

## PRE-OPERATIONAL TESTING PLAN

### Bluebonnet Sequestration Hub

1.0 Facility Information .....	1
2.0 Pre-Injection Test Plan – CO <sub>2</sub> Injector Wells .....	7
3.0 Pre-Injection Test Plan – In-Zone Monitoring Wells .....	17
4.0 Pre-Injection Test Plan – Water Production Wells .....	19
5.0 Pre-Injection Test Plan – Water Disposal Wells.....	20
6.0 Pre-Injection Test Plan – Above-Confining-Zone/USDW Monitoring Wells .....	21

### 1.0 Facility Information

Facility name: Bluebonnet Sequestration Hub (Bluebonnet Hub or the Project)  
Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3,  
Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7 Wells

Facility contact:

Claimed as PBI

Well location:

Claimed as PBI

Claimed as PBI

Pursuant to 40 CFR §146.87, this plan describes the testing and logging activities proposed by Bluebonnet Sequestration Hub, LLC for the Bluebonnet CCS 1, Bluebonnet CCS 2, Bluebonnet CCS 3, Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7, as well as the monitoring wells, water producer wells, and a water disposal well planned for the Bluebonnet Hub.

These testing and logging activities are restricted to the drilling, completion, and pre-injection phases of the project. Testing and monitoring activities during the injection and post-injection phases are described in the Testing and Monitoring Plan along with other non-well related pre-injection baseline activities, such as geophysical and geochemical monitoring.

As required by 40 CFR §146.87, all pre-injection testing procedures for logging, sampling, and testing will be submitted to the Underground Injection Control (UIC) Director for review. The results and data collected during the testing, sampling, and logging operations will be documented

Plan revision number: 2.  
Plan revision date: 11/01/2024.

in a report and submitted to the UIC Director after the procedures are completed, but before the start of the CO<sub>2</sub> injection operations.

The Bluebonnet Sequestration Hub, LLC will notify the UIC director at least 30 days prior to conducting the tests. Notice and the opportunity to witness these test/logs shall be provided to the UIC Director at least 48 hours in advance of the given procedure.

A table of the wells described in this document is shown in Table POT-1.

**Table POT-1: Bluebonnet Sequestration Hub wells.**

Claimed as PBI

- (1) ACZ: Above Confining Zone
- (2) USDW: Underground Source of Drinking Water

Figure POT-1 and Figure POT-2 show the location of the CO<sub>2</sub> injection wells, in-zone monitoring wells, water production wells, water disposal well, and USDW monitoring wells as proposed in the Bluebonnet Hub.

Plan revision number: 2.  
Plan revision date: 11/01/2024.

Well diagrams for the CO<sub>2</sub> Injection wells listed in Table POT-1 are presented in the Injector Wells Construction Details Plan of this permit. Well diagrams for the monitoring wells, water production wells, and water disposal well are presented in the Testing and Monitoring Plan.

# Claimed as PBI



**Figure POT-1: Location of CO<sub>2</sub> injector wells, in-zone monitoring wells, water production wells, and water disposal wells for the Bluebonnet Sequestration Hub.**

# Claimed as PBI



**Figure POT-2: Location of CO<sub>2</sub> injector wells and above-confining-zone/USDW monitoring wells for the Bluebonnet Sequestration Hub.**

The Bluebonnet Sequestration Hub, LLC will construct six new CO<sub>2</sub> injection wells, Bluebonnet CCS 1, Bluebonnet CCS 2, Bluebonnet CCS 3, Bluebonnet CC 5, Bluebonnet CCS 6, and Bluebonnet CCS 7, targeting injection in the **Claimed as PBI** sands.

In addition to the injectors, the project will construct three new in-zone monitoring wells (Bluebonnet IZM FM1, Bluebonnet IZM FM2, and Bluebonnet IZM M1) and will recomple the stratigraphic well **Claimed as PBI**.

Oxy Low Carbon Ventures, LLC, the parent company of Bluebonnet Sequestration Hub, LLC, drilled the **Claimed as PBI** stratigraphic well in 2022 and acquired advanced geophysical logs as well as **Claimed as PBI** full core and **Claimed as PBI** sidewall cores (SWC). The project also performed step rate and falloff tests in the prospect reservoirs and leak-off tests in the proposed confining zones. The results and a summary of the data acquisition program **Claimed as PBI** are shown in Appendix A in the AoR attachment. In May 2024, **Claimed as PBI** was reentered to collect additional water samples from the **Claimed as PBI** reservoir. The **Claimed as PBI** stratigraphic well was temporarily abandoned and will be re-completed as an in-zone monitoring well for the project.

The project plans to construct two water producer wells (Bluebonnet PRDW F1 and Bluebonnet PRDW F2) to extract water from the **Claimed as PBI** formation as a technique to control the pressure front during the injection phase. These wells will be completed with pressure and temperature sensors downhole and pressure and temperature sensors on the surface and will be used as part of the monitoring network to track the CO<sub>2</sub> plume and pressure front.

The project defines the above-confining zone as the first permeable zone above the **Claimed as PBI** Dissipation Zone. This first permeable formation is the base of the USDW as characterized by **Claimed as PBI** stratigraphic well and mapped laterally though the storage complex.

In May 2024, the project drilled **Claimed as PBI** targeting the shallow aquifers from the surface **Claimed as PBI**. The main objective of this well was to validate the base of the USDW and determine the water composition of the different flow units as part of the site characterization and baseline for injection operations. The detailed data acquired during **Claimed as PBI** construction is provided in Appendix B in the AoR attachment. **Claimed as PBI** will be used as monitoring well for the shallow aquifer to monitor changes in water composition during the injection and post-injection phases of the project.

The project plans to construct six additional above-confining-zone/USDW monitoring wells (Bluebonnet USDW 2, Bluebonnet USWD 3, Bluebonnet USDW 4, Bluebonnet USWD 5, Bluebonnet USDW 6, and Bluebonnet USWD 7). These wells will be used to track changes in pressure as well as in water composition of the base of the USDW in the Hub.

The project also plans to drill one water disposal well (Bluebonnet DSW M2) targeting the sands of the **Claimed as PBI** formation above the **Claimed as PBI** Confining Zone. This well will be used to dispose of the water extracted from the **Claimed as PBI** formation as well as fluid generated during the construction and operation of the Bluebonnet site.

## 2.0 Pre-Injection Test Plan – CO<sub>2</sub> Injector Wells

The following tests and logs will be run during drilling, casing installation, and completion of the Bluebonnet CCS 1, Bluebonnet CCS 2, Bluebonnet CCS 3, Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7 injector wells in accordance with the testing required under 40 CFR §146.87(a), (b), (c), (d), and (e).

The CO<sub>2</sub> injection well testing program includes a combination of advanced logging, sidewall coring, fluid sampling, and formation hydrogeologic testing. This program is complemented with an extensive data acquisition program executed in the **Claimed as PB** stratigraphic well, as well as the data acquisition planned in the additional monitoring wells, water producer wells, and water disposal well.

The pre-operational testing program will measure the depth, fluid salinity, thickness, mineralogy, lithology, porosity, and permeability information of the injection zone, overlying confining zone, and other relevant geologic formations. This data acquisition program will be used to determine conformance with the injection well construction requirements and to establish accurate baseline data for future monitoring activities.

Tables POT-2 and Table-3 list the logs, tests, and surveys proposed for the Bluebonnet CCS 1, Bluebonnet CCS 2, Bluebonnet CCS 3, Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7 wells to comply with 40 CFR §146.87 (a).

**Table POT-2: Logging, testing, and surveying plan for CO<sub>2</sub> injector wells – Part 1[(40 CFR 146.87 (a))].**

Claimed as PBI



# Claimed as PBI

# Claimed as PBI

**Table POT-3: Logging, testing and surveying plan for CO<sub>2</sub> injector wells – Part 2 [(40 CFR 146.87 (a))]**

Claimed as PBI

Plan revision number: 2.  
Plan revision date: 11/01/2024.

The long string sections of Bluebonnet CCS 1, Bluebonnet CCS 2, Bluebonnet CCS 3, Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7 will be drilled with synthetic based mud to ensure well stability while drilling, logging, and cementing. Therefore, spontaneous potential logs will not be possible to acquire. However, the project proposes additional new generation logs to improve reservoir and confining zone characterizations as described in Table POT-2 above.

The project will not collect full core while drilling the long string section in Bluebonnet CCS 01, Bluebonnet CCS 2, Bluebonnet CCS 3, Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7. Only sidewall cores will be collected, as allowed by 40 CFR §146.87 (b). The project team will also collect water samples in the injection zones as shown in Table POT-4.

As part of the data acquisition program for the Bluebonnet Hub, the project acquired reservoir pressure and water samples in 2022 for the [redacted] formation in Encanto 01 stratigraphic well as well as for the [redacted] formation. The water samples were deemed contaminated for the [redacted] reservoir. In 2024, the project re-entered [redacted] and collected four fluid samples from the [redacted] formation.

In 2024, the project also drilled water well [redacted] to acquire water samples in the first and second permeable zone below the shallowest seal, defined as the base of the USDW. In [redacted], water samples were collected at the base of the USDW and at the freshwater sands as part of the characterization. A detailed description of the baselines and data collected in [redacted] are provided in the AoR attachment in Appendix A.

**Table POT-4: Sidewall Cores and Water Sampling for CO<sub>2</sub> Injector Wells (40 CFR 146.87 (b)).**

# Claimed as PBI

The project team will record the fluid temperatures and reservoir pressures obtained from the wireline tool while taking the pressure points and water samples (40 CFR §146.87 (c)). The project team also plans to install downhole gauges that will allow us to determine original pressure and temperature at the top of the perforations.

The project team plans to perform the following analysis in the sidewall cores collected from CO<sub>2</sub> injection wells listed in Table POT-5.

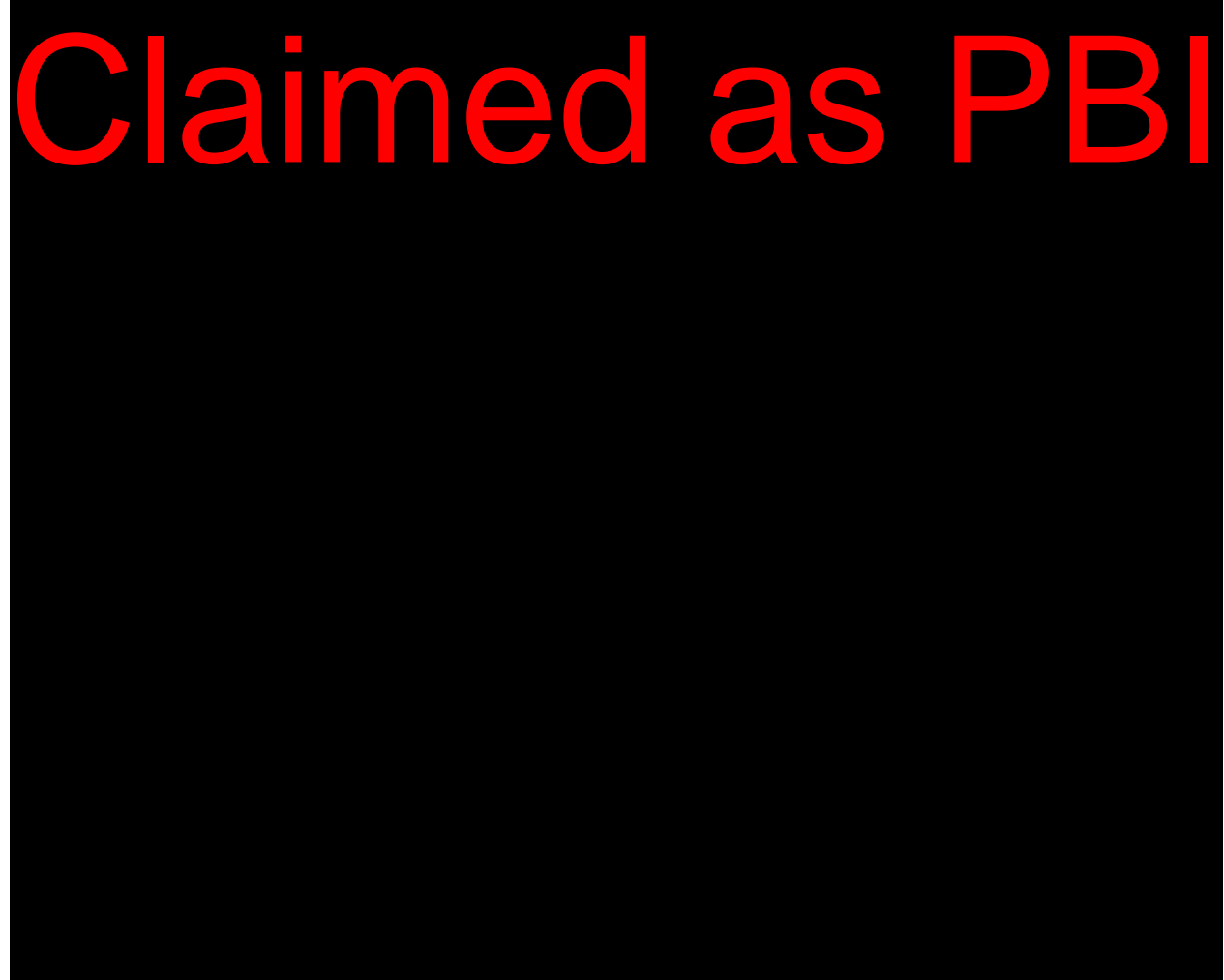
**Table POT-5: Core analysis to be performed in the rotary sidewall cores (RSWC) samples from CO<sub>2</sub> injector wells.**



The project team will send the water samples to a third-party lab for a complete analysis, including pH, conductivity, major cations, major anions, trace metals, dissolved gases, density, and TDS, amongst others. Table POT-6 shows the minimum analytics to be characterized in the downhole water samples (40 CFR §146.87 (d)(3) and 40 CFR §146.87 (c)).

**Table POT-6: Analyses and methods for water samples testing in the reservoir and overburden.**

Claimed as PBI



The static fluid level of the injection zones will be determined after well completion during the step rate test, injectivity tests, and falloff tests (40 CFR §146.87 (c)). The Bluebonnet Sequestration Hub, LLC will not acquire fluid samples through the open hole DST, by performing a pump off or swabbing after the well is completed, due to the potential for sand production when negative drawdown is applied to the reservoir, which could damage the well.

To comply with 40 CFR §146.87(d), the data to be acquired in the proposed Bluebonnet CCS 1, Bluebonnet CCS 2, Bluebonnet CCS 3, Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7 injection wells will include logging, formation pressure testing in the injection zones, mini frac test in the confining zones, rotary sidewall core sampling and analyses, and hydrogeologic testing to determine the physical and chemical characteristics of the injection and confining zones. This data will allow calibration of the data acquired in 2022 in the **Claimed as PBI** stratigraphic test well during the initial site characterization and will further serve as a baseline prior to commencing CO<sub>2</sub> injection.

Upon completion and prior to injection in the Bluebonnet CCS 1, Bluebonnet CCS 2, Bluebonnet CCS 3, Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7 wells, the project team will conduct the tests described in Table POT-7 to verify hydrogeologic characteristics of the injection zone, define fracture pressure for the injection zone, and identify the maximum parameters for injection (40 CFR 146.87 (d) (1) and 40 CFR 146.87 (e)).

**Table POT-7: Step rate test, injectivity test, and falloff test in CO<sub>2</sub> injectors.**

**Claimed as PBI**



### **3.0 Pre-Injection Test Plan – In-Zone Monitoring Wells**

#### ***3.1 In Zone Monitoring Wells – Bluebonnet IZM FM1, Bluebonnet IZM FM2 and Bluebonnet IZM M1.***

Bluebonnet IZM FM1, Bluebonnet IZM FM2, and Bluebonnet IZM M1 will be new wells drilled as part of the project. Table POT-8 shows the proposed logging, survey, and mud log sampling for these wells.

**Table POT-8: Logging, survey and sampling for in-zone monitoring wells**

Claimed as PBI

# Claimed as PBI

Notes: Logging depths will be adjusted when the wells are drilled.

Original pressure and temperature in the reservoir will be measured with a downhole gauge installed in the tubing ported to the reservoir below the packer.

### ***3.2 Encanto 01 – Recompletion as an In Zone Monitoring Well***

As described in the previous section, the **Claimed as PBI** stratigraphic well will be recompleted as an in-zone monitoring well. In addition to the data acquired during the stratigraphic campaign in 2022 and during the re-entry in May 2024, the well will be tested for mechanical integrity after the recompletion. A pulse neutron baseline will be acquired as well. Table POT-9 shows the logs and tests that will be performed during and after the recompletion of the well.

**Table POT-9: Cased hole logs for Encanto 01.**

# Claimed as PBI

The original pressure and temperature in the reservoir will be measured with a downhole gauge installed in the tubing ported to the reservoir below the packer.

#### **4.0 Pre-Injection Test Plan – Water Production Wells**

Bluebonnet PRDW F1 and Bluebonnet PRDW F2 will be new wells drilled as part of the project to withdraw water from the Claimed as Injection target as a technique to manage the pressure increases in the reservoir. Table POT-10 shows the proposed logging, survey, and mud log sampling for these wells.

**Table POT-10: Logging, survey, and sampling for water production wells**

**Claimed as PBI**

Note: Logging depths will be adjusted when the wells are drilled.

Plan revision number: 2.  
Plan revision date: 11/01/2024.

The original pressure and temperature in the reservoir zone will be measured with a downhole sensor, as part of the downhole completion.

### **5.0 Pre-Injection Test Plan – Water Disposal Well**

The project plans to drill one new Class I well in order to dispose of the water production from the Claimed as PBI Injection Zone, as well as the fluids generated or used during the construction and operation of the Hub. Bluebonnet DSW M2 will be the well, targeting the upper Claimed as PBI Sands located above the Claimed as PBI Confining Zone. Table POT-11 shows the proposed logging, survey, and mud log sampling for this well.

**Table POT-11: Logging, survey, and sampling for water disposal well.**

**Claimed as PBI**

Claimed as PBI

Note: Logging depths will be adjusted when the wells are drilled.

The original pressure and temperature in the reservoir will be measured with a downhole gauge installed in the tubing ported to the reservoir below the packer.

#### **6.0 Pre-Injection Test Plan – Above-Confining-Zone/USDW Monitoring Wells**

Bluebonnet USDW 1 will be completed to monitor the sands below the base of the USWD, while Bluebonnet USDW 2, Bluebonnet USDW 3, Bluebonnet USDW 4, Bluebonnet USDW 5, and Bluebonnet USDW 7 will be used to monitor changes in pressure and the water composition of the USDW. Bluebonnet USDW 6 will monitor changes in water composition in the above confining zone / USDW. Table POT-12 shows the proposed logging and survey for these wells.

**Table POT-12: Logging, survey, and sampling for above-confining-zone/USDW monitoring wells.**

Claimed as PBI