UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

CERTIFIED MAIL: RETURN RECEIPT REQUESTED (7016-0750-0000-6044-1315)

June 21, 2019

Robin Shropshire
Asset Manager
Panoche Energy Center
43883 West Panoche Road
Firebaugh, California 93622

RE: Underground Injection Control (UIC) Permit Renewal Application
Class 1 Non-Hazardous (NH) Permit No. R9UIC-CA1-FY17-2R
Technical Review

Dear Ms. Shropshire,

We received your revised application for a UIC permit on March 4, 2019. We spoke with you by phone on April 8, 2019 to discuss your application. We have reviewed your revised application and determined that we need additional information to proceed with our evaluation, as specified at Chapter 40 of the Code of Federal Regulations (40 CFR) § 124.3(c).

Specifically, we request that you provide the information detailed in the Enclosure, which is necessary to clarify, modify, or supplement previously submitted application materials. Please submit the information requested in the Enclosure by August 5, 2019.

Under EPA regulations, if an applicant fails to provide EPA with the necessary information and data to address deficiencies in the application, the permit may be denied. If, by August 5, 2019, we do not receive the additional information detailed in the Enclosure, EPA may initiate the process to deny your permit application. *See* 40 CFR § 124.3(d).

Thank you for your cooperation. If you have questions, please contact me at 415-972-3971, or Michele Dermer of my staff at 415-972-3417.

Sincerely,

David Albright
Groundwater Protection Section

Enclosure

cc: Cameron Campbell, CA DOGGR, Inland District
Clay Rodgers, Central Valley Regional Water Quality Control Board

Enclosure

Comments on Panoche Energy Center's (PEC) March 2019

Updated Class I Permit Application

Attachment A

1. The permit application's determination of the Zone of Endangering Influence (ZEI) relies on the gel strength of the plugging mud in abandoned wells to set a critical pressure (P) increase of 41.96 psi. This approach for setting the critical delta P is based on limited information. In particular, the application lacks information on the properties of these plugging muds over the long term. For example, there are five wells within the Area of Review (AoR) that were abandoned without cement plugs placed between the injection zone and the base of USDWs. Four of these five were abandoned 55 to 68 years ago, and there is no empirical evidence regarding whether the mud has retained the properties it had before the wells were abandoned, or if it will retain those properties in the long-term future (at least the next ten years of injection). Further, it is unknown if these muds have become stratified or have lost volume to the surrounding formations, potentially affecting gel strength. While the UIC application relies on literature citations to support the assumptions used in the ZEI calculations, empirical, depth-specific data would best demonstrate that the well(s) will not permit fluid movement that could endanger USDWs.

   Please design and provide a proposed sampling and testing protocol to collect and test drilling mud samples in at least two wells within the AoR that were only mud plugged (i.e. without a cement plug) between the injection zone and USDW to demonstrate that the gel strength, density, and composition support the approach to identifying the ZEI. The testing protocol should also include a discussion of the criteria used for well sample selection.

2. The data in Table A-2 depict shut-in pressure from 2015-2016 to 2016-2017 with the establishment of the enhanced wastewater system (EWS) and reduced injection volumes. The shut-in pressures are similar for 2016-2017 and 2017-2018, and injection volumes were similar (13 and 20 Mgal), suggesting the beginning of a plateau at this lower injection volume. However, these data are for two years of the overall period of operation. It is unclear from these data whether the pressure will be able to dissipate measurably during continued injection, especially given that this is a low-permeability formation and injection is projected to increase 1.45% each year (for a total of 17.16% between 2017-2018 and 2029-2030). Therefore, additional information about the pressure data and the model is needed to fully evaluate the predictions provided in the revised application. Please provide responses to the following:

   a) Are the shut-in pressures static?

   b) How long were the wells shut-in before the pressures were measured?

   c) Please describe how pressure dissipation is addressed in the modeling.

   d) Please note any uncertainties in the projected injection volume increase of 1.45% per year.

3. The modeling parameters described on Figure A-1 agree with the source reports cited by PEC. However, limited information is provided about the model, such as images of the model domain (e.g., how aquifer heterogeneity was handled). No details on the model output, such as graphs of pressure with time or pressure contours other than the radii shown in Figure A-1, were provided. Therefore, it is unclear how the pressure is predicted to change from 2018-2029, including how the pressure is predicted to dissipate (related also to Question 2).

   a) Please provide additional information from the model output in the form of graphs and tables of predicted pressures with time at the injection wells, and at the edge of the AoR.

   b) Please provide maps of pressure contours over the time frames modeled.

   c) Please provide the sources and magnitudes of uncertainties in the modeled pressures.

Attachment D

4. There is a substantial difference in the results of the two salinity calculation methods described in Attachment D of the revised application, and in URS (2009) summarized on Table D-2, with Method #1 resulting in lower values than Method #2. There are also differences between the two conversions from Rw to TDS, especially for values at the lower depths. PEC notes that the nomograph method yields more conservative TDS estimates (i.e., lower values). PEC's proposal to identify the base of the lowermost USDW at 3,430 feet KB as the contact between the Kreyenhagen and Tumey Formations appears to be consistent with the results of Method #1.

   It is not clear however why the results between the two methods are so different, especially since they are both based on Archie's equation.

   Please discuss why the results vary between Methods #1 and #2, and why PEC selected the results from Method #1 (i.e., calculation of Rw from log measurements of Ø and Rt) in determining the depth of the base of the lowermost USDW rather than Method #2.

Attachment I

5. No information related to the elastic properties of the injection zone was provided, as requested by EPA in May 2018.

   Please provide data that support the determination of elastic properties of the injection zone.

6. No data for oil/water saturation or compressibility in the file for IW1 were provided, as requested by EPA in May 2018.

   Please provide oil/water saturation and compressibility data for IW1.

Attachment K

7. ***In Table 3, AMEC 2012, the data for IW3 and IW4 are identical. Is this correct?***

Attachment L

8. The proposed construction plans for the IW5 and IW6 wells provide for surface casing to be installed to a depth of 2,000 feet in each well. Figures L-1 and L-2 depict the base of USDWs at 1,930 feet, whereas the base of USDWs is stated as 3,430 feet in the revised application text. Surface casing should be installed to at least 3,500 feet in these wells to provide two layers of casing and cement to protect the USDW.

   Please revise the proposed drilling and completion procedures and Figures L-1 and L-2 to reflect surface casing that is installed to at least 3,500 feet in the IW5 and IW6 wells, and to provide two layers of casing and cement to protect the USDW.

Attachment P

9. The proposed fall-off test (FOT) procedures provide for surface readings of pressures but not downhole pressure at the injection interval. If surface fall off pressures fall below zero during a FOT, and before reaching a radial flow regime, the results may not be usable or diagnostic of the key parameters of permeability, static pressure, and skin factor.

   If the other three wells were not shut-in long enough to reach static pressures before the FOT started in IW2, the FOT results may not be representative of the key reservoir parameters. The FOTs appear to confirm the over-pressured status of the Panoche Formation (the injection zone) and increasing static pressures over time. Permeabilities from the FOT analyses are consistently below 10 mD in the Panoche Formation.

   PEC's 2008 permit requires FOTs to be conducted in accordance with EPA Region 9 guidance, which requires bottom-hole pressure measurements. However, FOTs in the past several years have been conducted using surface measurements (injection tubing pressure and annulus pressure), with PEC basing this decision on the agreement between values derived from surface and bottom-hole data in their 2011 testing.

   Please revise the proposed FOT procedures to include bottom-hole pressure measurements, in accordance with Region 9 guidance.

Attachment Q

10. The plugging and abandonment plan for IW2 includes perforating and squeezing cement into the casing/wellbore annulus at 4,820 feet below the surface, according to the well schematic in Figure Q-2. If planned temperature logging is inconclusive or indicates upward fluid movement or other inter-formational flow in the uncemented portion of the borehole annulus, remedial squeeze cementing, as described in the P&A plan, will need to be performed.

    Note that PEC would need to adjust its financial assurance to reflect any revisions to the P&A procedures, if needed, based on the results of temperature logging. ***No response is required.***