

**ATTACHMENT D: INJECTION WELL PLUGGING PLAN  
40 CFR 146.92(b)**

**Elk Hills A1-A2 Storage Project**

**Facility Information**

Facility name: Elk Hills A1-A2 Storage  
357-7R

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Well location: Elk Hills Oil Field, Kern County, CA  
35.32802963 / -119.5449982

Carbon TerraVault 1 LLC (CTV) will conduct injection well plugging and abandonment according to the procedures below.

**Planned Tests or Measures to Determine Bottom-Hole Reservoir Pressure**

Before beginning the plugging and abandonment process, the pressure used to squeeze the cement will be determined from the bottom-hole pressure gauge. During plugging operations, the heavy-weighted cement slurry, as well as properly weighted displacement fluids, will be over-balanced ensuring that no reservoir fluids will be able to enter the wellbore during cementing operations.

**Planned External Mechanical Integrity Test(s)**

CTV will conduct at least one external mechanical integrity prior to plugging the injection well as required by 40 CFR 146.92(a).

A temperature log will be run over the entire depth of each sequestration well. Data from the logging runs will be evaluated for anomalies in the temperature curve, which would be indicative of fluid migration out of the injection zone. Data will be compared to the data from temperature logs performed prior to injection of CO<sub>2</sub>. Deviations between the temperature log performed before, after and during injection may indicate issues related to the integrity of the well casing or cement.

## **Information on Plugs**

CTV will use the materials and methods noted in Table 1 to plug the injection well. The cement formulation and required certification documents will be submitted to the agency with the well plugging plan. The owner or operator will report the wet density and will retain duplicate samples of the cement used for each plug.

Class G cement blend will be utilized that has a minimum 1,000 psi compressive strength and a maximum liquid permeability of 0.1 mD. The wells will have this cement placed inside casing from total depth (TD) of the well to surface. The cement will be set in plug segments per CTV's standard procedures.

**Table 1: Plugging details.**

<b>Plug Information</b>	<b>Plug #1</b>	<b>Plug #2</b>	<b>Plug #3</b>	<b>Plug #4</b>
Diameter of boring in which plug will be placed (in.)	6.184	6.366	6.366	6.366
Depth to bottom of tubing or drill pipe (ft)	8,785	2,970	1,448	25
Sacks of cement to be used (each plug)	65	25	25	5
Slurry volume to be pumped (ft <sup>3</sup> )	75	28	28	6
Slurry weight (lb./gal)	15.6	15.6	15.6	15.6
Calculated top of plug (ft)	8,427	2,845	1,323	0
Bottom of plug (ft)	8,785	2,970	1,448	25
Type of cement or other material	Class G	Class G	Class G	Class G
Method of emplacement (e.g., balance method, retainer method, or two-plug method)	Running Plug (Coiled Tubing)			

## **Narrative Description of Plugging Procedures**

### ***Notifications, Permits, and Inspections***

In compliance with 40 CFR 146.92(c), CTV will notify the regulatory agency at least 60 days before plugging the well and provide an updated Injection Well Plugging Plan, if applicable.

### ***Plugging Procedures***

The following procedures are planned for plugging:

1. Bottom hole pressure from down-hole pressure gauge is recorded and kill fluid density is calculated.
2. Well equipment is removed from the casing and the well is cleaned out to TD during rig operations. Subsequent operations are carried out utilizing a coiled tubing unit (CTU).
3. The CTU runs in the hole to TD and begins placing cement in the casing. The coiled tubing is kept about 100' inside of the cement plug and is pulled up-hole while cementing operations continue. Once the full plug is placed, the coiled tubing is pulled above the plug and the well is circulated to ensure the depth of the top of the plug. The tubing is then pulled up-hole while operations are paused to wait on cement. 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 cement is placed to surface.

CRC follows the following standards for plugging operations:

- Bottomhole plug - All perforations shall be plugged with cement, and the plug shall extend at least 100 feet above the top of a landed liner, the uppermost perforations, the casing cementing point, the water shut-off holes, or the oil or gas zone, whichever is highest.
- Base of USDW plug (Underground Source of Drinking Water is defined as a non-exempt aquifer that has >10,000 mg/L DTS):
  - If there is cement behind the casing across the base of USDW, a 100-foot cement plug shall be placed inside the casing across the interface.
  - If the top of the cement behind the casing is below the base of the USDW, squeeze-cementing shall be required through perforations to protect the freshwater deposits. In addition, a 100-foot cement plug shall be placed inside the casing across the fresh-saltwater interface.
- Surface Plug - The casing and all annuli shall be plugged at the surface with at least a 25-foot cement plug.