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Tina Kotek, Governor

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March 4, 2024

Todd Slater
Legacy Site Services, LLC
3553 West Chester Pike, #413
Newtown Square, PA 19073

Subject: 2023 Feasibility Study - Rejection
Arkema Facility, ECSI No. 398

Dear Mr. Slater:

The Oregon Department of Environmental Quality received and reviewed the September 2023 *Feasibility Study* (FS), prepared by Environmental Resources Management, Inc. (ERM) for Legacy Site Services LLC (Legacy). Based DEQ's initial review of the FS, the FS will require significant revisions prior to be accepted by DEQ. DEQ believes these revisions will require a considerable amount of time and effort, ultimately delaying important elements of the cleanup work needed to address risks to human health and the environment.

Based on previous input from Arkema on a desire to preform additional interim removal action measures (IRAMs) and initial review of the Draft FS, DEQ is rejecting the FS in its entirety. Comments received by DEQ from EPA, the Five Tribes, and the Yakima Nation are enclosed for your information.

DEQ is shifting the project focus to completing a series of IRAMs and FS data gaps investigations in order to accelerate cleanup of areas of highest risk, improve near-term source control of the stranded wedge outside of the barrier wall, and reduce remedy selection uncertainty.

Please contact me at 503-860-3943 or by email at Katie.Daugherty@deq.oregon.gov if you have any questions.

Sincerely,

Katie DAUGHERTY

Katie Daugherty, R.G.
Project Manager
Cleanup Program, Northwest Region

enclosures

ecc Brendan Robinson, ERM

REGION 10
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December 14, 2023

MEMORANDUM

SUBJECT: EPA Comments on the Feasibility Study
Arkema Inc. Facility, Portland, Oregon
ECSI # 398
September 2023

FROM: Laura Hanna, RG, Remedial Project Manager
Superfund and Emergency Management Division

TO: Katie Daughtery, RG, Project Manager
NWR Cleanup and Leaking UST Section, Oregon Department of Environmental Quality

Following are the U.S. Environmental Protection Agency's (EPA) comments on the *Feasibility Study, Arkema Inc. Facility, Portland, Oregon* (FS Report) prepared by ERM-West, Inc. on behalf of Legacy Site Services LLC. The former Arkema Inc. Facility (site) is listed in the Oregon Department of Environmental Quality (DEQ) Environmental Cleanup Site Information (ECSI) database as site ID 398, with a high priority for the groundwater pathway pending effectiveness of source control measures. The site is adjacent to the River Mile 7 West (RM7W) Arkema in-water remedial design project area, which include the riverbank. The RM7W Arkema in-water project area is part of the Portland Harbor Superfund Site (PHSS) that is performing remedial design for the PHSS Record of Decision (ROD) Selected Remedy through an administrative settlement agreement and order on consent (ASAOC) with the performing party. Contaminants of concern (COCs) in the RM7W Arkema Project Area sediments include dichlorodiphenyltrichloroethane (DDT), DDT metabolites, chlorobenzene, polychlorinated dibenzo-p-dioxins and dibenzofurans, polycyclic aromatic hydrocarbons, metals, and polychlorinated biphenyls. Asbestos is a COC in riverbank soils and may also be present in sediments.

EPA comments are organized as: "Primary," which identify concerns that must be resolved to achieve the objective, or "To Be Considered," which, if addressed or resolved, would reduce uncertainty, improve confidence in the document's conclusions, and/or best support the assessment's objectives.

Primary comments are grouped into the following sub-categories: (1) Conforming to Oregon regulatory requirements and guidance; (2) Protection of the Willamette River and consistency with the PHSS ROD Selected Remedy; (3) Sufficiency of information to identify a preferred remedial action; (4) Effectiveness of proposed alternatives; and (5) General.

Primary Comments

Conforming to Oregon regulatory requirements and feasibility study guidance

1. Revise the FS Report to provide an evaluation of each remedial alternative's feasibility by conducting a residual risk assessment to achieve the protectiveness goals, stated as remedial action objectives (RAOs) in Section 6.1, and the chemical-specific criteria listed in Tables 6-2 and 6-3. In addition, absence of a protectiveness evaluation per Oregon Administrative Rule (OAR) 340-122-0085(4)(a) undermines the document's ability to assess the balancing factor of effectiveness. The FS Report overall and specific sections, including Section 5.1.4 are inconsistent with and do not conform to the requirements in OAR 340-122-0040(2)(a) and OAR 340-122-0084(4) that require protectiveness be evaluated through a residual risk assessment conducted prior to selection or approval of the remedial action. The two statements in Section 5.1.4, "Satisfying the RAOs will attain acceptable residual risk" and the statement "The remedial design will describe the residual risk assessments to be conducted during performance evaluation of the remedial action," both indicate the protectiveness goal is not being evaluated in the FS Report and, as described in Section 8.4.5, is being deferred to after the remedial action is selected, designed, and implemented.

2. Revise the FS Report to adhere to the latest DEQ FS guidance (DEQ 2017) and update Section 10 accordingly. For example, revise the FS Report including Section 6.5.1 Effectiveness, page 6-4, to incorporate the need to determine whether each alternative will meet applicable or relevant water quality standards, (i.e., levels that will support a successful in-water cleanup). As currently written, the section implies the only quantitative effectiveness evaluation required by OAR concerns residual risk related to treatment of residuals which is only part of the quantitative analysis need. Per DEQ (2017): "With respect to hot spots in groundwater or surface water for which the current or reasonably likely future beneficial use(s) includes drinking water, a remedial action alternative would not be considered effective if it would not reduce contaminant concentrations to levels below National Primary Drinking Water Standards Maximum Contaminant Levels (MCLs) or other applicable or relevant water quality standards, criteria or guidance. Variability (e.g., seasonally or annually) in water flow and water use should be considered in the evaluation of effectiveness."

3. Revise the FS Report to cost all alternatives. Per DEQ (2017), Appendix B, "Oregon's environmental cleanup law requires remedial action alternatives to be evaluated based on their cost." Ranking and selecting a preferred alternative without costing all alternatives does not comply with this law. To support the reasonableness of the cost evaluation, the FS Report should include backup documentation, present value analysis, and other key items specified in *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 2000). The absence of supporting information limits EPA's ability to make an independent determination of whether the cost comparisons between alternatives components are reasonable and whether the recommended alternatives, based on cost and cost-effectiveness determinations, are supported. A comprehensive review of the costs was not performed.

Protection of the Willamette River and consistency with the PHSS ROD Selected Remedy

4. Revise the FS Report to describe how it supports meeting the in-water RAOs of the PHSS ROD. The FS Report describes reducing risk to in-water receptors without describing the overall source control objective of supporting the in-water remedy, and simply states this is under the RM7W ASAOC (EPA, 2020). It is beyond the scope of the in-water remedy to conduct sufficient upland source control such that it can meet all RAOs in the PHSS ROD. This is indicated in Section 6.6.7 (Interface with the In-Water Remedy) but otherwise absent from the document. The Portland Harbor ROD requires that upland actions actively address sources of groundwater contamination migrating to the river and that, in addition, in-water actions may be

warranted to address the portion of the plumes that extend into the river [1]. It is EPA's expectation that the upland actions actively address sources of groundwater contamination, and that in-water actions are only applied to address the portion of the plume that extends into the river (i.e., stranded wedge).

5. Section 6.4.2 Action Levels: EPA requests the opportunity to review and comment on any proposed methods to assess leaching to groundwater and develop site-specific remedial action levels for both the groundwater and the leaching to groundwater pathways.
6. Revise the FS Report to reflect Willamette River use as a drinking water source, which has been promulgated. As such, water discharging into the Willamette River must also meet MCLs to be consistent with the PHSS ROD. It is irrelevant to this formal beneficial use designation whether wells in the uplands or intakes in the river currently exist. As written, the FS Report designates the remedial goal in transition zone water as recharge to aquatic habitat, which has a different spatial scale for application than drinking water.

7. Table 6-1 Preliminary Project ARARs: Revise the applicable or relevant and appropriate requirements (ARARs) table to include evaluation of in-water ARARs identified in the PHSS ROD Tables 25a through 25c. The ARARs table presents co-mingled location, action, and chemical specific ARARs and truncates many potentially pertinent ARARs found in the PHSS ROD Table 25a through 25c. Per EPA's January 18, 2018 comments to DEQ on the Revised Upland Feasibility Study Work Plan about upland and in-water ARARs consistency at the site and the PHSS, the FS Report should be consistent with the ARARs identified in the PHSS ROD. A complete crosswalk table, or equivalent, with PHSS ROD Tables 25a through 25c ARARs should be included in the FS Report.

Sufficiency of information to support identifying a preferred remedial action.

8. Section 8 does not provide sufficient detail about the evaluation of each alternative for each evaluation criteria to support the ratings that have been presented for each alternative for each functional unit (FU). Although Section 8.2.2 provides some general information for the interpretation of ratings, it does not provide sufficient information to understand the development and application of the ratings. The additional supporting information should include evaluation of each subfactor for "effectiveness", "long-term reliability", "implementability", and "implementation of risk" (as listed in Sections 6.5.1 through 6.5.4) for each of the alternatives within each FU. Ratings for each evaluation factor for each alternative would need to be justified as part of the detailed analysis. Alternatives with the top overall and top effectiveness score are often not the selected alternative and the rationale for the preferred alternative is limited and not adequately substantiated.

[1] PH ROD Section 9: "It is EPA's expectations that DEQ's action to address upland source control will adequately address contaminated soils, surface water, and especially groundwater contamination migrating to the river . . ."; and PH ROD Sections 12.10 and 14.2 "The majority of the currently identified groundwater plumes are expected to be controlled by DEQ's upland source control actions and the remedial alternatives will only need to address the portion of the plumes that extend into the river or that continue to discharge contaminants to the river. Since the extent that these plumes impact the biologically-active zone in sediment (pore water) or surface water is not currently known, these areas will need to be refined during remedial design and, at that point, it will be determined which residual groundwater plumes will need to be addressed in the river through engineered caps."

9. Provide summary descriptions for the recommended alternatives at each FU to verify and assess whether the alternatives are functionally compatible across the site to achieve RAOs. Although alternatives for each media-specific FU would need to meet RAOs relevant to the associated FU, the alternatives across all FUs would need to collectively meet all RAOs. Therefore, a discussion is needed to clarify whether the alternatives can collectively address each RAO. EPA notes that achievement of RAOS could be evaluated by conducting a residual risk assessment.

10. Revise the FS Report to include a quantitative or qualitative evaluation of flux and the potential in-river impact reduction or reference a previous report where this information is presented. The FS Report lacks quantitative information on the degree of reduction of COC flux that is necessary to support alternative analysis relative to the technologies' effectiveness to achieve specific exposure point concentrations. It is unclear how one alternative can be ranked over another without knowing whether either alternative can sufficiently support in-water cleanup and over what timeframe.

11. Regarding testing of soil leachability to groundwater during design, EPA understands DEQ intent is to allow soil leachability testing to be conducted after hot spot removal and any removal actions. Leaving leachability testing to remedial design skews the comparison of alternatives, considering some alternatives may not be effective at meeting PHSS ROD cleanup levels in-water regardless of in-water remedy robustness.

12. A groundwater flow and contaminant fate and transport model should be developed during remedial design to determine if additional actions are needed. EPA acknowledges that DEQ has not approved any prior site-specific groundwater modeling. The complexities from spatial factors, nature of contaminants, and technology interactions create unknown conditions that indicate groundwater modeling should be performed to provide better understanding of groundwater flow and the feasibility of the recommended alternatives. Various factors impact groundwater flow at the site including groundwater proximity to surface water, operation and shutdown of the existing groundwater extraction and treatment system (GWET), impact from the existing groundwater barrier wall (GWBW), potential impact by future in situ stabilization (ISS) activities, and potential impact by future breaches in the GWBW for installation of in situ chemical reduction (ISCR) permeable reactor barrier (PRB).

Effectiveness of proposed alternatives.

13. Provide preliminary conceptual design information for the purpose of evaluating the alternatives. Section 8.17 summarizes the recommended alternatives and includes the statement, "The concept of a FU was useful for delineation of the site into discrete areas, strata, and allowed for an organized approach to conceptual designs and evaluation of specific technologies." The conceptual design and related evaluations referred to are needed because site conditions represent a challenge for developing effective alternatives. Such conditions are related to the diversity and concentrations of COCs, lithology, and proximity to surface water. Therefore, to evaluate effectiveness and identify a preferred alternative, the remedial alternatives in the FS Report should be supported with some degree of confidence or empirical demonstration of effectiveness such as pertinent case studies from literature, results from site-specific treatability/pilot studies, and/or modeling results. Examples where conceptual design information is needed is engineered cap reducing leaching to groundwater (FU-2, Alternative 3), ISCR/ISS effectiveness for specific COCs (FU-4 through FU-10), and PRB effectiveness for specific COCs/PRB not impacting in-water ecological receptors (groundwater downgradient of FU-5, -6, -8, and -10).

14. Provide descriptions of the potential impacts and associated resolution of incompatibility related to implementing various phases of remedial action. According to Section 8.17, Phase 1 of the proposed remedial action implementation includes ISCR/ISS at FU-9 and FU-4 and ISCR injection at FU-10, while Phase 2 includes ISCR injection at FU-8. ISCR/ISS can have significant impact to groundwater extraction infrastructures, groundwater flow, and groundwater quality. It is unclear whether the GWET system will continue operating throughout Phases 1 and 2 before being decommissioned as part of Phase 3. If the GWET system will continue operating during Phases 1 and 2 remedial action implementation, then the impact of ISCR/ISS to the recovery wells, to influent flow, and to water quality of the GWET should be estimated. If the recovery wells, influent flow, and water quality of the GWET will be impacted significantly, then evaluations should be made to determine whether the impacts are mitigable (i.e., no non-mitigable fatal flaws). Alternatively, if the GWET system will cease to operate when remedial action begins, then contingency measures should be included to achieve hydraulic containment until all phases of the remedial action are complete.

General

15. Revise the FS Report to provide COC concentration contours for soil and groundwater COCs or reference a previous report where this information is presented. The absence of concentration contours for various COCs at the FUs in the FS Report, is insufficient to support the application of a remedial technology to individual FUs because the FS Report does not provide information to gauge the extent and severity of the contamination at the site. If insufficient data are available to generate concentration contours, figures showing available concentration data would also be informative for assessing the application of technologies at FUs.

16. Section 8.12, Functional Unit 8: Northern Riverside Portion of Lots 3 and 4 Shallow, Intermediate, and Deep Groundwater Zones, pages 8-18 to 8-21: Revise the FS Report to include an augered application of the ISCR reagent (ISCR plus ISS similar to FU-9 Alternative 3), which has been shown to be immediately effective at other sites, in addition to injection and PRB evaluation. Injection of reagent is unlikely to ensure contact with the reagent and the hexavalent chromium producing an overreliance on the PRB. The PRB should only be a polishing step and overreliance could result in barrier clogging and preferential flow of groundwater routing around it, resulting in delayed achievement of RAOs.

To Be Considered Comments

1. Section 4, Locality of the Facility, page 4-9: Revise the text to acknowledge that groundwater plumes may extend into and beyond the riverbank zone into the river. The existing text simply acknowledges plumes may extend into the riverbank.

2. The riverbank is referred to throughout the FS Report without providing a riverbank definition. EPA recommends the definition provided in Appendix D of EPA's *Remedial Design Guidelines and Considerations* (EPA 2021) be used (i.e., the area from the top of bank extending to the shallow region of the river at -2 feet Columbia River Datum). This is important to ensure the upland and in-water remedies are adequately integrated.

3. Provide additional details on metals as groundwater COCs. Section 4.3.1.1 describes cadmium, nickel, and zinc being generally associated with the deep and gravel/basalt zones within Lot 1. Table 6-4 lists metals as COCs at shallow zones in FU-5 and FU-6 (in Lots 1 through 3) and at shallow and intermediate zones in FU-7

(in Lot 3). However, specific metals associated with FU-5 through FU-7 shallow/intermediate zone groundwater are not described.

4. Section 6.5, Remedy Selection Balancing Factors, pages 6-4 to 6-5: Revise all subsections of Section 6.5 to use verbatim OAR language from DEQ (2017) rather than paraphrasing or changing the meaning of the rule. For example, in Section 6.5.4, truncating "Potential impacts on workers" from the original, complete language ("Potential impacts on workers during implementation of the remedial action and the effectiveness and reliability of protective or mitigative measures.") changes the intent of the rule and could change the outcome of the comparative analysis of alternatives. Editorial changes in Section 6.5.5, such as "**reasonably likely** [emphasis added] beneficial uses of water" also changes the evaluation because DEQ (2017; footnote 9) language simply states, "restore the beneficial uses of water."

5. Section 8.6.6.1 Comparative Analysis, page 8-5: Revise the FS Report to further clarify or remove the implementation risk statements related to excavating large areas. It is unclear what "implementation risk due to excavating a large area near the river and the associated safety risks" means. Because of the limited information presented, it is unknown to the reader how the size of the area or the river proximity impacts risks.

6. Section 8.6.13.1 Comparative Analysis, page 8-7: Revise the preferred alternative to select Alternative 3 or revise the scoring based on new facts to be presented. While Alternative 3 (ISCO or ISCR and ISS) scores the best, it is not selected arbitrarily, because no category received a "5" score; selection seems deliberate owing to the additional cost relative to the next highest scored alternative.

7. Section 8.15, Functional Unit 11, Gravel/Basalt Zone Groundwater Lots 3 and 4: Revise this analysis to include some active cleanup alternative. Institutional controls/monitored natural attenuation are ineffective at mitigating ecological risk in transition zone water/porewater in the Willamette River.

References

EPA. 2021. *Remedial Design Guidelines and Considerations, Portland Harbor Superfund Site, Portland, Oregon*. Seattle, Washington: EPA Region 10.

EPA. 2020. *Administrative Settlement Agreement and Order on Consent for Remedial Design at River Mile 7 West Project Area*. Seattle, Washington: EPA Region 10.

EPA. 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. EPA 540-R-00-002. OSWER 9355.0-75. Washington, DC: EPA Office of Emergency and Remedial Response.

DEQ. 2017. *Guidance for Conducting Feasibility Studies*. Portland, Oregon: DEQ Environmental Cleanup Program.

cc: David Lacey, DEQ

IEc

MEMORANDUM | October 18, 2023

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 "Feasibility Study, Arkema Inc. Facility," dated September 2023

This memorandum, submitted on behalf of the Five Tribes,[1] reviews the *Feasibility Study, Arkema Inc. Facility* (FS) prepared by Environmental Resources Management (ERM) on behalf of Legacy Site Services LLC (ERM 2023a). Given the size and organization of the FS, which evaluates multiple alternatives for each Functional Unit separately, we focused our review on the alternative identified as "preferred" in the FS.

General Comments

1. The FS evaluates up to seven alternatives for each of the site's 12 Functional Units individually, making it difficult to get a sense for the whole of the remedy. In addition, some of the alternatives selected for certain Functional Units are dependent on the alternatives selected for other Functional Units. For a site this large and complex, we recommend the FS be revised to include a more cohesive summary of the alternatives across all Functional Units.
2. We note that several alternatives shown as "retained" in Table 7-2 are omitted from the lists of alternatives evaluated for Functional Units 11 and 12. We recommend that DEQ review the other Functional Units for any additional omissions.
3. None of the preferred alternatives proposed in the FS address one of the most problematic aspects of the site: the highly contaminated groundwater in the deep zone that continues to discharge to the river. The most recent groundwater monitoring report (ERM 2023b) shows that the groundwater in this zone continues to show high concentrations of chlorobenzene, perchlorate, and chloride and that groundwater in the deep zone is not being captured by the groundwater extraction and treatment (GWET) system. None of the preferred alternatives offers a remedial action likely to address this problem. We recommend evaluations of additional alternatives for the deep units.

[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.

Specific Comments

4. Section 4.2.3 describes past practices of storing salt and creating brine in the chlorate plant area. Section 4.2.3 reports chloride concentrations in the shallow, intermediate, and deep groundwater zones, all of which exceed that of seawater and thus indicate water of significant density. Notably, concentrations of chloride are reported to be higher in the deep zone than in the intermediate zone, strongly suggesting the possibility of density-driven downward transport of brine. While rare, dense aqueous phase liquid (DAPL) has been encountered at sites where brine was historically handled. We recommend that the potential for density-driven transport and/or DAPL accumulation be considered for this area of the site and, if appropriate, incorporated into the hydrogeologic conceptual model.

5. Section 4.6, "Summary of Preliminary Hydrogeologic Conceptual Model," is brief and lacks sufficient detail. We recommend that a more complete conceptual model be provided. The differences, if any, between the Hydrogeologic Conceptual Model and the Site Conceptual Model presented in the Remedial Investigation (ERM 2005) should be clarified.

6. We recommend that more clear and complete justification be provided for the balancing factors selected for the various remedial alternatives lest they be perceived as biased to favor certain alternatives. Table 7-2 provides a highly condensed summary of balancing factors, which are presented qualitatively (low, medium, high) rather than numerically (1-5) as in Tables 8-1 through 8-11. Some quantitative balancing factors in Tables 8-1 through 8-11 do not align with the qualitative ratings in Table 7-2 and thus seem questionable. For example, for Functional Unit 2, low rankings are assigned to the implementability and implementation risk of Alternatives 2a and 2b and are justified in Table 7-2 by the "presence of site infrastructure (i.e., GWET system)" and "health and safety hazards," respectively. While the factors identified are real, the ratings of 1 and 2 appear to be biased low. Contrary to the "low" rating for implementability, the GWET is confined to only one portion of the site and thus would not interfere with excavation over much of the site. Table 7-2 indicates the implementation risk of excavation is medium—which is consistent with a rating of 3 rather than 2. In contrast, Alternative 4 for Functional Unit 10 is given implementability and implementation risk ratings of 4 and 5, respectively. These seem unrealistically favorable given that Alternative 4 includes excavation of the existing groundwater barrier wall, which is up to 85 feet deep—obviously, a challenging construction task.

7. In Section 7.3, the description of remedial technologies considered is too general and lacks appropriate citations. We also recommend that additional information be provided to demonstrate the effectiveness of two particular technologies: 1) the combined application of in situ chemical reduction (ISCR) and in situ solidification and stabilization (ISS) and 2) the use of ISCR to treat perchlorate.

8. Section 7.3.15 describes monitored natural attenuation (MNA) in general terms without any attention to its effectiveness and applicability for the specific contaminants at this site. Since MNA is the only remedy considered for contaminated groundwater in the Gravel/Basalt Zone, we recommend more specific discussion of the geochemistry of that zone and the appropriateness of MNA for the contaminants in that zone in light of its geochemistry.

9. Section 8.6.4 presents Alternative 4 for Functional Unit 2 as excavation of direct exposure hot spots. We recommend the addition of a map or figure that clearly identifies the areas proposed for excavation in this alternative. Such a figure would allow the reader to identify the direct exposure hot spots that would otherwise be left in place to more fully evaluate the potential implications of other alternatives.

10. Section 8.6.7 identifies the preferred alternative for Functional Unit 2 as a compacted gravel cap, also referred to as an "engineered" cap. Compacted gravel is not a typical "capping" material for hazardous materials and we question its capability to prevent infiltration and thereby provide protection of groundwater. We recommend that the FS provide a detailed description of this capping material, how it would be installed, the specific construction quality assurance procedures that would be used during installation, and the expected hydraulic properties of the final cap.

11. Section 8.7.5 presents Alternative 5, the preferred alternative for shallow Functional Unit 4. While the text indicates that selection of this alternative is contingent on selection of the similar alternatives for deeper Functional Units 8 and 9, there is a seeming disconnect between the shallow and deep alternatives. Figure 8-2 shows only ten ISCR/ISS circles within Functional Unit 4, while Figure 8-4 shows nearly fifty within Functional Unit 9. It is unclear how a soil auger can bypass Functional Unit 4 and treat only Functional Units 8 or 9. Further, in the discussion for Functional Unit 9, Section 8.13.3.2 includes the sentence "If Alternative 3b is chosen for groundwater in FU-9, ISCR would also be used for the unsaturated soil overlaying FU-9." Given the similarities between Alternative 3a and 3b, it seems that a similar specification would apply to Alternative 3a as well. We recommend that this be clarified. If this specification does apply to Alternative 3a, that suggests that the extent of ISCR/ISS remedy for Functional Unit 4 would necessarily coincide with that for Functional Unit 9. Again, we recommend that the spatial extents of the actions for Functional Unit 4, 8, and 9 be clarified.

12. Section 8.11.2 identifies MNA as the preferred remedy for Functional Unit 7 but introduces some uncertainty with the statement "The success of this remedy is dependent on the implementation of remedies in immediately adjacent and *downgradient FUs*" (emphasis added). This qualification implies that the downgradient permeable reactive barrier (PRB) proposed for Functional Units 5, 6, and 10 is also intended as the ultimate remedy for Functional Unit 7. We recommend that the interaction of these various remedies be clarified and that the anticipated locations for the proposed six monitoring clusters be identified. Specifically, where are the monitoring clusters to be located relative to the PRB?

13. Section 8.13 identifies Enhanced ISCR and ISS as the preferred remedy for Functional Unit 9. We recommend that the FS provide additional explanation as to how ISCR and ISS will work together and examples of where the efficacy of the combined treatment has been previously demonstrated. While ISS is intended to solidify or stabilize the solid matrix and minimize transport, ISCR depends on transport to bring chemical agents to reactive sites. It would thus seem the two technologies would work antagonistically.

14. We recommend that the areal extent for ISCR/ISS in Functional Unit 9 be explained more completely. Specifically, Figure 8-4 shows a line of ISCR/ISS circles along the former dichlorodiphenyltrichloroethane (DDT) trench, which is among several areas where soil has been previously excavated and removed. We recommend that the report clarify why this particular area has been singled out for additional action while other previously excavated areas to the south are not designated for additional action.

15. For Functional Unit 9, we recommend that the anticipated vertical extent of the ISCR/ISS remedy be stated explicitly, recognizing that the actual extent will be finalized during remedial design and remedial action, as stated in Table 7-2. We believe it is important to at least estimate the anticipated vertical extent in the FS because, as pointed out in Table 7-2, effectiveness may be reduced in deeper zones. Table 7-2 gives an effectiveness rating of high, which would be inappropriate for the deeper zones.

16. Section 8.14.2 indicates that ISCR "provides a suitable environment for anaerobic biodegradation of perchlorate." In contrast, a recent fact sheet from the Air Force Center for Environmental Excellence (AFCEE 2022) indicates that ISCR for perchlorate is still the subject of active research. Under "cost effectiveness" the AFCEE (2022) fact sheet states: "Because the application of in situ anaerobic bioremediation technologies to perchlorate-contaminated groundwater is currently being validated, defensible cost and performance data are not yet available. Completion of the field efforts should provide valuable insight into the cost and performance of the technologies." We recommend the FS provide additional documentation for the effectiveness and past successful application of ISCR for treatment of perchlorate.

17. Table 8-10 identifies the preferred alternative for Functional Unit 11 as "Monitored Natural Attenuation and Verification in Remedial Design" while Section 8.16.2 describes the preferred alternative for Functional Unit 12 as "Monitored Natural Attenuation, Adaptive Management, and Verification in Remedial Design." In contrast, the text for both Functional Units mentions only MNA. We recommend that the adaptive management and verification in remedial design components also be described.

18. Sections 8.15 and 8.16 consider only two alternatives (No Action and MNA) for Functional Units 11 and 12. In contrast, Table 7-2 shows many other technologies, including various in-situ treatment options, retained for further assessment and ranking. This discrepancy between Table 7-2 and the report sections should be addressed. We believe the assessment of only the two alternatives for these Functional Units is insufficient. Unlike Functional Unit 7, groundwater from Functional Units 11 and 12 is unlikely to eventually pass through the riverside PRBs (although we also recommend that the FS indicate the extent to which Gravel/Basalt Unit groundwater may be captured by the PRBs). Perhaps for this reason, the effectiveness factor for MNA is only 2 for both Functional Units 11 and 12. Low effectiveness is consistent with ongoing monitoring (ERM 2023b) that shows high concentrations of chlorobenzene, perchlorate, and chloride in deep zone wells along the existing barrier wall. The current situation for the deep zone is essentially MNA and it does not seem to be working. We therefore recommend that other alternatives be evaluated.

Editorial Comments

19. On page 7-1, the acronym "HCSM" is used but not defined or included in the document's list of abbreviations.

20. On page 8-22, the first line in Section 8.13.3.1 should say Alternative 3a rather than Alternative 3b.

References

Air Force Center for Environmental Excellence (AFCEE). 2022. Perchlorate Treatment Technology Fact Sheet, In Situ Anaerobic Bioremediation. August. https://clu-in.org/download/contaminantfocus/perchlorate/anaerobic-bio.pdf

Environmental Resources Management (ERM). 2023a. Feasibility Study, Arkema Inc. Facility, Portland, Oregon. Portland, Oregon. September.

Environmental Resources Management (ERM). 2023b. Arkema Quarter 2, 2023, Groundwater Monitoring Report, Arkema Inc. Facility, Portland, Oregon. Portland, Oregon. September.

Environmental Resources Management (ERM). 2005. Upland Remedial Investigation Report Lots 3 & 4 and Tract A - Revision 1, Arkema, Inc., Portland Facility. Portland, Oregon. December.

Confederated Tribes and Bands
of the Yakama Nation

Established by the
Treaty of June 9, 1855

October 20, 2023

Via Electronic Mail – Katie.Daugherty@deq.oregon.gov & Novak.Elisabeth@epa.gov

Oregon Department of Environmental Quality
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Portland, Oregon 97232

U.S. Environmental Protection Agency
Region 10, Oregon Operations Office
c/o Madi Novak
805 SW Broadway, Suite 500
Portland, Oregon 97205

RE: Portland Harbor - Yakama Nation comments on the Arkema Inc. Facility, Upland Feasibility Study for the Upland Properties Adjacent to the 7W Arkema In-water Project Area

Dear Ms. Daugherty and Ms. Novak:

The Yakama Nation (YN) submits the following comments regarding the September 2023 Arkema Inc.Facility Feasibility Study (FS) for upland properties within the Portland Harbor Superfund Site adjacent and contaminant source to the River Mile 7W Arkema Portland Harbor In-water Project Area. This FS was prepared by Environmental Resources Management for Legacy Site Services.

This FS addresses six (6) tax parcels owned by Atofina Chemicals, Inc. These upland properties are divided into eleven (11) functional units (FUs) for evaluation of alternatives in different areas and media within the property boundaries. Riverbanks (FU-1) are deferred to InRiver cleanup and will be addressed in the remedial design process for in-water sediment management areas (SMAs). Oregon Department of Environmental Quality (DEQ) will use the information and recommendations within this FS to inform a Staff Report (comparable to and as protective as a CERCLA Proposed Plan) documenting the proposed cleanup decisions.

The YN is submitting these comments because our evaluation found significant deficiencies in the FS evaluations, supporting materials, and proposed cleanup alternative recommendations. We urge DEQ to reject the FS, request more robust evaluations, and require more protective FS remedial alternatives with contingencies.

General Comments and Questions

1. These comments originate from a more high level review of the Arkema Inc. Facility Upland FS. At this time, the YN does not have the capacity to perform a detailed review of the Upland FS. We therefore rely on DEQ and EPA to do a more thorough evaluation of RI data and data gaps, as well as RI/FS evaluations, conclusions and recommendations, to determine the long-term protectiveness with respect to human health and the environment, including habitat, ESA species, and Treaty Resources.
2. The extent of the "site" is wherever contamination has come to be located and not restricted to the tax parcel boundaries. We rely on DEQ and EPA to ensure that contaminant transport from within the tax parcels identified in the FS has not migrated to other neighboring upland parcels or waterbodies.
3. This is one of the most toxic upland and in-water sites our collective team has encountered with very unusual contaminant chemistry (rocket fuels, pesticides, fungicides, herbicides, salts, pH issues, etc.). This "toxic soup" of contamination can have synergistic effects that greatly increase harmful effects to receptors well beyond risk-based criteria predictions based on individual contaminants. There are numerous and wide-spread site releases of contaminants that are persistent, forever, bioaccumulative chemicals in multiple media that are not likely to attenuate naturally. However, monitored natural attenuation (MNA) is recommended for the majority of the site. The entire site exceeds OR Hotspot criteria for both soil and groundwater. The riverbanks and "riparian buffer" are located within an identified liquefaction zone, in the case of a large-scale earthquake. In addition, the property is directly adjacent to and discharges to the Willamette River, which (regardless of infrastructure and contamination) provides necessary habitat and a migration corridor to ESA listed species and Treaty Resources. An aggressive and protective upland cleanup is critical to eliminate ongoing exposure to human and environmental receptors and ensure the long-term cleanup effectiveness.
4. This does not appear to be an aggressive or protective cleanup. The PRP is proposing to leave ALL contamination in the upland behind, cap it in place, stabilize a very small portion of the hotspots using in-situ chemical reduction (ISCR) and in-situ stabilization (ISS), and rely mostly on monitored natural attenuation (MNA) and institutional controls (ICs). Along the river is where the PRP proposes to focus their in situ treatment of DNAPL and groundwater with a combination of injected (mostly) and excavated trenches of permeable reactive barriers (PRBs) using ISCR (in situ chemical reduction) and ISS (in situ solidification/stabilization - Portland cement) to prevent contaminated site groundwater from entering the river. This is a very minimal, ineffective, unreliable, approach that defers the true cost of failed cleanup to future owners and taxpayers.
5. The PRPs ranking system fails to meet the minimum requirements of CERCLA's process that employs 9 evaluation criteria (2 threshold, 5 balancing, 2 modifying) and weights implementability as 50% of the ranking total.
    a. Threshold Criteria – It is questionable whether the preferred alternatives are protective of human health and the environment. It also does not follow ARARs (ex. protective of construction workers, terrestrial receptors, addresses hotspots).
    b. Balancing Criteria –Long-term effectiveness, reduction in toxicity/mobility/volume, short-term effectiveness, implementability, cost - Some of the PRPs "Recommended Alternatives" don't even rank well on their own criteria of "long-term reliability (ex. FU-3, FU-7), effectiveness (ex. FU-7, FU-11), or other rankings.
    c. Modifying Criteria – State and Community acceptance - not discussed adequately
6. Has principal threat waste (PTW) criteria been developed for the Arkema upland site? How do the alternatives address PTW requirements? If PTW criteria has not been developed, why not?
7. How are the alternatives evaluated to determine and ensure the proposed remedy protectiveness of:
    a. Construction and outdoor industrial workers?

b. Terrestrial and riparian receptors? - see adjacent Doane Creek and Willamette River riparian habitat.
c. How/when will this proposed remedy return groundwater to its beneficial use?
d. How will this remedy provide a protective cleanup for other receptors/complete exposure pathways in the CSM?
e. This FS lacks the evaluation or visuals to determine the ultimate protectiveness for each complete exposure pathway/receptor. This information needs to be provided in the FS.

8. What reasonable restoration timeframe required, assumed, or expected? What evaluation has been conducted to determine if this is achievable?
9. Future land use. This minimalist cleanup leaves behind significant contamination at very shallow depths and below a thin cap. What incentives, requirements, or consequences are there if any future entity, who plans to redevelop or turn the property over for some kind of beneficial use, needs to excavate or regrade areas? Will the entire financial burden of redevelopment (and cleanup) fall on the land purchaser, or more likely the taxpayer? Or will this remain a derelict property that no environmentally savvy investor will risk taking on?
10. If any future entities wish to implement habitat improvements on any portion of the property (including upland, riverbanks or nearshore), will the proposed upland remedy preclude any possibility of accomplishing this? As described, the remaining shallow contamination and institutional controls appear likely to make it unsuitable and nearly impossible to finance or accomplish even minimal habitat improvements.
11. How has adequate evaluation of future ongoing impacts to upland, riparian, and aquatic habitat, resources, Treaty Resources, and ESA species with this proposed remedy been conducted? What mitigation measures are needed with this proposed remedy?
12. How involved is the maintenance and long-term effectiveness of the PRBs and PRB gates? Previously the GWET system experienced significant biofouling with its pump and treat system.
13. Riverbanks - How would this upland PRB prevent or allow for the various types of riverbank cleanup technologies available? Will this preferred remedy result in a large, 1/2 mile long, stranded wedge of toxic riverbank and shallow sediments? The nexus between upland and in-water cleanups must be part of this upland FS evaluation.
14. How adequately does this FS evaluate and address climate change and seismic model predictions?

Please do not hesitate to contact me with questions. I can be reached at (509) 985.3561 or shil@yakamafish-nsn.gov

Sincerely,

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