

# Environmental Dead Zones: The Evaluation of Contaminated Properties

by Michael Tachovsky

## Abstract

There are numerous environmentally contaminated sites throughout the world. The most seriously contaminated areas are typically those with pathways to human exposure and Class III land use restrictions. Land use is one of many components a buyer may consider when purchasing real estate. Where environmentally contaminated sites pose health risks, environmental agencies often impose land use restrictions. These restrictions fall into three classifications: (I) activity restrictions, (II) building restrictions, and (III) occupancy restrictions. When environmental land use restrictions are implemented, real estate appraisers may be asked to consider whether or not there is an impact to property value. This article discusses the evaluation of contaminated properties from a real estate valuation perspective. It sets forth the term “environmental dead zone” to describe certain environmentally contaminated sites, and it discusses environmental land use restrictions within a framework of three restriction classifications.

## Environmentally Contaminated Sites

Environmentally contaminated sites are part of our industrial and post-industrial society, as society demands commodities produced at many of these sites. However, society has become increasingly aware of the spread of environmental contamination beyond the commercial and industrial source sites. Today, there are more than 1,300 active “sites of concern” identified on the National Priorities List (NPL),<sup>1</sup> but there are even more sites that are unidentified or yet to be identified. In addition, the number of sites identified by the US Environmental Protection Agency (EPA) is small compared to the number identified by local and state governing boards. Such sites include gas stations, dry cleaners, landfills, agricultural farms, and more.

This article outlines considerations that real estate valuation professionals can make when

studying environmentally contaminated properties, including three classifications of land use restrictions related to contamination: (I) activity restrictions, (II) building restrictions, and (III) occupancy restrictions.

This article also discusses what will be referred to as “environmental dead zones” (EDZs). The term “environmental dead zone” does not appear in any official environmental documentation or in any academic or professional literature, but it is used here to describe environmentally contaminated areas with pathways to human exposure and Class III (occupancy) land use restrictions.<sup>2</sup> Thus, for purposes of the discussion in this article, the category EDZ has two defining factors: exposure and land use restrictions. When it comes to environmental contamination, *exposure* is the condition under which a potentially harmful material (e.g., radiation, hydrocarbons,

1. “Superfund Site Information,” US Environmental Protection Agency (EPA), search April 20, 2021, <https://bit.ly/34CFFbR>.

2. The EPA and scientific community use the term “dead zone” on its own as an ecological term to describe areas of water bodies where aquatic life cannot survive because of low oxygen levels, generally caused by significant nutrient pollution. See “The Effects: Dead Zones and Harmful Algal Blooms,” EPA, <https://bit.ly/3wU6Gnj>. The term “EDZ” used in this current article is broader than the ecological term for nutrient pollutants in bodies of water and refers to toxic pollutants on land.

PFCs) is contacted.<sup>3</sup> *Land use restrictions* are limitations to the conventional use of land. Land use “represents the economic and cultural activities (e.g., agricultural, residential, industrial, mining, and recreational uses) that are practiced at a given place”<sup>4</sup> and may also be defined as “the employment of a site or holding to produce revenue or other benefits.”<sup>5</sup> Land use is one of many components that a buyer may consider when purchasing real property. When environmentally contaminated sites pose human health risks, environmental agencies often implement land use restrictions,<sup>6</sup> which may influence a buyer’s purchasing decision. When land use restrictions are implemented, real estate valuation professionals may be asked to consider whether or not there is an impact to property value.

### US Environmental Policy

US environmental policies were established before awareness of the detrimental health and environmental concerns of contamination emerged on a widespread public scale. However, environmental concerns became more prominent during the 1960s.<sup>7</sup> In 1962, the book *Silent Spring*, by Rachel Carson, brought increased awareness of the detriments of toxic exposure. Carson reported on the insecticide DDT and how it entered the food chain, causing the thinning of eggshells, which in turn caused eggs to break before hatching. In the late 1970s, public concern increased regarding potentially catastrophic accidents with nuclear power facilities, and because of the chemical waste effects at Love Canal, public concern emerged over the storage of hazardous waste in the 1980s.<sup>8</sup> In the 1990s,

asbestos was a focus of concern as well as air quality with passage of the Clean Air Act Amendments and release of the EPA’s *Green Book* on air quality.<sup>9</sup> PFAS chemicals became a concern in the 2000s, with the recent and ongoing research on these chemicals’ health effects.<sup>10</sup> Concerns surrounding toxic chemicals and environmentally contaminated sites continue today.

Lawmakers have responded to the heightened environmental awareness by drafting comprehensive legislation.<sup>11</sup> Exhibit 1, partially adapted from *Real Estate Damages*, third edition,<sup>12</sup> provides a selected chronology of US environmental acts, laws, regulations, and policies.

The government’s role in regulation of property use is explained in *The Appraisal of Real Estate*, fifteenth edition, as follows:

All laws and operations of government are intended to serve the public. Thus, in the public interest, government may impose building restrictions, zoning and building ordinances, development and subdivision regulations, and other land use controls. These controls affect what may be developed, where development may occur, and what activities may be permitted subsequent to development. Since the 1960s, the federal government, in cooperation with the states, has increased its efforts to regulate the air and water emissions from manufacturing processes and to reduce pollution caused by dirt, chemicals, and noise. Land use regulations have been expanded to wetlands, beaches, and navigable waters and to preserve the habitats of endangered species.

As the nature and extent of land use controls change, so do the nature and extent of private land ownership. Such changes may affect markets and, ultimately, real

3. T. F. Long, M. L. Gargas, R. P. Hubner, and R. G. Tardiff, “The Role of Risk Assessment in Redeveloping Brownfields Sites,” in *Brownfields: A Comprehensive Guide to Redeveloping Contaminated Property*, 2nd ed., ed. Todd S. Davis (Chicago: American Bar Association, 2002), 285.

4. “Land Use: What Are the Trends in Land Use and Their Effects on Human Health and the Environment?” EPA, <https://www.epa.gov/report-environment/land-use>.

5. Appraisal Institute, *The Dictionary of Real Estate Appraisal*, 6th ed. (Chicago: Appraisal Institute, 2015), s.v. “land use.”

6. “Report to Congressional Requestors—Hazardous Waste Sites: Improved Effectiveness of Controls at Sites Could Better Protect the Public,” US Government Accountability Office (January 2005).

7. Howard Zinn, *A People’s History of the United States* (Harper Perennial, 2015), 441–442.

8. Louis Harris, *Public Opinion* (April/May 1980), 26.

9. “Nonattainment Areas for Criteria Pollutants (Green Book),” EPA, <https://www.epa.gov/green-book>.

10. See “PFOA, PFOS and Other PFAS,” EPA, <https://www.epa.gov/pfas/basic-information-pfas>; and C8 Science Panel website, <http://www.c8sciencepanel.org/>.

11. George P. Bernhardt, “Environmental Issues in Real Estate Purchase and Sale Agreements,” *Probate and Property* 34, no. 5 (September/October 2020): 54.

12. Randall Bell, *Real Estate Damages*, 3rd ed. (Chicago: Appraisal Institute, 2016), 210.

**Exhibit 1** Chronology of Selected Environmental Acts, Laws, Regulations, and Policies

Year	Act, Law, Regulation, or Policy	Year	Act, Law, Regulation, or Policy
1899	Rivers and Harbors Act (The "Refuse Act"). Designed to protect navigable waters, especially the Mississippi River system, from floating debris that constituted hazards to navigation.	1987	Federal Water Quality Act Air Toxics "Hot Spots" Information and Assessment Act
1947	Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	1990	Oil Pollution Act Clean Air Act Amendments Pollution Prevention Act Hazardous Waste Operations and Emergency Response Act
1948	Federal Water Pollution Control Act (Old Clean Water Act)		<i>Fleet Factors</i> —A lender does not even have to hold title to have liability under CERCLA. If the lender exerts control over a business, then it may become liable.
1954	Atomic Energy Act	1992	OSHA Process Safety Management Standards Title X Housing and Community Development Act (lead-based paint) EPA issues Lender Liability Rule—Attempted to protect lenders, etc., and struck down by Appeal Court 2/4/94.
1956	Clean Water Act	1994	ASTM Standard Practice for Site Assessment Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Order 12898)
1957	Price-Anderson Act. Designed to provide compensation for damages from potential nuclear accidents.	1995	EPA Officially Begins Brownfields Programs Contaminated Aquifer Policy Prospective Purchaser Agreements Comfort Letters EPA issues Lender Liability Policy. Attempts to protect still unconvinced lenders.
1963	Clean Air Act (CAA)	1997	The Kyoto Protocol results in 38 industrialized nations agreeing to reduce greenhouse emissions. The United States agrees to reduce emissions by 7%.
1966	National Historic Preservation Act	2000	The Everglades obtain \$7.8 billion in aid to restore the ecosystem.
1967	Clean Air Act Revision	2001	The Bush Administration refuses to sign the Kyoto Protocol. It is ratified in 2005; however, the United States and Australia do not sign the treaty.
1969	National Environmental Policy Act	2005	Price-Anderson Act amended.
1972	Marine Protection, Research, and Sanctuaries Act Federal Coastal Zone Management Act Federal Water Pollution Control Act Amendments (Clean Water Act) Federal Environmental Pesticide Control Act	2009	EPA releases Health Advisories of 400ppt for PFOA and 200ppt for PFOS.
1973	Federal Endangered Species Act	2014	The United Nation's Intergovernmental Panel on Climate Change (IPCC) releases a major report concerning climate change.
1974	Safe Drinking Water Act (SDWA)	2016	EPA establishes new Health Advisories of 70ppt for PFOA and PFOS in drinking water.
1976	Resource Conservation and Recovery Act (RCRA). Defined what was hazardous and drew a distinction between hazardous material and hazardous waste. Toxic Substances Control Act (TSCA)		
1977	Clean Water Act Amendments		
1978	Uranium Mill Tailings Radiation Control Act		
1979	Hazardous Liquid Pipeline Safety Act		
1980	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) "Superfund." Intended to take care of cleanups at sites that were no longer being operated.		
1984	Hazardous and Solid Waste Amendments		
1985	US Supreme Court support of Adjacent or Isolated Wetlands as "Waters of the U.S."		
1986	Safe Drinking Water and Toxic Enforcement Act (California Proposition 65) Superfund Amendment and Reauthorization Act (SARA) <i>Maryland Bank and Trust</i> —Superfund liability can attach to a lender that takes title to a property through foreclosure.		

Source: Adapted and updated from Randall Bell, *Real Estate Damages*, 3rd ed. (Chicago: Appraisal Institute, 2016), Exhibit 8.3.

estate values. Consequently, real estate valuation professionals ought to be familiar with the regulations and restrictions that apply to land use and understand how these regulations may affect a specific property.<sup>13</sup>

### Environmental Land Use Restrictions

As Exhibit 1 shows, many seminal US environmental laws were enacted between 1960 and 1980. These laws include the Clean Air Act (CAA, 1963), the Federal Water Pollution Control Act Amendments (Clean Water Act, 1972), the Federal Environmental Pesticide Control Act (1972), the Safe Drinking Water Act (SDWA, 1974), the Resource Conservation and Recovery Act (RCRA, 1976), the Toxic Substances Control Act (TSCA, 1976), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 1980).<sup>14</sup> Environmental contamination policies largely stem from the RCRA and CERCLA.<sup>15</sup> RCRA and CERCLA are similar and seek to achieve consistent outcomes, such as limiting exposure to hazardous substances. Nonetheless, there are differences. For example, RCRA's approach is management of solid and hazardous waste at facilities that are currently in use, while CERCLA is focused on the management and remediation of abandoned, non-operating sites.<sup>16</sup>

CERCLA was a modern tipping point in environmental policy as it marked the beginning of the Superfund. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites, provided liability of persons responsible for releases of contami-

nation at these sites, and established a trust fund to provide cleanup when no responsible party can be identified.<sup>17</sup> CERCLA addresses the protection of human health by managing the cleanup of the nation's worst environmentally contaminated sites and responding to significant environmental emergencies.<sup>18</sup> It also frames the discussion about pathways to human exposure, how to identify them, and their potential routes.<sup>19</sup> When human exposure pathways are identified, and a risk to human health is established, environmental land use restrictions are typically implemented through institutional controls.<sup>20</sup> Environmental agencies implement institutional controls using land use control (LUC) strategies, as such institutional controls are a subset of LUCs (Exhibit 2).<sup>21</sup>

In the United States, land use regulations as controls to promote public health and safety in urban areas date back to the Massachusetts Bay Company in the 1600s.<sup>22</sup> Local and state governing agencies have since adopted similar land use regulation strategies, commonly through zoning. As *The Appraisal of Real Estate*, fifteenth edition, notes, "It is important for appraisers to consider all known restrictions imposed on development, which may include not only zoning but other land use restrictions as well."<sup>23</sup>

LUCs are the chief approach for environmental agencies. Controls can be engineered (e.g., barriers, fences, and security guards) or non-engineered. Agencies use institutional controls as part of an overall site cleanup plan and as mechanisms to ensure that the engineered controls remain intact and operational;<sup>24</sup> they also

13. Appraisal Institute, *The Appraisal of Real Estate*, 15th ed. (Chicago: Appraisal Institute, 2020), 13.

14. Bernhardt, "Environmental Issues in Real Estate Purchase and Sale Agreements," 54.

15. Bell, *Real Estate Damages*, 3rd ed., 209.

16. "Qs & As on RCRA vs. CERCLA at the DuPont Pompton Lakes Works Site," EPA (February 2011). Another piece of legislation leading up the environmental policies of 1960 to 1980 is the Price-Anderson Act, which was first introduced in 1957 during the growth of nuclear energy in the private sector. This act is designed to provide compensation for damages from nuclear accidents.

17. "Superfund: CERCLA Overview," EPA, <https://www.epa.gov/superfund/superfund-cercla-overview>.

18. "Superfund: CERCLA Overview," EPA, <https://www.epa.gov/superfund/superfund-cercla-overview>.

19. "Superfund Human Exposure Dashboard," EPA, <https://bit.ly/3wfosl3>. *The Appraisal of Real Estate*, 15th ed., 187, also discusses environmental exposure pathways, including, but not limited to, air, surface, subsurface, vapor, well water, and safe storage.

20. "Superfund: Institutional Controls," EPA, <https://bit.ly/3gdOmjq>.

21. "Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Site," EPA Office of Solid Waste and Emergency Response (December 2012).

22. Roy P. Drachman, "Land Use Under Current Restraints," *The Appraisal Journal* (April 1974): 166.

23. *The Appraisal of Real Estate*, 15th ed., 394.

24. Thomas O. Jackson and J. Michael Sowinski Jr., "Institutional Controls and Contaminated Property Valuation," *The Appraisal Journal* (Fall 2006): 328-332.

help modify or guide human behavior at a site.<sup>25</sup> There are four categories of institutional controls: proprietary controls, government controls, enforcement and permit tools, and information devices.<sup>26</sup> Each category has numerous subtypes that can be implemented. Of the four categories, three restrict land use, and one is an advisory.

**Proprietary controls** refer to controls on land use that are considered private in nature because they tend to affect a single parcel of property and are established by private agreement between the property owner and a second party who, in turn, can enforce said controls. Common examples include easements that restrict use (also known as negative easements) and restrictive covenants.<sup>27</sup>

**Government controls** impose restrictions on land or resource use via the authority of a government entity. Typical examples of governmental controls include zoning, building codes, state, tribal, or local groundwater use regulations, commercial fishing bans, and sports/recreational fishing limits. The controls may be posed by federal, state, and local resources and public health agencies.<sup>28</sup>

**Enforcement and permit tools** are legal tools, such as administrative orders, permits, federal facility agreements, and consent decrees, that limit certain site activities or require the performance of specific activities (e.g., monitor and report on institutional control effectiveness). These legal tools may be issued unilaterally or negotiated.<sup>29</sup>

**Information devices** provide information or notification often as a recorded notice in property records or as advisories to local communities, tourists, recreational users, or other interested persons that residual contamination

remains on site. As such, informational devices generally do not provide enforceable restrictions. Typical informational devices include state registries of contaminated sites, notices in deeds, tracking systems, and fish/shellfish consumption advisories.<sup>30</sup>

In certain instances, LUCs can result in a restriction on the use of a property or group of properties. As such, environmental land use restrictions affect the use of real estate and are restrictions typically implemented through environmental agency strategies. Environmental agencies can employ a variety of land use restrictions. Some environmental land use restrictions are temporary, some are ongoing, some are mandatory, and some are voluntary. Economic and cultural land use might be impacted when such restrictions are implemented, raising the question as to whether land use restrictions impact real estate value.<sup>31</sup>

In evaluating any potential impacts on real estate value, three general classifications can be used; these are described in this article as Class I, activity restrictions; Class II, building restrictions; and Class III, occupancy restrictions. Exhibit 3 shows each category with the typical land use restrictions for the class and a description of the aim of the restrictions. The environmental land use classifications represent different categorical types of restrictions. Class III represents the most serious restrictions; for purposes of the current discussion, properties with Class III restrictions may be considered “environmental dead zones,” or “EDZs.” Each category is independent, but more than one category may apply to a property. For example, a property might have both a restriction on growing crops (Class I) and a restriction limiting residential development (Class II).

25. “Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Site,” EPA Office of Solid Waste and Emergency Response (December 2012).

26. “Institutional Controls: A Site Manager’s Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups,” EPA Office of Solid Waste and Emergency Response (September 2000).

27. “Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Site,” EPA Office of Solid Waste and Emergency Response (December 2012): 3.

28. “Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Site,” EPA Office of Solid Waste and Emergency Response (December 2012): 4.

29. “Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Site,” EPA Office of Solid Waste and Emergency Response (December 2012): 4.

30. “Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Site,” EPA Office of Solid Waste and Emergency Response (December 2012): 4.

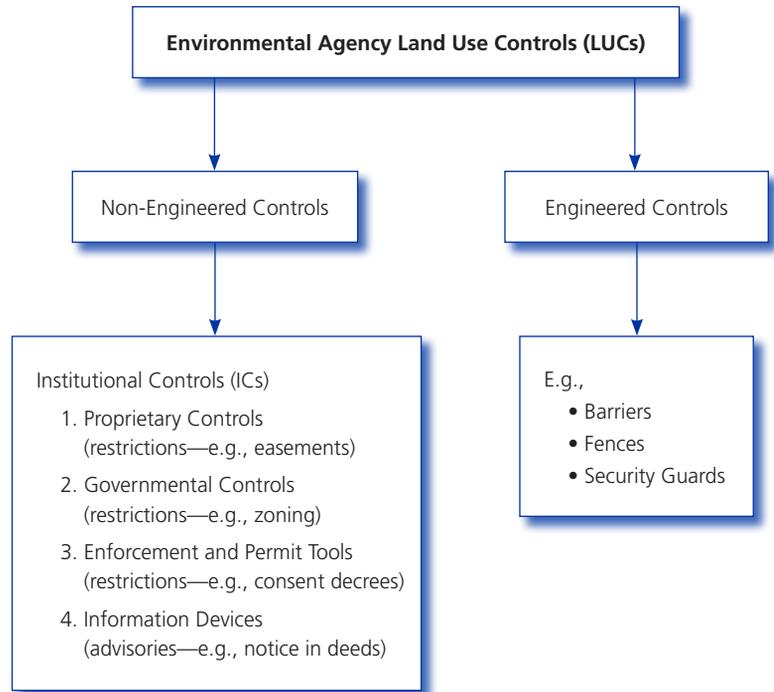
31. *Land use* as described in “Land Use: What Are the Trends in Land Use and Their Effects on Human Health and the Environment?” EPA, <https://www.epa.gov/report-environment/land-use>.

By reviewing past environmental contamination incidents, the nuances of classifications become apparent. For example, in the case of Three Mile Island, voluntary evacuation and numerous activity restrictions were set in place on March 28, 1979, resulting in both Class I and Class III land use restrictions. Once the evacuation warning was lifted, most of the residents returned to their homes within three weeks,<sup>32</sup> ceasing the Class III restriction. Like Three Mile Island, the residents of Chernobyl were evacuated, leading to a Class III or an environmental dead zone restriction. Since then, certain Chernobyl residents have been allowed to resettle in portions of the previous exclusion zone; however, most of the area surrounding the reactor remains an exclusion zone.

Brownfield redevelopment projects also illustrate changing environmental land use restriction classifications; however, restrictions and classifications do not always change over time. For example, the uranium mining town of Uravan, Colorado, has mostly continued as a Class III environmental dead zone site since its evacuation and demolition in 1986, with occupancy restrictions remaining in place. Another example is the Love Canal neighborhood, which encompasses both Class III and Class II restrictions. Rings 1 and 2 of the Love Canal signifies Class III restrictions and an environmental dead zone, because it is a fenced off exclusion zone where conventional occupancy is restricted. Ring 3 of the Love Canal area illustrates a Class II restriction, where a few residential homes await demolition and there are discussions of potential light industrial or retail redevelopment.<sup>33</sup>

Since the inception of CERCLA, thousands of environmental contamination sites have been identified across the United States.<sup>34</sup> When evaluating environmentally contaminated sites, it is important for real estate valuation professionals to convey the period of time and the environmental land use restriction classification at the time of the valuation analysis. As the examples have demonstrated, a site might have Class I and Class III restrictions at one time, and only Class I restrictions later. The EPA's

## Exhibit 2 Land Use Controls (LUCs) Flowchart



Sources: "Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites," EPA Office of Solid Waste and Emergency Response and Office of Enforcement and Compliance Assurance (December 2012); "Strategy to Ensure Institutional Control Implementation at Superfund Sites," EPA (September 2004); "Memorandum: Sample Federal Facility Land Use Control ROD Checklist with Suggested Language (LUC Checklist)," EPA Office of Solid Waste and Emergency Response (January 4, 2013); "Report to Congressional Requestors, Hazardous Waste Sites: Improved Effectiveness of Controls at Sites Could Better Protect the Public," US Government Accountability Office (January 2005).

Brownfields and Land Revitalization Program is designed to prevent, assess, safely clean up, and sustainably reuse brownfields,<sup>35</sup> and it may address a site with Class II residential development restrictions. Through cleanup efforts and changes in zoning, Class II residential zoning restrictions may be lowered to Class I restrictions or to none at all. In terms of real estate valuation, this relates to a contaminated property's remediation lifecycle stage, which consists of three stages of cleanup: before, during, and after remediation. The remediation lifecycle stage can be an important determinant of risk associ-

32. Susan Cutter and Kent Barnes, "Evacuation Behavior and Three Mile Island," *Disasters* 6, no. 2 (June 1982): 116–124.

33. Bell, *Real Estate Damages*, 3rd ed., 243.

34. "What Is Superfund?" EPA, <https://www.epa.gov/superfund/what-superfund>.

35. "Overview of EPA's Brownfields Program," EPA, <https://bit.ly/3wiepeK>.

**Exhibit 3** Land Use Restriction Classifications

Class	Category	Type of Restriction	Description
I	Activity	Crops and Farming, Excavation, Groundwater and Drinking Water, Gardening, etc.	Activity land use restrictions involve impacts to the typical day-to-day human uses of a property. This type of restriction aims to reduce human exposure by limiting pathways to exposure.
II	Building	Residential, Commercial, Industrial, etc.	Building land use restrictions are designed around what can be physically and legally developed on a property. These types of restrictions are typically legally imposed regulation such as zoning ordinances. Human exposure is limited by reducing exposure time and limiting overall pathways to exposure.
III	Occupancy	Evacuations, Exclusion Zones, Restricted Normal Human Exposure, etc.	Occupancy land use restrictions are typically the most restrictive of the land use restriction classes. They generally aim to almost completely eliminate normal human exposure, although in cases "safe" human exposure might be designated for testing and remediation efforts. Occupancy restrictions can be short-term (e.g., evacuations) or long-term (e.g., exclusion zones).

Source: Developed by Michael Tachovsky.

ated with environmental contamination, as environmental risk can be expected to vary with the remediation stage of the property.<sup>36</sup>

### Research Methodologies and EDZs

Classifying environmental land use restrictions and identifying EDZs can help real estate valuation professionals in the development of an opinion of value. As a real estate research method, this shares similarities with comparative research, which compares and contrasts multiple features and characteristics among data.<sup>37</sup> It is also similar to tools such as the Detrimental Conditions (DC) Matrix, which serves as a practical tool for organizing the numerous issues that accompany detrimental condition assignments.<sup>38</sup> By classifying environmental land use restrictions and identifying EDZs, a real estate valuation professional can better organize and analyze any issues that accompany contaminated sites.

### Market Awareness

When measuring environmental risk effects, if any, on property values, an analysis of market awareness in the study area may be necessary to determine whether market participants are knowledgeable of the detrimental condition. Robinson and Lucas observe that

a sometimes-overlooked component of market value is the extent that seller disclosure and buyer knowledge affect property value. Sellers and their intermediaries may have a legal obligation to disclose certain information about a property, but failure to do so is not uncommon. As a result, buyers may unknowingly purchase properties with a serious condition, such as environmental contamination.<sup>39</sup>

A seller may not know that their property is contaminated, and disclosure of the contamination may not occur. Although the market participants are not aware of the contamination issues, an appraiser may later be provided with scientific

36. Appraisal Standards Board, Advisory Opinion 9 (AO-9), "The Appraisal of Real Property That May Be Impacted by Environmental Contamination," in *USPAP Advisory Opinions, 2020–2021* (Washington, DC: Appraisal Foundation, 2020), Lines 93–96.

37. Randall Bell and Michael P. Bell, "Real Estate Research Methods," *The Appraisal Journal* (Fall 2015): 316.

38. Orell Anderson, "Environmental Contamination: An Analysis in the Context of the DC Matrix," *The Appraisal Journal* (July 2001): 331.

39. Rudy R. Robinson III and Scott R. Lucas, "Seller Disclosure and Buyer Knowledge: How They Affect Market Value," *The Appraisal Journal* (Spring 2007): 134.

evidence and must consider accounting for this knowledge in an assignment.

Accordingly, if a market lacks awareness of a detrimental condition, that does not automatically mean that the detrimental condition has no impact on market value. Robinson and Lucas state that an “appraiser cannot use the transaction as an impaired sale to measure the condition’s effect on value” if a buyer lacks awareness of the detrimental condition.<sup>40</sup> However, *Valuing Contaminated Properties* notes that “those sales actually do reveal the effect of that condition on prices and therefore values in that particular market”<sup>41</sup> and furthermore, “the knowledge standard against which that is determined is actual knowledge of typical buyers and sellers in the marketplace.”<sup>42</sup>

The anecdote of “actual knowledge” can be a false premise when an appraiser is provided conflicting evidence regarding a detrimental condition. Contrary to the anecdote of “actual knowledge,” there are thousands of lawsuits filed every year claiming real estate damages for the non-disclosure of detrimental conditions. In these lawsuits, property owners often state, “I would not have paid the same price had I *known* about the detrimental condition” or even “I would not have purchased the property had I *known* about the detrimental condition.” Consistent with the property owner narratives, the definition of *market value* in *The Appraisal of Real Estate*, fifteenth edition, is premised on a knowledgeable buyer and seller.<sup>43</sup> Simply stating that “actual knowledge” reflects the knowledge standards does not address market value when contrary evidence of a detrimental condition exists. A real estate valuation professional should study market awareness to determine if a market or parties of a transaction are well-informed of the nature and extent of a detrimental condition that is being studied, and

“verify information with a party to the transaction to ensure its accuracy and to gain insight into the motivation behind each transaction.”<sup>44</sup>

Market value does not require that a market have perfect knowledge of a detrimental condition. However, market participants should be well-informed of a detrimental condition for a transaction to be consistent with the definition of *market value* and requisite of an arm’s-length transaction.<sup>45</sup> When a real estate market has become knowledgeable of environmental influences (or other detrimental conditions) on properties in the study area, that market will either react or not react in its pricing decisions, based on its perception of risk and potential impact of the contamination (or detrimental condition).<sup>46</sup> Robinson and Lucas suggest the use of a questionnaire to determine market awareness of a detrimental condition.<sup>47</sup> Additionally, market awareness of a detrimental condition can be studied by analyzing real estate transaction documents and marketing material, such as transfer disclosure statements and multiple listing service records, when available. If transactions are identified that disclose the nature and extent of the detrimental condition, then those transactions can be studied to measure impacts, if any, of the condition.

Furthermore, some detrimental conditions are self-evident; for example, a recent wildfire will likely have burn zones that act as visual cues to market participants. Nonetheless, some environmental issues may be less evident to market participants, as general detrimental cues may be absent; for instance, contaminants themselves may be colorless, odorless, and tasteless. Even if some cues of a detrimental condition exist, market awareness of the condition may still be lacking or not be recognized by all market participants. For example, local media coverage of a property

40. Robinson and Lucas, “Seller Disclosure and Buyer Knowledge,” 136.

41. Richard Roddewig, ed., *Valuing Contaminated Properties: An Appraisal Institute Anthology Volume II* (Chicago: Appraisal Institute, 2014), 196.

42. Roddewig, *Valuing Contaminated Properties*, 196.

43. *Market value* is the most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, *knowledgeably*, and for self-interest, and assuming that neither is under undue duress. [Emphasis added.] *The Appraisal of Real Estate*, 15th ed., 48.

44. *The Appraisal of Real Estate*, 15th ed., 358.

45. Robinson and Lucas, “Seller Disclosure and Buyer Knowledge,” 137.

46. Thomas O. Jackson, “Surveys, Market Interviews, and Environmental Stigma,” *The Appraisal Journal* (Fall 2004): 303.

47. Robinson and Lucas, “Seller Disclosure and Buyer Knowledge,” 135. They note that a questionnaire is distinct from a formal survey.

condition does not necessarily create an informed market, because a limited percentage of a population may read or watch local news, media coverage on an issue may be time sensitive and covered for only a short period of time, and buyers from outside the area are less likely to have witnessed local news stories on the issue.

As such, a real estate valuation professional “should be careful not to assume that the mere existence of media attention indicates widespread public knowledge,”<sup>48</sup> when other indicators of a detrimental condition are lacking. Moreover, if indicators of a detrimental condition are lacking, and market awareness of the detrimental condition is lacking in a study area, then real estate valuation professionals may consider techniques such as case studies, surveys, and literature reviews to measure environmental risk effects, if any, on property values.

### Case Study Approach

*The Appraisal of Real Estate*, fifteenth edition, advises that “environmental case studies are typically useful when a source site is being appraised or in a situation involving an impacted neighborhood or area where there are insufficient sales to understand the effect of the environmental issue on prices and values.”<sup>49</sup> As such, when market awareness of an environmental condition is lacking in a study area, there may be insufficient data to evaluate price effects, if any, of the detrimental condition.

The case study approach itself is a comparative method<sup>50</sup> and a common approach throughout sciences, having a distinguished history across many disciplines including law, psychology, med-

icine, and political science.<sup>51</sup> Case studies have been defined as “the study of an issue through one or more cases within a bounded system,”<sup>52</sup> and numerous case studies may be considered in an analysis.

When using more than one case study, real estate valuation professionals may choose to employ another comparative method: an adjustment grid. Adjustment grids draw on the use of market grids like in the sales comparison approach. A case study grid can be developed to draw comparisons between the subject property(ies) and case studies.<sup>53</sup> With environmental case studies, a real estate valuation professional may consider using the relevant property characteristics in USPAP Advisory Opinion 9 to draw comparisons.<sup>54</sup> However, the use of an adjustment grid is not necessary,<sup>55</sup> nevertheless, valuation professionals should reconcile their data.

In sciences, the reconciliation process of multiple sets of data is referred to as triangulation, which is a well-known strategy to increase the reliability and validity of a study.<sup>56</sup> When applying the results of environmental case studies, an appraiser should consider whether the case studies are similarly situated with respect to the subject property(ies) and environmental condition<sup>57</sup>—however, when using case studies, things do not have to be identical or similar. For example, case studies do not need to be in the same area as the subject property(ies), and data limitations usually necessitate searching a broad geographical area.<sup>58</sup> It is rare, if not impossible, to find identical case studies; however, the objective is to find case studies that are similar on some level. The identification classification of land use restrictions and

48. Robinson and Lucas, “Seller Disclosure and Buyer Knowledge,” 135.

49. *The Appraisal of Real Estate*, 15th ed., 188.

50. Bell and Bell, “Real Estate Research Methods,” *The Appraisal Journal* (Fall 2015): 316.

51. John W. Creswell and Cheryl N. Poth, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, 4th ed. (Thousand Oaks, CA: Sage Publications, 2018), 97.

52. John W. Creswell, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, 2nd ed. (Thousand Oaks, CA: Sage Publications, 2007), 61.

53. A similar sales comparison approach is illustrated in Thomas O. Jackson, “The Effect of Previous Environmental Contamination on Industrial Real Estate Prices,” *The Appraisal Journal* (April 2001): 200–210.

54. *The Appraisal of Real Estate*, 15th ed., 188. Also see discussion in Thomas Jackson and Randall Bell, “The Analysis of Environmental Case Studies,” *The Appraisal Journal* (January 2002): 86–95.

55. *The Appraisal of Real Estate*, 15th ed., 361.

56. Robert Yin, chapter 4 in *Case Study Research: Design and Methods*, 5th ed. (Thousand Oaks, CA: Sage Publications, 2014).

57. Jackson and Bell, “The Analysis of Environmental Case Studies,” 87.

58. Michael V. Sanders, “Post-Repair Diminution in Value from Geotechnical Problems,” *The Appraisal Journal* (January 1996): 61.

identification of EDZs can assist in drawing on similarities among environmental conditions.

### Survey Approach

*The Appraisal of Real Estate*, fifteenth edition, discusses the use of surveys as a valuation technique, noting that surveys “need to be properly developed.”<sup>59</sup> A survey is a “market analysis procedure used to identify consumer preferences.”<sup>60</sup> Surveys are generally formal,<sup>61</sup> and different from informal market interviews,<sup>62</sup> and both are different from transactional verification. Formal surveys are typically distinguished by structured and standardized questions and may include a statistical analysis of survey responses. A particular concern with some surveys is hypothetical bias, which is the potential error that arises from not confronting an individual with a real situation.<sup>63</sup> With hypothetical survey scenarios, there is no economic consequence to respondents who overstate or understate values. However, research indicates that private-good survey studies result in less hypothetical bias than studies in which public goods are valued, and one way to mitigate hypothetical bias is to ask a follow-up question.<sup>64</sup>

Within the scope of formal surveys are two specialized approaches: contingent valuation (CV) and conjoint analysis; both approaches use survey data from participants responding to hypothetical scenarios.<sup>65</sup> Contingent valuation involves surveying a sample population about the economic impact of an issue under a hypothetical situation. Conjoint analysis involves respondents ranking various attributes of a good or service by preference. Contingent valuation received increased interest as a method to esti-

mate damages subsequent to recognition of the government’s right to sue for natural resource damages under CERCLA; nevertheless, real estate valuation professionals have contested its validity as a real estate valuation technique. The National Oceanic and Atmospheric Administration (NOAA) organized a panel to address CV issues that resulted in a number of recommendations in designing CV surveys. The general recommendations include developing an appropriate sample type and size, minimizing nonresponses, conducting surveys face-to-face or over the telephone, pretesting survey effects, reporting and archiving survey details, and pretesting the CV questionnaire.<sup>66</sup> These general guidelines should be followed if a real estate valuation professional chooses to use contingent valuation surveys.

As stated in *Real Estate Damages*, third edition, “Informal market interviews with knowledgeable subjects often provide valuable information and have long been a staple of research.”<sup>67</sup> In addition to informal interviews, formal market interviews can be conducted. Jackson cautions that when conducting formal market interviews, “there are three important elements: selection of participants to be interviewed, development of unbiased information about the subject property and its environmental condition [or detrimental condition], and construction of a structured questionnaire and interview protocol.”<sup>68</sup> Jackson also notes that market interviews are “closely akin to what appraisers refer to as sales confirmation or verification interviews.”<sup>69</sup> They should not be considered the same however. USPAP Standards Rule 1-4 sets forth that “an appraiser must collect, verify, and analyze all information

59. *The Appraisal of Real Estate*, 15th ed., 188.

60. *The Dictionary of Real Estate Appraisal*, 6th ed., s.v. “survey.”

61. Bell, *Real Estate Damages*, 3rd ed., 53.

62. Thomas O. Jackson, “Surveys, Market Interviews, and Environmental Stigma,” *The Appraisal Journal* (Fall 2004): 300.

63. Bell, *Real Estate Damages*, 3rd ed., 53.

64. Champ, Moore, and Bishop, “A Comparison of Approaches to Mitigate Hypothetical Bias,” *Agricultural Economics Review* (October 2009): 166.

65. Bell, *Real Estate Damages*, 3rd ed., 53.

66. Kenneth Arrow et al., “Report of the NOAA Panel on Contingent Valuation January 11, 1993” (May 9, 2001): 29–32, available at <https://bit.ly/3q2SupC>.

67. Bell, *Real Estate Damages*, 3rd ed., 10.

68. Jackson, “Surveys, Market Interviews, and Environmental Stigma,” 304.

69. Jackson, “Surveys, Market Interviews, and Environmental Stigma,” 301.

necessary for credible assignment results.”<sup>70</sup> As such, a verification interview involves the confirmation of the details in a transaction, when necessary. For example, in a nondisclosure state this may involve verifying a sale price through a broker or another party involved in the transaction. With an environmentally contaminated property, verification may involve confirming the details of a noted deed restriction. Insights such as these can provide useful information in a real estate valuation professional’s overall analysis. When something does not appear valid in a data set, a simple phone call verification may help clear up any data concerns. In analyses that involve large data sets, such as regressions, the data verification and confirmation process can be extensive, necessitating substantial research.

### Literature Review

*The Appraisal of Real Estate*, fifteenth edition, states that “relying on published articles as a basis for a value opinion is not a recognized appraisal technique in the absence of independent investigation and verification of the accuracy of the market data and conclusions.”<sup>71</sup> This language may come across as misleading when used out of context, however. As a result, real estate valuation professionals might limit their approach in the development of an opinion. A literature review is an established real estate research method that is grounded in hermeneutics. *Hermeneutics* simply means “the art and science of interpretation.”<sup>72</sup> It is an approach practiced by numerous professionals in a wide variety of fields. For real estate valuation professionals, the practice of hermeneutics might start with texts such as USPAP. In addition to USPAP, the valuers may consult the accumulated large body of professional knowledge and literature.

The professional literature provides numerous market data studies, including those involving environmentally contaminated properties. Such

published market data studies can be used as part of the reconciliation process in an assignment, and as a starting point to help identify potential case studies. The professional literature serves as a resource that appraisers can use to expand their wealth of knowledge and provide a meaningful evaluation of environmentally contaminated properties.

Moreover, in conjunction with the techniques described in this article and throughout professional appraisal literature,<sup>73</sup> real estate valuation professionals can provide a meaningful evaluation of environmentally contaminated sites for a variety of intended uses. Some intended uses include litigation matters, tax appeal, lending, land use impact studies, environmental impact studies, insurance claims, and a variety of other instances.

### Professional Guidance on Environmentally Contaminated Sites

USPAP Advisory Opinion 9 (AO-9), “The Appraisal of Real Property That May Be Impacted by Environmental Contamination,” provides guidelines for real estate professionals appraising environmentally contaminated properties. USPAP Advisory Opinion 9 outlines ten relevant environmental contamination property characteristics, and characteristic nine relates to identifying environmental land use restrictions, i.e., “potential limitations on the use of the property due to the contamination and its remediation.”<sup>74</sup>

Advisory Opinion 9 is not the only guidance for real estate valuers. *The Appraisal of Real Estate*, fifteenth edition, *Real Estate Damages*, third edition, and *Appraisal Institute Guide Note 6, Consideration of Hazardous Substances in the Appraisal Process*, also offer advice and discuss methodologies for appraising environmentally contaminated properties.

70. Appraisal Standards Board, Standards Rule 1-4 in *Uniform Standards of Professional Appraisal Practice*, 2020–2021 (Washington, DC: Appraisal Foundation, 2020), Lines 518–519.

71. *The Appraisal of Real Estate*, 15th ed., 188.

72. See Bell, *Real Estate Damages*, 3rd ed. (Appraisal Institute, 2016), 8–9; and Valerie Malhotra Bentz and Jeremy J. Shapiro, *Mindful Inquiry in Social Research* (Thousand Oaks, CA: Sage Publications, 1998), 105.

73. Some of these appraisal techniques are recognized in *The Appraisal of Real Estate*, 15th ed., and *Real Estate Damages*, 3rd ed. The techniques include, and are not limited to, regression, paired sales, sale/resale, case studies, literature review, market trends, income and yield capitalization rate analysis, loss of use, project delay, and many more. While there are numerous techniques available to real estate valuation professionals, it is not necessary to use them all; some or even one technique can produce credible opinions in an assignment.

74. Appraisal Standards Board, Advisory Opinion 9 in *USPAP Advisory Opinions*, 2020–2021, Line 117.

Since some environmental characteristics require scientific expertise, and an appraiser is usually not an expert in the scientific aspects of contamination, it is acceptable for experts from other fields to provide the necessary information. Likewise, an appraiser may rely on assistance from appropriate agencies and regulators when assessing the effects, if any, of contamination on prices and market value.<sup>75</sup> Appraisers are not expected to have the knowledge or experience needed to detect the presence of contaminants or to measure their quantities or remediation costs. Nonetheless, an appraiser can gain the competence and skills needed to provide an opinion of the effects of the contamination on prices and market values by properly considering reports and data prepared by environmental specialists.<sup>76</sup>

Where environmental land use restrictions are part of the scope of an assignment, but restrictions do not exist, an appraiser should employ a hypothetical condition that is clearly conveyed to the intended user(s). This is similar to using hypothetical conditions or extraordinary assumptions to indicate that a property is free of contamination.<sup>77</sup> Depending on the scope of work developed in an assignment, such as a prospective highest and best use analysis, if there are land use restrictions inherent in any applicable codes, ordinances, and regulations, a real estate valuation professional should investigate whether there is a reasonable probability of a change relative to the subject property(ies) along with any timing and cost considerations related to potential change.<sup>78</sup>

Early professional appraisal literature covering detrimental conditions generally focused on environmental contamination issues.<sup>79</sup> As the discussion progressed, the Appraisal Standards

Board released USPAP Advisory Opinion 9 outlining applicable cost, use, and risk effects to consider when analyzing the impacts, if any, of environmental contamination; however, cost, use, and risk effect considerations are applicable to all detrimental condition studies.<sup>80</sup> The appraisal profession has acknowledged the consideration of cost, use, and risk effects in detrimental condition assignments, and the Appraisal Standards Board should consider developing new guidance that expands on the topic of environmental contamination assignments to all detrimental condition assignments.

### Cost Effects

Advisory Opinion 9 notes that “cost effects primarily represent deductions for costs to remediate a contaminated property”<sup>81</sup> [or detrimental condition]. In some cases, the seller is deemed the responsible party and funds the remedial plan. In others, the buyer will be left with the responsibility for funding or completing the cleanup to regulatory standards and in accordance with an approved remedial action plan.<sup>82</sup> When evaluating a contaminated property, costs such as remediation are deducted from the unimpaired value of the subject property if they are to be borne by the subject property or buyer, whereas costs borne by the seller or a party other than the subject property or buyer should not be deducted from the unimpaired value. An exception would exist in those locations or jurisdictions where the property owner owns the subsurface and contaminated media and has a contingent liability for the remediation if the principal responsible party has not indicated or demonstrated a willingness and/or the financial feasibility to perform the required remediation below regulatory requirements.<sup>83</sup>

75. Appraisal Standards Board, Advisory Opinion 9 in *USPAP Advisory Opinions*, 2020–2021, Lines 119–121.

76. *The Appraisal of Real Estate*, 15th ed., 185.

77. Appraisal Standards Board, Advisory Opinion 9 in *USPAP Advisory Opinions*, 2020–2021, Lines 23–28 and 134–135.

78. *The Appraisal of Real Estate*, 15th ed., 310.

79. For example, Peter J. Patchin, “Valuation of Contaminated Property,” *The Appraisal Journal* (January 1988): 7–16; Peter J. Patchin, “Contaminated Properties: Stigma Revisited,” *The Appraisal Journal* (April 1991): 167–172; and Peter J. Patchin, “Contaminated Properties and the Sales Comparison Approach,” *The Appraisal Journal* (July 1994): 402–409.

80. Bell, *Real Estate Damages*, 3rd ed. (Appraisal Institute, 2016), 22–27.

81. Appraisal Standards Board, Advisory Opinion 9 in *USPAP Advisory Opinions*, 2020–2021, Lines 162–164.

82. Thomas O. Jackson and Chris Yost-Bremm, “Environmental Risk Premiums and Price Effects in Commercial Real Estate Transactions,” *The Appraisal Journal* (Winter 2018): 49.

83. “Interim Guidance on Settlements with De Minimis Waste Contributors under Section 122(g) of SARA,” EPA (June 19, 1987).

As Jackson and Yost-Bremm note, “A remediation plan and approach is typically developed to site-specific, risk-based standards, which may vary depending on surrounding land uses and other factors.”<sup>84</sup> As such, environmental land use controls implemented by government agencies may have an influence on cost effects because they may dictate the type and level of remediation. Furthermore, uncertainties concerning responsibility for future costs are generally reflected in risk effects.<sup>85</sup>

### Use Effects

Advisory Opinion 9 states “use effects reflect impacts on the utility of the site as a result of the contamination”<sup>86</sup> [or detrimental condition.] For example, the Marshall Islands Nuclear Claims Tribunal awarded compensation in excess of \$1 billion to subject atolls where environmental land use restrictions limited the use of the atolls or radioactivity levels exceeded government standards as a result of the Bikini Atoll atomic bomb testing.<sup>87</sup> In that case, compensation was determined using the framework of a “loss of use” real estate damage model, where **market rent** × time = use effect.<sup>88</sup> Use effects, as a result of environmental conditions, may also be considered with an analysis of project delays, changes in highest and best use, changes to income, and so forth. In some instances, a use effect may be temporary, such as an evacuation, and others may be ongoing, such as a change in use.

### Risk Effects

Advisory Opinion 9 states that risk effects “are derived from the market’s perception of increased environmental [or detrimental condition] risk and

uncertainty.”<sup>89</sup> Risk effects include stigma, which is “an adverse effect on property value produced by the market’s perception of increased environmental risk due to contamination.”<sup>90</sup> Risk generally falls into three categories associated with the three stages of the remediation lifecycle: an uncertainty factor, a project incentive, and market resistance.<sup>91</sup> The risk effects related to the property’s environmental condition include “risks related to remediation requirements; unknown or uncertain costs; and other factors.”<sup>92</sup> Land use controls implemented by environmental agencies, therefore, may have a beneficial effect because the controls can reduce uncertainty. Nonetheless, the land use controls even after remediation may not result in a return to full market value, as market resistance may still be present.

In considering the three detrimental condition approaches, Appraisal Institute Guide Note 6 sets forth the following simple formulaic framework:

**Impaired Value** = Unimpaired Value  
 – Cost Effects (Remediation and Related Costs)  
 – Use Effects (Effects on Site Usability)  
 – Risk Effects (Environmental Risk/Stigma)

**Property Value Diminution** = Cost Effects  
 (Remediation and Related Costs)  
 + Use Effects (Effects on Site Usability)  
 + Risk Effects (Environmental Risk/Stigma)

**Impaired Value** = Unimpaired Value  
 – Property Value Diminution<sup>93</sup>

84. Jackson and Yost-Bremm, “Environmental Risk Premiums and Price Effects in Commercial Real Estate Transactions,” 49.

85. Thomas O. Jackson and J. Michael Sowinski Jr., “Institutional Controls and Contaminated Property Valuation,” *The Appraisal Journal* (Fall 2006): 330.

86. Appraisal Standards Board, Advisory Opinion 9 in *USPAP Advisory Opinions*, 2020–2021, Lines 165–166.

87. Randall Bell, “Radioactive Contamination of Nuclear Weapons Test Site,” in *Applications in Litigation Valuation: A Pragmatist’s Guide*, ed. Jeffrey A. Johnson and Stephen J. Matonis (Chicago: Appraisal Institute, 2012), 222–231.

88. Bell, “Radioactive Contamination of Nuclear Weapons Test Site,” in *Applications in Litigation Valuation: A Pragmatist’s Guide*, 230.

89. Appraisal Standards Board, Advisory Opinion 9 in *USPAP Advisory Opinions*, 2020–2021, Line 169.

90. Appraisal Standards Board, Advisory Opinion 9 in *USPAP Advisory Opinions*, 2020–2021, Lines 85–86.

91. Bell, *Real Estate Damages*, 3rd ed., 26.

92. Jackson and Sowinski, “Institutional Controls and Contaminated Property Valuation,” 332.

93. Appraisal Institute, *Guide Note 6: Consideration of Hazardous Substances in the Appraisal Process* (Chicago: Appraisal Institute, 2013, rev. 2020), 7, <https://bit.ly/2RLm8mN>.

## Conclusion

Numerous sites of concern have been identified by environmental agencies as well as contaminants of concern. Additional analytical frameworks and tools can help aid the real estate valuation profession in assignments involving contaminated properties. The term “environmental dead zones” (EDZs) describes a specific type of environmentally contaminated property—those environmentally contaminated areas with pathways to human exposure and “Class III” land use restrictions.

From a real estate professional’s standpoint, EDZs have defining characteristics that should

be considered when valuing an environmentally contaminated site or property suspected of being contaminated. Such considerations include categorizing sites and market data according to environmental land use restrictions, which may fall into three general classifications: Class I, activity restrictions, Class II, building restrictions, and Class III, occupancy restrictions. By categorizing environmental land use restrictions, comparisons among market data can be made and the condition of a subject property(ies) can be described, assisting in assignments involving the evaluation of environmentally contaminated properties.

## About the Author

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## Additional Resources

Suggested by the Y. T. and Louise Lee Lum Library

### Appraisal Institute Lum Library

- Knowledge Base Information Files—Real estate damages
- *Diminution Valuation Assignments: Enhance the Importance of Highest and Best Use* (Conference presentation, 2019)

### CCIM Institute—Articles and monographs on commercial property environmental issues

<https://www.ccim.com/search/?srchtext=environmental&gmSsoPc=1>

### US Environmental Protection Agency

- **Chemicals and Toxics Topics**  
<https://www.epa.gov/environmental-topics/chemicals-and-toxics-topics>
- **Cleanups at Federal Facilities, Land Use Controls**  
<https://www.epa.gov/fedfac/land-use-controls-lucs>
- **Laws and Regulations**  
<https://www.epa.gov/laws-regulations>
- **Report on the Environment: Land Use**  
<https://www.epa.gov/report-environment/land-use>
- **Superfund: Institutional Controls**  
<https://www.epa.gov/superfund/superfund-institutional-controls>