

**2012**

**March**



**Bonavista Acid Gas Injection at South Rosevear  
Project Report**

**Preferred Carbon Land  
Management Solutions**

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## 1. Project Scope and Project Description

<b>Project Title:</b>	Bonavista Acid Gas Injection at South Rosevear
<b>Project Purpose and Objective:</b>	This project's purpose and objective is to determine the direct and indirect emission reductions as a result of the continued operation of AGI at the South Rosevear Gas Plant under the new management of Bonavista Petroleum. This project is a continuation of a previously registered project: Suncor South Rosevear Acid Gas Injection Project, CSA Project Identifier #2959-5549. <sup>1</sup>
<b>Project Start Date:</b>	March 5, 2007
<b>Credit Start Date:</b>	March 5, 2007
<b>Credit Duration Period:</b>	March 5, 2007 to March 4, 2015
<b>Expected Project Lifetime:</b>	This project concludes March 4, 2015. However, on or before this date the project will be re-examined and may apply for a 5 year crediting extension.
<b>Reporting Period:</b>	January 1, 2010 to December 31, 2011
<b>Estimated Emission Reductions</b>	Previously claimed GHG emission reductions are as follows:  2007: 14,950 tonnes of CO <sub>2</sub> e  2008: 7,469 tonnes of CO <sub>2</sub> e  2009: 3,145 tonnes of CO <sub>2</sub> e  Total: 25,564 tonnes of CO <sub>2</sub> e  For the time period of this report, the project GHG emission reductions are as follows:  2010: 18,650 tonnes of CO <sub>2</sub> e  2011: 13,775 tonnes of CO <sub>2</sub> e

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<sup>1</sup> Suncor South Rosevear Acid Gas Injection Offset Project registered on the Alberta Emission Offset Registry and listed at [http://www.carbonoffsetsolutions.ca/aeor/index.php?p=view\\_project&id=149](http://www.carbonoffsetsolutions.ca/aeor/index.php?p=view_project&id=149).

Total: 32,425 tonnes of CO<sub>2</sub>e

**Quantification Protocol:** Quantification Protocol for Acid Gas Injection, May 2008, Version 1, Alberta Environment.

**Protocol Justification:** The selected Protocol (Quantification Protocol for Acid Gas Injection, May 2008, Version 1, Alberta Environment) has direct applicability to this project as it sets out both the eligibility and quantification requirements for the resultant GHG emission reductions. Furthermore, the Protocol sets out the requirements for the project activities to be considered additional, real and, demonstrable.

The project captures and permanently sequesters the acid gas stream that previously was processed by a Sulphur Recovery Unit (SRU). The project also eliminates the previous requirement to incinerate a significant amount of tail gas from the SRU, further reducing GHG emissions from the baseline.

**Project Legal Land Description:** This project is located in Alberta at the South Rosevear Gas Plant and is unchanged from the previous project<sup>2</sup>.

Acid gas processing occurs at the Gas Plant which is located at LSD 16-11-54-15 W5

The acid gas injection well is located at LSD 8-11-54-15 W5

**Ownership:** Bonavista Petroleum is the majority owner and operator of the South Rosevear Gas Plant.<sup>3</sup> Bonavista Petroleum has the legal authority to bind the facility and its operations as it relates to the GHG reductions created in this project. Preferred Carbon Land Management Solutions (PCLMS) has acquired the GHG reductions created in this project.

**Reporting and Verification:** The reporting period for this project begins January 1, 2010 and ends December 31, 2011 with an annual delineation of the resultant GHG reductions.

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<sup>2</sup> Suncor South Rosevear Acid Gas Injection Offset Project, CSA Project Identifier #2959-5549.

<sup>3</sup> Bonavista Petroleum acquired ownership in the GHG reductions associated with the project starting January 1, 2010.

Preferred Carbon Land Management Solutions (PCLMS) has contracted KMPG Performance Registrar Inc to conduct project verification. Selection of KPMG and the subsequent verification process follows the definitions and criteria set out in the SGER (2007) and described in the additional guidance related to offset verification.<sup>4</sup> Accordingly, both the project verifier and the verification plan are developed in accordance with the regulation.

**Project Registration:**

This project and resulting emissions reductions will only be listed with Alberta Emissions Offsets Registry (AEOR). No other registrations will be made.

**Project Activity:**

This project is based on the GHG reductions created as a result of a change in the processing of acid gas at the South Rosevear Gas Plant. In particular, the SRU previously in operation at the facility was replaced with an acid gas injection scheme. The AGI permanently sequesters the acid gas containing significant amounts of CO<sub>2</sub> in a well defined geological formation (Beaverhill Lake B Pool). The AGI scheme also replaces the requirement for incineration of the tail gas stream from the SRU resulting in significant reductions in the consumption of fuel gas and associated GHG emissions.

This project meets the additional criteria as an eligible project type as set out under the SGER as follows:

<b>Offset Project Eligibility Criteria</b>	<b>Bonavista AGI at South Rosevear</b>
Occur in Alberta	The project is assured to have occurred in Alberta since all GHG offsets created are linked directly to legal surveyed descriptions (LSDs) unique to the Province.
Result from actions not otherwise required	Project activities are the result of voluntary

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<sup>4</sup> Section 6.0 – Third Party Verification, Technical Guidance for Offset Project Developers, Version 2.0, January 2011, SGER, Alberta Environment

by law and be beyond business as usual and sector common practices	actions taken. The AGI scheme, or project condition, has been implemented at a non-regulated facility and is not required by law.
Result from actions taken on or after January 1, 2002	The AGI scheme, or project condition, was implemented on March 5, 2007.
Be real, demonstrable, quantifiable, and verifiable	The project applies significant due diligence to confirm the occurrence of qualifying activities and the quantity of qualifying activities. The project is verifiable.
Have clearly established ownership	PCLMS has established clear and legal ownership of all GHG emission reductions from this project.
Be counted once for compliance purposes	This project and the resulting Verified Emission Reductions/Removals are unique, apply to specific years, and will only be listed once.
Be implemented according to a Government of Alberta approved quantification protocol	The Government of Alberta has extensively examined this type of project and has determined it to be an eligible project type under the Specified Gas Emitters Regulation 2007 (SGER 2007). This project applies an approved protocol and accompanying guidance.
Be third party verified by a qualified person(s) meeting the requirements for a third party auditor under section 18 of the Regulation	PCLMS has contracted KPMG PRI and confirmed their qualifications meet the requirements of the Regulation.
Be registered on the Alberta Emissions Offset Registry	This project and resulting emissions reductions will only be listed with Alberta Emissions Offsets Registry (AEOR).

## 2. PROJECT CONTACT INFORMATION

**Project Developer  
Contact Information** Preferred Carbon Land Management Solutions Ltd.

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**Verification  
Organization** KPMG Performance Registrar Inc.

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## 3. PROJECT DESCRIPTION AND LOCATION

The Bonavista Acid Gas Injection (AGI) Project at South Rosevear is the continuation of an AGI based greenhouse gas (GHG) reduction project that originated with Suncor Energy Oil and Gas Partnership and began operation on March 5, 2007. GHG offsets from this project were claimed and listed on the Alberta Emissions Offset Registry (AEOR) for the period ending December 31, 2009 by Suncor Energy<sup>5</sup>. For the period beginning January 1, 2010 through December 31, 2011, the South Rosevear Facility and related AGI Project came under the management of its new majority owner, Bonavista Petroleum .

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<sup>5</sup> Listed on the Alberta Offset Registry as "South Rosevear Acid Gas Injection Project, April 2010," CSA Project Identifier #2959-5549.

The AGI project replaced a pre-existing sulfur recovery unit (SRU) based on a multi-stage Claus process which emitted CO<sub>2</sub> and required significant amounts of fossil fuels to be consumed in the safe incineration of the resultant tail gases. The AGI project reduces GHG emissions through the permanent geological sequestration of the CO<sub>2</sub> in the acid gas stream and the significant reduction in the fossil fuel consumption related to the incineration of the SRU's tail gas stream.

The acid gas composed of mainly CO<sub>2</sub> and H<sub>2</sub>S is the result of the processing of sour natural gas. The acid gas is compressed, dehydrated, and moved via pipeline to a single injection well in the well-characterized Beaverhill B Pool. The AGI Project is permitted by the Energy Resources Conservation Board (ERCB) originally under Approval No. 10738 later amended under Approval No. 10738A and transferred to Bonavista Petroleum under Transfer Approval No. 1353-02-00. All compliance requirements under these approvals were in place and in good standing during the period claimed in this GHG offset project.

#### Bonavista South Rosevear Gas Plant



## 4. PROJECT DETAILS

There are no changes from the Project Plan.



## 5. REPORTING PERIOD

The reporting period for this project report covers the period January 1, 2010 to December 31, 2011.

## 6. GREENHOUSE GAS CALCULATIONS

The Project GHG emission reductions were determined based on the Quantification Protocol for Acid Gas Injection, Version 1, May 2008, Alberta Environment (Protocol). Two (2) flexibility mechanisms were employed in the Project including the following: 1) Flexibility Mechanism 1 from the Protocol, simulation of the multi-stage Claus process and related tail gas incineration and 2) Flexibility Mechanism 3 from the Protocol, Site Specific Emission Factors. A detailed description of the flexibility mechanisms used is provided in the Project Plan and their application did not change throughout the period of the Project. The formulas used to quantify the GHG emission reductions in the Project are set out as follows:

$$\text{Emission Reduction} = \text{Emissions}_{\text{Baseline}} - \text{Emissions}_{\text{Project}}$$

$$\text{Emissions}_{\text{Baseline}} = \text{Emissions}_{\text{Fuel Extraction and Processing}} + \text{Emissions}_{\text{Multi-Stage Claus Unit}} + \text{Emissions}_{\text{Incineration}}$$

$$\text{Emissions}_{\text{Project}} = \text{Emissions}_{\text{Fuel Extracting and Processing}} + \text{Emissions}_{\text{Upset Flaring}} + \text{Emissions}_{\text{Recycled Gas}} + \text{Emissions}_{\text{Injection Unit Operation}}$$

Where:

Emissions in the Baseline

$\text{Emissions}_{\text{Fuel Extraction and Processing}} = \text{emissions under SS B9 Fuel Extracting/Processing}$

$\text{Emissions}_{\text{Multi-Stage Claus Unit}} = \text{emissions under SS B5b Multi-Stage Claus Unit}$

$\text{Emissions}_{\text{Incineration}} = \text{emissions under SS B6 Incineration}$

Emissions in the Project

$\text{Emissions}_{\text{Fuel Extracting and Processing}} = \text{emissions under SS P12 Fuel Extraction/Processing}$

$\text{Emissions}_{\text{Upset Flaring}} = \text{emissions under SS P8 Upset Flaring}$

$\text{Emissions}_{\text{Injection Unit Operation}} = \text{emissions under SS P9 Injection Unit Operation}$

$\text{Emissions}_{\text{Recycled Gas}} = \text{emissions under SS P10 Recycled Gas}$

A detailed description of the calculations applicable in this Project with reference to the data requirements described in Sections 2.1.1 Quantification of Sources and Sinks and 5.0 Monitoring Plan of the Project Plan are as follows<sup>6</sup>:

Baseline Condition

Emissions<sub>Fuel Extraction and Processing</sub> = emissions under SS B9 Fuel Extracting/Processing

$$\text{CO}_2 \text{ Emissions} = \text{Volume of Natural Gas Consumed in Baseline (m}^3\text{)} \times (0.043 \text{ kg CO}_2\text{/m}^3 + 0.090 \text{ kg CO}_2\text{/m}^3)$$

$$\text{CH}_4 \text{ Emissions} = \text{Volume of Natural Gas Consumed in Baseline (m}^3\text{)} \times (0.0023 \text{ kg CH}_4\text{/m}^3 + 0.0003 \text{ kg CH}_4\text{/m}^3)$$

$$\text{NO}_2 \text{ Emissions} = \text{Volume of Natural Gas Consumed in Baseline (m}^3\text{)} \times (0.000004 \text{ kg NO}_2\text{/m}^3 + 0.000003 \text{ kg NO}_2\text{/m}^3)$$

Emissions<sub>Multi-Stage Claus Unit</sub> = emissions under SS B5b Multi-Stage Claus Unit

$$\text{Equivalent Volume of Fuel Gas to Generate Recoverable Heat} = \text{Recoverable Heat (MJ)} \div (\text{Lower Heating Value of Site Specific Natural Gas (MJ/m}^3\text{)} \times \text{Boiler Efficiency (\%)})$$

$$\text{CO}_2 \text{ Emissions} = \text{Equivalent Volume of Fuel Gas to Generate Recoverable Heat (m}^3\text{)} \times \text{Site Specific Emissions Factor (kg CO}_2\text{/m}^3\text{)}$$

$$\text{CH}_4 \text{ Emissions} = \text{Equivalent Volume of Fuel Gas to Generate Recoverable Heat (m}^3\text{)} \times 0.000037 \text{ (kg CH}_4\text{/m}^3\text{)}$$

$$\text{NO}_2 \text{ Emissions} = \text{Equivalent Volume of Fuel Gas to Generate Recoverable Heat (m}^3\text{)} \times 0.000033 \text{ (kg NO}_2\text{/m}^3\text{)}$$

Emissions<sub>Incineration</sub> = emissions under SS B6 Incineration

$$\text{CO}_2 \text{ Emissions}^7 = (\text{Total Volume of Gas Flared (m}^3\text{)} \times \text{Volume \% of CO}_2 \text{ in Gas Flared (\%)} \times 1.87 \text{ (kg CO}_2\text{/m}^3\text{)}) + (\text{Volume of Fuel Gas (m}^3\text{)} \times \text{Site Specific Emissions Factor (kg CO}_2\text{/m}^3\text{)})$$

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<sup>7</sup> Density of CO<sub>2</sub> at 15°C and 1 atm is 1.87 kg CO<sub>2</sub>/m<sup>3</sup>; volumetric flows are provided on 15°C and 1 atm basis

$$\text{CH}_4 \text{ Emissions}^8 = (\text{Total Volume of Gas Flared (m}^3) \times \text{Volume \% of CH}_4 \text{ in Gas Flared (\%)} \times 0.68 \text{ kg CH}_4/\text{m}^3 \times 44/16) + (\text{Volume of Fuel Gas (m}^3) \times 0.000037 \text{ (kg CH}_4/\text{m}^3))$$

$$\text{NO}_2 \text{ Emissions} = \text{Volume of Fuel Gas (m}^3) \times 0.000033 \text{ (kg NO}_2/\text{m}^3)$$

Project Condition

Emissions<sub>Fuel Extracting and Processing</sub> = emissions under SS P12 Fuel Extraction/Processing

$$\text{CO}_2 \text{ Emissions} = \text{Volume of Natural Gas Consumed in Project (m}^3) \times (0.043 \text{ kg CO}_2/\text{m}^3 + 0.090 \text{ kg CO}_2/\text{m}^3)$$

$$\text{CH}_4 \text{ Emissions} = \text{Volume of Natural Gas Consumed in Project (m}^3) \times (0.0023 \text{ kg CH}_4/\text{m}^3 + 0.0003 \text{ kg CH}_4/\text{m}^3)$$

$$\text{NO}_2 \text{ Emissions} = \text{Volume of Natural Gas Consumed in Project (m}^3) \times (0.000004 \text{ kg NO}_2/\text{m}^3 + 0.000003 \text{ kg NO}_2/\text{m}^3)$$

Emissions<sub>Upset Flaring</sub> = emissions under SS P8 Upset Flaring

$$\text{Volume Supplemental Fuel Gas} = \text{Volume of Acid Gas Flared (m}^3) \times ((20 \text{ MJ/m}^3 - \text{Lower Heating Value of Acid Gas (MJ/m}^3)) \div (\text{Lower Heating Value of Fuel Gas (MJ/m}^3) - 20 \text{ MJ/m}^3))$$

$$\text{CO}_2 \text{ Emissions} = (\text{Volume of Acid Gas Flared (m}^3) \times \text{Volume \% of CO}_2 \text{ in Acid Gas Flared (\%)} \times 1.87 \text{ (kg CO}_2/\text{m}^3)) + (\text{Volume of Supplemental Fuel Gas (m}^3) \times \text{Site Specific Emissions Factor (kg CO}_2/\text{m}^3))$$

$$\text{CH}_4 \text{ Emissions} = (\text{Total Volume of Acid Gas Flared (m}^3) \times \text{Volume \% of CH}_4 \text{ in Acid Gas Flared (\%)} \times 0.68 \text{ kg CH}_4/\text{m}^3 \times 44/16) + (\text{Volume of Supplemental Fuel Gas (m}^3) \times 0.000037 \text{ (kg CH}_4/\text{m}^3))$$

$$\text{NO}_2 \text{ Emissions} = \text{Volume of Supplemental Fuel Gas (m}^3) \times 0.000033 \text{ (kg NO}_2/\text{m}^3)$$

Emissions<sub>Injection Unit Operation</sub> = emissions under SS P9 Injection Unit Operation

$$\text{CO}_2 \text{ Emissions} = \text{Volume of Fuel Gas Consumed at Injection Well (m}^3) \times \text{Site Specific Emissions Factor (kg CO}_2/\text{m}^3)$$

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<sup>8</sup> Density of CH<sub>4</sub> at 15°C and 1 atm is 0.68 kg CH<sub>4</sub>/m<sup>3</sup>; volumetric flows are provided on 15°C and 1 atm basis

$$\text{CH}_4 \text{ Emissions} = \text{Volume of Fuel Gas Consumed at Injection Well (m}^3\text{)} \times 0.000037 \text{ (kg CH}_4\text{/m}^3\text{)}$$

$$\text{NO}_2 \text{ Emissions} = \text{Volume of Fuel Gas Consumed at Injection Well (m}^3\text{)} \times 0.000033 \text{ (kg NO}_2\text{/m}^3\text{)}$$

$$\text{Emissions}_{\text{Recycled Gas}} = \text{emissions under SS P10 Recycled Gas}^9$$

$$\text{CO}_2 \text{ Emissions} = (\text{Volume of Gas from Well 14-14 (m}^3\text{)} \times \text{Volume \% of CO}_2 \text{ in Gas from Well 14-14 (\%)} \times 1.87 \text{ (kg CO}_2\text{/m}^3\text{)}) + (\text{Volume of Gas from Well 9-22 (m}^3\text{)} \times \text{Volume \% of CO}_2 \text{ in Gas from Well 9-22 (\%)} \times 1.87 \text{ (kg CO}_2\text{/m}^3\text{)}) + (\text{Volume of Gas from Well 12-23 (m}^3\text{)} \times \text{Volume \% of CO}_2 \text{ in Gas from Well 12-23 (\%)} \times 1.87 \text{ (kg CO}_2\text{/m}^3\text{)})$$

## 7. GREENHOUSE GAS ASSERTION

The GHG reductions created by the Project are as follows:

Project Year	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Total CO <sub>2</sub> e
			CO <sub>2</sub> e in Tonnes	
2010	18,604	35	11	18,650
2011	13,742	23	10	13,775
Total	32,346	58	21	32,425

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<sup>9</sup> Well 14-14 was shut in during the month of July, 2010.

## 8. PROJECT DEVELOPER SIGNATURE

I am a duly authorized corporate officer of the project developer mentioned above and have personally examined and am familiar with the information submitted in this Offset Project Report including the accompanying Greenhouse Gas Assertion on which it is based. Based upon reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, I hereby warrant that the submitted information is true, accurate and complete to the best of my knowledge and belief, and that all matters affecting the validity of the emission reduction claim or the protocol(s) upon which it is based have been fully disclosed. I understand that any false statement made in the submitted information may result in de-registration of credits and may be punishable as a criminal offence in accordance with provincial or federal statutes.

The project developer has executed this Offset Project Report as of the 15 day of March, 2012.

Project Title: Bonavista Acid Gas Injection Project at South Rosevear

Preferred Carbon Land Management Solutions Ltd.

Signature:



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Date: March 15, 2012  
Name: Bruce Love  
Title: Director

## 9. References

Alberta Environment. May 2008. Quantification Protocol for Acid Gas Injection, Version 1, Specified Gas Emitters Regulation.

Alberta Environment. January 2011. Technical Guidance for Offset Project Developers, Version 2.0, Specified Gas Emitters Regulation.

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Energy Resources Conservation Board. November 2006 and November 2011. Directive 060, Upstream Petroleum Industry Flaring, Incinerating, and Venting.