CCME

Canadian Council of Ministers of the Environment | Le Conseil canadien des ministres de l'environnement

National Classification System for Contaminated Sites

Guidance Document

PN 1403

ISBN 978-1-896997-80-3 PDF

NOTE TO READERS

The Canadian Council of Ministers of the Environment (CCME) is the major intergovernmental forum in Canada for discussion and joint action on environmental issues of national, international and global concern. The 14 member governments work as partners in developing nationally consistent environmental standards, practices and legislation.

This document provides background information and guidance on the use of the 2008 National Classification System for Contaminated Sites (NCSCS). The 2008 NCSCS is a revised and updated version of the NCSCS that was published in 1992. Version 1.3 of the 2008 NCSCS was released in 2016. This guidance document was updated to reflect version 1.3 of the NCSCS in 2017. For additional technical information regarding this tool, please contact:

National Guidelines and Standards Office
Environment and Climate Change Canada
351 St. Joseph Blvd., 6th floor Annex
Gatineau, Quebec
K1A 0H3
Website: http://www.ec.gc.ca/

The 2008 National Classification System for Contaminated Sites was developed by the Soil Quality Guidelines Task Group of CCME.

Canadian Council of Ministers of the Environment
123 Main St., Suite 360
Winnipeg, Manitoba R3C 1A3
Phone: 204-948-2090
Email: info@ccme.ca Website:
www.ccme.ca

Reference listing:

CCME. 2008. National Classification System for Contaminated Sites: Guidance Document. Canadian Council of Ministers of the Environment, Winnipeg.

ACKNOWLEDGEMENTS

The initial draft of the revised National Classification System for Contaminated Sites (NCSCS) method was developed by Audrey Wagenaar and Reidar Zapf-Gilje of Golder Associates Ltd. (Golder 2005) for the CCME Soil Quality Guidelines Task Group. Kelly Potter of the National Guidelines and Standards Office of Environment Canada and Charito Cañero of Golder Associates Ltd. led the project required to finalize the revised version of the NCSCS. The performance testing of the draft revised NCSCS and preparation of the spreadsheet tool was conducted by Charito Cañero, Audrey Wagenaar, Nicky Jennings, and Eric Wilson of Golder Associates Ltd.

Thanks are extended to Jeremy Anglesey of Environment Canada and members of the federal Contaminated Sites Management Working Group for providing contaminated site data for use in the sensitivity analysis.

Review comments that contributed to the development of this project were provided by: Mike Zemanek (Alberta Environment); Joan La Rue-van Es (Manitoba Conservation); Hugues Ouellette (Développement durable, Environnement et Parc Québec); Ruth Hall (Yukon Department of Environment); Franz Environmental Inc. (on behalf of the federal Contaminated Sites Management Working Group); Renée Silke and J.A. Bond (Atomic Energy of Canada Limited); Chris Allaway, Jennifer Froese, Ute Pott, and Kelly Potter (Environment Canada); JoAnn Aldridge (Health Canada); Debbie Nicholls (Department of Fisheries and Oceans); Martin Brown (Public Works and Government Services Canada); and Mark Kavanagh (Alberta Energy and Utilities Board).

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

The Canadian Council of Ministers of the Environment's (CCME) National Classification System for Contaminated Sites (NCSCS) is a method for evaluating contaminated sites according to their current or potential adverse impact on human health and the environment. The NCSCS was developed to establish a rational and scientifically defensible system for comparable assessment of contaminated sites across Canada, and important management tool for prioritizing the investigation and remediation of contaminated sites since 1992.

At a multi-stakeholder workshop held in April 1990 (CCME Contaminated Sites Consultation Workshop), representatives from government, industry and the public agreed that a classification system was required, and recommended that the system should be relatively simple and applicable to all contaminated sites in Canada. Though simple, a defined amount of site characterization information is required for the Site to be classified using the NCSCS. Using the NCSCS, contaminated sites are evaluated using existing or generally available information on the Site's characteristics, contaminants, and location.

The NCSCS was originally developed based on a review of existing provincial, territorial and international methods for classifying contaminated sites. However, as new information became available, such as increased knowledge about risk assessment techniques and experience in the suitability of this system for classifying contaminated sites across Canada, the NCSCS has been updated. In 2005, Golder Associates Ltd. (Golder) prepared a draft revised NCSCS spreadsheet and report, as part of the Soil Quality Guidelines Task Group (SQGTG) work on devising a scoring system that is simpler to use, more objective, and that includes considerations of the magnitude and quality of information available and specific factors for northern and First Nation sites. Following posting of the draft revised NCSCS spreadsheet and report for public comment; revisions were made to the spreadsheet by the SQGTG.

This document and associated Excel based classification system supersedes the 1992 NCSCS, but incorporates much of the original system and also those changes made in the Federal Contaminated Sites Action Plan Contaminated Site Classification System (Franz Environmental 2005; referred to as the “FCSAP system”). The FCSAP system was also based on the original NCSCS.

The revised scoring system presented in this guidance was tested by Golder (2007) on a range of real sites with various levels of available data, to assess the consistency of scoring results between independent assessors, and to compare the scores obtained by the 1992 NCSCS, the FCSAP version, and the revised NCSCS.

1.2 Purpose of the National Classification System

The NCSCS is a tool to aid in the evaluation of contaminated sites. Its purpose is to provide scientific and technical assistance in the identification and prioritization of sites, which may be considered to represent high, medium, or low risk. The system classifies contaminated sites into

these general categories of risk in a systematic and rational manner, according to their current or potential adverse impact on human health and/or the environment.

The NCSCS is not designed to provide either a qualitative or quantitative risk assessment, but rather is a tool specifically for the classification and prioritization of contaminated sites. The system screens sites with respect to the need for further action (*e.g.*, characterization, risk assessment, remediation, etc.) to protect human health and the environment. Although many of the factors involved in a risk assessment study are addressed in this system, the procedure should not be used out of context to conduct risk analyses on individual sites.

It must be emphasized that this system constitutes a screening tool only. As such, it is beyond the scope of this system to address specific factors such as those of a technological, socioeconomic, political, or legal nature. Additional investigations will therefore usually be required before regulatory requirements or remedial designs can be finalized.

1.3 Site Classification Categories

Sites should not be ranked relative to one another. Sites must be classified on their individual characteristics in order to determine the appropriate classification (Class 1, 2, 3, or N) according to their priority for action, or Class INS (for sites that require further information before they can be classified). It should be noted that the term "action" here does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection. The classification groupings are as follows:

Class 1: High Priority for Action (Total NCSCS Score greater than 70)

The available information indicates that action (*e.g.*, further site characterization, risk management, remediation, etc.) is required to address existing concerns. Typically, Class 1 sites show a propensity to high concern for several factors, and measured or observed impacts have been documented. (Note, this category was previously called "Action Required".)

Class 2: Medium Priority for Action (Total NCSCS Score between 50 and 69.9)

The available information indicates that there is high potential for adverse impacts, although the threat to human health and the environment is generally not imminent. Typically, for Class 2 there is no direct indication of off-site contamination; however, the potential for off-site migration tends to be rated high and therefore some action is likely required. (Note, this category was previously called "Action Likely Required".)

Class 3: Low Priority for Action (Total NCSCS Score between 37 and 49.9)

The available information indicates that the Site is currently not a high concern. However, additional investigation may be carried out to confirm the site classification. (Note, this category was previously called "Action May Be Required".)

Class N: Not a Priority for Action (Total NCSCS Score less than 37)

The available information indicates there is likely no significant environmental impact or human health threats. There is likely no need for action unless new information becomes available indicating greater concerns, in which case, the Site should be re-examined. (Note, this category was previously called "Action Not Likely Required".)

Class INS: Insufficient Information (≥15% of Responses are "Do Not Know")

Although a minimum of a Phase I Environmental Site Assessment has been conducted for the site, there appears to be insufficient information to classify the Site. In this event, additional information is required to address data gaps.

1.4 Uses of the National Classification System

The main goal of the NCSCS is to provide a scientifically defensible method that will aid in identifying, on a technical basis, contaminated sites that present a high risk and therefore may require further work. Use of this system will help ensure that funding is allocated to contaminated sites that are considered highest priority for a jurisdiction (*i.e.,* encourage identification and remediation of highest priority sites first). Although other factors, such as socio-political considerations, may alter these priorities, as indicated above, these are beyond the scope this system.

1.5 Comparison of the Revised NCSCS

If additional information has been obtained since the Site has been classified using the 1992 NCSCS and FCSAP system, then it is recommended that the Site be reclassified. Regardless of availability of new information, it is preferable that Sites be reclassified with the revised NCSCS using the available information.

Should a new score and classification under the revised NCSCS not be required, the following provides a suggestion to convert previous scores using the 1992 NCSCS and FCSAP system. This option applies a correction factor which introduces an uncertainty in the converted score.

The results of the performance testing conducted by Golder (2007) indicate that scores obtained using the two previous scoring systems (1992 NCSCS and FCSAP system) are biased high when compared to the scores obtained with the revised. The average bias is almost identical for the 1992 NCSCS and the FCSAP systems at slightly less than 20%. It is recommended that the old scores be adjusted by an appropriate average bias for comparison to the revised NCSCS scores. The main reason for the bias is the inherent difference in how the different scoring systems calculate the total score.

1.6 Complementary Tools to the National Classification System

The NCSCS is suitable for classifying the majority of contaminated sites in Canada. However, this system does not specifically address contaminated sites with a significant marine or aquatic component, and therefore should not be used as the sole method for classifying these types of sites. Environmental conditions at marine and aquatic sites are best measured in the sediments as they act as long-term reservoirs of chemicals to the aquatic environment and to organisms living in or having direct contact with sediments. CCME has developed the Sediment Quality Index Calculator (SeQI). The SeQI provides a convenient means of summarizing sediment quality data and can complement the NCSCS. The SeQI provides a mathematical framework for assessing sediment quality conditions by comparing contaminant concentrations with their respective sediment quality guidelines.

Additionally, CCME has developed a Soil Quality Index (SoQI) Calculator. The CCME Soil Quality Index (SoQI) is another complementary tool that focuses on evaluating the relative hazard, by comparing contaminant concentrations with their respective soil quality guidelines.

1.7 Users of the National Classification System

The NCSCS scorings should be conducted by individuals with contaminated site experience. As new site information becomes available or as steps toward site remediation are taken, the site score should be revised to reflect the reduction in risk; and the Site reclassified as appropriate.

2.0 DESCRIPTION OF THE NATIONAL CLASSIFICATION SYSTEM

2.1 The Classification Method

The NCSCS presented in this manual uses an additive numerical method that assigns scores to a number of site characteristics or factors. In general, additive numerical methods such as this attempt to reduce the process of assessment and evaluation using a single score intended to represent a site's present or potential hazard.

This document and associated Excel based classification system supersedes the 1992 NCSCS, but incorporates much of the original system and also those changes made in the Federal Contaminated Sites Action Plan Contaminated Site Classification System (Franz Environmental 2005; referred to as the "FCSAP system").

The NCSCS has been an important management tool for prioritizing the remediation of contaminated sites since 1992 (CCME, 1992). Subsequently, the NCSCS underwent a review by the CCME Soil Quality Guidelines Task Group (SQGTG) and it was determined that updates were required to reduce subjectivity, reflect current soil quality guidelines, increase the breadth of ecological information and include parameters specific to northern landscapes. Golder Associates Ltd. was retained by CCME to conduct a review of the 1992 NCSCS, provide recommendations on improvements and build a new electronic NCSCS classification system, which was completed

in 2005. Changes incorporated into the revised NCSCS are outlined in Golder's report entitled "*The National Classification System for Contaminated Sites – Revised Version, 2005*".

The following objectives were addressed in the revised NCSCS based on Golder's review of the existing NCSCS and interviews with SQGTG members:

- Focus on science and leave the risk management issues to those utilizing the scores;
- Include some measure of uncertainty into the classification system;
- Increase objectivity;
- Make the classification system simpler to use;
- Include factors specific to northern sites (*e.g.*, permafrost, snow and lack of groundwater);
- Acknowledge potential risks associated with First Nations reliance on local traditional (unregulated) foods and other land resources;
- Include additional migration and exposure pathways (*e.g.*, dust, vapour and sediments);
- Include factors specific to the intended land use;
- Include off-ramps where immediate attention is required or where scoring is inappropriate;
- Include modifying factors for specific issues with defined scores (to avoid subjectivity) to permit the inclusion of factors outside the range of typical checklist questions;
- Retain as much continuity with the existing system as possible while making the required improvements; and,
- Create a similar numerical score to that which would have been calculated under the existing systems. The use of a similar scoring method will facilitate the transition to the new system and will eliminate the need for re-evaluation of sites already prioritized under existing systems.

Golder Associates Ltd. was retained by the SQGTG in 2007 to "test" the revised scoring system on a range of real sites; to assess the consistency of scoring results between independent assessors; to compare the scores obtained by the original NCSCS (1992), the FCSAP version, and the revised NCSCS (2005); and based on the findings provide this guidance document and NCSCS electronic spreadsheet.

2.2 Technical Basis for the Classification System

In traditional hazard assessment, an adverse effect on the environment or human health is the result of a chain of events from source to receptor. Accordingly, the NCSCS is designed to evaluate the

hazard, or hazard potential, of the Site by scoring site characteristics that can be grouped under one of three categories:

1. Contaminant Characteristics – This category relates to the relative hazard of contaminants present at the Site. The contaminant characteristics include contaminant specific factors such as residence media, toxic potency, exceedance of guidelines, contaminant quantity and modifying factors;

2. Migration Potential – This category allows for the determination of the potential for contaminants to leave the original residency media and move to another media, another portion of the Site, or off-site. Contaminants that are mobile and have the potential to move off-site may require action on a higher priority basis than those which are stable; and,

3. Exposure – This category includes aspects of both the exposure pathway and receptors analysis. The exposure pathway is the route a contaminant may follow (*e.g.*, groundwater, surface water, direct contact, and/or air) to a receptor. Receptors are living beings or resources that may be exposed to and affected by contamination (*e.g.*, humans, plants, animals, or environmental resources). Human and ecological exposures have been segregated due to differences in the types of potentially operable exposure pathways and receptor scenarios. Ecological receptors are further divided into terrestrial receptors and aquatic receptors.

2.3 Evaluation Factors

A number of evaluation factors are used as assessment tools within each of the three categories of site characteristics in the NCSCS. These evaluation factors were chosen to assess a Site in a technically sound manner. They attempt to assess the hazard of a Site based on general information regarding the nature of its contaminants and possible impact on human health and the environment through major environmental media (*i.e.*, water, soil, and air). However, based on a survey of available contaminated site information in Canada, in many cases, information may not be known about certain aspects of a site. Therefore, the factors chosen also reflect those for which information is considered generally available. The worksheet titles and sub-headings are as follows:

I Contaminant Characteristics	II Migration Potential	III Exposure
1. Residency Media	1. Groundwater Movement	1. Human Receptors A. Known Impact B. Potential a. Land Use b. Accessibility c. Exposure Route
2. Chemical Hazard	2. Surface Water Movement	2. Human Modifying Factors
3. Contaminant Exceedance Factor	3. Soil	3. Ecological Receptors A. Known Impact B. Potential a. Terrestrial b. Aquatic
4. Contaminant Quantity	4. Vapour	4. Ecological Modifying Factors A. Species at Risk B. Aesthetics
5. Modifying Factors	5. Sediment Movement	5. Other Receptors A. Permafrost
	6. Modifying Factors	

2.4 Numerical Weighting

The NCSCS uses a scoring system (maximum of 100 points) as a means of assessing the hazard of a site. The three categories of site characteristics (see Subsection 2.2) were determined to be of equal importance under the system, and are therefore weighted equally (33, 33, and 34 points, respectively).

Each of the evaluation factors in this classification system (*e.g.*, residency media of contaminants, rainfall, topography, etc.) is assigned a score ranging from 0 to 22. The score range is designed to weight the factors according to their potential or actual relevance in contributing to the hazard or risk of a site. Those factors that have been assigned high maximum scores are considered to be of greater relevance than those with low maximum scores.

For each factor, several possible scenarios are presented (*e.g.*, residency media of contaminants could be soil, groundwater, etc.; the topography of the Site could be steep or flat), and scoring guidelines are suggested for each scenario presented. These suggested scores (scoring guidelines) have been weighted according to their considered relative importance in determining risk.

As indicated above, the NCSCS evaluates sites by scoring them on a scale from 0 to 100. A total site score close to 0 in the system is one for which all the evaluation factors are assigned the lowest possible score. A score of 100 would represent a Site for which all the factors were assigned the highest possible score. In general, sites that exhibit observable or measured impacts on the

surrounding environment or have a high potential for causing negative impacts will score high under the system. Sites with minimal observed impacts or a low potential for causing impacts will generally receive a low score. The system is not designed to provide a quantitative risk assessment, but rather is a tool to screen sites with respect to need for further action (*e.g.*, characterization, risk assessment, remediation, etc.) to protect human and environmental health.

3.0 INSTRUCTIONS TO THE USER

3.1 The Classification System

The NCSCS consists of six components available in paper copies herein or as an Excel spreadsheet:

- Pre-Screening Checklist (Appendix I);
- Summary of Site Conditions (Appendix II);
- User's Guide (Appendix III);
- Site Classification Worksheets (Appendix IV);
- Summary Score Sheet (Appendix V); and,
- Reference Material (Appendix VI).

These components were designed to produce a National Classification System that provides well documented and consistent site classifications. Each of these components is described more fully in the following subsections.

3.2 The Classification Process

To classify contaminated sites appropriately using the NCSCS, the user should carry out the following steps, in the order shown:

1. Read and understand this Guidance Document and the User's Guide.

2. Obtain sufficient site information to complete the site classification. At least a Phase I Environmental Site Assessment (ESA) should be available in order to conduct the NCSCS exercise. The Phase I ESA consists of a preliminary desk-top type study involving nonintrusive data collection to determine whether there is a potential for the Site to be contaminated and to provide information to direct any intrusive investigations. The data collected as part of the Phase I ESA generally include a review of available information on current site conditions and history of the property, a site inspection and interviews with personnel familiar with the site. This stage is similar to "*Phase I: Site Information Assessment*" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997). If a Phase I ESA is not available, further site information should be gathered before the Site is classified.

It may be necessary to complete a Phase I ESA for the Site in conjunction with the NCSCS scoring exercise.

3. Refer to the Pre-Screening Checklist to determine if the Site is appropriate for classification or has site specific indicators that would default the Site to Class 1 priority ranking.

4. Complete the Worksheets (review and document existing information and consult specialists, as required). It is recommended to document the rationale for the scoring decisions.

5. Complete the Summary Score sheet.

6. Classify the Site.

3.3 The User

The user (the person applying the classification system) should be an experienced professional with appropriate technical expertise. For some evaluation factors (*e.g.*, permeability of geologic materials), it is recommended that the user consult a hydrogeologist. It may also be necessary to consult environmental chemists and biologists or other environmental scientists and professionals to assist in the interpretation of site conditions and impacts.

3.4 Pre-Screening

A Pre-Screening Checklist (Appendix I) has been included in the NCSCS to determine if the Site can either be considered a Class 1 site (to be remediated as soon as practical) or more information must be collected before the Site can be classified, or other hazards exist at the Site that must be addressed first before the Site can be classified using the revised NCSCS. If any of these factors apply to the Site being assessed, do not continue.

The Pre-Screening Checklist may identify Sites for which serious adverse impacts are known and have been well documented in appropriate site reports. The questions are designed to quickly summarize whether the Site is known to contain hazardous materials that are affecting human health and the environment. If it is known that the Site is adversely affecting humans or posing a fire or explosion hazard, the Site is automatically classified as Class 1.

Alternatively, if a sufficiently comprehensive environmental site assessment has been completed at the Site beginning with a Phase I ESA and including subsequent intrusive investigation phases and there are no exceedances (known or suspected) of the relevant CCME, provincial, or territorial guidelines/standards at the Site, and chemicals for which there are no guideline/standard do not exceed defensible toxicity benchmarks, it would not be necessary to classify the Site.

3.5 The Site and Summary of Site Conditions

The Site’s boundaries should be clearly defined by the User. It is recommended that the Summary of Site Conditions (Appendix II) provide as much information as possible in order to delineate the

bounds of the Site including a site plan drawn to scale indicating the boundaries in relation to well-defined references points and/or legal descriptions. It is recommended that the NCSCS evaluation only be conducted where information is available for the entire Site. Where only a portion of a Site has been characterized, it may be useful to classify these individual Areas of Potential Environmental Concern (APECs) as Sites with their own NCSCS score and classification.

3.5.1 Site Letter Grade

Available reports describing site activities, site conditions, environmental impacts, site remediation, and measures or systems used to protect human health and the environment should be consulted and referenced to determine the Site Letter Grade. The Site Letter Grade is related to the level of information available for the Site (as defined by the User) and provides an indication of information uncertainty based on the level of investigation and remediation work that has been carried out at the Site. The descriptions of the various categories are provided below.

F: Pre Phase I ESA – No environmental investigations have been conducted or there are only partial or incomplete Phase I ESA for the Site. It is not recommended to continue through the NCSCS when insufficient data are available.In these cases, it will generally be necessary to conduct a Phase I ESA or other site investigation tasks in order to complete the NCSCS scoring.

E: Phase I ESA – A preliminary desk-top type study has been conducted, involving non-intrusive data collection to determine whether there is a potential for the Site to be contaminated and to provide information to direct any intrusive investigations. Data collected may include a review of available information on current site conditions and history of the property, a site inspection and interviews with personnel familiar with the Site. [Note: This stage is similar to "*Phase I: Site Information Assessment*" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]

D: Limited Phase II ESA – An initial intrusive investigation and assessment of the property has been conducted, generally focusing on potential sources of contamination, to determine whether there is contamination present above the relevant screening guidelines or criteria, and to broadly define soil and groundwater conditions; samples have been collected and analyzed to identify, characterize and quantify contamination that may be present in air, soil, groundwater, surface water or building materials. [Note: This stage is similar to "*Phase II: Reconnaissance Testing Program*" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]

C: Detailed Phase II ESA – Further intrusive investigations have been conducted to characterize and delineate the contamination, to obtain detailed information on the soil and groundwater conditions, to identify the contaminant pathways, and to provide other information required to develop a remediation plan. [Note: This stage is similar to "*Phase III: Detailed Testing Program*" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]

B: Risk Assessment with or without Remedial Plan or Risk Management Strategy – A risk assessment has been completed, and if the risk was found to be unacceptable, a site-specific remedial action plan has been designed to mitigate environmental and health concerns associated with the Site, or a risk management strategy has been developed.

A: Confirmation Sampling – Remedial work, monitoring, and/or compliance testing have been conducted and confirmatory sampling demonstrates whether contamination has been removed or stabilized effectively and whether cleanup or risk management objectives have been attained.

3.6 The User's Guide

The User's Guide (Appendix III) documents the rationale behind each evaluation factor included in the NCSCS. It also presents guidelines for data interpretation and suggested sources of information to be reviewed when assessing the factor. The User's Guide should be read thoroughly before commencing a site classification under the system.

3.7 The Site Classification Worksheets

Site Classification Worksheets (Appendix IV) allow the User to organize and document the raw information needed to identify and rate the Site. For each evaluation factor, the User should refer to the User's Guide (for definitions or explanations relevant to the factor), document the available site information pertaining to that factor in the worksheet, and assign an appropriate score to the factor on the worksheet. The rationale for the selection of each score should be documented in the worksheet in the space provided. Documentation on the worksheet of the raw site data, as well as the rationale behind the score assigned to any particular factor, will facilitate peer review and reexamination of the site classification, as required.

The Worksheets provide scores which are to be circled and “fill-in-the-blank” sections for tallying the scores (known and potential). For each factor, the User may choose any score within a defined range. The User is prompted to conduct calculations and/or transfer the values to the Summary Score Sheet. The tally of scores is considered to be “raw” and have not been adjusted down to the total maximum score for the given category. In most cases, the possible total raw score will be greater than the maximum allowed.

3.8 Known Versus Potential Contamination or Impacts

For the purposes of this NCSCS, “known” is defined as scores that are assigned based on documented scientific and/or technical observations and “potential” refers to scores that are assigned when something is not known, although it may be suspected.

The NCSCS worksheets instruct the User to complete either the known contamination section or the potential for contamination section (*i.e.*, they are treated as mutually exclusive events and scores will be counted from only one section).

Care should be taken to include consideration of fate and transport of contaminants, especially in groundwater. For example, results from groundwater sampling may indicate acceptable groundwater quality, but consideration must be given to the potential for a groundwater plume to exist that has not yet reached the monitoring wells installed. If this is the case, then the User should conclude there is a potential for the groundwater to be contaminated.

This case demonstrates the importance of professional judgment in interpreting the potential for site contamination to exist, even when existing site investigation results may not demonstrate exceedance of contaminants. It may be useful to document both measured contamination levels and any circumstances that affect the potential for contamination or impacts to occur, and the rationale of whether to consider the contaminant issue in question as known or potential.

3.9 Information Gaps and Certainty Percentage

Before classifying a Site, the User should ensure that sufficient site information is available. However, there may be one or more factors in the NCSCS that cannot be addressed because of lack of information. In these cases the "Do Not Know" option should be selected, which results in a score that is one-half of its maximum; which is added in the "Potential" column.

The ratio of "Known" to "Potential" responses reflects the relative certainty, or confidence, of the resulting final score and the classification. The NCSCS system defines this ratio as the "Certainty Percentage".

The Certainty Percentage is generated from the number of sections assigned scores based on "known" information divided by the total number of sections. A high percentage indicates that more is known about the Site, and therefore there is more confidence in the classification, whereas a low percentage suggests that the classification should be treated with caution since the percentage is based mainly on potential rather than actual impacts.

In evaluating the total score, both the site letter grade and certainty percentage provide a means to assess the appropriateness of the total score obtained and associated site classification. As an option, and at the discretion of the Users and applicable juridications, an adjustment of between 10% and 20% of the total score may be added to account for Certainty Percentages of less than 70%.

3.10 Summary Score Sheet

The Summary Score sheet (Appendix V) provides the total site score by adding up the scores generated on each of the three worksheets and provides the corresponding Site Classification. It also provides an estimate of certainty in the score provided (Certainty Percentage).

This Site Classification is calculated based on the Total Score, as follows:

- Class 1 if the Total Score is between 70 and 100;
- Class 2 if the Total Score is between 50 and 69.9;
- Class 3 if the Total Score is between 37 and 49.9;
- Class N if the Total Score is less than 37; and,
- Class INS if more than, or equal to, 15% of responses are “Do Not Know”, or a site letter grade of F has been assigned.

The total score for the Site and the site classification provide information on the actual or potential impacts and indicate whether a Site is a high priority for remediation. The site letter grade and certainty percentage provide an indication of the quality and quantity of information available for the Site and indicate whether a Site is appropriate for classification and to what degree the classification can be relied upon. The site letter grade provides an initial qualitative indication based on the type of reports or assessments which have been conducted at the Site. The certainty percentage provides an indication of “known” and “potential” information as determined by the scoring exercise. Although a site letter grade of A through E is assigned, indicating that at least a Phase I ESA is available, the certainty percentage provides an evaluation of the quality of available data.

3.11 Reference Material

The additional following information, which may be useful to refer to while conducting the evaluation, is provided in Appendix VI:

- Contaminant Hazard Rankings;
- Examples of Persistent Substances;
- Examples of Substances in the Various Chemical Classes;
- Chemical-Specific Properties; and,
- Range of Values of Hydraulic Conductivity and Permeability.

4.0 ELECTRONIC CLASSIFICATION TOOL

The NCSCS classification system has also been assembled in Microsoft Excel and is available on the CCME website. The electronic tool includes drop down lists to increase ease and efficiency of use. It also limits the choices a User has, thus reducing subjectivity. All required information is provided within the Excel file, including rationale, method of evaluation and notes (with

citations where available) that may be required to resolve questions that a user might have. Scores are automatically summed at the bottom of the page and on the associated Summary Score sheet.

5.0 CONCLUSION

Within each priority category, further refinement of the relative classification of sites may be necessary. The National Classification System is a screening tool only. Firm conclusions about the need for remedial action will still depend on a number of factors (including planned longterm use or redevelopment of the Site, application of contaminated site criteria and relevant/sitespecific objectives of the jurisdiction in which the Site is located, local issues, availability of technology, remediation costs, etc.). These factors are beyond the scope of this system, however, and are not meant to be addressed.

6.0 REFERENCES

Canadian Council of Ministers of the Environment (CCME). 1992. National Classification System for Contaminated Sites.

Canadian Council of Ministers of the Environment (CCME). 1997. Guidance Document on the Management of Contaminated Sites in Canada.

Canadian Council of Ministers of the Environment (CCME). 2007. Sediment Quality Index Calculator. (available online at www.ccme.ca/)

Canadian Council of Ministers of the Environment (CCME). 2007. Soil Quality Index Calculator. (available online at www.ccme.ca/)

Franz Environmental. 2005. FCSAP Contaminated Site Classification Guidance Document. Final Report Version 1.6. Prepared for Environment Canada.

Freeze, R.A. and J.A. Cherry. 1979. Groundwater. Englewood Cliffs, New Jersey: PrenticeHall, Inc.

Golder Associates Ltd. 2005. The National Classification System for Contaminated Sites-Revised Version, 2005. Prepared for the CCME Soil Quality Guidelines Task Group.

Golder Associates Ltd. 2007. Interim Report, Performance Testing of the Revised National Classification System for Contaminated Sites. Prepared for the CCME Soil Quality Guidelines Task Group.

Todd, K.K. 1959. Ground Water Hydrology. New York: Wiley.

APPENDIX I

PRE-SCREENING CHECKLIST

CCME National Classification System for Contaminated Sites (2008) version 1.3
Pre-Screening Checklist

Please place a checkmark in the appropriate answer box.

Question	Response Yes	Response No	Comment
1. Are **Radioactive material**, **Bacterial contamination** or **Biological hazards** likely to be present at the site?			If yes, do not proceed through the NCSCS. Contact applicable regulatory agency immediately.
2. Are there **no contamination exceedances** (known or suspected)? Determination of exceedances may be based on: 1) CCME environmental quality guidelines; 2) equivalent provincial guidelines/standards if no CCME guideline exists for a specific chemical in a relevant medium; or 3) toxicity benchmarks derived from the literature for chemicals not covered by CCME or provincial guidelines/standards; 4) background concentration.			If yes (*i.e.*, there are no exceedances), do not proceed through the NCSCS.
3. Have **partial/incompleted or no environmental site investigations** been conducted for the Site?			If yes, do not proceed through the NCSCS.
4. Is there direct and significant evidence of **impacts to humans** at the site, or off-site due to migration of contaminants from the site?			If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated.
5. Is there direct and significant evidence of **impacts to ecological receptors** at the site, or off-site due to migration of contaminants from the site?			Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are considered to be severe, the site may be categorized as Class 1, regardless of the numerical total NCSCS score. For the purpose of application of the NCSCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction.
6. Are there indicators of significant **adverse effects in the exposure zone** (*i.e.,* the zone in which receptors may come into contact with contaminants)? Some examples are as follows: -Hydrocarbon sheen or NAPL in the exposure zone -Severely stressed biota or devoid of biota; -Presence of material at ground surface or sediment with suspected high concentration of contaminants such as ore tailings, sandblasting grit, slag, and coal tar.			To answer "yes", two scenarios should be satisfied; (1) there has to be a high probability that receptors will be exposed to the contaminant source in the near future, and (2) the predicted impacts to ecological receptors after exposure have to be significant (see question 5). A low probability of exposure resulting in significant impacts, or a high probability of exposure but with only low to moderate effects expected should not result in a Class 1 designation, neither would a low probability of exposure resulting in low-to-moderate effects. If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated.
7. Do measured concentrations of volatiles or unexploded ordnances represent an **explosion hazard**?			If yes, do not proceed through the NCSCS. Do not continue until the safety risks have been addressed. Consult your jurisdiction's occupational health and safety guidance or legislation on exposive hazards and measurement of lower explosive limits.

Rationale for not proceeding with NCSCS
(document any assumptions, reports, or site-specific information to support selection of "Yes" in Pre-Screening checklist)

If none of the above applies, proceed with the NCSCS scoring.

APPENDIX II

SUMMARY OF SITE CONDITIONS

CCME National Classification System for Contaminated Sites (2008) version 1.3
Appendix II - Summary of Site Conditions

Site: *(select how site will be identified, e.g., from Civic Address, Site Common Name, Code Identifier, Lat &Long, or UTM)*	
Civic Address: *(or other description of location)*	
Site Common Name : *(if applicable)*	
Code identifier : *(e.g., FCSI 8-digit identifier)*	
Site Owner or Custodian: *(Organization and Contact Person)*	
Legal description *or* metes and bounds:	
Approximate Site area:	
Parcel Identifier(s) [PID]: *(or Parcel Identification Numbers [PIN] if untitled Crown land)*	
Centre of site: *(provide latitude/longitude or UTM coordinates)*	Latitude: _____ degrees _____ min _____ secs Longitude: _____ degrees _____ min _____ secs
	UTM Coordinate: Northing _____ Easting _____
Site Land Use:	Current:
	Proposed:
Site Plan	**To delineate the bounds of the Site a site plan MUST be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.**
Provide a brief description of the Site:	

CCME National Classification System for Contaminated Sites (2008) version 1.3
Appendix II - Summary of Site Conditions

Affected media and Contaminants of Potential Concern (COPC):	

Site Letter Grade
Please circle the "letter" that best describes the level of information available for the site being assessed:
(Enter Letter Grade into Summary Score Sheet)

F– Pre Phase I
E– Phase I Environmental Site Assessment
D– Limited Phase II Environmental Site Assessment
C– Detailed Phase II Environmental Site Assessment
B– Risk Assessment with or without Remedial Plan or Risk Management Plan
A– Confirmation Sampling
If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	
Date Scoring Completed:	

APPENDIX III

USER'S GUIDE

CCME National Classification System for Contaminated Sites (2008) version 1.3
Appendix III - User's Guide

Instructions

1) Please review the following overview of contents. The revised CCME National Classification System for Contaminated Sites (NCSCS) consists of a pre-screening checklist, summary of site conditions, summary score sheet, and three instruction/worksheet pages for the user to fill out: Contaminant Characteristics, Migration Potential and Exposure. For ease of printing, the method of evaluation for scoring each section of the worksheet is provided in a separate Instructions tab. Reference material is also provided to assist with the evaluation. A brief description of each sheet is as follows:

Pre-Screening Checklist - Used to determine if the Site can either be considered a Class 1 site (to be remediated immediately) or if more information must be collected before the Site can be classified, or other hazards exist at the Site that must be addressed first before the Site can be classified using the revised NCSCS.

Site Description Sheet - Summarizes Site information. It also indicates the level of information available (Site Letter Grade) for the site to conduct the NCSCS scoring evaluation. The known/potential contaminants of concern and affected media will also be summarized here.

Contaminant Characteristics Instructions & Worksheet - Prompts the user for information related to the contaminants of potential concern (COPC) found at the site.

Migration Potential Instructions & Worksheet - Prompts the user for information related to physical transport processes which may move contamination to neighboring sites or re-distribute contamination within a site. Migration potential includes many of the exposure pathways, but is not limited to exposure pathways. Migration potential does not require clearly defined receptors.

Exposure Instructions & Worksheet - Prompts the user for information related to exposure pathways and receptors which may be located on the site.

Summary Score Sheet - Generates a total site score by adding up the scores generated on each of the three worksheets and provides the corresponding Site Classification. It also provides an estimate of certainty in the score provided (Certainty Percentage).

Reference Material - Additional information which may be useful to refer to when conducting the evaluation.
- Contaminant Hazard Ranking
- Examples of Persistent Substances
- Examples of Substances in the Various Chemical Classes
- Chemical-specific Properties
- Range of Values of Hydraulic Conductivity and Permeability

The worksheet titles and sub headings are as follows.

I. Contaminant Characteristics

1. Residency Media
2. Chemical Hazard
3. Contaminant Exceedance Factor
4. Contaminant Quantity
5. Modifying Factors

II. Migration Potential

1. Groundwater Movement
2. Surface water Movement
3. Soil
4. Vapour
5. Sediment Movement
6. Modifying Factors

III. Exposure

1. Human Receptors
   - A. Known Impact
   - B Potential
     - a. Land Use
     - b. Accessibility
     - c. Exposure Route
2. Human Modifying Factors
3. Ecological Receptors
   - A. Known Impact
   - B. Potential
     - a. Terrestrial
     - b. Aquatic
4. Ecological Modifying Factors
   - a. Species at Risk
   - b. Aesthetics
5. Other Receptors
   - a. Permafrost

2) This is an electronic form which can be printed out and **filled out on paper** by the user by hand. Within each Worksheet, the score is circled, either in the known or potential column. Subtotals will be prompted for at the end of each Section and the value transferred onto the Summary Sheet. Required calculations are also prompted in order to obtain the Total NCSCS Score. A separate Excel spreadsheet has been developed which will prompt the user for information and is meant to be used as an electronic tool for NCSCS evaluation.

3) When assigning scores for each factor, it is highly recommended to give a rationale (a column has been provided for this purpose in Worksheets I, II and III). Information that would be useful in justifying the scores assigned may include: a statement of any assumptions, a description of site-specific information, and references for any data sources (e.g., site visit, personal interview, site assessment reports, or other documents consulted).

4) The Site Letter Grade is related to the level of information available for the Site (as defined by the User) and provides an indication of completeness of information based on the level of investigation and remediation work that has been carried out at the site. More detailed descriptions of the various categories are provided below.

Site Letter Grade:	*Detailed Descriptions:*
F	***Pre Phase I ESA –*** No environmental investigations have been conducted or there are only partial or incomplete Phase I ESA for the Site. It is not recommended to continue through the NCSCS when insufficient data are available. In these cases, it will generally be necessary to conduct a Phase I ESA or other site investigation tasks in order to complete the NCSCS scoring.
E	***Phase I ESA –*** A preliminary desk-top type study has been conducted, involving non-intrusive data collection to determine whether there is a potential for the Site to be contaminated and to provide information to direct any intrusive investigations. Data collected may include a review of available information on current site conditions and history of the property, a site inspection and interviews with personnel familiar with the Site. [Note: This stage is similar to "Phase I: Site Information Assessment" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]
D	***Limited Phase II ESA –*** An initial intrusive investigation and assessment of the property has been conducted, generally focusing on potential sources of contamination, to determine whether there is contamination present above the relevant screening guidelines or criteria, and to broadly define soil and groundwater conditions; samples have been collected and analyzed to identify, characterize and quantify contamination that may be present in air, soil, groundwater, surface water or building materials. [Note: This stage is similar to "Phase II: Reconnaissance Testing Program" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]
C	***Detailed Phase II ESA –*** Further intrusive investigations have been conducted to characterize and delineate the contamination, to obtain detailed information on the soil and groundwater conditions, to identify the contaminant pathways, and to provide other information required to develop a remediation plan. [Note: This stage is similar to "Phase III: Detailed Testing Program" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]
B	***Risk Assessment with or without Remedial Plan or Risk Management Strategy –*** A risk assessment has been completed, and if the risk was found to be unacceptable, a site-specific remedial action plan has been designed to mitigate environmental and health concerns associated with the Site, or a risk management strategy has been developed.
A	***Confirmation Sampling –*** Remedial work, monitoring, and/or compliance testing have been conducted and confirmatory sampling demonstrates whether contamination has been removed or stabilized effectively and whether cleanup or risk management objectives have been attained.

5) A few terms are used throughout which require definition, they are as follows:

Known - refers to scores that are assigned based on documented scientific and/or technical observations

Potential - refers to scores that are assigned when something is not known, though it may be suspected

Raw - refers to score totals which have not been adjusted down to the total maximum score for the given category. In most cases the possible total raw score is greater than the maximum allowed

CCME National Classification System for Contaminated Sites (2008) version 1.3
Appendix III - User's Guide

Note: For some questions in the worksheets, the option selected will determine whether a "known" or "potential" score is assigned. In these cases, if "Do Not Know" is selected, a score will automatically be listed as "potential", whereas all of the other options in the list will provide a "known" score.

6) Certainty Percentage: The ratio of “Known” to “Potential” responses reflects the relative certainty, or confidence, of the resulting final score and the classification. The NCSCS system defines this ratio as the “Certainty Percentage”. The Certainty Percentage is generated from the number of sections assigned scores based on “known” information divided by the total number of sections. A high percentage indicates that more is known about the Site, and therefore there is more confidence in the classification, whereas a low percentage suggests that the classification should be treated with caution.

7) Site Classification Categories: Sites should not be ranked relative to one another. Sites must be classifed on their individual characteristics in order to determine the appropriate classification (Class 1, 2, 3, or N) according to their priority for action, or Class INS (Insufficient Information) for sites that require further information before they can be classifed. The classification groupings are as follows:

Class 1 - High Priority for Action (Total NCSCS Score greater than 70)

The available information indicates that action (*e.g.,* futher site characterization, risk management, remediation, etc.) is required to address existing concerns. Typically, Class 1 sites indicate high concern for several factors, and measured or observed impacts have been documented.

Class 2 - Medium Priority for Action (Total NCSCS Score between 50 and 69.9)

The available information indicates that there is high potential for adverse impacts, although the threat to human health and the environment is generally not imminent. There will tend not to be indication of off-site contamination, however, the potential for this was rated high and therefore some action is likely required.

Class 3 - Low Priority for Action (Total NCSCS Score between 37 and 49.9)

The available information indicates that this site is currently not a high concern. However, additional investigation may be carried out to confirm the site classification, and some degree of action may be required.

Class N - Not a Priority for Action (Total NCSCS Score less than 37)

The available information indicates there is probably no significant environmental impact or human health threats. There is likely no need for action unless new information becomes available indicating greater concerns, in which case the site should be re-examined.

Class INS - Insufficient Information (≥15% of Responses are "Do Not Know", or a site letter grade of F has been assigned)

There is insufficient information to classify the site. In this event, additional information is required to address data gaps.

8) Additional Complementary Tools to the NCSCS

The CCME Soil Quality Index (SoQI) is a complementary tool that focuses more on evaluating the relative hazard, by comparing contaminant concentrations with their respective soil quality guidelines. The SoQI uses three factors for its calculations, namely: 1) scope (% of contaminants that do not meet their respective guidelines), 2) frequency (% of individual tests of contaminants that do not meet their respective guidelines), and 3) amplitude (the amount by which the contaminants do not meet their respective guidelines). The soil quality index can be used to compare different contaminated sites with similar types of contamination as well as to see if the jurisdictional requirements have been met after remediation of a particular site.

The NCSCS was not developed for and is not readily applicable for the assessment of sites with a significant marine or aquatic component. Environmental conditions at marine and aquatic sites are best measured in the bed sediments as they act as long-term reservoirs of chemicals to the aquatic environment and to organisms living in or having direct contact with sediments. The CCME Sediment Quality Index (SeQI) provides a convenient means of summarizing sediment quality data and can complement the NCSCS. The SeQI provides a mathematical framework for assessing sediment quality conditions by comparing contaminant concentrations with their respective sediment quality guidelines.

CCME National Classification System (2008) version 1.3

Appendix III - (I) Contaminant Characteristics

Definition	Scoring Guideline	Method of Evaluation	Notes
1. Residency Media (replaces physical state)			
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? **yes** = has an exceedance or strongly suspected to have an exceedance **no** = does not have an exceedance or strongly suspected not to have an exceedance		The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline). Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at http://st-ts.ccme.ca/ For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil			
Yes	2		
No	0		
Do Not Know	1		
B. Groundwater			
Yes	2		
No	0		
Do Not Know	1		
C. Surface water			
Yes	2		
No	0		
Do Not Know	1		
D. Sediment			
Yes	2		
No	0		
Do Not Know	1		
2. Chemical Hazard			
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?		The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site. The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file. *See Attached Reference Material for Contaminant Hazard Rankings.*	Hazard as defined in the revised NCSCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
High	8		
Medium	4		
Low	2		
Do Not Know	4		

Appendix III - (I) Contaminant Characteristics

Definition	Scoring Guideline	Method of Evaluation	Notes
3. Contaminant Exceedance Factor			
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")? NAPL (mobile or immobile) High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	 8 6 4 2 4	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the *most conservative media-specific and land-use appropriate CCME* environmental quality guidelines. **Ranking should be based on contaminant with greatest exceedance of CCME guidelines.** Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines NAPL (LNAPL or DNAPL) = Contaminant is a non-aqueous phase liquid (*i.e.,* due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (*i.e.,* greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Any amount of NAPL should be scored, i.e. small amounts and sheens cannot be ignored. The presence of a NAPL (mobile or immoblie or regardless of amount) may be considered unnaceptable by some jurisidcations. If NAPL is present, consult jurisdiction on how to proceed with NCSCS. Other standards may include local background concentration or published toxicity benchmarks. Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria. Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (*i.e.,* CEF=>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
4. Contaminant Quantity (known or strongly suspected)			
What is the known or strongly suspected quantity of all contaminants? >10 hectare (ha) or 5000 m^3 2 to 10 ha or 1000 to 5000 m^3 <2 ha or 1000 m^3 Do Not Know	 9 6 2 4	Measure or estimate the area or quantity of total contamination (i.e, all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding applicable environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances are given a higher score.

CCME National Classification System (2008) version 1.3

Appendix III - (I) Contaminant Characteristics

Definition	Scoring Guideline	Method of Evaluation	Notes
5. Modifying Factors			
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment? Yes No Do Not Know	 2 0 1	Persistent chemicals, *e.g.,* PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics: (a) in air, (i) its half-life is equal to or greater than 2 days, or (ii) it is subject to atmospheric transport from its source to a remote area; (b) in water, its half-life is equal to or greater than 182 days; (c) in sediments, its half-life is equal to or greater than 365 days; or (d) in soil, its half-life is equal to or greater than 182 days. Elements do not degrade, therefore treat any metal, metalloid, or halogen COPC as persistent.	*Examples of Persistent Substances are provided in attached Reference Materials*
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location? Yes No Do Not Know	 2 0 1	If answered Yes, in Rationale for Score column document the location and extent of the infrastructure that is/may be damaged, verify the mode of contact between contaminants of potential concern (COPCs) and infrastructure, list the specific COPCs that could cause damage, and note the expected effect on specific infrastructure.	Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances? One Two to Four Five or More Do Not Know	 0 2 3 2	For the purposes of the revised NCSCS, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, polycyclic aromatic hydrocarbons, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	*Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.*

CCME National Classification System (2008) version 1.3

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
1. Groundwater Movement			
A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.			
i) For **potable groundwater environments**, 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For **non-potable environments** (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the applicable non potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.	12	Review chemical data and evaluate groundwater quality. The evaluation method concentrates on 1) a potable or non-potable groundwater environment; 2) the groundwater flow system and its potential to be an exposure pathway to known or potential receptors An aquifer is defined as a geologic unit that yields groundwater in usable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas). The evaluation of a non-potable environment will be based on a site specific basis. Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils. Seeps and springs are considered part of the groundwater pathway. In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.	The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries. Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source in the vicinity of the contaminated site. This information must be documented in the NCSCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resources such as internet links. Note that for potable groundwater that also daylights into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered. **Selected References** Potable Environments Guidelines for Canadian Drinking Water Quality: http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php Non-Potable Environments Canadian Water Quality Guidelines for Protection of Aquatic Life. CCME. 1999. http://cegg-rcge.ccme.ca Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	9		
iii) Meets GCDWQ for **potable environments**; meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for **non-potable environments** **or** Absence of groundwater exposure pathway (*i.e.,* there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).	0		

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
B. Potential for groundwater pathway.			
a. Relative mobility of contaminant		Organics Koc (L/kg) / Metals with higher mobility at acidic conditions / Metals with higher mobility at alkaline conditions	Reference: US EPA Soil Screening Guidance (Part 5 - Table 39). See attached reference material.
High	4	Koc < 500 (*i.e.,* log Koc < 2.7); pH < 5; pH > 8.5	If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivities and infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.
Moderate	2	Koc = 500 to 5000 (*i.e.,* log Koc = 2.7 to 3.7); pH = 5 to 6; pH = 7.5 to 8.5	
Low	1	Koc = 5,000 to 100,000 (*i.e.,* log Koc = 3.7 to 5); pH > 6; pH < 7.5	
Insignificant	0	Koc > 100,000 (*i.e.,* log Koc > 5)	
Do Not Know	2	For PHC fractions; score F1 as Moderate, F2 as Low, and F3 and F4 as Insignificant.	
b. Presence of engineered sub-surface containment?		Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved. Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for "Full Containment" scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, this category is evaluated as high. If there is less than full containment or if uncertain, then evaluate as medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.	Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links. **Selected Resources:** United States Environmental Protection Agency (USEPA) 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128.
No containment	3		
Partial containment	1.5		
Full containment	0		
Do Not Know	1.5		
c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway		The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow. Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway. The evaluation of this category is based on: 1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or 2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (*e.g.,* water table aquifer, first hydrostratigraphic unit or other groundwater pathway).	
3 m or less including no confining layer or discontinuous confining layer	1		
3 to 10 m	0.5		
> 10 m	0		
Do Not Know	0.5		

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
B. Potential for groundwater pathway.			
d. Hydraulic conductivity of confining layer $>10^{-4}$ cm/s or no confining layer 10^{-4} to 10^{-6} cm/s $<10^{-6}$ cm/s Do Not Know	 1 0.5 0 0.5	Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use "Range of Values of Hydraulic Conductivity and Permeability" figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on: 1) The presence and hydraulic conductivity ("K") of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or 2) The presence and permeability ("k") of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.	
e. Precipitation infiltration rate (Annual precipitation factor x surface soil relative permeability factor) High (infiltration score > 0.6) Moderate (0.4 < infiltration score ≤ 0.6) Low (0.2 < infiltration score ≤ 0.4) Very Low (0 < infiltration score ≤ 0.2) None (infiltration score = 0) Do Not Know	 1 0.6 0.4 0.2 0 0.4	Precipitation Refer to Environment Canada precipitation records for relevant areas (30 year average preferred). Divide annual precipitation (rainfall + snowfall) by 1000 and round to nearest tenth (*e.g.,* 667 mm = 0.7 score). Permeability For surface soil relative permeability (*i.e.,* infiltration) assume: gravel (1), sand (0.6), loam (0.3) and pavement or clay (0). Multiply the surface soil relative permeability factor with precipitation factor to obtain the score for precipitation infiltration rate (*e.g.,* precipitation factor of 0.7 from above x 0.6 (sand) = 0.42 or "Moderate").	Selected Sources: Environment Canada web page link: http://climate.weather.gc.ca/climate_normals/index_e.html Snow to rainfall conversion apply ratio of 10(snow):1(water) https://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=108C6C74-1
f. Hydraulic conductivity of aquifer $>10^{-2}$ cm/s 10^{-2} to 10^{-4} cm/s $<10^{-4}$ cm/s Do Not Know	 2 1 0 1	Determine the nature of geologic materials and estimate hydraulic conductivity of all aquifers of concern from published material (refer to "Range of Values of Hydraulic Conductivity and Permeability" in the Reference Material sheet).	

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
2. Surface Water Movement			
A. Demonstrated migration of COPC in surface water above background conditions			
Known concentrations of surface water: i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by >1 X; or There is known contact of contaminants with surface water based on site observations. or In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (*e.g.,* toxicity testing; or other indicator testing of exposure).	12	Collect all available information on quality of surface water near to site. Evaluate available data against Canadian Water Quality Guidelines (select appropriate guidelines based on local water use, e.g., recreation, irrigation, aquatic life, livestock watering etc.). The evaluation method concentrates on the surface water flow system and its potential to be an exposure pathway. Contamination is present on the surface (above ground) and has the potential to impact surface water bodies. Surface water is defined as a water body that supports one of the following uses: recreation, irrigation, livestock watering, aquatic life.	General Notes: Someone experienced must provide a thorough description of the sources researched to classify the surface water body in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links. Selected References: CCME. 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life. http://cegg-rcge.ccme.ca/ CCME. 1999. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water). http://cegg-rcge.ccme.ca/ Health and Welfare Canada. 1992. Guidelines for Canadian Recreational Water Quality. http://www.hc-sc.gc.ca/ewh-semt/water-eau/recreat/index-eng.php
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	8	Examples of indirect evidence may include observed staining of sediment and/or river banks, but surface water has not been tested.	
iii) Meets CWQG or absence of surface water exposure pathway (*e.g.,* Distance to nearest surface water is > 5 km.)	0		

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
B. Potential for migration of COPCs in surface water			
a. Presence of containment No containment Partial containment Full containment Do Not Know	 5 3 0.5 3	Review the existing engineered systems and relate these structures to site conditions and proximity to surface water and determine if full containment is achieved: score low if there is full containment such as capping, berms, dikes; score medium if there is partial containment such as natural barriers, trees, ditches, sedimentation ponds; score high if there are no intervening barriers between the site and nearby surface water. Full containment must include containment of all chemicals.	
b. Distance to Surface Water 0 to <100 m 100 - 300 m >300 m Do Not Know	 3 2 0.5 2	Review available mapping and survey data to determine distance to nearest surface water bodies.	
c. Topography Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	 2 1.5 1.5 1 0.5 0 1	Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (*e.g.,* trench, above ground, etc.).	
d. Run-off potential High (run-off score > 0.6) Moderate (0.4 < run-off score ≤ 0.6) Low (0.2 < run-off score ≤ 0.4) Very Low (0 < run-off score ≤ 0.2) None (run-off score = 0) Do Not Know	 1 0.6 0.4 0.2 0 0.4	Precipitation Refer to Environment Canada precipitation records for relevant areas (30 year average preferred). Divide precipitation (rainfall + snowfall) by 1000 and round to nearest tenth (*e.g.,* 667 mm = 0.7 score). Permeability For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the permeability (infiltration) factor with precipitation factor to obtain Run-off potential score (*e.g.,* precipitation factor of 0.7 from above x 0.6 (loam) = 0.42 or "Moderate").	Selected Sources: Environment Canada web page link: http://climate.weather.gc.ca/climate_normals/index_e.html Snow to rainfall conversion apply ratio of 10(snow):1(water) https://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=108C6C74-1
e. Flood potential 1 in 2 years 1 in 10 years 1 in 50 years not in floodplain Do Not Know	 1 0.5 0.2 0 0.5	Review published data such as flood plain mapping or flood potential (*e.g.,* spring or mountain run-off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.	

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
3. Surface Soils (potential for dust, dermal and ingestion exposure)			
A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)			
COPCs measured in surface soils exceed the CCME soil quality guideline.	12	Collect all available information on quality of surface soils (*i.e.,* top 1.5 metres) at the site. Evaluate available data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (*i.e,* agricultural, residential/parkland, commercial, or industrial), and soil texture if applicable (*i.e.,* coarse or fine). Examples of strongly suspected exceedences of soil guidelines may include evidence of staining, odours, or significant debris infill materials.	Selected References: CCME. 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health http://cegg-rcqe.ccme.ca/
Strongly suspected that soils exceed guideline(s).	9		
COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	0		
B. Potential for a surface soils (top 1.5 m) migration pathway			
a. Are the soils in question covered?		Consult engineering or risk assessment reports for the site. Alternatively, review photographs or perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCSCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.
Exposed	6		
Vegetated	4		
Landscaped	2		
Paved	0		
Do Not Know	4		
b. For what proportion of the year does the site remain covered by snow?		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).	
0 to 10% of the year	6		
10 to 30% of the year	3		
More than 30% of the year	0		
Do Not Know	3		

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
4. Vapour			
A. Demonstrated COPCs in vapour.			
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9		
Vapour has not been measured (i.e. not detected) and volatile hydrocarbons have not been found in site soils or groundwater, or vapour has been measured (indoor or outdoor) in concentrations not exceeding risk based concentrations.	0	Due to the potential for significant spatial and temporal variation in soil vapour concentrations, limited vapour monitoring studies (*e.g.,* single point in time "snap-shot") that do not detect vapour at sites where volatiles are suspected, does not necessarily mean that vapours are not an issue at the site. In this case, section B " Potential for COPCs in vapour" should be completed.	
B. Potential for COPCs in vapour			
a. Relative Volatility based on Henry's Law Constant, H' (dimensionless)		Reference: US EPA Soil Screening Guidance (Part 5 - Table 36) *Provided in Attached Reference Materials* For PHC fractions; score F1 as High, F2 as Moderate, and F3 and F4 as Not Volatile. Substance is considered Not Volatile (*i.e.,* pathway not a concern) if the product of the water solubility and unitless Henry's law constant does not exceed published or derived tolerable concentration or risk-specific concentration. If NAPL is present, see Appendix D of the CCME soil vapour quality guidelines protocol (CCME 2014) for further guidance	If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5. Selected References: CCME. 2014. A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours. Winnipeg, Manitoba. http://ceqg-rcge.ccme.ca/
High (H' > 1.0E-1)	4		
Moderate (H' = 1.0E-1 to 1.0E-3)	2.5		
Low (H' < 1.0E-3)	1		
Not Volatile	0		
Do Not Know	2.5		
b. What is the soil grain size?		Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours. Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter (D50 < 75 µm). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter (D50 > 75 µm).	
Fine	2		
Coarse	4		
Do Not Know	3		
c. Is the depth to the source less than 10m?		Review groundwater depths below grade for the site.	
Yes	2		
No	0		
Do Not Know	1		
d. Are there any preferential pathways?		Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathyways.	Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Yes	2		
No	0		
Do Not Know	1		

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
5. Sediment Movement			
A. Demonstrated migration of sediments containing COPCs			
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in the area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
Strongly suspected (based on observations and/or modelling)	9		
Sediments have been contained and there is no indication that sediments will migrate in future. or Sediment meets CCME sediment quality guidelines or absence of sediment exposure pathway (*i.e.,* within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0		
B. Potential for sediment migration			
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?		Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
Yes	0		
No	4		
Do Not Know	2		
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?		Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.	
Yes	4		
No	0		
Do Not Know	2		
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?		Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional may become scoured. If the sediments present at the site are in a lake or marine habitat, select "no" for this question.	
Yes	4		
No	0		
Do Not Know	2		

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
6. Modifying Factors			
Are there subsurface utility conduits in the area affected by contamination? Yes No Do Not Know	 4 0 2	Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	

CCME National Classification System (2008) version 1.3

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
1. Human			
A. Known exposure			
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site*)	22	*Where adverse effects on humans are documented, the site should be automatically designated as a Class 1 site (*i.e.,* action required). Known impacts could include blood test results (e.g. blood lead > 10 µg/dL) or results of other health based studies and tests. There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired. A score of 22 can also be assigned when Hazard Quotients (or Hazard Index) >> 1.0 or incremental lifetime cancer risks considerably exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals.	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet. Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site. **Selected References:** Health Canada – Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Heath Screening Level Risk Assessments http://www.hc-sc.gc.ca/ewh-semt/pubs/contamsite/index-eng.php United States Environmental Protection Agency, Integrated Risk Information System (IRIS) – http://toxnet.nlm.nih.gov
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients (or Hazard Index) > 0.2 (excluding the Estimated Daily Intake) or >1.0 with Estimated Daily Intake and/or for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this is typically either $>10^{-5}$ or $>10^{-6}$).	
No quantified or suspected exposures/impacts in humans.	0	The category, no exposure/impacts, can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients (or Hazard Index) of ≤ 0.2 (excluding the Estimated Daily Intake) or ≤ 1.0 with Estimated Daily Intake AND incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10^{-6} or 10^{-5}).	
B. Potential for human exposure			
a) Land use (provides an indication of potential human exposure scenarios)		Review zoning and land use maps over the distances indicated. If the proposed future land use is more “sensitive” than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (*e.g.,* greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Parkland includes campgrounds, but excludes wildlands such as national or provincial parks. Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (*e.g.,* children).
Agricultural	3		
Residential / Parkland	2		
Commercial	1		
Industrial	0.5		
Do Not Know	1.5		
b) Indicate the level of accessibility to the contaminated portion of the site (*e.g.,* the potential for coming in contact with contamination)		Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.	
Limited barriers to prevent site access; contamination not covered	2		
Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered.	1		
Controlled access or remote location and contaminants are covered	0		
Do Not Know	1		

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
B. Potential for human exposure			
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential). i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know	 3 0 1.5	If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
ii) inhalation (*i.e.,* inhalation of dust, vapour) Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know	 3 0 1.5	If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances) relative to buildings. Refer to (II) Migration Potential worksheet, 4B.a), *Potential for COPCs in Vapour* for a definition of volatility.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion. Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts. General Notes; Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links. **Selected References;** Canadian Council of Ministers of the Environment (CCME). 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 1332. http://ceqg-rcqe.ccme.ca/ Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
Dust - If there is contaminated surface soil (*e.g.,* top 1.5 m) , indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent (bedrock) Do Not Know Texture	 3 1 0 2	Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2006)) then these soils are more likely to generate dusts.	

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
B. Potential for human exposure			
iii) Ingestion (*i.e.,* ingestion of food items, water and soils [for children]), including traditional foods. Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future). 0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present No potential for aquifer contamination Do Not Know	 3 2.5 2 1.5 0 0 2	Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (*e.g.,* provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure. The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of flow and contaminant transport. For aquifers, examples of "No drinking water present" includes municipal bylaws prohibiting water wells for potable water use and naturally non-potable (e.g. saline) shallow groundwater. Groundwater drinking water may not be at risk from contamination due to a lack of hydrological connection between contaminated soil or groundwater, or the drinking water is sufficiently up-gradient of the contamination source. Selection of "No potential for aquifer contamination" must be supported with sufficient documentation, e.g. lithological and contaminant properties, well capture zones (map drawn to scale), and capture zone delineation methodology.	**Selected References:** Guidelines for Canadian Drinking Water Quality: http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable. Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.
Is an alternative water supply readily available? Yes No Not Applicable Do Not Know	 0 1 0 0.5	Answer Not Applicable if "No drinking water present" or "No potential for aquifer contamination" was selected in previous question.	
Is human ingestion of contaminated soils possible? Yes No Do Not Know	 3 0 1.5	If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.	
Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings? Yes No Do Not Know	 1 0 0.5	Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (*e.g.,* large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.	
2. Human Exposure Modifying Factors			
a) Strong reliance of local people on natural resources for survival (*i.e.,* food, water, shelter, etc.) in contaminated area. Yes No Do Not Know	 6 0 1		

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
3. Ecological			
A. Known exposure			
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.	18	Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (*i.e.,* a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired.	CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life. CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses. http://cegg-rcqe.ccme.ca/ Sensitive receptors- review: Canadian Council on Ecological Areas; www.ccea.org Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in *A Framework for Ecological Risk Assessment: General Guidance* (CCME 1996). Notes: Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	12	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.	
No quantified or suspected exposures/impacts in terrestrial or aquatic organisms	0	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects, such as site observations, tissue testing, toxicity testing and quantitative community assessments.	
B. Potential for ecological exposure (for the contaminated portion of the site)			
a) Terrestrial i) Land use		Review zoning and land use maps. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (*e.g.,* greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (*e.g.,* herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
Agricultural (or Wild lands)	3		
Residential/Parkland	2		
Commercial	1		
Industrial	0.5		
Do Not Know	1.5		
ii) Uptake potential Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site?		If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
Yes	1		
No	0		
Do Not Know	0.5		

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
B. Potential for ecological exposure (for the contaminated portion of the site)			
iii) Ingestion (*i.e.,* wildlife or domestic animals ingesting contaminated food items, soils or water) Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know	 1 0 0.5	Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.	
Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know	 1 0 0.5	Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.	
Can the contamination identified bioaccumulate? Yes No Do Not Know	 1 0 0.5	Substances can be considered bioaccumulative if; • There is a Tissue Residue Guideline (TRG) or Soil Quality Guideline for Soil and Food Ingestion for the protection of secondary (SQG_{2C}) and/or tertiary consumers (SQG_{3C}). • Bioaccumulation factor (BAF) or bioconcentration factor (BCF) greater than 5000. • If BAF or BCF is not available, or reliable, the log Kow is equal to or greater than 5. If a literature review indicates that a substance biomagnifies, it should be treated as biomagnifying regardless of whether or not it meets the criteria above. It should also be noted that some substances with a log Kow greater than 5 do not biomagnify. If studies on a substance with a high Kow demonstrate a lack of biomagnification in upper trophic levels, then the substance can be considered not bioaccumulative. Petroleum hydrocarbons F1 to F4 are not considered bioaccumulative.	*See attached Reference Material including log(Kow)* Consult *CEPA (1999) Persistence and Bioaccumulation Regulations* for additional guidance; http://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-107/page-1.html
Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	 3 2 1 0.5 1.5	It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
b) Aquatic i) Classification of aquatic environment Sensitive Typical Not applicable (no aquatic environment present) Do Not Know	 3 1 0 2	"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species. "Typical aquatic environments" include those in areas other than those listed above.	

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
B. Potential for ecological exposure (for the contaminated portion of the site)			
ii) Uptake potential Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know	 1 0 0.5	Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge) . 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater.	
Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	 3 2 1 0.5 1.5	It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and fens and other aquatic environments.
Are aquatic species (*i.e.,* forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No (or Not Applicable) Do Not Know	 1 0 0.5	Substances can be considered bioaccumulative if; • There is a Tissue Residue Guideline (TRG) • Bioaccumulation factor (BAF) or bioconcentration factor (BCF) greater than 5000. • If BAF or BCF is not available, or reliable, the log Kow is equal to or greater than 5. If a literature review indicates that a substance biomagnifies, it should be treated as biomagnifying regardless of whether or not it meets the criteria above. It should also be noted that some substances with a log Kow greater than 5 do not biomagnify. If studies on a substance with a high Kow demonstrate a lack of biomagnification in upper trophic levels, then the substance can be considered not bioaccumulative.	*See attached Reference Material including log(Kow)* Consult *CEPA (1999) Persistence and Bioaccumulation Regulations* for additional guidance; http://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-107/page-1.html

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
4. Ecological Exposure Modifying Factors			
a) Known, or potential, occurrence of a species at risk. Is there a potential for a species at risk to be present at the site, or a known presence? Yes No Do Not Know	 2 0 1	Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as NatureServe Explorer (http://explorer.natureserve.org/). Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance. To assess the potential for a species at risk to be present, the site (or surroundings) should be located within range of a species at risk (using on-line resources and consultation with knowledgeable government departments or biologists, see above), and there should be an assessment of habitat suitability for any identified potential species at risk.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act (http://www.sararegistry.gc.ca/species/schedules_e.cfm?id=1). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCMWLAP. 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection. http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk
b) Potential impact of aesthetics (*e.g.,* enrichment of a lake or tainting of food flavour). Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know	 2 0 1	Documentation may consist of environmental investigation reports, press articles, petitions or other records.	This Item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Is there evidence of olfactory impact (*i.e.,* unpleasant smell)? Yes No Do Not Know	 2 0 1	Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.	
Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know	 2 0 1	A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients *e.g.,* nitrogen or phosphorous releases to an aquatic body can act as a fertilizer.	
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	 2 0 1	Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
5. Other Potential Contaminant Receptors			
a) Exposure of permafrost (leading to erosion and structural concerns)			Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity?		Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.	
Yes	4		
No	0		
Do Not Know	2		
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment?		Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	
Yes	2		
No	0		
Do Not Know	1		

APPENDIX IV

SITE CLASSIFICATION WORKSHEETS

CCME National Classification System (2008) version 1.3

(I) Contaminant Characteristics

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
1. Residency Media (replaces physical state)			
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? **yes** = has an exceedance or strongly suspected to have an exceedance **no** = does not have an exceedance or strongly suspected not to have an exceedance			
A. Soil			
Yes	2		
No	0		
Do Not Know		1	
B. Groundwater			
Yes	2		
No	0		
Do Not Know		1	
C. Surface water			
Yes	2		
No	0		
Do Not Know		1	
D. Sediment			
Yes	2		
No	0		
Do Not Know		1	
1. Residency Media Subtotal			enter into Summary Score Sheet and add to Raw Total Score below
2. Chemical Hazard			
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?			
High	8		
Medium	4		
Low	2		
Do Not Know		4	
2. Chemical Hazard Subtotal			enter into Summary Score Sheet and add to Raw Total Score below
3. Contaminant Exceedance Factor			
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?			
NAPL (mobile or immobile)	8		
High (>100x)	6		
Medium (10x to 100x)	4		
Low (1x to 10x)	2		
Do Not Know		4	
3. Contaminant Exceedance Factor Subtotal			enter into Summary Score Sheet and add to Raw Total Score below

CCME National Classification System (2008) version 1.3

(I) Contaminant Characteristics

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
4. Contaminant Quantity (known or strongly suspected)			
What is the known or strongly suspected quantity of all contaminants?			
>10 hectare (ha) or 5000 m^3	9		
2 to 10 ha or 1000 to 5000 m^3	6		
<2 ha or 1000 m^3	2		
Do Not Know		4	
4. Contaminant Quality Subtotal			enter into Summary Score Sheet and add to Raw Total Score below
5. Modifying Factors			
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment?			
Yes	2		
No	0		
Do Not Know		1	
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location?			
Yes	2		
No	0		
Do Not Know		1	
How many different contaminant classes have representative CCME guideline exceedances?			
One	0		
Two to Four	2		
Five or More	3		
Do Not Know		2	
5. Modifying Factor Subtotal			enter into Summary Score Sheet and add to Raw Total Score below

Contaminant Characteristic Total

Raw Total Score			add up each Subtotal Column
Raw Combined Total Score (Known + Potential)			add two values above
Adjusted Total Score (Raw Combined / 40 * 33)			maximum 33

Total Number of Times that "Do Not Know" was Selected	

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
1. Groundwater Movement			
A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.			
i) For **potable groundwater environments**, 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For **non-potable environments** (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the appropriate non potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.	12		
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	9		
iii) Meets GCDWQ for **potable environments**; meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for **non-potable environments** **or** Absence of groundwater exposure pathway (*i.e.,* there is no aquifer at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).	0		
		Go to Potential (1B)	
Score (go to 2A)		enter into Summary Score Sheet (Section 1 - Known) and add to Raw Total Score below	

NOTE: If a score is assigned here for Known COPC Exceedances, then you should skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
B. Potential for groundwater pathway.			
a. Relative mobility of contaminant			
High		4	
Moderate		2	
Low		1	
Insignificant		0	
Do Not Know		2	
b. Presence of engineered sub-surface containment?			
No containment		3	
Partial containment		1.5	
Full containment		0	
Do Not Know		1.5	
c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway			
3 m or less including no confining layer or discontinuous confining layer		1	
3 to 10 m		0.5	
> 10 m		0	
Do Not Know		0.5	
d. Hydraulic conductivity of confining layer			
$>10^{-4}$ cm/s or no confining layer		1	
10^{-4} to 10^{-6} cm/s		0.5	
$<10^{-6}$ cm/s		0	
Do Not Know		0.5	
e. Precipitation infiltration rate (Annual precipitation factor x surface soil relative permeability factor)			
High (infiltration score > 0.6)		1	
Moderate (0.4 < infiltration score ≤ 0.6)		0.6	
Low (0.2 < infiltration score ≤ 0.4)		0.4	
Very Low (0 < infiltration score ≤ 0.2)		0.2	
None (infiltration score = 0)		0	
Do Not Know		0.4	
f. Hydraulic conductivity of aquifer			
$>10^{-2}$ cm/s		2	
10^{-2} to 10^{-4} cm/s		1	
$<10^{-4}$ cm/s		0	
Do Not Know		1	
1B Potential for groundwater pathway Subtotal			enter into Summary Score Sheet (Section 1 - Potential) and add to Raw Total Score below Note: if a "Known" score is provided, the "Potential" score is disallowed

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
2. Surface Water Movement			
A. Demonstrated migration of COPC in surface water above background conditions			
Known concentrations of surface water: i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by >1 X; or There is known contact of contaminants with surface water based on site observations. or In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (*e.g.,* toxicity testing; or other indicator testing of exposure).	12		
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	8		
iii) Meets CWQG or absence of surface water exposure pathway (*e.g.,* Distance to nearest surface water is > 5 km.)	0		
		Go to Potential (2B)	
Score (go to 3A)		enter into Summary Score Sheet (Section 2 - Known) and add to Raw Total Score below	

NOTE: If a score is assigned here for Demonstrated Migration in Surface Water, then you should skip Part B (Potential for migration of COPCs in surface water) and go to Section 3 (Surface Soils)

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
B. Potential for migration of COPCs in surface water			
a. Presence of containment			
No containment		5	
Partial containment		3	
Full containment		0.5	
Do Not Know		3	
b. Distance to Surface Water			
0 to <100 m		3	
100 - 300 m		2	
>300 m		0.5	
Do Not Know		2	
c. Topography			
Contaminants above ground level and slope is steep		2	
Contaminants at or below ground level and slope is		1.5	
Contaminants above ground level and slope is intermediate		1.5	
Contaminants at or below ground level and slope is intermediate		1	
Contaminants above ground level and slope is flat		0.5	
Contaminants at or below ground level and slope is flat		0	
Do Not Know		1	
d. Run-off potential			
High (run-off score > 0.6)		1	
Moderate (0.4 < run-off score ≤ 0.6)		0.6	
Low (0.2 < run-off score ≤ 0.4)		0.4	
Very Low (0 < run-off score ≤ 0.2)		0.2	
None (run-off score = 0)		0	
Do Not Know		0.4	
e. Flood potential			
1 in 2 years		1	
1 in 10 years		0.5	
1 in 50 years		0.2	
not in floodplain		0	
Do Not Know		0.5	
2B. Potential for Surface water pathway subtotal			enter into Summary Score Sheet (Section 2 - Potential) and add to Raw Total Score below Note: if a "Known" score is provided, the "Potential" score is disallowed

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
3. Surface Soils (potential for dust, dermal and ingestion exposure)			
A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)			
COPCs measured in surface soils exceed the CCME soil quality guideline. Strongly suspected that soil exceeds guideline(s). COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	12 9 0	Go to Potential (3B)	
Score (go to 4A)		enter into Summary Score Sheet (Section 3 - Known) and add to Raw Total Score below	

NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you should skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)

B. Potential for a surface soils (top 1.5 m) migration pathway			
a. Are the soils in question covered? Exposed Vegetated Landscaped Paved Do Not Know		 6 4 2 0 4	
b. For what proportion of the year does the site remain covered by snow? 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know		 6 3 0 3	
3B. Potential for Soil pathway Subtotal			enter into Summary Score Sheet (Section 3 - Potential) and add to Raw Total Score below Note: if a "Known" score is provided, the "Potential" score is disallowed

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
4. Vapour			
A. Demonstrated COPCs in vapour.			
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12		
Strongly suspected (based on observations and/or modelling)	9		
Vapour has not been measured (i.e. not detected) and volatile hydrocarbons have not been found in site soils or groundwater, or vapour has been measured (indoor or outdoor) in concentrations not exceeding risk based concentrations.	0		
		Go to Potential (4B)	
Score (go to 5A)		enter into Summary Score Sheet (Section 4 - Known) and add to Raw Total Score below	

NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you should skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)

B. Potential for COPCs in vapour			
a. Relative Volatility based on Henry's Law Constant, H' (dimensionless)			
High (H' > 1.0E-1)		4	
Moderate (H' = 1.0E-1 to 1.0E-3)		2.5	
Low (H' < 1.0E-3)		1	
Not Volatile		0	
Do Not Know		2.5	
b. What is the soil grain size?			
Fine		2	
Coarse		4	
Do Not Know		3	
c. Is the depth to the source less than 10m?			
Yes		2	
No		0	
Do Not Know		1	
d. Are there any preferential pathways?			
Yes		2	
No		0	
Do Not Know		1	
4B. Potential for Vapour pathway Subtotal			enter into Summary Score Sheet (Section 4 - Potential) and add to Raw Total Score below Note: if a "Known" score is provided, the "Potential" score is disallowed

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
5. Sediment Movement			
A. Demonstrated migration of sediments containing COPCs			
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12		
Strongly suspected (based on observations and/or modelling)	9		
Sediments have been contained and there is no indication that sediments will migrate in future. or Sediment meets CCME sediment quality guidelines or absence of sediment exposure pathway (*i.e.,* within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0		
		Go to Potential (5B)	
Score (go to 6)		enter into Summary Score Sheet (Section 5 - Known) and add to Raw Total Score below	

NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you should skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)

B. Potential for sediment migration			
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?			
Yes		0	
No		4	
Do Not Know		2	
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?			
Yes		4	
No		0	
Do Not Know		2	
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?			
Yes		4	
No		0	
Do Not Know		2	
5B. Potential for Sediment pathway Subtotal			enter into Summary Score Sheet (Section 5 - Potential) and add to Raw Total Score below Note: if a "Known" score is provided, the "Potential" score is disallowed

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
6. Modifying Factors			
Are there subsurface utility conduits in the area affected by contamination? Yes No Do Not Know	 4 0	 2	
6. Migration Potential Modifying Factors Subtotal			enter into Summary Score Sheet (Section 6 - Known or Potential) and add to Raw Total Score below

Migration Potential Total

Raw Total Score			add up each Subtotal Column
Raw Combined Total Score (Known + Potential)			add two values above
Adjusted Total Score (Raw Combined / 64 *33)			maximum 33

Total Number of Times that "Do Not Know" was Selected		Do not count "Do Not Know" in Potential sections when a score was assigned in corresponding Known section (applies to sections 1 through 5).

CCME National Classification System (2008) version 1.3

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
1. Human			
A. Known exposure			
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 site)	22		
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10		
No quantified or suspected exposures/impacts in humans.	0	Go to Potential (1B)	
Score (go to 2)		enter into Summary Score Sheet (Section 1 - Known) and add to Raw Combined Total Human Score below	

NOTE: If a score is assigned here for Known Exposure, then you should skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)

B. Potential for human exposure (if no exposure enter a score of zero)			
a) Land use (provides an indication of potential human exposure scenarios)			
Agricultural		3	
Residential / Parkland		2	
Commercial		1	
Industrial		0.5	
Do Not Know		1.5	
b) Indicate the level of accessibility to the contaminated portion of the site (*e.g.,* the potential for coming in contact with contamination)			
Limited barriers to prevent site access; contamination not		2	
Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered.		1	
Controlled access or remote location and contaminants are covered		0	
Do Not Know		1	
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential).			
i) direct contact			
Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated?			
Yes		3	
No		0	
Do Not Know		1.5	

CCME National Classification System (2008) version 1.3

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
B. Potential for human exposure (if no exposure enter a score of zero)			
ii) inhalation (*i.e.,* inhalation of dust, vapour)			
Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)?			
Yes		3	
No		0	
Do Not Know		1.5	
Dust - If there is contaminated surface soil (*e.g.,* top 1.5 m) , indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero.			
Fine		3	
Coarse		1	
Surface soil is not contaminated or absent (bedrock)		0	
Do Not Know Texture		2	
iii) Ingestion (*i.e.,* ingestion of food items, water and soils [for children]), including traditional foods.			
Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future).			
0 to 100 m		3	
100 to 300 m		2.5	
300 m to 1 km		2	
1 to 5 km		1.5	
No drinking water present		0	
No potential for aquifer contamination		0	
Do Not Know		2	
Is an alternative water supply readily available?			
Yes		0	
No		1	
Not Applicable		0	
Do Not Know		0.5	
Is human ingestion of contaminated soils possible?			
Yes		3	
No		0	
Do Not Know		1.5	
Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?			
Yes		1	
No		0	
Do Not Know		0.5	
1B Potential for Human Exposure Subtotal			enter into Summary Score Sheet (Section 1 - Potential) and add to Raw Combined Total Human Score below. Note: if a "Known" score is provided, the "Potential" score is disallowed.

CCME National Classification System (2008) version 1.3

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
2. Human Exposure Modifying Factors			
a) Strong reliance of local people on natural resources for survival (*i.e.,* food, water, shelter, etc.) in contaminated area.			
Yes	6		
No	0		
Do Not Know		1	
2. Human Exposure Modifying Factors Subtotal			enter into Summary Score Sheet (Section 2 - Known or Potential) and add to Raw Combined Total Human Score below
3. Ecological			
A. Known exposure			
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.	18		
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	12		
No quantified or suspected exposures/impacts in terrestrial or aquatic organisms	0		
		Go to Potential (3B)	
Score (go to 4)			enter into Summary Sheet (Section 3 - Known) and add to Raw Combined Total Ecological Score below

Note : If a score is assigned here for Known Exposure, then you should skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)

CCME National Classification System (2008) version 1.3

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
B. Potential for ecological exposure (for the contaminated portion of the site)			
a) Terrestrial			
i) Land use			
Agricultural (or Wild lands)		3	
Residential/Parkland		2	
Commercial		1	
Industrial		0.5	
Do Not Know		1.5	
ii) Uptake potential			
Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site?			
Yes		1	
No		0	
Do Not Know		0.5	
iii) Ingestion (*i.e.,* wildlife or domestic animals ingesting contaminated food items, soils or water)			
Are terrestrial animals likely to be ingesting contaminated water at the site?			
Yes		1	
No		0	
Do Not Know		0.5	
Are terrestrial animals likely to be ingesting contaminated soils at the site?			
Yes		1	
No		0	
Do Not Know		0.5	
Can the contamination identified bioaccumulate?			
Yes		1	
No		0	
Do Not Know		0.5	
Distance to sensitive terrestrial ecological area			
0 to 300 m		3	
300 m to 1 km		2	
1 to 5 km		1	
> 5 km		0.5	
Do Not Know		1.5	

CCME National Classification System (2008) version 1.3

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
B. Potential for ecological exposure (for the contaminated portion of the site)			
b) Aquatic			
i) Classification of aquatic environment			
Sensitive		3	
Typical		1	
Not Applicable (no aquatic environment present)		0	
Do Not Know		2	
ii) Uptake potential			
Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact?			
Yes		1	
No (or Not Applicable)		0	
Do Not Know		0.5	
Distance from the contaminated site to an important surface water resource			
0 to 300 m		3	
300 m to 1 km		2	
1 to 5 km		1	
> 5 km		0.5	
Do Not Know		1.5	
Are aquatic species (*i.e.,* forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues?			
Yes		1	
No (or Not Applicable)		0	
Do Not Know		0.5	
3B Potential for Ecological Exposure Subtotal			enter into Summary Score Sheet (Section 3 - Potential) and add to Raw Combined Total Ecological Score below. Note: if a "Known" score is provided, the "Potential" score is disallowed.

CCME National Classification System (2008) version 1.3

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
4. Ecological Exposure Modifying Factors			
a) Known, or potential, occurrence of a species at risk.			
Is there a potential for a species at risk to be present at the site, or a known presence?			
Yes	2		
No	0		
Do Not Know		1	
b) Potential impact of aesthetics (*e.g.,* enrichment of a lake or tainting of food flavor).			
Is there evidence of aesthetic impact to receiving water bodies?			
Yes	2		
No	0		
Do Not Know		1	
Is there evidence of olfactory impact (*i.e.,* unpleasant smell)?			
Yes	2		
No	0		
Do Not Know		1	
Is there evidence of increase in plant growth in the lake or water body?			
Yes	2		
No	0		
Do Not Know		1	
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different?			
Yes	2		
No	0		
Do Not Know		1	
4. Ecological Exposure Modifying Factors Subtotal			enter into Summary Score Sheet (Section 4 - Known and/or Potential) and add to Raw Combined Total Ecological Score below

CCME National Classification System (2008) version 1.3

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
5. Other Potential Contaminant Receptors			
a) Exposure of permafrost (leading to erosion and structural concerns)			
Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity?			
Yes	4		
No	0		
Do Not Know		2	
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment?			
Yes	2		
No	0		
Do Not Know		1	
5. Other Potential Contaminant Receptors Subtotal			enter into Summary Score Sheet (Section 5 - Known and/or Potential) and add to Total Other Receptors Score below

Exposure Total		
Raw Combined Total Human Score (Known + Potential)		add up all Subtotals for Human Exposure and Human Modifying Factors (Known + Potential)
Raw Combined Total Ecological Score (Known + Potential)		add up all Subtotals for Ecological Exposure and Ecological Modifying Factors (Known + Potential)
Total Other Receptors Score (Known + Potential)		add up Subtotals for Other Potential Contaminant Receptors (Known + Potential)
Adjusted Total Human Score		Enter the Raw Combined Total Human Score from above, or 22, whichever is lower
Adjusted Total Ecological Score		Enter the Raw Combined Total Ecological Score from above, or 18, whichever is lower
Total Exposure Score		add three values above (*i.e.,* Total Other, Adjusted Human, Adjusted Ecological)
Adjusted Total Score (Total Exposure / 46 * 34)		maximum 34

Total Number of Times that "Do Not Know" was Selected		Do not count "Do Not Know" in Potential sections when a score was assigned in corresponding Known sections (applies to section 1 and 3).

APPENDIX V

SUMMARY SCORE SHEET

CCME National Classification System (2008) version 1.3

Appendix V - Score Summary

Scores from individual worksheets are tallied in this worksheet.
Refer to this sheet after filling out the NCSCS completely.

I. Contaminant Characteristics

	Known	Potential
1. Residency Media		
2. Chemical Hazard		
3. Contaminant Exceedance Factor		
4. Contaminant Quantity		
5. Modifying Factors		
Raw Total Score		
Raw Combined Total Score (Known + Potential)		

Adjusted Total Score (Raw Combined Total /40*33) _____ (maximum 33)
(use for Total NCSCS Score)

II. Migration Potential

	Known	Potential
1. Groundwater Movement		
2. Surface Water Movement		
3. Soil		
4. Vapour		
5. Sediment Movement		
6. Modifying Factors		
Raw Total Score		
Raw Combined Total Score (Known + Potential)		

Adjusted Total Score (Raw Combined Total /64*33) _____ (maximum 33)
(use for Total NCSCS Score)

III. Exposure

	Known	Potential
1. Human Receptors		
2. Human Receptors Modifying Factors		
Raw Total Human Score		
(Add values in Sections 1 and 2 above)		
Raw Combined Total Human Score (Known + Potential)	_____	add two values above
Adjusted Total Human Score	_____	(maximum 22)
(Enter the Raw Total above, or 22, whichever is lower)		
3. Ecological Receptors		
4. Ecological Receptors Modifying Factors		
Raw Total Ecological Score		
(Add values in Sections 3 and 4 above)		
Raw Combined Total Ecological Score (Known + Potential)	_____	add two values above
Adjusted Total Ecological Score	_____	(maximum 18)
(Enter the Raw Total above, or 18, whichever is lower)		
5. Other Receptors		
Total Other Receptors Score (Known + Potential)	_____	add two values above
Total Exposure Score (Human + Ecological + Other)	_____	add Adjusted Totals for Human, Ecological, and Other Receptors
Adjusted Total Score (Total Exposure /46*34)	_____	(maximum 34)
(use for Total NCSCS Score)		

Site Score

Site (from Appendix II):

Site Letter Grade		
Certainty Percentage		(Number of gray-shaded boxes with values) / 16 x 100%
% Responses that are "Do Not Know"		(Total number of "Do Not Know" responses from 3 worksheets) / 58 x 100%
Total NCSCS Score for site		
Site Classification Category		

Site Classification Categories*:

Class 1** - High Priority for Action (Total NCS Score >70)
Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
Class N - Not a Priority for Action (Total NCS Score <37)
Class INS - Insufficient Information (≥15% of Responses are "Do Not Know", or a site letter grade of F has been assigned)

* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.
**assign Class 1 if "Known" human exposure = 22

APPENDIX VI

REFERENCE MATERIAL

CCME National Classification System (2008) version 1.3
Appendix VI - Reference Material

Table VI. 1 - Contaminant Hazard Ranking

(Based on the Proposed Hazard Ranking developed for the FCSAP Contaminated Sites Classification System)
This information is used in Sheet I (Contaminant Characteristics), section 2 (Chemical Hazard).

Chemical/Parameter	Hazard	CEPA	Carcinogenicity	Notes
Acetaldehyde	H	*	PHC	
Acetone	L			
Acrolein	H	*		
Acrylonitrile	H	*	PHC	
Alachlor	M			
Aldicarb	H			
Aldrin	H			
Allyl Alcohol	H			
Aluminum	L			
Ammonia	L	*		
Antimony	H			
Arsenic	H	*		
Atrazine	M			
Azinphos-Methyl	H			
Barium	L			
Bendiocarb	H			
Benzene	H	*	CHC	BTEX
Benzidine	H	*	CHC	
Beryllium	H		CHC	
Biphenyl, 1,1-	M			
2,3,4,5-Bis(2-Butylene)tetrahydro-2-furfural	H			
Bis(Chloromethyl)Ether	H	*	CHC	
Bis(2-Chloroethyl)Ether	H		CHC	
Bis(2-Chloroisopropyl)Ether	H			
Bis(2-Ethylhexyl)Phthalate	H	*		PH
Boron	L			
Bromacil	M			
Bromate	M			
Bromochlorodifluoromethane	M	*		HM
Bromochloromethane	H	*		HM
Bromodichloromethane	H			HM
Bromoform (Tribromomethane)	H		PHC	HM
Bromomethane	M			HM
Bromotrifluoromethane	M	*		HM
Bromoxynil	H			
Butadiene, 1,3-	H	*	CHC	
Cadmium	H	*	CHC	
Carbofuran	M			
Carbon Tetrachloride (Tetrachloromethane)	H		PHC	HM
Captafol	M			
Chloramines	M	*		
Chloride	L			
Chloroaniline, P-	H			
Chlorobenzene (mono)	M			

Chemical/Parameter	Hazard	CEPA	Carcinogenicity	Notes
Chlorobenzilate	M			
Chlorodimeform	M			
Chloroform	H		PHC	HM
Chloromethane	M			
Chloromethyl Methyl Ether	M	*		
(4-Chlorophenyl)Cyclopropylmethanone, O-((4-Nitrophenyl)Methyl)Oxime	H			
Chlorinated Benzenes				
Monochlorobenzene	M			
Dichlorobenzene, 1,2- (O-DCB)	M			
Dichlorobenzene, 1,3- (M-DCB)	M			
Dichlorobenzene, 1,4- (P-DCB)	H			
Trichlorobenzene, 1,2,3-	M			
Trichlorobenzene, 1,2,4-	M			
Trichlorobenzene, 1,3,5-	M			
Tetrachlorobenzene, 1,2,3,4-	M			
Tetrachlorobenzene, 1,2,3,5-	M			
Tetrachlorobenzene, 1,2,4,5-	M			
Pentachlorobenzene	M			
Hexachlorobenzene	H			
Chlorinated Ethanes				
Dichloroethane, 1,1-	M			
Dichloroethane, 1,2- (Ethylene Dichloride (EDC))	H		PHC	
Trichloroethane, 1,1,1-	H	*		
Trichloroethane, 1,1,2-	M			
Tetrachloroethane, 1,1,1,2-	M			
Tetrachloroethane, 1,1,2,2-	M			
Chlorinated Ethenes				
Monochloroethene (Vinyl Chloride)	H	*	CHC	
Dichloroeth(yl)ene, 1,1-	H			
Dichloroeth(yl)ene, 1,2- (cis or trans)	M			
Trichloroeth(yl)ene (TCE)	H	*		
Tetrachloroeth(yl)ene (PCE)	H	*		
Chlorinated Phenols		*		
Monochlorophenols	M			
Chlorophenol, 2-	M			
Dichlorophenols				
Dichlorophenol, 2,4-	M			
Trichlorophenols				
Trichlorophenol, 2,4,5-	H			
Trichlorophenol, 2,4,6-	H		PHC	
Tetrachlorophenols				
Tetrachlorophenol, 2,3,4,6-	H			
Pentachlorophenol (PCP)	H			
Chloromethane	M			HM
Chlorophenol, 2-	M			CP
Chlorothalonil	H			
Chlorpyrifos	H			
Chromium (Total)	M	*		
Chromium (III)	L	*		
Chromium (VI)	H	*	CHC	

Chemical/Parameter	Hazard	CEPA	Carcinogenicity	Notes
Coal Tar	H		CHC	Refer to PAHs
Cobalt	L			
Copper	L			
Creosote	M	*		Refer to PAHs
Crocidolite	L			
Cyanide (Free)	H			
Cyanazine	M			
Dibenzofuran	H	*		DF
Dibromoethane, 1,2- (Ethylene Dibromide (EDB))	H		PHC	
1,2-Dibromo-3-Chloropropane	H		PHC	
Dibromochloromethane	M	*		HM
Dibromotetrafluoroethane	M			
Dichlorobenzene, 1,2- (O-DCB)	M			CB
Dichlorobenzene, 1,3- (M-DCB)	M			CB
Dichlorobenzene, 1,4- (P-DCB)	H			CB
Dichlorobenzidine, 3,3'-	H		PHC	
DDD	H			
DDE	H			
DDT	H		PHC	
Deltamethrin	M			
Diazinon	M			
Dicamba	H			
Dichloroethane, 1,1-	H			CEA
Dichloroethane, 1,2- (EDC)	H		PHC	CEA
Dichloroeth(yl)ene, 1,1-	H			CEE
Dichloroeth(yl)ene, Cis-1,2-	M			CEE
Dichloroeth(yl)ene, Trans-1,2-	M			CEE
Dichloromethane (Methylene Chloride)	H		PHC	HM
Dichlorophenol, 2,4-	M			CP
Dichloropropane, 1,2-	H			
Dichloropropene, 1,3-	H		PHC	
Diclofop-Methyl	H			
Didecyl Dimethyl Ammonium Chloride	H			
Dieldrin	H			
Dimethoate	H			
Diethyl Phthalate	M			PH
Diethylene Glycol	L			GL
Dimethyl Phthalate	M			PH
Dimethylphenol, 2,4-	L			
Dinitrophenol, 2,4-	M			
Dinitrotoluene, 2,4-	H			
Dinoseb	H			
Di-n-octyl Phthalate	H			
Dioxane, 1,4-	H		PHC	
Dioxins/Furans	H			
Diquat	M			
Diuron	M			
Endosulfan	H			
Endrin	H			
Ethylbenzene	M			BTEX
Ethylene Dibromide (EDB)	H		PHC	
Ethylene Glycol	L			GL

Chemical/Parameter	Hazard	CEPA	Carcinogenicity	Notes
Ethylene Oxide	H		CHC	
Fluoroacetamide	M			
Fluorides	L	*		
Glycols				
Ethylene Glycol	L			
Diethylene Glycol	L			
Propylene Glycol	L			
Glyphosate	M			
Halogenated Methanes				
Bromochlorodifluoromethane	M	*		
Bromochloromethane	M	*		
Bromodichloromethane	H		PHC	
Bromomethane	M			
Bromotrifluoromethane	M	*		
Chloroform	M		PHC	HM
Chloromethane	M			
Dibromochloromethane	M			
Dichloromethane (Methylene Chloride)	H		PHC	
Methyl Bromide	M	*		
Tetrachloromethane (Carbon Tetrachloride)	H			
Tribromomethane (Bromoform)	H			
Trihalomethanes (THM)	M			
Heptachlor	H			
Heptachlor Epoxide	H			
Hexachlorobenzene	H		PHC	
Hexachlorobutadiene	H			
Hexachlorocyclohexane, Gamma	H		PHC	
Hexachloroethane	H		PHC	
Hydrobromofluorocarbons (HBFCS)	M	*		
Hydrochlorofluorocarbons (HCFCS)	M	*		
3-Iodo-2-propynyl Butyl Carbamate	H			
Iron	L			
Lead	H	*		neurotoxins / teratogens
Lead Arsenate	H			
Leptophos	H			
Lindane	H			
Linuron	H			
Lithium	L			
Malathion	M			
Manganese	L			
Mercury	H	*		
Methamidophos	H			
Methoxylchlor	H			
Methyl Bromide (Bromomethane)	M	*		
2-Methyl-4-chloro-phenoxy Acetic Acid	M			
Methyl Ethyl Ketone	L			
Methyl Isobutyl Ketone	L			
Methyl Mercury	H			

Chemical/Parameter	Hazard	CEPA	Carcinogenicity	Notes
Methyl-Parathion	H			
Methyl Tert Butyl Ether (MTBE)	M			
Metolachlor	M			
Metribuzin	H			
Molybdenum	L			
Monochloramine	M			
Monocrotophos	H			
Nickel	H	*		CEPA - inhalation
Nitrilotriacetic Acid	H		PHC	
Nitrate	L			
Nitrite	M			
Nonylphenol + Ethoxylates	H	*		
Organotins				
Tributyltin	H			
Tricyclohexyltin	H			
Triphenyltin	H			
Parathion	H			
Paraquat (as Dichloride)	H			
Pentachlorobenzene	M			CB
Pentachlorophenol (PCP)	H			CP
Petroleum Hydrocarbons				Ranking based upon fraction of toxic and mobile components in product. Lighter compounds such as benzene are more toxic and mobile.
Petroleum Hydrocarbons (Gasoline)	H			
Petroleum Hydrocarbons (Kerosene incl. Jet Fuels)	H			
Petroleum Hydrocarbons (Diesel incl Heating Oil)	M			
Petroleum Hydrocarbons (Heavy Oils)	L			
Petroleum Hydrocarbons (CCME F1)	H			
Petroleum Hydrocarbons (CCME F2)	M			
Petroleum Hydrocarbons (CCME F3)	L			
Petroleum Hydrocarbons (CCME F4)	L			
Phenol	L			
Phenoxy Herbicides	M			
Phorate	H			
Phosphamidon	H			
Phthalate Esters				
Bis(2-Ethylhexyl)Phthalate	H	*		
Diethyl Phthalate	H			
Dimethyl Phthalate	H			
Di-n-octyl Phthalate	H			
Polybrominated Biphenyls (PBB)	H	*		
Polychlorinated Biphenyls (PCB)	H			
Polychlorinated Terphenyls	H	*		
Polycyclic Aromatic Hydrocarbons	H	*	PHC	
Acenaphthene	M			
Acenaphthylene	M			
Acridine	H			
Anthracene	M			
Benzo(a)anthracene	H		PHC	
Benzo(a)pyrene	H		PHC	
Benzo(b)fluoranthene	H		PHC	

Chemical/Parameter	Hazard	CEPA	Carcinogenicity	Notes
Benzo(g,h,i)perylene	H			
Benzo(k)fluoranthene	H		PHC	
Chrysene	M			
Dibenzo(a,h)anthracene	H		PHC	
Fluoranthene	M			
Fluorene	M			
Indeno(1,2,3-c,d)pyrene	H		PHC	
Methylnaphthalenes	M			
Naphthalene	M			
Phenanthrene	M			
Pyrene	M			
Quinoline	H			
Propylene Glycol	L			GL
Radium	H			
Radon	H			
Selenium	M			
Silver	L			
Simazine	M			
Sodium	L			
Strontium-90	H			
Strychnine	H			
Styrene	H			
Sulphate	L			
Sulphide	L			
2,3,7,8-Tetrachlorodibenzo-p-dioxins (TCDD)	H	*		DF
Tebuthiuron	H			
Tetrachloroeth(yl)ene (PCE)	H	*		CEE
Tetraethyl Lead	H			
Tetrachlorobenzene, 1,2,3,4-	H			CB
Tetrachlorobenzene, 1,2,3,5-	H			CB
Tetrachlorobenzene, 1,2,4,5-	H			CB
Tetrachloroethane, 1,1,1,2-	M			CEA
Tetrachloroethane, 1,1,2,2-	M			CEA
Tetrachlorophenol, 2,3,4,6-	H			CP
Tetramethyl Lead	H	*		
Thallium	M			
Thiophene	M			
Tin	L			
Toluene	M			BTEX
Toxaphene	H			
Triallate	M			
Tribromomethane (Bromoform)	H			HM
Tributyltetradecylphosphonium Chloride	H	*		
Trichlorobenzene, 1,2,3-	H			CB
Trichlorobenzene, 1,2,4-	H			CB
Trichlorobenzene, 1,3,5-	H			CB
Trichloroethane, 1,1,1-	H	*		CEA
Trichloroethane, 1,1,2-	M			CEA
Trichloroeth(yl)ene (TCE)	H	*		CEE
Tricyclohexyltin Hydroxide	H			
Trichlorophenol, 2,4,5-	H			CP

Chemical/Parameter	Hazard	CEPA	Carcinogenicity	Notes
Trichlorophenol, 2,4,6-	H		PHC	CP
Trifluralin	H			
Trihalomethanes (THM)	M			
Tris(2,3-Dibromopropyl)phosphate	H			
Tritium	L			
Uranium (Non-radioactive) / (Radioactive)	M/H			
Vanadium	M			
Vinyl Chloride	H	*	CHC	CEE
Xylenes	M			BTEX
Zinc	L			

H = High Hazard
M = Medium Hazard
L = Low Hazard
Hazard ratings based on a number of factors including potential human and ecological health effects.

PHC = Potential Human Carcinogen
CHC = Confirmed Human Carcinogen

BTEX = benzene, toluene, ethylbenzene, and xylenes
CB = chlorobenzenes
CEA = chlorinated ethanes
CEE = chlorinated ethenes
CP = chlorophenols
DF = dioxins and furans
GL = glycols
HM = halomethanes
PAH = polycyclic aromatic hydrocarbons
PH = phthalate esters

CCME National Classification System (2008) version 1.3
Appendix VI - Reference Material

Table VI.2 - Examples of Persistent Substances

This information is used in Sheet I (Chemical Characteristics), section 5 (Modifying Factors).

aldrin	dieldrin	PCBs
benzo(a)pyrene	hexachlorobenzene	PCDDs/PCDFs (dioxins and furans)
chlordane	methylmercury	toxaphene
DDT	mirex	alkylated lead
DDE	octachlorostyrene	

Table VI. 3 - Examples of Substances in the Various Chemical Classes

This information is used in Sheet I (Chemical Characteristics), section 5 (Modifying Factors).

Chemical Class	Examples *
inorganic substances (including metals)	arsenic, barium, cadmium, hexavalent chromium, copper, cyanide, fluoride, lead, mercury, nickel, selenium, sulphur, zinc; brines or salts
volatile petroleum hydrocarbons (PHC)	benzene, toluene, ethylbenzene, xylenes, PHC F1
light extractable PHCs	PHC F2
heavy extractable PHCs	PHC F3
PAHs	Benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, pyrene
phenolic substances	phenol, pentachlorophenol, chlorophenols, nonchlorinated phenols (*e.g.,* 2,4-dinitrophenol, cresol, etc.)
chlorinated hydrocarbons	PCBs, tetrachloroethylene, trichloroethylene, dioxins and furans, trichlorobenzene, tetrachlorobenzene, pentachlorobenzene, hexachlorobenzene
halogenated methanes	carbon tetrachloride, chloroform, dichloromethane
phthalate esters	di-isononyl phthalate (DINP), di-isodecyl phthalate (DIDP), di-2-ethylhexyl phthalate (DEHP)
pesticides	DDT, hexachlorocyclohexane

* Note: Specific chemicals that belong to the various classes are not limited to those listed in this table. These lists are not exhaustive and are meant just to provide examples of substances that are typically encountered.

Table VI.4 - Chemical-specific Properties
(Adapted from USEPA Soil Screening Criteria)

The information on Koc is used in Sheet II (Migration Potential), section 1,B,a (Relative Mobility).
The information on the dimensionless Henry's law constant is used in Sheet II (Migration Potential), section 4,B,a (Relative Volatility).
The information on log Kow is used in Sheet III (Exposure), section 3,B,a,iii (Potential for Ecological Exposure - terrestrial ingestion), and section 3,B,b,ii (Potential for Ecological Exposure - aquatic uptake potential).

CAS No.	Compound	Solubility in Water @ 20-25°C (mg/L)	Henry's Law Constant (atm-m3/mol)	Dimensionless Henry's law constant (HLC [atm-m3/mol] * 41) (25 °C).	log Kow	Log Koc (L/kg)
83-32-9	Acenaphthene	4.24E+00	1.55E-04	6.36E-03	3.92	3.85
67-64-1	Acetone	1.00E+06	3.88E-05	1.59E-03	-0.24	-0.24
309-00-2	Aldrin	1.80E-01	1.70E-04	6.97E-03	6.5	6.39
120-12-7	Anthracene	4.34E-02	6.50E-05	2.67E-03	4.55	4.47
56-55-3	Benz(a)anthracene	9.40E-03	3.35E-06	1.37E-04	5.7	5.6
71-43-2	Benzene	1.75E+03	5.55E-03	2.28E-01	2.13	1.77
205-99-2	Benzo(b)fluoranthene	1.50E-03	1.11E-04	4.55E-03	6.2	6.09
207-08-9	Benzo(k)fluoranthene	8.00E-04	8.29E-07	3.40E-05	6.2	6.09
65-85-0	Benzoic acid	3.50E+03	1.54E-06	6.31E-05	1.86	—
50-32-8	Benzo(a)pyrene	1.62E-03	1.13E-06	4.63E-05	6.11	6.01
111-44-4	Bis(2-chloroethyl)ether	1.72E+04	1.80E-05	7.38E-04	1.21	1.19
117-81-7	Bis(2-ethylhexyl)phthalate	3.40E-01	1.02E-07	4.18E-06	7.3	7.18
75-27-4	Bromodichloromethane	6.74E+03	1.60E-03	6.56E-02	2.1	1.74
75-25-2	Bromoform	3.10E+03	5.35E-04	2.19E-02	2.35	1.94
71-36-3	Butanol	7.40E+04	8.81E-06	3.61E-04	0.85	0.84
85-68-7	Butyl benzyl phthalate	2.69E+00	1.26E-06	5.17E-05	4.84	4.76
86-74-8	Carbazole	7.48E+00	1.53E-08	6.26E-07	3.59	3.53
75-15-0	Carbon disulfide	1.19E+03	3.03E-02	1.24E+00	2	1.66
56-23-5	Carbon tetrachloride	7.93E+02	3.04E-02	1.25E+00	2.73	2.24
57-74-9	Chlordane	5.60E-02	4.86E-05	1.99E-03	6.32	5.08
106-47-8	*p-Chloroaniline*	5.30E+03	3.31E-07	1.36E-05	1.85	1.82
108-90-7	Chlorobenzene	4.72E+02	3.70E-03	1.52E-01	2.86	2.34
124-48-1	Chlorodibromomethane	2.60E+03	7.83E-04	3.21E-02	2.17	1.8
67-66-3	Chloroform	7.92E+03	3.67E-03	1.50E-01	1.92	1.6
95-57-8	2-Chlorophenol	2.20E+04	3.91E-04	1.60E-02	2.15	—
218-01-9	Chrysene	1.60E-03	9.46E-05	3.88E-03	5.7	5.6
72-54-8	DDD	9.00E-02	4.00E-06	1.64E-04	6.1	6
72-55-9	DDE	1.20E-01	2.10E-05	8.61E-04	6.76	6.65
50-29-3	DDT	2.50E-02	8.10E-06	3.32E-04	6.53	6.42
53-70-3	Dibenz(a,h)anthracene	2.49E-03	1.47E-08	6.03E-07	6.69	6.58
84-74-2	Di-n-butyl phthalate	1.12E+01	9.38E-10	3.85E-08	4.61	4.53
95-50-1	1,2-Dichlorobenzene	1.56E+02	1.90E-03	7.79E-02	3.43	2.79
106-46-7	1,4-Dichlorobenzene	7.38E+01	2.43E-03	9.96E-02	3.42	2.79
91-94-1	3,3-Dichlorobenzidine	3.11E+00	4.00E-09	1.64E-07	3.51	2.86
75-34-3	1,1-Dichloroethane	5.06E+03	5.62E-03	2.30E-01	1.79	1.5
107-06-2	1,2-Dichloroethane	8.52E+03	9.79E-04	4.01E-02	1.47	1.24
75-35-4	1,1-Dichloroethylene	2.25E+03	2.61E-02	1.07E+00	2.13	1.77
156-59-2	cis-1,2-Dichloroethylene	3.50E+03	4.08E-03	1.67E-01	1.86	1.55
156-60-5	trans-1,2-Dichloroethylene	6.30E+03	9.38E-03	3.85E-01	2.07	1.72
120-83-2	2,4-Dichlorophenol	4.50E+03	3.16E-06	1.30E-04	3.08	—
78-87-5	1,2-Dichloropropane	2.80E+03	2.80E-03	1.15E-01	1.97	1.64
542-75-6	1,3-Dichloropropene	2.80E+03	1.77E-02	7.26E-01	2	1.66
60-57-1	Dieldrin	1.95E-01	1.51E-05	6.19E-04	5.37	4.33
84-66-2	Diethylphthalate	1.08E+03	4.50E-07	1.85E-05	2.5	2.46
105-67-9	2,4-Dimethylphenol	7.87E+03	2.00E-06	8.20E-05	2.36	2.32
51-28-5	2,4-Dinitrophenol	2.79E+03	4.43E-07	1.82E-05	1.55	—
121-14-2	2,4-Dinitrotoluene	2.70E+02	9.26E-08	3.80E-06	2.01	1.98

CAS No.	Compound	Solubility in Water @ 20-25°C (mg/L)	Henry's Law Constant (atm-m3/mol)	Dimensionless Henry's law constant (HLC [atm-m3/mol] * 41) (25 °C).	log Kow	Log Koc (L/kg)
606-20-2	2,6-Dinitrotoluene	1.82E+02	7.47E-07	3.06E-05	1.87	1.84
117-84-0	Di-n-octyl phthalate	2.00E-02	6.68E-05	2.74E-03	8.06	7.92
115-29-7	Endosulfan	5.10E-01	1.12E-05	4.59E-04	4.1	3.33
72-20-8	Endrin	2.50E-01	7.52E-06	3.08E-04	5.06	4.09
100-41-4	Ethylbenzene	1.69E+02	7.88E-03	3.23E-01	3.14	2.56
206-44-0	Fluoranthene	2.06E-01	1.61E-05	6.60E-04	5.12	5.03
86-73-7	Fluorene	1.98E+00	6.36E-05	2.61E-03	4.21	4.14
76-44-8	Heptachlor	1.80E-01	1.09E-03	4.47E-02	6.26	6.15
1024-57-3	Heptachlor epoxide	2.00E-01	9.50E-06	3.90E-04	5	4.92
118-74-1	Hexachlorobenzene	6.20E+00	1.32E-03	5.41E-02	5.89	4.74
87-68-3	Hexachloro-1,3-butadiene	3.23E+00	8.15E-03	3.34E-01	4.81	4.73
319-84-6	a-HCH (a-BHC)	2.00E+00	1.06E-05	4.35E-04	3.8	3.09
319-85-7	b-HCH (b-BHC)	2.40E-01	7.43E-07	3.05E-05	3.81	3.1
58-89-9	g -HCH (Lindane)	6.80E+00	1.40E-05	5.74E-04	3.73	3.03
77-47-4	Hexachlorocyclopentadiene	1.80E+00	2.70E-02	1.11E+00	5.39	5.3
67-72-1	Hexachloroethane	5.00E+01	3.89E-03	1.59E-01	4	3.25
193-39-5	Indeno(1,2,3-cd)pyrene	2.20E-05	1.60E-06	6.56E-05	6.65	6.54
78-59-1	Isophorone	1.20E+04	6.64E-06	2.72E-04	1.7	1.67
7439-97-6	Mercury	—	1.14E-02	4.67E-01	—	—
72-43-5	Methoxychlor	4.50E-02	1.58E-05	6.48E-04	5.08	4.99
74-83-9	Methyl bromide	1.52E+04	6.24E-03	2.56E-01	1.19	1.02
75-09-2	Methylene chloride	1.30E+04	2.19E-03	8.98E-02	1.25	1.07
95-48-7	2-Methylphenol	2.60E+04	1.20E-06	4.92E-05	1.99	1.96
91-20-3	Naphthalene	3.10E+01	4.83E-04	1.98E-02	3.36	3.3
98-95-3	Nitrobenzene	2.09E+03	2.40E-05	9.84E-04	1.84	1.81
86-30-6	N-Nitrosodiphenylamine	3.51E+01	5.00E-06	2.05E-04	3.16	3.11
621-64-7	N-Nitrosodi-n-propylamine	9.89E+03	2.25E-06	9.23E-05	1.4	1.38
1336-36-3	PCBs	—	—	—	5.58	5.49
87-86-5	Pentachlorophenol	1.95E+03	2.44E-08	1.00E-06	5.09	—
108-95-2	Phenol	8.28E+04	3.97E-07	1.63E-05	1.48	1.46
129-00-0	Pyrene	1.35E-01	1.10E-05	4.51E-04	5.11	5.02
100-42-5	Styrene	3.10E+02	2.75E-03	1.13E-01	2.94	2.89
79-34-5	1,1,2,2-Tetrachloroethane	2.97E+03	3.45E-04	1.41E-02	2.39	1.97
127-18-4	Tetrachloroethylene	2.00E+02	1.84E-02	7.54E-01	2.67	2.19
108-88-3	Toluene	5.26E+02	6.64E-03	2.72E-01	2.75	2.26
8001-35-2	Toxaphene	7.40E-01	6.00E-06	2.46E-04	5.5	5.41
120-82-1	1,2,4-Trichlorobenzene	3.00E+02	1.42E-03	5.82E-02	4.01	3.25
71-55-6	1,1,1-Trichloroethane	1.33E+03	1.72E-02	7.05E-01	2.48	2.04
79-00-5	1,1,2-Trichloroethane	4.42E+03	9.13E-04	3.74E-02	2.05	1.7
79-01-6	Trichloroethylene	1.10E+03	1.03E-02	4.22E-01	2.71	2.22
95-95-4	2,4,5-Trichlorophenol	1.20E+03	4.33E-06	1.78E-04	3.9	—
88-06-2	2,4,6-Trichlorophenol	8.00E+02	7.79E-06	3.19E-04	3.7	—
108-05-4	Vinyl acetate	2.00E+04	5.11E-04	2.10E-02	0.73	0.72
75-01-4	Vinyl chloride	2.76E+03	2.70E-02	1.11E+00	1.5	1.27
108-38-3	m-Xylene	1.61E+02	7.34E-03	3.01E-01	3.2	2.61
95-47-6	o-Xylene	1.78E+02	5.19E-03	2.13E-01	3.13	2.56
106-42-3	p-Xylene	1.85E+02	7.66E-03	3.14E-01	3.17	2.59

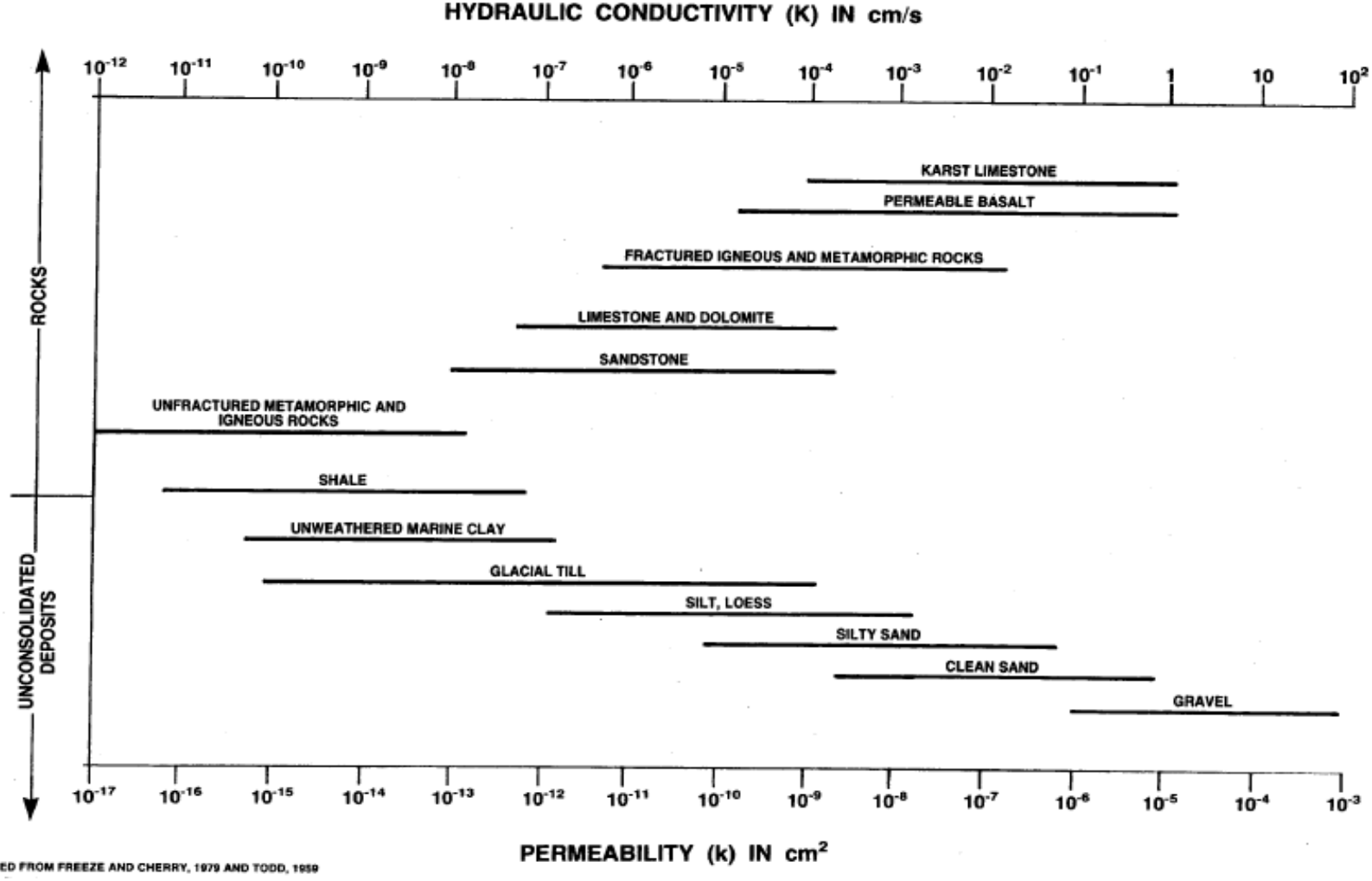
Source: United States Environmental Protection Agency. 1996. Soil Screening Guidance: Technical Background Document. (Part 5: Chemical-Specific Parameters)

CAS = Chemical Abstracts Service
Kow = Octanol/water partition coefficient

Appendix VI - Reference Material (2008) version 1.3

RANGE OF VALUES OF HYDRAULIC CONDUCTIVITY AND PERMEABILITY

The information on Koc is used in Sheet II (Migration Potential), section 1,B,f (Hydraulic Conductivity)



MODIFIED FROM FREEZE AND CHERRY, 1979 AND TODD, 1959