Plains CO_2 Reduction (PCOR) Partnership Monthly Update
December 1–31, 2014

PHASE III ACTIVITIES

Task 1 – Regional Characterization (Wesley D. Peck)

Highlights

- With regard to the upcoming U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) Atlas V:
  - Received a draft of our section of the atlas for review. Comments are due to DOE NETL January 9, 2015.
- With regard to the partners-only decision support system (DSS) Web site:
  - Continued to assemble a presentation on the DSS online mapping services to showcase the capabilities for viewing results in a comprehensive and interactive framework outside of a report.
  - Continued working with programming to improve the online geographic information system (GIS) map.
  - Updated North Dakota and Montana Petra projects with the latest general well information from each state's online resource as follows: 50 new North Dakota wells and five new Montana wells.
- Continued work on several value-added reports, including the following:
  - The draft regional characterization report summarizing all past and present efforts is currently under review.
  - Continued work on the report summarizing methods of original oil in place and CO_2 storage calculations.
  - Continued efforts on the Cedar Creek Anticline white paper.
- With regard to the **Aquistore core work** (12 samples):
  - Continued work on the value-added lab report (currently under review).
- With regard to the **Aquistore** project's static modeling and dynamic predictive simulations effort:
  - Continued working with Petroleum Technology Research Centre (PTRC) on understanding the Computer Modelling Group simulation files sent to them upon request.

Task 2 – Public Outreach and Education (Daniel J. Daly)

Highlights

- Added the November 2014 version of the NETL fact sheet "Plains CO_2 Reduction (PCOR) Partnership – Development Phase Large-Scale Field Projects" to the public Web site (replacing the previous version).
- Provided comments (at the request of Aquistore personnel) for materials for use at the Aquistore open house on December 11, 2014, and agreed to provide two posters (the general outreach poster, deliverable [D] 24, and the Aquistore project poster, D95) for display at the open house in Estevan, Saskatchewan.
- Traveled to Estevan, Saskatchewan, to attend the Aquistore Open House on December 11, 2014 (provided posters, but fell ill and ultimately was unable to attend).
- Completed a "teaser" video for the Bell Creek documentary that was shown to Denbury Resources Inc. (Denbury) personnel in Midland, Texas, during CO_2 Conference Week.
- On December 5, 2014, discussed a draft summary of classroom activities for the PCOR Partnership version of the Carbon Challenge (based on activities for the Carbon Challenge undertaken by groups in Regina, Saskatchewan, Canada; Scotland; Norway; Spain; and Australia; and recent discussions held with local teachers in the PCOR Partnership region).
- Continued efforts to expand the type and presentation of statistics for overall past outreach activities and for planning.
- Continued to revise three draft Phase II project fact sheets, including meetings with project personnel to discuss content, with a focus on terrestrial and McGregor projects.
- Continued working on the update to the Bell Creek project poster (D25, due March 31, 2015).
- Participated in the monthly Outreach Working Group conference call on December 18, 2014.
- Continued efforts with regard to the public Web site (www.undeerc.org/pcor), including the following:
  - Continued ongoing identification and repair of broken links.
- Continued collaborative efforts with Prairie Public Broadcasting (PPB), including the following:
  - Finalized interview schedules and interview questions for January 12 and 13, 2015, in Houston and Plano, Texas, for the coal 60-minute documentary (D22).
  - Worked on revisions and updated narration for Parts 3 and 4 of the four-part education video series "Meeting the Challenge."
  - Discussed the potential for produced interviews from documentaries (PPB has an ongoing process of producing full interviews from their activities, including PCOR Partnership documentaries, for inclusion in a publicly available archive database) as value-added products for the PCOR Partnership.

Task 3 – Permitting and NEPA (National Environmental Policy Act) Compliance (Charles D. Gorecki)

Highlights

- Continued review of the U.S. Environmental Protection Agency-proposed rule for carbon emissions from existing stationary sources.
- Began planning for D8, Permitting Review – Update 2, due September 30, 2015.

Task 4 – Site Characterization and Modeling (James A. Sorensen)

Highlights

- **Bell Creek** test site activities included the following:
  - With regard to geomechanical activities:
    - Continued working on D32, Geomechanical Report Update (due January 31, 2015).
    - Continued literature review and data collection for data deeper than the Madison Formation for the development of the 3-D mechanical earth model (MEM); the data can include outcrop data, Williston Basin logs, and surfaces derived from 3-D seismic data.
    - Continued geomechanical characterization of the Bell Creek Field, including updating the properties of the 3-D MEM. Synthetic logs for select wells were created to help with this process.
    - Continued collecting data and preparing for the geomechanical simulations.
  - Presented on PCOR Partnership activities at an intro to GIS class at North Dakota State University in Fargo, North Dakota, on December 10, 2014.
  - Discussed the final plan for 05-06 OW SCAL (special core analysis) work with Denbury and Core Labs.
  - Continued investigating options regarding microseismic data-processing services and 3-D vertical seismic profiling (VSP) data processing.
  - Continued building the updated facies model by incorporating new data, including seismic, to create a more accurate model of the field for better prediction of CO_2 movement.
  - Worked on incorporating lab-generated data into Techlog to supplement data currently in the 3-D model.
  - Continued working on Version 3 of the geologic model, including using AVO (amplitude-versus-offset) analysis to analyze 3-D seismic data in new ways and working on facies logs for Phases 1 and 2.
  - Training images were created for the Version 3 facies model, and multiple point statistics are being used to geostatistically populate the models in order to increase the accuracy and obtain better predictive results.
  - Applied Geology Laboratory activities included the following:
    - With regard to the 33-14R core (collected April 2013):
      - Continued fine-tuning the thin-section descriptions and x-ray diffraction data.
      - Continued work on the permeability-to-air report.
    - With regard to the 56-14R full-core plugs (collected March 2013):
      - Permeability to water is on hold awaiting equipment availability.

Task 5 – Well Drilling and Completion (John A. Hamling)

- This task ended in Quarter 3 – Budget Period (BP) 4, Year 7 (June 2014).

Task 6 – Infrastructure Development (Melanie D. Jensen)

Highlights

- Continued preparation of the update to the "Opportunities and Challenges Associated with CO_2 Compression and Transport During CCS Activities" report (D85, due March 2015).
- Continued to update technologies for the CO_2 capture technologies update overview.

Task 7 – CO_2 Procurement (John A. Harju)

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

Task 8 – Transportation and Injection Operations (Melanie D. Jensen)

Highlights

- Researched the effects of different impurities in CO_2 from anthropogenic sources on pipeline operation during start-up and shutdown as well as at transient conditions. The effects of impurities and CO_2 stream variability on operability of injection site infrastructure were also studied.

Task 9 – Operational Monitoring and Modeling (Charles D. Gorecki)

Highlights

- Worked on simulation computer cluster support.
- Continued the literature review for CO_2 enhanced oil recovery simulation strategies.
- **Bell Creek** injection-phase site activities included the following:
  - Investigated methods to improve porosity distribution in geologic models:
    - Compared the pulsed-neutron log (PNL) total crossplot porosity computed from baseline logs to the Version 2 geologic model porosity for each well with PNL data.
    - Compared effective porosity values from synthetic logs and PNL residual saturation tool calculations.
  - Worked on Phase 2 simulation file organization.
  - Worked on acquiring quotes and assessing vendor capabilities related to the 3-D VSP and microseismic processing.
  - Completed the 4-D seismic acquisition and the 4-D VSP, and began planning for data extraction, processing, and interpretation.
  - Continued reservoir surveillance and analysis of continuous permanent downhole monitoring data in the 05-06 OW well.
  - Continued injection-phase sampling work, including the following:
    - Updated the near-surface monitoring project database and interactive map product with data from the September sampling event, and implemented minor programming improvements to improve usability.
    - Completed the December 2014 quarterly soil gas- and water-monitoring event, December 1–3, 2014, as follows:
      - Over 210 soil gas samples were collected from Phases 1 and 2.
      - Water parameters were collected from a select group of nine wells in and around the injection zone (a sample was not collected from 05-04 because it was frozen).

    - Initiated analysis.
- Based on the most recent publicly available data, cumulative CO_2 injection is 1,361,551 metric tons through September 30, 2014 (Table 1).

Table 1. Bell Creek CO_2 Injection Totals for September 2014 (cumulative totals May 2013 to September 2014)

	September 2014 Injection
Total, Mscf	2,202,088
Total, U.S. tons*	125,956
Total, metric tons*	114,376
Cumulative Total, Mscf [+]	26,213,934
Cumulative Total, U.S. tons*[+]	1,499,396
Cumulative Total, metric tons*[+]	1,361,551

Source: Montana Board of Oil and Gas [MBOG] database.
* There is an approximately 2–3-month lag in posting of injection/production volumes to the MBOG database. This was calculated utilizing a conversion of 17.483 Mscf/U.S. ton and 19.253 Mscf/metric ton.
[+] Cumulative totals are for the period from May 2013 to the month listed.

Task 10 – Site Closure (to be announced [TBA])

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

Task 11 – Postinjection Monitoring and Modeling (TBA)

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

Task 12 – Project Assessment (Katherine K. Anagnost)

Highlights
- Submitted the annual assessment (D57) on December 30, 2014.

Task 13 – Project Management (Charles D. Gorecki)

Highlights
- Held a task leader meeting December 19, 2014. Topics discussed included updates on Bell Creek and Aquistore, upcoming deliverables/milestones and travel, as well as updates from task leaders present.
- Attended CO_2 Conference Week December 8–12, 2014, in Midland, Texas (www.co2conference.net/).
- Submitted an abstract to the CO_2Quest International Forum on Recent Developments of CCS Implementation on December 12, 2014 (www.co2quest.eu/ccsforum15.htm).
- Continued planning for the winter Technical Advisory Board meeting. The destination is Phoenix, Arizona, the first week in March, and the hotel agreement is in place.
- Deliverables and milestones completed in December:
    - November monthly update

– Task 12: D57 – Annual Assessment Report

Task 14 – RCSP (Regional Carbon Sequestration Partnership) Water Working Group (WWG) Coordination (Ryan J. Klapperich)

Highlights

- Continued the redesign of the water–CCS nexus graphic for both the WWG Web site and future fact sheet revisions.
- In response to a request from DOE, provided updated WWG graphic for the Crosscutting Program to use in a water-related document.
- Continued working with the consultant for the best practices manual (D80, due November 30, 2016):
  - Discussed revisions with consultant.
  - Discussed revisions with Andrea McNemar, DOE NETL, who will provide additional comments.
- Discussed the possibility of someone from DOE's Crosscutting group related to water to join us for the January WWG conference call.
- Completed review of a journal article submission to the International Journal of Greenhouse Gas Control.
- Attended the American Geophysical Union Fall Conference on behalf of the WWG in San Francisco, California, December 15–18, 2014.

Task 15 – Further Characterization of the Zama Acid Gas EOR, CO_2 Storage, and Monitoring Project (Charles D. Gorecki)

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

Task 16 – Characterization of the Basal Cambrian System (Wesley D. Peck)

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

Travel/Meetings

- November 30 – December 7, 2014: traveled to Gillette, Wyoming, for sampling at the Bell Creek Field.
- December 3–4, 2014: traveled to Morgantown, West Virginia, to visit DOE.
- December 7–12, 2014: traveled to Midland, Texas, to attend and present at CO_2 Conference Week.
- December 10, 2014: traveled to Fargo, North Dakota, to present at a GIS class at North Dakota State University.
- December 10–12, 2014: traveled to Estevan, Saskatchewan, Canada, for a community open house for the Aquistore Project.
- December 12–18, 2014: traveled to San Francisco, California, to attend the American Geophysical Union Fall Conference.
- December 14–20, 2014: traveled to Gillette, Wyoming, for sampling at the Bell Creek Field.

- December 15–16, 2014: traveled to Bismarck, North Dakota, to attend the Williston Basin Society of Petroleum Engineers (SPE) Meeting and SPE Board Meeting.

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