FACTSHEET FOR PARTNERSHIP FIELD VALIDATION TEST

Partnership Name	West Coast Regional Carbon Sequestration Partnership (**WESTCARB**)		
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Field Test Information: Field Test Name	Arizona Utilities CO_2 Storage Pilot		
Test Location	Northern Arizona		
Amount and Source of CO_2	Tons: 2000	Source: Manufactured (i.e., commercial)	
Field Test Partners (Primary Sponsors)	Salt River Project		
	Arizona Public Service Company		
	Tucson Electric Power		

Summary of Field Test Site and Operations:

The Arizona Utilities CO_2 Storage Pilot Test will be conducted in three phases. A discussion of each phase is provided below.

- **Phase I. Pre-pilot planning, geologic characterization and outreach**. The objective of Phase I is develop a better understanding of the hydrogeologic characteristics of the storage formations in the Colorado Plateau region and build support for a CO_2 storage pilot test among the surrounding communities. The scope of work for Phase I consists of developing a site-specific hydrogeologic model of sedimentary rocks underlying the Colorado Plateau in Northern Arizona. Data will be compiled to assess the storage potential of the region and identify the most promising storage targets. Concurrently, we will meet with community leaders, local businesses, citizens, landowners and other interested stakeholders to provide project information in an effort to gain support for the project. Detailed plans for Phase II will be developed. NEPA documentation for the project will be developed during Phase I.

- **Phase II**. **Site characterization, detailed pilot project planning and permitting.** The objective of Phase II is to drill a well into the potential storage formation, measure the permeability of the storage formations and seals, develop a detailed technical plan for the CO_2 injection test, and obtain the needed permits for the CO_2 storage pilot test. The scope of work for Phase II consists of drilling a borehole, nominally to a depth of 4000 feet, to characterize the storage potential of the Naco and Martin Formations. (The Naco and Martin Formations are Pennsylvanian and Devonian in age corresponding to the Lower Supai and Redwall/Devonian, respectively, shown in Figure 1. Table 1 lists the units, depths and thickness for the major storage formations and seals at the proposed pilot site). If the storage formations and seals show sufficient promise, detailed plans for the CO_2 injection experiment, including the monitoring program, will be developed. Meetings with the community will continue throughout Phase II.

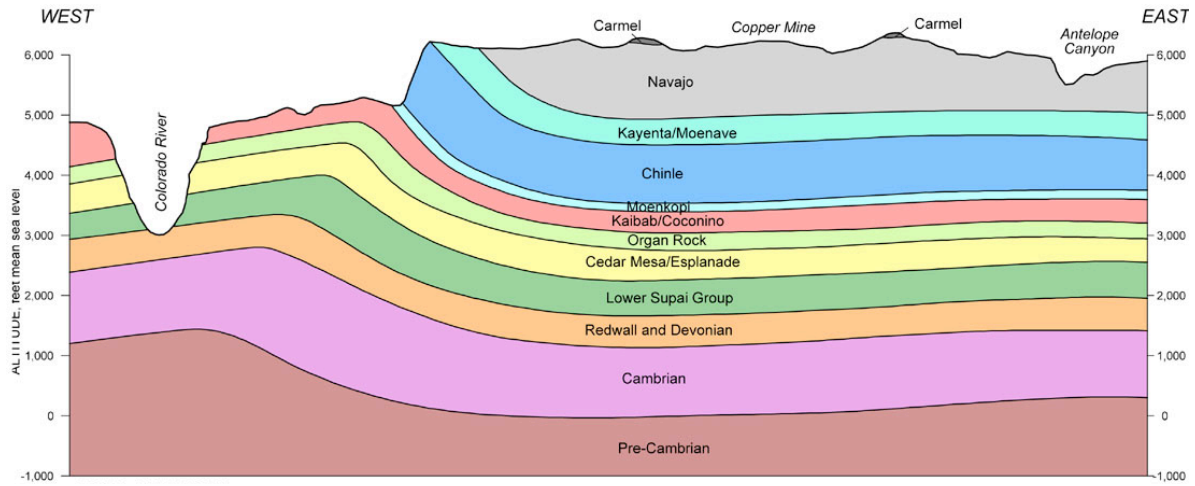


Figure 1. Schematic showing the subsurface lithology in Northern Arizona. Potential storage formations include the Naco Formation (i.e., equivalent to the Lower Supai) and the Devonian age Martin Formation.

Table 1

Formation	Top Elevation	Depth (ft)	Thickness(ft)
Moenkopi	5100	0	340
Coconino Sandstone	4760	340	300
Schnebly Hill Formation	4460	740	300
Supai Formation	4160	1040	2035
Naco Formation	2125	3075	500
Martin Formation	1625	3575	500
Pre-Cambrian Basement	1125	3775	--

Table 1. Summary of subsurface lithology at the proposed pilot test location, including the elevation, depth and thickness of potential storage reservoirs and seals. Potential storage reservoirs are indicated by the white color of the boxes, seals are indicated by gray shading.

- **Phase III. CO_2 injection, monitoring and storage assessment.** The objective of Phase III is to safely inject CO_2 into the most promising saline formation for CO_2 storage, track movement of the injected CO_2 and monitor to ensure compliance with environmental, health and safety related requirements. After completing the test, a comprehensive assessment of storage potential, relative to sources of CO_2, will be conducted. The scope of work for Phase III consists injecting approximately 2000 tones of CO_2 into the most promising storage formation and using a suite of monitoring tools to track migration and ensure compliance with all environment, health and safety requirements. A schematic showing the well configuration is provided in Figure 2. CO_2 will be purchased and transported to the site for injection. Results from the test will be used to extrapolate the regional storage potential of the Colorado Plateau in Northern Arizona. The capacity of the storage formations will be assessed relative to the size of regional sources of CO_2. Meetings with the community will continue throughout Phase III.

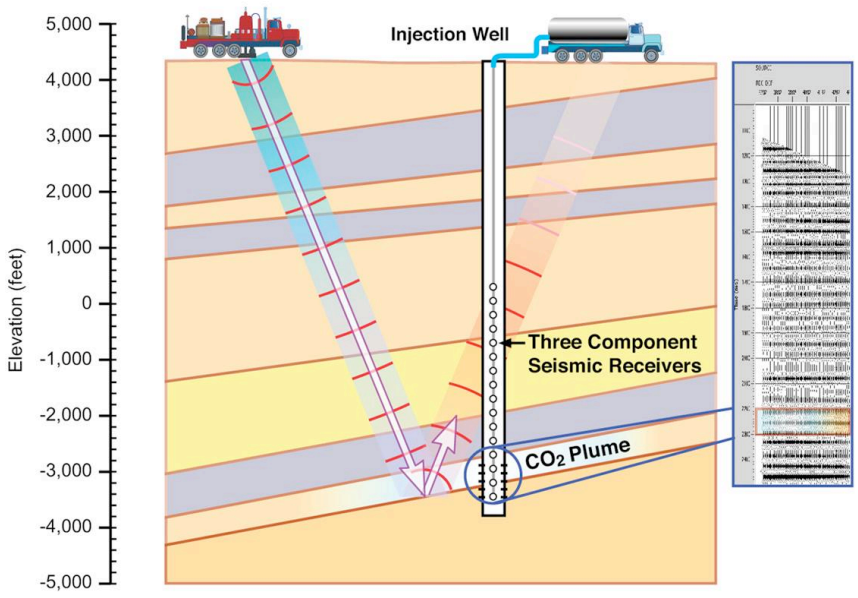


Figure 2. Schematic showing the single-well test design and VSP survey method for tracking plume migration. Additional monitoring techniques are described in Table 2.

Research Objectives:

The overall goal of the Arizona Utilities CO_2 Storage Pilot is demonstrate that geologic sequestration is a safe and permanent method to mitigate GHG emissions. In addition, The Arizona Utilities CO_2 Storage Pilot Test has three specific objectives:

1. Demonstrate the safety and feasibility of CO_2 storage in saline formations in the vast Colorado Plateau region in Arizona;
2. Demonstrate and test methods for monitoring CO_2 storage projects in consolidated sandstones, shale and carbonate fields; and
3. Gain experience with regulatory permitting and public outreach associated with CO_2 storage in a saline formation in Arizona.

This pilot will investigate CO_2 storage in saline formations in the Colorado Plateau region in Northern Arizona which underlies three coal-fired power plants (Navajo, Coronado and Springerville) operated by the Salt River Project and Cholla Station operated by Arizona Public Service Company. The magnitude of the annual CO_2 emissions in this area, the large storage potential of the saline formations of the Colorado Plateau and Black Mesa Basin and a high degree of interest by the local utility operator makes this an outstanding opportunity for assessing geologic storage options associated with large sources of CO_2 in the West.

Summary of Modeling and MMV Efforts:

Preliminary computer simulations will be conducted by Lawrence Berkeley National Laboratory using TOUGH2/EOS7C in support of the pilot tests at the conceptual design level. The questions addressed at the conceptual design level include the following:

1. How much CO_2 should be injected and at what rate?
2. What are the expected pressure and temperature changes in the reservoir associated with the injection?
3. What kind of monitoring and sampling should be conducted in the injection well?

A comprehensive set of hydrologic and geophysical monitoring techniques has been evaluated. The combination of subsurface and surface measurements listed in Table 2 has been determined to be the most cost-effective for meeting the objectives of the pilot project.

Table 2. Measurement Technologies Proposed for the Arizona Utilities CO_2 Storage Pilot Test.

Measurement technique	Measurement parameters	Application
Fluid composition	CO2 & natural gas composition Brine salinity, alkalinity, pH and composition	Predict solubility and mineral trapping Quantifying CO_2-water-rock interactions
Subsurface pressure	Reservoir pressure Overlying reservoir pressure Annulus pressure Groundwater aquifer pressure	Control of formation pressure below fracture gradient Wellbore and injection tubing condition Leakage out of the storage formation
Well logs	Gamma, SP, resistivity Brine salinity Sonic velocity CO_2 saturation (RST)	Lithology Tracking CO_2 movement in and above storage formation Tracking migration of brine into shallow aquifers Calibrating seismic velocities for VSP surveys
Vertical seismic profiling and crosswell seismic imaging	P and S wave velocity Reflection horizons Seismic amplitude attenuation	Detecting detailed distribution of CO_2 in the storage formation Detection leakage through faults and fractures
Cap rock integrity (if feasible)	Leakoff test	Natural stress state
CO_2 land surface flux monitoring using flux chambers and eddy covariance	CO_2 fluxes between the land surface and atmosphere atmosphere	Detect, locate and quantify CO_2 releases
Soil gas sampling	Soil gas composition Isotopic analysis of CO_2	Detect elevated levels of CO_2 Identify source of elevated soil gas CO_2

Accomplishments to Date:

Progress on pilot test is proceeding according to plan. The following has been accomplished.

- Arizona Public Service Company (APS) and Tucson Electric Power (TEP) joined WESTCARB this year. The Arizona utilities have pledged financial support for the pilot. In addition, APS has offered to host the pilot test on its property located near Joseph City/Holbrook Arizona.
- Public outreach meetings were held in August 2007 in Holbrook Arizona inform public of the proposed project and invite their questions and involvement.
- Business and community leaders embraced the pilot concept and are supportive of the project. Navajo County Board of Supervisors and North Arizona Council of Governments publically endorsed the pilot test.

- The partners developed media releases for local and statewide distribution resulting in several news articles.
- The partners have identified state and federal permitting requirements for drilling and CO_2 injection and are currently preparing the applications for these permits.
- WESTCARB sent requests for qualifications to selected engineering/geotechnical firms who will serve as the Site Project Manager responsible for overseeing drilling activities and performing the CO_2 injection tests. A contract for services should be in place by early 2008.
- Detailed scheduling and budget updating are underway.

Summarize Target Sink Storage Opportunities and Benefits to the Region:

Three coal-fired power plant sites in the Colorado Plateau-Arizona region generate from 30 to 40 Mt of CO_2 each year. Growing electricity markets could also result in the development of new generating capacity and additional sources of CO_2. The geologic setting of Northern Arizona provides thick (~ 3 km) sedimentary sequences with simple, near-horizontal, layer-cake stratigraphy and few faults. Multiple potential storage reservoir and overlying seal units exist in the area. The presence of oil, natural gas and CO_2 fields demonstrates the natural sealing capability of low permeability units within the area. The benefits of this project will be to assess and demonstrate the capacity of these attractive and large storage targets.

Cost:

Total Field Project Cost:

$ 5,500,000

DOE Share: **$** 4,400,000

___80_____%

Non-DOE Share: **$** 1,100,000

___20____%

Field Project Key Dates:

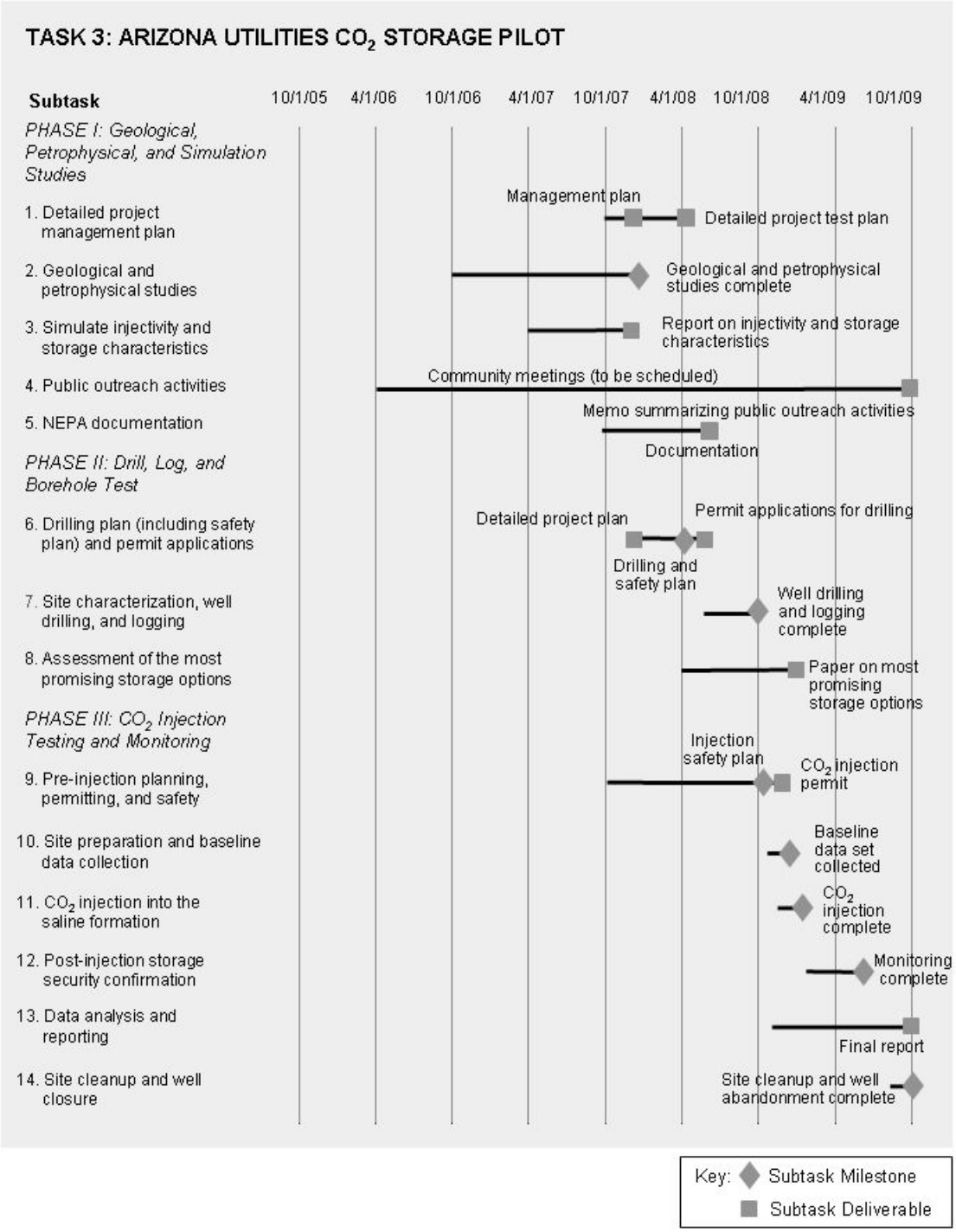
Drilling Operations Begin: 06/08

Baseline Completed: 12/08

Injection Operations Begin: 01/09

MMV Events: 10/08 to 07/09

Field Test Schedule and Milestones (Gantt Chart):



Additional Information:
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