



REGION 9

SAN FRANCISCO, CA 94105

November 13, 2024

Sent electronically only

Travis Lane
Chief Executive Officer
Tulare County Carbon Storage Project LLC

Re: Administrative Review – Notice of Incomplete Application
Tulare County Carbon Storage Project (TCCSP)
Underground Injection Control (UIC) Permit Application
Class VI Pre-Construction Permit Application No. R9UIC-CA6-FY25-1.1-1.2

Dear Travis Lane:

The United States Environmental Protection Agency, Region 9 (EPA), pursuant to 40 CFR §124.3(c), has conducted an administrative review of the subject permit application, prepared by the Tulare County Carbon Storage Project LLC (TCCSP), for two (2) proposed injection wells located in Tulare County, California. EPA's review included TCCSP's initial application submitted on October 7, 2024, and the corrected version of the post-injection site care and site closure plan submitted on October 15, 2024, via the Geologic Sequestration Data Tool. EPA determined that the application is incomplete. The additional information needed to make the application administratively complete and deficiencies that need to be addressed are described in the Enclosure to this letter.

Please submit the requested information by December 13, 2024. If you have any questions about this letter, please contact Calvin Ho at (415) 972-3262, or call me at (415) 972-3971.

Sincerely,
/s/ November 13, 2024

David Albright
Manager, Groundwater Protection Section

Enclosure

cc (via email): Chris Jones, CalGEM Central District
Alex Olson, Central Valley Regional Water Quality Control Board
Janice Zinky, California State Water Resources Control Board
Jason Dunn, California State Water Resources Control Board

ENCLOSURE

Request for Additional Information

1. General Application Information

- a. Please clarify which map in the application depicts all the information required in [40 CFR 146.82\(a\)\(2\)](#). If the required information is depicted in more than one map, please create one single map that includes all the required information. If particular features are not present, please clarify they are not present.
- b. Please provide, in the application narrative, a list of contacts for those States and Territories identified to be within the area of review (AoR) of the Class VI project. See [40 CFR 146.82\(a\)\(20\)](#).

2. Site Characterization Information

- a. Please provide, under the Seismic History section of the application narrative, a determination that the seismicity would not interfere with containment. See [40 CFR 146.82\(a\)\(3\)\(v\)](#).
- b. Please clarify which maps and stratigraphic cross sections indicate the direction of water movement, as required in [40 CFR 146.82\(a\)\(5\)](#).
- c. EPA understands that the applicant is collecting additional site-specific data, as outlined in [40 CFR 146.82\(a\)\(3\)\(iii\)](#), from a stratigraphic test well. Please update the application with AoR modeling, sensitivity analyses, geochemical analyses, and geomechanical analyses from the additional site-specific data collected.

3. Post-Injection Site Care (PISC) and Site Closure Plan

- a. Only Injector 2 is shown on Figures 9-3, 9-4, and 9-6. Please clarify whether these figures show the aggregated views of the predicted position of the carbon dioxide (CO₂) plume and/or the pressure buildup plume for both Injector 1 and Injector 2. See [40 CFR 146.93\(a\)\(2\)\(ii\)](#).
- b. Please include, in the PISC and site closure plan, documentation of the results of laboratory analyses, research studies, and/or field or site-specific studies to verify the information required in 40 CFR 146.93(c)(iv)-(v). See [40 CFR 146.93\(c\)\(1\)\(vi\)](#).

4. Injection Well Construction Information

- a. Please provide, under the Construction Procedures section of the application narrative, information on external pressure, internal pressure, and axial loading associated with the casing and cementing of each injection well. See [40 CFR 146.86\(b\)\(1\)\(ii\)](#).
- b. Please provide, under the Construction Procedures section of the application narrative, information on corrosiveness of the CO₂ stream and formation fluids. See [40 CFR 146.86\(b\)\(1\)\(v\)](#).
- c. Please provide, in the project narrative and testing and monitoring plan, a description of the alarms and automatic surface shut-off systems, and a depiction of the systems on well schematics. See [40 CFR 146.88\(e\)\(2\)](#).

5. UIC Class VI Well Materials

Under the Class VI regulations ([40 CFR Part 146 Subpart H](#)), injection and in-zone monitoring wells must be designed and built to withstand a potentially corrosive environment and prevent the endangerment of underground sources of drinking water (USDWs) for the life of the Class VI project. Based on internal EPA reviews of recent scientific literature and industry standards, and in consultation with EPA's Office of General Counsel, EPA Headquarters has determined that certain materials, including some Portland cement and Chromium-13 casing/tubing, are likely

not suitable for construction of these wells, particularly under potentially corrosive conditions when both water and CO₂ are present.

Factors dictating the presence of a corrosive environment are multifaceted and complex, making the selection of appropriate well construction materials a site-specific process that depends on, among other things, the composition of formation fluids and the CO₂ stream. Under acidic conditions, construction materials must be made of alloys that are able to withstand potential pH values below 2.5. Examples of such alloys include Chromium-25 and Hastelloy C-22, which are generally better suited to environments in which both water and CO₂ are present, either from formation fluids mixing with CO₂ or from water present within the CO₂ stream itself.

EPA is assessing each application to determine the appropriateness of alloys proposed for use in the construction of all injection and in-zone monitoring wells. Such reviews consider, among other things, the subsurface environment, project lifespan, and CO₂ stream composition ([40 CFR 146.86\(b\)](#)).

- a. Since the applicant proposes to use a less corrosion resistant alloy for injection and in-zone monitoring well construction, EPA requests that the applicant provide a project-specific justification for the use of the proposed alloy.
- b. To support the use of a less corrosion resistant alloy, EPA requests the applicant to submit a demonstration that must include, at a minimum, corrosion modeling over the timescale of the project in addition to the provision of site-specific information required by [40 CFR 146.82](#). Any corrosion modeling must consider the site-specific chemistry, including the CO₂ stream and formation fluids, as well as consider possible stress cases in addition to normal operations and any other relevant factors.

A few recent references¹ the applicant may find useful in evaluating the appropriateness of a chosen alloy are provided in the footnote below. *Note that the EPA and its employees do not endorse any non-federal entity on this list, nor their products, services, or enterprises. Providing links to a non-EPA website is for informational purposes only and the EPA cannot attest to the accuracy of the other site or the information it contains. Also, be aware that the privacy*

¹ References

- [AMPP Guide 21532-2023](#) (2023). Guideline for Materials Selection and Corrosion Control for CO₂ Transport and Injection.
- [Det Norske Veritas \(DNV\)](#) (2011). CO₂ Wells: Guideline for the Risk Management of Existing Wells at CO₂ Geological Storage Sites. DNV Report No. 2011-0448.
- [IEAGHG Technical Report 2018-08](#) (November 2018). Well Engineering and Injection Regularity in CO₂ Storage Wells.
- [Bilio et al](#) (2009). Institution of Chemical Engineers. CO₂ Pipelines Material and Safety Considerations. Symposium Series No. 155. 423-429.
- [Craig et al](#) (2023). International Journal of Greenhouse Gas Control. Guidelines for the Selection of Corrosion Resistant Alloys for CCS and CCUS Injection Wells.
- [Halseid et al](#) (2014). Energy Procedia. Corrosion and Bulk Phase Reactions in CO₂ Transport Pipelines with Impurities: Review Of Recent Published Studies. Vol 63; 2557-2569.
- [Morland et al](#) (2022). International Journal of Greenhouse Gas Control. Experimental Based CO₂ Transport Specification Ensuring Material Integrity. Vol 119.

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6. **Source(s) of Carbon Dioxide Stream**²

EPA's regulations for Class VI permits require the owner or operator, prior to the issuance of a permit for the construction of a Class VI well, to submit information about the source(s) of the CO₂ stream and an analysis of the chemical and physical characteristics of the CO₂ stream. See [40 CFR 146.82\(a\)\(7\)\(iii\) and \(iv\)](#). Such information is necessary for the applicant to demonstrate that the CO₂ stream is compatible with fluids and minerals in both the injection and the confining zones, and the well construction materials. In addition, this information is needed to properly model the AoR and to inform the project specific testing and monitoring plan. Although the applicant provided in the application specifications of the anticipated CO₂ stream composition, EPA needs more detailed information about the source(s) of the CO₂ stream and requests the applicant to provide:

- a. Identification of specific sources (e.g., a chemical plant) of the CO₂ stream that are finalized and under consideration.
- b. The approximate distance between each source and the injection facility, and method(s) for CO₂ stream transport.
- c. A laboratory analysis³ of the chemical and physical characteristics of the CO₂ stream from each identified source, which includes but is not limited to the items below:
 - A list of chemicals analyzed, including CO₂ and other constituents in the CO₂ stream (e.g., sulfur oxides, hydrogen sulfide, nitrogen oxides, oxygen, nitrogen, hydrogen, carbon monoxide, amines, methane, ethane, glycol, water content, etc.), with mass percentages of the constituents in the CO₂ stream;
 - A description of the sampling methodology;
 - Any laboratory analytical parameters and methods used, the name of the laboratory performing the analysis, and official laboratory analytical reports including sample chain-of-custody forms;
 - All sample dates and times;
 - A tabulation of all available CO₂ stream analyses, including any quality assurance/quality control samples;
 - Interpretation of the results with respect to UIC Class VI regulatory requirements (e.g., the compatibility of the CO₂ stream with fluids in the injection zone(s) and minerals in both the injection and the confining zones, and with well construction materials).
- d. A description of how the chemical and physical characteristics of the CO₂ stream that are based on the results of the laboratory analyses are incorporated into the AoR

² Carbon dioxide stream means carbon dioxide that has been captured from an emission source (e.g., a power plant), plus incidental associated substances derived from the source materials and the capture process, and any substances added to the stream to enable or improve the injection process. This subpart [subpart H of 40 CFR Part 146] does not apply to any carbon dioxide stream that meets the definition of a hazardous waste under 40 CFR Part 261. See 40 CFR 146.81(d).

³ For future sources, a carbon dioxide stream study may be conducted using industry-recognized process modeling software to characterize and understand the chemical and physical properties of the carbon dioxide stream. The modeler should be knowledgeable about the industrial processes of the facility where the carbon dioxide stream will be sourced from.

modeling, and updated AoR modeling, if necessary, to account for the data derived from the laboratory analyses of the CO₂ stream.

General Considerations

Please note that the information described in the sections below are not considered as part of the EPA's administrative completeness evaluation but should be considered by the permit applicant early in the UIC permitting process.

Considerations of Community Engagement and Environmental Justice

The permit application the applicant submitted to EPA's Geologic Sequestration Data Tool (GSDT) contains significant redactions due to confidential business information (CBI) claims. The redactions prevent public awareness of fundamental project information, such as a map showing the precise location of the proposed injection and monitoring wells. The redacted information also includes the applicable AoR, the geologic structure and hydrogeologic properties of the proposed storage site and overlying formations including the proposed injection and confining zones, all identified wells within the AoR, baseline geochemical data on subsurface formations including all underground sources of drinking water in the AoR of the proposed storage site, and certain proposed operating data including average and maximum injection pressure.

As you are aware, numerous communities and organizations have submitted comments to EPA regarding pending applications for UIC Class VI permits. These groups want to ensure that the public participation process is transparent and that the permits are protective of underground sources of drinking water. Further, EPA wants to ensure that environmental justice considerations, as appropriate, are incorporated into all aspects of the permitting process. We strongly believe that communities, including communities with environmental justice concerns, need to be fully informed, as early as possible, about the fundamentals of proposed carbon storage projects to enable equitable public participation in the permitting process. Please note that in instances where an applicant maintains confidentiality claims over fundamental project information, such as the location of the project, beyond the administrative review phase of the permitting process, EPA may defer or pause its technical evaluation of the application until such CBI claims are released by the applicant.

Considerations of Other Federal Laws

40 CFR 144.4 requires that EPA consider the potential applicability of several other federal laws, including the Wild and Scenic Rivers Act (WSRA), National Historic Preservation Act (NHPA), Endangered Species Act (ESA), Coastal Zone Management Act (CZMA), and the Fish and Wildlife Conservation Act (FWCA). Below is some guidance for specific consideration of ESA and NHPA compliance.

Endangered Species Act (ESA)

The ESA requires EPA to ensure, in consultation with the U.S. Fish and Wildlife Service (FWS), that any action authorized by EPA is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat. To facilitate EPA's consideration of ESA compliance, EPA suggests that the permit applicant use FWS's project planning tool to map out their project area and do a search for potential endangered species within the project area. The tool can be accessed here: <https://ecos.fws.gov/ipac/>.

Based on the results of the search, the permit applicant may need to hire a Wildlife Consultant to provide additional analysis or otherwise show how their project will not cause harm to endangered species with habitat located near the project site. Please provide a report depicting the results of the FWS project planning tool, including a map of the project area and any listed endangered or threatened species habitat near the site. Please include any comments or reports made by a Wildlife Consultant, if applicable.

National Historic Preservation Act (NHPA)

NHPA §106 requires a federal agency to take certain steps before it commits to any "undertaking," including the issuance of a permit or license, that has the potential to adversely affect property that is listed, or eligible for listing, in the National Register for Historic Places. The NHPA requires EPA, before issuing a permit, to adopt measures when feasible to mitigate potential adverse effects of the permitted activity and properties listed or eligible for listing in the National Register of Historic Places. The Act's requirements are to be implemented in cooperation with State Historic Preservation Officers and upon notice to, and when appropriate, in consultation with the Advisory Council on Historic Preservation.

To facilitate EPA's consideration of NHPA compliance for a proposed project, EPA suggests that the permit applicant identify the Historic Places designated in the National Register for Historic Places (<https://www.nps.gov/subjects/nationalregister/database-research.htm>) in close proximity to the project site. Based on the results of their review of the National Register of Historic Places listings in the county where the project site is located, the permit applicant may need to hire an archaeologist to provide additional analysis or otherwise show how their project will not adversely affect the identified historic places located near the project site. Please provide a list of the Historic Places near the project site. Please include any comments or reports made by an archaeologist, if applicable.

Considerations of Pore Space Rights for CO₂ Injection and Storage

Although it is not under EPA's authority, many local or state authorities such as county planning and resource management agencies may not approve an application for a carbon capture and storage project until the project developer demonstrates they have secured the necessary pore space rights from surface owners whose properties overlie the AoR. To facilitate EPA's understanding of this important project-related consideration, EPA strongly encourages that the applicant provides evidence of secured pore space rights in the UIC Class VI permit application.