

SESSION 4 - POLLUTIONS RELATED TO HYDROCARBON PRODUCTION AND DISTRIBUTION

CHAIR: MR. ADRIEN PILON, CANADA

CO-CHAIR: MR. RAOUL CAMPOMANES, FRANCE

INTRODUCTORY REMARKS OF THE CHAIRMAN: Mr. Adrien Pilon, Biotechnology Research Institute

I would like to invite yesterday and today's speakers to please provide us with copies of their presentations. We have recorded tapes of the meeting because we would like to prepare a report and send it to you as soon as possible.

I would like now to open Session No. 4, but first, I would like to introduce you to Mr. Raoul Campomanes from France, who is co-chairing this session with me.

This is a special topic requested for this session and I would like to introduce you to a Canadian colleague, Mr. Claude Chamberland, from Shell Canada who has accepted to share with us, the environmental aspects related to oil production and distribution sites with respect to the Canadian Council of Ministers' Guidelines for Petroleum Hydrocarbons.

Mr. Chamberland has been with Shell Canada for several years and he is the National Advisor for Environment and Contaminated Sites.

Please, Claude, it's yours.

Note: This text was prepared by the compilers from Mr. Pilon's recorded presentation.

Current Practices for Contaminated Lands - Shell Canada's Perspective

Speaker: *Mr. Claude Chamberland*
Shell Canada Products Limited
Canada

Agenda

- ♦ Pollution Prevention Measures Related to Hydrocarbon Production and Distribution - Shell Canada
- ♦ Legislative Context Regarding Contaminated Lands

Pollution Prevention



- ♦ In Canada, provinces and territories have jurisdiction over petroleum products storage and handling regulations and reclamation of contaminated lands.
- ♦ National guidelines formulated by the CCME (Canadian Council of Ministers of the Environment) are issued and recommended for application by the authorities having jurisdiction. (e.g. Code of practice for above-ground and underground storage tanks).

Caroline Gas Plant



Pollution Prevention and Corrective Measures

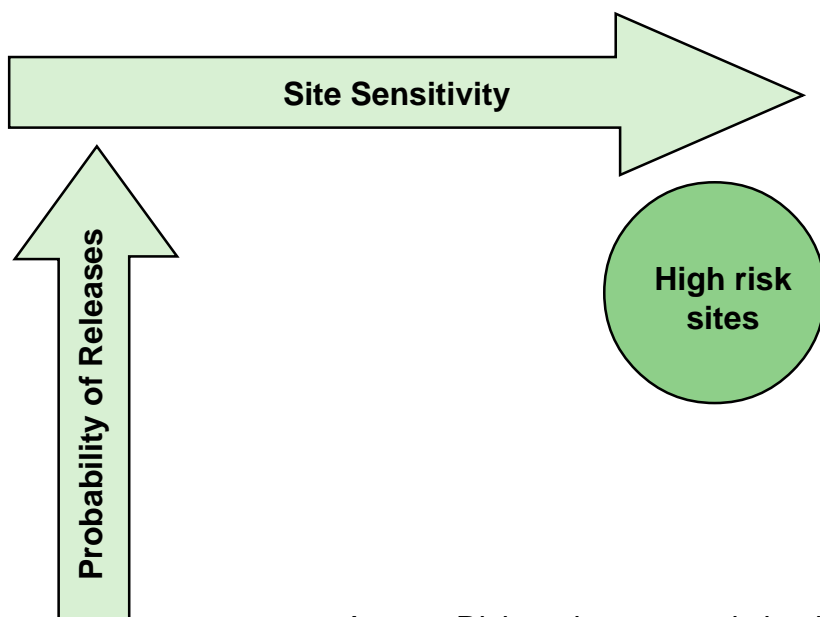
- ◆ For upstream sites, fully adhere to Alberta Energy and Utilities Board (EUB) guides:
 - EUB G55 Storage Requirements for the Upstream Petroleum Industry
 - EUB G58 Oilfield Waste Management Requirements for the Upstream Petroleum Industry
- ◆ Storage of liquids in tanks with secondary containment (e.g. impervious liners)
- ◆ No oily waste pits
- ◆ Limited temporary storage of wastes
- ◆ Proper Handling, Treatment and Disposal of upstream oilfield waste

Reference: <http://www.eub.gov.ab.ca/home.htm>

Pollution Prevention - Shell Canada

- ◆ Bulk storage of chemicals instead of use of containers
- ◆ Reduction of typical Well site “footprint” allowed by directional drilling
- ◆ Above-ground tank instrumentation to prevent overflow
- ◆ Limit underground tanks/piping
- ◆ Use of risk assessment for secondary containment to above-ground tanks not covered by G55
- ◆ Drilling cuttings stored on-site and disposed off-site in secured landfills
- ◆ Dedicated waste drums for specific wastes
- ◆ Piping material collected and stored in tanks
- ◆ Wastewater pond designed with secondary liners
- ◆ Training program for operators on pollution prevention
- ◆ For downstream sites, meet or exceed Petroleum Storage and Handling type of regulations in place in most provincial jurisdictions
 - Underground storage tank system with secondary containment for retail sites
 - Statistical Inventory Reconciliation for underground tanks
 - HSE inspection programme at retail sites
- ◆ Identify “High risk” sites and put controls in place to mitigate potential releases
 - Monitoring wells
 - Product transfer, spill protection
 - Manifold and pump skids protection
 - Equipment integrity testing programme
 - Equipment upgrades

Risk Assessment Matrix



Assess Risk and put controls in place at High Risk sites

Pollution Prevention and Corrective Measures

Contaminants' phases	Techniques	Conditions
Unsaturated zone (residual)	<u>SVE</u>	High V_p , low K_{oc} , High soil permeability
	<u>Excavation</u>	Highly organic soils with no effective porosity
Free phase liquids	<u>Pumping/bail</u>	Low K_{oc}
	<u>HVE</u>	Effective in low to moderate permeability
Saturated zone	Air sparging	High V_p , low K_{oc}
Dissolved	<u>HVE</u>	Effective in low to moderate permeability
	Activated Carbon	
	adsorption	High K_{oc}
	<u>Natural Att.</u>	Electrons acceptors
	Pump&Treat	High H

Italic and underlined indicates techniques most often used by Shell Canada

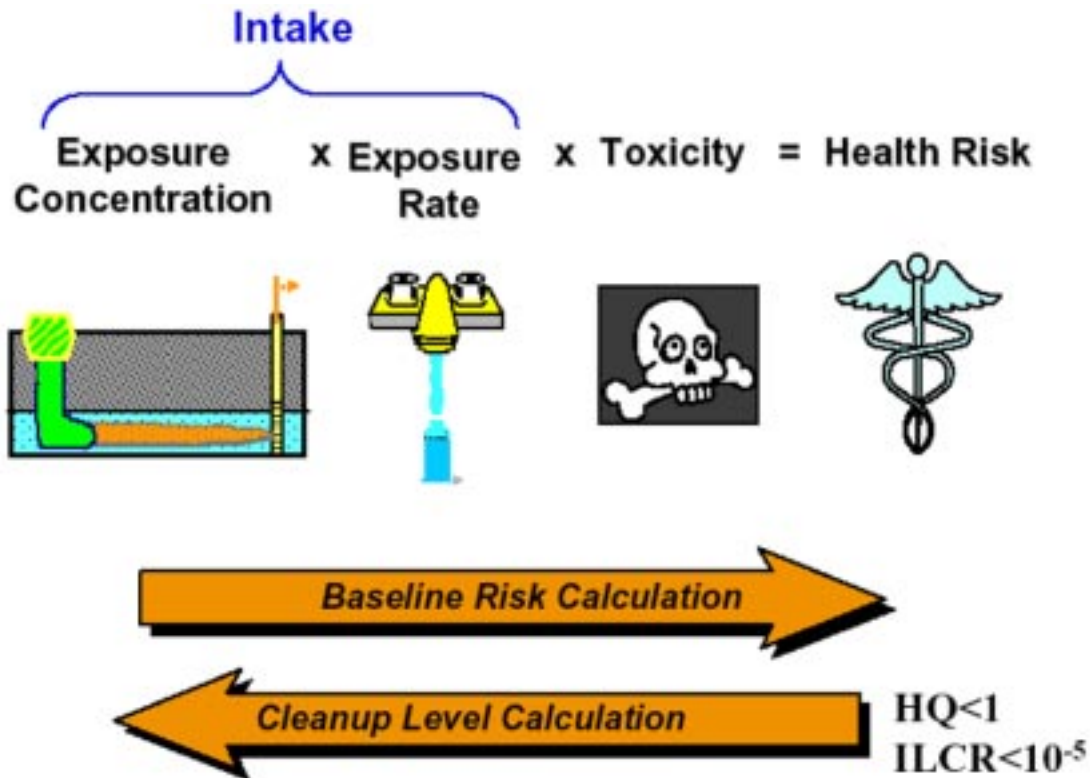
Legislative Context

- ♦ In Canada, provinces and territories have jurisdiction over petroleum products storage and handling regulations and reclamation of contaminated lands.
- ♦ Most jurisdictions have management processes in place to document compliance after a site has been remediated and before a change in land use.
- ♦ Typically, leased sites returned to the landlords or sites divested for another land use will be remediated.
- ♦ Over the past five years, risk-based approach for the management of contaminated sites has resulted in the following initiatives/guidelines:
 - *Guidelines for Contaminated sites in Ontario, 1996.*
 - Tables A to D based on environmental exposure models derived from Massachusetts (MADEP)
 - Site-specific risk assessment approach
 - Canadian Council of Ministers of the Environment (CCME). *1996 Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines*
 - *Contaminated Sites Regulation* in British Columbia, 1997.
 - Matrix and Site-Specific Standards
 - Atlantic Canada Partnership in Risk-Based Corrective Action Implementation, 1997. (Atlantic PIRI)
 - Three tiers
 - Human health pathways
 - Inhalation, dermal contact and ingestion of surface soils
 - Inhalation, leachate to groundwater and indoor air vapours from subsurface soils
 - Groundwater ingestion, vapours inhalation
 - Sandy and clayey types of soils
 - Total hydrocarbons
 - Natural attenuation and source depletion
 - Ecological receptors evaluation



Reference: <http://www.atlanticrbca.com>

- ♦ Atlantic RBCA Calculation of Risk-Based Cleanup Goals



- ♦ Canadian Council of Ministers of the Environment - Petroleum Hydrocarbons in Soil under the Canada-Wide Standard initiative, (PHC CWS 2000)
 - Three tiers
 - Four fractions; C6-C10, >C10-C16, >C16-C34, >C34+
 - Surface soil, subsurface soil; coarse and fine grained
 - BTEX “backed out”
 - Specific implementation in provinces left with each jurisdictions

Reference: <http://www.ccme.ca/index.html>

- ♦ Alberta Soil and Water Quality Guidelines for Hydrocarbons at Upstream Oil and Gas Facilities, 2001
 - Calibrate PHC CWS for Alberta geological and climatic conditions
 - Provide guidelines for natural areas
 - BTEX, PAH guidelines developed on same risk management basis as PHC CWS
 - Guidelines for PHC, BTEX, PAH presented for soil, subsoil: coarse and fine textures
 - Integrate concepts from reclamation/remediation framework
 - Allow for unconditional closures when site-specific parameters are used Tier 2A

Alberta Tier 1 Guidelines

Coarse grained soil - Residential Land use (mg/kg)

Pathway	B	T	E	X	F1	F2	F3	F4
Human soil ingestion	1200	22000	10000	Res	15000	8000	18000	25000
Human dermal contact	2700	Res	Res	Res	Res	Res	Res	Res
Human vapour inhalation*	0.048	120	54	14	30	150	NA	NA
Protection of potable groundwater*	0.13	1.6	0.36	49	3700	5100	NA	NA
Soil contact plants invertebrates	8.3	24	91	90	130	450	400	2800
Protection of groundwater for aquatic life*	1.6	0.16	79	59	360	230	NA	NA

Res: Concentration exceeds residual saturation

*: Pathway may be excluded

NA: Non applicable

Fine grained soil - Commercial Land use (mg/kg)

Pathway	B	T	E	X	F1	F2	F3	F4
Human soil ingestion	4400	Res	Res	Res	Res	29000	Res	Res
Human dermal contact	9700	Res	Res	Res	Res	Res	Res	Res
Human vapour inhalation*	9	22000	9700	2400	4600	25000	NA	NA
Protection of potable groundwater*	0.073	0.86	0.19	25	1900	2600	NA	NA
Soil contact plants invertebrates	38	450	690	1500	660	1500	2500	6600
Protection of groundwater for aquatic life*	Res	Res	Res	Res	TBD	TBD	Res	Res

Res: Concentration exceeds residual saturation

*: Pathway may be excluded

NA: Non applicable

- ◆ CCME PHC, Alberta Upstream and Atlantic RBCA are 3-tiered frameworks that allow the user to make cost-effective risk management decisions. (Risk-Based Decision Making)
- ◆ These protocols integrate:
 - Site Assessment
 - Risk Assessment
 - Remediation
 - Risk Management

Our Big Challenges!!!

- ◆ Shell Canada strongly supports the use of Risk-Based Remediation objectives. These must be based on sound scientific data.
- ◆ At present, there are no mechanisms to consider ecological soil contact receptors (plants, invertebrates) at a Tier 2 level. There is a need to develop such Tier 2 ecotoxicity protocol.
- ◆ There is still an environmental stigma with the general public, financial and legal communities associated with concentrations of chemicals of concern remaining.
- ◆ Potential long-term liabilities to present and past owners remain after site remediation in the absence of clear "Brownfield"-type of rules/legislation.

In the Mean Time, Too Much Resources are Still Spent on Non Risk-Based Remediation Work!



In Conclusion !!!

- ♦ Shell Canada strongly supports the concept of pollution prevention. **Don't spill it in the first place.**
- ♦ The use of Risk-Based Remediation objectives, based on sound scientific data, is fundamental in the allocation of limited resources towards the remediation of contaminated sites.
- ♦ But at present, there are several road blocks:
 - tier 2 ecotoxicity protocol;
 - environmental stigma with the general public and real estate communities;
 - continuous liabilities in the absence of clear "Brownfield"-type of legislation.
- ♦ Thank you