



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 April 1 – June 30, 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
April 1 – June 30, 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 April 1, 2013, through June 30, 2013.

An important milestone was reached this reporting period at the Denbury Onshore LLC (Denbury)-operated Bell Creek site, namely, CO₂ injection began May 2013. Prior to this event, the EERC completed its planned preinjection baseline monitoring program, with six rounds of water sampling (surface and groundwater), five rounds of soil gas sampling, and one Fox Hills Formation sampling event. Also, prior to injection, a new borehole observation well was drilled and completed, and permanent downhole geophone arrays were installed for postinjection monitoring purposes. Vertical seismic profiling acquisition and bottomhole pressure tests were also completed. In addition, petrophysical assessments of fieldwide core were documented, and mineralogical analyses were performed on sidewall and full-diameter core samples from the Bell Creek Field. A preinjection geochemical report is well under way documenting the findings.

The “PCOR Partnership Atlas, Fourth Edition, Revised,” was printed in June 2013 and is available to the public upon request. The atlas and copies of the Prairie Public Broadcasting–PCOR Partnership collaboratively produced documentaries were provided to nearly 200 teachers during two regional education events. These teachers hailed from 133 schools, 89 school districts, and five states and took back to their classrooms information about carbon capture, utilization, and storage. Regional characterization, modeling and simulation, and regulatory work group efforts also continued during this reporting period.



PLAINS CO₂ REDUCTION PARTNERSHIP PHASE III
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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 June 30, 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 Sequestration Program 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 (Figure 1)

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

Note: 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	Petroleum Technology Research Centre
Ameren Corporation	Iowa Department of Natural Resources	Petroleum Technology Transfer Council
American Coalition for Clean Coal Electricity	Lignite Energy Council	Pinnacle, a Halliburton Service
American Lignite Energy	Manitoba Geological Survey	Prairie Public Broadcasting
Apache Canada Ltd.	Marathon Oil Company	Pratt & Whitney Rocketdyne, Inc.
Aquistore	MEG Energy Corporation	Praxair, Inc.
Baker Hughes Incorporated	Melzer Consulting	Ramgen Power Systems, Inc.
Basin Electric Power Cooperative	Minnesota Power	RPS Energy Canada Ltd.
BillyJack Consulting Inc.	Minnkota Power Cooperative, Inc.	Saskatchewan Ministry of Industry and Resources
Biorecro AB	Missouri Department of Natural Resources	SaskPower
Blue Source, LLC	Missouri River Energy Services	Schlumberger
BNI Coal, Ltd.	Montana–Dakota Utilities Co.	Shell Canada Energy
British Columbia Ministry of Energy, Mines, and Petroleum Resources	Montana Department of Environmental Quality	Spectra Energy
British Columbia Oil and Gas Commission	National Commission on Energy Policy	Suncor Energy Inc.
C12 Energy, Inc.	Natural Resources Canada	TAQA North, Ltd.
Computer Modelling Group Ltd.	Nebraska Public Power District	TGS Geological Products and Services
Continental Resources, Inc.	North American Coal Corporation	University of Alberta
Dakota Gasification Company	North Dakota Department of Commerce	University of Regina
Denbury Onshore LLC	Division of Community Services	WBI Energy, Inc.
Eagle Operating, Inc.	North Dakota Department of Health	Weatherford Advanced Geotechnology
Eastern Iowa Community College District	North Dakota Geological Survey	Western Governors' Association
Enbridge Inc.	North Dakota Industrial Commission	Westmoreland Coal Company
Encore Acquisition Company	Department of Mineral Resources, Oil and Gas Division	Wisconsin Department of Agriculture, Trade and Consumer Protection
Energy Resources Conservation Board/Alberta Geological Survey	North Dakota Industrial Commission	Wyoming Office of State Lands and Investments
Environment Canada	Lignite Research, Development and Marketing Program	Xcel Energy
Excelsior Energy Inc.		

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

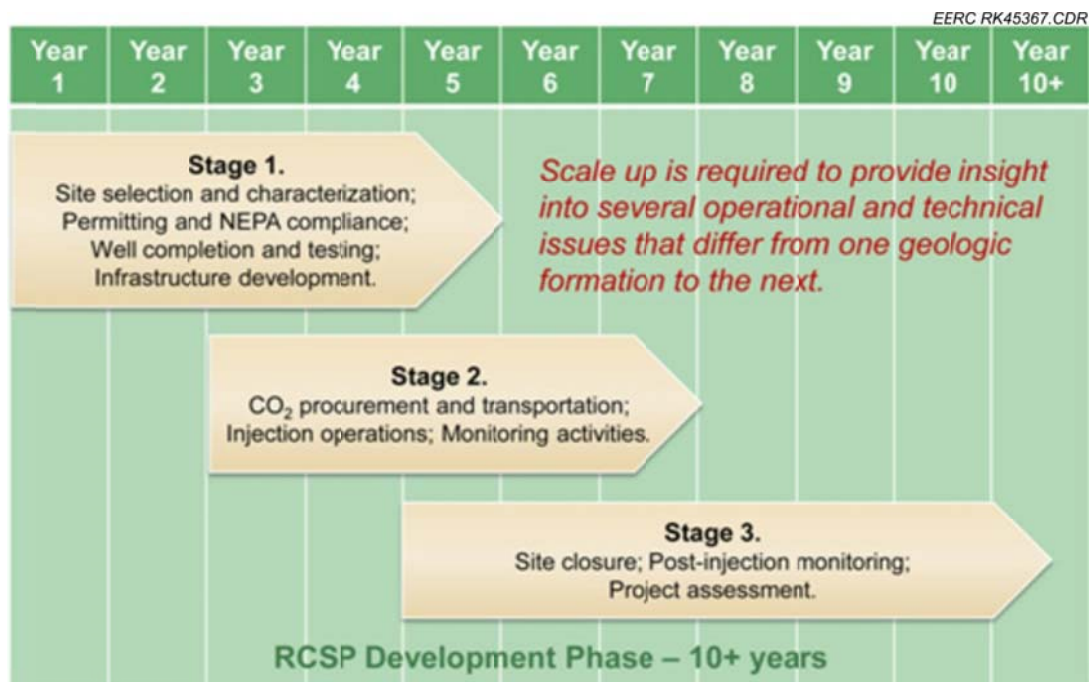


Figure 1. RCSP development phase: scaling up toward commercialization (source: www.netl.doe.gov/technologies/carbon_seq/infrastructure/rcspiii.html [accessed July 2013]).

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 toward the establishment of two 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 (Figure 2).

The PCOR Partnership's objectives for the demonstration projects are as follows: 1) conduct a successful field demonstration to verify that the region's large number of oil fields has the potential to store significant quantities of CO₂ in a safe, economical, and environmentally responsible manner and 2) conduct a successful demonstration to 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.

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

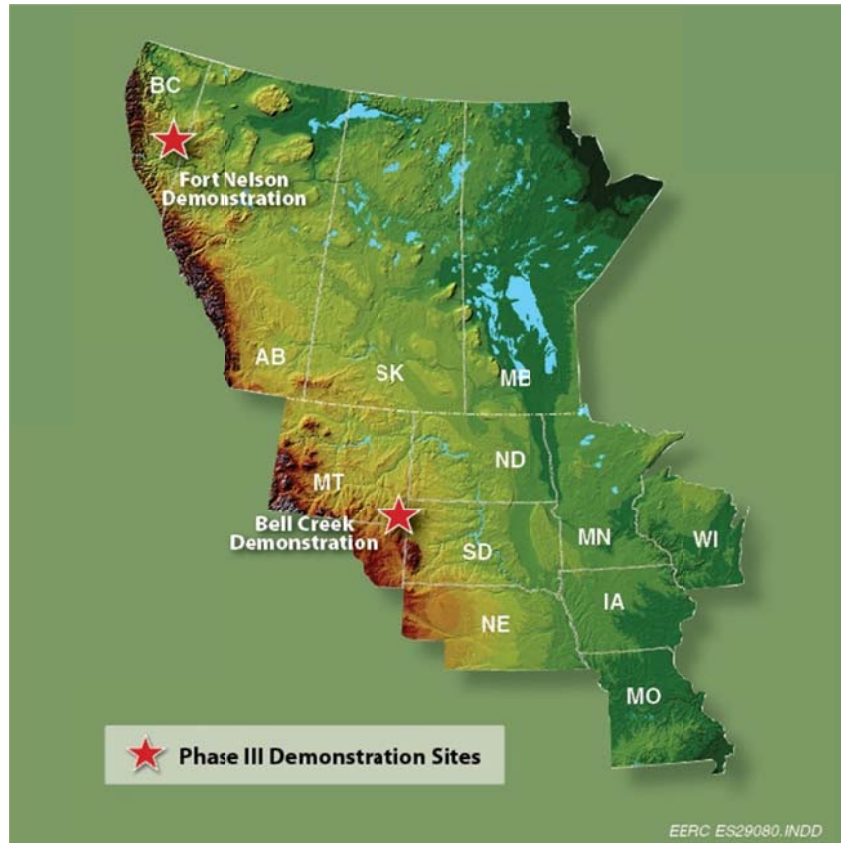


Figure 2. PCOR Partnership Phase III large-scale sites.

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.

PROGRESS OF WORK

Task 1 – Regional Characterization

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

- Continued revisions to the PCOR Partnership Atlas (Deliverable [D] 81, update due August 2013), including the following:

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 ¹
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

¹ To be announced.

- Submitted the revised version of the “PCOR Partnership Atlas, 4th Edition,” to DOE NETL for approval on May 1, 2013 (nearly 4 months ahead of schedule).
- Received approval of the “PCOR Partnership Atlas, 4th Edition, Revised,” on May 7, 2013.
- Received the over 1250 printed copies of the new atlas on June 4, 2013.
- Began distributing the new atlases in June 2013.
- Began the annual review and update of the attribute data for the CO₂ sources database (D1, due September 2013), including the following:
 - Updated the sources within the U.S. portion of the region.
 - Spent time trying to verify the existence of older sources.
 - Began updating the Canadian sources.
- Continued efforts to characterize the Cedar Creek Anticline (CCA), including the following:
 - Continued development of a geologic and operational database for the water injection and oil production data gathered to date.
 - Began drafting a value-added white paper on the characterization data.
- Continued efforts to characterize six saline formations for CO₂ storage (Broom Creek, Inyan Kara, Leduc, Minnelusa, Mission Canyon, and Winnipegosis Formations [Fms]), including the following:
 - Continued compilation of formation outlines.
 - Continued work on the Broom Creek Fm, including the following:
 - ♦ Continued work on the structural model.
 - ♦ Began petrophysical modeling.
 - ♦ Performed advanced analysis on the model.

- ◆ Worked on volume uncertainty analysis (2013 Broom Creek study area and Washburn study area).
- Continued to research permeability values of the Inyan Kara Fm in the Williston Basin with plans to use calculated permeability estimates to produce static models of potential geologic CO₂ storage.
- Continued literature review of the Leduc Fm, focusing on the Golden Spike Reef Complex.
- Continued work on the Minnelusa Fm, including the following:
 - ◆ Completed the base-case model.
 - ◆ Continued calculations on the storage capacity.
- Continued geologic characterization and CO₂ storage potential estimates for Cedar Hills Sandstone and Amazon Dolomite in Nebraska. Began work on a value-added report.
- Continued updates and maintenance of the Decision Support System (DSS), including the following:
 - Performed a thorough review of entire partners-only DSS for accuracy and relevance and saved revisions to a “test” site for review.
 - Updated the annual meeting information section, About the PCOR Partnership, Partner Directory, Keep Me Informed, and EERC contacts.
 - Updated the following pages: CO₂ Sources/Anthropogenic Sources, CO₂ Sources/Anthropogenic Sources, CO₂ Capture, CO₂ Capture/CO₂ Capture Technologies, Geologic Storage/Enhanced Oil Recovery, Geologic Storage/Oil and Gas Field Storage, Geologic Storage/Saline Formation, MVA, Glossary of Terms, Regulations, Carbon Markets, Field Validation Tests/Terrestrial, Field Validation Tests/Lignite, and Field Validation Tests/Northwest McGregor.
 - Completed adding updated Bell Creek information to the “Demonstration Projects” section on the test site.
 - Continued to update regional well information, i.e., for Manitoba and Montana, for the “Interactive Maps” section of the site.
 - Continued to add descriptions for the atlas images so that they can be added to the “Image Gallery.”
- Continued improving data management and data access using Petra software.
- Continued work on a value-added oil field and reservoir report, including the following activities:
 - Completed the Montana abandoned oil well section of the report.
 - Continued revisions based on recent feedback regarding CO₂ calculations.
 - Completed writing the methodology section, including collection and calculation data.
- With regard to the Aquistore project static modeling and dynamic predictive simulations effort:
 - Continued review of the observation well and injection well suites of data, e.g., logs, sidewall core analyses, drilling reports.
 - Began building the static model.
 - EERC staff participated in a Petroleum Technology Research Centre (PTRC) SERC (Science and Engineering Research Council) meeting held June 12, 2013.

- Began planning for the next Aquistore Risk Assessment and SERC meeting scheduled for July 9–12, 2013, in Regina, Saskatchewan.

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

- Although receipt of PTRC’s Aquistore model has been slightly delayed, it is not anticipated to delay the overall effort. EERC staff members have begun building the static model and will incorporate the PTRC information upon receipt.
- Schlumberger continues to prepare the Aquistore permit application for injection; permit must be filed and approved this fall in order to proceed.

Task 2 – Public Outreach and Education

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

- Participated in a conference call with Spectra Energy Transmission (Spectra) on April 4, 2013, regarding outreach tracking related to the Fort Nelson CCS Feasibility Project.
- Submitted an update to the general Phase III information PowerPoint presentation (D17) on May 31, 2013.
- Completed a survey of partner-related Web sites and began compiling the results in order to determine how partners are sharing carbon capture and storage-related information.
- Prepared presentation materials for the 12th Annual Carbon Capture, Utilization, and Sequestration Conference (CCUS-12) held May 13–16, 2013, in Pittsburgh, Pennsylvania. The RCSP Outreach Working Group (OWG) presented a session on message mapping.
- Continued gathering “site-specific” community outreach information for the Bell Creek project area and began developing a tracking protocol to capture the information.
- Participated in RCSP OWG conference calls on April 25 and June 20, 2013.
- Participated in Aquistore Outreach Advisory Panel conference calls on April 22 and June 3, 2013.
- Continued collaborative efforts with Prairie Public Broadcasting (PPB), including the following:
 - On April 30, 2013, the DOE Office of Fossil Energy released a Techline announcing that the PCOR Partnership–PPB documentary entitled “Global Energy and Carbon: Tracking Our Footprint” received a 2012 Platinum Best of Show Aurora Award in the nature/environment documentary category (www.fossil.energy.gov/news/techlines/2013/13018-PCOR_Documentary_Wins_Award.html).
 - On April 11, 2013, EERC staff captured video footage of the vertical seismic profiling (VSP) installation at the Bell Creek site.
 - Continued to work with PPB on Segments 1 and 2 (of four) of the educator presentation video to be used at teacher-training seminars and on the Web.

- Continued to work with PPB on editing the PDM (permanent downhole monitoring) value-added video (using footage collected from Bell Creek Well 05-06 OW).
- Continued preparations for filming with PPB at the Boundary Dam power plant on July 23, 2013.
- Continued to coordinate with PPB on scheduling film trips for upcoming documentary projects.
- Completed the final revisions to the outreach-tracking database.
- Continued efforts to review and improve the public Web site, including the following:
 - Improved Web site visibility to search engines via new page titles, additions to page tags, and new page URLs (uniform resource locators).
 - Added a Web site search tool using Google Site Search providing the capability to search topics and receive results exclusively within the public Web site.
 - Continued work on updating the education section.
 - Added a link to the Web site from the EERC home page.
 - Initiated an upgrade to the video clip player using Adobe Media Service. This upgrade will improve navigability, aid in tracking, and increase classroom access to middle and high school students.
- During this reporting period, information regarding the site visits to the PCOR Partnership public Web site included the following:
 - There were 1617* visits to the public Web site (www.undeerc.org/pcor), representing an increase of 33% over the 1209 visits from last quarter. See Figure 3 for the location of visitors.
 - There were 1202 new visitors (visitors whose visit was marked as a first-time visit) and 96 returning visitors for a total of 1298 visitors, representing a 29% increase over the 1005 visitors from last quarter.
 - ♦ New visitors made up 74% of the traffic to the Web site.
 - ♦ Returning visitors comprised 26% of the total visits (note: these results are based on the Google Analytics definition of new versus returning visitors, <https://support.google.com/analytics/>).
 - There was traffic from 72 countries. Of the 1617 visits, 62% of the Web traffic was domestic, and 38% was international. Table 3 lists the top ten countries with the highest number of visits to the PCOR Partnership Web site.
 - There were 322 visits originating from within the PCOR Partnership Region (Figure 4), representing an increase of 81% over the 178 visits from last quarter. Approximately 81% of the regional visits originated from the United States, and 19% came from Canada. Visits from within the PCOR Partnership region comprised 20% of the overall traffic to the public Web site (note: the totals are

* The PCOR Partnership uses Google Analytics to track activity for the public Web site. This Web analysis tool plays an integral part in understanding the online behavior of our Web site visitors. As instituted in the fall of 2012, the Advanced Segments feature in Google Analytics is used to exclude internal Web site traffic (project personnel and Web site maintenance visits), thus providing a reasonable starting point to gauge public activity. As with the two previous quarters, all results reported are for public (external) traffic only.

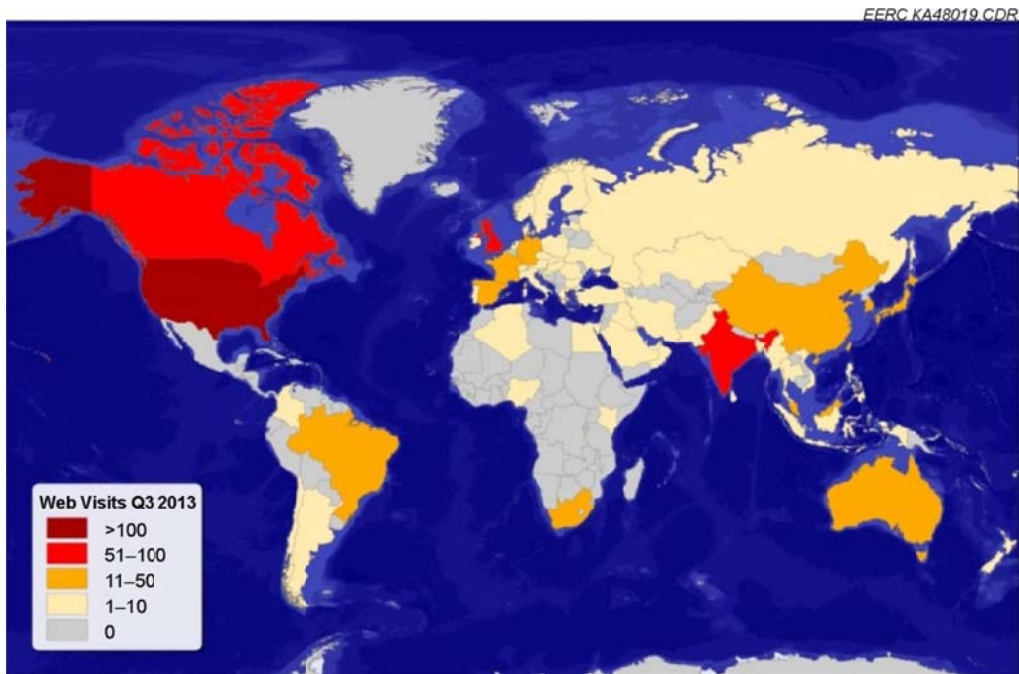


Figure 3. Map of PCOR Partnership Web site global traffic (source: Google Analytics).

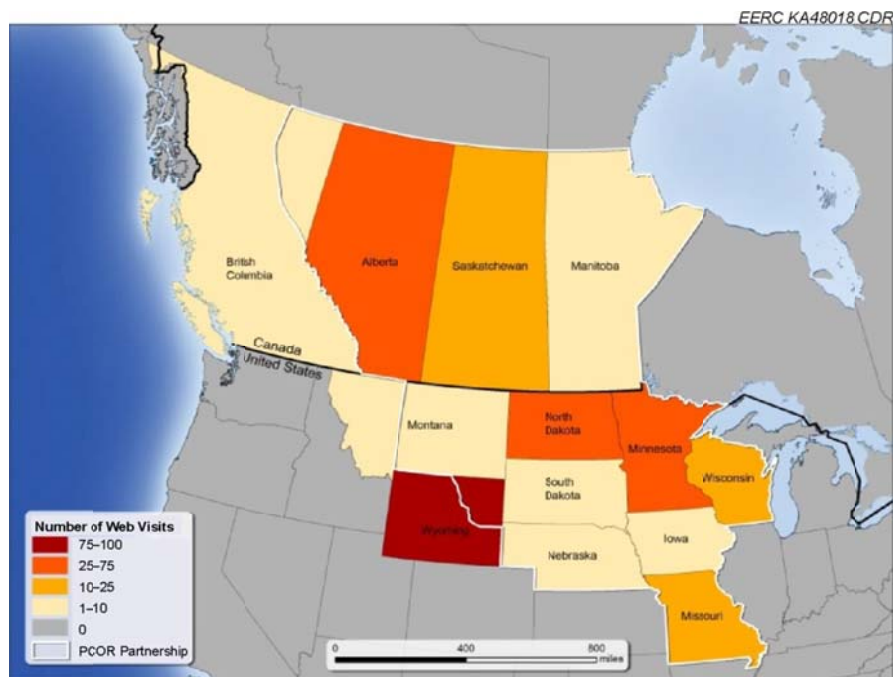


Figure 4. Map of PCOR Partnership Web site regional visits (source: Google Analytics).

Table 3. Visit Activity from the Top 10 Countries and the PCOR Partnership Region

Country	PCOR Partnership State/Province	Visits
1. United States		1006
	Wyoming	82
	Minnesota	68
	North Dakota	58
	Wisconsin	17
	Missouri	14
	Montana	8
	Nebraska	6
	Iowa	4
	South Dakota	3
2. Canada		91
	Alberta	39
	Saskatchewan	12
	British Columbia	8
	Manitoba	3
3. United Kingdom		67
4. India		55
5. Australia		48
6. South Korea		22
7. Malaysia		22
8. Taiwan		22
9. France		19
10. Germany		16
Other 62 Countries		238
Total Visits		1617

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).

- 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.
 - 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 (20%) is from persons familiar with the PCOR Partnership (Kaushik, 2010).
 - Search engine traffic refers to the use of keywords and accounted for nearly 67% of the traffic. Google Analytics provides the keywords visitors used. Approximately 28% of the keywords are specific to the EERC and the PCOR Partnership, and the other 72% are general terms such as “CO₂ sequestration.”

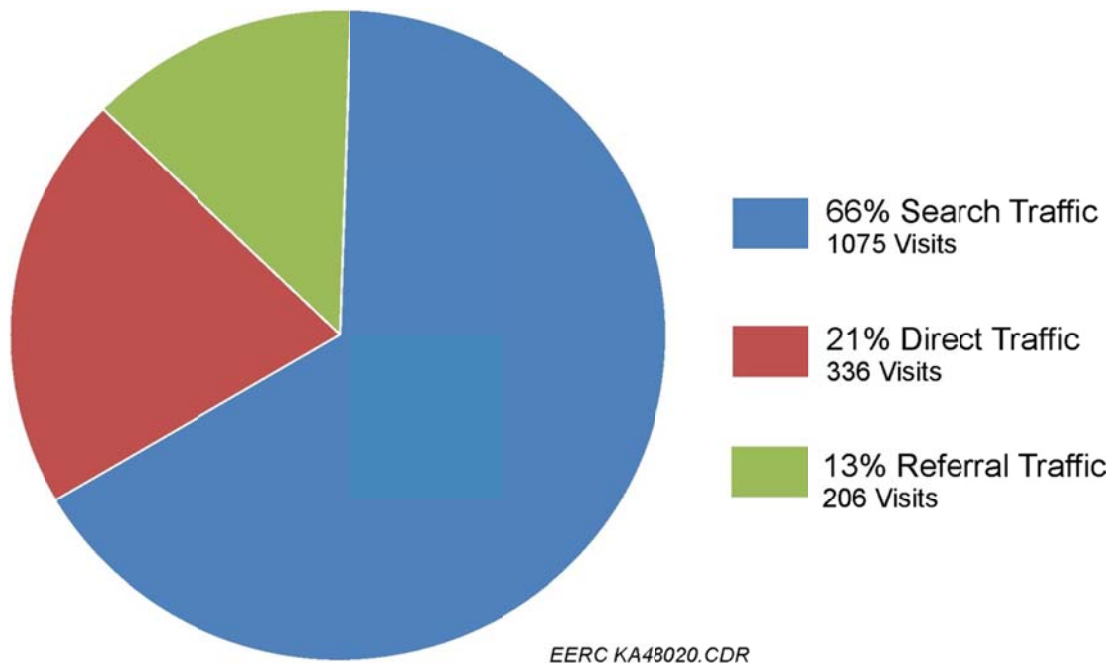


Figure 5. PCOR Partnership public Web site traffic sources (source: Google Analytics).

- Referral site traffic (13%) corresponds to the traffic directed to the PCOR Partnership Web page from other sites via links. The top three referring Web sites were DOE-based, specifically the Web sites of the Office of Fossil Energy (38 referral), NETL (34 referrals), and the main DOE Web site (19 referrals).
- During this reporting period, the nature of the visits to the PCOR Partnership public Web site included 3241 page views; the top five pages viewed are listed in Table 4.
- During this reporting period, the PCOR Partnership received media coverage from several external media outlets, primarily in response to the DOE Fossil Energy Techline entitled “Regional Partnership Documentary Wins ‘Best of Show’ Aurora Award” featured at the end of April 2013.
- During this reporting period, two telecasts on public television aired as follows:
 - “Reducing Our Carbon Footprint: The Role of Markets” was broadcast in North Dakota, northwestern Minnesota, and Manitoba.
 - “Global Energy and Carbon: Tracking Our Footprint” was broadcast in Ohio.
- During this reporting period, the PCOR Partnership participated in two education-related events:

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

Page Title	Page Views	% Page Views	Page
Home Page	675	21%	www.undeerc.org/pcor/default.aspx
What Is CO ₂ Sequestration	559	17%	www.undeerc.org/pcor/sequestration/whatissequestration.aspx
Video Clip Library	206	6.4%	www.undeerc.org/pcor/videogallery/default.aspx
CO ₂ Sequestration Projects	178	5.5%	www.undeerc.org/pcor/co2seqprojects/default.aspx
About the Partnership	145	4.5%	www.undeerc.org/pcor/about/default.aspx

- Participated in the PPB Teacher Training Institute entitled “Integrating Regional History, Culture, Science and the Arts” on June 25 and 26, 2013, in Moorhead, Minnesota and distributed over 60 information packets (atlas, documentaries, fact sheets).
- Presented at the 2013 Lignite Education Seminar: Energy, Economics, and Environment on June 18, 2013, in Bismarck, North Dakota, and distributed over 130 information packets.
- A total of 193 teachers from five states in the PCOR Partnership region (Figure 6) were in attendance at the two workshops:
 - ♦ Approximately 27% of these teachers taught science.

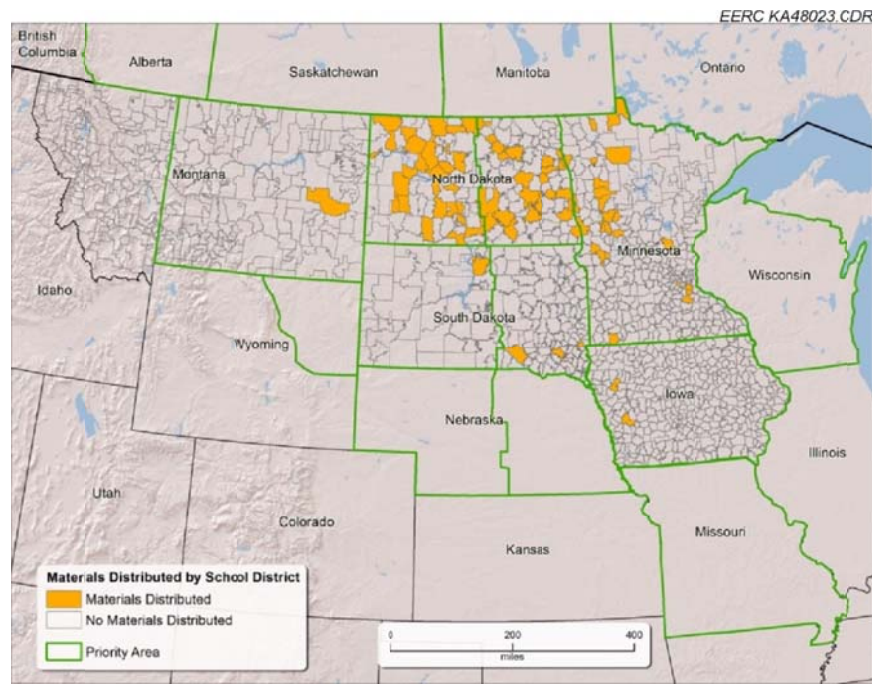


Figure 6. Distribution of school districts with representatives who attended presentations and received information packets.

- ◆ Eight of the participating teachers had previously heard a PCOR Partnership education presentation at a different workshop.
 - ◆ There were 133 schools representing 89 school districts in five of the nine states within the PCOR Partnership region.
 - ◆ Over 38 of the school districts represented by attendees were first-time recipients of PCOR Partnership outreach messages and materials.
- EERC employees attended 18 conferences/meetings and four workshops. Specifically, the PCOR Partnership outreach activities included nine oral presentations. In addition, the following quantities of outreach materials were distributed:
 - PCOR Partnership documentary entitled “Nature in the Balance: CO₂ Sequestration” – 73
 - PCOR Partnership documentary entitled “Reducing Our Carbon Footprint: The Role of Carbon Markets” – 73
 - PCOR Partnership documentary entitled “Out of the Air – Into the Soil” – 73
 - PCOR Partnership documentary entitled “Managing Carbon Dioxide: The Geologic Solution” – 238
 - PCOR Partnership documentary entitled “Global Energy and Carbon: Tracking Our Footprint” – 226
 - “PCOR Partnership Atlas, 4th Edition” – 248
 - “PCOR Partnership Atlas, 4th Edition, Revised” – 26
- PowerPoint presentations given by the project team regarding demonstration activities included the following:
 - Burnison, S.A., Peck, W.D., and Doll, T.E., 2013, Cedar Creek Anticline: Presented to Denbury Resources Inc. personnel, Plano, Texas, May 8, 2013.
 - Daly, D.J., 2013, Energy and carbon—the big picture: Presented at the Integrating Regional History, Culture, Science, and the Arts Prairie Public Broadcasting Teacher Training Institute, Moorhead, Minnesota, June 25–26, 2013.
 - Daly, D.J., 2013, Energy and CO₂ management—carbon capture and storage: Presented at the 2013 Lignite Education Seminar: Energy, Economics & Environment, Bismarck, North Dakota, June 17–20, 2013.
 - Daly, D.J., 2013, Reducing the carbon footprint—regional options: Presented at the Integrating Regional History, Culture, Science, and the Arts Prairie Public Broadcasting Teacher Training Institute, Moorhead, Minnesota, June 25–26, 2013.
 - Daly, D.J., Cumming, L., Garrett, G., Stone, M., Myhre, R., Mather, C., Tollefson, L., and Wade, S., 2013, Message mapping—a tool for developing and testing responses to stakeholder concerns: Presented at the 12th Annual Conference on Carbon Capture, Utilization & Sequestration, Pittsburgh, Pennsylvania, May 13–16, 2013.
 - Gorecki, C.D., 2013, Overview of the PCOR Partnership Program: Presented to Korean CCS R&D Center, Korea Institute of Energy Research, Kyung Hee University, and Korea Research Institute of Chemical Technology personnel, Grand Forks, North Dakota, May 20, 2013.
 - Hamling, J.A., and Gorecki, C.D., 2013, Bell Creek Project update meeting: Presented at the Bell Creek Project Update Meeting, Plano, Texas, May 7–8, 2013.

- Steadman, E.N., 2013, The PCOR Partnership: Presented at the U.S.–Canada Bilateral National Conference, Champaign, Illinois, April 23, 2013.
- Steadman, E.N., Harju, J.A., and Gorecki, C.D., 2013, Bell Creek MVA overview: Presented at the Carbon Sequestration Leadership Forum (CSLF) CO₂ Monitoring Interactive Workshop, Rome, Italy, April 16–19, 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 3 – Permitting and NEPA Compliance

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

- Participated in a conference call with the RCSP OWG coordinator to discuss Class VI permit cost factors.
- Presented in the CO₂ Transportation session at the Introduction to CO₂–Enhanced Oil Recovery (EOR) Workshop held on June 11 and 12, 2013, in Houston and Port Arthur, Texas. The workshop provided an overview of EOR and carbon capture, utilization, and storage (CCUS) to U.S. state and Canadian provincial regulators.
- Reviewed and commented on an IEA Greenhouse Gas R&D Programme (IEAGHG) draft report entitled “Developing a Small-Scale CO₂ Test Injection: Experience to Date and Best Practice.”
- Continued activities associated with the Interstate Oil and Gas Compact Commission (IOGCC) Carbon Geologic Storage (CGS) Task Force, including the following:
 - Continued work on the CGS Task Force report.
 - Hosted and participated in the CGS Task Force Operational and Postoperational Subgroup on May 8 and 9, 2013, in Minneapolis, Minnesota.
 - Hosted and presented at the CGS Task Force meeting on June 19 and 20, 2013, in Denver, Colorado.
 - Submitted on June 28, 2013, Milestone (M) 42, Findings and Recommendations of the Operational and Postoperational Subgroups Presented to the CGS Task Force.
- Continued planning for the 5th Annual Regulatory Roundup, including the following:
 - Set the dates and location for the meeting: July 30–31, 2013, in Deadwood, South Dakota.
 - Sent a “Save the Date” e-mail and draft agenda to participants.
 - Sent hotel information to participants.
- Continued review of new U.S. Environmental Protection Agency (EPA) geologic sequestration draft and final guidance documents, including the following:
 - Geologic Sequestration of Carbon Dioxide: Draft Underground Injection Control (UIC) Program Class VI Well Recordkeeping, Reporting and Data Management Guidance for Owners and Operators (comments due May 11, 2013).

- Geologic Sequestration of Carbon Dioxide: Draft Underground Injection Control (UIC) Program Class VI Well Recordkeeping, Reporting and Data Management Guidance for Permitting Authorities (comments due May 11, 2013).
- Geologic Sequestration of Carbon Dioxide: Draft Underground Injection Control (UIC) Program Class VI Well Plugging, Post-Injection Site Care, and Site Closure Guidance (comments due June 24, 2013).
- 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 April 4 and June 19, 2013.
 - Continued to modify a draft value-added report on closure activities.

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:

- Attended the Williston Basin Petroleum Conference (WBPC) in Regina, Saskatchewan, Canada.
- Modeling staff attended Schlumberger Network of Excellence in Training (NExT) software training entitled “Petrel Workflow Editor and Uncertainty Analysis” on April 11 and 12, 2013, in Houston, Texas.
- EERC staff participated in four half-day in-house Petrel software training sessions and a 1-hour training session led by Schlumberger Carbon Services (Schlumberger).
- **Bell Creek** test site activities included the following:
 - Received DOE approval on June 3, 2013, in the form of additional funding for additional core collection (36-14R and 56-14R), analysis, and logging activities on previously unavailable wells.
 - Presented a poster on May 21, 2013, entitled “Subsurface Core and Analogous Outcrop Characterization for the Muddy/Newcastle Formation of the Bell Creek Oil Field, Power River County, Montana” for the American Association of Petroleum Geologists (AAPG) Annual Convention & Exhibition 2013 (www.aapg.org/pittsburgh2013/).
 - Began preparation of an “AAPG Bulletin” journal article.
 - Continued seismic-related activities, including the following:
 - ◆ Worked on a scope of work for processing and interpreting the 3-D surface seismic data.
 - ◆ EERC staff traveled to the Bell Creek Field to observe the VSP acquisition on May 15–19, 2013 (Figures 7 and 8). Bottomhole pressure (BHP) tests were completed on May 13–15, 2013.



Figure 7. Bell Creek monitoring well 05-06 OW with a 50-level removable seismic receiver array hanging in it. The wire coming out of the wellhead is a fiber optic cable carrying 150 channels of data to the nearby recording trailer (May 2013).



Figure 8. Two 60,000-pound Vibroseis units provide the source energy at a grid of nearly 1000 shot points surrounding two receiver wells. This survey provides a baseline before injection of CO₂ begins (May 2013).

- ◆ Discussed passive seismic monitoring and 3-D VSP processing with Apex HiPoint LLC (APEX) at the Bell Creek site.
- ◆ Discussed the potential for a repeat survey in January 2014, in conjunction with Denbury's 4-D seismic survey.
- ◆ Received clipped 3-D seismic survey data covering approximately 45 mi² in Phase 1.
- Scheduled the final baseline PNL (pulsed neutron logging) campaign.
- Continued preparations for a guided field trip for Denbury staff scheduled for August 10–15, 2013, including the following:
 - ◆ EERC staff traveled to an outcrop near Hulett, Wyoming, on June 10, 2013, for preparations, planning, and landowner permissions.
 - ◆ Began preparation of a field guide for the Muddy Outcrop field trip.
 - ◆ Reviewed several new technical papers regarding Muddy Sandstone geology.
- Explored several topics to pursue for publication on Bell Creek geology and petrographic interpretations.
- Began work on the Bell Creek Test Site – Site Characterization Report (D64, due August 2013), which will include the following:
 - ◆ Conducted a literature review on over 674 well files.
 - ◆ Acquired lidar (light detection and ranging) for 79 mi².
 - ◆ Examined over 60 cores, including descriptions.
 - ◆ Reviewed logs from over 748 wells included in the geologic model.
- Began outlining the information to be included in the Wellbore Leakage Final Report (D36, due March 2014).
- Continued improving the reservoir simulation model with Computer Modelling Group GEM software – the improved model has simulated initial pressure and water saturation. Performed more case runs to test the input parameters.
- Continued work on the pressure model, adding in temperature and pressure from the reservoir model.
- Continued building a depofacies object model using historic and recently acquired core data.
- Continued work on the geomechanical modeling activities, including the following:
 - ◆ Continued revisions to D32, Geomechanical Report (submitted January 31, 2013), based on Denbury's comments.
 - ◆ Worked on improving the analytical geomechanical model.
 - ◆ Continued work on the 3-D MEM (mechanical earth model) using Techlog and Petrel software.
- Reviewed SCAL (special core analysis) test data received from Core Laboratories on April 4, 2013.
- Continued work on the Bell Creek Test Site – Preinjection Geochemical Report (D33/M12, due July 2013).
- Completed 05-06 OW sidewall core activities in the Applied Geology Laboratory (AGL), including the following:
 - ◆ Sent the value-added mineralogy report on 12 sidewall core samples to Denbury.
 - ◆ Completed data sheets and porosity point counting for the remaining 35 samples.

- Continued review and modification of the fieldwide petrophysical assessment (including 21 well packages) of 81 intervals of core from the U.S. Geological Survey (USGS) Denver Core Research Center.
- Met in-house to discuss 56-14R and 33-14R core analysis scopes of work.
- With regard to the 23 (Denbury – 8 and the EERC –15) sidewall cores collected from 56-14R:
 - ◆ Received thin sections from Wagner Petrographics on April 17, 2013.
 - ◆ Began photographing and describing thin sections.
- With regard to the 60 feet of full-diameter core collected from 33-14R, awaiting receipt of samples from Core Laboratories.
- Discussed in-house relative permeability testing capabilities.
- **Fort Nelson** test site activities included the following:
 - Sent the Fort Nelson Test Site – Site Characterization Report to Spectra for review and approval in May 2012. Comments were received on February 1, 2013, and revisions continued.
 - Sent the Fort Nelson Test Site – Geochemical Report to Spectra for review and approval in September 2012. Comments were received on February 7, 2013, and revisions continued.

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:

- Attended WBPC in Regina, Saskatchewan, Canada.
- Held in-house Bell Creek Project Update Meetings on April 22 and May 28, 2013. Topics included upcoming activities, core analysis update, surface and near-surface monitoring, verification, and accounting (MVA) activities, status of reports, PNL, seismic activities, modeling updates, and upcoming deliverables.
- A field crew traveled to the Bell Creek Field to provide technical support during the drilling and completion of the 04-03 OW well, as well as during the installation of the geophone array (Figures 9 and 10).
- Discussed geophone installation with representative(s) of Denbury and APEX.
- Submitted on April 15, 2013, an abstract entitled “Baseline Soil Gas Monitoring at the Bell Creek Combined CO₂ EOR and CO₂ Storage Project” for the Carbon Management Technology Conference (CMTTC) scheduled for October 21–23, 2013, in Alexandria, Virginia.
- Submitted to Denbury, for its review, a poster abstract entitled “Baseline Monitoring, Verification, and Accounting (MVA) at the Bell Creek Combined CO₂ Enhanced Oil Recovery and CO₂ Storage Project” for the Combined IEAGHG Monitoring and Environmental Research Network Meeting.



Figure 9. Geophone resting on 2⁷/₈-in. tubing prior to downhole installation in 04-03 OW in the Bell Creek Field (April 2013).



Figure 10. Rebar bracket protecting the geophone during downhole installation in 04-03 OW in the Bell Creek Field (April 2013).

- Continued efforts on the Fox Hills groundwater-monitoring wells (05-04 and 33-12), including the following:
 - Explored options for electric power metering.
 - Continued water-sampling efforts.
 - Evaluated permanent pump options in the field.
 - Collected and archived recent (April 4, 2013) baseline field data for the groundwater-monitoring wells. Results indicate that water quality is very good in both wells.
 - Received and began reviewing confirmatory analysis data from Cameron Cole Consulting regarding the monitoring well sampling conducted April 4, 2013.
 - Worked on bore logs.
 - Met with area landowners and installed permanent downhole pump in June 2013.
- Continued Fox Hills Fm CO₂ exposure testing to evaluate potential impact of CO₂ (as recommended by the PCOR Partnership Technical Advisory Board [TAB]), as follows:
 - Prepared drill cuttings for mineralogical analyses.
 - Examined dried drill cuttings under a microscope and submitted a sample for mineralogical analyses.
 - Reviewed the chemical analysis results.
 - Completed mineralogical analyses (x-ray diffraction and x-ray fluorescence) on the 33-12 drill cuttings. These data, along with water chemistry data from 33-12 groundwater, were used for PHREEQC model input data for CO₂-rock exposure simulations.
 - Completed a preliminary (1-week) exposure test to assess blending capabilities of mixed CO₂ and N₂ and the effects of different rock:water ratios. Began processing and summarizing corrected PDM data.
- Continued analysis of pressure gauge response from the 05-06 OW well, including the following:
 - Reviewed the PDM data processing procedures.
 - Analyzed reprocessed 05-06 OW PDM data after attempting to correct a calibration anomaly (coordinating efforts with PROMORE).
 - Tabulated the BHP surveys from July 2012 – January 2013 for selected wells for map creation.
- Continued to work on the value-added mitigation plan.
- Planned for and conducted a new (Event 6) complete baseline soil gas- and water-sampling trip during the week of April 22, 2013.
- Collected, scanned, and archived the soil gas data collection from March 2013. Analyzed nine (9) total samples.
- Met with the remaining landowners to deliver the water-sampling results from the two previous baseline sampling events.
- Completed preinjection baseline monitoring on May 22, 2013, with six rounds of water sampling (surface and groundwater), five rounds of soil gas sampling, and one Fox Hills sampling event, and began review of the data.
- Began planning for the annual fieldwide soil gas and water analysis (tentatively planned for October or November 2013).

- Discussed collecting oil and water, and incoming and recycled CO₂ samples, on a monthly basis at the Bell Creek site.
- Discussed the possibility of installing a temporary downhole pressure gauge in an injector and producer well for monitoring purposes.
- Installed protective fencing around the soil gas-profiling stations.
- Reviewed comments and updated figures on the value-added Bell Creek MVA report (integrating final baseline sampling event).
- Continued work on a draft of the Bell Creek Test Site – Monitoring Experimental Design Package (D43, due May 2013).

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

- A data file for the lower pressure/temperature gauge temperature reading from the 05-06 OW PDM system became corrupted for the lower pressure/temperature gauge. The anomaly appears to have affected the lower gauge temperature data recorded from January 8, 2013 – June 3, 2013. The issue was identified on May 9, 2013, during a scheduled data download. A software patch was written and installed to the system on June 3, 2013, after coordinating with PROMORE, the equipment and software vendor. We are coordinating with PROMORE to determine the cause of the corrupted calibration file and to install safeguards to prevent such incidents in the future. Currently, we are working with PROMORE in an attempt to reprocess the anomalous data to determine if the data are recoverable. The system is currently fully operational as of June 3, 2013. Only the lower gauge temperature data (which is a redundant temperature measurement system) was corrupted.

Task 6 – Infrastructure Development

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

- Began preparations for a trade or peer-reviewed journal article on pipeline sizing for sources that produce variable amounts of CO₂, including the following:
 - Completed research on pipeline sizing.
 - Calculated the volume for temporary CO₂ storage.
 - Prepared the first draft of a document describing the approach and results.
 - Began editing the document.
 - Began identifying journals for potential publication of the pipeline-sizing document.
- Submitted an abstract entitled “Assessing Temporary Storage Options to Attenuate Variable-Rate CO₂ Emissions for Use During Enhanced Oil Recovery” to CMTC scheduled for October 21–23, 2013, in Alexandria, Virginia.
- Began the process of updating the value-added 2011 capture technology assessment document. A literature search was initiated to identify CO₂ capture technologies that were not included in the document as well as updated information about technologies that were featured.

- Continued plans to attend the 2013 CO₂ Capture Technology Meeting scheduled for July 8–11, 2013, in Pittsburgh, Pennsylvania.

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

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

- Participated in ongoing project discussions with Denbury.
- Continued planning for the Bell Creek Test Site – Procurement Plan and Agreement Report (D48, due September 2013).

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

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

Task 8 – Transportation and Injection Operations

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

- Investigated CO₂-monitoring techniques that could be used to measure the amount of CO₂ that leaks from the surface equipment at an injection site.
- Held an in-house meeting to discuss a draft outline for a report on measurement of CO₂ fugitive emissions at injection sites.
- Initiated a cursory literature review of injection-related documents.

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 Schlumberger Oil Field Management (OFM) software training entitled “OFM Using Oil and Waterflood Examples” and “OFM Forecast Analysis &

Mapping Applications Fundamentals Combined Course” held April 15–18, 2013, in Denver, Colorado.

- Modeling staff participated in a 2-day workshop understanding the TOUGH2-EGS (Enhanced Geothermal Systems) simulator on June 3 and 4, 2013, at the Colorado School of Mines in Golden, Colorado.
- Modeling staff participated in a 2-day workshop on understanding and using the TOUGH2-CSM (Carbon Sequestration Modeling) simulator on June 5 and 6, 2013, at the Colorado School of Mines in Golden, Colorado.
- Modeling staff attended the ARMA (American Rock Mechanics Association) 47th U.S. Rock Mechanics/Geomechanics Symposium, as well as the 3rd Geomechanics Solutions for Environmental and Technical Challenges in Unconventional Resources Workshop, and the 2nd Workshop on Petroleum Geomechanics Testing in San Francisco, California, held June 27–30, 2013.
- Continued **Bell Creek** site activities, including the following:
 - Denbury began CO₂ injection in May 2013.
 - Submitted M26 entitled “Bell Creek Test Site – CO₂ Injection Initiated” on June 26, 2013. Received DOE approval on June 27, 2013.
 - Traveled to the Bell Creek Field June 25–27, 2013, and participated in a safety walk-through for the start-up of production and received an overview of injection operations.
 - Prepared an overview of continuous CO₂ injection results.
 - Continued PVT (pressure–volume–temperature) modeling work.
 - Conducted a literature search and review on PVT modeling.
 - Prepared a summary of prediction results and a summary of PVT model activity for Denbury.
 - Worked on prediction of CO₂ flooding: continuous injection and WAG (water alternating gas).
 - Conducted a literature review on experimental value of cap rock for CO₂ storage.
 - Continued work on Phase 1 history matching of the simulation model using CMOST (reservoir simulation software).
 - Conducted literature review on heavy-water capillary pressure test.
 - Continued work on the Simulation Report, Update 2 (D66, due August 30, 2013).
 - Correlated logs using Techlog.
 - Continued work on Phase 1 history matching of the simulation model using CMOST (reservoir simulation software).
 - Met internally to discuss the geochemical modeling progress.
- Continued **Fort Nelson** site activities, including the following:
 - Continued efforts to compile a report summarizing the activities and lessons learned at the Fort Nelson test site.
 - Continued work with Spectra on proposed scopes of work for 2012–2013 modeling efforts and sent a revision on April 11, 2013.
 - Sent D67, Fort Nelson Test Site – Simulation Report, to Spectra for review and approval in September 2011. Spectra comments were received February 4–7, 2013, and EERC review and revision continued.

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

- Lightning struck the continuous passive seismic monitoring control shack on the 04-03 OW well and damaged equipment. Hardware damage was repaired; however, several days' worth of monitoring data was lost when the system was down. The system is fully operational now.

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:

- Submitted D57, the annual assessment report, on December 28, 2012.

Task 13 – Project Management

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

- Welcomed new partner, Continental Resources, Inc., on April 22, 2013.
- Staff attended and presented at the CSLF Technical Group Meeting and CO₂-Monitoring Workshop held April 16–19, 2013, in Rome, Italy.
- Submitted an abstract on April 18, 2013, entitled “CO₂ Enhanced Oil Recovery (EOR): The Plains CO₂ Reduction Partnership’s Approach to Carbon Capture and Storage” to the International Petroleum Technology Conference (IPTC) scheduled for January 2014 in Doha, Qatar.
- Staff traveled to, presented at, and hosted an exhibit booth at the WBPC held April 30 – May 2, 2013, in Regina, Saskatchewan.
- Presented at the U.S.–Canada Clean Energy Dialogue II meeting in Champaign, Illinois.
- Compiled comments on the 2nd Annual TAB Meeting minutes.
- Participated in a conference call with BillyJack Consulting on May 16, 2013, and discussed plans for upcoming TAB events.
- Began planning for a TAB WebEx meeting scheduled for August 23, 2013, to discuss the Basal Cambrian project.
- Discussed participation in CCUS-12 with the conference coordinator.
- Participated in a conference call on May 7, 2013, with other regional partnerships as led by the Carbon Storage Program Infrastructure Coordinator, regarding the RCSP plenary panel discussion at CCUS-12.

- Prepared talking points for the CCUS-12 panel discussion.
- Participated in the CCUS-12 conference held May 13–16, 2013, in Pittsburgh, Pennsylvania.
- Staff traveled to Plano, Texas, to meet with Denbury on May 7 and 8, 2013, regarding various Bell Creek-related matters. Core samples were viewed, the 3-D seismic was reviewed, and an update presentation on Bell Creek activities was given as well as a brief overview of the work to date on the CCA characterization efforts.
- Met in-house on April 11, 2013, to discuss potential adjustments to the statement of project objectives.
- Participated in a conference call on April 12, 2013, with DOE NETL project management staff to discuss Bell Creek Phase 1 well information.
- In response to a request received from DOE NETL, provided brief information on May 9, 2013, regarding the lack of acid gas injection for EOR in the United States, and an indication that acid gas injection for disposal would fall under Class II.
- In response to a request received from DOE NETL, provided information on May 9, 2013, on the number and type of Phase II wells that used DOE NETL direct funding or cost share.
- In response to a request received from DOE NETL, on May 17, 2013, provided MVA cost estimates.
- Participated in a conference call with DOE on June 17, 2013, regarding an onshore/offshore MVA meeting scheduled for August 19, 2013 (10:00 a.m. to 3:00 p.m.), with representatives from Norway. The PCOR Partnership program manager will give a 20-minute presentation on EOR activities (Bell Creek) and MVA in extreme climates (Fort Nelson and Zama).
- Continued planning for the Dr. Deutsch geostatistics training scheduled to be held August 5–8, 2013, at the EERC.
- Received the poster invitation and abstract submission form (due by July 5) for the 2013 Carbon Storage R&D Project Review Meeting (Carbon Storage Meeting) and began discussing submittal options.
- Worked on several poster abstracts for the Carbon Storage Meeting, covering the projects at Zama and Bell Creek, and the Basal Cambrian characterization and modeling activities.
- Attended the IEAGHG Combined Modelling and Risk Assessment Network Meeting in Trondheim, Norway, June 10–13, 2013.
- Participated in monthly conference calls with Spectra management on May 9 and June 14, 2013.
- Conducted the monthly task leader meeting on April 2, 2013. Topics discussed included the annual meeting, upcoming conferences, and deliverables as well as updates from each task leader present.
- Conducted the monthly task leader meeting on May 17, 2013. Topics discussed included updates on the Bell Creek, Fort Nelson, Aquistore, and Basal Cambrian projects; a recap of the CCUS-12 conference; review of upcoming conferences and deliverables; and updates from each task leader present.
- Conducted the monthly task leader meeting on June 4, 2013. Topics discussed included updates on the Bell Creek, Fort Nelson, Aquistore, and Basal Cambrian projects;

review of upcoming conferences and deliverables; and updates from each task leader present.

- Continued preparations for the 2013 PCOR Partnership Annual Membership Meeting scheduled for September 25 and 26, 2013, in Minneapolis, Minnesota, including the following:
 - Sent an e-mail blast to all partner contacts on April 16, 2013, announcing that registration is open.
 - Mailed a postcard to all partner contacts on April 1, 2013, announcing the date and location for the annual meeting.
 - Began preparation of the preliminary meeting agenda.
 - Discussed progress made with encouraging partners (existing and potential) from the utility sector to attend the annual meeting.
- Deliverables and milestones completed in April:
 - March monthly update
 - Task 13: D58/D59: Quarterly Progress Report/Milestone Quarterly Report
 - Task 4: M14 – Bell Creek Test Site Geological Characterization Data Collection Completed
 - Task 14: M23 – Monthly WWG conference call held
 - Task 16: M35 – Basal Cambrian Dynamic Capacity Estimation Completed
- Deliverables and milestones completed in May:
 - April monthly update
 - Task 2: D17 – General Phase III Information PowerPoint Presentation (Update 4)
 - Task 5: D43 – Bell Creek Test Site – Monitoring Experimental Design Package
 - Task 14: M23 – Monthly WWG conference call held
 - Task 5: M27 – Bell Creek Test Site – MVA Equipment Installation and Baseline MVA Activities Completed
- Deliverables and milestones completed in June:
 - May monthly update
 - Task 3: M42 – Findings and Recommendations of the Operational and Postoperational Subgroups Presented to the CGS Task Force
 - Task 9: M26 – Bell Creek Test Site – CO₂ Injection Initiated
 - Task 14: M23 – Monthly WWG conference call held
 - Task 3: M37 – IOGCC Task Force Subgroup Meeting 2 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:

- Continued efforts on the next water-CCS nexus-related fact sheet (D99-2, due October 31, 2013) focused on water-monitoring technologies.

- Continued planning for the upcoming WWG annual meeting (scheduled for August 19, 2013, in Pittsburgh, Pennsylvania) including room setup, e-mail blasts, refreshments, and related items.
- Distributed the March 28, 2013, conference call notes on April 24, 2013.
- Held the monthly conference call on April 25, 2013.
- Distributed the April 25, 2013, conference call notes on May 23, 2013.
- Continued review of the WWG white paper for potential journal submission.
- Continued review of source material for the methodologies document.
- Distributed on April 18, 2013, a “mission statement” on the next fact sheet for WWG review and discussion.
- Submitted on April 15, 2013, an abstract entitled “Regional Carbon Sequestration Partnership Water Working Group White Paper on the Nexus of Water and Carbon Capture and Storage” for CMTC scheduled for October 21–23, 2013, in Alexandria, Virginia.
- Held the monthly conference call on May 30, 2013, and discussed comments to the fact sheet outline.
- Distributed the May 30, 2013, conference call notes on June 26, 2013.
- Held the monthly conference call on June 27, 2013, and discussed updates to the fact sheet outline and progress of the plans for the upcoming WWG annual meeting.
- Distributed a request for participation in the WWG open house to WWG members along with information on how to register for the DOE meeting poster session.

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:

- Effective April 29, 2013, Charles Gorecki assumed the task leader responsibilities.
- Met on April 2, 2013, to discuss next steps in drafting the Updated Regional Technology Implementation Plan (RTIP) for Zama (D86, due September 2013).
- Continued drafting the RTIP.
- Submitted an abstract entitled “Acid Gas Injection for Enhanced Oil Recovery and Long-Term Storage in Devonian-Aged Pinnacle Reefs” on April 26, 2013, for IPTC scheduled for January 2014, in Doha, Qatar.
- Participated in a call with BillyJack Consulting, Inc., on May 30, 2013, and received an update on personnel changes at Apache Canada (Zama).
- Upon request from DOE NETL, provided information on May 8, 2013, regarding the CO₂ injection masses for the six pinnacles at Zama, namely the F, G2G, NNN, RRR, Z3Z, and Muskeg L Pools.

- Held in-house Zama project update meetings on May 20 and June 20, 2013.
- Continued work on the G2G Pool, including the following:
 - Finished sensitivity analysis and began looking into analog core from Williston Basin pinnacle reefs for reference on porosity values.
 - Worked on water saturation modeling and considered alternative approaches for water saturation calculation.
 - Discussed and reviewed the progress of the dynamic simulation.
 - Worked on original oil in place (OOIP) correction.
 - Performed sensitivity analysis model properties.
 - Worked on troubleshooting the static model.
 - Tuned the history match and property model.
 - Worked on designing cases for the history match.
 - Worked on the simulation.
- Continued work on the Muskeg L Pool, including the following:
 - Worked on PVT modeling.
 - Started petrophysical modeling.
 - Completed the Muskeg L pinnacle model.
 - Continued work on permeability, water saturation, and OOIP.
 - Began recalculating CO₂ storage values using derived temperature and pressure gradients.
 - Continued work on dataflow and tuned the model.
- Continued a literature review on methods for quick CO₂ storage estimation.
- Began exploration of new techniques for oil–water saturation modeling.
- Investigated the possibility of using CO₂ Prophet to evaluate the NNN, RRR, and Z3Z pools.
- Viewed three cores at the core library for analog correlation purposes on the porosity found in Devonian pinnacle reefs from the Winnipegosis Formation.

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:

- Continued work on the report describing the wellbore integrity issues (D90, due September 2013).
- Continued work on a modeling and simulation report.
- Began preparing an abstract using the simulation data that have been performed on the Basal Cambrian.
- Continued injection scenario simulations.

- Continued work on eight additional injection scenarios by varying the rock compressibility and injection strategies to maximum CO₂ injection based on the 25 selected locations.
- Continued review of two Alberta Innovates – Technology Futures reports (due June 28, 2013) on the Basal Aquifer Project.
- Submitted a report on April 30, 2013, detailing that the basal Cambrian dynamic capacity estimation was completed (M35).
- Submitted an abstract entitled “Carbon Sequestration Case Study: Large-Scale Exploration in a Basal Saline System in Canada and the United States” for CMTC scheduled for October 21–23, 2013, in Alexandria, Virginia.
- Exported the 3-D model into average maps for Princeton University personnel.
- With regard to the Aquistore Project characterization:
 - Prepared an updated core plug sampling and analysis plan.
 - Traveled on April 30 – May 3, 2013, to sample core at TerraTek Labs in Calgary, Alberta, Canada.
 - Obtained 20 core samples with excellent plug recovery at all anticipated intervals.
 - Reviewed the whole core descriptions and compared them to intervals of core received at the EERC.
 - Continued cataloging and photographing samples.
 - Continued cleaning the salt from the samples using the Dean–Stark apparatus. Salts have been successfully cleaned from nine of the first 12 samples run; the remaining eight samples were through the first cleaning step on May 24, 2013. Samples still showing evidence of salt were run through polishing the first week in June.
 - Samples have been sent to Wagner Petrographics for thin-section preparation.
 - Finished cleaning the salt from the samples using the Dean–Stark.
 - Began evaluation and description of the thin sections received back from Wagner Petrographics.
 - Continued thin-section analyses. Samples are in the humidity chamber, prepped for upcoming grain density and porosity measurements.
 - Began preparing core plugs for permeability and geomechanical testing.

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.

PHASE III COST STATUS

The approved BP4 (Modification No. 25) budget along with actual costs incurred and in-kind cost share reported is shown in Table 5. A spending plan for BP4 and actual incurred cost by quarter of cash funds for BP4 are provided in Figure 11 and Table 6.

PHASE III SCHEDULE STATUS

Table 7 lists all deliverables and milestones by quarter, with completion dates, through the end of the reporting period (see Table 8 for the Gantt chart for BP4, Years 5 and 6).

Table 5. Phase III Budget – BP4

Organization	Approved Budget, \$	Actual Costs Incurred, \$
DOE Share – Cash	59,400,262	34,366,021
Nonfederal Share – Cash	2,411,971	2,528,601
Nonfederal Share – In-Kind	30,279,844	24,895,059
Total	92,092,077	61,789,681



Figure 11. PCOR Partnership Phase III, BP4, Years 3–6 funding (cash only).

Table 6. BP4 – Years 3–6 Spending Plan

Budget Period 4

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	\$ 4,563	\$ 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		
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		
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		
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		
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)		
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		

Table 7. 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 7. 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 7. 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 7. 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 7. 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 7. 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 7. 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 7. 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
D40: Task 4 – Fort Nelson Test Site – Geomechanical Report	6/30/13	
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	May 2013	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	6/20/13	6/28/13
Year 6 – Quarter 4 (July–September 2013)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/13	
D33: Task 4 – Bell Creek Test Site – Geochemical Final Report	7/31/13	
D67: Task 9 – Fort Nelson Test Site – Simulation Report	7/31/13	
M12: Task 4 – Bell Creek Test Site Geochemical Work Completed	7/31/13	
M23: Task 14 – Monthly WWG Conference Call Held	7/31/13	
D64: Task 4 – Bell Creek Test Site – Site Characterization Report	8/31/13	
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/13	
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	8/31/13	
M23: Task 14 – Monthly WWG Conference Call Held	8/31/13	

Continued . . .

Table 7. 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	
D6: Task 3 – Permitting Review – Update 1	9/30/13	
D48: Task 7 – Bell Creek Test Site – Procurement Plan and Agreement Report	9/30/13	
D86: Task 15 – Updated Regional Implementation Plan for Zama	9/30/13	
D90: Task 16 – Report – Wellbore Evaluation of the Basal Cambrian System	9/30/13	
D94: Task 2 – Aquistore Project Fact Sheet	9/30/13	
D95: Task 2 – Aquistore Project Poster	9/30/13	
D98: Task 3 – Report – Findings, Recommendations, and Guidance of CGS Task Force	9/30/13	
M23: Task 14 – Monthly WWG Conference Call Held	9/30/13	
M38: Task 3 – IOGCC Task Force Wrap-Up Meeting Held	9/30/13	
M39: Task 3 – IOGCC Task Force Editing Subgroup Meeting Held	9/30/13	
M40: Task 15 – Further Characterization of the Zama Acid Gas EOR, CO ₂ Storage, and Monitoring Project Completed	9/30/13	
Year 7 – Quarter 1 (October–December 2013)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/13	
D42: Task 5 – Bell Creek Test Site – Injection Experimental Design Package	10/31/13	
D99: Task 14 – Water/CCS Nexus-Related Fact Sheet	10/31/13	
M23: Task 14 – Monthly WWG Conference Call Held	10/31/13	
M23: Task 14 – Monthly WWG Conference Call Held	11/30/13	
D41: Fort Nelson Test Site – Geochemical Report (Update 1)	12/15/13	
D57: Task 12 – Project Assessment Annual Report	12/31/13	
M23: Task 14 – Monthly WWG Conference Call Held	12/31/13	
M24: Task 14 – WWG Annual Meeting Held	12/31/13	
Year 7 – Quarter 2 (January–March 2014)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly 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	
M23: Task 14 – Monthly WWG Conference Call Held	2/28/14	

Continued . . .

Table 7. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 7 – Quarter 2 (January–March 2014) (continued)		
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	
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	
M25: Task 9 – Fort Nelson Test Site – CO ₂ Injection Initiated	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	
M23: Task 14 – Monthly WWG Conference Call Held	6/30/14	

Table 8. PCOR Partnership Phase III, BP4, Years 5–6 Gantt Chart



Continued...

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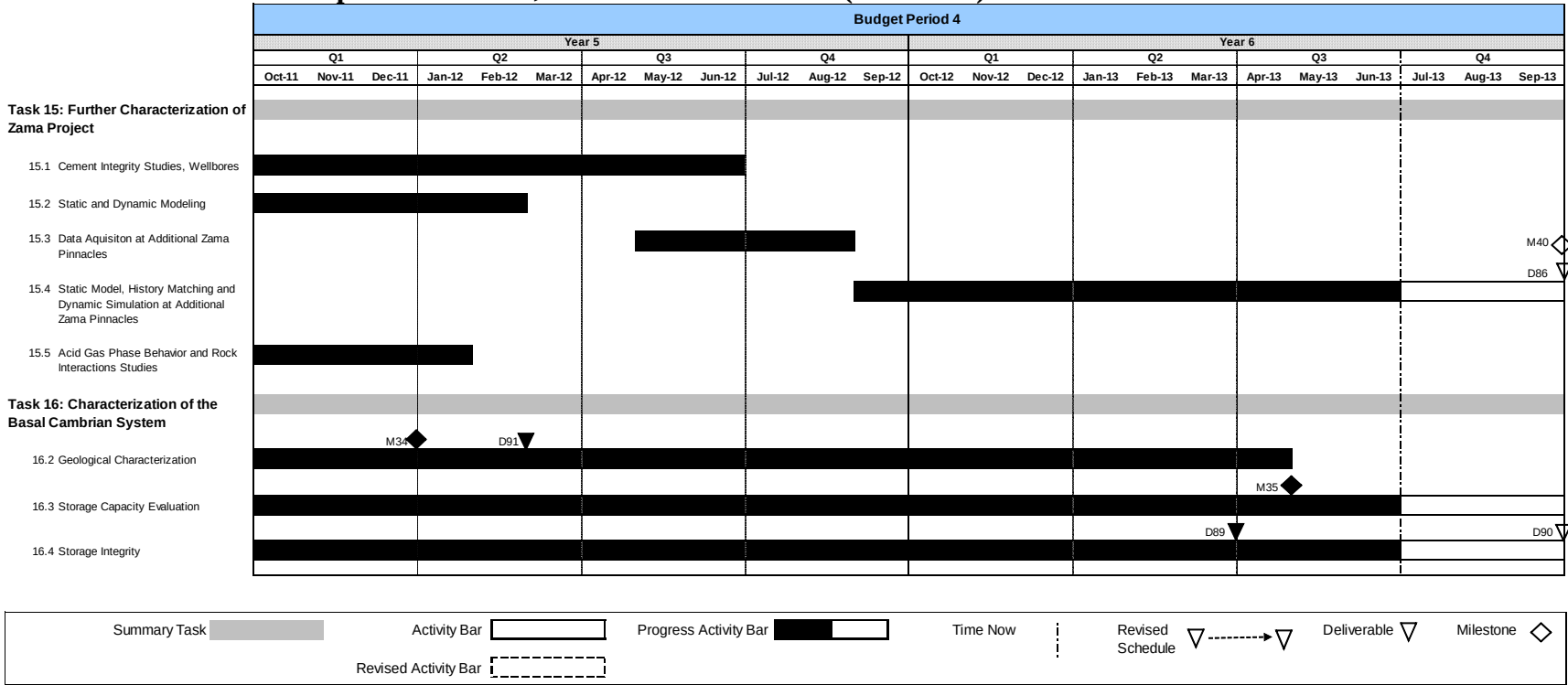


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Table 8. PCOR Partnership Phase III BP4, Years 5–6 Gantt Chart (continued)



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Table 8. PCOR Partnership Phase III BP4, Years 5–6 Gantt Chart (continued)

Key for Deliverables (D) ▼		Key for Milestones (M) ◆
D1 Review of Source Attributes	D66 BC Test Site – Simulation Report	M10 BC Test Site – Wellbore Leakage Data Collection Completed
D5 Second Target Area Completed	D67 FN Test Site – Simulation Report	M12 BC Test Site – Preinjection Geochemical Work Completed
D6 Permitting Review – Update 1	D81 Regional Carbon Sequestration Atlas	M14 BC Test Site – Geological Characterization Data Collection Completed
D10 DPRS Update	D84 Report – A Phased Approach to Building Pipeline Network for CO ₂ Transportation During CCS	M16 BC Test Site – Initiation of Production and Injection Simulations
D13 Public Site Updates	D86 Updated Regional Technology Implementation Plan for Zama	M23 Monthly WWG Conference Call Held
D14 General Phase III Fact Sheet	D89 Report – Geochemical Evaluation of the Basal Cambrian System	M24 WWG Annual Meeting Held
D15 BC Test Site Fact Sheet	D90 Report – Wellbore Evaluation of the Basal Cambrian System	M26 BC Test Site – CO ₂ Injection Initiated
D17 General Phase III Information PowerPoint Presentation	D91 Report – Geological Characterization of the Basal Cambrian System in the Williston Basin	M27 BC Test Site – MVA Equipment Installation and Baseline MVA Activities Completed
D18 BC Test Site PowerPoint Presentation	D93 Report – Geological Modeling and Simulation for the Aquistore Project	M29 FN Test Site – Site Characterization Report Completed
D19 FN Test Site PowerPoint Presentation	D94 Aquistore Project Fact Sheet	M32 FN Test Site – Geochemical Report Completed
D32 BC Test Site – Geomechanical Report	D95 Aquistore Project Poster	M34 Basal Cambrian Static Geological Model Completed
D33 BC Test Site – Preinjection Geochemical Report	D96 BC Test Site – 3-D Seismic Acquisition and Characterization Report	M35 Basal Cambrian Dynamic Capacity Estimation Completed
D40 FN Test Site – Geomechanical Report	D98 Report – Findings, Recommendations and Guidance of the GCS Task Force on Operational and Postoperational Liability	M36 Annual Advisory Board Meeting Scheduled
D41 FN Test Site – Geochemical Report	D99 Water/CCS Nexus Related Fact Sheet	M37 Subgroup Meetings Held
D43 BC Test Site – Monitoring Experimental Design Package		M38 Task Force Wrap-Up Meeting Held
D48 BC Test Site – Procurement Plan and Agreement Report		M39 Editing Subgroup Meeting Held
D57 Project Assessment Annual Report		M40 Further Characterization of the Zama Acid Gas EOR, CO ₂ Storage, and Monitoring Project Completed
D58 Quarterly Progress Report		M42 Findings and Recommendations of the Operational and Postoperational Liability Subgroups Presented to the GCS Task Force
D59 Milestone Quarterly Report		
D64 BC Test Site – Site Characterization Report		
D65 FN Test Site – Site Characterization Report		

PHASE III PRODUCTS OR TECHNOLOGY TRANSFER ACTIVITIES

During the reporting period, one abstract was accepted for poster presentation, and ten presentations (nine oral and one poster) were given at 18 different meetings/ conferences. In addition, a quarterly progress report, two deliverables, and five milestones were completed.

Abstracts

Submitted

- Gao, P., Gorecki, C.D., Braunberger, J.R., Shah, J., Steadman, E.N., and Harju, J.A., 2013, Acid gas injection for enhanced oil recovery and long-term storage in Devonian-aged pinnacle reefs [abs.]: International Petroleum Technology Conference, Doha, Qatar, January 20–22, 2014.
- Gorecki, C.D., Steadman, E.N., Harju, J.A., Hamling, J.A., and Ayash, S.C., 2013, CO₂ enhanced oil recovery (EOR)—the Plains CO₂ Reduction Partnership’s approach to carbon capture and storage [abs.]: International Petroleum Technology Conference, Doha, Qatar, January 20–22, 2014.
- Hamling, J.A., Stepan, D.J., Kalenze, N.S., and Klapperich, R.J., 2013, Baseline soil gas monitoring at the Bell Creek combined CO₂ EOR and CO₂ storage project [abs.]: Carbon Management Technology Conference, Alexandria, Virginia, October 21–23, 2013.
- Hamling, J.A., and Gorecki, C.D., 2013, 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 [abs.]: Carbon Management Technology Conference, Alexandria, Virginia, October 21–23, 2013.
- Klapperich, R.J., Gorecki, C.D., Sorensen, J.A., Steadman, E.N., Harju, J.A., McNemar, A.T., and Nakles, D.V., 2013, Regional Carbon Sequestration Partnership Water Working Group white paper on the nexus of water and carbon capture and storage [abs.]: Carbon Management Technology Conference, Alexandria, Virginia, October 21–23, 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 [abs.]: Carbon Management Technology Conference, Alexandria, Virginia, October 21–23, 2013.
- Peck, W.D., Steadman, E.N., Harju, J.A., Gorecki, C.D., Botnen, L.S., Daly, D.J., Jensen, M.D., Sorensen, J.A., Smith, S.A., Hamling, J.A., Klapperich, R.J., and Anagnost, K.K., 2013, The Plains CO₂ Reduction (PCOR) Partnership—a Regional Carbon Sequestration Partnership in the interior plains of North America [abs.]: EUEC 2014: Energy, Utility & Environment Conference, Phoenix, Arizona, February 3–5, 2014.
- Schlasner, S.M., Jensen, M.D., and Steadman, E.N., 2013, Assessing temporary storage options to attenuate variable-rate CO₂ emissions for use during enhanced oil recovery [abs.]: Carbon Management Technology Conference, Alexandria, Virginia, October 21–23, 2013.

Submitted and Accepted for Poster

Hamling, J.A., 2013, Baseline MVA at the Bell Creek combined CO₂ enhanced oil recovery and CO₂ storage project [abs.]: IEAGHG Combined Monitoring and Environmental Research Network Meeting, Canberra, Australia, August 27–30, 2013.

Presentations

Burnison, S.A., Peck, W.D., and Doll, T.E., 2013, Cedar Creek Anticline: Presented to Denbury Resources Inc. personnel, Plano, Texas, May 8, 2013.

Daly, D.J., 2013, Energy and carbon—the big picture: Presented at the Integrating Regional History, Culture, Science, and the Arts Prairie Public Broadcasting Teacher Training Institute, Moorhead, Minnesota, June 25–26, 2013.

Daly, D.J., 2013, Energy and CO₂ management—carbon capture and storage: Presented at the 2013 Lignite Education Seminar: Energy, Economics & Environment, Bismarck, North Dakota, June 17–20, 2013.

Daly, D.J., 2013, Reducing the carbon footprint—regional options: Presented at the Integrating Regional History, Culture, Science, and the Arts Prairie Public Broadcasting Teacher Training Institute, Moorhead, Minnesota, June 25–26, 2013.

Daly, D.J., Cumming, L., Garrett, G., Stone, M., Myhre, R., Mather, C., Tollefson, L., and Wade, S., 2013, Message mapping—a tool for developing and testing responses to stakeholder concerns: Presented at the 12th Annual Conference on Carbon Capture, Utilization & Sequestration, Pittsburgh, Pennsylvania, May 13–16, 2013.

Gorecki, C.D., 2013, Overview of the PCOR Partnership Program: Presented to Korean CCS R&D Center, Korea Institute of Energy Research, Kyung Hee University, and Korea Research Institute of Chemical Technology personnel, Grand Forks, North Dakota, May 20, 2013.

Hamling, J.A., and Gorecki, C.D., 2013, Bell Creek Project update meeting: Presented at the Bell Creek Project Update Meeting, Plano, Texas, May 7–8, 2013.

Steadman, E.N., 2013, The PCOR Partnership: Presented at the U.S.–Canada Bilateral National Conference, Champaign, Illinois, April 23, 2013.

Steadman, E.N., Harju, J.A., and Gorecki, C.D., 2013, Bell Creek MVA overview: Presented at the Carbon Sequestration Leadership Forum CO₂ Monitoring Interactive Workshop, Rome, Italy, April 16–19, 2013

Poster Presentations

Braunberger, J.R., Peck, W.D., Bailey, T.P., Bremer, J.M., Huffman, B.W., and Gorecki, C.D., 2013, Subsurface core and analogous outcrop characterization of the Muddy/Newcastle Formation for the Bell Creek oil field, Powder River County, Montana: Poster presented at the 2013 AAPG Annual Convention & Exhibition, Pittsburgh, Pennsylvania, May 19–22, 2013.

Journal Articles

Jensen, M.D., Pei, P., Snyder, A.C., Heebink, L.V., Botnen, L.S., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2012, A methodology for phased development of a hypothetical pipeline network for CO₂ transport during carbon capture, utilization, and storage: Energy and Fuels [in press].

Deliverables/Milestones

Draft

Ayash, S.C., Gorecki, C.D., Hamling, J.A., Steadman, E.N., and Harju, J.A., 2013, Bell Creek test site – geological characterization data collection completed: Plains CO₂ Reduction (PCOR) Partnership Phase III draft Task 4 Milestone M14 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, April.

Botnen, L.S., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Findings and recommendations of the operational and postoperational subgroups presented to the CGS Task Force: Plains CO₂ Reduction (PCOR) Partnership Phase III draft Task 3 Milestone M42 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, June.

Botnen, L.S., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, IOGCC Task Force subgroup Meeting 2 held: Plains CO₂ Reduction (PCOR) Partnership Phase III draft Task 3 Milestone M37 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, June.

Daly, D.J., Crocker, C.R., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Plains CO₂ Reduction (PCOR) Partnership general audience CO₂ sequestration outreach PowerPoint: Phase III draft Task 2 Deliverable D17 Update 4 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, May.

Hamling, J.A., Kalenze, N.S., Klapperich, R.J., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Bell Creek test site – MVA equipment installation and baseline MVA activities completed: Plains CO₂ Reduction (PCOR) Partnership Phase III draft Task 5 Milestone M27 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, May.

Kalenze, N.S., Hamling, J.A., Klapperich, R.J., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Bell Creek test site – monitoring experimental design package: Plains CO₂ Reduction (PCOR) Partnership Phase III draft Task 5 Deliverable D43 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, May.

Liu, G., Peck, W.D., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Basal Cambrian dynamic capacity estimation completed: Plains CO₂ Reduction (PCOR) Partnership Phase III draft Task 16 Milestone M35 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, April.

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., Klapperich, R.J., and, Saini, D., 2013, Plains CO₂ Reduction (PCOR) Partnership: Phase III monthly report (March 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, April.

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., Klapperich, R.J., and, Saini, D., 2013, Plains CO₂ Reduction (PCOR) Partnership: Phase III monthly report (April 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, May.

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 (May 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, June.

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 (January 1 – March 31, 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, April.

Meeting Minutes

Klapperich, R.J., 2013, Minutes—Regional Carbon Sequestration Partnership Water Working Group conference call: March 28, 2013.

Klapperich, R.J., 2013, Minutes—Regional Carbon Sequestration Partnership Water Working Group conference call: April 25, 2013.

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

MEETINGS/TRAVEL

Representatives from the PCOR Partnership attended and/or participated in the following 18 meetings/conferences, two training opportunities, and 17 project management site trips in this reporting period:

- April 1–5, 2013: Traveled to the Bell Creek Field for sampling work.
- April 2–12, 2013: Traveled to the Bell Creek Field for geophone installation.
- April 4, 2013: Traveled to inspect Lignite site reclamation near Kenmare, North Dakota.
- April 4–11, 2013: Traveled to the Bell Creek Field for project work.
- April 10–13, 2013: Attended Schlumberger NExT software training entitled “Petrel Workflow Editor and Uncertainty Analysis” in Houston, Texas.
- April 10–14, 2013: Traveled to the Bell Creek Field for project work.
- April 13–20, 2013: Presented at the CSLF meetings in Rome, Italy.
- April 14–18, 2013: Attended Schlumberger OFM software training entitled “OFM Using Oil and Waterflood Examples” and “OFM Forecast Analysis & Mapping Applications Fundamentals Combined Course” in Denver, Colorado.
- April 21 – May 1, 2013: Traveled to the Bell Creek Field for site sampling.
- April 22–25, 2013: Presented at the U.S.–Canada Clean Energy Dialogue II meeting in Champaign, Illinois.
- April 29 – May 3, 2013: Attended the WBPC in Regina, Saskatchewan, Canada.
- April 30, 2013: Met with PPB at its offices in Fargo, North Dakota.
- April 30 – May 3, 2013: Supervised core sampling at TerraTek Labs in Calgary, Alberta, Canada.
- May 7, 2013: Met with PPB at its offices in Fargo, North Dakota.
- May 7–8, 2013: Participated in meetings with Denbury in Plano, Texas.
- May 7–9, 2013: Participated in the IOGCC subgroup meeting in Minneapolis, Minnesota.
- May 8–10, 2013: Traveled to the Bell Creek Field for site work.
- May 13–19, 2013: Attended and participated in CCUS-12 in Pittsburgh, Pennsylvania.
- May 15–18, 2013: Traveled to the Bell Creek Field for site sampling.
- May 18, 2013: Attended AAPG short courses entitled “Quality Control for Subsurface Maps,” and “Sequence Stratigraphy Analysis of Shales: Key to Paleoclimate Archive, Subsurface Fluid Flow and Hydrocarbon Source” in Pittsburgh, Pennsylvania.
- May 18–22, 2013: Attended the IOGCC Midyear Issues Summit in Point Clear, Alabama.
- May 19–22, 2013: Presented at the AAPG Convention and Exhibition in Pittsburgh, Pennsylvania.
- May 19–23, 2013: Traveled to the Bell Creek Field for site work.

- May 28–30, 2013: Traveled to the Bell Creek Field to observe pump installation and to meet with area landowners.
- May 28–31, 2013: Traveled to the Bell Creek Field for sampling and site work.
- June 2–7, 2013: Participated in TOUGH2-EGS and TOUGH2-CSM workshops at the Colorado School of Mines in Golden, Colorado.
- June 8–14, 2013: Participated in the IEAGHG Combined Modelling and Risk Management Network Meeting in Trondheim, Norway.
- June 10–12, 2013: Presented at the Introduction to CO₂-EOR Workshop in Houston, Texas.
- June 10–14, 2013: Visited the Muddy Outcrop and area landowners near Hulett, Wyoming.
- June 11–14, 2013: Performed maintenance on equipment installed at the Bell Creek site.
- June 17–18, 2013: Presented at the 2013 Lignite Education Seminar: Energy, Economics, and Environment in Bismarck, North Dakota.
- June 18–21, 2013: Hosted and presented at the IOGCC CGS Task Force meeting held in Denver, Colorado.
- June 19, 2013: Traveled to inspect Lignite site reclamation near Kenmare, North Dakota.
- June 20–27, 2013: Attended the ARMA 47th U.S. Rock Mechanics/Geomechanics Symposium, as well as the 3rd Geomechanics Solutions for Environmental and Technical Challenges in Unconventional Resources Workshop, and the 2nd Workshop on Petroleum Geomechanics Testing in San Francisco, California.
- June 24–27, 2013: Conducted sampling work at the Bell Creek field near Gillette, Wyoming.
- June 25–26, 2013: Give a presentation entitled “Integrating Regional History, Culture, Science and the Arts” at the PPB Teacher Training Institute in Moorhead, Minnesota.
- June 25–27, 2013: Attended a meeting with Denbury personnel at the Bell Creek Field near Hulett, Wyoming.
- June 25–28, 2013: Met with area landowners and observed well pump installation at the Bell Creek Field near Gillette, Wyoming.

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

REFERENCES

Kaushik, A., 2010, *Web Analytics 2.0—the art of online accountability and science of customer centricity*: Indianapolis, Indiana, John Wiley, 86 p.