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MEMORANDUM | April 30, 2024

TO	Katie Daugherty and David Lacey, Oregon Department of Environmental Quality (DEQ)
FROM	Peter Shanahan, HydroAnalysis LLC (HALLC); Jennifer Hart and Gail Fricano, Industrial Economics, Inc. (IEc)
SUBJECT	Five Tribe review of "GWET System Effectiveness Evaluation, Arkema Inc. Facility," dated March 29, 2024

This memorandum, submitted on behalf of the Five Tribes,[1] reviews the *GWET* [Groundwater Extraction and Treatment] *System Effectiveness Evaluation* (2023 GWET SEE Report) prepared by Environmental Resource Management, Inc. (ERM) on behalf of Legacy Site Services, LLC (LSS) (ERM 2024).

Substantive Comments

1. Section 4.1.2 of the 2023 GWET SEE Report indicates that "the TCZOs [Target Capture Zone Objectives] are not being fully achieved as of the end of the reporting period." Section 6.4 describes various planned actions but states "More time at elevated extraction rates is necessary to evaluate whether GWET objectives are being met systemwide." ERM (2023), the 2022 GWET SEE Report, reached a similar conclusion: "Target Capture Zone Objectives are unlikely to be achieved until Q3 or Q4 of 2023. As the new extraction trenches come online and higher pumping rates are consistently achieved, compliance with Target Capture Zone Objectives will continue to be evaluated…" Based on our review of the 2023 GWET SEE Report, we conclude that the upgraded system, like the version before it, is undersized and not performing as designed. A variety of measures have been carried out and are proposed to remedy this situation; however, we are concerned that these minor adjustments will not achieve TCZOs. We recommend DEQ require LSS conduct an exhaustive evaluation as to whether the existing system can achieve TCZOs, and if not, what type of system should replace it.

2. Section 3.2 indicates that many of the pressure transducers (12 out of 54 piezometers) were inoperative for a month or more during 2023. The report states, "Transducers are typically inspected within 1 week of an issue being identified and typically repaired within 1 week to 1 month depending on whether a transducer replacement is required or not." Although not explicitly stated, the text implies that several weeks are needed to order and obtain a replacement transducer. Since transducers seem to fail with regularity, we recommend that spare transducers be purchased so that defective transducers can be replaced more expeditiously.

[1] The five tribes are the Confederated Tribes of the Grand Ronde Community of Oregon, the Nez Perce Tribe, the Confederated Tribes of Siletz Indians, the Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Warm Springs Reservation of Oregon.

3. Table 1a indicates that of the four recovery wells (RW), three (RW-14, -22, -25) were out of service due to equipment issues for all of May, June, and July. We recommend this extended outage be discussed and explained in Section 3.3 of the report.

4. Table 1a also shows that during the month of April seven of the fourteen trench extraction wells (EW) (EW-06, -08, -09, -10, -11, -12, -14) were out of service and an additional two extraction wells were below capacity (EW-02, -05). We recommend that this problematic period be discussed and explained in Section 3.3 of the report.

5. Section 4.1.1 describes operational difficulties due to "excessive friction loss at higher flows in the 3-inch conveyance line." This implies that the conveyance line, a holdover from the system pre-upgrade, is under-designed for the current system despite design calculations showing it would be adequate (ERM 2022). Section 6.1 states that "an event in January 2024 is planned to connect EWs in Trenches 5, 6, and 7 to the currently out-of-use conveyance line for Intermediate Zone based RWs." We recommend that the report indicate the size (diameter) of this conveyance line and provide calculations that show the increase in conveyance capacity. Friction coefficients used previously (ERM 2022) should be adjusted based on the performance of the existing conveyance line. Also, the SEE report is dated March 2024, which is after the so-called "planned event." We recommend that events that have occurred be reported, at least parenthetically, even if they occurred outside of the reporting period.

6. Section 6.2 lists numerous system shutdowns due to "solids handling issues," but without much specificity as to the nature of the problems other than their locale in the treatment system. We recommend more details be provided. We also recommend a more complete explanation of the system problems in general. Section 6.2 ascribes treatment-system problems to "variable solids and flowrates coming from new EWs." Variability seems unlikely to be the sole source of these problems. Rather, the descriptions in the text imply the system simply lacks adequate capacity for the new higher flows. If so, this represents a serious and systematic deficiency in the GWET system.

7. Section 6.4 indicates that "Solids handling was resolved in early 2023 through chemical trials, cleaning pressure filters, and replacing media in July 2023." This statement seems to be contradicted by the frequency of shutdowns listed in Section 6.2 that occurred after July 2023. We recommend LSS provide additional detail to explain why the maintenance performed in the first half of 2023 did not reduce the frequence of shutdowns in the second half of 2023. We also recommend that the list in Section 6.2 differentiate routine maintenance events from non-routine maintenance events.

8. Appendix C, page 3 of 47, reveals a distinct seasonal pattern in the concentration of chloride at shallow well MWA-63, which is located just beyond the eastern end of the barrier wall (i.e., on the river side of the wall). The data suggest a seasonal release of chloride to the river and may reveal important aspects of GWET system behavior. We recommend the concentration patterns at this well be discussed in Section 7.4.2.

9. The analysis of chloride in Section 7.4.2 includes a statement that trends at GCC5 and Proximal Wells "indicat[e] that the GWBW [groundwater barrier wall] is effectively preventing chloride migration towards the river." We recommend that this statement be qualified by adding "in this part of the site."

10. The analysis of perchlorate in Section 7.4.2 explains the trend of consistently increasing concentrations at deep well MWA-56D (see Appendix C, page 18 of 47) to be "likely from a proximal source on the exterior side of GCC4." This seems speculative. We recommend the report discuss what activities occurred or were likely to have occurred in this area that would give rise to a source of perchlorate, how such a source could give rise to increasing rather than steady concentration trends, and whether concentrations in the shallow and intermediate zones support the hypothesis there is a local source.

11. We recommend the statement from Section 4.1.2 that "TCZOs are not being fully achieved as of the end of the reporting period" be included in Section 8.1 as it is a significant conclusion from the 2023 GWET SEE results.

12. We recommend striking the first bullet item in Section 8.2 as the conclusion that equipment failures and malfunctions were resolved is not supported by the continued transducer failure rates reported in Section 3.2.

13. We recommend Section 8.2 include a statement that the upgrades to the GWET system have yet to achieve the forecasted 60 gallons per minute extraction rate on a sustained basis owing to system inadequacies and malfunctions.

14. This report contains many grammatical and typographical errors. We recommend greater attention to quality assurance and quality control.

Editorial Comments

15. Tables 1a and 1b report "Average Monthly Extraction Rates" and "Average Operational Monthly Extraction Rates." We recommend that these terms be defined in a footnote to each table.

16. Page 11 states "In accordance with the PMP [Performance Monitoring Plan], groundwater elevations are being monitored using the transducers and monthly manual groundwater elevation gauging." This phrasing leaves ambiguous how many of the 54 piezometers are monitored using pressure transducers, how many are monitored manually, or whether all are monitored both ways. We recommend this be clarified.

17. Page 11 states "cones of depression are apparent around each groundwater extraction trench." Inspection of contour plots in Appendix A shows this is not actually true for all months and all trenches.

18. Page 13 includes this vague description of future upgrades: "reconfiguring the conveyance line connections to EW trenches 5, 6, and 7." We recommend a clearer description—for example, "connecting EW trenches 5, 6, and 7 to an alternative discharge line."

References

Environmental Resource Management, Inc. (ERM). 2022. Final Design Report, Arkema Inc. Facility, Portland, Oregon. May 22.

Environmental Resource Management, Inc. (ERM). 2023. GWET System Effectiveness Evaluation, Arkema Inc. Facility, Portland, Oregon. April 12.

Environmental Resource Management, Inc. (ERM). 2024. GWET System Effectiveness Evaluation, Arkema Inc. Facility, Portland, Oregon. March 29.