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DATE: October 24, 2016

TO: Darsi Foss, Director
Remediation and Redevelopment Program
Department of Natural Resources

FROM: Jeffrey Phillips, Director
Bureau of Environmental and Occupational Health
Department of Health Services

SUBJECT: Response to the Remediation and Redevelopment (RR) Program's Request to Reassess the Residual Contaminant Levels (RCLs) for Polycyclic Aromatic Hydrocarbons (PAHs)

At your request, the Bureau of Environmental and Occupational Health (BEOH) has collaborated with the RR program over the past year to reassess how protective soil concentrations are established for PAHs in industrial and non-industrial settings. As described in Chapter NR 720 (NR 720) of Wisconsin Administrative Code and DNR publication RR-890, RCLs are calculated using methodology developed by the U.S. Environmental Protection Agency (EPA) and incorporated into their Regional Screening Level Web-calculator. BEOH staff reviewed the scientific literature for PAHs, as well as the assumptions and methodology used to calculate direct contact soil cleanup standards. On the basis of this review, BEOH offers the following modifications to the current methodology for assessing health risks from exposures to PAHs in soil, with the understanding that RR retains the ultimate responsibility for any alterations to NR 720.

- 1. Exclusively use cumulative cancer risk to assess carcinogenic PAHs in soil.** BEOH concludes that it is reasonable and protective of public health to assess carcinogenic PAHs (cPAHs) in soil solely using a cumulative risk approach. A cumulative approach sums the individual excess cancer risks of the cPAHs present in a soil sample and compares the summed value to the threshold for acceptable cumulative excess cancer risk of 1-in-100,000 (i.e., 1×10^{-5}). The rationale for this conclusion is that PAHs only occur in the environment in mixtures¹ and have similarities in their modes of carcinogenic action².

¹Bostrom et al. 2002. Cancer risk assessment, indicators, and guidelines for polycyclic aromatic hydrocarbons in the ambient air. *Env. Health Persp.* 110, supp 3: 451-489.

² U.S. EPA. 2010. Development of a Relative Potency Factor (RPF) Approach for Polycyclic Aromatic Hydrocarbon (PAH) Mixtures; EPA/635/R-08/012A.

http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=494851.

It is important to note that these conclusions are specific to currently regulated cPAHs and do not apply to other groups of chemicals. As EPA continues to evaluate the toxicity and carcinogenicity data for PAHs, refines their risk assessment methodology and develops health guidance values for currently unregulated PAH compounds, it may be necessary to review and update Wisconsin's approach to the assessment of PAHs in soil in the future.

2. **Adopt EPA's current default exposure assumptions.** EPA regularly updates and refines their exposure assumptions based on the most current population data. Many of the exposure assumptions presently listed in NR 720 are not based on the most current data and do not match EPA's recommended values for the general population. BEOH recommends that RR update the exposure assumptions for child and adult body weight, skin surface area, skin-soil adherence and exposure duration in NR 720 to reflect the EPA's most current default values in order to more accurately calculate risk-based RCLs. The attached tables compare the current NR 720 and EPA default values for these exposure variables.

We hope that these proposed modifications are helpful to you as you review your approach to evaluating PAHs in soils. Thank you for the opportunity to provide input on these decisions. We look forward to our continued collaboration on this reassessment process. Please contact me or my staff if you have any questions regarding the information contained in this letter.

Encl.: NR720 vs. EPA Default Values Tables

Cc: Judy Fassbender, DNR

NR 720 Exposure Assumption Inputs vs. EPA current defaults. Non-industrial.

	Abbr.	Units	NR 720	EPA Calculator Default^[1]
Exposure Frequency-resident child	EF _{res-c}	d/yr	350	350
Exposure Duration-resident child	ED _{res-c}	yr	6	6
Exposure Duration-resident adult	ED _{res-a}	yr	24	20
Soil Ingestion Rate-resident child	IRS _{res-c}	mg/d	200	200
Soil Ingestion Rate-resident adult	IRS _{res-a}	mg/d	100	100
Particulate Emission Factor (region specific value based on Chicago, IL)	PEF	m ³ /kg	1.43E+09	1.56E+09
Volatile Exposure Rate	VF	m ³ /kg	Contaminant specific soil-to-air- volatilization factor	Contaminant specific soil-to-air- volatilization factor
Exposure Time- resident	ET _{res}	hours/day	24	24
Surface Area Exposed-resident child	SA _{res-c}	cm ²	2,800	2,373
Surface Area Exposed-resident adult	SA _{res-a}	cm ²	5,700	6,032
Skin Adherence Factor-resident child	AF _{res-c}	mg/cm ²	0.2	0.2
Skin Adherence Factor-resident adult	AF _{res-a}	mg/cm ²	0.07	0.07
Body Weight- resident child	BW _{res-c}	kg	15	15
Body Weight- resident adult	BW _{res-a}	kg	70	80
Lifetime	LT	yrs	70	70

NR 720 Exposure Assumption Inputs vs. EPA current defaults. Industrial.

	Abbr.	Units	NR 720	EPA Calculator Default^[1]
Exposure Frequency- worker	EF _w	d/yr	250	250
Exposure Duration-worker	ED _w	yr	25	25
Soil Ingestion Rate- outdoor worker	IR _{ow}	mg/d	100	100
Particulate Emission Factor (region specific value based on Chicago, IL)	PEF	m ³ /kg	1.43 x10 ⁹	1.56 x 10 ⁹
Volatile Exposure Rate	VF	m ³ /kg	Contaminant specific soil-to-air- volatilization factor	Contaminant specific soil-to-air- volatilization factor
Exposure Time	EF	hours/day	8	8
Surface Area Exposed- adult	SA _w	cm ²	3,300	3,527
Skin Adherence Factor	AF _w	mg/cm ²	0.2	0.12
Body Weight - worker	BW _w	kg	70	80
Lifetime	LT	yrs	70	70

[1] Default values from: U.S. EPA Regional Screening Levels User Guide. May 2016.
<https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide-may-2016>