

via email

8 June 2023

Stephen Lee, Director
Louisiana Department of Natural Resources
Office of Conservation - Injection & Mining Division
617 North Third Street, LaSalle Building
Baton Rouge, Louisiana 70802-5431



Reference: 0688077

Subject: 2nd Analytical Data Submittal
Westlake US 2, LLC
Sulphur Dome
Calcasieu Parish, Louisiana

Dear Mr. Lee:

On behalf of Westlake US 2, LLC (Westlake), Environmental Resources Management Southwest, Inc. (ERM) is pleased to provide the Louisiana Department of Natural Resources (LDNR) Injection & Mining Division with the final laboratory analytical data for groundwater, surface water, and oil samples collected at the Sulphur Dome in Calcasieu Parish. The samples were collected by ERM during March through May 2023 sampling events.

Enclosed are the following:

- Table 1 – Ground Water Data
- Table 2 – Surface Water Data
- Table 3 – Central Lake Water Column Profile
- Table 4 – Dissolved Gasses Data
- Table 5 – Oil Data
- Figure 1-3 – Sample Location Maps
- Figure 4 – Piper Diagram
- Figure 5 – Dissolved Gas Isotopes
- Attachment 1 – Laboratory Reports

Only final laboratory reports received since the previous data submittal are provided in Attachment 1. Supplemental submittals will be made as additional final laboratory analytical data are received.

1. WATER SAMPLING RESULTS

Between March and May 2023, additional samples of groundwater, surface water, and oil were collected at the site. The sampling locations are shown on Figures 1-3. The water samples were analyzed by ALS Global laboratory based in Houston, Texas, a Louisiana Environmental Laboratory Accreditation Program (LELAP) accredited laboratory. Dissolved gases were submitted to and analyzed by Isotech, a Stratum Reservoir Company, located in Champaign, Illinois. Oil samples were submitted to SPL, a hydrocarbon analytical laboratory in Houston, Texas. All

samples were submitted under proper Chain-of-Custody in laboratory supplied containers with appropriate preservative and handling requirements.

1.1 Groundwater Sampling Results

On April 27, 2023, 5 groundwater samples were collected from the industrial water wells operated by Westlake, as well as the Cottages Well located west of Cavern 7 (see Figure 1). Well 019-1603 was not operational at the time of sampling and no sample could be obtained from this well. At each well, water was allowed to flow from each well for several minutes prior to sampling and field parameters, i.e., pH, specific conductivity (SC), oxidation-reduction potential (ORP), and temperature, were recorded with a hand-held meter at the time of sampling. The groundwater analytical data to date are summarized in Table 1. Nickel and vanadium were added to the analyte list during this sampling event.

Reported constituent concentrations were below their respective RECAP screening standards (GWSS) or EPA Secondary Maximum Contaminant Limits (SMCL), with the exception of iron and manganese. Alluvial aquifers throughout South Louisiana are known to exhibit elevated concentrations of naturally occurring iron, manganese, and other metals. Industrial processes utilizing steel piping can also influence the metal concentrations reported in the water. SMCLs are non-enforceable guidelines established by the EPA based on aesthetic qualities (e.g., odor, taste, etc.).

The brine samples, previously collected, were included on Table 1 for comparison but were not evaluated with respect to the RECAP GWSS or the SMCL because the brine is a manufactured product.

The piper diagram (Figure 4) illustrates the overall consistency of the groundwater quality. At this time, there is no indication that the groundwater at these locations has been influenced by or mixed with brine.

1.2 Surface Water Sampling Results

No additional surface water quality data have been received since the last data submittal. For completeness, the surface water sampling locations are provided on Figure 2, and the surface water quality data received to date are summarized on Table 2.

1.2.1 Central Lake Water Column Profile

The deepest portion of the Central Lake currently measured is in the area surrounding bubble site LDNR # 5, which is approximately 5-6 feet deep. On May 22, 2023, a profile of the water column was conducted at 1-foot depth intervals using a hand-held water quality meter. The water depth was measured at 5.0 feet. Tubing was set at discrete depth intervals and purged using a peristaltic pump prior to recording the water quality parameters. Previously water quality parameters were recorded at the top and bottom at bubble site LDNR # 4. The profile data are shown on Table 3. Generally, the water quality is consistent throughout the water column, and consistent with parameters recorded in January 2023. There is a slight change in water quality at the bottom of the lake where the pH and temperature are slightly lower, change to reducing conditions (ORP is negative), and conductivity slightly increases. The reducing conditions at the bottom are most likely attributed to decaying vegetation accumulating on the bottom.

1.3 Dissolved Gas Results

Dissolved gas data for bubble sites LDNR #21, 22, and 23, and the 5 industrial water wells sampled on March 30, 2023 are included in this submittal. A water sample was unable to be collected from the Cottages Well during this event. Dissolved gas data are summarized in Table 4. Several samples did not contain enough methane to perform the full isotopic analysis, including LDNR #23, and water well samples 019-580, 019-582, 019-995, and 019-1055.

The methane stable isotopic results were plotted on a linear chart (Figure 5) for comparison with known genetic classifications (Coleman, et al., 1995). Data previously collected by Lonquist of gas samples from the caverns and/or well annulus were also plotted for comparison.

The methane isotopic gas data indicate that the gas from the bubble sites has thermogenic origins, is likely deep gas, and is similar in isotopic composition to the cavern gas samples collected previously. The concentration of methane in the water wells was too low for complete isotopic evaluation, however, the carbon 13 isotopic data indicate the origin of gas in the Chicot aquifer is different than that observed in the caverns and at the bubble sites.

1.4 Gas Sampling Update

Following the Second Amendment to Compliance Order No. IMD 2022-027, several methods have been attempted to isolate and collect the gas from the bubble sites. On May 22, 2023, a method using a large, inverted funnel and standpipe sunk over the bubble site was successful in isolating the gas from submerged bubble sites within the Central Lake. Gas samples were collected from LDNR #3, 4, and 24 bubble sites within the Central Lake, which have relatively high bubble rates. Going forward, this method will be used to isolate and collect gas from submerged bubble sites if possible. Locations with low bubble rates are still being evaluated for sampling best methodology.

The results from attempts to isolate the gas from non-submerged bubble sites are still pending.

Additionally, attempts to isolate the bubbles located along the casing of and within the vault of the Cavern 7 brine well 7B have not been successful at this time. Efforts will continue to isolate the gas at that bubble location.

2. OIL SAMPLE RESULTS

On May 2, 2023 two oil samples were collected from oil wells SN 185997 and SN 209459 per the Second Amendment to Compliance Order No. IMD 2022-027. The samples were submitted to SPL for bulk/whole oil properties. The oil and gas sample locations are shown on Figure 3. The results from this sampling, along with data from previous sampling conducted by Intertek, are provided in Table 5. Based on the data comparison, the oil from Cavern 7B appears to be similar to the previous 7B oil samples and different from the Yellow Rock crude oil sample collected.

Gas was sampled from the annulus of SN 209459 on May 2, 2023. The results of this sampling are still pending.

3. SCHEDULE

Water wells will continue to be sampled on a monthly basis. The next water well sampling event is planned for June 26, 2023. The bubble sites will be sampled as discovered. All bubble sites were

sampled May 17-22, 2023. The results of that sampling effort will be provided to LDNR when available. The next full round of bubble site sampling is planned for the 3rd Quarter 2023.


We will continue to report additional sampling results to LDNR as they are received. Should you have any questions or need addition information, please contact us at scott.himes@erm.com and david.upthegrove@erm.com.

Sincerely,

Environmental Resources Management Southwest, Inc.



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FIGURES

TABLES

ATTACHMENT 1: LABORATORY REPORTS