PAH REASSESSMENT

A New Look at an Old Risk

A collaborative effort with the
Wisconsin Department of Health Services

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Key Points

- PAHs are different from other contaminants
- DNR revising approach to low-level PAH contamination in soil
- Changes apply to direct contact exposure
- EPA and DHS re-evaluations mean higher concentrations are protective

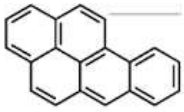
Polycyclic Aromatic Hydrocarbons

PAHs are:

- a group of chemicals that are formed during the incomplete burning of coal, oil, or other organic substances, such as tobacco and charbroiled meat.
- There are more than 100 different PAHs.
- PAHs generally occur as complex mixtures, not as single compounds.
- Source: ATSDR Web Site

PAH Reassessment

1. New technical information from EPA.
2. Adjustments based on review by DHS.
3. Upcoming PAH background study.



Benzo[A]Pyrene

New Technical Information from EPA

First Deliverable: RCL Spreadsheet Changes

1. New EPA Information

- PAH driver in most cleanups is benzo[a]pyrene (B(a)P).
- EPA lowered toxicity level for B(a)P.
- Changes made to DNR RCL Spreadsheet.
- B(a)P contaminant cleanup levels are less stringent, but protective.

1. New EPA Information

- B(a)P non-industrial direct contact RCL will increase from **15 ppb** to **115 ppb**.
- B(a)P industrial direct contact RCL will increase from **211** to **2,110** ppb.
- B(a)P groundwater protection RCL will not change.

1. New EPA Information

Exposure Assumptions

1. New EPA Information

- Exposure assumptions changed:
  - Standard person was 70kg, now 80kg
  - Larger people = More surface area
  - Change residences more frequently
- Will affect <u>all</u> compounds on spreadsheet
- Results in less than 10% difference in calculated RCL values

PAH Reassessment by DHS

Second Deliverable: Risk-Based Option for cPAHs

2. New Information from DHS

At DNR's request, DHS conducted:

- A reassessment of risk associated with carcinogenic PAHs (cPAHs).
- An evaluation of DNR's process for calculating cleanup standards for cPAHs in soil.

2. New Information from DHS

DHS determined cPAHs:

- Are always found as a mixture of cPAHs, never independently.
- Toxicologically, cPAHs act in an identical manner on humans.

DHS concludes it is appropriate to assess cPAHs on a cumulative basis.

2. New Information from DHS

- DNR's Current PAH Assessment Criteria
- NR 720.12(1) target excess cancer risk thresholds:
  - 1X10-6 for individual compounds, and
  - 1X10-5 for cumulative risk

2. New Information from DHS

- Risk-based approach allowed under NR 722.11(1)(b) when attaining compliance with the RCLs in NR 720 is not practicable.
- Proposed Approach:
  - Allow for cumulative assessment of 7 cPAHs using a modified RCL spreadsheet.
  - Develop a cumulative, non-industrial RCL threshold that is less stringent than individual RCLs, but still protective.

PAH Cancer Risk – cPAH Compounds

- Benzo(a)pyrene
- Dibenz(a,h)anthracene
- Benz(a)anthracene
- Benzo(b)fluoranthene
- Ideno(1,2,3-cd)pyrene
- Benzo(k)fluoranthene
- Chrysene
- Naphthalene
- 1-methylnaphthalene

cPAHs

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cPAHs
Cumulative Risk

- Naphthalene
- 1-methylnaphthalene

cPAHs
Individual Basis

PAH Cancer Risk

Cancer Risk for Benzo(a)pyrene = 

PAH Cancer Risk

- Benzo(a)pyrene = 
- Dibenz(a,h)anthracene =
- Benz(a)anthracene =
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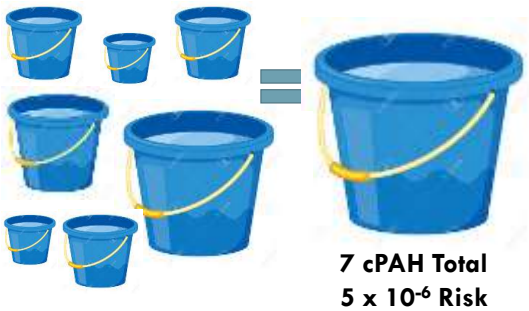
cPAH Cancer Risk



7 cPAH Total
5 x 10^{-6} Risk

cPAH Cancer Risk

Why use only half of the 1 x 10-5 cumulative excess cancer risk at this time?

- Only 7 cPAHs included now.
- More potent cPAHs known.
- Half the cumulative risk "bucket" held in reserve:
  - for future compounds
  - changes in risk of current compounds

Total Cancer Risk

7 cPAHs | **Non "7 cPAH" Carcinogens** | **Total Carcinogens**

Total Cancer Risk

Total Carcinogens = 1 x 10^{-5}

Evaluating New Cumulative Approach

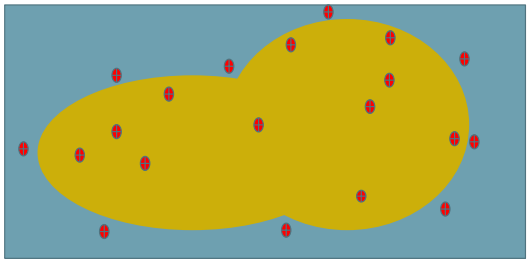
What will **not** be affected:

- Non-cancer risk summation.
- Industrial, direct contact RCLs.
- Groundwater pathway RCLs.
- Total cumulative risk for all carcinogenic compounds (1X10^{-5})

Evaluating New Cumulative Approach

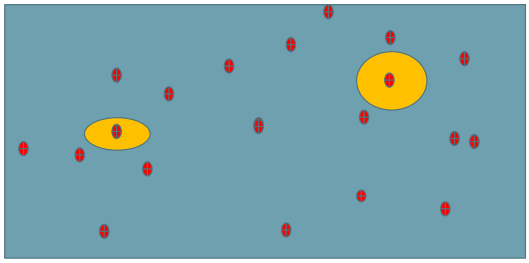
- Evaluated sites with cPAH data.
- Significant effect on sites with widespread, low-level PAH concentrations.
- Minimal effect on sites with contamination from a spill or discharge.

Evaluating New Approach



Example Site – Cap area with current RCLs

Evaluating New Approach



Example Site – Cap area with proposed RCLs

Evaluating New Approach

- Current DNR standards more restrictive than other Region V states.
- Proposed approach is similar to other Region V states.

New approach recognizes historic atmospheric deposition of PAHs from autos, industry, etc.

Risk Assessment Option – NR 722.11

- Risk-based approach allowed when attaining compliance with NR 720 RCLs is not practicable.
- Modified RCL spreadsheet proposed
- Process to be sent out for public comment

"Let's try it without the parachute."

Risk Assessment Option – NR 722.11

Current Spreadsheet

Risk Assessment Option – NR 722.11

Current Spreadsheet

Not-To-Exceed D-C RCL (mg/kg)	Basis	BTV (mg/kg)	INPUTTED Site Data (mg/kg)	Flag E = Individual Exceedance
5.52	ca		5.	
0.115	ca		0.3	E
1.14	ca		0.2	
1.15	ca		0.2	
11.5	ca		0.2	
115.	ca		0.2	
0.115	ca		0.2	E
1.15	ca		0.2	
17.8	ca		17.	
239.	nc		100.	
0.677	ca	8	8.	
400.		52	100.	

Risk Assessment Option – NR 722.11

Current Spreadsheet

12	Number of Individual Exceedance	(Cumulative) Hazard Index	(Cumulative) Cancer Risk
	2	0.7174	6.8E-06

NO! This NON-INDUSTRIAL site sampling location will need either further cleanup to lower contaminant levels or the construction of a cap/cover to address the direct-contact pathway.

Risk Assessment Option – NR 722.11

Modified Spreadsheet

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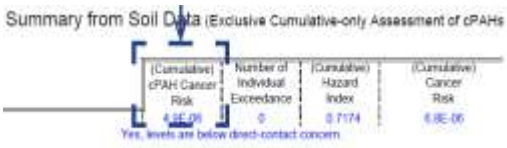
Modified Spreadsheet



Risk Assessment Option – NR 722.11

- Must input data for all compounds into spreadsheet
- Use full MDL levels for non-detects (NDs)
- Entering MDLs for NDs will typically use only a small percentage of the cumulative 5 x10^{-6} cPAH risk capacity.
- However, with extensive analytical interference, the proportion could become more significant.

Risk Assessment Option – NR 722.11

Relative Effects (based on data review):

- Cumulative risk of 5 x10^{-6} for seven cPAHs:
  - Significant increase in acceptable B(a)P levels, depending on relative PAH mixture.
  - B(a)P and Dibenzo(a,h)anthracene tend to drive direct contact RCL exceedances in moderately impacted soils.

PAH Background Study in Milwaukee

Third Deliverable: Study is Forthcoming

3. Proposed PAH Background Study

- Shallow soil samples to be collected in Milwaukee County parks.
- Samples analyzed for PAHs.
- Determine background threshold value for PAHs originating from atmospheric deposition.

Takeaways

- Change in EPA exposure assumptions changes all compounds on RCL spreadsheet by <10%
- Change in EPA RSL for B(a)P results in
  - non-industrial DC RCL increasing from 15 to 115 ppb
  - industrial DC RCL increasing from 211 to 2,110 ppb
- Cumulative assessment of 7cPAHs will increase "effective B(a)P concentration " in most situations.
- Background study will provide data to guide next steps in assessing PAH contamination approach.

PAH Reassessment

Questions