Human Health Risk Assessment Model Recommended for Manitoba Hydro Bipole III EIS

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November 15, 2012

Introduction

- When large resource development projects are announced, there are legitimate public concerns about impacts on health and well-being of local residents.
- Widespread belief that project will substantially degrade the environment, in particular air, water and country food quality.
- Large projects must be properly assessed, addressed and mitigated through the EIA process.
- Human health risk assessments (HHRAs) are now required for many EIAs in Canada.
- HHRAs have been conducted on a voluntary basis by certain proponents to address stakeholder concerns

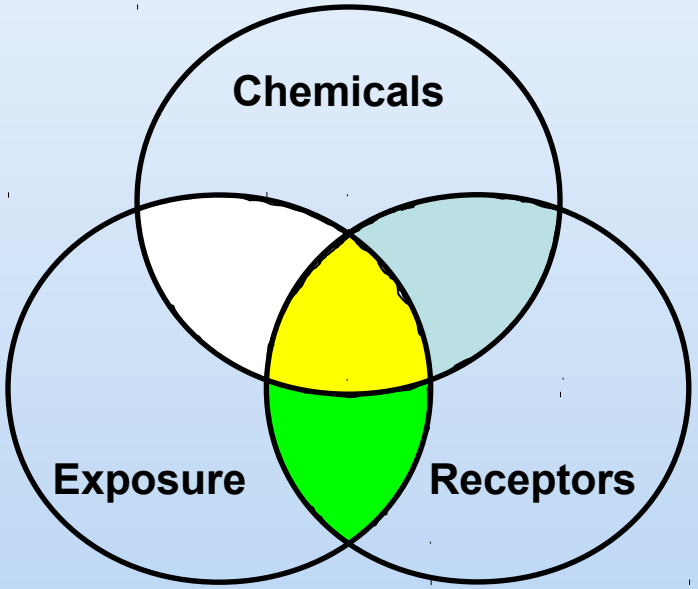
Introduction (cont'd)

- **Overall community health is determined by many socio-economic, genetic and lifestyle factors that are independent of environmental quality.**

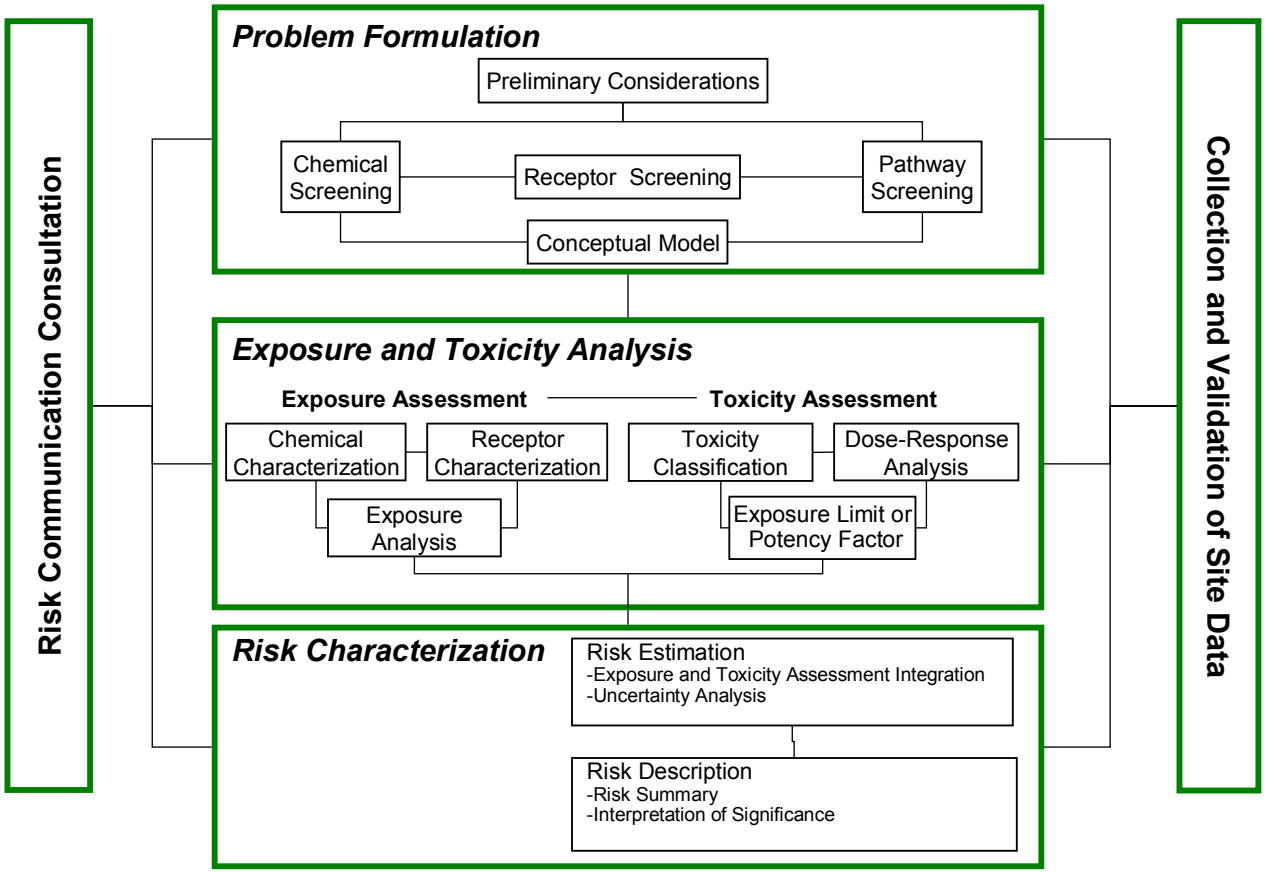
- **A health impact assessment (HIA) study has been proposed and described by Habitat Health consultants to address overall community health and well being.**

What is Human Health Risk Assessment?

- **A scientific study which assesses potential human health risks from exposure to chemical substances.**
- **Health risk is dependent upon toxicity of chemical(s) as well as degree and duration of exposure to those chemical(s).**



HHRA Paradigm



Why Do a Risk Assessment?

- To determine whether existing or future environmental conditions could result in adverse human health risks.
- To determine whether specific mitigation measures are needed, as well as follow-up monitoring to protect human health.
- To provide scientific information to the public regarding their concerns about potential health effects from industry.

Main Features of a Health Risk Assessment

- Very comprehensive – considers all contaminants - including those without air quality objectives
- Highly conservative approach - so risks are not under-estimated
- Public consultation and input essential in scoping of issues to be addressed
- Based on current scientific (toxicology) knowledge
- Sources of uncertainty identified and addressed
- Transparent and scientifically defensible
- Can assess potential health effects related to chemical mixtures

Typical COPCs Assessed in Project HHRAs

Criteria Air Contaminants

- **Nitrogen dioxide (NO2)**
- **Carbon monoxide (CO)**
- **Particulate matter (PM10 and PM2.5)**

Volatile Organic Compounds (VOCs)

Polycylic Aromatic Hydrocarbons (PAHs)

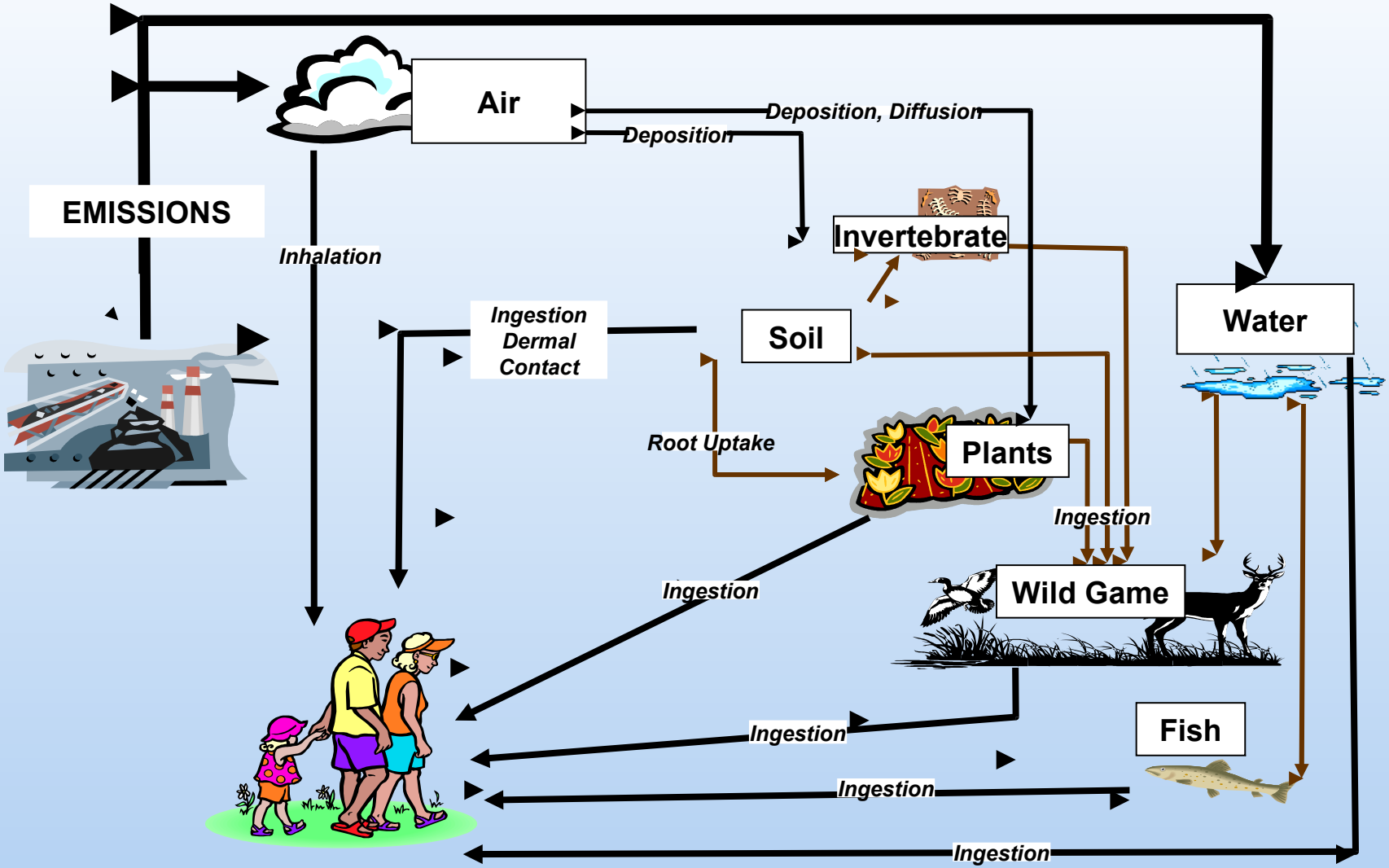
Metals

Note: COPC = chemical of potential concern

Identification of Human Receptors

- Urban community residents
- Rural non-farming residents
- Rural farming residents
- Potentially highly-exposed groups such as First Nation and Hutterite communities
- All age groups from infant to adult

Potential COPC Exposure Pathways



Exposure Assessment

Predicted maximum contaminant concentrations are assumed:

- **1-, 8-, 24-hour contaminant concentrations (acute effects)**
- **Annual average contaminant concentrations (chronic effects)**

Assessment Cases

The assessment scenarios for the EIA and risk assessment include:

- **Baseline case, includes existing air quality based on monitored results**
- **Project Alone case, includes the proposed project by itself**
- **Application case, includes the Baseline case plus the Project Alone case**
- **CEA (future) case, includes predicted air quality based on all announced projects**

COPC Exposure Limits

- Exposure limits have been established by reputable scientific or regulatory agencies such as Health Canada and the US EPA
- Exposure limits include safety factors to protect the general public and sensitive individuals

COPC Mixture Toxicity

Potential health effects are considered resulting from exposure to chemical mixtures including compounds that:

- **are structurally similar**
- **act toxicologically via similar mechanisms, or**
- **affect the same target tissue in the body**

Hazard Quotient (HQ) Values

$$HQ = \frac{\text{Exposure Estimate}}{\text{Exposure Limit}}$$

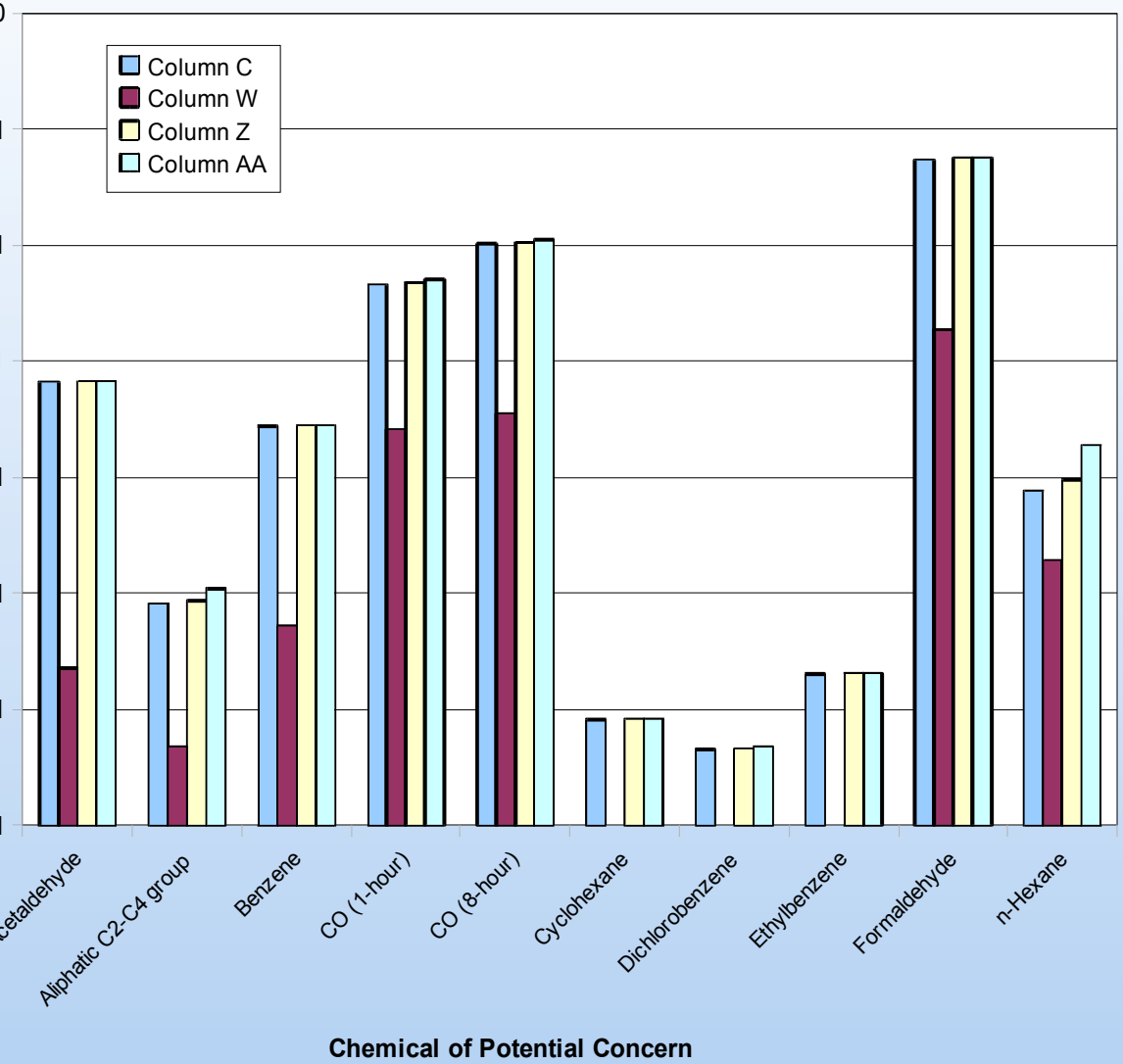
HQ < 1

- ✓ no health risks predicted
- ✓ no further analysis required

HQ > 1

- ✓ possible health risks predicted
- ✓ further analysis needed

Example of Hazard Quotients



Conservative Assumptions

- Maximum predicted contaminant concentrations and deposition rates
- Upper chemical concentrations in country foods
- Upper food consumption rates
- Exposure limits with safety factors to protect sensitive individuals
- The intention of these conservative assumptions is to “overestimate” potential exposures and therefore health risks.

Beyond Health Risk Assessment

- **Health risk assessment provides critical information required to ensure project contaminant emissions are safe**
- **Broader issues of community health and well-being may be addressed through a Health Impact Assessment (HIA) as proposed by Habitat Health consultants**

The Overall Determinants of Health

1. Income and social status
2. Social support networks
3. Education and literacy
4. Employment / working conditions
5. Personal health practices and coping skills
6. Physical environments
7. Social environments
8. Healthy child development
9. Biology and genetic endowment
10. Health services
11. Gender
12. Culture