

*Azimuth Consulting Group Partnership
**Transport Canada
***Public Works and Government Services Canada

RPIC Federal Contaminated Sites National Workshop, Ottawa 2014
Overview

Goal:
- Provide highlights of the Victoria Harbour (Lot 17) ecological risk assessment (ERA)
- Present a conceptual framework that facilitates evaluation of likely risk management actions in response to results of ERA

Approach:
- Review some challenges involved in linking ERA outputs and risk management decision-making needs
- Summarize the key components of the conceptual framework and provide examples from Lot 17
Victoria Harbour & sub-areas
Context for ERA

- Over the last decade, Transport Canada commissioned numerous studies to characterize sediment contamination and associated risks.
- Need to understand the contribution of sediment-bound contaminants (can be managed by Transport Canada) vs. water-bound contaminants (related to ongoing inputs from upland discharges).
- Formal ERA framework to support development of a remediation action plan/risk management plan (RAP/RMP).
ERA Scope and Approach

• Series of field studies, lab analysis and reporting addressing four receptor groups:
  – *Subtidal benthic invertebrates*
  – Intertidal communities
  – Finfish
  – *Wildlife (birds, mammals, reptiles)*

• Main ERA outputs for each receptor:
  – Characterize spatial extent and magnitude of potential effects
  – Estimate degree of uncertainty associated with each risk prediction, including likely cause(s)
  – Develop detailed “narrative” for each scenario
Subtidal Benthic Infauna
Field Programs and Analyses
## Detailed Station-by-Station WOE

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Figure 1. ERA predictions for subtidal infauna in Lot 17.

Risk Predictions and Uncertainties

- Benthic infauna: Inner & Upper Harbours, Selkirk Waterway
- Benthic infauna: South Bay
- Benthic infauna: Outer & Middle Harbours

Increasing Risk from COPCs
Wildlife

Photo: M. Gebauer
Studies and Analyses

Mostly relied on studies by other authors:

- Comparison of chemistry in prey to TRGs for wildlife
- Food chain modeling and comparisons estimated exposure to wildlife TRVs
- Direct measures of exposure and effects in river otter by Canadian Wildlife Services (J. Elliott) and graduate students (D. Guertin and C. Nelson)
Figure 2. ERA predictions for wildlife in Lot 17.
Linking ERA Outputs with Risk Management Needs

• Depending on the ERA results, a risk manager has different options:
  – No action (meets guidelines or standards)
  – Further studies to reduce uncertainty
  – Monitor as part of RAP/RMP to verify assumptions
  – Active source/pathway control
Challenges

• Regardless of the option (or combination of options) being contemplated, decision-making needs to be guided by whether risks and uncertainties are considered acceptable or not…

• This decision ultimately needs to be made by risk managers, but it’s the role of the risk assessor to clearly explain the risks and uncertainties

• Contrary to human health risk assessment, there are no formal definitions of “acceptable” ecological risks – this is true federally and provincially (in BC)
Challenges (cont’d)

• BC ERA policy and technical guidance is useful (e.g., ECx), but interpretation remains difficult:
  – Avoid oversimplified categorizations (e.g., 19% effect size vs. 21%)
  – Implications of ECx depend on assessment endpoint (e.g., population vs. organism)
  – No “one size fits all” effect size (e.g., mouse vs. moose)
  – ECx difficult to apply in weight-of-evidence (WOE)
  – Need to consider causality
Challenges (cont’d)

• “Acceptability” of risk and uncertainties is only one part of the decision-making process for a manager:
  – Public perceptions and stakeholder expectations
  – Potential operational and environmental impacts
  – Cost, benefits, and feasibility of active risk management
Conceptual Framework

• Objectives:
  – Support a transparent evaluation of risk management options available for each ERA conclusion
  – Provide risk managers with an opportunity to consider other information (outside of ERA) that might be important for decision-making
Framework (Cont’d)

• Approach
  – Depict ERA conclusions for each receptor group in terms of both:
    ➢ Risk (i.e., magnitude of contaminant-related impacts)
    ➢ Uncertainty (i.e., degree of confidence in the estimate of magnitude and cause of impact)
  – Present likely options for risk management on a similar scale of relative risk and uncertainty
  – Overlay of ERA conclusions on the range of likely management options
ERA Predictions

Figure 3. Risk predictions and uncertainties: relative scales and priorities for next steps.
Options for RAP/RMP vs. Risk Predictions

Figure 4. Conceptual framework showing range of likely RAP/RMP options depending on outcome of ERA.
Figure 5. Conceptual overlay for subtidal benthic infauna.
Figure 6. Conceptual overlay for wildlife.
Next Steps for Victoria Harbour (Lot 17)

- Monitoring sediment chemistry
- Monitoring fish tissue chemistry (i.e., to track exposure to fish themselves and to fish-eating birds like the heron)
- Monitoring sentinel fish population characteristics
- Develop risk-based “tool” for interpreting monitoring results