CLASS VI PERMIT APPLICATION NARRATIVE
40 CFR §146.82(a)

Brown Pelican CO_2 Sequestration Project

1.0 Project Background and Contact Information

Facility name: Brown Pelican CO_2 Sequestration Project
BRP CCS1, CCS2 and CCS3 Wells

Facility contact: Caroline Huet, Carbon Management Certification Lead
5 Greenway Plaza, Houston, TX 77046
[redacted]

Well location: Penwell, Texas

[redacted]

The Brown Pelican CO_2 Sequestration Project (BRP Project or Project) is part of the Oxy Low Carbon Ventures, LLC (OLCV), whose objective is to demonstrate technical feasibility of Carbon Capture and Storage (CCS) utilizing CO_2 from Direct Air Capture (DAC). The advancement of CCS technology is critically important in addressing CO_2 emissions and global climate change concerns. The BRP Project is designed to demonstrate utility-scale integration of transport and permanent storage of captured CO_2 into a deep geologic formation (i.e., geologic sequestration). A commercial-scale CCS system is currently being constructed and will be operated to provide safe, long-duration subsurface storage of CO_2.

The BRP Project will demonstrate that the geologic sequestration process can be done safely, ensuring that the injected CO_2 will be retained within the intended storage reservoir. By using safe and proven pipeline technology, the CO_2 will be transported to a storage site located near Penwell, Texas. The pipeline will be designed and installed according to all applicable standards and codes and will adhere to strict mechanical integrity testing schedules to ensure long-term reliability. The CO_2 will be injected into the Lower San Andres Formation at a proposed rate of [redacted]

The proposed Area of Review (AoR) has no known cultural sites or sites of archaeological significance. There is one known place of worship and one known cemetery within a 1-mile buffer zone surrounding the AoR. There are no known schools, hospitals, or nursing homes within the AoR or buffer zone surrounding the AoR.

GSDT Submission – Project Background and Contact Information
GSDT Module: Project Information Tracking ***Tab(s):*** General Information tab; Facility Information and Owner/Operator Information tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Required project and facility details ***[40 CFR §146.82(a)(1)]***

2.0 Site Characterization [40 CFR §146.82(c)(2)]

A detailed geologic evaluation was conducted both regionally and locally for the area pertaining to the BRP Project site using geologic, geophysical, and petrophysical data obtained from public literature and Oxy-licensed data. A detailed discussion of the geologic features, geochemistry, geomechanics, seismic history, Injection and Confining Zone details, and Area of Review (AoR) site suitability is described in the Area of Review and Corrective Action document of this application. Below are some highlights summarized from the detailed discussion.

2.1 Stratigraphic Framework [40 CFR §146.82(a)(3)(iii), §146.83]

[redacted]

The CO_2 Storage Complex in the proposed Project consists of four main elements shown in Figure 1:

1. Injection Zone [redacted]
2. Upper Confining Zone [redacted]
3. Regional Seal / Upper Confining System [redacted]; and
4. Lower Confining Zone [redacted]

[redacted]

[redacted]

[redacted]

2.2 Structural Framework [40 CFR §146.82(a)(3)(ii), §146.82(a)(3)(v), §146.82(a)(3)(vi)]

[redacted]

[1] https://earthquake.usgs.gov/earthquakes/search/
[2] https://www.beg.utexas.edu/texnet-cisr/texnet

[redacted]

2.3 Underground Sources of Drinking Water [40 CFR §146.82(a)(3)(vi), §146.82(a)(5)]

Southeast Ector County has two sources of groundwater in the extent of the Project that meet the formal definition of a Underground Source of Drinking Water (USDW) by EPA Class VI standard (40 CFR §144.3): the Pecos Valley major aquifer (surface to ~250 ft below ground level); and the Dockum minor aquifer / Santa Rosa Formation (~600 to 1,150 ft below ground level) (Bradley and Kalaswad, 2001; Mace et al., 2006; George et al., 2011).

[redacted]

2.4. Geochemistry [40 CFR §146.82(a)(6)]

2.5 Geocellular and Dynamic Model Construction

[redacted]

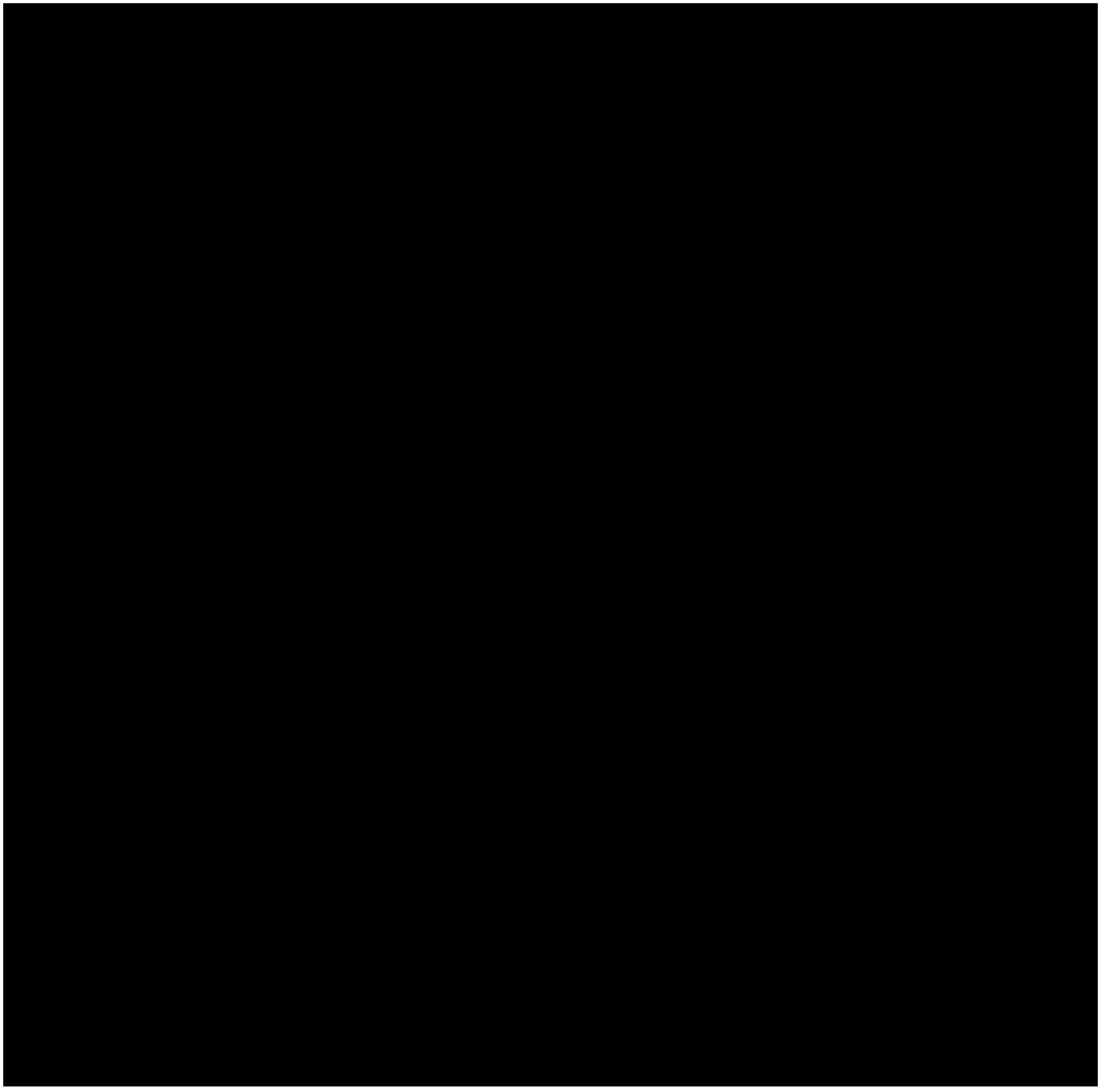
2.6 Site Storage Capacity

An initial estimation of the site storage capacity was performed using the CO_2 Screen tool by the U.S. DOE authored by Sanguinito et al. (2020) for estimating storage in saline formations, described by Equation 1:

$$G_{CO_2} = A_t h_g \phi_{tot} \rho_{CO_2} E_{saline} \quad \text{..... Equation 1}$$

where G_{CO_2} is the CO_2 storage capacity, A_t is the total area being assessed for CO_2 storage, h_g is the average gross thickness of the formation, ϕ_{tot} is the average total porosity of the formation, and E_{saline} is the CO_2 storage efficiency factor that reflects a fraction of the total pore volume filled by CO_2. The efficiency factors for area, volumetric, and microscopic displacement were

assigned default values using the CO_2 Screen tool based on lithology and depositional environment. The rest of the inputs were obtained from the geocellular model. The storage capacity was evaluated on a per-square-mile basis. Table 1 below describes the inputs used to estimate the storage capacity in million metric tons (MMT) per square mile.



[redacted]

3.0 AoR and Corrective Action [40 CFR §146.82]

[redacted]

AoR and Corrective Action GSDT Submissions
GSDT Module: AoR and Corrective Action ***Tab(s):*** All applicable tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Tabulation of all wells within AoR that penetrate confining zone ***[40 CFR §146.82(a)(4)]*** ☒ AoR and Corrective Action Plan ***[40 CFR §146.82(a)(13) and §146.84(b)]*** ☒ Computational modeling details ***[40 CFR §146.84(c)]***

4.0 Financial Responsibility

OLCV shall maintain financial responsibility and resources to meet the requirements of 40 CFR §146.85 and the conditions of this permit. Financial responsibility shall be maintained through all phases of the project. The approved financial assurance mechanisms are found in the Financial Assurance Plan document of this permit. The financial instrument(s) must be sufficient to cover the cost of:

- Corrective action (per 40 CFR §146.84);
- Injection well plugging (meeting the requirements of 40 CFR §146.92);
- Post-injection site care and site closure (meeting the requirements of 40 CFR §146.93);
- Emergency and remedial response (meeting the requirements of 40 CFR §146.94).

During the active life of the geologic sequestration project, OLCV must adjust the cost estimate for inflation within 60 days prior to the anniversary date of the establishment of the financial instrument(s) and provide this adjustment to the Program Director in an electronic format. OLCV must also provide to the Program Director written updates of adjustments to the cost estimate in an electronic format within 60 days of any amendments to the project plans that address the cost items covered in the Financial Assurance Plan.

OLCV shall provide notifications to meet the requirements of 40 CFR §146.85 and the conditions of this permit and shall take the following actions:

- Whenever the current cost estimate increases to an amount greater than the face amount of a financial instrument currently in use, OLCV, within 60 days after the increase, must either cause the face amount to be increased to an amount at least equal to the current cost estimate and submit evidence of such an increase to the Program Director, or obtain other financial responsibility instruments to cover the increase. Whenever the current cost estimate decreases, the face amount of the financial assurance instrument may be reduced to the amount of the current cost estimate only after OLCV has received written approval from the Program Director.

- OLCV must notify the Program Director by certified mail and in an electronic format of any adverse financial conditions, such as bankruptcy, which may affect the ability to carry out injection well plugging, post-injection site care and site closure, and any applicable ongoing actions under the Corrective Action and/or Emergency and Remedial Response Plan.

    - If OLCV or a third-party provider of a financial responsibility instrument is going through a bankruptcy, OLCV must notify the Program Director by certified mail and in an electronic format of the commencement of voluntary or involuntary proceedings under Title 11 US Code (Bankruptcy), which names OLCV as the debtor, within 10 days after commencement of the proceeding.

    - A guarantor of a corporate guarantee must make such a notification if he or she is named as debtor, as required under the terms of the guarantee.

    - A permittee who fulfills the requirements of financial assurance by obtaining a trust fund, surety bond, letter of credit, escrow account, or insurance policy will be deemed to be without the required financial assurance in the event of bankruptcy of the trustee (or issuing institution) or suspension/revocation of the authority of the trustee institution to act as trustee of the institution issuing the trust fund, surety bond, letter of credit, escrow account, or insurance policy.

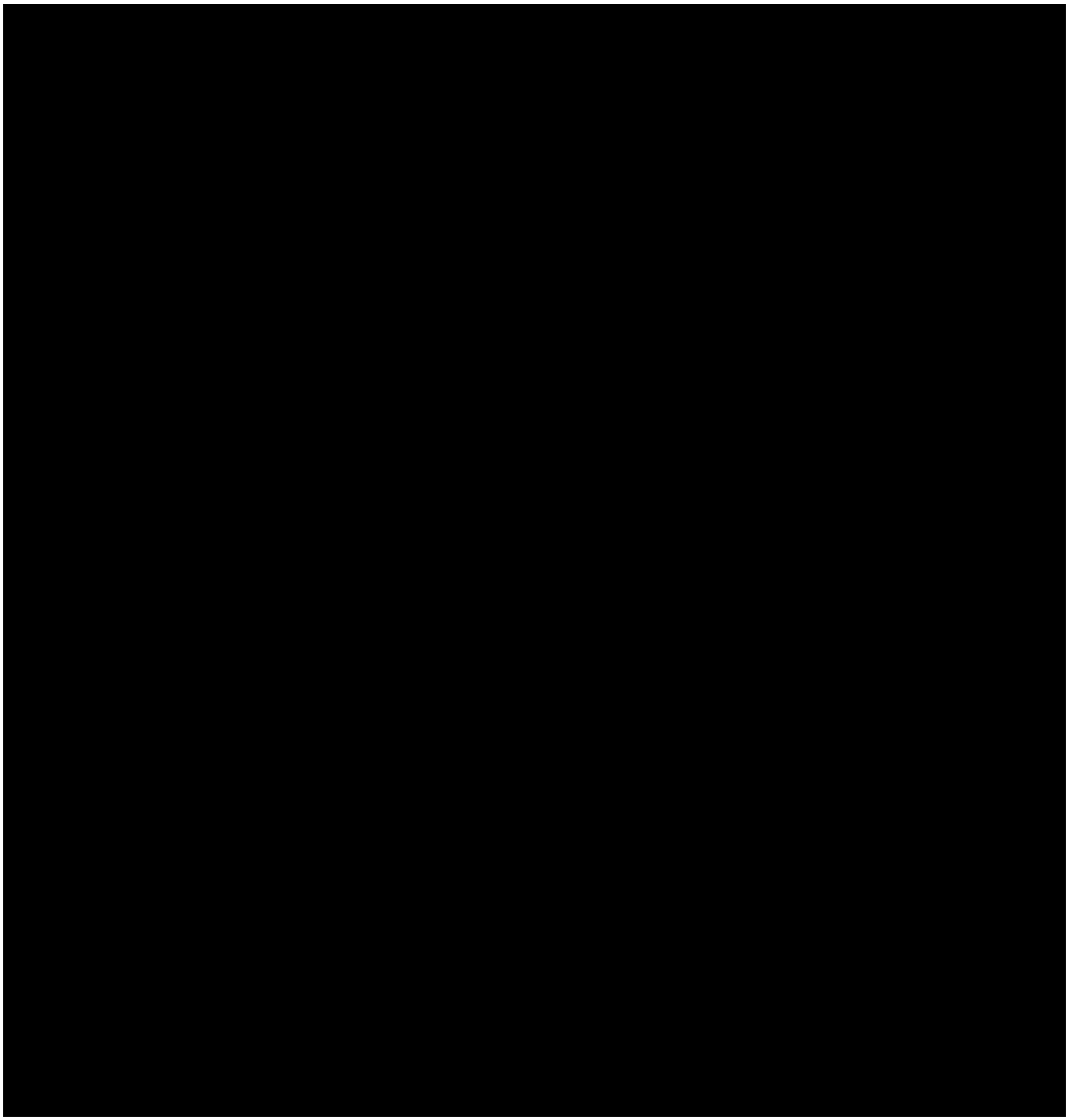
OLCV must establish other financial assurance or liability coverage, acceptable to the Program Director, within 60 days of a change to the Area of Review and Corrective Action Plan.

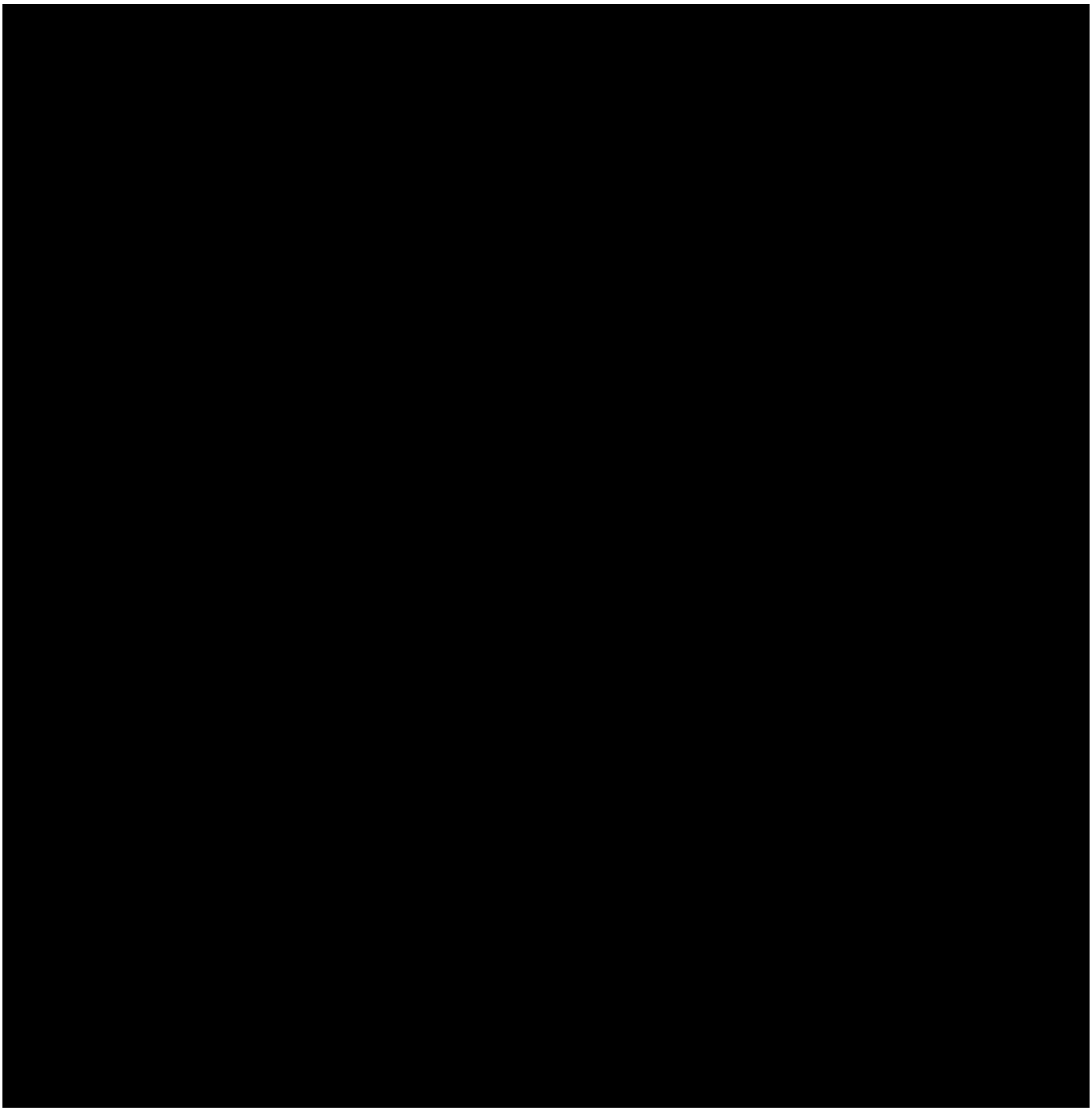
Financial Responsibility GSDT Submissions
GSDT Module: Financial Responsibility Demonstration ***Tab(s):*** Cost Estimate tab and all applicable financial instrument tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Demonstration of financial responsibility ***[40 CFR §146.82(a)(14) and §146.85]***

5.0 Injection Well Construction [40 CFR §146.82(c)(5), §146.82(a)(12)]]

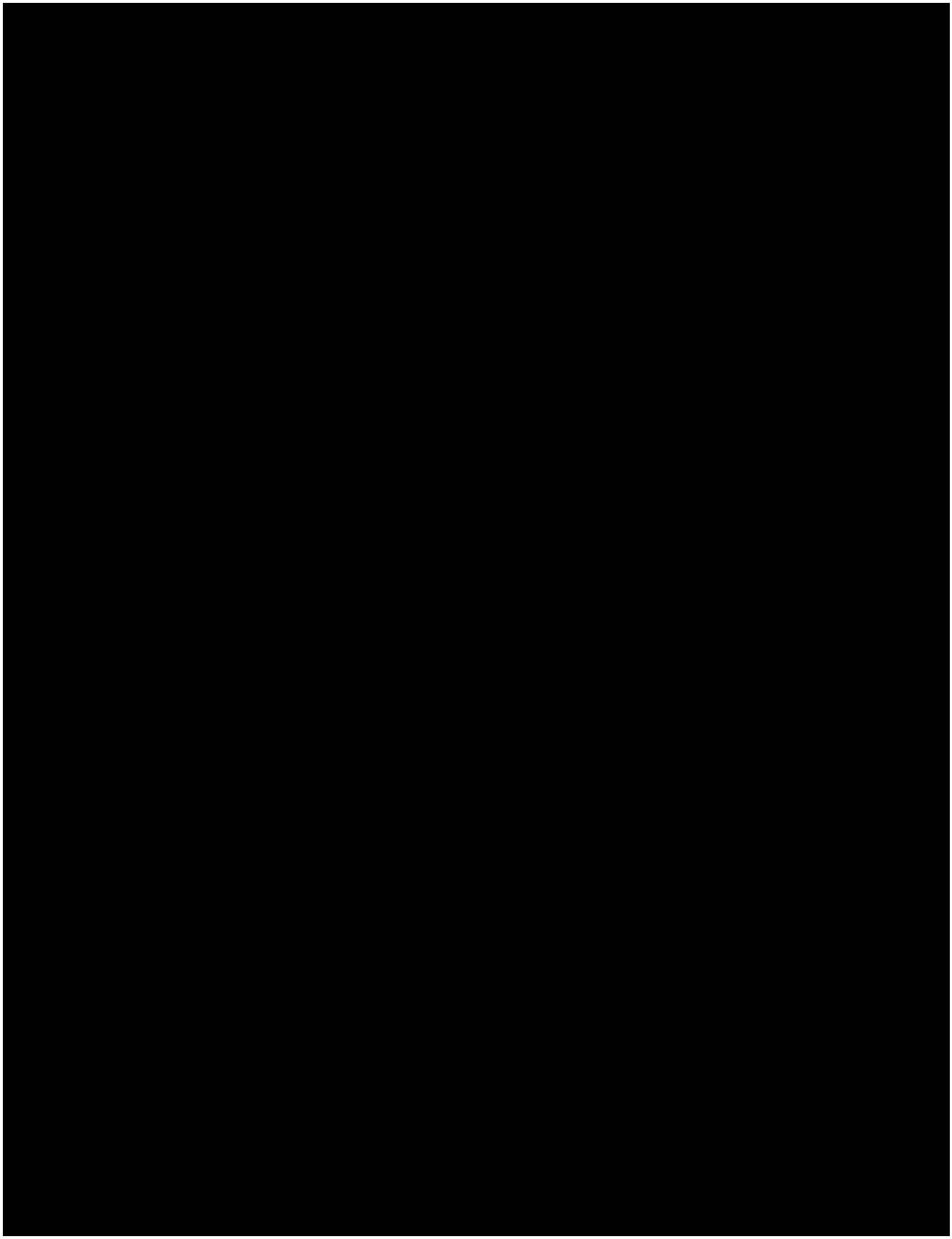
The CO_2 injection wells are designed with the highest standards and best practices for drilling and well construction (see Figure 4). The operational parameters were designed, and materials were selected to ensure mechanical integrity in the system and to optimize the operation during the life of the project.

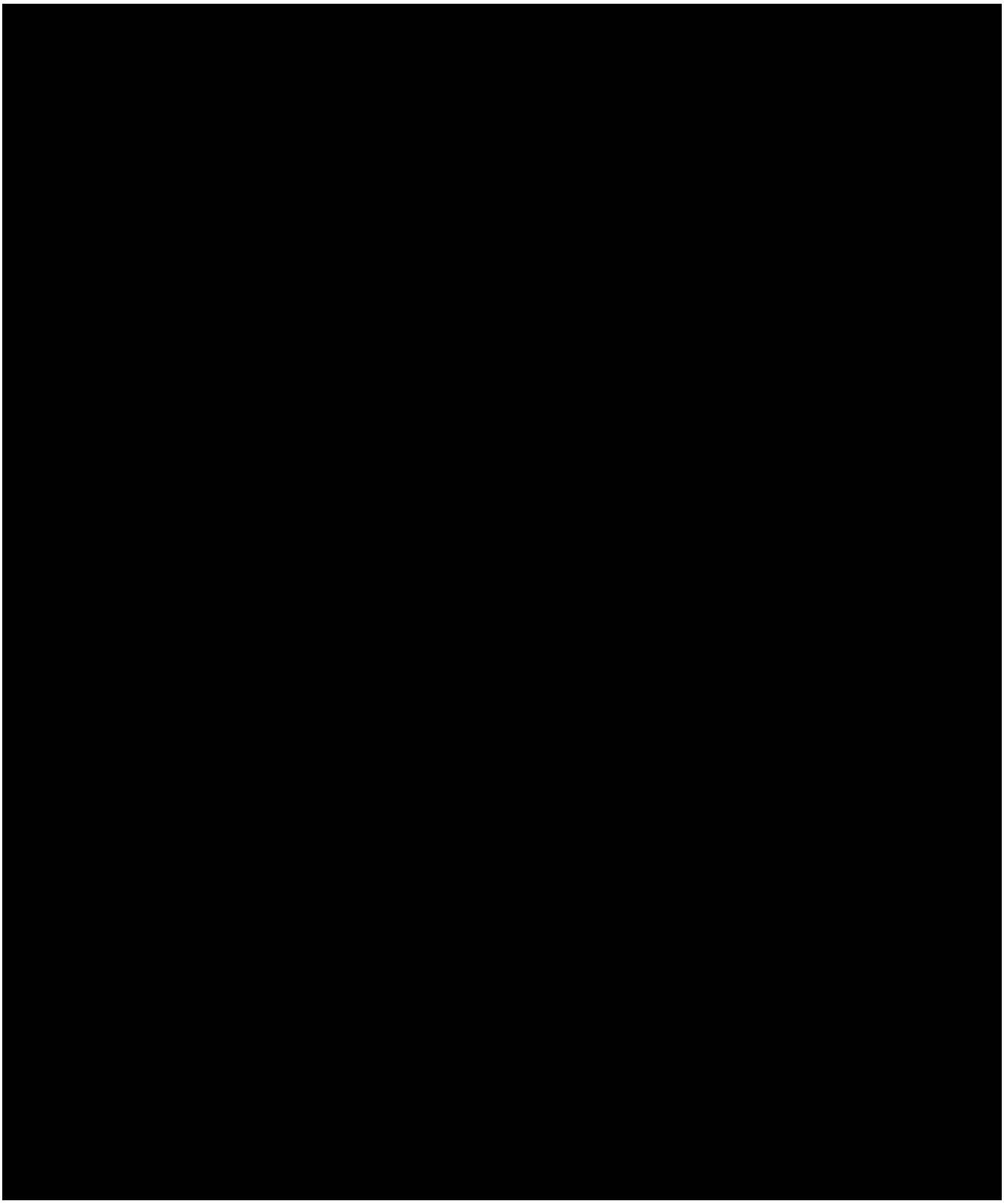
5.1 Well design and Construction: BRP CCS1



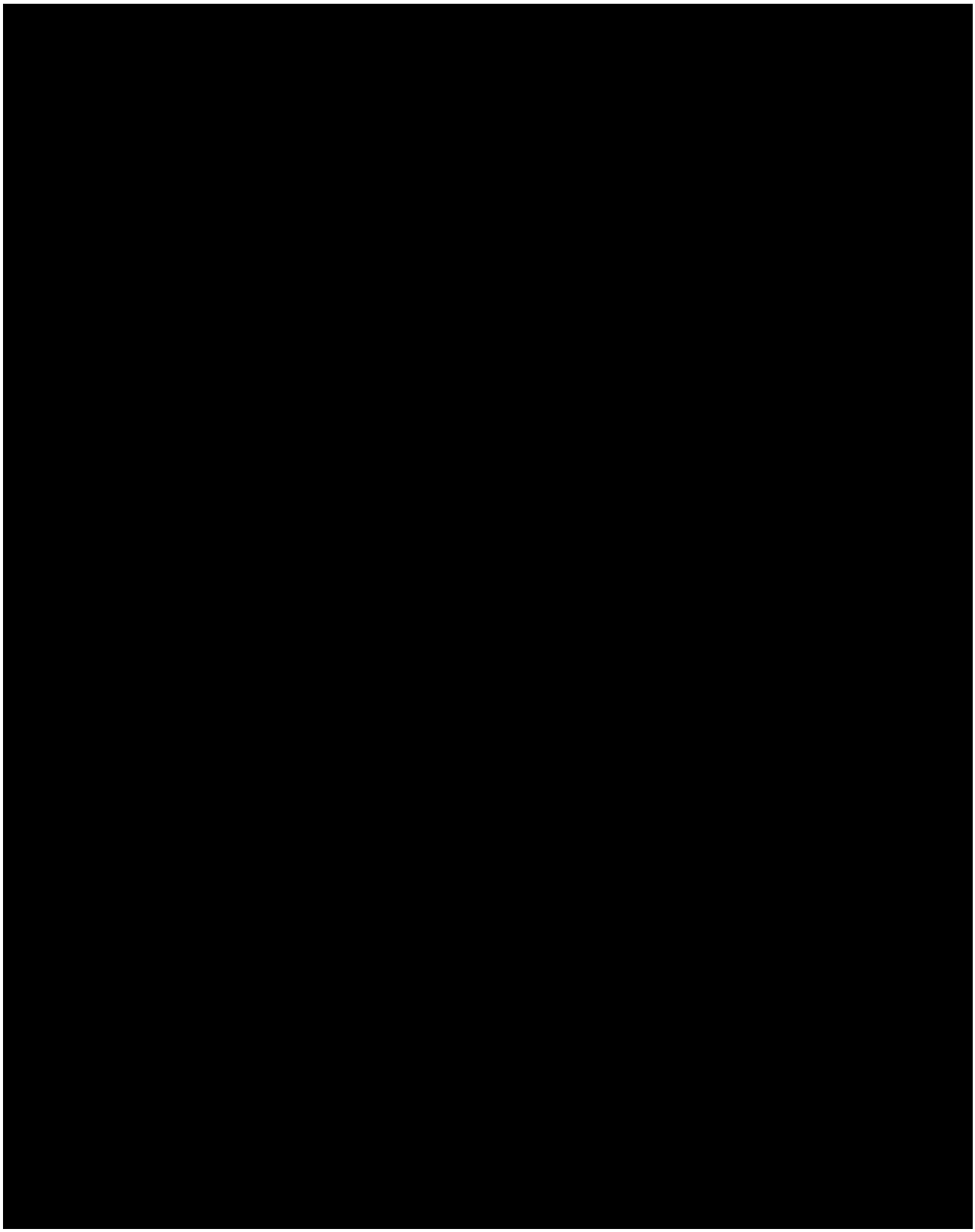


5.2. Well Design and Construction: BRP CCS2





5.3. Well Design and Construction: BRP CC3



[redacted]

6.0 Pre-Operational Logging and Testing [40 CFR §146.82(c)(4), (7) and §146.87]

[redacted]

Specific details on the proposed pre-operational logging and testing program are found in the Pre-Operational Testing Plan document that is part of this application.

Pre-Operational Logging and Testing GSDT Submissions
GSDT Module: Pre-Operational Testing ***Tab(s):*** Welcome tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Proposed pre-operational testing program ***[40 CFR §146.82(a)(8) and §146.87]***

7.0 Proposed Stimulation Program [40 CFR §146.82(a)(9)]

8.0 Well Operation [40 CFR §146.88]

The CO_2 Injection wells are designed to maximize the rate of injection as well as reduce the surface pressure and friction alongside the tubing, while maintaining the bottomhole pressure below 90% of the fracture pressure. [redacted]

[redacted]

8.2 Proposed Carbon Dioxide Stream [40 CFR §146.82(a)(7)(iii) and (iv)]

The CO_2 stream composition is shown below in Table 3. No injectant other than those identified in this permit shall be injected into the well except fluids used for stimulation, rework, and well tests as approved by the Program Director.

8.3 Reporting and Recordkeeping

Electronic reports, submittals, notifications, and records made and maintained by OLCV under this permit must be in an electronic format approved by EPA. OLCV shall submit all required reports electronically to the Program Director.

OLCV shall submit semi-annual reports containing:

- Any changes to the physical, chemical, and other relevant characteristics of the CO_2 stream from the proposed operating data;
- Monthly average, maximum, and minimum values for injection pressure, flow rate, daily volume, temperature, and annular pressure;
- A description of any event that exceeds operating parameters for the annulus or injection pressure specified in the permit;
- A description of any event that triggers the required shutoff systems and the responses taken;

- The monthly volume and/or mass of the CO_2 stream injected over the reporting period and volume and/or mass injected cumulatively over the life of the project;
- Monthly annulus fluid volume added or produced; and
- Results of the continuous monitoring required, including:
    - A tabulation of the (1) daily maximum injection pressure, (2) daily minimum annulus pressure, (3) daily minimum value of the difference between simultaneous measurements of annulus and injection pressure, (4) daily volume, (5) daily maximum flow rate, and (6) average annulus tank fluid level.
    - Graph(s) of the continuous monitoring required or of daily average values of the above parameters. The injection pressure, injection volume and flow rate, annulus fluid level, annulus pressure, and temperature shall be submitted as one or more graphs, using contrasting symbols or colors, or in another manner approved by the Program Director; and
- Results of any additional monitoring prescribed under 40 CFR §146.90 and implemented pursuant to the Testing and Monitoring Plan.

Any permit noncompliance shall be reported to the Program Director as described below:

- OLCV shall report to the Program Director any permit noncompliance that may endanger human health or the environment, and/or any events that require implementation of actions in the Emergency and Remedial Response Plan. Any information shall be provided orally within 24 hours from the time OLCV becomes aware of the circumstances. Such verbal reports shall include, but not be limited to, the following information:
    - Any evidence that the injected CO_2 stream or associated pressure front may cause an endangerment to a USDW or any monitoring or other information that indicates that any contaminant may have caused endangerment to a USDW;
    - Any noncompliance with a permit condition or malfunction of the injection system that may cause fluid migration into or between USDWs;
    - Any triggering of the shutoff system;
    - Any failure to maintain mechanical integrity; and
    - Pursuant to compliance with the requirement at 40 CFR §146.90(h) for surface air/soil gas monitoring or other monitoring technologies, if required by the Program Director, any release of CO_2 to the atmosphere or biosphere.
- A written submission shall be provided to the Program Director in an electronic format within five (5) days of the time OLCV becomes aware of the circumstances. The submission shall contain a description of the noncompliance and its cause; the period of

noncompliance (including the exact dates and times); and if the noncompliance has not been corrected, then the anticipated time it is expected to continue, as well as actions taken to implement appropriate protocols outlined in the Emergency and Remedial Response Plan document of this permit. This submission should also include the steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

Within 30 days, OLCV will report to the Program Director the results of periodic tests of mechanical integrity; any well workover, including stimulation; any other test of the injection well conducted by OLCV, if required by the Program Director.

The following items require advance notification from OLCV to the Program Director:

- **Well Tests.** OLCV shall give at least 30 days' advance written notice to the Program Director in an electronic format of any planned workover, stimulation, or other well test.
- **Planned Changes.** OLCV shall give written notice to the Program Director in an electronic format, as soon as possible, of any planned physical alterations or additions to the permitted injection facility other than minor repair/replacement or maintenance activities.
- **Anticipated Noncompliance.** OLCV shall give the Director advance notice of any planned changes in the facility or activity that may result in noncompliance with the permit requirements.

The following include other reporting requirements:

- **Compliance Schedules.** Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted in an electronic format by OLCV no later than 30 days after each schedule date.
- **Transfer of Permits.** This permit is not transferable to any person except after notice is sent to the Program Director in an electronic format at least 30 days before the transfer and requirements of 40 CFR §144.38(a) have been met. Pursuant to the requirements of 40 CFR §144.38(a), the Program Director will require modification or revocation and reissuance of the permit to change the name of OLCV and incorporate such other requirements as may be necessary under the Safe Drinking Water Act (SDWA).
- **Other Noncompliance.** OLCV shall report in an electronic format all other instances of noncompliance not otherwise reported with the next monitoring report. The reports shall contain the information listed in 40 CFR §144.51(l)(6).
- **Other Information.** When OLCV becomes aware of a failure to submit any relevant facts in the permit application or incorrect information has been submitted in a permit application or in any report to the Program Director, OLCV shall submit such facts or

corrected information in an electronic format within 10 days in accordance with 40 CFR §144.51(l)(8).

- **Report on Permit Review.** Within 30 days of receipt of this permit, OLCV shall certify to the Program Director in an electronic format that he or she has read and is personally familiar with all terms and conditions of this permit.

The following guidelines are provided for record keeping:

- OLCV shall retain records of all monitoring data collected for 10 years after it is collected.
- OLCV shall maintain records of all data required to complete the permit application form for this permit and any supplemental information (e.g., modeling inputs for AoR delineations and re-evaluations and plan modifications) submitted under 40 CFR §144.27, §144.31, §144.39, and §144.41 for a period of at least 10 years after site closure.
- OLCV shall retain records concerning the nature and composition of all injected fluids for 10 years after site closure.
- The retention periods may be extended at any time by a request of the Program Director. OLCV shall continue to retain records after the specified retention period of this permit, or any requested extension thereof expires, unless OLCV delivers the records to the Program Director or obtains written approval from the Program Director to discard the records.
- Records of monitoring information shall include:
    - The date, exact place, and time of sampling or measurements;
    - The name(s) of the individual(s) who performed the sampling or measurements;
    - A precise description of both the sampling methodology and handling of samples;
    - The date(s) analyses were performed;
    - The name(s) of the individual(s) who performed the analyses;
    - The analytical techniques or methods used; and
    - The results of such analyses.

9.0 Testing and Monitoring [40 CFR §146.82(c)(9) and §146.90]

[redacted]

[redacted]

Testing and Monitoring GSDT Submissions

GSDT Module: Project Plan Submissions
Tab(s): Testing and Monitoring tab

Please use the checkbox(es) to verify the following information was submitted to the GSDT:
☒ Updated Testing and Monitoring Plan ***[40 CFR §146.82(c)(9) and §146.90]***
☐ NO UPDATES NECESSARY

9.1 Mechanical Integrity

OLCV will conduct tests to verify the internal and external mechanical integrity of the Injector Wells before and during the injection phase pursuant to 40 CFR §146.89(c), 40 CFR §146.90(e), 40 CFR §146.87 (a)(2)(ii), and 40 CFR §146.87 (a)(3)(ii)]. Other than during periods of well workover or maintenance approved by the Program Director, in which the sealed tubing-casing annulus is disassembled for maintenance or corrective procedures, the injection well must have and maintain mechanical integrity consistent with 40 CFR §146.89.

The purpose of internal mechanical integrity testing is to confirm the absence of significant leakage within the injection tubing, casing, or packers [40 CFR §146.89(a)(1)]. Continuous monitoring of injection pressure, injection rate, injected volume and annulus pressure will be used to ensure internal mechanical integrity. In addition, annulus pressure tests will be periodically conducted to confirm gauge measurements.

The purpose of external mechanical integrity testing is to confirm the absence of significant leakage outside of the casing [(40 CFR §146.89(a)(2))]. OLCV proposes to conduct temperature logging in the Injector wells on an annual basis to demonstrate external mechanical integrity. In

[redacted]

Additional details regarding demonstrations of mechanical integrity are found in the Construction Plan, the Testing and Monitoring Plan, and the Injection Well Plugging Plan.

OLCV will observe the following reporting guidelines:

- OLCV shall notify the Program Director in an electronic format of his or her intent to demonstrate mechanical integrity at least 30 days before such demonstration. However, at the discretion of the Program Director, a shorter time may be allowed.
- Reports of mechanical integrity demonstrations that contain logs must include an interpretation of the results by a knowledgeable log analyst. OLCV shall report in an electronic format the results of a mechanical integrity demonstration.
- OLCV shall calibrate all gauges used in mechanical integrity demonstrations and other required monitoring to an accuracy of not less than 0.5% of full scale, within one year prior to each required test. The date of the most recent calibration shall be noted on or near the gauge or meter. A copy of the calibration certificate shall be submitted to the Program Director in an electronic format with the report of the test. Pressure gauge resolution shall be no greater than five (5) psi. Certain mechanical integrity and other testing may require greater accuracy and shall be identified in the procedure submitted to the Program Director before the test.

OLCV must adhere to the following guidelines regarding failure to maintain mechanical integrity:

- If OLCV or Program Director finds that the well fails to demonstrate mechanical integrity during a test, is unable to maintain mechanical integrity during operation, or that a loss of mechanical integrity as defined by 40 CFR §146.89(a)(1) or (2) is suspected during operation (such as a significant unexpected change in the annulus or injection pressure), OLCV must:
    - Immediately cease injection;
    - Take all steps reasonably necessary to determine whether there may have been a release of the injected CO_2 stream or formation fluids into any unauthorized zone. If there is evidence of USDW endangerment, OLCV shall implement the Emergency and Remedial Response Plan included in this permit;
    - Follow the reporting requirements as directed in the Emergency and Remedial Response Plan;
    - Restore and demonstrate mechanical integrity to the satisfaction of the Program Director and receive written approval from the Program Director before resuming injection; and
    - Notify the Program Director in an electronic format when injection is expected to resume.
- If a shutdown is triggered, either downhole or at the surface, OLCV must immediately investigate and identify the cause of the shutdown as expeditiously as possible. If, upon such investigation, the well appears to be lacking mechanical integrity or if the monitoring required indicates that the well may be lacking mechanical integrity, OLCV must take the actions described in the Emergency and Remedial Response Plan.
- If the well loses mechanical integrity before the next scheduled test date, then the well must be either plugged or repaired and retested within 30 days of losing mechanical integrity. OLCV shall not resume injection until the mechanical integrity is demonstrated and the Program Director gives written approval to recommence injection in cases where the well has lost mechanical integrity.

OLCV shall demonstrate mechanical integrity at any time upon written notice from the Program Director.

Testing and Monitoring GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Testing and Monitoring tab Please use the checkbox(es) to verify the following information was submitted to the GSDT:

☒ Testing and Monitoring Plan ***[40 CFR §146.82(a)(15) and §146.90]***

10.0 Injection Well Plugging

The CO_2 Injection wells will be plugged and abandoned (P&A'd) consistent with the requirements of Environmental Protection Agency (EPA) document 40 CFR Subpart H – Criteria and Standards Applicable to Class VI Wells. The plugging procedure and materials will be designed to prevent any unwanted fluid movement, resist the corrosive aspects of carbon dioxide (CO_2) with water mixtures, and protect any underground sources of drinking water (USDWs).

Detailed plugging procedures and diagrams are presented in the Well Plugging Plan that is submitted as part of this application.

Injection Well Plugging GSDT Submissions

GSDT Module: Project Plan Submissions
Tab(s): Injection Well Plugging tab

Please use the checkbox(es) to verify the following information was submitted to the GSDT:
☒ Injection Well Plugging Plan ***[40 CFR §146.82(a)(16) and §146.92(b)]***

11.0 Post-Injection Site Care and Site Closure Plan

The Post-Injection Site Care and Site Closure (PISC) Plan describes the activities that OLCV will perform to meet the requirements of 40 CFR §146.93. OLCV will monitor ground water quality and track the position of the carbon dioxide plume and pressure front for 50 years, or a shorter period should OLCV make a demonstration under 40 CFR §146.93(b)(2) that the geologic sequestration project no longer poses a risk of endangerment to USDWs. OLCV may not cease post-injection monitoring until a demonstration of non-endangerment of USDWs has been approved by the UIC Program Director pursuant to 40 CFR §146.93(b)(3). Following approval for site closure, OLCV will plug all monitoring wells, restore the site to its original condition, and submit a site closure report and associated documentation.

PISC and Site Closure GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** PISC and Site Closure tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ PISC and Site Closure Plan ***[40 CFR §146.82(a)(17) and §146.93(a)]***
GSDT Module: Alternative PISC Timeframe Demonstration ***Tab(s):*** All tabs (only if an alternative PISC timeframe is requested) Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Alternative PISC timeframe demonstration ***[40 CFR §146.82(a)(18) and §146.93(c)]***

12.0 Emergency and Remedial Response

The Emergency and Remedial Response Plan (ERRP) document of this permit describes actions OLCV shall take to address movement of the injection fluid or formation fluid in a manner that may endanger an underground source of drinking water (USDW) during the construction, operation, or post-injection site care periods.

If OLCV obtains evidence that the injected CO_2 stream and/or associated pressure front may cause endangerment to a USDW, OLCV will initiate a shutdown plan for the injection well, take all steps reasonably necessary to identify and characterize any release, notify the permitting agency (UIC Program Director) of the emergency event within 24 hours, and implement applicable portions of the approved ERRP.

Emergency and Remedial Response GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Emergency and Remedial Response tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Emergency and Remedial Response Plan ***[40 CFR §146.82(a)(19) and §146.94(a)]***

13.0 Injection Depth Waiver and Aquifer Exemption Expansion

Injection depth waivers are not requested in this permit application.

Injection Depth Waiver and Aquifer Exemption Expansion GSDT Submissions

GSDT Module: Injection Depth Waivers and Aquifer Exemption Expansions
Tab(s): All applicable tabs

Please use the checkbox(es) to verify the following information was submitted to the GSDT:

☐ Injection Depth Waiver supplemental report ***[40 CFR §146.82(d) and §146.95(a)]***

☐ Aquifer exemption expansion request and data ***[40 CFR §146.4(d) and §144.7(d)]***