POST-INJECTION SITE CARE AND SITE CLOSURE PLAN
40 CFR 146.93(a)

Bluebonnet Sequestration Hub

1.0 Facility Information 2
2.0 Pre- and Post-Injection Pressure Differential [40 CFR 146.93(a)(2)(i)] 2
2.1 Claimed as PBI [redacted] Pre- and Post-Injection Pressure Differential. 2
3.0 Predicted Position of the CO_2 Plume and Pressure Front at Site Closure [40 CFR 146.93(a)(2)(ii)] 15
3.1 Predicted Position of the CO_2 Plume and Pressure Front at Site Closure in Claimed as PBI [redacted] Injection Zones. 15
4.0 Post-Injection Monitoring Plan [40 CFR 146.93(a)(2)(iii)] 27
5.0 Schedule for Submitting Post-Injection Monitoring Results [40 CFR 146.93(a)(2)(iv)] 30
6.0 Non-Endangerment Demonstration Criteria 30
6.1 Introduction and Overview 31
6.2 Summary of Existing Monitoring Data 31
6.3 Summary of Computational Modeling History 31
6.4 Evaluation of Reservoir Pressure 31
6.5 Evaluation of CO_2 Plume 32
6.6 Evaluation of Emergencies or Other Events 32
7.0 Site Closure Plan 32
7.1 Plugging Monitoring Wells 33
7.2 Planned Remedial and Site Restoration Activities 33
7.3 Site Closure Report [40 CFR 146.93(f)] 34

1.0 Facility Information

Facility name: Bluebonnet CO_2 Sequestration Hub
Bluebonnet CCS 1, Bluebonnet CCS 2, Bluebonnet CCS 3, Bluebonnet CCS 5, Bluebonnet CCS 6 and Bluebonnet CCS 7 Wells.

Facility contacts: Claimed as PBI

Well location: Claimed as PBI

Claimed as PBI

Pursuant to 40 CFR §146.93 this Post-Injection Site Care and Site Closure (PISC) Plan describes the activities that the Bluebonnet Sequestration Hub, LLC will take after injection ceases in the site until closure. The Bluebonnet Sequestration Hub, LLC will monitor groundwater quality and track the position of the CO_2 plume and pressure front for 50 years post injection. The Bluebonnet Sequestration Hub, LLC, may not cease post-injection monitoring until a demonstration of non-endangerment of USDWs has been approved by the Underground Injection Control (UIC) Program Director. Following approval for site closure, the Bluebonnet Sequestration Hub, LLC, will plug all monitoring wells still active, restore the site in accordance with applicable law and good industry practice, and submit a site closure report and associated documentation.

2.0 Pre- and Post-Injection Pressure Differential [40 CFR 146.93(a)(2)(i)]

2.1 Claimed as PBI *Pre- and Post-Injection Pressure Differential.*

Based on the modeling of the pressure front as part of the AoR delineation, the magnitude and area of elevated pressure rapidly decreases over time after the end of injection reaching values close to original reservoir pressure in the first five years of the post-injection period.

The highest pressures are observed in the immediate vicinity of each CO_2 injector well. Table PISC-1 demonstrates the pressure differential at reference depth for Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3.

Table PISC-2 demonstrates the pressure differential at reference depth for Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7.

Table PISC-3 demonstrates the pressure differential at reference depth for each in zone monitoring well.

Figure PISC-1 and Figure PISC-2 show the bottomhole pressure versus time at reference depth for the CO_2 injector wells, Bluebonnet CCS 1, Bluebonnet CCS 2 , Bluebonnet CCS 3, Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7 and the in zone monitoring wells, Bluebonnet IZM FM1, Bluebonnet IZM FM2, Claimed as PBI and Bluebonnet IZM M1 well in the Area of Review (AoR).

Table PISC-1: Pressure differential to pre-injection conditions at the CO_2 injector wells Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3.

Table PISC-2: Pressure differential to pre-injection conditions at the CO_2 injector wells Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7

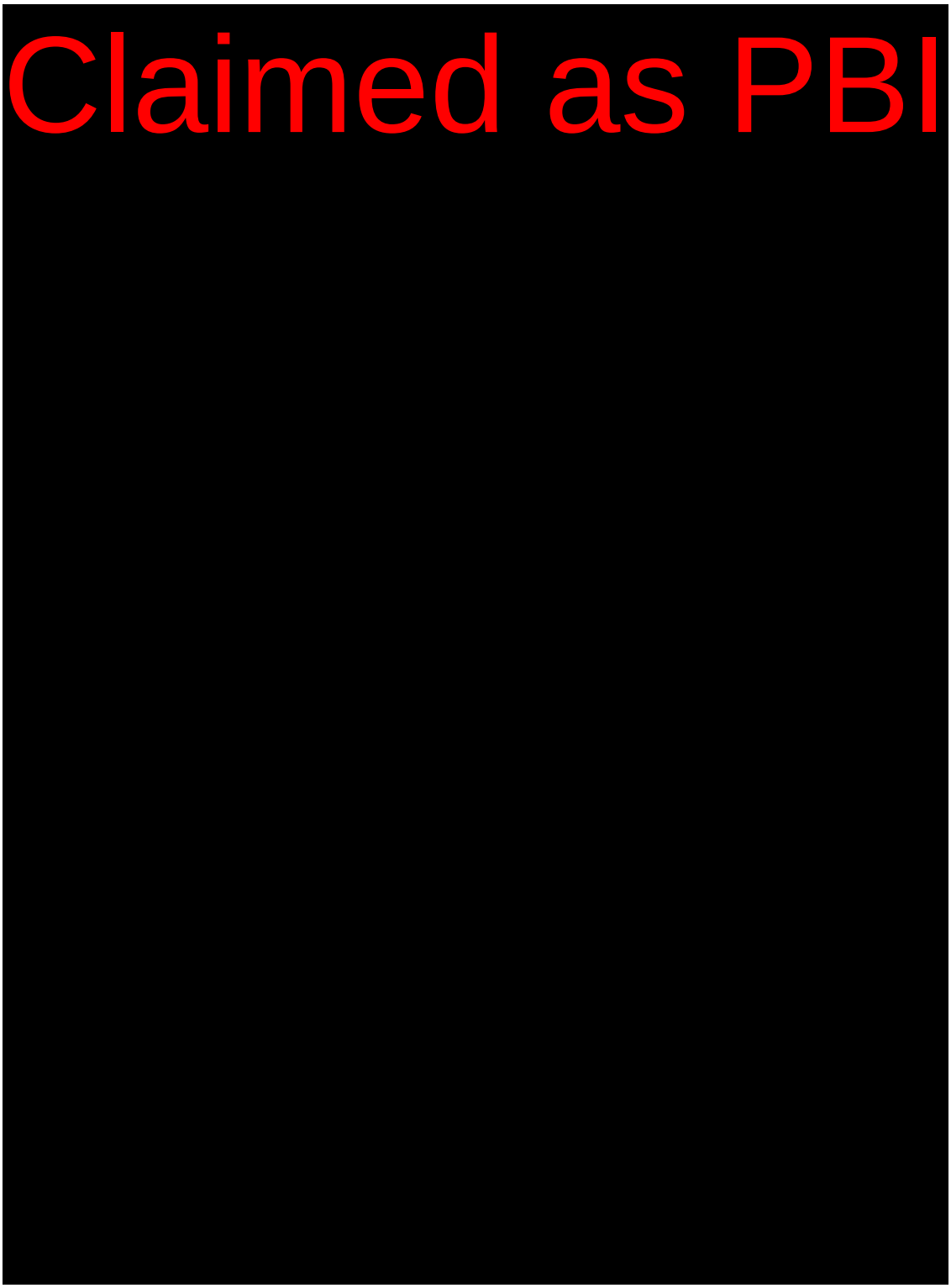

Table PISC-3: Pressure differential to pre-injection conditions at the in zone monitoring well locations Bluebonnet IZM FM1, Bluebonnet IZM FM2, Claimed as PBI and Bluebonnet IZM M1.

Figure PISC-1: Simulated pressure vs. time at reference depth in the Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3 injection wells and at the top of the [redacted] formation in the in zone monitoring wells Bluebonnet IZM FM1, Bluebonnet IZM FM2 and Claimed as PBI wells.

Figure PISC-2: Simulated pressure vs. time at reference depth in the Bluebonnet CCS 5, Bluebonnet CCS 6, and Bluebonnet CCS 7 injection wells and at the top of the Claimed as PBI formation in the in zone monitoring well Bluebonnet IZM M1.

Figure PISC-3, Figure PISC-4, and Figure PISC-5 show the simulated pressure differentials from the baseline at the reference point of the Claimed as PBI Injection Zone at the highest pressure increase point respectively.

Figure PISC-6 shows the pressure differential 50 years post injection in the Claimed as PBI Injection Zone. Figure PISC-7 shows the pressure differential 50 years post injection in the Claimed as Injection Zone. Figure PISC-8 shows the pressure differential 50 years post injection in the Claimed as PBI Injection Zone. The pressure will have dissipated below the critical pressure in all areas of the site in the first 5 years of the post-injection period.

Figure PISC-3: Averaged aqueous pressure differentials from the baseline condition in the Claimed as PBI Injection Zone (highest pressure increase point).

Figure PISC-4: Averaged aqueous pressure differentials from the baseline condition in the [redacted] Injection Zone (highest pressure increase point).

Figure PISC-5: Averaged aqueous pressure differentials from the baseline condition in the Claimed as PBI Injection Zone (higher pressure increase point).

Figure PISC-6: Averaged aqueous pressure differentials from the baseline condition after 50 years post injection in the Claimed as PBI Injection Zone

Figure PISC-7: Averaged aqueous pressure differentials from the baseline condition after 50 years post injection in the [redacted] Injection Zone.

Figure PISC-8: Averaged aqueous pressure differentials from the baseline condition after 50 years post injection in the Claimed as PBI Injection Zone.

3.0 Predicted Position of the CO_2 Plume and Pressure Front at Site Closure [40 CFR 146.93(a)(2)(ii)]

3.1 Predicted Position of the CO_2 Plume and Pressure Front at Site Closure in Claimed as PBI Injection Zones.

The reservoir simulation for Claimed as PBI reservoirs indicates that, after injection ceases, the CO_2 plume remains within the Claimed as PBI formations but continues to expand northward in the updip direction of the reservoir with time. The pressure front dissipated in the first years post injection as explain in the previous section. To be conservative, the sub AoR for Claimed as PBI was defined by the combination of the pressure front at the end of injection and the plume shape and size after 100 years post-injection show in Figure PISC-9 (Claimed as PBI, Figure PISC-10 (Frio Injection Zone), and Figure PISC-11 (Claimed as PBI

The colored area in Figure PISC-10 shows the CO_2 plume extent in year 70 (i.e., 50 years post-injection) and year 120 (100 years post injection) in the Claimed as Injection Zone. Figure PISC-11 shows CO_2 plume extent in year 70 (i.e., 50 years post-injection) and year 120 (100 years post injection) in the Claimed as PBI Injection Zones.

Figure PISC-12 demonstrates the simulated plume in different years for the Claimed as PBI Injection Zone. Figure PISC-13 demonstrates the simulated plume in different years for the Claimed as Injection Zone. Figure PISC-14 demonstrates the simulated plume at different years for the Claimed as PBI Injection Zone.

The differences between the 50-year post-injection vertical extent and the 100-year post-injection vertical extent are almost negligible. The calculated plume size difference between year 70 and year 120 year is about 0.07 mile^2 in the Claimed as and 0.02 mile^2 in the Claimed as PBI. This continued migration of the plume is due to buoyancy of the mobile supercritical phase CO_2, which moves along the strata in the updip direction.

Figure PISC-15, Figure PISC-16, Figure PISC-17, Figure PISC-18, Figure PISC-19, and Figure PISC-20 show a north-south cross section through wells Bluebonnet CCS 1, Bluebonnet CCS 2, Bluebonnet CCS 3, Bluebonnet CCS 5, Bluebonnet CCS 6 and Bluebonnet CCS 7.

In addition, as previously shown in Figure PISC-6, Figure PISC-7, and Figure PISC-8, all pressures have been reduced to levels below the level of endangerment to USDWs in the first 5 years post injection for each well. Therefore, 50 years post injection is considered as the site closure date.

The maps are based on the final AoR delineation modeling results submitted, pursuant to 40 CFR §146.84.

Figure PISC-9: Areal extent of the CO_2 plume after 100 years post injection in the Claimed as PBI formation

Figure PISC-10: Areal extent of the CO_2 plume at site closure 50 years post injection. The red outline represents the simulated CO_2 plume after 100 years post injection in the [redacted] formation.

Figure PISC-11: Areal extent of the CO_2 plume at site closure 50 years post injection. The red outline represents the simulated CO_2 plume at 100 years post injection in the Claimed as PBI formation.

Figure PISC-12: Simulated areal extent of the CO_2 plume from injection startup to shut-in, then to 100 years post injection in the Claimed as PBI formation.

Figure PISC-13: Simulated areal extent of the CO_2 plume from injection startup to shut-in, then to 100 years post injection in the [redacted] formation.

Figure PISC-14: Simulated areal extent of the CO_2 plume from injection start-up to shut-in, then to 100 years post injection in the Claimed as PBI formation.

Figure PISC-15: North–south cross-section through well Bluebonnet CCS 1 showing simulated gas saturation at 50 years post injection and at 100 years post injection.

Figure PISC-16: North–south cross-section through well Bluebonnet CCS 2 showing simulated gas saturation at 50 years post injection and at 100 years post injection.

Figure PISC-17: North–south cross-section through well Bluebonnet CCS 3 showing simulated gas saturation at 50 years post injection and at 100 years post injection.

Figure PISC-18: North–south cross-section through well Bluebonnet CCS 5 showing simulated gas saturation at 50 years post injection and at 100 years post injection.

Figure PISC-19: North–south cross-section through well Bluebonnet CCS 6 showing simulated gas saturation at 50 years post injection and at 100 years post injection.

Figure PISC-20: North–south cross-section through well Bluebonnet CCS 7 showing simulated gas saturation at 50 years post injection and at 100 years post injection.

4.0 Post-Injection Monitoring Plan [40 CFR 146.93(a)(2)(iii)]

Performing groundwater quality monitoring and plume and pressure front tracking as described in the following sections during the post-injection phase will meet the requirements of 40 CFR §146.93(a)(2)(iii). The results of all post-injection phase testing and monitoring will be submitted annually, within 60 days of the anniversary of the date that injection ceases, as described under Section 4.3 Schedule for Submitting Post-Injection Monitoring Results.

A quality assurance and surveillance plan (QASP) for all testing and monitoring activities during the injection and post-injection phases is provided as a separate document of this permit.

After the injection ceases, the project will plug and abandon all the CO_2 injector wells according to the plugging procedure proposed in the Injection Well Plugging Plan of this permit.

The project will abandon the water production wells, Bluebonnet PRDW F1 and Bluebonnet PRDW F2 during the operative life of the project at year 15 of injection, or when the last recompletion in Frio formation is performed in the Bluebonnet CCS 3 well.

After injection ceases, the Project will keep operative Bluebonnet IZM FM1, Bluebonnet IZM FM2, Claimed as PBI, Bluebonnet IZM M1, Bluebonnet DSW M2 and the seven USDW monitoring wells during the post-injection period.

After injection cease the Project will repeat a 2D surface seismic survey to map the extension of the CO_2 plume. This survey will be repeated at year 5 and 10 post injection and before the site closure as a proof of non-endangerment to USDW.

During the post-injection period, the model predicts that, 10 years after the injection ceases, the pressure variation every 5 years will be less than 5%, as shown in Table PISC-4, while the CO_2 plume will continue to slightly migrate but in stable rate.

For the first 10 years of the post-injection period, the monitoring program will focus on demonstrating stabilization of the pressure and CO_2 plume migration and demonstration of non-endangerment to USDW.

After 10 years of the post-injection period, the Project will plug Bluebonnet IZM FM1, Bluebonnet IZM FM2, Bluebonnet IZM M1, Claimed as PBI and Bluebonnet DSW M2 and will continue monitoring USWD groundwater with Bluebonnet USDW 01, Bluebonnet USDW 02, Bluebonnet USDW 03. Bluebonnet USDW 04, Bluebonnet USDW 05, Bluebonnet USDW 06 and Bluebonnet USDW 07, in combination visual inspections, and soil gas monitoring, until the closure of the site.

Table PISC-5 describes the methods and techniques to be used while monitoring the site during the post-injection period. Locations and frequency for each method or technique are also presented in Table PISC-5.

Table PISC-5: Monitoring Plan for post-injection site care.

Claimed as PBI

Claimed as PBI

Specifics of the methods, techniques, and analytics to be tested as part of the proposed monitoring plan are described in detailed in the Testing and Monitoring Plan and in the QASP document.

5.0 Schedule for Submitting Post-Injection Monitoring Results [40 CFR 146.93(a)(2)(iv)]

During the PISC period, the monitoring reports will be prepared annually and submitted to the EPA Region 6 UIC Branch Office. These reports will summarize methods and results of groundwater quality monitoring, CO_2 storage zone pressure tracking, and indirect geophysical monitoring for CO_2 plume tracking.

The PISC and Site Closure Plan will be reviewed every 5 years during the PISC period. Results of the plan review will be included in the PISC monitoring reports. The operational and monitoring results will be reviewed for adequacy in relation to the objectives of the PISC. The monitoring locations, methods, and schedule will be analyzed in relation to the size of the CO_2 storage zone, pressure front, and protection of USDWs. In case of changes to the PISC plan, a modified plan will be submitted to the EPA Region 6 UIC Branch Office at least 30 days before the planned initiation of the changes.

6.0 Non-Endangerment Demonstration Criteria

Prior to approval of the end of the post-injection phase, the Bluebonnet Sequestration Hub, LLC, will submit a demonstration of non-endangerment of USDWs to the UIC Program Director, per 40 CFR 146.93(b)(1), (2) and (3).

The Bluebonnet Sequestration Hub LLC, will issue a report to the UIC Program Director that will demonstrate that the project poses no danger to the USDWs, based on the evaluation of the site monitoring data used in conjunction with the project's computational model. The report will detail how the non-endangerment demonstration evaluation uses site-specific conditions to confirm and demonstrate non-endangerment. The report will include all relevant monitoring data and interpretations upon which the non-endangerment demonstration is based, model documentation and all supporting data, and any other information necessary for the UIC Program Director to review the analysis. The report will include the following sections.

6.1 Introduction and Overview

A summary of relevant background information will be provided, including the operational history of the injection project, the date of the non-endangerment demonstration relative to the post-injection period outlined in this PISC and Site Closure Plan, and a general overview of how monitoring and modeling results will be used together to support a demonstration of USDW non-endangerment.

6.2 Summary of Existing Monitoring Data

A summary of all previous monitoring data collected at the site, pursuant to the Testing and Monitoring Plan document and this PISC and Site Closure Plan, including data collected during the injection and post-injection phases of the project, will be submitted to help demonstrate non-endangerment. Data submittals will be in a format acceptable to the UIC Program Director [40 CFR 146.91(e)] and will include a narrative explanation of monitoring activities, including the dates of all monitoring events, changes to the monitoring program over time, and an explanation of all monitoring infrastructure that has existed at the site. Data will be compared with baseline data collected during site characterization [40 CFR 146.82(a)(6) and 146.87(d)(3)].

6.3 Summary of Computational Modeling History

The computational modeling results used for the AoR delineation will be compared to monitoring data collected during the operational and PISC periods. Monitoring data will also be compared with data collected during site characterization, as per 40 CFR 146.82(a)(6) and 146.87(d)(3). The data will be used to update the computational model and monitor the site, and will include both direct (e.g., measurements of pressure, temperature, groundwater quality) and indirect (e.g., 2D seismic, pulse neutron logging) geophysical methods.

Data generated during the PISC period will be used to show that the computational model accurately represents the storage site and can be used as a proxy to determine the plume's properties and size. The Bluebonnet Sequestration Hub, LLC, will demonstrate this degree of accuracy by comparing the monitoring data obtained during the operational and PISC period with the model's predicted properties (i.e., plume location, rate of movement, and pressure decay). Statistical methods will be employed to correlate the data and confirm the model's ability to represent the storage site accurately. The validation of the computational model with the large quantity of measured data will be a significant element to support the non-endangerment demonstration.

6.4 Evaluation of Reservoir Pressure

The Bluebonnet Sequestration Hub, LLC, will demonstrate non-endangerment to USDWs by showing that, during the PISC period, the pressure within the Claimed as PBI reservoir will have rapidly decreased to levels near its pre-injection static reservoir pressure. Because increased pressure is the primary driving force for fluid movement, which might endanger a USDW, the decay in the pressure differential provides strong justification that the injectant will no longer pose a risk to any USDWs.

The Bluebonnet Sequestration Hub, LLC, will monitor the downhole reservoir pressure at various locations and intervals using a combination of surface and downhole pressure gauges. The measured pressure at a specific depth interval will be compared with the pressure predicted by the computational model, which was previously shown in Figure PISC-1, Figure PISC-2, Figure PISC-3, and Figure PISC-4. Agreement between the actual and predicted values will validate the accuracy of the model and further demonstrate non-endangerment.

6.5 Evaluation of CO_2 Plume

The Bluebonnet Sequestration Hub, LLC, will use a combination of monitoring data, logs, geophysical surveys, and seismic methods to locate and track the movement of the CO_2 plume. The data produced by these activities will be compared with the modeled predictions (previously shown in Figure PISC-6 and Figure PISC-7) using statistical methods to validate the model's ability to represent the storage site accurately. The PISC monitoring data will show the stabilization of the separate-phase CO_2 plume as the reservoir pressure returns to its near pre-injection state.

6.6 Evaluation of Emergencies or Other Events

In addition to the CO_2 plume, mobilized fluids may also pose an ongoing risk to USDWs, as the reservoir fluids include brines high in total dissolved solids (TDS) and other drinking water contaminants. The geochemical data collected from USDW/above-confining-zone monitoring wells will be used to demonstrate that no mobilized fluids have moved above the confining formation, and therefore would not pose a risk to USDWs after the PISC period.

To demonstrate non-endangerment, the Bluebonnet Sequestration Hub, LLC, will compare the operational and PISC period samples of the lowermost USDW/above confining zone with the pre-injection characterization of the aquifers. This evaluation will demonstrate that no mobilized formation fluids have moved through the confining formation. In addition, this validation of confining zone integrity will demonstrate that the injectant and/or mobilized fluids will not represent an endangerment to any USDWs.

Other than the project and monitoring wells, other potential conduits for fluid movement or leakage pathways within the AoR will be adequately plugged and abandoned. Based on this information, the potential for fluid movement through artificial penetrations of the confining formation does not present a risk of endangerment to any USDWs.

7.0 Site Closure Plan

Pursuant 40 CFR §146.93(d), the Bluebonnet Sequestration Hub, LLC, will notify the UIC Program Director in writing at least 120 days before site closure. At this time, if any changes have been made to the original Post-Injection Site Care and Site Closure Plan, Bluebonnet Hub will provide the revised plan to the Program Director for approval.

The Bluebonnet Sequestration Hub, LLC, will conduct site closure activities to meet the requirements of 40 CFR 146.93(e) as described below. Once the UIC Program Director has approved closure of the site, the Bluebonnet Sequestration Hub, LLC, will plug the remaining

monitoring wells in a manner that will not allow movement of injection or formation fluids that would endanger a USDW.

Bluebonnet Sequestration Hub, LLC, will submit a site closure report to UIC Program Director within 90 days of site closure [40 CFR 146.93(f)].

In addition to the EPA, the Texas Railroad Commission, Claimed as PBI and any other agencies governing the project at the time of site closure will be notified prior to the scheduled site closure. Currently, there are no federally recognized Native American Tribes located within the AoR; however, if a federally recognized Native American Tribe becomes known within the AoR at the time of site closure, that tribe (or tribes) will be notified of the site closure.

7.1 Plugging Monitoring Wells

Upon conclusion of the 50-year post-injection site care period, any remaining monitoring well will be plugged and capped below grade in accordance with the approved plugging and abandonment plans, which is included as Appendix A in the Injection Well Plugging Plan.

After completion of the plugging activities, a plugging report will be submitted to the UIC Program Director describing the methods used and tests performed on the well during plugging. This report will be submitted to the UIC Program Director within 60 days of completing the plugging activities.

7.2 Planned Remedial and Site Restoration Activities

At the end of the PISC phase, Bluebonnet Sequestration Hub, LLC, will ensure the site is reclaimed and returned to predevelopment condition.

Surface equipment decommissioning will occur in two phases: the first phase will occur after the active injection phase and the second phase will occur at the end of the PISC phase.

At the end of the active injection period, plume monitoring will continue, but there will be no further need for the pumping and control equipment. The process control building at the surface pumping facility will remain. This building will serve as a hub for control and monitoring of the well network, so it will remain operational. The pumping system and aboveground pipe, valves, and fittings at the surface pumping facility will be removed.

The injection wells will be plugged per the Injection Well Plugging Plan document of this permit. The process control building at the pumping facility site will act as the collection node for data from the plume-monitoring equipment. This building will contain the equipment required to receive real-time data from the monitoring wells and other monitoring stations and send the data via an internet connection to be analyzed offsite during post-injection monitoring period.

Surface facilities will be removed at the end of the PISC phase. The site will be reclaimed and returned to predevelopment condition except any facilities still in operation to serve other active projects (e.g., electrical supply serving other power users and roadways used or needed by surface landowners). Buried pipelines are expected to be idled and abandoned in place.

The soil will be backfilled around the monitoring and geophysical wells to bring the area around the wells back to the preinstallation grade. Any remaining surface facilities associated with the monitoring wells will be reclaimed and the area will be returned to the predevelopment condition. Gravel well pads will be removed, and the land will be reclaimed for preconstruction uses.

7.3 Site Closure Report [40 CFR 146.93(f)]

A site closure report will be prepared and submitted within 90 days following site closure, documenting the following:

- Plugging of all injection and monitoring wells.
- Location of each well on a plat survey submitted to the local zoning authority.
- Notifications to State, local and Tribal authorities.
- Records regarding the nature, composition, and volume of CO_2 injected.
- Pre-injection, injection, and post-injection monitoring records.
- Certifications that all injection and storage activities have been completed.

Bluebonnet Sequestration Hub, LLC, will record a notation to the property's deed on which the CO_2 injection wells were located that will indicate the following:

- That the property was used for CO_2 sequestration.
- The name of the State agency, local authority and/or Tribe to which a plat of survey with injection well location was submitted.
- The volume of fluid injected.
- The formation into which the fluid was injected.
- The period over which the injection occurred.

The site closure report will be submitted to the permitting agency and maintained by Bluebonnet Sequestration Hub, LLC, for a period of 10 years following site closure. Additionally, the owner or operator will maintain the records collected during the post-injection period for a period of 10 years, after which these records will be delivered to the UIC Program Director.