AN INTRODUCTION TO ENVIRONMENTAL SITE ASSESSMENTS

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An Introduction to Environmental Site Assessments

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The information contained in this publication represents current research results available to CMHC and has been reviewed by a wide spectrum of experts in the housing industry. Readers are advised to evaluate the information, materials and techniques cautiously for themselves and to consult appropriate professional resources to determine whether information, materials and techniques are suitable in their case.

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Preface

Canadians are concerned about contamination of soil and groundwater. This problem appears to be growing.

Why is the problem growing? As communities expand, industrial and commercial land is being redeveloped, forcing us to deal with past contamination. At other sites that once seemed to be problem-free, we are discovering contamination that has been dormant for many years. Finally, sites are still being contaminated on a regular basis, despite improved environmental controls.

Part of the solution to the problem is to ensure that contamination does not occur in the first place. However, given our large and growing inventory of contaminated sites, prevention is not enough. We must also deal with the problems that already exist. The good news is that technology is available for both prevention and cleanup.

Existing contamination must first be identified so that decisions can be made about possible solutions. An evaluation procedure known as an environmental site assessment (ESA) is one method for detecting contamination. ESAs estimate the environmental risks associated with particular sites and allow informed decisions to be made.

This booklet is addressed to officials, organizations and individuals involved in all aspects of real estate transactions. It introduces ESAs, discusses why they are useful and describes how they should be carried out. Additional details about the first phase of an ESA are also provided.

This booklet is not a comprehensive reference manual and readers should not treat it as such. *Those who deal with contaminated sites should obtain qualified advice and assistance to supplement the information provided here.*

Chapter 1
Contaminated Sites:

The Problem

What is a contaminated site?

Contaminants are substances that, if present in sufficient quantities, can be harmful to the environment, to humans or to other living organisms. A contaminated site contains one or more of these substances at levels that raise environmental or health concerns.

Contaminants enter the soil in several ways and from many different sources. For example:

- If industrial or commercial operations are not properly managed, accidental spills and careless waste disposal practices can result in contamination by fuels, chemicals and other toxic substances. Spills are common and can occur just about anywhere and anytime. Chemicals spilled many years ago can linger in the soil and still be a problem today. As a result, contaminated land is often found near past or present industrial sites, such as refineries, steel plants, mines, scrap yards and chemical plants. Chemical discharges can also be associated with smaller-scale operations such as dry cleaning outlets, electrical contractors, print shops, waste processors and industrial waste disposal sites.
- Leakage of gasoline or other products from underground storage tanks (USTs) is another common cause of soil contamination. Indeed, contaminated sites are very often found near operating or former gas stations, or at other locations where fuels have been stored in USTs.

- Contamination can sometimes be traced to sites where municipalities bury their garbage. Along with relatively harmless wastes, municipal garbage also contains toxic materials such as solvents, paints and heavy metals. These can leach out of the waste if the site is not well managed. Contamination of nearby property may become a problem, whether the site is operating, has recently closed or has been closed for many years.
- Even land formerly used for farming may be suspect, due to the past use of pesticides and fertilizers or illegal dumping of hazardous wastes.

Why the concern?

The consequences of contamination can be negligible, mild or serious. The range of potential problems is broad, including both acute and long-term human health effects, safety concerns and detrimental effects on plant and animal populations.

Site contamination is a complex problem that seldom goes away by itself and can persist for decades. The problem may not be confined to the site itself, because contaminants often spread far beyond their original source. For instance, depending on local conditions, toxic substances can seep through the soil to the groundwater, which then becomes unfit for drinking. Natural groundwater flow can spread the contaminants over a wide area.

Soil gases from contaminated sites can travel considerable distances. If these gases enter buildings, they can pose a threat to health and safety. For example, occupants can become ill from breathing in even small amounts of these vapours, and methane from landfill sites can create potential explosion hazards.

How widespread is the problem?

Although all the contaminated sites in Canada have not been identified, it is clear that the problem is widespread. The distribution of known contaminated sites is similar to the distribution of past and present industrial and commercial activity. This distribution is not surprising, given the most typical sources of contamination. Developing complete lists of contaminated sites is a difficult task, because not all contaminated sites have been identified, new sites are becoming contaminated and not all spills and leaks are reported.

The box "Counting the Sites . . ." (next page) contains estimates from Environment Canada that provide some idea of the extent of the problem.

COUNTING THE SITES . . .

About 10,000 spills are reported each year in Canada, amounting to thousands of tonnes of fuels and other chemicals. Fuel products comprise about two-thirds of the reported spills. Officials estimate that the total number of unreported spills could be as high as 40,000.

From 7,500 to 20,000 underground storage tanks across Canada are thought to be leaking. As time passes, more of the older tanks will begin to leak due to problems such as corrosion.

There are at least 10,000 landfill sites across Canada. Contaminants may be seeping out of many of these.

Who is at risk, and why?

The health and safety of people who live or work at or very near a contaminated site are directly at risk. The local natural environment is also at risk.

But others can be affected, too. The immediate concern is the potential cleanup cost. Individuals and corporations are, with increasing frequency, being charged and convicted of offences associated with contaminated sites, although they may not have been directly responsible for the contamination. Such cases are expensive and can stain corporate or personal reputations long after a site is cleaned up and the case is closed.

As a result, lending institutions, and those who own, manage or invest in real estate, are learning that it is essential to be concerned about the environmental status of properties with which they are associated.

Chapter 2
Environmental Site Assessments

Part of the solution

An environmental site assessment (ESA) is performed by experts to determine whether or not a site is contaminated. A comprehensive ESA should also identify the nature, location and depth of any contamination. It should measure how much the contamination has spread, provide information about possible corrective action and identify any factors that could make the contamination worse or complicate the cleanup.

An ESA, as conducted in Canada, can consist of up to three distinct phases. Each phase is described briefly below. Further details about Phase I assessments, the focus of this booklet, are provided in Chapters 3 and 4.

Phase 1: Preliminary evaluation

Phase I of an ESA is carried out primarily to identify evidence of actual or potential contamination on a property. It is an information collection process that should include desk research, site inspection, interviews and a written report. For real estate transactions, this initial phase may be thought of as a preliminary risk survey. Phase I does not involve boreholes, soil tests or other intrusive types of sampling or testing.

This preliminary evaluation usually takes one to two weeks. Longer periods may be necessary if information is not readily available. The cost typically ranges from $2,000 to $3,000.

Phase II: Field sampling and analysis

If a Phase I assessment uncovers evidence of contamination or possible contamination, Phase II should follow. The purpose of a Phase II assessment is either to confirm the presence of contaminants or to demonstrate as far as possible that the site is not contaminated. If the problem is confirmed, the Phase II assessment also attempts to identify and describe the pollutants fully and to quantify their concentrations.

Phase II assessments make use of various sampling, analysing and measuring techniques. Some are intrusive techniques, such as drilling, testing and groundwater monitoring; others, such as studies of ambient air, are non-intrusive.

Phase II assessments require specialized capabilities. They are far more expensive than Phase I assessments, typically ranging from $5,000 to $10,000. In some cases, they can reach tens of thousands of dollars in costs. Costs range widely and depend on the nature of the investigation and on local conditions.

Phase I and Phase II assessments are important stepping stones for any remedial efforts that may follow.

Phase III: Remedial investigation

Phase III is an investigation of feasible follow-up approaches to be carried out if Phase II suggests unacceptable levels of contamination. Remedial investigations are site-specific and may have only a limited field component. Examples of Phase III activities include estimating human or environmental exposure (risk assessment) to the contaminants, assessing how to manage the contaminated materials, analysis of the socio-economics of remedial options, development of remediation criteria and development of a cleanup plan. Cleanup itself is not considered to be part of the assessment.

Timing and costs of this phase vary widely.

WHAT AN ESA CANNOT DO

Even the most thorough ESA may not be able to confirm unequivocally that a site is *not* contaminated, or guarantee that a site will not become contaminated in the future. An ESA can only determine that no indicators of contamination are found at the time of the investigation.

WHAT AN ESA IS NOT

The type of site investigation discussed in this booklet should not be confused with an *environmental compliance* or *performance audit* or with an *insurance audit*. A *compliance audit* is a review of a company's operating facilities and practices. Its purpose is to identify aspects of an operation that do not comply with current environmental legislation or company policies. An *insurance audit* is usually more superficial than a compliance audit. Its purpose is to help insurance companies in their underwriting decisions concerning environmental liability insurance policies.

Chapter 3
Phase I of an ESA

Getting started

This chapter discusses reasons for doing a Phase I assessment, and provides guidance on finding a qualified consultant to carry out the work. Chapter 4 outlines the steps involved in Phase I.

Why do a Phase I assessment?

There is currently no legal requirement in Canada to conduct environmental site investigations. However, organizations and individuals who provide mortgages, guarantee mortgages or invest in real estate should note that there are very compelling reasons to insist on an ESA before committing themselves to a transaction. The key reasons fall into three categories: financial, legal and environmental.

Financial reasons

The costs associated with contaminated property can be significant, and may have to be borne entirely or in part by past or present property owners, investors, lenders or even commercial tenants. Examples of potential financial repercussions are presented in the box "The Bottom Line" (next page).

Some of the financial burdens associated with environmental risks can be avoided if certain precautionary steps are followed. For example, when land is offered as security, its environmental acceptability should be assessed. A lender should not acquire title to mortgaged property unless satisfied that there are no indications of contamination on the property. The lender should also ensure that any business conducted on the property does not carry with it an unmanaged risk of contamination.

These precautionary steps depend on good, site-specific information. A Phase I assessment can help provide this information.

THE BOTTOM LINE

If a site is identified as contaminated, its market value will probably fall. A lending organization or individual who takes possession of such a site, due to foreclosure of a mortgage or for any other reason, may find that the property is worth very little. They may even find that the costs of a cleanup exceed the property's value.

A buyer who borrows money to purchase a property that turns out to be contaminated may subsequently be prosecuted for environmental offences and face fines and legal and cleanup costs. These expenses may reduce his or her ability to repay the loan. If lenders then have to take possession of the contaminated property, they may be prosecuted or become liable for the debtor's environmental problems, including clean up costs.

If contamination is found at a site, authorities could order anyone who has any control of the property (or business) to clean it up, whether or not they caused the contamination. Depending on local regulations, anyone who has ever owned or occupied that property may be ordered to participate in the cleanup. Creditors who were previously in possession of a contaminated property, for no matter how short a time, may also be required to cover some or all of the cleanup costs. Compliance with such orders can be extremely expensive.

Neighbours affected by nearby contaminated sites may sue those responsible, or sue current owners who may not even have caused the contamination.

Note: In Canada, the primary legal responsibility for dealing with pollution issues rests with provincial and municipal authorities. Consequently, the actual financial effects on property owners and others vary from jurisdiction to jurisdiction, and with legislative changes.

Legal reasons

"Due diligence," sometimes called "reasonable care," is a legal term for a set of actions taken by individuals or organizations to prevent an offence from occurring. In relation to contaminated sites, due diligence could require that an effective program, designed to prevent environmental problems, has been established and actively maintained. It might be expected that monitoring, improvements and other measures, as required, would back up the program.

A demonstration of due diligence has been used successfully as a defence strategy in legal cases dealing with environmental problems. If a lender or owner becomes involved in legal proceedings concerning contaminants at a particular site, a credible Phase I ESA, with appropriate follow-up, may help support a claim of due diligence.

Environmental reasons

A Phase I assessment may help reduce the environmental damage inflicted by contamination. By identifying potential problems, an ESA can alert those responsible to the need for cleanup or management of the contamination.

A Phase I assessment may also produce baseline environmental information about a site. If investigations are repeated when occupants or site uses change, it becomes possible to monitor ongoing environmental concerns about the property. In cases where a Phase II assessment is required, more detailed information can be developed.

The above points explain why Phase I assessments are *recommended*. In certain cases, a Phase I assessment is actually *required*. During real estate transactions, ESAs may be a condition of purchase. Some lending and insuring institutions may refuse to grant mortgages or provide mortgage insurance if they suspect the property is contaminated. They may insist on an ESA to prove a site's environmental acceptability, even at a formerly contaminated site that has been cleaned up. Several institutions are developing standard procedures to help provide protection from potential environmental liability associated with contaminated sites.

THE CANADA MORTGAGE AND HOUSING CORPORATION POLICY

Canada Mortgage and Housing Corporation (CMHC) now requires environmental site assessments in many areas in which it is involved. For complete information on CMHC's requirements, consult your local CMHC office.

Finding a consultant

If a Phase I assessment is to have value, a qualified independent consultant or group of consultants should conduct it. At present, professional standards for environmental site assessment services in Canada generally adhere to the Canadian Standards Association (CSA) *Phase I Environmental Site Assessment Information Product*, Z768-01, November 2001 (CSA Standard). Meanwhile, many groups and individuals with diverse skills and experience are conducting ESAs, with varying degrees of competence and success.

The ideal consultant for a Phase I assessment would have the following qualifications:

- The consultant should be *unbiased* and *independent* of the client.
- The consultant should have established *expertise* in the following areas:
  - information research and retrieval
  - environmental science
  - environmental legislation and regulations
  - chemistry and geochemistry
  - engineering (civil, chemical or mechanical).
- The consultant should be *experienced*. A solid, four-to-five-year track record in doing ESAs or similar activities is desirable. The record should be substantiated with references.
- All consultants engaged to carry out ESAs should provide evidence that they carry the appropriate *professional liability insurance*.

Besides these qualifications, consultants should understand the context in which the investigation is being conducted and be able to define the focus of the study. They should also be able to record and interpret the findings, draw conclusions and present this information comprehensively and accurately.

Many professionals are currently operating in Canada in fields related to site assessments. Environment Canada has produced a *Directory of Contaminated Sites Services*, which provides data about Canadian consulting firms and contractors with experience and expertise in site assessment or cleanup. The directory is available on disk. Details about how to obtain a copy are provided at the end of this booklet in the section "For More Information." Membership lists of certain industry and professional associations in Canada are also a potential source of names of those active in the ESA field. A list of these associations, with relevant contact information, is also provided at the end of this booklet.

Chapter 4
Phase 1: A Four-Step Process

This chapter outlines the four-step process for carrying out a Phase I assessment. The approach described here is based on Canadian Standards Association guideline CSA Z768-01. This chapter is not a "how to" manual for Phase I assessments, but rather an overview of what is involved.

A Phase I assessment consists of four basic steps:

- Site History Research
- Site Visit
- Interviews
- Written Report

The amount of work, the level of detail and the weight assigned to each step vary according to the size of the property, its history, the information available, and the reason for doing the assessment.

Step 1. Site history research

The first step in an ESA is a review of the records associated with a site to reconstruct the history of its *ownership* and *use*. Research should produce documented information about past activities that could have contributed to site contamination. The records may, for instance, reveal activities associated with the use of chemicals or other hazardous materials. Other records may identify the possible locations of underground storage tanks, even if the physical evidence of these tanks is no longer obvious.

This research is essential. The information it collects contributes to subsequent steps. If the ESA goes beyond Phase I to sampling and testing, valuable time, effort and money can be saved if the follow-up can draw on a complete, accurate history. Present or past owners of the site can provide much of the information required for this step. Government departments and other institutions and organizations are also prospective sources of information. Some agencies keep records for several decades. The researcher should note all activities undertaken during this exercise, including success or failure to obtain information from each source. This record will allow the research to be verified or duplicated later.

Examples of important information sources are listed in the table "Site History–Useful Documents" (next page).

Site History–Useful Documents

Documents	Possible information sources
1. Aerial photographs	Local libraries, private companies, the federal government, certain provincial government departments
2. Property use records	Insurance companies, municipal, provincial or federal government directories
3. Records of previous ownership, such as title transfer documents	Provincial land registries, title search companies
4. Previous environmental assessment reports	Engineering and other firms that have conducted environmental studies at the site
5. Company records, including site plans, building plans and permits, production and maintenance records, emergency response or contingency plans and spill reports	Internal company files and accounts
6. Geological and geotechnical reports	Engineering and other firms that have conducted environmental studies at the site
7. Environmental permits, orders and charges relating to hazardous material storage, hazardous waste treatment, landfills, and contamination of adjacent sites and other regulatory documents	Federal or provincial government agencies dealing with waste management, water quality, public health and environmental planning and protection

Note: This list is derived from the mandatory records review section in CSA guideline CSA Z768-01. Other optional sources can be found in that guideline.

Step 2. Site visit

The next step in a Phase I assessment is a visit to the site. The purpose of this visit is to observe and document environmental conditions on the property. It provides an opportunity to follow up on clues uncovered by the initial research. The site visit should include an inspection of all aspects of the property, including not only the exterior site conditions, but conditions inside any buildings as well.

The specifics of a site inspection vary from one property to another and are determined to a large extent by the information gathered during Step 1. Site visits involve passive observation. Researchers concentrate on any details that may suggest environmental contamination, while also noting the natural features that complete the physical profile of the site. Only those conditions that can be easily noticed, for example strong odours or visible evidence of storage tanks, are documented. Intrusive techniques, such as digging, or looking under floors or other hard-to-reach areas, are not used at this point. Samples are not gathered for analysis.

Researchers should take photographs of items of interest, such as storage drums, pools of liquid or disconnected transformers. Photographs should also be taken of adjacent sites to support the conclusions of the report.

Some organizations have developed site visit checklists to ensure that all researchers use a similar approach and that every possible item is inspected. "Visual Inspection–Looking for Evidence" (next page) describes three categories of observations that make up a typical Phase I site visit.

Visual inspection–Looking for evidence

1. General observation

- *Current* uses of the property that may involve hazardous materials.
- Details about *hazardous materials and unidentified substances* observed on the site.
- Evidence of present or former *underground* or *above-ground* storage tanks. These indicate a high probability of environmental contamination.
- The condition of any *storage areas* and *bins*. These can suggest the presence of hazardous materials such as solvents and other chemicals.
- The presence of *special attention* items, such as items containing asbestos, ozone-depleting substances and lead. Transformers and old light ballasts suggest the presence of PCBs, which may have leaked or spilled onto surface soils. Radon, mold, noise, electric and magnetic fields and vibration should also be assessed.
- *Unusual odours* at the site.
- *Housekeeping practices*, indicated by the general maintenance and appearance of a site, and by the condition and tidiness of any buildings, storage or waste-disposal areas.
- The *potable water supply* for the site.

2. Interior observations

- Type of fuel used in *heating* and *cooling systems*.
- *Stains* on floors, walls or ceilings.
- The location and condition of *floor drains* and *sumps*.
- *Interior finishes of buildings*, which may include hazardous materials such as asbestos.
- *Mechanical equipment* present on the site, which may include hydraulic elevators and hoists.

3. Exterior observations

- The *exterior condition of buildings* on the property.
- Natural and artificial *surface features* (i.e. topography, geology and hydrogeology). These features sometimes allow judgments to be made about subsurface conditions, such as direction of groundwater flow and migration of contaminants to or from the site.
- The presence of *wells* on the site. Those that are not used as sources of water may have been used for disposal of liquid wastes; those that are still in use are potential sources of contaminated water.
- *Waste disposal practices*, such as disposal of sewage and solid waste.
- *Pits and lagoons* used for waste disposal or waste treatment, *surface water drainage systems,* and *wastewater discharge systems*.
- *Surface staining*, which can suggest the discharge of waste materials or other causes of soil contamination.
- Type or condition of *vegetation*.

- Unusual surface formations and *areas of fill*. These may contain hazardous or otherwise contaminated materials.
- Features of *adjacent property* that may have a direct influence on the presence and type of contamination.
- *Waste water* and other liquid discharges from the site.
- *Watercourses*, ditches or standing water on the site, including storm water and runoff that may drain on or adjacent to the site.
- *Roads, parking facilities and rights of way* crossing or bordering the property.

Step 3. Interviews

The third step involves a series of interviews with selected individuals, including current property owners, managers or long-term employees. Interviews can gather valuable information that may not have been formally documented. They enable researchers to fill in gaps in the site profile. These exchanges can take place during the site visit. Interviews may also be held off-site with former owners, employees, occupants, neighbours, government officials and individuals who may have conducted site assessments in the past.

Questions should be asked about the nature of the operation at a site, waste-handling practices, underground storage tanks, and any legal proceedings or past environmental emergencies. Some organizations use checklists or questionnaires to streamline interviews.

Step 4. Written report

After the first three steps have been completed, the findings should be documented in a report that is well-organized and comprehensive and identifies any remaining information gaps.

The written report should cover all items specified in the original terms of reference for the assessment. It should list all sources and should be supported with figures, tables and photographs. The report should note the nature and extent of any limitations encountered during the study, such as missing documents or restricted access to the site or adjacent properties. The report's conclusions should be well-reasoned and should include recommendations for further assessment if evidence of contamination has been found. The report should not judge the acceptability of risks associated with any contamination found.

Each Phase I report should contain the sections listed in the box "The Report–Table of Contents."

The Report–Table of Contents

1. Executive Summary
2. Introduction
3. Site Description
4. Records Review
5. Site Visit
6. Interviews
7. Findings
8. Evaluation of Findings
9. Conclusions
10. Qualifications of Assessor
11. References and Supporting Documentation
12. Appendices
    - Maps, figures, photographs
    - Ownership/historical documentation
    - Regulatory documentation
    - Documentation of interviews
    - Contract between Client and Assessor

Chapter 5
After Phase I:

What next?

All steps in the Phase I ESA have been completed. The consultants have presented their report. What next?

Conditions at a site may change; the findings and conclusions in Phase I report are accurate only at the time of assessment. A Phase II investigation may be required to support, refute or extend the Phase I findings. Furthermore, as was previously noted, a Phase I assessment cannot determine with absolute certainty whether a site is clean or contaminated. It can, however, point to one of two basic outcomes.

Outcome #1 The assessment found nothing to suggest potential contamination.

Action: If the reason for initiating the ESA was to enable a real estate transaction to take place, no investigative follow-up is likely required. Potential site contamination should not be an obstacle to the transaction. Those involved should obtain legal advice to establish exactly what the next steps should be.

Outcome #2 The assessment suggests potential or actual contamination.

Action: The next steps will be determined by the policies and practices of the organizations involved, and by the consultants' conclusions and recommendations. For example, some institutions do not grant loans or mortgage insurance if there are indications of contamination. These organizations may require further investigation (a Phase II ESA) before the mortgage application can be considered. Under certain circumstances, a Phase III remedial investigation would also follow if site contamination is confirmed.

Conclusion

Environmental risks are often difficult to identify and manage, but out-of-sight should not mean out-of-mind. Ignoring the problem can have serious health, safety and environmental consequences. The direct financial costs can be considerable, as can indirect costs such as a tarnished corporate image, a damaged personal reputation or operational delays. Adequate environmental risk management can help avoid these problems.

More and more organizations are requiring environmental site assessments as a condition for real estate transactions. It is therefore increasingly important for those involved with real estate to be familiar with these procedures and related activities. Ultimately, ESAs may become universally accepted as an essential component of responsible asset management.

For More Information

For detailed guidance on Phase I ESAs, refer to the Canadian Standards Association Z768-01 *Phase I Environmental Site Assessment*. To obtain a copy, contact

Canadian Standards Association
5060 Spectrum Way
Mississauga ON L4W 5N6
Phone (416) 747-4000
Toll-free 1 800 463-6727
Fax (416) 747-2473
www.csa.ca

To obtain a disk of Environment Canada's *Directory of Contaminated Sites Services*, contact

Environment Canada
EP–Publications
Hull QC K1A 0H3
Phone: (819) 953-5921
Fax (819) 953-7253

The following associations can help identify consultants with expertise related to Environmental Site Assessments.

- Environmental Industry Associations–provincial associations provide lists of qualified consultants and environmental suppliers.
- Canadian Environmental Auditing Association
  1-6280 Kitimat Road
  Mississauga ON L5N 5M3
  Phone (905) 814-1160
  www.ceaa-acve.ca
- Associated Environmental Site Assessors of Canada Inc. (AESAC)
  PO Box 490 ON
  K0M 1N0
  Toll-free 1 (877) 512-3722
  www.aesac.ca

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