

# Outline

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# Background

 DFO is one of the largest federal custodial departments

- 1,400 properties in the Maritimes & Gulf regions
- over 8,000 nationally

 Key property types include:

- Aids to Navigation (lightstations, ranges, minor shore lights)
- Small Craft Harbours
- Science facilities (laboratories and biodiversity facilities)
- Coast Guard facilities (bases, search and rescue, loran-c sites)

 Under Treasury Board Policy, DFO is responsible for:

- assessing
- classifying
- applying risk management principles for its contaminated sites.

# Background

- Several hundred contaminated sites identified in assessments completed since the late 1990's.

## Common Issue





- Predominately metal impacted surface soil at coastal lightstations exceeding Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines.

## Sources of Contamination





- Past practices not environmentally sound regarding:
  - Use of lead based paint on building exteriors
  - Use of mercury as part of the light rotation system
  - Use and disposal of batteries
  - Burning or dumping of waste, garbage or other materials

# Background

## Need for a Risk Management Framework

-  Prioritize sites with a human health risk
-  Prioritize funding available for remediation/risk management
-  Address challenges of remediation at remote sites
-  Meet objectives of the Federal Contaminated Sites Action Plan (FCSAP) Program

## FCSAP Program

-  Provides assessment and remediation/risk management funding
-  Operates on an 80-20 cost shared basis with custodians
-  15 year, \$3.5 billion program
-  Objective to eliminate federal government's liability associated with contaminated sites by 2020.

# Development of Soil Screening Criteria

## Why the need for Soil Screening Criteria?

 Feasibility Issue

 CCME Soil Quality Guidelines based on 4 types of land use:

- Residential/parkland
- Agricultural
- Commercial
- Industrial

 CCME land uses do not necessarily apply to the wide variety of DFO properties

 May overestimate the level of risk posed at DFO sites

 May result in unnecessary and costly remediation

# Development of Soil Screening Criteria

- In 2001/02 and again in 2006/07, DFO, PWGSC and Jacques Whitford Limited (JWL) worked in collaboration with Health Canada to:
  1. Develop a tool to classify the various types of DFO properties in the Maritimes and Gulf Regions into relevant land use categories.
  2. Derive Soil Screening Criteria (SSC) for each land use category for select metals.
  3. Provide a risk management framework to facilitate appropriate mitigation strategies.

# DFO Land Use Categories

- Five DFO land use categories developed:
  - Residential
  - Residential/Parkland
  - Recreational
  - Occupational
  - Restricted/Remote
- Range in sensitivity from residential sites with constant exposure to remote sites with infrequent exposure.

# DFO Land Use Categories

## Residential

- permanent residence onsite
- assumed exposure on a continuous basis

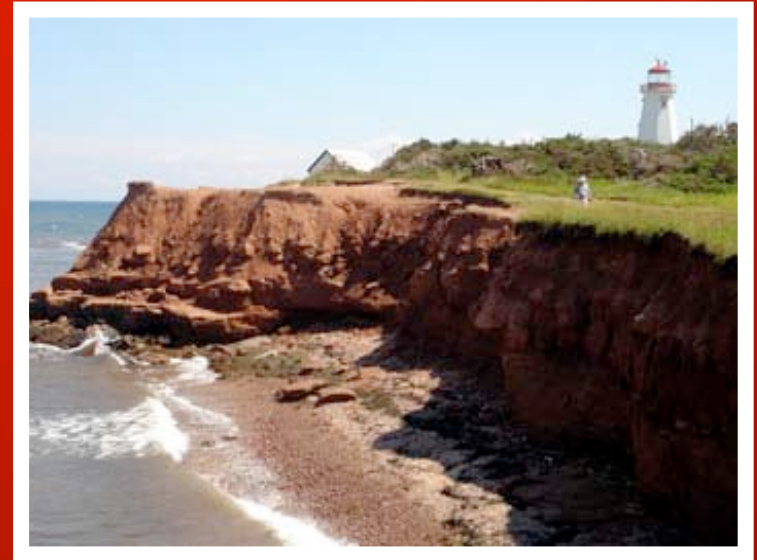


Machias Seal Island light station

# DFO Land Use Categories

## Residential Parkland

- site is publicly accessible
- within easy walking distance
- (1km) to residential area
- likely to attract visitors
- assumed exposure is every day of the year except the winter months (Dec-Mar)



East Point Lightstation, PEI

# DFO Land Use Categories

## Recreational

- Site is publicly accessible
- likely to attract visitors or sightseers
- beyond easy walking distance from a residential area (>1km).
- Assumed exposure is two days per week for 35 weeks of the year (weekends)



Wood Islands Lightstation, PEI

# DFO Land Use Categories

## Occupational

- Site is strictly used for occupational purposes
- not attractive to visitors as a recreational space
- assumed exposure equals that of commercial land (every weekday for 52 weeks of the year)



Dartmouth Coast Guard Base, NS

# DFO Land Use Categories

## Restricted/Remote

- site is in a remote location or has restricted access
- would not attract visitors
- exposure of one day per week for 52 weeks of the year (i.e. DFO staff on routine maintenance visits)



Portage Island Channel  
Range Lights, NB

# Receptor Characteristics

## Non-carcinogenic metals

- Receptors were modeled as either a toddler or adult with no extreme sensitivities.
  - Toddler: residential, residential/parkland, recreational
  - Adult: Occupational, Restricted/Remote

## Carcinogenic metals

Residential, residential/parkland, recreational

- A lifetime exposure (80 years) for a receptor averaged over 5 age groups.

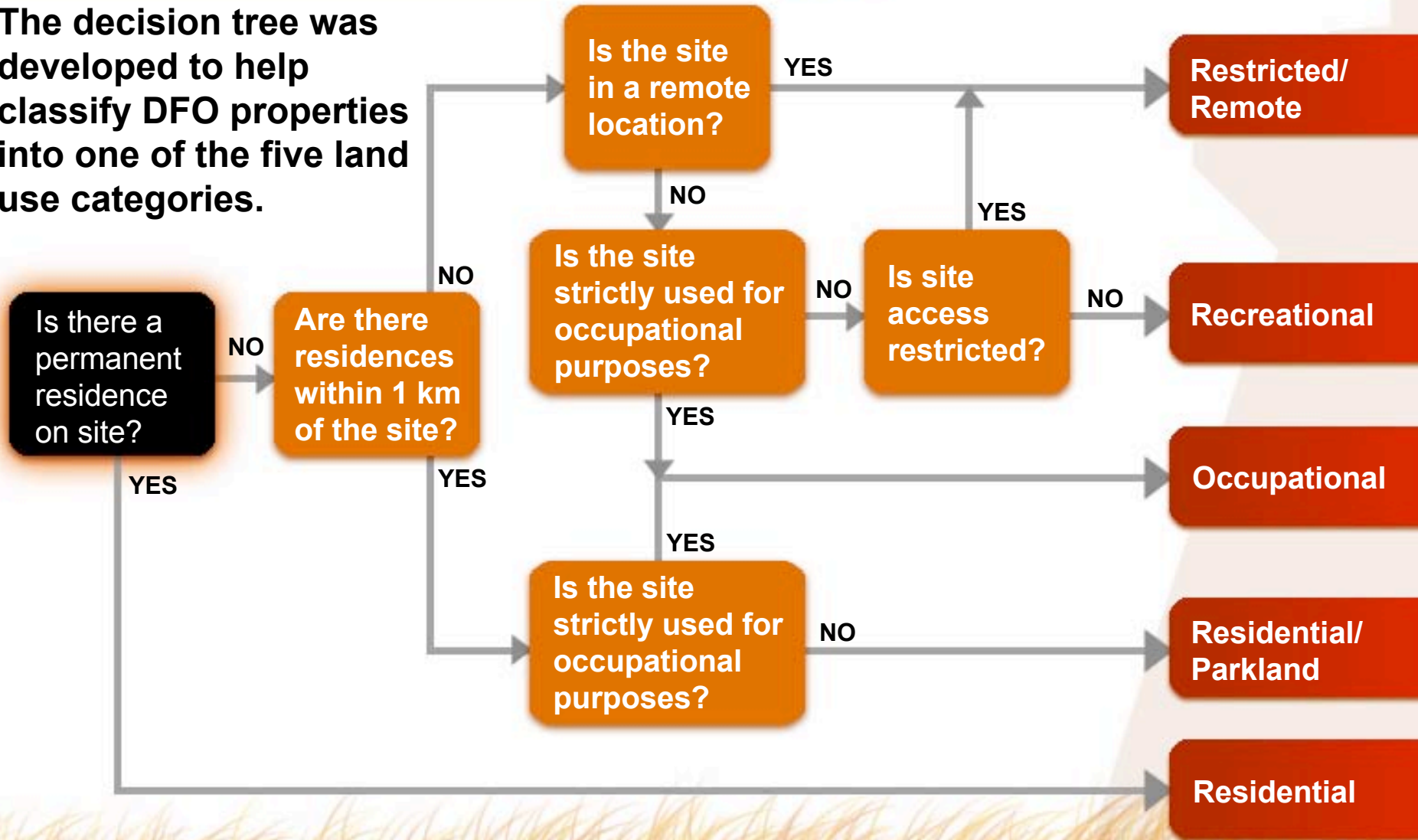
Occupational, Remote/Restricted

- Adult worker assumed to work at the site for 60 years of adulthood.

# Decision Tree

Assess site conditions & land use

The decision tree was developed to help classify DFO properties into one of the five land use categories.



# Decision Tree

Assess site conditions & land use

## DFO SITE CLASSIFICATION AND SOIL SCREENING CRITERIA (SSC) (mg/kg)

Residential		Residential/ Parkland		Occupational		Recreational		Restricted/ Remote	
As	31	As	34	As	41	As	55	As	100
Ba	610	Ba	910	Ba	21,000	Ba	3,200	Ba	100,000
Cd	29	Cd	44	Cd	1,200	Cd	100	Cd	6,000
Cr	1,100	Cr	1,600	Cr	4,200	Cr	5,400	Cr	21,000
Cu	1,100	Cu	1,700	Cu	21,000	Cu	5,900	Cu	100,000
Pb	600	Pb	870	Pb	16,000	Pb	2,000	Pb	78,000
Hg	37	Hg	55	Hg	950	Hg	190	Hg	4,800
Mo	190	Mo	290	Mo	3,200	Mo	990	Mo	16,000
Ni	53	Ni	62	Ni	430	Ni	210	Ni	2,200
V	1,600	V	2,400	V	28,000	V	8,000	V	140,000
Zn	29,000	Zn	43,000	Zn	>999,999	Zn	150,000	Zn	>999,999

# Soil Screening Criteria

- Identification of most commonly identified metals at DFO sites was completed through a review of over 350 Phased ESAs.
  - arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, vanadium, zinc.
- Soil Screening Criteria (SSCs) were developed for each land use category for each of the most commonly occurring metals.
- Methodology used to derive SSCs are consistent with CCME and Health Canada protocols and standard human health risk assessment technologies.
- Health Canada played an active and integral role in development of SSCs.
- DFO has committed to a 5-year review cycle

## Summary of CCME Soil Quality Guidelines (mg/kg)

Metal	CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Update 7.0)			
	Agricultural	Residential/ Parkland	Commercial	Industrial
Arsenic	12	12	12	12
Barium	750	500	2,000	2,000
Cadmium	1	10	22	22
Chromium	64	64	87	87
Copper	63	63	91	91
<b>Lead</b>	<b>70</b>	<b>140</b>	<b>260</b>	<b>600</b>
Mercury	7	7	24	24
Molybdenum	5	10	40	40
Nickel	50	50	50	50
Vanadium	130	130	130	130
Zinc	200	200	360	360

## Summary of Soil Screening Criteria (mg/kg)

Metal	Site Exposure Category				
	Residential	Residential/ Parkland	Recreational	Occupational	Restricted/ Remote
Arsenic	31	34	55	41	100
Barium	610	910	3,200	21,000	100,000
Cadmium	29	44	100	1,200	6,000
Chromium	1,100	1,600	5,400	4,200	21,000
Copper	1,100	1,700	5,900	21,000	100,000
Lead	600	870	2,000	16,000	78,000
Mercury	37	55	190	950	4,800
Molybdenum	190	290	990	3,200	16,000
Nickel	53	62	210	430	2,200
Vanadium	1,600	2,400	8,000	28,000	140,000
Zinc	29,000	43,000	150,000	>999,999	>999,999

## Benefits of Soil Screening Criteria

- Enables DFO to prioritize those sites which pose a risk to human health for further action.
- Quick, cost effective screening tool.
- Reduces the number of site specific risk assessments required.
- Number of properties requiring remediation or risk management is significantly reduced.
- Extent of surface area requiring corrective action is reduced for those properties that do need remediation.
- Funds are more effectively managed.
- SSCs will serve as a template for application in other DFO regions.

# Case Study

## East Point

### Lightstation, PE

- ESAs have identified 2580 m<sup>2</sup> of metals impacted soil exceeding CCME guidelines.
- Application of the SSC for a residential parkland exposure indicates 80 m<sup>2</sup> of soil requires remediation.



East Point Lightstation, PE



# Limitations of Soil Screening Criteria

- If federal site use were to change (i.e. recreational site developed as residential), a re-evaluation of the site classification would be required to determine if further action is required to address impacts.
- SSCs are based on human health only.

# Wrap-Up

- Large number of metal impacted sites in the Maritimes and Gulf Regions necessitated the development of a risk management tool.
- SSCs are a quick, cost-effective risk management screening tool
- Application ensures protection of human health
- Reduces department liability
- Assists DFO with meeting the FCSAP 2020 deadline

# Questions?

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**Thank -You!**