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May 22, 2015 *Also Sent Via E-mail*

Mr. Robert J. Wyatt
NW Natural
220 N.W. Second Avenue
Portland, OR 97209

Re: Revised Human Health and Ecological Risk Assessment Report
NW Natural "Gasco Site"
Portland, Oregon
ECSI No. 84

Dear Mr. Wyatt:

The Oregon Department of Environmental Quality (DEQ) reviewed the revised "Human Health and Ecological Risk Assessment Report – NW Natural Gasco Site" dated December 2014 and received December 24, 2014 (Revised HERA Report). Anchor QEA, LLC prepared the Revised HERA Report on behalf of NW Natural. The Revised HERA Report has been prepared in response to DEQ's May 8, 2014 comments on the Draft HERA Report[1] and our July 24, 2014 letter documenting the final resolution of the conditions for preparing the Revised HERA Report.

The primary purpose of this letter is to inform NW Natural that DEQ:

- Acknowledges the Revised HERA Report substantially addresses our May 8th conditions and the July 24th resolutions; and
- Approves the Revised HERA Report as the Gasco Site HERA Report (HERA Report) as revised by the final comments below (i.e., DEQ's final revisions are fully incorporated into and made part of the HERA Report).

DEQ's final comments are organized according to the conditions identified in our May 8th letter and amend the Revised HERA Report to address previous comments overlooked in the revised report and other unanticipated changes made to the document. DEQ is not requesting NW Natural to revise and resubmit the report. NW Natural's future references to the HERA Report will include this letter in the citation.

For clarification and to avoid misunderstandings, DEQ continues to refer to the Draft HERA Report and Revised HERA Report consistent with previous correspondence.

[1] Anchor QEA, LLC, 2013, "Human Health and Ecological Risk Assessment Report – NW Natural Gasco Site" dated October (received October 24, 2013)," a report prepared for NW Natural.

FINAL COMMENTS

COI and Data Screening

DEQ's final comments applicable to this condition are provided below.

Section 1.1. The last sentence in the last paragraph is revised by deleting, "… including potential in-water risk associated with riverbank soils."

Section 2.1.2. DEQ revises the third paragraph by adding the following sentence.

> The process resulting in completion of the HERA Report began following DEQ's issuance of the March 10, 2010 comments letter.

Section 2.1.3.3.2. DEQ revises the second sentence in the last paragraph to the following:

> It should be noted that the human health RBC for occupational use of groundwater that NW Natural used in the Revised HERA Report is based on the assumption that the groundwater is used as an industrial drinking water supply.

Section 2.2. DEQ adds the following paragraph to the end of the section:

> DEQ's May 8th letter clarified how COPCs are to be utilized during preparation of the Revised HERA Report. Based on the data analysis completed in the Draft HERA Report and DEQ's May 8th letter, the Revised HERA Report focuses on a subset of COPCs. The COPCs identified in the HERA Report, including TPH are considered COCs for the Gasco Site (see Table 1 of DEQ's May 22, 2015 letter) and will be included in the analyte list for sampling done to support the uplands FS. In addition, the list of COI for the Siltronic Site MGP RI and HERA will include, but not be limited to the COCs identified in Table 1 of DEQ's May 22nd letter.

Section 3.6.1, Using subsurface soil data to supplement the surface soil dataset. DEQ revises the second sentence in the last paragraph to:

> Spatial and analytical soil data gaps will be evaluated during the FS to appropriately support the evaluation of remedial alternatives.

Integration of MGP Residuals

Section 3.6.3, Assumption that MGP residual observations are indicators of unacceptable human health risk. DEQ adds the following sentence to the end of the first paragraph:

> Overall, soil laboratory analytical data indicate that the detected concentrations of many MGP COI exceed RBCs in samples with observed occurrence of MGP residuals.

Wetlands Ponds

DEQ makes the following amendments to Section 4.4 of the Revised HERA Report.

Section 4.4.4. DEQ deletes the second paragraph.

Section 4.4.4 and Section 4.4.5. DEQ replaces the last sentence in these sections with the following:

> Gasco Site FS alternatives will include at a minimum, the removal of all habitat features of the Wetlands Ponds by:
>
> - Permanently removing water from the ponds and preventing water from accumulating in the area of the ponds in the future; and
> - Filling and regrading the ponds area to: 1) prevent exposure to pond sediments by ecological receptors; and 2) eliminate the ponds as a potential source of recharge to the Fill WBZ.

DEQ expects that the work described above will be conducted as a removal action to address the immediate risks this area presents to birds and other receptors. The Wetlands Ponds removal action should be completed in advance of the future Record of Decision for the Gasco Site. Work to address the ponds will not limit implementation of remedial actions in the Former Tar Ponds Area overall, including further remediation of the Wetlands Ponds.

Groundwater and Human Health Risk

Section 3.4.3. DEQ makes the following addition to the end of the section:

> Although inclusion of the ingestion pathway overestimates risk, it is acknowledged that DEQ's RBC does not include dermal contact. Consequently, although including the ingestion route will overestimate risk, not including the dermal route will underestimate risk. Given the nature of the groundwater contamination in the Alluvium WBZ, inhalation of vapors and dermal contact represent important routes of exposure to occupational workers.

Section 3.5.2.1. DEQ revises the risk for the Former Tar Pond Area and Former Retorts/Koppers Area to 1×10^{-2} (from 1×10^{-22}).

Section 3.6.2, Soil Leaching to Groundwater. DEQ revises the section as indicated below.
The following sentences are deleted:

> The surficial fill WBZ Groundwater at the Gasco Uplands Site is present at depths ranging from 0 feet bgs to 30 or 40 feet bgs with the fill depths increasing along the shoreline. The alluvial WBZ extends from the fill to bedrock and ranges from approximately 75 feet bgs to more than 200 feet bgs near the Gasco/Siltronic property line (Anchor QEA 2012c).

The third to last sentence is revised as follows:

> Depending on site-specific conditions, the use of the Generic Soil Leaching to Groundwater RBC to screen soils when groundwater depths exceed the assumed 10 feet bgs depth may overestimate the potential for soil to leach to groundwater.

Section 3.6.2, Occupational worker exposure to alluvial WBZ groundwater. DEQ adds the following paragraph to the section:

> As summarized in Table 3-38, analysis of risks in soil includes evaluations with and without TPH. However, analysis of the risk associated with contaminated groundwater does not include

TPH, which is a COC for the Gasco Site. Lacking TPH data, the risk of exposure to human health is underestimated for the groundwater pathways and for cumulative human health site risk overall. In October 2014 NW Natural began collecting samples of groundwater from the Fill water-bearing zone (WBZ) and the Alluvium WBZ for analysis of TPH and TPH fractions. Going forward TPH and TPH fractions data for groundwater will be incorporated into the work being done on the Gasco Site and Siltronic Site.

Groundwater and Ecological Risk

DEQ makes the following changes to the Revised HERA Report.

Section 4.1. DEQ deletes the third and fourth sentences of the first paragraph.

Section 4.4.2. DEQ did not request or anticipate the addition of the riverbank exposure area to the Revised HERA Report.

Section 4.4.2.1. DEQ revisons to this section are provided below.
DEQ adds the following as the second to the last paragraph of the section:

The riverbank along the Gasco Site is included within two uplands ecological exposure areas; the Former Tar Ponds Area and Former Spent Oxide Area. The risk to terrestrial ecological receptors (i.e., birds and mammals) along the riverbank is by exposure to contaminated surface soil and seeps of groundwater from the Fill WBZ onto the riverbank. The cumulative risk to birds and mammals by groundwater seeps is primarily associated with the Former Tar Ponds Area which exhibits a hazard index of HI>20. In the Former Spent Oxide Area, the HI exceeded one at monitoring well MW-01-22 (HI>3).

DEQ replaces the last two sentences of the section with:

In addition, planning of the groundwater source control action for the Fill WBZ is ongoing. The objective of the Fill WBZ source control measure is to prevent contaminated groundwater in the fill from migrating from the uplands to the Willamette River.

Section 4.4.2.2. DEQ replaces the last two sentences in this section with:

In addition, the current groundwater source control action selected for the Alluvium WBZ (i.e., a well-based hydraulic control and containment system [HC&C system]) is designed to prevent contaminated groundwater in the alluvium from migrating from the uplands to the Willamette River. The hydraulic control and containment system is constructed. Initiation of long-term testing will begin in mid-2015 and is anticipated to transition into full-time full-scale operation.

Section 4.5.1. DEQ adds the following as the fourth and fifth paragraphs to the section:

For purposes of completing the Revised HERA Report, DEQ accepted presentations of average soil cumulative risk to ecological receptors evaluated on a point-by-point basis (i.e., plants and invertebrates). As indicated above, the Revised HERA Report presents an average of monitoring well (i.e., location specific) HIs across the Gasco Site riverbank but does not evaluate cumulative risk to ecological receptors on a point-by-point basis. That said, the

Revised HERA Report provides chemical-specific HQs in the Appendix E tables that can be used to calculate location-specific HIs for soil and groundwater as follows:

- Table E-4-1 provides chemical specific HQs to calculate HIs for exposure of plants and invertebrates to surface soil;
- Tables E-4-3a and E-4-3b provide chemical-specific HQs for each monitoring well in the Fill WBZ that can be used to calculate HIs for exposure to aquatic life by groundwater in the fill discharging to the Willamette River; and
- Tables E-4-5a and E-4-5b provide chemical-specific HQs for each monitoring well in the Alluvium WBZ that can be used to calculate HIs for exposure to aquatic life by groundwater in the alluvium discharging to the Willamette River.

Consistent with DEQ's May 8th comments to the Draft HERA Report (see Attachment 2), going forward location specific groundwater cumulative risk as the sum of all hazard quotients for multiple substances at a location, to aquatic life will be presented by monitoring well, not as an average of these values across the Gasco Site riverbank. Calculations of cumulative risk for soil and groundwater exposures in the Siltronic MGP HERA will rely on location depth interval-specific point-by-point HIs for soil (plants and invertebrates), and point-by-point HIs for groundwater calculated as the sum of location specific chemical hazard quotients where exposure is represented by the maximum or 90% UCL of the mean[2].

Section 4.5.2.3, Section 4.5.2.4, and Section 4.5.2.5. DEQ makes the following revisions:

- The term "average of point by point hazard indices" replaces "cumulative risk" throughout the three sections.
- The term "average of point by point HIs" replaces "Total Cumulative Risk" and "Total HI" in the bulleted lists in each section.
- In the first bulleted item of Section 4.5.2.5, the phase "average of point by point hazard indices across the Gasco Site riverbank" replaces "Total HI."

Uncertainty

DEQ's amendments to the uncertainty section are provided below.

Section 3.6. **Reasonable maximum exposure.** The second sentence in the second paragraph is revised as follows:

They are consistent with DEQ's goals of evaluating risks under a reasonable maximum exposure experienced(RME) scenario, which is evaluated by considering a mix of upper-bound and average estimates for exposure parameters, so that the overall exposure is a reasonable maximum that is unlikely to underestimate risk.

[2] Risk-related work performed for the Gasco Site uplands FS will use location depth interval-specific point-by-point HIs for soil and the maximum or 90% UCL of the mean point-by-point HIs for soil and groundwater to be consistent and comparable to the Siltronic Site.

Section 3.6.1. Using subsurface soil data to supplement the surface soil dataset. DEQ adds the following to the end of the second to the last paragraph:

> Discussions above focus on the uncertainty related to migrating soil data vertically upwards. For clarification, there is uncertainty associated with estimating risk from exposure to surface soil where available data at a location is limited to a sample from the upper 0.2-feet of the depth interval.

Section 3.6.2. Occupational worker exposure to alluvial WBZ groundwater. The following replaces the last three sentences in the first paragraph.

> As discussed previously, NW Natural screened groundwater in the alluvial WBZ against default Occupational Worker (Tap Water) RBCs, which assumes that the alluvial groundwater is being used as a drinking water source. DEQ acknowledges that this is an unlikely scenario at the Gasco Site and considers inhalation and dermal contact to be the primary occupational worker exposure pathways associated with groundwater in the Alluvium WBZ. NW Natural is willing to place institutional controls on the property that will eliminate this potential exposure.

Section 3.6.2. Use of estimated TPH concentrations in soil to calculate non-carcinogenic risks. The sentence provided below is added to the end of the last paragraph in the section:

> That said, based on the assessment discussed in Section 3.6.1 ("Methods used to estimate soil TPH concentrations"), comparisons of measured TPH concentrations to DEQ-estimated TPH concentrations indicate that risks associated with TPH may be underestimated.

Section 4.6.1, Sampling Design. The following replaces the second and third to the last sentences in the first paragraph.

> Observations made during construction of the groundwater treatment plant building indicate that MGP residuals occur in the surface soil depth interval beyond the northern margin of the excavated area. Consequently there is the potential for cyanide to be present in surface soil beyond the building footprint at concentrations similar to those detected beneath the building.

Sections 4.6.1. Additional chemicals detected in soil and groundwater that were not identified as COIs in revised HERA Report. DEQ adds the following sentences to the end of the third paragraph:

> Discussions above do not acknowledge the uncertainty associated with COPCs identified in groundwater for which analytical data are lacking in soil. In these situations the reported risk is likely underestimated as there is the potential for COPCs to occur in soil for which data are not available.

Section 4.6.1. Using subsurface soil data to supplement the surface soil dataset. DEQ replaces the last sentence with the following:

> Discussions above focus on the uncertainty related to migrating soil data vertically upwards. For clarification, there is uncertainty associated with estimating risk from exposure to surface soil where available data at a location is limited to a sample from the upper 0.2-feet of the depth interval. These uncertainties can be reduced by appropriate additional surface soil data collection in the FS to confirm surface soil characteristics.

Section 4.6.2, Methods used to screen surficial fill and alluvial groundwater against aquatic life criteria. DEQ makes the following addition to the section:

> Analysis of the risk associated with contaminated groundwater does not include TPH, which is a COC for the Gasco Site. Lacking TPH data, the risk of exposure to ecological receptors is potentially underestimated for the groundwater pathways and for cumulative site ecological risk overall. In October 2014 NW Natural began collecting samples of groundwater from the Fill water-bearing zone (WBZ) and the Alluvium WBZ for analysis of TPH and TPH fractions. Going forward TPH and TPH fractions data for groundwater will be incorporated into the work being done on the Gasco Site and Siltronic Site.

Section 4.6.4. The last sentence of the first paragraph is deleted.

HERA Iso-Concentration Figures

Section 5. DEQ makes the following revisions to this section of the Revised HERA Report:

- The title of the section is deleted and replaced by "Spatial Distribution of COCs Contributing to Risk."
- The second paragraph is deleted.
- Insert the following sentences at the beginning of the third paragraph:
  > To graphically indicate where unacceptable concentrations of COCs occur at the Gasco Site, Figures 5-1 to 5-3 were prepared. These figures present iso-contours based on calculated point-by-point EPC/screening level (SL) ratios.
- Delete second sentence in the fourth paragraph and add the following sentence to end of the paragraph:
  > Consequently, EPC/SL ratios have no quantitative meaning related to human health and/or ecological risk at the Gasco Site.

Iso-Concentration Figures. DEQ accepts the soil and groundwater iso-concentration figures provided for the Gasco Site in submittals dated February 16 (package of soil and groundwater iso-concentration maps not including TPH) and February 27, 2015 (total TPH iso-concentration figures for the Fill WBZ and Alluvium WBZ). Going forward, DEQ requires that:

- The site database and figures will be updated with data collected from monitoring wells MW-39F, MW-40F, and MW-41F.
- Future submittals of EPC/SL figures should use appropriate ranges of ratios for the data being graphically depicted. For example, according to the legend the maximum EPC/SL ratio shown on figures 5-3a through 5-3d is greater than 250. However, ratios of approximately 78,000 (see Table 4-21) are included in the report. In cases such as the example, an upper value of 250 is inadequate to represent the range of ratios being shown.
- Labels and contours of total and free cyanide data should use consistent concentration units on future submittals; and
- Soil and groundwater concentration data should be projected to the river and the U.S. Moorings property line using methods similar to those utilized for projecting data south to the Siltronic property line.

DEQ and NWN should discuss these expectations further either during discussions of the "integrated groundwater monitoring program" or the uplands FS planning and scoping process.

DEQ appreciates and acknowledges the work NW Natural has conducted in the process of completing the HERA Report, and looks forward to moving forward with the scoping and planning of the uplands Gasco Site FS.

Please contact me with questions regarding the attachments.

Sincerely,

Dana Bayuk
Project Manager
NW Region Cleanup Program

Attachment: Table 1

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ECSI No. 84 File

TABLE 1

Gasco Site Chemicals of Concern
1,2,4-Trimethylbenzene
1,2-Dichloroethene, cis-
1,3,5-Trimethylbenzene
1,3-Dichloropropene, trans-
1-Methylnaphthalene
2-Methylnaphthalene
2-Methylphenol (o-Cresol)
4-Methylphenol (p-Cresol)
Acenaphthene
Acenaphthylene
Acetone
Acrylonitrile
Aluminum
Ammonia
Anthracene
Antimony
Arsenic
Barium
Benz(a)anthracene
Benzene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Benzoic acid
Cadmium
Carbazole
Carbon disulfide
Chromium
Chrysene
Copper
Cyanide, available
Cyanide, free
Cyanide, total
Dibenz(a,h)anthracene
Dibenzofuran
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)
Ethylbenzene
Fluoranthene
Fluorene
Indeno(1,2,3-c,d)pyrene
Iron
Isopropylbenzene (Cumene)
Lead
Magnesium
Manganese
Mercury
Naphthalene
Nickel
Pentachlorophenol
Phenanthrene
Phenol
Pyrene
sec-Butylbenzene
Styrene
Sulfate
Sulfide
Thallium
Thiocyanate
Toluene
Total HPAH
Total LPAH
Total PAH Toxic Unit FCV
Total Petroleum Hydrocarbons
Total phenols (unspecified)
m-xylene
o,p-xylene
Total Xylene
Vanadium
Vinyl chloride
Zinc

NOTES:

LPAH = light-molecular weight polycyclic aromatic hydrocarbons

HPAH = heavy-molecular weight polycyclic aromatic hydrocarbons

TPH = Total Petroleum Hydrocarbons (includes TPH-fractions)

1. Gasco Site chemicals of concern (COC) include chemicals of potential concern with HQ>1.

2. List includes soil and groundwaterCOCs for human health and ecological exposure pathways identified in the Gasco Site HERA.

3. The list of COC for the Gasco Site will be included in any future risk-related work done on the Gasco Site.

4. The list of chemicals of interest (COI) for the Siltronic Corporation Site will include but not be limited to the Gasco Site COC, Sitronic Site COI, and calcium, potassium, nitrate and nitrite as nitrogen, and nitrite as nitrogen.