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D R A F T M E M O R A N D U M

TO: Glynis Carrosino, Project Manager, Department of Ecology, Toxics Cleanup Program

DATE: April 24, 2014

FROM: Rob Roberts and Allan Chartrand, SoundEarth Strategies, Inc.

SUBJECT: **Proposed Site-Specific Method B Approach for Contaminated Groundwater at Smokey Point Retail Site, Marysville, Washington**

This memo recaps what was discussed at our April 16, 2014 meeting in your Bellevue offices and presents our technical rationale for our proposed site-specific Method B approach to addressing benzene contamination in site groundwater.

Key project assumptions and proposed Method B risk assessment approach. Extensive soil and groundwater monitoring data collected at the SPR site (the site) during recent years has clarified that GRPH and BTEX values from the former USTs are all within compliance for both soil and groundwater with the exception of benzene, and that elevated benzene concentrations in groundwater represents the "driver" for the site. This groundwater is being protected to its highest beneficial use (potability) using a reasonable maximum exposure scenario as specified under WAC 173-340-720.

Overview of site groundwater data. Benzene concentrations as most recently measured in the eight groundwater monitoring wells (map locations, data tables and data reports have been sent to Ecology but we could resend if needed) are in compliance with the Method A value (5 µg/L) with the sole exception of MW115, for which the most recently measured concentration (early 2014) was 18 µg/L [note measurements of 5.2 µg/L during September 2012, and 5.75 µg/L during April 2013]. Significantly, MW116 represents the most southerly and downgradient point of the site and contaminant data have been in compliance with Method A for both soils and groundwater since 2009, demonstrating that benzene, GRPH, or other hydrocarbon constituents are unlikely to migrate offsite.

Accordingly, we believe it to be appropriate to propose a site-specific Method B approach, including site-specific exposure modifications as allowed under MTCA at WAC 173-340-740(3)c) and Section 747(3)(f) when it can be demonstrated that site-specific conditions more closely represent a protective scenario for the site using empirical measurements. We have such measurements for both soil and groundwater, which are preferable to simulations or model predictions. Based on our understanding of these site-specific conditions, it is appropriate to modify specific default input parameters in the Method B equations, including the exposure duration (ED), the exposure frequency (EF), and the acceptable cancer risk level, to more closely reflect the actual potential for exposure to contaminated site groundwater. The rationale for these proposed modifications is discussed below.

Modifying the exposure duration. We propose to shorten the exposure duration (as shown in Equation 720-2) from 30 to 10 years to reflect the consistent attenuation in groundwater benzene concentrations observed in the eight monitoring wells during recent years. Given that 7 of the 8 monitoring wells are already in compliance with Method A and that the eighth well (MW115) is near compliant, it appears that that an exposure duration of 10 instead of 30 years would be both conservative and protective of potential site inhabitants.

In addition, we have conducted preliminary fate and transport modeling which corroborate these findings, demonstrating that concentrations of benzene in groundwater are steadily declining in the current geochemical environment, and that the anticipated injections of sodium persulfate to contaminated groundwater are expected to further promote an oxidizing groundwater geochemical environment which will lead to continued biodegradation of these volatile, non-persistent organic compounds.

Thus we feel confident that this groundwater will be in compliance even with Method A within five years, but to be conservative and fully protective of possible residents ingesting this groundwater, we are proposing to replace the default Method B exposure duration of 30 years with a duration of 10 years.

Exposure frequency. WAC 173-340-357(3)(f) specifies a "commercial gas station scenario" for demonstrating when a cap or other remedy would be protective for contaminated soils for the soil ingestion and dermal contact exposure pathways. Although we are addressing groundwater rather than soil contamination at the subject site, we believe it would be appropriate to reduce the exposure frequency from 1.0 to 0.25 as suggested in this section of MTCA. This factor could be applied to the drinking water fraction (DWF) exposure parameter of Equation 720-2 (as shown on Table 1), reflecting reduced exposure to groundwater via the drinking water pathway. This modification would be reflective of the fact that the site is designated as commercial rather than residential, and the reduced likelihood of residential exposure to site groundwater designated for commercial land use. Moreover, since our data demonstrate that benzene and other contaminants are not migrating offsite, there is little likelihood of downgradient exposure, which could become residential in nature and theoretically necessitate a higher EF input value.

Potential modification of the acceptable cancer risk level. Equation 720-2 prescribes the conservative acceptable cancer risk of 10^{-6} (one in a million) which was intended for residential human exposure, while the subject site has been zoned as commercial and is likely to remain so for the foreseeable future. This reduced potential exposure limits the potential for a carcinogenic response associated with benzene. In addition, because benzene is the sole carcinogenic component of concern to the site rather than part of a potentially carcinogenic mixture, benzene would be expected to represent the sole compound of carcinogenic concern at the SPR site, lending further credibility for a 10^{-5} acceptable cancer risk on a commercial zoning, as opposed to residential or industrial zoning. We believe this approach to be consistent with human health risk assessment procedures as outlined in WAC 173-340-708, and that a 10^{-5} cancer risk level would be adequately protective of human health.

Following this rationale, if Equation 720-2 is run with a 10^{-5} rather than a 10^{-6} cancer risk, and combined with the other modifications discussed above, the modified Method B calculation would yield a value of 95.4 µg/L for benzene. Alternatively, if we modified the ED value to 10 years as discussed above,

retained the acceptable cancer risk level at 10^{-5}, and retained the EF/DWF parameter at 1.0, the resulting Method B value would be 23.8 µg/L for benzene. This value would still be conservative and protective of human health, which is reflective of residential exposure (thus warranting a more conservative level of protection) despite the fact that the SPR site is zoned as commercial. This value of 23.8 µg/L would appear to be the most appropriate and representative overall value for determining compliance for benzene groundwater levels at the SPR site, and is the value we are recommending. Table 1 below shows which default input parameters were modified, following the rationale presented, to yield the proposed Method B value of 23.8 µg/L for benzene.

Table 1: Specific Modifications Proposed for Method B Equation 720-2

Input Parameter	Default	Potential Modification	Proposed Modification
Exposure duration (ED)	30 years	10 years	10 years
Acceptable cancer risk level	10^{-6} (one in a million)	10^{-5} (one in a hundred thousand)	10^{-5}
Exposure frequency (EF)/drinking water fraction (DWF)	1.0	0.25	none

Overall site remedy. The overall proposed site remedy is monitored natural attenuation combined with a modified Method B cleanup level, proposed at 23.8 µg/L. This cleanup level will be combined with five quarters of groundwater compliance monitoring which will help to define seasonality over the course of an entire year, as well as engineering controls that can be relied on for the foreseeable future. Engineering controls include sodium persulfate injections to contaminated groundwater, a vapor barrier that has been installed under site buildings to prevent or mitigate vapor intrusion, and paving site soils to further mitigate exposure. In light of these proactive steps to bring this site into compliance, we are seeking an No Further Action-likely letter from TCP acknowledging that this approach addresses all appropriate requirements under MTCA Method B, and that no additional action not currently planned or specified is likely to be required.

cc: Tom Lee, Madison Development Group LLC
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