

PHAI Cleanup Criteria Amendment Application

MPH Council Training Session

Jennifer Turner, MSc, EP
Manager, HWP Environmental Management

Ron Brecher, PhD, DABT, C.Chem
Toxicologist, Independent Expert





Land Acknowledgment

Developing PHAI Cleanup Criteria*

1975 4,000 properties surveyed, 400 remediated in Port Hope

- 100,000 tonnes impacted soil excavated, transported to Chalk River for disposal – limited capacity

1991 CCME report, *Interim Canadian Environmental Quality Criteria for Contaminated Sites*

- Generic use, not intended for site-specific conditions – “generally protective of human and environmental health”
- Generally aligned with Ontario Ministry of Environment values published in *Soil, ground water and sediment standards for use under Part XV.1 of the Environmental Protection Act*

2006 Some background study reports suggested that remediation should focus on radiological materials

* Arsenic, although not a radionuclide, is associated with historic radiological waste in Port Hope



CCME = Canadian Council of Ministers of the Environment

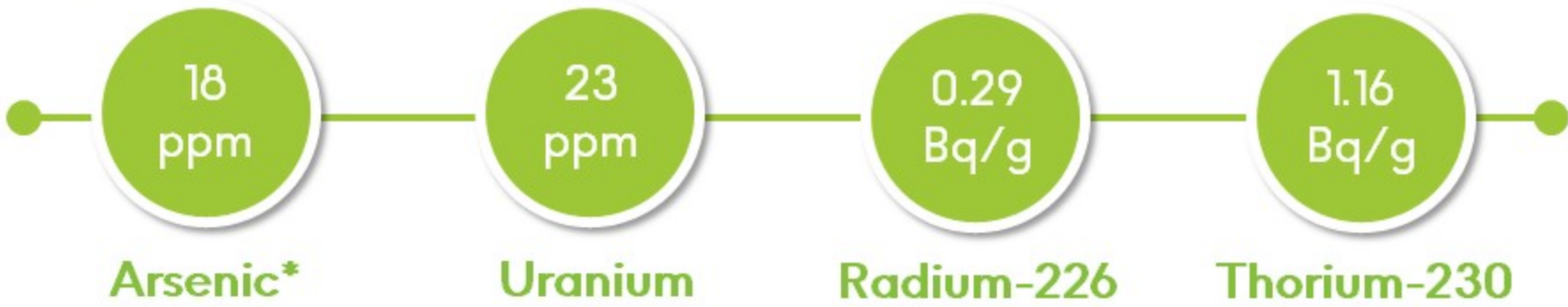


Confirming the PHAI Cleanup Criteria

Original Criteria Decision - 2006

- Strong desire from stakeholders to use existing, published, easily comparable provincial generic standards*
- Potential issues with adopting generic criteria at background levels were recognized
- Criteria finalized based on generic, Ontario standards (Ministry of Environment, Conservation and Parks)
- Included in both Environmental Assessment and CNSC Waste Nuclear Substance Licence
- Requires CNSC approval to change

Current Cleanup Criteria



*While natural levels of arsenic in soil up to 18 ppm considered typical within province, levels vary due to local geologic conditions.



Why Change the PHAI Cleanup Criteria?

Property Owner Feedback

- Length of property cleanup time
- Extent of impacts to property features
- Disruption to enjoyment of property

Port Hope Community Feedback

- Impact to community, environment, heritage features
- Intrusive, although studies show no adverse effects to human health/environment



Meeting current PHAI Cleanup Criteria



Larger volume of waste – chasing arsenic



Unintended consequences



2018 – 2024 Engagement Feedback Themes/Concerns



Indigenous Communities & Organizations

- Health implications
- Ecosystem impacts
- Request for broader studies



Port Hope Property Owners

- Length of completion time for remediation work on property
- Resulting impacts on property features
- Mortgage and financing impacts
- Property restrictions and Compliance Letters



General Public

- Potential impact of current CC on Port Hope environment
- Particularly concerned about number of trees

Arsenic in Port Hope?

Sources of Arsenic

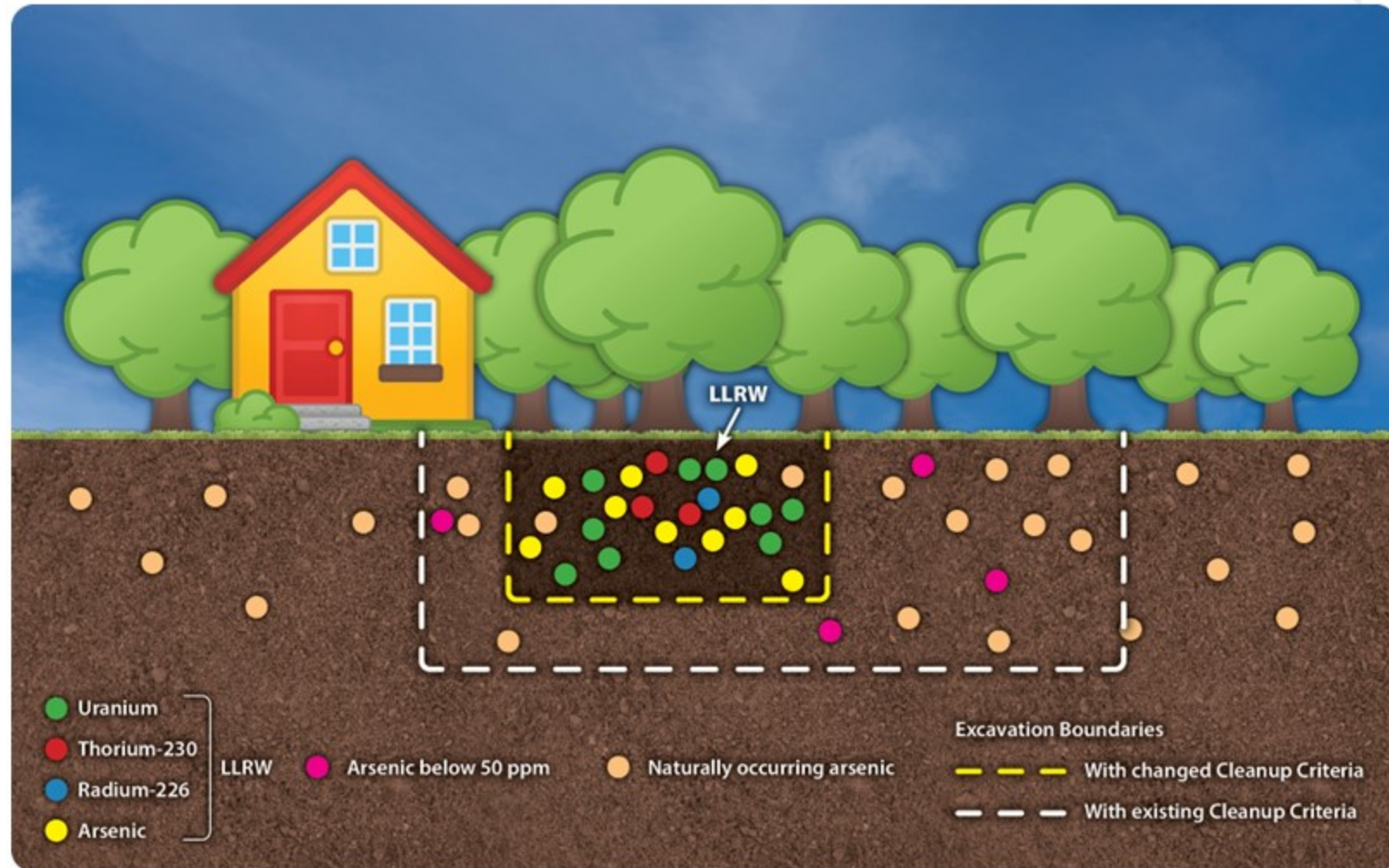
- Eldorado stack
- Eldorado fill
- Industrial waste
- Pesticides/herbicides
- Naturally occurring



Why Change the PHAI Cleanup Criteria?

Project Data – 25,000 Soil Samples Since 2012

- 10% of remediation beyond original design driven by arsenic
- Other elements:
 - 2.5% - Uranium
 - 3.2% - Radium-226
 - 0.1% - Thorium-230



Risk Assessment: Arsenic in Port Hope

- CNL commissioned risk assessment of arsenic exposure in Port Hope
- **Highly conservative regulatory process** to limit risk to public
- Designed to be protective of human health and the environment
- Estimates potential adverse effects to human and ecological receptors from exposure to the hazard (arsenic)

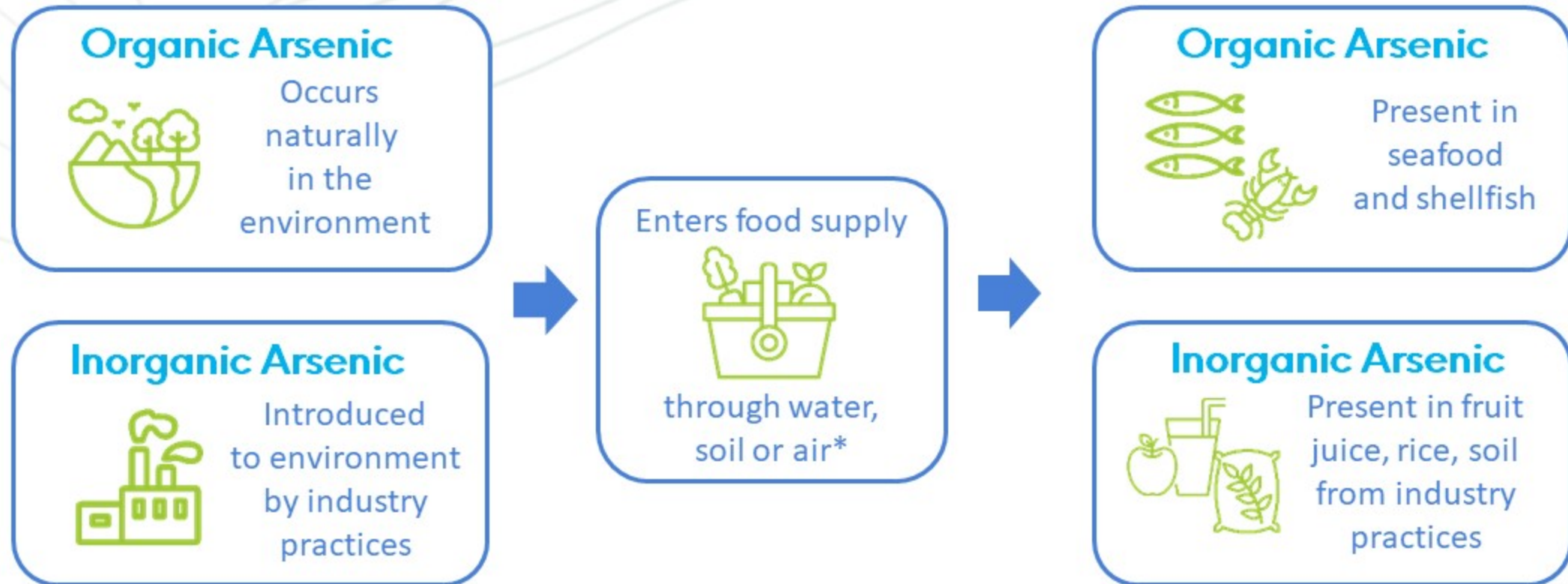
All three factors must overlap for a risk to be identified



For visualization purposes only



Arsenic – Organic vs. Inorganic



*Arsenic concentrations in foods sold in Canada **are low, have been stable** for many years

Inorganic Arsenic in Port Hope Environment

- There are multiple sources of inorganic arsenic in Port Hope
 - Low Level Radioactive Waste (LLRW)
 - Historical industrial practices
 - Agricultural chemicals
 - Pressure-treated wood products
- Inorganic arsenic in LLRW resulting from Eldorado Nuclear Ltd. activities
- Does not accumulate in environment or move up food chain from one species to another
- Not readily absorbed by the tissues of animals and plants
 - No measurable uptake of arsenic in Port Hope trees growing in soil with elevated arsenic levels
 - No elevated arsenic levels that could be attributed to LLRW found in Port Hope harbour fish tissues



What is 'parts per million' (PPM)?

- Number of parts of a substance per million parts of water/soil

How much is 1 part per million?

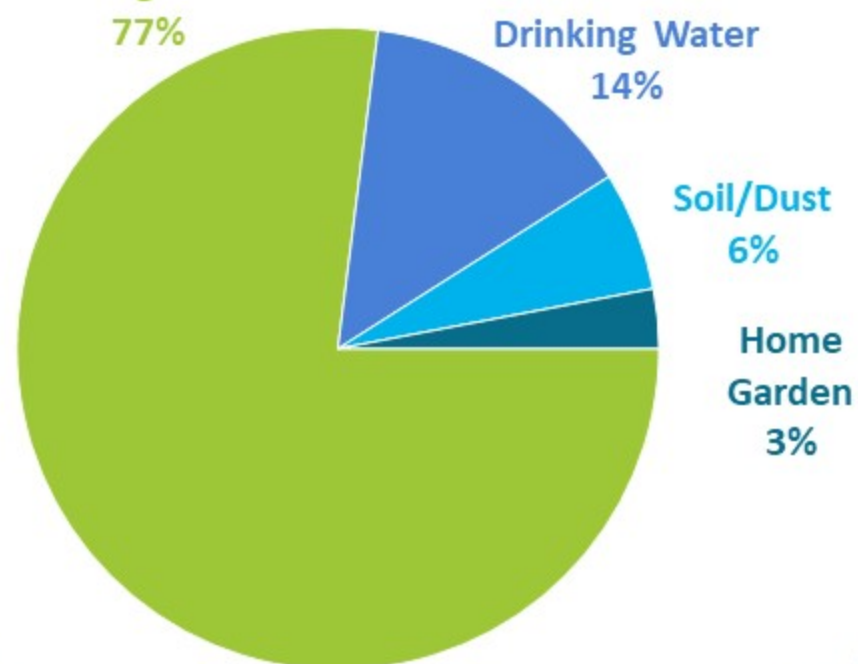
- **1 grain of sugar** in 273 sugar cubes
- **1 credit card** on a football field
- **1 minute** in two years
- **1 kernel** in 1,250 ears of corn
- **1 gram** of arsenic in a metric tonne of soil



Inorganic Arsenic: Hazard and Exposure

Inorganic Arsenic Contribution to Lifetime Cancer Risk* (*typical* Canadian, drinking municipal water)

Store-Bought Food**



- Largest source of exposure: store-bought foods consumed**
- Second-largest source: drinking water
- Regulations focus on limiting cancer risk from long-term, low-level exposures

*Health Canada. 2006. *Arsenic in Drinking Water*.

OMECP. 2022a. *Drinking Water Surveillance Program*. 2018-2020. Updated April 5, 2022

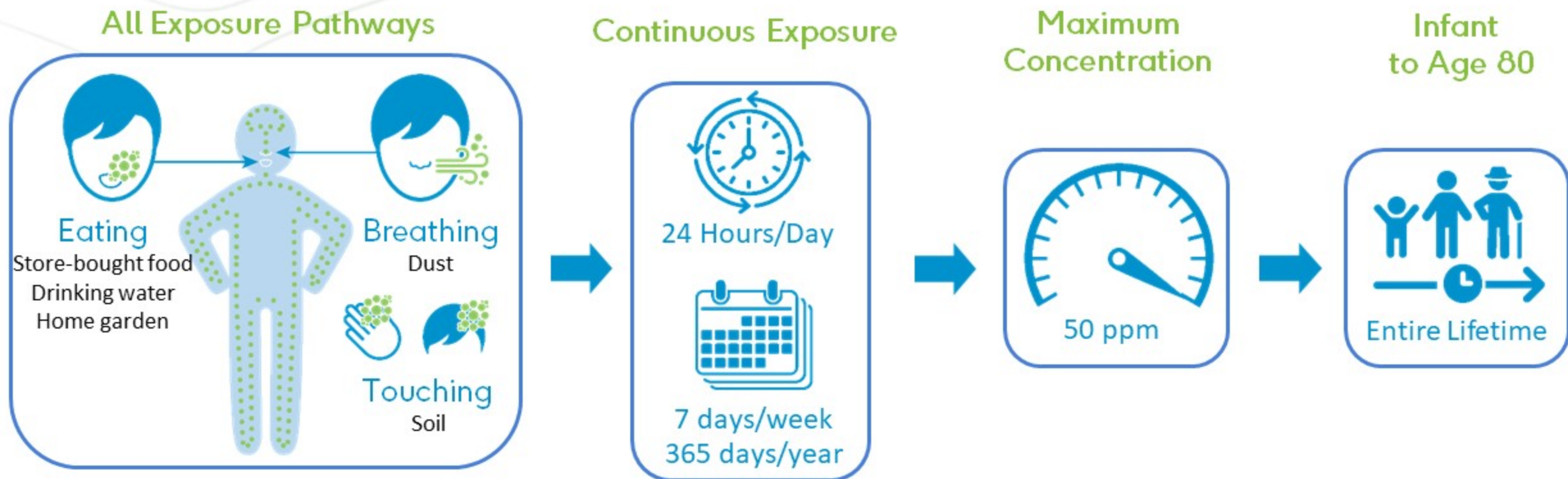
Municipality of Port Hope. 2020. *2019 Annual and Summary Report – Port Hope Drinking Water System No. 260058006*. February 4, 2020

Health Canada. 2021a. *Federal Contaminated Sites Risk Assessment in Canada. Guidance on Human Health Risk Preliminary Quantitative Risk Assessment (PQRA)*, Version 3.0. March 2021.

**Arsenic concentrations in foods sold in Canada are low, have been stable for many years

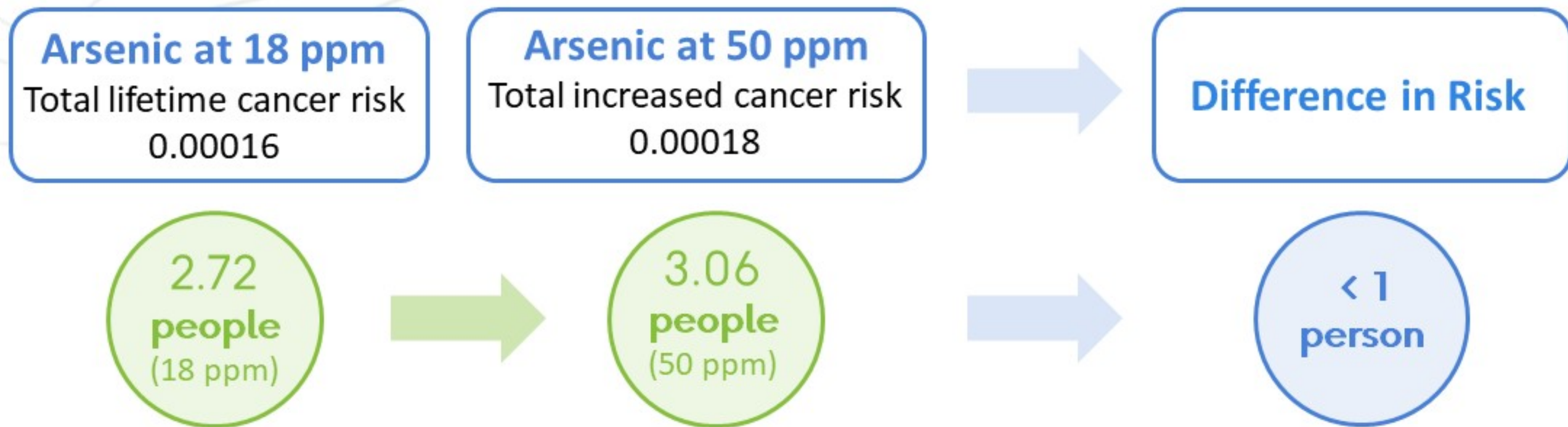
Risk Assessment Model* – Arsenic in Port Hope

- **Designed to be likely to overestimate** risk using all available data
- Assumes **lifetime continuous exposure to arsenic including at 50 ppm through soil pathways**
- Indigenous people are expected to have the same exposures as other Port Hope area residents
 - Urbanized setting does not support harvest of traditional country foods



Arsenic Risk Model - Lifetime Receptor (cancer risk)*

- Port Hope population approximately 17,000 people
- **Assuming continuous exposure to arsenic through all pathways for an individual's lifetime (80 years)**

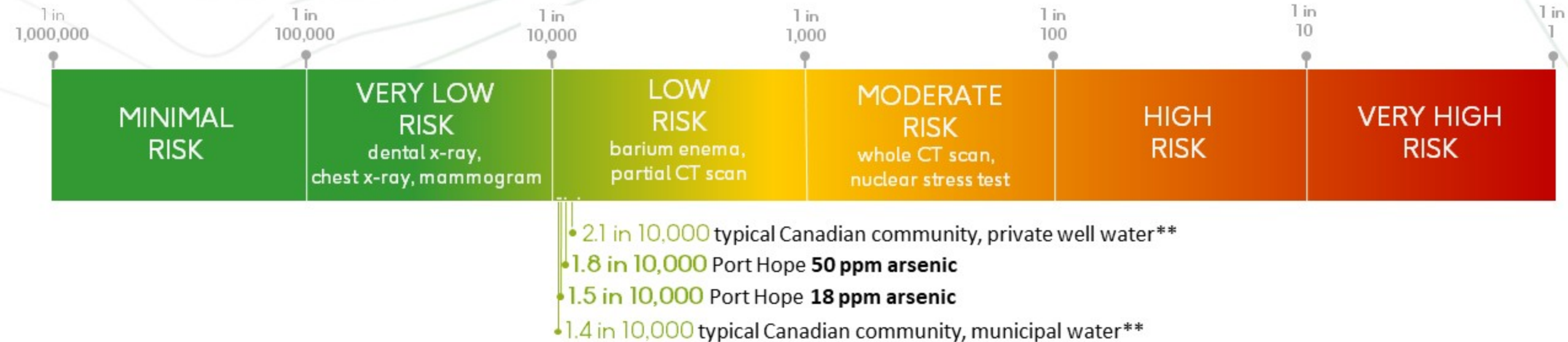


* Health Canada. 2021a. *Federal Contaminated Sites Risk Assessment in Canada. Guidance on Human Health Risk Preliminary Quantitative Risk Assessment (PQRA)*, Version 3.0. March 2021
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Comparing Arsenic Criterion Levels: Lifetime Risk of Developing Cancer*



- Risk increase range similar to other Canadian communities depending on local geologic conditions/drinking water source - **not likely measurable** using currently available methods



* Paling J. *Strategies to help patients understand risks*. BMJ. 2003; 327: 745-748. doi: 10.1136/bmj.327.7417.745.

** Health Canada. 2021a. *Federal Contaminated Sites Risk Assessment in Canada. Guidance on Human Health Risk Preliminary Quantitative Risk Assessment (PQRA)*, Version 3.0. March 2021.

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Biomonitoring of Urinary Arsenic

- No urinary biomonitoring study conducted in Port Hope for many reasons:
 - Predicted changes in urinary arsenic fall within range seen in general Canadian population
 - Too few Port Hope residents living in arsenic-impacted locations for robust biomonitoring study
 - Most properties have average arsenic soil concentrations of less than 18 $\mu\text{g}/\text{g}$
 - Most surface soil that had elevated arsenic (mainly in the stack deposition zone) has been remediated

Drawing Upon Biomonitoring Results in Other Communities

- Community biomonitoring in Canada, US, Australia and UK communities
- Multiple lines of evidence: risk assessments, urinary arsenic studies, community health info
- Arsenic in soil concentrations \rightarrow below about 100 $\mu\text{g}/\text{g}$
- Measured dose-response \rightarrow no strong relationship identified
- Studies concluded arsenic cleanup not warranted, despite soil levels being higher than provincial/national soil criteria



Comparison Communities

Canadian Communities with Alternate Values for Arsenic

Community (year of study)	Mean soil arsenic concentrations ($\mu\text{g/g}$) not associated with elevated urinary arsenic levels	Mean soil arsenic concentrations ($\mu\text{g/g}$) associated with elevated urinary arsenic levels	Regulator having jurisdiction over decision
Deloro, Ontario (1999)	50 to 216/zone; 111 ^a for entire town	None ^b	MECP
Wawa, Ontario (2001/2002)	<20 to >100 ^a	None ^b	MECP
Falconbridge, Ontario (2005)	78 ^a	None ^b	MECP
Balmertown, Ontario (1995)	58 (garden soil) 214 (yard soil) 239 (play areas)	Not evaluated	MECP
Flin Flon, Manitoba (2010)	16 to 67 ^a	None ^b	Manitoba Conservation, Manitoba Health, Saskatchewan Environment, Saskatchewan Health, Health Canada
City of Yellowknife, Ndilo and Dettah, NWT (2017-2018)	44 to 194 ^a	None ^b	Mackenzie Valley Environmental Impact Review Board, Health Canada

^a Value(s) represent the maximum mean soil arsenic concentration or entire mean soil arsenic concentration range in the study.

^b "None" indicates that the maximum mean soil arsenic concentration in the study area was not associated with elevated urinary arsenic.





Is the proposed new level safe?



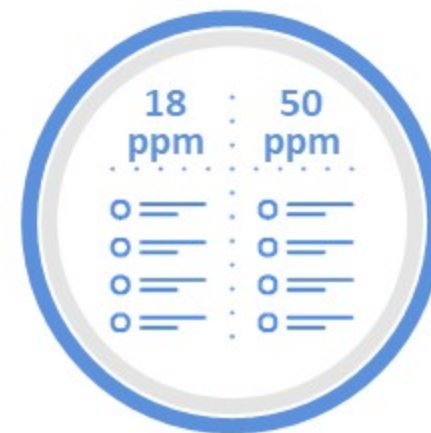
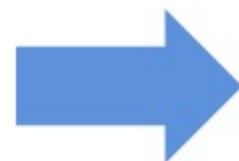
2009 CNSC SYNTHESIS REPORT

Reviewed more than 40 independent health/epidemiological studies undertaken over decades



REPORT CONFIRMED (Based on conclusive evidence)

No adverse health effects resulting from nuclear industry operations or exposure to contaminants in Port Hope soil



COMMISSIONED STUDIES CONCLUDE

(Based on risk assessment model)

Revising arsenic criterion from 18 ppm to 50 ppm results in **The risk to residents of Port Hope is low both at 18 ppm and at 50 ppm***

Protective of human health and the environment

Reduce Impact on Private Properties



Current Cleanup Criteria

Reduce Impact on Private Properties



Proposed Cleanup Criteria

Reduce Impact on Private Properties



Reduce Impact on Community



■ Remediation: current cleanup criteria – arsenic 18 ppm



■ Remediation: proposed cleanup criteria - arsenic 50 ppm

Reduce Impact on Trees



Current Cleanup Criteria

Reduce Impact on Trees



Proposed Cleanup Criteria

Reduce Impact on Trees



Benefits to Revised Cleanup Criteria

Reduces

- **Unintended** environmental impact (trees/ecosystems)
- **Individual** property cleanup volume/time
- **Overall number** of required private property cleanups

Increases

- **Properties qualified** for Compliance Letter without significant impact to property features



Financial and Other Factors

If Proposed Change to PHAI Cleanup Criteria is Approved



Mortgages & Refinancing
Compliance Letters
be issued for properties
meeting revised criterion



Land Use & Permitting
Unrestricted for current land use



Stigma & Fear
Cleanup complete
Property information available

Summary - Changing the PHAI Cleanup Criteria

- Incremental cancer risk for Port Hope is similar to general Canadian population
 - No significant difference between 18 $\mu\text{g/g}$ and 50 $\mu\text{g/g}$
- Remediation impacts reduced
 - Reduced community impacts – remediation-related traffic disruptions, noise, dust
 - Less damage to vegetation and ecosystems
 - Fewer properties require cleanup
 - Less soil removal
- Additional benefits to property owners
 - Compliance letters
 - No restrictions on property use





Miigwetch. Thank you. Merci



info@phai.ca



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