Underground Injection Control – Class VI Permit Application for Mockingbird Carbon Storage Project Injection Wells No. 01, No. 02, No. 03, and No. 04

SECTION 6 – INJECTION WELL PLUGGING PLAN

Mockingbird Carbon Storage Project
Allen Parish, Louisiana
ExxonMobil Low Carbon Solutions Onshore Storage, LLC
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SECTION 6 – INJECTION WELL PLUGGING PLAN

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6.1 Injection Well Plugging Plan

ExxonMobil Low Carbon Solutions Onshore Storage, LLC (ExxonMobil) is proposing to undertake the Mockingbird Carbon Storage (CS) (Mockingbird) Project in Allen Parish, Louisiana, to sequester and store CO_2 using four injection wells. This section for the Class VI Underground Injection Control (UIC) permit application for the project was prepared to meet the requirements of the Louisiana Administrative Code, Title 43 (LAC43): XVII **§3631**, for plugging and abandonment (P&A) of Mockingbird Injection Wells (INJ) No. 01, No. 02, No. 03, and No. 04. The purpose of the Injection Well Plugging Plan is to demonstrate the actions that ExxonMobil will take to mitigate the threat to underground sources of drinking water (USDWs) during the post-injection period.

For plugging the injection wells, ExxonMobil has selected materials that are compatible with the corrosive properties of the injection fluid, to maintain the mechanical integrity of the plug and well casing. Prior to plugging the wells, ExxonMobil will submit and obtain a Form UIC-17 Work Permit or successor document. The planned plugging procedures are aligned with best practices for restoring the upper confining zone (UCZ) integrity at each injection well location. [redacted]

6.2 Objectives

ExxonMobil will plug and abandon the injection wells to restore the UCZ and provide a barrier sufficient to contain CO_2 and brine in the permitted injection zone and isolate the USDW.

The Injection Well Plugging Plan and procedures were designed to meet the following objectives:

- Measure the bottomhole reservoir pressure prior to conducting plugging activities (LAC43: XVII **§3631.A.3.a**).
- Assess the external mechanical integrity of the long string casing by using appropriate testing methods to demonstrate isolation consistent with LAC43: XVII **§3631.A.3.b**.
- Select the type, grade, and quantity of material to be used in plugging, to withstand contact with CO_2 and acidified liquids in the injection stages (LAC43: XVII **§3631.A.3.g**).
- Detail the methods, locations, and types of plugs used within the wells (LAC43: XVII **§3631.A.3.f** and **§3631.A.3.h**).

6.3 Preparation of Wells Prior to Plugging

ExxonMobil will repair deficiencies identified during the life of the proposed injection wells to mitigate potential leaks to USDWs (LAC43: XVII **§3621.A.7.b**). Historical mechanical integrity test (MIT) data and prior remedial measures will be considered prior to plugging operations. If required, those remedial activities will be included in an amendment to this plan.

6.3.1 Flushing the Wells with Kill Weight Fluid

Pressure control will be accomplished using kill weight brine that is weighted and compatible with the injectate and formation fluids (LAC43: XVII **§3631.A.2**).

6.3.2 Removal of Well Components and Obstructions

Prior to plugging, uncemented and non-permanent components of the wells will be removed. The surface and long string casings will be cemented to the surface during well construction per *Section 4 – Well Construction Plan and Operating Conditions* and will remain in place.

6.3.3 Planned Tests or Measures to Determine Bottomhole Pressure

[redacted] The bottomhole reservoir pressure will be used to estimate the density of kill weight brine needed to establish static equilibrium prior to plug placement.

6.3.4 Planned External MITs

The MIT will be used to identify the potential for significant fluid movement toward the USDW in the casing, tubing, or packer (LAC43: XVII **§3627.A.1**). ExxonMobil will conduct at least one of the tests listed in Table 6-1 as part of the monitoring program, to verify external mechanical integrity as required in LAC43: XVII **§3631.A.2**.

[redacted]

The results of the MIT will be documented and provided to the Commissioner of Conservation (Commissioner). If any deviation from the baseline logs performed with respect to the UCZ and potential flow toward USDW are identified, the Commissioner will be informed, and an investigation will be performed.

6.3.5 CO_2-Compatible Materials

In accordance with LAC43: XVII **§3631.A.3.e** and **g**, a cement that is compatible with CO_2 will be used as the UCZ cement plug. ExxonMobil will evaluate potential cement options prior to implementing the cementing operations, with the intent to provide a barrier that can withstand the temperature, pressure, and chemical interactions.

Cement at intervals above the UCZ will be based on blended Portland cement. A list of common cement additives is provided in Table 6-2 for the blended Portland cement, to improve setting time, reduce porosity, and improve overall strength if needed. Not all additives listed will be utilized. ExxonMobil will report the additives utilized and the wet density and will retain duplicate samples of the cement used for each plug in the plugging reports.

Table 6-2 – Common Cement Additives

Additive Type/Category	Common Additives
[redacted]	

6.3.6 Planned Site Restoration Activities

After the injection wells have been plugged and abandoned, the wellhead equipment and surface facilities will be removed from the Mockingbird Project site. The surface will be restored to a condition agreed upon by the landowner and by the Commissioner, as appropriate.

6.4 Injection Well Zonal Isolation and Final P&A

As discussed above, a plug will be set for injection zone isolation and the final P&A will occur at the end of the Mockingbird Project. The following details outline the procedures for both types of plugs to be installed. The volume and depth of the plugs will depend on the final geology and downhole conditions of the proposed injection wells as assessed during construction, as required by LAC43: XVII **§3631.A.3.e** and **f**.

6.4.1 Zonal Isolation and Intermediate Plug-Back Plan

[redacted]

[redacted]

6.4.1.1 Pre-Zonal Isolation Activities

ExxonMobil will comply with reporting and notification provisions for the Commissioner, which require a 60-day advance written notice before planned recompletion efforts are undertaken (LAC43: XVII **§3631.A.4**).

[redacted]

[redacted]

6.4.2 Final P&A

After injection operations cease and post-operational monitoring in the injection wells is completed, the wells will be prepared for final P&A—the general procedures for which are described below.

6.4.2.1 Pre-Plugging Activities (Notifications, Permits, and Inspections)

ExxonMobil will comply with reporting and notification provisions and provide written notification to the Commissioner before planned plugging efforts by obtaining a work permit on Form UIC-17 or a successor form. Details required under LAC43: XVII **§3631.A.3** will be provided with Form UIC-17. If changes have been made to the original approved Injection Well Plugging Plan, ExxonMobil will provide the amended plan to the Commissioner.

6.4.2.2 Plugging Procedure, Injection Wells

[redacted]

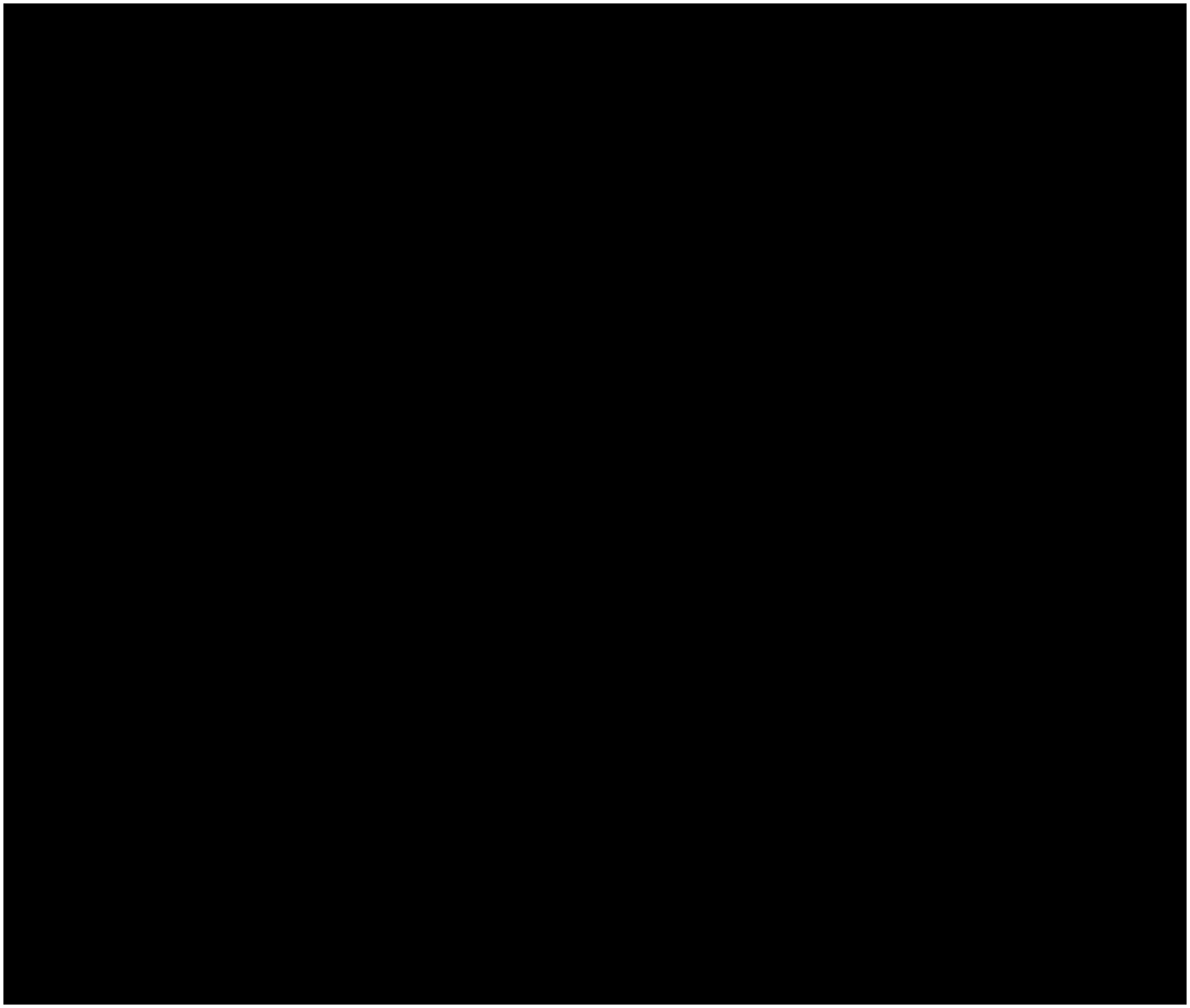
[redacted] (LAC43: XVII **§3631.A.2**).

[redacted]. Report will be provided to the Louisiana Department of Energy and Natural Resources.

[redacted]

6.4.2.3 Plugging Details, Mockingbird INJ No. 01

Table 6-3 provides the plugging details for Mockingbird INJ No. 01 (LAC43: XVII **§3631.A.3.e**, **f**, **g**, and **h**); *Appendix F* shows the final plugged schematic.



6.4.2.4 Plugging Details, Mockingbird INJ No. 02

Table 6-4 provides the plugging details for Mockingbird INJ No. 02 (LAC43: XVII **§3631.A.3.e**, **f**, **g**, and **h**); *Appendix F* shows the final plugged schematic.

[redacted]

6.4.2.5 Plugging Details, Mockingbird INJ No. 03

Table 6-5 provides the plugging details for Mockingbird INJ No. 03 (LAC43: XVII **§3631.A.3.e**, **f**, **g**, and **h**); *Appendix F* shows the final plugged schematic.

[redacted]

[redacted]

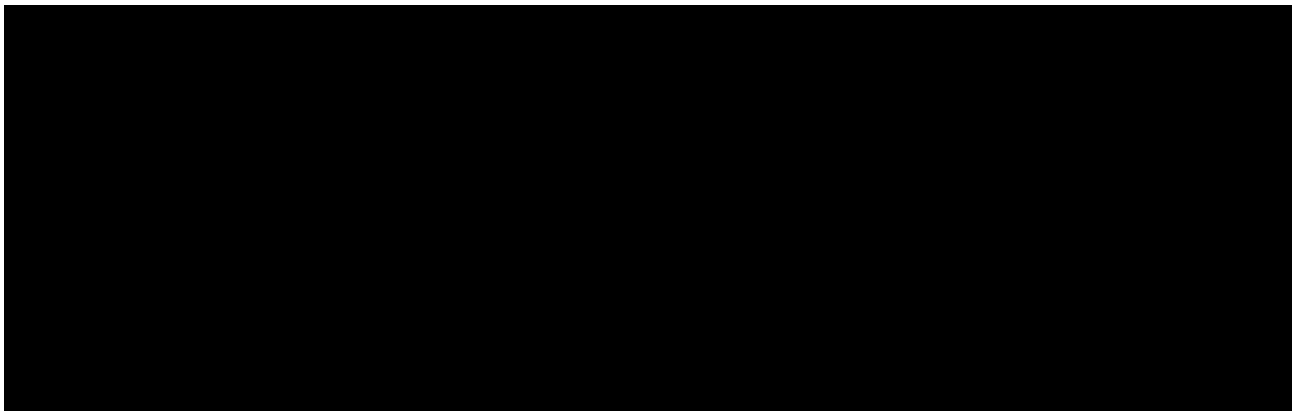
[redacted]

6.4.2.6 Plugging Details, Mockingbird INJ No. 04

Table 6-6 provides the plugging details for Mockingbird INJ No. 04 (LAC43: XVII **§3631.A.3.e**, **f**, **g**, and **h**); *Appendix F* shows the final plugged schematic.

[redacted]

[redacted]



6.5 Notifications and Record Keeping

The procedures described above are subject to modification during execution. ExxonMobil will submit a revised plan to the Commissioner in the event that changes to the approved plugging plan are necessary. Completed plugging forms, records, and lab information will be supplied to the regulatory agencies as required by the permit. In accordance with LAC43: XVII **§3631.A.5**, a well closure report, including a Form UIC–P&A or successor form, will be filed with the LDENR within 30 days after plugging and abandonment.

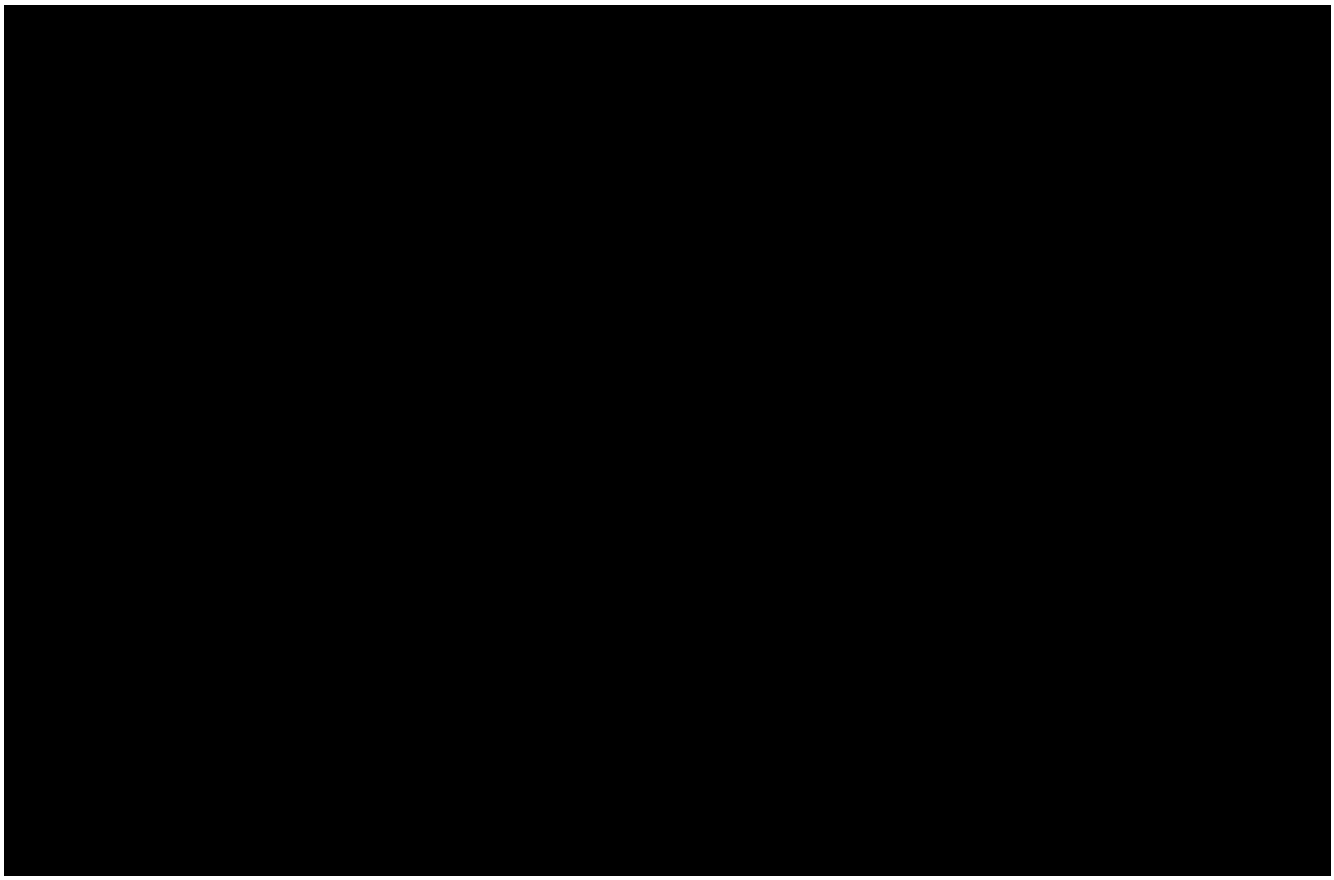
Well plugging reports, PISC data—including data and information used to develop the demonstration of the alternative PISC time frame—and the site closure report collected pursuant to the requirements in LAC43: XVII **§3633.A.6** and **8**, will be retained by ExxonMobil. Site closure and reporting are discussed in *Section 7 – Post-Injection Site Care and Site Closure Plan*.

The plugging report will provide the following information:

- Results of tests to determine BHP and mechanical integrity
- Type and number of plugs used
- Cement type, yield, grade, weight, and quantity of material for plugs
- Method of cement plug emplacement
- Top and bottom of each cement plug
- Post-P&A schematic

6.6 Monitoring Well P&A

Monitoring wells must be plugged in accordance with LAC43: XVII **§3633.A.5**, to not allow movement of injection or formation fluids that could endanger USDWs. Specific monitoring wells will remain in place after the proposed injection wells have been plugged and abandoned for use in monitoring activities associated with the Post-Injection Site Care and Site Closure Plan. ExxonMobil will assess the monitoring well plugging procedures prior to P&A in relation to this plan. Documentation of appropriate P&A of the monitoring wells will be submitted to the Commissioner in accordance with LAC43: XVII **§3633.A.6.a**.



[redacted]

6.7 Amendments to the P&A Plan

The Injection Well Plugging Plan will be amended to account for changes in conditions that trigger modification to the AOR. ExxonMobil will inquire with the Commissioner to confirm whether such changes in conditions warrant amendments to this plan. Revisions to the plan can be made at any time and submitted when notifying the Commissioner of the intent to plug the wells prior to conducting the plugging activity (LAC43: XVII **§3631.A.4**).

[redacted]

Appendix F – Well Plugging Plan

- See Section 0 – Application Narrative for PE Stamp Cover Page

Appendix F1 – Plugging Schematics