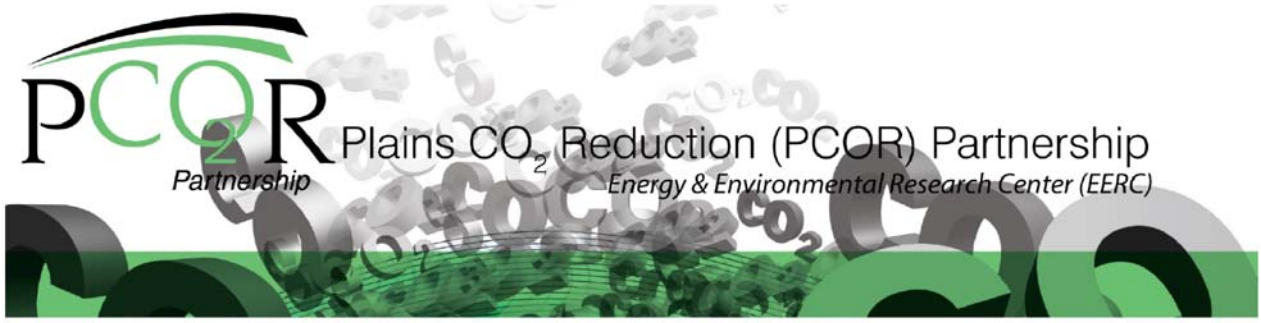


PLAINS CO_2 REDUCTION PARTNERSHIP PHASE III

Quarterly Technical Progress Report

(for the period July 1 – September 30, 2009)

Prepared for:

Karlene Fine

North Dakota Industrial Commission
600 East Boulevard Avenue
State Capitol, 14th Floor
Bismarck, ND 58505-0840

Contract Nos. FY08-LX111-162 and G015-030
EERC Funds 9821–9825

Prepared by:

Edward N. Steadman
John A. Harju
Lucia Romuld
James A. Sorensen
Daniel J. Daly
Melanie D. Jensen
Lisa S. Botnen
Wesley D. Peck
Steven A. Smith
Charles D. Gorecki
Tami Jo Votava
Katherine K. Anagnost

Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

November 2009

NORTH DAKOTA INDUSTRIAL COMMISSION DISCLAIMER

This report was prepared by the Energy & Environmental Research Center (EERC) pursuant to an agreement partially funded by the Industrial Commission of North Dakota, and neither the EERC nor any of its subcontractors nor the North Dakota Industrial Commission nor any person acting on behalf of either:

(A) Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or

(B) Assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this report.

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the North Dakota Industrial Commission. The views and opinions of authors expressed herein do not necessarily state or reflect those of the North Dakota Industrial Commission.

EERC DISCLAIMER

LEGAL NOTICE This research report was prepared by the EERC, an agency of the University of North Dakota, as an account of work sponsored by the U.S. Department of Energy and the North Dakota Industrial Commission. Because of the research nature of the work performed, neither the EERC nor any of its employees makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement or recommendation by the EERC.

TABLE OF CONTENTS

Continued…

TABLE OF CONTENTS, continued

LIST OF FIGURES

LIST OF TABLES

PLAINS CO_2 REDUCTION PARTNERSHIP PHASE III
Quarterly Technical Progress Report
July 1 – September 30, 2009

INTRODUCTION

The Plains CO_2 Reduction (PCOR) Partnership is one of seven regional partnerships operating under the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) Regional Carbon Sequestration Partnership (RCSP) Program. The PCOR Partnership is led by the Energy & Environmental Research Center (EERC) at the University of North Dakota (UND) in Grand Forks, North Dakota. The PCOR Partnership region includes all or part of nine states (Iowa, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wisconsin, and Wyoming) and four Canadian provinces (Alberta, British Columbia, Manitoba, and Saskatchewan).

Phase III is a 10-year project, divided into three budget periods (BPs), running from October 1, 2007, to September 30, 2017. This progress report summarizes the activities for the above-referenced reporting period (July 1 – September 30, 2009) for Phase III.

The activities for Phase III of the PCOR Partnership include two large-volume carbon dioxide (CO_2) storage demonstration tests (Figure 1) along with continued regional characterization and outreach. Fourteen tasks will be implemented; see Table 1 for the responsibility matrix.

Table 1. Phase III Responsibility Matrix

Phase III Task Description	Responsible Party
Task 1 – Regional Characterization	Wes Peck
Task 2 – Public Outreach and Education	Dan Daly
Task 3 – Permitting and National Environmental Policy Act (NEPA) Compliance	Lisa Botnen
Task 4 – Site Characterization and Modeling	Jim Sorensen
Task 5 – Well Drilling and Completion	Steve Smith
Task 6 – Infrastructure Development	Melanie Jensen
Task 7 – CO_2 Procurement	John Harju
Task 8 – Transportation and Injection Operations	Steve Smith
Task 9 – Operational Monitoring and Modeling	Charles Gorecki
Task 10 – Site Closure	TBA
Task 11 – Postinjection Monitoring and Modeling	TBA
Task 12 – Project Assessment	Katherine Anagnost
Task 13 – Project Management	Ed Steadman
Task 14 – RCSP Water Group Coordination	Charles Gorecki

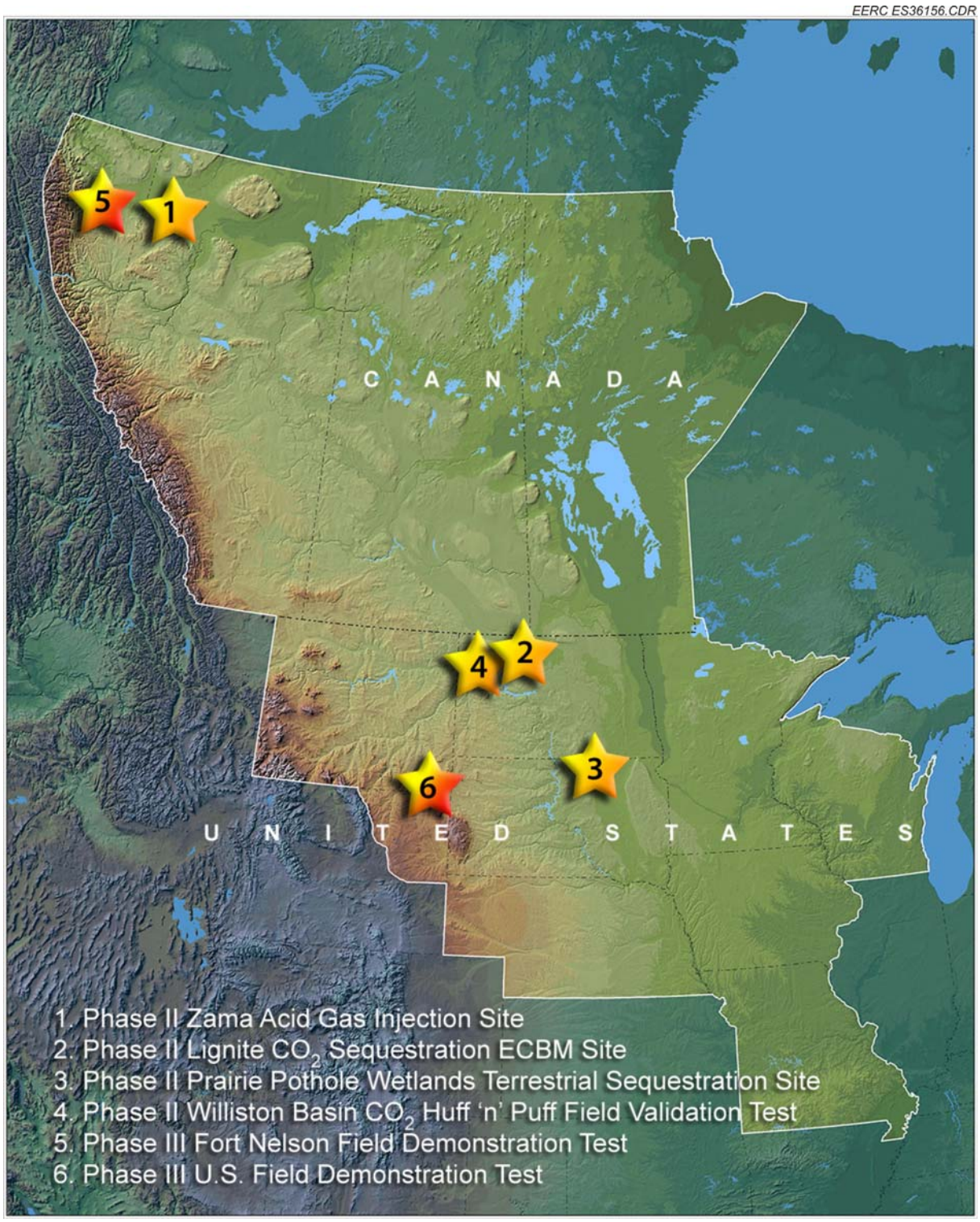


Figure 1. PCOR Partnership Phase III demonstration test sites.

SUMMARY OF SIGNIFICANT PHASE III ACCOMPLISHMENTS

Task 1 – Regional Characterization

Significant accomplishments for Task 1 for the reporting period included the following:

- A report was completed that outlines the current regulatory framework for North Dakota and Alberta with regard to CO_2 storage (D3).
- A recent review of attributes associated with the large stationary sources in the PCOR Partnership region (D1) was completed.
- A revision to the PCOR Partnership Partners-Only Decision Support System (DSS, ©2007–2009 EERC Foundation) Web site was completed. The renovation of the Web site was completed at the end of September and went live in October (D9).
- The Missouri Department of Natural Resources, Division of Geology and Land Survey (MO DGLS) completed a review the oil and gas lease files of an additional 34 counties (bringing the total counties reviewed to 88 of 114).
- Evaluation of MO DGLS, U.S. Geological Survey (USGS), and the U.S. Environmental Protection Agency (EPA) water analysis was completed. This resulted in entry of 1589 analyses in 53 Missouri counties along and northwest of the freshwater–saline transition. These data are used to contour the total dissolved solids (TDS) in groundwater for six major hydrologic units.
- MO DGLS staff attended a meeting of Underground Injection Control (UIC) coordinators from EPA Region 7. Topics discussed included geologic sequestration of CO_2 and proposed EPA Class VI regulations.

Task 2 – Public Outreach and Education

Significant accomplishments for Task 2 for the reporting period included the following:

- EERC staff participated in the Outreach Working Group activities and Weyburn–Midale project advisory activities for outreach.
- A PowerPoint presentation for the Fort Nelson CCS Project (D16) was completed.
- EERC staff attended the Keystone Center's Teacher Training Opportunity "CSI: Climate Status Investigations" (July 29–30, 2009) in Omaha, Nebraska, and filmed the proceedings.
- 12 of the more than 50 video clips (D20) to be placed on the public Web site were finalized. The remaining clips will be placed on the Web site as they are finalized.
- EERC staff participated in the monthly conference calls and related activities of the Outreach Working Group including a workshop in Washington, D.C., to develop a Best Practices Manual for outreach.
- EERC staff participated in telephone conference calls and reviewed materials with respect to a new Web site for the Weyburn–Midale project.

Task 3 – Permitting and NEPA Compliance

Significant accomplishments for Task 3 for the reporting period included the following:

- The NEPA for non-site specific and non-field-based work for the PCOR Partnership project for BP4 and BP5 was completed.
- A review was completed of EPA's recent release of additional data related to the geologic sequestration of carbon dioxide under the "Federal Requirements under the UIC Program for Carbon Dioxide (CO_2) Geologic Sequestration (GS) Wells."
- EERC staff participated on September 3, 2009, in CCEMC's "Climate Change and Emissions Management Act: Alberta's Response to Reduce Emissions" webinar that described the Act and the CCEMC. The CCEMC is the innovative initiative of Alberta to address climate change issues through funding new emission-reducing technology. The Expression of Interest (EOI) applications are due September 30, 2009.
- EERC staff attended Platt's 2nd Annual Carbon Capture and Sequestration Conference 2009 on September 14–15, 2009, in Washington, D.C. This event highlighted the latest information on policy and economics of carbon capture and storage (CCS).
- EERC staff participated in activities of the Interstate Oil and Gas Compact Commission (IOGCC) Pipeline Transportation Task Force.

Task 4 – Site Characterization and Modeling

Significant accomplishments for Task 4 for the reporting period included the following:

- A confidential draft report based on data from Spectra Energy and Oxand Risk & Project Management Solutions entitled "Fort Nelson Carbon Capture and Storage Project: Risk Management Framework and First-Round Risk Assessment Results" was completed on September 21, 2009.
- The U.S. Test Site was selected (M4) and data collection was initiated (M5) on September 30, 2009.
- Version 1 of a static petrophysical model of the potential target formations and seals in the Fort Nelson study area was developed. This model will be used to conduct dynamic injection and plume fate modeling and to support the risk assessment efforts.

Task 5 – Well Drilling and Completion

This task is anticipated to be initiated Quarter 1 – BP4, Year 3. Once activities are initiated, progress will be communicated through quarterly progress reports.

Task 6 – Infrastructure Development

Significant accomplishments for Task 6 for the reporting period included the following:

- A topical report was completed entitled "Preliminary Design of Advanced Compression Technology," (D47).
- Ramgen Power Systems, LLC (Ramgen), developed a novel compression stage called the Rampressor™ that offers a step-change improvement in both areas.
  - The Rampressor is based on supersonic shock compression theory.
  - The efficiency of this compression process is very high because the compressor has very few aerodynamic leading edges and minimal drag.

- Ramgen's current development work is focused on preparing a demonstration unit sized for use in a 250-MW pulverized-coal plant.
- Ramgen collaborated with the PCOR Partnership to perform the activities necessary for the integration of the Rampressor into a CCS demonstration project.
- The topical report (D47) describes the efforts that have been taken to ensure smooth integration of the Rampressor into the PCOR Partnership's large-scale CCS demonstration scheduled for roughly 2012–2013.

Task 7 – CO_2 Procurement

Significant accomplishments for Task 7 for the reporting period included the following:

- Discussions continued with potential CO_2 suppliers. Because of the sensitive nature of negotiations, specifics cannot be shared at the present time.
- EERC staff attended the North Dakota Industrial Commission Oil and Gas Council meeting on August 6, 2009, in Bismarck, North Dakota, and discussed ongoing negotiations to secure a CO_2 supplier for the Phase III demonstration project.

Task 8 – Transportation and Injection Operations

This task is anticipated to be initiated Quarter 3 – BP4, Year 4. Once activities are initiated, progress will be communicated and detailed in the quarterly progress report.

Task 9 – Operational Monitoring and Modeling

This task is anticipated to be initiated Quarter 1 – BP4, Year 3. Once activities are initiated, progress will be communicated and detailed in the quarterly progress report.

Task 10 – Site Closure

This task is anticipated to be initiated Quarter 1 – BP5, Year 9. Once activities are initiated, progress will be communicated and detailed in the quarterly progress report.

Task 11 – Postinjection Monitoring and Modeling

This task is anticipated to be initiated Quarter 1 – BP5, Year 9. Once activities are initiated, progress will be communicated and detailed in the quarterly progress report.

Task 12 – Project Assessment

There were no significant accomplishments for Task 12 during the reporting period. The next Project Assessment Report is due December 31, 2009.

Task 13 – Project Management

Phase III of the PCOR Partnership started October 1, 2007. Phase II members in good standing are automatically enrolled in Phase III for the overlapping years (October 1, 2007 – September 30, 2009). As denoted in Table 2, the PCOR Partnership currently has 86 partners.

Significant accomplishments for Task 13 for the reporting period included the following:

- The PCOR Partnership Program Manager continued to serve as chairman for the North American Energy Working Group (NAEWG)–North America Carbon Atlas Partnership (NACAP) Methodology Subcommittee (on CO_2 Storage Capacity Estimation), duties of which included the following:
  - A conference call was held on July 14, 2009.
  - Presented the subcommittee's efforts to NAEWG-NACAP at a meeting July 22–23, 2009, in Pittsburgh, Pennsylvania.

Table 2. PCOR Partnership Membership, Phase II/Phase III

U.S. Department of Energy National Energy Technology Laboratory	Great River Energy	North Dakota Industrial Commission Oil and Gas Research Council
UND EERC	Hess Corporation	North Dakota Natural Resources Trust
Abengoa Bioenergy New Technologies	Huntsman Corporation	North Dakota Petroleum Council
Air Products and Chemicals	Interstate Oil and Gas Compact Commission	North Dakota State University
Alberta Department of Energy	Iowa Department of Natural Resources	Otter Tail Power Company
Alberta Research Council	Lignite Energy Council	Oxand Risk & Project Management Solutions
ALLETE	Manitoba Geological Survey	Petroleum Technology Research Centre
Ameren Corporation	Marathon Oil Company	Petroleum Technology Transfer Council
American Coalition for Clean Coal Electricity	MEG Energy Corporation	Prairie Public Broadcasting
American Lignite Energy (ALE)	Melzer Consulting	Pratt & Whitney Rocketdyne, Inc.
Apache Canada Ltd.	Minnesota Power	Ramgen Power Systems, Inc.
Baker Hughes Oilfield Operations, Inc.	Minnkota Power Cooperative, Inc.	RPS Energy Canada Ltd. – APA Petroleum Engineering Inc.
Basin Electric Power Cooperative	Missouri Department of Natural Resources	Saskatchewan Industry and Resources
Biorecro AB	Missouri River Energy Services	SaskPower
Blue Source, LLC	Montana–Dakota Utilities Co.	Schlumberger
BNI Coal, Ltd.	Montana Department of Environmental Quality	Shell Canada Energy
British Columbia Ministry of Energy, Mines, and Petroleum Resources	National Commission on Energy Policy	Spectra Energy
Carbozyme, Inc.	Natural Resources Canada	Strategic West Energy Ltd.
Computer Modelling Group, Inc.	Nebraska Public Power District	Suncor Energy Inc.
Dakota Gasification Company	Nexant, Inc.	TAQA NORTH, Ltd.
Ducks Unlimited Canada	North American Coal Corporation	TGS Geological Products and Services
Ducks Unlimited, Inc.	North Dakota Department of Commerce Division of Community Services	University of Alberta
Eagle Operating, Inc.	North Dakota Department of Health	U.S. Geological Survey Northern Prairie Wildlife Research Center
Eastern Iowa Community College District	North Dakota Geological Survey	Weatherford Advanced Geotechnology
Enbridge Inc.	North Dakota Industrial Commission Department of Mineral Resources, Oil and Gas Division	Western Governors' Association
Encore Acquisition Company	North Dakota Industrial Commission Lignite Research, Development and Marketing Program	Westmoreland Coal Company
Energy Resources Conservation Board/ Alberta Geological Survey	North Dakota Pipeline Authority	Wisconsin Department of Agriculture, Trade and Consumer Protection
Environment Canada		Xcel Energy
Excelsior Energy Inc.		
Fischer Oil and Gas, Inc.		
Great Northern Power Development, LP		

- The Project Management Plan was submitted as an Appendix to the Continuation Application (EERC Proposal 2009-0271).
- A response was prepared to a July 31, 2009, letter to the Editor of the *Grand Forks Herald*. The response appeared on August 5, 2009.
- An abstract was submitted entitled "The Plains CO_2 Reduction (PCOR) Partnership: Carbon Management Options for the Central Interior of North America" for consideration at the upcoming Electric Utilities Environmental Conference 2010: 13th Annual Energy & Environmental Conference and Expo scheduled for February 1–4, 2010, in Phoenix, Arizona.
- Visits were hosted from the NETL Program Manager on July 7, 2009; Spectra Energy on July 7–8, 2009; and Oxand on July 8, 2009.
- Visitors from Baker Hughes Incorporated (a partner since April 2009) were hosted to discuss collaboration between Baker Hughes Integrated Operations and the PCOR Partnership Program.
- EERC staff attended the North Dakota Industrial Commission Oil and Gas Council meeting on August 6, 2009, in Bismarck, North Dakota, and discussed ongoing negotiations to secure a CO_2 supplier for the Phase III demonstration project.
- EERC staff reviewed papers submitted for the Society of Petroleum Engineers (SPE) International Conference on CO_2 Capture, Storage, and Utilization scheduled for November 2–4, 2009, in San Diego, California.
- EERC staff prepared for and presented at a meeting with DOE and NETL representatives in Pittsburgh, Pennsylvania, on August 27, 2009, regarding negotiations to secure a CO_2 supplier for the pending demonstration project, and reviewed potential alternate plans.
- A conference call was held on August 18, 2009, with several interested parties to further discuss CO_2-sourcing issues.
- EERC staff participated in a free webinar on September 22, 2009, sponsored by the International Energy Agency (IEA) CCS entitled "How Stable is Stable? – What is Required for CCS Site Handover?"
- An e-mail blast was sent (www.undeerc.org/PCOR/PCOR09/email/email090911.asp) to the membership on Friday, September 11, 2009, and included all the information needed to register for the premeeting workshops, the meeting, and the evening dinner. Links to the annual meeting registration Web site can be found on the EERC's Web site, the PCOR Partnership public Web site, and the Partners-Only DSS Web site.
- Notification was received from the Lignite Energy Council's Awards Committee that Ed Steadman and John Harju have been designated to receive the "Distinguished Service – Research and Development Award" because of their leadership and counsel on CO_2 storage projects involving the lignite industry. The awards will be presented on October 8, 2009, in Bismarck, North Dakota.
- Phase II members were contacted via U.S. mail in order to solicit continued support of the PCOR Partnership for Phase III, Budget Periods 4 and 5 activities.
- An Oxand Risk & Project Management Solutions' letter of support was received for Phase II and Phase III of the PCOR Partnership program.
- Proposed letters of agreement for membership in Phase III (beginning BP4) of the PCOR Partnership were distributed via e-mail to members of Phase II (and Phase III, BP3).

- The Risk Management Plan Outline (D77) was completed on September 18, 2009.

Task 14 – RCSP Water Working Group (WWG) Coordination

Significant accomplishments for Task 14 for the reporting period included the following:

- EERC staff coordinated and held conference calls with members representing each of the seven regional partnerships and DOE NETL in both August and September to primarily discuss the draft White Paper on the Nexus of CCS and Water (D78).
- The draft White Paper on the Nexus of CCS and Water was completed and submitted to the WWG participants on August 21, 2009.
- Comments on the draft (D78) were recieved from the WWG participants on or before September 21, 2009.
- A new report logo banner was created for WWG reports.

PHASE III PROGRESS OF WORK

Task 1 – Regional Characterization

The Regional Characterization task entails the review, characterization, and update of the PCOR Partnership region's CO_2 sinks and sources for inclusion in the DSS. Activities in this reporting period include the following:

- Point data for the Bevier coal bed were used to create a map depicting the thickness of the coal and amount of overburden. A jpeg of the draft version of the map is shown in Figure 2.
- Maps of remaining coal beds will be completed during this upcoming quarter.
- Additionally, geographic information system (GIS) layers depicting point data location, thickness of coal, and thickness of overburden will be provided to EERC upon completion of metadata.
- MO DGLS continues its review of oil and gas files pertaining to various leases. Review of 7211 files has yielded 43 porosity and permeability studies, 28 water chemistry analysis, ten formation test reports of core, and four detailed geologic reports. These reports will be provided to the EERC upon completion of the file review.
- Work is under way to prepare a draft report on the geologic storage opportunities in the state of Nebraska. The Cedar Hills Sandstone and Maha Formations in western Nebraska show promising characteristics for storage. The extent of the Forest City Basin in southeast Nebraska will be examined for storage potential for sources along the Missouri River.

Task 2 – Public Outreach and Education

Task 2 continues to provide outreach and education mechanisms to raise awareness regarding CO_2 storage opportunities in the region as well as outreach to select target audiences

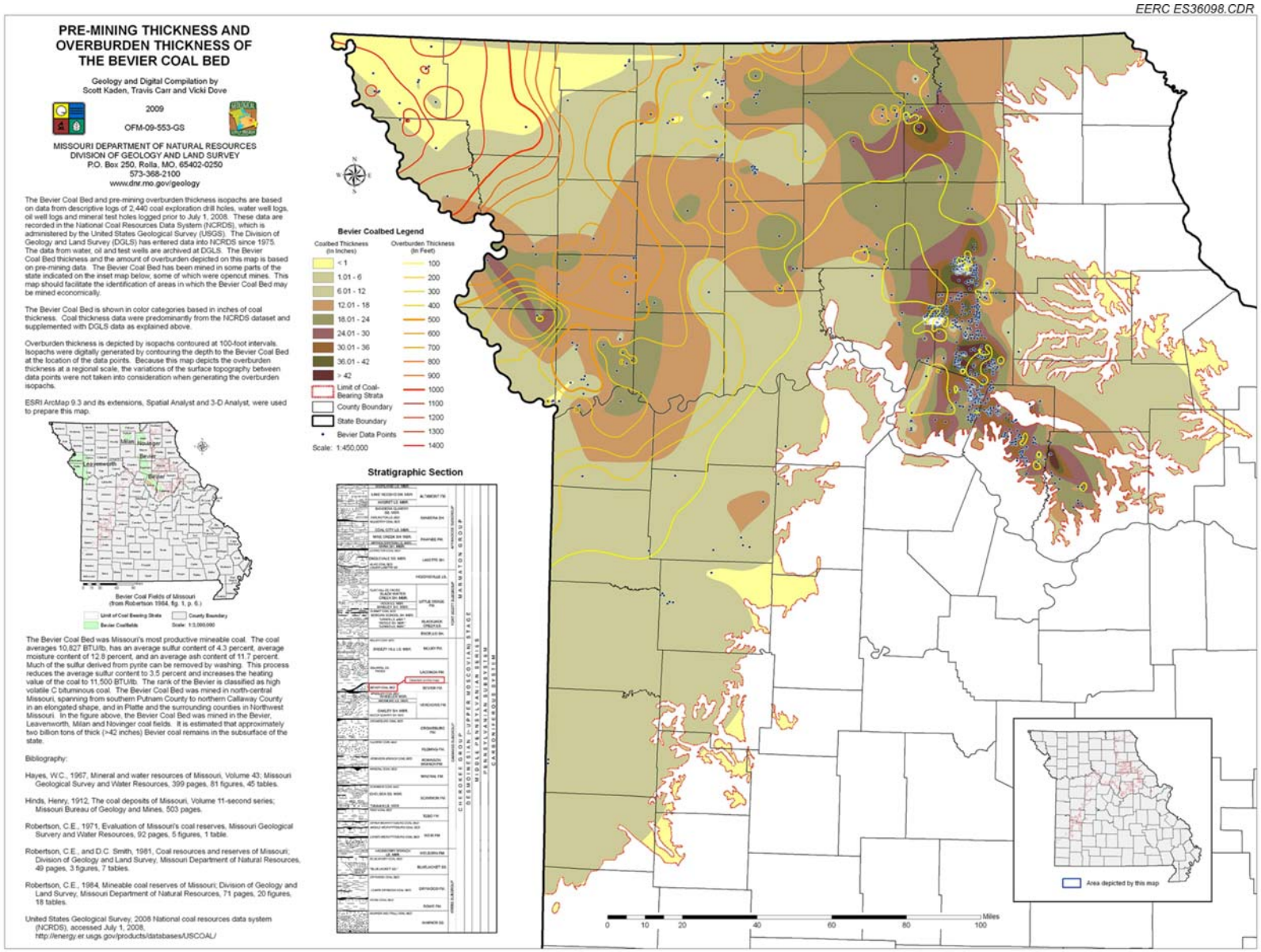


Figure 2. Thickness and overburden map of the Bevier coal bed.

concerned with the demonstration activities. Activities in this reporting period include the following:

- Efforts continued to populate the Outreach Information System which will contain a record of outreach activities as well as provide a basis for assessing audience exposure to outreach activities.
- An evaluation was initiated of the audit of outreach materials by Lipman Hearne, a marketing and communications firm, and its recommendations for improving outreach materials and strategy.
- Efforts continued on development of pages for the public Web site focused on sequestration field validation tests and demonstrations in the region.
- Continued efforts on Web pages for the Phase III demonstrations.
- Preparations were initiated for an outreach workshop to be held at the PCOR Partnership Annual Meeting in early December 2009 in St. Louis, Missouri.
- Work continued on materials for classroom use.
- An evaluation of comments on outreach materials from outside reviewers was initiated.

Task 3 – Permitting and NEPA Compliance

The goal of Task 3 is to assist demonstration site owners with all permits and approvals needed to comply with state, provincial, and federal requirements. The EERC will also identify and track existing and evolving regulations for CO_2 storage and transportation. Activities for the reporting period included the following:

- Tracking and analyzing various state, provincial, and regional GHG reduction and CCS initiatives continued.
- Efforts continued to update to the regulatory section of the DSS.
- EERC staff continued to follow and review legislative actions occurring in Congress for any implications relating to CCS.
- An analysis of carbon market strategies continued.
- Ongoing review of recent publications relating to regulating CO_2 sequestration and MVA issues continued.
- Actions by the province of British Columbia were monitored for the effect they may have on the Fort Nelson demonstration project.
- Efforts continued to support Spectra Energy's permitting efforts for the Fort Nelson demonstration.
- Additionally, the EERC participated in numerous conference calls of the IOGCC Pipeline Transportation Task Force.

Task 4 – Site Characterization and Modeling

Task 4 is focused on evaluating the effectiveness of large-scale CO_2 sequestration in geological formations at two different sites. The first site will examine CO_2 sequestration in conjunction with EOR operations in a deep carbonate reservoir in a field site in the United States. Activities for the reporting period included the following:

- EERC staff continued to monitor the negotiations for the sale and transportation of the CO_2 between prospective owner/operators of CO_2 sources and prospective owner/operators of oil reservoirs.
- Efforts continued to develop a Geological Characterization Experimental Design Package (D31).
- The collection of baseline geological data at the regional and subregional scale (M7) was initiated.
- Baseline data was obtained for specific areas of interest including the Dickinson area, the Cedar Creek Anticline, the Nesson Anticline, and the Northeast Flank.
- Efforts continued to develop experimental design package (D42).
- Efforts were focused on using well log data and field-based observations to characterize the general geological conditions of an area in southwestern North Dakota that includes several oil fields under consideration for CO_2-based EOR activities under Phase III.

The second site will examine CO_2 sequestration in a carbonate brine-saturated formation near Fort Nelson, British Columbia. Activities for the reporting period included the following:

- Efforts continued to develop the MVA plan for the Fort Nelson demonstration.
- Efforts focused on developing a Risk Management Plan (RMP) for the injection portion of the Fort Nelson CCS project. The results of the risk assessment (which is conducted as part of the RMP) will be used to determine the key MVA activities necessary to manage and mitigate risk and to finalize the MVA plan for the Fort Nelson CCS project.
- Efforts continued to collect and compile results from previous efforts to characterize the geology and hydrogeology of the area.
- Development was initiated of a version 2 static petrophysical model of the potential injection zones and overlying seals.
- Dynamic injection modeling was initiated using the version 1 petrophysical model. It is anticipated that the development of both static and dynamic models will be an iterative process – with each iteration being developed in the context of new data that will be collected over the next 2 years of field-based activities at Fort Nelson.
- A Project Risk Assessment Plan was initiated for the Fort Nelson demonstration.

Task 5 – Well Drilling and Completion

This task will be initiated in BP4. The EERC is planning to work with the commercial operator of the selected oil field and provide technical support to develop engineering designs for the installation of necessary injection, production, and monitoring wells and develop operational plans for the injection and recycling of CO_2 over the duration of the project. Progress in this task will be reported once activities are initiated.

Task 6 – Infrastructure Development

This task will facilitate the infrastructure planning required for CCS to be implemented on a wide-scale regional basis as well as the development of the specific infrastructure associated with the capture, dehydration, compression, and pipeline transportation of CO_2 from its source to an oil field for EOR. Activities for the reporting period include the following:

- An internal review continued of the updated CO_2 capture technologies value-added topical report, highlighting technologies that are applicable to the PCOR Partnership Phase III demonstration project.
- The potential pipeline infrastructure needed to move CO_2 from the planned Mesaba integrated gasification combined-cycle plant to various geological sequestration opportunities in the PCOR Partnership region was estimated.
- Preliminary calculations needed to investigate CO_2 compressors that could be utilized in a potential U.S.-based demonstration were completed and provided to Trimeric. Engineers at Trimeric estimated that purchase and installation of compression and dehydration equipment that would be sized appropriately for use in a 20 to 60 million scfd CCS demonstration would cost $13 million to $16.25 million.
- Details were researched such as thermodynamics, solvent costs, efficiencies, etc., for various near-term CO_2 capture technologies at the request of a PCOR Partnership partner.
- A report prepared for the EERC by Biorecro AB discussing carbon credits associated with CCS from biofuel-fired combustion was reviewed.
- Information was gathered regarding water usage during carbon capture activities.
- The CO_2 capture technologies table that is contained in the newly designed PCOR Partnership Partners-only Web site was reviewed.
- The information regarding four CO_2 sources on the DSS was updated.

Task 7 – CO_2 Procurement

This task documents CO_2 procurement procedures for the EOR activities. EERC personnel interface with commercial partners with respect to CO_2 procurement for a second Phase III demonstration as a means of documenting critical pathways for future projects. Activities for the reporting period include the following:

- Discussions continued with prospective owner/operators of CO_2 sources and prospective owner/operators of oil reservoirs for the Phase III U.S. field demonstration.
- A potential source being pursued is a natural gas-processing plant in the westerly portion of the region, wherein previously vented CO_2 would be transported via a new pipeline to an oil field in the region for use in EOR. This location is now designated as the U.S. field demonstration site. Additional details will be divulged once negotiations are completed and agreements are in place.

Task 8 – Transportation and Injection Operations

This task will be initiated in the second year of BP4 and will consist of monitoring and documenting commercial partner activities related to transport of CO_2 via pipeline to the U.S. field demonstration site as well as on-site injection. Progress will be reported in this task once activities are initiated.

Task 9 – Operational Monitoring and Modeling

This task will be initiated at the beginning of BP4 to develop data sets for the large-volume CO_2 injection tests that 1) verify that injection operations do not adversely impact human health or the environment and 2) validate the storage of CO_2 for the purpose of developing and, ultimately, monetizing carbon credits.

Task 10 – Site Closure

Task 10 will conduct research with regard to site closure practices and procedures that would be applicable for sites similar to the PCOR Partnership demonstration. This task will be initiated Quarter 1 – BP5, Year 9. Once activities are initiated, progress will be communicated.

Task 11 – Postinjection Monitoring and Modeling

This task will use the data generated by the site characterization and monitoring activities to provide the technical basis for 1) the formal establishment of carbon credits that are directly linked to the volume of CO_2 injected into the site and 2) a third-party carbon-trading entity to validate and ultimately monetize the credits derived from the Phase III tests. This task will be initiated Quarter 1 – BP5, Year 9. Once activities are initiated, the progress will be communicated.

Task 12 – Project Assessment

Task 12 entails the evaluation of Phase III project progress, accomplishments, and goals. Project assessment was conducted for all active Phase III tasks for the period running from October 1, 2007 – September 30, 2008, and illustrated in the project assessment annual report (D57). The report was submitted on December 31, 2008. The next project assessment report is due December 31, 2009.

Task 13 – Project Management

This task focuses on ensuring the overall success of the entire program by providing experienced management and leadership to each of the individual tasks and to the program as a whole. The project manager and task leaders meet regularly to report the progress of their tasks and discuss any issues and corrective actions necessary. Task leaders are also responsible to provide the project manager with written weekly updates. These updates include highlights (including trip reports), issues (i.e., budget, staffing, technical issues, etc.), opportunities, and travel plans. The monthly, quarterly, and yearly updates can be found on the PCOR Partnership DSS. The following activities for this reporting period were performed:

- Planning continued for the upcoming 2009 PCOR Partnership Annual Meeting scheduled for December 1–3, 2009, in St. Louis, Missouri, including ongoing efforts to post the registration information on the Internet and plan evening activities for attendees.

- Preparation continued of materials for October 26, 2009, as Session Coordinator for the Carbon Management session in conjunction with the EERC's Air Quality VII Conference, including preparation of a presentation and a paper to be used during the session.
- EERC staff hosted a task leader meeting at the EERC on July 27, 2009, where topics discussed included the Phase III – BP4: Continuation Application; the Regulatory Meeting – Brainstorming Session; DOE Techlines; the 2009 PCOR Partnership Annual Meeting; the Phase III U.S. Site Selection Update, and a Fort Nelson Update, as well as other task leader activities.
- EERC staff followed up with CSLF regarding the application submitted June 22, 2009, for recognition of Spectra Energy's Fort Nelson demonstration project.
- A new approach for tracking and processing the multitude of upcoming milestones, deliverables, and value-added reports was discussed internally.
- Preparations continued for a PowerPoint presentation and a poster for the Fort Nelson CCS Project seeking CSLF recognition at the Third CSLF Ministerial Meeting in London, England, October 11–16, 2009.
- EERC staff hosted a task leader meeting on September 11, 2009. Topics discussed included the plans for the upcoming annual meeting, an update on proposed Phase III demonstration sites, and a review of past proposals and upcoming deliverables.
- Efforts continued to streamline the process for existing Phase II members to continue their membership into Phase III, BPs 4 and 5, i.e., the next 8 years.

Task 14 – RCSP WWG Coordination

The purpose of the WWG is to address the wide variety of concerns and opportunities at the nexus of carbon storage and water resources. Development of documents under this task is led by the EERC, with input from all WWG participants. Activities for the reporting period included the following:

- Development continued of the final version of the White Paper on the Nexus of CCS and Water, with the final due on October 30, 2009.

PHASE III COST STATUS

The approved BP3 (Modification No. 16) budget along with actual costs incurred and in-kind cost share reported is shown in Table 3. A spending plan for BP3 and actual incurred cost by quarter of cash funds for BP3 is provided in Figure 3 and Table 4.

Table 3. Phase III Budget – BP3

Organization	Approved Budget	Actual Costs Incurred
DOE Share – Cash	$4,133,219	$4,190,566
Nonfederal Share – Cash	$908,847	$887,694
Nonfederal Share – In-Kind	$4,850,385	$2,585,256
Total	$9,892,451	$7,663,516

PHASE III SCHEDULE STATUS

Table 5 lists all deliverables and milestones by quarter, with completion dates, through the end of the reporting period (see Table 6 for the Gantt chart for BP3).

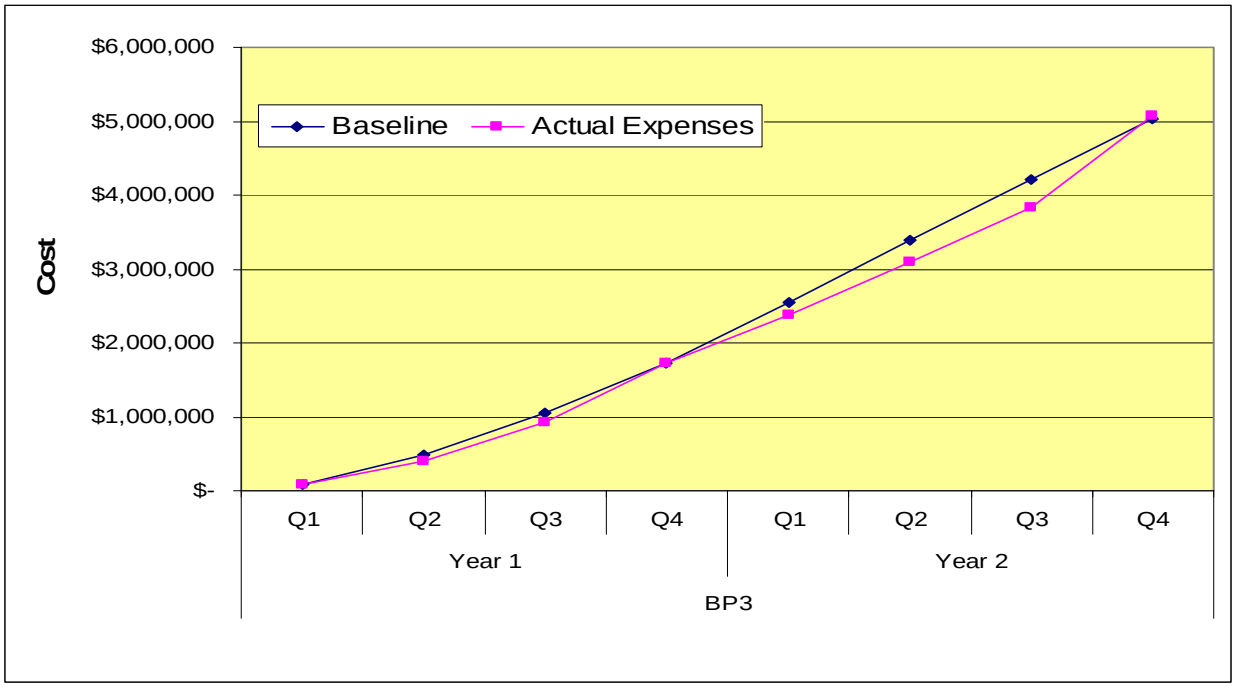


Figure 3. PCOR Partnership Phase III, BP3, funding (cash only).

ACTUAL OR ANTICIPATED PHASE III PROBLEMS OR DELAYS

Task 1 – Regional Characterization

- MO DGLS staff continued to work with City Utilities of Springfield, Missouri, on their proposed demonstration project to sequester CO_2 in a shallow aquifer below the power plant.

Task 2 – Public Outreach and Education

Nothing anticipated at this time.

Task 3 – Permitting and NEPA Compliance

Nothing to note at this time.

Table 4. BP3 Spending Plan

Baseline Reporting Quarter	Q1		Q2		Q3		Q4		Q1		Q2		Q3		Q4	
	Q1	Cum. BP Total	Q2	Cum. BP Total	Q3	Cum. BP Total	Q4	Cum. BP Total	Q1	Cum. BP Total	Q2	Cum. BP Total	Q3	Cum. BP Total	Q4	Cum. BP Total
Baseline Cost Plan																
Federal Share	$ 88,728	$ 88,728	$ 318,976	$ 407,704	$ 510,620	$ 918,324	$ 597,684	$ 1,516,008	$ 654,303	$ 2,170,311	$ 654,303	$ 2,824,614	$ 654,303	$ 3,478,916	$ 654,303	$ 4,133,219
Non-Federal Share	$ -	$ -	$ 68,000	$ 68,000	$ 67,999	$ 135,999	$ 67,999	$ 203,998	$ 176,212	$ 380,210	$ 176,212	$ 556,422	$ 176,212	$ 732,634	$ 176,213	$ 908,847
Total Planned	$ 88,728	$ 88,728	$ 386,976	$ 475,704	$ 578,619	$ 1,054,323	$ 665,683	$ 1,720,006	$ 830,515	$ 2,550,521	$ 830,515	$ 3,381,036	$ 830,515	$ 4,211,550	$ 830,516	$ 5,042,066
Actual Incurred Cost																
Federal Share	$ 88,728	$ 88,728	$ 318,976	$ 407,704	$ 510,620	$ 918,324	$ 597,684	$ 1,516,008	$ 390,254	$ 1,906,262	$ 365,077	$ 2,271,339	$ 743,537	$ 3,014,876	$ 1,175,690	$ 4,190,566
Non-Federal Share	$ -	$ -	$ -	$ -	$ -	$ -	$ 204,037	$ 204,037	$ 261,465	$ 465,502	$ 349,283	$ 814,785	$ 2,778	$ 817,563	$ 70,131	$ 887,694
Total Incurred Cost	$ 88,728	$ 88,728	$ 318,976	$ 407,704	$ 510,620	$ 918,324	$ 801,721	$ 1,720,045	$ 651,719	$ 2,371,764	$ 714,360	$ 3,086,124	$ 746,315	$ 3,832,439	$ 1,245,821	$ 5,078,260
Variance																
Federal Share	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 264,049	$ 264,049	$ 289,226	$ 553,275	$ (89,234)	$ 464,040	$ (521,387)	$ (57,347)
Non-Federal Share	$ -	$ -	$ 68,000	$ 68,000	$ 67,999	$ 135,999	$ (136,038)	$ (39)	$ (85,253)	$ (85,292)	$ (173,071)	$ (258,363)	$ 173,434	$ (84,929)	$ 106,082	$ 21,153
Total Variance	$ -	$ -	$ 68,000	$ 68,000	$ 67,999	$ 135,999	$ (136,038)	$ (39)	$ 178,796	$ 178,757	$ 116,155	$ 294,912	$ 84,200	$ 379,111	$ (415,305)	$ (36,194)

Table 5. Phase III Milestones and Deliverables

Title/Description	Due Date	Actual Completion Date
Year 1 – Quarter 1 (October–December 2007)		
M17: Task 4 – Fort Nelson Test Site Selected	12/31/07	12/28/07
D37: Task 4 – Fort Nelson Test Site – Site Geological Characterization Experimental Design Package	12/31/07	12/28/07
D63: Task 13 – Project Management Plan	12/31/07	12/28/07
Year 1 – Quarter 2 (January–March 2008)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/08	1/31/08
D38: Task 4 – Fort Nelson Test Site – Geomechanical Experimental Design Package	1/31/08	1/31/08
M1: Task 1 – Three Target Areas Selected for Detailed Characterization	3/31/08	3/20/08
M18: Task 4 – Fort Nelson Test Site Geochemical Work Initiated	3/31/08	3/19/08
D11: Task 2 – Outreach Plan	3/31/08	3/31/08
D30: Task 4 – U.S. Test Site – Geomechanical Experimental Design Package	3/31/08	3/31/08
D27: Task 3 – Environmental Questionnaire – Fort Nelson Test Site	3/31/08	4/02/08
Year 1 – Quarter 3 (April–June 2008)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/08	4/30/08
D14: Task 2 – General Phase III Fact Sheet	4/30/08	4/30/08
D17: Task 2 – General Phase III Information PowerPoint Presentation	5/30/08	5/30/08
M3: Task 3 – Start Environmental Questionnaire for U.S. Test Site	6/30/08	6/27/08
M6: Task 4 – U.S. Test Site Geochemical Work Initiated	6/30/08	6/30/08
M7: Task 4 – U.S. Test Site Geological Characterization Data Collection Initiated	6/30/08	6/30/08
Year 1 – Quarter 4 (July–September 2008)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/08	7/31/08
D12: Task 2 – Demonstration Web Pages on the Public Site	7/31/08	7/31/08
M2: Task 1 – Demonstration Project Reporting System (DPRS) Prototype Completed	9/30/08	9/26/08
D1: Task 1 – Review of Source Attributes	9/30/08	9/26/08
Year 2 – Quarter 1 (October–December 2008)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/08	10/31/08
D20: Task 2 – Documentary Support to PowerPoint and Web Site	12/31/08	12/31/08
D57: Task 12 – Project Assessment Annual Report	12/31/08	12/31/08

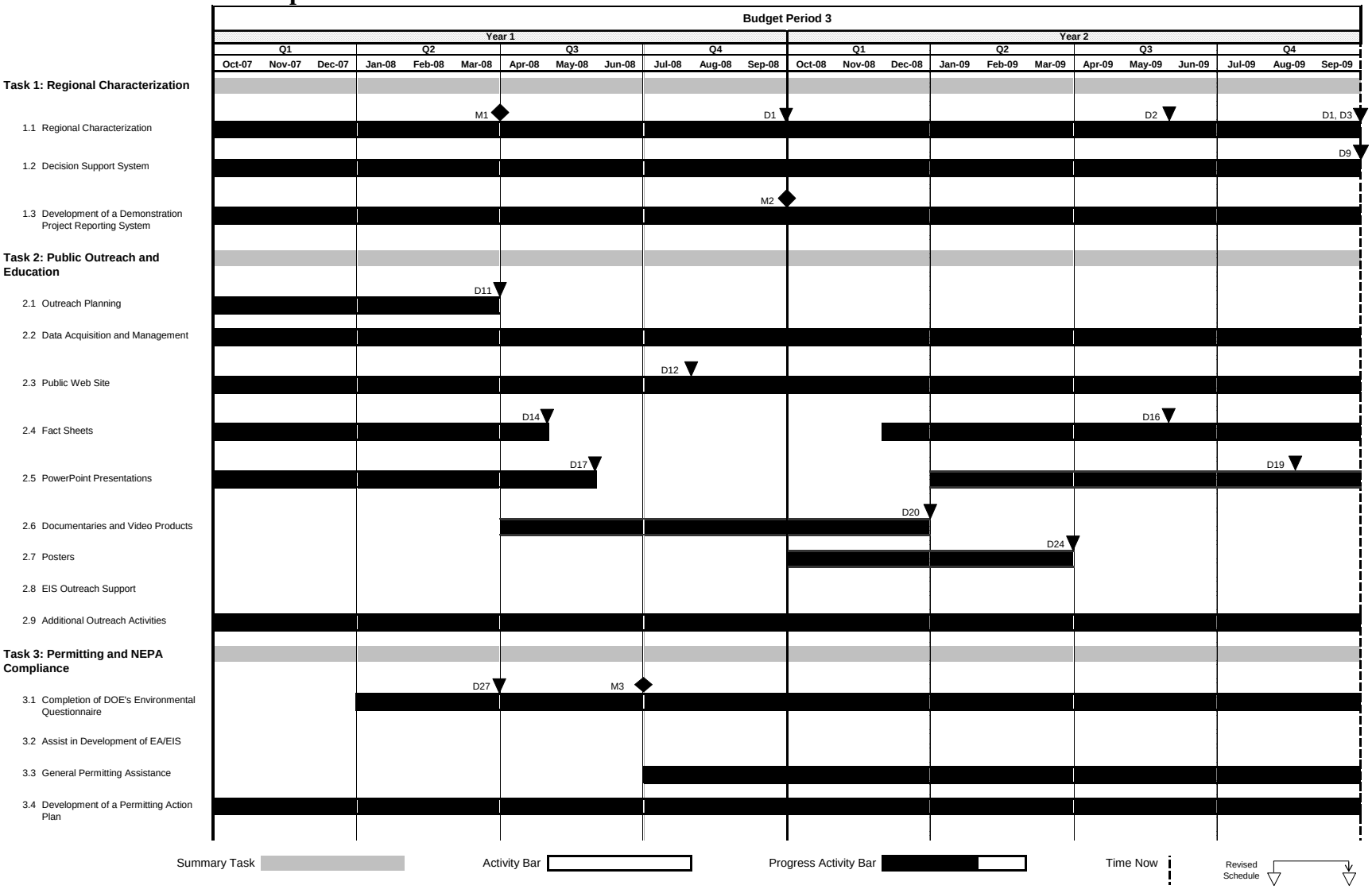
Continued…

Table 5. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 2 – Quarter 2 (January–March 2009)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/09	1/30/09
M21: Task 14 – Outline of White Paper on Nexus of CO_2 Capture and Sequestration (CCS) and Water, Part Subtask 14.2 – White Paper on Nexus of CCS and Water	2/27/09	2/27/09
M23: Task 14 – Monthly WWG Conference Call Held	2/26/09	
D24: Task 2 – PCOR Partnership Region Sequestration General Poster	3/31/09	3/31/09
M23: Task 14 – Monthly WWG Conference Call Held	3/31/09	3/31/09
Year 2 – Quarter 3 (April–June 2009)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/09	4/30/09
M23: Task 14 – Monthly WWG Conference Call Held	4/30/09	4/30/09
D2: Task 1 – First Target Area Completed	5/29/09	5/29/09
M23: Task 14 – Monthly WWG Conference Call Held	5/29/09	5/29/09
M24: Task 14 – WWG Annual Meeting Held	5/29/09	5/07/09
D16: Task 2 – Fort Nelson Test Site Fact Sheet	5/29/09	5/29/09
M23: Task 14 – Monthly WWG Conference Call Held	6/30/09	6/25/09
Year 2 – Quarter 4 (July–September 2009)		
M23: Task 14 – Monthly WWG Conference Call Held	7/31/09	Not required by DOE (7/16/09)
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/09	7/31/09
D19: Task 2 – Fort Nelson Test Site PowerPoint Presentation	7/31/09	7/31/09
M22: Task 14 – Draft White Paper - Nexus of CCS and Water Available for Comments	8/17/09	8/18/09 (DOE) 8/21/09 (WWG)
M23: Task 14 – Monthly WWG Conference Call Held	8/31/09	8/25/09
M4: Task 4 – U.S. Test Site Selected	9/30/09	9/30/09*
M5: Task 4 – Data Collection Initiated for U.S. Test Site	9/30/09	9/30/09
M23: Task 14 – Monthly WWG Conference Call Held	9/30/09	9/22/09
D1: Task 1 – Review of Source Attributes	9/30/09	9/25/09
D3: Task 1 – Permitting Review – One State and One Province	9/30/09	9/30/09
D9: Task 1 – Updated DSS	9/30/09	9/29/09
D47: Task 6 – Topical Report on the Preliminary Design of Advanced Compression Technology	9/30/09	9/30/09
D77: Task 13 – Risk Management Plan Outline	9/30/09	9/18/09

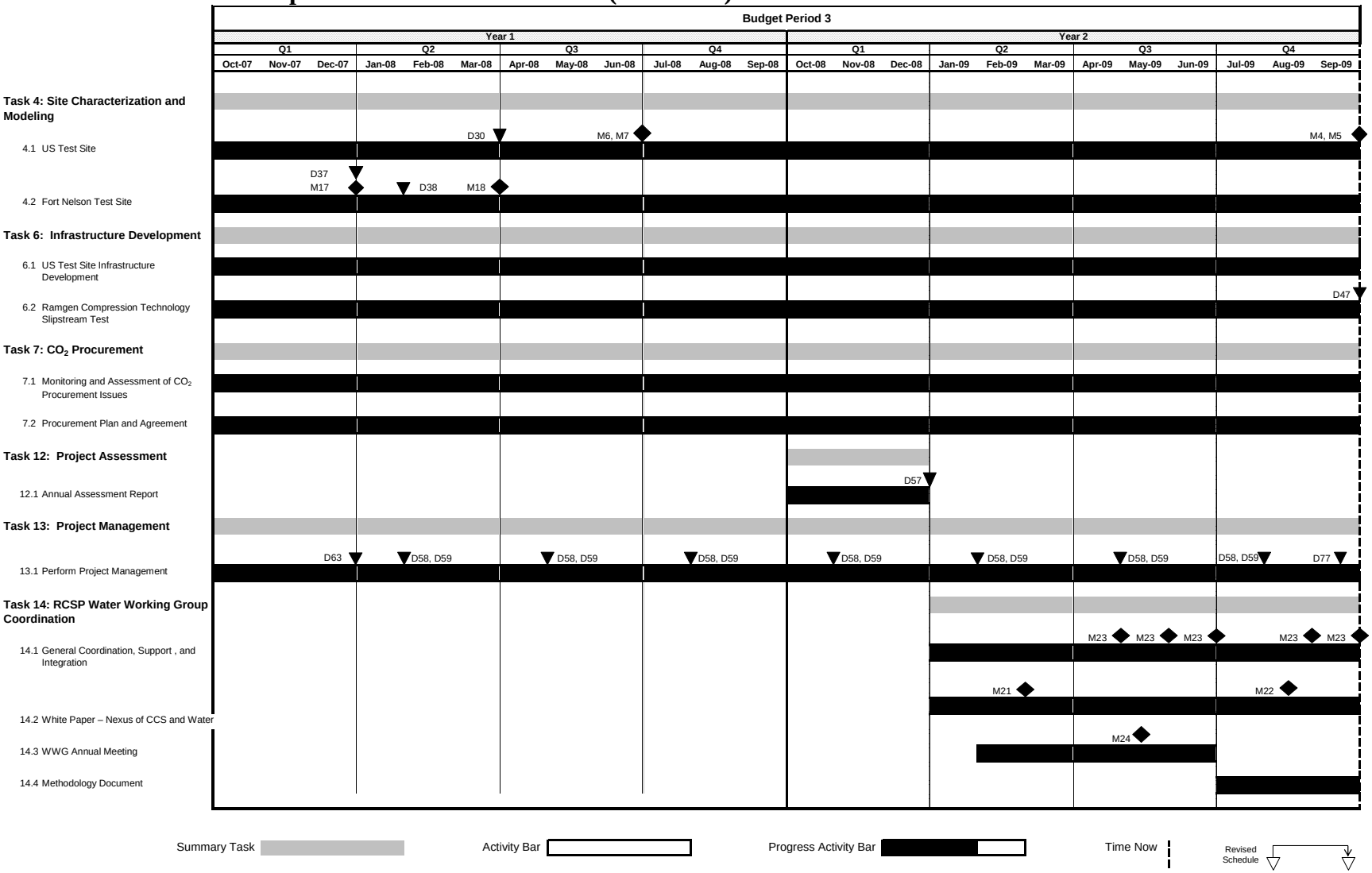
***** *Location of the U.S. Test Site will be disclosed once negotiations have been completed.*

Table 6. PCOR Partnership Phase III BP3 Gantt Chart



Continued…

Table 6. PCOR Partnership Phase III BP3 Gantt Chart (continued)



Continued…

Table 6. PCOR Partnership Phase III BP3 Gantt Chart (continued)

Key for Phase III Deliverables (D) ▼				Key for Phase III Milestones (M) ◆	
D1	Review of Source Attributes	D27	FN Test Site – Environmental Questionnaire	M1	Three Target Areas Selected
D2	First Target Area Completed	D30	United States (US) Test Site – Geomechanical Experimental Design Package	M2	DPRS Prototype
D3	Permitting Review – One State and One Province	D37	FN Test Site – Site Geological Characterization Experimental Design Package	M3	Start Environmental Questionnaire for US Test Site
D9	Updated DSS	D38	FN Test Site – Geomechanical Experimental Design Package	M4	US Test Site Selected
D11	Outreach Plan	D47	Topical Report on the Preliminary Design of Advanced Compression Technology	M5	Data Collection Initiated for US Test Site
D12	Demonstration Web Pages on the Public Site	D57	Project Assessment Annual Report	M6	US Test Site Geochemical Work Initiated
D14	General Phase III Fact Sheet	D58	Quarterly Progress Report	M7	US Test Site Geological Characterization Data Collection Initiated
D16	Fort Nelson (FN) – Test Site Fact Sheet	D59	Milestone Quarterly Report	M17	FN Test Site Selected
D17	General Phase III Information PowerPoint Presentation	D63	Project Management Plan	M18	FN Test Site Geochemical Work Initiated
D19	FN Test Site – PowerPoint Presentation	D77	Risk Management Plan Outline	M21	Outline of White Paper on Nexus of CCS and Water Available for Comments
D20	Video Support to PowerPoint and Web Site	D78	Final White Paper on the Nexus of CCS and Water	M22	Draft White Paper on the Nexus of CCS and Water Available for Comments
D24	PCOR Partnership Region Sequestration General Poster			M23	Monthly WWG Conference Call Held
				M24	WWG Annual Meeting Held

Task 4 – Site Characterization and Modeling

Negotiations are still ongoing for the U.S. field demonstration field site. Until negotiations are completed, the demonstration schedule is uncertain.

Task 5 – Well Drilling and Completion

Nothing to note at this time.

Task 6 – Infrastructure Development

Some of the work on this task has been delayed while the plans for CO_2 capture and geologic sequestration for the demonstration projects are finalized.

Task 7 – CO_2 Procurement

The EERC continues to pursue potential CO_2 sources that meet the goals of the project.

- Significant effort was previously focused on facilitating negotiations between one particular CO_2 supplier and regional oil companies.
- Potential alternative arrangements include a CO_2 capture facility at another regional coal-fired utility and integration of that CO_2 with that of a colocated ethanol production facility.
- Other potential alternative sources are also being pursued.

Task 8 – Transportation and Injection Operations

Nothing to note at this time.

Task 9 – Operational Monitoring and Modeling

Nothing to note at this time.

Task 10 – Site Closure

Nothing to note at this time.

Task 11 – Postinjection Monitoring and Modeling

Nothing to note at this time.

Task 12 – Project Assessment

Nothing to note at this time.

Task 13 – Project Management

Because negotiations are ongoing and still uncertain for the U.S. field demonstration, attendant deliverables and milestones were approved for extension by DOE.

Task 14 – RCSP WWG Coordination

Nothing to note at this time.

PHASE III PRODUCTS OR TECHNOLOGY TRANSFER ACTIVITIES

Task 1 – Regional Characterization

- A Review of Source Attributes (D1) was completed on September 25, 2009.
- A Permitting Review – One State and One Province (D3) was completed on September 30, 2009.
- The Update to the DSS (D9) was completed on September 25, 2009.

Task 2 – Public Outreach and Education

- A PowerPoint presentation on the Fort Nelson demonstration site (D19) was completed on July 31, 2009.

Task 3 – Permitting and NEPA Compliance

- The NEPA for non-site specific and non-field-based work for the PCOR Partnership project for BP4 and BP5 was completed.

Task 4 – Site Characterization and Modeling

- M4 and M5 were completed on September 30, 2009.

Task 5 – Well Drilling and Completion

Not applicable.

Task 6 – Infrastructure Development

- D47, the topical report entitled "Preliminary Design of Advanced Compression Technology," was completed on September 30, 2009.
- EERC staff attended the 3rd Carbon Capture and Sequestration Summit and its associated workshop entitled "From the Smokestack to the Gas Tank: Transforming CO_2 into Fuel." These events were held September 14–16, 2009, in Washington, D.C.

Task 7 – CO_2 Procurement

Numerous discussions with potential CO_2 suppliers have taken place. Because of the sensitive nature of negotiations, specifics cannot be shared at the present time.

Task 8 – Transportation and Injection Operations

Not applicable.

Task 9 – Operational Monitoring and Modeling

Not applicable.

Task 10 – Site Closure

Not applicable.

Task 11 – Postinjection Monitoring and Modeling

Not applicable.

Task 12 – Project Assessment

No deliverables were due during this reporting period.

Task 13 – Project Management

- The Quarterly Progress Report/Milestone Quarterly Report (D58/59) was completed on July 31, 2009.
- The draft Risk Management Plan Outline (D77) was completed on September 18, 2009.
- The following PowerPoint presentations were presented:

  "Plains CO_2 Reduction (PCOR) Partnership Projects at Fort Nelson and Williston Basin"
  Carbon Capture 2009: Status & Outlook
  July 17, 2009
  Washington, DC
  Ed Steadman
  Energy & Environmental Research Center

  Overview of the PCOR Partnership Field-Based Activities:
  Williston Basin Demonstration Project;
  Fort Nelson CCS Project;
  McGregor Huff 'n' Puff Project
  July 30, 2009
  Jim Sorensen, Steve Smith, Darren Schmidt, Ed Steadman, John Harju
  Energy & Environmental Research Center

Task 14 – RCSP WWG Coordination

- The WWG Monthly Conference Calls (M23) are up to date, and the meeting notes were submitted to DOE on September 3 and October 9, 2009.

MEETINGS/TRAVEL

Representatives from the PCOR Partnership participated in and/or presented at the following meetings and conferences in this reporting period:

- June 29 – July 1, 2009: Participated in a Fort Nelson Risk Management meeting at Spectra Energy in Calgary, Alberta, Canada.
- July 14–15, 2009: Attended the RCSP Public Outreach Working Group meeting in Washington, D.C.
- July 14–17, 2009: Participated in a Fort Nelson Risk Management meeting at Spectra Energy in Calgary, Alberta, Canada.
- July 15–17, 2009: Presented at the Infocast 3rd Annual Carbon Capture Status & Outlook Conference, in Washington, D.C.
- July 20–21, 2009: Attended the North America Carbon Atlas Partnership Meetings in Morgantown, West Virginia.
- July 22–23, 2009: Presented at the North America Energy Working Group–North American Carbon Atlas Partnership meeting in Pittsburgh, Pennsylvania.
- July 27–30, 2009: Participated in a Fort Nelson Risk Management meeting at Spectra Energy in Calgary, Alberta, Canada.
- July 28–29, 2009: Met with Nebraska Public Power District in Denver, Colorado.
- July 29–30, 2009: Presented at the Keystone Center for Education: Climate Status Investigations Teacher Workshop in Omaha, Nebraska.
- August 3–5, 2009: Attended the IOGCC Carbon Capture & Geologic Storage Task Force meeting in Oklahoma City, Oklahoma.
- August 6, 2009: Presented at the North Dakota Industrial Commission Oil and Gas Council meeting in Bismarck, North Dakota.
- August 16–19, 2009: Presented at the AAPG/Scientific Ecology Group, Inc. /SPE Hedberg Research Conference "Geological Carbon Sequestration: Prediction and Verification" in Vancouver, British Columbia, Canada.
- August 24–27, 2009: Traveled to Spectra Energy offices for meetings regarding the Fort Nelson risk management plan in Calgary, Alberta, Canada.
- August 24–27, 2009: Attended meetings regarding CO_2 sourcing issues in Fort Worth, Texas, and Pittsburgh, Pennsylvania.
- September 3, 2009: Participated in CCEMC's Webinar entitled "Climate Change and Emissions Management Act: Alberta's Response to Reduce Emissions."
- September 13–16, 2009: Attended the Platt's 2nd Annual Carbon Capture & Sequestration Policy, Economics, Regulation and Risk Conference in Washington, D.C.

- September 13–16, 2009: Attended the ACI 3rd Annual Carbon Capture and Sequestration Summit and Post-Summit Workshop entitled "From the Smokestack to the Gas Tank: Transforming CO2 into Fuel" in Washington, D.C.
- September 13–16, 2009: Attended the Water/Energy Sustainability Symposium at the 2009 Ground Water Protection Council Annual Forum in Salt Lake City, Utah.
- September 15–17, 2009: Presented at the 2009 North Dakota Solid Waste and Recycling Symposium in Minot, North Dakota.
- September 22, 2009: Participated in IEA CCS Webinar entitled "How Stable is Stable? – What is Required for CCS Site Handover?"
- September 22–25, 2009: Met with representatives of Spectra Energy in Calgary, Alberta, Canada.

Materials presented at these meetings are available to partners on the PCOR Partnership DSS Web site (http://www2.undeerc.org/website/pcorp/).

REFERENCES

None.