INJECTION WELL PLUGGING PLAN
40 CFR 146.92(b)

Sugarberry CCS Hub

Facility Information

Facility Name: Sugarberry CCS Hub

Facility Contact: Sugarberry CCS, LLC
14302 FNB Parkway
Omaha, NE 68154

RRC Organization Report Number: 102245

Well Locations: Projection WGS84

Well	County/State	Latitude	Longitude
SB-01	Hopkins, TX	33.202707	-95.338539
SB-02	Hopkins, TX	33.189225	-95.375952
SB-03	Hopkins, TX	33.196028	-95.405035
SB-04	Hopkins, TX	33.219565	-95.434859
SB-05	Hopkins, TX	33.207361	-95.385666

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List of Acronyms/Abbreviations

BBL(S)	Barrel(s)
BOP	Blowout Preventer
CBL	Cement Bond Log
CCS	Carbon Capture and Sequestration
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
EPA	Environmental Protection Agency
FT	Foot/Feet
FT^3	Cubic Feet
ID	Interior Diameter
LB/Gal	Pound per Gallon
MD	Measured Depth
MFC	Multi-finger Caliper
MIT	Mechanical Integrity Test
MTD	Magnetic Thickness Detector
NU	Nipple Up
OD	Outside Diameter
POOH	Pull out open hole
PNC	Pulsed Neutron Capture
PSI	Pounds per Square Inch
RRC	Texas Railroad Commission
RU	Rig Up
SB	Sugarberry CCS Hub
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TD	Total Depth
TIH	Trip in Hole
UIC	Underground Injection Control
USDW	Underground Source of Drinking Water
USIT	Ultrasonic Imaging Tool

A. Introduction

Sugarberry CCS, LLC will conduct injection well plugging and abandonment operations according to the procedures outlined below. Plugging and abandonment procedures will be performed in accordance with the EPA's requirements under 40 CFR 146.92 and 40 CFR 146.93(e). Additionally, this plan acknowledges the Texas requirements for plugging and abandonment of injection and monitoring wells under 16 TAC 3.14 and 16 TAC 5.203(k). This plan will help ensure that abandoned wells maintain integrity and will not pose a threat to USDWs and that all formations bearing usable quality water, oil, gas, or geothermal resources are protected (16 TAC 3.14(d)). This plan focuses on the procedures for plugging and abandonment of injection wells only. All in-zone and above-zone monitoring wells will follow the same procedures.

Plugging activities at an injection well will begin following the cessation of CO_2 injection in that well. However, Sugarberry CCS, LLC may choose to delay plugging of selected injection wells and use them to monitor in-zone reservoir conditions post-injection. To note, Texas considers a well to be inactive if it has had no disposal or other permitted activity for at least 12 months [16 TAC 3.15(a) and TAC 5.203(k)] Sugarberry CCS, LLC will notify the UIC Program Director in writing at least 60 days prior to any plugging operations [40 CFR 146.92(c); 16 TAC 5.203(k)(3)].

B. Bottom-Hole Reservoir Pressure Determination

Bottom-hole pressure measurements will be recorded throughout the injection and post-injection phases using Baker Hughes Dual SureSENS or similar downhole pressure gauges. Pressure gauges will be placed in the injection tubing or in the deep casing string within the injection zone. The pressure devices will allow for continuous, real-time, surface readout of the downhole pressure data. The gauges allow for operational pressures that range from 15 psi to 11,000 psi with an accuracy of +/- 0.02%. After cessation of injection operations, the downhole pressure gauges will continue to record data and will be used to obtain a final bottomhole pressure within the injection zone prior to commencing plugging operations. If the downhole gauges fail to provide the needed data, the wellbore will be flushed with a brine solution for pressure control and cleansing, and wireline gauges will be deployed to record the bottomhole static conditions.

C. Mechanical Integrity Tests

Prior to plugging operations, Sugarberry CCS, LLC will conduct integrity testing to verify the external and internal mechanical integrity (MIT) of the injection well(s) as required by 40 CFR 146.92 (b)(2) and 16 TAC 5.203(k). The injection tubing and packers will be removed prior to cementing operations, but they will remain in place and utilized for internal or external MIT testing as needed. Long string casing will remain in the well and be examined for integrity. Prior to performing any MIT's, the well(s) will be flushed with brine to pressure-stabilize the injection

zone(s). Casing inspection tools will be run on wireline and/or coil tubing as needed. A description of the testing methods is summarized in **Table 8-1** and discussed in detail thereafter.

Table 8-1. Mechanical Integrity Test Options

Test Description	Location
Cement Bond Log(s) CBL (External MIT)	Run CBL & Ultrasonic Logs: Compare to initial log runs. Discrepancies, if any, can be noted between the logs as an indication of cement quality improvement (due to carbon hydroxide hardening of cement) or degradation (due to casing movement or other cement sheath disturbance).
Temperature Log (External MIT)	Run temperature log post-injection to register any fluid movement external to the long string casing. This option is recommended if the fiber-optic cable is no longer in service. Noise or pulsed neutron capture (PNC) logs may be used if anomalies are identified in the temperature logs.
Pressure Test (Internal MIT)	Perform a pressure test on the 9 ⅝" casing from the upper packer to surface before removing the tubing and packers. Test pressure to be greater than annulus pressure maintained during injection activities.
Casing Caliper Log (Internal MIT)	Casing caliper log (optional if long string casing successfully passes the pressure test (above). Caliper log will provide information about long string casing internal wall thickness loss due to corrosion or erosion. Any corrosion or pitting in the casing will be addressed to ensure proper isolation from the USDWs
Noise Log (External MIT)	Acoustic log run to measure acoustic impedances released by flowing fluid. Run in the injection tubing or long string casing from the cap rock to surface. This option will identify potential leak points in the event the well fails the pressure test.
Pulsed Neutron Capture (PNC) Log (External MIT)	Long String Casing/Injection Tubing: Specified intervals near USDW, confining zone, injection zone

C.1. Cement Bond Logs

After tubing and packer have been removed, a cement bond log and/or other type of cement interpretation log will be run down the long string casing, from surface to total depth (TD), to assess cement quality and bond. These logs will be compared to the initial log runs performed during the construction of the well or changes in well completion. Discrepancies or changes found in the logs will be used to determine integrity mitigation practices, if needed.

C.2. Temperature Log Evaluation

Temperature data will be continuously collected over the entire depth of the injection well via externally mounted fiber optic cable (refer to **Section 4, Injection Well Construction Plan**). Data from the log will be evaluated for anomalies in the temperature curve, which would be indicative of fluid migration outside of the injection zone. This data will also be compared to the information gathered from the baseline logs performed prior to injection, and temperature logs run during injection of CO_2 into the well. Deviations noted between the temperature logs performed before and after the injection of CO_2, that raise issues related to fluid migration or well integrity, will be addressed as needed. Noise logs or pulsed neutron capture logs are an option to further evaluate any anomalies identified in the temperature log data. If the fiber-optic cable is no longer in operation at the time of plugging and abandonment, a wireline temperature log will be run downhole to assess temperature anomalies and possible fluid movement behind casing.

C.3. Pressure Test

Prior to removing the tubing and packer(s), the long string casing will be pressure tested from the upper packer to surface. The test pressure will be increased to a level greater than the annulus pressure that was maintained during injection operations. If adequate pressure is held for 15 minutes to an hour after the pressure stabilizes the integrity of the long string casing can be verified for the isolated section.

C.4. Caliper Casing Log

A multi-arm casing caliper and magnetic thickness detector log can be run in the long string casing to assess and identify pipe deformation and/or internal wall thickness loss or damage due to corrosion, erosion, or shifting of pipe. This log would be run from surface to TD in the event the well does not pass a pressure test or shows other signs of casing failure.

C.5. Noise Log Evaluation

An acoustic/noise log can be run over the entire depth of the injection well to determine fluid flow and/or fluid migration behind casing. This test can be performed during the waning stage of CO_2 injection or after CO_2 injection has ceased. Data from the logging run will be used to determine areas of micro-annuli formation and potential cement degradation. Any issues determined from the acoustic/noise log related to the integrity of the well casing or cement, or the migration of fluid above the confining zone, will be addressed as needed.

C.6. Pulsed Neutron Capture Log Evaluation

A pulsed neutron capture (PNC) log can be run over the entire depth of the injection well(s) to determine the presence of CO_2 molecules behind casing. This log can be run prior to or after the cessation of injection activities. Although the log will be run over the entire depth, stationary readings will be collected above the injection intervals, above and below the upper confining unit, and at the top and base of the

lowermost USDW. Data from the logging run will be used to determine the extent of CO_2 migration, if any, and if the integrity of the well casing and/or cement has been compromised. Any issues identified from the log data will be addressed as needed.

D. Information on Plugs

Sugarberry CCS, LLC will use the materials and methods discussed below and found in Table 8-2 to plug the injection well(s). The volume and depth of the plugs will depend on 1) the final geology and downhole conditions of the well, as assessed during construction; and 2) the mechanical conditions assessed during the post-injection evaluation procedures and integrity testing. The cement(s) formulated for plugging will be compatible with the carbon dioxide stream and downhole conditions. Along with the well-plugging plan and certification documents, Sugarberry CCS, LLC will submit (to the required agency) the cement formulation and wet density reports and will retain duplicate samples of the cement used for each plug.

All cement plugs will be pumped and emplaced inside the long string casing. Cement plugs 1-4in all five injection wells will be pumped through cement retainers and across the injection zone(s), confining zone, and all depths between these zones, using Schlumberger's EverCRETE (or similar CO_2-resistant cement). The cement formulation and required certification documents will be submitted to an authorized regulatory agency with the final well plugging plan. A cement retainer allows cement to be emplaced under pressure, forcing cement through the perforations and into the surrounding formation and prevents fluid migration between different zones. The pressure used to emplace the cement will be determined from the bottom-hole pressure data acquired prior to plugging operations. A maximum pressure threshold of 90% of the determined reservoir fracture pressure for the Woodbine and Paluxy Formations will be utilized to constrain pressure increases during the cement injection process. If the injection pressure reaches the 90% fracture pressure threshold, and the total amount of cement has not been pumped into the injection zone, cement pumping will cease. Cementing tubing will be removed from the cement retainer to allow the pressure to return to static conditions. After allowing the pressure to decline, the tubing will be re-strung through the cement retainer, and cement pumping will be attempted again. A rapid increase in pressure on the tubing would indicate that the Woodbine or Paluxy perforations have been sealed with cement, and no additional cement will be added to the zone or plug. Plugs 5 – 7 will be emplaced using the balance method and will utilize Class A cement. The balance method of plug placement and cementing utilizes alternating plugs of high density (balanced) fluid and cement. This method ensures stable and even cement placement throughout the plug interval and prevents the workover tubing from sticking in the cement column.

Each plug will be allowed to cure for 24 - 48 hours, depending on the corresponding depth, pressure, and temperature. Cement plugs will be tagged and/or pressure tested to ensure competency. Load weights and/or test pressures will be determined in the field at the time of plugging. Cement volumes were calculated by volumetric calculations. (Example: Assuming 9.625-inch 47 lb/ft casing with an I.D. of 8.681-in; [500 feet x 0.411 ft^3ft^{-1} x 1.1 excess]/ 1.11ft^3/sack = 203 sacks). A cement sample from each cement plug will be kept for analysis by the cement vendor.

Table 8-2. Cement Plug Details

Plug Information	Plug #1	Plug #2	Plug #3	Plug #4	Plug #5	Plug #6	Plug #7
Diameter of casing in which plug will be placed (Inches)	8.681	8.681	8.681	8.681	8.681	8.681	8.681
Depth to bottom of tubing or drill pipe (MD) (feet)	5,450	5,050	4,225	3,530	2,400	1,900	600
Sacks of cement to be used	183	336	283	205	204	204	244
Slurry volume to be pumped (bbl)	22	40	34	24	24	24	29
Slurry weight (lb./gal)	15.8	15.8	15.8	15.8	15.6	15.6	15.6
Calculated top of plug (MD) (feet)	5,050	4,225	3,530	3,025	1,900	1,400	0
Bottom of plug (MD) (feet)	5,500	5,050	4,225	3,530	2,400	1,900	600
Plug Thickness (feet)	450	825	695	505	500	500	600
Type of cement or other material	Ever CRETE	Ever CRETE	Ever CRETE	Ever CRETE	Class A	Class A	Class A
Method of emplacement (e.g., balance method, retainer method, or two-plug method)	Retainer	Retainer	Retainer	Retainer	Balance	Balance	Balance

Plug #1 will be pumped through the first retainer, which will be set at 5,050 ft MD. This retainer depth is within the base of the Fredericksburg formation and approximately 50 ft above the top of the Paluxy Formation, the lower injection zone. Plug #1 will have an estimated thickness of 450 ft and will cover the extent of the lower injection zone.

Plug #2 will be pumped through the second retainer, which will be set at 4,225 ft MD. This retainer is within the Washita Formation and is approximately 50 ft below the base of the Woodbine formation, the upper injection zone. Plug #2 will have an estimated thickness of 825 feet and will cover the extent between the lower and upper injection zones.

Plug #3 will be pumped through the third retainer, which will be set at 3,530 ft MD. This retainer depth is within the base of the Eagle Ford Formation, the upper confining zone, and approximately 50 ft above the top of the Woodbine Formation, the upper injection zone. Plug #3 will have an estimated thickness of 695 feet and will cover the extent of the upper injection zone.

Plug #4 will be pumped through the fourth retainer, which will be set at 3,025 ft MD. This retainer depth is within the base of the Austin Chalk Formation and approximately 50 ft above the Eagle

Ford Formation, which is the upper confining zone. Plug #4 will have an estimated thickness of 505 feet and will cover the extent of the upper confining unit. An additional 50 feet of cement will be emplaced above the fourth retainer.

An approximately 575 ft column of drilling fluid (i.e., mud) will be placed above the fourth cement retainer from 2,975 ft MD to 2,400 ft MD.

Plug #5 will be pumped and emplaced above the drilling fluid column using the balance method, from 2,400 ft MD to 1,900 ft MD. Plug #5 will have an estimated thickness of 500 feet and will cover the base of surface casing.

Plug #6 will be pumped and emplaced above Plug #5 using the balance method, from 1,900 ft MD to 1,400 ft MD. Plug #6 will have an estimated thickness of 500 feet and will cover the depths of the lowermost USDW.

An approximately 800 ft column of drilling fluid will be placed above Plug #6 from 1,400 ft MD to 600 ft MD.

Plug #7 will be pumped and emplaced above the second drilling fluid column using the balance method, from 600 ft MD to surface. Plug #7 will have an estimated thickness of 600 feet and will cover the shallow surface groundwater system.

After the production casing has been filled with cement, all casing sections will be cut off approximately three (3) feet below surface and a steel cap will be welded to the top of the deep casing string. The cap will have the well identification number, the Class VI UIC well permit number, and the date of plug and abandonment inscribed on it. All surface infrastructure, including concrete pads will be removed, and soil will be backfilled around the well to bring the area back to pre-well-installation conditions. This area will then be planted with natural vegetation. **Figure 8-1** provides a schematic of the wellbore and the position of cement retainers, drilling fluid columns, and cement plugs post-plugging and abandonment. The wellbore schematic for SB-01 is representative of the manner in which the remaining wells will be plugged and abandoned.

E. Narrative Description of Plugging Procedures

E.1. Notifications, Permits, and Inspections

The following are notifications and reporting required for plugging a well, which shall be submitted separately for each well:

- **60-Day Notification**: Sugarberry CCS, LLC will notify the UIC Program Director and RRC in writing at least 60 days prior to the plugging of an injection well. Any changes to this plan shall be submitted no later than with the notification. The RRC also requires this notification for the plugging of an observation well that penetrates the base of usable quality water. [40 CFR 146.92(c); 16 TAC 5.203(k)(3)]

- **RRC Form W-3A**: Sugarberry CCS, LLC will submit a notice of intent to plug and abandon an injection well or observation well that penetrates the base of USDW on RRC Form W-3A to the RRC Kilgore District office and Division office in Austin at least five days prior to the beginning of plugging operations. The submission shall include the proposed plugging procedure, including cement formulation, and complete casing record, and work shall not commence until the proposed procedure has been approved by RRC. [16 TAC 3.14(a)(3); 5.203(k)(3)(B)]

- **Well Plugging Report**: Within 30 days of plugging an injection well, Sugarberry CCS, LLC will submit a well plugging report using RRC Form W-3 to the UIC Program Director and RRC Kilgore District. The RRC also requires this report for the plugging of an observation well that penetrates the base of usable quality water. [40 CFR 146.92(d); 16 TAC 5.203(k)(4)]

E.2. Plugging Procedures

All injection and observation wells will be plugged following the schedule outlined in **PISC and Site Closure Plan (Section 9).** All casing in the wells will be cemented to the surface during construction (40 CFR 146.86) and will not be retrievable at abandonment. Before commencing plugging activities, all materials will be confirmed compatible with CO_2 and formulation fluids. Final cement formulation will be without volume extenders and in compliance with 16 TAC 3.14 (d)(4).

Shallow groundwater wells will be plugged in accordance with 16 TAC 76.104.

The methods and materials described in this part are based upon current understanding of the geology at the site and the current well designs. If necessary, the plan will be updated to reflect the latest well designs. Any changes to the plan will be submitted at least 60 days prior to the plugging of the well and approved by the UIC Program Director prior to commencing plugging activities.

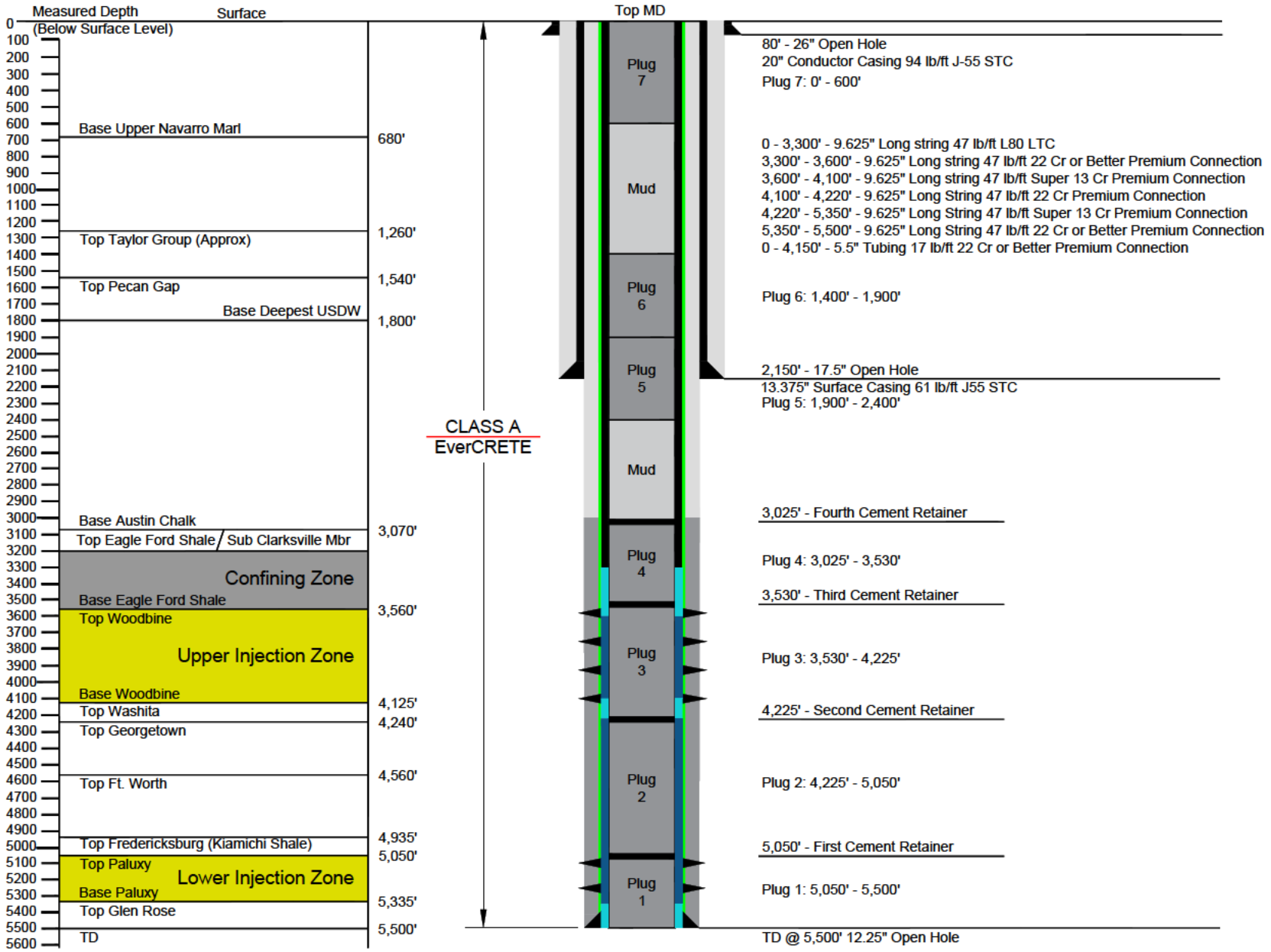
A generalized summary of the plugging and abandonment approach for each CO_2 injection well

and each observation well (except shallow groundwater wells) is as follows:

1. Contact the EPA UIC Program Director at least 60 days before plugging the well and provide updated plugging plan in compliance with 40 CFR 146.92(c).
2. Obtain bottom hole pressure per Section B of this plan. Compare test results to predicted values.
3. Hold site-specific safety meeting with all crews prior to commencement of operations.
4. Move in and rig up the workover rig on well.
5. Flush tubing with a minimum of two wellbore volumes of weight brine (drilling mud if higher density required), sufficient to overbalance injection reservoir pressures and displace carbon dioxide from the immediate wellbore area. [40 CFR 146.929(c); 16 TAC 5.203(k)]
6. Install back pressure valve (BPV), remove tree and rig up blowout preventer on well. Test BOP.
7. Unset upper and lower retrievable packers and seal assembly.
8. Circulate weighted brine into protection casing annulus sufficient to overbalance injection reservoir pressure.
9. Retrieve/remove injection tubing, upper/lower retrievable packer and seal assembly from the well.
10. Run in hole with 2 ⅞-inch workstring and bit to total depth. Circulate well clean. POOH.
11. Run temperature logs, casing inspection and cement bond logs to determine integrity of casing and cement bond [40 CFR 146.89; 40 CFR 146.929(c); 16 TAC 5.203(k)]. Note: if logs indicate potential for inter-formational fluid movement, modify closure plan to remediate and prevent it.
12. Pick up 9 ⅝-inch cement retainer and run in well to 5,050 ft MD.
13. Run workstring in to well and latch into retainer. Rig up cementing equipment and pump 22 barrels (183 sacks) of EverCRETE CO_2 resistant cement (Plug 1). Displace the cement to near top of retainer. Pull workstring out of retainer and dump 1 bbl (5.1 sacks) of cement on top of retainer. Pull the workstring up 450 ft and reverse circulate.
14. Shut well in and monitor pressure.
15. After waiting for the cement to cure (minimum 24 hours), locate the top of the cement plug and load and/or pressure test the cement plug to ensure its competency.
16. Pick up 9 ⅝-inch cement retainer and run in well to 4,225 ft MD.
17. Run workstring in to well and latch into retainer. Rig up cementing equipment and pump 40 barrels (336 sacks) of EverCRETE CO_2 resistant cement (Plug 2). Displace the cement to near top of retainer. Pull workstring out of retainer and dump 1 bbl (5.1 sacks) of cement on top of retainer. Pull the workstring up 850 ft and reverse circulate.
18. Shut well in and monitor pressure.
19. After waiting for the cement to cure (minimum 24 hours), locate the top of the cement plug and load and/or pressure test the cement plug to ensure its competency.
20. Pick up 9 ⅝-inch cement retainer and run in well to 3,530 ft MD.
21. Run workstring into well and latch into retainer. Rig up cementing equipment and pump 34 barrels (283 sacks) of EverCRETE CO_2 resistant cement (Plug 3). Displace the cement to near top of retainer. Pull workstring out of retainer and dump 1 bbl (5.1 sacks) of cement on top of retainer. Pull the workstring up 505 ft and reverse circulate.

22. Shut well in and monitor pressure.
23. After waiting for the cement to cure (minimum 24 hours), locate the top of the cement plug and load and/or pressure test the cement plug to ensure its competency.
24. Pick up 9 ⅝-inch cement retainer and run in well to 3,025 ft MD.
25. Run workstring into well and latch into retainer. Rig up cementing equipment and pump 24 bbls (205 sacks) of EverCRETE CO_2 resistant cement (Plug 4). Displace the cement to near top of retainer. Pull workstring out of retainer and dump 1 bbl (5.1 sacks) of cement on top of retainer. Pull the workstring up 625 ft and reverse circulate.
26. Shut well in and monitor pressure.
27. After waiting for the cement to cure (minimum 24 hours), locate the top of the cement plug and load and/or pressure test the cement plug to ensure its competency.
28. Displace the brine in the wellbore with drilling fluid to a depth of 2,400 ft MD. The drilling fluid will have a minimum of 15.6 lb/gal density and sufficient viscosity.
29. Run workstring with stinger into well to a depth of 2,400 ft MD. Rig up cementing equipment and pump 24 bbls (204 sacks) of Class A cement (Plug 5). After setting of the plug, slowly pull up workstring to 1,800 ft MD (~100 ft above the theoretical top of the plug) and reverse circulate.
30. Shut well in and monitor pressure.
31. After waiting for the cement to cure (minimum 24 hours), locate the top of the cement plug and load and/or pressure test the cement plug to ensure its competency.
32. Run workstring with stinger into well to a depth of 1,890 ft MD. Rig up cementing equipment and pump 24 bbls (204 sacks) of Class A cement (Plug 6). After setting of the plug, slowly pull up workstring to 1,300 ft MD (~100 ft above the theoretical top of the plug) and reverse circulate.
33. Shut well in and monitor pressure.
34. After waiting for the cement to cure (minimum 24 hours), locate the top of the cement plug and load and/or pressure test the cement plug to ensure its competency.
35. Displace the brine in the wellbore with drilling fluid to a depth of 600'. The drilling fluid will have a minimum of 15.6 lb/gal density and sufficient viscosity.
36. Run workstring with stinger into well to a depth of 600 ft MD. Rig up cementing equipment and pump 29 bbls (244 sacks) of Class A cement (Plug 7) until cement is visible at surface. Slowly pull workstring to surface and pump additional cement as needed.
37. Allow the cement to cure (minimum 24 hours). If cement head drops within the casing, add additional cement as needed by use of a tremie and allow to cure.
38. Remove wellhead, cut off casing three feet below ground surface and weld steel plate on top.
39. Rig down workover rig and associated equipment and move off location. Clean project site.
40. Erect a permanent marker on the well with the permit number, date of plugging and company name identified on the marker.
41. A plugging report shall be submitted to the UIC Program Director within 60 days of plugging and closure in accordance with the requirements of 40 CFR 146.92(d). The report shall be certified accurate by Sugarberry CCS, LLC and the contractor who performed the plugging operations.

FIGURE



Legend

- DAS/DTS Fiber Optic Cable
- Perforations

Cement
- Class A
- EverCRETE

Long String Casing
- L-80
- Super 13 Cr
- 22 Cr or Better

Rock Type
- Injection Zone
- Confining Zone

FIGURE 8-1
PROPOSED WELL PLUG AND ABANDONMENT DIAGRAM - SB-01
SUGARBERRY CCS HUB
SUGARBERRY CCS, LLC
HOPKINS COUNTY, TEXAS

SCS ENGINEERS

Wichita, KS | April 2025