

## PRE-OPERATIONAL TESTING PLAN

### Bluebonnet Sequestration Hub

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### 1.0 Facility Information

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

Facility contacts:

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Well location:

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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, and Bluebonnet CCS 3, as well as the monitoring wells, water producer wells, and water disposal wells 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.

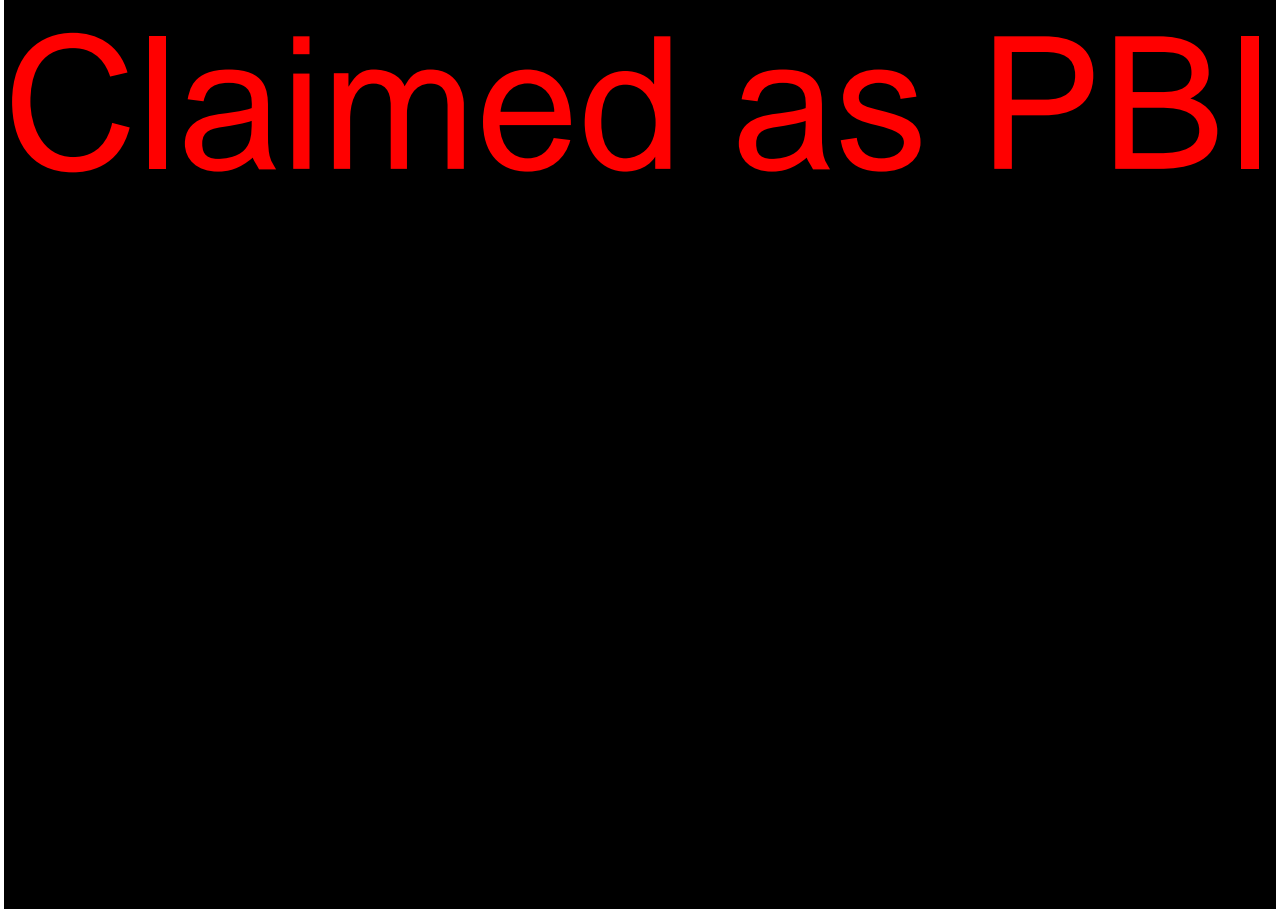
As required by 40 CFR §146.87, all pre-injection testing procedures for logging, sampling, and testing, will be submitted to the Underground Injection Control (UIC) Director for review. The results and data collected during the testing, sampling, and logging operations will be documented in a report and submitted to the UIC Director after the procedures are completed, but before the start of the CO<sub>2</sub> injection operations.

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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.**



- (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> injector wells, in-zone monitoring wells, water production wells, water disposal wells, and USDW monitoring wells as proposed in the Bluebonnet Hub.

Well diagrams for all the wells listed in Table POT-1 are presented in the Injector Wells Construction Details Plan of this permit.

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**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.**

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

Bluebonnet Sequestration Hub, LLC, will construct three new CO<sub>2</sub> injection wells, (Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3), targeting injection in the Frio and Hackberry sands.

In addition to the injector wells, 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 Encanto 01.

Oxy Low Carbon Ventures, LLC, the parent company of Bluebonnet Sequestration Hub, LLC, drilled the stratigraphic well Encanto 01 in 2022 and acquired advanced geophysical logs as well as **Claimed as PBI**. The project also performed step rate tests and falloff tests in the prospect reservoirs and leak-off tests on the proposed confining zones. The results and a summary of the data acquisition program for Encanto 01 are shown in Appendix A in the AoR attachment. In May 2024, Encanto 01 was reentered to collect additional water samples from the Frio reservoir. Stratigraphic well Encanto 01 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 Frio 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 Miocene Dissipation Zone. This first permeable formation is the base of the USDW as characterized by stratigraphic well Encanto 01 and mapped laterally though the storage complex.

In May 2024, the project drilled Bluebonnet USDW 1, targeting the shallow aquifers from the **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 Bluebonnet USDW 1 construction is provided in Appendix B in the AoR attachment. Bluebonnet USDW 1 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 five additional above-confining-zone/USDW monitoring wells (Bluebonnet USDW 2, Bluebonnet USWD 3, Bluebonnet USDW 4, Bluebonnet USWD 5, and Bluebonnet USDW 6). 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 two water disposal wells (Bluebonnet DSW M1 and Bluebonnet DSW M2), targeting the sands of the Miocene formation above the Lower Miocene Confining Zone. These wells will be used to dispose the water extracted from the Frio 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 in the Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3 injector wells in accordance with the testing required under 40 CFR §146.87(a), (b), (c), (d), and (e).

The CO<sub>2</sub> injector 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 stratigraphic well Encanto 01, as well as the data acquisition planned in the additional monitoring wells, water producer wells, and water disposal wells.

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 -3 list the logs, tests, and surveys proposed for the Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3 well 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))].**

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

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

The long string sections of Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3 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, and Bluebonnet CCS 3. 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 Miocene formation in stratigraphic well Encanto 01, as well as for the Frio formation. The water samples were deemed contaminated for the Frio reservoir. In 2024 the project reentered Encanto 01 and collected four fluid samples from the Frio formation.

In 2024, the project also drilled water well Bluebonnet USWD 1 to acquire water samples in the first and second permeable zone below the shallowest seal, defined as the base of the USDW. In Bluebonnet USDW 1, 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 Encanto 01 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)).**

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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 top of the perforations.

The project team plans to perform the following analysis in the sidewall cores collected from Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3, 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.**

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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, among 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.**

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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)). 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, and Bluebonnet CCS 3 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 Encanto 01 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, and Bluebonnet CCS 3 wells, the project team will conduct the tests described in Table POT-7 to verify

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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.**

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### **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.**

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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 stratigraphic well Encanto 01 will be recompleted as an in-zone monitoring well. In addition to the data acquired during the stratigraphic campaign in 2022 and during the reentry 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.**

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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 Frio 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.**

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

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 Wells**

The project plans to drill two new Class I wells in order to dispose the water production from the Frio Injection Zone, as well as the fluids generated or used during the construction and operation of the Hub. Bluebonnet DSW M1 and Bluebonnet DSW M2 will be new wells, targeting the upper Miocene Sands located above the Lower Miocene Confining Zone. Table POT-11 shows the proposed logging, survey, and mud log sampling for these wells.

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

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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

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Bluebonnet USDW 6 will be used to monitor changes in pressure and the water composition of the 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.**



Note: Details, tools, and procedures for the logging, sampling and tests are described in the QASP attachment to this permit.