1.01
AM_N	kg/kmol	14.01
$MM_{RG,h}$	kg/kmol	16.16

Flaring Tool Equation 5	Unit	1400
$TV_{n,FG,h} = V_{n,FG,h} * FM_{RG,h}$	m^3/h	103.43
$V_{n,FG,h}$	m^3/kg residual gas	1.63
$FM_{RG,h}$	kg residual gas/h	63.41

Flaring Tool Equation 6	Unit	1400
$V_{n,FG,h} = V_{n,CO2,h} + V_{n,O2,h} + V_{n,N2,h}$	m^3/kg residual gas	1.6312
$V_{n,CO2,h}$	m^3/kg residual gas	1.372
$V_{n,O2,h}$	m^3/kg residual gas	0.2589
$V_{n,N2,h}$	m^3/kg residual gas	0

Flaring Tool Equation 7	Unit	1400
$V_{n,O2,h} = n_{O2,h} * MV_n$	m^3/kg residual gas	0.2589
$N_{O2,h}$	kmol/kg residual gas	0.0116
MV_n	m^3/kmol	22.4

Flaring Tool Equation 8	Unit	1400
$\mathbf{V_{n,N2,h}} = MV_n*[fm_{N,h}/200AM_n + [[1-MF_{O2}]/MF_{O2}]*[F_h + n_{O2,h}]]$	m^3/kg residual gas	11.299
MV_n	m^3/kmol	22.4
$fm_{N,h}$	NA	0.017
AM_n	kg/kmol	14.01
MF_{O2}	NA	0.21
F_h	kmol/kg residual gas	0.12253
$n_{O2,h}$	kmol/kg residual gas	0.0116

Flaring Tool Equation 9	Unit	1400
$V_{n,CO2,g} = fm_{C,h}/AMc*MV_n$	m^3/kg residual gas	1.372
$fm_{C,h}$	NA	0.735
AM_C	kg/kmol	12
MV_n	m^3/kmol	22.4

Flaring Tool Equation 10	Unit	1400
$n_{O2,h} = t_{O2,h}/[1-[t_{O2,h}/MF_{O2}]] * [fm_{C,h}/AM_C + fm_{N,h}/2AM_N + [[1-MF_{O2}]/MF_{O2}]*F_h]$	kmol/kg residual gas	0.0116
$t_{O2,h}$	NA	0.020
MF_{O2}	NA	0.21
F_h	kmol/kg residual gas	0.12253
$fm_{C,h}$	NA	0.735
$fm_{N,h}$	NA	0.017
AM_C	kg/kmol	12
AM_N	kg/kmol	14.01

Flaring Tool Equation 11	Unit	1400
$F_h = fm_{C,h}/AM_C + fm_{H,h}/4AM_H – fm_{O,h}/2AM_O$	kmol O_2/kg residual gas	0.1225
$fm_{C,h}$	NA	0.735
$fm_{H,h}$	NA	0.248
$fm_{O,h}$	NA	0
AM_C	kg/kmol	12
AM_H	kg/kmol	1.01
AM_O	kg/kmol	16

Flaring Tool Equation 12	Unit	1400
$TM_{FG,h} = [TV_{n,FG,h} * fv_{CH4,FG,h}] /1000,000$	kg/h	0.62056
TV (n,FG,h)	m^3/h exhaust gas	103.4
$fv_{CH4,FG,h}$	mg/m	6000
Flaring Tool Equation 13		
$TM_{RG,h} = FV_{RG,h} * fv_{CH4,RG,h} * \rho_{CH4,n}$	kg/h	62.77
$FV_{RG,h}$	m^3/h	88.6
$fv_{CH4,RG,h}$		0.99
$\rho_{CH4,n}$	kg/ m^3	0.716
Flaring Tool Equation 14		
$\eta_{flare,h} = 1 – TM_{FG,h}/TM_{RG,h}$		99.01%
$TM_{FG,h}$	kg/h	0.62056
$TM_{RG,h}$	kg/h	62.77
Flaring Tool Equation 15		
$PE_{flare,y} = \Sigma_{8760} TM_{RG,h}*[1-\eta_{flare,h}]*$	tCO2e	114
$GWP_{CH4}/1000$		
$TM_{RH,h}$	kg/h	62.77
$\eta_{flare,h}$		99.01%
GWP_{CH4}	tCO2e/ tCH4	21

Baseline Emission Equation **$BE_y = FM_{RG,h} * h * GWP_{CH4} / 1000$**	**Unit**	**1400**
BE_y	tCO2e/y	11,664
$FM_{RG,h}$	kg/hr	63.41
H	hours per year	8,760
GWP_{CH4}	tCO2e/tCH4	21

B.6.4 Summary of the ex-ante estimation of emission reductions:

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Emission Reduction Equation **$ER_y = BE_y – PE_y$**	**Unit**	**1400**
BE_y	tCO_2e/year	11,664
PE_y	tCO_2e/year	114
ER_y	tCO_2e/year	11,550

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	$fv_{\mathbf{CH4,\ h}}$
Data unit:	-
Description:	Volumetric fraction of component CH_4 in the residual gas in the hour *h*
Source of data to be used:	Measurements by project participants using a continuous gas analyser
Value of data	
Description of measurement methods and procedures to be applied:	Ensure that the same basis (dry or wet) is considered for this measurement and the measurement of the volumetric flow rate of the residual gas ($FV_{RG,\ h}$) when the residual gas temperature exceeds 60°C
Monitoring frequency	Continuously. Values to be averaged hourly or at shorter time interval
QA/QC procedures to be applied:	Analysers must be periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard certified gas.
Any comment:	As a simplified approach, project participants may only measure the methane content of the residual gas and consider the remaining part as N_2.

Data / Parameter:	$FV_{RG,h}$
Data unit:	Mg/m^3
Description:	Concentration of the residual gas in the dry basis at normal conditions in the hour *h*
Source of data to be used:	Measurements by project participants using a flow meter
Value of data	
Description of measurement methods and procedures to be applied:	Ensure that the same basis (dry or wet) is considered for this measurement and the measurement of volumetric fraction of all components in the residual gas ($fv_{i,h}$) when the residual gas temperature exceeds 60°C
Monitoring frequency	Continuously. Values to be averaged hourly or at a shorter time interval
QA/QC procedures to be applied:	Flow meters are to be periodically calibrated according to the manufacturer's recommendation.
Any comment:	Monitoring of this parameter is only applicable in case of enclosed flares and continuous monitoring of the flare efficiency. Measurement instruments may read ppmv or % values. To convert from ppmv to mg/m^3 simply multiply by 0.716. 1% equal 10 000 ppmv.

Data / Parameter:	$t_{O2, h}$
Data unit:	-
Description:	Volumetric fraction of O_2 in the exhaust gas of the flare in the hour *h*
Source of data to be used:	Measurements by project participants using a continuous gas anlayser
Value of data	
Description of measurement methods and procedures to be applied:	Extractive sampling analysers with water and particulates removal devices or in situ analysers for wet basis determination. The point of measurement (sampling point) shall be in the upper section of the flare (80% of total flare height). Sampling shall be conducted with appropriate sampling probes adequate to high temperatures level (e.g. inconel probes). An excessively high temperature at the sampling point (above 700°C) may be an indication that the flare is not being adequately operated or that its capacity is not adequate to the actual flow.
Monitoring frequency	Continuously. Values to be averaged hourly or at shorter time interval
QA/QC procedures to be applied:	Analysers must be periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard gas.

Data / Parameter:	$fv_{CH4,FG,h}$
Data unit:	Mg/m^3
Description:	Concentration of methane in the exhaust gas of the flare in dry basis at normal conditions in the hour *h*
Source of data to be used:	Measurements by project participants using a continuous gas analyser
Value of data	
Description of measurement methods and procedures to be applied:	Extractive sampling analysers with water and particulates removal devices or in situ analyser for wet basis determination. The point of measurement (sampling point) shall be in the upper section of the flare (80% of total flare height). Sampling shall be conducted with appropriate sampling probes adequate to high temperatures level (above 700°C) may be an indication that the flare is not being adequately operated or that its capacity is not adequate to the actual flow.
Monitoring frequency	Continuously. Values to be averaged hourly or at a shorter time interval
QA/QC procedures to be applied:	Analysers must be periodically calibrated according to manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard gas.
Any comment:	Monitoring of this parameter is only applicable in case of enclosed flares and continuous monitoring of the flare efficiency. Measurement instruments may read ppmv or % values. To convert from ppmv to mg/m^3 simply multiply by 0.716. 1% equal 10 000 ppmv.

Data / Parameter:	$\mathbf{T_{flare}}$

Data unit:	° C
Description:	Temperature in the exhaust gas of the flare
Source of data to be used:	Measurements by project participants
Value of data	Around or above 500 ° C
Description of measurement methods and procedures to be applied:	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. A temperature above 500°C indicates that a significant amount of gases are still being burnt and that the flare is operating.
Monitoring frequency:	Continuously
QA/QC procedures to be applied:	Thermocouples should be replaced or calibrated every year.
Any comment:	An excessively high temperature at the sampling point (above 700°C) may be an indication that the flare is not being adequately operated or that its capacity is not adequate to the actual flow.

B.7.2 Description of the monitoring plan:

The collection of the monitoring data will be the responsibility of the environmental manager at the mine. The calculations and the drafting of the emission reduction report will be the responsibility of the Promethium Carbon. The procedures for collecting the data, maintenance and calibration of the monitoring equipment will be incorporated into the existing ISO documentation and the associated quality control procedures. The CDM data will form part of internal audit at the mine. Archiving of the data and annual emission reduction reports will at the Goldfields head office under the care of the chief ventilation and air quality officer.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Promethium Carbon Pty(Ltd) completed the baseline and monitoring plan in July 2007

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

Jan 2008

C.1.2. Expected operational lifetime of the project activity:

Duration of the equipment, if maintained in accordance with manufacturers instructions is beyond 21 years.

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

1 January 2008

C.2.1.2. Length of the first crediting period:

Seven years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

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D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The South African National Environmental Act does not require an environmental impact study for erecting an enclosed flare.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The environmental impacts are positive as the methane is destroyed and the risk of veldfires is reduced.

SECTION E. Stakeholders' comments

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E.1. Brief description how comments by local stakeholders have been invited and compiled:

The mining rights, including surface boreholes, belong to Goldfields Ltd, while the surface area belongs to a number of farmers. The surface is actively used as farming land. The respective farmers and other stakeholders were contacted and informed about this project. This process is ongoing and details will be included in the final PDD prior to project validation.

E.2. Summary of the comments received:

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E.3. Report on how due account was taken of any comments received:

>>

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Promethium Carbon
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Represented by:	
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Salutation:	
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Middle Name:	
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Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding has been used in the development of this project or will be needed for the implementation of the project

Annex 3

BASELINE INFORMATION

Boreholes on the Beatrix property

Borehole ID	Y WGS84	X WGS84	% CH 4	Velocity m/s	Hole diameter
1174	28714.154	3123438.563	3%	BDL[1]	150mm
1176	24069.384	3127597.397	100%	BDL	100mm
1352	19385.181	3125568.723	6%	BDL	75mm
1400	25191.261	3123081.825	100%	9m/s	70mm
1629	26809.465	3110764.878	100%	BDL	50mm
1732	25736.949	3117018.79	12%	BDL	200mm
1733	25843.739	3119518.378	100%	BDL	100mm
1781	26512.481	3118039.01	92%	BDL	100mm
1849	26164.008	3116053.485	2%	BDL	150mm
1884	26490.269	3117008.611	1%	BDL	100mm
1919	18437.239	3124455.804	5%	BDL	100mm
1998	17539.88	3124544.975	12%	BDL	100
2035	20227.988	3125308.683	85%	BDL	100mm
2043	19219.029	3126179.484	35%	BDL	100
2044	19806.845	3125860.688	70%	BDL	100mm
2178	22957.824	3130912.109	88%	BDL	100mm
2264	21122.094	3124136.732	100%	1.88m/s	100mm
AGR1	25740.911	3113776.2	12%	BDL	50mm
B10	close to main road		88%	BDL	150mm
DBE1			55%	5m/s	75mm
DDG1			78%	BDL	50mm
DR4	20436.903	3118076.082	1.60%	BDL	100mm
DR7	23638.857	3121067.163	52%	BDL	75mm
DWV11LG	21903.763	3122329.004	100%	BDL	75mm
DWV11O	21903.763	3122329.004	100%	BDL	75mm
EX1			100%	18.5m/s	75mm
JDR11	19504.312	3118841.493	20%	BDL	150mm
JDR16	21271.807	3118471.472	100%	Not measured	75mm
MD4-Lower	26448.136	3112510.212	100%	BDL	50mm
MD5	27287.591	3114703.162	Not measured	BDL	100mm
MD6	27441	3112202	100%	BDL	105mm

[1] DBL - Below Detection Limit

Borehole ID	Y WGS84	X WGS84	% CH 4	Velocity m/s	Hole diameter
MD7	27399.651	3112958.551	1.20%	BDL	50mm
SR17	24996.954	3114014.129	5%	BDL	75mm
SR20	25176.69	3112887.057	5%	BDL	75mm
ST17	24287.599	3120352.646	100%	BDL	75 mm
ST22	24465.26	3121326.444	50%	BDL	150mm
ST23	25673.312	3120626.47	100%	10.3m/s	130mm

Safety considerations:

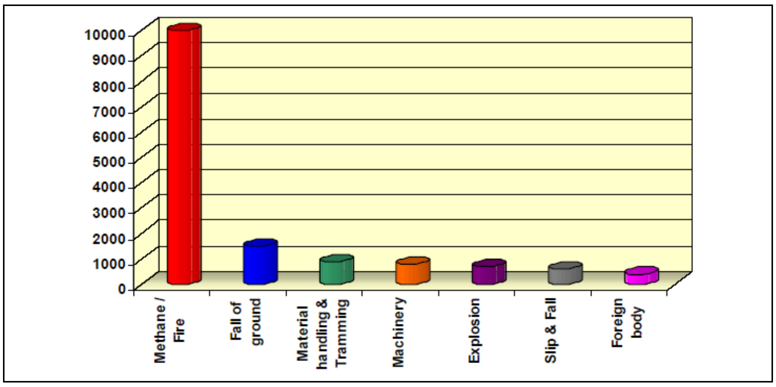
No boreholes in the area may be plugged or closed as a safety measure for the underground mining activities. A summary of the safety related incidents due to the occurrence of methane in Beatrix is provided in Table 1 below:

Year	**Cause**	**Outcome**
1983	Methane explosion in Beisa section	16 Fatalities
1989	Methane, explosion during blasting	No effect
1990	Oxygen deficiency in raise due to methane	1 Fatality
1993	Methane, ignition – during blasting	1Injury - burns
1995	Methane, ignition – during blasting	2 Fatalities
1999	Methane, fire in sealed off area	No effect
1999	Methane, fire during blasting	No effect
1999	Methane, ignition – during blasting	1 Fatality
2000	Methane, explosion – Cause unknown	7 Fatalities
2001	Methane, explosion – Cause unknown	13 Fatalities

Table 1: Methane related safety incidents at Beatrix

The impact of methane on the operations can be seen in the annual baseline risk assessments done by Beatrix management in the mine as required by the Mines Health and Safety Act. In 2001 (Figure 1 below) methane and fire related hazards is identified as the major risk in the Beatrix operation.

Figure 1: Beatrix Risk Assessment – 2001



Annex 4

MONITORING INFORMATION

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