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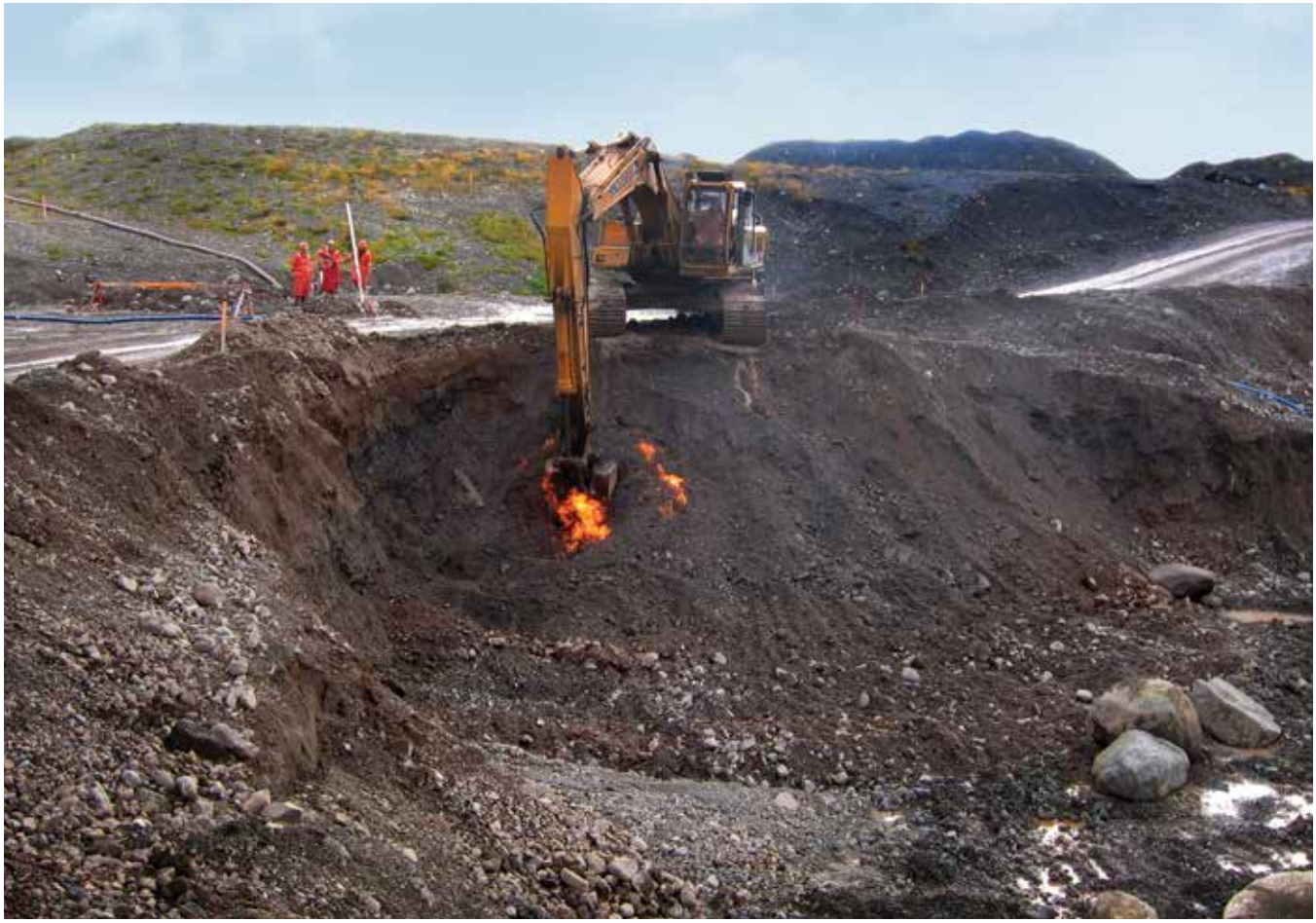

MANAGING CONTAMINATION

for productive use, development and divestiture of real property

Developing an unbiased and reliable valuation of real property is complex. When the real property is impacted by environmental contamination, valuation complexity can increase significantly (e.g., going from simple geometry to differential calculus). Historically, life was easier: property impacted by contamination had zero value – or, more accurately, potential negative value due to the ill-defined environmental liabilities. The arithmetic was clear, contaminated sites offered little opportunity for value realization and lots of potential for costing a lot of money. Problem solved. Over time, however, things have changed and contaminated sites, addressed and managed appropriately, are considered great opportunities for productive use, regeneration, development and divestiture.

This article examines how contaminated sites (i.e., with impacted environmental media) can be managed so that opportunities such as (increased) revenue, financing, freeing financial reserves, ending environmental monitoring, investing in the community, changing property perceptions, and property sales can be realized. We start by reviewing what a contaminated property is. Subsequently, we describe the assessment process typically employed in characterizing contaminated properties; how risks to human health and the environment are evaluated, managed, and, if necessary, remediated; and, potential value-add approaches to facilitate the productive re-use and/or redevelopment of a contaminated property.

CONTAMINATED PROPERTY

Contaminated property is land that is impacted with one or more chemicals present at levels that exceed an applicable, generic, numerical criterion. Typically, the contamination is a result of historical uses of the property or activities on the property, though chemicals migrating (or brought) from off-site could also contaminate the property. As brownfields, contaminated property is typically "abandoned, idle, or underutilized commercial or industrial properties" whose redevelopment or reuse or divesture is complicated by the presence of contamination. However, contaminated property is not always a brownfield: for example, fallow farmland, previously used for orchards, may continue to be impacted by pesticides used during the life of the orchard; residential property may be impacted by the remnants of a domestic fuel oil spill; or, an active dry cleaner may be impacted by past uses at the site, even though current practices do not adversely affect the environment.

Many chemicals can be a contaminant, depending on what levels are present in what media (i.e., soil, groundwater, sediment, surface water). For the sake of managing, analyzing and evaluating, chemicals have been grouped into categories consistent with their composition and properties including, for example: petroleum hydrocarbons (PHCs), polychlorinated biphenyls (PCBs), metals, inorganics, polycyclic aromatic hydrocarbons (PAH), dioxins, volatile organic compounds (VOCs), dioxins, and organopesticides, perfluorinated compounds (PFCs). Other contaminants of potential concern include asbestos, mould, and radiation.

The numerical criterion establishes a benchmark to indicate whether a specific chemical may present an unacceptable risk to human health or the environment, in a given media. The derivation of these benchmarks are complex, but is based on toxicological, physiological and other site-specific considerations. Generic benchmarks are developed and/or adopted by federal and provincial governments based on current science and are subject to change over time. If detected at levels above the generic criteria, the property is considered contaminated; nevertheless, as discussed below, more evaluation is needed to assess whether there is an unacceptable risk and need for risk management or remediation. The applicability of benchmarks derived by federal or provincial governments depends primarily on property ownership and location; however, other factors may influence applicability of specific criterion.

DEFINING THE PROBLEM

In order to properly consider potential implications of contamination on a property's valuation, the nature and extent of contamination needs to be understood. Unfortunately, like trying to appraise the value of a residence without going into a house, characterizing the nature and extent of subsurface contamination (i.e., what contaminants, at what levels and where) is challenging. Characterizing subsurface contamination is part art and part science, being done with incomplete knowledge, extrapolating between sample locations and making assumption on contaminant fate and transport, based on a conceptual site model developed from available data, experience and professional judgement.

One of the critical elements in defining the problem is the identification of the applicable benchmark criteria. As suggested previously, the benchmark criteria are typically based on land-use (e.g., agricultural, parkland, residential, commercial, industrial), nature of water supply (i.e., private wells, municipal water supplies, source water protection areas), and soil type (i.e., coarse versus fine-grained soils, or bedrock). Criteria can change substantively depending on land-use and consideration of future land

use is critical in defining whether you have an issue and the nature and extent of that issue. Should the potential future use consider more restrictive land use (e.g., going from industrial to residential), for example, the nature and extent of contamination may be significantly larger. Conversely, a property may be considered contaminated for residential land-use, but not for commercial or industrial land-use.

Phase Environmental Site Assessment

In order to assess whether and, if so, the degree which a property is contaminated, industry standards such as the Canadian Standards Association (CSA) *Standard Z769-01 (R2012) Phase I Environmental Site Assessment (ESA)* and CSA *Standard Z769-00 (R2013) Phase II ESA* are typically followed to a) identify potential sources, nature and indications of contamination b) confirm the presence and nature of contamination, and c) delineate the extent of contamination. Some jurisdictions (e.g., Ontario Ministry of Environment, with *O.Reg 153/04*) have specific requirements that differ from the CSA Standards framework. Nevertheless, a *Phase I ESA* is generally conducted as a due diligence measure to assess whether current or historical uses of the property, or from adjacent/nearby properties, may have caused contamination to be present on a property. The *Phase I ESA* generally involves a review of available records (e.g., fire insurance maps, geological maps, previous environmental reports, aerial photographs, drilled well records, underground utility records, and city zoning records) regarding activities on and near the property, a site visit, interviews with people familiar with both current and past activities at the site, and reporting. Should a potential source of potential contamination be identified or potential contamination is observed during the site reconnaissance, additional assessment in the form of a *Phase II ESA* is required. The *Phase II ESA* typically involves intrusive multi-media sampling (e.g., test pit excavation, borehole advancement, monitoring well installation) and laboratory analysis to characterize the nature and extent of contamination in the subsurface. To supplement traditional borehole advancement and sample collection, innovative assessment technologies such as ground penetrating radar, laser-induced fluorescence, membrane interface probes and the like are becoming commonplace. The *Phase II ESA* is complete when the nature of the contamination (i.e., the type, volume, concentrations, origin) is known and the horizontal and vertical extent of contamination is delineated to the generic, benchmark criteria, applicable to each impacted media.

During the *Phase II ESA*, a conceptual site model (CSM) is developed (and routinely revised with new data and information) to understand contaminant fate and transport and, subsequently, support risk management and remediation.

IDENTIFYING RISK

The presence of contamination does not necessarily mean that an unacceptable risk is present, nor that remediation is required for a contaminated property. Often overlooked, the risk assessment phase (i.e., human health and ecological risk assessment) is one of the more important phases in managing contamination on a property. The risk assessment will evaluate whether the identified contaminants (at the levels identified) present an unacceptable risk based on potential receptors and the exposure pathway that connects the contaminant to a receptor. Exposure pathways considered during risk to human health assessment include dermal contact, ingestion, inhalation, vapour migration from groundwater to indoor air, and soil leaching to groundwater. If no receptor exists or the pathway between the contaminant and the receptor is not complete (e.g., contamination in soil presenting a direct contact risk is paved over), no risk will be present. The risk assessment will consider site (exposure) pathway-specific factors not considered by the generic benchmark criteria and will evaluate the carcinogenic and non-carcinogenic risks associated with contaminants identified in the *Phase II ESA*. Ultimately, the risk assessment will identify whether an unacceptable risk is present and what risk-based screening levels and remedial criteria are appropriate for the site.

> Property appraisers who are trying to identify the potential cost implications associated with a contaminated property should **work with a qualified environmental site professional** to identify how, given the known nature of extent of contamination, risk management and remediation can be effectively applied.

RISK MANAGEMENT

Risk management is only needed where an unacceptable risk is present and can involve a) removing the source (i.e., the contamination); b) remediating the impacted media; c) applying engineering or institutional/administrative controls; or d) a combination of these three. In some cases, removal of the source is quick, easy and relatively inexpensive. However, often, source removal is complex and time consuming, expensive, or technically impracticable. In the latter cases, unacceptable risks are managed via remediation and engineering/administrative controls or a combination of both.

Remedial approaches are identified and developed based on various site-specific factors that include:

- geology (i.e., nature of soil [coarse versus fine], bedrock);
- hydrogeology;
- nature, extent, location, and accessibility to contamination;
- risk drives and exposure pathways;
- time available; and,
- future land-use and redevelopment plans.

Remedial approaches may include, to name a few, excavation, in-situ chemical oxidation, in-situ enhanced bioremediation, multi-phase vapour extraction, groundwater pump and treat, thermal heating, biopiles, ex-situ soil washing, or various containment approaches (e.g., capping). With more recalcitrant contaminants or for properties impacted by a number of disparate contaminants, the overall remedial approach may require more than one approach.

Engineering and institutional (or administrative) controls are often a cost-effective way to address current unacceptable risks, but also are very effective when integrated into future redevelopment. Targeted application of engineering or institutional controls to an operable (i.e., complete) exposure pathway can effectively eliminate the risk by preventing a receptor from being exposed to a contaminant. Engineering controls may include asphalt pavement, building construction, slab-on-grade construction, vapour barriers, or use of commercial zoning at ground floor. Institutional controls may include changing the zoning to be less environmentally restrictive, land-use restrictions (e.g., no build zones, no well drilling), and/or siting and redevelopment planning.

VALUATION CONSIDERATIONS

Given the number of variables that could drive the cost of assessment and remediation (and the degree to which those variables can fluctuate), suggesting general cost implications would be irresponsible. However, within the contaminated site management spectrum, remediation is typically more expensive than assessment – many say that spending $10 in assessment will save you at least $100 in remediation.

During the course of addressing a contaminated property, opinion of costs are often developed based on the conceptual site model and refined and updated as more information comes available, as remedial options are evaluated, and as remedial designs are

prepared and tendered. The development of these costs can be useful for understanding the financial implications of addressing the contamination per se (i.e., following the traditional approach of remediating the property first and redeveloping the property later), but true value can only be seen with a holistic picture of a property owner's future plan for the site. Numerous case studies are available that demonstrate that successfully integrating remediation and risk management into the redevelopment plan greatly reduces the overall project cost. Property appraisers who are trying to identify the potential cost implications associated with a contaminated property should work with a qualified environmental site professional to identify how, given the known nature of extent of contamination, risk management and remediation can be effectively applied.

QUALIFIED ENVIRONMENTAL SITE PROFESSIONAL

Given the nature of contaminated site assessment, many provinces require those conducting the work to be appropriately qualified and, in some cases, specifically designated (e.g., Contaminated Site Approved Professional in British Columbia and a Qualified Professional in Ontario). Most jurisdictions require ESAs to be conducted or supervised by a professional engineer, professional geoscientist, or, in some cases, a professional biologist. Professionals licensed and so designated to conduct and oversee contaminated site assessment and remediation work must meet specific and relevant educational and experience requirements, and demonstrate high ethical practices and meet the standard of care in the industry.

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SUMMARY

Real property impacted by contamination can be effectively managed for productive use, development, regeneration and divestiture. Phased environmental site assessments define the nature and extent of the contamination and characterize site conditions so that factors that influence risk and remediation are identified. Applicable risks to human health and ecological receptors are evaluated and, if unacceptable risks are present, appropriate risk management involving remediation and/or engineering or administrative controls are applied to manage the contamination on the property.

While the traditional approach involved remediating first and redeveloping later, numerous case studies demonstrate that integration of risk management measures into redevelopment and future use offer a potential for significant cost savings. Property valuation of contaminated sites is not a zero sum game and the value of integrating remedial efforts into redevelopment adds another (but vital) complexity into property valuation. Working with an environmental site professional is a must for a property appraiser to competently estimate the value of a contaminated property.