

FACT SHEET

Intent to Issue an Amended Class VI Underground Injection Control Permit for Oxy Low Carbon Ventures, LLC

Brown Pelican Carbon Capture and Sequestration (CCS) Project Ector County, Texas

Oxy Low Carbon Ventures, LLC (“Oxy”) has applied to the Railroad Commission of Texas (“RRC”) for an amended Class VI Underground Injection Control (UIC) permit to operate injection wells for geologic storage of carbon dioxide. The injection wells are located on the Shoebar Ranch in Ector County approximately 20 miles southwest of Odessa Texas. The locations of the wells are included in Table 1 below.

Table 1: Well Identification and Locations (NAD 83)

Well Name	API No.	UIC No.	Latitude	Longitude
BRP #CCS1	135-44040	000127399	31.769743	-102.730903
BRP #CCS2	135-44041	000127400	31.757690	-102.729692
BRP #CCS3	135-44062	000127401	31.768079	-102.713033

Oxy plans to inject a total of 9.11 Million Metric Tons (MMT) into the proposed wells over a 12-year injection period. The source of the carbon dioxide the applicant plans to inject is the Stratos Direct Air Capture (DAC) facility near the Brown Pelican CCS Facility. The captured carbon dioxide from this facility will then be compressed on location into a liquid, supercritical fluid which will then be injected deep into the ground through the three injection wells.

Oxy selected the locations of the proposed wells based on its research and used site-specific data to ensure that the carbon dioxide would be safely stored in the proposed injection formation. The proposed injection formation is the Permian Lower San Andres Formation, at depths between approximately 4,452 – 5,130 feet below ground surface. Above the injection formation are three impermeable sealing layers consisting of an Upper Confining Zone (Upper San Andres and Grayburg Formations), and an overlying Regional Seal/Upper Confining System (Queen through Rustler Formations), which together comprise an approximately 2700-foot-thick rock layer that will ensure the injection fluid does not migrate outside of the injection formation. The Lower San Andres injection formation/sequestration reservoir is also underlain by a Lower Confining Zone (Upper Glorieta Formation).

Oxy also proposes to monitor the wells and the geologic storage facility during the 12-year injection period, and at least 50 years after injection ceases, or until a demonstration of non-endangerment to underground sources of drinking water has been approved by the RRC.

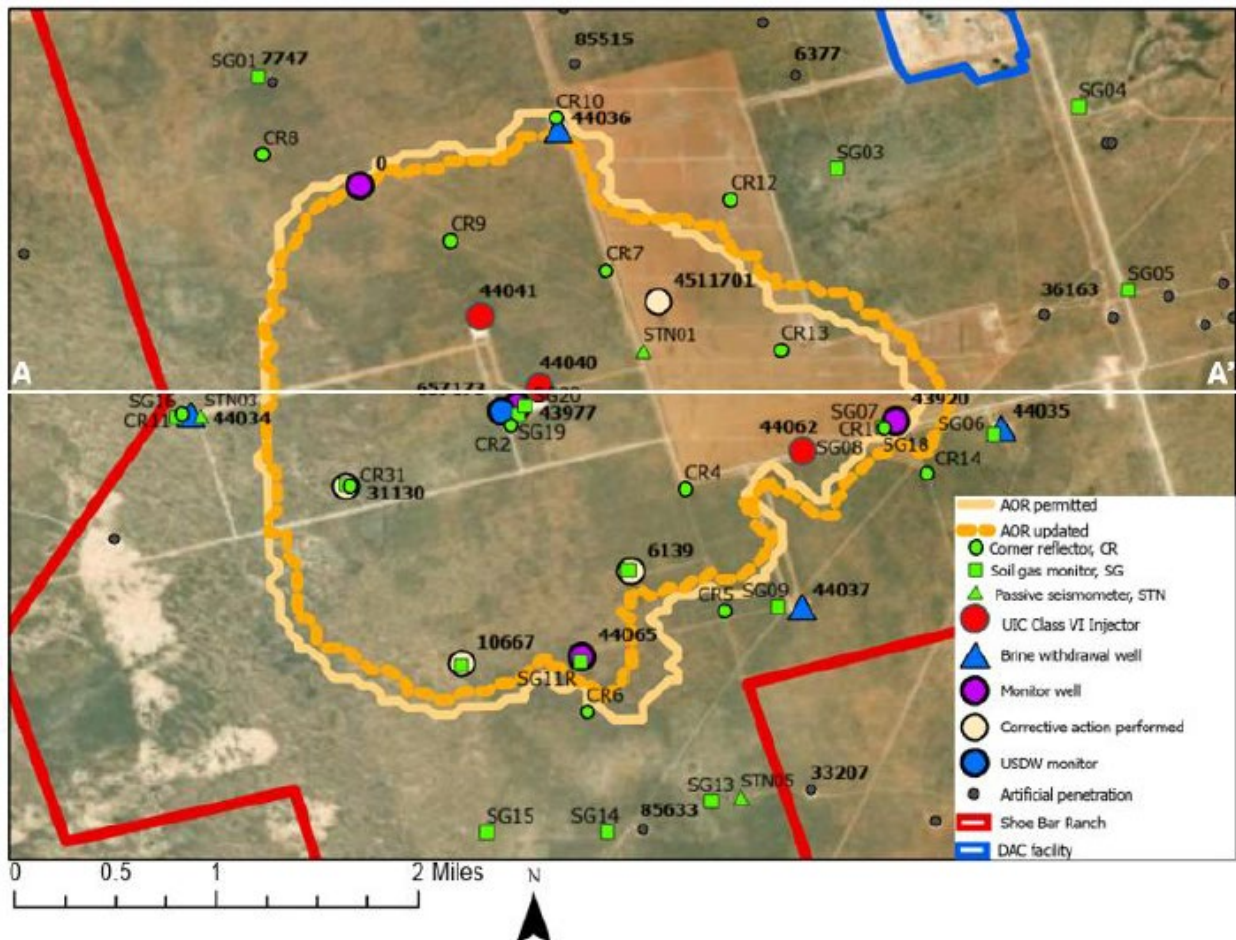
Technical background and details of the Applicant's CCS project

The RRC's review of the permit application has determined that the proposed injection complies with the Texas Class VI UIC regulations. Therefore, the RRC proposes to issue a permit for the proposed injection wells. RRC regulations require that the RRC Class VI UIC permits for carbon dioxide storage specify conditions for the construction, operation, monitoring, reporting, plugging, post-injection site care, and site closure of Class VI injection wells. These conditions are designed to prevent the movement of fluids into any underground source of drinking water. Refer to Chapter 5, Subchapters A and B for the general provisions of Class VI UIC permits. Information on the proposed activity and proposed permit conditions is provided below.

Area of Review (AoR) and Corrective Action:

The AoR, is the region surrounding the geologic storage project where underground sources of drinking water may be endangered by the injection activity (e.g., if there are any improperly sealed, completed, or abandoned wells that penetrate the confining zone that could provide a conduit for fluid migration). The AoR for the proposed well(s) is 4.8 square miles and was delineated using a simulation that predicts the movement of the carbon dioxide plume and pressure front based on available information about planned injection operations and the subsurface rock formations. Refer to **Figure 1** below.

Figure 1. Oxy BRP Proposed Amended Class VI UIC AoR



Based on the Applicant's search of well records, there were 3 wellbores within the Area of Review that required plugging because the wellbores penetrate the injection zone or confining layer. RRC reviewed the plugging and abandonment plans for the well(s) proposed by the applicant, who subsequently re-entered and properly plugged and abandoned the three wells.

Oxy must re-evaluate the AoR by assessing monitoring and operational data every five (5) years over the duration of the project to verify that the carbon dioxide plume and pressure front are moving as predicted. If there are any significant changes from the modeled predictions, the Applicant must revise the project-specific plans described here, and RRC will modify the permit per 16 TAC §5.202(d)(2).

Underground Sources of Drinking Water:

Underground sources of drinking water are defined as aquifers or portions thereof which contain less than 10,000 milligrams per liter (mg/l) of total dissolved solids and are being used, or could be used, as a source of drinking water.

The Groundwater Advisory Unit has determined that the lowest geologic formation that has the potential to be an underground source of drinking water is the Santa Rosa Member of the Dockum Group aquifer, which ranges in depth between ~600 and 1,150 feet below ground surface unit in the AoR.

Class VI Well Construction Requirements:

The Applicant has drilled 3 new Class VI injection wells. The construction of the injection wells meets the regulatory criteria at 16 TAC §5.203(e). All Class VI wells must be constructed with materials and cements that can withstand exposure to carbon dioxide and carbon dioxide/water mixtures over the life of the project. Class VI wells also must be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. These wells are equipped with an automatic surface shut-off system that would shut off the well if any permitted operating parameters—such as injection pressure—diverge from permit limitations. The BRP # CCS1 injection well was drilled and constructed with the perforated injection casing situated at a specific hole-angle of approximately 48.6 degrees from true vertical. The BRP # CCS3 injection well was drilled and constructed with the perforated injection casing situated at a specific hole-angle of approximately 59.8 degrees from true vertical. 16 TAC §5.203 (e) (C)(i) states: Tubing and packer: All injection wells must inject fluids through tubing set on a packer. Packers must be set no higher than 100 feet above the top of the permitted injection interval or at a location approved by the director. Setting an injection packer not more than 100 feet above the uppermost perforations of the injection interval in the specific instances of either the BRP # CCS1 or BRP # CCS3 injection wells, would require setting the injection packers in relatively high-angle inclined sections of these wellbores. Well intervention and logging will be required several times throughout the life of each of these wells and setting an injection packer at wellbore inclinations greater than 30 degrees will make these subsequent well interventions and logging operations technically challenging, especially trying to pass downhole equipment on wireline through the installed landing nipple above each packer. Given these circumstances, the operator has requested and the Director has granted an injection-packer setting-depth variance for construction of the BRP # CCS1 and BRP # CCS3 wells. This variance allows the injection packer to be set more than 100 feet TVD above the uppermost injection zone in each of these two higher-angle inclined wellbores. Under this injection-packer setting-depth variance, the injection packer in the BRP # CCS1 will be set approximately 390 feet TVD above the uppermost injection interval, and the injection packer in the BRP # CCS3 will be set approximately 605 feet TVD above the uppermost injection interval.

Injection Fluid:

The injected fluid will be at least 96.5% pure carbon dioxide. Oxy may propose for the RRC to review additional sources of carbon dioxide for injection, The RRC will review whether the chemical and physical characteristics of the carbon dioxide stream from any additional proposed source meet the permit requirements. The RRC will also review whether injecting carbon dioxide from the additional source would alter the project or permit requirements and result in the need for a major permit modification, including public notice.

Maximum Injection Pressure:

The operational parameters originally permitted for the BRP Project (UIC Permit 55294) were based on data from the Shoe Bar 1 and Shoe Bar 1AZ stratigraphic test wells. However, based on new mini-frac test data from the three recently drilled and constructed UIC Class VI injector wells (BRP #CCS1, BRP #CCS2, and BRP #CCS3), Oxy has updated the maximum bottomhole pressure limit for these wells. Accordingly, Oxy updated the Injection Well Operating Conditions (Attachment E of Class VI SIP Permit No. 55294) to reflect the updated CO₂ injection rates and pressures.

The three proposed CO₂ injection wells will each be injecting into slightly different perforated intervals within the Lower San Andres formation. Therefore, each of the three injector wells in this facility has a different depth-dependent maximum allowable bottomhole injection pressure listed as follows:

- Maximum Bottomhole Injection Pressure for BRP #CCS1: 3,362 psig
- Maximum Bottomhole Injection Pressure for BRP #CCS2: 4,111 psig
- Maximum Bottomhole Injection Pressure for BRP #CCS3: 2,830 psig

These maximum allowable (not-to-exceed) bottomhole injection pressures ensure that the pressure during injection does not initiate fractures in the injection or confining zones and ensures that the injection pressure will not cause movement of injection or formation fluids into an underground source of drinking water.

Monitoring and Reporting Requirements:

The draft permit will implement an RRC-approved Testing and Monitoring Plan. Oxy is required to analyze the carbon dioxide stream quarterly to provide information about its chemical and physical characteristics. Oxy is also required to demonstrate well integrity before injection begins and periodically throughout the duration of injection operations. Oxy is required to conduct and pass a two-part mechanical integrity test, in accordance with 16 TAC §5.203(h) and §5.206(f), before the RRC will authorize the start of injection.

After injection begins, Oxy is required to:

- Continuously observe and record injection pressure, flow rate and volume, and the pressure on the annulus (the space between casing and tubing) to detect leaks in the casing, tubing, or packer.
- Annually demonstrate external mechanical integrity using a temperature or noise log or another approved method to detect any fluid movement behind the casing.
- Test the injection wells for signs of corrosion every quarter to provide early indication of any well material corrosion due to contact with carbon dioxide in the presence of water that could compromise the well.
- Monitor the environment near the wells to verify that the project and the injected carbon dioxide plume are behaving as predicted and that carbon dioxide is not migrating outside the injection formation. The Applicant would perform groundwater quality monitoring in shallow and deep wells quarterly to detect geochemical changes that may be a result of injection, such as leaching or mobilization of heavy metals and organic compounds or fluid displacement that could impact Underground sources of drinking water.
- Perform pressure fall-off testing at least every five years to verify that the injection zone is responding to injection as predicted.
- Track the movement of the carbon dioxide plume and pressure front using direct methods such as fluid monitoring of the injection zone and Underground sources of drinking water and pressure monitoring of the injection zone, and indirect methods such as seismicity monitoring and pulse neutron logging of well bores to verify that the carbon

dioxide plume and pressure front are moving as predicted or to provide early indication if they are not.

Oxy will be required to submit results of this monitoring to the RRC semiannually or within 30 days of the completion of a mechanical integrity test or other required testing.

Emergency and Remedial Response:

As required by 16 TAC §5.203(n), Oxy has prepared and the RRC has approved, a site-specific Emergency and Remedial Response Plan (ERRP) that identifies key resources, including oil and gas production resources not associated with the Project, impermeable sealing layers consisting of the Upper Confining Zone (Upper San Andres and Grayburg Formations) and Regional Seal/Upper Confining System (Queen through Rustler Formations), overlying the carbon dioxide plume, and the nearest census designated area of Pennwell, Texas, located ~7.5 miles from the Brown Pelican CCS Facility.

The Emergency and Remedial Response Plan describes the responses that would be taken to address adverse events, and identifies the staff, equipment, and other resources available to support emergency and remedial response events. The emergency and remedial response provisions of the permit facilitate expeditious responses and prevent or mitigate harm to public health and the environment, including underground sources of drinking water. The Emergency and Remedial Response Plan is an enforceable part of the permit.

Financial Responsibility:

Oxy has demonstrated, and will maintain, adequate financial responsibility to perform all needed corrective action on wells in the AoR, to plug the injection wells, to perform all required post-injection site care, to close the site, and to conduct any needed emergency and remedial response measures. The total initial cost estimates for these activities to be covered by the approved financial assurance mechanisms is \$18,045,089 Million USD. Oxy is using a Letter of Credit to cover costs and demonstrate financial responsibility.

The draft permits require Oxy to annually update cost estimates for the covered activities. These provisions ensure that resources are available to perform the required activities without using public funds.

Plugging and Abandonment:

The draft permits include an Injection Well Plugging Plan for environmentally protective well plugging at the cessation of injection operations. All injection and monitoring wells drilled by Oxy will be plugged using approved materials that are compatible with carbon dioxide/water mixtures to ensure that the wells will not serve as conduits for fluid movement into underground sources of drinking water.

Post-Injection Site Care and Site Closure:

Oxy is required to implement a RRC-approved Post-Injection Site Care and Site Closure Plan. Following the cessation of injection, the permittee is required to continue monitoring of groundwater quality and track the position of the carbon dioxide plume and pressure front in a similar manner to what is described under “Monitoring and Reporting Requirements” above. This monitoring will help confirm predictions about the behavior of the carbon dioxide plume and pressure front (e.g., that pressures are subsiding after injection ceases) and provide early indication of any potential endangerment of underground sources of drinking water. Oxy will continue post-injection monitoring for at least 50 years and until it demonstrates non-endangerment of underground sources of drinking water based on monitoring and other site data. At the end of the Post-Injection Site Care period, if site data supports it, the RRC may authorize Oxy to close the site.

Following authorization to proceed with site-closure activities, Oxy will plug all monitoring wells with carbon dioxide-compatible materials to ensure they cannot serve as conduits for fluid movement and would restore the site to its original condition.

Administrative Record

The full administrative record, including all data submitted by the applicant in support of its permit application, is available for public review at the RRC's District 08 Office at the following address:

Railroad Commission of Texas
District 08 Office
10 Desta Dr, Suite 500 E
Midland, TX 79705

The office is open 8:00 a.m. – 5:00 p.m., weekdays. To review the administrative record or for additional information please contact Jeff Morgan (Director of RRC District 08) at phone: 432-684-5581, fax: 432-684-6005, or email: midland@rrc.texas.gov.

On the Web for more information about the project and draft for Class VI UIC Permits:
<https://www.rrc.texas.gov/oil-and-gas/applications-and-permits/injection-storage-permits/co2-storage/co2-notices>