REGION 8

DENVER, CO 80202

# Injection Depth Waiver Evaluation for Geologic Sequestration

Director's Report to the Regional Administrator

Permit Number: CO62455-12770

Carbon Storage Solutions, LLC

Front Range Storage Complex

Windsor, Colorado

**Purpose**

The Underground Injection Control (UIC) Program regulations for Carbon Dioxide Geologic Sequestration Wells, or Class VI wells, (40 CFR § 146.81 et seq.), require that owners or operators of Class VI wells inject below the lowermost formation containing an underground source of drinking water (USDW). See 40 CFR § 146.5(f). However, the regulations also include a waiver process to allow for injection in instances where USDWs are very deep and well construction and injection at depths below the lowermost USDW may be impractical or technologically infeasible, and when it can be demonstrated that USDWs above and below the injection zone can be protected from endangerment. Therefore, the Class VI Rule establishes a process, at 40 CFR § 146.95, by which applicants can seek a waiver of the Class VI injection depth requirements, allowing them to inject into non-USDWs that lie above or in between USDWs. Determinations for injection depth waivers are made independently for each Class VI project.

The purpose of this injection depth waiver report for UIC Permit CO 62455-12770, required by 40 CFR 146.95(b), is to provide the Regional Administrator with comprehensive documentation that demonstrates the proposed geologic sequestration activities at depths above the lowermost USDW will not endanger USDWs above or below the injection formation. This injection depth waiver

evaluation applies only to the UIC Class VI well associated with the Carbon Storage Solutions, LLC, geologic sequestration project at the Front Range Storage Complex in Windsor, Colorado. Specifically, this report provides an evaluation of the following information as it relates to siting, construction, and operation of the proposed geologic sequestration project:

1. The integrity of the upper and lower confining units (§146.95(b)(1)(i));
2. The suitability of the injection zone and its potential capacity to sequester carbon dioxide, accounting for the availability of alternative injection sites (§146.95(b)(1)(ii) and (iii));
3. Other site characterization data (§146.95(b)(1)(iv)), which includes the testing and monitoring plan;
4. The proposed emergency and remedial response plan, including the proposed plan for securing alternative resources or treating USDW formation waters in the event of contamination related to the Class VI injection activity (§146.95(b)(1)(iv) and (viii));
5. The demonstration of financial responsibility (§146.95(b)(1)(iv));
6. Public water supplies in the project area, including community drinking-water needs, demands, and supplies (§146.95(b)(1)(v)); planned needs, potential and/or future use of USDWs and non-USDWs (§146.95(b)(1)(vi)); and results of consultation with the Public Water System Supervision Directors of all States and Tribes having jurisdiction over lands within the area of review for the project (§146.95(b)(2) and (3)); and
7. Planned or permitted water, hydrocarbon, or mineral resource exploitation potential of the proposed injection formation(s) and other formations both above and below the injection zone (§146.95(b)(1)(vii)).

## Project Description

### Introduction

Carbon Storage Solutions, LLC (CSS), a subsidiary of Front Range Energy, LLC (FRE), proposes a geologic sequestration (GS) project at the Front Range Storage Complex (FRSC) in Windsor, Colorado. The project captures and stores carbon dioxide ($CO_2$) emissions from the FRE ethanol plant, which produces fuel-grade ethanol and other products.

The project expects to capture up to 127,800 metric tons of $CO_2$ annually, a by-product of the fermentation process at the FRE ethanol plant. CSS liquefies the captured $CO_2$ using equipment located at the ethanol plant and then sequesters it in the storage complex beneath the FRE property (Figure 1).

The Lyons Sandstone will serve as the injection zone due to its lateral continuity, hydraulic isolation, and adequate volume to contain the injected $CO_2$. CSS plans to inject $CO_2$ into the storage complex for at least 12 years, followed by post-injection site care (PISC) period of at least 20 years and then site closure and plugging and abandonment of the injection well and all monitoring wells in accordance with EPA regulations.

The Lyons Sandstone is not below the lowermost USDW at the FRSC, as is required for Class VI

injection. See 40 CFR § 146.5(f). USDWs, by definition under 40 CFR 144.3 and 146.3, include aquifers currently used by public water supply systems or otherwise used to supply drinking water as well as those aquifers that meet certain criteria indicating they could be used as drinking water, even if they are not currently used. An aquifer or portion of an aquifer that contains fewer than 10,000 milligrams per liter (mg/L) of total dissolved solids (TDS) is considered a USDW unless it has been exempted (40 CFR 146.3). CSS's application did not address the potential yield of water production from the Ingleside Formation at this site; therefore, it is presumed to have a sufficient quantity to supply a public water system. Where there is no data to demonstrate a lack of adequate yield to supply a public water system, the regulations assume that the aquifer is a USDW. See 40 CFR 144.1(g). The Ingleside Formation is a USDW at the FRSC site, based on a water sample collected from the Front Range 2-1 deep-zone monitoring well showing that the formation has 3,388 mg/L TDS at that location. Additional confirmation identifying the Ingleside as a USDW is provided by water quality data available through the U.S. Geological Survey Produced Water Database for 6 wells located between about 5 and 13 miles away from the FRSC, which indicate TDS concentrations for the Ingleside range from 2,217 to 5,738 mg/L. In addition, the EPA has approved 6 aquifer exemptions for stratigraphically equivalent formations of similar geologic age to the Ingleside approximately 20—35 miles east of the FRSC. Therefore, in order to be able to inject in the Lyons Sandstone, CSS has applied for an injection depth waiver under 40 CFR 146.95.

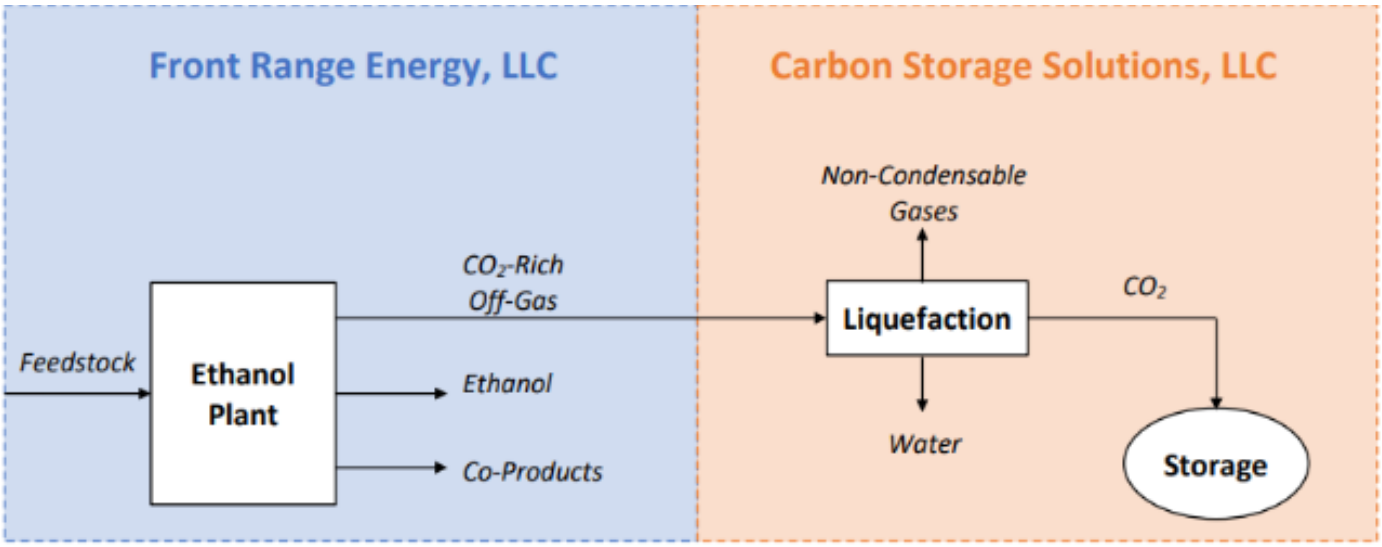



**Figure 1.** Integration of Carbon Storage Solutions, LLC Geologic Sequestration Project with Front Range Energy, LLC (modified from Carbon Storage Solutions, 2024a, Figure A.1-2).

## Project Location

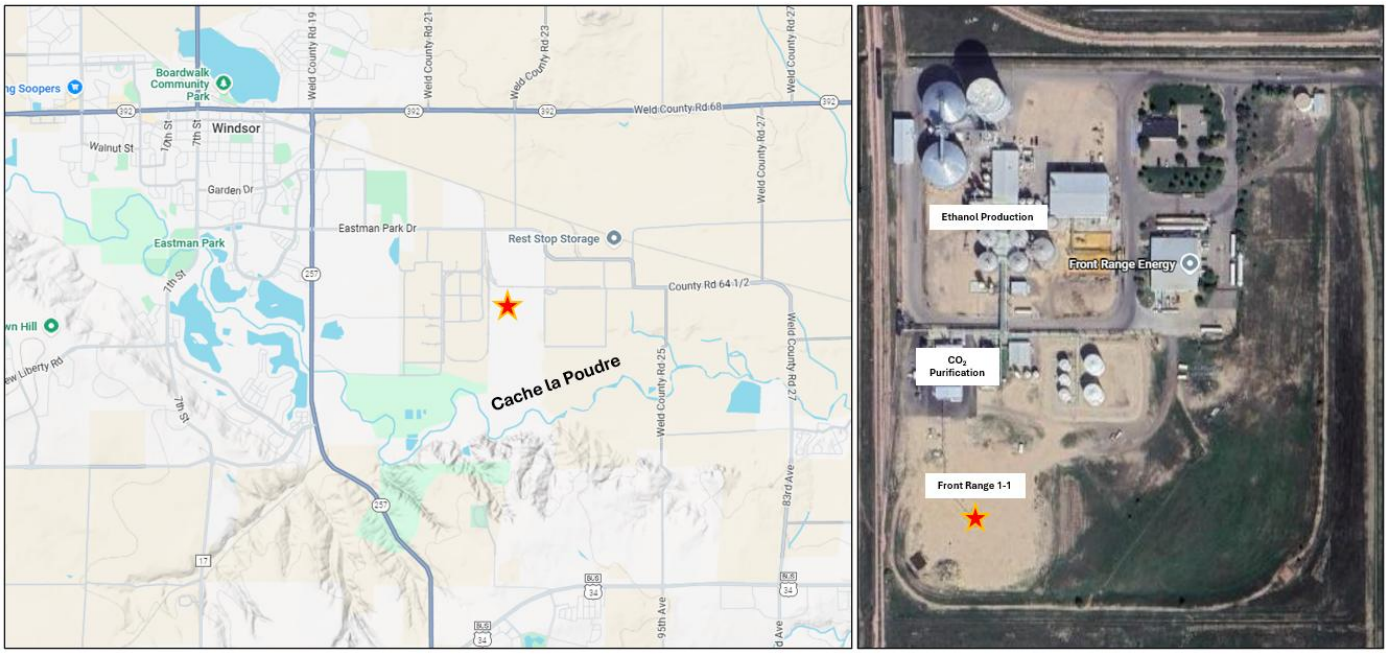



**Figure 2**. Location of Front Range Energy Ethanol Plant and Front Range 1-1 Injection Well.

The proposed injection well, Front Range 1-1, is in the Denver-Julesburg Basin of Colorado (Figs. 2 and 3A) with a surface location of 40.454964 latitude and -104.859761 longitude in Section 26, Township 6 North, Range 67 West. The well is deviated with bottomhole coordinates of 40.449494, -104.852200 in Section 35, Township 6 North, Range 67 West. The well is in the Greater Wattenberg area of Weld County, which is the 7th largest oil- and gas-producing county in the United States. The FRE ethanol plant is approximately 2.75 miles from the Town of Windsor's center. The distance from the FRE ethanol production plant to the Front Range 1-1 injection well is less than ¼ mile, and all aspects of the project are on Front Range Energy property.

## Site Geology and Hydrology

The Front Range 1-1 well is near the axis of the Denver-Julesburg Basin, where sedimentary strata are deep (Figs. 3A and 3B). The axis is flanked by steeply dipping strata rising to the Front Range Uplift to the west and a gently rising eastern flank (Higley et al., 2006). A generalized regional hydrostratigraphic column showing major aquifers and confining units within the Denver Basin is shown in Figure 4. The proposed sequestration reservoir is the Lyons Sandstone. The Lyons Sandstone is confined above by the Opeche Shale and Blaine Anhydrite Members of the Lykins Formation and below by the Owl Canyon Formation, part of the lower Satanka Group. The deepest USDW above the injection zone is the Entrada Formation, which is a thick, porous sandstone. The lowermost USDW at the site was found to be the Ingleside Formation, which generally consists of alternating sequences of sandstone and

limestone.

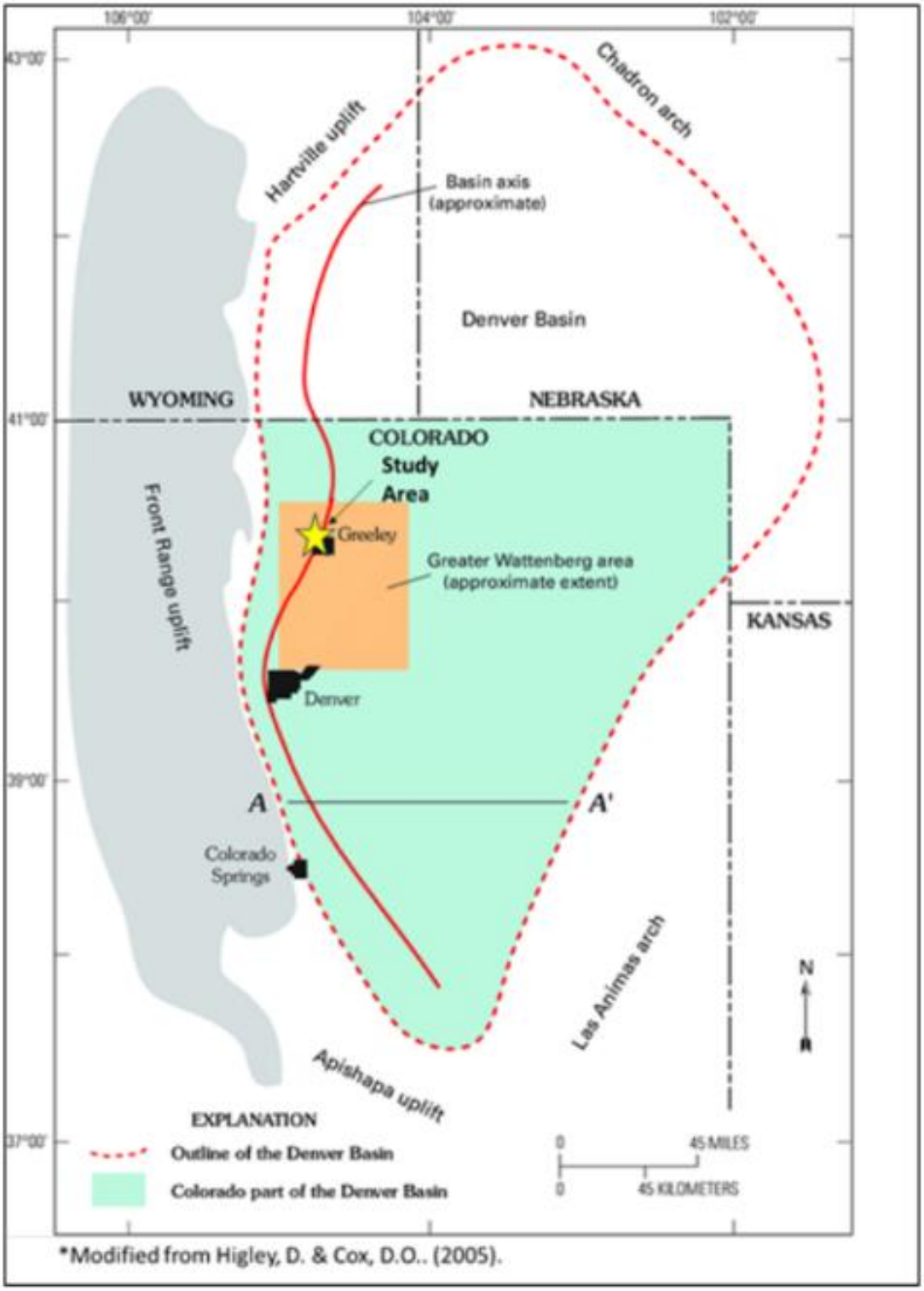
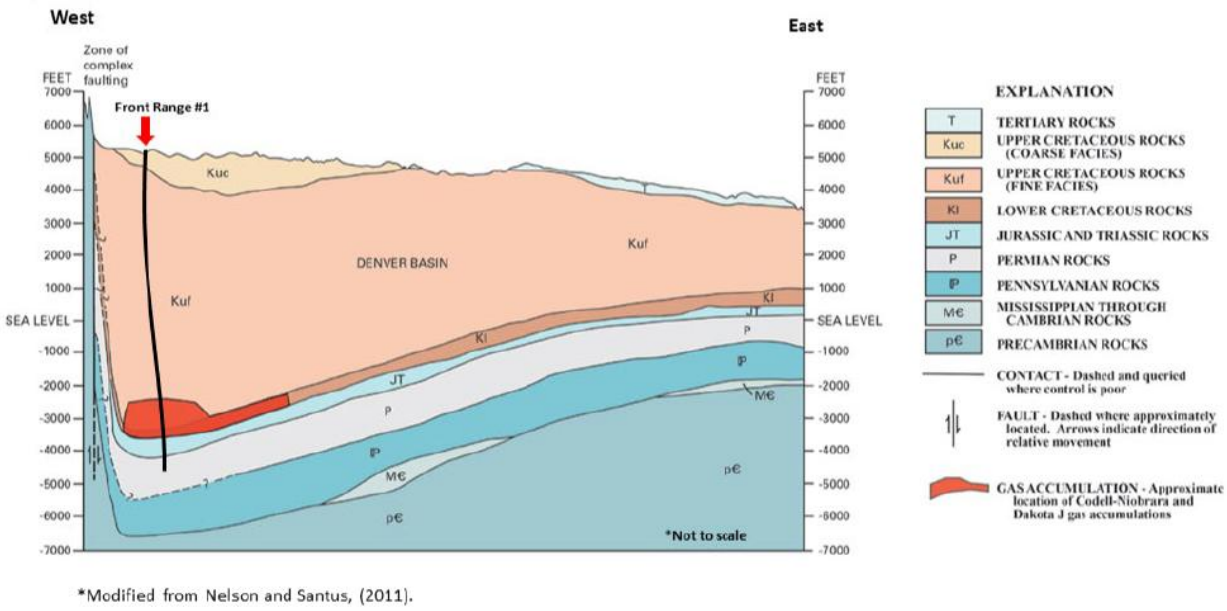
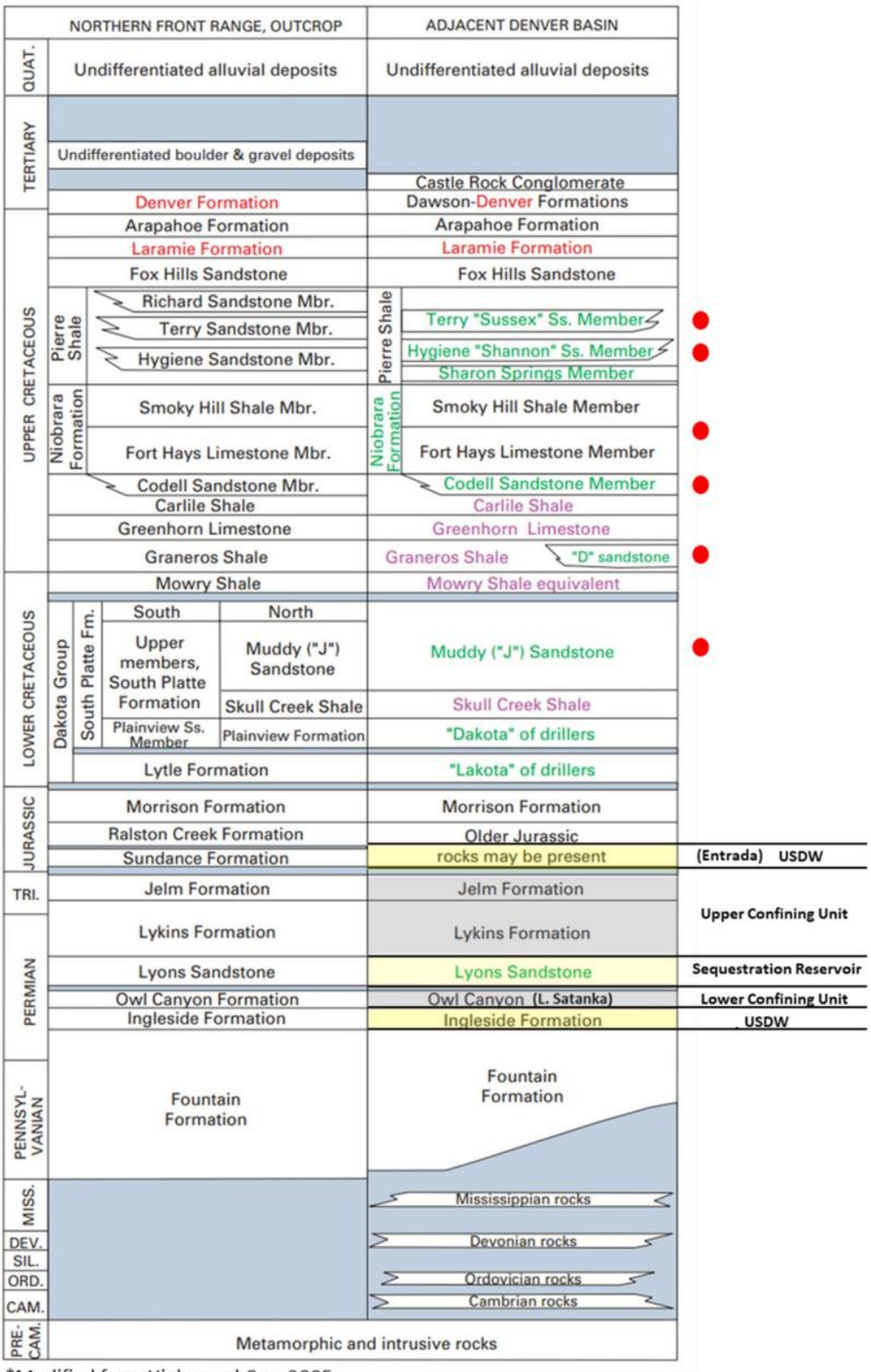



**Figure 3A.** Location of Front Range 1-1 well in relation to the greater Denver-Jules Basin. Solid red line denotes the basin axis. (modified from CSS, 2024a, Figure A.I.2-1).




*Modified from Nelson and Santus, (2011).

**Figure 3B.** Cross Section Showing Generalized Structure of Denver-Julesburg Basin (modified from CSS, 2024a, Figure A.I.2-2). The Lyons Sandstone is a formation within the Permian Rocks.




*Modified from Higley and Cox, 2005.

**Figure 4.** Regional Hydrostratigraphic Column of Denver Basin. Red dots indicate oil and gas production zone. (modified from CSS, 2024a, Figure A.I.2-9).

**Integrity of Upper and Lower Confining Units (40 CFR 146.95(b)(1)(i))**

The FRSC was evaluated and characterized for geologic sequestration by using data from publicly available well records, academic literature, and seismic surveys, as well as site-specific log and core data from the drilling and testing of the Front Range 1-1 injection well and its associated deep-zone monitoring well, Front Range 2-1. CSS demonstrated that the injection zone is bounded by laterally continuous, impermeable confining units above and below the injection zone, adequate to prevent fluid movement and pressure buildup outside of the injection zone; and that the confining units are free of transmissive faults and fractures. Additional information is presented below concerning regional fracture properties, including a demonstration that such fractures will not interfere with injection, serve as conduits, or endanger USDWs.

Upper Confining Zone

The upper confining zone consists of the Opeche Shale and Blaine Evaporite, which are members of the Lykins Formation (Figure 5).

*Opeche Shale*: This unit is characterized by predominantly brownish-red claystone with interbeds of gypsum, sandstone, and sandy shales. It is 29 feet thick at the Front Range 1-1 well with 95% of the formation consisting of shale that exhibits a clay content of approximately 64%. The remaining 5% is composed of thin intervals of dolomite, anhydrite, and siltstone. Porosity measured in two core specimens of the Opeche was 3.23 and 7.68%. These porosity values represent total porosities that include clay-bound water, not effective porosities.

*Blaine Evaporite*: The Blaine Evaporite directly overlies the Lyons Sandstone and is composed of thick beds of gypsum/anhydrite, alternating with shale and thin dolostones. At the Front Range 1-1 well, the Blaine is 55 feet thick with 48 feet (88%) composed of anhydrite. The remaining 7 feet contain thin mudstone/shale, siltstones, and dolomite. Porosity measured in core specimens of the Blaine ranged from 0.67% to 3.2%. A thin-section photomicrograph of anhydrite from the Blaine indicated a porosity of 1.04% and permeability of 3.21 millidarcies (mD).

Lower Confining Zone

*Owl Canyon Formation (Lower Satanka):* The Owl Canyon Formation, part of The Lower Satanka Group is the underlying confining unit beneath the Lyons Sandstone. The formation generally is characterized by a series of interbedded siltstones, shales, and sandstones. The Lower Satanka Formation was not fully penetrated by the Front Range 1-1 well. Therefore, its exact thickness at the well is unknown. However, its thickness at the Front Range 2-1 deep-zone monitoring well, which was drilled to the Ingleside Formation about 1.2 miles northwest of the Front Range 1-1 bottomhole location, was approximately 231 feet. Based on testing of core specimens collected in the upper 50 feet of the formation, the Lower Satanka has porosity ranging from 1.5 to 5.29% with an average of 2.62% and Klinkenberg permeability ranging from 0.0007 to 0.005 mD with an average of 0.0012 mD.

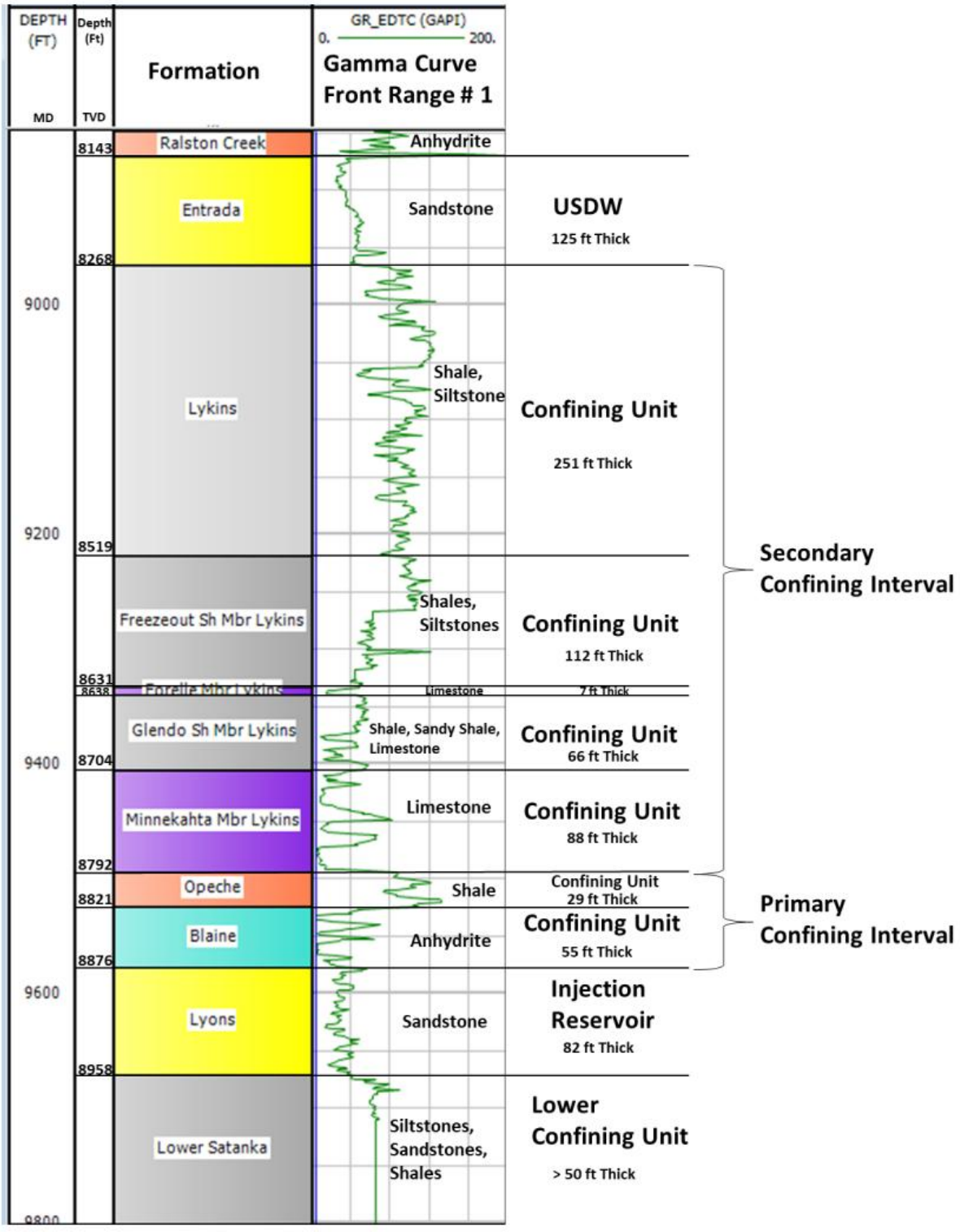



**Figure 5.** Site-specific confining units and proposed injection interval at the Front Range 1-1 well, including measured depths (MD) along the deviated well path, true vertical depths (TVD), and lithology (modified from CSS, 2024b, Figure I.1.4-2).

The thickness and low porosity and permeability of the upper and lower confining zones indicate they are effective seals with the ability to prevent migration of fluids, including $CO_2$, upward or downward out of the Lyons reservoir. In addition, mercury injection capillary pressure (MICP) testing of core specimens indicates that $CO_2$ column heights of 27,239 feet for the Blaine and 1,150 feet for the Lower Satanka can be sufficiently supported in the Lyons before leakage would occur. These large positive column heights provide further support that the Blaine and Lower Satanka are suitable confining zones for the FRSC. Additional evidence for the integrity of the upper and lower confining zones is provided by differences in formation pore pressures and TDS concentrations (Table 1) among the Lyons Sandstone injection zone, the lowermost USDW overlying the Lyons (Entrada Sandstone), and the underlying Ingleside USDW, suggesting the formations are not hydraulically connected.

| Formation | TDS Value (mg/L) |
|---|---|
| Entrada | 8,736 |
| Lyons | 34,076 |
| Ingleside | 3,388 |

**Table 1.** Total dissolved solids (TDS) concentrations of the Lyons Sandstone injection zone, the lowermost USDW above the Lyons (Entrada Sandstone), and the Ingleside USDW below the Lyons. Values were determined from samples collected at the Front Range 1-1 and Front Range 2-1 locations. (CSS, 2024)

**Suitability and Capacity of the Injection Zone (40 CFR 146.95(b)(1)(ii) and (iii))**

The suitability of the injection zone for geologic sequestration of $CO_2$ was evaluated based on its lateral continuity, the lack of transmissive faults and fractures, and knowledge of current or planned artificial penetrations into the injection zone or formations below it. The potential capacity of the injection zone also was evaluated, accounting for the availability of alternative injection sites.

Injection Zone

*Lyons Sandstone:* The Lyons Sandstone injection reservoir, 82 feet thick at the Front Range 1-1 site (Figure 5), is described as a fine-grained, quartzose sandstone consisting of about 70% quartz with minor amounts of potassium, plagioclase, and anhydrite. It has porosity ranging from 3.6 to 15% with an average of 7.8%. The formation's permeability ranges from 0.13 to 19 mD with an average of 3.3 mD. These reservoir values indicate that the formation's suitability to sequester carbon dioxide. The Lyons Formation exhibited a total dissolved solids concentration (TDS) of 34,076 mg/L at the Front Range 1-1 well, and the formation has a regional average value of 38,105 mg/L, which characterizes it as a non-USDW.

Lateral Continuity

The injection zone and upper and lower confining zones have sufficient lateral extent to contain the injected carbon dioxide stream and displaced formation fluids. CSS submitted geologic cross-sections

(Figures 6a–c) through the area of the Front Range 1-1 well that demonstrate continuity of the injection zone and the upper and lower confining zones as required at 40 CFR § 146.95(a)(1).

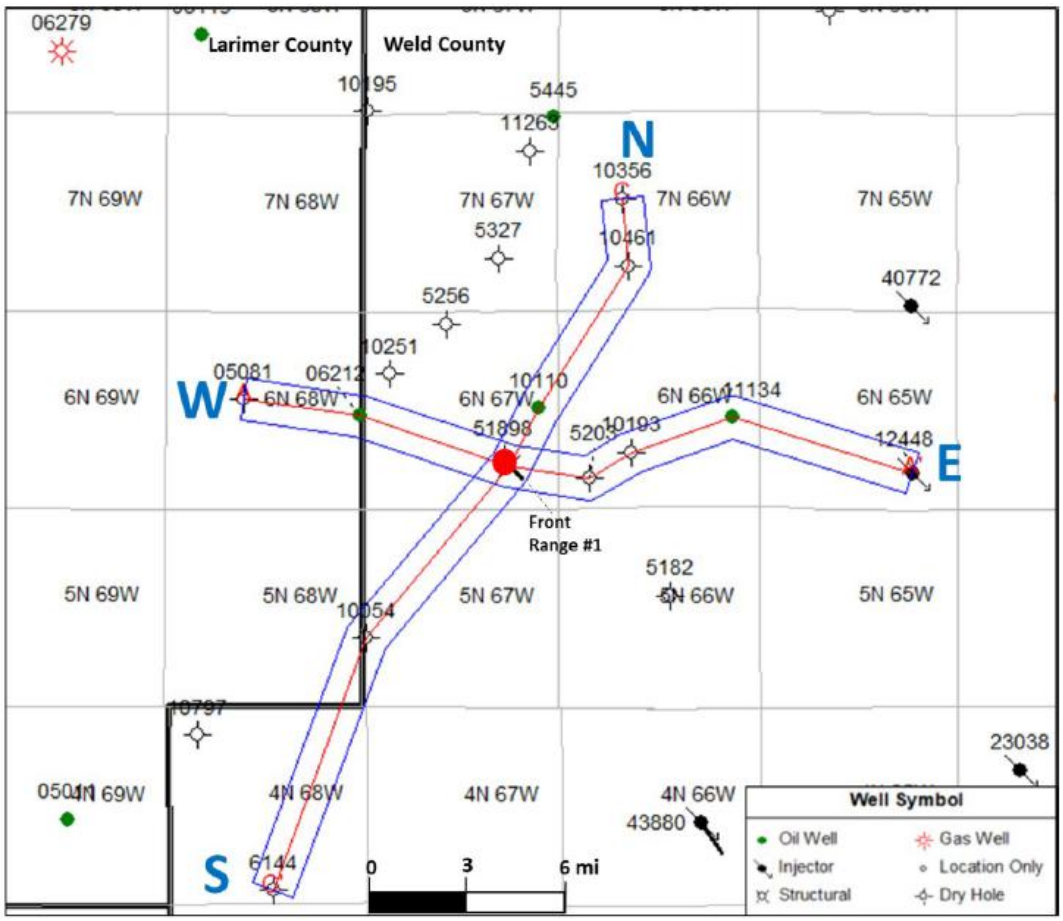



**Figure 6A**. Cross-section location map. Wells are identified by the last digits of their API number (modified from CSS, 2024b, Figure I.1.4-3).

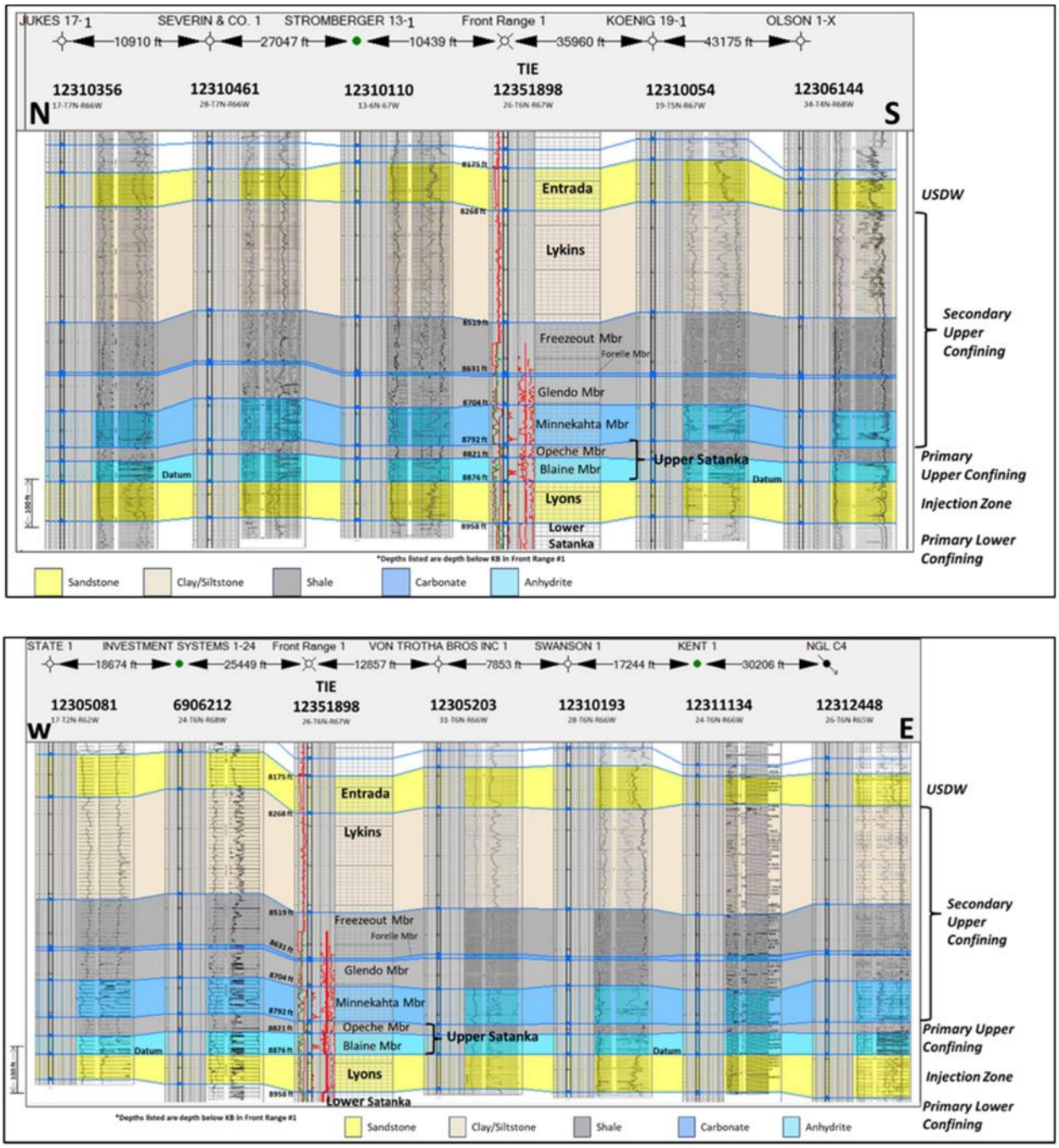



**Figure 6B**. Geologic cross sections showing north to south (N-S) and west to east (W-E) lateral continuity of strata across the area of the Front Range Storage Complex. Datum is top of the Lyons Formation (modified from CSS, 2024b, Figure I.1.4-4 and I.1.4-5).

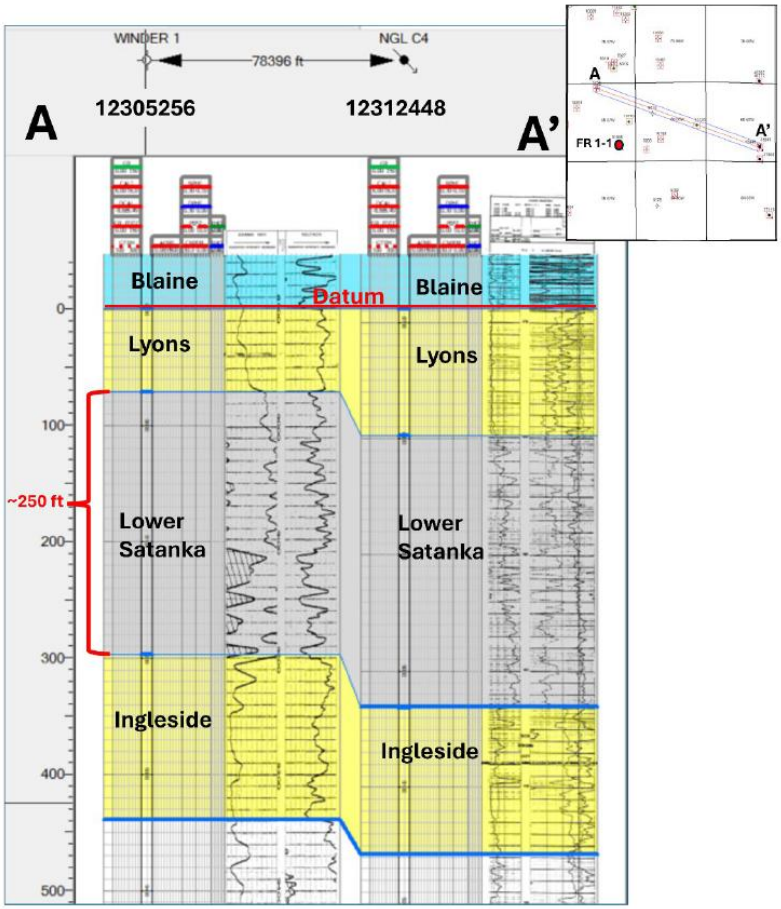



**Figure 6C**. Geologic cross section showing full thickness and continuity of the Lower Satanka confining zone across the area of the Front Range Storage Complex. Datum is top of the Lyons Sandstone (modified from CSS, 2024b, Figure I.1.4-7).

## Faults and Fractures

Faulting in the region of the FRSC is sparse and well documented. Results of a seismic survey (Figure 7) further demonstrate that the injection zone and confining zone are laterally continuous across the area of review (AOR), which is the region surrounding the proposed well where USDWs may be endangered by the injection activity, and that no faults are present that would allow $CO_2$ migration out of the Lyons injection zone. A single wrench fault was identified 4 miles south of the project area that shows basement offset, but the fault propagates upward into a fold that does not appear to offset sedimentary strata.

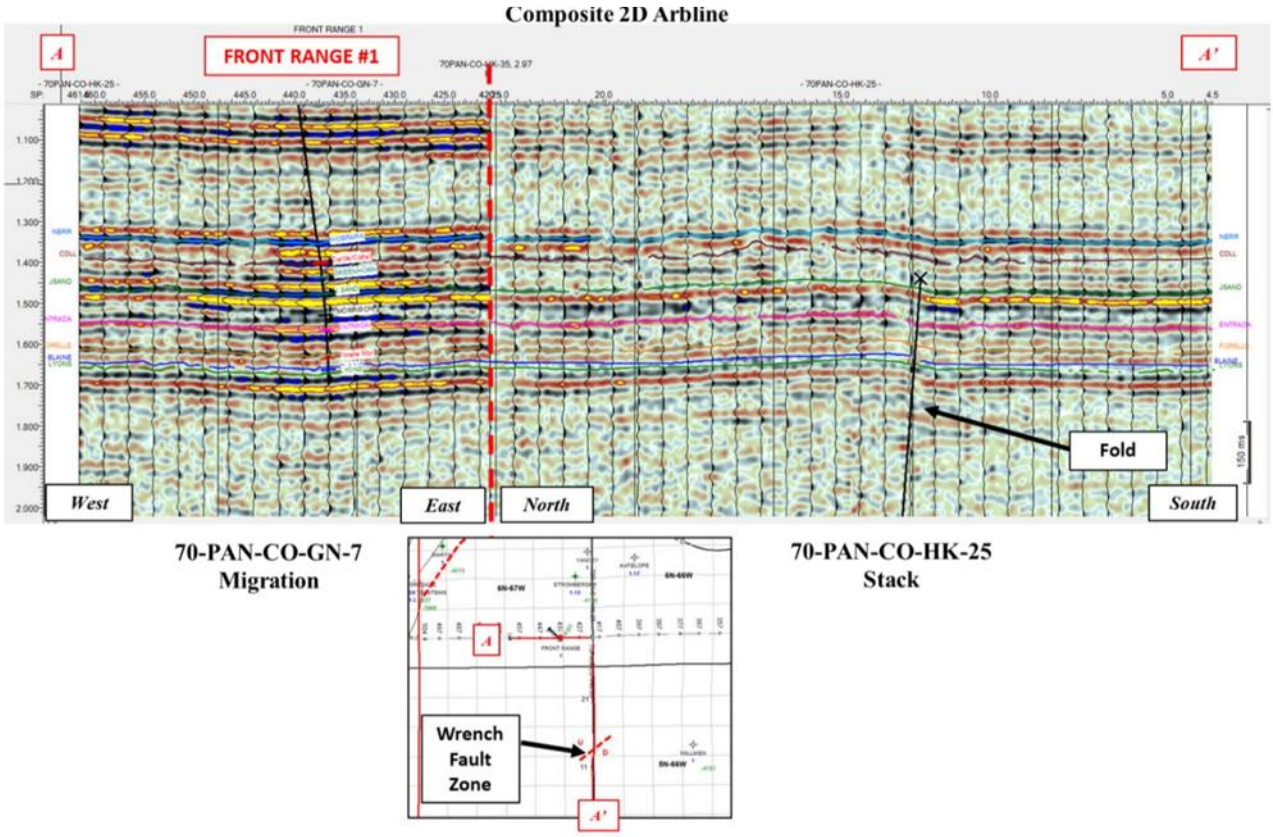



**Figure 7**. Composite 2D seismic line across the area of review for the Front Range 1-1 well (CSS, 2024b, Figure I.1.4-6).

Natural fractures were identified within the Lyons injection zone, the Opeche Shale Member of the Lykins Formation, and the Lower Satanka Formation by 3D far-field analysis of a sonic scanner

log (Figure 8). However, the fractures appear to be isolated and do not connect through the upper or lower confining zones. Thus, transmissive faults and fractures that would provide a conduit for $CO_2$ leakage out of the injection zone do not appear to be present within the AOR.

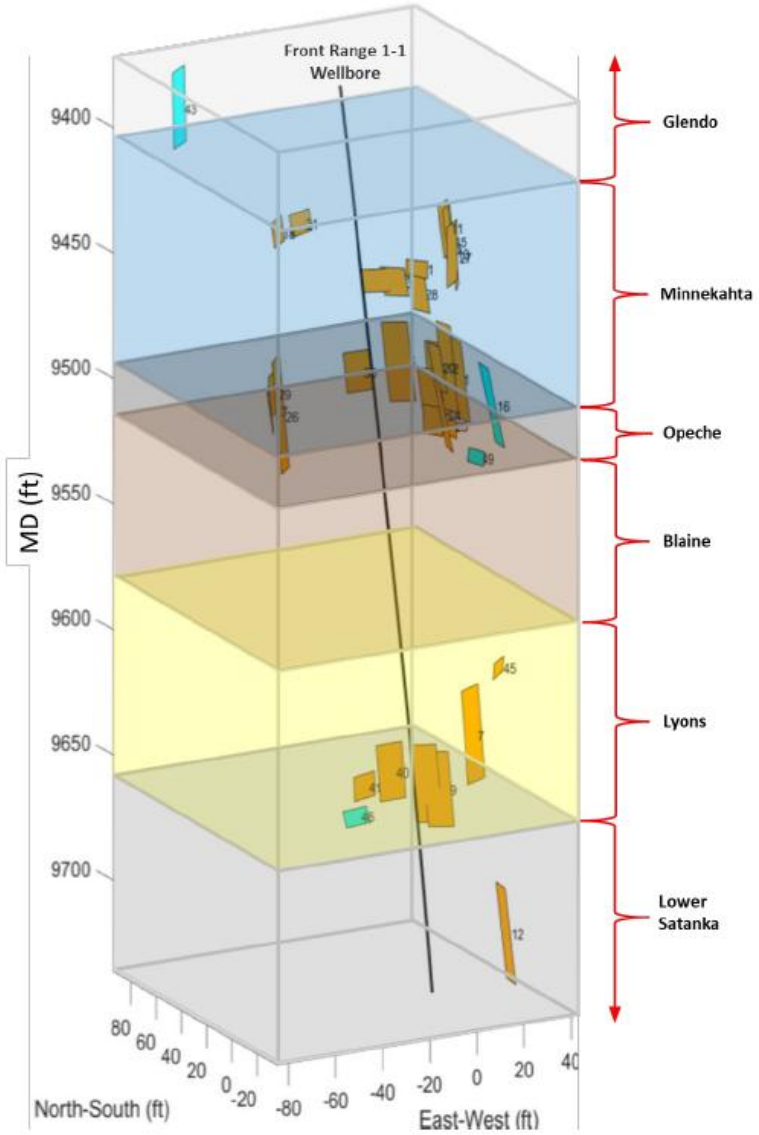



**Figure 8.** Diagram showing fracture clusters detected by 3D Far Field log analysis in the FR 1-1 well (modified from CSS, 2024b, Figure I.1.4-23).

## Current or Planned Artificial Penetrations

The only current penetrations of the Lyons Sandstone within the AOR are the Front Range 1-1 injection well and the Front Range 2-1 monitoring well. The Front Range 1-1 injection well is deviated with a measured depth (MD) of 9,723 feet bgs and true vertical depth (TVD) of about 9,028 feet. Construction of the Front Range 1-1 well was completed in March 2023. However, the construction did not comply with 40 CFR 146.86(b)(3), which requires that at least one long string casing extend to the injection zone and be cemented to the surface. Carbon Storage Solutions successfully conducted remedial cementing in January 2026, which brought the well into compliance with 40 CFR 146.86(b)(3). The surface casing of the Front Range 1-1 well extends through the base of the nearest USDW (Entrada) directly above the injection zone and is cemented to the surface in accordance with § 146.95(f)(2)(iii).

The Front Range 2-1 is a vertical well completed to a depth of 9,390 feet. The Front Range 2-1 is properly constructed to prevent movement of $CO_2$ or formation fluids out of the injection zone. There are no known other artificial penetrations planned within the AOR.

**Potential Capacity of the Geologic Formation(s) to Sequester Carbon Dioxide, accounting for the availability of alternative injection sites**

With a thickness of 82 feet, average porosity of 7.8%, and average permeability of 3.3 mD, the Lyons Sandstone at the FRSC has sufficient capacity for the planned injection volume of 1.54 million metric tons to be injected over 12 years. Natural fractures present within the Lyons likely will increase the formation's permeability and overall injectivity. Carbon Storage Solutions conducted computational modeling as a requirement of the Class VI permit application process (§146.84(c)). The model incorporates all the reservoir properties from logging, coring, analysis, and injection testing and was used to delineate the AOR for the Front Range 1-1 well based on the maximum lateral extent of 1) the pressure perturbation capable of mobilizing fluids that could endanger USDWs; and 2) the $CO_2$ plume over the lifetime of the project, including the post-injection site care period. The modeling results also demonstrate that USDWs above and below the injection zone will not be endangered as a result of fluid movement (40 CFR § 146.95(a)(3)). Figure 9 shows the simulated maximum areal extent (6.4 square miles) of the plume and a cross section of the approximate maximum vertical and lateral extents of the plume in year 32 at the end of the post-injection site care period. The model shows the injected $CO_2$ remains in the Lyons Sandstone and that it is concentrated near the Front Range 1-1.

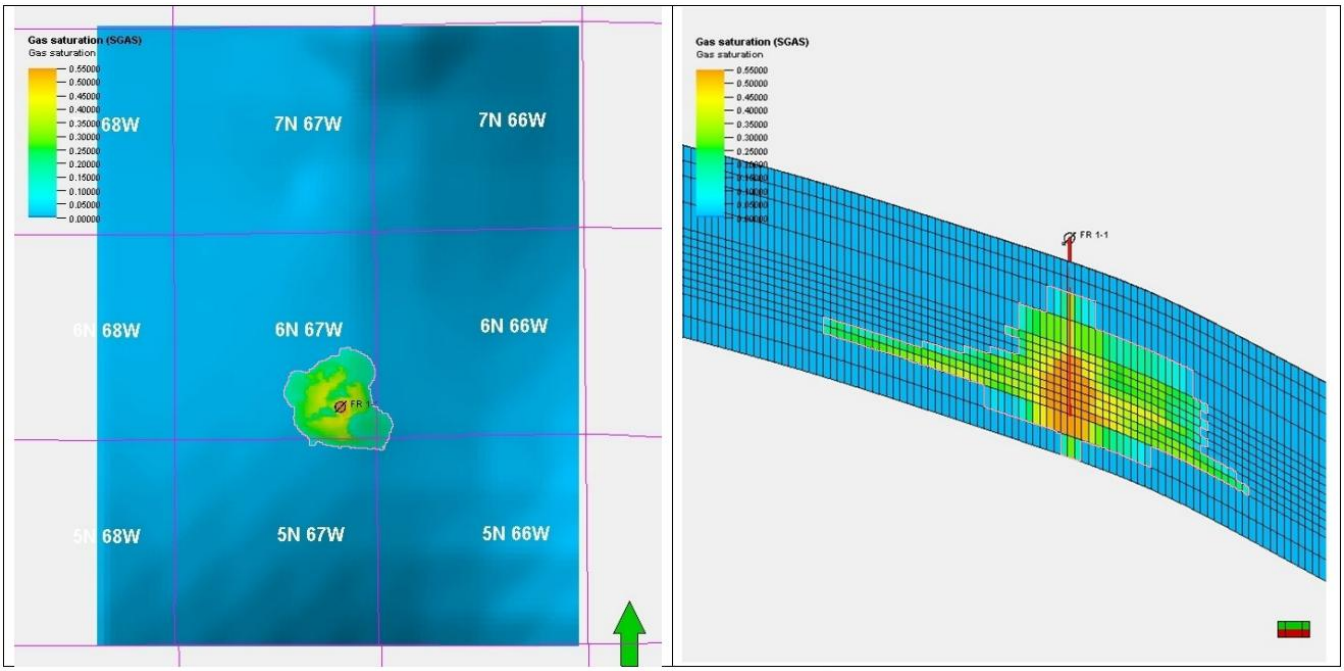



**Figure 9.** Simulated maximum extent of $CO_2$ plume in year 32. Left: plan view of plume extent; right: cross section showing vertical and lateral plume extent. Gas saturation is the proportion of formation pore space filled with $CO_2$. FR 1-1 denotes well location (modified from CSS, 2024a, Figure B.4-4).

At the Front Range 1-1 well, the only sedimentary stratigraphic unit below the Ingleside USDW is the Fountain Formation, which unconformably overlies Precambrian metamorphic and intrusive rocks (Figure 4). Although the Fountain Formation, which generally consists of arkosic conglomerates and sandstones, may have potential to serve as an injection zone for the FRSC, its proximity to the basement limits its use for GS because of increased induced seismicity risk resulting from injection near the basement. In addition, sufficient confinement between the Fountain and the overlying Ingleside may not be present to prevent fluid movement into the Ingleside.

**Other Site Characterization Data, Proposed Emergency Plan, Financial Responsibility (40 CFR 146.95(b)(1)(iv)**

Testing and Monitoring Plan

Carbon Storage Solutions' testing and monitoring plan is outlined in the Class VI application and the injection depth waiver request and is incorporated into the Permit as enforceable requirements. The purpose of the plan is to verify that the GS project is operating as permitted and is not endangering USDWs. The plan is tailored to ensure protection of USDWs both above and below the injection zone if a waiver is granted (§146.95(a)(5)). The plan includes testing requirements for internal and external mechanical integrity (MI) of the Front Range 1-1 and Front Range 2-1 wells to ensure they are operating properly and do not provide a pathway for fluid migration out of the injection zone. The internal MI of the tubing-casing annulus will be monitored continuously during injection by using temperature and pressure gauges installed in both wells. External MI testing of the annulus between the casing and the formation will be conducted annually with oxygen activation, temperature, or noise logging. An indication of internal or external MI failure will institute a cessation of injection and trigger investigation for rework, thereby protecting USDWs from leakage. Carbon Storage Solutions must also perform corrosion monitoring of the injection well and deep-zone monitoring well construction materials for loss of mass, thickness, cracking, pitting, and other signs of corrosion on a quarterly basis in accordance with 40 CFR §146.90(c). This ensures that wellbore components meet the minimum standards for material strength and performance set forth in 40 CFR §146.86(b) to prevent leakage due to compromised well materials.

In accordance with §146.95(f)(3)(i) and (f)(4)(i), groundwater quality, geochemical changes, and pressure monitoring will be conducted at the Front Range 2-1 monitoring well for the Entrada Sandstone above the injection zone and the Ingleside Formation below the injection zone to detect movement of fluids from the Lyons into these USDWs. Samples will be collected quarterly in project years 1 and 2, semi-annually in years 3-5, annually in years 6-12, and the monitoring will continue during the post-injection site care period. If changes are detected that may be a result of $CO_2$ or injection-zone fluid movement through the confining zones, then appropriate emergency and remedial response actions must be taken to ensure USDWs are not endangered.

In addition, the extent of the $CO_2$ plume and pressure front will be monitored by using both direct and indirect methods in accordance with §146.95(f)(3)(ii) and (f)(4)(ii). Direct monitoring will be accomplished by measuring downhole pressure and temperature continuously in the Lyons, Entrada, and Ingleside Formations at the Front Range 1-1 and Front Range 2-1 wells. Indirect monitoring will consist of pulsed neutron logging of $CO_2$ saturation at the Front Range 1-1 and Front Range 1-2 wells

on an annual basis and acquiring vertical seismic profiles across the site every 5 years. Results of this monitoring will be compared to those of the computational model and used to re-evaluate the AOR and corrective action plan as described in §146.84(e) to ensure USDWs are protected.

Emergency and Remedial Response Plan

The Permit incorporates CSSs' emergency and remedial response plan as enforceable conditions in Attachment F. The plan addresses the risks of brine or $CO_2$ leakage into USDWs above and below the injection zone and outlines responses for minor and major contamination events with shutdown plans and notification of regulatory authorities included as requirements. Remediation work would depend on the type of event that occurs and requires the assistance of other regulatory agencies. Carbon Storage Solutions and its subcontractors assume responsibility for securing alternative drinking water sources or treating USDW formation waters in the event of Entrada or Ingleside Formation contamination related to the Class VI injection activity per 40 CFR 146.95(b)(1)(viii).

Financial Responsibility Demonstration

Carbon Storage Solutions has the appropriate financial instruments in place to cover emergency and remedial response work, post-injection site care, and plugging and abandonment (Table 2). The demonstration includes consideration of addition costs for monitoring the Ingleside USDW, tracking the plume and pressure-front in the injection zone, and securing alternative resources or treating USDW formation waters in the event of USDW contamination related to the Class VI injection activity.

| Activity | Estimated Cost to Perform Work, $2024 | Financial Instruments | |
|---|---|---|---|
| | | Coverage, Current $ | Type |
| Corrective Action | $0 | Not Applicable | Not Applicable |
| Well Plugging and Abandonment | Front Range 1-1: $423K<br>Front Range 2-1: $311K | Front Range 1-1: $465K<br>Front Range 2-1: $342K | Surety |
| PISC and Site Closure | PISC: $5.4MM<br>Site Closure: $263K | PISC: $6.0MM<br>Site Closure: $290K | Surety |
| Emergency and Remedial Response | $12.6MM | $15MM | Third Party Insurance |
| K=thousand | | | |
| MM = million | | | |

**Table 2.** Financial Instruments for the Front Range Storage Complex project.

**Community needs, demands, and supply from drinking water sources, and Planned needs, potential and future use of USDWs and non-USDWs in the area 40 CFR 146.95(b)(1)(v) and (vi)**

Carbon Storage Solutions is applying for an injection depth waiver because the Ingleside Formation, which occurs below the Lyons injection zone at an estimated 9,200 feet below ground surface, is a USDW at the FRSC location. Extracting water at this depth is not cost effective relative to the cost of using surface water or shallow ground water.

The Front Range 1-1 well is located in an industrial park away from residential areas. The Town of Windsor, Colorado, is approximately 2.75 miles away. Windsor currently uses surface water for its drinking water supply. Carbon Storage Solutions provided a comparison of the cost per 1,000 gallons for current water supplies and the anticipated cost of supplying Lyons Formation drinking water to the nearby municipalities of Greeley, Windsor, and Severance (Table 3). The current cost to supply water to these municipalities ranges from $6.51 to 8.86 per thousand gallons, whereas the estimated cost to supply groundwater from the Lyons Formation ranges from $59.35 to 79.14 per thousand gallons, which is about 7–9 times more expensive when the cost to drill a well and acquire pipeline right of way (totalling $3–4 million) is considered. As the Ingleside formation is deeper than the Lyons formation, it would cost even more to utilize it as a drinking water source. Also as noted below, the water quality of the Ingleside formation is highly variable, making it less likely to be used as a future source of drinking water.

**Consultation with the Public Water System Supervision (PWSS) Directors**

In accordance with 40 CFR 146.95(b)(2), the EPA consulted with the Colorado Department of Public Health and Environment (CDPHE) which has PWSS authority over lands within the area of review. CDPHE coordinates with the Colorado Energy and Carbon Management Commission (ECMC) and Colorado Department of Natural Resources (CDNR). On August 19, 2025, the EPA met with water-resource officers from ECMC, CDNR, and CDPHE concerning whether the Ingleside Formation is currently being utilized or is planned to be utilized as a drinking-water resource in the foreseeable future. Currently no communities are utilizing the Ingleside Formation or have plans to do so. The PWSS Director cited the depth and highly variable water quality of the Ingleside as constraints on utilizing the aquifer as a resource in the regional area surrounding the FRSC.

| Table of Data and Economic Calculations | | | | | | |
|---|---|---|---|---|---|---|
| | Greely | | Windsor | | Severance | |
| Distance from WDW (miles) | 15 | | 4 | | 6 | |
| Population | 108795 | | 32716 | | 7683 | |
| Reference | 2020 Census (92,889 in 2010) | | 2020 Census (18,644 in 2010) | | 2020 Census (3,165 in 2010) | |
| | Surface Water (Cache la Poudre River, Laramie River, Big Thompson River, and Colorado River Basins) Upper Laramie Aquifer at TerryRanch | | Surface Water Diversion | | Surface Water Diversion | |
| Storage volume (G) | 69,750,000 | See Water Distribution System | 2,000,000 | Storage Tank | 1,000,000 | |
| Total Treatment Capacity (GPM) | 73,000,000 | Peak Treatment Capacity of Bellvue and Boyd Lake Facilities | 2,559,000 | Max annual Contracted Volume | 548 | Projected for 2024 884 Ac-Ft |
| Typical Household Usage (GPM/pp) | 0.05 | Greely Household Water Budget Guidelines | 0.056 | | 0.083 | |
| Household Usage (GPM) | 5,304 | | 1,818 | | 640 | |
| % of Capacity | 0.01% | | 0.07% | | 116.83% | |
| Annual Household Usage (G) | 2,787,871,875 | | 955,307,200 | | 336,515,400 | |
| Total City Peak Demand (GPM) | 31,944 | TBL ES-1 2021 Water Transmission and Distribution Master Plan | | | | |
| % of Capacity | 0.04% | | | | | |
| Current Cost per 1000 gal | $ 8.86 | $5.61 to $11.81 variable depending on usage | $ 6.51 | 2nd Tier Single Family Residential | $ 8.01 | |
| Annual Cost for Average Usage | $ 24,720,847 | | $ 6,224,161 | | | |
| Supply for Lyons Well (GPM) | 100.0 | | 100.0 | | 100.0 | |
| Supply (BWPD) | 3429 | | 3429 | | 3429 | |
| Annual Supply (G) | 52,560,000 | | 52,560,000 | | 52,560,000 | |
| % of Annual Household Usage | 2% | | 6% | | 16% | |
| Treatment Cost ($/bbl) | $ 0.50 | | $ 0.50 | | $ 0.50 | |
| Cost for 1-year Treatment | $ 625,714 | | $ 625,714 | | $ 625,714 | |
| Procurement & Installation Cost ($/inch-ft) | $ 5.00 | | $ 5.00 | | $ 5.00 | |
| Right-of-Way Procurement Cost ($/mile) | $ 10,000 | | $ 10,000 | | $ 10,000 | |
| Pipeline Diameter (inches) | 4 in. | | 4 in. | | 4 in. | |
| Cost to Build Pipeline Right-of-Way | $ 1,584,000 | | $ 422,400 | | $ 633,600 | |
| Cost to Acquire Right-of-Way | $ 150,000 | | $ 40,000 | | $ 60,000 | |
| Cost to Drill/Aquire Well | $ 1,800,000 | | $ 1,800,000 | | $ 1,800,000 | |
| **Total Cost of Lyons Water Supply ($)** | **$ 4,159,714** | | **$ 2,888,114** | | **$ 3,119,314** | |
| **Total Cost of Lyons Water Supply ($/1000 G)** | **$ 79.14** | | **$ 54.95** | | **$ 59.35** | |

**Table 3**. Cost of current water supplies compared to a Lyons water supply (CSS, 2024b)

## Water, hydrocarbon, or mineral resource exploitation potential 40 CFR 146.95(b)(1)(vii)

The Denver-Julesburg Basin in central Colorado is a highly productive region for oil and gas, featuring numerous stacked formations that yield economic quantities of resources (see Figure 4). All these formations are situated above the Ingleside Formation, and no production wells will penetrate the Ingleside as the deepest Underground Source of Drinking Water (USDW). The Ingleside is not an oil and gas production zone.

## Conclusion

Based on the information summarized above, CSS has provided the demonstrations required by 40 CFR § 146.95, and this evaluation indicates that issuance of an injection depth waiver would not cause an endangerment to USDWs.

**References**

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Nelson, P.H., Santus, S.L., 2011, Gas, oil, and water production from Wattenberg Field in the Denver Basin, Colorado: U.S. Geological Survey Open-File Report 2011-1175, HTML Document, https://doi.org/10.3133/ofr20111175.