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November 28, 2023

Oregon Department of Environmental Quality (DEQ)
Northwest Region Office
700 NE Multnomah Street, Suite 600
Portland, Oregon 97232

Attention: Kevin Dana, Cleanup Project Manager

Subject: Response to Comments on Preliminary (30%) Design Report Riverbank Source Control Measure
Crawford Street South Site
Portland, Oregon
ECSI No. 2363
File No. 6209-010-01

This letter responds to comments on the Preliminary (30%) Design Report Riverbank Source Control Measure (PDR) for the Crawford Street South CSS site (ECSI # 2363) located in Portland, Oregon (the Site). A draft PDR was submitted to the Oregon Department of Environmental Quality (DEQ) on June 15, 2023. The DEQ provided comments in a letter dated October 30, 2023; the DEQ included comments prepared by the U.S. Environmental Protection Agency (EPA), IEc, on behalf of five federally recognized tribes, and Yakama Nation with the October 30, 2023 letter. The comments provided by each party are presented in italic font below, followed by our response in regular font.

RESPONSE TO DEQ COMMENTS

- EPA notes in their Primary Comments that DEQ is the lead agency for the riverbank remediation and overall source control work at Crawford Street South. As a result, the work being conducted by GeoEngineers will not be covered under EPA's Programmatic Biological Assessment unless project oversight is transferred from DEQ to EPA. GeoEngineers will need to pursue individual consultations with the U.S. Fish & Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). However, as USFWS has already determined that no formal consultation with EPA will be needed for Portland Harbor cleanup work, you may be able to use much of the information already submitted by EPA to USFWS to make a similar argument that formal consultation will not be necessary.*

Response: We appreciate the clarification and would like an opportunity to discuss this comment further with your DEQ project team and the EPA team as it will likely have a significant impact on the schedule for achieving final design.



- The Tribes commented that it is unclear as to whether all of the black sand fill will be removed from the riverbank. DEQ agrees with the Tribes that all of the black sand fill should be removed, as the black sand appears to be the source of much of the Principal Threat Waste (PTW) exceedances identified in the riverbank leave surface.*

Response: As noted in Section 5.2.1, visible black sand fill encountered during riverbank layback will be removed and, based on the riverbank characterization sampling, it is anticipated that this will remove the majority of the black sand. However, some black sand fill in the upper bank may be buried beneath 2 or more feet of soil that does not contain PTW as indicated on Figures 5a (location XS11-30) and 5b (location XS2-50) of the PDR. This black sand may not be accessed during the layback. Further, conducting a removal action to remove the overlying soil and then excavate all of the black sand fill could destabilize the riverbank and complicate the layback. Black sand fill that is currently buried below the anticipated leave surface and not visible during the layback will be capped in place by at least 2 additional feet of clean soil, ensuring that future exposure to humans or biota is mitigated. The riverbank cap is being designed assuming that some black sand fill will be buried and inaccessible during the layback and subsequently includes safeguards to safely and reliably contain this material in place.

- The Yakama Nation also noted that no rationale was provided for leaving PTW in the riverbank leave surface (e.g., excessive cost, infeasibility) beyond an assurance that the amended soil cap would capture and contain the PTW. Given the concerns expressed by all parties about leaving PTW in the riverbank, DEQ recommends that an effort be made to at least remove all identified PTW from the riverbank leave surface, unless it can be demonstrated that such a removal would be infeasible or impracticable.*

Response: As identified in the Source Control Evaluation Work Plan (Cascadia, 2021), the results of both the historical review of site uses and the riverbank soil investigations support that the contaminants of concern (COCs) found in riverbank soil are sourced from the fill material comprising the riverbanks. The objective of the investigations was to characterize the leave surface recognizing that the material making up the riverbank is predominantly fill and the COCs identified at the leave surface were likely ubiquitous throughout the fill. Therefore, the riverbank layback has been designed with this assumption in mind and does not propose to place cap amendments just in the places where the highest COC concentrations are identified; rather, the layback and cap design assumes that these high concentrations could occur in variable small, localized areas throughout the fill, as represented by the leave surface characterization results. The only way to remove all PTW would be to remove all of the fill material making up the riverbank, which would be impractical and prohibitively expensive.

- Finally, EPA expressed concerns with the coordination between the proposed riverbank remedy at Crawford Street South and the still under-development in-water and riverbank remedies at the adjacent Cathedral Park and Willamette Cove sites, noting in particular that the transitions from the proposed riverbank leave surface at Crawford Street to the existing riverbank surfaces are “exceptionally steep”. Preliminary (30%) designs are anticipated at both Cathedral Park (in-water) and Willamette Cove in the next six months. DEQ recommends that GeoEngineers coordinate and consult with the adjacent parties to ensure that the proposed remedies at Crawford Street, Cathedral Park (in-water), and Willamette Cove are consistent and complement one another. DEQ can assist in facilitating these conversations if needed.*



Response: We agree that coordinating with the Cathedral Park and Willamette Cove in-water technical teams is imperative to ensure that the proposed remedies complement one another. We have reached out to the Willamette Cove in-water team to initiate discussions on coordinating designs; the Willamette Cove Group (WC Group) is planning to submit its 30% Design by the end of this year (2023). The proposed laybacks for the riverbank of Willamette Cove are consistent with the layback slope for Crawford Street and the two parties can initiate discussions on integrating the boundaries once the WC Group has received approval of the layback slope from the EPA. We will also plan to reach out to the Cathedral Park technical team to initiate discussions on integrating the proposed in-water design for the Cathedral Park Project Area with the Crawford Street South riverbank layback. The design team will integrate construction methods to accommodate varying schedules for the adjacent property interfaces. This intent would be to decouple future project timelines and may include temporary interfaces and grades. Additional details are provided in response to EPA comment 6.c.

RESPONSE TO EPA COMMENTS

EPA comments were organized into “Primary,” “To Be Considered,” and “Matters of Style” and the responses below follow this organization.

Primary

1. *The PRD describes an action that is anticipated to be conducted under DEQ oversight as a Source Control Action under the upland Consent Order. Remove all references in the PRD that indicate an intention to conduct the work subject to the PH ROD and/or CERCLA, or, if the parties prefer to conduct the work under CERCLA, a meeting with EPA and DEQ should be held to discuss the options.*

Response: The Design Reports will be revised to remove references that the work will be conducted subject to the Portland Harbor Record of Decision (PH ROD) and, rather will note that it will be conducted consistent with the PH ROD.

2. **Coordination with Adjacent Sites:** *At this point in the process, EPA recommends a technical meeting with the two adjacent properties, including the Willamette Cove and Cathedral Park in-water remedial design project areas. EPA believes there is value in meeting to discuss the technical details of the evolving designs in order to provide a contiguous remedy as the designs transition from one site to another.*

Response: As noted above, the CSS team has initiated coordination with the WC Group. We would welcome a meeting with the EPA team working on the Cathedral Park in-water remedy design.

3. **Section 5.3.1.5 Endangered Species Act.** *EPA’s current understanding is that this work is being overseen by DEQ, so the PDR would not be covered by the Programmatic Biological Assessment nor the forthcoming Biological Opinion so an individual consultation will be necessary.*

Response: Understood. We appreciate the clarification and will work through the traditional agency in-water work permit process.



4. **Geotechnical Data and Evaluations:** Include geotechnical investigation data (field and lab) and calculation backups in the pre-final (90 to 95%) design report. The requested additional supporting information is necessary for reviewing geotechnical design assumptions used in preparing the remedial design. Examples of additional supporting information include:

- a. *Field and laboratory geotechnical investigation data and calculation backups used to develop assumptions for soil properties in the stability evaluation.*

Response: This supporting information can be provided.

- b. *The Preliminary Report of Geotechnical Engineering Services (GeoDesign 2015) cited in Section 6.7.*

Response: This supporting information can be provided.

- c. *An existing condition slope stability calculation. Comparing proposed conditions to existing conditions is important for understanding the impacts of the proposed design, especially in circumstances where the proposed design does not meet acceptable safety factors.*

Response: A stability analysis of the existing or current slope conditions can be provided. We anticipate that this will include an analysis of the current slope condition under all anticipated loading conditions (i.e., seismic and static).

- d. *Slope stability evaluation for the condition related to removing 5 feet of sediment from the toe of the cap (distance 125) to 150 feet offshore (approximate distance 270) as shown on the cross sections in Appendix J. This area is part of the SMA assumed for dredging offshore of XS1 through XS3.*

As commented during the BODR, the design of the toe support must be independent and not rely on any surrounding sediments for geotechnical stability. The PHSS ROD Selected Remedy in the shallow region states that dredging to a depth of 5 feet with placement of a cap/backfill to grade may occur adjacent to the reinforced toe; that scenario must be factored in the design and stability modeling assumptions.

Response: An analysis of this area and condition can be provided.

- e. *Other geotechnical evaluations needed to perform cap design. The PDR should identify when bearing capacity, cap settlement, and veneer stability calculations will be performed.*

Response: These additional analyses or checks can be provided in the next submittal.

- f. *An alternate design option that has a factor of safety above 1.1 for liquefied conditions and evaluation of the post-seismic event with SMA dredging to 5 feet adjacent to the toe of the cap. Additionally, provide a measurable number associated with "strong shaking" such as a modified Mercalli intensity value or other quantifiable measure.*

EPA has concerns regarding the liquefied condition slope stability factor of safety below the minimum. Figure J-3 depicts not only the localized slip surface on the cap at FS=0.62



but the entire slope representing a global stability failure from the top of bank (FS depicted in this zone are between 0.62 to 0.92). Failure of the bank slope in areas adjacent to the in-water SMA may impact the in-water remedy. Additionally, the in-water remedy, which would potentially remove up to 5 feet of sediment, will further decrease the factor of safety for the design bank cap.

Response: Analysis of a design alternative that could achieve a factor of safety above 1.1 for liquefied conditions could be provided. However, we anticipate that achieving this calculated factor of safety would require removal of most, if not all, of the fill material that comprises the banks and could potentially create slopes that would extend well beyond the project limits. The final project would not be practicable and would be prohibitively expensive.

The paragraph that includes the reference to “strong shaking” also references “regional seismic event that exceeds a 6.5 magnitude.” The purpose of this recommendation is to let the personnel responsible for inspection know when a seismic inspection is required. The reference to “strong shaking” and “enough force to knock objects from shelves” is based on the Modified Mercalli Intensity (MMI) for about an Intensity V event. We have purposely avoided direct reference to the MMI because it is not a measure that is generally reported in local media and therefore it is difficult to use as an indication of when an inspection is required. We selected criteria that could either be felt directly for the people required to do the inspection or would be reported by the U.S. Geological Survey (USGS).

We understand the concern. We suggest additional discussion with EPA on the expected slope deformation following a design seismic event and collaboration with the in-water remedy team to develop an appropriate integrated solution.

5. **Chemical Isolation Modeling Evaluation:** *Revise the assumptions, input, and boundary conditions used in the chemical isolation modeling evaluation in the pre-final (90 to 95%) design report. The requested revisions and additional supporting information are necessary for correctly applying the CAPSIM model for remedial design. Examples of revisions include:*

- a. *Revise the text to include acenaphthene as a surrogate for polycyclic aromatic hydrocarbon (PAHs). Acenaphthene should be included as a surrogate PAH to provide a conservative estimate of PAH transport through the cap. Acenaphthene has the lowest log K_{oc} value and, as such, it is the most mobile compound out of the four noncarcinogenic PAHs most frequently detected in groundwater.*

Response: Acenaphthene will be included as a surrogate for PAHs.

- b. *Revise the text to provide the log K_{oc} partition coefficient for di-n-butylphthalate. The text states that BEHP has similar transport properties as di-n-butylphthalate. This statement needs to be supported by partition coefficient information to verify that BEHP can be used to represent di-n-butylphthalate transport through the cap.*

Response: The Log K_{oc} partition coefficient for di-n-butylphthalate is 4.53, while the Log K_{oc} for BEHP is 5.83. As requested, the Log K_{oc} for di-n-butylphthalate will be included in the pre-final (90 to 95%) design report. However, di-n-butylphthalate does not have a ROD cleanup level for surface water,



groundwater, or riverbank soil/sediment. Therefore, BEHP will continue to be used as a surrogate for di-n-butylphthalate.

- c. *Revise or remove the text in Appendix K page K-6 that states that the amendment dose is overestimated owing to conservative cap design. EPA agrees that conservative modeling assumptions have been used for cap design. However, the groundwater data used to determine flux rates and porewater concentrations are based on limited rounds of groundwater sampling. The text goes on to state that development of site-specific partitioning coefficients is not recommended. In the absence of additional empirical data collection, EPA supports relying on a conservative design. Because of the uncertainty in model inputs based on limited groundwater monitoring data and the acknowledged variability in these results, it cannot be said with certainty that the amendment dose is an overestimate.*

Response: The sentence in Section 4.3 of Appendix K states that the modeling results may overestimate the required amendment dose. This statement will be retained. However, the text in the pre-final (90 to 95%) design report will indicate that other factors, including the groundwater flux rates and porewater concentrations, also affect whether the required amendment dose is overestimated.

- d. *Revise all model simulations to use the “mass transfer” benthic boundary type and measured surface water concentrations to realistically simulate mass transfer to and from the water column. Based on review of the model output files in conjunction with the boundary conditions described in this section, it appears that the top boundary condition was set to a fixed concentration of 0 at the surface. As noted in the CapSim 4.0 Quick Start Manual, “If the surface boundary condition is set to 0 concentration, then breakthrough of contaminant might never be observed since the concentration at the surface is always forced to be 0. A better condition might be to employ a mass transfer boundary condition at the surface with the overlying water concentration.” Because the benthic boundary condition type was selected as “fixed concentration”, the mass transfer coefficient described in the text will have little to no effect on accurately simulating mass transfer to and from the surface water column. It is evident from the model outputs that the concentration at the surface is being artificially forced to 0.*

Response: EPA is correct that the groundwater concentrations are being forced to 0 at the top of the Filter Layer. However, the point of compliance is at the top of the Sand Cap, below the 15-centimeter Filter Layer. As shown in the CapSim model output figures (K-2, K-4, K-6, K-8, K-10, and K-12), the surface boundary condition of 0 does not appear to affect the model results within the Sand Cap but does affect the model results within the overlying Filter Layer. Therefore, changes to the model simulations are not necessary based on this comment.

- e. *Considering the uncertainty due to lack of empirical porewater and seepage flux data, final filter layer thickness, and constructability issues for such a low granular activated carbon (GAC) dose, EPA recommends (pending any revisions to cap design based on additional data collection) using a GAC dose of 0.25% in a 30 cm sand cap. Additional rounds of groundwater monitoring data would be useful to reevaluate groundwater flux rates and input porewater concentrations in the pre-final design.*



Response: This comment will be considered when preparing the pre-final (90 to 95%) design report. As noted in the response to EPA To Be Considered Comment 11, a seepage study will be performed to better assess flux rates at the Site and the seepage study results will be used in the CapSim modeling for the pre-final design.

6. **Preliminary (30%) Design Drawings:** *Revise the design drawings to include a complete set of drawings for review in the pre-final (90 to 95%) design. A complete set of drawings is needed to support construction that will meet remedial design objectives. Examples of revisions and additional information to be included in the drawings include:*

- a. *Provide Excavation Grading Plans. Excavation of soil and sediment are needed to install the cap. The current plans only show the proposed finish ground with the top of cap grading. Grading for the soil and sediment removal will be 4 ft to 6 ft deeper and will need to consider impacts on adjacent properties.*

Response: An excavation grading plan will be included in the pre-final design. As mentioned above, we will coordinate with the Cathedral Park and Willamette Cove in-water technical teams. The excavation grading plans will likely need to include temporary shoring and/or armoring of transitions with adjacent property interfaces to accommodate varying schedules as discussed below.

- b. *Revise the Proposed Grading Plan – West (Sheet 3.0). The daylight slope tying into the western property is exceptionally steep. The current design shows a slope of 8.5H:9V (approximately 1H:1V) between Elevations 19 and 28. A proposed slope steeper than 1H:1V does not meet the stability considerations provided in the report and is likely to fail. The design should provide acceptable slopes or a retaining wall. Revise the design to provide acceptable slopes or a retaining wall on the daylight grading back to adjacent properties. Area parallel to the river cross sections should be provided to show how it will be capped and successfully daylighted. Add boring and sediment sample locations to the plan sheets and associated cross sections.*

Response: The transitions between the east and west properties will be refined in the pre-final design to show how the proposed design will tie into the adjacent sites. The anticipated solution will include building the riverbank cap at the Crawford Street South site as shown and using shoring (e.g., installation of sheet piling and/or placement of large riprap) to address steep slopes with the adjacent sites. These transition solutions could be designed to be short-term (1 year or less) or long-term (greater than 1 year) depending on the status of cleanup activities on the adjacent properties. Regardless of its duration, it is anticipated that the temporary shoring would be removed when the adjacent site is laid back to match the proposed 5H:1V and 3H:1V slopes. Boring and sediment sample locations will be added to the plan sheets and associated cross sections.

- c. *Revise the Proposed Grading Plan – East (Sheet 3.1). Similar to the west side, the daylight slope tying into the eastern property is exceptionally steep. The current design shows a slope of 12H:17V (approximately 0.75H:1V) between Elevations 17 and 34. Additionally, a proposed oversteepened slope is shown between Elevations 4 and 11 where cap slopes are shown with a slope of 13H:7V (i.e., steeper than 2H:1V). Revise the design to provide acceptable slopes or a retaining wall. Area parallel to the river cross sections should be*



provided to show how it will be capped and successfully daylighted. Add boring and sediment sample locations to the plan sheets and associated cross sections.

Response: See the response to EPA Comment 6.b.

- d. *Revise the Proposed Grading Sections (Sheet 3.2). The cap toe is ending inside of the Cathedral Park SMA where there are known RAL exceedances. The added material to help support the cap at the toe should be constructed of cap material along the horizontal toe and 3:1 slope so that the entire area impacted is capped. Depending on the final remedy for the in-water SMA shallow zone, this will also allow for a cap transition. EPA is currently investigating the edges of the Cathedral Park SMAs and is likely intending to dredge rather than cap adjacent to the northern end of the site. Provide granular filter and amended sand under the full extent of the cap toe.*

Response: We will initiate coordination with the Cathedral Park in-water team to determine the best methods for integrating the riverbank capping at the Crawford Street South site with the Cathedral Park Sediment Management Area (SMA) remedy.

- e. *Show the extents of the adjacent in-water SMA and indicate next to the toe of the slope that sediment will be removed during the in-water work. Additionally, the design should be consistent with requirements in the shallow zone related to habitat and top of cap elevation.*

Response: We will show and call out the in-water Cathedral Park SMA adjacent to the northern end of the Crawford Street South site once it is fully delineated.

To Be Considered

1. **Section 3.4. Existing Habitat Conditions, page 7:** *Revise the text in the pre-final (90 to 95%) design report to clarify that the NMFS (not the U.S. Fish and Wildlife Service [USFWS]) is anticipated to provide a biological opinion. The USFWS concurred with EPA's finding that implementation of the PHSS cleanup is not likely to adversely affect the bull trout or its designated critical habitat. Therefore, no formal consultation with USFWS was needed and USFWS is not preparing a biological opinion.*

Response: We will revise the text for the pre-final design to clarify that this project will be permitted under U.S. Army Corps of Engineers (USACE) authority, and they will be consulting with NMFS on behalf of this project. If required by NMFS, the applicant will be providing a Biological Assessment to the USACE. We acknowledge that U.S. Fish and Wildlife Service (USFWS) may not require formal consultation, however we will follow the USACE instructions related to applicability of past USFWS involvement on this proposed project.

2. **Section 4 Nature and Extent of COCs in Riverbank Soil, pages 11 and 12:** *Revise the text in the pre-final (90 to 95%) design report to indicate that COC exceedances beyond the top of bank will be characterized in accordance with the upland Consent Order and that upland characterization will include an evaluation of COCs against the Joint Source Control Strategy (JSCS) screening level values (SLVs) and the PHSS ROD CULs. This comment is based on EPA's previous comments on the BODR regarding the lateral extent of contamination for polychlorinated biphenyls (PCBs),*



1,2,3,7,8-pentachlorodibenzo-p-dioxin (PeCDD), and total polycyclic aromatic hydrocarbons (PAHs) beyond the top of bank toward the existing parking area.

One comment response indicated that delineation was not necessary for the upland portion of the site and that PCBs do not present an unacceptable risk to human health, the environment, or the Willamette River, based on the following: (1) the depth, (2) the fact that they are overlain by 2 feet of soil containing total PCB concentrations below PHSS CULs, and (3) their location of more than 40 feet inland of the current top of bank. Two other comment responses indicated that further lateral delineation of COCs (PeCDD and total PAHs) is not needed because conservative assumptions are being used in the development of the capping layers for the RBSCM. While COCs in the upland portion of the site are not required to be delineated laterally as part of the RBSCM, characterization of the uplands should follow the upland Consent Order and be protective of the Willamette River. The PHSS ROD CULs do not apply as remediation thresholds for upland soil but can be used for purposes of identifying contaminant sources with pathways that are threats to the Willamette River. The source control pathways for upland soil include overland flow and groundwater. The PHSS human health and ecological risk assessments do not address upland terrestrial exposure scenarios.

Response: The upland soil has been characterized in accordance with the upland Consent Order. The Consent Order requires an Upland Source Control Evaluation for riverbank soil, groundwater, and stormwater. Riverbank soil has been characterized and is being addressed via the Riverbank Source Control Measure (RBSCM) currently under design. Groundwater has been evaluated as detailed in the Groundwater Source Control Evaluation Report (GeoEngineers, 2022). Stormwater has been evaluated as detailed in Source Control Evaluation Work Plan (GeoEngineers, 2021) and an interim Stormwater Source Control Measure (SWSCM) was developed to address stormwater management on an interim basis until the Site is redeveloped (GeoEngineers, 2021). The stormwater pathway identified the erosion of surface soil in the upland area being entrained into stormwater as a potential complete pathway to the river and surface soil was investigated and evaluated as a part of this pathway. The interim SWSCM Work Plan was developed to address surface soil that could migrate off the upland site via the stormwater pathway. Final stormwater management will be incorporated into the site development plans. The final drainage design for the upland site will be developed in accordance with City of Portland Stormwater Management guidance and will go through rigorous permit review. If necessary, safeguards can be established to ensure that the upland development will be constructed in a manner that precludes the infiltration of collected stormwater through riverbank soil as well as its overland runoff down capped surfaces. The riverbank remedy will abut the upland portion of the site and will address the riverbank soil. Therefore, all pathways identified in the Consent Order have been assessed and remedies, where needed, are currently in design.

- 3. Section 5.1. Overview of Planned Riverbank Source Control Measure, second paragraph, page 13:** *Revise the text in the pre-final (90 to 95%) design report to include warning of substantial erosion (e.g., visible barrier material after a storm event) as another purpose in placement of a geotextile fabric demarcation layer between underlying contaminated soils and the clean cap above. The requested revision is needed so that the demarcation layer is appropriately included in long-term monitoring plans.*

Response: The text for the pre-final design will be revised to add that another purpose of the geotextile fabric is to provide a visible barrier as a warning in case of substantial erosion. This purpose will also be included in long-term monitoring plans and incorporated into the institutional controls.

4. **Section 5.2.1. RBSCM Components, Vegetation Removal, page 13:** *Revise the second sentence regarding “salvaged vegetation” to read as “selected salvaged native vegetation”. Non- native vegetation and native vegetation not supportive of salmon habitat should not be incorporated into any habitat enhancement.*

Response: The sentence will be revised as requested.

5. **Section 5.2.1. RBSCM Components – Riverbank Layback, page 13:** *The text states that concrete debris found on-site may be crushed and reused. Large or buried debris could have been in contact with contamination and potential contamination should be considered and evaluated before reuse. Describe the proposed approach, if any, to evaluate the suitability of concrete debris for reuse, with respect to potential chemical contamination in surrounding soil in the pre-final (90 to 95%) design report.*

Response: The proposed approach will be described as requested.

6. **Section 5.2.1. RBSCM Components – Construction of Cap, page 13:** *Revise the term “protective material” to “armor stone or armor layer” in the pre-final (90 to 95%) design report. The term “protective material” is unnecessarily vague for a design report and should be revised to identify and introduce the armor layer.*

Response: The term “armor layer” implies an angular riprap material, which is not representative of the coarsened streambed material consisting of 10- to 12-inch cobbles and boulders sized to resist erosive forces and protect the lower layers of the cap. For this reason, we plan to continue to refer to this as a protective layer to avoid confusing it with an angular riprap material, which is not consistent with the shoreline restoration approach for this project.

7. **Section 5.2.1. RBSCM Components, Institutional Controls, page 14:** *Vegetation Removal, revise the second sentence regarding “salvaged vegetation” to read as “selected salvaged native vegetation” as non-native vegetation and native vegetation not supportive of salmon habitat will not be incorporated into any habitat enhancement. Revise this section and Section 7.10 in the pre- final (90 to 95%) design report to consider institutional controls (ICs) to prevent digging, as well as other more aggressive IC measures. Additional ICs may be appropriate to prevent digging in this area, consistent with the IC easements to ensure measures are permanently in place.*

Response: The sentence will be revised as requested. Sections 5.2.1 and 7.10 will be revised to discuss the role of institutional controls in limiting or preventing digging.

8. **Section 5.3.1.3. Section 404 of the CWA, pages 15–16:** *Revise this section in the pre-final (90 to 95%) design report to note that USACE administers Section 404 in this jurisdiction while EPA administers aspects related to wetlands. The text is incorrect in that it states EPA has no role in CWA 404 implementation.*



Response: The text will be revised as requested; application for 404 approval will be made to the USACE.

9. **Section 6.0 Engineering Design Considerations, page 18:** *Revise the third sentence to include erosive forces from vessel propeller wash.*

Response: We will revise the sentence to include erosive forces from propeller wash, as these were considered. However, forces related to navigation impacts (including vessel propeller wash) are later reported to be negligible because the site is located outside of the navigation channel within an area where no vessel activity is reported or supported.

10. **Section 6.13. Habitat Considerations, page 31:** *The text incorrectly states that the PHSS ROD does not require habitat improvements. Habitat improvements such as bank layback, vegetation, and inclusion of habitat layers are required for disturbed areas to compensate for short-term impacts of the cleanup. Do not include the statement that the ROD does not have habitat improvement requirements in the pre-final (90 to 95%) design report.*

Response: The text will be revised as requested and this statement will be removed.

11. **Section 6.3. Groundwater Flux Rate, pages 21–23:** *Revise the text in the pre-final (90 to 95%) design report to consider evaluating groundwater flux rates using seepage meter data that may be collected before the final design.*

Cap designs below ordinary high water for other areas at PHSS are collecting empirical groundwater flux rates using seepage meters instead of relying on flux rate estimates based on groundwater gauging data. The need for such data is evident from the temporal variability in groundwater flux rates presented in Table 6.3-1 and Appendix H. A seepage meter data collection event, targeting the period of maximum anticipated groundwater discharge to the river, should be considered to refine cap design, as needed.

Response: A seepage study will be performed and the results will be incorporated into the pre-final design.

12. **Section 7.2 Site Preparation, Erosion Control, and Pollution Prevention, pages 34–35:** *CWA 401 requirements should be similar to those being required for EPA in-water actions, specifically to include COC monitoring at the outset of the project. See also the comment on Section 5.3.1.3, above. Include COC monitoring at the outset of the project in the pre-final (90 to 95%) design report.*

Response: A Water Quality Monitoring Plan (WQMP) will be submitted with the pre-final (90% to 95%) design and will describe the COC monitoring program for the project.

13. **Section 7.7. Riverbank Cap Profile, pages 37–38, and Section 7.8 Cap Design, pages 38–39:** *A habitat layer is mentioned in Section 6.13 (“an engineered beach mix layer consisting of 2.5-inch minus gravel to the uppermost layer of all caps...”) but is not described in Sections 7.7 or 7.8. Revise the text in the pre-final (90 to 95%) design report to discuss the habitat beach mix that is mentioned in Section 6.13. Clarify if that material is the same as the armored cap material and if*

the same habitat or armor stone will be used along the entire cap even in areas above ordinary high water. Provide an estimated mean particle diameter (D50) range for the habitat and/or armor layer.

Response: Additional detail will be added to sections 7.7 and 7.8 describing the application and extent of the beach mix in the uppermost layer (coarsened streambed material) of the cap below ordinary high water (OHW) and will include a detail in the design drawings that depicts the incorporation of beach mix into the coarsened streambed material. Protective material will continue above OHW and will include a mixture of soil and angular riprap with voids filled by smooth rounded rock (coarsened streambed material) to provide stability while also fostering habitat enhancement planting survival. We will provide a material gradation for the coarsened streambed material.

14. Section 7.9. Riverbank Restoration, page 40: *Develop a design detail in the pre-final (90 to 95%) design report for the proposed large woody material (LWM) and evaluate/discuss how embedded LWM could affect cap integrity over time with respect to LWM mobilization and localized scour.*

The stability analysis in Appendix N evaluates three different configurations for LWM installation, including two options for deep embedment into the beach zone. To better ensure proper installation and structure stability, a design detail depicting LWM structure installation should be included in future design phases. Also, LWM tends to mobilize, even when anchored or embedded, and can induce localized scour around the root wad or exposed end. Cap design and LWM installation methods should consider the potential for scour or LWM mobilization.

Response: The design of LWM will advance in the pre-final design to include details that show placement and ballasting in the design drawings and describe considerations for scour and material mobilization in the report. The LWM design would be considered sacrificial elements over the primary cap function.

15. Section 7.10. Institutional Controls, page 40: *Clarify in the pre-final (90 to 95%) design report that a project-area-specific Institutional Control Plan will be required.*

Response: The pre-final design report will clarify that a site-specific institutional control plan will be prepared for the project.

16. Appendix J Geotechnical Stability Considerations, Design Seismic Event, page J-2: *Provide background backup information and maps related to calculation of site class and site coefficients (i.e., PGA_M , PGA , F_{PGA}) in the pre-final (90 to 95%) design report. Section 6.7 provides rationale about how the PGA for the 475-year return period was calculated. The table provided in Appendix J is confusing because it does not discuss the 200-year return period that is associated with the mapped PGA of 0.168. Additionally, the 0.246 g associated with this table as a modified peak ground acceleration is the PGA value for the 475-year return period, not the modified value. The documentation maps would be easy to add to the appendix as a quality control check.*

Response: We can provide additional documentation and clarification in the pre-final design documents.



17. Appendix J Geotechnical Stability Considerations, Conclusions and Recommendations for Slope Maintenance, pages J-4 and J-5: Provide estimated vertical deflections for the post- seismic (liquefied) case scenario in the pre-final (90 to 95%) design report. The description provided under this section identifies that preventing or mitigating the effects of soil liquefaction would require ground improvement, but it is not discussed in detail which vertical deflections would trigger the need for ground improvement measures or the potential for those trigger levels to be observed at the site. It is not understood if the liquefied scenario has the potential to result in catastrophic failure.

Response: We can provide estimates for vertical deflections due to liquefaction. However, vertical deflections are not the controlling effect of liquefaction on the slope. The effect of soil liquefaction that could require ground improvement is the loss of soil strength that could lead to potential slope instability.

18. Appendix J Geotechnical Stability Considerations, Slope Stability Methodology, page J-4: The requested revision is necessary for compliance with State of Oregon regulations. Provide minimum factors of safety in accordance with the State of Oregon, rather than the Washington State DOT regulations provided, in the pre-final (90 to 95%) design report.

Response: The seismic and slope stability analysis will be based on applicable sections of the Oregon Department of Transportation Geotechnical Design Manual (January 2023).

19. Appendix J Geotechnical Stability Considerations, Slope Stability Methodology, page J-4: Perform slope stability evaluation based upon assumed scour potential in the pre-final (90 to 95%) design report. It should be stated if the potential for scour in areas along the slope is significant and what the estimated scour potential is. It is recommended that a stability analysis be performed based on the anticipated scour, as there may be certain storm events or conditions that trigger the need for additional survey and immediate repair work to be completed.

Response: The slope stability analysis can incorporate scour as a design case.

20. Appendix K Chemical Isolation Modeling Evaluation, Section 2.1. Dioxins/Furans, page K-1: The text states that PeCDD has similar transport properties as TCDD, TCDF, and HxCDF. This statement needs to be supported by partition coefficient information to verify that PeCDD can be used as a representative compound for all dioxins/furans. Expand the discussion in the pre-final (90 to 95%) design report to provide the log K_{oc} partition coefficients for TCDD, TCDF, PeCDD, and HxCDF.

Response: The Log K_{oc} values for TCDD (6.4 log L/kg), TCDF (7.0 log L/kg), and HxCDF (7.8 to 8.0 log L/kg) will be included in the pre-final (90 to 95%) design report, along with the Log K_{oc} for PeCDD (6.6 log L/kg). Additional discussion will be included in the pre-final (90 to 95%) design report to support the use of PeCDD as a surrogate for TCDD, TCDF, and HxCDF.

21. Appendix K Chemical Isolation Modeling Evaluation, Section 3.2. Model Domain and Target Levels, Model Media, page K-3: Revise the text in the pre-final (90 to 95%) design report to clarify that groundwater concentrations were used as reported, and soil concentrations were used to determine equivalent porewater concentrations using equilibrium partitioning to derive porewater concentrations for model inputs.



The text states that COC concentrations in groundwater samples and riverbank soil samples were used to derive porewater equivalents for model input values. This statement makes it sound like groundwater data were also processed in some manner to obtain equivalent porewater concentrations. EPA assumes this is not the case, so the text should be revised to accurately describe any post-processing of groundwater and soil sample data for determining porewater concentration inputs.

Response: The pre-final (90 to 95%) design report will clarify that the CapSim porewater input concentrations were estimated using two approaches: (1) using measured groundwater concentrations, and (2) using measured soil concentrations and equilibrium partitioning coefficients to derive porewater concentrations.

22. Appendix K Chemical Isolation Modeling Evaluation, Section 4.1. Porewater Concentrations, Riverbank Groundwater Data, page K-4: *Revise the text in the pre-final (90 to 95%) design report to provide additional discussion as to why November/December 2021 groundwater results were not considered representative of current conditions.*

The text states that, "Groundwater results from the samples collected in November/December 2021 were not used because these samples were collected right after the wells were installed and developed and the data are not representative of current conditions." The discussion should be expanded to provide further clarification, using the 2021 results to support the discussion.

Response: The pre-final (90 to 95%) design report will include further clarification to explain why the November/December 2021 results are not considered representative of current conditions. Additional groundwater sampling is being conducted in December 2023 and these data will be used instead of the November/December 2021 results.

23. Appendix M Preliminary (30%) Design Drawings: *It is unclear whether the cap layer and sand/streambed thicknesses are minimums or expected. This would also clarify what the expected material gradations are beyond stating coarsened streambed material or clean sand. Provide a cap detail sheet in the pre-final (90 to 95%) design report, including details for all cap layers and sand/streambed armor sizes (e.g., D15, D50, D85). The details should also include minimum and expected over placement allowances.*

Response: Additional detail will be provided in the pre-final design drawings and report that depicts material gradations and minimum and maximum placement allowances.

24. Appendix M Preliminary (30%) Design Drawings, Proposed Grading Sections, Sheet 3.2: *Reference of the vertical datum used in the design is needed to ensure the correct datum and elevations are used during implementation. Include a reference to the vertical datum used in the general notes or on each sheet in the pre-final (90 to 95%) design report.*

Response: The vertical datum is currently stated under the "Survey Datum" note in the lower right corner on Drawing No. 1.1 "General Construction Notes and Quantities." The vertical datum being used is North American Vertical Datum of 1988 (NAVD88) and this will be provided in the general notes and on each sheet in the pre-final design as requested.



25. **Appendix M Preliminary (30%) Design Drawings, Restoration Plan – West and Restoration Plan – East, Sheets 4.0 and 4.1:** The only mention of a beach zone within the 30% design is on Sheets 4.0 and 4.1. Descriptions and details regarding design and performance objectives of this area should be included in the design. Provide additional details regarding the beach zone in the pre-final (90 to 95%) design report.

Response: Performance objectives in this zone will be refined through the USACE permitting process and consultation with NMFS. Additional details regarding design and performance objectives will be included in the pre-final design drawings and report.

Matters of Style

1. **Section 6.3. Groundwater Flux Rate, pages 21 to 23:** The second to last sentence in this section refers to Appendix G for calculation detail. Appendix G presents Cross-Sectional View of COCs at Leave Surface. Revise the text to reference Appendix H for flux rate calculation details in the pre-final (90 to 95%) design report.

Response: The reference to Appendix G will be changed to Appendix H in the next submittal. We appreciate the catch.

2. **Appendix J, Figures J-1 to J-3:** Figures appear to be duplicated and attached twice. Remove duplicate figures from Appendix J in the pre-final (90 to 95%) design report.

Response: Duplicates will be removed in the next submittal.

RESPONSE TO THE FIVE TRIBES COMMENTS

General Comments

1. Overall, the report appears to be thorough and well prepared. We do, however, have some concerns regarding the proposed post-remediation habitat in the intertidal and shallow subtidal zone. The report indicates that post-remediation, the river bank will be laid back, stabilized, and vegetated with native riparian plants. However, the shoreline will have a very uniform geometry and a sediment cap will be topped by 10-inch rounded rocks (additional specific details provided in Comment #5). If the long-term site use permits, we strongly encourage the Crawford Street Corporation to consider incorporating additional design elements in intertidal and shallow subtidal areas to benefit biota. If there are no technically feasible methods that can improve habitat quality, please provide sufficient justification for the current design plans.

Response: This project will proceed through the traditional USACE 404 approval process, which will determine the most appropriate method for compliance with Endangered Species Act (ESA) requirements. It is possible an individual Biological Assessment and a Habitat Equivalency Analysis (HEA) may be required. Explanation of impacts, avoidance approach, minimization efforts and mitigation will be required. Through this process it is possible that additional design elements might be integrated.



Specific Comments

2. On page 13, the report indicates that black sand encountered during site work will be removed. Figure 3 identifies two areas where black sand is known to occur on site; however, the site plans in Appendix M include no mention of black sand. Those responsible for construction are likely to rely heavily on site plans. Thus, we recommend that the Construction Notes in Drawing 1.1 include instructions on removal of black sand and the known locations of black sand be shown on Drawing 2.0.

Response: The Construction Notes in Drawing 1.1 will be revised to include instructions on the removal of accessible black sand during layback of the riverbank and that the known locations of black sand will be shown on Drawing 2.0.

3. On page 17, the report states that a habitat equivalency analysis (HEA) is not anticipated because the site's source control measure has been developed within the framework of the U.S. Environmental Protection Agency's Programmatic Biological Assessment (PBA) (EPA 2021). However, the PBA states that "Additional SMA [sediment management area]/project-specific data collection would be conducted, as needed, to supplement existing data to quantify existing and proposed habitat conditions." We recommend the Crawford Street Corporation coordinate with DEQ and EPA on the need for additional habitat data collection and completion of a HEA to determine any mitigation needs.

Response: As noted above, if the project is not covered under the Programmatic Biological Assessment as stated in EPA Comment 1, we anticipate working through the traditional USACE 404 approval process, which may include an HEA.

4. On page 17, the report indicates that an Inadvertent Discovery Plan will be developed to address potential discoveries of cultural resources during ground-disturbing work. In addition, we recommend the Crawford Street Corporation coordinate with Tribal cultural resource representatives during design.

Response: Noted.

5. On page 32, the report cites EPA's PBA for impacts to riverbed habitat from capping (EPA 2021); however, the measure recommending application of a beach mix layer (2.5 inches or less) does not appear to be proposed. Rather than a beach mix, the cap would be covered by 2 feet of coarsened streambed mix with a median diameter of 10 inches. In contrast, beach mix is described as follows in the PBA (EPA 2021, page 57):

"Apply an engineered beach mix layer consisting of rounded gravel typically 2.5 inches or less (or other appropriate native material as determined during project-specific remedial design) to the uppermost layer of all caps and dredge leave surfaces in riverbank and shallow areas. This "beach mix" layer would provide appropriate substrate habitat for colonization by benthic organisms."

We recommend that the preliminary design report clarify how and if a beach mix is to be incorporated in the sediment cap. If a beach mix is not intended, we recommend the report provide a rationale for its exclusion.



Response: Additional detail will be added to Sections 7.7 and 7.8 describing the application and extent of the beach mix in the uppermost layer (coarsened streambed material) of the cap to be placed at and below OHW and will include a detail in the design drawings that depicts the incorporation of beach mix into the coarsened streambed material. We will provide a material gradation for the coarsened streambed material. Additional details will be refined through the USACE permitting process and consultation with NMFS.

RESPONSE TO YAKAMA COMMENTS

1. *We appreciate that the design includes removal, where encountered during excavation, of the contaminated black sandblast grit waste. Will the excavation continue to a lateral and vertical extent until all the black sandblast grit waste is removed?*

Response: Please refer to the responses to DEQ Comment 2 and Five Tribes General Comment 2.

2. *The vertical extent of contamination along the riverbank has not been identified in several areas. This is unacceptable for sample locations in which there are concentrations exceeding principal threat waste (PTW) levels at depth adjacent to the PHSS. Understanding the full extent of riverbank contamination is important in assessing potential risks associated with remedial design options that are protective of the PHSS cleanup and restoration efforts (see below section on Habitat).*

Response: Please refer to the response to DEQ Comment 3.

3. *There is no rationale provided for leaving PTW in place at this site. Considering they are already cutting into the bank and altering the slope of the riverbank, why wouldn't they excavate all material in exceedance of PTW?*

Response: The source of the COCs in the riverbank soil is the fill material that makes up the bank. It is not practical nor feasible to consider removing all materials in exceedance of PTW because, in practice, this would likely entail removing all of the fill material that comprises the bank. Therefore, the riverbank design has been developed to safely and reliably contain this material in place.

4. *Figures 5a through 5g – To assist the reader, it would be most helpful for these cross-sections to include the riverbank area groundwater data including well screen depths color-coded for chemical exceedances (similar to how riverbank soils are shown). There were groundwater exceedances found (see bullet list below) that may discharge to sediments based on groundwater elevations; however, it is difficult to tell with how the data are presented. Adding the data to the above figures would be very helpful in alleviating or identifying potential concerns. The exceedances were:*

- MW-1 (D/F, pesticides, dissolved cadmium)
- MW-2 (D/F, PAHs, BEHP, pentachlorophenol, DDD, dissolved metals [cadmium, copper, zinc])
- MW-5 (D/F, PAHs, dissolved metals [cadmium, copper])
- MW-6 (D/F, dissolved cadmium)
- MW-7 (D/F, DDE, DDT)
- MW-8 (D/F, PAHs, DDE, DDT)



- *MW-10 (D/F, DDD, DDE, dissolved cadmium)*

Response: Because four quarters of groundwater data have been collected to characterize the groundwater quality and a fifth event is planned, it would be difficult to accurately portray this information on a map. Fate and transport modeling using the accepted CapSim model was performed to evaluate the potential discharge of groundwater containing COCs at concentrations above PHSS ROD Cleanup Levels (CULs) to the river. The output of this modeling effort will be used to design the cap to mitigate potential concerns. The CapSim modeling assumed both the highest observed groundwater concentrations in the three most recent events, as well as averages, to conservatively design the cap. For additional conservatism, no attenuation of the chemicals is assumed from the well location and the more than 100 feet until the closest discharge could occur to the river.

5. *Habitat*

The Willamette River provides important habitat for salmon and other aquatic resources. Several ESA-listed and tribally important species and their designated critical habitat (and essential fish habitat) are supported by the Willamette River: Chinook, coho, chum, and sockeye salmon; steelhead trout and bull trout, eulachon, sturgeon, and Pacific lamprey.

According to the 2021 Programmatic Biological Assessment (PBA), the Crawford Street project site shoreline has presence of natural cover and supports migration, rearing, foraging and adult habitat for salmonid species as well as those listed above. The project site has beach habitat with large wood and shorelines with natural vegetation. It is estimated that a quarter of the project site is in the 100-year floodplain.

The Site is part of the City of Portland River Overlay Zones and is a part of the Greenway Overlay Zone designated as a “River Water Quality” overlay zone. The Site is currently vacant and being actively marketed for acquisition and redevelopment. It is expected that the property will be redeveloped for high-density housing and light commercial mixed use. A bicycle/pedestrian path along the top of the riverbank, an extension of the Willamette Greenway Trail, is also anticipated.

The Trustees Restoration Plan calls out three sites adjacent to or in the Crawford Street project site: Cathedral Park; Steel Hammer (within project site called out as a prime area for restoration); and Willamette Cove.

Actions at these sites include:

- *Protecting and enhancing existing native vegetation and removing invasive species*
- *Excavating and regrading the shoreline to create shallow inwater habitat*
- *Excavating and regrading shoreline to increase off-channel floodplain habitat and flood storage*
- *Sloping banks, adding large wood and revegetating with native plants*
- *Revegetating upland areas*
- *Creating wildlife corridors and crossings*

Yakama Nation is concerned about changes to the nearshore environment that may negatively affect ESA-listed and treaty-protected species and resources. Our concern goes beyond individual elements



of remedial design to the overall quality of habitat that will be present following remediation, including riparian, nearshore and aquatic habitat that supports salmonids and other tribally important species such as lamprey and sturgeon. Habitat and species should be considered early and throughout all phases of remedial design to allow for overall improvement of the environment including future mitigation and restoration efforts.

Careful consideration and documentation of existing conditions will inform design approaches, such as removing all PTW, that do not impede future restoration at the site and support a post-remediation condition that improves the existing habitat in riverbank and nearshore areas. Similar actions, to those listed above, for the shallow water, beach, shoreline and upland habitats should be considered for Crawford Street project site. Restoration of this area would improve connectivity of habitat between Cathedral Park and Willamette Cove which are publicly-protected greenspaces.

In general, the Crawford Street 30% design report is well written and to the point. However, information related to capping and leaving PTW behind and its impacts to post-remediation restoration functioning for the long term to provide uncontaminated habitat is lacking. The following provides comments and suggestions needed to provide a more thorough understanding of the effects and impacts to species and habitat.

- a. *The document states that individual consultation is not necessary even with acknowledging that PTW will be capped and left behind in the 100-year floodplain where restoration will occur and habitat will be used by salmonids and other aquatic and terrestrial species. Please provide more information on why all PTW will not be removed and how PTW left behind will not impact or impede future restoration and habitat.*

Response: Please see response to DEQ Comment 3.

- b. *The document states that a Habitat Equivalency Analysis is not necessary even though compensatory mitigation due to capping is expected. Please provide more explanation on how this conclusion was determined.*

Response: Please see responses to the Five Tribe Comments 1 and 3.

- c. *The document provides an alert that a request will be made for working outside of the ODFW approved inwater work windows, inwater work window extensions without boundaries can and do negatively impact ESA-listed and tribally important species. As such these extensions should not be emphasized as a mitigative measure. In reality, standard mitigative measures are to work within approved inwater work windows. A more conservative approach would be to allow inwater work windows on a year-by-year basis to ensure the project is moving forward as predicted in this document. A contingency plan should be put in place in the event that complications arise, and the project cannot be completed in the proposed three-year timeframe. Caution should be taken in allowing recurring inwater work window extensions for unlimited years to come since Crawford Street is not the only site in the Willamette River that will be conducting such an intensive project. The document lacks mention of how impacts related to it and other separate projects within the Superfund site will combine to potentially create a "Death by a*



Thousand Cuts” situation, particularly if multiple projects are granted inwater work window extensions. These potential impacts should be part of the analyses.

Response: To the extent practicable, in-water work will be conducted within the in-water windows; however, if short-term measures would prevent the need to conduct work across multiple work windows and result in less impact on habitat, an extension may be contemplated. We agree that a contingency plan is a good idea and will be prepared as a part of pre-final design.

- d. *NMFS has not issued its Programmatic Biological Opinion. A requirement of this programmatic process is that NMFS will verify and confirm results of the HEA which the 30% design document states is not necessary. When will NMFS be engaged to determine HEA requirements; as well as assess the call for inwater work window extensions; and the proposed habitat mitigation, including placement habitat mix and large wood, with PTW capped and left in place in the 100-year floodplain?*

Response: Per DEQ comments, this project is not eligible for coverage under a future Programmatic Biological Opinion and thus USACE will be the lead federal agency. As such, coordination with NMFS will occur through the UASCE. This is the formal 404 approval process and the final approved project will result in the least environmental damaging practicable solution (LEDPA).

If you have any questions regarding this response to comments or the project in general, please do not hesitate to contact me at 503.577.1535 or aspencer@geoengineers.com.

Sincerely,
GeoEngineers, Inc.



Amanda Spencer, PE, RG
Principal Hydrogeologist

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