



June 7, 2024

David Albright
Manager, Groundwater Protection Section
United States Environmental Protection Agency Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Re: Response to Request for Additional Information, Potential Project Interference with the Pelican Renewables and CTV III Projects (March 11, 2024)
Carbon TerraVault Holdings LLC (CTV) V Project
Underground Injection Control (UIC) Permit Application
Class VI Pre-Construction Permit Application No. R9UIC-CA6-FY23-6.1 to 6.6

Dear Mr. Albright:

Carbon TerraVault Holdings LLC (CTV) has prepared this response to the U.S. Environmental Protection Agency Region IX ("EPA") CTV V Class VI Permit Application Request for Additional Information dated March 11, 2024. A technical response to the request for a project interference study is attached to this letter. In addition we have revised the CTV V Class VI permit application Appendix 9 to present a risk-based area of review (AoR) analysis. Revised Appendix 9 includes two reports, including (1) a risk-based brine leakage and aquifer impact modeling study and (2) an abandoned well fluid migration analysis prepared by Irani Engineering. The Irani Engineering report was originally prepared for the CTV III project; however, it is also pertinent to CTV V because the two projects are located in the same vicinity.

Based on the risk-based AoR approach, updated CTV V permit application materials will include the extent of the carbon dioxide (CO₂) plume areas as the AoR. Revised AoR maps will be included separately with the updated permit application materials in response to the EPA CTV V technical comment letter dated May 24, 2024.

An updated version of CTV V Appendix 9 and a copy of this letter have been uploaded to the GSDT, and are also submitted via email.

Sincerely,

CARBON TERRAVALT HOLDINGS LLC

Faisal Latif

Faisal Latif
Technical Manager

CTV V Interference Effects

CTV conducted a study to understand the possible interference effects of the Pelican Renewables Class VI project and the CTV III Class VI project on the CTV V project area. The CTV V project is expected to inject a total of 10.3 MMT of carbon dioxide (CO₂) into the Mokelumne River Formation using three injectors. The Pelican Renewables Class VI permit proposes to inject a total of 40 MMT of CO₂ using two injectors. Further South the CTV III project proposes to inject a total of 70.3MMT of CO₂ into the Mokelumne river formation using six injectors. Through the study, CTV has investigated the effect of the simultaneous injection of these three projects into the Mokelumne River Formation on cumulative pressure increase in the project area. Figure 1 depicts the location of the three Class VI permits in the Mokelumne River formation.

CTV V modeling work was submitted to EPA for review on 12/13/2023, including a geo-model that was built using Schlumberger Petrel. Supercritical CO₂ injection into the saline formation using 3 Mokelumne injectors was simulated with Schlumberger Eclipse reservoir modeling package. The extent of the CTV V geo-model overlaps with the Pelican Renewables Rindge Tract acreage, and hence for this model update the exact locations of the two Pelican injectors were identified and added to the simulation model. Table 1 lists the location of the injectors and their operating conditions, where information on Pelican Renewables injectors was obtained from the Pelican Renewables Class VI permit application.

Because the distance between the CTV V model southern edge and nearest CTV III well is more than 6 miles, the CTV III project is outside of the CTV V model domain. Therefore the effect of CTV III injection on CTV V was accounted for using the application of a numerical aquifer with elevated pressure on the southern boundary of the CTV V model. The inputs for this aquifer were based on the CTV III interference study submitted to the EPA for review on 05/24/2024. All other CTV V boundary conditions were kept the same as the original reference case and are consistent with the original CTV V permit application submission.

To account for the CTV III project, an excess pressure is applied on the Southern CTV V model boundary and is varied with time increasing from 25 pounds per square inch (psi) to a peak incremental pressure of 150 psi (to cover the CTV III injection period), and is then reduced over the 100 years post injection period (Figure 2). In the model set up, the two CTV projects inject simultaneously, where the peak pressure from CTV III is observed after 28 years of injection on the model's Southern boundary. A corresponding average aquifer flux of 86 barrels per day per psi (STB/d/psi) was estimated to account for the fluid displaced by the CTV III injection into the CTV V project area, which was consistent with the volume of injected CO₂ in CTV III at reservoir conditions.

The Southern boundary pressure head is overcome by CTV V and Pelican Renewables injection leading to a negative aquifer flux (reservoir brine flowing south out of the CTV model area) during the injection period, and during the 100 years post injection. As shown in the pressure increase map (Figure 3) there will be an increased pressure in the CTV V project area at the peak injection/pressure time step of the project; however, the pressure increase is not in excess of what is evaluated in the risk based Area of Review (AoR) study also attached with this response (Appendix 9: CTV V Risk based AoR Reports).

The CTV V Mokelumne River Formation plume is not expected to migrate south due to the local bed dips and effects of the Meganos canyon erosion. The simulation results confirm this and show negligible to no plume encroachment on Rindge Tract.

The above described interference study adequately captures the interference and cumulative effects of the CTV III and Pelican Renewables projects on the CTV V project.

Table 1. List of injectors for CTV V and Pelican Rindge Tract storage projects

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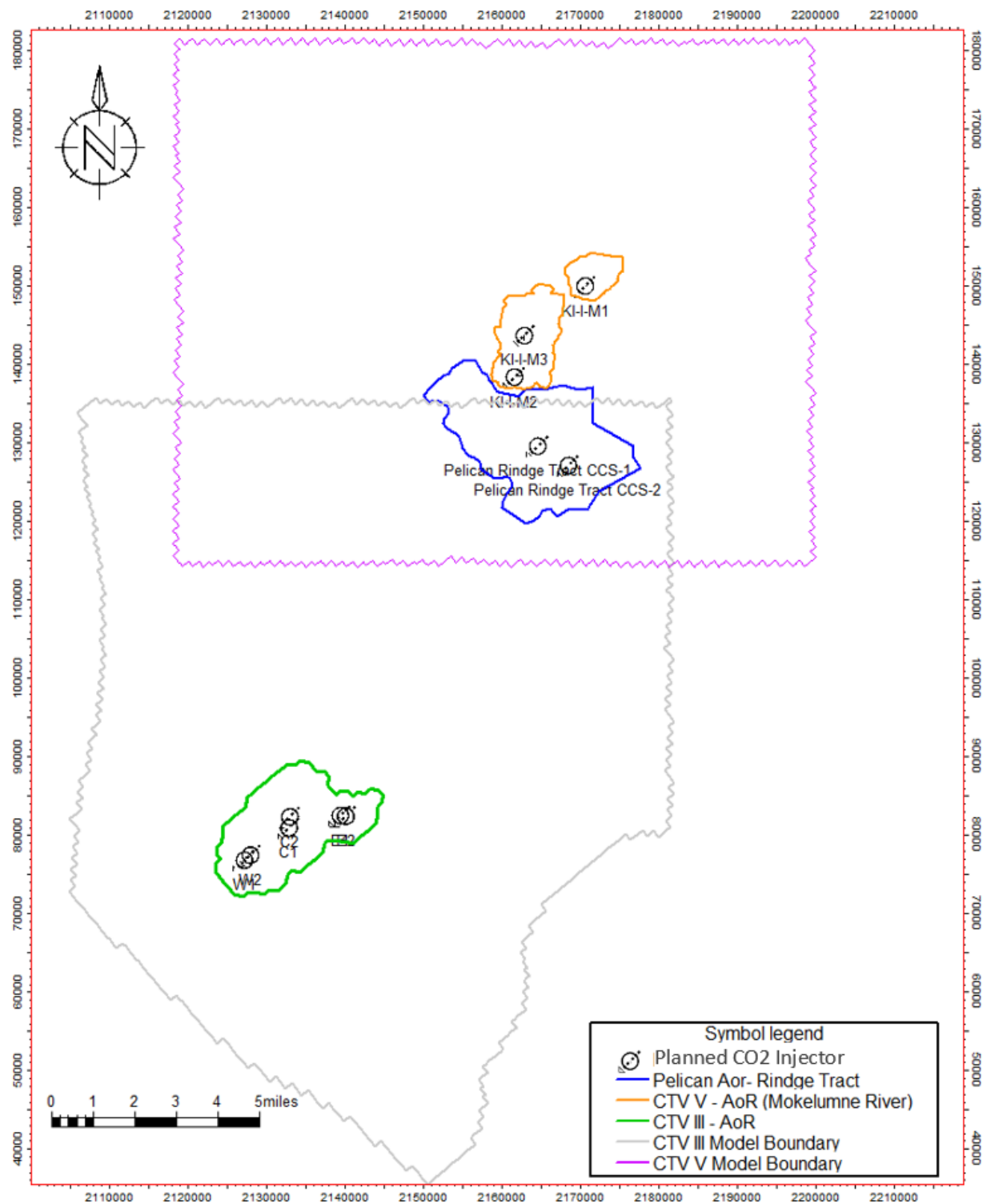


Figure 1. CTV V, CTV III and Pelican Rindge Tract storage projects in the Mokelumne River formation

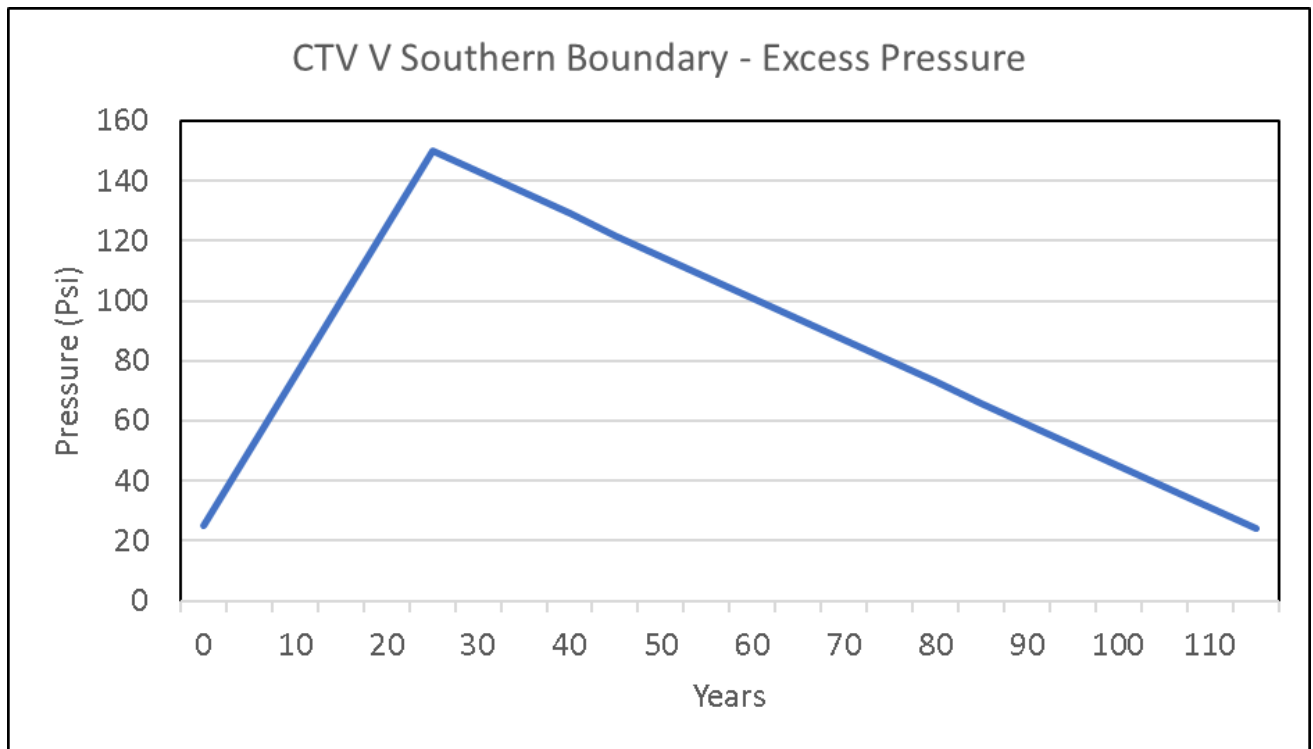


Figure 2. Incremental pressure applied at the southern boundary of the CTV V model to account for the effects of CTV III injection

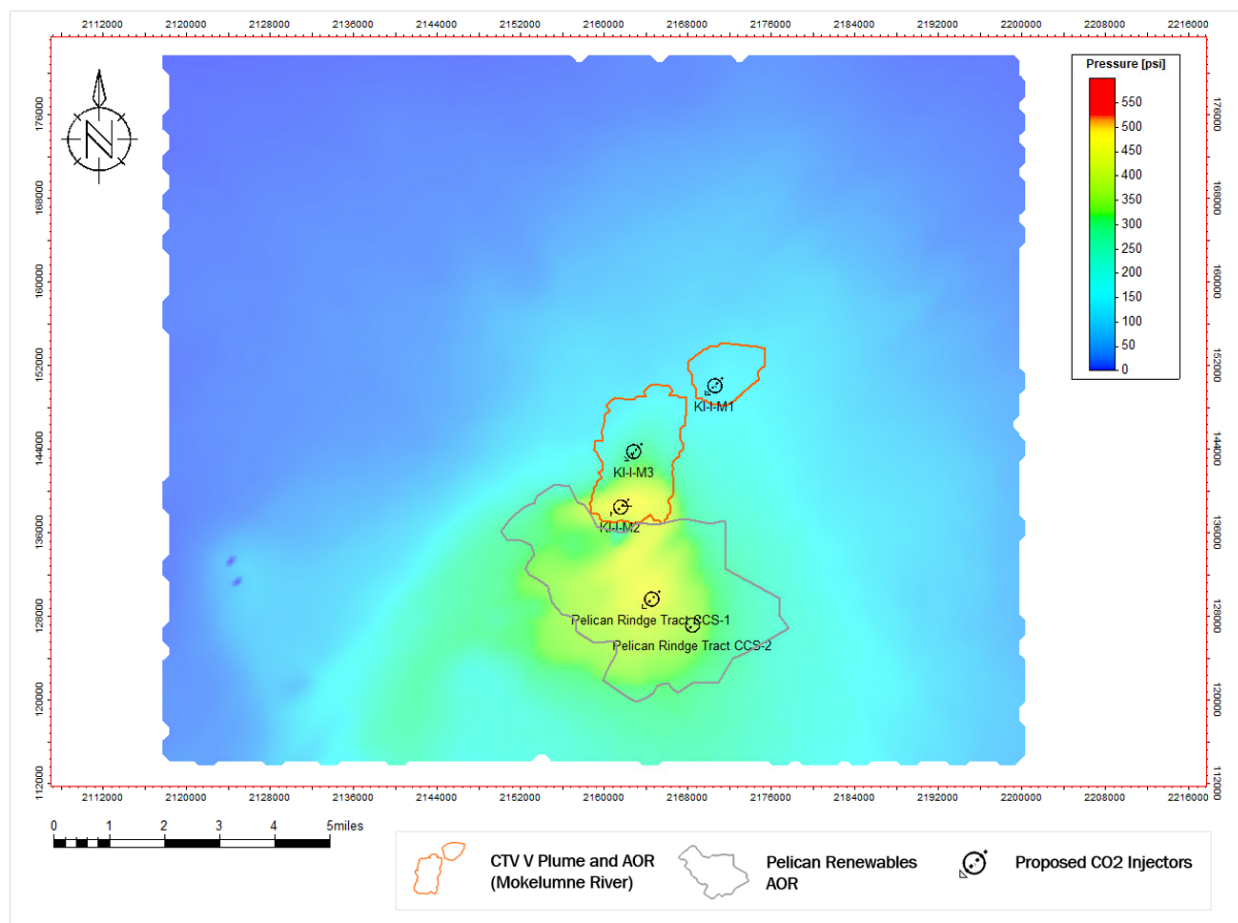


Figure 3. CTV V Average incremental pressure map for the peak injection/pressure time step