

**APPLICATION OF
RISK MANAGEMENT
TO
NORTHERN AFFAIRS
CONTAMINATED SITES**

*NATO/CCMS PILOT STUDY
2005*

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INDIAN & NORTHERN AFFAIRS CANADA

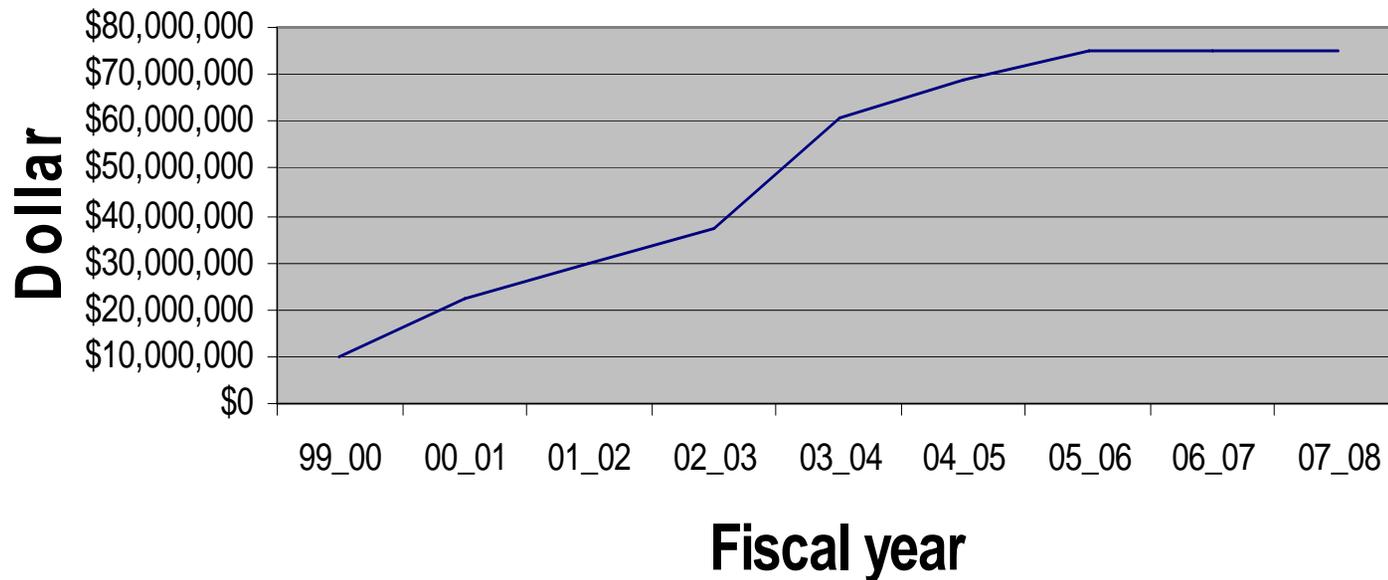
CONTAMINATED SITES PROGRAM

- 1825 sites
- 976 have been assessed and either no further action is required or remediation is complete;
- 825 sites require assessment/may require action;
- 63 known sites representing \$754 million in liability;
- 35 of these sites are known to have human and environmental hazards and legal obligations (NCS 1) including abandoned mines (14) and former military installations (21)



RAPID GROWTH IN FUNDING

Past Expenditures and Budget Forecast 1999-2008



PROGRAM CHALLENGES

- **Management** - “new” program responsibility that requires a consistent approach to ensure delivery of a successful and fully accountable program
- **Capacity** - northern capacity to participate and benefit from the clean-up of these sites including integration of traditional knowledge into decision-making
- **Technical/operational** – technically and logistically challenging program
- **Legacy** - there is a lack of trust that must be addressed





MANAGING RISK

- Increase in complexity and scale of sites
- Very significant risk exposure – requirement to manage
- Current tools are not sufficient
 - National Classification System (CCME)
 - Northern Environmental Risk Assessment Strategy (INAC)
- Look to private sector best practice
- Piloted risk management approach at Faro/Anvil Range and Giant Mine Projects
- Decision made to develop Risk Management Procedure to be in place for all sites by end of FY 2004/05



OBJECTIVES

To provide:

1. A consistent methodology for developing an inventory and evaluating the many different types of risks at contaminated sites;
2. A process to ensure that no high risk items are “falling through the cracks”; and
3. A basis for prioritizing risk mitigation or control activities within and among sites.

BUILDING BLOCKS

- Treasury Board (TB) policies and guidance on departmental risk assessment and management frameworks
- INAC Contaminated Sites Management Policy (August 2002)
- *Canadian Standards Association Standard, CAN/CSA-850-97 (Reaffirmed 2002) Risk Management Guideline for Decision Makers*



RISK MANAGEMENT STEPS

1. **Initiation:** Establish the process, identify risk tolerances of organization and develop definitions accordingly
2. **Preliminary Analysis:** What could go wrong? Develop a broad range of risk scenarios (events) for all aspects of the project.
3. **Risk Rating:** What are the consequences of these events and how likely are they to occur?
4. **Risk Evaluation:** Is the risk acceptable? Ties in to step 1 – identifying risk tolerances. ALARP principle (As Low as Reasonably Practicable).
5. **Control/Action:** Each level of risk triggers predetermined levels of action (low risk → monitor, very high risk → mitigate immediately)
6. **Monitoring and Review:** Monitor process to ensure high risk items are acted upon. Roll-up results regionally and nationally to identify priorities.



RISK MATRIX

- Consider an Event: e.g. 'Public access to open pits leads to a fatality'
- Risk = Consequence Severity x Likelihood

Likelihood	Consequence Severity				
	Low	Minor	Moderate	Major	Critical
Almost Certain	Moderate	Moderately High	High	Very High	Very High
Likely	Moderate	Moderate	Moderately High	High	Very High
Possible	Low	Moderate	Moderately High	High	High
Unlikely	Low	Low	Moderate	Moderately High	Moderately High
Very Unlikely	Low	Low	Low	Moderate	Moderately High

DEFINITIONS OF CONSEQUENCE SEVERITY

- Consequence types and definitions developed by project team based on departmental and federal policies and on pilot tests.
- Six Consequence Types:
 - i. Environmental Impact
 - ii. Human Health and Safety
 - iii. Legal Obligations
 - iv. Consequence Costs
 - v. Community/Media/Reputation
 - vi. Special Considerations (Impact to traditional lands and lifestyle)

Consequence Severity Definitions

Consequence Categories	Low	Minor	Moderate	Major	Critical
Environmental Impact	No impact.	Minor localized or short-term impacts.	Significant impact on valued ecosystem component.	Significant impact on valued ecosystem component and medium-term impairment of ecosystem function.	Serious long-term impairment of ecosystem function.
Special Considerations	Some disturbance but no impact to traditional land use.	Minor or perceived impact to traditional land use.	Some mitigatable impact to traditional land use.	Significant temporary impact to traditional land use.	Significant permanent impact on traditional land use.
Legal and other Obligations	<p>No non-compliance but lack of conformance with departmental policy requirement.</p> <p>Informal advice from a regulatory agency.</p> <p>No land claim or other agreement.</p>	<p>Technical/Administrative non-compliance with permit, approval or regulatory requirement.</p> <p>Warning letter issued.</p> <p>Land claim or other agreement requires the Crown to satisfy administrative obligations (e.g. notification).</p>	<p>Breach of regulations, permits, or approvals (e.g. 1 day violation of discharge limits).</p> <p>Order or direction issued.</p> <p>Land claim or other agreement requires the Crown to respond, but no time frame is specified.</p>	<p>Substantive breach of regulations, permits or approvals (e.g. multi-day violation of discharge limits).</p> <p>Prosecution.</p> <p>Land claim or other agreement requires the Crown to exercise its obligations within a specified time frame (i.e. 2-5 years)</p>	<p>Major breach of regulation – willful violation.</p> <p>Court order issued.</p> <p>Land claim or other agreement requires the Crown to exercise its obligations within a specified short time frame (i.e. 1-2 years)</p>
Consequence Costs	< \$100,000	\$100,000 - \$500,000	\$500,000 – \$2.5 million	\$2.5 – \$10 million	>\$10 Million
Community/Media/Reputation	Local concerns, but no local complaints or adverse press coverage.	Public concern restricted to local complaints or local adverse press coverage.	Heightened concern by local community, criticism by NGOs or adverse local /regional media attention.	Significant adverse national public, NGO or media attention.	Serious public outcry/demonstrations or adverse International NGO attention or media coverage.
Human Health and Safety	Low-level short-term subjective symptoms. No measurable physical effect. No medical treatment.	Objective but reversible disability/impairment and /or medical treatment injuries requiring hospitalization.	Moderate irreversible disability or impairment to one or more people.	Single fatality and /or severe irreversible disability or impairment to one or more people.	Multiple fatalities.

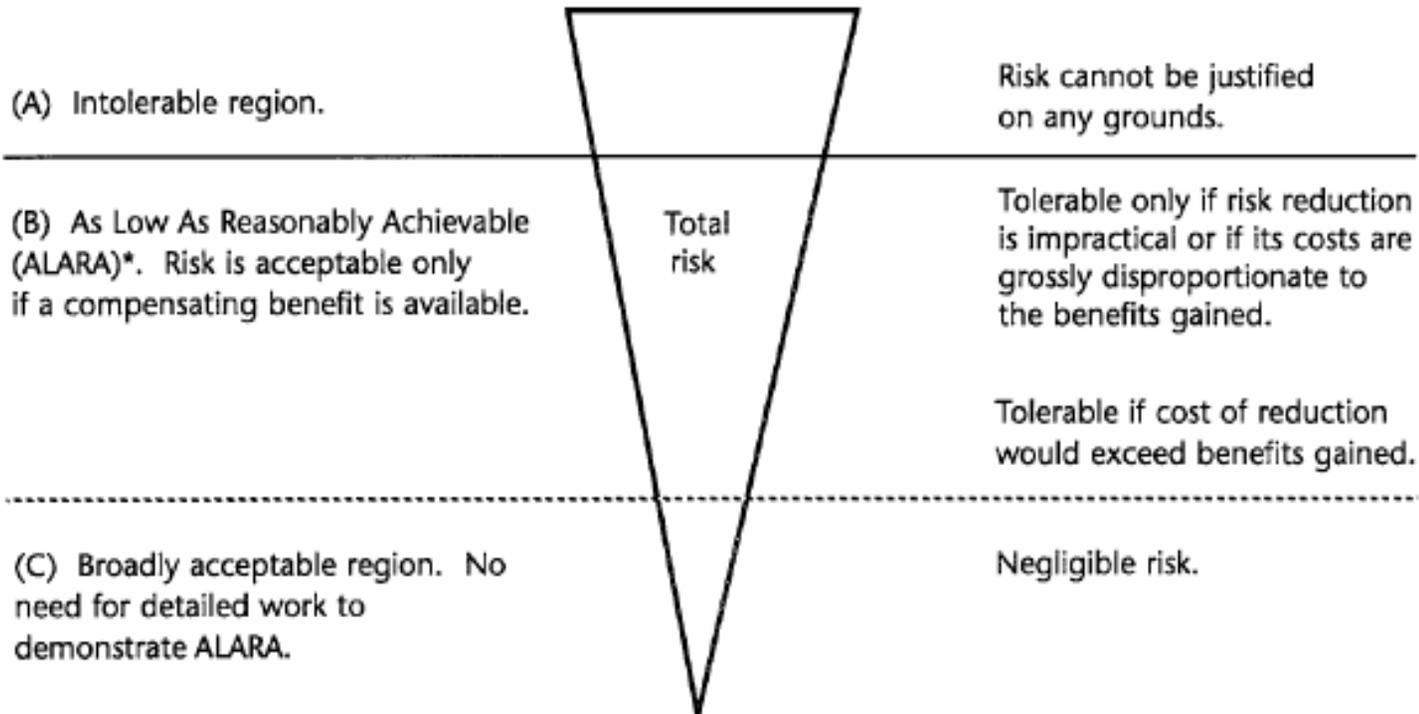
Likelihood Definitions

Assigned Likelihood	Descriptive	Health Events Only	Frequency of Occurrence for Other Events
Almost Certain	Happens often	1 case / 100 person-years	High frequency (more than once per year)
Likely	Could easily happen	1 case / 1,000 person-years	Event does occur, has a history, once every 1-10 years
Possible	Could happen and has happened elsewhere	1 case / 10,000 person-years	Occurs once every 10-100 years
Unlikely	Hasn't happened yet but could	1 case / 100,000 person-years	Occurs once every 100-1000 years
Very Unlikely	Conceivable, but only in extreme circumstances	1 case / 1,000,000 person-years	Occurs once every 1000-10,000 years

Combining the tables for Environmental Risk ...

Likelihood		Consequence Severity				
		Low	Minor	Moderate	Major	Critical
		No impact.	Minor localized or short term impacts.	Significant impact on valued ecosystem component.	Significant impact on valued ecosystem component and medium-term impairment of ecosystem function.	Serious long-term impairment of ecosystem function.
Almost Certain	Happens often	Moderate	Moderately High	High	Very High	Very High
Likely	Could easily happen	Moderate	Moderate	Moderately High	High	Very High
Possible	Could happen and has happened elsewhere	Low	Moderate	Moderately High	High	High
Unlikely	Hasn't happened yet but could	Low	Low	Moderate	Moderately High	Moderately High
Very Unlikely	Conceivable, but only in extreme circumstances	Low	Low	Low	Moderate	Moderately High

CONSIDERATION - *RISK EVALUATION*



*Another term which is often used is ALARP — as low as is reasonably practical. ALARP and ALARA are similar in concept and application.

RISK MATRIX WITH ALARP REGIONS

Likelihood	Consequence Severity				
	Low	Minor	Moderate	Major	Critical
Almost Certain	Moderate	Moderately High	High	Very High	Very High
Likely	Moderate	Moderate	Moderately High	High	Very High
Possible	Low	Moderate	Moderately High	High	High
Unlikely	Low	Low	Moderate	Moderately High	Moderately High
Very Unlikely	Low	Low	Low	Moderate	Moderately High

ALARP Region (Yellow cells: Moderate/Moderately High, Moderate/Moderate, Moderate/Moderate)

Broadly Acceptable Region (Green cells: Low/Low, Low/Low, Low/Low)

Intolerable Region (Red cells: Very High/Very High, High/Very High)



POSSIBLE ACTION LIMITS

1. Intolerable Region

- **Very High** - Priority to mitigate immediately
- **High** - Priority to mitigate within 2 years

2. ALARP Region

- **Moderately High Risk** - Mitigate within 2 years subject to priority
- **Moderate Risk** - Mitigate within 5 years subject to priority

3. Broadly Acceptable Region

- **Low Risk** - Monitor over 10 years



IMPLEMENTATION: RISK MANAGEMENT WORKSHOP

- Participants: project managers, consultants, and other site experts
- Facilitator introduces process and guides group through event identification and risk analysis
- Identification of events aided by use of common element lists for different classes of sites (e.g. for mine sites: dams, diversions, tailings, open pits, underground, waste rock, water treatment, infrastructure, buildings/tanks/structure, and site administration)
- Rapporteur records all events using a web-based risk management tool (also a database for risk management information)
- Results are also posted on a risk matrix poster in the workshop.



ELEMENT CATEGORIES

Mine Sites

- Dams
- Diversions
- Tailings and Sediments
- Open Pits
- Underground
- Waste Rock
- Water Treatment
- Infrastructure
- Buildings, Tanks, Structures
- Site Administration

Military and Other Sites

- Buildings and Structures
- Dumps
- Barrels and Site Debris
- Fuel Tanks
- Contaminated Soil
- Site Administration



Risk Management Tool: Entering an Event

NAP - Contaminated/Waste Site Inventory - Microsoft Internet Explorer

http://shqsdiintra1/nap/xCWS/addevents.asp?ElementNum=347&Action=N&ControlNum=0&Cont...

Event Details

Event Description: Failure of dam due to (failure mode) leads to release of tailings into river X

Event Number: 1.1.1

	Check applicable consequence	Consequence Severity	Likelihood	Risk
Env. Imp.:	<input checked="" type="checkbox"/>	2. Minor	2. Unlikely	Low
Special Cons.:	<input checked="" type="checkbox"/>	4. Major		
Legal Obl.:	<input type="checkbox"/>			
Cons. Costs:	<input type="checkbox"/>			
Com/Media/Rep.:	<input type="checkbox"/>			
Hum. Health & Saf.:	<input type="checkbox"/>			
Controls:				

Save Exit

1. Very Unlikely
2. Unlikely
3. Possible
4. Likely
5. Almost Certain

WPP-Part I
PPA-Part II

Done Local intranet

Risk Management Tool: Main Screen

NAP - Contaminated/Waste Site Inventory - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://shqsdiintra1/nap/xCWS/cs_risk_mgt.asp Go Links


 Indian and Northern Affairs Canada / Affaires Indiennes et du Nord Canada
 

Français	Contact Us	Help	Search	Canada Site
Site Inventory	Administration	Reports	Corporate Procedures	

MN022 - Faro

Logout

NAP

- General Info.
- TB Info.
- Desc. Section
- Access/Monitor
- Financial
- Document
- Contact
- Risk Mgt Tool
- WPP-Part I
- PPA-Part II

Save List Add

Risk Management					
Element	Event	Consequence		Likelihood	Risk Rating
Add new +		Type	Severity	Probability	Descriptive
1. Dams					
1.1 North Dam					Add Event...+
1.1.1 Failure of dam due to (failure mode) leads to release of tailings into River X		Env. Imp.	2. Minor	2. Unlikely	Low
		Special Cons.	4. Major	1. Very Unlikely	Moderate
		Cons. Costs	4. Major	2. Unlikely	Moderately High

Save List Add

Done Local intranet

Risk Management Tool: Generating a Report

NAP - Contaminated/Waste Site Inventory - Microsoft Internet Explorer

Crystal Enterprise - Microsoft Internet Explorer

Crystal Report Viewer - Microsoft Internet Explorer

powered by crystal

Preview

+ NM181


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 Canada

Risk Management - Event Summary Report

Runtime : 03/16/2005 @ 12:06 UNPROTECTED

NM181	TERRA #1 (NORTH MINE)	<i>Mine Sites</i>		NORTH WEST TERRITORIES
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10. Site Administration

Event	Consequence	Severity	Likelihood	
10.1 Contracting Issues				
10.1.1 Lack of legal clarity about land claim agreement leads to crown failing to satisfy obligations	Legal Obl.	2. Minor	3. Possible	Moderate
10.1.2 Addressing land claim issues leads to project delays and cost increases	Cons. Costs	3. Moderate	3. Possible	Moderately High
10.1.3 Differences in contracting policies between government departments lead to project delays/increased costs	Cons. Costs	3. Moderate	3. Possible	Moderately High
10.1.5 Activities at Port Radium lead to changes in project requirements, delays, and increased costs.	Cons. Costs	3. Moderate	3. Possible	Moderately High
10.2 Jurisdiction/Tenure Issues				
10.2.1 Difference between Salt and De line leads to project delays and cost increases	Cons. Costs	3. Moderate	4. Likely	Moderately High
10.1.4 Mining claims lead to increased consultation (delays) or project costs	Cons. Costs	3. Moderate	2. Unlikely	Moderate

Risk Management Tool: Risk Matrix Report

- Each number references an event
- One column for each consequence type in each risk level
- Matrix provides visual representation of trends

Likelihood	Consequence Severity																													
	LOW					MINOR					MODERATE					MAJOR					CRITICAL									
	EI	SC	LO	CC	CMR	HHS	EI	SC	LO	CC	CMR	HHS	EI	SC	LO	CC	CMR	HHS	EI	SC	LO	CC	CMR	HHS	EI	SC	LO	CC	CMR	HHS
ALMOST CERTAIN	3.6.2		5.1.2	3.1.1	3.1.1		3.1.1	3.6.3			3.6.1						3.5.3													
	3.5.2						3.3.1	10.4.1																						
	10.4.1							3.1.2			10.3.3																			
LIKELY			8.3.3				9.2.2				8.3.1		3.5.1			10.4.2						10.3.3								
										10.1.4	8.3.2		3.1.2			5.3.1	9.1.2													
										10.1.2																				
										10.1.1																				
UNLIKELY		3.5.2			3.3.2		3.1.3									10.2.1	9.1.1						10.1.3	1.1.1						
		3.1.1			3.1.4		1.1.1																							
VERY UNLIKELY													3.4.2		1.1.1		3.4.1						9.2.1						8.1.1	
																							5.2.1						9.4.2	
																							5.1.1							
																							10.3.2							
																							10.3.1							
																							9.4.1							

Legend	EI Environmental Impact	SC Special Considerations	LO Legal Obligations
	CC Consequence Costs	CMR Community Media Reputation	HHS Human Health and Safety

FOR FURTHER INFORMATION

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