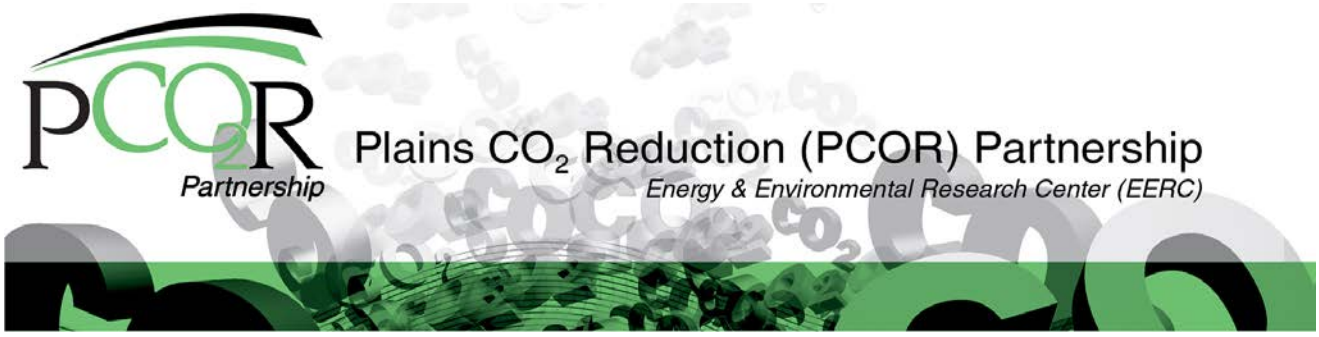

PLAINS CO_2 REDUCTION PARTNERSHIP PHASE III

Quarterly Technical Progress Report
Task 13 – Deliverable D58/D59

(for the period October 1 – December 31, 2016)

Prepared for:

Federal Information Tracking System (FITS)
National Energy Technology Laboratory
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EXECUTIVE SUMMARY

The Plains CO_2 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_2 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 October 1 through December 31, 2016.

The focus on extended and enhanced work, specifically in the Bell Creek activities, continued. As of October 31, 2016, 3.442 million tonnes of total gas (composition of approximately 98% CO_2) had been purchased for injection into the Bell Creek Field since May 2013, equating to an estimated ***3.384 million tonnes of CO_2 stored***.

The PCOR Partnership was pleased to add Tri-State Generation and Transmission Association, Inc., as a new partner in October 2016.

Ten tasks continued. In addition to the foregoing, the PCOR Partnership adaptive management approach best practices manual was submitted to DOE and the PCOR Partnership Technical Advisory Board; the PCOR Partnership Atlas 5th Edition was submitted; modeling and simulation activities continued in support of the Aquistore and Bell Creek projects; numerous interviews were performed for two documentaries, and one documentary was submitted; compilation of the regulatory permitting document continued; Bell Creek-specific life cycle assessment model development continued; a long-term, cost-effective strategy for monitoring, verification, and accounting of associated CO_2 storage at the Bell Creek Field is being developed; and a Special Issue of the *International Journal of Greenhouse Gas Control* on the nexus of water and carbon capture and storage was submitted.

PLAINS CO_2 REDUCTION PARTNERSHIP PHASE III
Quarterly Technical Progress Report
October 1 – December 31, 2016

INTRODUCTION

The Plains CO_2 Reduction (PCOR) Partnership is one of seven regional partnerships operating under the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) Regional Carbon Sequestration 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 December 31, 2016, 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	Great River Energy	North Dakota Pipeline Authority
UND EERC	Halliburton	Omaha Public Power District
Abengoa Bioenergy New Technologies	Hess Corporation	Otter Tail Power Company
Air Products and Chemicals, Inc.	Huntsman Corporation	Outsource Petrophysics, Inc.
Alberta Department of Energy	Husky Energy Inc.	Oxand Risk & Project Management Solutions
Alberta Department of Environment	Indian Land Tenure Foundation	Peabody Energy
Alberta Innovates – Technology Futures	Interstate Oil and Gas Compact Commission	Petro Harvester Oil & Gas
ALLETE	Iowa Department of Natural Resources	Petroleum Technology Research Centre
Ameren Corporation	Lignite Energy Council	Petroleum Technology Transfer Council
American Coalition for Clean Coal Electricity	Manitoba Geological Survey	Pinnacle, a Halliburton Service
American Lignite Energy	Marathon Oil Company	Prairie Public Broadcasting
Apache Canada Ltd.	MBI Energy Services	Pratt & Whitney Rocketdyne, Inc.
Aquistore	MEG Energy Corporation	Praxair, Inc.
Baker Hughes Incorporated	Melzer Consulting	Ramgen Power Systems, Inc.
Basin Electric Power Cooperative	Minnesota Power	Red Trail Energy, LLC
BillyJack Consulting Inc.	Minnkota Power Cooperative, Inc.	RPS Energy Canada Ltd.
Biorecro AB	Missouri Department of Natural Resources	Saskatchewan Ministry of Industry and Resources
Blue Source, LLC	Missouri River Energy Services	SaskPower
BNI Coal, Ltd.	Montana–Dakota Utilities Co.	Schlumberger
British Columbia Ministry of Energy, Mines, and Petroleum Resources	Montana Department of Environmental Quality	Sejong University
British Columbia Oil and Gas Commission	National Commission on Energy Policy	Shell Canada Limited
C12 Energy, Inc.	Natural Resources Canada	Spectra Energy
The CETER Group, Ltd.	Nebraska Public Power District	Suncor Energy Inc.
Computer Modelling Group Ltd.	North American Coal Corporation	TAQA North, Ltd.
Continental Resources, Inc.	North Dakota Department of Commerce Division of Community Services	TGS Geological Products and Services
Dakota Gasification Company	North Dakota Department of Health	Tri-State Generation and Transmission Association, Inc.
Denbury Resources Inc.	North Dakota Geological Survey	Tundra Oil and Gas
Eagle Operating, Inc.	North Dakota Industrial Commission Department of Mineral Resources, Oil and Gas Division	University of Alberta
Eastern Iowa Community College District	North Dakota Industrial Commission Lignite Research, Development and Marketing Program	University of Regina
Enbridge Inc.	North Dakota Industrial Commission Oil and Gas Research Council	WBI Energy, Inc.
Encore Acquisition Company	North Dakota Natural Resources Trust	Weatherford Advanced Geotechnology
Energy Resources Conservation Board/ Alberta Geological Survey	North Dakota Petroleum Council	Western Governors' Association
Environment Canada		Westmoreland Coal Company
Excelsior Energy Inc.		Wisconsin Department of Agriculture, Trade and Consumer Protection
General Electric Global Research Oil & Gas Technology Center		Wyoming Office of State Lands and Investments
Great Northern Project Development, LP		Xcel Energy

The overall mission of the Phase III program is to 1) gather characterization data to verify the ability of the target formations to store carbon dioxide (CO_2), 2) facilitate the development of the infrastructure required to transport CO_2 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_2, 5) facilitate the establishment of a technical framework by which carbon credits can be monetized for CO_2 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

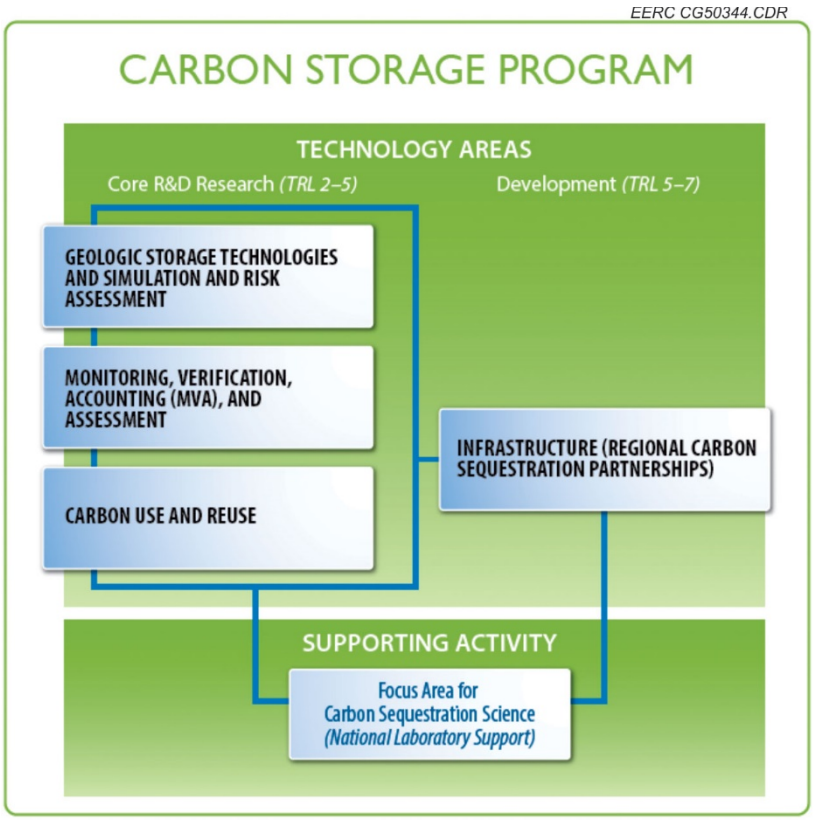

Figure 1. DOE Carbon Storage Program technology areas featuring regional partnerships (courtesy of Andrea Dunn, DOE NETL; "TRL" stands for technology readiness level).

utilize the infrastructure of its region to maximize CO_2 injection volumes. A programmatic development phase (Phase III) goal is implementation of large-scale field testing involving at least 1 million metric tons of CO_2 per project. Each of the RCSP large-volume injection tests is designed to demonstrate that the CO_2 storage sites have the potential to store regional CO_2 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_2 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_2 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_2 storage. During Phase III, the PCOR Partnership will continue to refine storage resource estimates and evaluate other factors relevant to regional storage goals.

The PCOR Partnership plans to achieve its Phase III mission through a series of 16 tasks: 1) Regional Characterization; 2) Public Outreach and Education; 3) Permitting and National Environmental Policy Act (NEPA) Compliance; 4) Site Characterization and Modeling; 5) Well Drilling and Completion (completed); 6) Infrastructure Development; 7) CO_2 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_2 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

Phase III Task Description	Task Leader
Task 1 – Regional Characterization	Wesley D. Peck
Task 2 – Public Outreach and Education	Daniel J. Daly
Task 3 – Permitting and NEPA Compliance	Charles D. Gorecki
Task 4 – Site Characterization and Modeling	James A. Sorensen
Task 5 – Well Drilling and Completion (completed)	John A. Hamling
Task 6 – Infrastructure Development	Melanie D. Jensen
Task 7 – CO_2 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_2 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:

- Received approval for Deliverable (D) 1 entitled "Review of Source Attributes" on October 6, 2016.
- Submitted Deliverable (D) 81 entitled "PCOR Partnership Atlas 5th Edition" on December 30, 2016.
- Updated information and continued work on the partners-only Decision Support System (DSS) Web site, including the following:
  - Completed draft text for an update to the Bell Creek portion.
  - Updated content on site development; regional background; site operations; characterization; MVA; and modeling/simulation activities. These updates are undergoing internal review prior to incorporation on the DSS Web site.
  - Fixed broken PCOR Partnership partner links.
  - Added several recently approved reports to the DSS.
- Continued activities to update the content of the **PCOR Partnership general database**, including the following:

  - Updated North Dakota and Montana Petra projects with the latest well, production, and injection information from each state's online resource as follows: added 149 new North Dakota wells and eight new Montana wells.
  - Updated South Dakota, Manitoba, and British Columbia projects with well and production data, as available.
  - Began importing the additional Wyoming well logs into Petra.
  - Continued database preventive maintenance of Petra projects
- Continued work on oilfield regional models, including the following:
  - Searched for North Dakota oil fields with no waterflood activities for characterization modeling efforts. Worked on digitizing well logs.
  - Searched for top and log data to construct a model of the Duperow Formation.
  - Modified the model to include the entire Beaver Creek Field. Assigned lithofacies to the wells, and upscaled the logs. Added permeability and porosity values.
  - Completed distributing properties in the Beaver Creek Field model.
  - Continued digitizing needed logs for the Gooseneck Field model.
- With regard to the **Williston Basin** CO_2 storage sink relative permeability laboratory characterization effort:
  - Completed a draft of the final value-added report, due January 31, 2017.
  - Worked on the internal review of the draft value-added report.
  - Submitted a technical paper to the 13th International Greenhouse Gas Control Technologies (GHGT-13) Conference.
- With regard to the **Aquistore** project:
  - Continued to download and process injection and pressure data as available.
  - Presented "A Numerical Simulation Update of the Aquistore CO_2 Storage Project" at the American Institute of Chemical Engineers (AIChE) Conference held November 13–18, 2016, in San Francisco, California.
  - Participated in a Science and Engineering Research Committee (SERC) call on October 5, 2016, that focused on the pulsed-neutron log (PNL) logging that Schlumberger has performed in the injection and observation wells.
  - Presented a poster entitled "Numerical Modeling of the Aquistore CO_2 Storage Project," at the GHGT-13 Conference held November 14–18, 2016, in Lausanne, Switzerland.
  - Injection data for the Aquistore injection well was not available during the reporting period.
  - With regard to static **modeling** and dynamic predictive **simulation** activities:
    - Continued to download and process daily injection rate, pressure, and temperature data as available.
    - Used CMOST to evaluate history match.
    - Continued work on regional models, including gridding the Gooseneck Field.

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 2 – Public Outreach and Education

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

- Submitted Documentary D21 entitled "The Bell Creek Story – CO_2 in Action" to DOE NETL for review on October 31, 2016.
- Submitted the value-added "Household Energy and Carbon Web Pages Report" for the July 1 – September 30, 2016, quarter on October 27, 2016.
- Submitted D15 Fact Sheet (Update) entitled "Bell Creek Integrated CO_2 EOR and Storage Project" on November 30, 2016, and received approval from DOE on December 6, 2016. However, this document has been sent to Denbury for review. Once approved by Denbury, DOE will have another opportunity to review and approve.
- Requested review of several pages (What Is CO_2?, What Is CO_2 Sequestration?, Terrestrial Sequestration, and Technical Reports) and one new page (Partners-Only Landing Page) for the public PCOR Partnership Web site update on November 3, 2016. Received approval on November 9, 2016. These updates went live November 10, 2016.
- During the quarter, the PCOR Partnership was represented by EERC personnel at 22 meetings/conferences and two workshops. Specifically, the PCOR Partnership outreach activities included 13 oral presentations, four recycled posters, one new poster, two recycled booths, and one new booth. The following quantities of PCOR Partnership outreach materials were distributed:
  - PCOR Partnership documentary entitled "Nature in the Balance: CO_2 Sequestration" – 5
  - PCOR Partnership documentary entitled "Reducing Our Carbon Footprint: The Role of Carbon Markets" – 4
  - PCOR Partnership documentary entitled "Out of the Air – Into the Soil" – 3
  - PCOR Partnership documentary entitled "Managing Carbon Dioxide: The Geologic Solution" – 12
  - PCOR Partnership documentary entitled "Global Energy and Carbon: Tracking Our Footprint" – 11
  - PCOR Partnership video training guide entitled "Installing a Casing-Conveyed Permanent Downhole Monitoring System" – 1
  - "Plains CO_2 Reduction Partnership Atlas, 4th Edition, Revised" – 43
- Uploaded an outreach-related paper related to the presentation accepted for the GHGT-13 Conference. Another paper was written in collaboration with PTRC and uploaded.
- Continued the development and internal review of two value-added fact sheets (Enhanced Oil Recovery [EOR] 101 and Green Oil).
- Continued work on the value-added update of the Phase II Terrestrial Sequestration fact sheet.
- Continued work on the draft updated Phase II Zama fact sheet.
- **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 OWG calls on October 20, 2016, and December 15, 2016. Discussed suggested topics and a schedule for calls for 2017.
    - ♦ No call was held in November.
- Continued efforts to update the **public Web site** (www.undeerc.org/pcor), including the following:
  - – Continued work on updates to the public PCOR Partnership Web site, including the following:
    - ♦ A new Partners-Only landing page.
    - ♦ A new look for the following pages: What Is CO_2?, What Is CO_2 Sequestration?, and Terrestrial Sequestration.
    - ♦ New print-friendly page PDFs for the three pages above as well as for the following pages: CO_2 Sequestration Projects and Technical Posters.
  - – Continued ongoing identification and repair of broken links.
- Senior EERC PCOR Partnership managers traveled to Plano, Texas, for a screening of Documentary D21 "The Bell Creek Story – CO_2 in Action" with Denbury Onshore (Denbury) personnel on November 7, 2016, and noted Denbury's comments.
- Continued collaborative efforts with **Prairie Public Broadcasting (PPB)**, including the following:
  - – With regard to D22, the "Coal in the Modern Age" 60-minute documentary:
    - ♦ Discussed storyline changes and an action plan with a representative from PPB and EERC management on October 14, 2016.
    - ♦ Performed additional research to add to the script.
    - ♦ Began incorporating recent interviews into the script.
    - ♦ Scheduled the final interviews for January 2017 with Ed Steadman and Roy Beard, EERC.
    - ♦ Provided the draft final script to PPB for final production.
    - ♦ Traveled to Fargo, North Dakota, on December 30, 2016, for a review meeting with PPB.
- Information regarding the **site sessions/visits** to the PCOR Partnership public Web site included the following:
  - – There were 6381 sessions/visits to the public Web site (www.undeerc.org/pcor). Traffic decreased over 29% from last quarter (9043 sessions/visits). The reason for the significant decrease is unclear at this time.
  - – There were 5553 unique visitors to the public Web site, representing a 29% decrease from last quarter (7861 visitors). In particular, 86% of these visitors were new to the Web site (visitors whose visit was marked as a first-time visit in this quarter).
  - – Of the 6381 sessions/visits, 37.5% of the Web traffic was domestic and 62.5% was international. Table 3 lists the top ten countries for visits to the PCOR Partnership Web site: United States, India, Australia, Canada, United Kingdom, Philippines, Malaysia, New Zealand, Pakistan, and Kenya. There was traffic from 130 countries overall (Figure 3).
  - – There were 424 sessions/visits originating from within the PCOR Partnership region (a 28% decrease from last quarter) (Figure 4). Approximately 64% of the regional visits originated from the United States, and 36% came from Canada. Visits from

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

	Country	Sessions/ Visits*	PCOR Partnership State/Province	Visits*
1	United States	2393		
			North Dakota	94
			Minnesota	61
			Wisconsin	39
			Missouri	35
			Montana	12
			Iowa	11
			Nebraska	9
			Wyoming	7
			South Dakota	4
2	India	1256		
3	Australia	513		
4	Canada	311		
			Alberta	81
			British Columbia	36
			Saskatchewan	22
			Manitoba	13
5	United Kingdom	250		
6	Philippines	186		
7	Malaysia	98		
8	New Zealand	90		
9	Pakistan	77		
10	Kenya	64		
	Other 120 countries	1143		
Total Sessions/Visits		**6381**	**Total PCOR Partnership Visits**	**424**

*Arranged by the number of visits to the site.

  - within the PCOR Partnership region represent approximately 6.6% 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).
- During this reporting period, a breakdown of how visitors came to the PCOR Partnership Web site, also referred to as **traffic sources** (Figure 5), 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 88% 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 "carbon sequestration," "what is CO_2," and "CO_2 sequestration."

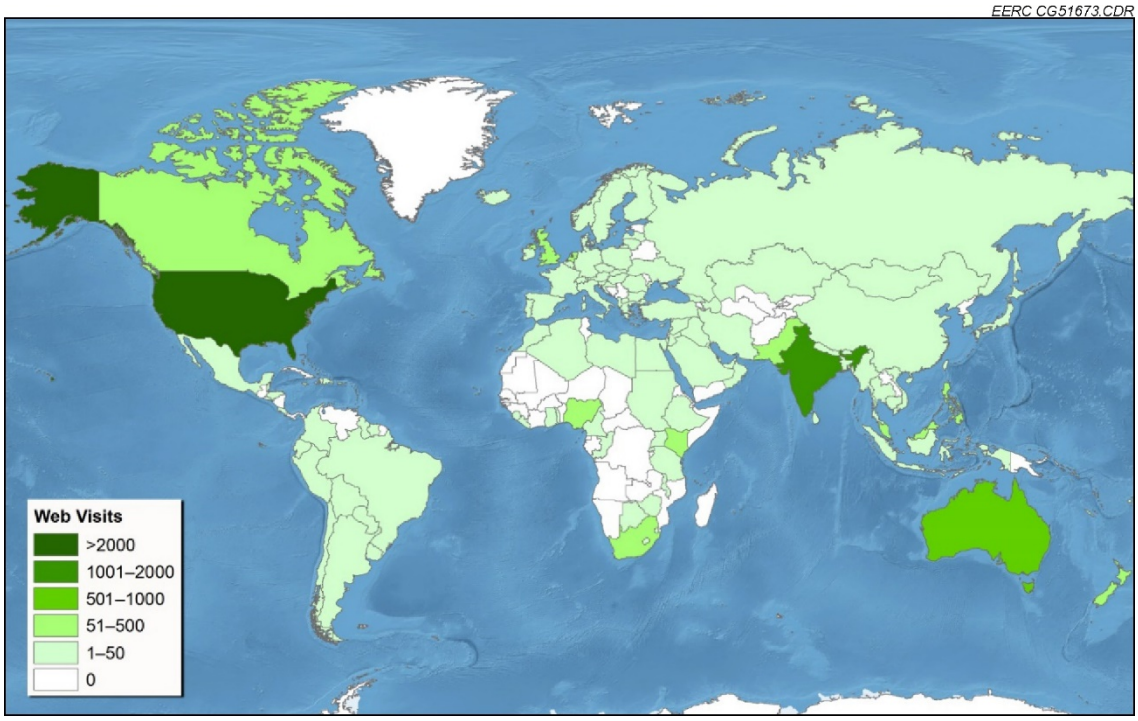

Figure 3. Map of PCOR Partnership Web site global traffic for this reporting period.

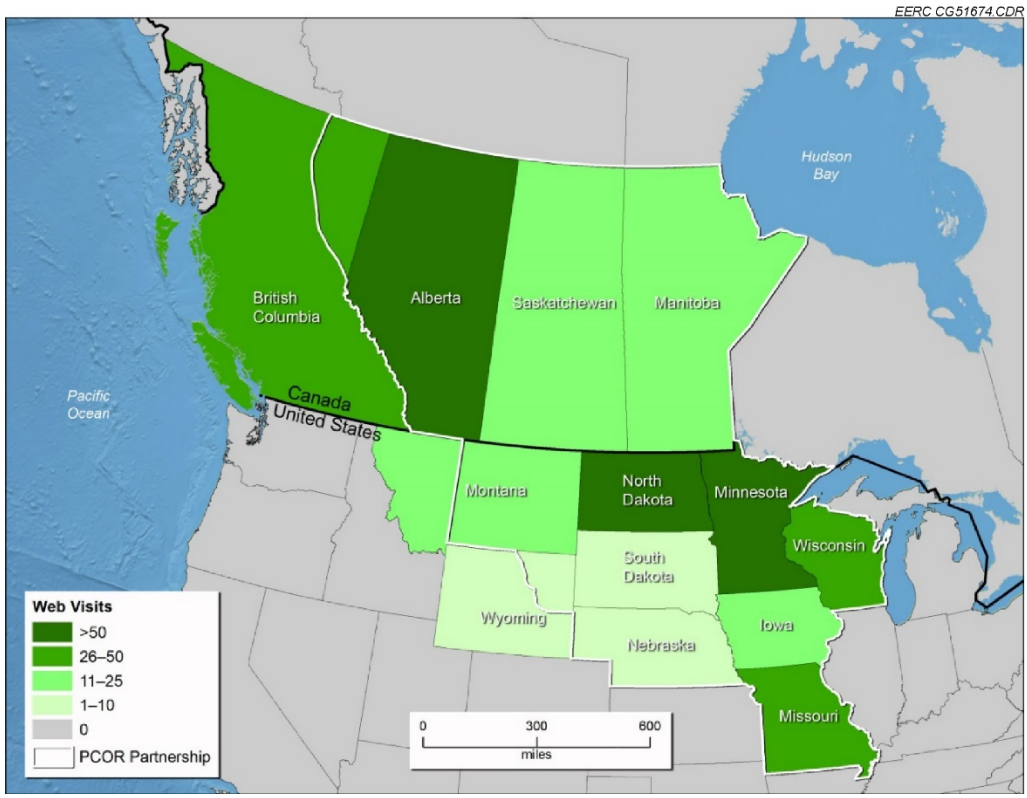

Figure 4. Map of PCOR Partnership Web site regional visits for this reporting period.

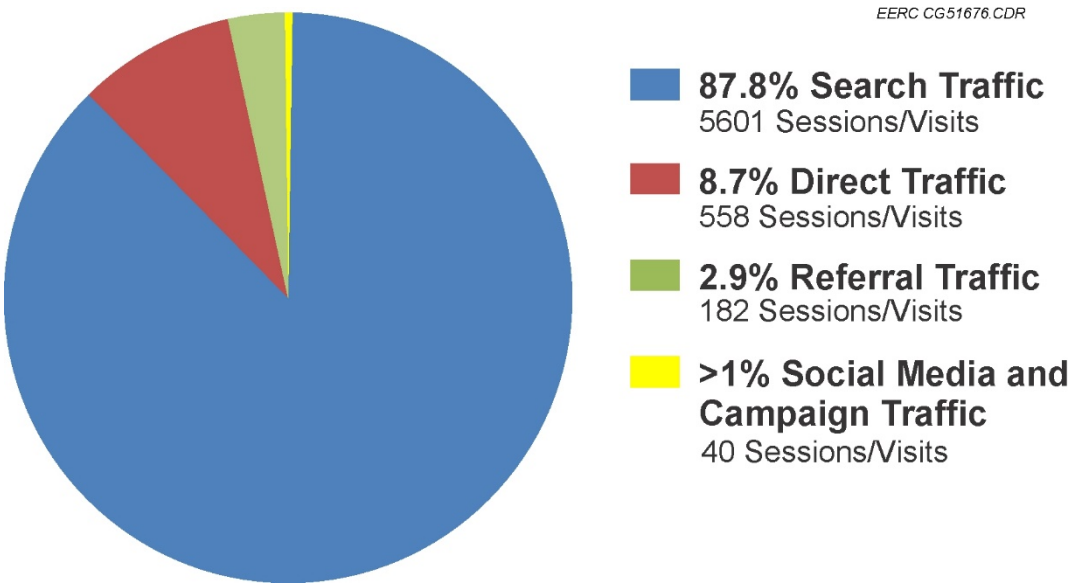

Figure 5. PCOR Partnership public Web site traffic sources for this reporting period.

  - Direct traffic consists of those visitors who bookmark or type a specific URL (e.g., www.undeerc.org/pcor) into the Web address bar. It is likely that most of the direct traffic (over 8.8%) is from persons familiar with the PCOR Partnership.
  - Referral site traffic (approximately 3%) corresponds to the traffic directed to the PCOR Partnership Web page from other sites via links. The top referring Web sites were from arthapedia.in, an Indian economy and government Web site (to the What is CO_2 Sequestration page), and energy.gov (to the Home page).
  - Less than 1% of site traffic (40 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 9596 page views (a 23% decrease from last quarter); the top five pages viewed are listed in Table 4. These five pages make up about 70% of total page views.
- 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. Three 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.
- In addition to YouTube and the public Web site, PCOR Partnership documentaries and video clips are available on PBS Learning Media. This free, online media service was developed for K–12 educators to enhance learning through images, videos, etc., and provides teachers with the ability to create custom lesson plans based on this content. Table 7 lists the top five video clips viewed during this quarter on PBS Learning Media.

Table 4. Top "Page Views" on the PCOR Partnership Public Web Site

Page Title	Page Views	% Page Views	Page
What Is CO_2 Sequestration?	4041	42.1	www.undeerc.org/pcor/sequestration/whatissequestration.aspx
What Is CO_2?	1713	17.9	www.undeerc.org/pcor/sequestration/whatisco2.aspx
Home Page	392	4.1	www.undeerc.org/pcor/default.aspx
CO_2 Sequestration Projects	337	3.5	www.undeerc.org/pcor/co2sequestrationprojects/default.aspx
Carbon and CO_2 on Earth	275	2.9	www.undeerc.org/pcor/sequestration/co2onearth.aspx

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

Video	Video Length	Views	Est. Minutes Watched	Avg. View Duration
Reforestation in Brazil	4:41	623	1418	2:30
Reducing Our Carbon Footprint: The Role of Markets Documentary	26:49	494	2451	5:00
The Phases of Oil Recovery – So Far	2:40	375	638	2:10
Installing a Casing-Conveyed Permanent Downhole Monitoring System	19:19	115	597	5:20
Household Energy Around the World	5:34	69	190	3:20

Table 6. PCOR Partnership Documentaries on PPB YouTube Channel Accessed

Video	Video Length	Views	Est. Minutes Watched	Avg. View Duration
Global Energy and Carbon: Tracking Our Footprint	26:47	783	4640	6:30
Managing Carbon Dioxide: The Geologic Solution	26:47	79	525	7:00
Out of the Air and Into the Soil	27:02	46	183	4:00

Table 7. Top Five EERC PCOR Partnership-Related Videos Viewed on PBS Learning Media

Video	Video Length	Views
CO_2 and the Greenhouse Effect	1:40	27
Household Energy Around the World	5:34	15
Carbon Capture and Storage	6:13	15
Sequestration Potential in the Prairies	2:05	15
CO_2 Flooding and Geologic Sequestration	3:13	15

- PCOR Partnership documentaries and video clips have also been made available on the North Dakota Studies Web site at ndstudies.org. This Web site promotes the teaching of North Dakota history, geography, culture, and other subjects by providing lesson plans, videos, curriculum, and images for use by teachers, students, and the general public. Table 8 lists the top video clips viewed during this quarter on ndstudies.org.

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.

Table 8. Top EERC PCOR Partnership-Related Videos Viewed on North Dakota Studies

Video	Video Length	Views
Tracking Our Footprint	3:16	2
Reforestation in Brazil	4:41	1
Sequestering Carbon in Wetlands	3:08	1
Tracking Out Footprint – Electricity	1:04	1

Task 3 – Permitting and NEPA Compliance

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

- Received approval for D8 entitled "Permitting Review – Update 3" on October 11, 2016.
- Attended the Interstate Oil and Gas Compact Commission (IOGCC) Annual Meeting in Little Rock, Arkansas, held October 2–4, 2016.
- Submitted a request for an extension on D76, Regulatory Perspective Regarding the Geologic Storage of CO_2 in the PCOR Partnership Region, to January 31, 2017. Received approval on November 2, 2016.
- The Webinar entitled "Environmental Regulations under the Trump Administration" originally scheduled to be held on December 15, 2016, was rescheduled by the presenter for January 10, 2017.
- Continued working on the regulatory permitting document for the PCOR Partnership region (D76 – Regional Regulatory Perspective). The goal of this document is to provide the PCOR Partnership states and provinces a regulatory perspective regarding the dedicated and associated geologic storage of CO_2 in the PCOR Partnership region:
  - Continued the review and edit, with a consultant from The CETER Group (CETER).
  - Held a conference call with a consultant from CETER to discuss comments from the internal review and the path forward.

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

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

Task 4 – Site Characterization and Modeling

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

- Postponed a petrophysics training event to be led by PCOR Partnership member Eric Pasternack, Outsource Petrophysics, that had been planned for December 15–16, 2016, tentatively to February 2017. The event will be held at the EERC and the North Dakota Geological Survey Wilson M. Laird Core and Sample Library.
- Discussed the EERC's modeling and simulation software capabilities and efforts related to the calculation of dynamic storage efficiency with a representative from DOE NETL. Sent a condensed version of the dynamic storage efficiency workflow used at the EERC.
- Continued work on the PCOR Partnership Site Characterization BPM (D35):
  - Held a meeting to discuss D35. Discussion centered on associated storage versus dedicated storage. Also discussed terminology such as CCS; carbon capture, utilization, and storage (CCUS); geologic storage, etc. Adjusted the BPM outline to reflect these discussions. Wrote introductory text for the BPM that discusses these ideas.
  - Continued modifications to the outline.
  - Modified and added to the executive summary and the introduction.
  - Continued writing and revising text and creating figures, including Sections 1–6.
  - Continued initial internal review of sections throughout the writing process.
- **Bell Creek** test site activities included the following:
  - With regard to **modeling** efforts, the following activities occurred:
    - Continued to evaluate and input Bell Creek petrophysical property distributions into the Version 3 model.
    - Continued minor adaptations to the Version 3 model for Bell Creek Phase Areas 4 and 5.

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

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

Task 5 – Well Drilling and Completion

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:

- Worked on the 2017 update to D85 (Opportunities and Challenges Associated with CO_2 Compression and Transportation During CCUS Activities).
- Continued work on an updated version of the 2011 CO_2 capture technologies overview value-added document:
  - Continued to incorporate technology updates and new technologies into the update.
  - Continued to edit text of the summary to reflect status changes, new vendor information, etc.

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_2 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 three memos regarding official updated volumes of tonnes of CO_2 purchased for injection and tonnes of CO_2 stored at Bell Creek. At the end of BP4 (March 31, 2016), 2.979 million tonnes of CO_2 had been stored.
  - Submitted a memo on October 21, 2016. As of August 31, 2016, the most recent month of record, 3.290 million tonnes of total gas (composition of approximately 98% CO_2) has been purchased for injection into the Bell Creek Field, equating to an estimated ***3.235 million tonnes of CO_2 stored*.**
  - Submitted a memo on November 21, 2016. As of September 30, 2016, the most recent month of record, 3.374 million tonnes of total gas (composition of approximately 98% CO_2) has been purchased for injection into the Bell Creek Field, equating to an estimated ***3.318 million tonnes of CO_2 stored***.
  - Submitted a memo on December 7, 2016. As of October 31, 2016, the most recent month of record, 3.442 million tonnes of total gas (composition of approximately 98% CO_2) has been purchased for injection into the Bell Creek Field, equating to an estimated ***3.384 million tonnes of CO_2 stored***.
- Submitted D105 entitled "Comparison of Non-EOR and EOR Life Cycle Assessments" on October 31, 2016. This report has been provided to Denbury for concurrent review. This concludes the life cycle analysis (LCA) task.
- Drafted a paper entitled "The Value of 4-D Seismic Monitoring at the Bell Creek – A Mature Oilfield Undergoing CO_2 Enhanced Oil Recovery" to be presented at a

European Association of Geoscientists and Engineers (EAGE) conference. The paper is due January 2017.

- Held a Bell Creek project update meeting with Denbury on October 17, 2016, in Plano, Texas. Discussions included the fall 2016 PNL program, a geophysics update, InSAR (interferometric synthetic aperture radar) analysis, a geomodeling and simulation update, the Bell Creek-specific life cycle assessment, and general topics
- Submitted M52 entitled "Bell Creek Test Site – Analysis of Extended Pulsed-Neutron Log Campaign Data Completed" on November 29, 2016, and received approval in December 2016.
- Received approval of a revision of D66 (Bell Creek Test Site – Simulation Report [Update 4]) on October 13, 2016, with comments from Denbury incorporated.
- Presented "Lessons Learned in Near-Surface Monitoring for Large-Scale CO_2 Storage" at the AIChE Conference held November 13–18, 2016, in San Francisco, California.
- Held a Schlumberger-led geophysical logging training workshop at the EERC October 31 – November 4, 2016. It covered tools, principles, applications, and processing of various geophysical logging techniques that can be used to collect data for modeling and MVA.
- Conducted a series of WebEx meetings with a representative from CETER to review and discuss InSAR, modeling, PNL, and seismic activities at Bell Creek for use in evaluating the MVA program relative to risk assessment as part of MVA BPM development.
- Submitted a paper entitled "Measured Crude Oil MMPs (minimum miscibility pressures) with Pure and Mixed CO_2, Methane, and Ethane, and Their Relevance to Enhanced Oil Recovery from Middle Bakken and Bakken Shales" prepared for presentation at the Society of Petroleum Engineers (SPE) Canada Unconventional Resources Conference to be held in Calgary, Alberta, Canada, February 15–16, 2017. The paper covers work performed under the PCOR Partnership and a Bakken-related EERC project.
- Gave three presentations at the GHGT-13 Conference held November 14–18, 2016, in Lausanne, Switzerland. The titles and lead authors are as follows:
  - "Monitoring 3.2 million tons of CO_2 at the Bell Creek Oil Field" (John Hamling).
  - "4-D Seismic Monitoring of Injected CO_2 Enhances Geological Interpretation, Reservoir Simulation, and Production Operations" (Shaughn Burnison).
  - "Impact of CO_2 Impurity on MMP and Oil Recovery Performance of Bell Creek Oil Field" (Lu Jin).
- Completed work on LCA of oil produced during EOR compared with oil produced conventionally. The draft report (D105) was prepared and submitted on October 31, 2016.
- Continued **Bell Creek** site activities, including the following:
  - Used the most recent publicly available data to determine that cumulative total CO_2 gas injection is 6,137,704 tonnes through October 31, 2016. 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_2 (Table 9).
  - As of October 31, 2016, the most recent month of record during this reporting period, 3.442 million tonnes of total gas (composition of approximately 98% CO_2)

Table 9. Bell Creek CO_2 Gas Injection Totals for October 2016 (cumulative totals May 2013 to October 2016)[1]

	October 2016 Injection
Total, Mscf	3,621,869
Total, tons[2]	207,165
Total, tonnes[2]	188,120
Cumulative Total, Mscf[2]	118,169,212
Cumulative Total, tons[2,3]	6,759,092
Cumulative Total,tonnes[2,3]	6,137,704

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

[1] There has been a lag in posting of injection/production volumes to the MBOG database. Total gas injection volumes are ***NOT CORRECTED*** for gas composition and include the combined purchased and recycled gas streams.

[2] This was calculated utilizing a conversion of 17.483 Mscf/ton and 19.253 Mscf/tonnes.

[3] Cumulative totals are for the period from May 2013 to the month listed.

has been purchased for injection into the Bell Creek Field, equating to an estimated 3.384 million tonnes of CO_2 stored (Table 10), 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_2 storage volume estimate by correcting the gas purchase volume (approximately 98% CO_2) obtained from Denbury's custody transfer meter with gas compositional data.

– With regard to **modeling** and **simulation** efforts:
  - ♦ Consistent progress since April 2011.
  - ♦ History match is complete for Bell Creek Phases 1–3. Prediction simulation is complete for Bell Creek Phases 1 and 2. CO_2 migration simulation is complete for Bell Creek Phases 3–7.

    Analyzed production–injection data for the whole Bell Creek Field for CO_2 flooding. Integrated the processed CO_2-flooding data through April 2016 into the Bell Creek Phase 3 simulation model, and adjusted the simulation model to match the production data.

Table 10. Cumulative Total Gas Purchased and Estimated Associated CO_2 Storage Volumes for the Bell Creek Field[1]

	October 2016 Gas Totals
Monthly Total Gas Purchased, MMscf[2]	1302
Monthly Total Gas Purchased, million tons[2]	0.074
Monthly Total Gas Purchased, million tonnes[2]	0.068
Cumulative Total Gas Purchased, MMscf[2,3]	66,261
Cumulative Total Gas Purchased, million tons[2,3]	3.790
Cumulative Total Gas Purchased, million tonnes[2,3]	3.442
Cumulative Total CO_2 Stored, MMscf[3,4]	65,160
Cumulative Total CO_2 Stored, million tons[3,4]	3.727
Cumulative Total CO_2 Stored, million tonnes[3,4]	3.384

[1] Conversion factors of 17.483 Mscf/ton and 19.253 Mscf/tonne were used to calculate volumes.

[2] Total gas purchase volumes are ***NOT CORRECTED*** for gas composition.

[3] Cumulative totals are for the period from May 2013 to the month listed.

[4] Total CO_2 stored volumes are ***CORRECTED*** for gas composition.

- Generated simulation results for use in D66.
- Successfully matched the CO_2-flooding history for Phase 3.
- Worked on designing new continuous CO_2 injection (CCI) and water alternating gas (WAG) predictive simulation cases for oil production and CO_2 storage prediction.
- Generated plots for CO_2 flooding and associated storage performance analysis for the entire field, including oil production, water production and injection, and gas production, injection, and storage.
- Constructed ten simulation cases with the main impurities observed in recycled gas using the seven-component PVT (pressure, volume, temperature) model in the Bell Creek Phase 1 and 2 areas for long-term performance prediction and comparison.
- Continued processing prediction/injection historical data for wells in Bell Creek Phase 4 and the nearby area and developing a simulation model to be used for history matching and prediction simulation of the Bell Creek Phase 4 area.
- Continued dynamic reservoir pressure and multiphase fluid flow simulation efforts:
  - Consistent progress since April 2011.
  - History matching is complete for Bell Creek Phases 1–3. Predictive simulation is complete for Bell Creek Phases 1 and 2. Long-term simulations of CO_2 migration are complete for Bell Creek Phases 3–7.
  - History-matched the primary depletion stage in the Bell Creek Phase 4 area in the Version 2 geologic model.
  - Worked on debugging the simulation model based on the Version 3 geologic model.
  - Improved the permeability distribution in the Phase 4 simulation model based on production data.
  - Continued processing production/injection historical data for wells in Bell Creek Phase 4 and nearby areas and developing a simulation model to be used for history matching and predictive simulations of the Bell Creek Phase 4 area. Integrated approximately 50 years of production/injection data into the Bell Creek Phase 4 simulation model, covering primary production, waterflooding, and CO_2 EOR stages in the phase.
  - Ran simulation cases for history match in the Bell Creek Phase Area 4 simulation model on the primary depletion stage.
  - Calculated original oil, gas, and water in place in the Bell Creek Phase Area 4 simulation model based on the Version 2 geologic model and compared the results to the production history.
  - Converted the initial Version 3 geologic model to a simulation model. Integrated completion data, PVT data, and production history into the dynamic model.

– 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.
- Completed processing the 05-06 OW data sets through July 11, 2016.

♦ Continued working with the fall 2015 4-D surface seismic data set from Bell Creek, including the following:
- Continued 4-D seismic data analysis and interpretation. Analysis included data from May 22 – September 5, 2013.
- Visualization and interpretation of 4-D seismic amplitude maps with respect to the estimated CO_2 volume injected for the periods between August 2012 – October 2014 and August 2012 – September 2015.
- Performed an initial run of prestack inversion to examine the pressure effect in the Bell Creek oil field. Worked on well-based velocity model generation, angle gather generation, extraction of wavelets, correlation of wells, and building an initial model. Applied inversion analysis to the volume to generate S-wave and P-wave velocities, density, Vp/Vs ratio, and P-impedance and S-impedance volumes for the baseline (2012) data.
- Performed inversion for S-wave velocity at Bell Creek using HampsonRussell, a geophysical processing and interpretation software package.

♦ Continued Bell Creek microseismic data processing, including the following:
- Worked to improve the automation of the data processing using the MiVu software modules Model Building, Survey Design, and Visualization.
- Created the first iteration of a 3-D model for event location and magnitude estimation.
- Installed a new version of GeoTomo software. This included MiVu (microseismic tool), VECON (modeling tool), and GeoThrust (surface seismic tool). Began using the new MiVu version to process microseismic data.
- Initiated a numerical modeling exercise in MiVu (microseismic tool). The objective is to use synthetic events of different magnitudes to improve the data-processing workflow, location, and magnitude estimations when using real data.
- Used available information, including vertical seismic profile (VSP) and surface seismic data and horizons, to improve the initial velocity model for microseismic event localization.

– With regard to **injection-phase PNL** activities:

♦ Submitted a revised fall 2016 PNL logging program to a representative at Denbury based on discussions held at the update meeting on October 17, 2016, in Plano, Texas. Fifteen candidate wells in Bell Creek Phases 1 and 4 were selected for repeats, with acquisition of eleven Bell Creek Phase 1 production wells scheduled for December 2016 and acquisition of four Bell Creek Phase 4 production wells scheduled for spring 2017 (pending sufficient CO_2 breakthrough). The wells are located in the seismic study area, so the PNL data from these wells could be used in production analysis, static modeling, seismic study, and dynamic simulation.

♦ Received concurrence from Denbury on the expanded Bell Creek PNL program. Eleven (11) wells (Bell Creek Phase Areas 1 and 3) will be logged this winter, and four wells are tentatively planned to be logged next spring (2017). Discussed

the expanded Bell Creek PNL program with representatives from Denbury and Schlumberger.
    - ♦ Discussed the expanded Bell Creek PNL acquisition plans with representatives from Denbury and Schlumberger and tentatively scheduled field acquisition to begin the week of January 3, 2017.
  - With regard to **injection-phase sampling** activities:
    - ♦ Travel for Bell Creek activities:
      - Staff traveled to Gillette, Wyoming on December 9–21, 2016, to collect PNLs.
      - Continued working with a representative from Denbury on the fourth round of oil sample collection from a select group of wells in Bell Creek.
      - Worked with Denbury personnel to initiate the fifth round of oil sample collection from a select group of wells in the Bell Creek Field.
      - Completed analyses of oil samples collected from 2014 through October 2016 from the Bell Creek oil field for oil compositional monitoring. Completed initial data reduction. The data are undergoing internal review.
      - Analyzed 35–40 soil–gas samples collected at the Bell Creek Field site during the October 2016 sampling event. This represents one of the last small-scale sampling events (soil–gas profile stations only) that will be conducted. This work was conducted in order to provide a data set to look at long-term annual trends in natural soil gas variability.
      - Completed the analysis of purchase/recycle CO_2 gas samples collected from the Bell Creek Field on November 29, 2016.
      - Continued looking into modeling options as a way to validate experimental data from the vanishing interfacial technique. This technique is used to determine MMP.
    - ♦ A summary of all oil and CO_2 gas stream samples collected for analyses to date is provided in Table 11.
    - ♦ Completed processing the field meter readings of Fox Hills Formation monitoring wells (two samples total) from May 2016.

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

- The SuperMicro Linux personal computer operational issues for the borehole seismic array for passive seismic monitoring of 04-03 OW were resolved, and the machine was brought to the Bell Creek Field for reinstallation on November 30, 2016. However, during installation, the GeoRes acquisition system failed to boot and then failed to power up (switch appears to be broken). Both systems were brought back to the EERC. In-house testing has been completed. A reinstallation is anticipated during the next geophysics visit to the Bell Creek Field.
- The expanded PNL acquisition (11 production wells in development Phases 1 and 3) was postponed to January 2017.
- Fourty-eight crude oil samples that were collected from seven wells (starting in January 2014) were analyzed by high-resolution gas chromatography coupled with flame ionization detection (GC/FID) to determine if changes in the hydrocarbon molecular weight

Table 11. Oil and CO_2 Gas Stream Sampling and Analyses

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

[1] P = purchase CO_2 gas stream, R = recycle CO_2 gas stream, O = produced oil stream, and G = produced CO_2 gas stream.
[2] Oil samples collected but not yet analyzed.

distributions in produced oil occur during the EOR operations. Crude oil sampling is continuing, and new samples will be analyzed in the same manner as they become available.

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:

- 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 12 – Project Assessment

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

- Worked on compilation of the annual report.

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:

- Submitted M36 entitled "Technical Advisory Board Meeting Scheduled" on December 28, 2016.
- Hosted a meeting with Richard Esposito, Southeast Regional Carbon Sequestration Partnership (SECARB), to discuss updates related to PCOR Partnership and SECARB among other research projects on October 25, 2016, at the EERC.
- Attended the GHGT-13 Conference held November 14–18, 2016, in Lausanne, Switzerland. Charlie Gorecki, John Hamling, Neil Wildgust, and Nick Bosshart served as chairs or cochairs for sessions at the conference. All presentations and a PDF of a poster were provided to DOE under separate cover on November 14. 2016. Presentations, with the corresponding PCOR Partnership task, included the following:
  - Task 1: Relative Permeability of Williston Basin CO_2 Storage Targets
  - Task 1: Numerical Modeling of the Aquistore CO_2 Storage Project
  - Task 2: Regionwide and Project-Level Outreach – The PCOR Partnership Approach
  - Task 9: Monitoring 3.2 million tons of CO_2 at the Bell Creek Oil Field
  - Task 9: 4-D Seismic Monitoring of Injected CO_2 Enhances Geological Interpretation, Reservoir Simulation, and Production Operations

  - Task 9: Impact of CO_2 Impurity on MMP and Oil Recovery Performance of Bell Creek Oil Field
  - Task 9: Effects of Reservoir Temperature and Percent Levels of Methane and Ethane on CO_2/Oil MMP Values as Determined Using Vanishing Interfacial Tension/Capillary Rise
  - Task 9: A Life Cycle Analysis of Incremental Oil Produced via CO_2 EOR
- Attended the Midwest Regional Carbon Sequestration 2016 Annual Partners Meeting held November 2, 2016, in Columbus, Ohio.
- Worked on addressing a request to revise the PCOR Partnership case studies for the DOE Simulation and Risk Assessment BPM received from Sarah Wade. The revised case studies and comments on the draft Simulation and Risk Assessment BPM were submitted to Ms. Wade on October 14, 2016.
- Began compiling project information for the upcoming IEA Greenhouse Gas R&D Programme Fiscal Year 2017 (FY17) Regional Carbon Sequestration Partnerships (RCSP) Expert Review to be held January 23–27, 2017, in Pittsburgh, Pennsylvania. Submissions included the following:
  - Submitted the Project Technical Summary to PCOR Partnership program manager on December 9, 2016, for DOE to upload to a SharePoint site for transfer to the peer review panel.
  - Submitted the draft PowerPoint presentation to the PCOR Partnership program manager on December 21, 2016. Following review, submitted the final presentation on December 22, 2016, for DOE to upload to a SharePoint site for transfer to the peer review panel.
- Received a request from DOE to review and provide comments on a DOE NETL RCSP poster for the GHGT-13 Conference. The poster was reviewed and comments were provided on October 31, 2016.
- Received feedback from PCOR Partnership Technical Advisory Board (TAB) members Stefan Bachu and Ray Hattenbach on the Adaptive Management Approach BPM (D102). Once all comments from TAB have been received, a revised version of the document will be issued.
  - Worked with a consultant from CETER to revise D102, incorporating comments received from TAB members.
  - A revised final draft was completed and is undergoing additional internal review.
- Held a task leader meeting October 10, 2016. Topics discussed included Bell Creek and Aquistore project updates, the upcoming RCSP peer review, past and upcoming conferences, upcoming training opportunities, and task leader updates.
- Completed PCOR Partnership Programmatic and Bell Creek-specific risk assessment workshops. These were led via WebEx by project consultants from CETER with the purpose of updating the risk registers and assessing the likelihood of occurrence and severity of impact should the risk occur. This information will be used to help track the risk profiles of the Bell Creek project and overall PCOR Partnership program.
- Worked on compiling project information for the upcoming IEA Greenhouse Gas R&D Programme FY17 Expert Review to be held January 23–27, 2017, in Pittsburgh, Pennsylvania. Selected and submitted three technical documents highlighting the PCOR Partnership's work to the Peer Review panel:

  - Plains CO_2 Reduction (PCOR) Partnership Atlas, 4th Edition, Revised
  - Fort Nelson Carbon Capture and Storage Feasibility Study – A Best Practices Manual for Storage in a Deep Carbonate Saline Formation
  - How Green Is My Oil? A Detailed Look at Greenhouse Gas Accounting for CO_2 Enhanced Oil Recovery (CO_2 EOR) Sites
- Submitted a revised list of recommended FY17 quarterly DOE-tracked milestones upon DOE's request.
- Held a task leader meeting November 1, 2016. Topics discussed included interviewing additional personnel, planning for the upcoming RCSP Expert Review, upcoming conferences and meetings, and task updates. Also discussed the continued commercial interest in PCOR Partnership membership.
- Held a task leader meeting December 8, 2016. Topics discussed included preparations for the January 2017 RCSP peer review, Bell Creek and Aquistore project updates, past and upcoming conferences, upcoming training opportunities, and task leader updates.
- Held two planning meetings for the 2017 PCOR Partnership Annual Membership Meeting. Topics discussed included possible locations, potential dates, and the focus/goal of the meeting.
- Worked on selecting a date for the 2017 annual TAB meeting.
- Upon request, compiled and submitted a response to DOE regarding PCOR Partnership international collaboration during the October–December 2016 quarter.
- Deliverables and milestones completed in October:
  - September monthly update
  - Task 2: D21 – Bell Creek Test Site 30-minute Documentary
  - Task 9: D105 – Comparison of Non-EOR and EOR Life Cycle Assessments
  - Task 13: D58/D59 – Quarterly Progress Report/Milestone Quarterly Report
- Deliverables and milestones completed in November:
  - October monthly update
  - Task 2: D15 – Bell Creek Integrated CO_2 EOR and Storage Project Fact Sheet (update)
  - Task 9: M52 – Bell Creek Test Site – Analysis of Extended Pulsed-Neutron Log Campaign Data Completed
- Deliverables and milestones completed in December:
  - November monthly update
  - Task 1: D81 – PCOR Partnership Atlas 5th Edition
  - Task 12: D57 – Annual Assessment Report
  - Task 13: M36 – TAB Meeting Scheduled
  - Task 14: D106 – Special Issue of IJGGC (International Journal of Greenhouse Gas Control) – Nexus of Water and Carbon Capture and Storage

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:

- Agreed to participate as a panelist for the "Science Challenges to Improve Industrial Water Use" panel at the DOE workshop: Basic Research Needs for the Energy–Water Nexus: New Approaches to Ensure Robust and Secure Energy and Water Systems to be held January 4–6, 2017, in North Bethesda, Maryland.
- Submitted D106 entitled "Special Issue of IJGGC – Nexus of Water and Carbon Capture and Storage" on December 29, 2016.
- Continued work on a draft outline for D107 (Journal Article or Topical Report – Major Research Focuses for Water and CCS).
- With regard to the Special Issue of IJGGC on the "Nexus of Water and Carbon Capture and Storage":
  - Submitted the introductory article and recommended journal publications to IJGGC for the special issue.
- Held the quarterly conference call on November 16, 2016. Topics included the following:
  - Discussed progress on the IJGGC Special Issue and the outline for D107 (Journal Task 14 – RCSP WWG Coordination
- Sent notes from the November 16, 2016, fall quarter WWG conference call to WWG members.

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_2 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 (Modification No. 35) budget along with actual costs incurred and in-kind cost share reported are shown in Table 12. A spending plan for BP5 and actual incurred cost by quarter of cash funds for BP5 are provided in Figure 6 and Table 13.

Table 12. Phase III Budget – BP5

Organization	Approved Budget, $*	Actual Costs Incurred, $
DOE Share – Cash	13,946,212	5,083,286
Nonfederal Share	5,711,194	5,574,544
Total	19,657,406	10,657,830

*As of Modification No. 35.

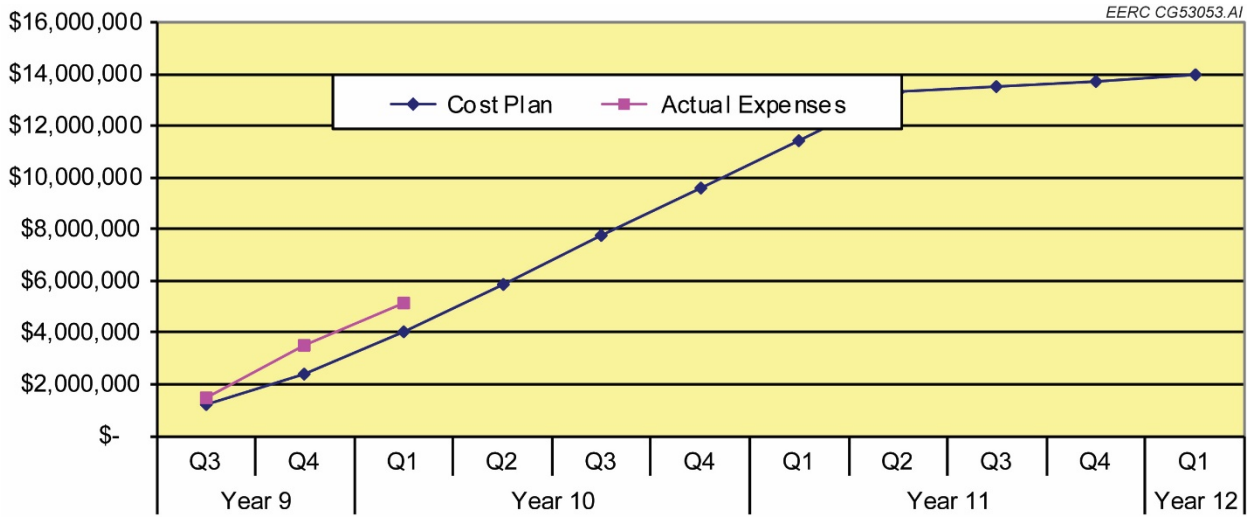

Figure 6. PCOR Partnership Phase III, BP5, Years 9–12 funding (cash only).

PHASE III SCHEDULE STATUS

Table 14 lists all deliverables and milestones by quarter, with completion dates, through the end of the reporting period (see Table 15 for the Gantt chart for BP5, Years 9–12).

Table 13. 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	$ 60,477,018	$ 1,497,211	$ 1,497,211	$ 1,962,929	$ 3,460,140	$ 1,623,146	$ 5,083,286						
Nonfederal Share	$ (4,110)	$ 2,991,641	$ 10,655	$ 3,002,296	$ 7,501	$ 7,501	$ 30,340	$ 37,841	$ 10,788	$ 48,629						
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						
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)						
Nonfederal Share	$ 4,110	$ (579,670)	$ (10,655)	$ (590,325)	$ (7,501)	$ (7,501)	$ (30,340)	$ (37,841)	$ (10,788)	$ (48,629)						
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)						

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 14. Phase III Milestones and Deliverables

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

Continued . . .

Table 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 2 – Quarter 2 (January–March 2009)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/09	1/30/09
M21: Task 14 – Outline of White Paper on Nexus of CO_2 CCS and Water, Part Subtask 14.2 – White Paper on Nexus of CCS and Water	2/28/09	2/27/09
D24: Task 2 – PCOR Partnership Region Sequestration General Poster	3/31/09	3/31/09
Year 2 – Quarter 3 (April–June 2009)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/09	4/30/09
M23: Task 14 – Monthly WWG Conference Call Held	4/30/09	4/15/09
D2: Task 1 – First Target Area Completed	5/29/09	5/29/09
M23: Task 14 – Monthly WWG Conference Call Held	5/29/09	5/29/09
D16: Task 2 – Fort Nelson Test Site Fact Sheet	5/29/09	5/29/09
M24: Task 14 – WWG Annual Meeting Held	5/31/09	5/07/09
M23: Task 14 – Monthly WWG Conference Call Held	6/30/09	6/25/09
Year 2 – Quarter 4 (July–September 2009)		
M23: Task 14 – Monthly WWG Conference Call Held	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 14. Phase III Milestones and Deliverables (continued)

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

Continued . . .

Table 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 4 – Quarter 1 (October–December 2010)		
D87: Task 4 – Bell Creek Test Site – Geomechanical Experimental Design Package	10/30/10	10/29/10
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/10	10/29/10
M23: Task 14 – Monthly WWG Conference Call Held	10/31/10	10/26/10
M23: Task 14 – Monthly WWG Conference Call Held	11/30/10	Waived by DOE
D57: Task 12 – Project Assessment Annual Report	12/31/10	12/23/10
M23: Task 14 – Monthly WWG Conference Call Held	12/31/10	12/13/10
Year 4 – Quarter 2 (January–March 2011)		
M8: Task 4 – Bell Creek Test Site Wellbore Leakage Data Collection Initiated	1/15/11	1/14/11
D31: Task 4 – Bell Creek Test Site – Geological Characterization Experimental Design Package	1/31/11	1/27/11
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/11	1/31/11
M23: Task 14 – Monthly WWG Conference Call Held	1/31/11	1/19/11
M28: Task 4 – Bell Creek Geological Experimental Design Package Completed	1/31/11	1/27/11
D15: Task 2 – Bell Creek Test Site Fact Sheet	2/28/11	2/28/11
M23: Task 14 – Monthly WWG Conference Call Held	2/28/11	Waived by DOE
D10: Task 1 – Demonstration Project Reporting System Update	3/31/11	3/25/11
D18: Task 2 – Bell Creek Test Site PowerPoint Presentation (update)	3/31/11	3/31/11
D26: Task 2 – Fort Nelson Test Site Poster	3/31/11	3/31/11
D28: Task 3 – Environmental Questionnaire – Bell Creek Test Site	3/31/11	3/30/11
D85: Task 6 – Report – Opportunities and Challenges Associated with CO_2 Compression and Transportation During CCS Activities	3/31/11	3/31/11
M23: Task 14 – Monthly WWG Conference Call Held	3/31/11	3/22/11
Year 4 – Quarter 3 (April–June 2011)		
M30: Task 5 – Bell Creek Test Site Baseline MVA Initiated	4/01/11	3/24/11
M23: Task 14 – Monthly WWG Conference Call Held	4/30/11	4/21/11
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/11	4/29/11
D88: Task 13 – Programmatic Risk Management Plan	4/30/11	4/29/11
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/11	5/31/11
D34: Task 4 – Bell Creek Test Site – Baseline Hydrogeological Final Report	5/31/11	5/31/11

Continued . . .

Table 14. Phase III Milestones and Deliverables (continued)

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

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

Continued . . .

Table 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 5 – Quarter 2 (January–March 2012)		
M16: Task 4 – Bell Creek Test Site – Initiation of Production and Injection Simulation	1/13/12	12/29/11
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/12	1/31/12
D65: Task 4 – Fort Nelson Test Site – Site Characterization Report	1/31/12	1/31/12
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	1/31/12	1/31/12
M23: Task 14 – Monthly WWG Conference Call Held	1/31/12	1/19/12
M29: Task 4 – Fort Nelson Site Characterization Report Completed	1/31/12	1/31/12
D91: Task 16 – Report – Geological Characterization of the Basal Cambrian System in the Williston Basin	2/29/12	2/29/12
M23: Task 14 – Monthly WWG Conference Call Held	2/29/12	2/28/12
D5: Task 1 – Second Target Area Completed	3/31/12	3/30/12
D18: Task 2 – Bell Creek Test Site PowerPoint Presentation (update)	3/31/12	3/30/12
M10: Task 4 – Bell Creek Test Site Wellbore Leakage Data Collection Completed	3/31/12	3/12/12
M36: Task 13 – Annual Advisory Board Scheduled	3/31/12	3/28/12
M23: Task 14 – Monthly WWG Conference Call Held	3/31/12	3/27/12
Year 5 – Quarter 3 (April–June 2012)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/12	4/30/12
M23: Task 14 – Monthly WWG Conference Call Held	4/30/12	Waived by DOE
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/12	5/31/12
M23: Task 14 – Monthly WWG Conference Call Held	5/31/12	5/31/12
D19: Task 2 – Fort Nelson Test Site PowerPoint Presentation (update)	6/30/12	6/29/12
D41: Task 4 – Fort Nelson Test Site – Geochemical Report	6/30/12	6/29/12
D84: Task 6 – Report – A Phased Approach to Building Pipeline Network for CO_2 Transportation During CCS	6/30/12	6/29/12
M23: Task 14 – Monthly WWG Conference Call Held	6/30/12	6/28/12
M24: Task 14 – WWG Annual Meeting Held	6/30/12	5/3/12
M32: Task 4 – Fort Nelson Geochemical Report Completed	6/30/12	6/29/12

Continued . . .

Table 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 5 – Quarter 4 (July–September 2012)		
D13: Task 2 – Public Site Updates	7/31/12	7/31/12
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/12	7/31/12
D67: Task 9 – Fort Nelson Test Site – Simulation Report	7/31/12	7/31/12
M23: Task 14 – Monthly WWG Conference Call Held	7/31/12	7/24/12
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/12	8/31/12
M23: Task 14 – Monthly WWG Conference Call Held	8/31/12	8/30/12
D1: Task 1 – Review of Source Attributes	9/30/12	9/28/12
D10: Task 1 – DPRS Update	9/30/12	9/28/12
M23: Task 14 – Monthly WWG Conference Call Held	9/30/12	9/27/12
Year 6 – Quarter 1 (October–December 2012)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/12	10/31/12
M23: Task 14 – Monthly WWG Conference Call Held	10/31/12	10/25/12
M23: Task 14 – Monthly WWG Conference Call Held	11/30/12	11/28/12
D57: Task 12 – Project Assessment Annual Report	12/31/12	12/28/12
M23: Task 14 – Monthly WWG Conference Call Held	12/31/12	Waived by DOE
Year 6 – Quarter 2 (January–March 2013)		
D32: Task 4 – Bell Creek Test Site – Geomechanical Final Report	1/31/13	1/31/13
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/13	1/31/13
M23: Task 14 – Monthly WWG Conference Call Held	1/31/13	1/16/13
D14: Task 2 – General Phase III Fact Sheet (update)	2/28/13	2/28/13
M23: Task 14 – Monthly WWG Conference Call Held	2/28/13	2/28/13
D85: Task 6 – Report – Opportunities and Challenges Associated with CO_2 Compression and Transportation During CCS Activities	3/31/13	Waived by DOE (journal article)
D89: Task 16 – Report – Geochemical Evaluation of the Basal Cambrian System	3/31/13	3/28/13
D99: Task 14 – Water/CCS Nexus-Related Fact Sheet	3/31/13	3/22/13
M23: Task 14 – Monthly WWG Conference Call Held	3/31/13	3/28/13
M36: Task 13 – Annual Advisory Board Meeting Scheduled	3/31/13	3/27/13

Continued . . .

Table 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 6 – Quarter 3 (April–June 2013)		
D15: Task 2 – Bell Creek Test Site Fact Sheet (update)	4/15/13	3/25/13
D16: Task 2 – Fort Nelson Test Site Fact Sheet (update)	4/30/13	Waived by DOE
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/13	4/30/13
M14: Task 4 – Bell Creek Test Site Geological Characterization Data Collection Completed	4/30/13	4/30/13
M23: Task 14 – Monthly WWG Conference Call Held	4/30/13	4/25/13
M35: Task 16 – Basal Cambrian Dynamic Capacity Estimation Completed	4/30/13	4/30/13
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/13	5/31/13
D43: Task 5 – Bell Creek Test Site – Monitoring Experimental Design Package	5/31/13	5/31/13
M23: Task 14 – Monthly WWG Conference Call Held	5/31/13	5/30/13
M27: Task 5 – Bell Creek Test Site – MVA Equipment Installation and Baseline MVA Activities Completed	5/31/13	5/31/13
M23: Task 14 – Monthly WWG Conference Call Held	6/30/13	6/27/13
M26: Task 9 – Bell Creek Test Site – CO_2 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
Year 6 – Quarter 4 (July–September 2013)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/13	7/31/13
D33: Task 4 – Bell Creek Test Site – Geochemical Final Report	7/31/13	7/31/13
M12: Task 4 – Bell Creek Test Site Geochemical Work Completed	7/31/13	7/31/13
M23: Task 14 – Monthly WWG Conference Call Held	7/31/13	7/25/13
D64: Task 4 – Bell Creek Test Site – Site Characterization Report	8/31/13	8/29/13
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/13	8/30/13
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	8/31/13	5/1/13
M23: Task 14 – Monthly WWG Conference Call Held	8/31/13	Waived by DOE

Continued . . .

Table 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 6 – Quarter 4 (July–September 2013) (continued)		
D1: Task 1 – Review of Source Attributes	9/30/13	9/5/13
D6: Task 3 – Permitting Review – Update 1	9/30/13	9/24/13
D48: Task 7 – Bell Creek Test Site – Procurement Plan and Agreement Report	9/30/13	9/24/13
D90: Task 16 – Report – Wellbore Evaluation of the Basal Cambrian System	9/30/13	9/5/13
D94:Task 2 – Aquistore Project Fact Sheet	9/30/13	9/30/13
D95: Task 2 – Aquistore Project Poster	9/30/13	9/30/13
D98: Task 3 – Report – Findings, Recommendations, and Guidance of CGS Task Force	9/30/13	8/30/13
M23: Task 14 – Monthly WWG Conference Call Held	9/30/13	9/30/13
M38: Task 3 – IOGCC Task Force Wrap-Up Meeting Held	9/30/13	8/16/13 – sent 9/5/13
M39: Task 3 – IOGCC Task Force Editing Subgroup Meeting Held	9/30/13	6/3/13 – sent 9/5/13
M40: Task 15 – Further Characterization of the Zama Acid Gas EOR, CO_2 Storage, and Monitoring Project Completed	9/30/13	9/24/13
Year 7 – Quarter 1 (October–December 2013)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/13	10/31/13
D42: Task 5 – Bell Creek Test Site – Injection Experimental Design Package	10/31/13	10/30/13
D99: Task 14 – Water–CCS Nexus-Related Fact Sheet	10/31/13	10/31/13
M23: Task 14 – Monthly WWG Conference Call Held	10/31/13	10/31/13
M23: Task 14 – Monthly WWG Conference Call Held	11/30/13	11/21/13
M23: Task 14 – Monthly WWG Conference Call Held	12/31/13	Waived by DOE
M24: Task 14 – WWG Annual Meeting Held	12/31/13	8/19/13
M43: Task 9 – Bell Creek Test Site – First Full-Repeat Sampling of the Groundwater-Soil Gas-Monitoring Program Completed	12/31/13	11/15/13 – sent 12/13/13
Year 7 – Quarter 2 (January–March 2014)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/14	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 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 7 – Quarter 2 (January–March 2014) (continued)		
D86: Task 15 – Updated Regional Implementation Plan for Zama	2/28/14	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
Year 7 – Quarter 3 (April–June 2014)		
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: Task14 – 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

Continued…

Table 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 7 – Quarter 4 (July–September 2014)		
D13: Task 2 – Public Site Updates	7/31/14	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
Year 8 – Quarter 1 (October–December 2014)		
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_2 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
Year 8 – Quarter 2 (January–March 2015)		
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

Continued . . .

Table 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 8 – Quarter 3 (April–June 2015)		
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_2 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_2 Injected	6/30/15	6/30/15
Year 8 – Quarter 4 (July–September 2015)		
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_2 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
Year 9 – Quarter 1 (October–December 2015)		
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 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 9 – Quarter 2 (January–March 2016)		
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_2 Stored	3/31/16	3/22/16
Year 9 – Quarter 3 (April–June 2016)		
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 – Monthly WWG Conference Call Held	6/30/16	4/27/16
Year 9 – Quarter 4 (July–September 2016)		
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 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 9 – Quarter 4 (July–September 2016) (continued)		
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 – Monthly WWG Conference Call Held	9/30/16	9/28/16
Year 10 – Quarter 1 (October–December 2016)		
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 – Monthly 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
Year 10 – Quarter 2 (January–March 2017)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/17	
D22: Task 2 – Energy from Coal 60-minute Documentary	1/31/17	
D76: Task 3 – Regional Regulatory Perspective	1/31/17	
M60: Task 1 – Data Submitted to EDX	2/28/17	
D35: Task 4 – Bell Creek Test Site – Best Practices Manual – Site Characterization	3/31/17	
M23: Task 14 – Monthly WWG Conference Call Held	3/31/17	

Continued . . .

Table 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 10 – Quarter 3 (April–June 2017)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/17	
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/17	
D69: Task 9 – Bell Creek Test Site – Best Practices Manual – Simulation Report	5/31/17	
D85: Task 6 – Report – Opportunities and Challenges Associated with CO_2 Compression and Transportation During CCUS Activities	5/31/17	
D101: Task 14 – WWG Web Site Content Update 1	5/31/17	
D104: Task 9 – Analysis of Expanded Seismic Campaign	6/30/17	
M23: Task 14 – Monthly WWG Conference Call Held	6/30/17	
M47: Task 2 – Bell Creek Test Site 30-Minute Documentary Broadcast	6/30/17	
Year 10 – Quarter 4 (July–September 2017)		
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 – Monthly WWG Conference Call Held	9/30/17	
M55: Task 9 – Initial Trace Analysis Completed	9/30/17	
M62: Task 14 – Research Related to Water and CCS Nexus Completed	9/30/17	

Table 15. Phase III, BP5, Years 9–12 Gantt Chart

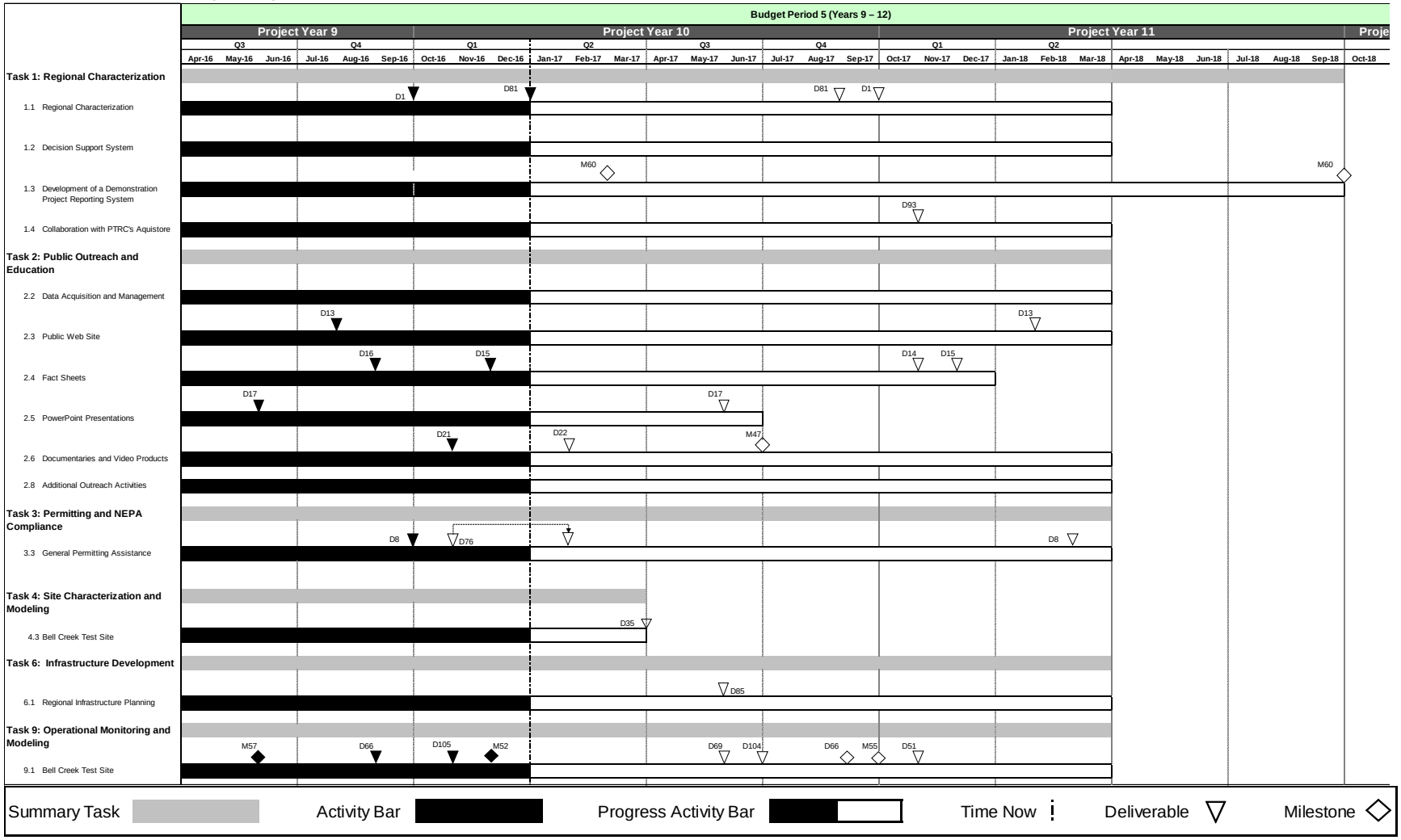

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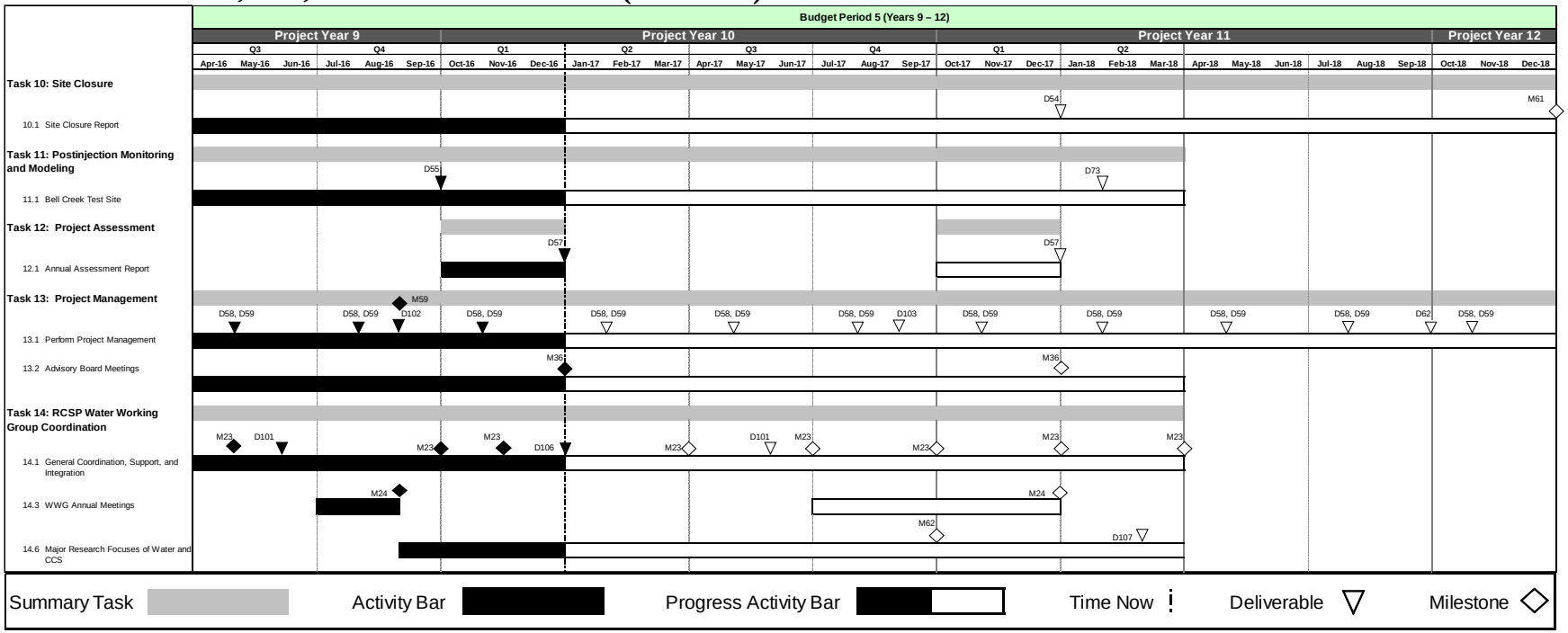
Table 15. Phase III, BP5, Years 9–12 Gantt Chart (continued)



Key for Deliverables (D)			
D1	Review of Source Attributes	D62	Final Report
D8	Permitting Review	D66	BC Test Site – Simulation Report
D13	Public Site Updates	D69	BC Test Site – Best Practices Manual – Simulation
D14	General Phase III Fact Sheet	D73	Report – Monitoring and Modeling Fate of Stored CO_2
D15	BC Test Site Fact Sheet	D76	Regional Regulatory Perspective
D16	Fort Nelson Test Site Fact Sheet	D81	Regional Carbon Sequestration Atlas
D17	General Phase III Information PowerPoint Presentation	D85	Report – Opportunities and Challenges Associated with CO_2 Compression
D21	BC Test Site 30-minute Documentary	D93	Report – Geological Modeling and Simulation for the Aquistore Project
D22	Energy from Coal 60-minute Documentary	D101	WWG Web Site Content Update
D35	BC Test Site – Best Practices Manual – Site Characterization	D102	Best Practices Manual – Adaptive Management Approach
D51	BC Test Site – Best Practices Manual – Monitoring for CO_2 Storage and CO_2 EOR	D103	Best Practices Manual – Programmatic Risk Management
D54	Report – Site Closure Procedures	D104	BC Test Site – Analysis of Expanded Seismic Campaign
D55	BC Test Site – Cost-Effective Long-Term Monitoring Strategies Report	D105	Comparison of Non-EOR and EOR Life Cycle Assessment
D57	Project Assessment Annual Report	D106	Special Issue of IJGGC – Nexus of Water and Carbon Capture and Storage
D58	Quarterly Progress Report	D107	Journal Article or Topical Report – Major Research Focuses of Water and CCS
D59	Milestone Quarterly Report		

Key for Milestones (M)	
M23	WWG Conference Call Held
M24	WWG Annual Meeting Held
M36	Annual Advisory Board Meeting Scheduled
M47	BC Test Site 30-minute Video Broadcast
M52	BC Test Site – Initial Analysis of Extended Pulsed-Neutron Logging Campaign Data Completed
M55	Investigation of Crude Oil Compositional Changes During CO_2 EOR Completed
M57	Life Cycle Analysis for EOR Completed
M59	Adaptive Management Approach Best Practices Manual Completed
M60	Data Submitted to EDX
M61	Site Closure for Bell Creek Test Completed
M62	Research Related to Water and CCS Nexus Completed

January-17

PHASE III PRODUCTS OR TECHNOLOGY TRANSFER ACTIVITIES

During the reporting period, two abstracts were submitted for presentation and ten oral and one poster presentation were given at ten different meetings and conferences. In addition, a quarterly progress report, eight deliverables/milestones (seven draft and one approved) were completed. Three deliverables from previous quarters also received approval. In addition to the products cited below, staff also undertook one project management site trip. For more detail, see the Meetings/Travel section.

Abstracts

Submitted

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., 2016, The Plains CO_2 Reduction Partnership—CO_2 injection update and results of adaptive management approach [abs.]: 2017 Carbon Capture, Utilization & Storage Conference, Chicago, Illinois, April 10–13, 2017.

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., 2016, Demonstration of secure CO_2 geological storage in the PCOR Partnership region [abs.]: GeoConvention 2017, Calgary, Alberta, May 15–19, 2017.

Presentations

Azzolina, N.A., Hamling, J.A., Peck, W.D., Gorecki, C.D., Nakles, D.V., and Melzer, L.S., 2016, A life cycle analysis of incremental oil produced via CO_2 enhanced oil recovery (EOR): Presented at the 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Burnison, S.A., Bosshart, N.W., Salako, O., Reed, S., Hamling, J.A., and Gorecki, C.D., 2016, 4-D seismic monitoring of injected CO_2 enhances geological interpretation, reservoir simulation, and production operations: Presented at the 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Daly, D.J., Crocker, C.R., Gorecki, C.D. (authors), and Wildgust, N. (presenter), 2016, Regionwide outreach in a project-level world—lessons from the PCOR Partnership: Presented at the 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Gorecki, C.D., and Ayash, S.C., 2016, The Plains CO_2 Reduction (PCOR) Partnership Program update: Presented to Southern Company personnel, Grand Forks, North Dakota, October 25, 2016.

Hamling, J.A., Glazewski, K.A., Leroux, K.M., Kalenze, N.S., Bosshart, N.W., Burnison, S.A., Klapperich, R.J., Stepan, D.J., Gorecki, C.D., and Richards, T.L., 2016, Monitoring 3.2 million tonnes of CO_2 at the Bell Creek oil field: Presented at the 13th International Conference on

Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

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Jin, L., Pekot, L.J., Hawthorne, S.B., Gobran, B., Greeves, A., Bosshart, N.W., Jiang, T., Hamling, J.A., and Gorecki, C.D., 2016, Impact of CO_2 impurity on MMP and oil recovery performance of the Bell Creek oil field: Presented at the 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Leroux, K.M., Glazewski, K.A., Kalenze, N.S., Botnen, B.W., Stepan, D.J., Klapperich, R.J., and Hamling, J.A., 2016, Lessons learned in near-surface monitoring for large-scale CO_2 storage: Presented at the 2016 AIChE Annual Meeting, San Francisco, California, November 13–18, 2016.

Smith, S.A., Beddoe, C.L., Mibeck, B.A.F., Heebink, L.V., Kurz, B.A., Peck, W.D., and Jin, L., 2016, Relative permeability of Williston Basin CO_2 storage targets: Presented at the 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Sorensen, J.A., 2016, Research to unlock the EOR potential of unconventional reservoirs: Panel talk presented at the 2016 CO_2/ ROZ Conference, Midland, Texas, December 6–8, 2016.

Poster Presentation

Jiang, T., Pekot, L.J., Peck, W.D., Sorensen, J.A., Gorecki, C.D., and Worth, K., 2016, A numerical simulation update of the Aquistore CO_2 storage project: Presented at the 2016 AIChE Annual Meeting, San Francisco, California, November 13–18, 2016.

Deliverables/Milestones

Draft Submitted

Ayash, S.C., and Gorecki, C.D., 2016, Technical Advisory Board meeting scheduled: Plains CO_2 Reduction (PCOR) Partnership Phase III draft Task 13 M36 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, December.

Daly, D.J., Crocker, C.R., Crossland, J.L., Hamling, J.A., and Gorecki, C.D., 2016, Bell Creek integrated CO_2 EOR and storage project: Plains CO_2 Reduction (PCOR) Partnership Phase III draft Task 2 Deliverable D15 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, November.

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documentary for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, October.

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Peck, W.P., Battle, E.P., Grove, M.M., Glazewski, K.A., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2016, Plains CO_2 Reduction (PCOR) Partnership atlas (5th ed.): Plains CO_2 Reduction (PCOR) Partnership Phase III draft Task 1 Deliverable D81 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, December.

Approved

Bosshart, N.W., Jin, L., Dotzenrod, N.W., Burnison, S.A., Ge, J., He, J., Burton-Kelly, M.E., Ayash, S.C., Gorecki, C.D., Hamling, J.A., Steadman, E.N., and Harju, J.A., 2015, Bell Creek test site – simulation report: Plains CO_2 Reduction (PCOR) Partnership Phase III Task 9 Deliverable D66 (Update 4) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2016-EERC-10-09, Grand Forks, North Dakota, Energy & Environmental Research Center, August.

Bosshart, N.W., Oster, B.S., Botnen, B.W., Hamling, J.A., and Gorecki, C.D., 2016, Bell Creek test site – initial analysis of extended PNL campaign data completed: Plains CO_2 Reduction (PCOR) Partnership Phase III Task 9 Milestone M52 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2016-EERC-12-15, Grand Forks, North Dakota, Energy & Environmental Research Center, November.

Glazewski, K.A., Kovacevich, J.T., Jensen, M.D., Peck, W.D., and Gorecki, C.D., 2016, Review of source attributes: Plains CO_2 Reduction Partnership Phase III Task 1 Deliverable D1 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No.

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Progress Reports

Monthlies

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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., 2016, Plains CO_2 Reduction (PCOR) Partnership: Phase III monthly report (October 1–31, 2016) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, November.

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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., 2016, Plains CO_2 Reduction Partnership Phase III: Task 13 Deliverable D58/D59 quarterly technical progress report (July 1 – September 30, 2016) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592 and North Dakota Industrial Commission Contract Nos. FY08-LX111-162 and G-015-030, Grand Forks, North Dakota, Energy & Environmental Research Center, October.

Papers

Azzolina, N.A., Hamling, J.A., Peck, W.D., Gorecki, C.D., Nakles, D.V., and Melzer, L.S., 2016, A life cycle analysis of incremental oil produced via CO_2 EOR: Paper presented at the 13th

International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Burnison, S.A., Bosshart, N.W., Salako, O., Reed, S., Hamling, J.A., and Gorecki, C.D., 2016, 4-D seismic monitoring of injected CO_2 enhances geological interpretation, reservoir simulation, and production operations: Paper presented at the 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Daly, D.J., Crocker, C.R., Gorecki, C.D. (authors), and Wildgust, N. (presenter), 2016, Regionwide outreach in a project-level world—lessons from the PCOR Partnership: Presented at the 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Smith, S.A., Beddoe, C.L., Mibeck, B.A.F., Heebink, L.V., Kurz, B.A., Peck, W.D., and Jin, L., 2016, Relative permeability of Williston Basin CO_2 storage targets: Paper presented at the 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Meeting Minutes

Klapperich, R.J., and Tennyson, M., 2016, Minutes—Regional Carbon Sequestration Partnerships Water Working Group conference call: November 16, 2016.

MEETINGS/TRAVEL

Representatives from the PCOR Partnership incurred travel costs for their participation in the following 19 meetings/conferences, two workshops, and five project management site trips in this reporting period:

- October 1–5, 2016: traveled to Little Rock, Arkansas, to attend the IOGCC Annual Meeting.
- October 16–18, 2016: traveled to Plano, Texas, to attend a meeting with Denbury and to attend the Society of Geophysicists Annual Meeting.
- October 26–28, 2016: traveled to Washington, D.C., to attend the U.S. Energy Association Panel Discussion on Carbon, Capture, Utilization, & Storage Act.
- November 1–3, 2016: traveled to Columbus, Ohio, to attend the Midwest Regional Carbon Sequestration Partnership 2016 Annual Partners Meeting.
- November 6–8, 2016: traveled to Plano, Texas, for meetings with Denbury regarding the PCOR Partnership Bell Creek documentary, PNL planning, geophysics and InSAR discussion, and Bell Creek-related GHGT-13 Conference presentations.
- November 9–19, 2016: traveled to Lausanne, Switzerland, to attend and present at the 13th Conference on Greenhouse Gas Control Technologies.
- November 13–18, 2016: traveled to San Francisco, California, to present at the AIChE Annual Meeting.
- December 5–6, 2016: traveled to Bismarck, North Dakota, to attend the Joint North Dakota Petroleum Council Legislative Reception.

- December 5–9, 2016: traveled to Midland, Texas, to attend and present at the 14th Annual CO_2 Conference Week.
- December 9–21, 2016: traveled to Gillette, Wyoming, to collect PNLs at the Bell Creek site.
- December 30, 2016: traveled to Fargo, North Dakota, to work on the PCOR Partnership coal documentary (D22) with PPB.

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