



**JOHN BEL EDWARDS**  
GOVERNOR

**State of Louisiana**  
**DEPARTMENT OF NATURAL RESOURCES**  
**OFFICE OF CONSERVATION**

**THOMAS F. HARRIS**  
SECRETARY

**RICHARD P. IEYOUB**  
COMMISSIONER OF CONSERVATION

**March 3, 2023**

**Mr. Joshua Bradley**  
Eagle US 2, LLC (E208)  
1300 PPG Drive  
Westlake, LA 70669

**RE: Eagle's Response to the First Supplement to Compliance Order No. IMD 2022-027**  
Sulphur Mines Salt Dome, Calcasieu Parish, LA

**\* \* \* \* NOTICE OF DEFICIENCIES \* \* \* \***

This Notice of Deficiencies, in reference to the Response to the First Supplement to Compliance Order No. IMD 2022-027, is issued under the general authority of the Minerals, Oil and Gas and Environmental Quality Law, LA R.S. 30:1 et seq, and under the specific authority set forth in Sections 6G and 18 thereof.

In order to keep track of additions, modifications, etc., please submit all requested responses and clarifications in one package and include the revision date on the lower right hand corner of each page.

**Part A – Review of Eagle's Submittal:**

**Section 1 – Site Setting:**

1. The narrative discussing caprock depth does not match the illustration shown on Figure 2. The caprock is known to occur as shallow as 350 feet in some areas of the dome. Please correct this discrepancy in the narrative and on Figure 2.
2. The narrative discussing the top of salt depth does not match the records held by the Injection and Mining Division (IMD). Please address this discrepancy.
3. The associated Figure 3 showing the TOS contours does not match IMD records. Please address this discrepancy and review the structural mapping standards found on the LDNR/IMD website for additional mapping requirements.
4. Figure 4 illustrates most caverns at their maximum diameter. Please include all caverns, including the plugged and abandoned caverns. In addition, please refer to item #3 (above) in reference to the contouring discrepancies.

5. Figures 2, 3, and 4 are lacking a Louisiana licensed PG stamp, as it is required for all geologic interpretations. Please correct this issue and be advised that the license holder must currently be in good standing with the Louisiana Board of Professional Geoscientists. Please note that if these figures are not original geologic work, a reference to the original work should be included instead.
6. Page 2 of Section 1 states that there are no numerical criteria for chlorides, sulfates, or TDS within the drainage basin subsegments. Please re-evaluate this statement after reviewing information found in the SAND 80-7141 report and the "Environmental Remedial Evaluation Report" prepared by CH2M Hill dated November 1992.

### **Section 2 – Work Plan:**

7. Within the work plan provide by ERM, it appears that there are fundamental details missing from the proposed plan. It is stated that ERM will better define the depth of the USDW; however, the methodology, scope, aerial extent of the plan, and how the USDW will be protected are all details left out of the discussion. Please resubmit with a full plan.

### **Section 2.1 – USDW Evaluation:**

8. Within this section, it is stated that ERM has developed a plan to better evaluate the USDW; however, the plan is not included in this report. Please provide the omitted information.

### **Section 2.2 – Water Well Sampling:**

9. Within this section, it is stated that Eagle intends to use 4-5 water wells off the dome for their sampling effort. Please provide a descriptive explanation that discusses why these off-dome wells were selected, and why no other existing water wells on the Sulphur Mines dome were proposed for sampling and/or why no monitor well installations were proposed as part of this background investigation.
10. This section proposes quarterly sampling for calendar year 2023, followed by semi-annual sampling for two additional years. IMD requests monthly sampling at this time; future changes to the sampling request will be considered upon request but should not be part of the plan. Please revise the proposed schedule for all sections included in this submittal.
11. Please include details in this section explaining why the proposed parameters were chosen for the sampling efforts and what those parameters would tell us if detected. Additionally, please include pH as one of the parameters.
12. The last sentence of this section states that active bubbling sites will be sampled for dissolved gases and sent to a laboratory for analysis. Please be advised that all sites with observed bubbling (whether currently active or not) shall remain of interest and should continue to be sampled.
13. Please clarify (a) if samples have already been submitted to Isotech and (b) which isotopes will be evaluated.
14. The nomenclature used while sampling is unclear when compared to the laboratory results and chain of custody. Please provide clarification so that the sample results can clearly be correlated to the sample location. In addition, please provide an interpretive report of the sample results.

**Section 2.3 – Water Well Survey:**

15. Please provide the timeline for the execution of this survey.

**Section 2.4 – Capture Zone Analysis:**

16. Please clarify the geographic extent of this proposed analysis.

17. Please provide potentiometric map(s) of the seasonal groundwater flow and local water table. If this changes according to water well use or pumping patterns, please provide a descriptive report with the potentiometric surface(s).

**Section 2.5 - Surface Water Sampling:**

18. Please refer to item #13 and item #14 (above) and apply to this section.

19. In this section it is stated, “The waters where bubbles have been observed are isolated and do not have any connection to surrounding water bodies.” Please provide a descriptive explanation that supports this statement, or modify the statement. the reasoning behind this statement. Additionally, please refer to the following publically available literature below:

- a. Pages 4-14 thru 4-20 of SAND 80-7141 report identifies interconnectivity between the caprock, aquifers, and salt stock. The report also discusses the surface water connectivity.
- b. Section 5.2 of SAND 80-7141 discusses the hydrologic connectivity between water wells and caprock. Page 5-9 states, “Previous oil and gas, and sulphur mining activities created approximately 900 borings into the caprock. Most of these early wells were not sealed or plugged. They still act as vertical conduits for groundwater migration between the caprock, overlying aquifers, and the surface.”
- c. The 1992 “Environmental Remedial Evaluation Report” prepared by CH2M Hill (pp. 1-4) discusses hydraulic connections to central lake.

20. As with all laboratory analyses, IMD requires a professional interpretation of the results. Please provide an interpretive report and plan to update that report as data become available upon implementation of the plan.

21. Please be advised that all sites that have had observed bubbling (whether active or not) remain of interest and should continue to be sampled. Requests to modify sampling schedules will be considered upon request but should not be part of the plan.

**Section 2.6 - Surface Water Profile:**

22. This section discusses the use of a “handheld meter.” As with any sampling equipment used during this investigation, Eagle must provide the make, model, calibration schedule and relevant specifications for the device used.

23. Please describe the regular operational utilization of the central lake water pumps, including how often they are used and what activates their use.
- a. Please explain the potential effects of pumping that may occur during sampling and how dilution may affect the quality of the results.
  - b. Please provide a design drawing and specifications of the aforementioned pump.

**Attachment C - Geomechanical Plan:**

24. Redaction of the timing for the geomechanical assessment is not acceptable. Please provide an expected timeline for completion and submittal of the geomechanical assessment.
25. The scope of the proposed plan appears to be focused on PPG 7B and PPG 6X. However, the First Supplement to Compliance Order No. IMD 2022-027 requires a geomechanical analysis of the salt dome. Please address this inconsistency.
26. Under the Numerical Modeling Section, please explain why the plan is proposing to use stratigraphic data from an older geomechanical study (2017) instead of using the most recent data.
- a. Additionally, please explain why other nearby potential pressure regimes are not being considered, such as offset caverns and off-dome strata.
27. The last paragraph in the Numerical Modeling Section, it is stated that “The proposed 3D modeling approach will assume that the salt is perfectly bonded to the adjacent non-salt rock formations along the dome flank.” Please provide a descriptive explanation regarding why this is the most appropriate assumption.
28. Please provide the referenced 2017 geomechanical report on coalesced caverns (RSI 2574) in electronic format to IMD.

**Attachment D – Failure Analysis Plan:**

29. The proposed draft date of July 2023 is not acceptable considering the potential impacts of the potential loss of cavern 7B. This failure analysis shall be submitted to IMD with extreme expediency.
30. Please provide a Louisiana licensed PG or PE stamp on the plan, as it is required for all geologic or engineering interpretations. Please be advised that the license holder must currently be in good standing with their respective oversight Boards.

**Attachment E - 3D Seismic:**

31. The proposed plan does not discuss the incorporation of available VSP data as discussed in previous meetings with Eagle. Please update the plan to include these data or provide an explanation regarding any non-applicability of these data.

32. Please clarify in the “Final Deliverables” section that the edge of salt will also be integrated into this study, particularly the western flank of the dome.
33. The 3-D seismic evaluation plan should include a visual survey to verify well locations, in addition to historic research. Please add this detail to the plan.
34. The proposed timeline should be re-evaluated for the potential for overlapping timeframes.

**Attachment F – Microseismic Monitoring:**

35. A powerpoint slide deck is not an acceptable format for the requested microseismic plan. Please formalize the information contained in this presentation into a formal plan.
36. To date, IMD has not received any data regarding the microseismic monitoring. Please provide the preliminary data with an interpretive report. Additionally, please clarify whether the velocity survey/velocity model needs to be completed prior to having any monitoring results.
37. Eagle shall submit a timeline of the seismic monitoring to date, and future updates shall be provided to IMD on a weekly basis. In addition to seismicity reports, updates shall include:
  - a. Location map of the semi-permanent stations introduced in phase 2; and
  - b. Data and interpretation of results on phase 2, prior to moving to phase 3.
38. Please provide a Louisiana licensed PG or PE stamp on the plan, as it is required for all geologic or engineering interpretations. Please be advised that the license holder must currently be in good standing with their respective oversight Boards.

**Attachment G – InSAR Subsidence Monitoring:**

39. A powerpoint slide deck is not an acceptable format for the requested subsidence plan. Please formalize the information contained in this presentation into a formal plan.
40. On page 9, it is stated that no deviation from established subsidence trend has been observed to date. However, IMD has not received any recent subsidence data. Please provide this information to IMD as soon as possible.
41. Please provide a Louisiana licensed PG stamp on the plan, as it is required for all geologic interpretations. Please be advised that the license holder must currently be in good standing with the Louisiana Board of Professional Geoscientists.

**B. Review of the NewFields “Preliminary Report – Chemical Fingerprint of Oils” Westlake Sulphur Dome Study**

42. As detailed on page 2 of this preliminary report, discussions of these results are not included in this preliminary report. Please finalize the report and include a discussion of the data presented in the report.

43. It is the understanding of this Office that oil samples were collected from one or more oil wells along the western flank of the dome which are operated by Yellow Rock, LLC (Y6303). Please explain why no oil data from these productive wells have been included in the scope of this study.

**C. Additional Action Items Required for Eagle:**

44. Please submit a fault plane map (with fault and fold displacement). This may be submitted after geophysical characterization is complete.

45. This area is under the United States Army Corps of Engineers (USACE) jurisdiction and is subject to the Section 404 Clean Waters Act. Please provide proof of Eagle's coordination with the USACE.

46. Within ten (10) days, please provide a Gantt chart or other similar organizational tool in order to illustrate and better understand the project schedule in a format that can be updated as projects progress.

47. Please provide IMD with an interpretive report of the drone imagery, including temperature ranges.

All documents prepared in response to this Notice of Deficiencies shall be submitted within **ten (10) days** of receipt of this letter.

This list of deficiencies should not necessarily be considered complete. If additional deficiencies become apparent, either in newly submitted information or in part of the original permit application, additional information, revisions, or clarifications will be requested.

The Commissioner of Conservation reserves the right to require further investigative and remediation actions as may be deemed necessary. All documents prepared by Eagle in response to this Notice shall be submitted to Stephen H. Lee, Director of the Injection and Mining Division.

Failure to comply with a Compliance Order shall subject Eagle to civil penalties of not more than \$32,500 per day for each day of continuing violation and for each individual violation as provided in RS 30:18 in addition to any other appropriate regulatory sanctions as provided by law.

Yours very truly,

Richard P. Ieyoub  
Commissioner of Conservation



Stephen H. Lee, Director  
Injection & Mining Division

SHL:CD: