ENVIRONMENTAL APPEALS BOARD
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C.

In re	)	
Pratt Zero Carbon, LLC	)	**UIC Appeal No. 26-03**
Pratt Energy CCUS #1 (PECCUS-1)	)	
Pratt County, Kansas	)	
Class VI UIC Permit No. KSS151570001	)	

RESPONSE OF PRATT ZERO CARBON, LLC TO PETITION FOR REVIEW

ATTACHMENT 8

REGION 7
LENEXA, KS 66219

December 11, 2025

Mr. David Mog
Plant Manager
Pratt Energy, LLC
10333 NE 30th St.
Pratt, Kansas 67124

Re: Request for Additional Information – 01v1
Underground Injection Control Class VI Permit Application No. KSS151570001

Dear Mr. Mog:

We received your application for an Underground Injection Control Class VI permit on November 30, 2023. On May 23, 2024, we sent you a letter indicating that your application is complete, as specified at Chapter 40 of the Code of Federal Regulations Part 124.3(c). Today, we are sending you a request through the Geologic Sequestration Data Tool for additional information needed to clarify, modify, or supplement the previously submitted material. See 40 C.F.R. Part 124.3(c). We are unable to continue processing key components of your permit application until we receive this additional information.

The items of necessary clarification, modification, and supplementation are provided as an enclosure to this letter.

Please submit the information requested above by 30 days from the date of this letter. If you are unable to provide the information by this date, you may (a) provide an alternative date by which you will provide the requested information and justification for why the information cannot be provided by the deadline, or (b) withdraw your application until you have all of the required information. If option (b) is chosen, once you have all of the necessary information, you may resubmit your full permit application at any time.

You may assert a confidentiality claim on information that contains trade secret, proprietary, or confidential business information (collectively Private Business Information) on data submitted to the Environmental Protection Agency pursuant to 40 C.F.R. Part 2.203(b). If a PBI claim does not accompany the information at the time it is submitted to the EPA, then the Agency may make the information available to the public without further notice. See 40 C.F.R. Part 2.203(c); 41 Fed. Reg. 36,902 (September 1, 1976).

If, by 30 days from the date of this letter, we do not receive the requested information or notification regarding a request for extension, and if you do not withdraw your application, the EPA may consider initiating the process to deny your permit application. See 40 CFR Part 124.6.

Please note that, to ensure the protection of underground sources of drinking water, the Safe Drinking Water Act Section 1421 prohibits underground injection which is not authorized by rule or a permit issued by the EPA or an authorized State. Safe Drinking Water Act, 42 U.S.C. 300h(b)(1)(A); 40 C.F.R. 144.11.

Thank you for your continued cooperation during the technical review process. If you have questions or would like to schedule a meeting to discuss this request, please contact Ben Meissner at Meissner.Benjamin@epa.gov or (913) 551-7992.

Sincerely,

NEFTALI HERNANDEZ-SANTIAGO

Digitally signed by NEFTALI HERNANDEZ-SANTIAGO
Date: 2025.12.11 16:09:39 -06'00'

Neftali Hernandez-Santiago
Supervisor
Groundwater and Drinking Water Branch

cc: Manoj Valluri
Project Manager, ARI, Inc.

(A) #	(B) Category	(C) Topic	(D) Comment/Question	(E) Response (Applicant)	(F) Follow-Up Question (Permitting Authority)	(G) Follow-Up Response (Applicant)
1	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Regional Geology and Geologic Structure	The lower confining unit on the type log is identified as a potential reservoir on the stratigraphic chart. Please revise.	Addressed in Section 1.2.1 in Figure 1-4. Now both zones are indicated as potential reservoir zones. Any mention of primary and secondary reservoirs and confining units has been removed.	No further questions.	
2	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Regional Geology and Geologic Structure	The Marmaton group is not described in this section. Please include this discussion.	Addressed in Addressed in Section 1.2.4 Injection and Confining Zone Details to provide details on the Marmaton.	No further questions.	
3	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Regional Geology and Geologic Structure	Shallower units are identified but not described in the permit application. Please include a discussion of these shallower formations.	Addressed in Section 1.2.4 Injection and Confining Zone Details to provide further descriptions of the shallow formations.	No further questions.	
4	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	AOR and Corrective Action	Consider re-locating the IZM well closer to the injection well for better data/resolution on the plume/pressure front mapping.	Addressed in Section 2.3.2 of the AoR and Corrective Action Plan to elaborate on the rationale for choosing the IZM well location far field from the injection well.	No further questions.	
5	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Maps and Cross Sections of the AoR	Considering historic drilling in the area, including boreholes which penetrate the proposed injection formations, additional research into undocumented boreholes/penetrations is needed.	Addressed in Section 2.4.1 of the AoR and Corrective Action Plan. The KGS online database alongside the Enverus online database and TGS360 online databases were used to locate deep artificial penetrations. Additionally, Pratt has worked with a local driller to gain further insights into the PECCUS-1 project area for deep well penetrations.	No further questions.	
6	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Injection and Confining Zone Properties	The method of modeling the porosity/permeability and lithology of both the injection zone and confining zones are not described sufficiently. Please elaborate on this.	Addressed in Section 1.2.4 under the Facies and Petrophysical Modeling subsection to explain the petrophysical property modeling methodology. This is explained at a high level, with specifics provided for in the AoR and Corrective Action Plan under Section 2.1.3, Static Earth Modeling Details.	No further questions.	
7	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Injection and Confining Zone Properties	Please provide information on the method used to develop the facies model.	Addressed in Section 1.2.4 under the Facies and Petrophysical Modeling subsection to explain the GR electro-facies model development using GR threshold values to delineate the different facies (i.e., carbonates from the mud rocks). This is explained at a high level, with specifics provided for in the AoR and Corrective Action Plan under Section 2.1.3, Static Earth Modeling Details.	No further questions.	
8	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Seismic History and Seismic Risk	While historic natural seismicity is discussed there is no discussion of induced seismicity included. Please discuss this within the permit application.	Addressed in Section 1.2.6. by evaluating seismic events reported by USGS since 2015 through 2024 within a search radius of 50 miles from PECCUS-1.	No further questions.	

9	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Hydrologic and Hydrogeologic Information	Please include a discussion of the characteristics of the primary aquifers providing drinking water (i.e., TDS).	Addressed in Section 1.2.7 Hydrologic and Hydrogeologic Information with the addition of information available on the primary aquifers.	No further questions.	
10	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Hydrologic and Hydrogeologic Information	Please provide and/or discuss geochemical information for the Shawnee formation.	Addressed in Section 1.2.8 Geochemistry. Site-specific geochemical data for PECCUS-1 is not available. Drilling and testing of the PE AZM-1 includes rock and fluid sampling and geochemical testing. These data will be included in subsequent iterations of this application.	No further questions.	
11	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Injection Zone Geochemistry	Please discuss if there will be a concern of trace metals being mobilized in the injection zone during operations.	Addressed in Section 1.2.8 by including discussion on possibility of trace metal mobilization as well as plan to evaluate such effects using site-specific data and geochemical modeling.	No further questions.	
12	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Mineralogy, Petrology, and Lithology of Injection and Confining Zones	Please provide discussion/information on the mineralogy and petrology of the injection and confining zones.	Addressed in Section 1.2.4 under the Mineralogy and Petrology of the Storage Complex subsection.	No further questions.	
13	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Mineralogy, Petrology, and Lithology of Injection and Confining Zones	Please provide characterization information on the middle and upper seal and upper sequestration reservoir (i.e., scientific articles, geologic surveys, core sample data, etc.).	Addressed in Section 1.2.4. While data from a nearby study were used for descriptions, logging and sampling activities from the PE AZM-1 well will provide site-specific descriptions. These data will be included in subsequent iterations of this application.	No further questions.	
14	**Geologic Site Characterization Narrative – Information Required under (146.82(a))**	Surface Air and/or Soil Gas Data	Please provide information on CO_2 levels in soil gas or at the surface, if known, or how data will be collected, sampling periods, interpreted with soil properties and environments, and reported.	Addressed in Section 1.9. Site-specific information on soil gas or surface CO_2 levels were not found in literature. Pratt will implement soil gas sampling according to US EPA Region 4 Soil Gas Sampling operating procedure (ID: LSASDPROC-307-R5) as detailed in this section.	Please provide additional details on number of and locations of sampling points. Additionally please provide parameters which will be used to establish a baseline for comparison during injection activities.	
15	**Geologic Site Characterization Narrative – Comprehensive Evaluation to Determine Site Suitability (146.83)**	Facies Changes in the Injection or Confining Zones	Please provide additional information on the method used to distribute facies in the geomodel to ensure the facies interpretations are consistent with the available geologic data.	Addressed in Section 1.2.4 under the Facies and Petrophysical Modeling subsection to explain the method of preparing the facies model. A cross-section through the electro-facies model and explanation of how this model ties to the GR logs has been added.	No further questions.	
16	**Geologic Site Characterization Narrative – Comprehensive Evaluation to Determine Site Suitability (146.83)**	Injection Zone Seal	Section 1.2.4 states that data was not available to calculate if the mid seal between the two reservoirs is brittle or ductile. Please use the data used to calculate the fracture gradient to determine if the seal is brittle or ductile.	Addressed in Section 1.2.5 Geomechanical Information, with additional information that indicates that the Douglas group is expected to have brittle characteristics.	No further questions.	

17	**Geologic Site Characterization Narrative – Comprehensive Evaluation to Determine Site Suitability (146.83)**	Faulting	Figure 1-16 shows faults near the site without discussing their stratigraphic extent. Figure 1-17 and the text also describe a possible nearby fault within the Arbuckle. Please describe how the potential fault will be investigated and incorporated into the modeling to ensure it will not be effected by injection activities.	Addressed in Section 1.2.3. Image logs and injection tests will be sued to gather data on presence or absence of faults and fractures in proejct area in the vicinity of project wells. 3D seismic data acquisition, as described in the Testing and Monitoring Plan, will be used to image the modeled CO2 plume area. Seismic horizons and faults (if present) will be interpreted and integrated into the SEM's structural framework for the site.	No further questions. However, the text above Figure 1-16 reads "proejct", this should likely be revised to "project"	
18	**Geologic Site Characterization Narrative**	Site Characterization	On page 8, it indicates the city of Pratt has a population of 6,835 people based on the 2010 census. Please update this with more recent 2020 census data.	Addressed in Section 1.2.1 (pg. 10). According to the 2023 United States census, the population of Pratt, Kansas was 6,546 people.	No further questions.	
19	**Geologic Site Characterization Narrative**	Site Characterization	Figure 1-1 provides a topographic map of central Pratt County. Please include the proposed injection well location and clearly show the proposed AoR.	Figure 1-1 shows the location of the proposed injection well. Please see Figure 1-6 or 1-28 for a map of the AoR and key project features.	Please provide a more zoomed in topographic map of the site location with the area of review also illustrated on it.	
20	**Geologic Site Characterization Narrative**	Site Characterization	Figure 1-2: please revise this figure to more clearly show Pratt county and the proposed site.	Please see Figure 1-7 for a structural map of the top of the Lansing Group for Pratt County.	No further questions.	
21	**Geologic Site Characterization Narrative**	Site Characterization	~~Figure 1-3~~ Figure 1-4 provides a stratigraphic column depicting the target reservoirs and confining zones. Please ensure the wording corresponds with Figure 1-6 when it comes to potential reservoirs vs. target reservoirs.	Addressed in Figure 1-4. Language updated to be more explicit regarding target and potential reservoirs. All usages of "secondary" and "primary" reservoirs and "secondary" and "primary" caprocks have been removed.	No further questions.	
22	**Geologic Site Characterization Narrative**	Site Characterization	Please provide clarification on which formations are being chosen for injection and how that is represented in the modeling data. Please ensure you are providing what is currently being planned and not what may happen in the future.	Addressed in Section 1.2.2. Language is now more explicit regarding the target reservoirs being the Shawnee and LKC Groups. With the characterization well (PE AZM-1) currently being drilled, we will have further data on the Viola and Simpson.	No further questions.	
23	**Geologic Site Characterization Narrative**	Site Characterization	Figure 1-5 does not appear to include the well names used for the cross sections. Additionally, the colors being used the cross section lines depicted are difficult to see. Please review both of these items for this figure.	Addressed in Figure 1-5 by enlarging figure.	No further questions.	
24	**Geologic Site Characterization Narrative**	Site Characterization	On page 19, it states, “The Wabaunsee Group overlies…. Is considered the secondary confine zone. Please revise this, and other applicable references, to “confining zone”.	Addressed in Section 1.2.2. to remove any references to primary and secondary zones.	No further questions.	
25	**Geologic Site Characterization Narrative**	Site Characterization	At the bottom of page 25, it discusses that permeabilities were sourced from the Carr et al., 1986 document. Please elaborate on the proximity of these samples and how they are representative of site conditions.	Carr (1986) does not explicitly note where the studied wells were located. However, based on reviewing several ancillary maps, the data appears to be from southern Kansas. There is a need for site-specific data to better understand permeability. This is currently being addressed with the drilling and testing of PE AZM-1.	No further questions.	

26	**Geologic Site Characterization Narrative**	Site Characterization	The table on page 28 mentions the IBDP site. Please elaborate on what this site is and how it pertains to the proposed Pratt operations.	Addressed in Section 1.2.4 Table 1-8 to note the injectate stream is pure (>99.5 vol% CO2) and does not contain chemicals that could adversely react with injection or confining zones. Removed any referenced to the IBDP site.	No further questions.	
27	**Geologic Site Characterization Narrative**	Site Characterization	The table on page 28 mentions cyclothems of carbonate and mudstone beds. It then discusses the carbonates heterogeneity but does not discuss the mudstones. Please elaborate on this.	Addressed in Section 1.2.4 Table 1-8. There is greater heterogeneity among the carbonate beds due to different carbonate fabrics and diagenesis. Language added on proxy descriptions of the mud rock compositions. Findings from lithological descriptions and testing of samples at PE AZM-1 will be used to supplement findings.	It appears that Table 1-8 is missing discussion on the "integrity of the confining zone".	
28	**Geologic Site Characterization Narrative**	Site Characterization	Figure 1-17 includes a blue and green background with a blue line denoting Pratt County. Please change this to a more prominent color for readability.	Addressed in Figure 1-17 with a black outline instead.	No further questions.	
29	**Geologic Site Characterization Narrative**	Seismicity	Section 1.2.5 discusses seismicity up until 2014. Please include discussion of seismicity in the area from 2014 to the present.	Addressed in Section 1.2.6. The USGS's Seismicity Map was explored in order to gauge nearby seismic activity since January 2015 through March 2024.	No further questions.	
30	**Geologic Site Characterization Narrative**	Seismicity	Figure 1-18 shows historic earthquakes and earthquakes detected by KGS up until 2014. Please clarify if these are the nearest seismicity recorded to the site and include additional information post-2014.	Addressed in Section 1.2.6. and noted that since 2014, induced seismicity associated with wastewater injection has occurred in nearby counties and is discussed in this section.	No further questions.	
31	**Geologic Site Characterization Narrative**	Site Characterization	Figure 1-19 includes regional aquifer information from Carr et al., 1986. Based on their report, this data is from 1953 and is from approximately 600 samples across the state. Please elaborate on **how this information is still relevant** to the proposed project or if a subset of data was utilized.	Although the data is more than 70 years old is it expected that the geochemistry of these formations is generally unaltered over this relatively short geologic time frame. This regional aquifer data were used alongside other available local aquifer data sets from the Kansas Geological Survey to evaluate expected salinity variations in the storage formations. Fluid sampling and resistivity logging from the PE AZM-1 well will be used to supplement this analysis when such data become available.	No further questions.	
32	**Geologic Site Characterization Narrative**	Site Characterization	Page 38 indicates that data collected indicates high porosity and permeability for the Lansing and Shawnee groups but does not specify where that data came from. Please elaborate.	Addressed in Section 1.3. Removed claims about this being 'high' but noted the properties are 'adequate'. Current data includes reviewing porosity data from nearby wells. Data form currently drilled PE AZM-1 well will be sued to supplement this analysis in subsequent iterations.	No further questions.	
33	**Geologic Site Characterization Narrative**	Seismicity	On page 38, it mentions a lack of strong, natural seismicity in southern Kansas making CO2 migration into a USDW unlikely. This appears to disregard induced seismicity. Please elaborate on this including seismicity data post 2014.	Addressed in Section 1.3 to include a short discussion on avoiding Arbuckle for injection to avoid induced seismicity.	No further questions.	
34	**Geologic Site Characterization Narrative**	Site Characterization	Page 39 mentions two wells which are penetrating the storage complex, please include the well names here.	Addressed in Section 1.3 by noting the Rolf #1 and Swingle #1 wells.	No further questions.	

35	**Geologic Site Characterization Narrative**	Site Characterization	Page 39 mentions that Pratt will periodically monitor the AoR for additional wellbores. Please elaborate on how that monitoring will be conducted and at what time schedule.	Addressed in Section 1.4. Pratt will develop consistent communication plan with the Kansas Geological Survey (KGS), Kansas Corporation Commission (KCC) and local drillers to ensure they are promptly communicating about any new wellbores that could interfere with the storage project and develop corrective actions as necessary.	No further questions.	
36	**Geologic Site Characterization Narrative**	Site Characterization	On page 41, Pratt Energy mentions not anticipating a well stimulation program but may propose one. If one is likely to occur, please provide the proposed stimulation procedures as part of this review.	Addressed in Section 1.6.1. by indicating a typical acid-wash treatment will be used to clean perforations at pressures well below fracture pressure of the formation.	No further questions.	
37	**Geologic Site Characterization Narrative**	Site Characterization	On page 41, it mentions that the area is expected to have "drilling hazards" but these are not elaborated on. Please include additional discussion on these drilling hazards.	Addressed in Section 1.6.2. One such hazard is drilling through the Hutchinson Salt from 1,325 to 1,800 ft MD.	No further questions.	
38	**Geologic Site Characterization Narrative**	Mechanical Integrity Testing	On page 45, it indicates an annular pressure test will be performed within 24 hours of cementing the casing. Please elaborate if this means the MIT will be conducted before the 24-hour mark or at the 24-hour mark. Additionally, Region 7 prefers at least 48 hours between when cementing is completed and an annulus pressure test is conducted. Please revise or discuss how 24 hours is adequate.	Addressed in Section 1.7. by updating wait on cement time from 24 hours to 48 hours.	No further questions.	
39	**Geologic Site Characterization Narrative**	Operational Parameters	On page 48, it refences that 90% of the fracture pressure at the mid- perf depth is 2,111 psi. This value should have a more conservative calculation using the bottom of the primary confining layer. Please use this reference depth for the 90% of fracture pressure throughout the document.	Addressed and updated Table 1-11 in Section 1.8.2. The reference of fracture pressure was revised to use the top perforation depth (also the top of injection formation) of 3,300 ft resulting in a maximum allowable downhole pressure of 2,079 at the top perforation. Maximum allowable surface pressure was re-modeled in Pipesim using the revised downhole constraint. The newly calculated MASP is 1,541psi.	Please ensure these updated values are reflected throughout the application.	
40	**Geologic Site Characterization Narrative**	Operational Parameters	On page 48, it states the average injection rate will be 160,000 metric tons per year (440/day) and a maximum of 225,000 metric tons per year (616/day). However, in Table 1-10, these two values are included as Metric tons/day. Please revise these to the correct units.	Addressed in Section 1.8.2. Table 1-11 was revised to correct the mislabeled units.	No further questions.	
41	**Geologic Site Characterization Narrative**	Operational Parameters	Table 1-10 includes maximum and average injection volumes and/or Mass for a 30-year period as 2,700,000 and 1,920,000, respectively. This appears to account for the proposed 12 year operation, however the entry in the table mentions a 30-year period. Please revise.	Addressed in Section 1.8.2. Table 1-11 was revised to remove the 30 year reference.	No further questions.	

42	**Geologic Site Characterization Narrative**	Operational Parameters	Table 1-10 includes information on the maximum, minimum, and differential pressures for the annulus. It includes the maximum as 264 psi, the minimum as 59.02 psi, and the differential as 250. However, based on the proposed operational pressures of 2,111 psi downhole, this is significantly below the requirements under 146.88(c) which indicates the annulus pressure must exceed the operating pressures of the well unless it is determined that it may cause damage to the well. Please revise this information to conform with the requirements under 146.88(c).	Addressed in Section 1.8.2, Table 1-11. The annulus pressures were revised based on the revised maximum downhole pressure of 2,079 psia.	Please ensure these updated values are reflected throughout the application.	
43	**Geologic Site Characterization Narrative**	Monitoring	On page 50, it mentions that during the injection phase, monitoring will include external mechanical integrity testing but does not include internal. Please revise this to include both.	Addressed in Section 1.9. Internal mechanical integrity will be demonstrated during the injection phase through continuous annulus pressure monitoring.	Please clarify all aspects required under 146.89 (b) are included (pressure, rate, volume, annulus pressure, and annulus volume).	
44	**Geologic Site Characterization Narrative**	Monitoring	Throughout the narrative seismic monitoring is mentioned. However, there doesn't appear to be any specific information on what that will entail. Please include the proposed seismic monitoring that will be conducted.	Addressed in Section 1.9. The spatial nature and extent of the CO2 plume will be monitored indirectly using a either combination of three-dimensional vertical seismic profiling (3D VSP) and/or 3D surface seismic. Previous seismic feasibility studies resulted in inconclusive results due to lack of site specific data, in particular lack of di-pole sonic log data from surface to reservoir. After the necessary stratigraphic well data are collected another seismic feasibility study will be conducted to identify the appropriate site specific seismic imaging technology needed. Pratt will update the Testing and monitoring plan with plume imaging technology specifics at that time to reflect current reservoir knowledge.	No further questions.	
45	**Geologic Site Characterization Narrative**	Monitoring	On page 50, it indicates that the CO2 stream will be analyzed at a frequency sufficient to generate representative data. In the testing and monitoring section it indicates this sampling will occur quarterly. Please clarify and include on this page.	Addressed in Section 1.9. The CO2 stream will be sampled and analyzed quarterly to generate data that is representative of its physical and chemical characteristics (40 CFR 146.90(a)). The CO2 will be sampled on the injection well pad between the compression system and injection well from a sampling port in the flowline.	No further questions.	
46	**Geologic Site Characterization Narrative**	Emergency and Remedial Response	On page 53, it mentions that periodic training will be provided to various staff, but does not mentions local emergency response staff. Will they be included in periodic training, and how often will periodic training be held?	Addressed in Section 1.12. The section has been updated to include local emergency response teams in the periodic training, which will occur on an annual basis.	No further questions.	
47	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	It appears that salt precipitation and mineral dissolution are not accounted for in the modeling provided. Please provide information on the potential for precipitation/dissolution in the injection zone during injection activities.	Addressed in Section 2.1.1 Model Background with additional text indicating the salt precipitation and calcite dissolution in general will have an insignificant impact on storage quality.	No further questions.	

48	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	Table 1-7 discusses why geochemical modeling was not utilized due to being similar to the Illinois Basing Decatur Project. It should be noted that the Mount Simon used in the Decatur project is siliceous, while the proposed Pratt formation is a carbonate. Please address this discrepancy as it pertains to the lack of geochemical modeling.	Addressed in Section 2.1.1 Model Background with inclusion of references relevant to the carbonate formations, which in general indicate insignificant changes during injection operations.	No further questions.	
49	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	It does not appear to specify how injection occurs in the well. Was a wellbore model used? Is a source at the top of the well with large vertical permeability in grid blocks?	Addressed in Section Well Model Details of the Computational Modeling Details document. GEM provides the option to model injection at a specific rate in grid blocks at depth using the Peaceman (1983) method.	No further questions.	
50	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	It appears a constant injection rate is used for the 12 year injection period. Please discuss why start- stop injection rates were not considered in the modeling.	Addressed in Section 2.1.8 Operational Information with addition of discussion of selecting a constant injection rate.	A discussion of selecting constant injection rate could not be found within the updated documents. Please include this discussion or provide a page number where this discussion can be found.	
51	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	On Page 28, it indicates the pressure buildup plume area is 94.7 mi2 following injection. This is larger than the model area of 80 mi2. Additionally, on page 32, it indicates the pressure buildup plume area is 0.26 mi2. Please elaborate/correct these discrepancies.	Addressed in Section 2.2.1 by correcting the value to 0.26 $mile^2$.	No further questions.	
52	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	There appears to be additional discrepancies regarding the Arbuckle. Tables 1-6 and 2[A]-2 indicate the Arbuckle is included in the modeling, however, Figure 2[A]-6 and Table 2[A]-6 indicate it is not included. Please address this discrepancy.	Addressed in Section 2.1.3.1 of Static Earth Model Details with additional information that indicates that Arbuckle formation is not used in fluid flow modeling.	No further questions.	
53	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	The lateral dimensions of 500 ft may be too coarse to resolve near- injection-well effects. Please provide clarification/justification on the decision for 500 ft lateral dimensions.	Addressed in Section 2.3.4 Sensitivity Analysis with the inclusion of grid size as an additional sensitivity parameter.	No further questions.	
54	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	It doesn't appear that the duration of time that is modeled is stated within the application. Please clarify.	Addressed in Section 2.1.8 Operational Information with the inclusion of simulated injection and post-injection time frames.	No further questions.	
55	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	Figures 2-15 and 2-16 show modeling of the CO2 plume out to 50 years and it appears that the plume extends during this period. While it may have stabilized during this time, it's not possible to determine when stabilization occurs from the figures provided. Please provide additional time increments between 25 and 50 years post-injection to determine when the plume has stabilized.	Addressed in Figure 2-19 by the inclusion of two additional plume polygons for post-injection years 33 and 41.	No further questions.	

56	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	Table 2[A]-12 provides a salinity of 110,000 mg/L, but Figure 14 of the cited refence the chloride concentrations of the Lansing- Kansas City at the site is approximately 125,000 mg/L. If the cations are sodium, then the salinity would be approximately 210,000 mg/L. Additionally, there is no concentration data provided for the Shawnee in the reference. Please elaborate on the values used and how they were appropriate or please revise.	Addressed in Section 2.3.4 Sensitivity Analysis where due to uncertainty in site specific formation brine salinity is used as sensitivity parameter with a high case corresponding to 231,000 mg/L. When site-specific fluid data from PE AZM-1 well becomes available, representative salinity values will be used in subsequent model iterations.	No further questions.	
57	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	Table 2[A]-12 does not include depths for brine density and salinity suggesting these values are constant throughout the model. Pressure and temperature gradients are provided but it is not described how they are incorporated into the modeling. Please include this information in the permit application and modeling.	Addressed in Section 2.1.7 Initial Conditions with additional details describing that the initial conditions of pressure and temperature in the reservoir simulation are depth dependent and so do the formation fluid properties. Formation fluid density value and corresponding depth are updated to remove ambiguity that is a constant value.	No further questions.	
58	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	The description for porosity modeling in Section 1.2.3.1 is insufficient for review. The section states that they were upscaled to the grid but does not explain the method used. It also includes porosity discrepancies between the porosity log and the upscaled porosities in the shale facies. Please provide this and any additional information so a complete review can be done on this information.	Addressed in Section 2.1.3.1. Further discussion of the methodology was provided to indicate the porosity modeling was accomplished using GRFS while collocated, co-kriged with the GR electro-facies model. Table 2-7 was updated to show minimum and maximum values for porosity range.	No further questions.	
59	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	There does not appear to be any permeability logging presented in Section 1.2.3.1 nor is there any vertical to horizontal permeability making it difficult to know if it was isotropic or anisotropic between the two directions. Please provide additional information so a complete review on this can be conducted.	Permeability modeling was accomplished using GRFS while collocated, co-kriged with the porosity model. Updated Section 2.1.3.1 to clarify. The laterally continuous beds were considered isotropic in the X-Y direction. Table 2-7 was updated to show minimum and maximum for permeability range.	No further questions.	
60	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	CO2-brine relative permeability curves for carbonate and shale from literature were used. However, Table 2[A]-11 indicates the system has an oil phase which needs to be considered due to the CO2-oil phase with brine curves potentially not being the same as the curves utilized.	Addressed in Section 2.1.4 Constitutive Relationships and Other Rock Properties, by revising figure captions to better identify the oil relative permeability curve.	No further questions.	

61	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling (Table 2-6)	It appears the permeability of the analogous carbonate for the Lansing was 10 µD for CO_2 and 18 µD for brine. There appears to be a discrepancy with the average for the Lansing in the model of 9 mD The curve measured from the Nisku formation in the paper cited of 9.7% porosity, 8 mD permeability and 46 mD to brine may be more appropriate for the Lansing. Additionally, the water saturation end point of 0.33 is more appropriate for a reservoir rock than the 0.60 of the chosen carbonate. Please correct the discrepancies and justify the chosen analogues or adjust the model accordingly.	Addressed in Section 2.3.4 Sensitivity Analysis by modeling irreducible water saturation as a sensitivity parameter. The result indicates that the AoR reduces when irreducible water saturation is low compared to the base case. The average permeability for Nisku sample was comparatively large, and to be on the conservative side we selected the sample with reported permeability equal smaller than the average value at the PECCUS-1 formations. Therefore, the relative permeability curve that is currently used provides conservative estimate of pressure buildup in the system as well as free phase CO_2 plume extent.	No further questions.	
62	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	Please provide the method used for selecting the analogous carbonate for the Shawnee.	Addressed in Section 2.1.4 Constitutive Relationships and Other Rock Properties by adding additional text that indicates that same relative permeability was used for both Shawnee and LKC formations due to their petrophysical data's close resemblance to the sample reported in literature.	No further questions.	
63	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	The drainage curve selected for shale was based on the Heebner Shale having a pore range of 0.002-0.01 µm. The source of this data needs to be provided.	Addressed in Section 2.1.4 Constitutive Relationships and Other Rock Properties by revising text and making it more generic. Pore size distribution for Heebner shale is not currently available so an analog was used. This assumption will be verified using data forthcoming from the PE AZM-1 well.	No further questions.	
64	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	The legend in Figure 2-6 indicates three facies were modeled, but it appears the modeling was of continuous gamma ray counts vs. categorical facies. Figure 2-4 indicates a gamma ray count threshold was used to define shale. Please clearly indicate if this was the case.	Updated Section 2.1.3.1 as suggested. Discrete facies were not explicitly modeled. Instead, the GR log was used to broadly discriminate the carbonate rocks from the mud rocks where a GR threshold of <58 API represented Carbonates.	No further questions.	
65	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	Relative permeability curves for shale and carbonate were used. Please state and justify which was used for mudstone.	Addressed in Section 2.1.4 Constitutive Relationships and Other Rock Properties by mentioning that due to the comparable particle sizes of shale and mudstone, a single relative permeability curve was used for both facies. Also noted that data during pre-operational testing will be used to determine if a separate treatment of relative permeability curves is warranted.	No further questions.	
66	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	A single relative permeability curve was used for each geologic unit, as shown in Table 2-8. However, Figure 2-6 shows as having at least two curves utilized by lithology. Which relative permeability curve did the model utilize? The curves should be done by the facies rather than the geologic unit or provide justification to the strategy utilized.	Addressed in Section 2.1.4 Constitutive Relationships and Other Rock Properties with the specification that due to a single dominant facies, the relative permeability curve assignment is based on the zone type rather than facies type.	No further questions.	

67	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	The type and number of temperature measurements utilized from the offset legacy well should be provided.	Addressed in Section 2.1.7 Initial Conditions by addition of the suggested information.	No further questions.	
68	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	The pressure gradient in Table 2-9 appears to be based on three offset legacy wells. However, these are different wells than the one provided in Section 1.2.5, which indicates it was how the pressure gradient was calculated. Please address this discrepancy.	Addressed in Section 2.1.7 Initial Conditions by listing the correct API numbers of the wells used for initial pressure data.	No further questions.	
69	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	Section 1.2.5 indicates the hydrostatic pressure gradient in Table 2-9 was calculated by final shut-in pressure of a DST in the Douglas Shale. However, Figure 2-4 shows the legacy well indicated the Douglas Shale is shale facies throughout via gamma ray count. This means the final shut-in pressure of the DST has a high probability of not being representative of the formations above and below this shale. Please provide more applicable pressure gradients for the adjacent formations.	Addressed in Section 2.1.7 Initial Conditions by revising the listed depths. The wells listed in Table 2-9 with API numbers 15-151-21405-00 and 15-151-21910-00 have the DST data available for storage zone that indicate pressure gradient values close to 0.37 psi/ft. Therefore, the current initial conditions are representative of the shale as well as storage zone. Depth-dependent pressure was used to initialize all storage zones. The reference depth of 3,770 ft to report pressure value happened to be corresponding to the shale interval.	No further questions.	
70	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	Please indicate if the Shawnee will be used as a storage reservoir. If so, the fracture gradient calculated from the Douglas formation would need to be revised to the Wabaunsee.	Addressed in Section 1.2.5 Geomechanical Information of the Project Narrative. Given the similar in situ fluid pressure and rock type, the fracture gradient calculated for Douglas should be applicable for Wabaunsee.	No further questions.	
71	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	The equation provided for overburden gradient is actually for overburden pressure. The equation for the former is given but without depth terms. Please revise.	Addressed in Section 1.2.5 Geomechanical Information of the Project Narrative by adding subscript "g" to denote gradient and to differentiate pressure from pressure gradient.	No further questions.	
72	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	The equation provided for fracture gradient using the three input parameters equals a gradient of 0.53 psi/ft rather than the 0.69 psi/ft given. It appears this may be have been calculated using Eaton's method. Please clarify.	Addressed in Section 1.2.5 Geomechanical Information of the Project Narrative by specifying Eaton's method was used.	No further questions.	
73	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	Due to pore pressure gradient being utilized in the above equation and calculated from data which is likely less than the initial pressure, the fracture gradient calculated above would be lower than the actual fracture gradient provided.	With in situ formation pressure gradient of 0.37 psi/ft, overburden gradient of 0.985 psi/ft and Poisson's ratio of 0.34, Eaton's method yields 0.69 psi/ft fracture gradient, for details please see Section 1.2.5 Geomechanical Information of Project Narrative.	No further questions.	
74	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling	The reference provides an improved method for predicting the fracture gradient relative to Eaton's method. The minimum of this method provides a slightly higher value. Please justify why the reference's method was not used in favor of Eaton's method.	Eaton's method was preferred due to its simplicity and use with available data. As detailed site specific data becomes available from pre-operational activities, other methods will be utilized as needed and applicable.	No further questions.	

75	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	When calculating the minimum pressure in the injection zone which could cause flow into the lowermost USDW, please use Equation 2 in EPA's Class VI AoR guidance document. This is a more appropriate equation for this calculation. Additionally, when calculating the minimum pressures, please utilize the top of the reservoir for calculation vs. the top of the perforations.	Addressed in Section 2.3.1. Equation 2 of Method 1 was used for the computation of threshold pressure. The top of the injection zone also correlates to the topmost perforation in the Shawnee. Specified in Table 2-13.	It appears that the equation listed in the document was not updated to reflect the use of Equation 2 of Method 1. Please revise this to the correct method used and ensure the values are reflected appropriately throughout the application.	
76	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	Figure 2-18 provides the pressure increase on a section at various times at the base of the caprock. However, the location of this contact isn't included which prevents interpreting the pressure increase at the top of the seal. Please include this information so additional review can be conducted.	Addressed in Section 2.2.1. Time snapshots in Figure 2-18 are a zoomed in view of a 2D cross section that passes through the injection well location. It depicts the caprock as well as storage formations. Figure captions are updated to elaborate this and to facilitate the interpretation process.	No further questions.	
77	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	Please provide scales for Figures 2-17 and 2-18.	Addressed in Figure 2-17 and Figure 2-18 with inclusion of scales.	Please include the units depicted on the scale.	
78	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	As mentioned previously, Figure 2- 15 does not match what is provided in the discussion. Please revise this to address the discrepancy.	Addressed in Section 2.2.1 Predictions of System Behavior with revision of text that better reflects the data depicted in Figures 2-15 to Figure 2-18.	No further questions.	
79	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	Please provide an explanation on the lack of vertical migration provided on Figure 2-16. Particularly, as it regards the buoyancy of the CO_2 stream and accounting for residual oil mixing.	Addressed in Section 2.2.1 Predictions of System Behavior by inclusion of the role of low permeability layers in separating the plumes in two storage zones. Also added the suggest discussion of buoyancy and how it plays out.	No further questions.	
80	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	Please provide a graph showing CO_2 mass in the model over time. This will help verify the modeling is accounting for the total volume of CO_2 to be injected.	Addressed by updating Figure 2-14 with the inclusion of the CO_2 mass injection rate.	No further questions.	
81	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	Please provide how the model was calibrated. Additionally, a sensitivity study of mesh refinement and permeability will be needed.	Section 2.2.2 Model Calibration and Validation summarized the model calibration with the existing available data. The grid and permeability sensitivity are addressed in Section 2.3.4 Sensitivity Analysis, by inclusion of permeability and grid sensitivity as a sensitivity parameter.	No further questions.	
82	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	Please provide uncertainty calculations for the parameters used in the modeling.	Addressed in Section 2.3.4 Sensitivity Analysis by analyzing the sensitivity of plumes to the most uncertain parameters in the modeling setup. The majority of the parameters were varied by 50% unless such variations yielded unreasonable values for the geologic setting.	No further questions.	
83	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	On page 19, Figure 2-10 uses "Lancing" instead of "Lansing." Please revise.	Corrected as noted.	No further questions.	

84	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Geologic Barriers	On page 21, it indicates there are no known geological barriers to fluid flow in the model area. However, when reviewing the State Oil and Gas Databases, it appears that the IUKA-CARMI field to the north and the ROLLINGSON field to the east both can produce from the Lansing-Kansas City formation. However, there are many dry wells located near the injection point. Please elaborate on this discrepancy in the context of potential geologic barriers or structures which may have prevented oil and gas being located near the proposed injection well.	The geological horizons at PECCUS-1 in general dip North-East to South-West. Although the wells in the vicinity of PECCUS-1 are mostly dry, some traces of oil and gas are expected to be present, but not of commercial value. This suggests migrations of these fluids from source rocks in the south-west to north-east due to buoyancy. It is possible that the hydrocarbon accumulations in the noted Iuka-Carmi and Rollings fields are structural traps. Well testing during construction of injection and monitoring wells will be sued to ascertain any formation boundaries or discontinuities, if they exist, within the project area.	No further questions.	
85	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	Under section 2.1.9, there is an “Error! Reference source not found” message. Please update this reference.	Corrected as noted.	No further questions.	
86	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	On page 25, please update Table 2- 11 based on previous comments about how injection pressures were calculated.	Addressed in Section 2.1.10 Fracture Pressure and Fracture Gradient by inclusion of the equation to estimate maximum allowable bottomhole pressure.	The equation provided above Table 2-11 incorrectly uses the term "Frecature Pressure" when this should likely be Fracture Gradient. Please revise accordingly.	
87	**Area of Review and Corrective Action Plan 146.84(b)**	Site Monitoring Locations	Please include a description of how the shallow groundwater injection wells located outside the 50 year PISC will yield valuable information regarding potential USDW endangerment near the injection well. Otherwise, please relocate these wells closer to the injection well where pressures are more likely to initiate upward migration of injected fluids into a USDW.	Added language in Section 2.3.2 to note the well placement followed NE-SW trending faults in the region. For this reason, the LUSDW GW 2 well is located approximately 0.25 miles southwest of the AoR and north/northeast of any potential faults.	Please ensure updated sampling information and locations are correctly incorporated into the application.	
88	**Area of Review and Corrective Action Plan 146.84(b)**	Site Monitoring Locations	EPA Region 7 typically requests injection zone monitoring wells to coincide with the anticipated location of the CO2 plume five years after injection starts with direct injection zone sampling to better verify the modeling results. Please elaborate on why the currently proposed injection zone monitoring well is located outside the AoR and how this will still yield valuable data. Otherwise, please relocate the monitoring well to a location more proximal to the 5-year AoR.	Modified language in Section 2.3.2 to note the in-zone monitoring well will be used to monitor pressure increases outside of the AoR and the monitoring data collected from this well will be used to calibrate the dynamic model. It will also serve as a “sentry” well to monitor for CO2 migration outside of the AoR. Moreover, modeled pressure response reaches the current proposed location and hence, the data gathered from the well could be valuable in re-calibrating the model.	No further questions.	
89	**Area of Review and Corrective Action Plan 146.84(b)**	Modeling Outcomes	Figure 2-24 shows a spike within the first few years of injection operations, which then drops and begins a steady increase the remainder of the proposed injection activities. However, this spike is not described in the text itself. Please elaborate on this pressure build up increase and decrease.	Addressed in Section 2.3.3 Plume Stabilization and Post-Injection Monitoring Period with updated text to explain the pressure peak.	No further questions.	

90	**Area of Review and Corrective Action Plan 146.84(b)**	Corrective Action	On page 34, please revise the API number for Rolf #1 well to include the standard dashes and remove the extra four digits to better match the KGS online database.	Addressed with suggested revisions.	No further questions.	
91	**Area of Review and Corrective Action Plan 146.84(b)**	Corrective Action	Section 2.4 mentions two wells which penetrate the confining zone and storage formations. However, there appear to be several other wells at similar depths that may fall within the AoR. Please elaborate on the following wells: Hoffman 1: 15-151-20195 Hoffman 1: 15-151-20287 Rolf 1: 15-151-00299 Urdy 1: 15-151-20180 Apperson 1: 15-151-10333	Addressed in Section 2.4.1. Tabulation of Wells within the Storage Complex AoR by including a buffer zone of 500 ft around the AoR and identifying the wells that fall within this buffer zone.	No further questions.	
92	**Area of Review and Corrective Action Plan 146.84(b)**	Corrective Action	It indicates that the KGS online database was utilized to identify legacy oil/gas wells. Were any additional methods used to identify legacy wellbores which may penetrate the confining zone? Please incorporate the search methods into the narrative or justify the search method used.	Addressed in Section 2.4.1 Tabulation of Wells within the Storage Complex AoR, with revised text that indicates that alongside the KGS database, other online database were also searched for legacy wellbores.	No further questions.	
93	**Area of Review and Corrective Action Plan 146.84(b)**	Corrective Action	Section 2.4.2. indicates that Pratt will secure surface access rights to obtain access to legacy wells. What will Pratt do to obtain access to legacy wells if surface access rights are unable to be obtained?	Addressed in Section 2.4.2 with an update on current land negotiations. Pratt is close to securing surface rights to these wells, agreements to access have been negotiated in the past and are being evaluated.	No further questions.	
94	**Area of Review and Corrective Action Plan 146.84(b)**	Corrective Action	Section 2.4.3. should also include instructions and schematics for each well to be remediated as part of the corrective action.	Addressed with inclusion of well diagrams as a separate attachment (02_PBI_Appendix_PECCUS-1_Wellbore_Diagrams_for_Corrective_Action). The corrective action schedule is detailed in Section 2.4.3 and covers the legacy wells that will need corrective action.	Please provide schematics/diagrams depicting the proposed plugging activities that will be conducted on wells in need of remediation.	
95	**Area of Review and Corrective Action Plan 146.84(b)**	Corrective Action	Table 2-12 includes an “Error! Bookmark not defined” message. Please revise.	Corrected as noted.	No further questions.	