A Pipeline Spill Revisited: How Long Do Impacts on Home Prices Last?

by Richard J. Roddewig, MAI, Charles T. Brigden, and Anne S. Baxendale

Abstract
The Trump administration has approved pipeline proposals and plans to open more offshore and Bureau of Land Management areas to oil and gas leasing. Consequently, appraisers may be asked more frequently to determine the effect of future pipeline ruptures on home prices. A 2001 article published in The Appraisal Journal investigated the effect of an April 2000 pipeline rupture, and resulting spill, on home sale prices along the Patuxent River in Maryland. That study looked at sales in one community impacted by the spill, Golden Beach, and studied sale prices during the first six months following the incident. The study concluded there was a 10.9% to 12.6% diminution in property values. However, since the sales data involved covered only the first six months following the spill, the authors recommended that further research be done to determine if the impact on prices extended beyond six months. The current study completes the additional research recommended by the authors of the 2001 Appraisal Journal article. The study analyses sales data between 1997 and 2008 using matched pairs and trendline analysis. The results confirm there was an impact on prices in the first eighteen months or so after the spill, but find that by 2002, following completion of shoreline cleanup, prices had rebounded, and there was no permanent impact on prices in subsequent years.

Introduction
In 2017, the Trump Administration promised to “unleash America’s $50 trillion untapped shale, oil, and natural gas reserves” through a series of moves, including opening of more offshore and Bureau of Land Management areas to production through leasing, repeal or easing of environmental regulations, and promotion of construction of pipelines and support infrastructure. Some of the administration’s first oil and gas initiatives involved pipelines. For example, President Trump signed an executive order to advance approval of the Keystone XL and Dakota Access oil pipelines, which would bring Canadian and North Dakota oil and gas to refineries in the Midwest and Texas. In the case of the Keystone XL pipeline, this action reversed the Obama administration’s November 2015 decision to deny construction approval. The US network of oil and gas pipelines is one of the most extensive in the world, consisting of more than 305,000 miles of interstate and intrastate natural gas transmission pipelines and an additional 190,000 miles of crude oil and refined petroleum product pipelines.

Spills and leaks from this pipeline network have been a concern for decades. One study found that more than 7.0 million gallons (168,000 barrels) of oil were spilled in more than...
1,000 pipeline incidents between January 2010 and mid-May 2015. While many of the spills were small, contained quickly, and cleaned up before any extensive impact on land or water resources, others were quite significant in terms of barrels of oil spilled and environmental impacts. One of the largest pipeline ruptures in recent years occurred in Marshall, Michigan, in July 2010. There, an estimated 20,000 barrels of heavy crude oil worked its way into Talmadge Creek and then into the Kalamazoo River, requiring cleanup in 35 miles of the river system.

While much of the public concern about oil and gas production and pipeline construction relates to environmental and climate change issues, some also involves concerns about the impact of spills on property values in communities where leaks and spills may occur. For example, in the wake of the Marshall, Michigan, Enbridge pipeline spill, a lawsuit alleging impact on property prices and values was filed by attorneys for a proposed class of more than 17,000 property owners affected by the spill and subsequent remediation along the Kalamazoo River.

**Pipeline Spills in the Real Estate Appraisal Literature**

Despite the concerns among property owners about the possible impact of pipeline spills on property prices and values, only two articles have appeared in *The Appraisal Journal* on the topic—the first in 1999 and the second in 2001.

The 1999 *Appraisal Journal* article by Simons studied sale prices paid for 218 homes either on or adjacent to a 30-mile pipeline easement in Fairfax County, Virginia, during 1985–1997. A March 1993 leak in the pipeline released 9,700 barrels of petroleum product in a surface spill. Some of the petroleum flowed into a creek and then into the Potomac River. Although “[v]ery few properties along the pipeline right-of-way were directly contaminated by the rupture, … a number of mostly residential downstream properties along the creek were impacted as the petroleum passed by their homes, some of which had to be evacuated.” In the aftermath of the leak, the pipeline company undertook extensive excavation testing of the integrity of the pipeline in the county over the next several years. The article reports the results of a regression analysis of sales data before and after the event. The study arrived at the following conclusions:

[S]ingle-family homes with easements along the Colonial Pipeline right of way located within two miles of a well-publicized, substantial pipeline rupture experience a loss in value of 4%–5% after the rupture, relative to comparable noncontaminated properties not on the pipeline. For the entire Fairfax pipeline corridor, based on the two studies along the Colonial Pipeline corridor, the conclusion is that same county single-family homes (with losses of 0.3%–1.4%) and townhouses (loss of 2.6%) with pipeline easements within 10 miles of a well-publicized, substantial pipeline rupture experience a loss in value of 1%–2% after the rupture, relative to comparable noncontaminated properties away from the pipeline right of way.

---


6. The US Chamber of Commerce has emphasized the overall safety of the pipeline system, stating, “[T]he fact is pipelines safely move oil all the time. A report from the American Petroleum Institute and the Association of Oil Pipe Lines finds that 99.999% of crude oil and petroleum products are safely delivered. In 2014, 9.3 billion barrels of crude oil were delivered—a 31% increase since 2010. While more oil has been transported, there have been fewer spills. ‘The number of pipeline incidents per year in public spaces (i.e., outside of operator facilities) have declined by more than half since 1999,’ the report notes.” Sean Hackbarth, “Arrests, Arson, and Anger: Anti-Energy Protesters Target North Dakota Pipeline,” US Chamber of Commerce, August 25, 2016, http://bit.ly/NDpipelines.


The 2001 Appraisal Journal article by Simons, Winson-Geideman, and Mikelbank analyzes the impact of a pipeline spill and subsequent cleanup effort on home prices in a study area encompassing 10 miles along both shores of the Patuxent River in Maryland. In April 2000, a 52-mile pipeline owned by Potomac Electric Power Co. (Pepco) and operated by Support Terminal Services (ST Services) ruptured and leaked an estimated 140,400 gallons of fuel oil into Swanson Creek near Chalk Point in Prince George County, Maryland about 40 miles southeast of Washington, DC. Some of the fuel oil subsequently flowed from the creek into the Patuxent River.

Simons, Winson-Geideman, and Mikelbank analyze single-family detached home sales data in the Property View database published by the State of Maryland and identify 2,295 sales in the study area for the period 1990–October 2000. Of those sales, 300 occurred after the impact of the spill was felt in the real estate marketplace and 35 of the 300 post-event sales involved “rights in waterfront property contaminated by oil.” The study methodology was described as a “predictive regression analysis,” comparing actual sale prices paid “post leak” to the sale prices predicted by the model for those same properties. The study concludes there was a 10.9% diminution in property value for non-waterfront single-family residential properties. The study also reports an average 12.6% reduction in value of waterfront single-family residential properties derived from three post-spill waterfront sales.

However, the Simons, Winson-Geideman, and Mikelbank research reported in The Appraisal Journal looks only at what happened in the study area market during the first six months following the April 2000 Pepco spill. Simons, Winson-Geideman, and Mikelbank indicate the adverse impact on prices found could be only temporary and recommend that “[a]n analysis should be conducted that quantifies the effects of the [Patuxent] oil spill on property values over time” since “[i]ntuitive judgment suggests that the impact from the spill may diminish, although it is too soon to conclude that it will, and if it does, how quickly.” They also recommend that “a comparable analysis of sales in similar markets in the Patuxomac River region” should also be done to determine if the impact they saw during the first six months was only temporary.

The current article investigates the questions raised but not answered in the Simons, Winson-Geideman, and Mikelbank article related to the 2000 Pepco pipeline break:

- First, was the impact of the Pepco Patuxent River spill on home prices temporary or permanent?
- Second, if the impact was temporary, how long did the impact on prices last?

15. The study selected May 15, 2000, rather than April 8, 2000, as the effective date of market impact in order “to allow for contract maturation” and to ensure that the post-spill transactions analyzed “were executed after the spill date.” Simons, Winson-Geideman, and Mikelbank, “Effects of an Oil Pipeline Rupture,” 413.
16. Simons, Winson-Geideman, and Mikelbank, “Effects of an Oil Pipeline Rupture,” 414. Of those waterfront property sales, only three involved properties with frontage on the water. The remaining thirty-two were in subdivisions where ownership of a lot carried with it the right to use the neighborhood association’s waterfront amenities, such as a beach/shoreline park, boat launch ramp, and/or a dock, etc.
17. Simons, Winson-Geideman, and Mikelbank describe the model specification as follows: “There are four types of variables: structural, neighborhood, date/time of sale, and environmental (affected by the oil spill). Structural variables include square feet, lot size, waterfront property status, unit age in 2000, central air, heat type, number of fireplaces, garage size, full and partial bathrooms, and additional structures (such as boat docks and pool houses). Neighborhood variables include median household income and a county dummy variable to account for differing school districts. Date variables account for the sales season and the year of sale. The environmental variable identifies those sales with rights in waterfront property contaminated by oil that sold after the May 15 cut-off date subsequent to the pipeline rupture.”
19. Simons, Winson-Geideman, and Mikelbank also suggest analyzing other property types and how they are affected by the spill, how property values in the proximity of impacted sites are affected, and analyzing any potential loss of liquidity (days on market, transaction volume, etc.).
In the course of answering those questions, trendline analysis is used for determining the impact of contamination and confirming the conclusions from the multiple regression model used by Simons, Winson-Geideman, and Mikelbank in their 2001 *Appraisal Journal* study of the Patuxent River situation.

**Pepco Pipeline Patuxent River Spill Incident**

Pipeline operator ST Services took four and a half hours to report the Swanson Creek leak in Prince George County and shut down pipeline transportation operations. During that time, the marshland in Swanson Creek became heavily oiled, although the spill seemed to be limited to the immediate area surrounding the Chalk Point power plant. Response crews were unable to contain the leak, however, as a storm moved through the area the day after the spill. This allowed the fuel oil to seep into the Patuxent River and flow downstream towards the Chesapeake Bay. Maps in Exhibit 1 depict the location of the generating station and spill site in relation to the Patuxent River.

**Investigation, Cleanup, and Monitoring Activities**

State and federal agencies were involved in the investigation and cleanup of the spill site, the marsh and shoreline areas along Swanson Creek, and the surface and shoreline areas extending 10 miles downstream along the Patuxent River.

Pepco took responsibility for the leak and cleanup from the onset, and it is estimated that the company spent over $70 million on cleanup efforts between April 7, 2000 and June 2002. In January 2002, The Marsh Assessment Subgroup issued its extent of oiling report, which described the total extent of oiling, and the location of oil relative to different shoreline habitats of the Patuxent River and its tributaries. The degree of oiling at various locations and in various habitats was categorized in the report as either light, moderate, or heavy.

Assessment of the situation was carried out by Shoreline Clean-up Assessment Teams (SCAT), using a combination of data gathered during field observations between April 13 and 24, 2000 and aerial photography of the affected area. The hardest-hit area was the approximately 3-mile stretch of Swanson Creek, which received heavy oiling from the Chalk Point spill.

Cleanup crews engaged in “boom deployment and maintenance, skimming and pumping of mobile oil, swabbing, trenching, pressure washing, raking and removal of oiled vegetation.”21 *The Baltimore Sun* reported 507 cleanup workers were in the field in April 2000 along with 17 vacuum trucks and 37 oil skimming boats.22 According to a report prepared by Entrix, Inc., the emergency response phase of the cleanup was completed on May 16, 2000, and the majority of river surface water oil reclamation cleanup also was completed by the same date.

Even after active cleanup was completed, Swanson Creek and Patuxent River marshes continued to require monitoring. A permanent boom was put in place to keep any additional oil from seeping out of Swanson Creek marshes into the Patuxent River. Pepco reported in 2010 that it was continuing to monitor subsurface sediments and shorelines for oil. In its 2010 *Annual Environmental Sustainability Report*, Pepco reported that “30 of the original 101 shoreline monitoring locations remain,” and they will continue to be monitored yearly.

**Local Awareness from Media Coverage, Litigation, and Fines and Penalties**

The spill and subsequent cleanup received extensive television and print media coverage. *The Baltimore Sun* ran a series of stories on the spill between April 2000 and December 2002. It reported as many as 100 waterfront property owners and fishermen sued Pepco for damages

---


related to the spill. Of those lawsuits, six were dismissed and the majority of the outstanding cases were settled. Additionally, eleven class action lawsuits were filed by fishermen, property owners, and others following the spill. Pepco and ST Services were fined $674,000 by the federal government for understating the amount of oil leaked from the pipeline and $2.7 million by the state and federal government for assessment of damages done to the environment. Further, a settlement with the state’s Department of the Environment required the two companies to pay an additional $1.95 million in civil penalties to be placed in the state’s oil and clean water funds. Fines allowed the local government to launch a $2.7 million restoration project on the Patuxent River in December 2002. These projects continued through 2004.

**Study Area in Previous Research on Effect of Patuxent River Pipeline Spill on Prices**

Two-thirds of the sales analyzed by Simons, Winson-Geideman, and Mikelbank are properties located within the community of Golden Beach, which is on the west shore of the Patuxent River, directly south of the pipeline spill site on Swanson Creek. Golden Beach is a census-designated place with a population of 2,665 reported in the 2000 census. It consists of a small housing development with a private beach, located within the larger postal designation of Mechanicsville. The location of Golden Beach in relation to the site of the Pepco pipeline spill is shown in Exhibit 2.

As previously noted, the Simons, Winson-Geideman, and Mikelbank study involved only sales that occurred in the first six months following the spill. It concluded there was a 10.9% diminution in property value for non-waterfront single family residential properties. The study also reported an average 12.6% reduction in

---


26. Dang, “Pepco Fined.”

value of waterfront single-family residential properties. That conclusion was based, however, on only three post-spill waterfront sales.28

**Generally Accepted Methods for Determining Oil Spill Impacts**

Over the past three decades, the appraisal profession has developed a set of generally accepted and recognized techniques for determining the impact of various types of environmental conditions and contamination and any associated environmental stigma on property prices, markets, and values.

The focus of much of the profession has been on environmental stigma during or following investigation and cleanup. Environmental stigma has been defined as “an adverse effect on property value produced by the market’s perception of increased environmental risk due to contamination.”29

The central source for determining the appropriate methods of the real estate appraisal profession related to stigma analysis are the courses, seminars, articles, and books related to the impact of detrimental conditions on prices and values. In the Appraisal Institute’s book Real Estate Damages, third edition, environmental conditions, including contamination, are a type of detrimental condition specifically recognized and discussed.30 The first version of this text, published in 1999, was entitled Real Estate Damages: An Analysis of Detrimental Conditions. It set forth a detrimental condition matrix and applied it to a variety of types of detrimental conditions (including environmental conditions and contamination) that potentially affect real estate markets and values. This model continues to be used today. It stresses that the impact of a detrimental condition has a life cycle, and as a result, the impacts on real estate prices and values can change over time.

The methods for determining the stigma impact from detrimental conditions, including environmental conditions,31 as set forth in the third edition of Real Estate Damages, include the following:

- Paired sales analysis, including sale/resale analysis;
- Analysis of impaired sales comparables, including analysis of market resistance;
- Neighborhood studies including trendline analysis;
- Proximity studies;
- Case study analysis; and
- Statistical studies including simple and multiple regression analysis and time series (trendline) analysis.32

---

31. Real Estate Damages, 3rd ed., classifies detrimental conditions into ten categories. Environmental conditions and contamination are characterized as “Class VIII Environmental and Biomedical Conditions” described as “Contamination, health and toxicity issues, i.e., spills, hazmat, asbestos (1979), lead paint (1978), mold, radioactive, metals, solvents, biological, hydrocarbons, plague, epidemic, etc.” (page 29).
Distinguishing Temporary from Permanent Impacts

Standards of professional appraisal practice and the peer-reviewed professional real estate literature recognize that the effect of environmental contamination on real estate prices and values can change over time and, when an impact does occur, it is typically temporary rather than permanent. For example, USPAP Advisory Opinion 9 (AO-9) recognizes value impacts can vary depending on the stage of remediation at which value is measured:

A contaminated property’s remediation lifecycle stage is an important determinant of the risk associated with environmental contamination. Environmental risk can be expected to vary with the remediation lifecycle stage of the property. (AO-9, Lines 88–89)

Mundy, in a 1992 article in The Appraisal Journal, was one of the first to clearly articulate how the real estate impact of contamination can change over time. He summarized the temporary impact of contamination as follows:

The impact a contaminating material has on the value of a property can be traced on a time continuum. Initially, a clean property has a value equal to full market value. In many cases a dirty (i.e., contaminated) property that is perceived as clean can also have a value equal to full market value. When the public, or an influential part of it, (e.g., a scientist, the media) becomes aware that a contaminated property poses a health or financial risk (either real or perceived), the property is transformed into a problem property, which will affect value.

When the market perceives a property as a problem, value will be significantly affected in several ways. A disclosure requirement by the sales agent or seller, concern on the part of the lender, and appraiser uncertainty all may have a noticeable effect on the marketability of the property. When a property loses its marketability, it also loses its value. Considerable uncertainty may occur at this stage as people involved in the transaction attempt to understand the magnitude of the problem.

When the problem is understood, uncertainty is lessened and the value of a property should then increase to a point at which the difference between its contaminated value and its market value is the sum of the cost to control plus any residual stigma. When the contamination is controlled, the value of the property would be expected to increase to full market value if the public believes scientists and public health experts.

Whether this actually occurs is debatable, however, because the public does not necessarily agree with the scientific community. This difference between cured value and full market value is the residual uncertainty caused by stigma, and should decrease with time as the public’s perception of risk subsides—assuming there is no further contamination.

The factor of persistence concerns the time between the onset of a problem and the decrease in stigma to the point at which full market value is again reached. The length of time is a function of the severity of the problem and varies with the type and amount of contamination, time to cure as well as how the cure is accomplished, media exposure, real and perceived health risk, and visibility, among other things.

Stigma can be especially high during the early stages of investigation of an environmental situation due to the uncertainty about the nature, severity and extent of the contamination. As Mundy states, the level of stigma typically decreases over time, and eventually ends once a remediation plan and program is in place or it is determined that no remediation is necessary. That typical pattern of a significant early impact on values followed by recovery has long been recognized by the appraisal profession. Exhibit 3 shows Mundy’s timeline and explanation of the six periods in how contamination affects property value.

There are some situations in which even after investigation and any required cleanup have been completed, some previously contaminated properties may suffer a diminution in value. This may also be true of some clean properties located in proximity to known contaminated property. However, stigma is not uniform and is not always present.

Each edition of Real Estate Damages has included a detrimental condition model that recognizes detrimental conditions have a life cycle that proceeds through an initial impact stage, an assessment stage, a repair stage, and finally to an ongoing stage. At each stage, cost, use, and risk factors can vary depending on the case-by-case circumstances. The impacts on real estate values can change, depending on the stage and the interplay between cost, use, and risk factors.

The Appraisal Institute’s 2001 seminar Appraising Environmentally Contaminated Properties: Understanding and Evaluating Stigma stressed that contamination impact on property markets can be either permanent or temporary. The seminar suggested that in many appraisal assignments it is essential to chart the date of appraised value by reference to the typical investigation and remediation cycle involving the property being appraised. Later editions of the seminar recognized the same principles.

Much of the appraisal literature also has recognized that contamination may have temporary rather than permanent effects. For example, Jackson, in his 2001 review of the real estate literature on the impact of various types of environmental contamination, concludes as follows:

In the residential studies, published from 1982 to 1999, adverse price impacts from these and other sources were identified by fifteen studies and no price impacts, or positive price effects, were found in four studies. With respect to the temporary or permanent nature of the impacts, eight of the residential studies indicated that the effect was temporary and three indicated a permanent effect. . . . In summary, the studies of environmental impacts on these properties generally indicate that there is an effect on prices but that this effect is temporary.”

The third edition of the Real Estate Damages also makes the following points that are particularly relevant to a review of the Patuxent River situation in the wake of the pipeline rupture:

The fact that a property is impacted by a detrimental condition does not automatically mean that it has a material impact on the property’s value. Detrimental conditions may or may not cause a material impact on value. Frequently, detrimental conditions have no material impact on value whatsoever.

Techniques to Determine Whether Price Impact of Patuxent River Contamination Was Temporary or Permanent

As previously mentioned, Simons, Winson-Geideman, and Mikelbank used multiple regression modeling in their 2001 analysis of the Patuxent River situation, and find a price impact between 10.9% and 12.6% during the first six months after the pipeline rupture. They conclude that additional research would be needed to determine if the price impact eventually ceased after the cleanup had been completed.


35. See Appraisal Institute, Analyzing the Effects of Environmental Contamination on Real Property, 2010, Part 3-35 to Part 3-37.

36. Thomas O. Jackson, “The Effects of Environmental Contamination on Real Estate: A Literature Review,” The Journal of Real Estate Literature 9, no. 2 (2001): 110. See also, for example, Brian H. Hurd, “Valuing Superfund Site Cleanup: Evidence of Recovering Stigmatized Property Value,” The Appraisal Journal (October 2002): 426–437; and Richard J. Roddewig, ed., preface to Valuing Contaminated Properties: An Appraisal Institute Anthology, vol. 2 (Chicago: Appraisal Institute, 2014), xviii, which states, “There is now a general understanding in the appraisal profession that any impact on prices and values can end long before remediation or cleanup is completed. When they do occur, impacts on prices and values are typically temporary, although the length of the temporary impact can sometimes be measured in years rather than weeks or months.”

This present article attempts to answer the following questions:

- Was the oil spill impact on home prices along the Patuxent River temporary or permanent?
- If temporary, how long did the impact on home prices last?
- Can any of the other generally accepted techniques for determining impacts from contamination be used to determine that impact and its duration?
- Do the results of the other techniques validate the results of the regression model used in the 2001 analysis by Simons, Winson-Geideman, and Mikelbank?

The current study uses paired sales analysis, including sale/resale analysis and various types of trendline analysis, to answer those questions. Jackson's 2003 Appraisal Journal article includes the following discussion of paired sales analysis as presented in the 1999 edition of Real Estate Damages:

Bell describes paired sales analysis as “one of the most useful applications of this approach (sales comparison approach),” where “the subject property, or similarly impacted properties, termed test areas, and unimpacted properties, termed control areas” are compared and “if a legitimate detrimental condition exists, there will likely be a measurable (and clearly discernable) and consistent difference between the two sets of market data; if not, there will likely be no significant difference between the two sets of data. This process involves the study of a group of sales with a detrimental condition, which are then compared with a group of otherwise similar market data without the detrimental condition.”

Sale/resale analysis is a form of paired sales analysis. In this analysis, the same property is compared to the sale and resale of a similar property or a group of similar properties to understand differences in changes in market price or value due to factors affecting one of the pairings but not the other. Trendline analysis (a variant of times series analysis) is another form of paired sales analysis. In this analysis, prices over time are plotted in a time series (linear) graph presentation. Trendline analysis can be presented in a variety of formats, either as a simple linear or curvilinear regression model plotting prices against date of sale, or in a presentation of average or median prices on a weekly, monthly, quarterly, or yearly basis. It can be used to compare price trends in a potentially affected neighborhood to another neighborhood, or in the case of detrimental conditions including oil spills, to compare prices paid over time in the impacted area to prices paid in a control area.

Golden Beach Sale/Resale Analysis, Price Appreciation

For this case study, the research first investigated whether any of the homes that sold in 2000 in Golden Beach after the date of the April 2000 spill and included in the Simons, Winson-Geideman, and Mikelbank 2001 analysis were resold again in the years following the Pepco spill. Five such resales since 2000 were found. None of the resales involved the three Golden Beach directly oiled waterfront properties in the 2001 analysis. The first sale prices and second sale prices were compared to determine the compounded annual rate of appreciation. The compounded rate of price appreciation in Golden Beach was then compared to price increases demonstrated by sale/resale of homes in unoiled riverfront communities. The sale/resale transactions in Golden Beach are shown in Exhibit 4. All Golden Beach properties appreciated in price following the pipeline spill. Three of the five properties experienced significant double-digit compound annual growth.

40. The Dictionary of Real Estate Appraisal, 6th ed. (Chicago: Appraisal Institute, 2015), defines trend analysis as, “A quantitative technique used to identify and measure trends in the sale prices of comparable properties; useful when sales data on highly comparable properties is lacking but a broad database on properties with less similar characteristics is available. Market sensitivity is investigated by testing various factors that influence sale prices.” (page 236) See also, The Appraisal of Real Estate, 14th ed., 403.
41. The resale pairings were controlled to exclude comparisons involving significant renovation between sales.
The price appreciation rates in Golden Beach were then compared with price appreciation rates in two Potomac River communities, Wicomico Shores and Saint Clement Shores, that were not affected by the Patuxent River oiling event; these communities served as control areas. In these two unoiled Potomac River waterfront communities, eighteen homes were identified that sold in 2000 and later resold between 2003 and 2009. The control area sale/resale transactions indicated an average annual appreciation rate of 11.8% and a median appreciation rate of 12.9%, roughly comparable to the 12.2% annual average and 12.5% median compounded rate of appreciation in Golden Beach.

### Comparison of Golden Beach and St. Mary's County Prices per Square Foot Using Simple Polynomial Regression Model Trendlines

A simple polynomial regression model in Excel was used to compare Golden Beach and St. Mary's County prices paid per square foot between 1997 and the end of 2008. The database included 240 sales in Golden Beach and 7,439 sales in St. Mary's County outside of Golden Beach. The trendline resulting from the regression model is shown in Exhibit 5. This regression model does not appear to show any impact from the 2000 spill event. The "best fit" Golden Beach trend line price curve is slightly below the St. Mary's County trendline in 1998 and the first half of 1999 and then surpasses the price line in the rest of the county in early 2000 and continues to be above the county trendline for the duration of the analytical period. Note, however, the relatively low $R^2$ of each trendline—0.5998 for Golden Beach and an even lower 0.4644 for St. Mary's County. The $R^2$ for a regression model is one measure of how well the model explains the data. An Appraisal Institute course describes $R^2$ as a “mathematical representation of the proportion of the variation in $y$ [the dependent variable] accounted for by the independent variables” (Simons, Winson-Geideman, and Mikelbank, 2001). The trendline for St. Mary's County excludes the sales that occurred in Golden Beach.

#### Exhibit 4 Sale/Resale Comparison, Golden Beach Home Price Appreciation

<table>
<thead>
<tr>
<th>Interior Observation No. *</th>
<th>Sale Year</th>
<th>Sale Price ($)</th>
<th>Difference ($)</th>
<th>Annual %</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2000</td>
<td>156,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2006</td>
<td>325,000</td>
<td>169,000</td>
<td>12.5</td>
</tr>
<tr>
<td>21/14</td>
<td>2000</td>
<td>110,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21/14</td>
<td>2010</td>
<td>137,000</td>
<td>27,000</td>
<td>2.2</td>
</tr>
<tr>
<td>16</td>
<td>2000</td>
<td>129,650</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>2009</td>
<td>199,000</td>
<td>69,350</td>
<td>4.7</td>
</tr>
<tr>
<td>19</td>
<td>2000</td>
<td>104,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>2003</td>
<td>173,000</td>
<td>68,800</td>
<td>17.8</td>
</tr>
<tr>
<td>15</td>
<td>2000</td>
<td>75,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>2006</td>
<td>276,900</td>
<td>201,900</td>
<td>23.7</td>
</tr>
</tbody>
</table>

Average compounded annual rate of appreciation 12.2
Median compounded annual rate of appreciation 12.5


† Observation numbers 21 and 14 both sold for $110,000 in 2000, therefore it was not possible to explicitly identify which observation was analyzed based on the information provided in the 2001 article.

The price appreciation rates in Golden Beach were then compared with price appreciation rates in two Potomac River communities, Wicomico Shores and Saint Clement Shores, that were not affected by the Patuxent River oiling event; these communities served as control areas. In these two unoiled Potomac River waterfront communities, eighteen homes were identified that sold in 2000 and later resold between 2003 and 2009. The control area sale/resale transactions indicated an average annual appreciation rate of 11.8% and a median appreciation rate of 12.9%, roughly comparable to the 12.2% annual average and 12.5% median compounded rate of appreciation in Golden Beach.

Note, however, the relatively low $R^2$ of each trendline—0.5998 for Golden Beach and an even lower 0.4644 for St. Mary's County. The $R^2$ for a regression model is one measure of how well the model explains the data. An Appraisal Institute course describes $R^2$ as a “mathematical representation of the proportion of the variation in $y$ [the dependent variable] accounted for by the independent variables” (Simons, Winson-Geideman, and Mikelbank, 2001). The trendline for St. Mary's County excludes the sales that occurred in Golden Beach.

---

42. Simons, Winson-Geideman, and Mikelbank state that the data used in their study is from the Property View database of the State of Maryland. In the current study, the sales data for Golden Beach, the other individual communities, and St. Mary's County are from the Mid-Atlantic Region multiple listing service (MRIS). The MdProperty View database from the Maryland Department of Planning, used in the 2001 analysis, could not be used because the department's user's manual states sales before 2001 are no longer available online, see http://bit.ly/Mdpropertyview. The same filters are used here as in the 2001 study, which included only detached, single-family homes but excluded homes on lots larger than 5.0 acres and homes selling for less than $40,000 or more than $400,000; all prices less than $40,000 and greater than $400,000 have been indexed in future years for inflation at 2.5% per year. To conform with the filters used by Simons, Winson-Geideman, and Mikelbank, sales that did not show home size square footage have been excluded as well as sales with square footage of less than 770 square feet or greater than 3,000 square feet, and sales indicating the home was built more than 100 years ago. The trendline for St. Mary's County excludes the sales that occurred in Golden Beach.
A Pipeline Spill Revisited: How Long Do Impacts on Home Prices Last?

At

www.appraisalinstitute.org
Winter 2018 • The Appraisal Journal

43. Appraisal Institute, Quantitative Analysis (Version PCS02GDCH-D) (2012), Part 10-286. It has been described in simpler terms as, “One of the measures of how well the model explains the data is the $R^2$ value. Differences between observations that are not explained by the model remain in the error term. The $R^2$ value tells you what percent of those differences is explained by the model. An $R^2$ of .68 means that 68% of the variance in the observed values of the dependent variable is explained by the model, and 32% of those differences remains unexplained in the error term.” “Regression Analysis” (PowerPoint presentation, state agency staff workshop, “System Level Fiscal Capacity for Funding Education in Tennessee,” Tennessee Advisory Commission on Intergovernmental Relations, February 24, 2005), http://bit.ly/r-squared.
The average price of only $116,269, or 30% less than the prices paid before the spill event.

The table in Exhibit 7 appears to confirm that the temporary impact of the pipeline rupture on Golden Beach prices extended into 2001, as evidenced by the following:

- In the pre-spill period between 1997 and 1999, the average price of a home in Golden Beach was 83% of the average price of all other homes sold in St. Mary’s County and 91% of St. Mary’s County prices in 1999, the last year before the pipeline incident. However, in 2001, the first full year after the spill incident, that ratio dropped to 80%.
- From 1999 to 2001, the average price paid in Golden Beach dropped by 6.85% while rising by 2.91% in the rest of St. Mary’s County as a whole, demonstrating a potential pipeline impact in 2001 of about -9.8%.
- In the three pre-spill years 1997 to 1999, the compounded annual rate of home price appreciation in Golden Beach was 4.93%. Projecting the 1999 Golden Beach average price forward to 2001 at a 4.93% rate indicates the expected average price—if pre-spill appreciation had continued—in 2001 would have been $147,845, compared to an actual average price of only $125,087, which was about 15.4% less than what would have been expected.

However, the average home price data also indicates that by 2002, the impact of the pipeline spill on Golden Beach prices had ended, and that the Pepco spill had no permanent adverse impact on Golden Beach home prices, as evidenced by the following:

- The average price of a Golden Beach home surged by 37% from 2001 to 2002 compared to only a 5.0% increase in the rest of St. Mary’s County.
- The 1997 to 2008 annual average price trendline for Golden Beach tracks closely with the price trendline for St. Mary’s County as a whole, both before and after the Pepco spill in 2000. This is an indication that the Pepco spill and subsequent investi-
The average price differential between Golden Beach and St. Mary’s County (excluding Golden Beach) in the three years before the spill was 83% and from 2002 (more than 18 months post-spill) to 2008 actually improved to a 92% average.

The average price of a Golden Beach home increased approximately 6.92% per year between 1997 and 2008, slightly higher than the 6.19% average increase in St. Mary’s County as a whole.

From 2001—the year with the most significant impact from the spill on Golden Beach prices—until 2008, the compounded annual price appreciation in Golden Beach was 10.69% compared to only 8.73% per year in St. Mary’s County as a whole.44

Comparison of Golden Beach and St. Mary’s County Prices per Square Foot

Home prices in the study area also were examined on a price per square foot basis. If the difference between prices paid in St. Mary’s County and Golden Beach is related to differences in the sizes of the homes, such a comparison would tend to eliminate some of that differential.45

The graph in Exhibit 8 compares the Golden Beach and St. Mary’s County (excluding Golden

44. Both Golden Beach and St. Mary’s County as a whole experienced a decrease in average home prices in 2008 as a result of the Great Recession. Although the decrease in prices in Golden Beach (-15.1%) was greater than in St. Mary’s County as a whole (-9.4%), the ratio of the average price in Golden Beach to the average price of the county was 91%, as high or higher than any of the three years (1997 to 1999) before the Pepco spill event. Nothing in the published media or online indicates that there was any additional investigation, remediation activity, or publicity involving the 2000 Pepco spill that could account for the differential drop in average prices in 2008.

45. The fourteenth edition of The Appraisal of Real Estate states as follows: “Appraisers use units of comparison to facilitate comparison of the subject and comparable properties. The sales should be analyzed to determine which units of comparison indicate the least amount of variance when applied to the comparable sales. This analysis will identify the proper unit of comparison to be used, such as price per acre or price per square foot, which is especially important for properties located in markets that are in transition.” (page 386) It goes on to note, “The variable with the least variation would be a likely candidate for the best unit of comparison.” (page 387)
Golden Beach) average annual prices on a price paid per square foot basis. Once again, the Exhibit 8 trendline shows a likely impact on home prices in Golden Beach in 2001. Prices paid per square foot dropped by about 6.8% from 2000 to 2001 in Golden Beach, while increasing by about 1.0% in St. Mary's County as a whole. However, the graph shows an increase in prices in Golden Beach in the year of the pipeline break. Once again, if prices are compared based on a signed contract price before and after the April 7 spill event, the results indicate an impact in the final nine months of 2000. The seven contracts signed in Golden Beach in 2000 before April 7 were at an average contract price of $102 per square foot compared to an average price of $98 per square foot in the thirteen contracts signed after April 7. That indicates an impact of about -4.0% in 2000 due to the spill and subsequent cleanup. That is significantly lower than the -30% impact found when analyzing signed contracts in 2000 based on absolute sale prices rather than price per square foot.

The price per square foot trendline in Exhibit 8 even more clearly shows that Golden Beach prices recovered rapidly in 2002 in the wake of the cleanup of the spill. The average price per square foot increased by 30% in Golden Beach in 2002 compared to an 11.6% increase in the rest of the county, and prices were 19% higher in Golden Beach than in the rest of the county, the highest differential in the entire eleven-year period shown. Between 2001—the year of the greatest spill impact on prices—and 2008, Golden Beach prices increased an average of 10.3% compared to only 8.3% in the rest of St. Mary's County.

To understand variations within each year, the price per square foot data was reviewed on a moving average trendline (Exhibit 9). The moving average trendline clearly shows a decrease in the average price in Golden Beach in the last quarter of 2000 and extending into 2001, followed by recovering prices in the second part of 2001.
2001. By the end of 2001, the Golden Beach moving average trendline was back to its pre-spill relationship to St. Mary’s County prices.\(^\text{46}\)

**Comparison of Golden Beach Prices and St. Mary’s County Riverfront Communities Not Affected by Pipeline Spill**

How does the price trendline in Golden Beach compare to other St. Mary’s County riverfront communities not on the Patuxent and therefore not affected by the Pepco pipeline spill? To address this question, shorelines were inspected along various inlets off the Potomac River on the west side of St. Mary’s County, and two communities, Wicomico Shores and Saint Clement Shores, were selected as control areas for comparison to Golden Beach.

The location of the control areas in relation to Golden Beach and the Patuxent River is shown in Exhibit 10. Exhibit 11 shows the location of the sales that occurred in Wicomico Shores and Saint Clement Shores between 1997 and 2008. The sale price trends between 1997 and 2008 in the two control areas compared to Golden Beach are shown in Exhibit 12.

The Exhibit 12 trendline for Golden Beach tracks quite closely with the control area trendline during the years between 1997 and 2007. The average price of a Golden Beach home increased 9.41% per year during those years while increasing 9.57% per year in the Wicomico Shores/Saint Clement Shores control area. In 2008, due to the nationwide housing market crash and Great Recession, prices in both Golden Beach and Wicomico Shores/Saint Clement Shores dropped. The 15.1% drop in prices in Golden Beach significantly exceeded the 3.69% drop in prices in the combined unoiled control area communities. Since there was no new media attention related to the April 2000 spill and no new spill investigation or remediation activity, the differential in price impact during the Great Recession must have been due to other factors at work in the respective communities.

When measured from 2001—the year of most significant average impact from the spill and subsequent cleanup—to 2007, prices in Golden Beach increased at a 15.69% compounded rate while increasing at an 11.81% rate in the combined control area communities. Even when

---

\(^{46}\) The large number of sales (7,255) in the St. Mary’s County database results in an evening out of peaks and valleys both in this graph and in the earlier average price per year graph. In contrast, the smaller number of sales (240) in Golden Beach during the same period results in peaks and valleys due to the smaller number of sales in each period.
measured from 2001 to the recession-affected year 2008, Golden Beach prices outperform the two control areas (10.69% compared to 9.46% annual compounded price appreciation).

As discussed earlier in this article, although the average price of a home in Golden Beach showed an increase in 2000 compared to 1999, that was due to prices paid in 2000 before the April 7 spill event. After April 7, signed contracts indicate a -30% impact due to the spill event. In contrast, prices in the Wicomico Shores/Saint Clement Shores control area increased by 6.28% from 1999 to 2000. Also in 2001, the average home price in Wicomico Shores/Saint Clement Shores increased by 10.33% while prices in Golden Beach declined by 8.78% compared to 2000.

The comparison between Golden Beach and the two control areas, like the comparison between Golden Beach and the rest of St. Mary’s County, again indicates that the impact of the Pepco spill and cleanup had ended by 2002.

Golden Beach home prices rebounded to an average of $171,200, a 36.9% increase over the average 2001 price. In contrast, the average price increased by only 5.6% in the two control communities. Also of note is the 110% ratio between Golden Beach and control area prices in 2002, higher than any year pre-spill and the highest of any year between 1997 and 2008.

The comparison of prices paid in Golden Beach and prices in the two unoiled control areas confirms the conclusions from the earlier comparison with St. Mary’s County as a whole, i.e., there was a significant impact on prices in 2000 and 2001, followed by a quick rebound in prices in 2002.

Measured on a price paid per square foot basis (Exhibit 13), the 6.8% decrease in prices between 2000 and 2001 in Golden Beach compared to the 5.1% increase in prices in the two control areas in the same years is an indication of a possible -11.9% impact on prices in Golden Beach in 2001 due to the Pepco spill. Again, however, the Exhibit 13 trendline shows a substantial rebound in 2002. Also of note are the ratios of Golden Beach prices to prices in the two control areas, which were at their highest levels in 2002 and 2003.
**Exhibit 11** Maps Showing Location of Wicomico Shores and Saint Clement Shores Home Sales

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
On a price per square foot basis, Golden Beach outperformed the two control areas whether measured between 1997 and 2008 (8.1% increase annually compared to 7.8%) or between 2001 (year of greatest spill impact) and 2008 (10.3% increase annually in Golden Beach compared to 9.1% in the control areas). Similar to what was seen in the analysis of prices paid per home, prices per square foot in 2008 decreased due to the housing crash and recession. However, when measured on a price per square foot basis, the recession appears to have had a greater impact in the Wicomico Shores/Saint Clement Shores control area (13.7% year-to-year decrease) than in Golden Beach (7.7% decrease from 2007 to 2008).

Note also the ratio of control area sale prices to Golden Beach prices. Prior to the 2000 spill year, the annual average price in Golden Beach was between 3.0% and 11% lower than the average price paid in the Wicomico Shores/Saint Clement Shores control area, and averaged 7.3% lower overall. In 2002 and 2003, the first two years after the spill impact ended, prices in Golden Beach were 7.0% and 8.0% higher than in the control areas, and between 2002 and 2008, Golden Beach prices were on average only 3.5% lower than in the control area, a better ratio than in the three pre-spill years.

The comparison of Golden Beach to other non-oiled riverfront communities in St. Mary’s County indicates the following:

- There was a temporary impact on prices in Golden Beach in 2000. When measured on a full year to full year comparison between 2000 and 2001, the analysis indicates a possible 11.9% impact from the April 7 spill event and subsequent investigation and cleanup in 2000.
- In 2001, when measured on an average price paid per home, there is support for a further 19.1% impact when the 10.3% average price increase in Wicomico Shores/Saint Clement Shores is added to the 8.8% decrease in the average price in Golden Beach.
- Prices rebounded dramatically in Golden Beach in 2002, and again in 2003, in comparison to the price rise in the combined control area. That confirms the conclusion from the comparison of Golden Beach to St. Mary’s County as a whole that the impact of
A Pipeline Spill Revisited: How Long Do Impacts on Home Prices Last?

The Pepco spill on prices was temporary and had ended by 2002.

- The trendlines, whether measured from 1997 to 2007 and 2008, or from 2001 to 2007 and 2008, also confirm there was no permanent impact on prices in Golden Beach from the April 7, 2000 pipeline rupture and the temporary impacts had ended by 2002.

Analysis of Sale Prices in Other Patuxent River Communities Lightly Oiled by Pepco Spill

Golden Beach was the closest community downstream from the Pepco pipeline spill on Swanson Creek. Golden Beach received considerable media attention because of the amount of oil it received. However, some communities farther down the Patuxent River were only slightly oiled or experienced only an oil sheen on the river. To determine if variations in the amount of oil or length of cleanup affected prices along the Patuxent, Hollywood Shores and Sandgates, two other Patuxent River communities, were studied. Hollywood Shores only received light oiling. Sandgates also received shoreline oiling; Sandgates is smaller than both Golden Beach and Hollywood Shores and was not specifically mentioned in the press.

The location of Hollywood Shores and Sandgates in relation to Golden Beach is shown on the map in Exhibit 14. The locations of sales between 1997 and 2008 in the Hollywood Shores and Sandgates communities are shown in the maps in Exhibit 15. The trendline graph in Exhibit 16 compares annual prices in Golden Beach to annual prices in the combined lightly oiled communities of Hollywood Shores and Sandgates.

Appraisal theory would suggest that prices in the lightly oiled communities on the Patuxent River would be less affected than prices in Golden Beach, the heaviest oiled riverfront community in the wake of the April 2007 pipeline rupture.

However, that does not appear to be the case. During 1997 through 1999, annual prices in Hollywood Shores/Sandgates were on average 8.3% lower than in Golden Beach. During 2002 through 2008—years in which the earlier analysis indicated Golden Beach prices were no longer temporarily lower than those in Hollywood Shores and Sandgates.
impacted by the April 2000 spill event—annual prices in Hollywood Shores/Sandgates were on average 6.4% lower than in Golden Beach. Although that might seem to indicate that the lightly oiled communities performed better than Golden Beach after the April 2000 Pepco spill event, the average 2002 to 2008 price ratio was significantly affected by the relatively high differential between the communities in 2004 when the combined Hollywood Shores/Sandgates average price was 11% higher than in Golden Beach. Excluding the year 2004 data, prices between 2002 and 2008 in the lightly oiled communities were on average 9.3% lower than in the heaviest oiled Golden Beach riverfront community, a price differential slightly lower than the average for the three years before the spill, 1997 to 1999.

This indicates that the impact of the April 2000 pipeline spill event was similar in both the heaviest and lightly oiled riverfront areas, and that the heaviest oiled community did not incur any significantly larger impact from the spill. As indicated earlier, home prices dropped by about 6.8% from 2000 to 2001 in Golden Beach. In the lightly oiled Hollywood Shores/Sandgates communities, home prices decreased by 8.4% from 2000 to 2001, slightly more than in Golden Beach. In 2002, both Golden Beach and Hollywood Shores/Sandgates rebounded quickly—increasing by 37% in heavily oiled Golden Beach and by 34% in the lightly oiled Hollywood Shores/Sandgates communities.

The trendline comparison in Exhibit 17, based on prices per square foot, also demonstrates that any effect from the April 2000 Pepco spill event and subsequent cleanup ended by 2002. With the exception of 2004, the trendlines are remarkably similar. Excluding 2004, the average price per square foot before the spill in 1997 to 1999 was 5.0% higher in Hollywood Shores/Sandgates than in Golden Beach, and from 2002 through 2008 (excluding 2004) was also 5.0% higher in Hollywood Shores/Sandgates than in Golden Beach.
Exhibit 15  Maps Showing Location of Hollywood Shores and Sandgates Home Sales
Exhibit 16  Golden Beach vs. Lightly Oiled Hollywood Shores and Sandgates Trendline, Price per Home

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale Price ($)</td>
<td>121,964</td>
<td>108,005</td>
<td>134,279</td>
<td>137,128</td>
<td>125,087</td>
<td>171,200</td>
<td>170,892</td>
<td>197,199</td>
<td>257,106</td>
<td>293,438</td>
<td>299,898</td>
<td>254,594</td>
</tr>
<tr>
<td>Golden Beach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hollywood Shores &amp; Sandgates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio*</td>
<td>0.91</td>
<td>1.01</td>
<td>0.83</td>
<td>0.88</td>
<td>0.88</td>
<td>0.86</td>
<td>1.03</td>
<td>1.11</td>
<td>0.93</td>
<td>0.87</td>
<td>0.89</td>
<td>0.86</td>
</tr>
</tbody>
</table>

*Lightly Oiled to Golden Beach

Exhibit 17  Golden Beach vs. Lightly Oiled Hollywood Shores and Sandgates Trendline, Price per Square Foot

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale Price/SF ($)</td>
<td>81</td>
<td>80</td>
<td>91</td>
<td>103</td>
<td>96</td>
<td>125</td>
<td>139</td>
<td>146</td>
<td>193</td>
<td>190</td>
<td>207</td>
<td>191</td>
</tr>
<tr>
<td>Golden Beach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hollywood Shores &amp; Sandgates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio*</td>
<td>1.04</td>
<td>1.13</td>
<td>0.99</td>
<td>0.96</td>
<td>1.05</td>
<td>1.01</td>
<td>1.05</td>
<td>1.33</td>
<td>1.03</td>
<td>1.12</td>
<td>1.04</td>
<td>1.02</td>
</tr>
</tbody>
</table>

*Lightly Oiled to Golden Beach
Summary and Conclusion

Given recent approval of pipeline proposals and plans to open more Bureau of Land Management and offshore areas to oil and gas leasing, appraisers may be asked more frequently in the coming years to determine the effect of future pipeline ruptures on home prices. A search of the published real estate appraisal literature reveals only two prior Appraisal Journal articles studying the impact of past pipeline spills on home prices. An article published in The Appraisal Journal in October 2001 investigated the effect of a pipeline rupture and resulting spill near the Pepco power station on the Patuxent River in Maryland. That study looked at sales in only one community impacted by the spill, Golden Beach, and studied prices only during the first six months following the incident. The study concluded there was a 10.9% diminution in property value for non-waterfront single-family residential properties. The study also reported an average 12.6% reduction in value of waterfront single-family residential properties; however this was derived from only three waterfront sales. Since the sales data involved in that study covered only the first six months, the authors recommended that further research be done to determine if the impact on home prices extended beyond six months.

The current study completes that additional research recommended by the authors of the October 2001 Appraisal Journal article. Data was collected and analyzed for sales between 1997 and 2008 using matched pairs and trendline analysis—two methods generally recognized in the appraisal profession for determining the impact of environmental conditions and contamination on property prices. The results of this follow-up research and analysis of home sales after the Patuxent River spill are as follows:

• The conclusions of Simons, Winson-Geideman, and Mikelbank are generally confirmed. Their 2001 Appraisal Journal article reported there was an impact on value in Golden Beach, the most heavily oiled community, in the first six months following the April 2000 pipeline rupture, and they find a 10.9% to 12.6% impact due to the Pepco spill.

• The paired sale analysis comparing sale/resale of five homes in Golden Beach to sale/resale prices of eighteen homes in two unoiled Potomac River waterfront communities indicates roughly comparable rates of appreciation between 2000 and later years.

• The polynomial regression model fails to indicate any impact from the April 2000 pipeline spill event. However, given the relatively low $R^2$, the model offers limited statistical significance.

• The trendline analysis of signed contract data in 2000 before and after the April 7 spill date indicates a possible -30% impact when measured based on contract sale prices. However, when taking into account differences in home size, the impact in 2000 following the pipeline spill was only -4.0%.

• The impact due to the spill and subsequent cleanup continued into 2001. When based on a comparison of expected 2001 prices given the 1997–1999 pre-spill price trends in Golden Beach, the impact was between 9.8% and 15.4%.

• The statement by Simons, Winson-Geideman, and Mikelbank that “(i)nuitive judgment suggests that the impact from the spill may diminish” was correct. The follow-up analysis of sales data post-spill indicates that if there was an impact, it was temporary and did not last past 2001. In 2002, prices in Golden Beach surged, increasing by 37% compared to only a 5.0% increase in the rest of the county. The ratio of the average home price in Golden Beach compared to the rest of the county in 2002 was at its highest at any point before or after the spill event and subsequent cleanup.

• There was no permanent impact to real estate prices along the Patuxent as a result of the Pepco spill. When measured over the entire 1997 to 2008 period of analysis, the Golden Beach average price trendline tracks well with the rest of the county. It also tracks well with average prices in two unoiled communities in St. Mary’s County not affected by the spill.

• There was no spill-related price impact in 2002 or later years once cleanup was completed.

• Although the study by Simons, Winson-Geideman, and Mikelbank did not specifically analyze the potential difference in impact from the pipeline spill and cleanup situation on heavily oiled versus lightly oiled riverfront communities, the current study looked at that issue. Contrary to appraisal theory, the analysis did not find significant evidence of any differential impact between heavily oiled and lightly oiled riverfront communities.

The study’s finding that there was no permanent impact, and that prices recovered in 2002 about two years after the Pepco spill and following completion of the cleanup of the pipeline spill, is significant for homeowners affected by future pipeline spills. Property owners who sell during the investigation and cleanup may suffer an actual out-of-pocket loss. Homeowners who have no plans or need to sell during the period of investigation and cleanup can wait out the period of temporary impact; they are likely to suffer no permanent impact on the price or value of their homes. This is in-line with what the published appraisal literature has found in many other contamination situations—impacts on prices and value are typically temporary and may end once remediation of the contamination situation is completed.

About the Authors

Richard J. Roddewig, JD, MAI, CRE, FRICS, is managing director with Jones Lang LaSalle Valuation & Advisory Services, LLC. Roddewig has almost forty years of professional real estate appraisal experience. He is currently licensed as a certified general real estate appraiser in more than twenty states and works both nationally and internationally on complex appraisal assignments, many of which involve expert testimony in litigation. His experience includes assignments in more than forty states, and preparation of expert testimony in many types of court cases at both the state and federal levels. He has authored, coauthored, edited, or contributed to fourteen books and has authored more than sixty articles in professional journals, including fifteen prior articles in The Appraisal Journal. He is a past winner of both the Sanders A. Kahn Award and the George L. Schumtz Award of the Appraisal Institute. Roddewig holds both an MS degree and a JD degree from the University of Chicago. Contact: Richard.Roddewig@am.jll.com

Charles T. Brigden, CRE, FRICS, is an executive vice president with Jones Lang LaSalle Valuation & Advisory Services, LLC, focusing on complex real estate analysis and litigation support. Brigden, a certified general real estate appraiser, works nationally out of Jones Lang LaSalle’s Chicago office on a wide variety of appraisal assignments focused on complex special-purpose properties; the impact of environmental conditions and contamination on prices, values, and markets; and the appraisal of historic properties and scenic land. He currently serves as the chair of the Midwest Chapter of The Counselors of Real Estate, and has been a presenter at the annual meetings of the Appraisal Institute. Brigden has an MS in real estate from the University of Wisconsin and is a candidate for the MAI designation of the Appraisal Institute. Contact: Charles.Brigden@am.jll.com

Anne S. Baxendale is a senior real estate analyst with Jones Lang LaSalle Valuation & Advisory Services, LLC in Chicago. Baxendale concentrates her appraisal work on analysis of large-scale market and transactional data using custom-built databases and geographic information system (GIS) technology. Much of her work involves data analysis to determine the impact of environmental conditions and contamination on real estate prices and markets. She holds a master of urban planning degree with a geospatial analysis and visualization certification from the University of Illinois at Chicago. Contact: Anne.Baxendale@am.jll.com

Acknowledgments

Some of our initial research to identify and replicate the sales database utilized in The Appraisal Journal’s October 2001 article, “The Effects of an Oil Pipeline Rupture on Single-Family House Prices,” authored by Robert A. Simons, Kimberly Winson-Geideman, and Brian A. Mikelbank, was funded by Enbridge Energy L.P. Subsequent research, data gathering, and analysis was self-funded by the authors.
Additional Resources
Suggested by the Y. T. and Louise Lee Lum Library

American Petroleum Institute—Natural Gas & Oil
http://www.api.org/oil-and-natural-gas

Appraisal Institute
• Guide Note 6, Consideration of Hazardous Substances in the Appraisal Process
  https://www.appraisalinstitute.org/assets/1/7/guide-note-6.pdf

• Lum Library, External Resources [Login required]
  • Information Files—Real estate damages/environmental hazards
  • Information Files—Real estate damages/proximity impact

Appraisal Standards Board
Advisory Opinion 9, “The Appraisal of Real Property That May Be Impacted by Environmental Contamination”

National Transportation Safety Board—Pipeline Accident Reports
https://www.ntsb.gov/investigations/AccidentReports/Pages/pipeline.aspx

US Energy Information Administration Independent Statistics and Analysis
https://www.eia.gov/

US Environmental Protection Agency—Environmental Topics
https://www.epa.gov/environmental-topics