Incorporating Risk Assessment into an Emergency Spill Response – Part Two

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Outline

We know our problem – what's next?

- Establish remedial objectives
- Select the ideal approach
- Support the approach
- Monitor and confirm





Establish Remedial Objectives

- Reduce contaminants to levels that protect the environment
- Minimize additional impacts to the environment





Risk Assessment and MNA

RA will:

- Evaluate the level of protection required for human and ecological receptors
- Reduce the need for environmental disturbance
- Determine appropriate site specific target levels (SSTLs)
- MNA will:
 - Assess if remediation targets will be reached through regular monitoring and sampling



Risk Assessment



Risk Assessment

- Consisted of Multiple Lines of Evidence:
 - Literature Review
 - Human health modeling
 - Ecological health modeling
 - Ecological health studies
 - -Wetland health study
 - -Biotreatability study
 - -Ecotoxicity study
 - -Aquatic habitat study







Human Health Assessment



- No unacceptable human health risks related to exposure to CoCs at the Site
- SSTLs not required for the protection of human health (worker or First Nation community members)

Ecological Health Assessment



Ecological Health Studies - Wetland

Initial assessment in 2013 assessed the effects of the oil released and the second assessment in 2014 evaluated changes over one growing season







Ecological Health Studies - Wetland

- Signs of dead or stressed vegetation were 10%-20% or less of sampled plots
- Limited to stressed/dead leaves and a few dead white birch







Ecological Health Studies - Biotreatability

Biodegradation assessment of PSC completed by National Research Council to characterize microbial population and measure degradation







Ecological Health Studies - Ecotoxicity

- Completed ecotoxicity study in 2014 to assess vegetation growth and invertebrate survival in soils with varying contaminant concentrations
- Completed earthworm avoidance test by exposing earthworms to impacted and non-impacted soil







Ecological Health Studies - Ecotoxicity

- No biological response in lake substrate resulting from exposure to PHC
- Adverse effect of PHC exposure in ROW soils for plants and earthworms avoided, but no significant effect on collembola
- Adverse effect in fen substrates in six of seven biological responses
- Established no-observable effects concentrations as SSTLs



Ecological Health Studies - Aquatic Habitat

Completed benthic sampling program in August 2014 to assess benthic populations and hydrocarbon concentrations in the sediment







Ecological Health Studies - Aquatic Habitat





Ecological Health Studies – Aquatic Habitat



Comparison of Benthic Indices (Corrected for Water Depth) with Petroleum Hydrocarbons F1-F4 (Corrected for TOC): Corrected Species Abundance

Ecological Health Studies - Conclusions

- Potential risk to Mallard Duck who lives in the fen area 100% of the time
- Potential risk to terrestrial plants and invertebrates
- Potential risk to aquatic plants and benthic invertebrates
- Derived SSTLs for soil and sediment
 - ROW soil 2,367 mg PHC F2+F3/kg
 - Fen soil 15,551 mg PHC F2+F3/kg
 - Sediment 2,600 mg PHC F1-F4/kg





Overall Risk Assessment Conclusions

- Human health assessment no issues
- Ecological health assessment potential risk
- Wetland study small % of stressed and dead vegetation
- Biotreatability study PHC will degrade
- Ecotoxicity study no effects concentrations established
- Aquatic health study no effects measured



Monitored Natural Attenuation Program

- Groundwater monitoring and sampling program (MNA)
- Degradation sampling program and nutrient chemistry level within fen
- Groundwater results indicate that MNA is ongoing based on decreasing trends in contaminant concentrations





Next Steps

2015 Workplan:

- Additional groundwater monitoring and sampling program to support MNA
- Degradation sampling program to determine hydrocarbon reduction
- Wetland health study follow up to assess vegetation recovery and soil assessment to determine if vegetation effects are linked to remaining impacts in the soil
- Update RA with 2015 data



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Discussion and Questions

