
Quantifying Diminution in Value Due to Detrimental Conditions: An Application to Environmentally Contaminated Properties

RANDALL BELL

Quantifying damages in a case involving diminution in value is an involved process, particularly when environmentally contaminated properties are involved. This article reviews the standard categories of detrimental conditions and the various fundamental issues that must be addressed in any assignment involving detrimental conditions. Next, the basic components of measuring diminution in value are introduced in formula form, along with a discussion of some of the unique aspects of analyzing environmentally contaminated properties. Finally, a case study is presented that illustrates the application of these methodologies.

There are a wide variety of detrimental conditions that can affect real estate values, ranging from temporary easements, to airport noise, to serious toxic waste, geotechnical issues, and natural disasters. Determining the value of a property unaffected by such conditions is a relatively straightforward process; however, determining the impact (or lack of impact) of a detrimental condition on value requires the application of specific formulas and procedures. Environmental contamination presents one of the most involved problems in the valuation of real estate; however, by utilizing appropriate methodologies, one can conduct a meaningful study of this issue.

CLASSIFYING DETRIMENTAL CONDITIONS

All of the dozens of detrimental conditions can generally be placed within ten standard categories. This is essential because each classification has unique patterns and attributes. Because conditions may vary

Randall Bell, MAI, is president of Bell & Associates, Inc., of Santa Monica and Laguna Niguel, California, specializing in valuation and diminution-in-value issues. He is a Member of the Appraisal Institute (MAI), holds an MBA from UCLA in Real Estate, and has testified as an expert witness on numerous occasions.

in the degree of impact on value, each situation must be independently analyzed. **Exhibit 1** sets forth each classification, along with graphs depicting the relationship between value and detrimental condition.

The quantification of damages can only be determined by compiling, verifying, and properly analyzing relevant market data and remediation costs. **Exhibit 2** summarizes the formulas for detrimental conditions. These two exhibits form the foundation for the valuation methodologies for detrimental conditions in general, including specific environmental conditions.

VALUATION OF PROPERTY DAMAGED BY A DETRIMENTAL CONDITION

The basic premise of measuring the value of a property damaged by a detrimental condition is to recognize all, or a combination of, six basic elements: (1) the value as if no detrimental condition exists; (2) the value when the detrimental condition occurs or is discovered; (3) the value when the condition is assessed; (4) the value when the condition is resolved or remedied; (5) the net present value of any residual or ongoing costs or losses; and (6) the effects of any negative market perceptions or adverse market reactions, sometimes referred to as "stigma." Each detrimental condition class has distinct graphic patterns that center upon the inclusion, noninclusion, timing, and impact of these six elements. These factors are illustrated in **Exhibit 3**, the Complex Detrimental Condition Model.

As Exhibit 3 indicates, the first step with any detrimental condition is to value the property as if it were a Class I Condition, where there is no detrimental condition. This is reflected as Point A. Upon the discovery of the detrimental condition, the value may fall to Point B. Some detrimental conditions require an assessment, such as a soils or engineering study. The value during this period is usually the lowest, as a potential buyer would likely require a very significant discount to entice him or her to purchase a property where the extent of damage is unknown.

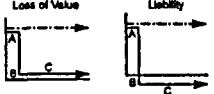
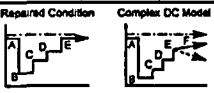
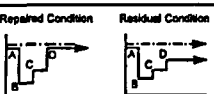
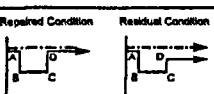
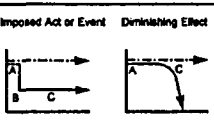
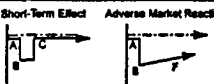
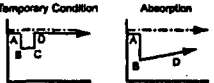
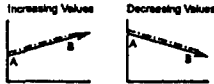
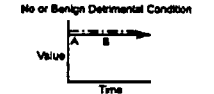
Upon the completion of a study, if in fact one is required, the value will generally increase to Point C. If repairs are required, then the value will increase to Point D upon completion. As expected, the cost of repairs is measured by Point D minus Point C.

Point E reflects the value of the property after considering the net present value of any ongoing conditions, such as absorption costs, monitoring wells, loss of utility, continuing oversight or maintenance, additional financing or insurance costs, and any restrictions on the property's use. In some conditions, an adverse market perception remains, which is indicated as Point F.

Exhibit 1. Impact of Detrimental Conditions on Real Estate Values

Class	Definition	Types of Conditions	Diminution in Value
I	No Detrimental Condition	Undisputed absence of detrimental issues	<i>Straightforward valuation</i>
II	Benign Condition	An act or event occurs, but has no effect on value	<i>Class III through X Conditions, where there is no impact on value</i>
III	Market Condition	The increase or decrease of value due to general market conditions	Economy Supply & Demand
IV	Temporary Condition	A short-term event	Absorption/Bankruptcy Construction Easement Deferred Maintenance Neighboring Construction
V	Indirect Condition	A non-real estate event that is perceived to affect the property value	Crime Scene/Legal Action Disease/Tragedy Riot/Civil Unrest Superstition
VI	Imposed Condition	An act or forced event that affects value	Bond or Tax Assessment Downzone/Historical Site Eminent Domain/Ground Lease Nuisance/Loss of View Power Lines - EMF/Easements Sewage or Power Plant Surrounding Use/Illegal Use Traffic/Airport Noise
VII	Super-Surface Construction Condition	A construction issue above grade	ADA Compliance Asbestos Construction Defect Lead Paint
VIII	Sub-Surface Construction Condition	A construction issue below grade	Drainage/Tunneling Grading/Cut & Fill Retaining Wall or Slope Soil Compaction
IX	Curable Environmental or Natural Condition	A natural occurrence or contamination issue that can be economically and physically remedied	Archeological Site Earthquake/Natural Disaster Endangered Species Expansive/Subsiding Soil Geotechnical/Flood/Landslide Groundwater Contamination Landfill/Radon Gas/PCBs Slope Instability/Settlement Soil Contamination/LUST Toxic/Hazardous Waste
X	Incurable Environmental or Natural Condition	A natural occurrence or contamination issue that cannot be economically or physically remedied	

Key to Graphs
 - - - - - Value With No Detrimental Condition
 - - - - - Value With Detrimental Condition
 A: Value Prior to Detrimental Condition
 B: Value Upon (Discovery of) Condition
 C: Value Upon Assessment of Condition
 D: Value Upon Condition Resolved/Repaired
 E: Value Upon On-Going Costs/Losses Resolved
 F: Adverse Market Reaction



The graphs illustrate the common characteristics of conditions that may impact values, but in no way are intended to quantify these issues. Exceptions do exist. © 1996 Randall Bell, MAI.

Exhibit 2. Basic Formulas for Detrimental Conditions

CLASS I	$V_I = I_o/R_o$, as if no DC
CLASS II	$V_{II} = V_I$
CLASS III	$V_{III} = [V_I \times (1-MT)] + NPV_{IR}$
CLASS IV	$V_{IV} = V_I - NPV_{TC} + NPV_{IR}$
CLASS V	$V_V = V_I \times (1 - CA) + NPV_{IR}$ or $V_V = NPV_{AC} + NPV_{IR}$
CLASSES VI-VII	$V = V_I \times (1 - CA) + NPV_{IR}$

CLASSES VII-X

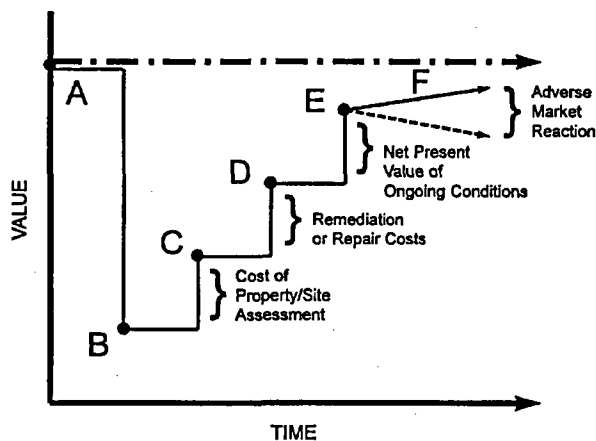
$$V = V_I - \{[PAC + (RC \times RRISK) + DR + NPV_{AC} + NPV_{OM} + NPV_{FI} + NPV_{RU}] \times [1 - AMR]\} + NPV_{IR}$$

Class IX, Where $V > 0$; Class X, Where $V \leq 0$

KEY TO FORMULAS

V	=	Value
I_o	=	Net Operating Income
R_o	=	Overall Rate, or Capitalization Rate
MT	=	Market Conditions Over Time
NPV_{TC}	=	Net Present Value of Costs of Loss of Utility from Temporary Condition
NPV_{IR}	=	Net Present Value of Insurance and Recoveries
CA	=	Condition Adjustment
PAC	=	Property Assessment Cost i.e., site assessments, phase I, phase II, intrusive testing, well monitoring, etc.
RC	=	Remediation or Repair Cost i.e., administrative & general, agency oversight, backfill, disposal, engineering excavation, insurance, legal oversight, miscellaneous, permits, remediation, repairs sampling & analysis, soil compacting, transport & hauling, treatment, trenching & backhoe, etc.
RRISK	=	Risk Factor to account for the uncertainties of future repair or remediation costs
DR	=	Demolition and Reconstruction Costs i.e., structure, landscape, paving, utilities, well site removal, etc.
NPV_{AC}	=	Net Present Value of Absorption Costs or Loss of Utility i.e., fixed operation costs, lost rents, tenant relocation, leasing commissions
NPV_{OM}	=	Net Present Value of Oversight and Maintenance i.e., operations & management program (O&M), periodic reviews, eventual repairs or remediation, reinstallation of wells, post-remediation monitoring, etc.
NPV_{FI}	=	Net Present Value of Financing and Insurance Cost Premiums
NPV_{RU}	=	Net Present Value of Restrictions on Use
AMR	=	Adverse Market Reaction a.k.a. onus, taint, stigma, negative residual perception, etc.

**Exhibit 3. Complex Detrimental Condition Model
(Classes VII to IX)**



**CLASS IX—CURABLE ENVIRONMENTAL
OR NATURAL CONDITION**

Class IX detrimental conditions involve environmental or natural conditions that may be economically and physically repaired. These include soil contamination, toxic and hazardous waste, archeological findings, endangered species, geotechnical problems, and others.

These detrimental conditions may involve a significant safety issue to the occupants of the property. If the detrimental condition can be fully assessed and repaired, the property value may return to the level prior to the condition having occurred. However, if a reasonable question remains as to the effectiveness of the repair or remediation, there may be a residual loss of value. Again, the impact on value involves the costs to clean up or fortify the site, any incidental costs, and any residual conditions.

Additionally, if the property is contaminated, there may be continued and justified concerns about problems and issues resurfacing. No governmental agency will irrevocably certify a site as "clean," even if the site has undergone remediation and has "site closure" status. In fact, once contaminated, a site is always on a "list" and, as a result, may be reexamined closely in the future. **Exhibit 4** shows the general flow of activity related to a contaminated site.

Even with site closure, the sale, refinancing, or new use of a property

will trigger a Phase I survey, which in turn could lead to a Phase II study. This, of course, could result in the governmental regulatory agency re-reviewing the property, with possible new political agendas or other factors that could have been altered since the previous site closure was issued. The net result is that a formally contaminated site has the possibility, however small in some cases, of being put through the site assessment and remediation process again and again.

While an environmental expert may have his or her concerns alleviated upon reviewing a specific situation, a nonengineer (such as a potential buyer or lender) will likely look at a formally contaminated property with skepticism, resistance, or outright contemptuousness. It is this ongoing concern that creates an adverse market reaction, which is sometimes referred to as a stigma, onus, taint, or impairment. This is caused by the general resistance to properties that have a history of problems, the fear of future liabilities or hidden cleanup costs, and the trouble factor of owning such a property.

CLASS X—INCURABLE ENVIRONMENTAL OR NATURAL CONDITIONS

Class X represents the most serious detrimental conditions, as the property may not be economically or physically remedied and, as a result, the property has lost considerable or all value. In some conditions, a property may be a liability if the condition creates a serious hazard or if the cost of repair exceeds the property value.

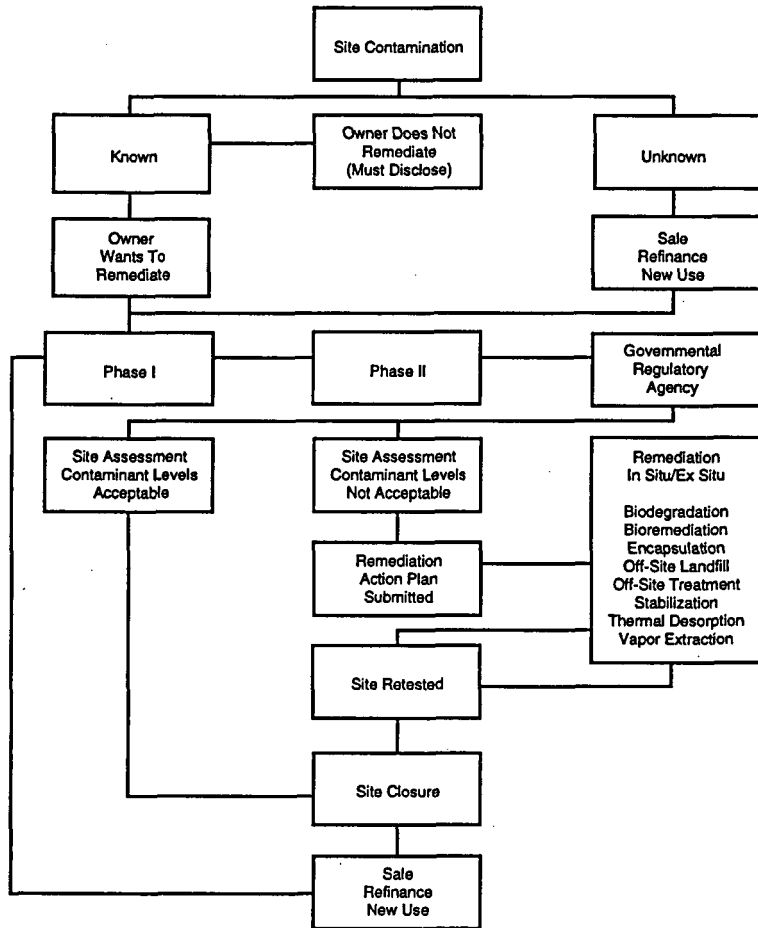
Class X detrimental conditions include contamination that is so serious that it poses a health hazard or the cost to remediate the site exceeds the property's Class I value. They also include problems that cannot be economically and physically repaired. In some situations, a Class X detrimental condition may be curable, but not by the property owner, for example, a condition stemming from a property belonging to another person or entity.

Graphically, Class X reflects a total or overwhelming loss in value when a condition is discovered. These situations are so severe that the property can become virtually worthless or even a liability if the costs to correct the detrimental condition exceed the property's Class I value.

CASE STUDY

The following case study illustrates the application of many of these concepts. (Please note that it is improper for an appraiser to identify contaminants or to estimate the extent of contamination, remediation costs, or the time frame for remediation; however, a competent appraiser will have the resources available to review such estimates for general reasonableness.) This case study involves a

Exhibit 4. Activity Flow for a Contaminated Site



building that was sold without the proper disclosure of an illegally installed underground storage tank (UST). The UST had been used to hold petroleum products but was later abandoned for that purpose and used for the storage of toxic waste from an industrial user. The UST was later removed; however, the contents of the UST had leaked into the soil and groundwater. Clearly, this is a Class IX or X detrimental condition.

The site assessment costs include all the costs associated with monitoring the site before and after remediation. (Site assessment during remediation can be included under that section.) They would include Phase I and II studies, soil and geotechnical studies, well removal and reinstallation, and other site monitoring costs. These costs are provided by the engineering firms, and because this work is common, these cost estimates are generally straightforward. In this example, the site assessment costs totaled \$214,418.

The remediation costs involve all costs associated with the actual cleanup and correction of the site. This could include a vast spectrum of costs, depending on the remediation method chosen. In this case, the remediation method chosen was excavation of the contaminated portions of the site, treatment of the soil by incineration, and disposal of treated soil in an approved landfill. The costs would include agency oversight, engineering, legal review, permits, sampling and analysis, backfill, and the actual remediation. Again, these costs are provided by the engineers of the firm contracted to conduct the remediation; however, very special care should be taken to review the completeness of such estimates, as it is not uncommon to greatly exceed original cost estimates in remediation issues. The firm providing the estimates should clearly set forth whether the costs are best-case, expected-case, or worst-case scenarios. This is important for the implementation of the next step.

As stated, remediation costs can exceed their original estimates. For this reason, a risk factor may be required to adjust remediation costs to reflect a true reasonable worst-case scenario. The premise for this adjustment is that the real estate market must have a sensible assurance that *all* possible remediation costs will be accounted for in the estimates provided. In this case, upon investigation it was determined that the remediation costs were based on an expected-case basis. When deposited, the engineers and technical experts stated that these costs could reasonably double. Based on this information, a 200-percent risk factor was applied to the remediation costs to reflect what costs may actually be incurred. It is important to note that the risk factor applied to the remediation costs relates to the hard costs of remediation and should not be confused with intangible losses, such as stigma. Informed potential buyers must have reasonable assurance that they have a clear indication of their potential cash liability; therefore, it is essential that the total remediation costs accurately reflect the total maximum reasonable cleanup costs, not just a cursory and optimistic estimate.

During the remediation process, there may be disruptions to the use of the property, which result in a loss of rental revenues or the

utility of the property. In this case, the remediation was expected to take 180 days. The tenant was willing to stay on the premises, not break the lease, and adjust its operations to accommodate the remediation process in return for receiving free rent during this period. Additionally, the landlord agreed to rent some storage yard areas in the area for \$25,000 to allow this tenant to continue its business operations. Operating expenses, which were paid by the tenant under the terms of a net lease, would also be paid by the landlord. These costs totaled \$254,930.

Contaminated or formerly contaminated sites may incur difficulty in obtaining financing. Lenders will generally not even consider financing a site that is yet to have contamination remedied and may be very reluctant to finance a property that has been remedied. This is usually due to the concerns related to governmental agencies not permanently certifying a site as "clean." This could result in an environmental review of the property, additional loan points, a higher interest rate, or a lower loan-to-value ratio. The net result is that the property owner may pay additional financing costs. In this case, a survey was conducted with numerous lenders, and based on site-specific characteristics, an additional financing fee of \$75,000 was considered appropriate.

A contaminated site may also incur restrictions in use. For example, the site may now be limited to industrial uses, even if it had been a commercial or residential use. In this case, the site was in the path of development of conversions from industrial to research and development space. Based on the imposed restriction that this site be used only for industrial purposes, the lost potential R&D use resulted in a \$250,000 loss. This was based on the premiums paid in the market for properties that could be converted to such a use.

At this point, the total costs and losses are subtotaled, and an adjustment is made for the overall adverse market reaction related to a contaminated or formerly contaminated property. This reflects the market's resistance to purchase such a property and associated fears when otherwise similar properties are available that have had no history of contamination.

Such losses can be documented from the market. Generally, less sophisticated buyers will often not purchase a site that has a contamination issue; however, there are investors that specifically target contaminated properties for purchase at a discount. The discount is provided as an incentive to purchase a property that may have additional and undiscovered contamination as well as the risk of new agency policies or intervention. In this case, interviews with such buyers indicated that a 15-percent discount would be appropriate;

Exhibit 5. Summary of Calculations

1	Value Unimpaired	12,600,000	12,600,000
2	Less Total Remediation & Related Costs:		
3	Site Assessment Costs		
4	Phase I	11,500	
5	Phase II	155,411	
6	Wells Operations & Mgt. (O&M)	29,235	
7	Reinstallation of Wells	<u>18,272</u>	
8	Subtotal		214,418
9	Remediation		
10	Agency Oversight	3,000	
11	Backfill	120,000	
12	Engineering	14,617	
13	Soils Removal	160,000	
14	Legal (Nonlitigation)	35,000	
15	Off-Site Treatment & Disposal	320,000	
16	Permits	7,500	
17	Sampling & Analysis	<u>15,000</u>	
18	Subtotal	675,117	
19	Remediation Inclusive of Risk Factor	200%	1,350,234
20	Improvement Demolition & Build-Back		
21	Demolition & Hauling	117,760	
22	Side Driveway	8,550	
23	Structure Reconstruction	896,000	
24	Utilities	<u>35,000</u>	
25	Subtotal		1,057,310
26	Absorption & Lost Rents or Utility		
27	Fixed Operating Expenses	29,264	
28	Lost Rents	200,666	
29	Tenant Relocation	<u>25,000</u>	
30	Subtotal		254,930
31	Additional Financing Costs	75,000	75,000
32	Restrictions on Use	250,000	<u>250,000</u>
33	Costs & Losses Before Adverse Market Reaction		3,201,892
34	Indicated Value Prior to Adverse Market Reaction		9,398,108
35	Adverse Market Reaction Adjustment	15%	<u>1,409,716</u>
36	Value, "As Contaminated"		7,988,392
37	Rounded	37%	8,000,000

however, this percentage may be higher or lower for other situations. This rate is applied to the overall property value to indicate a final value "as contaminated." The total losses attributable to the contamination are 37 percent of the Class I value. This figure is cross-referenced for reasonableness and is comparable with the percentage losses of other similarly contaminated properties. A summary of the calculations used in this case study is set forth in **Exhibit 5**.

CONCLUSION

Environmentally contaminated properties provide some of the most complex situations in real estate valuation. The starting point for such an assignment is to first have a general overview of the valuation of detrimental conditions. From that, the standard formulas may be applied, which address the basic components that result in the valuation "as contaminated." These are the cost of a full assessment, the cost of remediation, any ongoing conditions, and the adverse market reactions to such a property (stigma). Upon properly addressing these four categories of costs and losses, the value of a contaminated property may be fully and accurately assessed.

