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DEPARTMENT OF ECOLOGY
Southwest Region Office
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December 4, 2023

Tasya Gray, LG
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Scott Hooton
Port of Tacoma
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Tacoma, WA 98401-1837
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Re: Additional recommendations for fourth quarter 2023 groundwater sampling

Site Name:	Taylor Way and Alexander Avenue Fill Area (TWAAFA)
Site Address:	1500 Block Taylor Way E, Tacoma, Pierce County, WA 98409
Agreed Order:	DE 14260
Enforcement Order:	DE 19410
Facility/Site ID:	1403183
Cleanup Site ID:	4692

Dear Tasya Gray and Scott Hooton:

Thank you for your October 23, 2023, letter[1] in response to the Department of Ecology's (Ecology) September 6, 2023, letter.[2] Ecology agrees with your proposed dissolved metals sampling event during 4th quarter 2023. However, Ecology has the following additional recommendations for analyses during this sampling event:

1. Filtered and unfiltered aluminum and iron: Research by Thorbjornsen and Myers (2007, 2008)[3] and Myers (2010)[4] show that geochemical evaluations can be used in support of site investigations to indicate the presence or absence of metal contamination and delineate the extent of metal contamination. Specifically, aluminum and iron have been shown to be

[1] Dalton, Olmsted, & Fuglevand, Inc. (DOF), 2023, Ecology September *6,* 2023, letter regarding *"*Comments on fourth quarter groundwater report and requirement for additional groundwater sampling*"* – Response to Comments, October 23.
[2] Ecology, 2023, Comments on fourth quarter groundwater report and requirement for additional groundwater sampling, September 6.
[3] Thorbjornsen, K., & Myers, J., 2007, Identifying metals contamination in groundwater using geochemical correlation evaluation. Environmental Forensics, 8, 25–35; and Thorbjornsen, K. & Myers, J., 2008, Geochemical Evaluation of Metals in Groundwater at Long-Term Monitoring Sites and Active Remediation Sites, Remediation, Spring issue, pp 99-114.
[4] Myers, J. 2010, Geochemical Evaluations of Metals in Groundwater*:* Distinguishing Naturally Elevated Concentrations from Contamination, On Site RVAAP Meeting Presentation, February 9.

particularly useful as reference elements for evaluating metals concentrations at sites. Therefore, please include analyses for filtered and unfiltered aluminum and iron for all wells sampled**.**

2. Collect unfiltered metals also: Ecology recommends that you also collect unfiltered metals samples for analyses for the parameters in Table 1 of your October 23 letter**.** This would aid the geochemical evaluation through a comparison of filtered verses unfiltered concentrations and for use in x-y plots of unfiltered metals verses aluminum or iron as suggested by Thorbjornsen and Myers (2007).

3. Field Parameters and Oxidation Reduction Potential (ORP): Please continue to collect the field parameters of pH, conductivity, temperature, dissolved oxygen (DO), ORP, and turbidity during purging as you have done during previous sampling events. However, as stated by EPA (2023), in the absence of a specified reference scale, ORP data has no meaning.[5] Therefore, the reference scale used should always be specified. ORP measurements that are converted to a hydrogen scale can be reported as "Eh". EPA (2023) recommends that direct measurement data recorded on field forms be described as "ORP referenced to Ag/AgCl electrode" (example if a silver/silver chloride electrode is used). In addition to the type of ORP electrode, the field form should also indicate the type of electrode solution used (for example potassium chloride or KCl) and the strength (for example saturated/4 molar [M] or 3.5M, or 3.3M). EPA (2023) includes a table with correction factors for temperature and various molar KCl solutions for use in converting field ORP data to Eh. This would be performed using the formula:

   Redox Potential (Eh) = (Potential correction factor, in millivolts [mV]) + (field ORP measurement [mV]).[6]

   Please include in the data report an ORP summary table of data converted to Eh. EPA (2023) also recommends that final reporting values of Eh or ORP should be rounded to the nearest 10 mV.

[5] U.S. Environmental Protection Agency (EPA), 2023, Operating Procedure*:* Field Measurement of Oxidation-Reduction Potential, LSASDPROC-113-R4, Laboratory Services & Applied Science Division, Athens, Georgia, Effective Date April 22.
[6] https://in-situ.com/us/news/orp-field-measurements-reporting-redox-potential-eh-correctly

The above comments were transmitted via email on October 25, 2023.[7] If you have any questions regarding this letter, please contact me at 360-890-0059 or steve.teel@ecy.wa.gov.

Sincerely,

Steve Teel, LHG
Cleanup Project Manager/Hydrogeologist
Toxics Cleanup Program
Southwest Region Office

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Ecology Site File

[7] Ecology, Additional recommendations for TWAAFA 4Q2023 groundwater sampling. Email from Steve Teel to Tasya Gray, DOF, and Scott Hooton, Port of Tacoma, October 25, 2023.