

Management of Provincial Contaminated Sites Policy

(Approved by Cabinet September 2004)

Executive Summary

Crown land makes up 94 percent of all lands in British Columbia. Over the past 150 years, Provincial growth and development has left thousands of sites that have been altered from their original natural state. In some instances crown land development or usage has been superficial and does not pose a hazard to human health or the environment; but in other instances the development process has left a legacy of contamination (or potential contamination). Although there is no central database of crown contaminated sites, estimates from the Auditor General suggest that there are more than 2,000 known or potentially contaminated sites in BC.¹

Various activities (Underground Storage Tanks (USTs), oil and gas exploration, forestry and mining activities, and the transportation infrastructure, to name but a few) have sometimes had a severe and potentially hazardous effect on the environment. Their effect is also potentially hazardous to human health.

This policy framework provides the basis for the overall government approach to managing contaminated sites on provincial lands. The framework was developed with the assistance of the Provincial Contaminated Sites Committee, a cross government committee consisting of representation from the Ministry of Energy and Mines, Ministry of Forests, Ministry of Transportation, British Columbia Buildings Corporation, Land and Water BC, Ministry of the Attorney General, Crown Agencies Secretariat, Office of the Comptroller General, Treasury Board Staff and the Ministry of Sustainable Resource Management. The cross-government policies are built upon the experience of other jurisdictions including Canada, USA, Great Britain, Australia and New Zealand.

Policy Principles

The following are the principles underlying the government wide policies.

- Provincial Standards and Risk-Based Approach
- Polluter Pays Principle
- Consultation and Cooperation
- Consistency and Fairness
- Accountability and Transparency
- Innovative Leadership
- Promotion of Prevention
- Sound Science

Policy Objectives

The following broad policy objectives have been identified:

- Limit the impact of provincial contaminated sites on human health and the environment using a risk based approach.
- Encourage accurate recording of financial activities and liabilities related to provincial contaminated sites.

¹ Office of the Auditor General of British Columbia. 2002/2003 Report 5: Managing Contaminated Sites on Provincial Lands. ISBN: 0-7726-4869-7

- Ensure that management and remediation activities reflect the need to effectively use limited public resources by prioritizing government activities related to provincial contaminated sites.
- Ensure a consistent and coordinated cross government approach to provincial contaminated sites.
- Increase public awareness and understanding of the management of provincial contaminated sites.
- Increase accountability for provincial contaminated sites.
- Encourage redevelopment of provincial contaminated sites and associated economic benefits.

These objectives support the government's three long-term goals:

- A strong and vibrant provincial economy;
- A supportive social fabric; and
- Safe, healthy communities and a sustainable environment.

Policies

The following high level policies have been developed and detailed to assist government in corporately managing its contaminated sites portfolio and responding to the issues raised in the report of the Auditor General.

A consistent risk based approach will be used for the identification, classification and prioritization of contaminated sites on provincial lands and information shall be stored in a consistent manner.

Sites suspected to be contaminated shall be prioritised on a government wide basis based on a risk assessment approach.

Agencies shall account for financial liabilities in relation to contaminated sites in accordance with approved government financial policies for recording liabilities.

The Crown Contaminated Sites Program will promote innovative strategies to recover the economic value of contaminated provincial sites.

The Provincial Contaminated Sites Committee will continue to provide a forum to identify issues, develop strategies, policies and management procedures for the management of provincial contaminated sites.

Consistent policies will be followed in determining agency responsibility for provincial contaminated sites.

A cross-government reporting framework will guide reporting related to the management of provincial contaminated sites.

Annual Process for Provincial Contaminated Sites

Activity	Timeframe	Description
Screening of Site Types	April	The Provincial Contaminated Sites Committee (PCSC) will gather information on site type characteristics and an expert sub committee will use priority criteria to screen site types (such as forest ranger stations, abandoned mines etc) to determine which sites are likely to pose such a low risk as to require no investigation or activity and which sites are likely to require further consideration.
Specific Site Identification	April	The Crown Contaminated Sites Program (CCSP) will work with PCSC to identify those specific sites that should be considered for prioritization. Information will be gathered to allow the use of a coarse screening tool to be applied to twenty sites.
Specific Sites Prioritization	June	Expert sub committee will determine the sites relative priority and recommend next steps (such as further investigation or remediation) and report back to PCSC.
DMCERD Review	July	PCSC will provide a list of recommendations to DMCERD regarding the priority of sites, recommended actions and fiscal implications if known eg. contingent/actual liability. DMCERD will review the list of priority sites and actions and instruct CCSP and the appropriate agency/ministry to prepare Treasury Board materials for highest priority sites.
Treasury Board Materials Prepared	August	CCSP will work with the responsible agency/ministry to develop TB materials related to priority actions for next fiscal year.
Treasury Board Consideration	September	TB will consider requested priority actions for the next fiscal year.
Authorized Activities Undertaken	March of year with approved budget	Based on TB direction, CCSP and the responsible agency/ministry will oversee the undertaking of actions approved by Treasury Board.

1. Introduction

In December 2002 the Auditor General of BC published a report entitled “*Managing Contaminated Sites on Provincial Lands*”. The report noted that contaminated sites owned by provincial ministries and agencies, including Crown lands, were managed separately by individual agencies and were not subject to any overall provincial government oversight, management or co-ordination.

The Auditor General concluded that the Province does not have an adequate program in place for managing its contaminated sites and it is not accounting for its performance in this respect adequately. The foundation for a sound program is lacking; ministries and agencies are not guided by clear direction from the government; and management roles and responsibilities are not clearly defined. Further, there are significant gaps in the information which ministries and agencies need to develop management plans for, and to manage, their contaminated sites.

Without a clear and co-ordinated plan to manage its contaminated sites, ministries and agencies are unable to account for their performance in a meaningful way and, by extension, neither is the Province.

The Auditor General recommended that:

1. Government should identify a lead agency with the appropriate authority to oversee the development and implementation of a comprehensive and co-ordinated government-wide framework for managing its contaminated sites.
2. Government should ensure that the information needed to develop sound site management plans is obtained, and that management plans are developed and used as the basis for making resource allocation and funding decisions. This process should include a province-wide prioritisation process of sites to guide the allocation of scarce funds to where they will achieve the greatest reduction in risk. In the longer term, government will need to ensure that performance targets for managing contaminated sites are balanced with the staff and other resources it allocates to meeting these expectations.
3. Government should establish a management accountability framework for its contaminated sites that requires the disclosure of financial liabilities, expenditures and information about the accomplishments of its management of contaminated sites, both government-wide and specific to agencies and ministries.

Since it is responsible for administering the *Land Act*, the Ministry of Sustainable Resource Management (MSRM) accepted responsibility for responding to the Auditor General’s report, and then for taking the leadership in addressing the points raised. MSRM also committed to lead the development of government-wide policies to guide management of government owned contaminated sites and to work with the Office of the Comptroller General (OCG) to include financial reporting requirements to ensure that adequate information is compiled to facilitate liability assessment, risk management and performance reporting.

The British Columbia Government's Strategic Plan 2004/05-2006/07 includes a commitment to: "Implement a streamlined, science-based, results-oriented regulatory approach to protect human health and the environment and ensure effective enforcement."

The Ministry of Water, Land and Air Protection (WLAP) (as regulator) and MSRM (as representative of the landowner of Crown lands) are named as being accountable in the Strategic Plan for ensuring the revamped regime is implemented. WLAP is charged with regulating activities related to contaminated sites under the *Waste Management Act* and Contaminated Sites Regulation. MSRM as land owner of Crown land is subject to the provisions of the *Waste Management Act* and the regulatory authority vested in WLAP by the Act. Other agencies such as Forests, BCBC, LWBC etc. are also subject to the same regulatory authority. WLAP ensures that the provisions of the *Waste Management Act* are enforced on private and public land.

Multiple federal, provincial and international contaminated sites' agencies and policies were reviewed to develop a comprehensive survey of policies, processes and methodologies for addressing contaminated sites. A list of reference material is provided in the bibliography. All materials have been reviewed and approved by the Provincial Contaminated Sites Committee (PCSC).

2. Principles

The following are the broad principles underlying the cross-government policies. These represent the spirit and intent of government's approach to Crown Land contamination issues.

1. Provincial Risk Management Approach

Reduce and eliminate, where possible, risks to human health, and the environment as well as minimizing legal and financial liability associated with contaminated sites.

Risk management and remediation standards will be in keeping with the *Waste Management Act* and the Contaminated Sites Regulation. Sites shall be managed in a cost-effective and consistent manner based on available resources with current and future site use taken into consideration.

2. Polluter Pays Principle

Whenever possible, the person or organization responsible for the pollution will pay for pollution control, clean up costs, and any consequential costs including damages.

3. Consultation and Cooperation

Management of provincial sites shall be co-operative across agencies and involve appropriate consultation with interested parties. Working cooperatively with First Nations will be necessary for the remediation and investigation of some specific sites.

4. Consistency and Fairness

Processes and standards developed should ensure consistency and fairness.

5. Accountability and Transparency

Government will increase its accountability and the transparency with which provincial contaminated sites are managed.

6. Innovative Leadership

Innovative opportunities and approaches will be pursued when managing provincial contaminated sites (e.g. P3s, brownfield redevelopments...).

7. Promotion of Prevention

Minimize the creation of future provincial contaminated sites and associated liabilities.

8. Sound Science

Sound science and technology will guide the management of contaminated sites on provincial lands.

3. Policy Objectives

The following are the overall objectives of the Cross-government policies for the management of provincial contaminated sites:

- Limit the impact of provincial contaminated sites on human health and the environment using a risk based approach.
- Encourage accurate recording of financial activities and financial liabilities related to provincial contaminated sites.
- Ensure that management and remediation activities reflect the need to effectively use limited public resources by prioritizing government activities related to provincial contaminated sites.
- Ensure a consistent and coordinated cross government approach to provincial contaminated sites.
- Increase public awareness and understanding of the management of provincial contaminated sites.
- Improve agency accountability for provincial contaminated sites.
- Encourage redevelopment of provincial contaminated sites and associated social and economic benefits.

4. Policies

4.1 A consistent risk based approach will be used for the identification and classification of contaminated sites on provincial lands and information shall be stored in a consistent manner

Before any action is undertaken in relation to a contaminated site, it must be determined if the province is potentially responsible for the site. Unless a site raises immanent human health concerns, the province will not take action until an assessment of potential provincial responsibility is undertaken. Some sites are alleged to be provincial contaminated sites but are in fact not provincial sites. An appropriate search of the sites history to determine past usage and other potentially responsible parties should be completed to ensure the province is potential responsible person for the site in question and to identify other potentially responsible persons to share the pain.

Provincial contaminated sites will be categorized in the following fashion:

Category I Site

A site with substances in the soil or groundwater that do not exceed the “screening values.”

Category II Site

A site with substances in the soil or groundwater that exceed the “screening values,” but a screening level risk assessment indicates that the substances do not pose a risk to human health or the environment because they cannot reach a receptor.

Category III Site

A site with substances in the soil or groundwater that pose some risk, but a detailed risk assessment indicates that it is not an unacceptable risk for the site’s intended use.

Category IV Site

A site with substances in the soil or groundwater that pose an unacceptable risk to human health or the environment.

Data on provincial contaminated sites will be stored in the Crown Contaminated Sites Database developed for the express purpose of providing a management and information tool to manage contaminated sites on provincial land.

Data required will include, but is not limited to: site location, responsible agency, contact information, nature of contaminant, site classification, remediation action, current status, historic use and reason for provincial involvement. The standards and descriptions for these data elements are identified in the Systems Analysis Document prepared for the Crown Contaminated Sites Database.

Previously contaminated sites that have been remediated should be included in the database once other data on current sites has been entered and assessed.

4.2 Sites suspected to be contaminated shall be prioritised on a government wide basis based on a risk assessment approach

After it has been determined that a site is the responsibility of the province, consideration of the priority of the site, investigations of the site and remedial options can be considered. However, before sites are remediated, it is necessary to determine whether remediation is required, merely “desirable”, or not remediated. Each jurisdiction in Canada follows a process which includes the identification and classification of potentially contaminated sites, and one or more levels of site assessment, which together result in a recommendation to either remediate, to “manage and monitor²” the site, or to do nothing.

The successful management and remediation of a contaminated site is a function of obtaining sufficient information to evaluate the necessary measures to carry out the required action. This is often an expensive process, and can even exceed the cost of the eventual remediation in some instances. On the other hand, too little data may produce limited or incorrect results, and this could lead to higher remediation expenditures than necessary or funds being invested in the wrong places.

Since funding restrictions prevent government from addressing all the sites at once, it is necessary to rank sites in order of their priority (or risk) so that the funds available on a year-by-year basis will be invested first in the highest risk sites. In order to facilitate ranking of sites a two-stage methodology with a Stage 1 “coarse filter” and Stage 2 “fine filter” will be used. The reason for this two-stage process is that only high priority sites identified by the first stage as having the highest risk need be passed through the “fine filter” of the second stage to determine spending priorities. The process and criteria for prioritizing sites is contained in Appendix A.

The priority process is intended to guide government’s overall approach to managing contaminated sites on provincial lands, however, individual ministries or agencies may choose to address a site outside of this process should doing so support the goals and objectives of the ministry or agency. Funding for such activities would need to be covered by the supporting ministry or agency and any funding request to Treasury Board for such an activity outside the provincial program would not be supported by MSRM or reviewed by the Provincial Contaminated Site Committee.

Government has many sites where contamination is suspected on the basis of past usage, but whose specific locations are not known. The cost of identifying, locating and inventorying these sites is also unknown and could be significant. However, the nature of the past activities is such that, even if the sites were inventoried and investigated, many would be unlikely to rank highly for remediation.

Money spent on locating and inventorying these sites might be a waste of government funds if no contamination were actually found to be present, or if the contamination identified was not

² “Management and monitoring” is a possible solution when a decision is made not to remediate a site or if the remediation funds are not immediately available.

serious by comparison with other, higher-risk sites. On the other hand, the sites cannot be ignored, principally because they *might* include some higher risk areas whose locations are unknown. The priority setting process must therefore be able to separate the potentially high risk sites from the medium and low risk sites.

Government will require explicit support for decisions taken with regard to these sites, even if the recommended decision is “no action”. Government needs a defensible and auditable approach to placing some of these sites on the “back burner” so as not to absorb funds unnecessarily for the location, identification and investigation of their current status. The decision problem is to conduct a high-level assessment of the sites, based on the data available, in order to provide some indication of the likely risk, and thus to identify those where further action might be warranted. The process for prioritizing site categories or sites in unknown locations is contained in Appendix B. It is possible that sites in the low risk category could be elevated to a higher category should new information come to light.

In order to comply with the government budget cycle and provide an annual list of potential priority sites for government consideration prior to the commencement of a fiscal year, the following process will be followed:

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4.3 Agencies shall account for financial liabilities in accordance with approved government financial policies for recording liabilities

Contaminated sites may represent financial liabilities to the Province, and must be reported or recorded once provincial responsibility and the requirement to take action, now or in the future, has been established or can reasonably be anticipated based on the specifics of the site.

The estimated cost of contaminated site remediation shall be recorded in the current year if it fits the criteria of a financial liability. This will impact the current year budget for the agency with primary responsibility for the site.

If it is unclear whether the government is likely to incur remediation costs or costs are unknown, the potential costs should be considered as contingent liabilities.

Studies to further delineate contamination, once an initial assessment has established that there clearly is a requirement to remediate (thus there is an accounting liability), should be included in the estimate of costs and financial liabilities. A financial liability is not recognized as such until the site is sufficiently assessed to establish that there is clearly contamination for which the province is responsible and which must be managed.

Ongoing monitoring, used to verify that contaminants have been dealt with, or that they are adequately contained, or are naturally attenuating themselves, are part of an ongoing obligation and therefore considered a financial obligation, and are therefore reported in the financial liability figure.

Sites where financial liabilities are shared between two or more provincial agencies, or where there is dispute over responsibilities and jurisdictions, can present situations where the assignment of financial liabilities is difficult. Unless the parties have agreed to a specific level of participation, or legal counsel provides the opinion that through legal means a third party can be held responsible for a portion of the total financial liability, it should be booked for the province by the custodial ministry or agency. In any case, only one department should report the financial liability. Note that sensitive information on specific cases in litigation or negotiation with non-provincial parties should not be made public.

Agencies should estimate costs using the most appropriate methods for their circumstances. Methods may include technical or engineering estimates, historical comparisons or other analytical tools. The costs should be estimated based on the technology and costs at the time the damage is incurred or identified (current cost estimate). Estimates will be reassessed and adjusted annually to recognize technological advances, inflation and progress toward remediation as appropriate. The inflation rate to be used for the annual adjustment is the change in the consumer price index.

It is acceptable to establish a range of remediation costs to estimate and record a financial liability. For example, establishing the range of costs between \$5 - \$10 million would fit the criteria of a reasonable estimate, but a range of \$5 - \$50 million would not, given the wide range in the estimate (a factor of two versus a factor of ten). It is also permissible to book the lower value of any estimate until more accurate information would indicate a need to do otherwise.

Financial liabilities will not be recorded for those sites where action is unlikely to be required. This could include sites that are assessed as being low risk and requiring no further follow up, or sites where no cause for action can be foreseen.

4.4 The Crown Contaminated Sites Program will promote innovative strategies to recover the economic value of provincial contaminated sites

Some contaminated sites will have the potential to be remediated in partnership with the private sector or other levels of government. These partnerships have the potential to decrease the over all costs to the province.

Sites will be prioritized according to the policies and process contained in Section 4.2. Additionally, sites will be assessed to determine the potential benefits of remediation in partnership with the private sector or other levels of government. Decreasing the costs associated with effective remediation and increasing the economic value of a site as a result of remediation will be given due consideration after the site priority has been determined. A business case that indicates the potential for generating net revenues to the province associated with lease, sale, or redevelopment of site as a result of remediation, will make a strong case for proceeding with remediation.

A provincial brownfield strategy shall be developed in conjunction with provincial, municipal and federal agencies.

4.5 The Provincial Contaminated Sites Committee will continue to provide a forum to identify issues, develop strategies, policies and management procedures for the management of provincial contaminated sites

In order to continue to develop the cross government framework and actively assist with managing provincial contaminated sites, there is a need to continue the Provincial Contaminated Sites Committee. Accordingly, the Provincial Contaminated Sites Committee will continue to function in accordance with the terms of reference developed for the Committee.

4.6 Consistent policies will be followed in determining agency responsibility for provincial contaminated sites

Individual agencies will remain responsible for the management of their own contaminated sites and for the expenditures required to manage them. However, future priority funding will first be applied only to those sites which rank the highest risk in the provincial assessment. This might require that the agencies involved in the management of contaminated sites develop joint Treasury Board submissions with the Crown Contaminated Sites Program for future funding of contaminated sites activities. The government-wide ranking will help ensure the veracity and propriety of the funds requested. Specific sites with remediation activities already underway or remediation programs currently in place and funded will not be subject to this policy nor required to be assessed or addressed on a provincial basis.

As most contaminated sites are the result of past activities on the land base, and there has historically been limited understanding of the issues related to contaminated sites, determining agency accounting responsibility for past contamination will be on a case by case

basis. However, in determining which ministry or agency has responsibility to record costs for investigation and/or remediation of provincial contaminated sites that arise henceforth, the following shall be considered the order of priority in determining provincial agency responsibility:

1. Who is the polluter? Is the agency or ministry directly responsible for the contamination via its actions?
2. Who had over sight of the activity causing contamination? Which agency or Ministry is responsible for overseeing or permitting the activities that resulted in contamination?
3. Which agency owns the land on which the contamination exists?

4.7 A cross-government reporting framework will guide reporting related to the management of provincial contaminated sites.

The Auditor General's report concluded, in part, that ministries and agencies need to improve reporting and accountability for governments' contaminated sites. Reporting on status, progress, and key indicators of the program is a critical step in the response to the Auditor General's report.

Initially all performance indicators should be derived from the attributes stored in the Crown Contaminated Sites Program database. These indicators, generally defined in terms of individual site characteristics, include:

- numbers and location of contaminated sites and the classification of each site;
- costs and methods of managing and/or remediating site contamination;
- human health or ecological risk of the contaminated sites; and
- programs to prevent further or future site contamination.

Initially, the reports will focus on producing a reliable picture of the key operational performance indicators, including individual site attributes. As the reporting system matures, management performance indicators will be brought into the output documentation.

Three separate report outputs will be produced.

1. Annual Financial Report. To meet the obligations of the *Budget and Transparency Act*, as well as to operate in accordance with the provincial adoption of Generally Accepted Accounting Principles, the Provincial Contaminated Sites Committee will provide information for inclusion in the annual Public Accounts Report of the Office of the Comptroller General.

The information will be subject to the requirements identified by OCG and may contain the following attributes:

- Number of sites with available data
- Category, classification rating
- Agency or agencies responsible

- Financial liability status & amount
- Expenditures in FY and to date

2. Synoptic Crown Contaminated Sites Program Reporting. The second publication will be in a synoptic, Web-based reporting presence. This online resource will provide access to all stakeholders to the following reporting:

- All public data contained in the CCSP database, with appropriate search tools to locate sites geographically, regionally, and by various indicators
- Online versions of all Biennial Reports, in HTML and .PDF format
- Current status of the CCSP (inventory summaries, etc.)

Additionally, the site will provide ongoing access to:

- Links to related industry, government, and educational sites
- Vehicles for feedback
- CCSP legislation, policy, principles, frameworks, etc.
- Direct contact information

3. Biennial Report. A formal report on the state of Crown contaminated sites will be published once every two years. The report will be designed for corporate, external, and public consumption, and will have the “look and feel” of a corporate annual report.

The two-year report period is based on two rationales: first, the rate of change of environmental indicators such as site inventories and classifications tends to be such that an annual reporting period may not reflect significant reportable changes. In addition, remediation efforts tend to take longer than a single year, thus suggesting that the period of reportable change in the indicators selected is more consistent with a biennial report.

The format of the biennial report would include the following:

- Overview of principles, policy, process, governance, and legislation driving the CCSP
- Accounting on the key environmental, social, and economic indicators maintained by the program
- Anecdotal, case study, and success story vignettes from the experience province wide
- Comparison of BC progress to other jurisdictions worldwide

The biennial report will be structured around a central thematic focus with each publication. While all components expected in a report would be included, each issue would provide an in-depth report on a particular industrial sector, governance issue, or environmental regime; all reporting will be informed by this focal theme. For example, report themes could include the *oil & gas industry, groundwater, coastal environments, or First Nations.*

5. Bibliography

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- BC Ministry of Water, Land and Air Protection. Environmental Trends in British Columbia 2002. ISSN 1481-7284. An overview of BC trends in water pollution, toxic contaminants, stewardship, air pollution, human health and the environment, and climate change.
- CCME. Canada-wide Accord on Environmental Harmonization. This agreement's objective is to achieve greater effectiveness, efficiency, accountability, predictability and clarity of environmental management for issues of Canada-wide interest, by using a cooperative approach, to develop and implement consistent environmental measures in all jurisdictions, including policies, standards, objectives, legislation and regulations. To this end, it proposed 13 principles (refer to section 5.1).
- CCME. Canada-wide Environmental Standards Sub-agreement. This agreement provides for the continual development, improvement, and attainment of priority Canada-wide Environmental Standards for environmental quality and human health across Canada. It also provides for a cooperative, co-ordinated federal, provincial and territorial approach for: identifying Canada-wide environmental priorities; developing Canada-wide Environmental Standards for the identified priorities; agreeing on the actions required and obligations of governments for attaining the agreed-upon Canada-wide Environmental Standards; effective, efficient and harmonized implementation; and accountability to Canadians for meeting obligations and attaining agreed-upon Canada-wide Environmental Standards.
- CCME. Statement of Principles to Guide Cooperative Arrangements on Environmental Monitoring and Reporting. October 2002. The Statement is to guide the development of monitoring and reporting agreements, where they are needed. The Statement of Principles is not intended to set out a national monitoring strategy for Canada, but it can assist in achieving consistency in methodologies and reporting protocols.
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approach serves as a proactive management tool so that the necessary steps are taken to characterize, classify and prioritize contaminated sites and to ensure for their use within the context of the federal contaminated site management process.

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- Global Reporting Initiative. *Public agency sustainability reporting*. GRI Resource Document Series. January 2004.
- Government of British Columbia. Provincial Policy for Consultation with First Nations. October 2002. This document describes the Provincial approach to consultation with First Nations on aboriginal rights and/or title that have been asserted but have not been proven through a Court process.
- Government of Canada, Department of Fisheries and Oceans. A Method for ranking contaminated marine and Aquatic Sites on Canadian Federal Properties, Final Version. Not dated. The ranking method proposed in this document is intended to complement the National Classification System for Contaminated Sites (CCME 1992). Its purpose is to provide an evaluative framework for ranking marine and aquatic sites within general categories of concern, thereby indicating the need for further action. Like the National Classification System for Contaminated Sites, it is not intended to provide a general or quantitative risk assessment; rather, it is to be used solely as a tool for screening-level identification and prioritization of contaminated marine and aquatic sites. This system was developed for the Department of Fisheries and Oceans.

- Government of Canada, Privy Council Office. A Framework for the Application of Precaution in Science-based Decision Making about Risk. This Framework outlines guiding principles for the application of precaution to science-based decision making in areas of federal regulatory activity for the protection of health and safety and the environment and the conservation of natural resources.
- Ministry of Economic Development, Small Business and Trade. Impact of Proposed Contaminated Sites Legislation on the Economy of British Columbia. April 1993. An assessment of impacts that proposed legislation may have on various industries, businesses, regions, and communities in the province.
- Ministry of Municipal Affairs and Housing, Toronto, Ontario. Municipal Financial Tools for Planning and Development. 2000. Developed to help municipalities identify a range of potential financing tools available to support planning and development activities. It describes a number of municipal financial and planning incentives that encourage re-development, revitalization and improvement of existing built-up areas and neighbourhoods and municipalities.
- Ministry of Water, Land and Air Protection, British Columbia. Final Report of the Minister's Advisory Panel on Contaminated Sites. January 2003. A complete review of the contaminated sites system in BC along with recommendations that would become the basis for a new policy framework in the province.
- National Round Table on the Environment and the Economy. Cleaning up the Past, Building the Future: A National Brownfield Redevelopment Strategy for Canada. 2003. Proposed strategy and impacts of redeveloping brownfields in Canada. Includes overview of international experiences and economic analysis.
- New Brunswick Department of the Environment. Guideline for the Management of Contaminated Sites. June 1999. This documentation is intended to assist those involved with contaminated properties in understanding the responsibilities of the various parties, the expectations of the New Brunswick Department of the Environment (NBDOE) and the options which are available to achieve satisfactory closure at contaminated sites in New Brunswick. It includes sections on regulatory rationale, management process, and responsibilities of the parties.
- New Zealand Ministry for the Environment. *Contaminated land management guidelines no. 1: Reporting on contaminated sites in New Zealand*. October 2003.
- Northeast-Midwest Institute. Brownfield Policies in the Midwest. Charles Bartsch. Paper associated with workshop "Midwestern Metropolitan Areas: Performance and Policy." held at the Federal Reserve Bank of Chicago. November 28, 1995. Overview of regional incentives (grants, loans, tax programs...); comparison of costs for typical brownfield versus typical greenfield; voluntary cleanup programs; financial obstacles and barriers to development.
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adequate program for managing its contaminated sites and whether it is adequately accounting for its performance.

- Ontario Ministry of Environment and Energy Standards Development Branch. Guidance on Site Specific Risk Assessment for Use at Contaminated Sites in Ontario. May 1996. ISBN-0-7778-4058-03. This document has been prepared for the purpose of giving general guidance on conducting both human health and ecological risk assessments for site clean-ups in Ontario. It is neither a detailed description of the risk assessment process nor a field guide to conducting risk assessments. The document is organized into three parts. Part 1 is a general introduction to the process of risk assessment. Part 2 provides some general guidance for conducting human health risk assessment for the remediation of contaminated sites in Ontario. Part 3 provides a basic framework for conducting site specific ecological risk assessments for the remediation of contaminated sites in Ontario.
- Ontario Ministry of the Environment and Energy. Guidelines for use on Contaminated Sites in Ontario. Revised February 1997. ISBN 0-7778-6114-3. These guidelines provide advice and information to property owners and consultants to use when assessing the environmental condition of a property, when determining whether or not restoration is required and in determining the kind of restoration needed to allow continued use of the site. A four-step process is outlined: site assessment, sampling and analysis, remedial work plan, and completion.
- Ontario Ministry of the Environment, New Program Development Branch. A Framework for Ontario's Cooperative Agreements. March 2003. Full description of the incentives and agreements between the Provincial government and leaders in environmental compliance.
- Ontario Ministry of the Environment. Managing the Environment, A Review of Best Practices. January 2001. A high-level review of best practices with respect to how environment departments in other jurisdictions meet current challenges and execute their various management responsibilities. The study is not a detailed program or policy review. As such, the approach was not in terms of the appropriateness of various environmental policies and the report did not review and evaluate specific Ministry programs.
- Oregon Department of Environmental Quality. 14th Annual Environmental Cleanup Report. January 2003. Annual report to the Legislature. The report's primary focus is on DEQ's Environmental Cleanup Program. Additional information is provided about cleanups of leaking underground storage tanks (including heating oil tanks) and cleanups of spills.
- Treasury Board of Canada Secretariat. Policy on Accounting for Costs and Liabilities and Related to Contaminated Sites. Effective date April 2002. This policy is to ensure that all costs and liabilities related to management and remediation of federal environmentally contaminated sites are accounted for and reported in the financial statements of the government in the fiscal year in which environmental damage is incurred, or in the fiscal year in which costs and liabilities are identified.
- Treasury Board of Canada Secretariat. Treasury Board Federal Contaminated Sites Management Policy, effective as of July 1 2002. This policy is one element of the Federal Contaminated Sites Management Framework, which consists of a group of Treasury

Board policies and best practices advisories. Policy Statement: It is government policy that federal departments and agencies ensure sound environmental stewardship of federal real property in their care by avoiding contamination and by managing contaminated sites in a consistent and systematic manner that recognizes the principle of risk management and results in the best value for the Canadian taxpayer.

- Treasury Board of Canada, Secretariat. Best Practices Advisory: Contaminated Sites Management Plan. This best practices advisory is one element of the Federal Contaminated Sites Management Framework. The Treasury Board Federal Contaminated Sites Management Policy states that "Departments and agencies will develop a departmental Contaminated Sites Management Plan within one year of the coming into force of this policy." This best practices advisory is intended to provide guidance on the development and content of departmental contaminated sites management plans. (Note that the requirement is for an overall departmental plan rather than for a plan for each site).
- Treasury Board of Canada, Secretariat. Best Practices Advisory: Federal Brownfields. This best practices advisory is one element of the Federal Contaminated Sites Management Framework and is intended to provide guidance on the management of "brownfields" to those departments and agencies whose mandate does not normally include property development or redevelopment.
- UK Department of Environment, Food and Rural Affairs. Guidelines for Environmental Risk Assessment and Management. 2000. The guidelines describe general principles and provide case studies to demonstrate how environmental risk assessment and management processes can be applied across a diverse range of activities. The framework set out here can be applied to a wide range of hazardous activities and environmental systems, and across a diversity of spatial and temporal scales. The principles described can be applied at all levels of environmental protection, from broad policy development to site-specific risk management decisions.
- US EPA, Office of Enforcement and Standards. The Yellow Book: Guide to Environmental Enforcement and Compliance at Federal Facilities. EPA 315-B-98-011, February 1999. To assist Federal agencies in meeting mandated requirements under various laws and Executive Orders, EPA has developed this Guide to Environmental Enforcement and Compliance at Federal Facilities, commonly referred to as The Yellow Book, to serve as a roadmap for Federal agency compliance. The Yellow Book's primary purpose is to provide field-level personnel with environmental responsibilities at Federal facilities with a comprehensive informational tool to both help them comply with environmental requirements and to understand the enforcement and compliance processes used by EPA at Federal facilities.
- US EPA. Using the Triad Approach to Streamlining Brownfield Site Assessment and Cleanup. June 2003. A complete guide to the EPA process named Triad because of its three pronged approach to site assessment and remediation. This new approach focuses on the management of uncertainty by incorporating (1) a systematic project planning, (2) dynamic work plan strategies, and (3) the use of real-time measurement technologies.

- Wisconsin DNR. The Financial Resource Guide for Cleanup and Redevelopment. 2002. Complete overview of all federal, state and local programs aiding brownfield redevelopments
- Wisconsin DNR. Where's the Money. Indirect and direct funding sources available through State agencies.

Appendix A Prioritization Process

The prioritization process is based in part on the National Contaminated Sites Classification System (NCSCS) which uses three “overarching” groups of information for prioritising contaminated sites for attention:

1. *Contaminants*, the relative hazard of the contaminant(s) present at the site;
2. *Exposure Pathways*, the route a contaminant takes to a receptor, for example groundwater, surface water, direct contact, air; and
3. *Receptors*, the living beings or resources that may be exposed to, or affected by, the contamination.

These three NCSCS information groups may be thought of as three “overarching” decision criteria or “Level 1” criteria. Table 1 (next page) shows that two additional levels of criteria are used in the NCSCS for each of the three overarching criteria. These are denoted in the table as “Level 2” and “Level 3” criteria. There are 9 “Level 2” criteria and 39 “Level 3” criteria.

TABLE 1 – NCSCS DATA ELEMENTS	
Level 2 Decision Criteria (General data requirement)	Level 3 Decision Criteria (Detailed data requirement)
CONTAMINANTS	
1. Degree of hazard	1. Type and toxicity of contaminants
2. Quantity of hazardous material	2. Area/volume of contaminant
3. Predominant physical state	3. Liquids/gases
	4. Sludges
	5. Solids
	6. Other “special” considerations
EXPOSURE PATHWAYS	
4. Groundwater	7. Known groundwater contamination, if any
	8. Engineered subsurface containment
	9. Thickness of confining layer over aquifers
	10. Hydraulic conductivity of confining layer
	11. Annual rainfall
	12. Hydraulic conductivity of aquifer
	13. Other “special” considerations
5. Surface Water	14. Observed or measured contamination, if any
	15. Surface containment
	16. Distance to perennial surface water
	17. Topography (terrain, above ground, buried)
	18. Run-off potential
	19. Flood potential
	20. Other “special” considerations
6. Direct contact and air	21. Known contamination off-site
	22. Airborne emissions
	23. Accessibility of site
	24. Hazardous soil gas migration
	25. Other “special” considerations
RECEPTORS	
7. Human and animal (water)	26. Known adverse effects on humans
	27. Known contamination of drinking water supply
	28. Distance to nearest drinking water supply
	29. Availability of alternate drinking water supply
	30. Known impact on used water resource
	31. Proximity of water resource to site
	32. Water uses
8. Land use	33. Known contamination of land used by humans
	34. Land use adjacent to the site
	35. Other “special” considerations
9. Environment	36. Known adverse impacts on sensitive environments
	37. Distance from site to nearest sensitive environment
	38. Distance to major groundwater recharge or discharge area
	39. Other “special” considerations

The Stage 1 prioritization process relies on the nine Level 2 criteria and the Stage 2 process on those of the 39 Level 3 criteria for which data is available. The Stage 1 process is outlined below.

Using the Level 2 criteria, the key issues involved are as follows.

KEY DECISION ISSUES	
CONTAMINANTS	
Degree of hazard	How hazardous to humans is the contaminant present at the site?
Quantity of hazardous material	Is there a large, medium or small amount of contamination?
Predominant physical state	Is the contaminant in a form that easily migrates into the water supply?
EXPOSURE PATHWAYS	
Groundwater	Is there known groundwater contamination?
Surface Water	Is there run-off potential to a permanent body of water or to a water supply?
Direct contact and air	Is the site easily accessible?
RECEPTORS	
Human	How close is the site to human habitation, highways, parks or recreation areas?
Land use	What is the actual or proposed land use for the site?
Environment	How close is the site to an environmentally sensitive area?

Decision Matrix

Using the criteria from above, a decision matrix for the Stage 1 process has been developed and is depicted below. An evaluation panel of experts will consider the criteria and develop recommendations regarding the ranking of the sites.

DECISION MATRIX FOR INDIVIDUAL CONTAMINATED SITE REMEDIATION PROJECTS			
Level 1 Criteria	Contaminants	Exposure Pathways	Receptors
Level 2 Criteria	1 Type and toxicity of contaminant	4 Groundwater contamination	7 Humans
	2 Quantity of hazardous material	5 Surface water contamination	8 Land use indicators
	3 Predominant physical state	6 Direct contact (access)	9 Environmental indicators

Working independently, the evaluation panel members will each select one of the four statements for each criterion with “D” statements representing the highest risk and “A” statements the lowest risk. The statements may be refined to reflect any refinements in the site class information.

1 Type and toxicity of contaminant	
The contaminant is <i>low</i> on the list of toxic contaminants	1
The contaminant is <i>moderate</i> on the list of contaminants	2
The contaminant is <i>high</i> on the list of contaminants	3
The contaminant is <i>highly toxic and today would require immediate clean-up</i>	4

2 Quantity of hazardous material	
The quantity is <i>minor</i> (range of measures required) and not increasing	1
The quantity is <i>moderate</i> (range of measures measure required) and not increasing	2
The quantity is <i>significant</i> (range of measures measure required) and not increasing	3
The quantity is <i>significant</i> (range of measures measure required) and tending to increasing	4

3 Predominant physical state	
The contaminant was in <i>gaseous</i> form and would evaporate quickly before contaminating the water supply	1
The contaminant was in <i>solid</i> form and would be unlikely to contaminate the water supply if released	2
The contaminant was in <i>sludge</i> form and would be less likely to contaminate the water supply if released	3
The contaminant was in <i>liquid</i> form and would be very likely to contaminate the water supply if released	4

4 Groundwater contamination	
If left unremediated, this site is <i>unlikely</i> to contaminate groundwater	1
If left unremediated, this site is <i>moderately likely</i> to contaminate groundwater	2
If left unremediated, this site is <i>very likely</i> to contaminate groundwater	3
If left unremediated, this site is <i>already contaminating</i> groundwater	4

5 Surface water contamination	
If left unremediated, this site is <i>unlikely</i> to contaminate permanent water bodies by means of run-off	1
If left unremediated, this site is <i>moderately likely</i> to contaminate permanent water bodies by means of run-off	2
If left unremediated, this site is <i>very likely</i> to contaminate permanent water bodies by means of run-off	3
If left unremediated, this site is <i>already contaminating</i> permanent water bodies by means of run-off	4

6 Direct contact (access)	
This site is 20 miles or more from an environmentally sensitive area.	1
This site is within 5 to 20 miles of an environmentally sensitive area.	2
This site is within to 5 miles of an environmentally sensitive area.	3
This site is within an environmentally sensitive area.	4

7 Human Health Impacts	
This site is <i>unlikely</i> to have direct adverse effects on humans	1
This site is <i>moderately likely</i> to have direct adverse effects on humans	2
This site is <i>likely</i> to have direct adverse effects on humans	3
This site is <i>highly likely</i> to have a direct adverse effects on humans	4

8 Land use indicators	
This site is <i>not expected to be used</i> in the foreseeable future	1
This site is expected to be used for a <i>purpose consistent with</i> that which created the original contamination	2

This site is expected to be used for a <i>purpose not consistent</i> with that which created the original contamination, <i>but not within three years</i>	3
This site is expected to be used for a <i>purpose not consistent</i> with that which created the original contamination <i>within three years</i>	4

9 Environmental indicators	
This site is <i>unlikely</i> to have direct adverse effects on the local environment	1
This site is <i>moderately likely</i> to have direct adverse effects on the local environment	2
This site is <i>very likely</i> to have adverse effects on the local environment	3
This site is <i>already</i> having adverse effects on the local environment	4

A “gateway criterion” is one which determines a course of action whatever the indicators say about the other criteria. Thus all site classes identified as high risk by reference to all the criteria, and also showing “4” ratings for Criteria 7 would be immediately prioritised as high risk.

Appendix B Unlocated Sites

Decision Criteria for unlocated sites

The decision indicators fall into three classes – usage related, contaminant related and “other”. While some indicators may not be available, they may sometimes be derived from other indicators. These are shown in below as “dependencies”. For example, data regarding the type of contaminant is dependent on the prior use as indicated by the site class; and the possibility of natural correction over time is partially dependent on the type of contaminant typical of the site class.

Not all of the factors need be included in the decision process. For example, once a suspected contaminant type is identified, it may be expressed in terms of its expected impact on living things - the “known adverse effects”. Similarly, the quantity of contaminant may be estimated by reference to the age and length of use factors. The indicators and the dependencies needed to perform this initial site class assessment are illustrated below.

Table 3 INDICATORS AND DATA DEPENDENCIES FOR UNLOCATED SITE CLASSES	
Indicators (known, estimated or assumed)	Dependencies
<i>Site Situation (Usage) Factors</i>	
Known use of the site class	None
Approximate age of the suspected contamination	None
Approximate number of years sites in the class were used	Known use of the site class
Approximate number of years since sites within the class were last used	Known use of the site class
<i>Inherent Contaminant Risk Factors</i>	
Type of contaminants expected to be present at sites within the class	Usage in this site class
Quantity of hazardous material area/volume of contaminant	Usage in this site class and the length of time used
Predominant physical state - liquids/gases sludges or solids	Type of contaminant
Whether the contaminant in the site class is of a type where there is a likelihood of natural correction over time	Type of contaminant
The probability of release of the contaminant, if known	Type of contaminant
Known potential adverse effects human and animals	Type of contaminant
Known potential adverse impacts on sensitive environments	Type of contaminant
<i>Other Factors</i>	
The closeness of a typical site in the class to human habitation	Known use of the site class

It is likely that the indicators for a particular site class may only be assessed as generically “high, medium or low”. For example, a site class with a contaminant with a high degree of toxicity and a limited ability to correct itself over time, on a site which was known to be used for many years, will be ranked as a “potentially high risk” site class. A site with a less toxic contaminant which was used only for a short time would be ranked as a lower risk.

On-Site Sampling

Where this high level prioritisation process is used, it will be useful to locate and sample a small number of individual sites within each site group to test the validity of the results and the chosen decision approach. Sites from each site class would be located and visited, and a one-day preliminary investigation conducted. The results would then be compared with those predicted by the decision model.

Since the decision model is site class specific and not location specific, any location-related factors (such as pathways and receptors) would not be included in the sample assessment. This is because it is an assessment mainly of the inherent contaminant risk and its typical potential impact at the immediate site in the field. However, pathways and receptors are considered implicitly through consideration of several of the decision criteria. It would be sensible to examine these factors at the time of the visit and record the data accordingly for future reference.

The Provincial Contaminated Sites Committee will use experts to assess the various classes of unlocated sites and develop an initial potential risk assessment. This will be compared to the detailed assessments contemplated in Section 4.2 to determine likely priority of the unlocated sites and the need for further investigation.