# CONSTRUCTION DETAILS
# 40 CFR 146.86

## Facility Information

Facility Name: Capio [redacted] Sequestration, LLC
Well Name: Capio [redacted] CCS Well No. 1

Facility contact: Peter Hollis, Capio Sequestration - President
Michael Neese, Capio Sequestration - Senior Vice President
109 N. Post Oak Ln, Suite 140, Houston, Texas 77024
832-551-3300 / pete@fidelisinfra.com

Well location: [redacted]
Pointe Coupee Parish, Louisiana
[redacted]

## Introduction

The construction details for the injection well are described herein. Capio [redacted] Sequestration, LLC ("Capio") proposes constructing one new injection well for the permanent sequestration of supercritical carbon dioxide ($scCO_2$). Capio will ensure that the injection well is constructed and completed to prevent the movement of fluids into or between USDWs or other unauthorized zones. Also, the well's construction will allow the use of appropriate testing devices and workover tools and continuous monitoring of the annulus space between the injection tubing and the long string casing.

After the construction of the drilling pad, a conductor casing will be driven to the specified depth. A vertical well will be drilled and completed with a surface casing and long string-cased hole to a total depth of approximately [redacted] ft. The surface and long string casings will be cemented. The long string casing will be completed with $CO_2$-resistant cement from total depth through the confining zone. A conceptual well construction diagram is provided in **Figure 5-1**. Actual depths will depend on site-specific characterization data obtained when drilling the injection well.

# Figure 5-1. Construction Diagram of Injection Well

**Capio [redacted] CCS Well No. 1**

**Pointe Coupee Parish, Louisiana**

**Location:** [redacted]
**Ground Level Elevation:** [redacted]

| Installation | Present Condition | OD | ID |
|---|---|---|---|
| | 5-1/2" Sub Surface Safety Valve at [redacted] (with SS Surface Control Line) | 24" | |
| | 24" Conductor at [redacted] | | |
| | 17-1/2" Hole Drilled to [redacted] | | |
| | 13-3/8", 68#, J-55 Casing @ [redacted] (Cemented to Surface) | 13.375" | 12.515" |
| | 12-1/4" Hole Drilled from [redacted] | | |
| | 5-1/2", 17.0#, N-80, SMAX-TSR Tubing (Corrosion Resistant) | 5.500" | 4.892" |
| | Fiber Optic Sensor Line Strapped on 9-5/8" Casing to [redacted] (Top of ECP) | | |
| | Tubing Seal Assembly (Stabbed into Seal Bore Packer) | | |
| | Gravel Pack Liner Seal Bore Packer Top @ [redacted] (Corrosion Resistant) | | |
| | 5-1/2" Gravel Pack Liner (Corrosion Resistant) | | |
| | 9-5/8", 43.5#, L-80, LT&C @ [redacted] (Corrosion Resistant Pipe from [redacted]) Cemented to surface (Corrosion Resistant Cement [redacted]) | 9.625" | 8.755" |
| | TD at [redacted] | | |

| Formation | MD (ft) |
|---|---|
| Base of USDW | [redacted] |
| Top Base Middle Miocene (2ndry conf. unit) | [redacted] |
| Base Middle Miocene (2ndry conf. unit) | [redacted] |
| Top [redacted] Confining Int. (upper conf. unit) | [redacted] |
| Base [redacted] Confining Int. (upper conf. unit) | [redacted] |
| Top [redacted] | [redacted] |
| Base [redacted] (injection interval) | [redacted] |
| Top [redacted] (injection interval) | [redacted] |
| Base [redacted] (injection interval) | [redacted] |
| Total Depth | [redacted] |

| | |
|---|---|
| Prepared By: [redacted] | Date: 11/01/2022 |
| Updated By: SCS Engineers | Date: 11/04/2022 |

Formation lithology and relative depths are described in Section 1 – Site Characterization. Based on the Class V characterization well, the bottom hole temperature at approximately [redacted] ft is [redacted] degrees Fahrenheit. The following subsections include information on construction procedures, casing cementing specifications, tubing and packer program, annulus fluid, and wellhead. Anticipated injection pressure, annulus pressure, and injection rate are in Section 7 – Well Operation.

## Injection Well Construction Details

### *Pre-construction Activities*

Prior to the beginning of drilling operations, Capio will work with the [redacted] This includes planning around recreational activities such as hunting as well as being aware of mating seasons for certain protected species that may live [redacted].

### *Construction Procedures*

During drilling and completion operations, all activities are conducted in compliance with the Louisiana Office of Conservation and per 40 CFR 146.86. Drilling fluids will be maintained during all drilling stages to; control bottom hole pressures, support the wellbore and maintain stability, prevent formation influx and seal permeable formations, circulate cuttings away from the drilling bit to the surface, mitigate drilling damage to the targeted reservoir, and to cool the drilling bit and work string. Maintaining proper drilling fluids is important to prevent the movement of fluids into or between USDWs. Mud samples will be analyzed throughout drilling to ensure downhole pressure control. Well control will be maintained at all times through the use and frequent testing of blowout preventers. Care will be taken to prevent or minimize the discharge or spillage of construction-related fluids and debris. All personnel will be trained in proper emergency response, and a response plan will be maintained onsite. All drilling and completion activities will be annotated on daily drilling reports.

The following general construction procedures will be used in construction and completion of the injection well. Section 6 - Pre-Operational Logging and Testing contains information on deviation surveys, formation samples, logs, and tests to be conducted during drilling and before the operation of the injection well.

**Prepare the location.** Survey the well pad; provide notification of subsurface work to local underground utility location authority; conduct earthwork grading to level the location and construction well pad mats; drive conductor casing; excavate and board cellar; lay down containment where rig substructure will be placed.

**Mobilize in and rig up.** Set rig substructure and rig appurtenances; raise derrick and install remaining equipment; mix spud fluids; make ready to drill surface hole.

**Drill and complete surface hole.** Commence drilling a surface hole from surface to casing set depth; conduct deviation (1 degree or less) surveys; conduct logging; run casing with centralizers; cement casing with approximately 25% excess; wait on cement; run cement bond log.

**Drill and complete production hole.** Drill out float shoe; drill to core point; conduct straight hole surveys; run core barrels and bit to core confining interval; drill to core point; conduct straight hole surveys; run core barrels and bit to core injection interval; drill to total depth; condition hole; conduct logging; run casing with centralizers and strapped fiber optic monitoring system; cement casing with approximately 25% excess; wait on cement; pressure test casing; run cement bond log.

**Run tubing and packer.** Run tubing with packer; set packer; displace annular fluids with treated fresh water; set the liner hanger packer; pack off tubing in the surface head; top off annulus with treated fresh water; pressure test annulus.

**Rig down and demobilize.** Rig down; off-rent equipment; demobilize; restore location.

**Pre-operational testing.** Set wellhead and Christmas tree; pressure test of wellhead; conduct reservoir testing; test fiber optic monitoring system.

Proposed pilot hole depths and diameters are referenced in **Table 5-1**.

***Table 5-1. Open Hole Diameters and Intervals***

| Name | Depth Interval (feet) | Open Hole Diameter (inches) | Comment |
|---|---|---|---|
| Conductor | [redacted] | N/A | Driven to bedrock |
| Surface | [redacted] | 17½ | Drilled to the primary seal |
| Intermediate | [redacted] | N/A | N/A |
| Long-string | [redacted] | 12¼ | Drilled to tubing seal assembly (stabbed into seal bore packer) |

The operational injection schedule is presented in **Table 5-2**.

***Table 5-2. Injection Schedule***

| Years | Injection Interval (Miocene Sand Identifier) | Volume (metric tons per year) |
|---|---|---|
| [redacted] | Bottom third [redacted] | [redacted] |
| [redacted] | Middle third [redacted] | [redacted] |
| [redacted] | Top third [redacted] | [redacted] |
| [redacted] | Bottom half [redacted] | [redacted] |

### *Casing and Cementing*

As specified in 40 CFR 146.86(b), casing and cement or other materials used in the construction of the injection well will have sufficient structural strength and be designed for the life of the geologic sequestration project. All well materials, including casing, cement, tubing, and packer will be compatible with fluids with which the materials may be expected to come into contact and will meet or exceed standards developed for such materials by the American Petroleum Institute

(API), ASTM International, or comparable standards. The casing and cementing program is designed to prevent movement of fluids into or between USDWs as summarized in **Table 5-3**.

***Table 5-3. Casing Program***

| Casing[1] | Depth Interval (feet) | Outside Diameter (inches) | Inside/Drift Diameter (inches) | Weight (lbs/ft) | Grade (API) | Design Coupling | Burst Strength (psi) | Collapse Strength (psi) |
|---|---|---|---|---|---|---|---|---|
| Conductor | 0 - [redacted] | 24 | UNK | N/A | N/A | N/A | N/A | N/A |
| Surface | 0 - [redacted] | 13⅜ | 12.259 | 68 | J-55 | STC | 3,450 | 1,950 |
| Intermediate | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Long-string | 0 - [redacted] | 9⅝ | 8.599 | 43.5 | L-80 | LTC | 6,330 | 3,810 |
| Long-string | [redacted] | 9⅝ | 8.599 | 43.5 | L-80, 25Cr[2] | LTC | 6,330 | 3,810 |

(1) Conceptual casing program may be revised based on products available at the time of completion
(2) Super duplex 25 chrome stainless steel, corrosion resistant alloy

Casing centralizers will be used on the surface and long string casings to ensure sufficient cement bond to the borehole and casing. Float shoes will be run on the lowermost joint of the surface and long string casing strings. Surface casing will extend through the base of the USDW and will be cemented to the surface. One long string casing, using a sufficient number of centralizers to ensure proper cement bond, will extend into the injection zone and will be completed with conduits which allow for flow into the appropriate sand zone.

Cementing will occur in stages so that $CO_2$ resistant latex is uniformly placed from total depth through the confining zone. If cement returns are not observed at the surface remedial cementing techniques will be used to ensure sufficient bond. Cement and cement additives will be compatible with the carbon dioxide stream and formation fluids from total depth through the confining zone and of sufficient quality and quantity to maintain integrity over the design life of the geologic sequestration project. The integrity and location of the cement will be verified using cement bond logs and/or casing inspection logs capable of evaluating cement quality radially and identifying the location of channels to ensure that USDWs are not endangered. The conceptual cementing program is summarized in **Table 5-4**.

### *Table 5-4. Cementing Program*

| Casing | Casing Depth Interval (feet) | Borehole Diameter (inches) | Casing Outside Diameter (inches) | Cement Interval (feet) | Cement[(1)(2)] |
|---|---|---|---|---|---|
| Conductor | 0 - [redacted] | 24 | 24 | N/A[(3)] | N/A[(3)] |
| Surface | 0 - [redacted] | 17½ | 13⅜ | 0 - [redacted] | [redacted] |
| Intermediate | N/A | N/A | N/A | N/A | N/A |
| Long-string | 0 - [redacted] | 12¼ | 9⅝ | 0 - [redacted] | [redacted] |
| Long-string | [redacted] | 12¼ | 9⅝ | [redacted] | [redacted] |

(1) Conceptual cement program may be revised based on similar products available at completion
(2) Cement calculations are estimates and include 25% excess
(3) Conductor casing driven, will not require cement

### *Tubing and Packer*

Supercritical carbon dioxide will be injected into the well through tubing and packer that are comprised of corrosion resistant materials. The $CO_2$ stream will originate from two Capio-controlled facilities.

- [redacted] facility will generate up to [redacted] metric tons annually
- [redacted] facility will generate up to [redacted] metric tons annually

The cumulative $CO_2$ stream will be transported from the facilities to the injection well in a supercritical state. The anticipated $CO_2$ stream composition is characterized in **Table 5-5**.

***Table 5-5. Chemical Composition of $CO_2$ Stream***

| Component | Pipeline Overall Fluid Value | Capio CryoCap™ FG Value | Units |
|---|---|---|---|
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |

GT = Greater than, LT = Less than

Tubing and packer materials used in the construction of the injection well will be compatible with fluids with which the materials may be expected to come into contact. These materials and/or coatings will meet or exceed standards developed by the API, ASTM International, or comparable standards.

A packer will be placed at the terminus of the injection tubing and isolate the annulus from the injection zone for continuous monitoring for tubing and packer leaks, as described in Section 8 – Testing and Monitoring. The packer will be installed inside the long string casing less than 100 feet above the perforated injection interval.

The tubing will stab into a seal bore packer, AS-1X mechanical packer (or equivalent). The packer will be manufactured or plated with corrosion resistant materials and will be rated with a minimum

[redacted] psi differential, which exceeds the anticipated differential during installation, workovers, and injection.

Specifications for the conceptual design tubing and packer are provided in **Tables 5-6** and **5-7** below.

***Table 5-6. Tubing Specifications(1)***

| Name | Depth Interval (feet) | Outside Diameter (inches) | Inside/Drift Diameter (inches) | Weight (lbs/ft) | Grade (API) | Design Coupling | Burst Strength (psi) | Collapse Strength (psi) |
|---|---|---|---|---|---|---|---|---|
| Injection tubing | [redacted] | 5½ | 4.767 | 17 | N-80, 25Cr | LTC | 7,740 | 6,390 |

(1) Conceptual tubing program may be revised based on similar products available at the time of completion

***Table 5-7. Packer Specifications(1)***

| Packer Type and Material | Packer Setting Depth (feet) | Length (inches) | Packer Main Body Outer Diameter (inches) | Packer Inner Diameter (inches) |
|---|---|---|---|---|
| Stainless steel, 7K, AS-1X | [redacted] | 98 | 8.375 | 4.5 |

(1) Conceptual packer program may be revised based on similar products available at the time of completion

### *Annulus Fluid*

The annular space above the packer between the long string casing and injection tubing will be filled with fluid to provide structural support for the injection tubing and continuous monitoring of internal mechanical integrity. If required, fluid pressure measured at the surface within the annulus will be maintained to exceed the maximum injection pressure within the injection tube at the elevation of the injection zone. This pressure differential (surface) will not exceed a value that is more than [redacted] psi greater than the injection pressure at the surface. Assuming packer placement at a measured depth of [redacted] ft, the volume of the annular space will be approximately [redacted] gal.

The annulus fluid will be freshwater with a corrosion inhibitor, biocide, and an oxygen scavenger. Depending on final selection of tubing, long string and packer materials, the annulus may include a dilute salt solution such as potassium chloride (KCl), sodium chloride (NaCl), calcium chloride (CaCl2), or similar solutions. The fluid will be mixed onsite using freshwater or it will be acquired pre-mixed. The fluid will also be filtered to ensure that solids do not interfere with the packer or other components of the annulus monitoring system.

### *Wellhead*

The wellhead and Christmas tree will be composed of materials compatible with the injection fluid to minimize corrosion. In general, all components that come into contact with the CO2 injection fluid will be made of a corrosion-resistant alloy such as stainless steel. Because the CO2 injection fluid will be very dry, use of stainless-steel components for the flow-wetted components is a conservative

measure to minimize corrosion and increase the life expectancy of this equipment. Materials that will not have contact with the injection fluid will be manufactured of carbon steel. All materials will comply with the API Specification 6A – Specification for Wellhead and Christmas Tree Equipment.