Management of LNAPL Sites under FCSAP

RPIC 2014 National Contaminated Sites Workshop
Ottawa, ON
Brian Drover, Environment Canada
Craig Wells, National Defence
April, 2014
Purpose

• To provide an overview of Canadian federal legislation and policy related to the management of federal LNAPL sites in Canada.

• Define the regulatory/policy issues that constrain solutions for management of federal LNAPL sites in Canada

• Introduce the FCSAP LNAPL Site Management Framework
Outline

• Role of FCSAP Expert Support in Contaminated Site Management Decisions
• Relevant Environmental Legislation in Canada
• Relevant FCSAP Policy
• Relevant experience at FCSAP Project Sites
• LNAPL Site Management Framework overview
FCSAP
Science Based Expert Support

- EC, HC, DFO
- Review project documentation to ensure that the risks posed by the sites have been considered in project proposals.
- Provide technical and regulatory advice to site owners.

Since its creation in 2008, FCSAP has provided tangible evidence of the Government of Canada’s long-term commitment to managing federal contaminated sites. In Phase 1 of the strategy (2009-2012), the following results were achieved with a successful total of $3.1 billion:

- Assessment activities were conducted on over 9,000 sites.
- 6,900 site assessments were completed.
- Remediation activities began at 250 of approximately 8,400 sites across Canada.
- Remediation work was completed at 150 sites.
- Site review and maintenance work was undertaken at over 1,000 sites to maintain necessary systems and prevent an increase in remediation and closure costs.

The assessment of 9,400 suspected sites contributed substantial information on the true extent of contamination of the federal inventory. As of fiscal 2012, the top 100 Federal Contaminated Sites (FCSAP) totalled over $1 billion, including:

- $2.935 billion in total (including $1.790 billion for remediation).
- $1.184 expected sites, and
- $1.535 sites that were not identified in the original assessment.

Under Canada’s Recovery Action Plan (2013-2016), the FCSAP program received additional incremental funding of $6.5 billion to accelerate the management and assessment of federal sites.

In Phase II of the FCSAP (2011-16), federal departments will focus on remediation.

Since its creation in 2009, the FCSAP has provided tangible evidence of the Government of Canada’s long-term commitment to managing federal contaminated sites. In Phase 1 of the strategy (2009-2012), the following results were achieved with a successful total of $3.1 billion:

- Assessment activities were conducted on over 9,000 sites.
- 6,900 site assessments were completed.
- Remediation activities began at 250 of approximately 8,400 sites across Canada.
- Remediation work was completed at 150 sites.
- Site review and maintenance work was undertaken at over 1,000 sites to maintain necessary systems and prevent an increase in remediation and closure costs.

The assessment of 9,400 suspected sites contributed substantial information on the true extent of contamination of the federal inventory. As of fiscal 2012, the top 100 Federal Contaminated Sites (FCSAP) totalled over $1 billion, including:

- $2.935 billion in total (including $1.790 billion for remediation).
- $1.184 expected sites, and
- $1.535 sites that were not identified in the original assessment.

Under Canada’s Recovery Action Plan (2013-2016), the FCSAP program received additional incremental funding of $6.5 billion to accelerate the management and assessment of federal sites.

In Phase II of the FCSAP (2011-16), federal departments will focus on remediation.
Fisheries Act

- DFO has primary responsibility for administration of the *Fisheries Act*, which includes responsibility for administration and enforcement of the provisions dealing with physical alteration of fish habitat.

- Environment Canada has been assigned responsibility for administration and enforcement of the *Fisheries Act* pollution prevention provisions dealing with the deposit of deleterious substances into water frequented by fish.
Fisheries Act – cont’d

S. 36(3) “… no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.”

• Keys Points
  – Deposit
  – Deleterious
  – Waters Frequented by Fish
Contaminated Sites Context

- No regulations specific to contaminated sites
- TB Policy and CCME Guidance provide for the use of either remediation or risk management in addressing contaminated sites
  - 6.1.12 TB Policy on Management of Real Property - Known and suspected contaminated sites are assessed and classified and risk management principles are applied to determine the most appropriate and cost-effective course of action for each site. Priority must be given to sites posing the highest human health and ecological risks. Management activities (including remediation) must be undertaken to the extent required for current or intended federal use. These activities must be guided by standards endorsed by the Canadian Council of Ministers of the Environment (CCME) or similar standards or requirements that may be applicable abroad. …

- A Federal Approach to Contaminated Sites (developed by the federal Contaminated Sites Management Working Group) allows for, and encourages, the development of a risk management strategy to cost effectively address contamination at federal sites
FCSAP Policy

• All custodians receiving FCSAP funding are expected to follow FCSAP policy (founded on Treasury Board Policy on the Management of Real Property, and CCME Guidance)
  – Reporting
  – Eligible Costs
  – Site Closure
  – Estimating Liability
  – etc
Summary of selected NAPL Guidance in Canada and elsewhere

- BC MOE NAPL Protocols
- CRA technical guidance (2011) prepared for Environment Canada
- ITRC – guidance docs, training courses
  - Evaluating Natural Source Zone Depletion at Sites with LNAPL (LNAPL-1),
  - Evaluating LNAPL Remedial Technologies for Achieving Project Goals (LNAPL-2)
- ASTM
  - E2531 – LCSMs,
  - E2856 - Transmissivity
- API LNAPL guide, models
- CRCCARE (Australia)
  - Selecting and assessing strategies for remediation LNAPL in soils and aquifers
  - Technical impracticability of further remediation for LNAPL-impacted soils and aquifers
Maximum Extent Practicable (MEP) Concept

- Code of Federal Regulations (40 CFR §280.64) USTs
- Regulatory agencies have required removal of LNAPL to the “maximum extent practicable” (MEP)
- Interpretation of MEP was left to the “implementing agency” – differences between State Government implementation
- MEP requirements focus on LNAPL body.
- No explicit MEP requirements in Canadian Legislation – more focused on receiving environment
Guiding Principles

• Solutions driven by Canadian federal regulatory framework (receiving environment focus vs MEP focus)

• In addition to regulatory requirements, solutions must respect TB and FCSAP goals and policies

• Solutions must be transparent. Environmental and social benefits must be clear
Current and Future LNAPL Guidance

- FCSAP LNAPL workshop, Ottawa (March, 2010)
- Technical Guidance on LNAPL Management (March, 2010)
- DND LNAPL workshop, Halifax (June 18, 2013)

- Find specific solutions for LNAPL issues at GBRP

- Contract to create succinct practical guidance for the management of FCSAP LNAPL sites (complete by March, 2014)
Elements of Proposed Guidance

- Succinct guidance which can apply to small or large LNAPL sites, complex or simple
- Guidance is specific but not prescriptive
- Appropriate level of effort on LNAPL investigation
- LNAPL only, FCSAP only – mature plumes
- LNAPL conceptual site model (LCSM) is key
- Focus on risk to receiving environment (less emphasis on “Extent Practicable” goals)
- Focus on groundwater program and risks associated with dissolved contaminants (less emphasis on free product mobility/recoverability issues)
LNAPL Site Management Framework

- LNAPL is a significant issue at some federal contaminated sites (Goose Bay is one example)
- Poses a challenge for custodians to meet policy and program goals
- In 2010 EC held a workshop to set the agenda for a made in Canada solution to risk-based federal LNAPL site management
- In 2013, a follow-up workshop was held in the context of the Goose Bay Remediation Project
- The outcome was a Risk-Based Site Management Framework for Goose Bay, that was adaptable for other federal sites
**Phase 1 – Identify Goals**

1. Identify site management goals / end-point scenario (current or intended Federal land use) / regulatory compliance requirements
2. Quantify site management goals using risk-based criteria
3. Identify actual/potential exposure pathways due to:
   a) Direct - contact/ingestion of LNAPL; dissolved-phase exceedances at point of impingement;

**Phase 2 – Data Collection**

4. Identify site management goals / end-point scenario (current or intended Federal land use) / regulatory compliance requirements
5. Quantify site management goals using risk-based criteria

**Phase 3 – Analyze Data Through Multiple Lines of Evidence**

6. Gather relevant past data and site specific information including contaminants of concern (COCs) into a preliminary LNAPL Conceptual Site Model (LCSM), which will be updated in Phases 2 & 3
7. Identify data gaps (Cushman & Rousseau. Appendix F)
8. Collect necessary data to achieve horizontal and vertical delineation using field investigative techniques
9. Identify data gaps (Cushman & Rousseau. Appendix F)
10. Evaluate data through concurrent, multi-faceted approach (primary lines of evidence in bold):
    a) LNAPL Mobility/Recoverability: Transmissivity (bail-down tests, manual skimming tests, remediation system data), soil core data (saturations/potentially recoverable fraction);
    b) LNAPL/Dissolved Phase Stability:
        i) Statistical and trend analysis of various parameters [including dissolved phase constituents and other Monitored Natural Attenuation (MNA) parameters]:
           - Determine plume stability using isopleth maps and statistical analysis (such as Mann-Kendall and/or linear regression) to see changes in plume area, mass, and average concentration over time;
        ii) Pore entry threshold pressures, spreading coefficients, and saturation/residual saturation

**Phase 4 – Implement The Management Strategy**

11. Plan for LNAPL/LDNAPL mobility and recoverability in the soil matrix with transmissivity
12. Plan for in-well LNAPL thickness trends over time (focus on bail-down tests, manual skimming tests, isopleth maps and statistical analysis (such as Mann-Kendall and/or linear regression)
13. Use the LCSM to design and implement active remedial strategy, Monitored Natural Attenuation (MNA) program, or Long Term Monitoring (LTM) program
14. Use the LCSM to design and implement active remedial strategy, Monitored Natural Attenuation (MNA) program, or Long Term Monitoring (LTM) program
15. Carry out strategy, feed data back into evaluation methodology (Phase 3)
16. If unacceptable risk still exists, revert to Phase 1 and re-evaluate goals
17. Proceed to Phase 5 when risk is addressed and site management goals have been reached

**Phase 5 – Report the Results & Seek Closure**

18. Update the LCSM with the results of the management strategy
19. Focus on the net benefit of the site management strategy, rather than on specific metrics (such as volume of LNAPL removed/recovered)
20. Present all relevant material in an overall site context, with supporting documentation as necessary, to appropriate authorities for site closure
The following presentations will explore aspects of the LNAPL Site Management Framework:

- “It’s All About the LNAPL Conceptual Site Model” – Matt Rousseau, CRA
- “Ricker Method® for Plume Stability Analysis and LNAPL Removal Benefit Analysis (LRBA)” – Joe Ricker, Earthcon
- “Practical and Innovative Approaches to Evaluate Sites with LNAPL” – David Fursevich, SNC Lavalin
- “Stakeholder Engagement and Risk Communication – Essential Aspects of Project Success” – Lynn Pilgrim, AMEC
- “LNAPL Management Framework Case Study: 5 Wing Goose Bay” – Tom MacNeil, AMEC
Questions?