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Critical Challenges. **Practical Solutions.**

DEVELOPING AND VALIDATING PRESSURE MANAGEMENT AND PLUME CONTROL STRATEGIES IN THE WILLISTON BASIN THROUGH A BRINE EXTRACTION AND STORAGE TEST (BEST) – PHASE II

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Energy & Environmental Research Center

U.S. Department of Energy

National Energy Technology Laboratory

Mastering the Subsurface Through Technology Innovation, Partnerships and Collaboration:
Carbon Storage and Oil and Natural Gas Technologies Review Meeting

August 1–3, 2017

Critical Challenges. Practical Solutions.

DISCLAIMER AND ACKNOWLEDGMENT

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OUTLINE

- Technical Status
  - Active Reservoir Management (ARM)
  - Brine Treatment Test Bed
- Accomplishments
- Lessons Learned
- Synergy Opportunities
- Summary

UNIQUE CONSIDERATIONS OF COMMERCIAL GEOLOGIC CO_2 STORAGE SITES

- Buoyant fluid
- Large volumes = large footprint
- Regulatory compliance, liability, and associated costs
- Conformance and utilization efficiency
- Access to pore space
  - Leasing, unitization, trespass
- Assuring permanence and credits

Because of a host of technical, social, regulatory, environmental, and economic factors, brine disposal tends to be more accessible and generally quicker, easier, and less costly to implement compared to dedicated CO_2 storage.

CONSIDERATIONS OF EMPLOYING BRINE EXTRACTION AS A MEANS OF ENGINEERED PRESSURE MANAGEMENT AT DEDICATED CO_2 STORAGE SITES

- Incremental cost
  - Wells and infrastructure
  - Operating and energy
- Requires disposal of extracted brine
  - Treatment and discharge
  - Reinjected into a different suitable geologic formation
- Efficiency losses
  - bbl_{out} > incremental bbl_{in}
- Complicates project
- Additional health, safety, and environmental risk

Brine extraction can enable dedicated CO_2 storage and improve the geologic CO_2 storage potential of a site.

TWO COMPLEMENTARY COMPONENTS

<u>ARM Test</u>

- Reduce stress on sealing formation
- Geosteer fluid plume
- Divert pressure from leakage pathways
- Reduce area of review (AOR)
- Improve injectivity, capacity, and storage efficiency
- Validate monitoring techniques, and forecast model capabilities

<u>Brine Treatment Test Bed</u>

- Alternate source of water
- Reduced disposal volumes
- Salable products for beneficial use

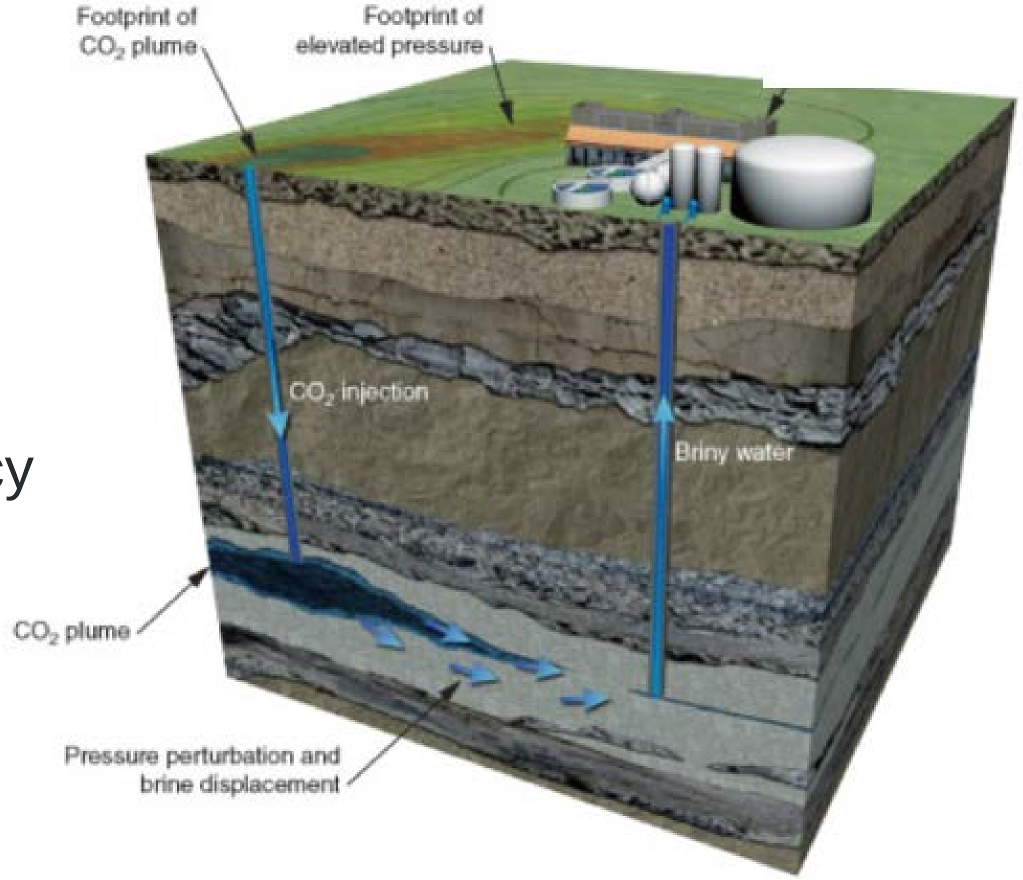
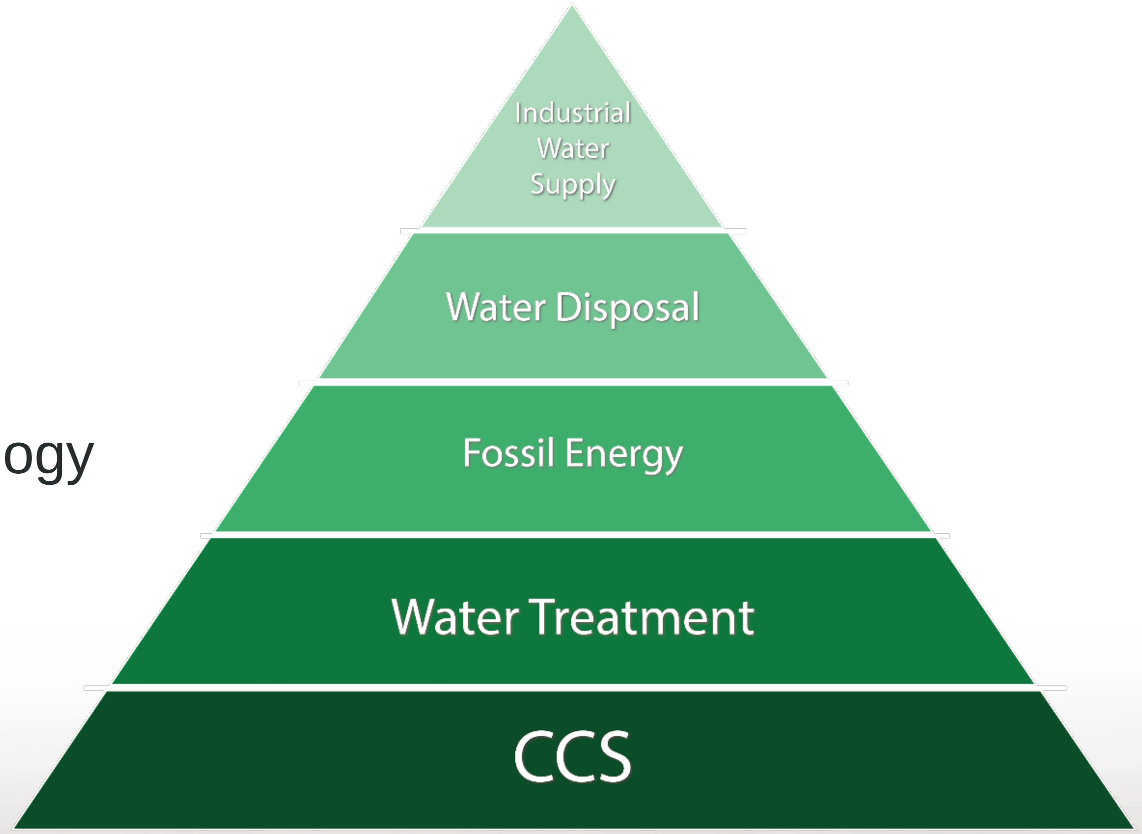


Illustration modified from Lawrence Livermore National Laboratory https://str.llnl.gov/Dec10/aines.html

FIELD IMPLEMENTATION

- Evaluate ARM strategies
- Validate ARM performance against forecasts
- Evaluate ARM economics
- Test monitoring techniques
- Brine treatment technology test bed and technology testing
- Field test ARM implementation and operations



Synergies

TECHNICAL STATUS

Phase I – Complete

- Regional characterization
- Site screening and feasibility study
- Site selection
- Geologic modeling
- Reservoir simulation resulting in ARM schema
- Site infrastructure design and field implementation plan

Phase II – Under Way

- ARM site preparation
  - Permitting
  - Well drilling
  - Surface infrastructure installation
  - Site characterization/model updates
- Test site preparation
  - Permitting
  - Test bed facility installation
  - Solicitation of treatment technologies
- ARM operations
  - Injection/extraction testing
  - Monitoring, verification, and accounting (MVA) implementation
  - Model updates/history matching
- Test bed treatment operations
  - Facility shakedown/training
  - Long-term performance evaluations
- ARM site closeout
  - ARM site decommissioning
  - Finalization of ARM test results/ data
- Brine treatment test bed site closeout
  - Treatment test bed decommissioning
  - Finalization of test bed results/ data

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PHASE 2 TIME LINE

Site Preparation	Operations	Decommissioning
July 7, 2016 – January 2018	January 2018 – April 2020	April 2020 – July 2020

Site Preparation

- Contracting
- Public outreach
- Site survey
- Permitting and bonding
- Install brine handling
- Drill BEST-E1 well
- Drill BEST-I1 well
- Utility installation
- Install pipeline
- Brine treatment facility installation, testing, and training
- Brine treatment technology selection

Operations

- BSEM survey
- Well interference testing
- ARM demonstration
- Tracer survey
- Brine treatment technology testing
- Brine treatment technology assessment
- Repeat BSEM survey

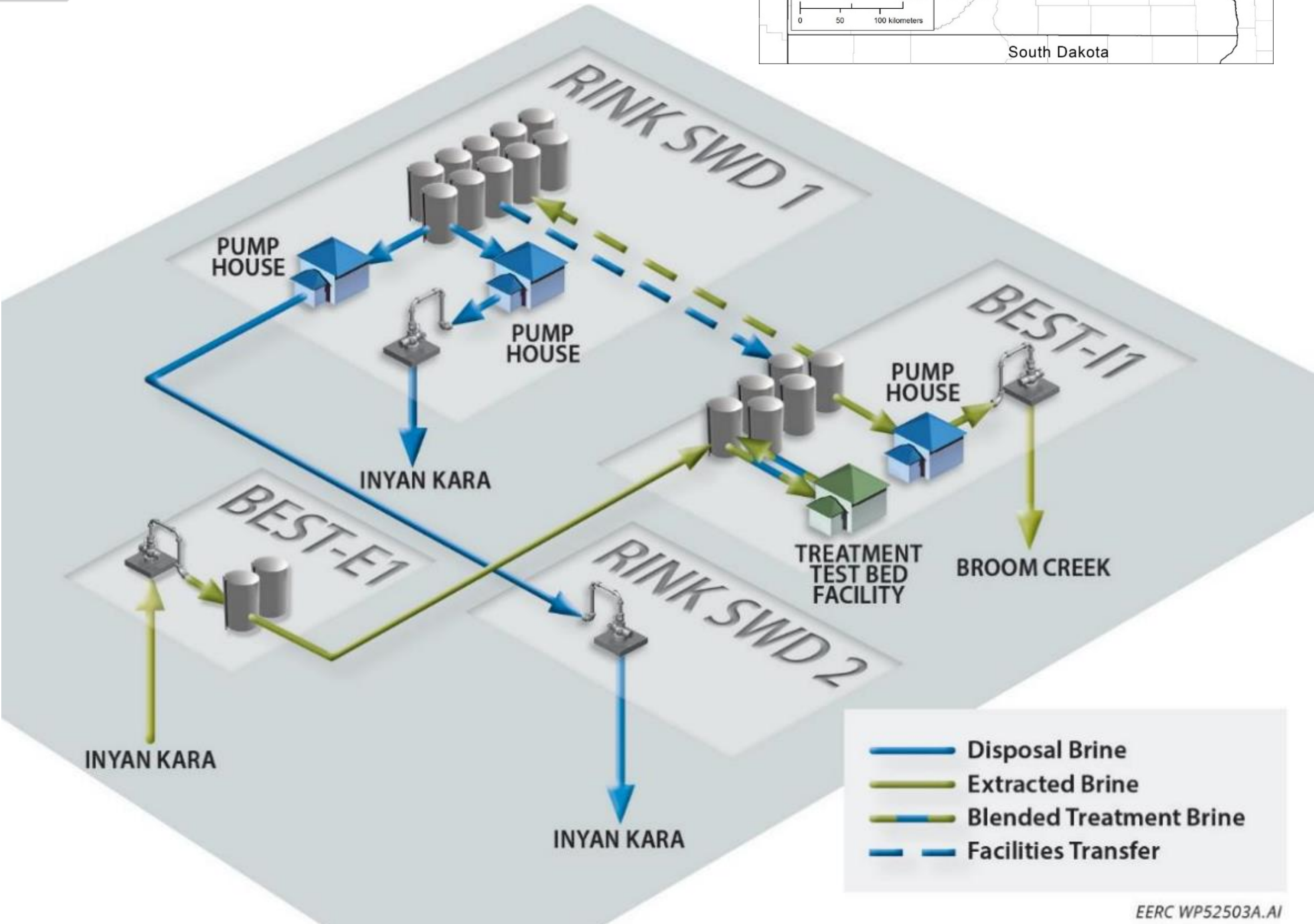
Decommissioning

- Contracting
- Decommissioning and transfer operations to Nuverra
- Project reporting

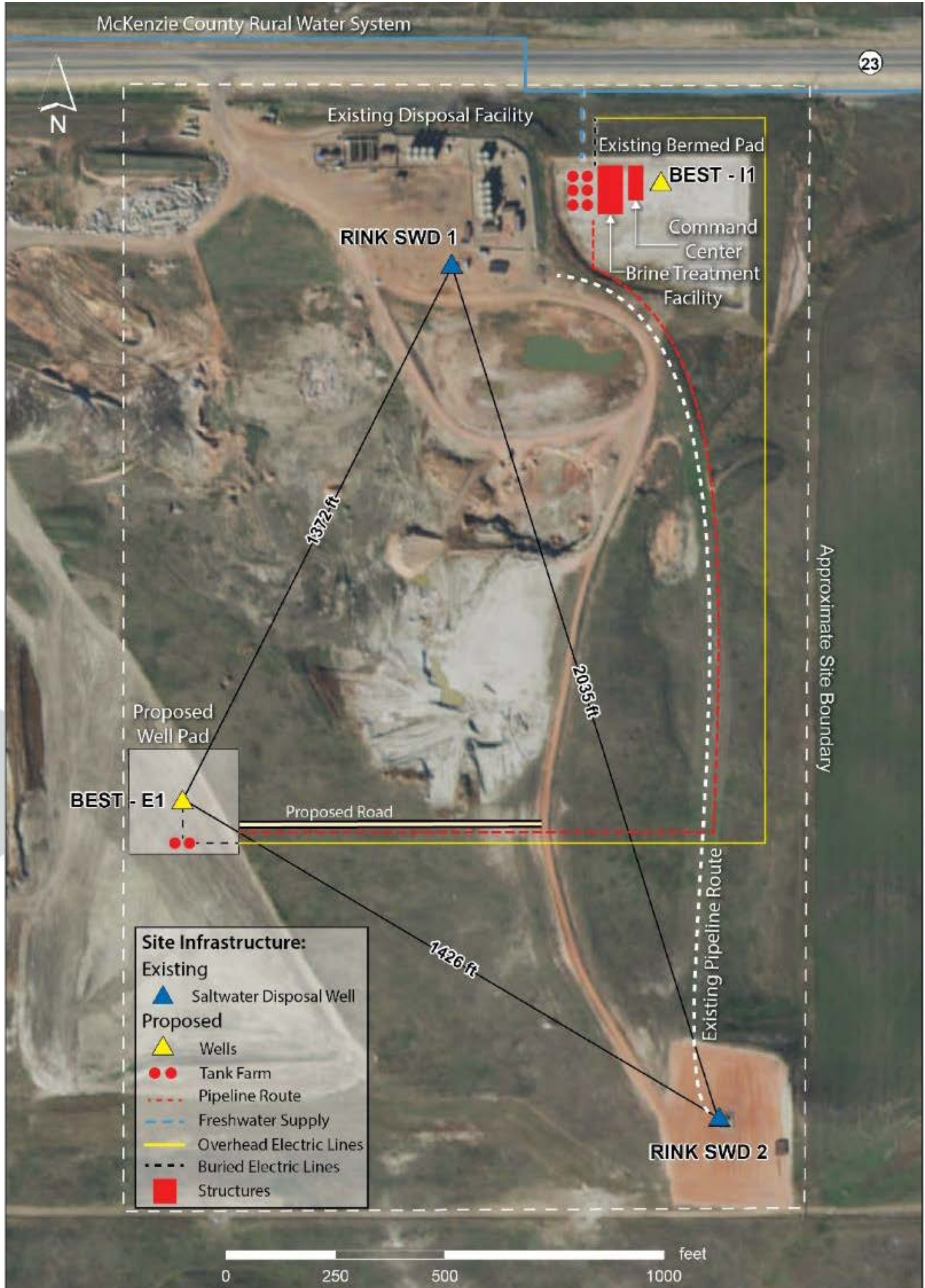
ACTIVE WATER DISPOSAL SITES AS A PROXY FOR DEDICATED CO_2 STORAGE

THE SITE

Saskatchewan
Manitoba
CANADA
UNITED STATES
Williston
Minot
BEST Site
North Dakota
Montana
Grand Forks
Minnesota
Bismarck
Dickinson
Fargo
South Dakota
0 40 80 miles
0 50 100 kilometers



RINK SWD 1
PUMP HOUSE
PUMP HOUSE
BEST-I1
PUMP HOUSE
INYAN KARA
BEST-E1
TREATMENT TEST BED FACILITY
BROOM CREEK
RINK SWD 2
INYAN KARA
INYAN KARA
Disposal Brine
Extracted Brine
Blended Treatment Brine
Facilities Transfer
EERC WP52503A.AI



McKenzie County Rural Water System
23
N
Existing Disposal Facility
Existing Bermed Pad
BEST - I1
RINK SWD 1
Command Center
Brine Treatment Facility
1372 ft
2035 ft
Approximate Site Boundary
Proposed Well Pad
BEST - E1
Proposed Road
1426 ft
Existing Pipeline Route
Site Infrastructure:
Existing
Saltwater Disposal Well
Proposed
Wells
Tank Farm
Pipeline Route
Freshwater Supply
Overhead Electric Lines
Buried Electric Lines
Structures
RINK SWD 2
feet
0 250 500 1000

SITE GEOLOGY

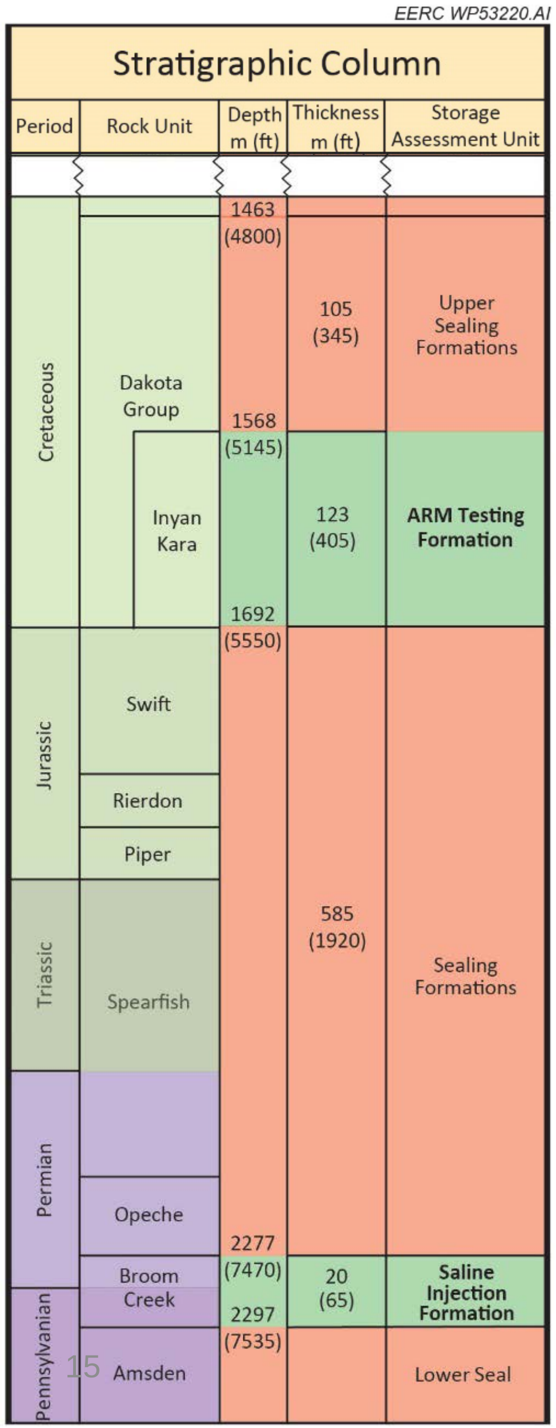
Inyan Kara Formation

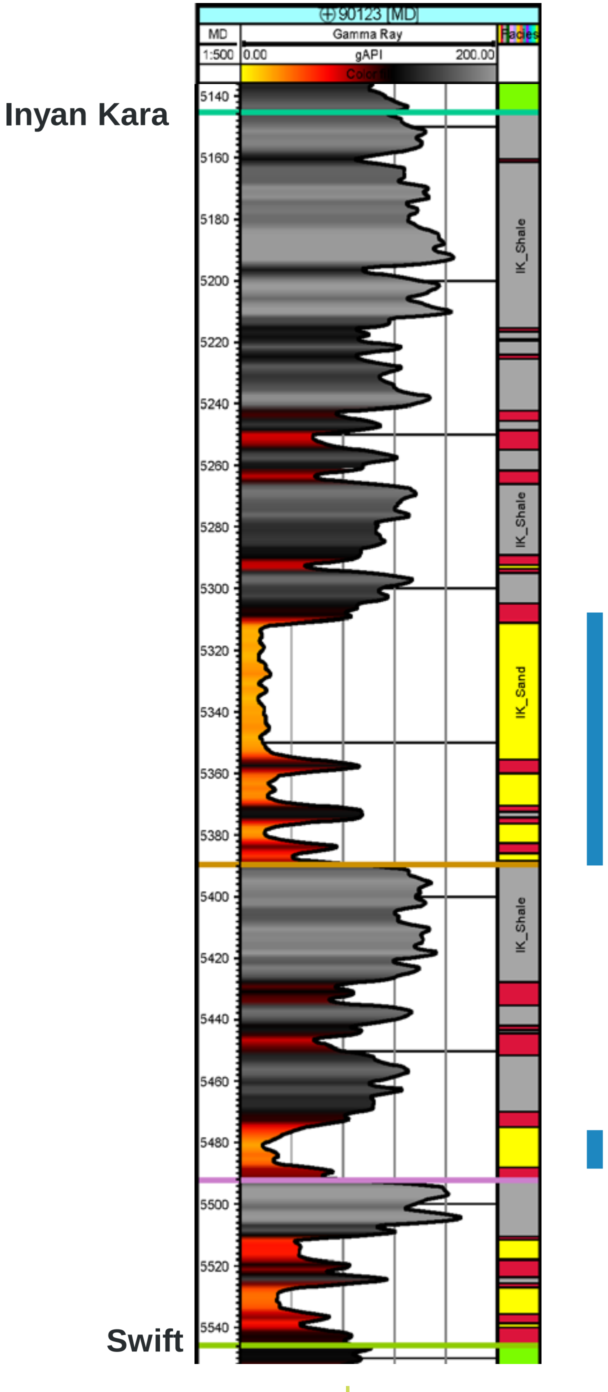
- Nearshore/shallow marine sandstone
- 1568-m depth (5145 ft)
- ~120 m thick (400 ft)

Broom Creek Formation

- Eolian/nearshore marine sandstone
- 2277-m depth (7470 ft)
- ~20 m thick (65 ft)

Both formations have thick sealing units and are potential CO_2 storage targets in the Williston Basin.





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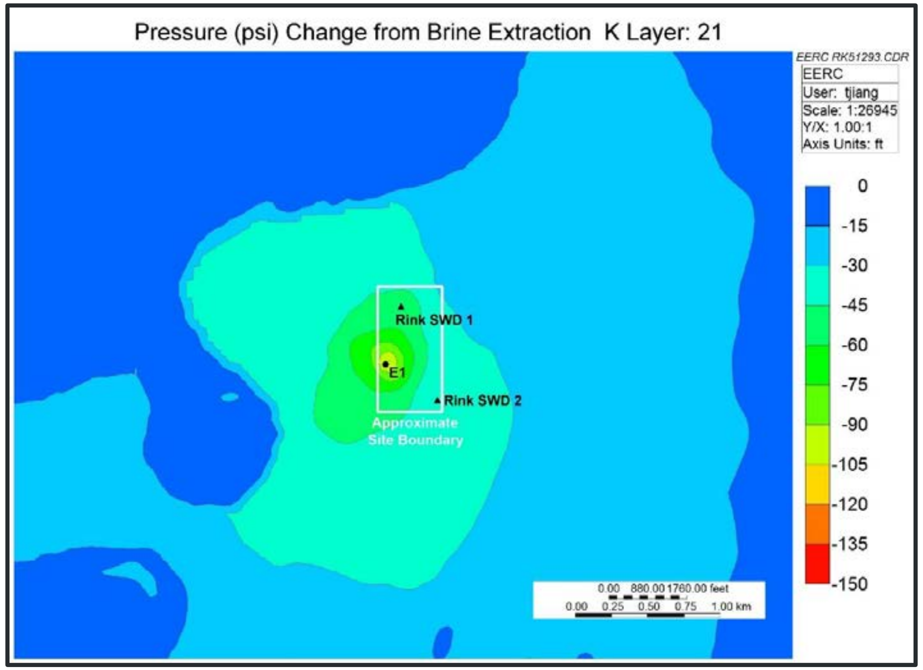
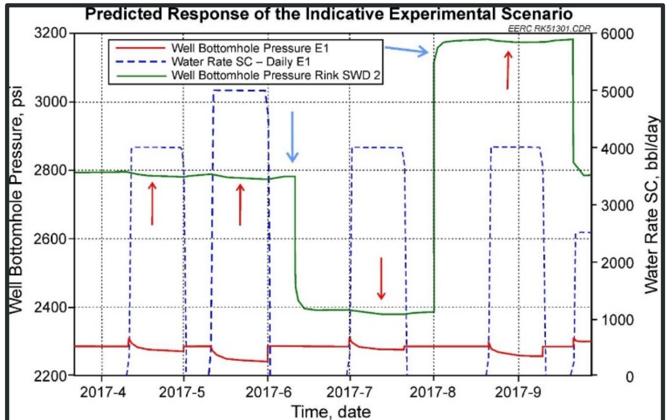
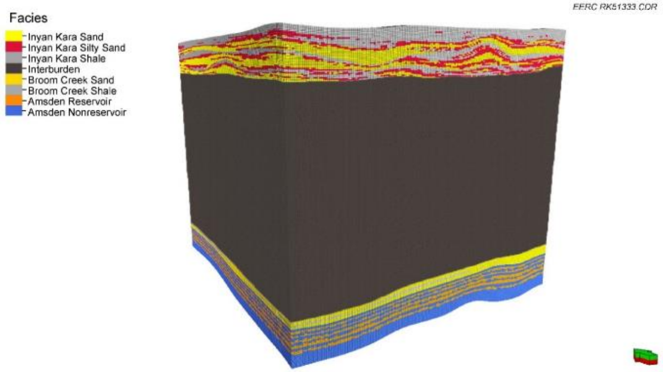
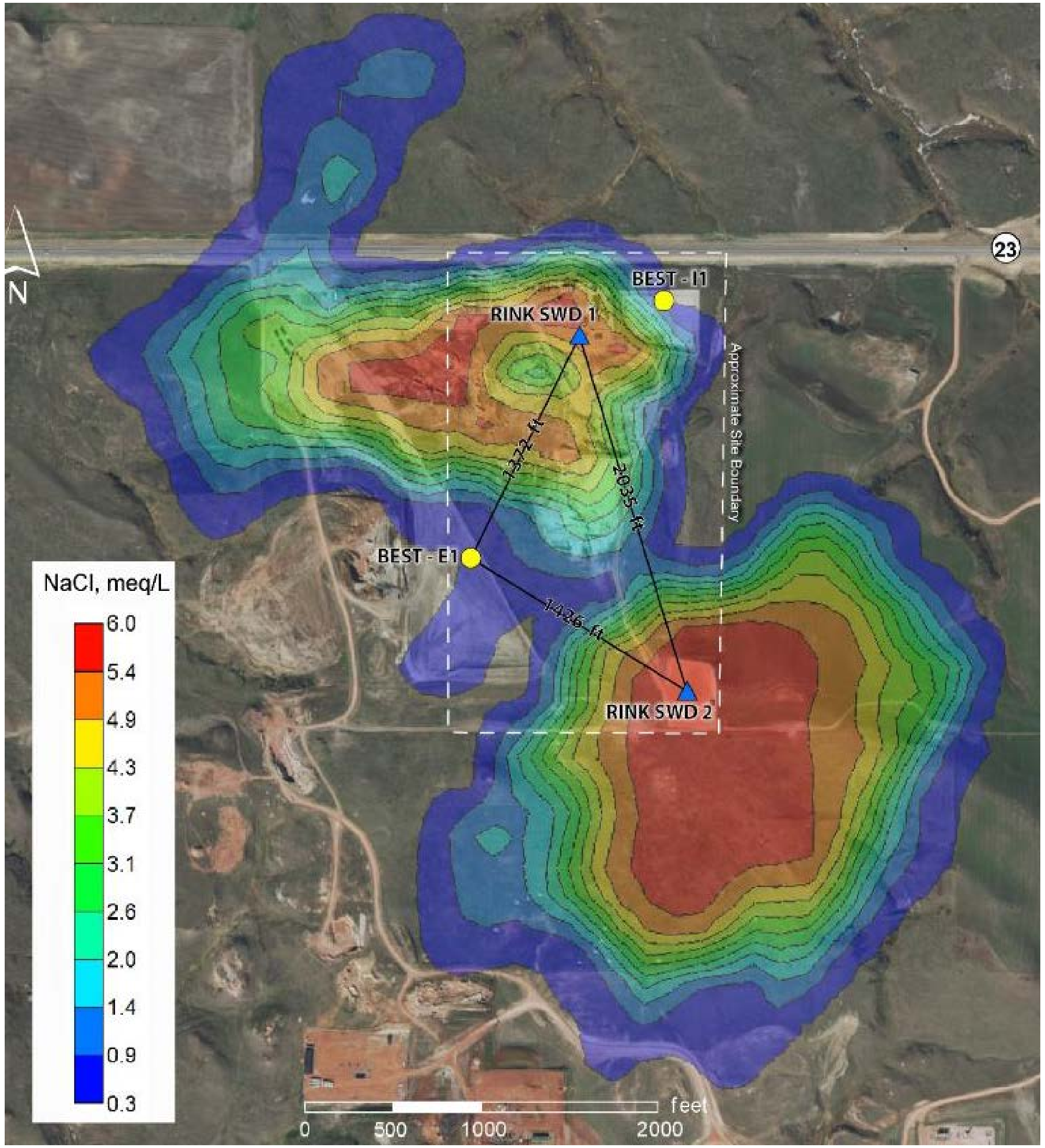
THE DESIGN (BALANCE)









Critical Challenges. **Practical Solutions.**

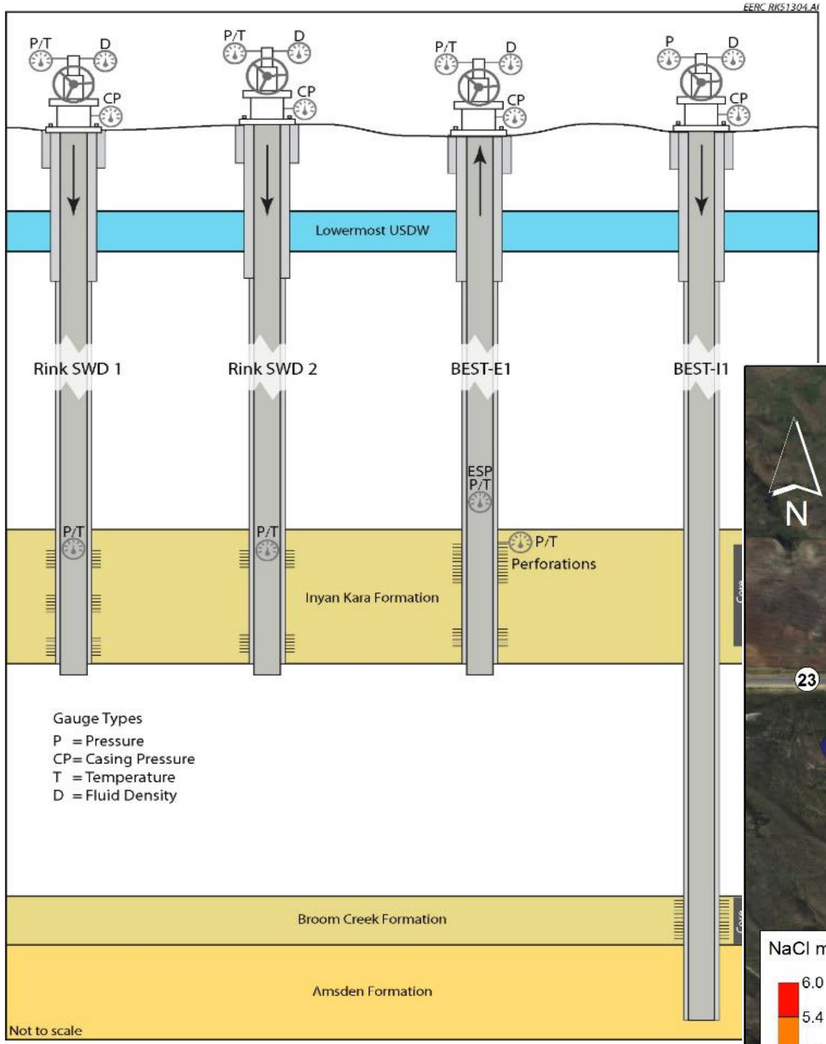
MVA PROGRAM

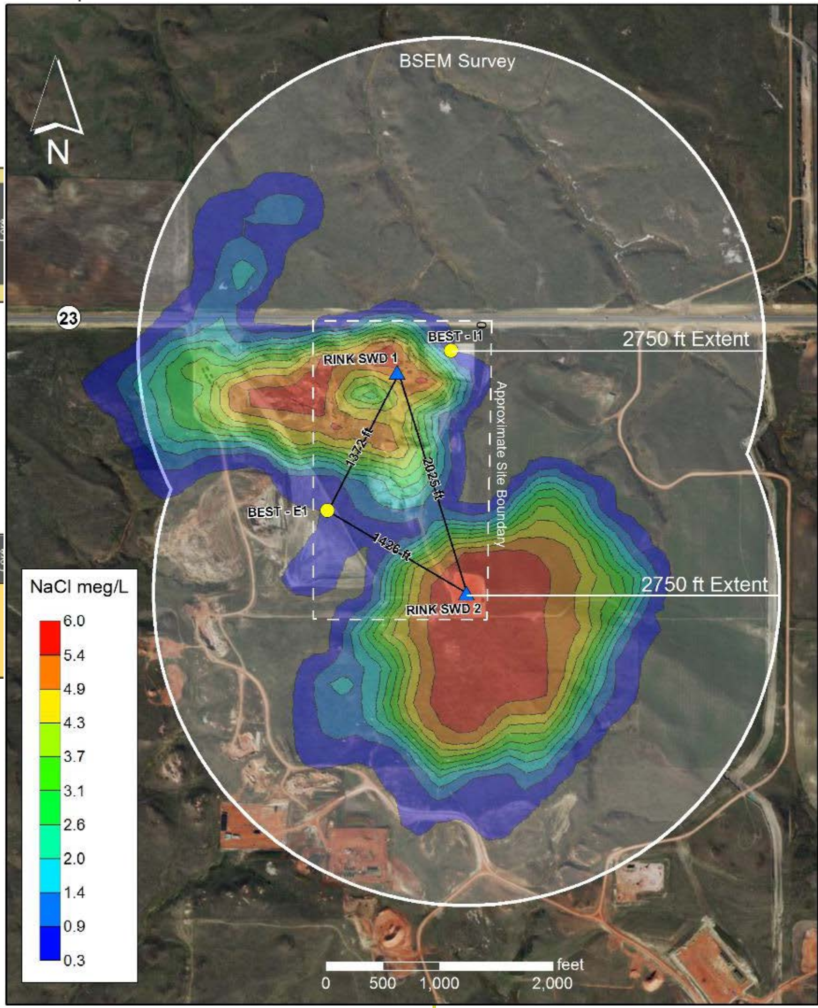
<u>Reservoir Surveillance</u>

- Well evaluation
  - Logging, coring, testing
- Borehole to surface electromagnetic (BSEM)
- Active reservoir surveillance
  - Pressure, temperature, flow rates, fluid density
- Tracer survey
- Fluid sampling

<u>Safety and Performance</u>

- Tank and pipeline monitoring and response plans
- Dual containment pipeline
- Flow and density meters
- Power and chemicals
- Pipeline monitoring
- High-level/low-level shutdown
- Remote sensing





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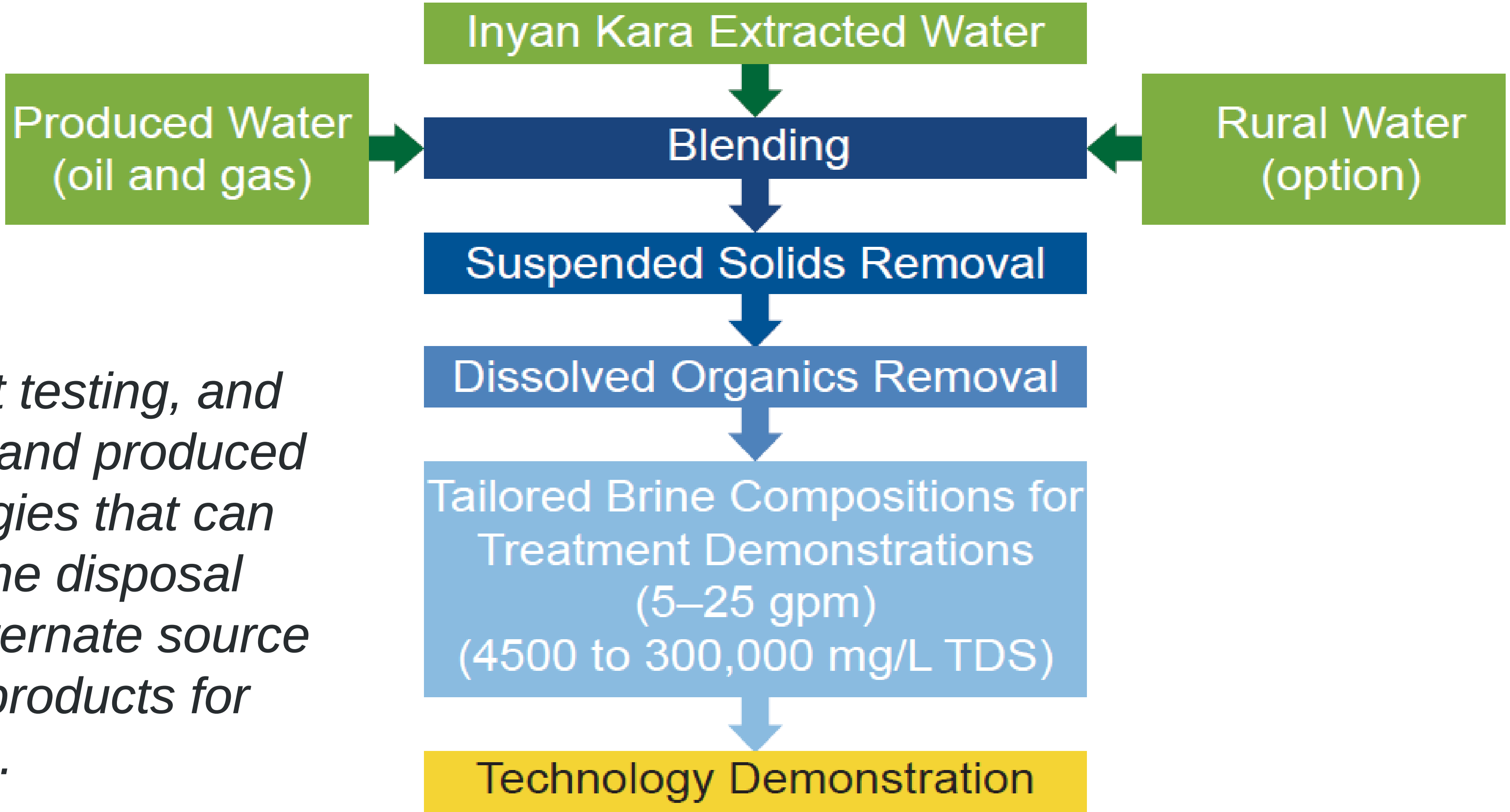
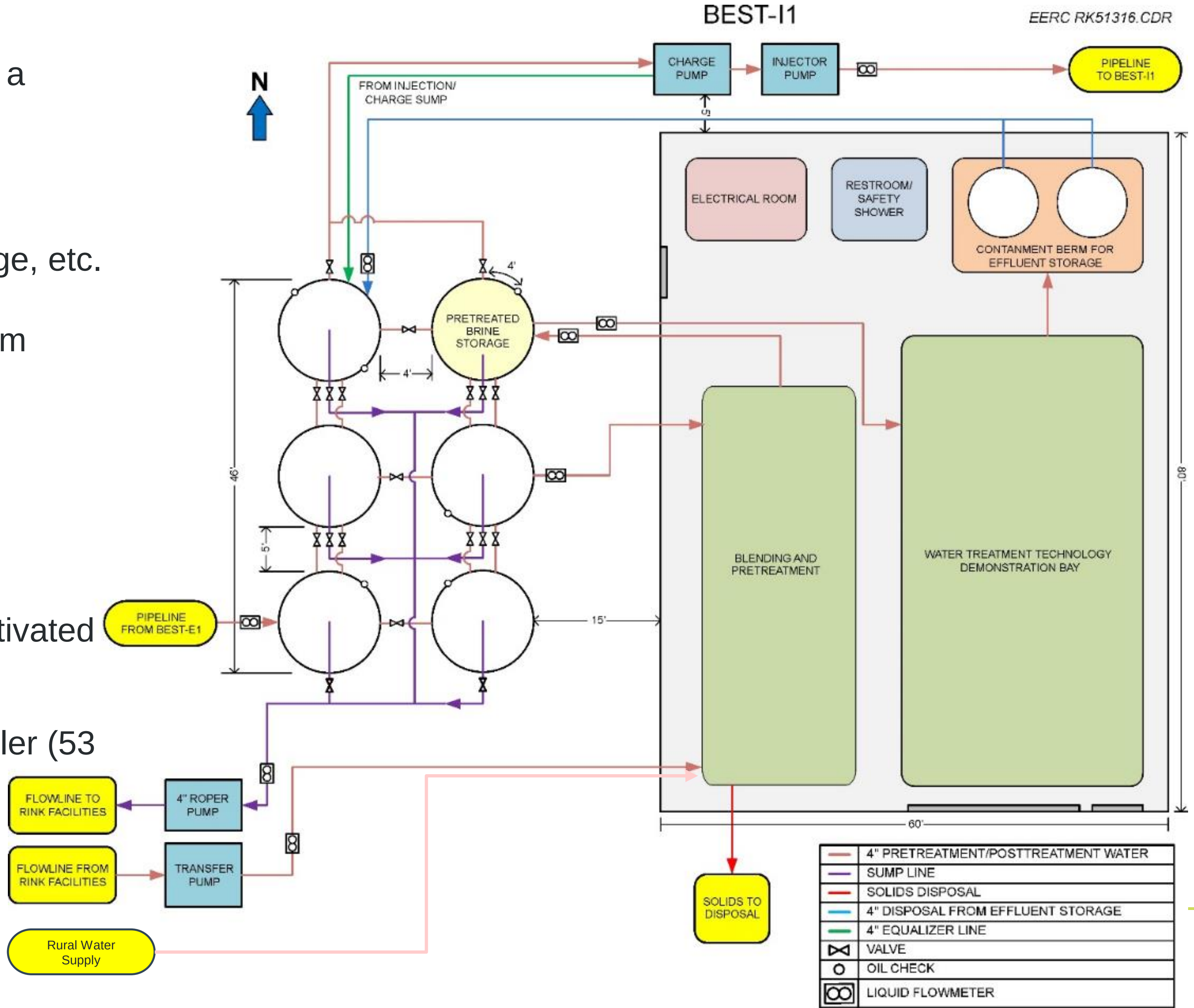
BRINE TREATMENT TEST BED



Enable development, pilot testing, and advancement of extracted and produced water treatment technologies that can meaningfully reduce brine disposal volumes and provide an alternate source of water and/or salable products for beneficial use.

BRINE TREATMENT TEST BED

- Permanently installed heated enclosure with a concrete floor integrated with ARM-related infrastructure
  - 30–60⁺-day extended-duration tests
  - 24/7/365 operations-capable
  - Monitoring of energy, flow, chemical usage, etc.
  - Waste management
- Pilot treatment rates ranging from 5 to 25 gpm
- Pretreatment
  - Blending of water to target TDS level of 180,000 mg/L or tailored blends to suit capabilities and/or limitations of selected technologies
  - Suspended solids removal (dissolved air flotation [DAF])
  - Dissolved organics removal (granular activated carbon [GAC])
- Technology demonstration bay
  - Accommodates standard semitractor trailer (53 ft long) inside the building
  - 300 kW electric power
  - Propane (5000-gal tank)
  - Noncontact cooling water (30 gpm)



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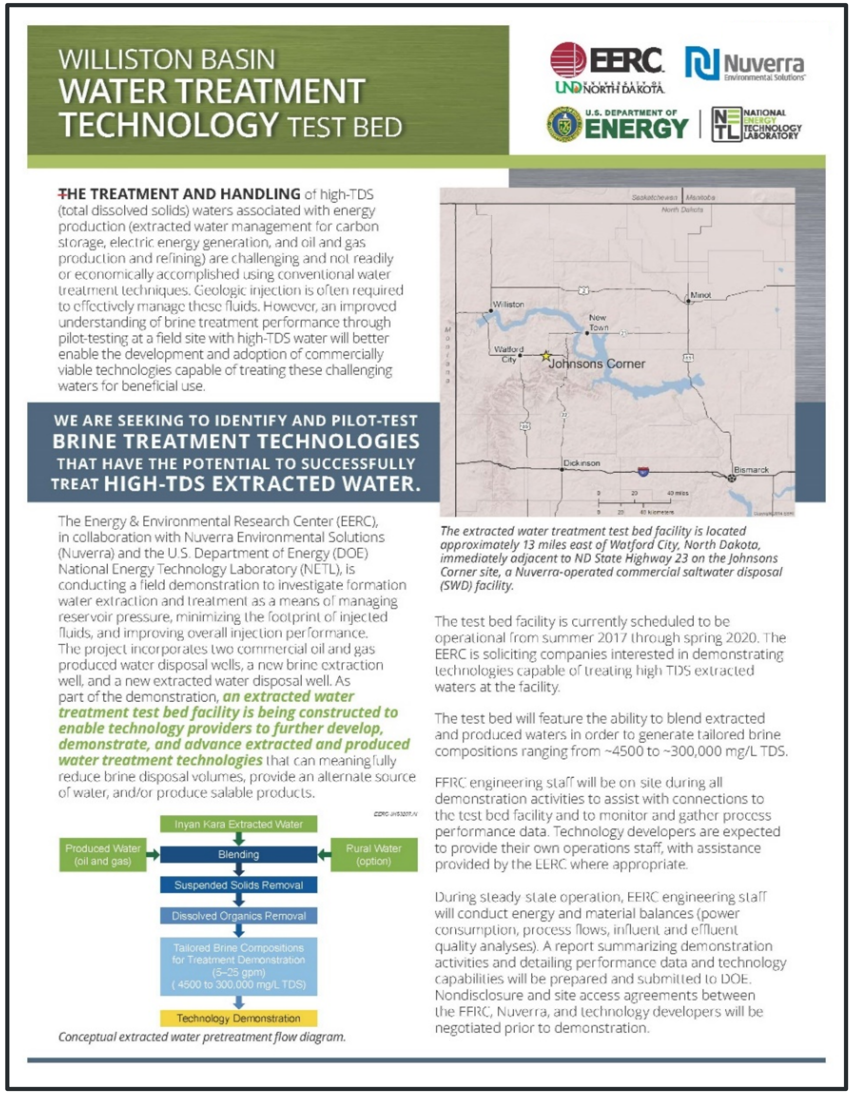
BRINE TREATMENT TEST BED OPERATIONS

- Shakedown testing of all pretreatment equipment prior to pilot tests.
- Selected technologies connected to the test bed facility – electric, propane, cooling water (EERC assistance to ensure safety requirements are satisfied).
- Technology vendors to provide operations staff, with assistance by EERC staff.
- During steady-state operation, EERC staff will conduct energy and material balances (power consumption, process flows, influent and effluent quality analyses).
- Extended operating periods (60+ days) to identify maintenance requirements and any operational issues.
- Operations will be scheduled to coincide with preferable operational windows (weather, ARM test program, etc.) where possible.

Top-ranked technologies may receive operating cost offsets.

SOLICITING BRINE TREATMENT TECHNOLOGIES

- NETL, EPRI, and the EERC are coordinating efforts to define water treatment goals and solicit technologies for pilot testing.
- The North Dakota and Florida facilities will provide unique water treatment scenarios but will have similar operational capabilities.
  - Both facilities will provide opportunity for extended-duration testing.
- The EERC test bed is anticipated to be operational in the fall of 2017.
- Site access agreements will be negotiated between host site operator, EERC, and brine treatment technology provider.



WILLISTON BASIN
WATER TREATMENT TECHNOLOGY TEST BED

THE TREATMENT AND HANDLING of high-TDS (total dissolved solids) waters associated with energy production (extracted water management for carbon storage, electric energy generation, and oil and gas production and refining) are challenging and not readily or economically accomplished using conventional water treatment techniques. Geologic injection is often required to effectively manage these fluids. However, an improved understanding of brine treatment performance through pilot-testing at a field site with high-TDS water will better enable the development and adoption of commercially viable technologies capable of treating these challenging waters for beneficial use.

WE ARE SEEKING TO IDENTIFY AND PILOT-TEST **BRINE TREATMENT TECHNOLOGIES** THAT HAVE THE POTENTIAL TO SUCCESSFULLY TREAT **HIGH-TDS EXTRACTED WATER.**

The Energy & Environmental Research Center (EERC), in collaboration with Nuverra Environmental Solutions (Nuverra) and the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL), is conducting a field demonstration to investigate formation water extraction and treatment as a means of managing reservoir pressure, minimizing the footprint of injected fluids, and improving overall injection performance. The project incorporates two commercial oil and gas produced water disposal wells, a new brine extraction well, and a new extracted water disposal well. As part of the demonstration, ***an extracted water treatment test bed facility is being constructed to enable technology providers to further develop, demonstrate, and advance extracted and produced water treatment technologies*** that can meaningfully reduce brine disposal volumes, provide an alternate source of water, and/or produce salable products.

Conceptual extracted water pretreatment flow diagram.

The extracted water treatment test bed facility is located approximately 13 miles east of Watford City, North Dakota, immediately adjacent to ND State Highway 23 on the Johnsons Corner site, a Nuverra-operated commercial saltwater disposal (SWD) facility.

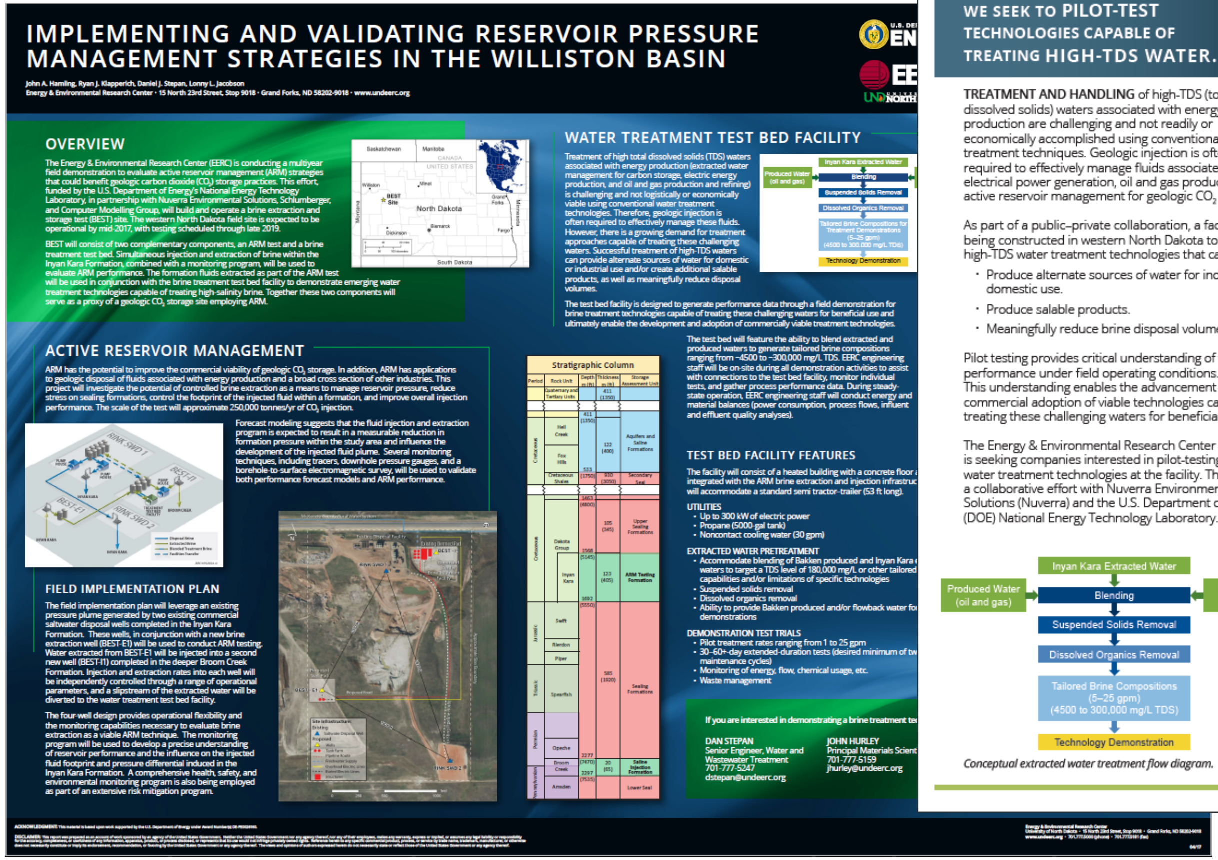
The test bed facility is currently scheduled to be operational from summer 2017 through spring 2020. The EERC is soliciting companies interested in demonstrating technologies capable of treating high TDS extracted waters at the facility.

The test bed will feature the ability to blend extracted and produced waters in order to generate tailored brine compositions ranging from ~4500 to ~300,000 mg/L TDS.

EERC engineering staff will be on site during all demonstration activities to assist with connections to the test bed facility and to monitor and gather process performance data. Technology developers are expected to provide their own operations staff, with assistance provided by the EERC where appropriate.

During steady state operation, EERC engineering staff will conduct energy and material balances (power consumption, process flows, influent and effluent quality analyses). A report summarizing demonstration activities and detailing performance data and technology capabilities will be prepared and submitted to DOE. Nondisclosure and site access agreements between the EERC, Nuverra, and technology developers will be negotiated prior to demonstration.

OUREACH AND INFORMATION



IMPLEMENTING AND VALIDATING RESERVOIR PRESSURE MANAGEMENT STRATEGIES IN THE WILLISTON BASIN

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Energy & Environmental Research Center • 15 North 23rd Street, Stop 9018 • Grand Forks, ND 58202-9018 • www.undeerc.org

OVERVIEW

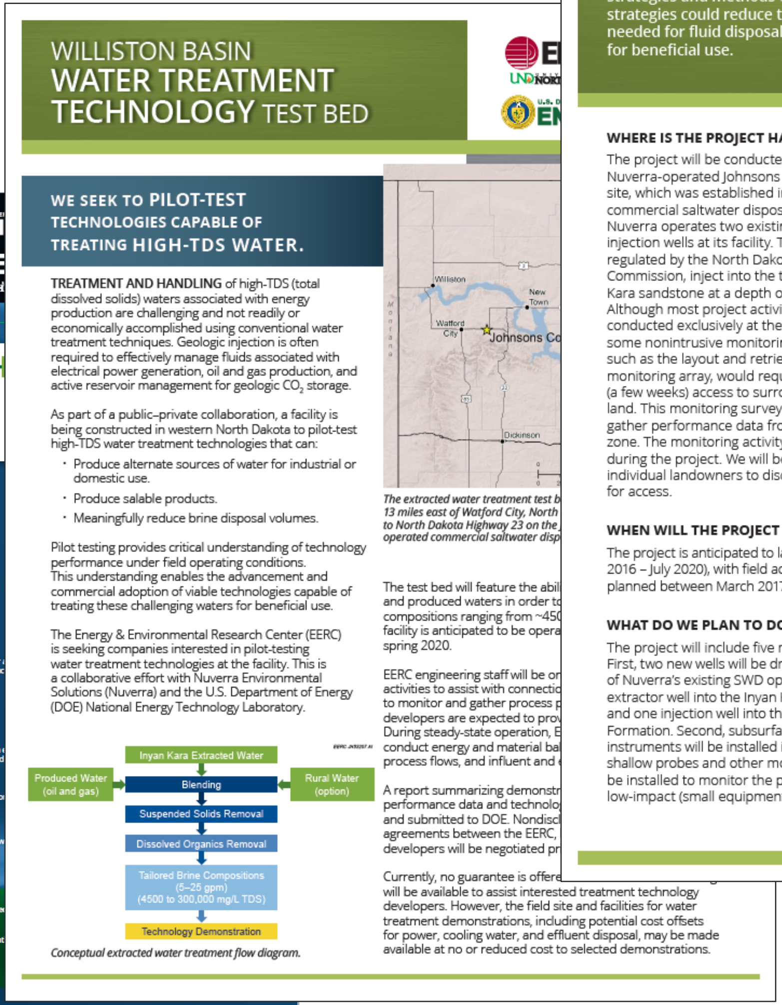
ACTIVE RESERVOIR MANAGEMENT

FIELD IMPLEMENTATION PLAN

WATER TREATMENT TEST BED FACILITY

Stratigraphic Column

TEST BED FACILITY FEATURES



WILLISTON BASIN WATER TREATMENT TECHNOLOGY TEST BED

WE SEEK TO PILOT-TEST TECHNOLOGIES CAPABLE OF TREATING HIGH-TDS WATER.

TREATMENT AND HANDLING of high-TDS (total dissolved solids) waters associated with energy production are challenging and not readily or economically accomplished using conventional water treatment techniques. Geologic injection is often required to effectively manage fluids associated with electrical power generation, oil and gas production, and active reservoir management for geologic CO_2 storage.

As part of a public–private collaboration, a facility is being constructed in western North Dakota to pilot-test high-TDS water treatment technologies that can:

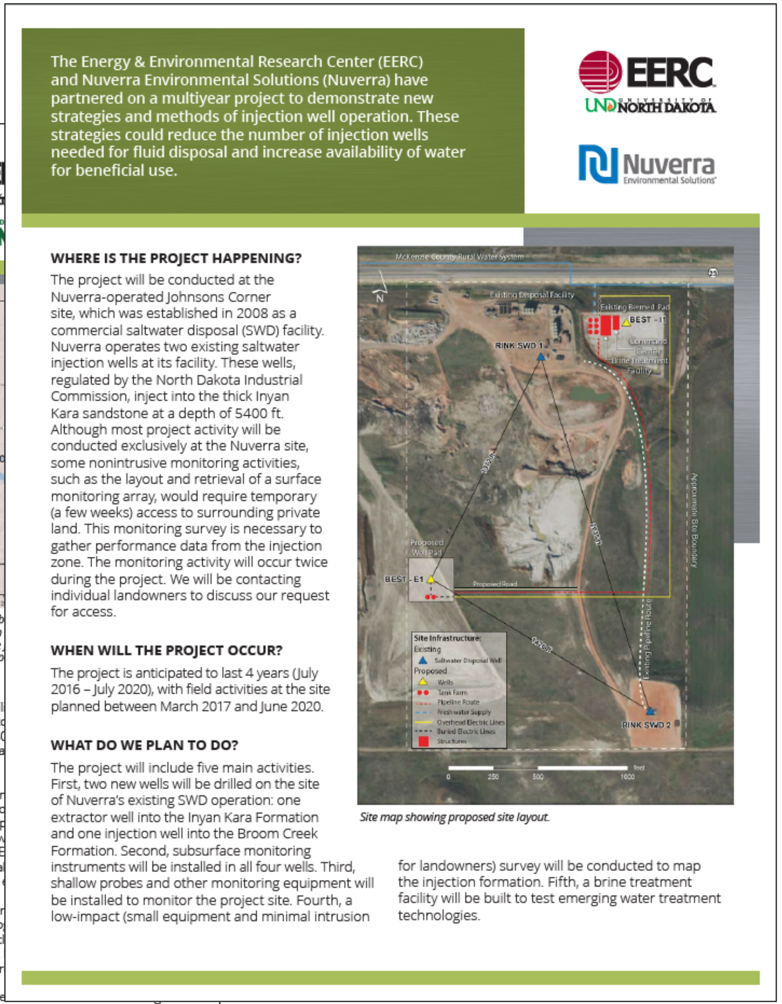
- Produce alternate sources of water for industrial or domestic use.
- Produce salable products.
- Meaningfully reduce brine disposal volumes.

Pilot testing provides critical understanding of technology performance under field operating conditions. This understanding enables the advancement and commercial adoption of viable technologies capable of treating these challenging waters for beneficial use.

The Energy & Environmental Research Center (EERC) is seeking companies interested in pilot-testing water treatment technologies at the facility. This is a collaborative effort with Nuverra Environmental Solutions (Nuverra) and the U.S. Department of Energy (DOE) National Energy Technology Laboratory.

Conceptual extracted water treatment flow diagram.

Currently, no guarantee is offere… will be available to assist interested treatment technology developers. However, the field site and facilities for water treatment demonstrations, including potential cost offsets for power, cooling water, and effluent disposal, may be made available at no or reduced cost to selected demonstrations.



The Energy & Environmental Research Center (EERC) and Nuverra Environmental Solutions (Nuverra) have partnered on a multiyear project to demonstrate new strategies and methods of injection well operation. These strategies could reduce the number of injection wells needed for fluid disposal and increase availability of water for beneficial use.

WHERE IS THE PROJECT HAPPENING?

The project will be conducted at the Nuverra-operated Johnsons Corner site, which was established in 2008 as a commercial saltwater disposal (SWD) facility. Nuverra operates two existing saltwater injection wells at its facility. These wells, regulated by the North Dakota Industrial Commission, inject into the thick Inyan Kara sandstone at a depth of 5400 ft. Although most project activity will be conducted exclusively at the Nuverra site, some nonintrusive monitoring activities, such as the layout and retrieval of a surface monitoring array, would require temporary (a few weeks) access to surrounding private land. This monitoring survey is necessary to gather performance data from the injection zone. The monitoring activity will occur twice during the project. We will be contacting individual landowners to discuss our request for access.

WHEN WILL THE PROJECT OCCUR?

The project is anticipated to last 4 years (July 2016 – July 2020), with field activities at the site planned between March 2017 and June 2020.

WHAT DO WE PLAN TO DO?

The project will include five main activities. First, two new wells will be drilled on the site of Nuverra's existing SWD operation: one extractor well into the Inyan Kara Formation and one injection well into the Broom Creek Formation. Second, subsurface monitoring instruments will be installed in all four wells. Third, shallow probes and other monitoring equipment will be installed to monitor the project site. Fourth, a low-impact (small equipment and minimal intrusion for landowners) survey will be conducted to map the injection formation. Fifth, a brine treatment facility will be built to test emerging water treatment technologies.

Site map showing proposed site layout.

ACCOMPLISHMENTS

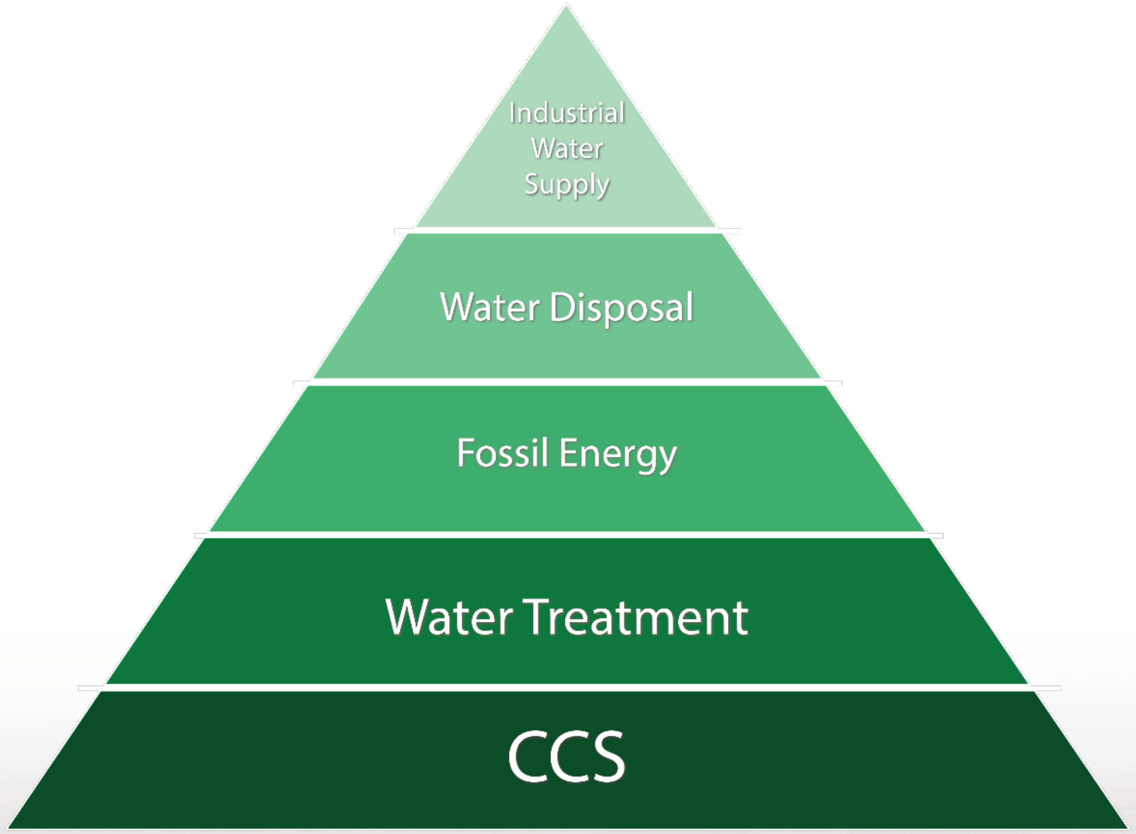
- Design and preparation work largely accomplished.
  - Contracts and teaming arrangement between project partners and many vendors are in place.
  - Most site access agreements are in place.
  - Site survey work completed.
  - Site electrical design and engineering complete.
  - Project permits and bonds have been filed and received (including drilling, injection, and brine-handling facilities).
  - Brine treatment test bed facility engineering design is 99% complete.
  - Scouting trip for BSEM survey has been completed.
  - Pipeline design has been completed.
  - Procurement and assembly of unit processes are in progress.
- Next step is infrastructure and well installation and testing, with ARM and brine treatment technology tests to follow.

LESSONS LEARNED

- A small induced change in pressure can impact a large area surrounding the well in highly permeable systems.
- Monitoring brine on brine plume development is more challenging than CO_2, but the density and salinity contrast should be sufficient.
- Brine plume migration is not an exact proxy for CO_2, but experience with other injection/production studies suggests appropriate corrections can be made.
- Extensive site characterization program will substantially improve forward modeling accuracy.
- Operational flexibility allows project to be adaptive to geologic uncertainty.
- Treatment of high-TDS water remains challenging; no “magic bullet.”
- Market drivers are still limited for driving treatment technology advances.

SYNERGY

- Produced water treatment and use
- Wastewater and produced water disposal
- Crosscutting water treatment applications and technology development
- North Dakota Carbon Safe Phase 2
  - Core and characterization
- EPRI-led Florida BEST Phase 2 project
  - e.g., technology vetting, complementary ARM test program, knowledge-sharing workshop, etc.



Synergies

SUMMARY

- BEST field test projects are designed to field-test ARM strategies.
  - North Dakota and Florida
- Both will operate brine treatment technology test bed facilities.
- Program likely to have benefits for CO_2 storage and broad range of industries by:
  - Reducing stress on sealing formations.
  - Providing mechanism for controlling pressure and injected fluid plume.
  - Reducing AOR.
  - Increasing storage capacity/efficiency.

<u>Next Steps</u>

✓ Receive well permits

❑ Procure remaining material and vendors

❑ Brine treatment facility construction

❑ Drill and complete BEST-E1 and BEST-I1

❑ Conduct characterization program, and update ARM test schema

❑ Complete infrastructure installation

❑ Brine treatment technology vetting and selection

CONTACT INFORMATION

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THANK YOU!


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CONFIDENTIAL APPENDIX

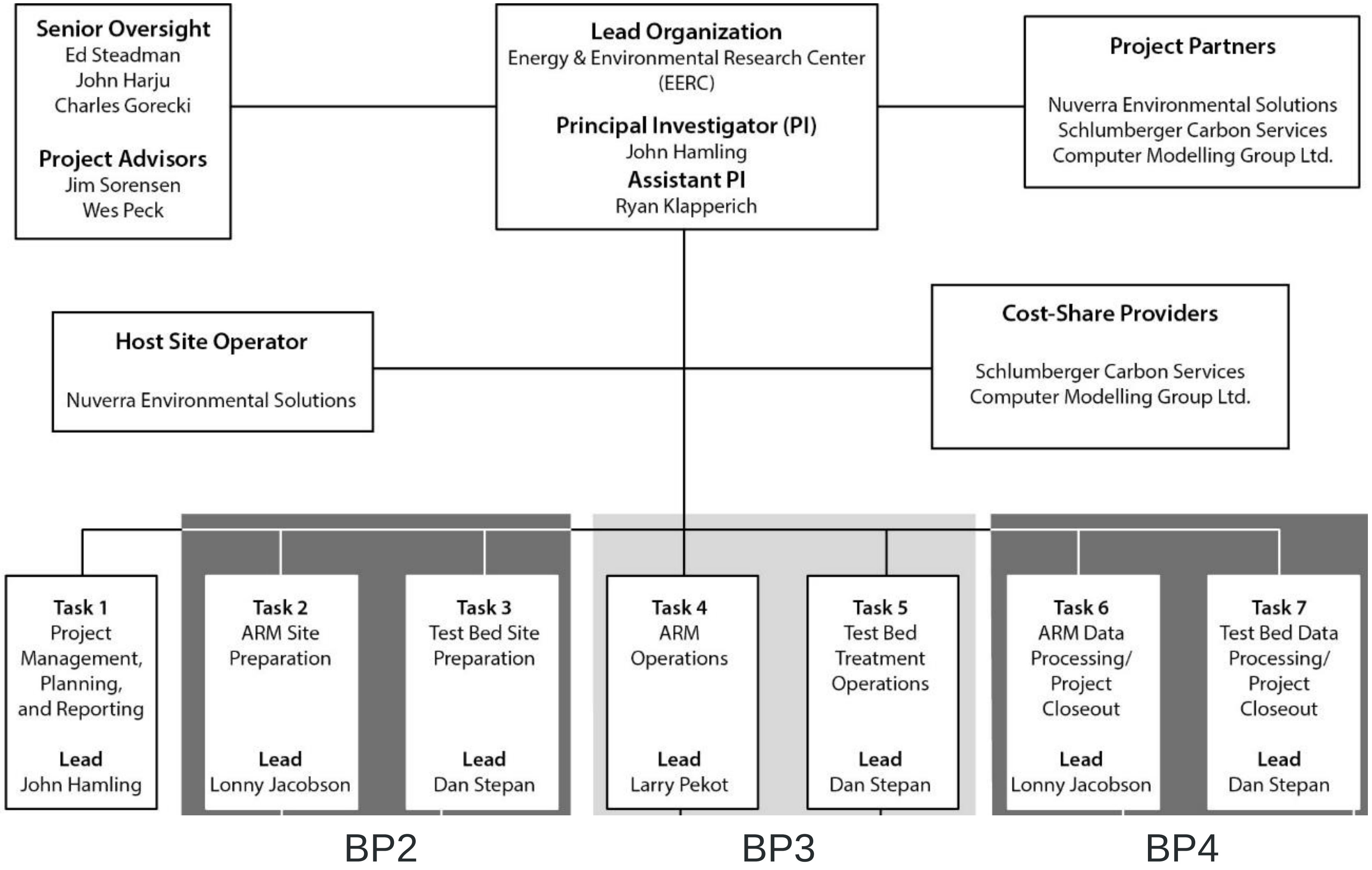
BENEFIT TO THE PROGRAM

This project is expected to result in the development of engineering strategies/approaches to quantitatively affect changes in differential formation pressure and to monitor, predict, and manage differential pressure plume movement in the subsurface for future CO_2 saline storage projects. Additionally, the brine treatment technology evaluation is expected to provide valuable information on the ability to produce water for beneficial use. The results derived from implementation of the project will provide a significant contribution to the U.S. Department of Energy's (DOE's) Carbon Storage Program goals. Specifically, this project will support **Goals 1 and 2** by validating technologies that will improve reservoir storage efficiency, ensure containment effectiveness, and/or ensure storage permanence by controlling injected fluid plumes in a representative CO_2 storage target. Geologic characterization of the target horizons will provide fundamental data to improve storage coefficients related to the respective depositional environments investigated, directly contributing to **Goal 3**. In addition, this project will support **Goal 4** by producing information that will be useful for inclusion in DOE best practices manuals.

PROJECT OVERVIEW – GOALS AND OBJECTIVES

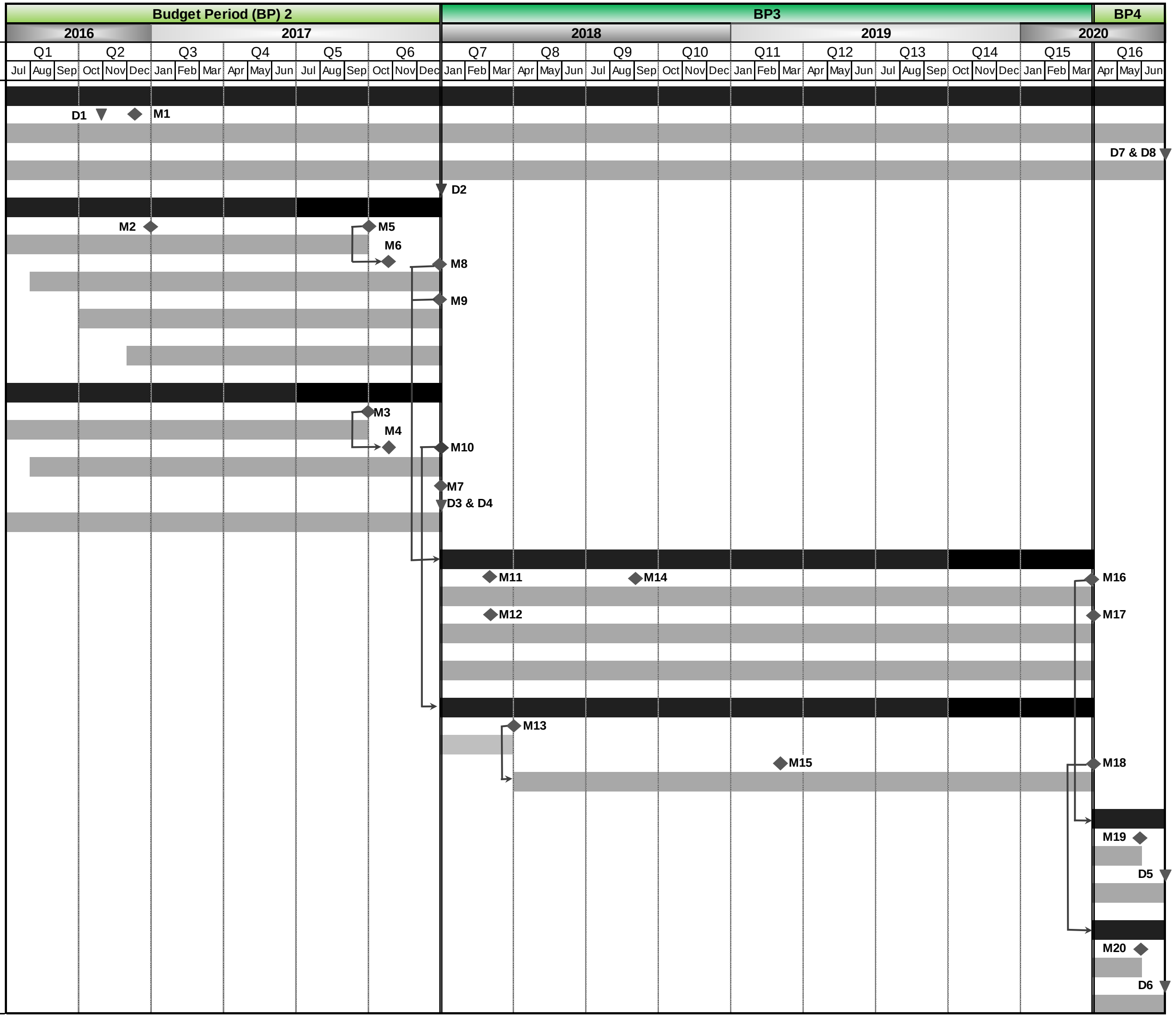
- Confirm efficacy of the ARM approaches developed during Phase I
  - Formation pressure
  - Predicting and monitoring plume movement
  - Validating pressure and brine plume model predictions
- Implement and operate a test bed facility for the evaluation of selected brine treatment technologies
- Three development stages over 48 months
  1. Site preparation and construction
  2. Site operations including ARM and extracted brine treatment technology testing and demonstration
  3. Project closeout/decommissioning and data processing/reporting

ORGANIZATION CHART



GANTT CHART

Task	Start Date	End Date
Task 1.0 – Project Management, Planning and Reporting	**7/7/16**	**7/6/20**
1.1 – Project Management	7/7/16	7/6/20
1.2 – Project Reporting	7/7/16	7/6/20
Task 2.0 – ARM Site Preparation	**7/7/16**	**12/31/17**
2.1 – ARM Permitting	7/7/16	9/30/17
2.2 – Well Installation	8/1/16	12/31/17
2.3 – Surface Infrastructure Installation	10/1/16	12/31/17
2.4 – Updated Site Characterization and Modeling	12/1/16	12/31/17
Task 3.0 – Test Bed Site Preparation	**7/7/16**	**12/31/17**
3.1 – Test Bed Facilities Permitting	7/7/16	9/30/17
3.2 – Test Bed Facility Installation	8/1/16	12/31/17
3.3 – Solicitation of Treatment Technologies	7/7/16	12/31/17
Task 4.0 – ARM Operations	**1/1/18**	**3/31/20**
4.1 – Injection/Extraction Testing	1/1/18	3/31/20
4.2 – MVA Implementation	1/1/18	3/31/20
4.3 – Model Updates/History Matching	1/1/18	3/31/20
Task 5.0 – Test Bed Treatment Operations	**1/1/18**	**3/31/20**
5.1 – Facility Shakedown/Training	1/1/18	3/31/18
5.2 – Long-Term Performance Evaluations	4/1/18	3/31/20
Task 6.0 – ARM Data Processing/Project Closeout	**4/1/20**	**6/30/20**
6.1 – ARM Site Decommissioning/Disposition	4/1/20	5/31/20
6.2 – Finalization of ARM Test Results	4/1/20	6/30/20
Task 7.0 – Test Bed Data Processing/Project Closeout	**4/1/20**	**6/30/20**
7.1 – Test Bed Decommissioning/Disposition	4/1/20	5/31/20
7.2 – Finalization of Test Bed Results	4/1/20	6/30/20



Note: The contract modification for Phase II was fully executed on September 9, 2016.

Deliverables ▼

- D1 – Updated PMP
- D2 – Field Implementation Plan (FIP) Finalized
- D3 – Water Treatment Technology Selection Process Summary
- D4 – Preliminary Schedule of Technologies
- D5 – Vol. 1 – ARM Engineering and Evaluation Summary
- D6 – Vol. 2 – Technology Evaluation Report
- D7 – Data Submission to EDX
- D8 – Lessons Learned Document

Key for Milestones (M) ◆

- M1 – Project Kickoff Meeting
- M2 – Permit to Drill Submitted
- M3 – Water Treatment Test Bed Permit Received
- M4 – Start Water Treatment Facilities Construction
- M5 – Permit to Drill Received
- M6 – Start Site Preparation
- M7 – First Treatment Technology Selected
- M8 – Well Installation Complete
- M9 – Surface Installation Complete
- M10 – Water Treatment Facilities Complete
- M11 – Initiate Stage 1 of Experimental Scenario
- M12 – Initiate Collection of Operational Data
- M13 – Water Treatment Test Bed Fully Operational
- M14 – Initiate Stage 2 of Experimental Scenario
- M15 – First Treatment Technology Evaluated
- M16 – Completion of ARM Operations
- M17 – Conduct Repeat BSEM Survey
- M18 – Completion of Water Treatment Technology Demonstration
- M19 – ARM Site Decommissioning/Disposition Completed
- M20 – Water Treatment Test Bed Decommissioning/Disposition Completed

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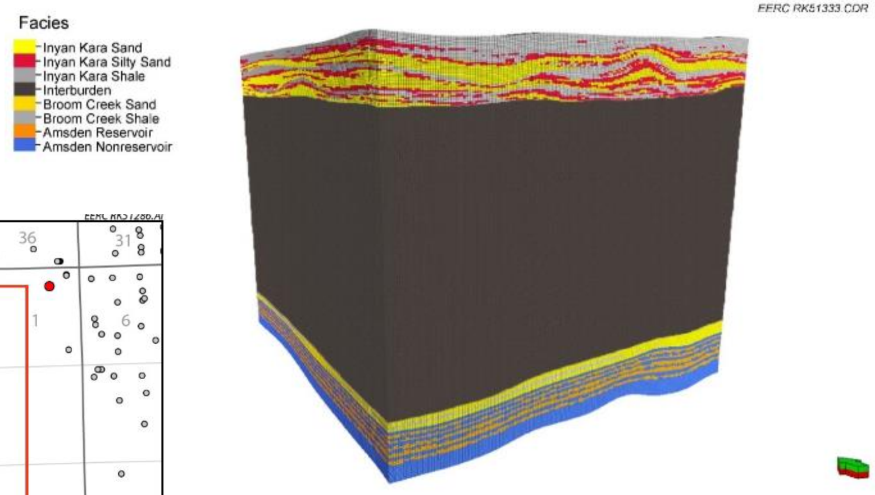
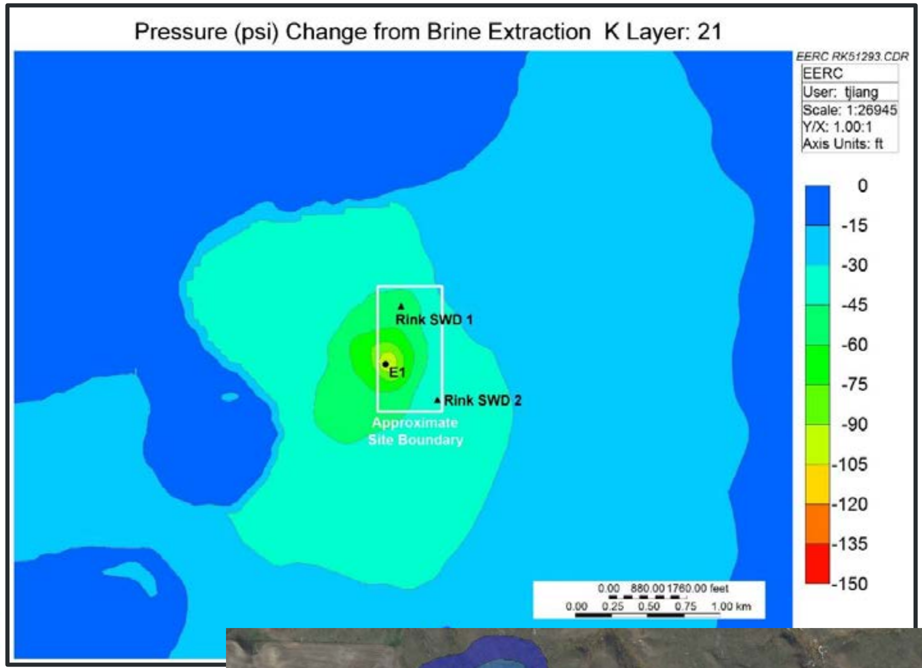
BACKUP SLIDES FOR Q&A

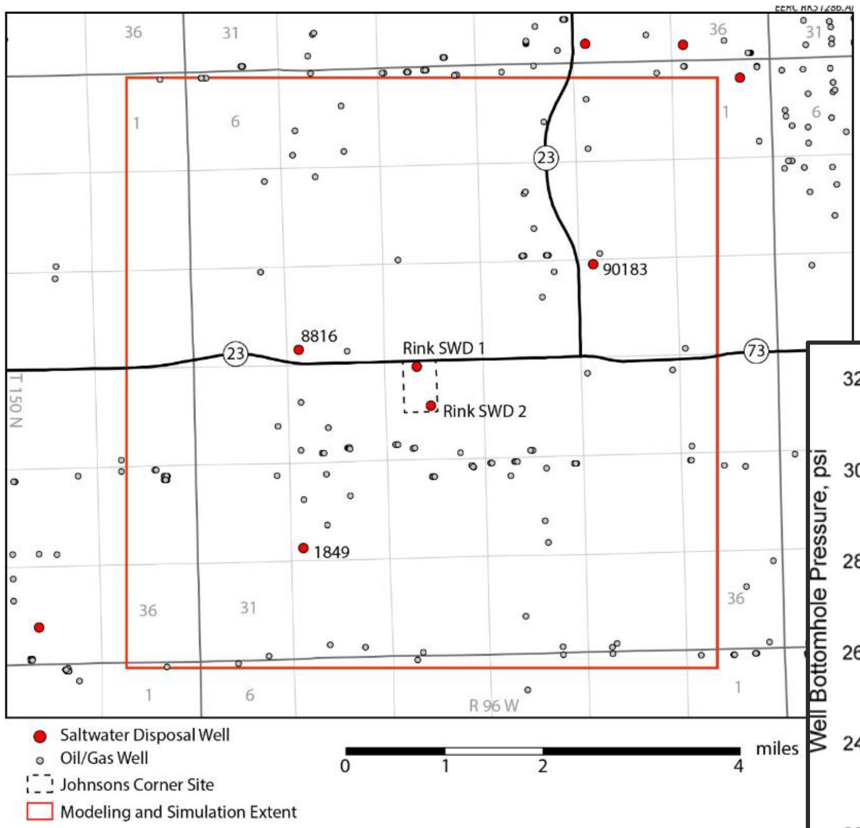
CO_2 PROXY JUSTIFICATION

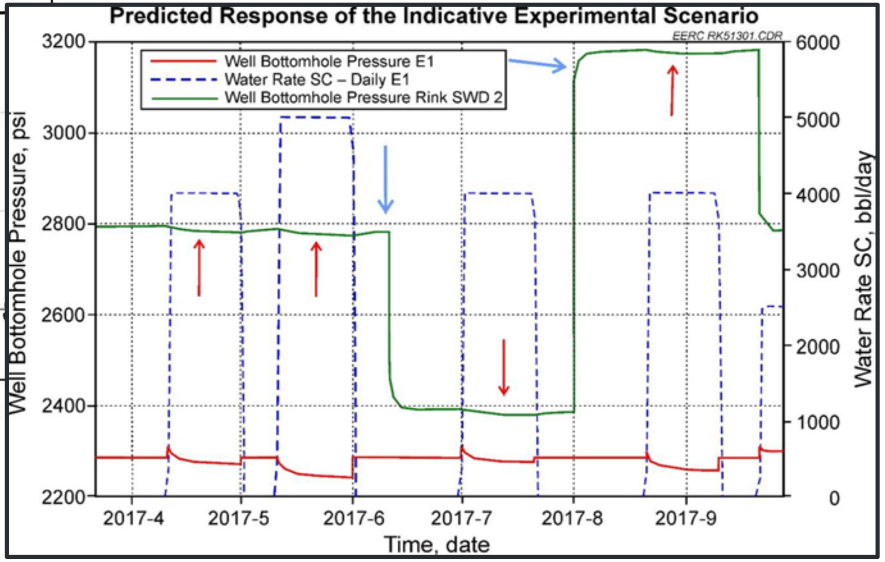
- CO_2 volume predictions can be made injection and production data.
  - EERC has experience with this.
- Workflows have been developed to account for differences between.
- Practically speaking, using brine is generally quicker, easier, and less costly to implement compared to CO_2.
- Injection formation and AOR will have similar response to ARM
- Volumes of water being handled mimic commercial-scale volumes of CO_2.
- For large-scale CO_2 storage (million+ tons/yr) pressure plume likely to exceed fluid plume; small changes in pressure can result in large changes to the extent of the pressure plume.
  - Field pressure interactions will be examined by the BEST experiment.
  - Field monitoring for pressure interactions will be tested by BEST.

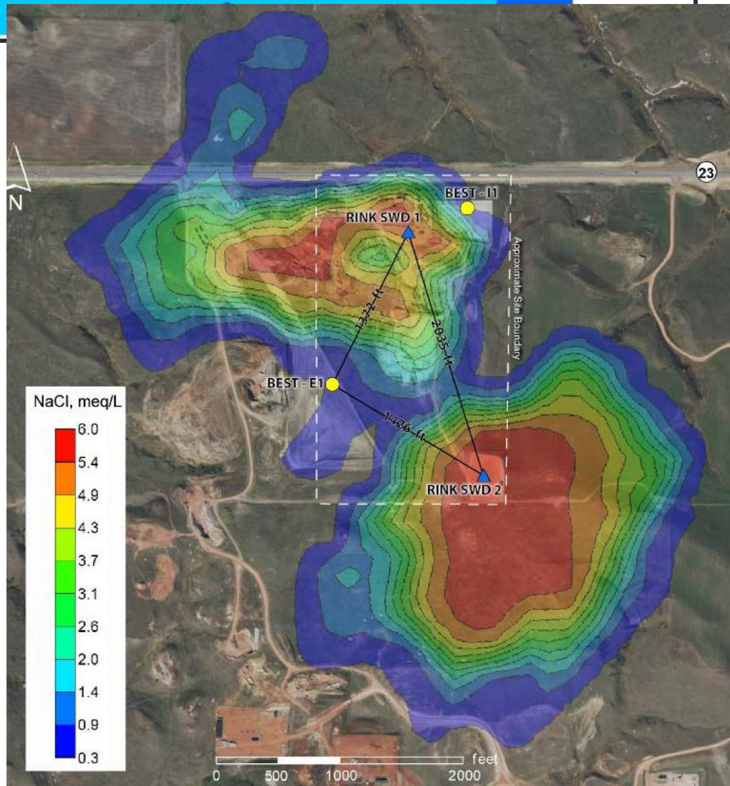
MODELING AND SIMULATION

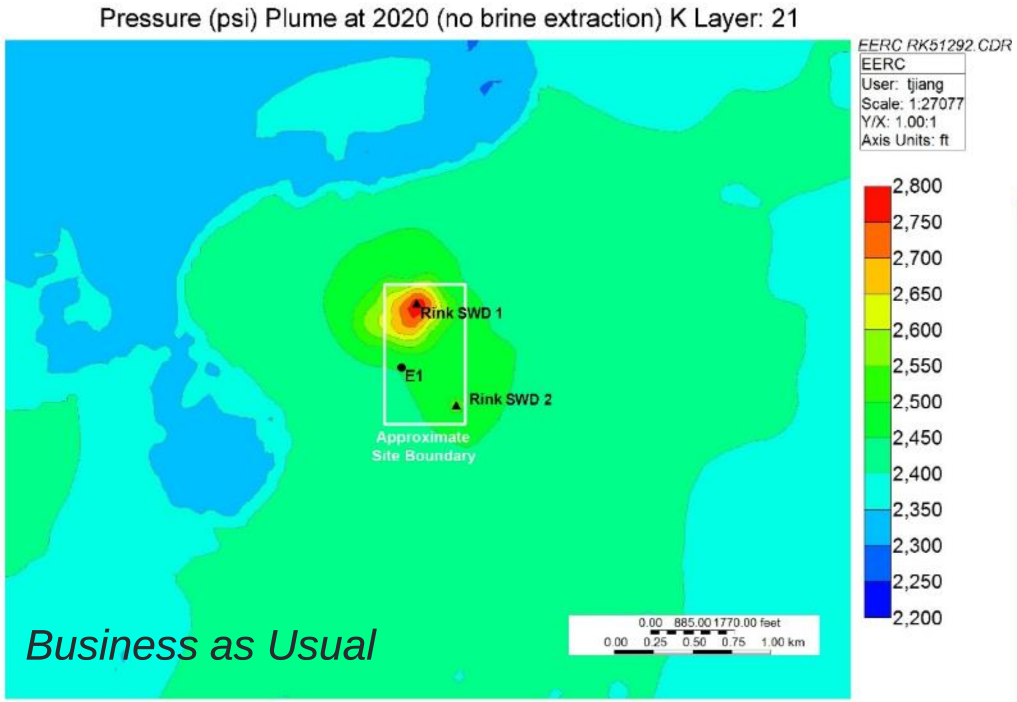








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EERC RK51292.CDR
EERC
User: tjiang
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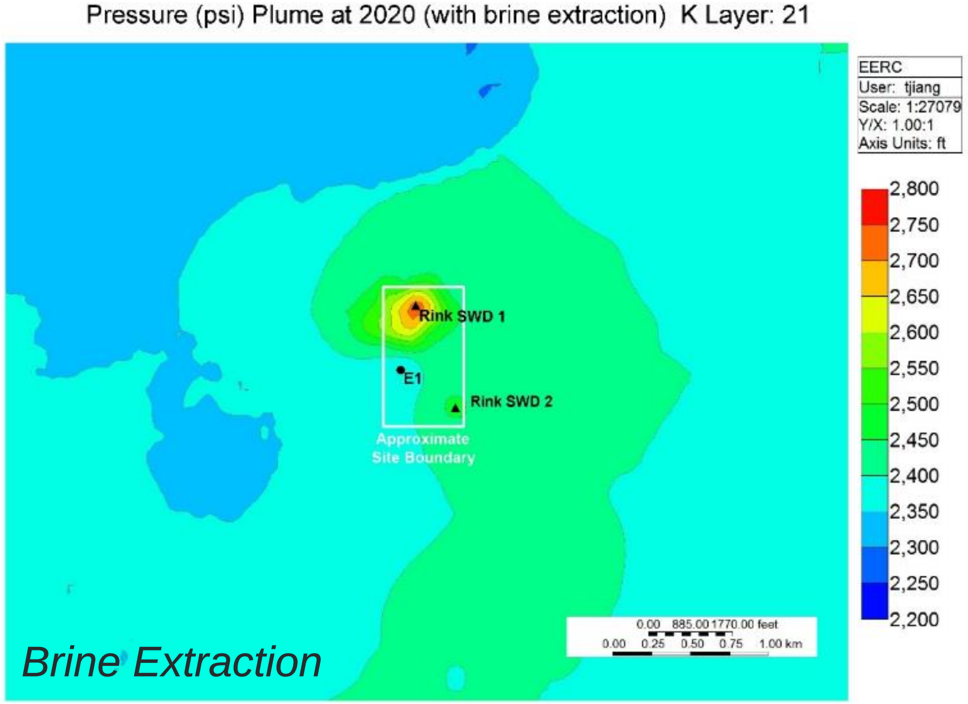
Axis Units: ft
2,800
2,750
2,700
2,650
2,600
2,550
2,500
2,450
2,400
2,350
2,300
2,250
2,200
Rink SWD 1
E1
Rink SWD 2
Approximate
Site Boundary
0.00 885.00 1770.00 feet
0.00 0.25 0.50 0.75 1.00 km
Business as Usual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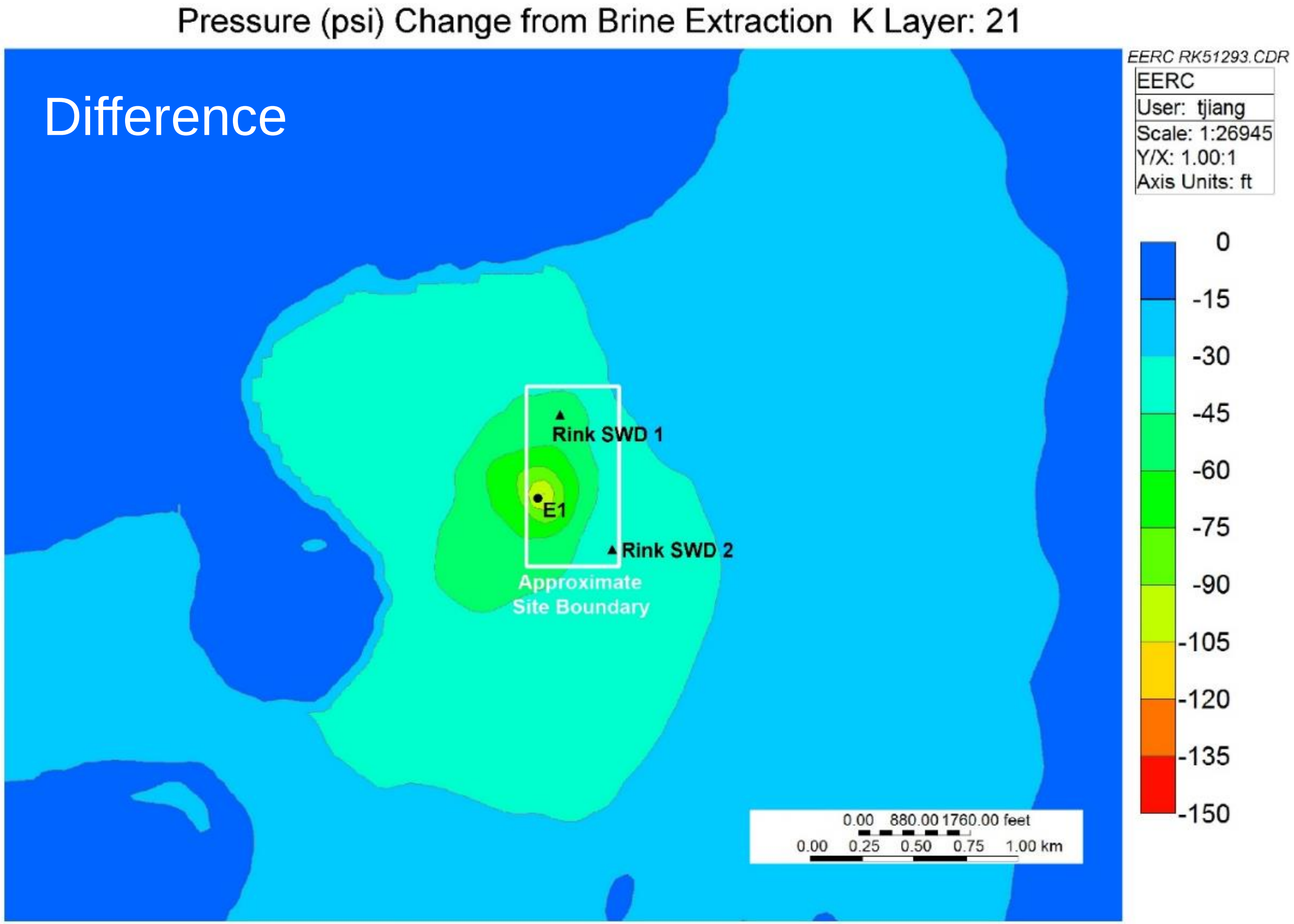
2,550
2,500
2,450
2,400
2,350
2,300
2,250
2,200
Rink SWD 1
E1
Rink SWD 2
Approximate
Site Boundary
0.00 885.00 1770.00 feet
0.00 0.25 0.50 0.75 1.00 km
Brine Extraction


Pressure (psi) Change from Brine Extraction K Layer: 21
EERC RK51293.CDR
EERC
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Axis Units: ft
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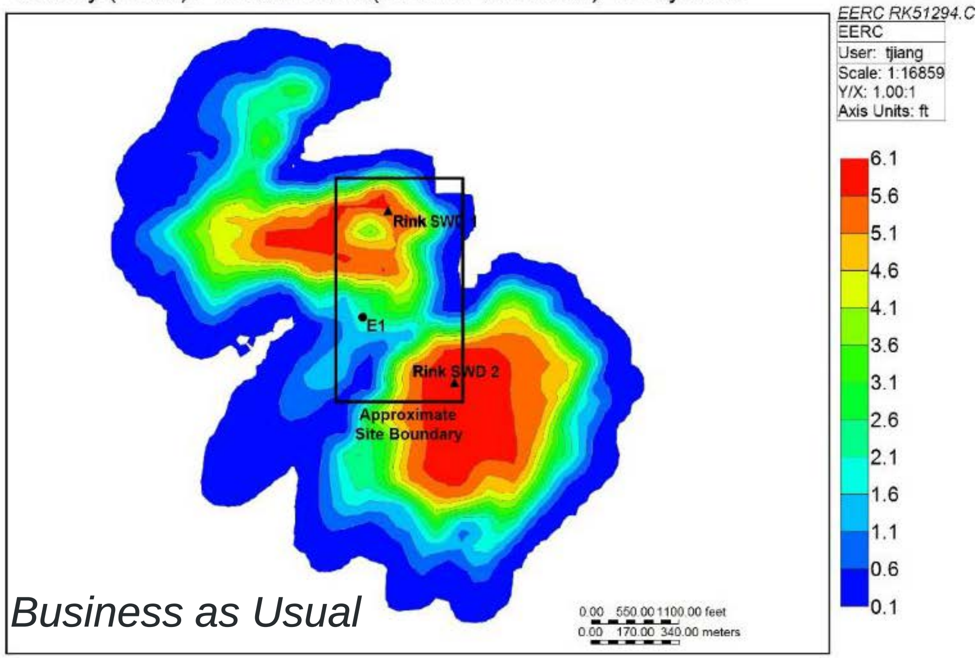
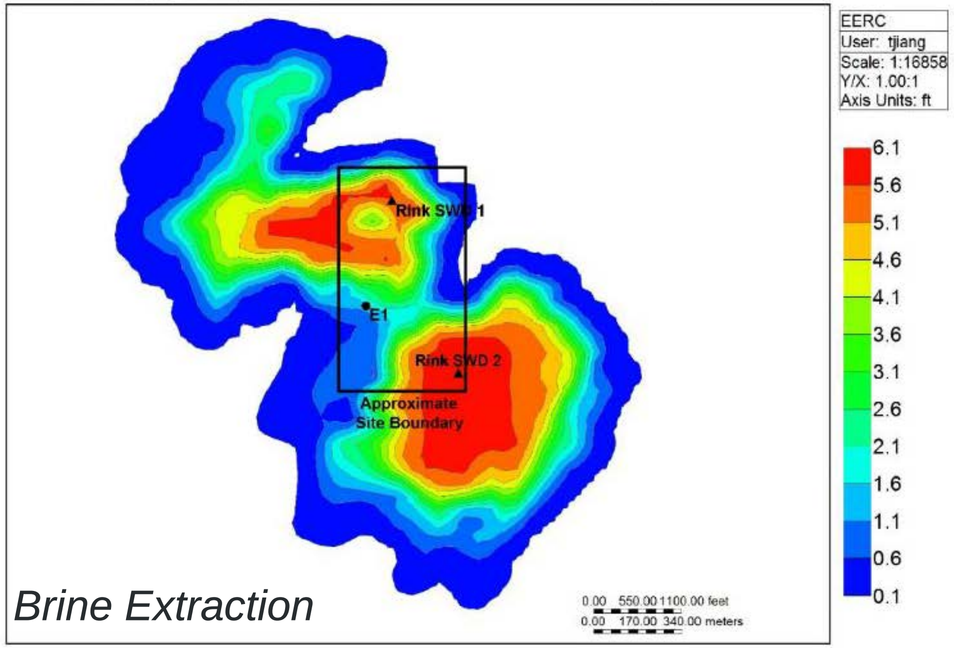
-15
-30
-45
-60
-75
-90
-105
-120
-135
-150
Difference
Rink SWD 1
E1
Rink SWD 2
Approximate
Site Boundary
0.00 880.00 1760.00 feet
0.00 0.25 0.50 0.75 1.00 km

Salinity (molar) Plume at 2020 (no brine extraction) K Layer: 21



Salinity (molar) Plume after Brine Extraction K Layer: 21



Salinity (molar) Change from Brine Extraction K Layer: 21