



Plains CO<sub>2</sub> Reduction (PCOR) Partnership  
Energy & Environmental Research Center (EERC)

## PLAINS CO<sub>2</sub> REDUCTION PARTNERSHIP PHASE III

### Quarterly Technical Progress Report Task 13 – Deliverable D58/D59

*(for the period April 1 – June 30, 2017)*

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## **PLAINS CO<sub>2</sub> REDUCTION PARTNERSHIP PHASE III**

### **Quarterly Technical Progress Report**

**April 1 – June 30, 2017**

### **EXECUTIVE SUMMARY**

The Plains CO<sub>2</sub> Reduction (PCOR) Partnership is one of seven Regional Carbon Sequestration Partnerships competitively awarded by the U.S. Department of Energy (DOE) National Energy Technology Laboratory in 2003 as part of a national plan to mitigate greenhouse gas emissions. The PCOR Partnership is led by the Energy & Environmental Research Center 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 multiyear (2007–2017) development phase, is an extension of the characterization (Phase I) and validation (Phase II) phases and is intended to confirm that commercial-scale CO<sub>2</sub> capture, transportation, and storage can be achieved safely, permanently, and economically over extended periods in the PCOR Partnership region. Budget Period 5 began April 1, 2016.

This progress report presents an update of Phase III PCOR Partnership activities from April 1 through June 30, 2017. The broadcast premiere for *The Bell Creek Story: CO<sub>2</sub> in Action* (Documentary Deliverable 21) was on June 19, 2017, at 7:00 PM CDT on Prairie Public Broadcasting stations. Documentary DVDs were distributed to PCOR Partnership contacts. The PCOR Partnership hosted the 2017 Technical Advisory Board (TAB) meeting May 23–24, 2017, with valuable feedback and guidance provided by the TAB members on the activities presented. Planning continued for the 2017 PCOR Partnership Annual Membership Meeting and Workshop, which will be held October 24–26, 2017, in Plano, Texas.

PCOR Partnership activities focused on Bell Creek modeling and simulation activities, the preparation of comprehensive deliverables, and participation in conferences/meetings and workshops. Laboratory experiments were completed in a hysteresis study to inform simulation model parameters. Work continued related to seismic InSAR (interferometric synthetic aperture radar) and pulsed-neutron log data. Writing continued on several deliverables detailing best practices and lessons learned. The PCOR Partnership was represented at 11 conferences and meetings and four workshops.

Ten tasks continued. In addition to the foregoing, modeling and simulation activities continued in support of the Aquistore project, the PCOR Partnership Atlas 5th Edition is available on the PCOR Partnership Web site, work continued on an update to Opportunities and Challenges Associated with CO<sub>2</sub> Compression and Transportation During Carbon Capture, Utilization, and Storage Activities, the sixth round of oil sample collection was completed in the Bell Creek Field, and development of an article or report on the major research focuses for water and carbon capture and storage continued.



**PLAINS CO<sub>2</sub> REDUCTION PARTNERSHIP PHASE III**  
**Quarterly Technical Progress Report**  
**April 1 – June 30, 2017**

## **INTRODUCTION**

The Plains CO<sub>2</sub> 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 Partnerships (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, 2017, is listed in Table 1. The PCOR Partnership region includes all or part of nine states (Iowa, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wisconsin, and Wyoming) and four Canadian provinces (Alberta, British Columbia, Manitoba, and Saskatchewan).

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

The PCOR Partnership Program is being implemented in three phases:

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

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

- BP3: October 1, 2007 – September 30, 2009
- BP4: October 1, 2009 – March 31, 2016
- BP5: April 1, 2016 – September 30, 2017

BP1 and BP2 were effective in Phase II.



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

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

The overall mission of the Phase III program is to 1) gather characterization data to verify the ability of the target formations to store carbon dioxide (CO<sub>2</sub>), 2) facilitate the development of the infrastructure required to transport CO<sub>2</sub> 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 CO<sub>2</sub>, 5) facilitate the establishment of a technical framework by which carbon credits can be monetized for CO<sub>2</sub> stored in geologic formations, 6) continue collaboration with other RCSPs, and 7) provide outreach and education for CCS 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

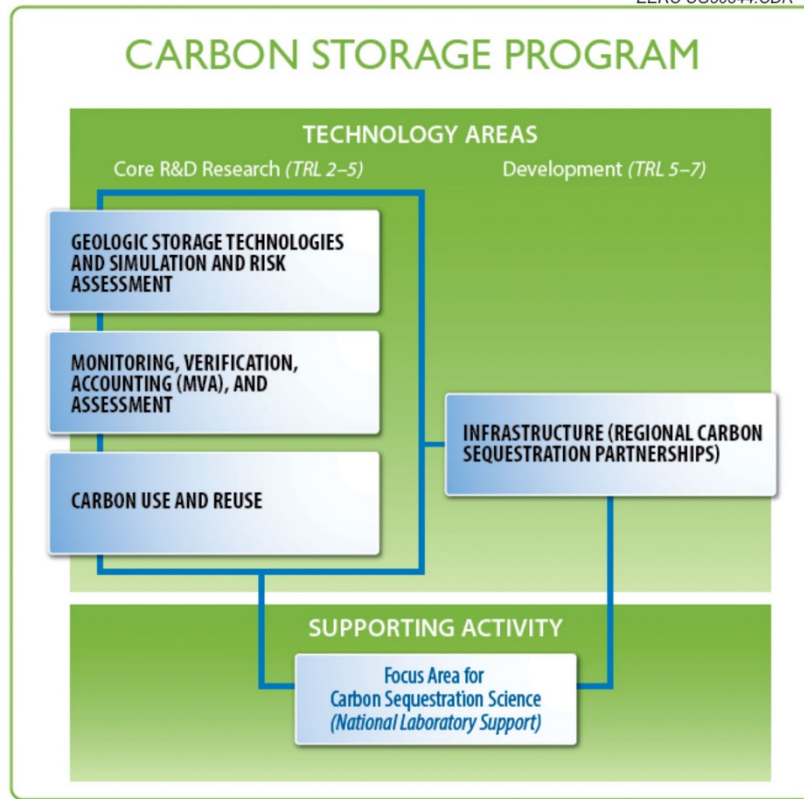


Figure 1. DOE Carbon Storage Program technology areas featuring regional partnerships (courtesy of Andrea Dunn, DOE NETL; “TRL” stands for technology readiness level).

utilize the infrastructure of its region to maximize CO<sub>2</sub> injection volumes. A programmatic development phase (Phase III) goal is implementation of large-scale field testing involving at least 1 million tonnes of CO<sub>2</sub> per project. Each of the RCSP large-volume injection tests is designed to demonstrate that the CO<sub>2</sub> storage sites have the potential to store regional CO<sub>2</sub> emissions safely, permanently, and economically for hundreds of years.

The PCOR Partnership is working with Denbury Onshore LLC (Denbury) in the Denbury-operated Bell Creek oil field in Powder River County in southeastern Montana. The PCOR Partnership has also conducted a feasibility study for Spectra Energy Transmission’s (Spectra’s) Fort Nelson gas-processing facility, situated near Fort Nelson, British Columbia, Canada. In addition, the PCOR Partnership is collaborating with the Petroleum Technology Research Centre (PTRC) on site characterization, risk assessment, and monitoring, verification, and accounting (MVA) activities associated with the Aquistore project near Estevan, Saskatchewan, Canada. The PCOR Partnership’s work has concluded with Apache Canada Ltd. to further characterize the Zama Acid Gas Enhanced Oil Recovery (EOR), CO<sub>2</sub> Storage, and Monitoring Project in Alberta, Canada, as well as its work on a multiyear, binational characterization effort of the basal Cambrian system (Figure 2).



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

The PCOR Partnership's objectives for the demonstration projects are as follows: 1) conduct a successful Bell Creek demonstration to verify that the region's large number of oil fields have the potential to store significant quantities of CO<sub>2</sub> in a safe, economical, and environmentally responsible manner and 2) support Spectra's feasibility study of a Fort Nelson demonstration to verify the economic feasibility of using the region's carbonate saline formations for safe, long-term CO<sub>2</sub> 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 (completed); 5) Well Drilling and Completion (completed); 6) Infrastructure Development; 7) CO<sub>2</sub> Procurement (completed); 8) Transportation and Injection Operations (completed); 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 EOR, CO<sub>2</sub> Storage, and Monitoring Project (completed); and 16) Characterization of the Basal Cambrian System (completed). Table 2 lists the responsibility matrix for these 16 tasks.

**Table 2. Phase III Responsibility Matrix**

<b>Phase III Task Description</b>	<b>Task Leader</b>
Task 1 – Regional Characterization	Wesley D. Peck
Task 2 – Public Outreach and Education	Daniel J. Daly
Task 3 – Permitting and NEPA Compliance	Charles D. Gorecki
Task 4 – Site Characterization and Modeling (completed)	James A. Sorensen
Task 5 – Well Drilling and Completion (completed)	John A. Hamling
Task 6 – Infrastructure Development	Melanie D. Jensen
Task 7 – CO <sub>2</sub> Procurement (completed)	John A. Harju
Task 8 – Transportation and Injection Operations (completed)	Melanie D. Jensen
Task 9 – Operational Monitoring and Modeling	John A. Hamling and Lawrence J. Pekot
Task 10 – Site Closure	John A. Hamling
Task 11 – Postinjection Monitoring and Modeling	John A. Hamling and Lawrence J. Pekot
Task 12 – Project Assessment	Loreal V. Heebink
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 <sub>2</sub> Storage, and Monitoring Project (completed)	Charles D. Gorecki
Task 16 – Characterization of the Basal Cambrian System (completed)	Wesley D. Peck

## PROGRESS OF WORK

### Task 1 – Regional Characterization

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

- Submitted an abstract entitled “Geologic Storage of Carbon Dioxide in the Central Plains of North America” for consideration for the American Institute of Chemical Engineers (AIChE) Annual Meeting to be held October 29 – November 3, 2017, in Minneapolis, Minnesota.
- Shipped copies of the “PCOR Partnership Atlas 5th Edition” (Deliverable [D] 81) to PCOR Partnership contacts.
- Began the yearly review of the CO<sub>2</sub> sources data set for D1 – Review of Source Attributes (update).
- Updated information and continued work on the partners-only Decision Support System (DSS) Web site, including the following:
  - On the Home page, replaced the atlas thumbnail with the PCOR Partnership Atlas 5th Edition (Atlas 5) image and updated the links to Atlas 5.
  - On the Atlas page, replaced the banner with the Atlas 5 image, updated the title of the atlas, updated the downloadable PDF with the new version, and replaced the individual chapter PDFs.

- On the Demonstration Projects page, replaced the Fort Nelson fact sheet with the most recent version.
- On the Products Database page, updated the contact name to Janelle Ensrud.
- Worked on material for content updates to the Bell Creek portion of the PCOR Partnership members-only DSS on the PCOR Partnership regional background, characterization, MVA, and modeling/simulation activities.
- Fixed broken PCOR Partnership partner links.
- Continued activities to update the content of the **PCOR Partnership general database**, including the following:
  - Updated North Dakota and Manitoba well and production data.
  - Updated South Dakota, Montana, Wyoming, Nebraska, and Saskatchewan well information.
  - Updated North Dakota injection data.
  - Continued database preventive maintenance of Petra projects.
- Continued work on oilfield regional models, including the following:
  - Completed the Beaver Creek Field model for dynamic simulation.
  - Completed the Gooseneck Field model for dynamic simulation.
- With regard to the Nebraska value-added effort:
  - Modified maps for a value-added report on the geologic characterization and CO<sub>2</sub> storage potential of the state of Nebraska following internal review.
  - Improved the structure/extent model of the Cedar Hills Formation in Nebraska, and recalculated potential storage capacity.
- With regard to the **Williston Basin** CO<sub>2</sub> storage sink relative permeability laboratory characterization effort:
  - Continued the internal review of the draft value-added report.
  - Made revisions to the draft value-added report based on comments from the internal review.
- With regard to the **Aquistore** project:
  - A new contracting agreement regarding data sharing and an EERC–PTRC relationship with respect to modeling was signed and is effective as of May 30, 2017.
  - Participated in Science and Engineering Research Committee (SERC) conference calls on May 17, May 31, and June 28, 2017. No SERC conference calls were held in April 2017.
  - As of June 5, 2017, approximately 102,000 tonnes of CO<sub>2</sub> has been injected at the Aquistore site.
  - With regard to static **modeling** and dynamic predictive **simulation** activities:
    - ◆ Continued to download and process daily injection rate, pressure, and temperature data as available. Data through June 5, 2017, were provided.
    - ◆ Updated the history match of the pressure response and well log data.
    - ◆ Set up an updated base-case forecast.
    - ◆ Since early 2017, a limited quantity of CO<sub>2</sub> was injected because of plant/facility shutdown or maintenance. Injection data are shown in Figure 3.

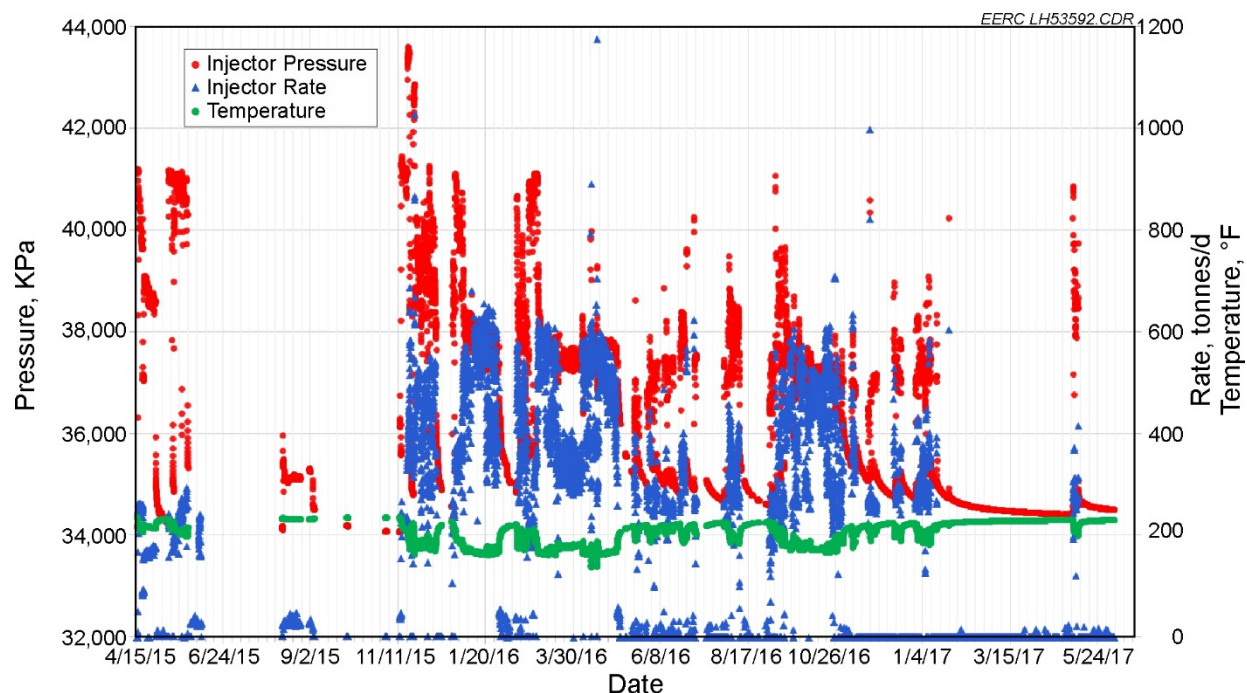


Figure 3. Aquistore field data: downhole pressure and temperature of injection well and injection rate.

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

- The printing vendor reprinted Atlas 5 (D81), as printing issues were noted in a majority of the copies. The reprint took care of the issues.

## Task 2 – Public Outreach and Education

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

- The broadcast premiere of *The Bell Creek Story: CO<sub>2</sub> in Action* (Documentary D21) was on June 19, 2017, at 7:00 PM CDT on Prairie Public Broadcasting (PPB) stations.
- Submitted D17 entitled “General Audience CO<sub>2</sub> Sequestration Outreach PowerPoint Presentation” on May 31, 2017, and received approval on June 14, 2017.
- Submitted Milestone (M) 47 entitled “Bell Creek Test Site – 30-minute Documentary Broadcast” on June 29, 2017.
- Received approval for the value-added “Household Energy and Carbon Web Pages Report” for the October 1 – December 31, 2016, quarter on April 5, 2017.
- Submitted the value-added “Household Energy and Carbon Web Pages Report” for the January 1 – March 31, 2017, quarter on April 28, 2017, and received approval on May 11, 2017.
- Submitted a value-added fact sheet update entitled “Terrestrial Carbon Sequestration Validation Test” on May 10, 2017, and received approval on May 11, 2017.



- At the direction of Traci Rodosta, DOE, submitted a request to Darin Damiani and John Litynski, DOE Headquarters, to review and comment on the draft 1-hour Documentary D22 entitled “Coal Powered” on May 18, 2017.
- During the quarter, the PCOR Partnership was represented by EERC personnel at 11 meetings/conferences and four workshops. Specifically, the PCOR Partnership outreach activities included 12 oral presentations and one recycled poster. The following quantities of PCOR Partnership outreach materials were distributed:
  - PCOR Partnership documentary entitled “Nature in the Balance: CO<sub>2</sub> Sequestration” – 2
  - PCOR Partnership documentary entitled “Reducing Our Carbon Footprint: The Role of Carbon Markets” – 1
  - PCOR Partnership documentary entitled “Out of the Air – Into the Soil” – 2
  - PCOR Partnership documentary entitled “Managing Carbon Dioxide: The Geologic Solution” – 113
  - PCOR Partnership documentary entitled “Global Energy and Carbon: Tracking Our Footprint” – 114
  - PCOR Partnership documentary entitled “The Bell Creek Story: CO<sub>2</sub> in Action” – 383
  - Atlas 5 – 395
- Continued activities associated with **education and teacher education** seminars. The PCOR Partnership outreach team participated in one teacher training workshop and education conference. This activity included introducing PCOR Partnership materials (DVDs, atlas, and Web site awareness) to educators in K–12 schools. A total of 108 teachers representing 56 different school districts in six states and one Canadian province in and adjacent to the PCOR Partnership region were in attendance. Figure 4 shows the geographic distribution of the teachers who received materials by their corresponding school districts. A 4-day coal-focused workshop, the Lignite Energy Council (LEC) Teacher Seminar, presented by the North Dakota LEC, was held June 12–15, 2017, in Bismarck, North Dakota. The PCOR Partnership task leader presented “Energy and CO<sub>2</sub> Management: Carbon Capture and Storage.”
- Continued work related to Documentary D21 (*The Bell Creek Story: CO<sub>2</sub> in Action*), including the following:
  - Finalized the DVD components. Submitted artwork and DVD content to the printer, RelyMedia, for reproduction on April 28, 2017.
  - Approved the DVD artwork proofs from the printer, RelyMedia (see Figure 5). Received an order of 1000 DVDs on May 12, 2017.
  - Provided DVDs for distribution at the annual PCOR Partnership Technical Advisory Board (TAB) meeting held May 23–24, 2017.
  - Shipped copies of *The Bell Creek Story: CO<sub>2</sub> in Action* DVD to PCOR Partnership contacts.
- Continued revising text and compiling images for the draft updated Phase II Zama fact sheet.

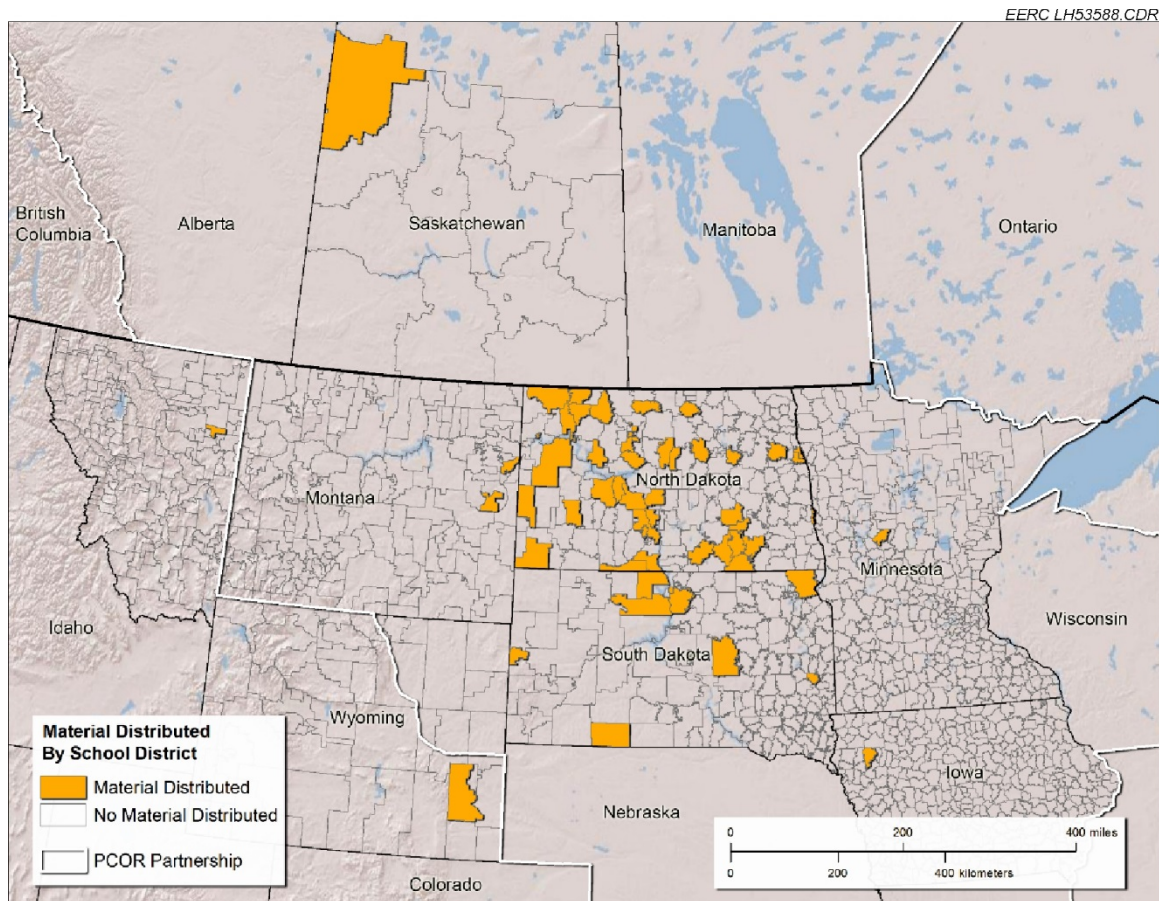


Figure 4. Distribution of teachers who received materials by school district this reporting period.

- **Conference call** activity this quarter included the following:
  - No monthly Aquistore Outreach Advisory Group phone calls were held this quarter.
  - With regard to the monthly RCSP Program Outreach Working Group (OWG) conference calls:
    - ◆ Participated in the OWG call for April 20, 2017.
    - ◆ Participated in the monthly OWG conference call on May 18, 2017. The topics were a review of the CarbonSAFE (Carbon Storage Assurance and Facility Enterprise) activities and the update of the DOE Outreach Best Practices Manual (BPM).
    - ◆ Participated in the OWG call for June 22, 2017. Topics included a discussion of an outreach budget planning aid and potential activities for OWG.



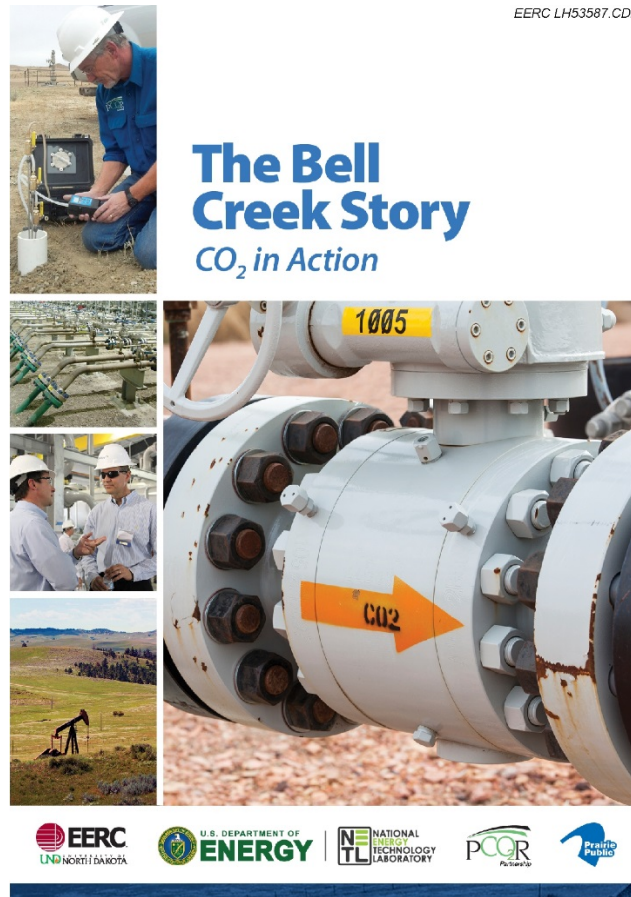


Figure 5. *The Bell Creek Story: CO<sub>2</sub> in Action* DVD cover.

- Continued efforts to update the **public Web site** ([www.undeerc.org/pcor](http://www.undeerc.org/pcor)), including the following:
  - Continued to write content for CarbonSAFE project pages to be added to the CO<sub>2</sub> Sequestration Projects section of the public Web site in a future update. Continued to work on changes to the CO<sub>2</sub> Projects Map image to include these projects.
  - Separated the Atlas 5 (D81) PDF version into chapters for easier download. Uploaded the Atlas 5 PDF version. Related updates were made on the Home, Atlas, and Request Information pages.
  - Worked on content for a CO<sub>2</sub> storage feasibility study page related to the Red Trail Energy, LLC, ethanol facility.
  - Continued work on updates to the Technical Posters page.
  - Programmed and uploaded technical reports.
  - Requested DOE NETL review and approval of the following proposed changes to the PCOR Partnership public Web site on June 15, 2017, which then occurred at the time of the PPB broadcast premiere of the D21 documentary *The Bell Creek Story: CO<sub>2</sub> in Action* (M47) on June 19, 2017, at 7:00 PM CDT:
    - ◆ The Bell Creek Story: CO<sub>2</sub> in Action – new page
    - ◆ Documentaries page – updated to include the new documentaries

- ◆ Home page – changed the Featured Documentary at the bottom of the page to *The Bell Creek Story*
- ◆ Request Information form – Added *The Bell Creek Story* to the order form
- Continued content updates and preparation for Web site format on the following pages:
  - ◆ Aquistore Project
  - ◆ Boundary Dam Project
  - ◆ CO<sub>2</sub>, Climate, and Sequestration
  - ◆ Weyburn–Midale
  - ◆ Greenhouse Effect
  - ◆ Fort Nelson
- Replaced the 2016 PCOR Partnership Annual Membership Meeting and Workshop image and hyperlink on the home page with the 2017 PCOR Partnership Annual Membership Meeting and Workshop image and hyperlink. This went live June 9, 2017.
- Worked with all 80 PCOR Partnership videos on the public Web site to ensure that the videos play in all Web browsers.
- Continued ongoing identification and repair of broken links. Fixed and reviewed broken Web site links. They are now live.
- Continued collaborative efforts with **PPB**, including the following:
  - With regard to D21, *The Bell Creek Story: CO<sub>2</sub> in Action* 30-minute documentary:
    - ◆ Sent video clip production instructions to PPB to begin making video clips from *The Bell Creek Story: CO<sub>2</sub> in Action*.
    - ◆ Reviewed and approved the PPB promotional spot for the documentary premiere.
    - ◆ Coordinated promotion of the documentary premiere with PPB.
- Information regarding the **site sessions/visits** to the PCOR Partnership public Web site included the following:
  - There were 10,390 sessions/visits to the public Web site ([www.undeerc.org/pcor](http://www.undeerc.org/pcor)). Traffic increased 6% from last quarter (9831 sessions/visits).
  - There were 9201 unique visitors to the public Web site, representing a 6% increase from last quarter (8717 visitors). In particular, over 88% of these visitors were new to the Web site (visitors whose visit was marked as a first-time visit in this quarter).
  - Of the 10,390 sessions/visits, 47% of the Web traffic was domestic and 53% was international. Table 3 lists the top ten countries for visits to the PCOR Partnership Web site: United States, India, Canada, United Kingdom, Australia, Nigeria, Philippines, Malaysia, Denmark, and Russia. There was traffic from 148 countries overall (Figure 6).
  - There were 724 sessions/visits originating from within the PCOR Partnership region (approximately a 10% decrease from last quarter) (Figure 7). Approximately 71% of the regional visits originated from the United States, and 29% came from Canada. Visits from within the PCOR Partnership region represent approximately 8% of the overall traffic to the public Web site (it should be noted that the totals are exaggerated 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).

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

	<b>Country</b>	<b>Sessions/ Visits*</b>	<b>PCOR Partnership State/Province</b>	<b>Visits*</b>
1	United States	4834		
			North Dakota	158
			Minnesota	123
			Wisconsin	75
			Missouri	54
			Iowa	34
			Montana	25
			Nebraska	22
			Wyoming	15
			South Dakota	9
2	India	1362		
3	Canada	604		
			British Columbia	102
			Alberta	72
			Saskatchewan	21
			Manitoba	14
4	United Kingdom	570		
5	Australia	331		
6	Nigeria	204		
7	Philippines	165		
8	Malaysia	105		
9	Denmark	99		
10	Russia	99		
	Other 138 countries	2017		
<b>Total Sessions/Visits</b>		<b>10,390</b>	<b>Total PCOR Partnership Visits</b>	<b>724</b>

\*Arranged by the number of visits to the site.

- During this reporting period, a breakdown of how visitors came to the PCOR Partnership Web site, also referred to as **traffic sources** (Figure 8), was determined and is provided below:
  - Search traffic refers to the use of search engines such as Google, Bing, and Yahoo. Search traffic accounted for almost 84% of the overall traffic that came to the public Web site. Google Analytics provides keywords that visitors used to find the public Web site. The top three search phrases were “CO<sub>2</sub>,” “carbon sequestration,” and “what is CO<sub>2</sub>.”
  - Direct traffic consists of those visitors who bookmark or type a specific URL (e.g., [www.undeerc.org/pcor](http://www.undeerc.org/pcor)) into the Web address bar. It is likely that most of the direct traffic (almost 12%) is from persons familiar with the PCOR Partnership.

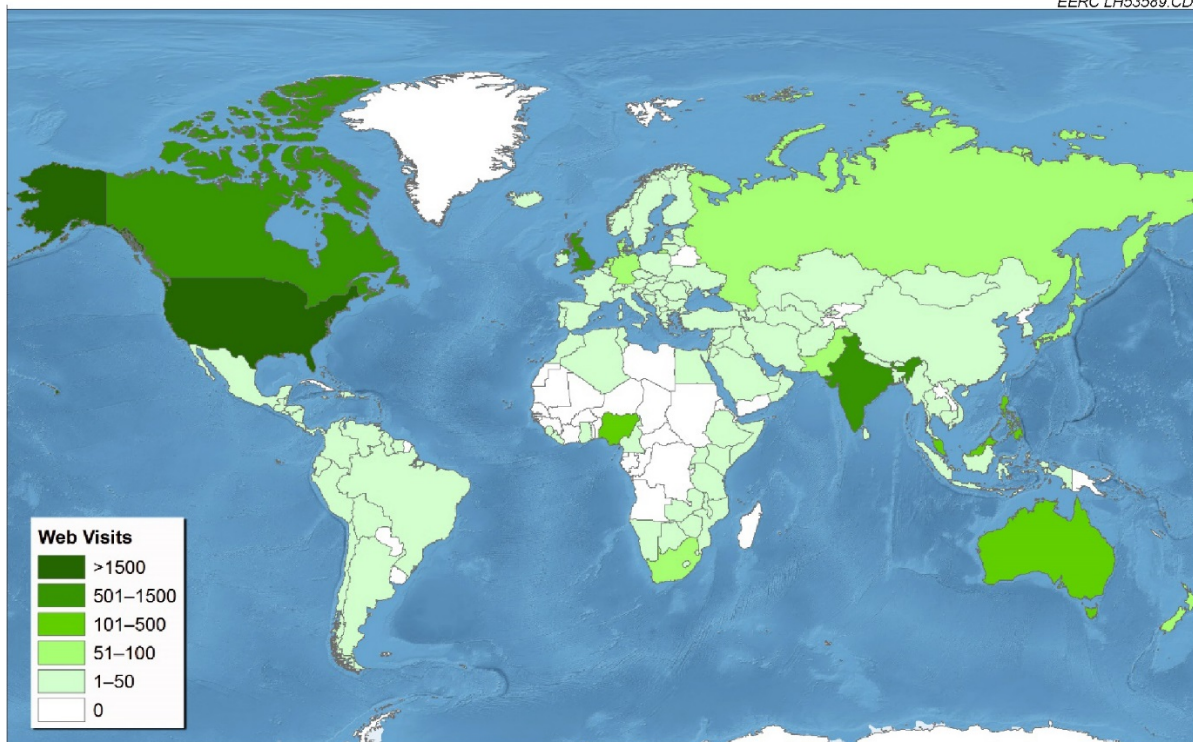


Figure 6. Map of PCOR Partnership Web site global traffic for this reporting period.

- Referral site traffic (over 4%) corresponds to the traffic directed to the PCOR Partnership Web page from other sites via links. The top referring Web sites were from classroom.google.com (an online learning platform), arthapedia.in (Indian economy and government Web site), and energy.gov.
- Less than 1% of site traffic (36 visitors) resulted from teacher campaigns and social interactions, such as e-mail or social media sources (e.g., Facebook and YouTube).
- During this reporting period, the **nature of the sessions** to the PCOR Partnership public Web site included 16,795 page views (an almost 8% increase from last quarter); the top five pages viewed are listed in Table 4. These five pages make up almost 74% of total page views. The increase in page views can be attributed to the addition of a new Web page and the release of a new documentary *The Bell Creek Story: CO<sub>2</sub> in Action*. Additionally, there was a large spike in page views on May 9, 2017 (illustrated in Figure 9) from Ohio students/teachers utilizing the PCOR Partnership video clip library and accessing the Web page “What is CO<sub>2</sub>” for their online learning platform classroom.google.com.
- All five full-length documentaries and 50 video clips taken from the documentaries have been uploaded to the EERC’s YouTube channel. The top five accessed YouTube videos are listed in Table 5. Because of the volume of material, the videos were organized into seven playlists. Each video description includes one or more links to the PCOR Partnership public Web site. Two PCOR Partnership full-length documentaries are also on the PPB YouTube Channel. These are listed in Table 6. These videos can also be streamed on the PCOR Partnership public Web site.

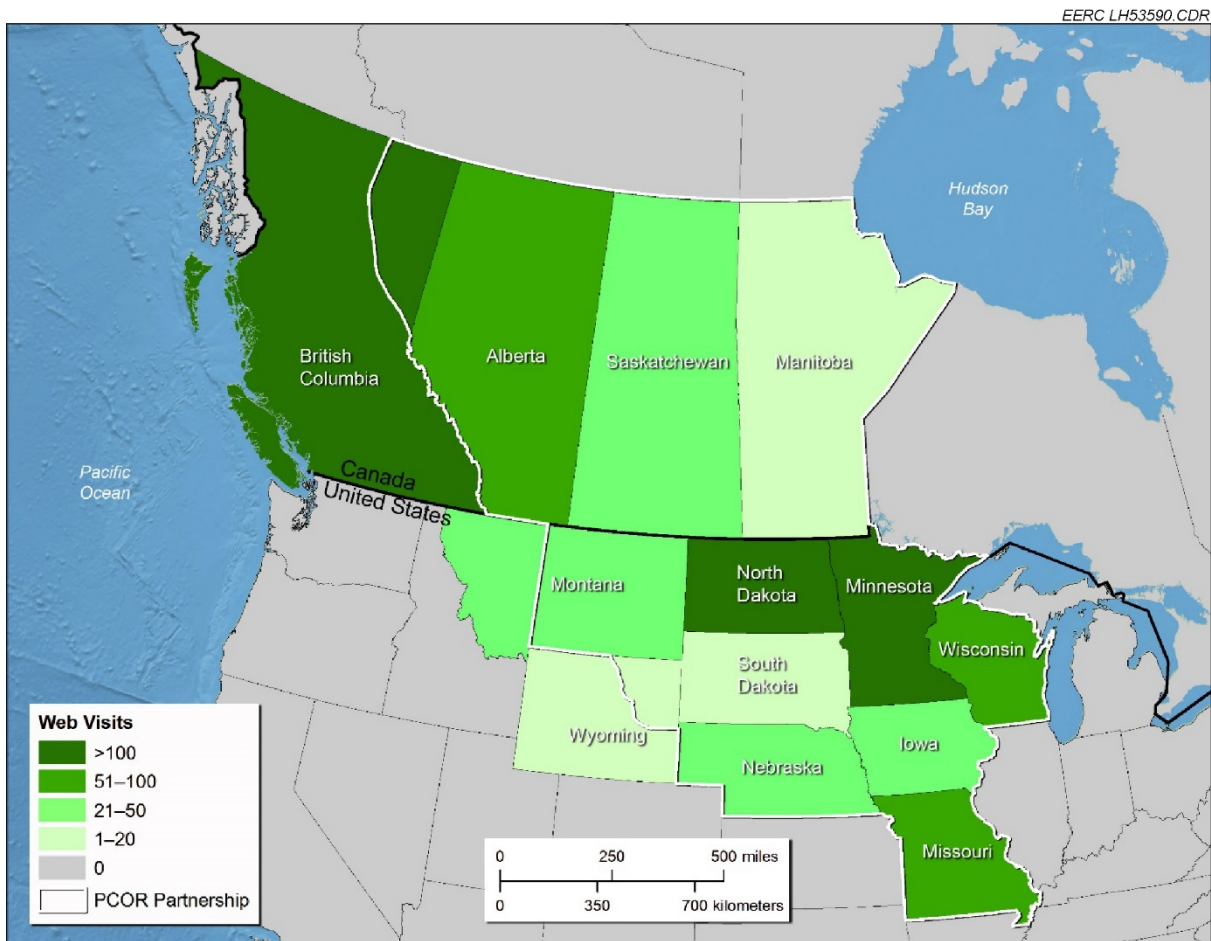


Figure 7. Map of PCOR Partnership Web site regional visits for this reporting period.

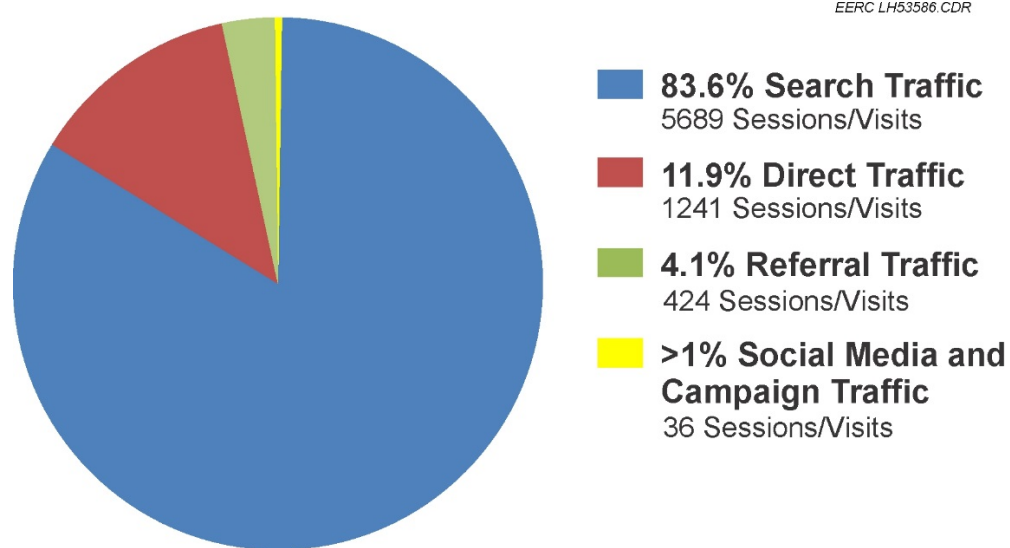


Figure 8. PCOR Partnership public Web site traffic sources for this reporting period.



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

<b>Page Title</b>	<b>Page Views</b>	<b>% Page Views</b>	<b>Page</b>
What Is CO <sub>2</sub> ?	5416	32.2	<a href="http://www.undeerc.org/pcor/sequestration/whatisco2.aspx">www.undeerc.org/pcor/sequestration/whatisco2.aspx</a>
What Is CO <sub>2</sub> Sequestration?	4938	29.4	<a href="http://www.undeerc.org/pcor/sequestration/whatissequestration.aspx">www.undeerc.org/pcor/sequestration/whatissequestration.aspx</a>
Carbon Capture and Storage (CCS)	873	5.2	<a href="http://www.undeerc.org/pcor/sequestration/ccs.aspx">www.undeerc.org/pcor/sequestration/ccs.aspx</a>
Terrestrial CO <sub>2</sub> Sequestration Projects	615	3.7	<a href="http://www.undeerc.org/pcor/region/terrestrial/default.aspx">www.undeerc.org/pcor/region/terrestrial/default.aspx</a>
	528	3.1	<a href="http://www.undeerc.org/pcor/co2sequestrationprojects/default.aspx">www.undeerc.org/pcor/co2sequestrationprojects/default.aspx</a>

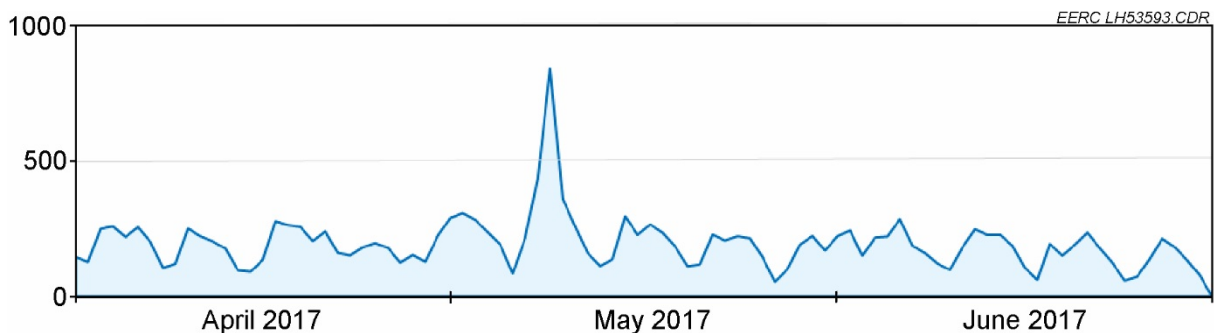


Figure 9. PCOR Partnership public Web site page views for this reporting period (Source: Google Analytics).

**Table 5. Top Five EERC PCOR Partnership-Related YouTube Channel Videos Accessed**

<b>Video</b>	<b>Video Length</b>	<b>Views</b>	<b>Est. Minutes Watched</b>	<b>Avg. View Duration</b>
Reforestation in Brazil	4:41	886	1837	2:10
Reducing Our Carbon Footprint: The Role of Markets Documentary	26:49	725	3660	5:00
The Phases of Oil Recovery – So Far	2:40	566	940	1:45
Installing a Casing-Conveyed Permanent Downhole Monitoring System	19:19	149	794	5:15
Reservoir Geology 101: Fluid in the Rocks	1:50	110	138	1:15

**Table 6. PCOR Partnership Documentaries on PPB YouTube Channel Accessed**

<b>Video</b>	<b>Video Length</b>	<b>Views</b>	<b>Est. Minutes Watched</b>	<b>Avg. View Duration</b>
Global Energy and Carbon: Tracking Our Footprint	32:36	983	7272	7:25
CO <sub>2</sub> EOR and Geologic CO <sub>2</sub> Sequestration	3:13	98	169	1:45
The Bell Creek Story: CO <sub>2</sub> in Action	26:45	84	338	4:00

- During this reporting period, the PCOR Partnership received **public television exposure** from documentaries broadcast in the PPB region in four states and one Canadian province. A total of four broadcasts aired, with “Reducing Our Carbon Footprint: The Role of Markets” and “Global Energy and Carbon: Tracking Our Footprint” each airing once and a new documentary “The Bell Creek Story: CO<sub>2</sub> in Action” airing twice.

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:

- Attended the Interstate Oil and Gas Compact Commission (IOGCC) Annual Business Meeting, which was held May 7–9, 2017, in Oklahoma City, Oklahoma. A Task 3 representative represented North Dakota as the Vice Chairman of the Environment and Safety Committee.

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**

This task ended in Quarter 1 – BP5, Year 10 (March 2017).

- Received approval for D35 entitled “Best Practices Manual (BPM) for Site Characterization” on June 14, 2017.

### **Task 5 – Well Drilling and Completion**

This task ended in Quarter 3 – BP4, Year 7 (June 2014).

### **Task 6 – Infrastructure Development**

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

- Submitted D85 entitled “Opportunities and Challenges Associated with CO<sub>2</sub> Compression and Transport During CCS Activities” on May 31, 2017, for review, and received approval on June 29, 2017.
- Accepted an invitation to participate as an instructor/mentor at the IEAGHG (International Energy Agency Greenhouse Gas R&D Programme) Summer School to be held July 17–23, 2017, in Regina, Saskatchewan, Canada. Submitted a presentation entitled “CO<sub>2</sub> Transport” to IEAGHG. Prepared notes to accompany the updated PowerPoint presentation for another PCOR Partnership representative who will be presenting the topic.

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 – CO<sub>2</sub> Procurement**

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

### **Task 8 – Transportation and Injection Operations**

This task ended Quarter 4, BP4, Year 8 (September 2015).

### **Task 9 – Operational Monitoring and Modeling**

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

- Submitted D69 entitled “Best Practices for Modeling and Simulation of CO<sub>2</sub> Storage” on May 31, 2017.
- Submitted and received approval for M64 entitled “Initial Analysis of Expanded Seismic Campaign Data Completed” on June 27, 2017. Examples of the interpretation of the 4-D data sets (time-lapse differencing of pre- and postinjection 3-D data sets) are shown in Figure 10.



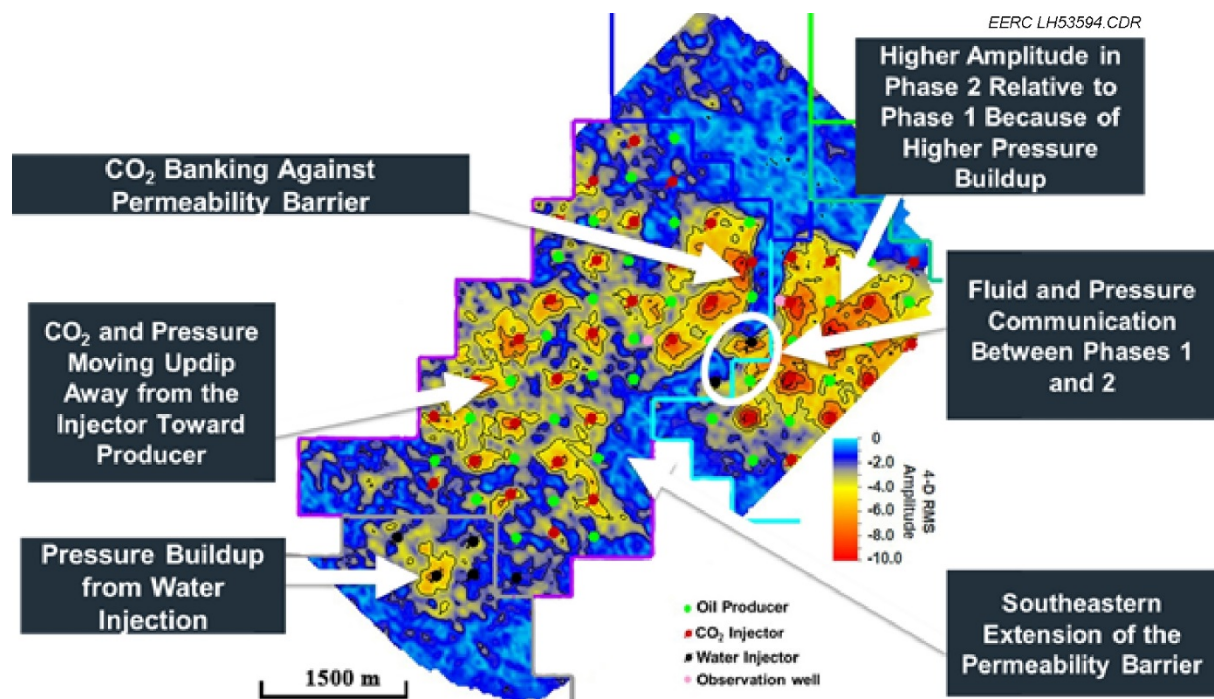


Figure 10. Summary of 2014–2012 overlapping 4-D amplitude difference map interpretation at Phases 1 and 2.

- Submitted the executive summary of D104 entitled “Analysis of Expanded Seismic Campaign” on June 30, 2017. The report is being reviewed by Denbury. If deemed not confidential, the client-approved version will be submitted upon completion of Denbury review.
- Submitted a memo on May 10, 2017, regarding official updated volumes of metric tons of CO<sub>2</sub> purchased for injection and metric tons of CO<sub>2</sub> stored at Bell Creek. As of March 31, 2017, the most recent month of record, 3.787 million tonnes of total gas (composition of approximately 98% CO<sub>2</sub>) has been purchased for injection into the Bell Creek Field, equating to an estimated **3.728 million tonnes of CO<sub>2</sub> stored**. At the end of BP4, 2.979 million tonnes of CO<sub>2</sub> had been stored.
- The PCOR Partnership Project Manager attended the 79th European Association of Geoscientists & Engineers (EAGE) Conference & Exhibition 2017 held June 12–15, 2017, in Paris, France, and presented “The Value of 4-D Seismic Monitoring at Bell Creek – A Mature Oil Field Undergoing CO<sub>2</sub> Enhanced Oil Recovery.”
- The PCOR Partnership task leader attended the IEAGHG Monitoring and Network Meeting held June 13–15, 2017, in Traverse City, Michigan, and presented “Integrating Monitoring Data: Understanding Reservoir Behavior and CO<sub>2</sub> Movement at the Bell Creek Commercial CO<sub>2</sub> EOR Project.” The task leader also participated in the Near-Surface/Surface Baseline Monitoring – Commonalities/Site-Specific Subtleties and Leakage Monitoring panel session, presenting information on the Bell Creek project.
- Attended the American Rock Mechanics Association (ARMA) Symposium and Hydraulic Fracturing Workshop held June 25–28, 2017, in San Francisco, California.

- Accepted an invitation to participate as an instructor/mentor at the 2017 IEAGHG Summer School to be held July 17–23, 2017, in Regina, Saskatchewan, Canada. Submitted a presentation entitled “Wellbore Integrity” to IEAGHG.
- Continued work on the BPM – Monitoring for CO<sub>2</sub> Storage and CO<sub>2</sub> EOR (D51), including the following:
  - Developed the BPM approach.
  - Revised the outline.
  - Determined reference resources.
  - Revised text in the MVA overview section.
  - Developed recommended best practices, lessons learned, and case studies and placed in the appropriate sections.
  - Worked on the text in several sections.
- Developed an outline and draft content for D66 Simulation Report Update 6, including information regarding the construction of the Version 3 (V3) static geologic model.
- Based on mutual agreement with the DOE project manager, the PCOR Partnership plans to submit an update to D69 (Best Practices for Modeling and Simulation of CO<sub>2</sub> Storage), which was submitted May 31, 2017, that incorporates additional reviewer perspectives and findings. Met to discuss the path forward for revisions. Commenced revisions to lessons learned, case studies, and text.
- Continued **Bell Creek** site activities, including the following:
  - Used the most recent publicly available data to determine that cumulative total CO<sub>2</sub> gas injection is 7,327,314 tonnes through April 30, 2017. This value represents the total gas volume injected, which includes purchase and recycle streams and is NOT corrected for a gas composition of approximately 98% CO<sub>2</sub> (Table 7).
  - As of March 31, 2017, the most recent month of record during this reporting period, 3.787 million tonnes of total gas (composition of approximately 98% CO<sub>2</sub>) has been purchased for injection into the Bell Creek Field, equating to an estimated 3.728 million tonnes of CO<sub>2</sub> stored (Table 8), with the difference comprising other trace gases in the purchase gas stream. A separate methodology from that used to calculate total gas injected was used to calculate a cumulative associated CO<sub>2</sub> storage volume estimate by correcting the gas purchase volume (approximately 98% CO<sub>2</sub>) obtained from Denbury’s custody transfer meter with gas compositional data.
  - With regard to **injection-phase monitoring** efforts:
    - ◆ Continued reservoir pressure and distributed temperature monitoring of 05-06 OW (observation well) from the permanent downhole monitoring system using the casing-conveyed pressure–temperature gauges and fiber-optic distributed temperature system:
      - Near-continuous operation since April 2012.
    - ◆ Received approval from Denbury to acquire several check shots with a trailer-mounted weight-drop source (source purchased for use on a separate DOE project) to aid in calibration and interpretation of data collected using the permanent borehole array in Well 04-03 OW. Planned a field trip for borehole array restart and check shot acquisition in mid-July 2017.

**Table 7. Bell Creek CO<sub>2</sub> Gas Injection Totals for April 2017 (cumulative totals May 2013 to April 2017)<sup>1</sup>**

	<b>April 2017 Injection</b>
Total, Mscf	4,011,941
Total, tons <sup>2</sup>	229,477
Total, tonnes <sup>3</sup>	208,380
Cumulative Total, Mscf <sup>4</sup>	136,976,749
Cumulative Total, tons <sup>2,4</sup>	7,834,854
Cumulative Total, tonnes <sup>3,4</sup>	7,114,567

Source: Montana Board of Oil and Gas (MBOG) database.

<sup>1</sup> Total gas injection quantities are **NOT CORRECTED** for gas composition and include the combined purchased and recycled gas streams.

<sup>2</sup> Calculated utilizing a conversion of 17.483 Mscf/ton.

<sup>3</sup> Calculated utilizing a conversion of 19.253 Mscf/tonne.

<sup>4</sup> Cumulative totals are for the period from May 2013 to the month listed.

**Table 8. Cumulative Total Gas Purchased and Estimated Associated CO<sub>2</sub> Storage for the Bell Creek Field<sup>1</sup>**

	<b>March 2017 Gas Totals</b>
Monthly Total Gas Purchased, MMscf <sup>2</sup>	1439
Monthly Total Gas Purchased, million tons <sup>2</sup>	0.082
Monthly Total Gas Purchased, million tonnes <sup>2</sup>	0.075
Cumulative Total Gas Purchased, MMscf <sup>2,3</sup>	72,903
Cumulative Total Gas Purchased, million tons <sup>2,3</sup>	4.170
Cumulative Total Gas Purchased, million tonnes <sup>2,3</sup>	3.787
Cumulative Total CO <sub>2</sub> Stored, MMscf <sup>3,4</sup>	71,780
Cumulative Total CO <sub>2</sub> Stored, million tons <sup>3,4</sup>	4.106
Cumulative Total CO <sub>2</sub> Stored, million tonnes <sup>3,4</sup>	3.728

<sup>1</sup> Conversion factors of 17.483 Mscf/ton and 19.253 Mscf/tonne were used to calculate equivalent purchase and storage quantities.

<sup>2</sup> Total gas purchased **NOT CORRECTED** for gas composition.

<sup>3</sup> Cumulative totals are for the period from May 2013 to the month listed.

<sup>4</sup> Total CO<sub>2</sub> stored **CORRECTED** for gas composition.

- ◆ Continued working with the 4-D surface seismic data set from Bell Creek. Analysis included the following:
  - Completed prestack inversions of angle-gather stacks (near, mid, and far). Generated slices (maps) of inverted volumes over the reservoir.
  - Continued 4-D seismic data analysis and interpretation to fine-tune figures for the D104 report.
- ◆ Continued Bell Creek Field microseismic data processing focused on data collected May–June 2013 and June–July 2014, including the following:
  - Conducted ray tracing modeling to validate string shots and to improve velocity model used in data processing.
- ◆ Worked with InSAR (interferometric synthetic aperture radar) data spanning September 2015 to May 2016, including analysis of surface deformation and calibration against other monitoring/operational data and simulation models.

- ◆ Final InSAR monitoring results are expected in July 2017 from TRE Canada.
- With regard to **injection-phase sampling** activities:
  - ◆ Completed the sixth round of oil sample collection, with Denbury personnel, from a select group of wells in the Bell Creek Field. Analysis of the samples is on hold until field observations show CO<sub>2</sub> breakthrough in a newly CO<sub>2</sub>-flooded area
  - ◆ Worked with Denbury to sample purchase/recycle samples in the Bell Creek oil field.
  - ◆ Continued work on data processing of oil composition and “miscible” phase analyses from previous sample sets.
  - ◆ A summary of all oil and CO<sub>2</sub> gas stream samples collected for analyses to date is provided in Table 9.
- With regard to **modeling** and **simulation** efforts:
  - ◆ Continued dynamic reservoir pressure and multiphase fluid flow simulation efforts. The modeling and simulation focus remains on Bell Creek Field Phase Areas 1–4. Accomplishments and activities include the following:
    - History matching of the simulation model is complete for Phase Areas 1–3. Predictive simulation is complete for Phase Areas 1 and 2. Long-term simulations of CO<sub>2</sub> migration are complete for Phase Areas 3–7.

**Table 9. Oil and CO<sub>2</sub> Gas Stream Sampling and Analyses**

Date Sampled	Purchase/ Recycle <sup>1</sup>	Production Stream by Development Phase, Well <sup>1</sup>									
		Phase 1				Phase 3			Phase 4		
		56-14R	32-02	05-06	04-04	28-02	21-10	21-14	34-09	34-07	34-03
Jan 2014		O	O	O							
Mar 2014		O	O								
May 2014	P	O	O	O							
Jun 2014	PR	O	O	O							
Jul 2014	PR	O	O	O							
Sep 2014	PR	OG	OG	O							
Oct 2014	PR	O	O								
Nov/Dec 2014		OG	OG	G							
Jan 2015			O	OG							
Mar 2015		G	G	G							
Apr 2015	PR										
Jun 2015		O	O	O							
Jul 2015	PR	G	G	G							
Sep 2015	PR										
Nov 2015		O		O							
Jan 2016	PR										
Apr/May 2016		O	O	O	O	O	O	O			
Jun/Jul 2016	PR	O		O	O	O	O	O			
Aug/Sep 2016		O	O		O	O	O	O	O		
Oct 2016				O							
Nov/Dec 2016 <sup>2</sup>	PR	O	O	O	O	O	O	O	O	O	O
Feb 2017 <sup>2</sup>		O	O		O	O	O	O	O	O	O
May 2017 <sup>2</sup>		O	O	O	O	O	O	O	O	O	O

<sup>1</sup> P = purchase CO<sub>2</sub> gas stream, R = recycle CO<sub>2</sub> gas stream, O = produced oil stream, and G = produced CO<sub>2</sub> gas stream.

<sup>2</sup> Oil samples collected but not yet analyzed.

- History matching of the simulation model is complete for the primary depletion, waterflooding, and CO<sub>2</sub>-flooding stages for Phase Area 4 using the simulation model based on the V3 geologic model.
- Worked on pressure and CO<sub>2</sub> plume distribution in Phase Area 4. Generated rescue models, which are used to create images for evaluating the effects of CO<sub>2</sub> injection in Phase Area 4.
- Prepared restart files for CCI (continuous CO<sub>2</sub> injection) and WAG (water alternating gas) operations in the Phase Areas 1–2 combined model. Worked on a long-term CO<sub>2</sub> migration simulation using the combined model. The purpose of the simulation is to predict the distribution of the CO<sub>2</sub> plume following the completion of EOR operations.
- ◆ Continued work with pulsed-neutron log (PNL) data in the Techlog project.
- ◆ Studied the relationship between time-lapse sigma log change and CO<sub>2</sub> volume changes from the interpreted PNL results of a Bell Creek Oil Field well.
- ◆ Worked on comparing 4-D seismic response with PNL-measured CO<sub>2</sub> saturations for relevant Bell Creek wells.
- ◆ Obtained Schlumberger's Techlog project containing interpretations completed for the wells logged in the January 2017 PNL campaign.
- ◆ Completed seismic well tie for 23 PNL wells in the Bell Creek Petrel model.
- ◆ Worked on incorporating rock mechanics well logs into a geomechanical inversion project.
- Continued with a hysteresis study and interpretation of the results to inform simulation model parameters, including the following:
  - ◆ Performed laboratory tests on the second, third, and fourth study samples. Determined CO<sub>2</sub> permeability, brine permeability, oil permeability, and hysteresis. This completed the laboratory tests.
  - ◆ Worked on finalizing hysteresis curves from the permeability and hysteresis tests in a hysteresis study and plotted with respect to CO<sub>2</sub>.
  - ◆ Worked on relative permeability hysteresis curve modeling based on oil and gas relative permeability curves measured using CO<sub>2</sub>–oil drainage–imbibition cycles performed previously.

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 10 – Site Closure**

Significant accomplishments for Task 10 for the reporting period included the following:

- No activity this quarter.

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 11 – Postinjection Monitoring and Modeling**

Significant accomplishments for Task 11 for the reporting period included the following:

- Began reviewing relevant materials, and drafted an outline for D73 (Monitoring and Modeling Fate of Stored CO<sub>2</sub>).

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 12 – Project Assessment**

Significant accomplishments for Task 12 for the reporting period included the following:

- Continued work on the BP5 program year (PY) 10 annual report. Updated sections in the annual report based on information in the quarterly reports and on deliverables and milestones submitted through March 2017.

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 13 – Project Management**

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

- Attended the Carbon Capture, Utilization, and Storage (CCUS) Conference held April 10–13, 2017, in Chicago, Illinois. Participated in the “Making History – Major CCUS Projects in the U.S.” panel discussion. Presented “The Plains CO<sub>2</sub> Reduction Partnership: CO<sub>2</sub> Injection Update and Results of Adaptive Management Approach.”
- Presented “An Adaptive Management Approach for Monitoring CO<sub>2</sub> Storage” at the U.S.–Taiwan International CCS Conference in Taipei, Taiwan, April 17–21, 2017 as a representative of the U.S.–Taiwan CCS Delegation to Taipei (invited by DOE). The presentation contained lessons learned through the PCOR Partnership. The draft version of *The Bell Creek Story: CO<sub>2</sub> in Action* documentary (D21, Task 2) was also shown.

- Attended the Carbon Sequestration Leadership Forum (CSLF) Mid-Year Meeting, held April 30 – May 3, 2017, in Abu Dhabi, United Arab Emirates (UAE).
- Attended GeoConvention 2017 held May 15–19, 2017, in Calgary, Alberta, Canada, and presented “Demonstration of Secure CO<sub>2</sub> Geological Storage in the PCOR Partnership Region.”
- Hosted the 2017 TAB meeting May 23–24, 2017, in San Francisco, California.
  - Several topics were discussed, including updates on Bell Creek and Aquistore projects, PCOR Partnership BPM development, and other ongoing CCS projects in the PCOR Partnership region. TAB members provided feedback and guidance on the activities presented.
  - TAB members in attendance included Stefan Bachu, Stacey Dahl, Jim Erdle, Bill Jackson, Ray Hattenbach, Mike Jones, and Steve Melzer (see Figure 11). Attending from the EERC were Scott Ayash, Charlie Gorecki, John Harju, Dave Nakles, Ed Steadman, and Neil Wildgust.
- Attended the 2017 Stanford Center for Carbon Storage (SCCS) Affiliates Meeting & Workshop at Stanford University held May 26, 2017, in Metro Park, California, and presented “The Plains CO<sub>2</sub> Reduction Partnership: CO<sub>2</sub> Injection Update and Results of Adaptive Management Approach.”
- Attended the 2nd International Workshop on Offshore Geologic CO<sub>2</sub> Storage held June 19–20, 2017, in Beaumont, Texas.



Figure 11. 2017 TAB meeting participants.



- Presented a poster entitled “Reducing Greenhouse Gas Emissions – Energy with a Smaller Carbon Footprint” at the Bureau of Economic Geology (BEG) Open House held June 21, 2017, in Beaumont, Texas.
- Submitted an abstract entitled “The Plains CO<sub>2</sub> Reduction (PCOR) Partnership: Successes Leading to New Innovation” for consideration at EAGE’s Near Surface Geoscience 2017 to be held September 3–7, 2017, in Malmö, Sweden. At the time of this report, the abstract has been accepted for oral presentation.
- Completed revisions to D102/M59 entitled “Best Practice for the Commercial Deployment of Carbon Dioxide Geologic Storage: Adaptive Management Approach” based on the concurrent review by the PCOR Partnership TAB members. Submitted the revised version on May 23, 2017, for additional DOE review and received approval on May 25, 2017.
- Completed a review of text from the Global Carbon Capture and Storage Institute (GCCSI) Web site regarding Bell Creek as requested by DOE. Updated the information using publicly accessible information. Received input from a Denbury representative. Submitted the revised text to DOE on June 22, 2017.
- Submitted the quarterly international activity update on June 21, 2017.
- Developed an outline for the programmatic risk management BPM (D103). Began drafting text.
- Worked on a planned special issue of the *International Journal of Greenhouse Gas Control* (IJGGC) focused on Bell Creek activities, including compiling a list of articles and working on a management plan.
- Held a task leader meeting April 4, 2017. Topics discussed included the PCOR Partnership BPMs, planning for the 2017 annual TAB and PCOR Partnership annual meetings, Bell Creek project updates, upcoming conferences, and task leader updates.
- Held a task leader meeting May 2, 2017. Topics discussed included the PCOR Partnership BPMs, planning for the 2017 TAB and PCOR Partnership annual meetings, Bell Creek project updates, upcoming conferences, and task leader updates.
- Held a task leader meeting June 26, 2017. Topics discussed included recommendations from discussions at the 2017 annual TAB meeting, deliverables, planning for the 2017 PCOR Partnership annual meeting, and task updates.
- Continued planning for the PCOR Partnership Annual Membership Meeting, including the following:
  - Chose Plano, Texas, as the new venue, with dates of October 24–26, 2017.
  - Held a planning meeting April 25, 2017, to discuss potential speakers, potential special event sponsors, Pioneer Award recipients, and workshop ideas.
  - Signed a contract with a hotel in Plano, Texas.
  - Sent a save-the-date e-mail blast on May 16, 2017, to announce the meeting. The 2017 PCOR Partnership Annual Membership Meeting and Workshop will be held October 24–26, 2017, at the Renaissance Dallas at Plano Legacy West Hotel in Plano, Texas.
  - Sent the save-the-date postcards on May 19, 2017.
  - Held a planning meeting June 1, 2017, to discuss workshop ideas, potential speakers, attendee gift ideas, potential Pioneer Award recipients, and hotel developments.



- The 2017 PCOR Partnership Annual Membership Meeting Web site went live June 2, 2017, at [www.undeerc.org/PCOR17](http://www.undeerc.org/PCOR17).
- Continued development of the draft agenda.
- Worked with the hotel on plans and the guest room reservation link.
- Updated the venue page on the meeting Web site with the room block reservation information and link.
- Sent an e-mail blast on June 28, 2017, to announce that meeting registration is open and the hotel room block is available.
- Worked on edits to the project management plan (PMP).
- Deliverables and milestones completed in April:
  - March monthly update
  - Task 13: D58/D59 – Quarterly Progress Report/Milestone Quarterly Report
- Deliverables and milestones completed in May:
  - April monthly update
  - Task 2: D17 – General Audience CO<sub>2</sub> Sequestration Outreach PowerPoint Presentation
  - Task 6: D85 – Opportunities and Challenges Associated with CO<sub>2</sub> Compression and Transport During CCS Activities
  - Task 9: D69 – Best Practices for Modeling and Simulation of CO<sub>2</sub> Storage
  - Task 14: D101 – WWG Web Site Content Update
- Deliverables and milestones completed in June:
  - May monthly update
  - Task 2: M47 – Bell Creek Test Site – 30-minute Documentary Broadcast
  - Task 9: M64 – Initial Analysis of Expanded Seismic Campaign Data Completed
  - Task 9: D104 – Analysis of Expanded Seismic Campaign (executive summary only)
  - Task 14: M23 – Monthly WWG Conference Call Held

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 14 – RCSP WWG Coordination**

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

- Submitted D101 entitled “Water Working Group Web Site Content Update” on May 23, 2017, for review and received approval on May 25, 2017.
- Continued work on D107 (Journal Article or Topical Report – Major Research Focuses for Water and CCS), including the following:
  - Created detailed outlines for each report section.
  - Worked on a schedule for the development of D107.
  - Revised text.
  - Distributed the draft D107 to the WWG on June 26, 2017, in advance of the quarterly conference call.

- Held the quarterly conference call for June 28, 2017. Topics included review of the draft outline and draft sections of D107, the draft agenda for the WWG annual meeting tentatively scheduled for August 2, 2017, and partnership updates.
- Worked on an agenda, potential guest speakers, and planning details for the WWG annual meeting.

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, CO<sub>2</sub> Storage, and Monitoring Project**

This task ended Quarter 2, BP4, Year 7 (February 2014).

#### **Task 16 – Characterization of the Basal Cambrian System**

This task ended Quarter 2, BP4, Year 7 (March 2014).

### **PHASE III COST STATUS**

The approved BP5 budget along with actual costs incurred and in-kind cost share reported are shown in Table 10. A spending plan for BP5 and actual incurred cost by quarter of cash funds for BP5 are provided in Figure 12 and Table 11.

**Table 10. Phase III Budget – BP5**

<b>Organization</b>	<b>Approved Budget, \$*</b>	<b>Actual Costs Incurred, \$</b>
DOE Share – Cash	13,946,212	7,789,039
Nonfederal Share	5,711,194	5,758,837
<b>Total</b>	<b>19,657,406</b>	<b>13,547,876</b>

\*As of Modification No. 36.

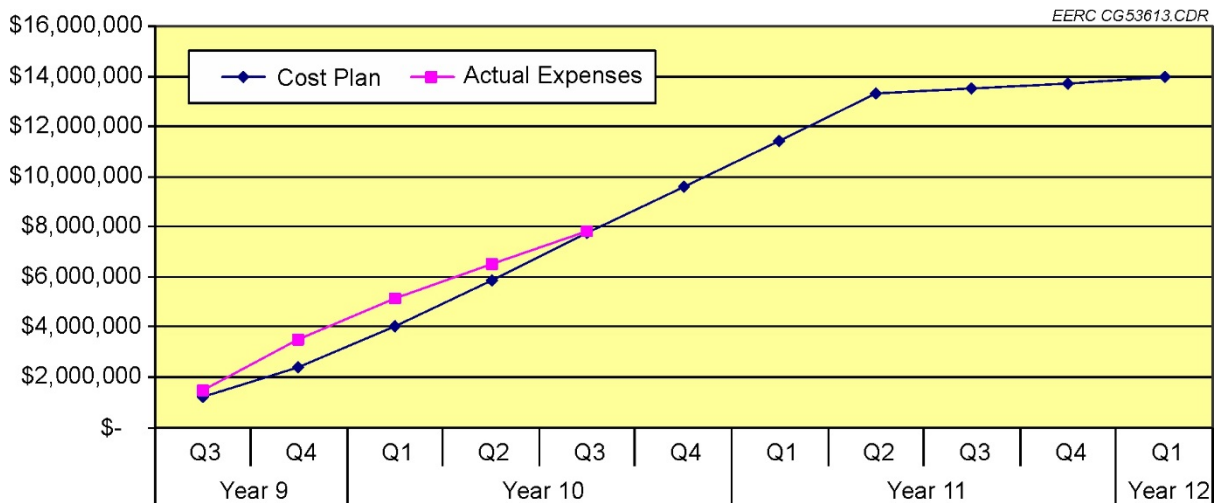


Figure 12. PCOR Partnership Phase III, BP5, Years 9–12 funding (cash only).

### PHASE III SCHEDULE STATUS

Table 12 lists all deliverables and milestones by quarter, with completion dates, through the end of the reporting period (see Table 13 for the Gantt chart for BP5, Years 9–12).

**Table 11. Phase III, BP5, Years 9–12 Spending Plan**

Budget Period 4				Budget Period 5												
Baseline Reporting Quarter	Year 9								Year 10							
	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	\$ 2,250,000	\$ 62,873,437	\$ 2,250,000	\$ 65,123,437	\$ 1,202,894	\$ 1,202,894	\$ 1,202,894	\$ 2,405,788	\$ 1,623,146	\$ 4,028,934	\$ 1,855,986	\$ 5,884,920	\$ 1,855,986	\$ 7,740,906	\$ 1,855,986	\$ 9,596,892
Nonfederal Share	\$ -	\$ 2,411,971	\$ -	\$ 2,411,971	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Planned	\$ 2,250,000	\$ 65,285,408	\$ 2,250,000	\$ 67,535,408	\$ 1,202,894	\$ 1,202,894	\$ 1,202,894	\$ 2,405,788	\$ 1,623,146	\$ 4,028,934	\$ 1,855,986	\$ 5,884,920	\$ 1,855,986	\$ 7,740,906	\$ 1,855,986	\$ 9,596,892
Actual Incurred Cost																
Federal Share	\$ 1,909,898	\$ 57,914,662	\$ 2,562,356	\$ 60,477,211	\$ 1,497,211	\$ 1,497,211	\$ 1,962,929	\$ 3,460,140	\$ 1,623,146	\$ 5,083,286	\$ 1,362,782	\$ 6,446,068	\$ 1,342,971	\$ 7,789,039		
Nonfederal Share	\$ (4,110)	\$ 2,991,641	\$ 10,655	\$ 3,002,296	\$ 7,501	\$ 7,501	\$ 30,340	\$ 37,841	\$ 10,788	\$ 48,629	\$ 530	\$ 49,159	\$ 14	\$ 49,173		
Total Incurred Cost	\$ 1,905,788	\$ 60,906,303	\$ 2,573,011	\$ 63,479,314	\$ 1,504,712	\$ 1,504,712	\$ 1,993,269	\$ 3,497,981	\$ 1,633,934	\$ 5,131,915	\$ 1,363,312	\$ 6,495,227	\$ 1,342,985	\$ 7,838,212		
Variance																
Federal Share	\$ 340,102	\$ 4,958,775	\$ (312,356)	\$ 4,646,419	\$ (294,317)	\$ (294,317)	\$ (760,035)	\$ (1,054,352)	\$ -	\$ (1,054,352)	\$ 493,204	\$ (561,148)	\$ 513,015	\$ (48,133)		
Nonfederal Share	\$ 4,110	\$ (579,670)	\$ (10,655)	\$ (590,325)	\$ (7,501)	\$ (7,501)	\$ (30,340)	\$ (37,841)	\$ (10,788)	\$ (48,629)	\$ (530)	\$ (49,159)	\$ (14)	\$ (49,173)		
Total Variance	\$ 344,212	\$ 4,379,105	\$ (323,011)	\$ 4,056,094	\$ (301,818)	\$ (301,818)	\$ (790,375)	\$ (1,092,193)	\$ (10,788)	\$ (1,102,981)	\$ 492,674	\$ (610,307)	\$ 513,001	\$ (97,306)		

Budget Period 5																
Baseline Reporting Quarter	Year 11								Year 12							
	Q1		Q2		Q3		Q4		Q1							
	Q1	Cum. BP Total	Q2	Cum. BP Total	Q3	Cum. BP Total	Q4	Cum. BP Total	Q1	Cum. BP Total						
Baseline Cost Plan																
Federal Share	\$ 1,855,987	\$ 11,452,879	\$ 1,855,987	\$ 13,308,866	\$ 212,449	\$ 13,521,315	\$ 212,449	\$ 13,733,764	\$ 212,448	\$ 13,946,212						
Nonfederal Share	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -						
Total Planned	\$ 1,855,987	\$ 11,452,879	\$ 1,855,987	\$ 13,308,866	\$ 212,449	\$ 13,521,315	\$ 212,449	\$ 13,733,764	\$ 212,448	\$ 13,946,212						
Actual Incurred Cost																
Federal Share	\$ -	\$ -	\$ -	\$ -												
Nonfederal Share	\$ -	\$ -	\$ -	\$ -												
Total Incurred Cost	\$ -	\$ -	\$ -	\$ -												
Variance																
Federal Share	\$ -	\$ -	\$ -	\$ -												
Nonfederal Share	\$ -	\$ -	\$ -	\$ -												
Total Variance	\$ -	\$ -	\$ -	\$ -												

**Table 12. Phase III Milestones and Deliverables**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 1 – Quarter 1 (October–December 2007)</b>		
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
<b>Year 1 – Quarter 2 (January–March 2008)</b>		
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
<b>Year 1 – Quarter 3 (April–June 2008)</b>		
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
<b>Year 1 – Quarter 4 (July–September 2008)</b>		
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
<b>Year 2 – Quarter 1 (October–December 2008)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 2 – Quarter 2 (January–March 2009)</b>		
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 <sub>2</sub> 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
<b>Year 2 – Quarter 3 (April–June 2009)</b>		
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
<b>Year 2 – Quarter 4 (July–September 2009)</b>		
M23: Task 14 – Monthly WWG Conference Call Held	Not applicable	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 3 – 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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 3 – Quarter 1 (October–December 2009)</b>		
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
<b>Year 3 – Quarter 2 (January–March 2010)</b>		
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
<b>Year 3 – Quarter 3 (April–June 2010)</b>		
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
<b>Year 3 – Quarter 4 (July–September 2010)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 4 – Quarter 1 (October–December 2010)</b>		
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
<b>Year 4 – Quarter 2 (January–March 2011)</b>		
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 <sub>2</sub> 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
<b>Year 4 – Quarter 3 (April–June 2011)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 4 – Quarter 3 (April–June 2011) (continued)</b>		
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
<b>Year 4 – Quarter 4 (July–September 2011)</b>		
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 <sup>+</sup>	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
<b>Year 5 – Quarter 1 (October–December 2011)</b>		
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

<sup>+</sup> Name change requested September 28, 2011, and approved October 3, 2011.

Continued . . .

**Table 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 5 – Quarter 2 (January–March 2012)</b>		
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
<b>Year 5 – Quarter 3 (April–June 2012)</b>		
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 <sub>2</sub> 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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 5 – Quarter 4 (July–September 2012)</b>		
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
<b>Year 6 – Quarter 1 (October–December 2012)</b>		
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
<b>Year 6 – Quarter 2 (January–March 2013)</b>		
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 <sub>2</sub> 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 12. Phase III Milestones and Deliverables (continued)**

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

Continued . . .

**Table 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 6 – Quarter 4 (July–September 2013) (continued)</b>		
D1: Task 1 – Review of Source Attributes	9/30/13	9/5/13
D6: Task 3 – Permitting Review – Update 1	9/30/13	9/24/13
D48: Task 7 – Bell Creek Test Site – Procurement Plan and Agreement Report	9/30/13	9/24/13
D90: Task 16 – Report – Wellbore Evaluation of the Basal Cambrian System	9/30/13	9/5/13
D94: Task 2 – Aquistore Project Fact Sheet	9/30/13	9/30/13
D95: Task 2 – Aquistore Project Poster	9/30/13	9/30/13
D98: Task 3 – Report – Findings, Recommendations, and Guidance of CGS Task Force	9/30/13	8/30/13
M23: Task 14 – Monthly WWG Conference Call Held	9/30/13	9/30/13
M38: Task 3 – IOGCC Task Force Wrap-Up Meeting Held	9/30/13	8/16/13 – sent 9/5/13
M39: Task 3 – IOGCC Task Force Editing Subgroup Meeting Held	9/30/13	6/3/13 – sent 9/5/13
M40: Task 15 – Further Characterization of the Zama Acid Gas EOR, CO <sub>2</sub> Storage, and Monitoring Project Completed	9/30/13	9/24/13
<b>Year 7 – Quarter 1 (October–December 2013)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/13	10/31/13
D42: Task 5 – Bell Creek Test Site – Injection Experimental Design Package	10/31/13	10/30/13
D99: Task 14 – Water–CCS Nexus-Related Fact Sheet	10/31/13	10/31/13
M23: Task 14 – Monthly WWG Conference Call Held	10/31/13	10/31/13
M23: Task 14 – Monthly WWG Conference Call Held	11/30/13	11/21/13
M23: Task 14 – Monthly WWG Conference Call Held	12/31/13	Waived by DOE
M24: Task 14 – WWG Annual Meeting Held	12/31/13	8/19/13
M43: Task 9 – Bell Creek Test Site – First Full-Repeat Sampling of the Groundwater-Soil Gas-Monitoring Program Completed	12/31/13	11/15/13 – sent 12/13/13
<b>Year 7 – Quarter 2 (January–March 2014)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/14	1/31/14
D57: Task 12 – Project Assessment Annual Report	1/31/14	1/31/14
M23: Task 14 – Monthly WWG Conference Call Held	1/31/14	1/28/14
M41: Task 6 – Decision to Incorporate Ramgen Compression Technology into Bell Creek Project	1/31/14	1/29/14

Continued . . .

**Table 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 7 – Quarter 2 (January–March 2014) (continued)</b>		
D86: Task 15 – Updated Regional Implementation Plan for Zama	2/28/14	2/28/14
M23: Task 14 – Monthly WWG Conference Call Held	2/28/14	2/27/14
D24: Task 2 – PCOR Partnership Region Sequestration General Poster (update)	3/31/14	3/27/14
D36: Task 4 – Bell Creek Test Site – Wellbore Leakage Final Report	3/31/14	3/19/14
D92: Task 16 – Report – Storage Capacity and Regional Implications for Large-Scale Storage in the Basal Cambrian System	3/31/14	3/27/14
D93: Task 1 – Geological Modeling and Simulation Report for the Aquistore Project	3/31/14	3/25/14
D96: Task 4 – Bell Creek Test Site – 3-D Seismic and Characterization Report	3/31/14	3/27/14
M23: Task 14 – Monthly WWG Conference Call Held	3/31/14	3/25/14
M36: Task 13 – Annual Advisory Board Meeting Scheduled	3/31/14	3/4/14 Sent 3/25/14
M44: Task 9 – Bell Creek Test Site – First 3-D VSP Repeat Surveys Completed	3/31/14	3/1/14 Sent 3/25/14
<b>Year 7 – Quarter 3 (April–June 2014)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/14	4/30/14
M23: Task 14 – Monthly WWG Conference Call Held	4/30/14	4/24/14
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/14	5/30/14
D101: Task 14 – WWG Web Site Content Update	5/31/14	5/30/14
M23: Task 14 – Monthly WWG Conference Call Held	5/31/14	5/21/14
D44: Task 5 – Bell Creek Test Site – Drilling and Completion Activities Report	6/30/14	5/30/14
M23: Task 14 – Monthly WWG Conference Call Held	6/30/14	6/26/14
M45: Task 9 – Bell Creek Test Site – First Full-Repeat of Pulsed Neutron Logging Campaign Completed	6/30/14	6/9/14
M46: Task 9 – Bell Creek Test Site – 1 Year of Injection Completed	6/30/14	6/26/14

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**Table 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 7 – Quarter 4 (July–September 2014)</b>		
D13: Task 2 – Public Site Updates	7/31/14	7/29/14
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/14	7/31/14
M23: Task 14 – Monthly WWG Conference Call Held	7/31/14	7/17/14 WebEx
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/14	8/27/14 Exec. Sum.
M23: Task 14 – Monthly WWG Conference Call Held	8/31/14	Waived by DOE
D1: Task 1 – Review of Source Attributes	9/30/14	9/24/14
D7: Task 1 – Third Target Area Completed	9/30/14	9/26/14
D93: Task 1 – Geological Modeling and Simulation Report for the Aquistore Project	9/30/14	9/30/14
D100: Task 9 – Fort Nelson Test Site – Best Practices Manual – Feasibility Study	9/30/14	9/30/14
M23: Task 14 – Monthly WWG Conference Call Held	9/30/14	9/30/14
<b>Year 8 – Quarter 1 (October–December 2014)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/14	10/31/14
D99: Task 14 – Water/CCS Nexus-Related Fact Sheet	10/31/14	10/31/14
M23: Task 14 – Monthly WWG Conference Call Held	10/31/14	10/28/14
M48: Task 9 – Bell Creek Test Site – 1 Million Metric Tons of CO <sub>2</sub> Injected	10/31/14	10/29/14
M23: Task 14 – Monthly WWG Conference Call Held	11/30/14	11/25/14
D57: Task 12 – Project Assessment Annual Report	12/31/14	12/30/14
M24: Task 14 – WWG Annual Meeting Held	12/31/14	8/11/14
<b>Year 8 – Quarter 2 (January–March 2015)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/15	1/30/15
D32: Task 4 – Bell Creek Test Site – Geomechanical Report (Update 1)	1/31/15	1/28/15
M23: Task 14 – Monthly WWG Conference Call Held	1/31/15	1/27/15
M23: Task 14 – Monthly WWG Conference Call Held	2/28/15	2/26/15
D25: Task 2 – Bell Creek Test Site Poster (update)	3/31/15	2/5/15
M23: Task 14 – Monthly WWG Conference Call Held	3/31/15	3/25/15
M36: Task 13 – Annual Advisory Board Meeting Scheduled	3/31/15	3/31/15

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**Table 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 8 – Quarter 3 (April–June 2015)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/15	4/29/15
M23: Task 14 – Monthly WWG Conference Call Held	4/30/15	4/28/15
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/15	6/1/15
M23: Task 14 – Monthly WWG Conference Call Held	5/30/15	5/28/15
D85: Task 6 – Report – Opportunities and Challenges Associated with CO <sub>2</sub> Compression and Transportation During CCUS (carbon capture, utilization, and storage) Activities (update)	5/31/15	5/29/15
M23: Task 14 – Monthly WWG Conference Call Held	6/30/15	6/23/15
M49: Task 9 – Bell Creek Test Site – 1.5 Million Metric Tons of CO <sub>2</sub> Injected	6/30/15	6/30/15
<b>Year 8 – Quarter 4 (July–September 2015)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/15	7/31/15
M23: Task 14 – Monthly WWG Conference Call Held	7/31/15	Waived by DOE
M50: Task 9 – Bell Creek Test Site – 2 Years of Near-Surface Assurance Monitoring Completed	7/31/15	7/21/15
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/15	8/27/15 Exec. Sum.
M23: Task 14 – Monthly WWG Conference Call Held	8/31/15	Waived by DOE
M51: Task 9 – Bell Creek Test Site – Initial Analysis for First Large-Scale Repeat Pulsed-Neutron Logging Campaign Post-Significant CO <sub>2</sub> Injection Completed	8/31/15	8/31/15
D1: Task 1 – Review of Source Attributes (update)	9/30/15	9/23/15
D8: Task 3 – Permitting Review – Update 2	9/30/15	9/30/15
D49: Task 8 – Bell Creek Test Site – Transportation and Injection Operations Report	7/31/15	9/29/15
M23: Task 14 – Monthly WWG Conference Call Held	9/30/15	9/30/15
<b>Year 9 – Quarter 1 (October–December 2015)</b>		
D59/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/15	10/31/15
M23: Task 14 – Monthly WWG Conference Call Held	10/31/15	10/29/15
M23: Task 14 – Monthly WWG Conference Call Held	11/30/15	Waived by DOE
D57: Task 12 – Project Annual Assessment Report	12/31/15	12/31/15
M24: Task 14 – WWG Annual Meeting Held	12/31/15	8/20/15
M53: Task 9 – Expanded Baseline and Time-Lapse 3-D Surface Seismic Survey Completed	12/31/15	12/17/15

Continued . . .



**Table 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 9 – Quarter 2 (January–March 2016)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/16	1/31/16
M23: Task 14 – Monthly WWG Conference Call Held	1/31/16	1/27/16
M54: Task 9 – Initial Processing and Analysis of Historic InSAR Data Completed	1/31/16	1/26/16
D14: Task 2 – General Phase III Fact Sheet (update)	2/29/16	2/26/16
D93: Task 1 – Geological Modeling and Simulation Report for the Aquistore Project (Update 2)	2/29/16	2/29/16
M23: Task 14 – Monthly WWG Conference Call Held	2/29/16	Waived by DOE
D11: Task 2 – Outreach Plan (update)	3/31/16	3/28/16
D45: Task 6 – Bell Creek Test Site – Infrastructure Development Report	3/31/16	3/31/16
M23: Task 14 – Monthly WWG Conference Call Held	3/31/16	Waived by DOE
M36: Task 13 – Annual Advisory Board Meeting Scheduled	3/31/16	3/31/16
M56: Task 9 – Life Cycle Analysis for Primary and Secondary Recovery Oil Completed	3/31/16	3/31/16
M58: Task 9 – Bell Creek Test Site – Completion of 2.75 Million Metric Tons of CO <sub>2</sub> Stored	3/31/16	3/22/16
<b>Year 9 – Quarter 3 (April–June 2016)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/16	4/29/16
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/16	5/31/16
D101: Task 14 – WWG Web Site Content Update 1	5/31/16	5/31/16
M57: Task 9 – Life Cycle Analysis for EOR at the Bell Creek Field Completed	5/31/16	5/26/16
M23: Task 14 – WWG Conference Call Held	6/30/16	4/27/16
<b>Year 9 – Quarter 4 (July–September 2016)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/16	7/29/16
D13: Task 2 – Public Site Updates	7/31/16	7/21/16
D16: Task 2 – Fort Nelson Test Site Fact Sheet (update)	8/31/16	8/29/16
D66: Task 9 – Bell Creek Test Site – Simulation Report (update)	8/31/16	8/31/16
D102: Task 13 – Best Practices Manual – Adaptive Management Approach	8/31/16	8/31/16
M59: Task 9 – Completed the PCOR Partnership Adaptive Management Approach Best Practices Manual	8/31/16	8/31/16

Continued . . .

**Table 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 9 – Quarter 4 (July–September 2016) (continued)</b>		
D1: Task 1 – Review of Source Attributes (update)	9/30/16	9/29/16
D8: Task 3 – Permitting Review – Update 3	9/30/16	9/29/16
D55: Task 11 – Bell Creek Test Site – Cost-Effective Long-Term Monitoring Strategies Report	9/30/16	9/30/16
M23: Task 14 – WWG Conference Call Held	9/30/16	9/28/16
<b>Year 10 – Quarter 1 (October–December 2016)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/16	10/27/16
D21: Task 2 – Bell Creek Test Site 30-minute Documentary	10/31/16	10/31/16
D105: Task 9 – Comparison of Non-EOR and EOR Life Cycle Assessments	10/31/16	10/31/16
D15: Task 2 – Bell Creek Test Site Fact Sheet (update)	11/30/16	11/30/16
M52: Task 9 – Initial Analysis of Extended Pulsed-Neutron Logging Campaign Data Completed	11/30/16	11/29/16
D57: Task 12 – Project Assessment Annual Report	12/31/16	12/30/16
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	12/31/16	12/30/16
D106: Task 14 – Special Issue of IJGGC – Nexus of Water and Carbon Capture and Storage	12/31/16	12/29/16
M23: Task 14 – WWG Conference Call Held	12/30/16	11/16/16
M24: Task 14 – WWG Annual Meeting Held	12/31/16	8/18/16
M36: Task 13 – Annual Advisory Board Meeting Scheduled	12/31/16	12/28/16
<b>Year 10 – Quarter 2 (January–March 2017)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/17	1/31/17
D22: Task 2 – Energy from Coal 60-minute Documentary	1/31/17	1/31/17
D76: Task 3 – Regional Regulatory Perspective	1/31/17	1/31/17
D35: Task 4 – Bell Creek Test Site – Best Practices Manual – Site Characterization	3/31/17	3/31/17
M23: Task 14 – WWG Conference Call Held	3/31/17	3/30/17
M60: Task 1 – Data Submitted to EDX	3/31/17	3/7/17
M63: Task 9 – Initial Analysis of Processed InSAR Data Completed	3/31/17	3/31/17

Continued . . .

**Table 12. Phase III Milestones and Deliverables (continued)**

Title/Description	Due Date	Actual Completion Date
<b>Year 10 – Quarter 3 (April–June 2017)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/17	4/27/17
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/17	5/31/17
D69: Task 9 – Best Practices Manual – Simulation Report	5/31/17	5/31/17
D85: Task 6 – Report – Opportunities and Challenges Associated with CO <sub>2</sub> Compression and Transportation During CCUS Activities	5/31/17	5/31/17
D101: Task 14 – WWG Web Site Content Update 1	5/31/17	5/23/17
D104: Task 9 – Analysis of Expanded Seismic Campaign	6/30/17	6/30/17
M64: Task 9 – Initial Analysis of Expanded Seismic Campaign Data Completed	6/30/17	6/27/17
M23: Task 14 – WWG Conference Call Held	6/30/17	6/28/17
M47: Task 2 – Bell Creek Test Site 30-Minute Documentary Broadcast	6/30/17	6/19/17
<b>Year 10 – Quarter 4 (July–September 2017)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/17	
D66: Task 9 – Bell Creek Test Site – Simulation Report (Update 6)	8/31/17	
D81: Task 1 – PCOR Partnership Atlas (update)	8/31/17	
D103: Task 13 – Best Practices Manual – Programmatic Risk Management	8/31/17	
D1: Task 1 – Review of Source Attributes (update)	9/30/17	
M23: Task 14 – WWG Conference Call Held	9/30/17	
M55: Task 9 – Investigation of Crude Oil Compositional Changes during CO <sub>2</sub> EOR Completed	9/30/17	
M62: Task 14 – Research Related to Water and CCS Nexus Completed	9/30/17	
<b>Year 11 – Quarter 1 (October–December 2017)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/17	
D14: Task 2 – General Phase III Fact Sheet (update)	10/31/17	
D51: Task 9 – Best Practices Manual – Monitoring for CO <sub>2</sub> Storage and CO <sub>2</sub> EOR	10/31/17	
D93: Task 1 – Geological Modeling and Simulation Report for the Aquistore Project (Update 3)	10/31/17	
D15: Task 2 – Bell Creek Test Site Fact Sheet (update)	11/30/17	

Continued . . .

**Table 12. Phase III Milestones and Deliverables (continued)**

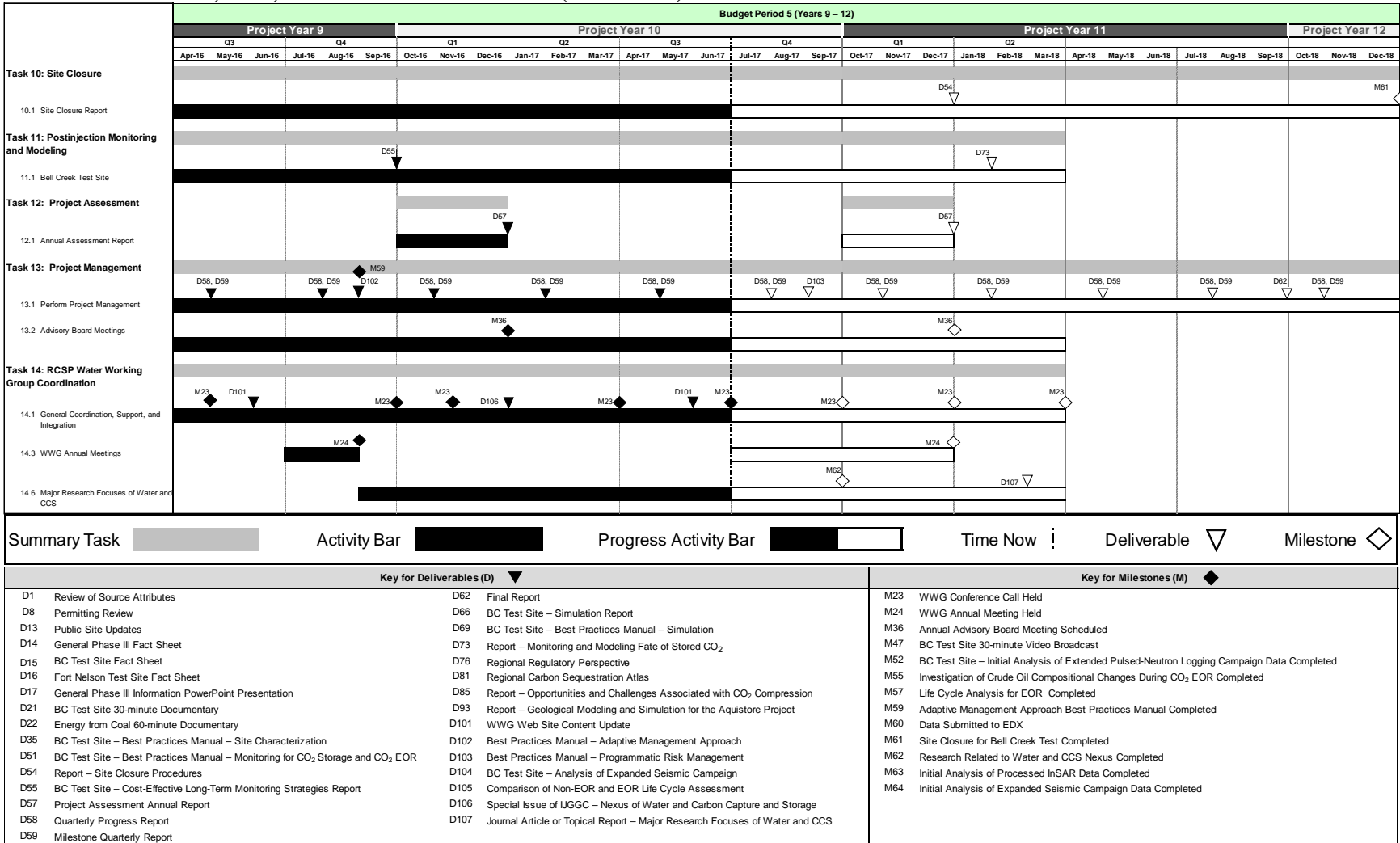
<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 11 – Quarter 1 (October–December 2017) (continued)</b>		
D54: Task 10 – Report – Site Closure Procedures	12/31/17	
D57: Task 12 – Project Assessment Annual Report	12/31/17	
M23: Task 14 – WWG Conference Call Held	12/31/17	
M24: Task 14 – WWG Annual Meeting Held	12/31/17	
M36: Task 13 – Annual Advisory Board Meeting Scheduled	12/31/17	
<b>Year 11 – Quarter 2 (January–March 2018)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/18	
D13: Task 2 – Public Site Updates	1/31/18	
D73: Task 11 – Bell Creek Test Site –Monitoring and Modeling Fate of CO <sub>2</sub> Progress Report	1/31/18	
D8: Task 3 – Permitting Review – Update 4	2/28/18	
D107: Task 14 – Journal Article or Topical Report – Major Research Focuses for Water and CCS	2/28/18	
M23: Task 14 – Monthly WWG Conference Call Held	3/31/18	

Table 13. Phase III, BP5, Years 9–12 Gantt Chart



Continued . . .

Table 13. Phase III, BP5, Years 9–12 Gantt Chart (continued)



## PHASE III PRODUCTS OR TECHNOLOGY TRANSFER ACTIVITIES

During the reporting period, one abstract was submitted, three abstracts were accepted for presentation, and 11 oral presentations were given at 11 different meetings and conferences and a workshop. In addition, a quarterly progress report, seven deliverables/milestones (three draft and four approved), and two value-added reports were completed. Two deliverables and one value-added report from previous quarters also received approval. For more detail, see the Meetings/Travel section.

### Abstracts

#### *Submitted and Accepted for Presentation*

Wildgust, N., Gorecki, C.D., Ayash, S.C., Peck, W.D., Hamling, J.A., Sorensen, J.A., Daly, D.J., Jensen, M.D., Klapperich, R.J., Heebink, L.V., Pekot, L.J., Steadman, E.N., and Harju, J.A., 2017, Demonstration of secure CO<sub>2</sub> geologic storage associated with enhanced oil recovery in the PCOR Partnership region [abs.]: Carbon Management Technology Conference 2017, Houston, Texas, July 17–20, 2017.

#### *Accepted for Presentation*

Gorecki, C.D., Ayash, S.C., Wildgust, N., Peck, W.D., Hamling, J.A., Pekot, L.J., Sorensen, J.A., Jensen, M.D., Daly, D.J., Klapperich, R.J., and Heebink, L.V., 2017, The Plains CO<sub>2</sub> Reduction (PCOR) Partnership—successes leading to new innovation [abs.]: Near Surface Geoscience Conference & Exhibition 2017, Malmo, Sweden, September 3–7, 2017.

Nakles, D.V., Peck, W.D., Wildgust, N., Hamling, J.A., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2017, Geologic storage of carbon dioxide in the central plains of North America [abs.]: 2017 American Institute of Chemical Engineers (AIChE) Annual Meeting, Minneapolis, Minnesota, October 29 – November 3, 2017.

### Presentations

Daly, D.J., and Crocker, C.R., 2017, Energy and CO<sub>2</sub> management—carbon capture and storage: Presented at the 2017 Lignite Education Seminar, Bismarck, North Dakota, June 13, 2017.

Gorecki, C.D., and Ayash, S.C., 2017, An adaptive management approach for monitoring CO<sub>2</sub> storage: Presented at the US–Taiwan International CCS Conference, Taipei, Taiwan, April 17–21, 2017.

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## **Deliverables/Milestones**

### ***Draft Submitted***

Crocker, C.R., Daly, D.J., Crossland, J.L., and Gorecki, C.D., 2017, Bell Creek Test Site – 30-minute documentary broadcast: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III draft Task 2 Milestone M47 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.

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Daly, D.J., Crocker, C.R., Wildgust, N., and Gorecki, C.D., 2017, General audience CO<sub>2</sub> sequestration outreach PowerPoint presentation: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III Task 2 Deliverable D17 (update 8) 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.

Jensen, M.D., Schlasner, S.M., Gorecki, C.D., and Wildgust, N., 2017, Opportunities and challenges associated with CO<sub>2</sub> compression and transport during CCS activities: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III Task 6 Deliverable D85 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2017-EERC-06-17, Grand Forks, North Dakota, Energy & Environmental Research Center, May.

Klapperich, R.J., Nakles, D.V., and Gorecki, C.D., 2017, Water Working Group Web site content update: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III Task 14 Deliverable D101 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2017-EERC-05-19, Grand Forks, North Dakota, Energy & Environmental Research Center, May.

## **Progress Reports**

### ***Monthlies***

Gorecki, C.D., Steadman, E.N., Peck, W.D., Daly, D.J., Hamling, J.A., Jensen, M.D., Harju, J.A., Pekot, L.J., Heebink, L.V., Klapperich, R.J., and Ensrud, J.R., 2017, Plains CO<sub>2</sub> Reduction (PCOR) Partnership: Phase III monthly report (March 1–31, 2017)) 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., Hamling, J.A., Jensen, M.D., Harju, J.A., Pekot, L.J., Heebink, L.V., Klapperich, R.J., and Ensrud, J.R., 2017, Plains CO<sub>2</sub> Reduction (PCOR) Partnership: Phase III monthly report (April 1–30, 2017)) 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., Hamling, J.A., Jensen, M.D., Harju, J.A., Pekot, L.J., Heebink, L.V., Klapperich, R.J., and Ensrud, J.R., 2017, Plains CO<sub>2</sub> Reduction (PCOR) Partnership: Phase III monthly report (May 1–31, 2017)) 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., Daly, D.J., Hamling, J.A., Jensen, M.D., Peck, W.D., Klapperich, R.J., Heebink, L.V., Pekot, L.J., Ensrud, J.R., and Votava, T.J., 2017, Plains CO<sub>2</sub> Reduction Partnership Phase III: Task 13 Deliverable D58/D59 quarterly technical progress report (January 1 – March 31, 2017) 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.

## **Value-Added Products**

### ***Submitted and Approved***

Crossland, J.L., Daly, D.J., Crocker, C.R., Botnen, B.W., Gorecki, C.D., and Steadman, E.N., 2017, Terrestrial carbon sequestration validation test: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III value-added fact sheet 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.

Crossland, J.L., Daly, D.J., and Gorecki, C.D., 2017, Household energy and carbon Web pages report: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III value-added report (January 1 –

March 31, 2017) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2017-EERC-06-12, Grand Forks, North Dakota, Energy & Environmental Research Center, April.

### ***Approved***

Crossland, J.L., Daly, D.J., and Gorecki, C.D., 2017, Household energy and carbon Web pages report: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III value-added report (January 1 – March 31, 2017) for North Dakota Department of Commerce, EERC Publication 2017-EERC-04-18, Grand Forks, North Dakota, Energy & Environmental Research Center, April.

### **Meeting Minutes**

Klapperich, R.J., 2017, Minutes—Regional Carbon Sequestration Partnerships Water Working Group conference call: March 30, 2017.

### **MEETINGS/TRAVEL**

Representatives from the PCOR Partnership incurred travel costs for their participation in the following 11 meetings/conferences and four workshops. In addition, off-site staff members traveled to the EERC on two separate occasions in this reporting period:

- April 3–7, 2017: off-site staff traveled to Grand Forks, North Dakota, to work on-site at the EERC on various projects.
- April 10–13, 2017: traveled to Chicago, Illinois, to present at and participate in the CCUS Conference.
- April 17–21, 2017: traveled to Taipei, Taiwan, to attend the U.S.–Taiwan International Carbon Capture & Sequestration Conference.
- April 18–19, 2017: traveled to Bismarck, North Dakota, to attend the LEC Annual Meeting.
- April 27 – May 4, 2017: traveled to Abu Dhabi, UAE, to attend the CSLF 2017 Mid-Year Meeting.
- May 6–10, 2017: traveled to Oklahoma City, Oklahoma, to attend the IOGCC Annual Meeting.
- May 13–21, 2017: traveled to Calgary, Alberta, Canada, to present at Geoconvention 2017.
- May 21–25, 2017: traveled to San Francisco, California, to host the PCOR Partnership TAB Annual Meeting.
- May 25–27, 2017: traveled from San Francisco, California, to Metro Park, California, to attend the 2017 SCCS Affiliates Meeting & Workshop at Stanford University.
- June 5–9, 2017: remote staff traveled to the EERC for project meetings.
- June 9–16, 2017: traveled to Paris, France, to present at the 79th EAGE Conference & Expo.
- June 12–13, 2017: traveled to Bismarck, North Dakota, to present at the LEC Teacher Seminar.

- June 12–16, 2017: traveled to Traverse City, Michigan, to attend the IEAGHG 11th Annual Network Meeting.
- June 18–22, 2017: traveled to Beaumont, Texas, to attend the 2nd International Workshop on Offshore Geologic CO<sub>2</sub> Storage.
- June 21, 2017: a staff member already in Beaumont, Texas, presented at the Lamar University Center for Innovation and Commercialization.
- June 24–28, 2017: traveled to San Francisco, California, to attend the ARMA Symposium and Hydraulic Fracturing Workshop.

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