

Enclosure 1 - Evaluation of CTV's May 2025 Responses
August 2025

*Carbon TerraVault Holdings LLC (CTV) II Project
Underground Injection Control (UIC) Permit Application
Class VI Pre-Construction Permit Application No. R9UIC-CA6-FY22-4.1-4.5*

EPA Region 9 has evaluated CTV's May 2025 responses to our comments on various modules of the CTV II Class VI permit application. Below please find our follow-up requests/comments for CTV regarding the responses.

I. Requests regarding CTV May 2025 responses to comments on Attachment B: Area of Review (AoR) & corrective action plan

According to Section 2 of Attachment B, CTV proposed the AoR to be the areal extent of the CO₂ plume at 100-year post-injection plus a 500-foot buffer zone ("the existing AoR").

1. *Please provide in Attachment B a figure that shows, on a base map, the contour of the critical pressure front and the contour of the separate-phase CO₂ plume at 100-year post-injection.*
2. *Please also provide in Attachment B a figure using the same base map that shows the contour, which encompasses the maximum extent of the contour of the critical pressure front or the contour of the separate-phase CO₂ plume at 100-year post-injection. The areal extent surrounded by this contour delineates the AoR ("the updated AoR").*
3. *In the case that the updated AoR is not entirely encompassed by the existing AoR:*
 - a. *please identify any wellbores that penetrate the confining zone within the updated AoR but outside the existing AoR;*
 - b. *please replace the existing AoR with the updated AoR on all application figures that show the existing AoR as the AoR; and*
 - c. *please replace the text descriptions of the existing AoR with descriptions of the updated AoR in all application attachments and appendices.*

According to Section 3 of Attachment B and Appendix 7, CTV identified through internal databases and California Geologic Energy Management Division (CalGEM) web-based databases, 28 wellbores within the existing AoR: 16 wellbores require plugging and abandonment (P&A) prior to injection, 3 wellbores require corrective action prior to injection, 4 wellbores are proposed for monitoring well conversion, and 5 wellbores require no action. CTV provided in Appendix 9 the current and proposed post-corrective action wellbore diagrams for the 3 wellbores requiring corrective action.

Section 4.2 of EPA's UIC Class VI Well AoR and Corrective Action Guidance discusses four stages of an abandoned well investigation within the AoR¹: historical research, site reconnaissance, review of aerial and satellite imagery, and one or more geophysical surveys. The Guidance recommends applicants begin by reviewing state and local databases, as this can provide a list of known abandoned wells and informs any subsequent identification efforts.

¹ See pages 52-56 at <https://www.epa.gov/sites/default/files/2015-07/documents/epa816r13005.pdf> for details about the four stages of an abandoned well investigation with the AoR.

While many states have digitized their records, older well data might not be readily available in digital formats, requiring searches in separate locations or media types. Site reconnaissance follows, where local residents and property owners are interviewed, and physical searches are conducted for surface features indicative of abandoned wells, such as well derricks, access roads, and brine pits. Aerial and satellite imagery reviews are recommended for identifying abandoned wells, utilizing historical aerial photographs and satellite images to detect surface features associated with drilling activities. These images can reveal drill derricks, rig platforms, and spatial patterns indicative of well sites. Geophysical surveys supplement these identification methods, employing techniques like magnetic, ground penetrating radar, and electromagnetic methods to detect abandoned wells.

4. *Please supplement the records review of the CalGEM well databases with a review of aerial and satellite imagery to identify any abandoned wells that may penetrate the confining zone within the updated AoR. Provide a rationale if CTV believes a review of aerial and satellite imagery is infeasible or unnecessary for this project.*
5. *Please add to the Well Table (Appendix 7):*
 - a. *columns with information about each wellbore's location, depth, construction, and record of plugging and/or completion; and*
 - b. *the information about any additional wellbores identified according to Requests 3a and 4 above.*
6. *Please provide in Attachment B a figure showing the locations of all the wellbores listed in Appendix 7, including any additional wellbores identified according to Requests 3a and 4 above.*
7. *Please provide in Appendix 8 (P&A Procedure) the current and proposed post-P&A wellbore diagrams for the 16 wellbores that require plugging and abandonment prior to injection.*
8. *Please provide in Attachment B the current and proposed post-conversion wellbore diagrams for the 4 wellbores CTV proposed to be converted to monitoring wells.*
9. *Please provide in Attachment B wellbore diagrams that illustrate the current wellbore condition of the 5 wellbores CTV proposed to take no action on.*
10. *Please provide in Attachment B wellbore diagrams that illustrate the current wellbore condition of any additional wellbores identified according to Requests 3a and 4 above.*
11. *Please provide documentation of all the well records CTV reviewed for the 28 wellbores and any additional wellbores identified according to Requests 3a and 4 above.*

II. Requests regarding CTV May 2025 responses to comments on well operation and construction plans

1. *Please add to Tables 1 through 5 of Appendix 4 (Operational Procedures) the maximum surface and downhole annulus pressures for each injector.*

2. *For UI-INJ-5, the average surface injection pressure is greater than the average surface annulus pressure in Table 5 of Appendix 4. Please propose an average surface annulus pressure that meets the requirements of 40 CFR 144.88(c).*
3. *Please update the tables that contain injection well operating conditions in Appendix 12 (Summary of Requirements) to be consistent with Tables 1 through 5 of Appendix 4. For example, the Appendix 12 tables provided no average injection and annulus pressures for surface and downhole, and no information on where (surface or downhole) the casing/tubing pressure differential will be measured at and whether the pressure differential is an average or maximum value.*
4. *No updated Attachments G1 through G5 mentioned in the response were found. Please provide the updated attachments.*

III. Requests regarding CTV May 2025 responses to comments on Appendix 10: critical pressure calculation

1. *Please double check the model results showing on Figure 3 of Appendix 10, as pressure fronts over time would generally become smaller further away from injection wells. Update Figure 3 as necessary or explain why the modeled pressure fronts over time are getting larger away from the injection wells.*
2. *Except for Figure 3, all figures in Appendix 10 that contain pressure information showed a North-South flow barrier. Please clarify the inconsistency.*
3. *Please highlight on Figure 3 of Appendix 10 the contour corresponding to the critical pressure front.*
4. *Please highlight on Figure 4 of Appendix 10 the contour corresponding to the pressure difference in critical pressure front.*

IV. Requests regarding CTV May 2025 responses to comments on Appendix 13: corrosion modeling and material selection for injection and monitoring wells

1. *Please clarify if Table 4 and Table 5 of Appendix 13 summarize the corrosion impact of various corrosion resistant alloy (CRA) materials on well tubing only. If so, please provide similar tables that summarize the corrosion impact of the CRA materials on casing and downhole equipment of the injection and monitoring wells.*
2. *Please clarify if the degradation front for Portland cement over time shown on Figure 5 of Appendix 13 is representative for Class G Portland cement. If not, please provide a similar figure for Class G Portland cement.*

3. *Please provide documentation of well component specifications, including the thickness of the tubing and casing selected for injection and monitoring wells, and their manufacturer's tolerance for wall thickness.*

In its response, CTV requested detailed information regarding the EPA evaluation of Portland cement, including the findings of the internal EPA review. CTV also requested copies or citations of the scientific literature and industry standards referenced in the evaluation.

EPA response: For the information CTV requested, please refer to the email titled UIC Class VI Well Materials - CTV II UIC Permit Application, from David Albright of EPA Region 9 to Faisal Latif of CTV, dated September 3, 2024.

V. General comments

CTV shall revise as necessary other application attachments and appendices that are not mentioned in the requests above, such as the testing and monitoring plan, emergency and remedial response plan, and financial responsibility document to reflect AoR updates, and identification and assessment of any additional wellbores. For instance, CTV may need to adjust locations of the proposed monitoring wells or increase the cost estimate for well corrective action, which in turn requires a revision of the monitoring plan or the financial responsibility document.