



Plains CO₂ Reduction (PCOR) Partnership
Energy & Environmental Research Center (EERC)

PLAINS CO₂ REDUCTION PARTNERSHIP PHASE III

Quarterly Technical Progress Report Task 13 – Deliverable D58/D59

(for the period October 1 – December 31, 2013)

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EERC Funds 15422, 15577, and 9850
DOE Project Manager: Andrea T. McNemar
EERC Principal Investigator: Charles D. Gorecki

Prepared by:

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

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

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PLAINS CO₂ REDUCTION PARTNERSHIP PHASE III

Quarterly Technical Progress Report

October 1 – December 31, 2013

EXECUTIVE SUMMARY

The Plains CO₂ Reduction (PCOR) Partnership is one of seven Regional Carbon Sequestration Partnerships (RCSPs) competitively awarded by the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) in 2003 as part of a national plan to mitigate greenhouse gas emissions. The PCOR Partnership is led by the Energy & Environmental Research Center (EERC) at the University of North Dakota and continues to include stakeholders from the public and private sector in Phase III. The PCOR Partnership region includes all or part of nine U.S. states and four Canadian provinces.

Phase III, the development phase, a 10-year effort (2007–2017), is an extension of the characterization (Phase I) and validation (Phase II) phases. The Phase III efforts of the PCOR Partnership include two large-volume demonstration tests—one in Canada and one in the United States—that focus on injecting carbon dioxide (CO₂) into deep geologic formations for CO₂ storage. Budget Period 4 (Years 3–8 of Phase III) began October 1, 2009.

This progress report presents an update of Phase III PCOR Partnership activities from October 1, 2013, through December 31, 2013.

On November 14, 2013, the PCOR Partnership presented an overview of its technical program before the IEA Greenhouse Gas R&D Programme expert review of the RCSPs in Washington, D.C. The panel's evaluation and recommendations are anticipated in January 2014.

Activities at the Bell Creek site continued at a robust pace during this reporting period. Denbury Resources Inc. (Denbury) has cumulatively injected (May–November 2013) 291,544 metric tons of CO₂. Meanwhile, the PCOR Partnership completed its first full-field operational phase soil gas- and groundwater-sampling event on November 15, 2013 as well as monthly sampling activities. Pulsed-neutron logging activities were completed on three wells and analysis continued of the 3-D seismic data. A fieldwide petrophysical assessment report (including 21 well packages) of 81 intervals of core was finalized and submitted to the U.S. Geological Survey Denver Core Research Center, DOE NETL, and Denbury.

Regional characterization, modeling and simulation, and outreach and education efforts also continued. The RCSP Water Working Group, led by the PCOR Partnership, produced a new fact sheet, available online at www.undeerc.org/pcor. In addition, 18 presentations sharing the goals and efforts of the PCOR Partnership were given at 16 different meetings/conferences.



PLAINS CO₂ REDUCTION PARTNERSHIP PHASE III
Quarterly Technical Progress Report
October 1 – December 31, 2013

INTRODUCTION

The Plains CO₂ 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, and includes stakeholders from the public and private sectors. The membership, as of December 31, 2013, is listed in Table 1. 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).

The RCSP Program is part of NETL's Carbon Storage Program (Figure 1) and is a government–industry effort tasked with determining the most suitable technologies, regulations, and infrastructure needs for carbon capture and storage (CCS) on the North American continent.

The PCOR Partnership Program is being implemented in three phases:

- Phase I – Characterization Phase (2003–2005): characterized opportunities for carbon sequestration
- Phase II – Validation Phase (2005–2009): conducted small-scale field validation tests
- Phase III – Development Phase (2007–2017): involves large-volume carbon storage demonstration tests

Phase III is divided into three budget periods (BPs), running from October 1, 2007, to September 30, 2017:

- BP3: October 1, 2007 – September 30, 2009
- BP4: October 1, 2009 – September 30, 2015
- BP5: October 1, 2015 – September 30, 2017

BP1 and BP2 were effective in Phase II.

Table 1. PCOR Partnership Membership Phase III (October 1, 2007 – present, inclusive)

DOE NETL	Great Northern Project Development, LP	North Dakota Industrial Commission
UND EERC	Great River Energy	Oil and Gas Research Council
Abengoa Bioenergy New Technologies	Halliburton	North Dakota Natural Resources Trust
Air Products and Chemicals, Inc.	Hess Corporation	North Dakota Petroleum Council
Alberta Department of Energy	Huntsman Corporation	North Dakota Pipeline Authority
Alberta Department of Environment	Husky Energy Inc.	Otter Tail Power Company
Alberta Innovates – Technology Futures	Indian Land Tenure Foundation	Oxand Risk & Project Management Solutions
ALLETE	Interstate Oil and Gas Compact Commission	Peabody Energy
Ameren Corporation	Iowa Department of Natural Resources	Petroleum Technology Research Centre
American Coalition for Clean Coal Electricity	Lignite Energy Council	Petroleum Technology Transfer Council
American Lignite Energy	Manitoba Geological Survey	Pinnacle, a Halliburton Service
Apache Canada Ltd.	Marathon Oil Company	Prairie Public Broadcasting
Aquistore	MEG Energy Corporation	Pratt & Whitney Rocketdyne, Inc.
Baker Hughes Incorporated	Melzer Consulting	Praxair, Inc.
Basin Electric Power Cooperative	Minnesota Power	Ramgen Power Systems, Inc.
BillyJack Consulting Inc.	Minnkota Power Cooperative, Inc.	RPS Energy Canada Ltd.
Biorecro AB	Missouri Department of Natural Resources	Saskatchewan Ministry of Industry and Resources
Blue Source, LLC	Missouri River Energy Services	SaskPower
BNI Coal, Ltd.	Montana–Dakota Utilities Co.	Schlumberger
British Columbia Ministry of Energy, Mines, and Petroleum Resources	Montana Department of Environmental Quality	Shell Canada Limited
British Columbia Oil and Gas Commission	National Commission on Energy Policy	Spectra Energy
C12 Energy, Inc.	Natural Resources Canada	Suncor Energy Inc.
Computer Modelling Group Ltd.	Nebraska Public Power District	TAQA North, Ltd.
Continental Resources, Inc.	North American Coal Corporation	TGS Geological Products and Services
Dakota Gasification Company	North Dakota Department of Commerce	University of Alberta
Denbury Onshore LLC	Division of Community Services	University of Regina
Eagle Operating, Inc.	North Dakota Department of Health	WBI Energy, Inc.
Eastern Iowa Community College District	North Dakota Geological Survey	Weatherford Advanced Geotechnology
Enbridge Inc.	North Dakota Industrial Commission	Western Governors' Association
Encore Acquisition Company	Department of Mineral Resources, Oil and Gas Division	Westmoreland Coal Company
Energy Resources Conservation Board/Alberta Geological Survey	North Dakota Industrial Commission	Wisconsin Department of Agriculture, Trade and Consumer Protection
Environment Canada	Lignite Research, Development and Marketing Program	Wyoming Office of State Lands and Investments
Excelsior Energy Inc.		Xcel Energy

The overall mission of the Phase III program is to 1) gather characterization data to verify the ability of the target formations to store carbon dioxide (CO₂), 2) facilitate the development of the infrastructure required to transport CO₂ from sources to the injection sites, 3) facilitate sensible development of the rapidly evolving North American regulatory and permitting framework, 4) develop opportunities for PCOR Partnership partners to capture and store CO₂, 5) facilitate establishment of a technical framework by which carbon credits can be monetized for CO₂ stored in geologic formations, 6) continue collaboration with other RCSPs, and 7) provide outreach and education for CO₂ capture and storage stakeholders and the general public.

In Phase III, the PCOR Partnership is building on the information generated in its characterization (Phase I) and validation (Phase II) phases. The PCOR Partnership plans to fully utilize the infrastructure of its region to maximize CO₂ injection volumes. A programmatic development phase (Phase III) goal is implementation of large-scale field testing involving at

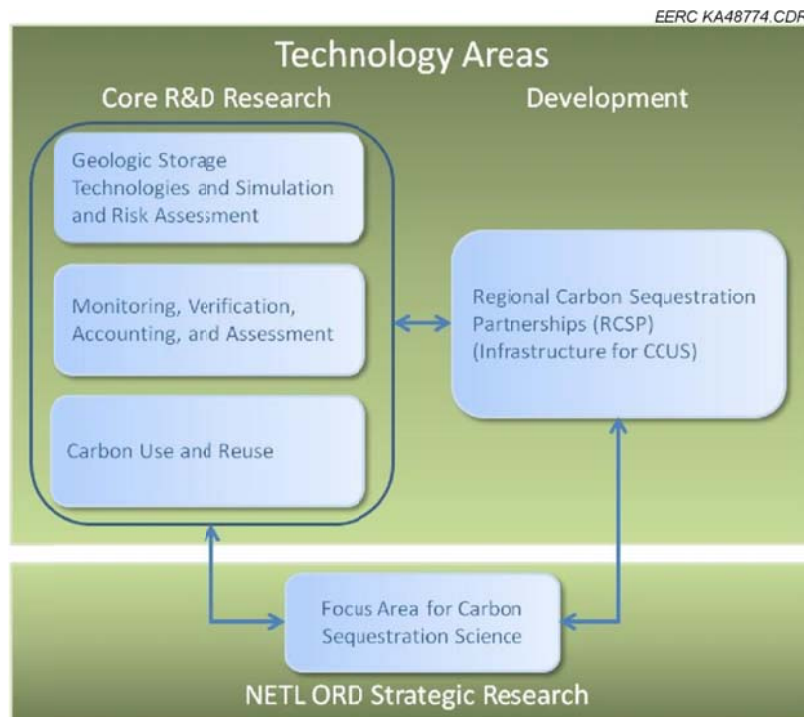


Figure 1. DOE Carbon Storage Program technology areas featuring regional partnerships (courtesy of DOE NETL).

least 1 million tons (Mt) of CO₂ a project. Each of the RCSP's large-volume injection tests is designed to demonstrate that the CO₂ storage sites have the potential to store regional CO₂ emissions safely, permanently, and economically for hundreds of years.

The PCOR Partnership is working with two large-scale demonstration sites. The sites are located 1) in the Denbury Resources Inc. (Denbury)-owned Bell Creek oil field in Powder River County in southeastern Montana and 2) near Spectra Energy Transmission's (Spectra's) Fort Nelson gas-processing facility, situated near Fort Nelson, British Columbia, Canada. In addition, the PCOR Partnership is collaborating with the Petroleum Technology Research Centre (PTRC) on site characterization, risk assessment, and monitoring, verification, and accounting (MVA) activities associated with the Aquistore Project near Estevan, Saskatchewan, Canada. It is also working with Apache Canada Ltd. to further characterize the Zama Acid Gas EOR, CO₂ Storage, and Monitoring Project in Alberta, Canada, as well as working on a multiyear, binational characterization effort of the basal Cambrian system (Figure 2).

The PCOR Partnership's objectives are as follows: 1) conduct a successful field demonstration to verify that the region's large number of oil fields have the potential to store significant quantities of CO₂ in a safe, economical, and environmentally responsible manner and 2) verify the economic feasibility of using the region's carbonate saline formations for safe, long-term CO₂ storage. During Phase III, the PCOR Partnership will continue to refine storage resource estimates and evaluate other factors relevant to regional storage goals.

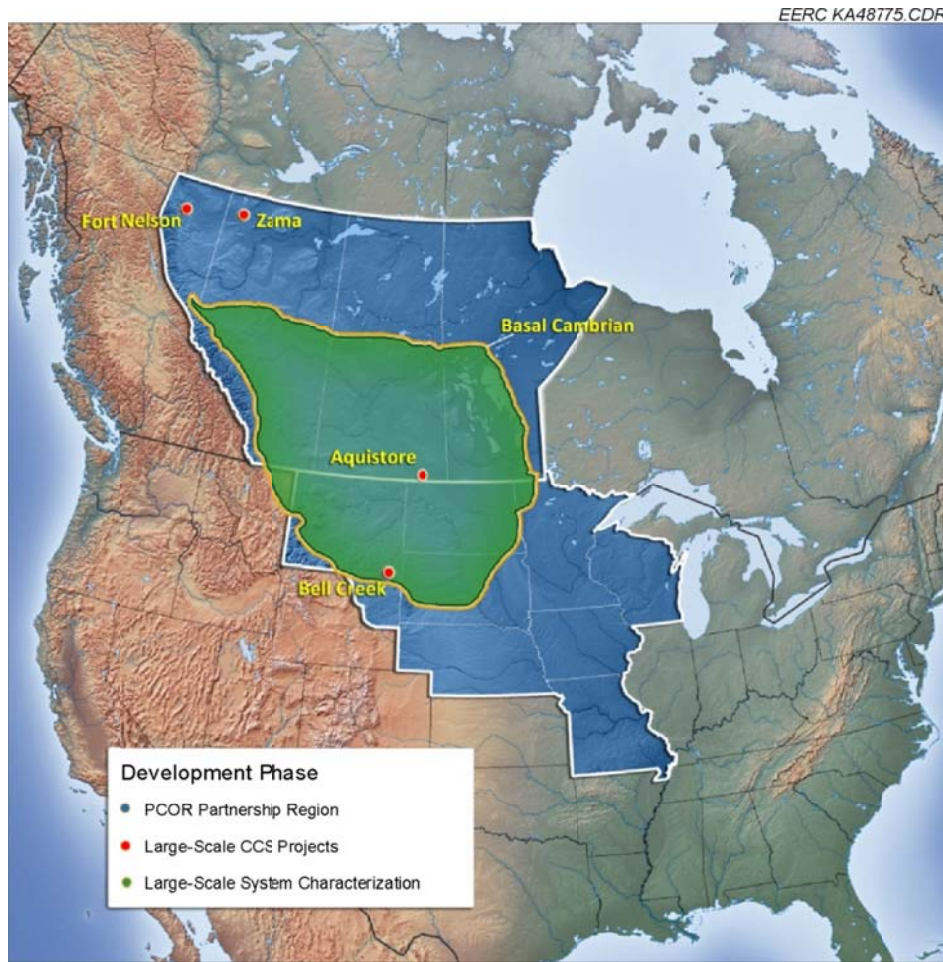


Figure 2. Location of large-scale sites in PCOR Partnership Phase III.

The PCOR Partnership plans to achieve its Phase III mission through a series of 16 tasks: 1) Regional Characterization; 2) Public Outreach and Education; 3) Permitting and National Environmental Policy Act (NEPA) Compliance; 4) Site Characterization and Modeling; 5) Well Drilling and Completion; 6) Infrastructure Development; 7) CO₂ Procurement; 8) Transportation and Injection Operations; 9) Operational Monitoring and Modeling; 10) Site Closure; 11) Postinjection Monitoring and Modeling; 12) Project Assessment; 13) Project Management; 14) RCSP Water Working Group (WWG) Coordination; 15) Further Characterization of the Zama Acid Gas Enhanced Oil Recovery (EOR), CO₂ Storage, and Monitoring Project; and 16) Characterization of the Basal Cambrian System. Table 2 lists the responsibility matrix for these 16 tasks.

It should be noted that Tasks 10 and 11 will not be initiated until BP5.

Table 2. Phase III Responsibility Matrix

Phase III Task Description	Task Leader
Task 1 – Regional Characterization	Wesley D. Peck
Task 2 – Public Outreach and Education	Daniel J. Daly
Task 3 – Permitting and NEPA Compliance	Lisa S. Botnen
Task 4 – Site Characterization and Modeling	James A. Sorensen
Task 5 – Well Drilling and Completion	John A. Hamling
Task 6 – Infrastructure Development	Melanie D. Jensen
Task 7 – CO ₂ Procurement	John A. Harju
Task 8 – Transportation and Injection Operations	Melanie D. Jensen
Task 9 – Operational Monitoring and Modeling	Charles D. Gorecki
Task 10 – Site Closure	TBA*
Task 11 – Postinjection Monitoring and Modeling	TBA
Task 12 – Project Assessment	Katherine K. Anagnost
Task 13 – Project Management	Charles D. Gorecki
Task 14 – RCSP WWG Coordination	Ryan J. Klapperich
Task 15 – Further Characterization of the Zama Acid Gas EOR, CO ₂ Storage, and Monitoring Project	Charles D. Gorecki
Task 16 – Characterization of the Basal Cambrian System	Wesley D. Peck

* To be announced.

PROGRESS OF WORK

Task 1 – Regional Characterization

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

- Created a location inset map for Burke County, North Dakota, for use in the Lignite Field Validation Test site overview fact sheet (in conjunction with Task 2).
- Obtained and updated the PETRA[®] software licenses for 2014.
- Continued value-added efforts to **characterize saline formations** for CO₂ storage, including the following:
 - Updated and began review of the Broom Creek Formation outline.
 - Continued drafting new outlines for the Leduc and Minnelusa Formations.
 - Continued efforts to find information and data pertaining to the Minnelusa formation outline.
 - Began literature review for the Inyan Kara Formation value-added outline.
 - Worked on an abstract for the upcoming 12th International Conference on Greenhouse Gas Technologies (GHGT-12) entitled “A Workflow to Determine CO₂ Storage in Deep Saline Formations.”
- Continued work on several additional **value-added reports**, including the following:
 - Report entitled “Montana Abandoned Oil Field Creation” in which an effort was made to approximate the oilfield boundaries in Montana based on oilfield information contained within oil well shape files.
 - Report summarizing methods of original oil in place and CO₂ storage calculations.

- Report on characterization of the Cedar Creek Anticline.
- Report on characterization of the state of Nebraska for CO₂ storage opportunities (in internal review).
- Report summarizing all past and present general regional characterization efforts.
- With regard to **NATCARB** (National Carbon Sequestration Database and Geographic Information System) activities:
 - Compiled statistics for NATCARB data, and wrote up notes for changes that were made since the last NATCARB submission.
 - Collected data related to saline storage modeling outputs.
 - Completed the initial upload of data.
 - Uploaded Mission Canyon model data into the geodatabase.
 - Completed reloading data into the newly released geodatabase.
 - Continued work on the oil and gas reservoir/pool table.
 - Participated in a conference call on October 30, 2013, regarding NATCARB data and the upcoming DOE NETL Atlas, Fifth Edition (Atlas V).
 - Received the “call for data” and associated guidelines from DOE NETL for Atlas V.
 - Added facility identifiers and rectified discrepancies to the CO₂ sources in the PCOR Partnership region in the United States in response to a NATCARB request. This will enable DOE to match sources more efficiently with U.S. Environmental Protection Agency (EPA) data.
 - Worked with Big Sky Carbon Sequestration Partnership (Big Sky) personnel on oilfield data, particularly in Montana, in order to resolve any data differences.
 - Discussed the Montana data with NATCARB personnel and the planned approach for overlapping regional data shared by Big Sky and the PCOR Partnership.
 - Successfully uploaded PCOR Partnership data to the DOE ftp site.
- Continued activities to update the content on the partners-only **Decision Support System (DSS)**, including the following:
 - Met in-house October 24, 2013, to review proposed changes currently housed on a test site.
 - Moved the 2013 Annual Membership Meeting Web page to “live” from the test site (www2.undeerc.org/website/PCORP/AnnualMeetingWorkshop/2013/).
 - Worked closely with programming staff to continue assembling the pop-up reports with CO₂ and EOR estimates related to oil fields and pools.
- With regard to the **Aquistore** Project static modeling and dynamic predictive simulations effort:
 - Calculated CO₂ density from formation depth, temperature, and pressure data and distributed it in the static geologic model.
 - Continued reviewing the permeability versus porosity relationship for the Black Island and Deadwood Formations using available core data
 - Continued work populating the static geologic model.
 - Populated the expanded model with horizontal permeability.
 - Reviewed the Schlumberger Carbon Services (Schlumberger) model, and compared it to the EERC model.
 - Began populating the fine-scaled model.

- Calculated CO₂ mass storage for all pore volume cases in both the expanded and fine-scale models.
- Documented the static modeling workflow.
- Built the model for simulation.
- Ran the test model to check the settings for the smooth simulation.
- Found the injection bottomhole pressure (BHP) and relative permeability data for simulation by working with team members.
- Verified that formation pressure in the static model was in agreement with Deadwood Formation drillstem test (DST) data.
- Discussed the boundary conditions for the model, and ran a case for the open system.
- Summarized the base simulation results, and made a couple of new cases.
- Began running the new cases for simulation.
- Upscaled the model for dynamic gridding simulation.
- Began writing the Geological Modeling and Simulation Report for the Aquistore Project (Deliverable [D] 93, due March 2014).
- Worked on an abstract for GHGT-12 entitled “Model Development of the Aquistore CO₂ Storage Project.”

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- With regard to the Aquistore Project, the capture facility is complete, but turbine installation is delayed. CO₂ injection is anticipated in spring 2014.

Task 2 – Public Outreach and Education

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

- During this reporting period, the PCOR Partnership was represented by EERC personnel at 16 conferences/meetings. Specifically, the PCOR Partnership outreach activities included 18 oral presentations, one poster presentation, and one exhibit booth. The following quantities of PCOR Partnership outreach materials were distributed:
 - PCOR Partnership documentary entitled “Nature in the Balance: CO₂ Sequestration” – two
 - PCOR Partnership documentary entitled “Reducing Our Carbon Footprint: The Role of Carbon Markets” – two
 - PCOR Partnership documentary entitled “Out of the Air – Into the Soil” – two
 - PCOR Partnership documentary entitled “Managing Carbon Dioxide: The Geologic Solution” – eight
 - PCOR Partnership documentary entitled “Global Energy and Carbon: Tracking Our Footprint” – eight
 - “PCOR Partnership Atlas, 4th Edition, Revised” – 18

- Continued an in-house review of outreach products and actions using a standard industry-accepted framework.
- Continued planning for an update to the CO₂ general storage poster (D24, due March 2014) and held an in-house discussion on October 4, 2014.
- Continued efforts to prepare and update **project-related fact sheets**, including the following activities:
 - Prepared a schedule for completing value-added updates/revisions to the Phase II site fact sheets.
 - Continued drafting the four-page Lignite Field Validation Test site overview fact sheet.
 - Updated the two-page Bell Creek fact sheet (value-added) to reflect the fact that CO₂ injection is now under way.
- Held an in-house meeting to discuss the scope and schedule for upcoming documentary productions.
- Continued collaborative efforts with **Prairie Public Broadcasting (PPB)**, including the following:
 - Traveled to the Boundary Dam power plant on October 23, 2013, near Estevan, Saskatchewan, Canada, to film interviews and location footage of the power plant and the CO₂ capture facility.
 - Previewed and discussed Parts 1 and 2 of the four-part educators Carbon and Energy video series in-house on October 16, 2013.
 - Met with PPB personnel on November 19, 2013, to discuss budgets, education activities, and participation in a carbon capture, utilization, and storage (CCUS) workshop in July 2014.
 - Continued preparations for a focus group to be led by PPB's education group to help in developing and evaluating educator-based outreach materials.
 - On December 6, 2013, met with 12 teachers at PPB offices in Fargo, North Dakota, to obtain feedback on outreach posters, educator videos (in production), educator Web pages (in development), and select Web site changes (under consideration).
 - On December 9, 2013, received a written summary of the comments received during the teacher meeting held at PPB offices.
 - On December 12, began in-house review of the PPB footage obtained while filming at the Boundary Dam facility.
 - Prepared a storyboard in PowerPoint outlining the proposed Bell Creek documentary (D21).
- Continued efforts to expand/improve **outreach-tracking efforts**, including the following:
 - On November 22, 2013, met in-house to discuss the inclusion of tracking tags for the addition of the documentaries and video clips on YouTube.
 - Continued updating forms and database programming with regard to site-specific community outreach efforts.
- Prepared information and a presentation for a partner, and continued to work on outreach materials following a meeting on October 14, 2013. Met again with the partner on November 12, 2013, and responded to a request for review on December 12, 2013.

- On December 9, 2013, participated in a conference call with an **educator** representing teachers from the Catholic Schools in Regina, Saskatchewan, who had developed a set of classroom activities about CCS.
- Received an invitation from the Global CCS Institute to participate in a CCS education workshop session planned for the Canadian Embassy in Washington, D.C., in February 2014.
- Provided comments to the steering committee of the IEAGHG (IEA Greenhouse Gas R&D Programme) Social Research Network in preparation for its fourth meeting on January 14 and 15, 2014, in Calgary, Alberta, Canada.
- Accepted an invitation to present at the North Dakota–Minnesota Geographic Alliances Collaborative Workshop scheduled for June 17–20, 2014.
- Prepared for and participated in the **PTRC** outreach workshop held November 14, 2013, in Regina, Saskatchewan, Canada.
- There were no Aquistore advisory committee conference calls during this reporting period.
- Participated in **RCSP Outreach Working Group** (OWG) activities, including the following:
 - Participated in the monthly conference call on October 17, 2013.
 - On November 21, 2013, participated in the monthly conference calls and provided input on the draft abstract prepared by the OWG for GHGT-12.
 - On December 19, 2013, participated in the monthly conference call and discussed a GHGT-12 abstract under preparation and member participation in the upcoming Global CCS Institute education workshop scheduled for February 2014.
- Continued efforts to update the **public Web site** (www.undeerc.org/pcor), including the following:
 - Continued planning for the next update report (D13, due July 2014).
 - Continued updates to the layout of the fact sheet page.
 - Continued a status review of all internal as well as external linked information, and repaired broken links.
 - Added the four regional technology implementation plans for Phase II validation activities and the Phase II final report to the site.
 - Continued Web research efforts using Google Analytics for the PCOR Partnership Web site (www.undeerc.org/pcor).
 - Held an in-house progress review meeting on December 20, 2013.
- During this reporting period, information regarding the **site visits** to the PCOR Partnership public Web site included the following:
 - There were 1602 visits to the public Web site (www.undeerc.org/pcor). Traffic increased by 39% over last quarter (1155 visits).
 - There were 1359 visitors to the public Web site, representing a 37% increase over last quarter (989 visitors). In particular, 80% (1283 visitors) of visitors were new to the Web site (visitors whose visit was marked as a first-time visit in this quarter), while visitors with two or more visits made up the remaining 20% (319 visitors).
 - Of the 1602 visits, 58% of the Web traffic was domestic and 42% was international. Table 3 lists the top ten countries with the highest number of visits to the PCOR Partnership Web site. There was traffic from 75 countries overall (Figure 3).

Table 3. Visit Activity from the Top Ten Countries and the PCOR Partnership Region

Country	PCOR Partnership State/Province	Visits
1. United States		937
	North Dakota	72
	Minnesota	39
	Montana	26
	Missouri	15
	Nebraska	14
	Wisconsin	12
	South Dakota	10
	Wyoming	7
	Iowa	4
2. Canada		111
	Alberta	25
	Saskatchewan	14
	British Columbia	9
	Manitoba	1
3. India		103
4. United Kingdom		81
5. Philippines		27
6. Australia		19
7. Germany		18
8. Japan		17
9. Brazil		16
10. France		14
Other 65 Countries		259
Total Visits		1602

- There were 248 visits originating from within the PCOR Partnership region (Figure 4), representing an increase of 13% from the 219 visits from last quarter. Approximately 80% of the regional visits originated from the United States, and 20% came from Canada. Visits from within the PCOR Partnership region comprised 16% of the overall traffic to the public Web site (It should be noted that the totals are skewed to some degree because the visit location data were aggregated at the state and province levels, even though the PCOR Partnership region formally includes only portions of British Columbia, Montana, and Wyoming).
- Visitors from within the PCOR Partnership region visited over three pages per visit, stayed on the Web site almost 3 minutes, and were more likely to continue into the Web site from their landing page, as indicated by a lower-than-overall bounce rate of 55% (versus 72% overall).
- During this reporting period, a breakdown of how visitors came to the PCOR Partnership Web site, also referred to as **traffic sources** (Figure 5), is provided below:

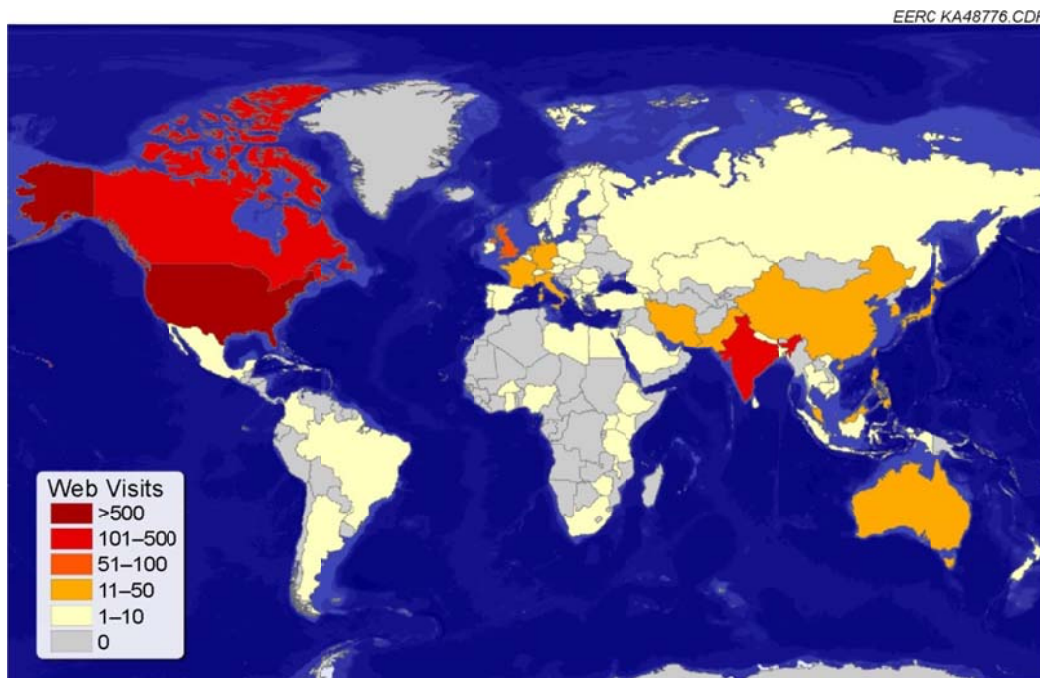


Figure 3. Map of PCOR Partnership Web site global traffic.

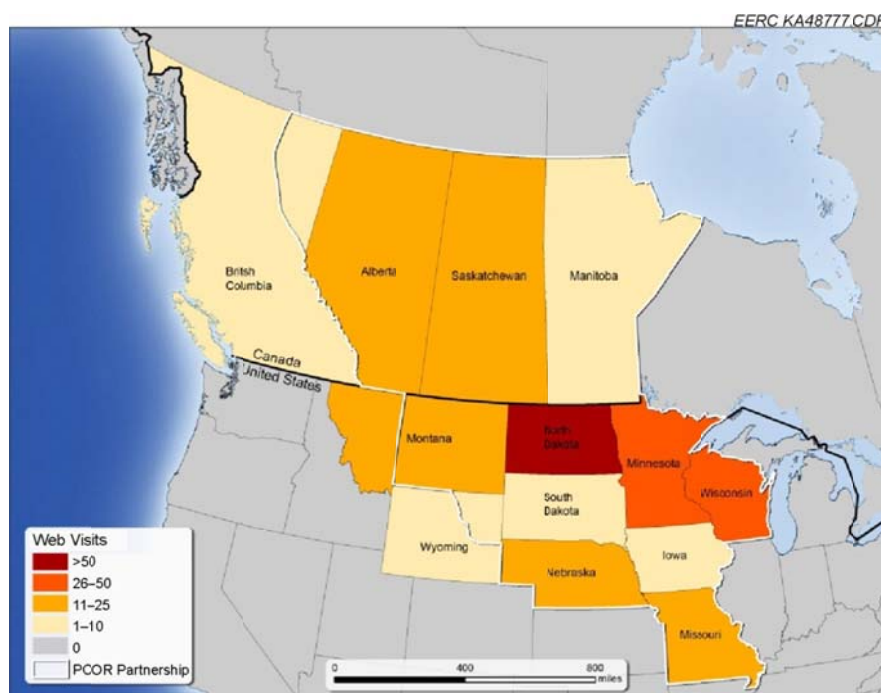


Figure 4. Map of PCOR Partnership Web site regional visits.

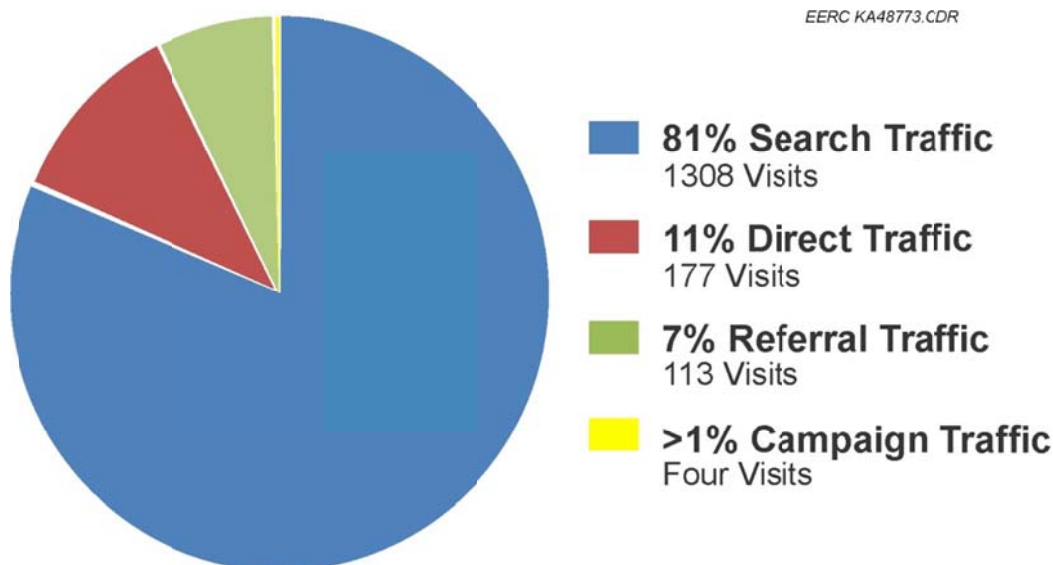


Figure 5. PCOR Partnership public Web site traffic sources.

- Direct traffic consists of those visitors who bookmark or type in the URL (www.undeerc.org/pcor). It is likely that most of the direct traffic (11%) is from persons familiar with the PCOR Partnership.
- Search engine traffic refers to the use of keywords and accounted for nearly 81% of the traffic. Google Analytics provides the keywords visitors used. The top three keywords used include “CO₂ Sequestration,” “PCOR,” and “What Is CO₂?.”
- Referral site traffic (7%) corresponds to the traffic directed to the PCOR Partnership Web page from other sites via links. The top two referring Web sites were DOE-based, specifically the main DOE Web site and the NETL Web site.
- During this reporting period, the **nature of the visits** to the PCOR Partnership public Web site included 3060 page views; the top five pages viewed are listed in Table 4.

Table 4. Top Pages for “Page Views” on the PCOR Partnership Public Web Site

Page Title	Page Views	% Page Views	Page
What Is CO ₂ Sequestration	698	23%	www.undeerc.org/pcor/sequestration/whatissequestration.aspx
Home Page	524	17%	www.undeerc.org/pcor/
Video Clip Library	290	9.5%	www.undeerc.org/pcor/Video-Clip-Library/default.aspx
CO ₂ Sequestration Projects	154	5.0%	www.undeerc.org/PCOR/CO2SequestrationProjects/
Carbon Sequestration, Climate Change, and CO ₂	110	3.6%	www.undeerc.org/PCOR/Sequestration/

- During this reporting period, “Global Energy and Carbon: Tracking Our Footprint” was broadcast twice in North Carolina; however, there were no documentaries aired in the PCOR Partnership region during this reporting period.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- All activities are on schedule, and there were no problems or delays during the reporting period.

Task 3 – Permitting and NEPA Compliance

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

- Began review of EPA’s “Geologic Sequestration of Carbon Dioxide: Draft Underground Injection Control (UIC) Program Guidance on Transitioning Class II Wells to Class VI Wells.” This document provides information regarding how Class II operations should be evaluated to determine if repermitting as Class VI wells is necessary and also discusses the Class VI requirements that apply to transitioning wells. Comments are due March 1, 2014 (<http://water.epa.gov/type/groundwater/uic/class6/upload/epa816p13004.pdf>).
- Began review of EPA’s final rule conditionally excluding CO₂ streams in geologic sequestration activities from the Resource Conservation and Recovery Act (RCRA) requirements.
- Reviewed proposals by western U.S. states and Canadian provinces to align their greenhouse gas reduction targets.
- Began review of British Columbia’s proposal to update its Water Act with the new Water Sustainability Act.
- Participated on October 8, 2013, in a North America 2050 Sequestration Working Group Webinar – Demonstrating Carbon Storage.
- Attended the North Dakota Industrial Commission (NDIC) hearing held November 13, 2013, in Grand Forks, where the petition of an energy company for unitized management, operation, and further development was heard.
- With regard to **Interstate Oil and Gas Compact Commission (IOGCC) Carbon Geologic Storage (CGS) Task Force** efforts:
 - Worked with IOGCC staff in preparing the Web site, fact sheets, and final report layout for the Report – Findings, Recommendations, and Guidance of the CGS Task Force on Operational and Postoperational Liability (D98).
 - Reviewed DOE NETL comments on the IOGCC draft report, and contacted various task force members to discuss and review comments.
 - Held two conference calls with IOGCC to discuss the finalization of the report and communication strategies.
 - Attended the 2013 IOGCC Annual Meeting (www.iogcc.state.ok.us/agenda) on November 4–6, 2013, in Long Beach, California, where the chair of the CGS Task Force presented “CO₂ Phase III: Guidelines for States & Provinces on Operational and Postoperational Liabilities.”

- Prepared an abstract entitled “Guidance for States and Provinces on Operational and Postoperational Liability in the Regulation of Carbon Geologic Storage” for submittal to GHGT-12.
- With regard to the **Lignite Field Validation Test** site (Phase II) closure:
 - Continued efforts to monitor the site during the reclamation phase, including site visits on October 12 and November 29, 2013.
 - Submitted a draft (value-added) report on closure activities on October 30, 2013.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- All activities are on schedule, and there were no problems or delays during the reporting period.

Task 4 – Site Characterization and Modeling

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

- **Fort Nelson** test site activities included the following:
 - Continued to work on revisions to the Fort Nelson Test Site – Site Characterization Report (received from Spectra on February 1, 2013).
 - Continued to work on revisions to the Fort Nelson Test Site – Geochemical Report (received from Spectra on February 7, 2013).
 - Discussed the characterization work with an interested partner.
- **Bell Creek** test site activities included the following:
 - Continued work on the D36 (due March 2014), including the following:
 - ◆ Continued evaluation of wells to document utilized remedial measures.
 - ◆ Began review of bacteria-based CO₂ remediation technology.
 - ◆ Analyzed a sample of casing corrosion recovered from a nearby offset well outside the injection area (03-09) to identify and characterize corrosion mechanisms not related to CO₂.
 - ◆ Continued work on a complementary mitigation plan.
 - Discussed a potential abstract on outcrop characterization for the 2014 Rocky Mountain Section (RMS) American Association of Petroleum Geologists (AAPG) Annual Meeting.
 - With regard to geomechanical efforts, the following activities occurred:
 - ◆ Continued preparing for the 3-D mechanical earth model (MEM) and geomechanical modeling and simulations.
 - ◆ Worked on updating the properties in the 1-D MEM and 3-D MEM in Techlog and Petrel.
 - ◆ Revised the geomechanical report (D32), and sent it to Denbury for review on October 24, 2013.
 - With regard to Applied Geology Laboratory activities:
 - ◆ Finalized the value-added petrophysical assessment report (including 21 well packages) of 81 intervals of core from the U.S. Geological Survey (USGS) Denver Core Research Center (CRC).

- o Uploaded the report for Denbury on November 19, 2013.
- o Sent the report and remaining core samples to CRC on November 22, 2013.
- o Submitted the report to DOE NETL on December 10, 2013.
- ◆ With regard to the 60 feet of full-diameter 33-14R core (collected April 2013), Denbury released the samples to Core Labs, and validation work began the last week in November.
 - o Core Labs began testing during the week of December 16, 2013.
 - o The EERC will perform 19 x-ray fluorescence spectroscopy (XRF) and x-ray diffraction (XRD) analyses.
- ◆ With regard to the 56-14R sidewall core (21 samples), determined that one sample will be tested for porosity and another for SEM (scanning electron microscopy) mineral mapping (using the thin section).
- ◆ On October 2, 2013, planned additional analyses for 56-14R full-core plugs (CO₂ exposure and comparisons to static vs. flow-through testing).
- With regard to SCAL (special core analysis) work:
 - ◆ Reviewed SCAL results using the U.S. Bureau of Mines methods for wettability and capillary pressure.
 - ◆ Met in-house to discuss progress following a phone call with Core Labs.
 - ◆ Searched for and reviewed the core-selecting method for SCAL tests.
 - ◆ Reviewed Core Labs experimental results.
- On November 14 and 15, 2013, EERC Lab staff visited with personnel at Coretest Systems, Inc., and Stanford University, both in California, to evaluate relative permeability methodologies and equipment options.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- All activities are on schedule, and there were no problems or delays during the reporting period.

Task 5 – Well Drilling and Completion

Significant accomplishments for Task 5 for the reporting period included the following:

- Submitted the Injection Experimental Design Package (D42) on October 31, 2013.
- Presented on the Bell Creek monitoring program at CO₂ Conference Week held December 9–13, 2013, in Midland, Texas (www.co2conference.net/).
- Presented a poster entitled “Baseline Soil Gas Monitoring at the Bell Creek Combined CO₂ EOR and CO₂ Storage Project” at the Carbon Management Technology Conference (CMTC) held October 21–23, 2013, in Arlington, Virginia.
- Attended the North American Wellbore Integrity Workshop in Denver, Colorado.
- Continued work on the value-added Baseline Surface and Near-Surface MVA report and appendixes (data from all six sampling and analysis events).
- Began drafting a protocol for groundwater sampling if a measured field parameter (pH, alkalinity, specific conductivity) falls outside the range of a 95% confidence interval as established during baseline MVA sampling and analyses.

- Continued work on the value-added report entitled “Laboratory Evaluation of Potential CO₂–Rock–Groundwater Interactions Within the Groundwater Zone Overlying the Bell Creek Reservoir.”

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- All activities are on schedule, and there were no problems or delays during the reporting period.

Task 6 – Infrastructure Development

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

- Continued information searches needed to update the capture technologies overview document (value-added report, 2011) and its companion interactive DSS Web page.
- Estimated (using several different sets of assumptions) the carbon footprint of a processing system for drill cuttings in which diesel is driven off of the cuttings and captured for reuse elsewhere.
- Continued work on a journal article (about the attenuation of variable CO₂ sources for use in EOR). This article replaces D85 (Opportunities and Challenges Associated with CO₂ Compression and Transportation During CCUS Activities – 2013 version). The journal selected is *Energy & Environmental Science* (www.rsc.org/publishing/journals/ee/about.asp).
- Presented a PCOR Partnership Program update at the 9th Annual Power Summit cohosted by Nebraska Public Power District and the Nebraska Department of Environmental Quality in Lincoln, Nebraska.
- In conjunction with Task 1, worked to add a new EPA GHG identifier to the CO₂ sources in the PCOR Partnership portion of the United States, and rectified discrepancies.
- Continued efforts toward the decision point regarding potential incorporation of Ramgen compression technology into the Bell Creek project (Milestone [M] 41, due January 2014).

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- All activities are on schedule, and there were no problems or delays during the reporting period.

Task 7 – CO₂ Procurement

This task ended Quarter 4, BP4, Year 6 (September 2013).

Task 8 – Transportation and Injection Operations

Significant accomplishments for Task 8 for the reporting period included the following:

- Attended the in-house Bell Creek project update meeting on December 4, 2013.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- All activities are on schedule, and there were no problems or delays during the reporting period.

Task 9 – Operational Monitoring and Modeling

Significant accomplishments for Task 9 for the reporting period included the following:

- Modeling staff attended the Society of Petroleum Engineers (SPE) ATCE (Annual Technical Conference and Exhibition) held September 30 – October 2, 2013, in New Orleans, Louisiana.
- Began work on an abstract about advanced 3-D modeling using multiple-point statistics for the upcoming RMS AAPG Annual Meeting.
- Continued **Bell Creek** site activities, including the following:
 - Injected cumulatively (May–November 2013) 291,544 metric tons of CO₂ (Table 5).
 - Achieved M43 entitled “Bell Creek Test Site – First Full-Field Operational Phase Soil Gas- and Groundwater-Sampling Event Completed” on November 15, 2013, and provided documentation to DOE NETL on December 13, 2013.
 - Brainstormed ideas to streamline the deliverable review process.
 - Worked on several abstracts for GHGT-12, including:
 - ♦ “Overview of the Bell Creek Combined CO₂ Storage and CO₂ Enhanced Oil Recovery Study: One Year’s Worth of CO₂ Injection.”

Table 5. Bell Creek CO₂ Injection Totals September–November 2013 (cumulative totals May to September–November 2013)

	September 2013 Injection (Mcf)	October 2013 Injection (Mcf)	November 2013 Injection (Mcf)
TOTAL, Mscf	1,122,584	1,155,008	978,071
TOTAL, U.S. tons*	64,210	66,065	55,944
TOTAL, metric tons*	58,307	59,991	50,801
Cumulative Total, Mscf ⁺	3,480,010	4,635,018	5,613,089
Cumulative Total, U.S. tons* ⁺	199,051	265,116	321,060
Cumulative total, metric tons* ⁺	180,752	240,743	291,544

Source: Montana Board of Oil & Gas [MBOG] Database.

* There is an approximately 2–3 month lag in posting of injection/production volumes to the MBOG database. This was calculated utilizing a conversion of 17.483 Mscf/U.S.ton and 19.253 Mscf/metric ton.

⁺ Cumulative totals are for the period from May 2013 to the month(s) listed.

- ◆ “A Rapid Method for Determining CO₂–Oil MMP (Minimum Miscibility Pressure) and Visual Observations of CO₂–Oil Interactions at Reservoir Conditions.”
- ◆ “Characterization and Time-Lapse Monitoring Utilizing Pulsed-Neutron Well Logging at an Incidental CO₂ Storage Demonstration.”
- Experimented with MMP apparatus techniques for the near-surface 3-D model.
- Participated on November 12, 2013, in a WebEx with Denbury focusing on CO₂–oil-phase behavior.
- Participated in a Webinar entitled “Simulating Geological Sequestration of CO₂ with COMSOL Multiphysics” on November 12, 2013, to determine the software’s applicability to Bell Creek modeling activities.
- Worked on the Bell Creek simulation to include CO₂ injection data.
- Worked on updating the Bell Creek Phase 1 injection simulation to show the CO₂ plume through January 1, 2014. This will be used to discuss the utility of conducting a repeat 3-D vertical seismic profile (VSP) with Denbury.
- Started preliminary simulation work of the Bell Creek oil field, Phase 2.
- Worked on predictive simulation.
- Met in-house to discuss creation of a near-surface model from the Pierre Formation to the surface.
- Worked on setting up the Version 3 geologic model.
- Worked on building a facies model for a fieldwide model, including the following:
 - ◆ Compiled all core descriptions from USGS, Exxon, and the Bureau of Environmental Geology, and began mapping facies in cross sections throughout the field to look for trends.
 - ◆ Began importing advanced geophysical log suites from the monitoring and redrill wells.
- Held a Bell Creek project update meeting on December 4, 2013. Topics discussed included upcoming activities and key dates, surface and near-surface MVA update, a seismic update, the outcrop field trip, pulsed-neutron logging (PNL), a documentary update, and upcoming deliverables.
- Conducted **literature reviews** on the following topics:
 - ◆ Experimentally setting initial water saturation.
 - ◆ CO₂ WAG (water alternating gas) hysteresis trapping.
 - ◆ CO₂ hysteresis in CO₂ flood.
 - ◆ Performing petrophysical analysis on PNLs.
 - ◆ Participated on November 15, 2013, in a WebEx with Schlumberger personnel to discuss the repeat PNL results on 05-01.
 - ◆ Continued analyzing water and oil saturations computed from PNLs, and began 3-D modeling.
 - ◆ Bell Creek completion methods.
 - ◆ Estimation of stress using 3-D seismic data and leakage characterization using above-zone pressure monitoring.
 - ◆ Continued literature review for petrophysical analysis.
- With regard to **injection-phase seismic** efforts:
 - ◆ An in-house meeting was held to discuss the current analysis of the 3-D seismic data.

- ◆ Practiced 3-D seismic data viewing and interpretation in Petrel software.
- ◆ Continued evaluating methods to derive the rock mechanical properties from seismic data.
- ◆ Continued assessing various techniques used for the estimation of stress using 3-D seismic data and leakage characterization using above-zone pressure monitoring.
- ◆ Spoke Denbury personnel on December 9, 2013, regarding the 3-D VSPs.
- ◆ Held a conference call with SIGMA³ to discuss Bell Creek passive seismic monitoring including due dates.
- Continued analysis of **pressure gauge response** from the 05-06 OW well, including:
 - ◆ Processed permanent downhole-monitoring (PDM).
 - ◆ Continued work on refining the automated procedure for processing the PDM data.
- With regard to **injection-phase PNL** activities:
 - ◆ Continued the literature review, and held discussions with a Denbury consultant regarding water petrophysical calculations from PNLs.
 - ◆ Continued analyzing water and oil saturations computed from PNLs.
 - ◆ Completed repeat PNL logging in the 05-06 OW, 05-07, and 05-05 wells.
 - ◆ Reviewed LAS (log ASCII standard) headers, and outlined concerns and expectations moving forward with repeat logging.
 - ◆ Recomputed water and oil saturations for PNL logs through the reservoir zone, and produced ArcGIS maps.
 - ◆ Presented “Characterization and Time-Lapse Monitoring of a Combined CO₂ EOR and CO₂ Storage Project at the Bell Creek Oil Field Utilizing Pulsed-Neutron Well Logging” at CMTC in Alexandria, Virginia.
- With regard to **injection-phase sampling** activities:
 - ◆ Completed processing May and June 2013 soil gas data for the selected active wells, interspaced locations, and soil gas profile stations (SGPSs)—all were within the biological respiration range or below.
 - ◆ Completed processing water data from the June, July, and August 2013 sampling events for the two Fox Hills Formation groundwater-monitoring wells.
 - ◆ Completed statistical analyses of the July and August 2013 soil gas CO₂ measurements for active wells (35 and 61 samples, respectively), interspaced locations (nine and ten samples, respectively), and plugged and abandoned (P&A) wells (three directional samples at three wells during July and August). Completed processing of the July and August 2013 soil gas data for the ten SGPSs at three sampling depths (3.5 ft, 9.0 ft, and 14 ft).
 - ◆ Completed sampling the October portion (first trip) of the first full-repeat surface and near-surface water and soil gas-sampling event on October 6, 2013. Approximately 75% of the total samples (water and soil gas) were collected prior to the arrival of Winter Storm “Atlas” (Figure 6). Data analysis and processing has been completed on approximately 250 fieldwide soil gas samples, shallow groundwater and surface water samples (20 of 27), and two Fox Hills Formation groundwater-monitoring wells.



Figure 6. Pictures after Winter Storm “Atlas” near Hulett, Wyoming (top), and in Rapid City, South Dakota (bottom). Top photo courtesy of Craig Seidel, and bottom photo from online Rapid City Journal, http://rapidcityjournal.com/photos/winter-storm-atlas/collection_82a122aa-6e17-55c6-af1a-d9931e65b578.html#4 (accessed November 6, 2013).

- ◆ Completed sampling, analysis, and processing to the final first full-repeat surface and near-surface water and soil gas-sampling event on November 15, 2013 (second trip). Soil gas samples (331 total) consisting of active, P&A, and redrilled wells; interspaced locations; and the SGPSs along with duplicates, field blanks, ambient air measurements, and background samples. Water samples consisted of seven of the remaining 27 shallow groundwater and surface waters as well as the two Fox Hills Formation groundwater-monitoring wells.
- ◆ Completed the December monthly sampling event on December 13, 2013, which consisted of SGPS/Phase 1/Interspaced wells (approximately 130 samples) and two Fox Hills Formation groundwater-monitoring wells. Data analysis and processing are under way.
- ◆ Continued to compile October and November 2013 water quality data for landowner packages.
- ◆ Spoke with Denbury personnel on December 10, 2013, regarding water wells and flow rate.
- ◆ Reviewed in-house the soil gas field sampling techniques used to collect the samples between the original sample, duplicates, and ambient air blanks.
- ◆ Began preparations (equipment maintenance and restocking) for the January 2014 sampling event.
- ◆ Continued work with Denbury personnel to collect monthly oil samples from three wells in the Phase 1 area.
- ◆ Continued work with Denbury personnel to collect a CO₂ sample from the injection stream.
- ◆ Conducted personal air-monitoring training at the EERC on December 5, 2013.
- With regard to the **quarterly summary of monitoring operations** during the injection phase at the Bell Creek site:
 - Continuous downhole injection monitoring since May 22, 2013, including:
 - ◆ Pressure in two lobes of the Bell Creek sands.
 - ◆ Pressure in overlying zone.
 - ◆ Continuous distributed temperature.
 - ◆ Continued analysis of data.
 - PNL
 - ◆ Held Web-Ex with Schlumberger (November 22, 2013) to discuss a summary on initial results for the PNL logs for 05-05, 05-07, and 05-01 injector wells.
 - ◆ Acquired three PNL repeat logs in the 05-05, 05-07, 05-01 injection wells and the 05-06OW well.
 - ◆ Acquired an injection spinner log in the 05-01 well.
 - ◆ Initiated planning for an additional four repeats (three production wells and the 05-06OW).
 - Conducted monthly soil gas sampling at select well locations, SGPSs, and water samples at Fox Hills monitoring wells, including:
 - ◆ Approximately 130 soil gas samples (December 10–12, 2013) and two Fox Hills groundwater-monitoring well samples (December 10, 2013).
 - Analysis is under way.

- Collected the complete data set for the annual first full-repeat near-surface operational monitoring survey. Because of a severe winter storm during the September–October 2013 sampling event, a second trip was conducted on November 11–15, 2013, to collect the remaining soil gas and water samples. This effort was coordinated concurrently with the monthly November event for sampling soil gas at selected well locations, SGPSs, and water at the Fox Hills groundwater-monitoring wells, including:
 - ◆ Three hundred thirty-one soil gas samples.
 - ◆ Nine water samples.
- Analysis is complete.
- Continued passive seismic monitoring since May 22, 2013, from 04-03 OW permanent geophone array.
- Continued **Fort Nelson** site activities, including the following:
 - Began drafting an abstract for GHGT-12 entitled “Application of Canadian Standards Association (CSA) Guidelines for Geologic Storage of CO₂ Toward the Development of a Monitoring, Verification, and Accounting Plan for a Potential CCS Project at Fort Nelson, British Columbia, Canada.”
 - Began drafting an abstract for the 13th Carbon Capture, Utilization, and Storage Conference (CCUS-13) entitled “Development of a Monitoring, Verification, and Accounting Plan for a Potential CCS Project at Fort Nelson, British Columbia, Canada.”
 - Continued reviewing previous simulation results to investigate the CO₂ plume output.
 - Continued efforts to draft an overview of the feasibility study activities, including the following:
 - ◆ Compile a comprehensive report summarizing technical activities.
 - ◆ Prepare a document comparing and contrasting Fort Nelson characterization, modeling, and risk assessment work with the CSA Guidelines for Geological Storage of CO₂.
 - ◆ Prepare a rudimentary MVA plan that combines the existing shallow-surface MVA plan with a new deep-subsurface MVA plan in order to create a comprehensive MVA plan that is compliant with the CSA Guidelines.
 - Continued review of Spectra’s comments on the Fort Nelson Test Site – Simulation Report (D67, originally submitted September 2011). Comments were received February 4–7, 2013, and revisions are under way.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- The first Bell Creek full-field operational monitoring soil gas- and water-sampling trip was interrupted because of a severe winter storm. Remaining samples were collected in November 2013.
- Experienced possible tool failure during initial log of Bell Creek 05-01 (relogging with different tool to confirm).

- It should be noted that the cumulative injection amount for May–August 2013, was misstated in the previous quarterly report as 262,390 tons. The actual cumulative amount was 134,841 tons (122,445 metric tons).

Task 10 – Site Closure

This task is anticipated to be initiated in Quarter 1, BP5, Year 9 (October 2015).

Task 11 – Postinjection Monitoring and Modeling

This task is anticipated to be initiated in Quarter 1, BP5, Year 9 (October 2015).

Task 12 – Project Assessment

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

- The due date for D57, the 2013 annual assessment report, was extended to January 31, 2014.

Task 13 – Project Management

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

- Welcomed Peabody Energy as a new partner on December 2, 2013.
- Presented “The Plains CO₂ Reduction Partnership: Demonstrating CO₂ Storage Solutions,” on October 21, 2013, at the EERC’s Air Quality IX Conference in Arlington, Virginia.
- Worked on an e-poster for International Petroleum Technology Conference (IPTC) in Doha, Qatar, entitled “CO₂ Enhanced Oil Recovery (EOR): The Plains CO₂ Reduction Partnership’s Approach to Carbon Capture and Storage.”
- Prepared an abstract for GHGT-12 regarding the PCOR Partnership’s adaptive management strategy for CCS projects.
- Submitted an abstract entitled “The Plains CO₂ Reduction (PCOR) Partnership Program: Addressing CO₂ Storage Through Enhanced Oil Recovery” on November 5, 2013, to the 4th EAGE (European Association of Geoscientists and Engineers) CO₂ Geological Storage Workshop.
- Reviewed abstracts for the upcoming 76th EAGE Conference and Exhibition 2014.
- Participated in a conference call led by NETL on October 3, 2013, to continue the conversation that was started at the August annual review meeting and expand on the activities between the RCSPs and NRAP (National Risk Assessment Partnership).
- Continued reviewing recommendations for the organization of PCOR Partnership data, especially all of the data generated regarding the Bell Creek project.
- Participated in a conference call with BillyJack Consulting on November 18, 2013.
- Held several calls with Denbury to discuss and coordinate invoice tracking and revised cost-share reporting.

- On October 29, 2013, submitted a contract modification request regarding 1) the Bell Creek cost overrun; 2) Denbury-reported, in-kind cost share; and 3) a revised statement of project objectives, incorporating changes (new and approved) since June 2012.
- Prepared for a meeting at the EERC on November 5 and 6, 2013, to evaluate current data management practices (especially with regard to Bell Creek).
- Presented an overview of the PCOR Partnership Program to an EERC visitor, Omaha Public Power District, on October 18, 2013.
- Participated in a conference call with China National Petroleum Corporation on October 18, 2013, and shared information about the EERC's work in the CO₂ EOR space, including PCOR Partnership activities.
- Submitted proposed changes upon request to NETL's "PCOR Partnership – Development Phase Large-Scale Field Tests" on October 18, 2013.
- Attended the 2013 Midwest Carbon Sequestration Science Conference in Champaign, Illinois, October 7–9, 2013, and participated in a tour of the Illinois Basin – Decatur Project at the Archer Daniels Midland Company in Decatur, Illinois, on October 9, 2013 (www.sequestration.org/resources/PAGOct2013/index-PAG.html).
- Attended the Midwest Regional Carbon Sequestration Partnership meeting hosted by Battelle and Core Energy in Traverse City, Michigan, October 2 and 3, 2013.
- Continued to review Program Year 7 budgets.
- Prepared for the IEAGHG 2013 **Expert Review** of the RCSP's Initiative, including the following:
 - Provided the final PCOR Partnership presentation on October 31, 2013.
 - Presented a WebEx on November 1, 2013, to run through the expert review presentation for nonpanelist TAB (Technical Advisory Board) members.
 - Revised the Bell Creek project information form and PCOR Partnership presentation.
 - Presented the PowerPoint to the in-house PCOR Partnership team for comment on November 12, 2013.
 - Gave a 45-minute presentation before the expert panel on November 14, 2013, in Washington, D.C., and participated in the 45-minute question-and-answer session following the presentation.
- Attended the North Dakota Lignite Research Council meeting in Bismarck, North Dakota, and visited with several partners that were present.
- With regard to an update to the **programmatic risk management plan**:
 - Met to discuss PCOR Partnership programmatic and Bell Creek technical risk assessments on December 16.
 - Discussed presenting the risk assessment process to TAB members in 2014.
- Conducted **task leader meetings** on October 1 and November 26, 2013. Topics discussed included an overview of the expert panel review, updates on the Bell Creek, Fort Nelson, Aquistore, and basal Cambrian projects; upcoming TAB meetings; review of upcoming conferences and deliverables; and updates from each task leader present.
- Sent an e-mail reminder to the TAB members about the upcoming winter meeting scheduled for March 4 and 5, 2014, in Austin, Texas.
- Deliverables and milestones completed in October:
 - Task 5: D42 – Bell Creek Test Site – Injection Experimental Design Package

- Task 13: D58/D59: Quarterly Progress Report/Milestone Quarterly Report
- Task 14: M23 – Monthly WWG conference call held
- Task 14: M99 – Water/CCS Nexus-Related Fact Sheet
- Deliverables and milestones completed in November:
 - October monthly update
 - Task 14: M23 – Monthly WWG conference call held
- Deliverables and milestones completed in December:
 - November monthly update
 - Task 9: M43 – Bell Creek Test Site – First Full-Repeat Sampling of the Groundwater- and Soil Gas-Monitoring Program Completed
 - Task 14: M24 – WWG Annual Meeting held

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- Continued discussions with Spectra regarding a path forward for the Fort Nelson project now that CO₂ injection will be significantly delayed.

Task 14 – RCSP WWG Coordination

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

- Prepared an abstract on the nexus of water and CCS for GHGT-12.
- Reviewed notes from the November call.
- Discussed options for the next fact sheet and deliverable.
- Submitted the draft MVA fact sheet entitled “Monitoring, Verification, and Accounting Plans for Protection of Water Resources During the Geologic Storage of Carbon Dioxide” (D99-2) on October 31, 2013.
- Held the monthly conference call on October 31, 2013, to discuss recent activities and plans for a special WWG session at the GHGT-12.
- Distributed the notes from the August annual meeting on October 10, 2013.
- Distributed the notes from the September conference call on October 17, 2013.
- Presented “RCSP WWG: The Nexus of Water and Carbon Capture and Storage” at CMTC in Alexandria, Virginia.
- Scheduled and held the monthly conference call on November 21, 2013. Agenda items included the following:
 - Welcome new participants (if needed)
 - WWG fact sheet topic selection
 - GHGT-12 abstract/paper ideas
 - WWG deliverable approval
 - RCSP updates
- Distributed the notes from the October conference call on November 21, 2013. Seven persons participated, representing three partnerships. Topics discussed included:
 - Finalization of the MVA fact sheet (D99-2 due October 31, 2013).
 - Overview of CMTC.
 - Potential water-focused session at GHGT-12.

- Plan to contact the RCSPs to confirm their WWG contacts (primary and backup).
- Topics for the next fact sheet (D99-3 due October 2014).
- Discussion of upcoming deliverables, e.g., water resource estimation methodology report (2014) and best practices manual (2016).
- Distributed the notes from the November call on December 9, 2013.
- DOE NETL waived the requirement for the December conference call on November 21, 2013.
- Held a conference call with the NETL project manager on November 25, 2013.
- Evaluated two water-related risk assessment tools created by the International Petroleum Industry Environmental Conservation Association and the Global Environmental Management Initiative for the oil and gas industry.
- Began work on outlining a fact sheet describing modeling efforts among the various partnerships.
- Met with representatives from Idaho National Laboratory to discuss potential collaborative opportunities on water and energy issues.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- All activities are on schedule, and there were no problems or delays during the reporting period.

Task 15 – Further Characterization of the Zama Acid Gas EOR, CO₂ Storage, and Monitoring Project

Significant accomplishments for Task 15 for the reporting period included the following:

- Discussed initial core work that was performed.
- Conducted a literature review for storage in complex structures.
- Investigated and ran Monte Carlo simulations to estimate storage capacity of Zama pools.
- Worked on abstracts for the GHGT-12, CCUS-13, and the RMS AAPG Annual Meeting.
- Continued work on the Updated Regional Technology Implementation Plan for Zama (D86, due February 2014), more specifically rewriting the geologic modeling sections.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- All activities are on schedule, and there were no problems or delays during the reporting period.

Task 16 – Characterization of the Basal Cambrian System

Significant accomplishments for Task 16 for the reporting period included the following:

- Worked on preparing abstracts for GHGT-12, including the following:
 - “Evaluation of Large-Scale Carbon Dioxide Storage Potential in the Basal Saline System in the Alberta and Williston Basins in North America.”
 - “A Regional Wellbore Evaluation of the Basal Cambrian System.”
- Worked on an abstract for CCUS-13.
- Submitted an abstract entitled “Case Study of Large-Scale Carbon Dioxide Storage in the Basal Saline System Utilizing a High-Performance Parallel Computing Cluster” for the High-Performance Computing Conference at Rice University in March 2014.
- Presented “Carbon Sequestration Case Study: Large-Scale Exploration in a Basal Saline System in Canada and the United States” at CMTC in Alexandria, Virginia.
- Attended a 1-day workshop (following CMTC) regarding water management.
- Continued work on the final report (D92: Task 16 – Report – Storage Capacity and Regional Implications for Large-Scale Storage in the Basal Cambrian System, due March 2014).
- Compiled data for a manuscript using Bayesian classifiers and Bayesian networks to assess CO₂ leakage risk from wells in the basal Cambrian.
- Presented “Wellbore Evaluation of the Basal Cambrian System in the U.S. Portion of the Williston Basin” at the North American Wellbore Integrity Workshop on October 16, 2013, in Denver, Colorado.
- With regard to the **Aquistore** project (20 core samples) mineralogical characterization:
 - Continued water permeability testing on nine of the 11 samples.
 - Planned relative permeability testing, including the following:
 - ◆ Selected three cores for testing.
 - ◆ Will use additional SEM characterization to understand the chemical and physical impacts to the cores from CO₂ exposure during relative permeability testing.
 - Initiated gas permeability testing on the remaining nine samples of the original 20. (It should be noted that the original plans were for analysis of only 11 of the 20 samples; however, it was determined that additional samples would be beneficial to the modeling efforts. All porosity and gas permeability data were provided to the modelers [see Task 1]).
 - Completed water permeability testing on nine of the 11 samples.
 - Completed gas permeability testing on 20 of 20 samples.
 - Relative permeability testing was completed on the first Aquistore sample.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- Relative permeability testing was anticipated to begin in late November 2013. However, because of ongoing efforts to prepare the testing apparatus, testing was delayed until December 2013.

PHASE III COST STATUS

The approved BP4 (Modification No. 26) budget along with actual costs incurred and in-kind cost share reported is shown in Table 6. A spending plan for BP4 and actual incurred cost by quarter of cash funds for BP4 are provided in Figure 7 and Table 7.

PHASE III SCHEDULE STATUS

Table 8 lists all deliverables and milestones by quarter, with completion dates, through the end of the reporting period (see Table 9 for the Gantt chart for BP4, Years 7 and 8).

Table 6. Phase III Budget – BP4

Organization	Approved Budget*, \$	Actual Costs Incurred, \$
DOE Share – Cash	59,400,262	40,488,302
Nonfederal Share – Cash	2,411,971	2,748,257
Nonfederal Share – In-Kind	30,279,844	25,478,488
Total	92,092,077	68,715,047

*As of Mod 26.

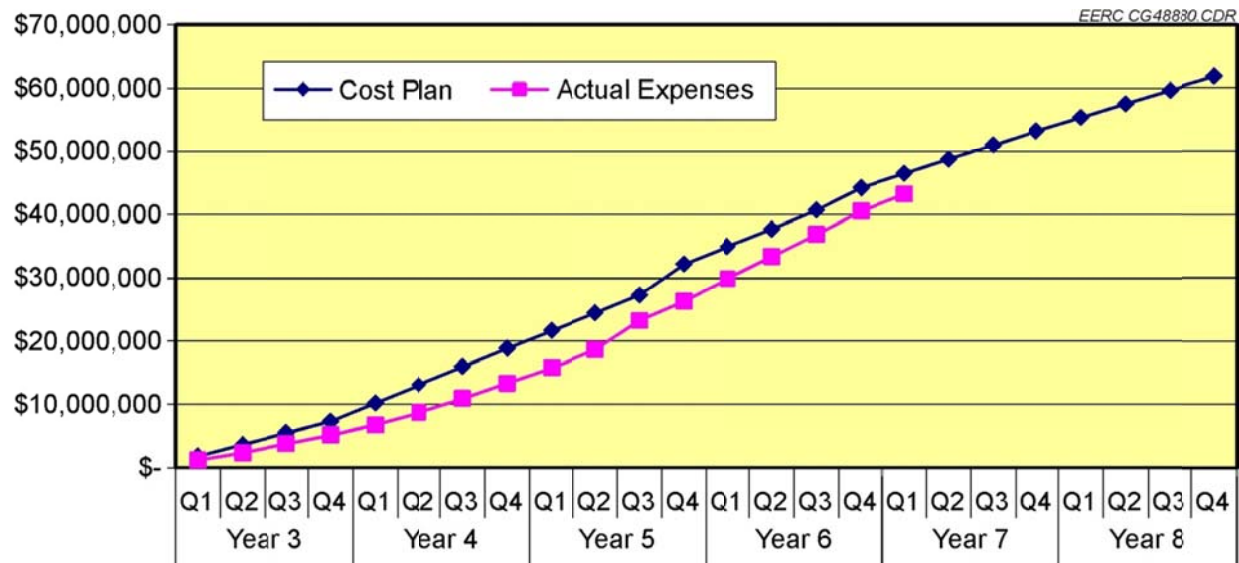


Figure 7. PCOR Partnership Phase III, BP4, Years 3–8 funding (cash only).

Table 7. Phase III, BP4, Years 3–8 Spending Plan

Baseline Reporting Quarter	Year 3								Year 4							
	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	\$1,692,969	\$1,692,969	\$1,692,969	\$3,385,938	\$1,692,969	\$5,078,906	\$1,692,969	\$6,771,875	\$2,707,624	\$9,479,499	\$2,707,624	\$12,187,123	\$2,707,624	\$14,894,747	\$2,707,624	\$17,602,371
Nonfederal Share	\$127,735	\$127,735	\$127,735	\$255,470	\$127,735	\$383,204	\$127,735	\$510,939	\$177,644	\$688,583	\$177,644	\$866,227	\$177,644	\$1,043,871	\$177,644	\$1,221,515
Total Planned	\$1,820,704	\$1,820,704	\$1,820,704	\$3,641,407	\$1,820,704	\$5,462,111	\$1,820,704	\$7,282,814	\$2,885,268	\$10,168,082	\$2,885,268	\$13,053,350	\$2,885,268	\$15,938,618	\$2,885,268	\$18,823,886
Actual Incurred Cost																
Federal Share	\$1,025,953	\$1,025,953	\$983,104	\$2,009,057	\$1,352,281	\$3,361,338	\$1,347,660	\$4,708,998	\$1,531,401	\$6,240,399	\$1,864,304	\$8,104,703	\$1,982,465	\$10,087,168	\$2,163,678	\$12,250,846
Nonfederal Share	\$171,873	\$171,873	\$164,935	\$336,808	\$74,929	\$411,737	\$4563	\$416,300	\$80,246	\$496,546	\$56,614	\$553,160	\$257,142	\$810,302	\$251,531	\$1,061,833
Total Incurred Cost	\$1,197,826	\$1,197,826	\$1,148,039	\$2,345,865	\$1,427,210	\$3,773,075	\$1,352,223	\$5,125,298	\$1,611,647	\$6,736,945	\$1,920,918	\$8,657,863	\$2,239,607	\$10,897,470	\$2,415,209	\$13,312,679
Variance																
Federal Share	\$667,016	\$667,016	\$709,865	\$1,376,881	\$340,688	\$1,717,568	\$345,309	\$2,062,877	\$1,176,223	\$3,239,100	\$843,320	\$4,082,420	\$725,159	\$4,807,579	\$543,946	\$5,351,525
Nonfederal Share	\$(44,138)	\$(44,138)	\$(37,200)	\$(81,339)	\$52,806	\$(28,533)	\$123,172	\$94,639	\$97,398	\$192,037	\$121,030	\$313,067	\$(79,498)	\$233,569	\$(73,887)	\$159,682
Total Variance	\$622,878	\$622,878	\$672,665	\$1,295,542	\$393,494	\$1,689,036	\$468,481	\$2,157,516	\$1,273,621	\$3,431,137	\$964,350	\$4,395,487	\$645,661	\$5,041,148	\$470,059	\$5,511,207

Baseline Reporting Quarter	Year 5								Year 6							
	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	\$2,671,493	\$20,273,864	\$2,671,493	\$22,945,356	\$2,671,493	\$25,616,849	\$4,771,676	\$30,388,524	\$2,612,701	\$33,001,225	\$2,612,701	\$35,613,925	\$2,862,592	\$38,476,517	\$3,362,375	\$41,838,891
Nonfederal Share	\$152,429	\$1,373,944	\$152,429	\$1,526,373	\$152,429	\$1,678,802	\$152,429	\$1,831,231	\$145,185	\$1,976,416	\$145,185	\$2,121,601	\$145,185	\$2,266,786	\$145,185	\$2,411,971
Total Planned	\$2,823,922	\$21,647,808	\$2,823,922	\$24,471,729	\$2,823,922	\$27,295,651	\$4,924,105	\$32,219,755	\$2,757,886	\$34,977,641	\$2,757,886	\$37,735,526	\$3,007,777	\$40,743,303	\$3,507,560	\$44,250,862
Actual Incurred Cost																
Federal Share	\$2,255,269	\$14,506,115	\$2,762,335	\$17,268,450	\$4,349,081	\$21,617,531	\$2,768,852	\$24,386,383	\$3,463,510	\$27,849,893	\$3,244,138	\$31,094,031	\$3,271,990	\$34,366,021	\$3,542,974	\$37,908,995
Nonfederal Share	\$160,751	\$1,222,584	\$134,138	\$1,356,722	\$264,409	\$1,621,131	\$296,942	\$1,918,073	\$156,655	\$2,074,728	\$244,345	\$2,319,073	\$209,528	\$2,528,601	\$156,775	\$2,685,376
Total Incurred Cost	\$2,416,020	\$15,728,699	\$2,896,473	\$18,625,172	\$4,613,490	\$23,238,662	\$3,065,794	\$26,304,456	\$3,620,165	\$29,924,621	\$3,488,483	\$33,413,104	\$3,481,518	\$36,894,622	\$3,699,749	\$40,594,371
Variance																
Federal Share	\$416,224	\$5,767,749	\$(90,843)	\$5,676,906	\$(1,677,589)	\$3,999,318	\$2,002,824	\$6,002,141	\$(850,810)	\$5,151,332	\$(631,438)	\$4,519,894	\$(409,399)	\$4,110,496	\$(180,600)	\$3,929,896
Nonfederal Share	\$(8,322)	\$151,360	\$18,291	\$169,651	\$(111,980)	\$57,671	\$(144,513)	\$(86,842)	\$(11,470)	\$(98,312)	\$(99,160)	\$(197,472)	\$(64,343)	\$(261,815)	\$(11,590)	\$(273,405)
Total Variance	\$407,902	\$5,919,109	\$(72,552)	\$5,846,557	\$(1,789,569)	\$4,056,989	\$1,858,311	\$5,915,299	\$(862,280)	\$5,053,020	\$(730,598)	\$4,322,422	\$(473,742)	\$3,848,681	\$(192,190)	\$3,656,491

Baseline Reporting Quarter	Year 7								Year 8							
	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	\$2,253,496	\$44,092,387	\$2,253,496	\$46,345,883	\$2,253,496	\$48,599,378	\$2,253,496	\$50,852,874	\$2,136,847	\$52,989,721	\$2,136,847	\$55,126,568	\$2,136,847	\$57,263,415	\$2,136,847	\$59,400,262
NonFederal Share	\$-	\$2,411,971	\$-	\$2,411,971	\$-	\$2,411,971	\$-	\$2,411,971	\$-	\$2,411,971	\$-	\$2,411,971	\$-	\$2,411,971	\$-	\$2,411,971
Total Planned	\$2,253,496	\$46,504,358	\$2,253,496	\$48,757,854	\$2,253,496	\$51,011,349	\$2,253,496	\$53,264,845	\$2,136,847	\$55,401,692	\$2,136,847	\$57,538,539	\$2,136,847	\$59,675,386	\$2,136,847	\$61,812,233
Actual Incurred Cost																
Federal Share	\$2,579,307	\$40,488,302														
NonFederal Share	\$62,881	\$2,748,257														
Total Incurred Cost	\$2,642,188	\$43,236,559														
Variance																
Federal Share	\$(325,811)	\$3,604,085														
NonFederal Share	\$(62,881)	\$(336,286)														
Total Variance	\$(388,692)	\$3,267,799														

Table 8. Phase III Milestones and Deliverables

Title/Description	Due Date	Actual Completion Date
Year 1 – Quarter 1 (October–December 2007)		
D37: Task 4 – Fort Nelson Test Site – Geological Characterization Experimental Design Package	12/31/07	12/28/07
D63: Task 13 – Project Management Plan	12/31/07	12/28/07
M17: Task 4 – Fort Nelson Test Site Selected	12/31/07	12/28/07
Year 1 – Quarter 2 (January–March 2008)		
D38: Task 4 – Fort Nelson Test Site – Geomechanical Experimental Design Package	1/31/08	1/31/08
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/08	1/31/08
D11: Task 2 – Outreach Plan	3/31/08	3/31/08
D27: Task 3 – Environmental Questionnaire – Fort Nelson Test Site	3/31/08	4/02/08
D30: Task 4 – Williston Basin Test Site – Geomechanical Experimental Design Package	3/31/08	3/31/08
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
Year 1 – Quarter 3 (April–June 2008)		
D14: Task 2 – General Phase III Fact Sheet	4/30/08	4/30/08
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	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 Williston Basin Test Site	6/30/08	6/27/08
M6: Task 4 – Williston Basin Test Site Geochemical Work Initiated	6/30/08	6/30/08
M7: Task 4 – Williston Basin Test Site Geological Characterization Data Collection Initiated	6/30/08	6/30/08
Year 1 – Quarter 4 (July–September 2008)		
D12: Task 2 – Demonstration Web Pages on the Public Site	7/31/08	7/31/08
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/08	7/31/08
D1: Task 1 – Review of Source Attributes	9/30/08	9/26/08
M2: Task 1 – Demonstration Project Reporting System (DPRS) Prototype Completed	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 8. 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 CCS and Water, Part Subtask 14.2 – White Paper on Nexus of CCS and Water	2/28/09	2/27/09
D24: Task 2 – PCOR Partnership Region Sequestration General Poster	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	4/15/09
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
D16: Task 2 – Fort Nelson Test Site Fact Sheet	5/29/09	5/29/09
M24: Task 14 – WWG Annual Meeting Held	5/31/09	5/07/09
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	N/A	Not required
D19: Task 2 – Fort Nelson Test Site PowerPoint Presentation	7/31/09	7/31/09
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	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
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 – 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
M4: Task 4 – Bell Creek Test Site Selected	9/30/09	9/30/09
M5: Task 4 – Bell Creek Test Site – Data Collection Initiated	9/30/09	9/30/09
M23: Task 14 – Monthly WWG Conference Call Held	9/30/09	9/22/09

Continued . . .

Table 8. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 3 – Quarter 1 (October–December 2009)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/30/09	11/02/09
D78: Task 14 – Final White Paper on the Nexus of CCS and Water	10/30/09	10/28/09
M23: Task 14 – Monthly WWG Conference Call Held	10/31/09	10/26/09
M23: Task 14 – Monthly WWG Conference Call Held	11/30/09	11/16/09
D57: Task 12 – Project Assessment Annual Report	12/31/09	12/31/09
M23: Task 14 – Monthly WWG Conference Call Held	12/31/09	Waived by DOE
Year 3 – Quarter 2 (January–March 2010)		
D13: Task 2 – Public Site Updates	1/15/10	1/15/10
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/10	1/29/10
M23: Task 14 – Monthly WWG Conference Call Held	1/31/10	1/6/10
D79: Task 14 – Water Resource Estimation Methodology Document	2/28/10	Waived by DOE
M23: Task 14 – Monthly WWG Conference Call Held	2/28/10	2/25/10
D11: Task 2 – Outreach Plan	3/31/10	3/31/10
M23: Task 14 – Monthly WWG Conference Call Held	3/31/10	3/23/10
Year 3 – Quarter 3 (April–June 2010)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/10	4/30/10
M23: Task 14 – Monthly WWG Conference Call Held	4/30/10	4/28/10
M23: Task 14 – Monthly WWG Conference Call Held	5/31/10	5/13/10
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	6/30/10	6/30/10
D19: Task 2 – Fort Nelson Test Site PowerPoint Presentation (update)	6/30/10	6/29/10
M23: Task 14 – Monthly WWG Conference Call Held	6/30/10	6/23/10
M24: Task 14 – WWG Annual Meeting Held	6/30/10	5/13/10
Year 3 – Quarter 4 (July–September 2010)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/10	7/29/10
M23: Task 14 – Monthly WWG Conference Call Held	7/31/10	7/28/10
M23: Task 14 – Monthly WWG Conference Call Held	8/31/10	8/31/10
D1: Task 1 – Review of Source Attributes	9/30/10	9/20/10
D52: Task 9 – Fort Nelson Test Site – Site Characterization, Modeling, and Monitoring Plan	9/30/10	9/30/10
M9: Task 4 – Bell Creek Test Site Geological Model Development Initiated	9/30/10	9/30/10
M23: Task 14 – Monthly WWG Conference Call Held	9/30/10	Waived by DOE

Continued . . .

Table 8. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 4 – Quarter 1 (October–December 2010)		
D87: Task 4 – Bell Creek Test Site – Geomechanical Experimental Design Package	10/30/10	10/29/10
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/10	10/29/10
M23: Task 14 – Monthly WWG Conference Call Held	10/31/10	10/26/10
M23: Task 14 – Monthly WWG Conference Call Held	11/30/10	Waived by DOE
D57: Task 12 – Project Assessment Annual Report	12/31/10	12/23/10
M23: Task 14 – Monthly WWG Conference Call Held	12/31/10	12/13/10
Year 4 – Quarter 2 (January–March 2011)		
M8: Task 4 – Bell Creek Test Site Wellbore Leakage Data Collection Initiated	1/15/11	1/14/11
D31: Task 4 – Bell Creek Test Site – Geological Characterization Experimental Design Package	1/31/11	1/27/11
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/11	1/31/11
M23: Task 14 – Monthly WWG Conference Call Held	1/31/11	1/19/11
M28: Task 4 – Bell Creek Geological Experimental Design Package Completed	1/31/11	1/27/11
D15: Task 2 – Bell Creek Test Site Fact Sheet	2/28/11	2/28/11
M23: Task 14 – Monthly WWG Conference Call Held	2/28/11	Waived by DOE
D10: Task 1 – Demonstration Project Reporting System Update	3/31/11	3/25/11
D18: Task 2 – Bell Creek Test Site PowerPoint Presentation (update)	3/31/11	3/31/11
D26: Task 2 – Fort Nelson Test Site Poster	3/31/11	3/31/11
D28: Task 3 – Environmental Questionnaire – Bell Creek Test Site	3/31/11	3/30/11
D85: Task 6 – Report – Opportunities and Challenges Associated with CO ₂ Compression and Transportation During CCS Activities	3/31/11	3/31/11
M23: Task 14 – Monthly WWG Conference Call Held	3/31/11	3/22/11
Year 4 – Quarter 3 (April–June 2011)		
M30: Task 5 – Bell Creek Test Site Baseline MVA Initiated	4/01/11	3/24/11
M23: Task 14 – Monthly WWG Conference Call Held	4/30/11	4/21/11
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/11	4/29/11
D88: Task 13 – Programmatic Risk Management Plan	4/30/11	4/29/11
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/11	5/31/11
D34: Task 4 – Bell Creek Test Site – Baseline Hydrogeological Final Report	5/31/11	5/31/11

Continued . . .

Table 8. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 4 – Quarter 3 (April–June 2011) (continued)		
M23: Task 14 – Monthly WWG Conference Call Held	5/31/11	5/5/11
D19: Task 2 – Fort Nelson Test Site PowerPoint Presentation (update)	6/30/11	6/30/11
M23: Task 14 – Monthly WWG Conference Call Held	6/30/11	6/23/11
M24: Task 14 – WWG Annual Meeting Held	6/30/11	5/5/11
Year 4 – Quarter 4 (July–September 2011)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/11	7/28/11
M23: Task 14 – Monthly WWG Conference Call Held	7/31/11	7/26/11
D29: Task 3 – Permitting Action Plan	8/31/11	8/31/11
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/11	8/31/11
D67: Task 9 – Fort Nelson Test Site – Simulation Report	7/31/11	8/31/11
M23: Task 14 – Monthly WWG Conference Call Held	8/31/11	8/24/11
D1: Task 1 – Review of Source Attributes	9/30/11	9/21/11
D4: Task 1 – Permitting Review – Basic EPA Requirements ⁺	9/30/11	9/30/11
D9: Task 1 – Updated DSS	9/30/11	9/23/11
D25: Task 2 – Bell Creek Test Site Poster	9/30/11	9/30/11
D50: Task 9 – Bell Creek Test Site – Site Characterization, Modeling, and Monitoring Plan	9/30/11	9/30/11
M23: Task 14 – Monthly WWG Conference Call Held	9/30/11	Waived by DOE
M31: Task 9 – Bell Creek Test Site – Site Characterization, Modeling, and Monitoring Plan Completed	9/30/11	9/30/11
M33: Task 16 – Basal Cambrian Baseline Geological Characterization Completed	9/30/11	9/29/11
Year 5 – Quarter 1 (October–December 2011)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/11	10/31/11
M23: Task 14 – Monthly WWG Conference Call Held	10/31/11	10/26/11
M23: Task 14 – Monthly WWG Conference Call Held	11/30/11	11/30/11
D57: Task 12 – Project Assessment Annual Report	12/31/11	12/30/11
M23: Task 14 – Monthly WWG Conference Call Held	12/31/11	Waived by DOE
M34: Task 16 – Basal Cambrian Static Geological Model Completed	12/31/11	12/21/11

⁺ Name change requested September 28, 2011, and approved October 3, 2011.

Continued . . .

Table 8. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 5 – Quarter 2 (January–March 2012)		
M16: Task 4 – Bell Creek Test Site – Initiation of Production and Injection Simulation	1/13/12	12/29/11
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/12	1/31/12
D65: Task 4 – Fort Nelson Test Site – Site Characterization Report	1/31/12	1/31/12
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	1/31/12	1/31/12
M23: Task 14 – Monthly WWG Conference Call Held	1/31/12	1/19/12
M29: Task 4 – Fort Nelson Site Characterization Report Completed	1/31/12	1/31/12
D91: Task 16 – Report – Geological Characterization of the Basal Cambrian System in the Williston Basin	2/29/12	2/29/12
M23: Task 14 – Monthly WWG Conference Call Held	2/29/12	2/28/12
D5: Task 1 – Second Target Area Completed	3/31/12	3/30/12
D18: Task 2 – Bell Creek Test Site PowerPoint Presentation (update)	3/31/12	3/30/12
M10: Task 4 – Bell Creek Test Site Wellbore Leakage Data Collection Completed	3/31/12	3/12/12
M36: Task 13 – Annual Advisory Board Scheduled	3/31/12	3/28/12
M23: Task 14 – Monthly WWG Conference Call Held	3/31/12	3/27/12
Year 5 – Quarter 3 (April–June 2012)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/12	4/30/12
M23: Task 14 – Monthly WWG Conference Call Held	4/30/12	Waived by DOE
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/12	5/31/12
M23: Task 14 – Monthly WWG Conference Call Held	5/31/12	5/31/12
D19: Task 2 – Fort Nelson Test Site PowerPoint Presentation (update)	6/30/12	6/29/12
D41: Task 4 – Fort Nelson Test Site – Geochemical Report	6/30/12	6/29/12
D84: Task 6 – Report – A Phased Approach to Building Pipeline Network for CO ₂ Transportation During CCS	6/30/12	6/29/12
M23: Task 14 – Monthly WWG Conference Call Held	6/30/12	6/28/12
M24: Task 14 – WWG Annual Meeting Held	6/30/12	5/3/12
M32: Task 4 – Fort Nelson Geochemical Report Completed	6/30/12	6/29/12

Continued . . .

Table 8. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 5 – Quarter 4 (July–September 2012)		
D13: Task 2 – Public Site Updates	7/31/12	7/31/12
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/12	7/31/12
D67: Task 9 – Fort Nelson Test Site – Simulation Report	7/31/12	7/31/12
M23: Task 14 – Monthly WWG Conference Call Held	7/31/12	7/24/12
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/12	8/31/12
M23: Task 14 – Monthly WWG Conference Call Held	8/31/12	8/30/12
D1: Task 1 – Review of Source Attributes	9/30/12	9/28/12
D10: Task 1 – DPRS Update	9/30/12	9/28/12
M23: Task 14 – Monthly WWG Conference Call Held	9/30/12	9/27/12
Year 6 – Quarter 1 (October–December 2012)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/12	10/31/12
M23: Task 14 – Monthly WWG Conference Call Held	10/31/12	10/25/12
M23: Task 14 – Monthly WWG Conference Call Held	11/30/12	11/28/12
D57: Task 12 – Project Assessment Annual Report	12/31/12	12/28/12
M23: Task 14 – Monthly WWG Conference Call Held	12/31/12	Waived by DOE
M37: Task 3 – IOGCC Task Force Subgroup Meeting 1 Held	12/31/12	12/21/12
Year 6 – Quarter 2 (January–March 2013)		
D32: Task 4 – Bell Creek Test Site – Geomechanical Final Report	1/31/13	1/31/13
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/13	1/31/13
M23: Task 14 – Monthly WWG Conference Call Held	1/31/13	1/16/13
D14: Task 2 – General Phase III Fact Sheet (update)	2/28/13	2/28/13
M23: Task 14 – Monthly WWG Conference Call Held	2/28/13	2/28/13
D85: Task 6 – Report – Opportunities and Challenges Associated with CO ₂ Compression and Transportation During CCS Activities	3/31/13	Waived by DOE (journal article)
D89: Task 16 – Report – Geochemical Evaluation of the Basal Cambrian System	3/31/13	3/28/13
D99: Task 14 – Water/CCS Nexus-Related Fact Sheet	3/31/13	3/22/13
M23: Task 14 – Monthly WWG Conference Call Held	3/31/13	3/28/13
M36: Task 13 – Annual Advisory Board Meeting Scheduled	3/31/13	3/27/13

Continued . . .

Table 8. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 6 – Quarter 3 (April–June 2013)		
D15: Task 2 – Bell Creek Test Site Fact Sheet (update)	4/15/13	3/25/13
D16: Task 2 – Fort Nelson Test Site Fact Sheet (update)	4/30/13	Waived by DOE
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/13	4/30/13
M14: Task 4 – Bell Creek Test Site Geological Characterization Data Collection Completed	4/30/13	4/30/13
M23: Task 14 – Monthly WWG Conference Call Held	4/30/13	4/25/13
M35: Task 16 – Basal Cambrian Dynamic Capacity Estimation Completed	4/30/13	4/30/13
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/13	5/31/13
D43: Task 5 – Bell Creek Test Site – Monitoring Experimental Design Package	5/31/13	5/31/13
M23: Task 14 – Monthly WWG Conference Call Held	5/31/13	5/30/13
M27: Task 5 – Bell Creek Test Site – MVA Equipment Installation and Baseline MVA Activities Completed	5/31/13	5/31/13
M23: Task 14 – Monthly WWG Conference Call Held	6/30/13	6/27/13
M26: Task 8 – Bell Creek Test Site – CO ₂ Injection Initiated	6/30/13	May 2013 – sent 6/25/13
M37: Task 3 – IOGCC Task Force Subgroup Meeting 2 Held	5/9/13	5/29/13
M42: Task 3 – Findings and Recommendations of the Operational and Postoperational Subgroups Presented to the CGS Task Force	6/30/13	6/20/13 – sent 6/28/13
Year 6 – Quarter 4 (July–September 2013)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/13	7/31/13
D33: Task 4 – Bell Creek Test Site – Geochemical Final Report	7/31/13	7/31/13
M12: Task 4 – Bell Creek Test Site Geochemical Work Completed	7/31/13	7/31/13
M23: Task 14 – Monthly WWG Conference Call Held	7/31/13	7/25/13
D64: Task 4 – Bell Creek Test Site – Site Characterization Report	8/31/13	8/29/13
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/13	8/30/13
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	8/31/13	5/1/13
M23: Task 14 – Monthly WWG Conference Call Held	8/31/13	Waived by DOE

Continued . . .

Table 8. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 6 – Quarter 4 (July–September 2013) (continued)		
D1: Task 1 – Review of Source Attributes	9/30/13	9/5/13
D6: Task 3 – Permitting Review – Update 1	9/30/13	9/24/13
D48: Task 7 – Bell Creek Test Site – Procurement Plan and Agreement Report	9/30/13	9/24/13
D90: Task 16 – Report – Wellbore Evaluation of the Basal Cambrian System	9/30/13	9/5/13
D94: Task 2 – Aquistore Project Fact Sheet	9/30/13	9/30/13
D95: Task 2 – Aquistore Project Poster	9/30/13	9/30/13
D98: Task 3 – Report – Findings, Recommendations, and Guidance of CGS Task Force	9/30/13	8/30/13
M23: Task 14 – Monthly WWG Conference Call Held	9/30/13	9/30/13
M38: Task 3 – IOGCC Task Force Wrap-Up Meeting Held	9/30/13	8/16/13 – sent 9/5/13
M39: Task 3 – IOGCC Task Force Editing Subgroup Meeting Held	9/30/13	6/3/13 – sent 9/5/13
M40: Task 15 – Further Characterization of the Zama Acid Gas EOR, CO ₂ Storage, and Monitoring Project Completed	9/30/13	9/24/13
Year 7 – Quarter 1 (October–December 2013)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/13	10/31/13
D42: Task 5 – Bell Creek Test Site – Injection Experimental Design Package	10/31/13	10/30/13
D99: Task 14 – Water/CCS Nexus-Related Fact Sheet	10/31/13	10/31/13
M23: Task 14 – Monthly WWG Conference Call Held	10/31/13	10/31/13
M23: Task 14 – Monthly WWG Conference Call Held	11/30/13	11/21/13
M23: Task 14 – Monthly WWG Conference Call Held	12/31/13	Waived by DOE
M24: Task 14 – WWG Annual Meeting Held	12/31/13	8/19/13
M43: Task 9 – Bell Creek Test Site – First Full-Repeat Sampling of the Groundwater- Soil Gas-Monitoring Program Completed	12/31/13	11/15/13 – sent 12/13/13
Year 7 – Quarter 2 (January–March 2014)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/14	
D57: Task 12 – Project Assessment Annual Report	1/31/14	
M23: Task 14 – Monthly WWG Conference Call Held	1/31/14	
M41: Task 6 – Decision to Incorporate Ramgen Compression Technology into Bell Creek Project	1/31/14	

Continued . . .

Table 8. Phase III Milestones and Deliverables (continued)

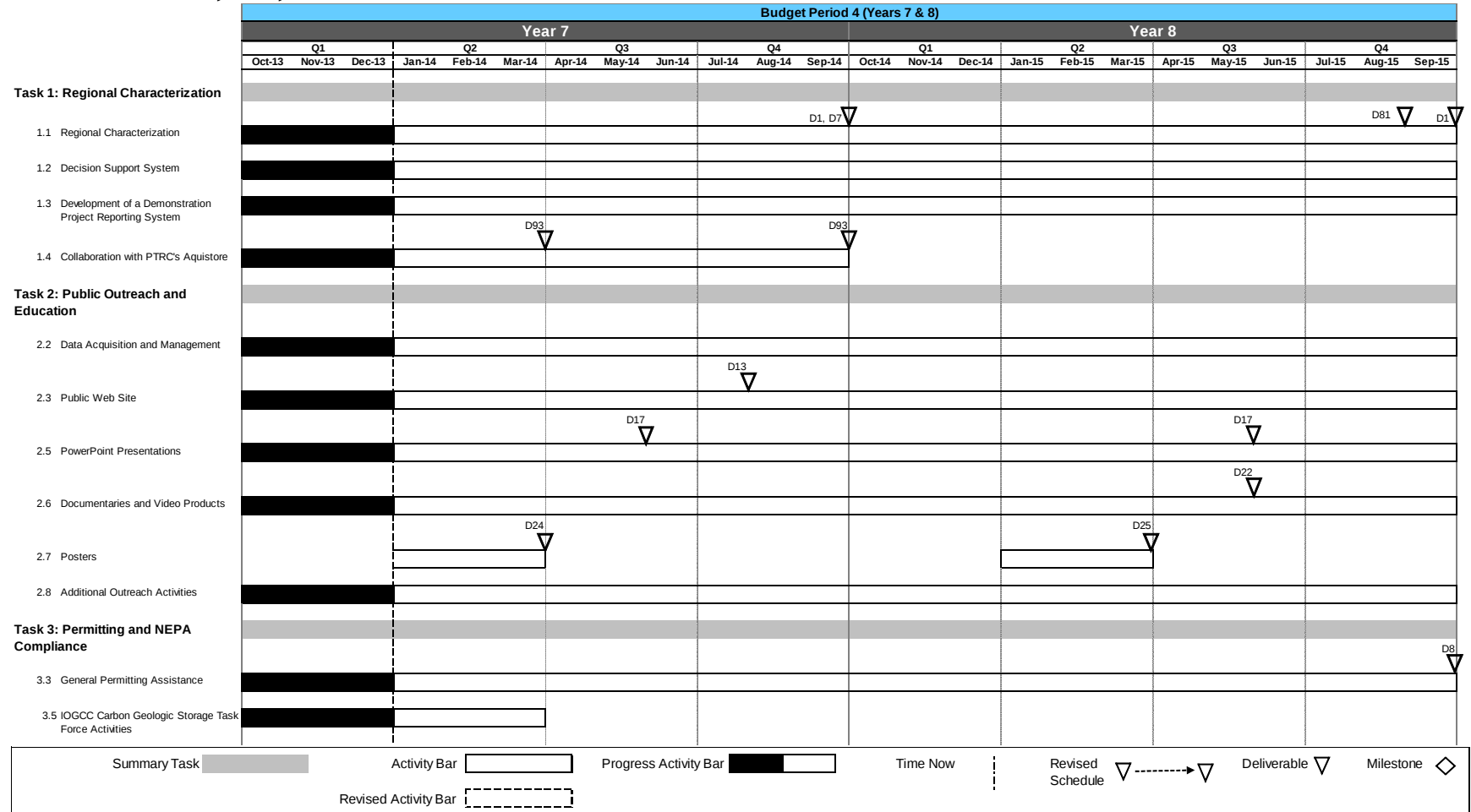
Title/Description	Due Date	Actual Completion Date
Year 7 – Quarter 2 (January–March 2014) (continued)		
D86: Task 15 – Updated Regional Implementation Plan for Zama	2/28/14	
M23: Task 14 – Monthly WWG Conference Call Held	2/28/14	
D24: Task 2 – PCOR Partnership Region Sequestration General Poster (update)	3/31/14	
D36: Task 4 – Bell Creek Test Site – Wellbore Leakage Final Report	3/31/14	
D92: Task 16 – Report – Storage Capacity and Regional Implications for Large-Scale Storage in the Basal Cambrian System	3/31/14	
D93: Task 1 – Geological Modeling and Simulation Report for the Aquistore Project	6/30/13	
D96: Task 4 – Bell Creek Test Site – 3-D Seismic and Characterization Report	6/30/13	
M23: Task 14 – Monthly WWG Conference Call Held	3/31/14	
M36: Task 13 – Annual Advisory Board Meeting Scheduled	3/31/14	
M44: Task 9 – Bell Creek Test Site – First 3-D VSP Repeat Surveys Completed	3/31/14	
Year 7 – Quarter 3 (April–June 2014)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/14	
M23: Task 14 – Monthly WWG Conference Call Held	4/30/14	
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/14	
D79: Task 14 – Water Resource Estimation Methodology Document (update)	5/31/14	
M23: Task 14 – Monthly WWG Conference Call Held	5/31/14	
D44: Task 5 – Bell Creek Test Site – Drilling and Completion Activities Report	6/30/14	
D100: Task 9 – Fort Nelson Test Site – Best Practices Manual – Feasibility Study	6/30/14	
M23: Task 14 – Monthly WWG Conference Call Held	6/30/14	
M45: Task 9 – Bell Creek Test Site – First Full-Repeat of Pulsed Neutron Logging Campaign Completed	6/30/14	
M46: Task 9 – Bell Creek Test Site – 1 Year of Injection Completed	6/30/14	

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Table 8. Phase III Milestones and Deliverables (continued)

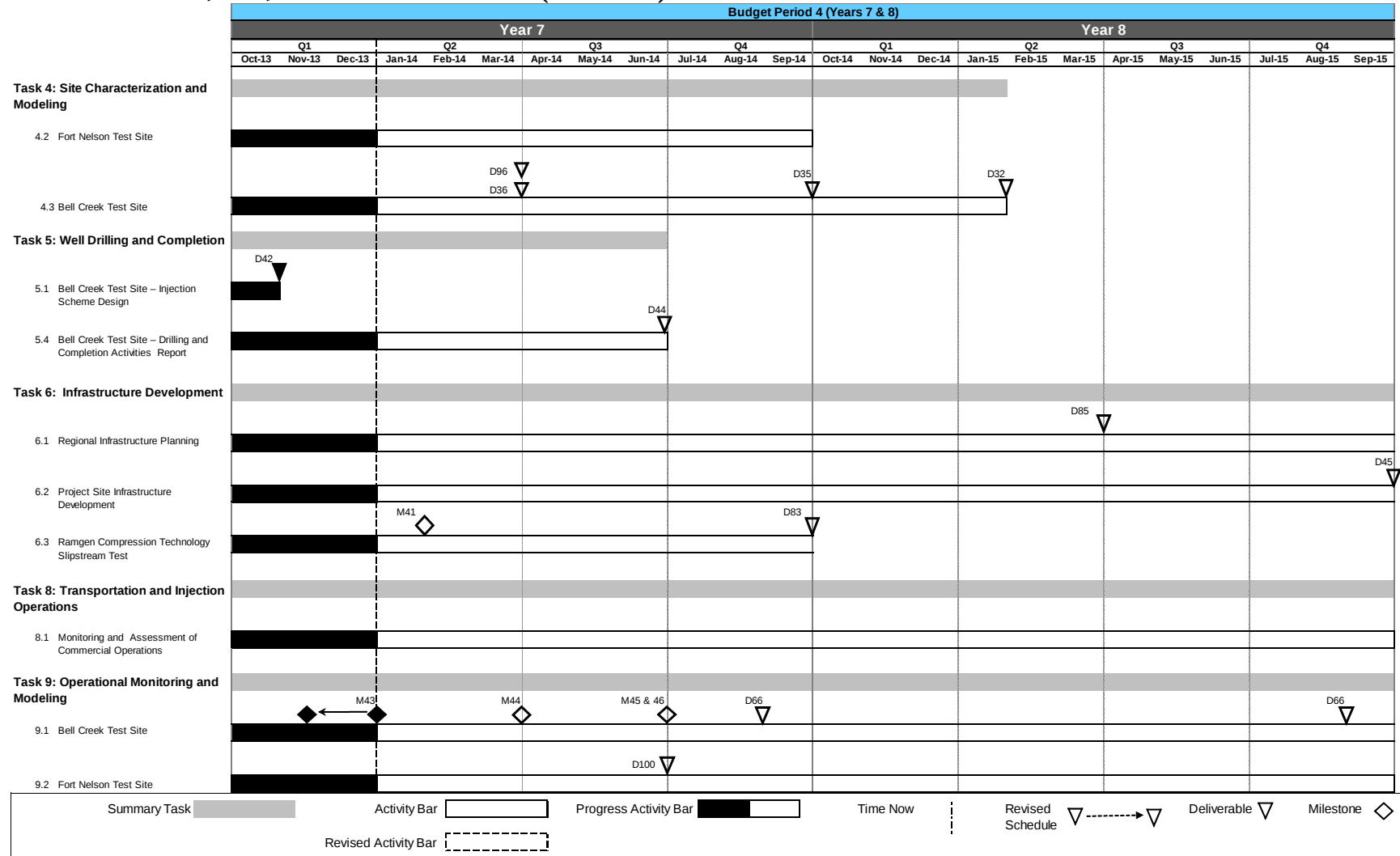
Title/Description	Due Date	Actual Completion Date
Year 7 – Quarter 4 (July–September 2014)		
D13: Task 2 – Public Site Updates	7/31/14	
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/14	
M23: Task 14 – Monthly WWG Conference Call Held	7/31/14	
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/14	
M23: Task 14 – Monthly WWG Conference Call Held	8/31/14	
D1: Task 1 – Review of Source Attributes	9/30/14	
D7: Task 1 – Third Target Area Completed	9/30/14	
D35: Task 4 – Bell Creek Test Site – Best Practices Manual – Site Characterization	9/30/14	
D83: Task 6 – Report – Integration of Advanced Compression Technology with CO ₂ Storage	9/30/14	
D93: Task 1 – Geological Modeling and Simulation Report for the Aquistore Project	9/30/14	
M23: Task 14 – Monthly WWG Conference Call Held	9/30/14	
Year 8 – Quarter 1 (October–December 2014)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/14	
D99: Task 14 – Water/CCS Nexus-Related Fact Sheet	10/31/14	
M23: Task 14 – Monthly WWG Conference Call Held	10/31/14	
M23: Task 14 – Monthly WWG Conference Call Held	11/30/14	
D57: Task 12 – Project Assessment Annual Report	12/31/14	
M23: Task 14 – Monthly WWG Conference Call Held	12/31/14	
M24: Task 14 – WWG Annual Meeting Held	12/31/14	

Table 9. Phase III, BP4, Years 7–8 Gantt Chart



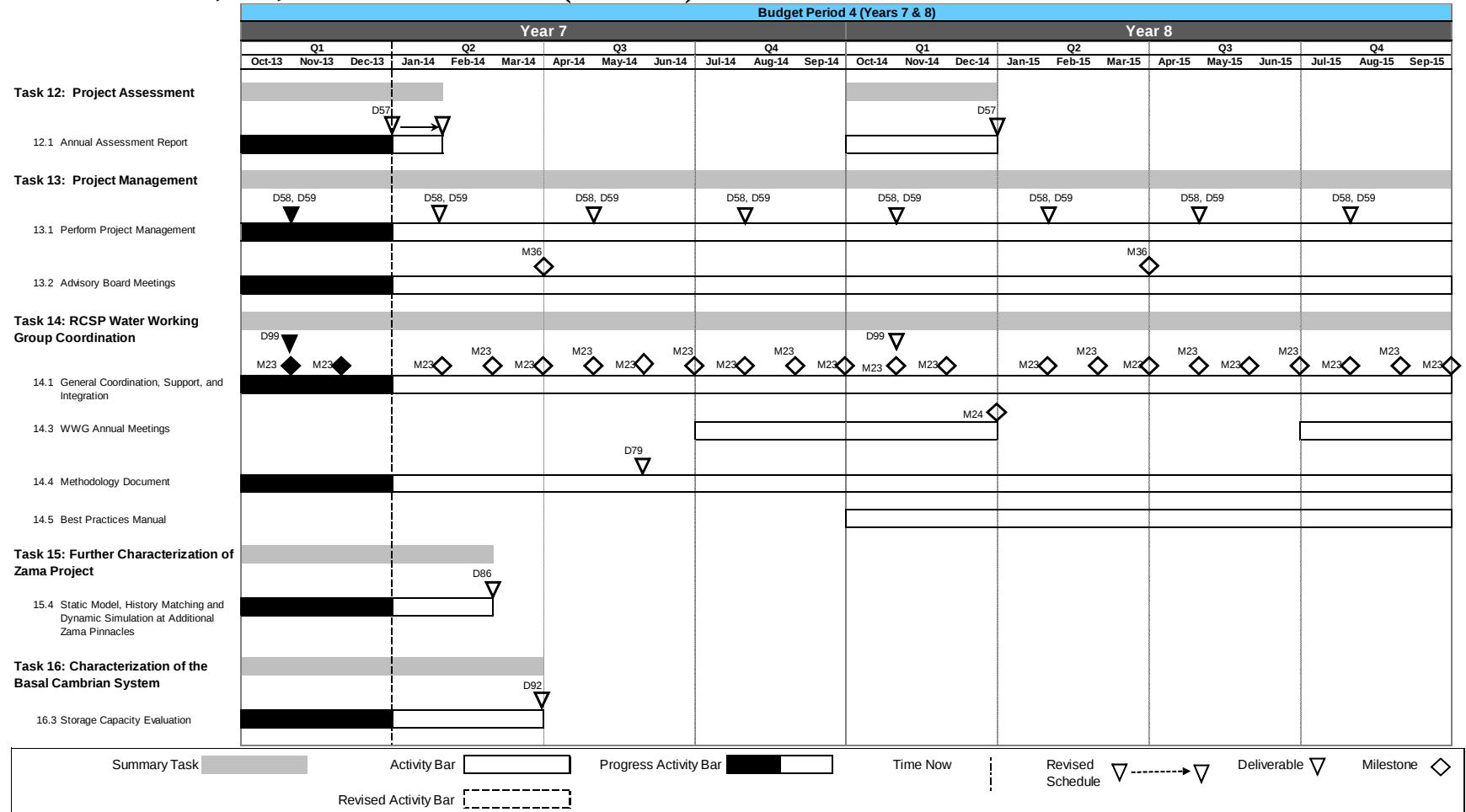
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Table 9. Phase III, BP4, Years 7–8 Gantt Chart (continued)



Continued.....

Table 9. Phase III, BP4, Years 7–8 Gantt Chart (continued)



Continued...

Table 9. Phase III BP4, Years 7–8 Gantt Chart (continued)

Key for Deliverables ▼				Key for Milestones ◆	
D1	Review of Source Attributes	D57	Project Assessment Annual Report	M23	Monthly WWG Conference Call Held
D7	Third Target Area Completed	D59	Milestone Quarterly Report	M24	WWG Annual Meeting Held
D8	Permitting Review – Update 2	D66	BC Test Site – Simulation Report	M36	Annual Advisory Board Meeting Scheduled
D13	Public Site Updates	D79	Report – Water Resource Estimation Methodology	M41	Decision to Incorporate Ramgen Compression Technology into BC Project
D17	General Phase III Information PowerPoint Presentation	D81	Regional Carbon Sequestration Atlas	M43	BC Test Site – First Full-Repeat Sampling of the Groundwater- and Soil Gas- Monitoring Program Completed
D22	Domestic Energy and Carbon 30-Minute Documentary	D83	Report – Integration of Advanced Compression Technology With CO ₂ Storage	M44	BC Test Site – First 3-D VSP Repeat Surveys Completed
D24	PCOR Partnership Region CO ₂ Storage General Poster	D85	Report – Opportunities and Challenges Associated with CO ₂ Compression and Transportation During CCUS Activities	M45	BC Test Site – First Full-Repeat of Pulsed-Neutron Logging Campaign Completed
D25	BC Test Site Poster (Update)	D86	Updated Regional Technology Implementation Plan for Zama	M46	BC Test Site – 1 Year of Injection Completed
D32	BC Test Site – Geomechanical Report	D92	Report – Storage Capacity and Regional Implications for Large-Scale Storage in the Basal Cambrian System		
D35	BC Test Site – Best Practices Manual – Site Characterization	D93	Report – Geological Modeling and Simulation for the Aquistore Project		
D36	BC Test Site – Wellbore Leakage Final Report	D96	BC Test Site – 3-D Seismic Acquisition and Characterization Report		
D42	BC Test Site – Injection Experimental Design Package	D99	Nexus of Water and CCS Fact Sheet		
D44	BC Test Site – Drilling and Completion Activities Report	D100	FN Test Site – Best Practices Manual– Feasibility Study		
D45	Report – Infrastructure Development				
D58	Quarterly Progress Report				

1/28/2014

PHASE III PRODUCTS OR TECHNOLOGY TRANSFER ACTIVITIES

During the reporting period, one abstract was accepted for poster presentation, and 18 presentations (17 oral and one poster) were given at 16 different meetings/conferences. In addition, a quarterly progress report, five deliverables (two draft and three approved), four milestones (one draft and three approved), and two value-added products were completed.

Abstracts

Submitted

Liu, G., Peck, W.D., Braunberger, J.R., Klenner, R.C.L., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, A case study of large-scale carbon dioxide storage in the basal saline system utilizing a high-performance parallel computing cluster [abs.]: Rice University Oil and Gas High Performance Computing (HPC) Workshop, Houston, Texas, March 6, 2014.

Submitted and Accepted for Poster Presentation

Gorecki, C.D., Hamling, J.A., Ayash, S.C., Steadman, E.N., and Harju, J.A., 2013, The Plains CO₂ Reduction (PCOR) Partnership Program—addressing CO₂ storage through enhanced oil recovery [abs.]: 4th European Association of Geoscientists & Engineers (EAGE) CO₂ Geological Storage Workshop, Stavanger, Norway, April 23–25, 2014.

Rejected for Presentation

Bosshart, N.W., Braunberger, J.D., Gorecki, C.D., and Steadman, E.N., 2013, Using multiple-point statistics in the modeling of a Winnipegosis Formation pinnacle reef for enhanced oil recovery and CO₂ storage applications [abs.]: American Association of Petroleum Geologists Annual Convention and Exhibition 2014, Houston, Texas, April 6–9, 2014.

Presentations

Braunberger, J.R., 2013, A geospatial overview in the Plains CO₂ Reduction (PCOR) Partnership: Lecture for Introduction to GIS presented at North Dakota State University, Fargo, North Dakota, December 11, 2013.

Burnison, S.A., Ditty, P., Gorecki, C.D., Hamling, J.A., Steadman, E.N., and Harju, J.A., 2013, Integrated geophysical monitoring program to study flood performance and incidental CO₂ storage associated with a CO₂ EOR project in the Bell Creek oil field: Presented at the American Geophysical Union Fall Meeting, San Francisco, California, December 9–13, 2013.

Gorecki, C.D., 2013, Plains CO₂ Reduction (PCOR) Partnership—demonstrating CO₂ storage solutions: Presented to Omaha Public Power District personnel, Grand Forks, North Dakota, October 18, 2013.

Gorecki, C.D., 2013, Plains CO₂ Reduction (PCOR) Partnership—demonstrating CO₂ storage solutions: Presented via WebEx for the Scalable, Automated, Semipermanent Seismic Array (SASSA) Project Kickoff, Grand Forks, North Dakota, October 29, 2013.

- Gorecki, C.D., 2013, Plains CO₂ Reduction (PCOR) Partnership – Phase III—DE-FC26-05NT42592: Presented at the U.S. Department of Energy National Energy Technology Laboratory Strategic Center for Coal FY14 Regional Carbon Sequestration Partnerships Expert Review, Arlington, Virginia, November 11–14, 2013.
- Gorecki, C.D., 2013, RCSP Water Working Group (WWG)—the nexus of water and carbon capture and storage: Presented at the Carbon Management Technology Conference, Alexandria, Virginia, October 21–23, 2013.
- Gorecki, C.D., and Hamling, J.A., 2013, PCOR Partnership data sources: Presented via WebEx for the Scalable, Automated, Semipermanent Seismic Array (SASSA) Project Kickoff, Grand Forks, North Dakota, October 29, 2013.
- Hamling, J.A., 2013, Evaluation of pulsed-neutron well logging for time-lapse monitoring: Presented at the Midland CO₂ Conference Week Short Course on Surveillance and Monitoring of CO₂ Injection Projects, a Part of the 19th Annual CO₂ Flooding Conference, Midland, Texas, December 9–13, 2013.
- Hamling, J.A., and Gorecki, C.D., 2013, Pulsed-neutron well logging for characterization and time-lapse monitoring of a combined CO₂ EOR and CO₂ incidental storage project: Presented at the Carbon Management Technology Conference, Alexandria, Virginia, October 21–23, 2013.
- Hawthorne, S.B., 2013, Non-traditional (naïve?) thoughts on CO₂ EOR from the lab (down the miscibility rabbit hole): Presentation for the Denbury Oil Phase Behavior (Bell Creek) Webinar, Grand Forks, North Dakota, November 13, 2013.
- Jensen, M.D., 2013, Overview of activities within the Plains CO₂ Reduction (PCOR) Partnership and the Partnership for CO₂ Capture (PCO₂C): Presented at the Nebraska Power Summit, Lincoln, Nebraska, November 5, 2013.
- Liu, G., Peck, W.D., Braunberger, J.R., Klenner, R.C.L., Gorecki, C.D., and Steadman, E.N., 2013, Carbon sequestration case study—large-scale exploration in a basal saline system in Canada and the United States: Presented at the Carbon Management Technology Conference, Alexandria, Virginia, October 21–23, 2013.
- Peck, W.D., 2013, Wellbore evaluation of the basal Cambrian system in the U.S. portion of the Williston Basin: Presented at the North American Wellbore Integrity Workshop, Denver, Colorado, October 16–17, 2013.
- Steadman, E.N., 2013, CO₂ utilization and storage capabilities: Presented to Suncor Energy Inc. personnel, Grand Forks, North Dakota, December 18, 2013.
- Steadman, E.N., 2013, The Energy & Environmental Research Center (EERC) Oil and Gas Group and Plains CO₂ Reduction (PCOR) Partnership: Presented to Basin Electric Power Cooperative and Dakota Gasification Company personnel, Grand Forks, North Dakota, October 28, 2013.
- Steadman, E.N., 2013, Plains CO₂ Reduction (PCOR) Partnership Program—accomplishments and path forward: Presented to U.S. Department of Energy personnel, Grand Forks, North Dakota, October 2, 2013.

Steadman, E.N., 2013, Plains CO₂ Reduction (PCOR) Partnership—demonstrating CO₂ storage solutions, *in* Proceedings of Air Quality IX: An International Conference on Environmental Topics Associated with Energy Production: Arlington, Virginia, October 21–23, 2013.

Poster Presentations

Hamling, J.A., Stepan, D.J., Kalenze, N.S., Klapperich, R.J., Botnen, B.W., and Leroux, K.M., 2013, Baseline soil gas monitoring at the Bell Creek combined CO₂ enhanced oil recovery and CO₂ storage project: Poster presented at the Carbon Management Technology Conference, Alexandria, Virginia, October 21–23, 2013

Deliverables/Milestones

Draft

Kalenze, N.S., Klapperich, R.J., Hamling, J.A., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Bell Creek test site – first full-field operational phase soil gas- and groundwater-sampling event completed: Plains CO₂ Reduction (PCOR) Partnership Phase III draft Task 9 Milestone M43 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, December 2013.

Kalenze, N.S., Klapperich, R.J., Hamling, J.A., Ayash, S.C., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Bell Creek test site – injection experimental design package: Plains CO₂ Reduction (PCOR) Partnership Phase III draft Task 5 Deliverable D42 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, October.

Klapperich, R.J., Gorecki, C.D., McNemar, A.T., Steadman, E.N., and Harju, J.A., 2013, Monitoring, verification, and accounting plans for protection of water resources during the geologic storage of carbon dioxide: Plains CO₂ Reduction (PCOR) Partnership Phase III draft Deliverable D99 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, October 2013.

Approved

Botnen, L.S., Gorecki, C.D., and Steadman, E.N., 2013, Permitting review – update 1: Plains CO₂ Reduction (PCOR) Partnership Phase III Task 3 Deliverable D6 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2013-EERC-11-10, Grand Forks, North Dakota, Energy & Environmental Research Center, September.

Botnen, L.S., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, IOGCC Task Force editing subgroup meeting held: Plains CO₂ Reduction (PCOR) Partnership Phase III Task 3 Milestone M39 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2013-EERC-10-12, Grand Forks, North Dakota, Energy & Environmental Research Center, September.

- Botnen, L.S., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, IOGCC Task Force wrap-up meeting held: Plains CO₂ Reduction (PCOR) Partnership Phase III Task 3 Milestone M38 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2013-EERC-10-11, Grand Forks, North Dakota, Energy & Environmental Research Center, September.
- Galbreath, K.C., Laumb, J.D., McCollor, D.P., Peck, W.D., Thompson, J.S., Kurz, B.A., Klenner, R.C.L., Smith, S.A., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Geochemical evaluation of the basal Cambrian system: Plains CO₂ Reduction (PCOR) Partnership Phase III Task 16 Deliverable D89 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2013-EERC-11-11, Grand Forks, North Dakota, Energy & Environmental Research Center, March.
- Gao, P., Ayash, S.C., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Further characterization of Zama acid gas EOR, CO₂ storage, and monitoring project completed: Plains CO₂ Reduction (PCOR) Partnership Phase III Task 15 Milestone M40 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2013-EERC-10-13, Grand Forks, North Dakota, Energy & Environmental Research Center, September.
- Jensen, M.D., Haley, J.D., Peck, W.D., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Review of source attributes: Plains CO₂ Reduction (PCOR) Partnership Phase III Task 1 Deliverable D1 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2013-EERC-11-12, Grand Forks, North Dakota, Energy & Environmental Research Center, September.

Value-Added Products

- Braunberger, J.R., Klapperich, R.J., Mibeck, B.A.F., Eylands, K.E., Huffman, B.W., Bremer, J.M., Bailey, T.P., Heebink, L.V., and Smith, S.A., 2013, Petrophysical assessment of USGS core samples for the Bell Creek project: Plains CO₂ Reduction (PCOR) Partnership value-added report for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592 and the U.S. Geological Survey Core Research Center, Grand Forks, North Dakota, Energy & Environmental Research Center, November 2013.
- Daly, D.J., Crocker, C.R., Hamling, J.A., Gorecki, C.D., Steadman, E.A., and Harju, J.A., 2013, Bell Creek Integrated CO₂ EOR and Storage Project: Plains CO₂ Reduction (PCOR) Partnership value-added report for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, November 2013.

Progress Reports

Monthlies

Gorecki, C.D., Steadman, E.N., Peck, W.D., Daly, D.J., Botnen, L.S., Sorensen, J.A., Hamling, J.A., Jensen, M.D., Harju, J.A., Anagnost, K.K., and Klapperich, R.J., 2013, Plains CO₂ Reduction (PCOR) Partnership: Phase III monthly report (October 1–31, 2013) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, November.

Gorecki, C.D., Steadman, E.N., Peck, W.D., Daly, D.J., Botnen, L.S., Sorensen, J.A., Hamling, J.A., Jensen, M.D., Harju, J.A., Anagnost, K.K., and Klapperich, R.J., 2013, Plains CO₂ Reduction (PCOR) Partnership: Phase III monthly report (November 1–30, 2013) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, December.

Quarterlies

Gorecki, C.D., Harju, J.A., Steadman, E.N., Romuld, L., Sorensen, J.A., Botnen, L.S., Daly, D.J., Hamling, J.A., Jensen, M.D., Peck, W.D., Klapperich, R.J., Anagnost, K.K., and Votava, T.J., 2013, Plains CO₂ Reduction Partnership Phase III: Task 13 Deliverable D58/59 quarterly technical progress report (July 1 – September 30, 2013) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592 and North Dakota Industrial Commission Contract Nos. FY08-LX111-162 and G-015-030, Grand Forks, North Dakota, Energy & Environmental Research Center, October.

Meeting Minutes

Klapperich, R.J., and Tennyson, M., 2013, Annual meeting minutes—Regional Carbon Sequestration Partnership Water Working Group annual meeting: Pittsburgh, Pennsylvania, August 19, 2013.

Klapperich, R.J., 2013, Minutes—Regional Carbon Sequestration Partnership Water Working Group monthly conference call: September 30, 2013.

Klapperich, R.J., 2013, Minutes—Regional Carbon Sequestration Partnership Water Working Group monthly conference call: October 31, 2013.

Klapperich, R.J., 2013, Minutes—Regional Carbon Sequestration Partnership Water Working Group monthly conference call: November 21, 2013.

MEETINGS/TRAVEL

Representatives from the PCOR Partnership attended and/or participated in the following 16 meetings/conferences and six project management site trips in this reporting period:

- September 27 – October 3, 2013: Attended SPE ATCE in New Orleans, Louisiana.
- September 29 – October 6, 2013: Visited landowners and performed soil gas and water sampling at the Bell Creek site.
- October 1–3, 2013: Attended the Midwest Regional Carbon Sequestration Partnership meeting in Traverse City, Michigan.
- October 7–9, 2013: Attended the 2013 Midwest Carbon Sequestration Science Conference in Champaign, Illinois, and toured the Illinois Basin – Decatur Project at the Archer Daniels Midland Company in Decatur, Illinois.
- October 10, 2014: Inspected the Phase II Lignite Field Validation Test site near Kenmare, North Dakota.
- October 15–17, 2013: Presented at the North American Wellbore Integrity Workshop on Denver, Colorado.
- October 20–23, 2013: Presented at CMTC in Alexandria, Virginia.
- October 20–23, 2013: Presented at Air Quality IX in Arlington, Virginia.
- November 2–7, 2013: Attended the 2013 IOGCC Annual Meeting in Long Beach, California.
- November 4–5, 2013: Presented at the 9th Annual Power Summit in Lincoln, Nebraska.
- November 10–16, 2013: Traveled to the Bell Creek area for sampling activities.
- November 13–15, 2013: Presented at the Fiscal Year 14 RCSP Expert Review in Washington, D.C.
- November 13–15, 2013: Participated in a PTRC outreach workshop in Regina, Saskatchewan, Canada.
- November 13–16, 2013: Visited Stanford University and Core test in San Francisco and Santa Cruz, California, respectively.
- November 19, 2013: Attended a meeting with PPB at its offices in Fargo, North Dakota.
- November 19, 2013: Attended the North Dakota Lignite Research Council meeting in Bismarck, North Dakota.
- November 29, 2013: Inspected the Phase II Lignite Field Validation Test site near Kenmare, North Dakota.
- December 6, 2013: Attended a teacher focus group meeting at PPB offices in Fargo, North Dakota.
- December 8–12, 2013: Presented at the AGU (American Geophysical Union) Fall Meeting held in San Francisco, California.
- December 8–13, 2013: Participated in CO₂ Conference Week in Midland, Texas.
- December 9–14, 2013: Traveled to the Bell Creek oil field for monthly sampling efforts.
- December 10–11, 2013: Visited the hotel venue for the 2014 annual membership meeting in Denver, Colorado.

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

