ATTACHMENT F

INJECTION WELL PLUGGING PLAN 40 CFR 146.92(b)

1. FACILITY INFORMATION

Facility Name: CarbonFrontier

Facility Contact: Faisal Latif, Storage Development Manager
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Well Information:

Well Number	County, State	Latitude	Longitude
CI1-64Z-27N	Kern County, CA	35°33'9.4877"N	119°48'26.3702"W
CI2-64Z-35N	Kern County, CA	35°32'32.6713"N	119°47'37.0682"W
CI3-64Z-35N	Kern County, CA	35°32'11.6457"N	119°47'7.5912"W
CI4-64Z-35N	Kern County, CA	35°31'55.4154"N	119°46'51.7864"W
27R-27N	Kern County, CA	35°33'2.4280"N	119°48'28.6103"W
55-26N	Kern County, CA	35°32'43.2520"N	119°47'32.7755"W
64-35N	Kern County, CA	35°31'44.3600"N	119°46'44.9788"W
9-1N	Kern County, CA	35°31'31.6480"N	119°46'37.0154"W
64-27N	Kern County, CA	35°32'38.0979"N	119°47'54.6576"W

Version History

File Name	Version	Date	Description of Change
Attachment F – Aera CCS Injection Well Plugging Plan.pdf	1	January 19, 2023	Original document
Att F – CarbonFrontier Injection Well Plugging Plan_REV1_03062023.pdf	2	March 6, 2023	Revisions made based on EPA administrative review comments from February 23, 2023
Attachment F – CarbonFrontier Injection Well Plugging Plan V3 04182024.pdf	3	April 18, 2024	Revisions made to clarify plugging procedures
Attachment F – CarbonFrontier Injection Well Plugging Plan V4 10152024.pdf	4	October 15, 2024	Revisions made based on EPA Technical Review comments from September 12, 2024

This injection well plugging plan was developed for the nine proposed Class VI injection wells, collectively. While the proposed overall abandonment process is similar for both repurposed and newly drilled injection wells, well-specific information is presented where relevant.

In developing the Well Plugging and Abandonment Plan, Aera considered (1) the location and thickness of the lowermost sequestration zone and freshwater aquifer-containing strata, (2) well construction details such as the depth of the bottom of the intermediate and surface casings, (3) types of subsurface formations penetrated by the well and their geochemistry, and (4) the composition of the CO_2 stream and formation fluid geochemistry.

Aera Energy LLC (Aera) will conduct injection well plugging and abandonment according to the procedures below.

2. PLANNED TESTS OR MEASURES TO DETERMINE BOTTOM-HOLE RESERVOIR PRESSURE

Prior to plugging and abandoning Class VI injection wells, bottom-hole reservoir pressure will be measured with a downhole pressure gauge at each well pursuant to the requirements of 40 CFR 146.92(a). Bottom-hole reservoir pressure will inform the appropriate buffer fluid for flushing and kill fluid weight prior to plugging.

3. PLANNED EXTERNAL MECHANICAL INTEGRITY TEST(S)

Aera will conduct at least one of the external mechanical integrity tests (MIT) listed in **Table 1** to evaluate external mechanical integrity prior to plugging the injection wells as required by 40 CFR 146.92(a). An MIT log will be run over the entire depth of each injection well. Collected survey data will be evaluated for anomalies indicative of loss of mechanical integrity, as defined by 40 CFR 146.89(a). Should anomalies be detected, the plugging procedure will be modified.

Table 1: Planned MITs

Test Description	Location
Temperature log	Wireline well log
Noise log	Wireline well log
Oxygen activation log	Wireline well log

4. INFORMATION ON PLUGS

Aera will use materials and methods noted in **Table 2** to plug newly drilled injection wells and materials and methods in **Table 3** to plug repurposed injection wells and monitoring wells. A plugging diagram for new injection wells is presented in **Figure 1**. A plugging diagram for repurposed injection and monitoring wells is presented in **Figure 2**. The injection wells will be filled with American Petroleum Institute (API) Class G cement from total depth (TD) to surface. The exact volume and depth of plugs will depend on the well geometry and downhole conditions of the well as assessed during construction. Where direct exposure to CO_2-laden water is expected, a CO_2 resistant blend of API Class G cement will be used. In these cases, CO_2-resistent additives such as fly ash will be added to the Class G cement blend. The cement formulation and required certification documents will be submitted with the well plugging plan. Aera will report the wet density and will retain duplicate samples of the cement used for each plug. Cement volumes will be calculated onsite.

Table 2: Plugging Details (Newly Drilled Injection Well)

Plug Information	Plug #1	Plug #2	Plug #3
Diameter of boring in which plug will be placed (in)	4.5	7	7
Depth to bottom of tubing or drill pipe (ft)	8,500	7,700	7,300
Sacks of cement to be used for each plug	61	77	1,403
Slurry volume to be pumped (ft^3)	70	88	1,614
Slurry weight (lb/gal)	15.8	15.8	15.8
Calculated top of plug (ft)	7,700	7,300	0
Bottom of plug (ft)	8,500	7,700	7,300
Type of cement or other material	API Class G cement with CO_2 resistant additives	API Class G cement with CO_2 resistant additives	API Class G cement
Method of emplacement (e.g., balance method, retainer method, or two-plug method)	Balanced	Balanced	Balanced

API: American Petroleum Institute
ft: foot or feet
ft3: cubic foot or feet
in: inch or inches
lb./gal: pound(s) per gallon

Table 3: Plugging Details (Repurposed Injection and Monitoring Wells)

Plug Information	Plug #1	Plug #2	Plug #3	Plug #4
Diameter of boring in which plug will be placed (in)	4.5	7	9	9 + outer annuli
Depth to bottom of tubing or drill pipe (ft)	8,500	7,700	7,300	750
Sacks of cement to be used for each plug	61	77	2,005	461
Slurry volume to be pumped (ft^3)	70	88	2,305	530
Slurry weight (lb/gal)	15.8	15.8	15.8	15.8
Calculated top of plug (ft)	7,700	7,300	750	0
Bottom of plug (ft)	8,500	7,700	7,300	750
Type of cement or other material	API Class G cement with CO_2 resistant additives	API Class G cement with CO_2 resistant additives	API Class G cement	API Class G cement
Method of emplacement (e.g., balance method, retainer method, or two-plug method)	Balanced	Balanced	Balanced	Balanced

API: American Petroleum Institute
ft: foot or feet
ft^3: cubic foot or feet
in: inch or inches
lb./gal: pound(s) per gallon

5. NARRATIVE DESCRIPTION OF PLUGGING PROCEDURES

5.1 Notifications, Permits, and Inspections

Prior to plugging Aera will evaluate whether additional amendments to this Well Plugging and Abandonment Plan are necessary based on the operational and monitoring history of each well. Considerations will include injectate and formation fluid chemistry, MIT results, injection rates and volumes from throughout the operational life of each well, and whether any significant changes in the CCS project may affect plugging of the well. The final CO_2-resistant cement formulation will be determined based on this evaluation. In compliance with the requirements of 40 CFR 146.92(c), Aera will notify the Underground Injection Control (UIC) Program Director at least 60 days before plugging the well and provide an updated Injection Well Plugging Plan, if applicable.

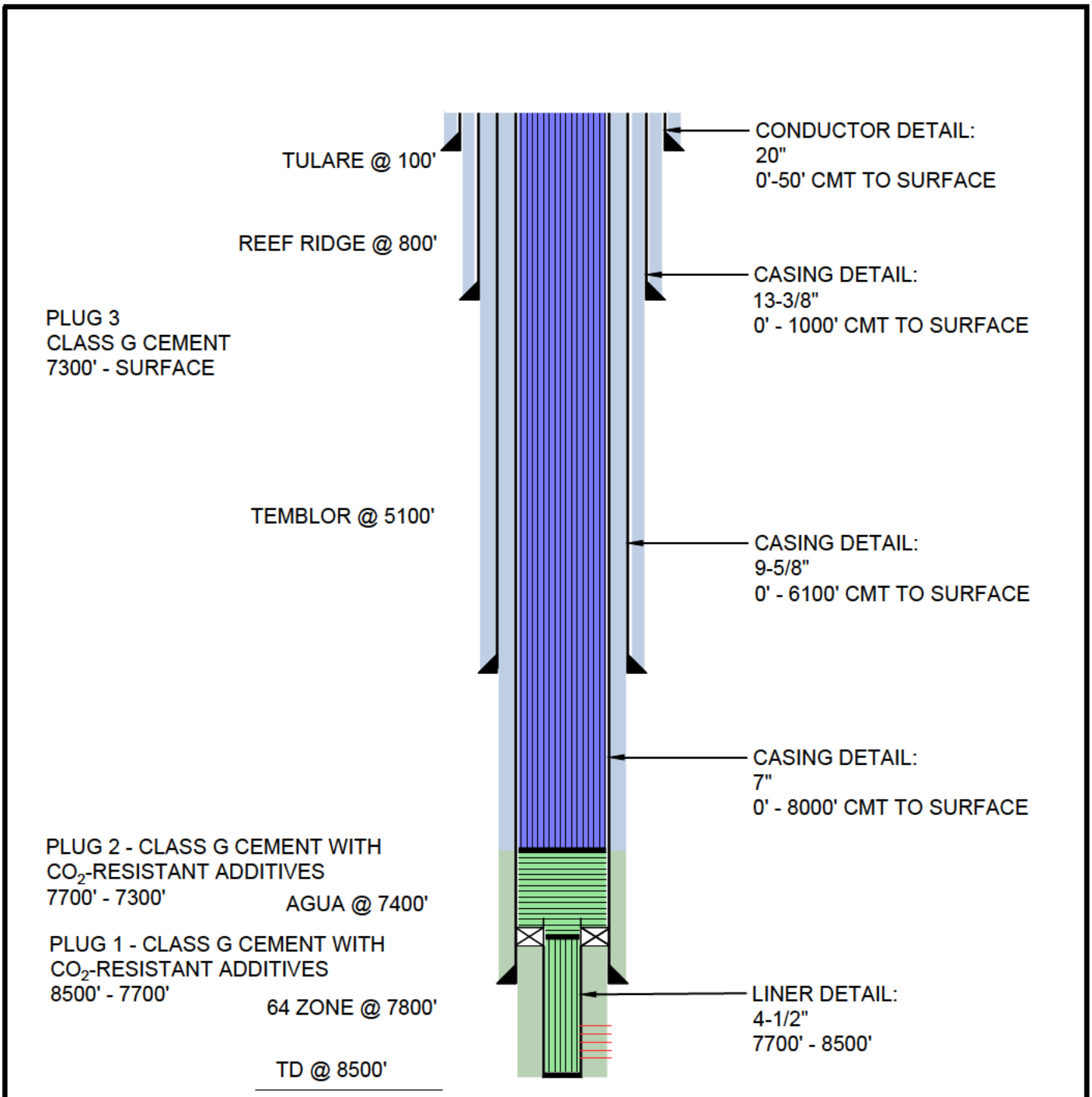
5.2 Plugging Procedures

1. Bottom-hole pressure from down-hole pressure gauge is recorded and kill fluid density is calculated.
2. External mechanical integrity is demonstrated through approved logging methods.
3. The injection well is flushed with a buffer fluid.
4. Well equipment is removed from the casing and the well is cleaned out to TD.
5. The following plugging operations will be performed by utilizing a coiled tubing unit:
    a. Run in the hole to TD and begin placing API Class G cement inside of the casing. Where direct exposure to CO_2-laden water is expected, a CO_2 resistant blend of API Class G cement will be used.
    b. Once the full plug is placed, pull the coiled tubing above the plug and circulate the well to clean out above the top of the plug.
    c. Pull the coiled tubing up-hole while operations are paused to wait for the cement plug to set. Once the cement has set, the coiled tubing is run back in the hole to witness the depth and hardness of the plug before initiating the next cemented plug interval. This process is repeated until API Class G cement is placed to the surface.
    d. In repurposed injection and monitoring wells, perforate the casing, where necessary, and squeeze API Class G cement outside of the casing to promote a sound connection between casing annuli and the borehole wall.
6. Plug the casing and annuli at the surface with at least a 25-foot API Class G cement plug.
7. Remove and excavate the wellhead.
8. Permanently affix a finished steel plate and label with identifying information.

6. PLUGGING REPORT

In compliance with the requirements of 40 CFR 146.92(d), Aera will prepare and submit to the UIC Program Director within 60 days after plugging the well a Plugging Report. The Plugging Report will include (1) a statement that the well was plugged in accordance with the Well Plugging and Abandonment Plan, (2) if the actual plugging differed from the Well Plugging and Abandonment Plan, a statement describing the actual plugging and an updated plan specifying the differences; and (3) a statement that the well was inspected using approved detection methods and found to have no leaks. Aera will retain the Plugging Report for 10 years following site closure.

Figures



LEGEND

- CLASS G CEMENT WITH CO_2-RESISTANT ADDITIVES (EXISTING)
- CLASS G CEMENT (EXISTING)
- CLASS G CEMENT WITH CO_2-RESISTANT ADDITIVES
- CLASS G CEMENT PLUG
- INJECTOR PERFORATIONS (EXISTING)

NOT TO SCALE

PLUGGING SCHEMATIC -
NEWLY DRILLED WELL

NORTH BELRIDGE OIL FIELD
WEST KERN COUNTY
CALIFORNIA

BLADE ENERGY PARTNERS

FIGURE
1

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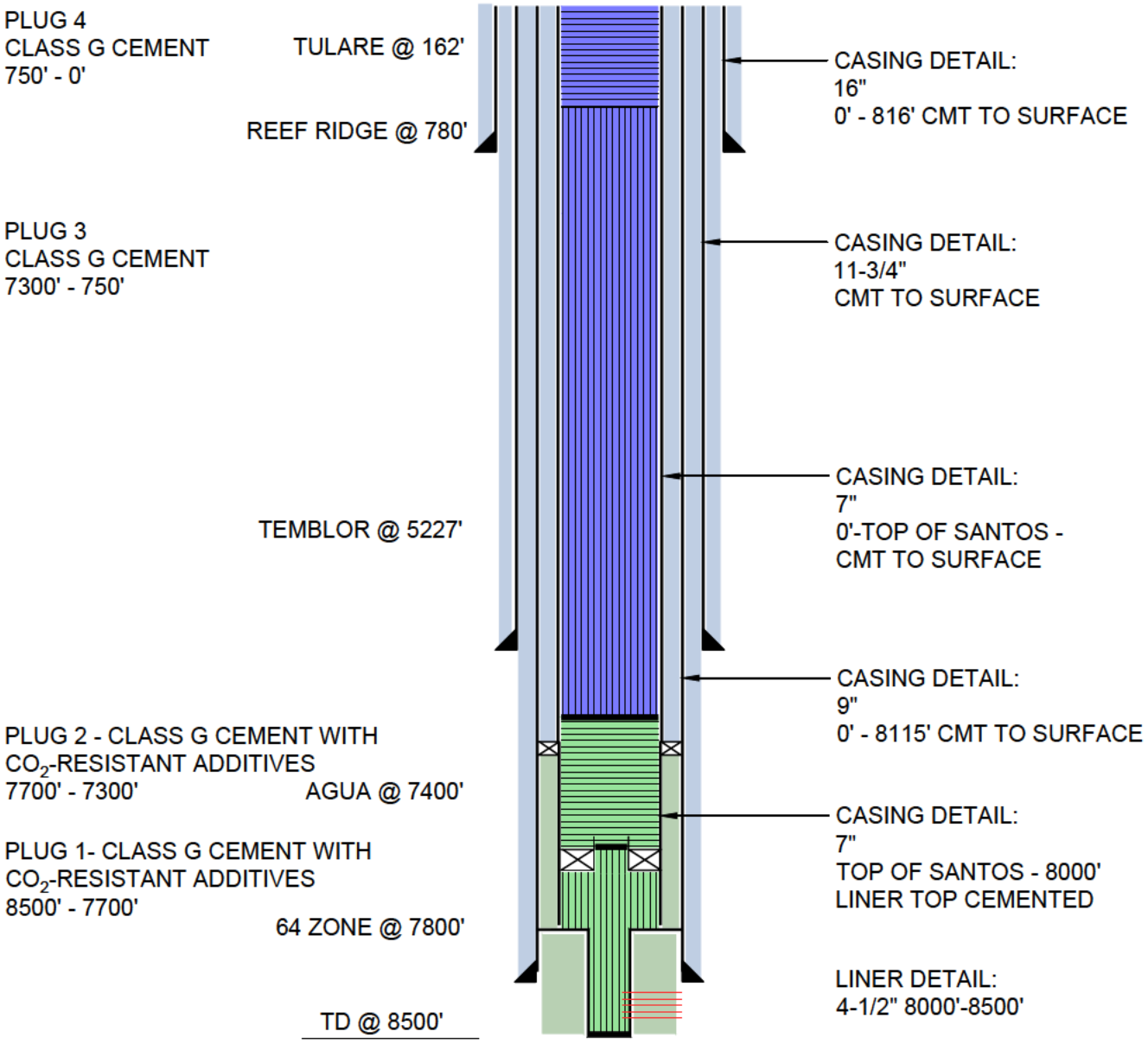
C:_GEOPWDS01\DMS12821\WELLBORE SCHEMATIC FIGURE J-1 - Last Saved By: SBerdy on 7/26/23



LEGEND

- CLASS G CEMENT WITH CO_2-RESISTANT ADDITIVES (EXISTING)
- CLASS G CEMENT (EXISTING)
- CLASS G CEMENT WITH CO_2-RESISTANT ADDITIVES
- CLASS G CEMENT PLUG
- INJECTOR PERFORATIONS (EXISTING)

NOT TO SCALE

PLUGGING SCHEMATIC -
RE PURPOSED INJECTION AND MONITORING WELL
NORTH BELRIDGE OIL FIELD
WEST KERN COUNTY
CALIFORNIA

BLADE ENERGY PARTNERS

FIGURE
2

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