



## Federal Contaminated Sites



# Federal Contaminated Sites Action Plan (FCSAP) - Ecological Risk Assessment and Background Soils Data



Rita Mroz  
Environment Canada  
Environmental Protection Operations  
Directorate

Workshop on Role of Geochemical Data in  
Ecological and Human Health Risk Assessment,  
Halifax, March 17-18, 2010



Government  
of Canada

Gouvernement  
du Canada

Canada



## Federal Contaminated Sites

# Federal Contaminated Sites Action Plan

### Program objectives:

- Reduce ecological and human health risks;
- Reduce federal financial liability;
- Increase public confidence.

Established in 2005 with a \$3.5 billion commitment over 10 years, to address high risk federal sites

### Specifically encourages human health and ecological risk assessments at federal sites

- helps federal custodians determine if a site is contaminated and to what extent;
- provides financial assistance.



Government  
of Canada

Gouvernement  
du Canada

Canada



## Ecological Risk Assessment

Canadian Council of Ministers of the Environment,  
“A Framework for Ecological Risk Assessment”  
(1996,1997)

US-EPA definition: process that evaluates the  
likelihood of adverse ecological effects that may  
occur or are occurring as a result of exposure to  
one or more stressors







# Types of ERA

## Screening level ERA

- Simple, qualitative and/or comparative methods and relies heavily on literature information and previously collected data. Descriptive as opposed to predictive.

## Preliminary quantitative ERA

- Uses such tools as literature-derived toxicity benchmarks and uptake factors. Quantitative estimates of exposure and risk are provided.

## Detailed quantitative ERA

- Relies on site-specific data and predictive modelling. May include toxicity bioassays and/or site-specific uptake factors.

Detail

Uncertainty





# Types of ERA

Each type of risk assessment is progressively more detailed (from screening level to detailed quantitative studies)

The level of uncertainty decreases as the amount of site-specific information is included in the evaluation.

Some of the reasons for progressing from a largely qualitative assessment to a quantitative assessment (either preliminary or detailed):

- rare or endangered species present
- critical/sensitive habitat for wildlife
- migratory birds or fisheries issues
- designated lands (natural area, park, or ecological reserve).





# Does CCME Use Background Geochemical Data To Develop Criteria?

CCME Environmental Quality Guidelines

Soil Quality Guidelines – Human Health

$SQG_{HH}$

(considers background)

Soil Quality Guidelines – Ecological

$SQG_E$

(does not consider background)

Most stringent value

Soil Quality Guidelines Final  
 $SQG_F$





## Deriving CCME Ecological Soil Quality Guidelines ( $SQG_E$ )

Source: CCME, 2006

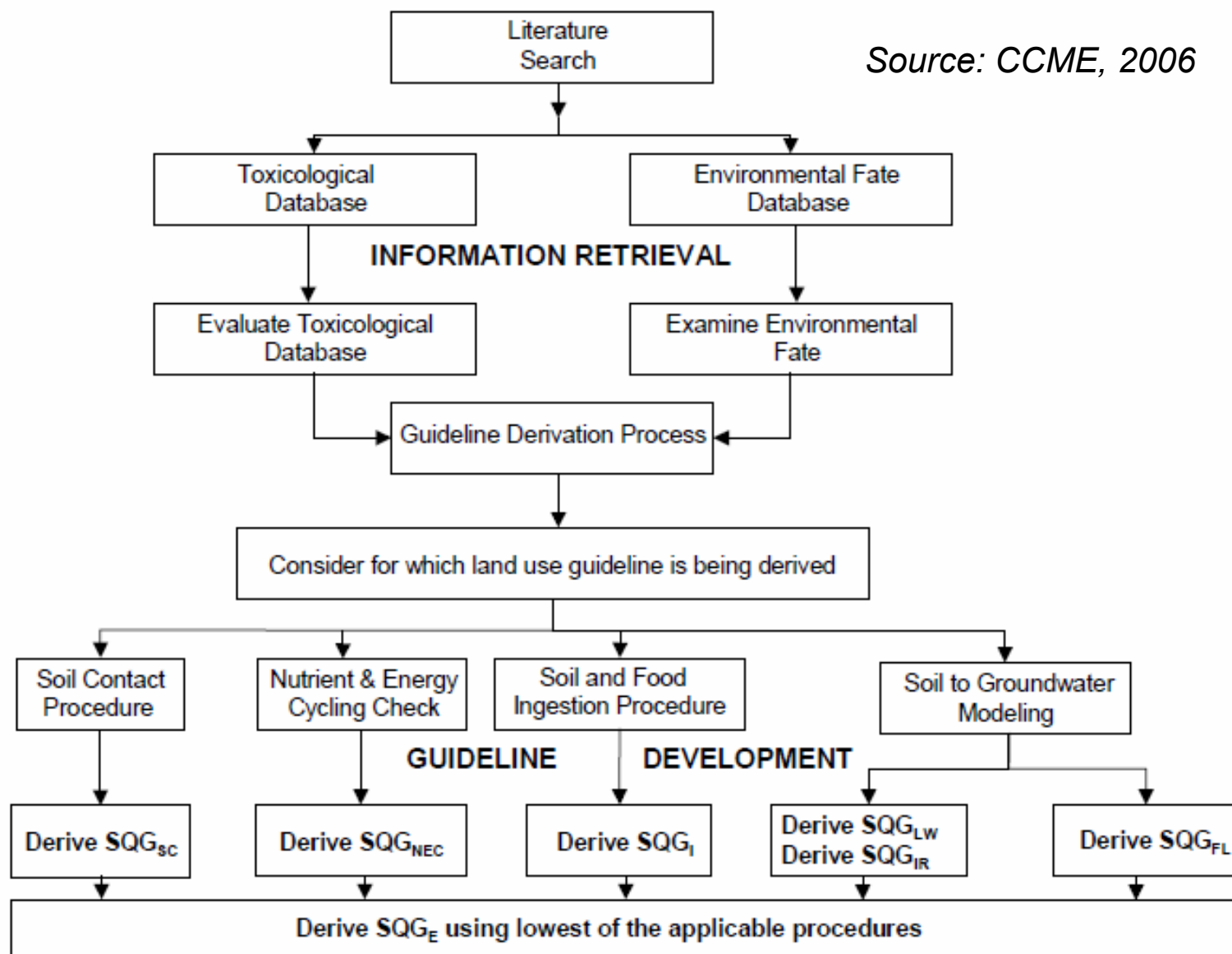


Figure 9: Overall Procedure for Deriving Environmental Soil Quality Guidelines for Agricultural, Residential/Parkland, Commercial and Industrial Land Uses







# Deriving CCME Ecological Soil Quality Guidelines ( $SQG_E$ )

Guidelines derived from ranking toxicity data and selecting the most appropriate study.

Level of protection required is dependent on land use

Factors considered in protection of the environment:

1. Direct contact exposure
2. Nutrient/energy cycling check
3. Ingestion of food and soil
4. Global warming modelling

While SQGHH derivation is based on toxicity and estimates of soil background concentration, SQGE derivation is based solely on toxicity with no estimate of exposure (including background). Exposure is assumed to be 100% (the plants and animals live in the soil)







## How Does CCME Recommend Using Background Geochemical Data?

Final Soil Quality Guideline ( $SQG_F$ ) can be compared to natural background;

- If  $SQG_F$  is less than natural background for the particular area, one can adopt the background concentration

But where does one find background data for the Atlantic Region?

- Not easily attainable





## Federal Contaminated Sites

# Background Soil Chemistry/Toxicology Database for the Atlantic Region (2004-present)

- Identified the need for “background” soil data. If available, the use of local background data to screen potential contaminants of concern is often preferred, as the data are more relevant to site specific ecological and geochemical characteristics.
- Divided the region into eco-zones
- Developed and adopted a sampling methodology
- Chemical analyses for metals, polycyclic aromatic hydrocarbons (PAHs), total organic carbon (TOC), grain size, and pH.
- Toxicity testing (earthworms; *Collembola* sp., 3 plant assays (Northern wheatgrass, lettuce, alfalfa))
- Soil sampling – 2004 -2010



Government  
of Canada

Gouvernement  
du Canada

Canada



## Federal Contaminated Sites

### On-Going Partnerships

- Natural Resources Canada –  
Geological Survey of Canada /  
Health Canada
- North American Soils  
Geochemical Landscapes Project  
(NASGLP)
  - Comparison of sampling  
protocols
  - Comparison of soil  
geochemical data



Government  
of Canada

Gouvernement  
du Canada

Canada





## Federal Contaminated Sites

### References

- Canadian Council of Ministers of the Environment, 1997. Framework for ecological risk assessment: technical appendices. (Download at [http://www.ccme.ca/assets/pdf/pn\\_1274\\_e.pdf](http://www.ccme.ca/assets/pdf/pn_1274_e.pdf) [accessed March 25, 2010])
- Canadian Council of Ministers of the Environment, 1996. A Framework for Ecological Risk Assessment: General Guidance. (Download at [http://www.ccme.ca/assets/pdf/pn\\_1195\\_e.pdf](http://www.ccme.ca/assets/pdf/pn_1195_e.pdf) [accessed March 25, 2010])



Government  
of Canada

Gouvernement  
du Canada

Canada